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A
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Quantity PER ENGINE		SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
0,001		1 004	107.246.880.500	CONCEPT GUIDANCE Fuel Oil Treatment		107.246.880		0,001
		1 003	107.428.377.500	DISTILLATE FUELS CONCEPT GUIDANCE		107.428.377		0,001
		1 002	107.341.454.500	INSTRUCTION FOR FLUSHING		107.341.454		0,001
		1 001	PAAD363013	FUEL OIL SYSTEM HFO&MDO&MGO		DAAD134061		0,001

PAAD363014	Free space for lic.	Q-Code XXXXXX						Main Drw. H
		Standard ISO; JIS						
Modif.								
MaterialID	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date

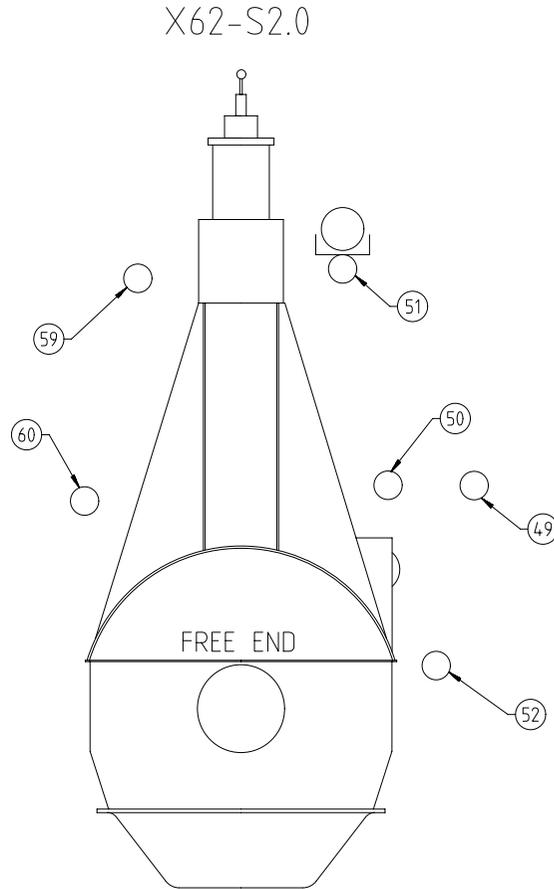
	Product W5-8X62-S2.0	FUEL OIL SYSTEM Brennstoffsystem
	Units mm kg NX	Basic Material

SURFACE PROTECTION SEE GROUP 0344	Made	19.08.2020	Sudant Deogade	Scale	-	Size	A3	Page	1/1	Material ID	
TOLERANCING PRINCIPLE ISO8015	Chkd	26.02.2021	jpi101 Pickup	Design Group	9723	Drawing ID	DAAD134062		Rev.	-	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	26.02.2021	mhu019 Hug								

Approved
DIM - DIMENSIONAL DRAWING - Confidential

SPECIFICATION which must be met:

⑥0 OUTLET - Heating medium for fuel oil trace heating
 - Connected to condensate manifold or thermal oil return



④9 INLET - Fuel oil
 Fuel oil quality at engine inlet: according to specification in Marine Installation Manual (MIM)
 Pressure at engine inlet: stopped engine: 10 bar
 running engine: 7-10 bar
 Volume flow: according to GTD
 Viscosity:
 - Viscosity for HFO: 10-20 cSt (recommendation: 13-17 cSt)
 - Viscosity MDO/MGO: 2-20 cSt
 Filtration:
 - At least one filter unit close to the engine inlet.
 - One filter unit with max. 10 micron (absolute, sphere passing mesh) in the fuel system (either in feed- or booster circuit)
 - Bypass filter in parallel to the main fuel oil filter with max. 25 micron (absolute, sphere passing mesh)
 Fuel change-over:
 - Max. temperature gradient during fuel change-over: 2 °C/min
 - Fuel amount on engine side: mentioned in table 1 on page 2.
 - Fuel amount on system side: according to project specific system layout.

⑤0 OUTLET - Fuel return
 - Normal operation condition: Returning to mixing unit.
 - During fuel change-over while engine is not in service: returning to service tank.

