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		EXECUTIONS		
FUEL TYPE	MGO only with ≤ 0.1 % sulphur	X		
	MDO & MGO only		X	
	HFO & MDO & MGO			X

			Net Weight								
			0,001	0,001	0,001						
1	1	1	006	107.246.880.500	CONCEPT GUIDANCE Fuel Oil Treatment	107.246.880					0,001
1	1	1	005	107.428.377.500	DISTILLATE FUELS CONCEPT GUIDANCE	107.428.377					0,001
1	1	1	004	107.341.454.500	INSTRUCTION FOR FLUSHING	107.341.454					0,001
1	-	-	003	PAAD380491	FUEL OIL SYSTEM MGO only, int. pilot FO supply	DAAD142948					0,001
-	1	-	002	PAAD380487	FUEL OIL SYSTEM MDO&MGO only, int. pilot	DAAD142946					0,001
-	-	1	001	PAAD380484	FUEL OIL SYSTEM HFO&MDO&MGO, ext. pilot FO	DAAD142942					0,001

Quantity PER ENGINE	SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
		PAAD380498				Q-Code XXXXXX	Main Drw. H
		PAAD380497				Standard ISO; JIS	
		PAAD380495					

	Product W5-8X52DF-S1.0	FUEL OIL SYSTEM Brennstoffsystem
	Units mm kg NX	Basic Material

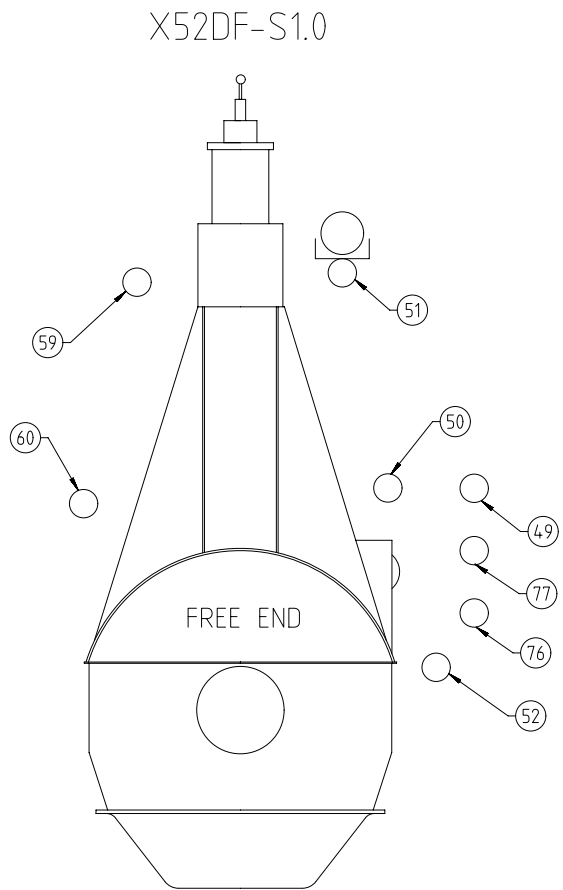
SURFACE PROTECTION SEE GROUP 0344	Made	20.04.2021 dki021 DH.Kim	Scale	-	Size	A3	Page	1/1	Material ID	
TOLERANCING PRINCIPLE ISO8015	Chkd	23.04.2021 jpi101 Pickup	Design Group		Drawing ID	DAAD142952	Rev.	-		
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	23.04.2021 mhu019 Hug		9723						

Approved
DIM - DIMENSIONAL DRAWING - Confidential

SPECIFICATIONS which must be met:

(76)	<p>INLET - Pilot fuel oil</p> <p>Fuel oil quality at engine inlet: MDO or MGO</p> <p>Pressure at engine inlet: 7.0 - 8.0 bar</p> <p>Volume flow: according to GTD</p> <p>Viscosity: - Viscosity MDO/MGO: 2-17 cSt</p> <p>Filtration: - One filter unit with max. 