⑤1 OUTLET - Drain rail-unit (dirty)
 - Dirty fuel: Mixed drain (LO,FO) from rail-unit, not for re-use
 - Free flow by gravity to sludge oil tank or appropriate tank.
 - Pipe insulated and heated up (50-95 °C)

⑤2 OUTLET - Fuel return, pressureless (clean)
 - This pressureless fuel return consists of the following 2 types of clean fuel, namely:
 'Normal drainage'
 Expected (design) fuel return from the fuel pump and injection control side during normal operation.
 'Leakage'
 Unexpected fuel return from an emergency situation only (e.g. high pressure pipe damage).
 - Clean fuel must be collected in a drain tank (or appropriate tank) by gravity free flow
 - Piping must be insulated and heated (50-95°C)

⑤9 INLET - Heating medium for fuel oil trace heating
 - Connected to steam or thermal oil supply

1	008	PAAD100322	MIXING UNIT	DAAD031429		0,001	
QTY	SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
Free space for file						Q-Code XXXXXX Standard ISO; JIS	Main Drw.
Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number
		Product 5-8X62-S2.0		FUEL OIL SYSTEM HFO&MDO&MGO Brennstoffsystem			Net Weight 0,001
SURFACE PROTECTION SEE GROUP 0344		Made	21.02.2021 dki021 DH.Kim	Scale	-	Size	A2
TOLERANCING PRINCIPLE ISO8015		Chkd	26.02.2021 jpi101 Pickup	Design Group		Page	1/2
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	26.02.2021 mhu019 Hug	7273	Material ID	DAAD134061	Rev. -

SYSTEM PROPOSAL - Main fuel oil supply and fuel oil treatment

Pos. ENGINE COMPONENTS *3)

EC01	Fuel rail unit
EC02	Fuel supply unit

Possible tank arrangements:

Option 1)
 HFO: 1 settling tank, 1 service tank
 LSHFO: 1 settling tank, 1 service tank
 MDO: 1 settling tank, 1 service tank

Option 2)
 HFO: 2 settling tanks, 1 service tank
 LSHFO: 2 settling tanks, 1 service tank
 MDO: 1 settling tank, 1 service tank

Option 3)
 HFO & LSHFO combined 2 settling tanks
 HFO: 1 service tank
 LSHFO: 1 service tank
 MDO: 1 settling tank, 1 service tank

Pos. ENGINE CONNECTIONS *2)

49	INLET - Fuel oil
50	OUTLET - Fuel return
51	OUTLET - Drain rail-unit (dirty)
52	OUTLET - Fuel return, pressureless (clean)
59	INLET - Heating medium for fuel oil trace heating
60	OUTLET - Heating medium for fuel oil trace heating

Number of cylinders

			5	6	7	8
Main engine X62-S2.0 (RT rated)	power	(kW)	13425	16110	18795	21480
	speed	(rpm)	108			

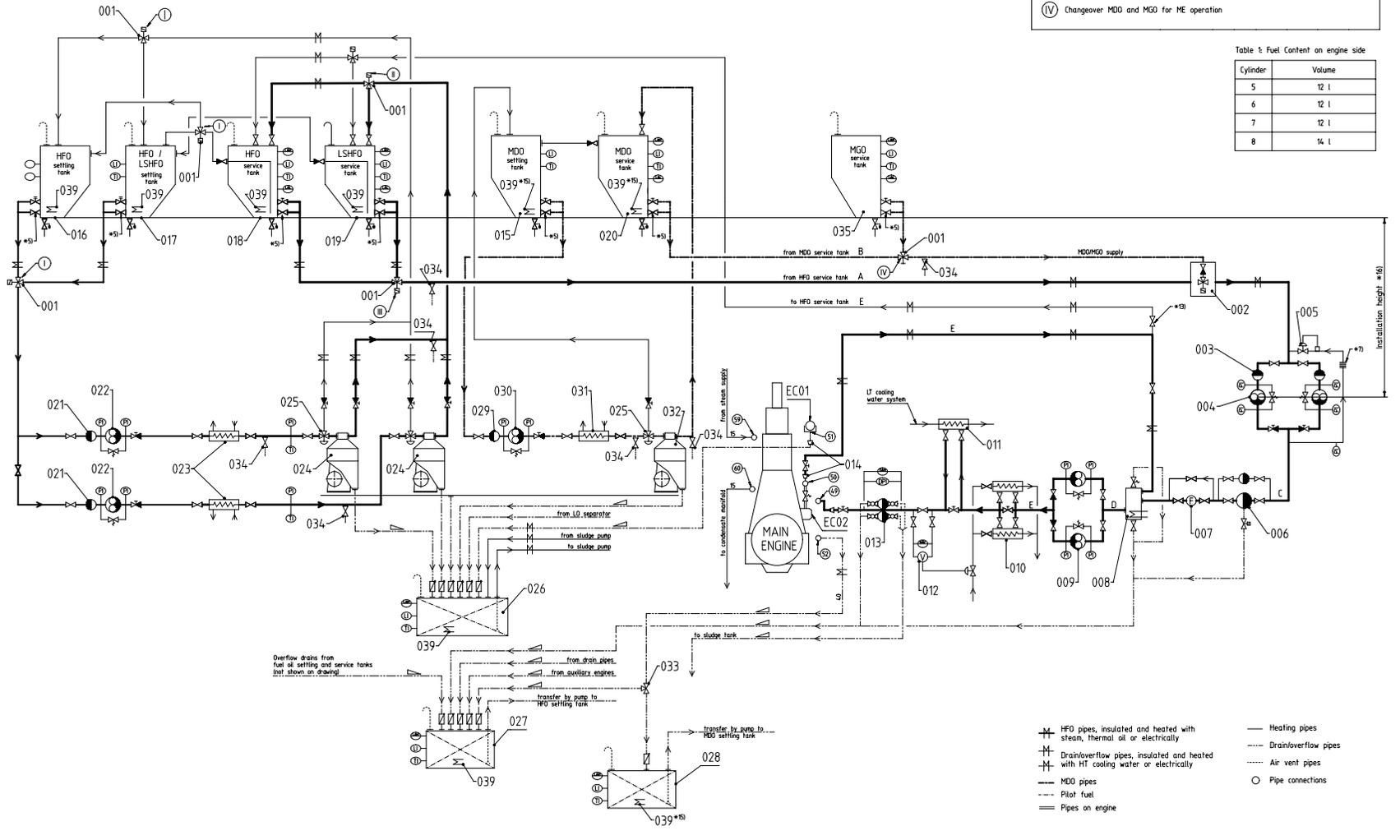
Proposal for dimensioning *4)

Mixing unit	volume	(l)	acc. to separate drawing			
HFO settling tank	volume	(m³)	21	25	30	34
HFO service tank	volume	(m³)	21	25	30	34
MDO settling tank	volume	(m³)	23	28	32	37
MDO/MGO drain tank *10)	volume	(m³)	2.3	2.8	3.2	3.7
Nominal pipe diameter	A	DN	50	50	45	65
	B	DN	40	40	40	50
	C	DN	40	50	50	50
	D	DN	65	80	80	80
	E	DN	50	65	65	65

- I Both valves to be interconnected
- II Changeover LSHFO and HFO for fuel treatment
- III Changeover LSHFO and HFO for ME operation
- IV Changeover MDO and MGO for ME operation

Table 1: Fuel Content on engine side

Cylinder	Volume
5	12 l
6	12 l
7	12 l
8	14 l



Pos. SYSTEM COMPONENTS *1)

001	Three-way valve, manually or remotely operated
002	Automatic fuel change-over unit
003	Suction strainer (mesh size acc. to pump suppliers requirement)
004	Low pressure feed pump
005	Pressure regulating valve
006	Automatic self-cleaning filter, 10 micron, heated (trace heating acceptable)
007	Flowmeter
008	Mixing unit, heated and insulated (according to separate drawing as linked on page 1)
009	High pressure booster pump
010	Fuel oil end-heater
011	MDO/MGO heat exchanger
012	Viscosimeter
013	Fuel oil filter, 25 micron, heated (trace heating acceptable)
014	Transition Piece (adapter) *10)
015	MDO settling tank, heated and insulated
016	HFO settling tank, heated and insulated
017	LSHFO settling tank, heated and insulated
018	HFO service tank, heated and insulated
019	LSHFO service tank, heated and insulated
020	MDO service tank
021	Suction strainer (mesh size acc. to pump suppliers requirement)
022	HFO/LSHFO separator supply pump, with safety valve
023	HFO/LSHFO pre-heater
024	Self-cleaning HFO/LSHFO separator *6)
025	Three-way valve, diaphragm operated
026	Sludge tank
027	Fuel oil drain tank *12)
028	MDO/MGO drain tank *10) *12)
029	Suction strainer (mesh size acc. to pump suppliers requirement)
030	MDO separator supply pump, with safety valve
031	MDO pre-heater
032	Self-cleaning MDO separator *6)
033	Three-way valve for switching between fuel drain tank and MDO/MGO clean leakage tank *8)
034	Fuel sampling cock *8)
035	MGO service tank
039	Heating coil

- Remarks
- All heaters to be fitted with thermometers, relief valves, drains and drip trays. Not shown on drawing.
 - Steam tracers on main engine are laid out for 7 bar saturated steam.
 - Air vent and drain pipes must be fully functional at all inclination angles of the ship at which the engine must be operational.
 - Overflow and drain pipes for fuel oil tanks are not shown

- *1) To be installed by the shipyard.
- *2) Refer to the "Pipe Connection Plan" for the execution and location of the engine pipe connections.
- *3) To be delivered by the engine manufacturer, i.e. already equipped on engine side.
- *4) All capacities and the given diameters are valid for the mentioned engine rating and serve just as an example. The given tank capacities are based on 8 h settling tank change-over intervals. To make the layout for the project specific rating please refer to design group 9730 "Fuel velocities and flow rates, recommended values for pipework of diesel plants". Rating specific flow rates are provided by GTU.
- *5) Valve to be kept closed during normal engine operation. For draining only.
- *6) Separator capacity related to viscosity; layout according to certified flow rate (CFR) recommended.
- *7) The return line must be fully exposed to air without any insulation and equipped with cooling ribs or other type of radiative cooler.
- *8) Recommended position for fuel oil sampling to check fuel oil quality.
- *9) Just to be applied if in addition to the fuel drain tank a separate tank for collection of clean MDO/MGO is installed to enable the switching between the different tanks depending on the fuel in use.
- *10) Installed as required (check with "Pipe Connection Plan").
- *11) The normal drainage rate of MDO/MGO is significantly higher than the normal drainage rate of HFO. Therefore during long-term operation on MDO/MGO the collection of clean MDO/MGO in a separate drain tank is highly recommended. Regarding the tank size we recommend a volume which is approx. 10% of the volume of the MDO/MGO service tank. The design volume of the MDO/MGO drain tank considers a combination of normal drainage and unexpected emergency leakage.
- *12) The tank inlet only to be equipped with a swing check valve to avoid inadmissible backpressure.
- *13) Close during normal engine operation.
- *14) A heating coil in the MDO tank is required when DMB is used. Target heating temperature: 40 °C.
- *15) The location of pump's installation must comply with the supplier's requirements by considering the relative height between the pump and the service tank, in combination with the pressure drop of the piping.

- HFO pipes, insulated and heated with steam, thermal oil or electrically
- Heating pipes
- Drain/overflow pipes
- Drain/overflow pipes, insulated and heated with HT cooling water or electrically
- MDO pipes
- Air vent pipes
- Pilot fuel
- Pipes on engine
- Pipe connections

WINGARD
 Manufacturer and Supplier

FUEL OIL SYSTEM
 HFO&MDO&MGO
 Brennstoffsystem

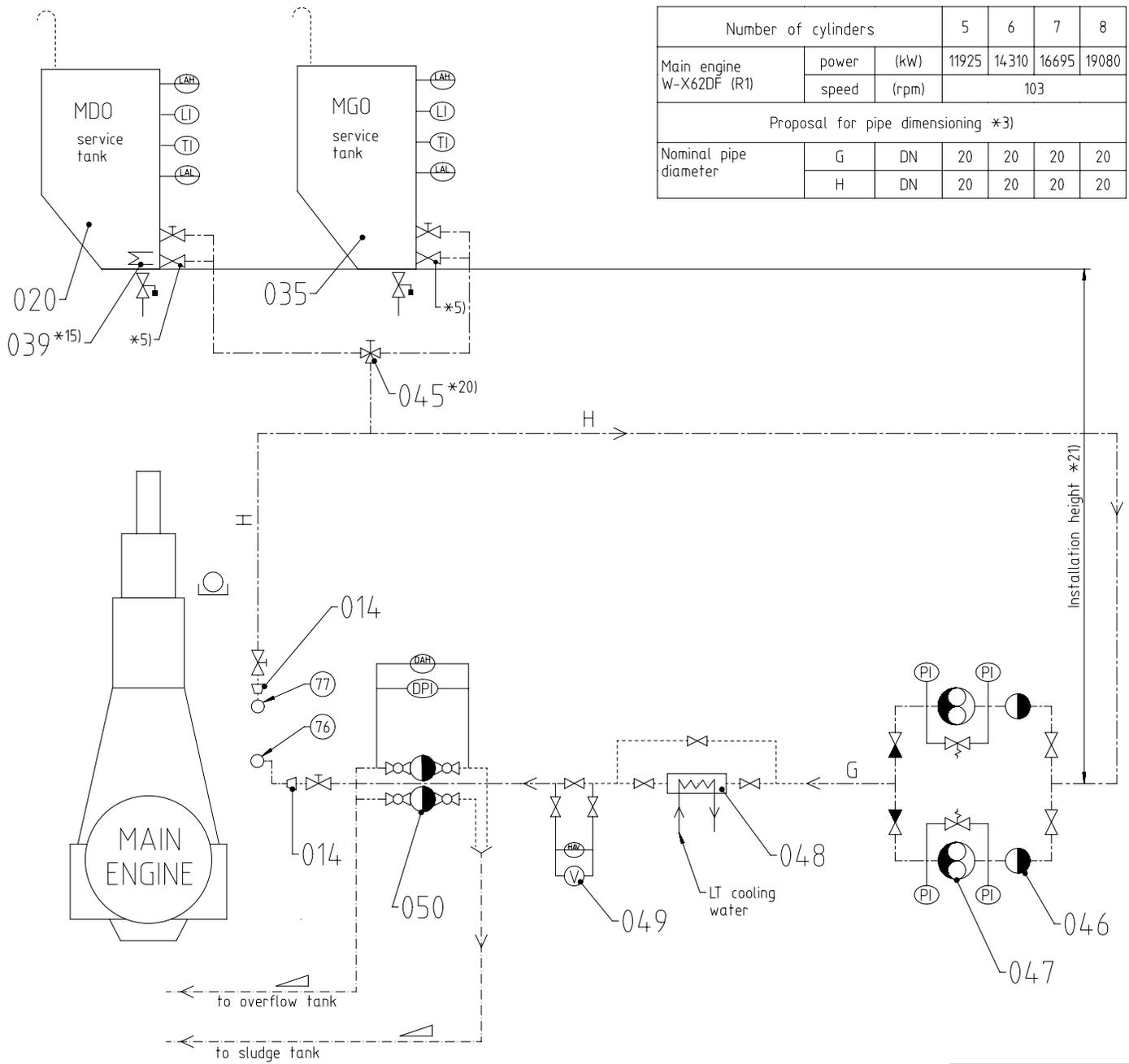
Scale: 1:20
 Date: 21.02.2021
 Drawing No: PAAD363013

SYSTEM PROPOSAL - Pilot fuel supply

Pos.	ENGINE CONNECTIONS *2)
76	INLET - Pilot fuel
77	OUTLET - Pilot fuel

Pos.	SYSTEM COMPONENTS *1)
014	Transition Piece (adapter) *10)
020	MDO service tank
035	MGO service tank
039	Heating coil
045	Three-way valve, pilot fuel supply, manually or remotely operated
046	Suction strainer (mesh size acc. to pump suppliers requirement)
047	Pilot fuel feed pump
048	Pilot fuel cooler and/or heater
049	Viscometer
050	Fuel oil filter, max. 10 micron (absolute, sphere passing mesh)

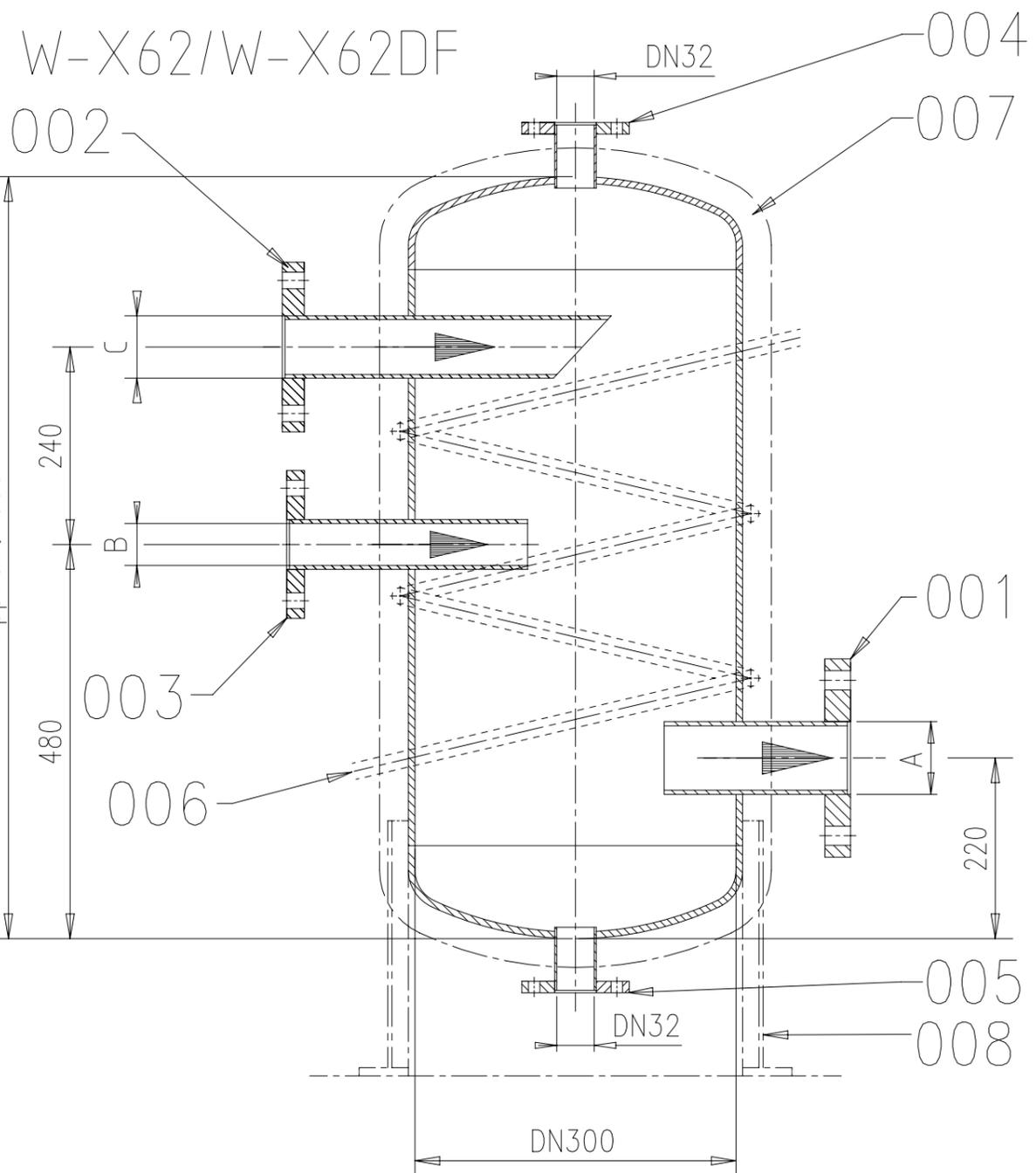
Number of cylinders		5	6	7	8
Main engine W-X62DF (R1)	power (kW)	11925	14310	16695	19080
	speed (rpm)	103			
Proposal for pipe dimensioning *3)					
Nominal pipe diameter	G DN	20	20	20	20
	H DN	20	20	20	20



Remarks

- Air vent and drain pipes must be fully functional at all inclination angles of the ship at which the engine must be operational.
- Overflow and drain pipes for fuel oil tanks are not shown
- *1) To be delivered by external supplier and to be installed by the shipyard.
- *2) Refer to the "Pipe Connection Plan" for the execution and location of the engine pipe connections.
- *3) All capacities and the given diameters are valid for the mentioned engine rating and serve just as an example. To make the layout for the project specific rating please refer to design group 9730 "Fluid velocities and flow rates, recommended values for pipework of diesel plants" Rating specific flow rates are provided by GTD.
- *5) Valve to be kept closed during normal engine operation. For draining only.
- *10) Installed as required (check with the "Pipe Connection Plan").
- *15) A heating coil in the MDO tank is required when DMB is used. Target heating temperature: 40 °C.
- *20) Only to be installed if different pilot fuel qualities are used to enable the changeover.
- *21) The location of the pump's installation must comply with the supplier's requirements by considering the relative height between the pump and the service tank, in combination with the pressure drop of the piping

Free space for file	Q-Code XXXXXX	Main Draw.
Standard ISO; JIS		
Modif. C	EAAAD089573	01.10.2018
Number	Drawn date	
D	EAAAD090034	08.07.2019
Number	Drawn date	
E	EAAAD091789	24.09.2020
Number	Drawn date	
F	EAAAD095177	21.10.2020
Number	Drawn date	
Product 5-8X62DF		FUEL OIL SYSTEM HFO&MDO&MGO Brennstoffsystem
Units	mm kg	NX
Basic Material		Net Weight 0,001
SURFACE PROTECTION SEE GROUP 0344		Made 29.07.2014 mhu019 M.Hug
TOLERANCING PRINCIPLE ISO8015		Scale - Size A2 Page 3/3 Material ID PAAD168254
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Chkd 16.01.2015 wwa008 Wang Design Group 9723 Drawing ID DAAD053320 Rev. F
		Appd 16.01.2015 bha009 Haag



Pos.	Description
001	Outlet
002	Inlet, return line
003	Inlet, from feed pump
004	Outlet safety valve
005	Drain
006	Heating coil
007	Insulation
008	Mounting brackets *1)

Remarks:

- Configuration and dimensioning of the mixing unit have to comply with the relevant classification society/rules.
- *1) Mounting brackets for fixation on floor plate. The mixing unit must not be fitted unsupported under any circumstances.
- *2) Shown on drawing.

Nominal pipe diameters (DN)

No. of cyl.	A	B	C
	DN	DN	DN
4	65	40	50
5	65	40	50
6	80	50	65
7	80	50	65
8	80	50	65

Capacity: 65 l
 Design pressure: 10 bar
 Service temperature: 150 °C

*2)

Free space for lic.	Q-Code	XXXXXX	Main Drw.
	Standard	ISO; JIS	

Modif.	A	EAAD087849	14.06.2017						
		Number	Drawn date			Number	Drawn date		



Winterthur Gas & Diesel

Product W-62

MIXING UNIT
TO FUEL OIL SYSTEM

Units	mm kg	NX	Basic Material	Net Weight	0.001
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SURFACE PROTECTION SEE GROUP 0344	Chkd	30.11.2012	ase06	A.Sekulic	Scale	-	Size	A3	Page	1/1	Material ID	PAAD100322
TOLERANCING PRINCIPLE ISO8015	Appd	30.11.2012	wvr001	Wroblewski	Design Group	9723	Drawing ID	DAAD031429		Rev.	A	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK												

MIDS_WinGD-X62-S2.0_FUEL-OIL-SYSTEM

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2021-03-01	DRAWING SET	First web upload

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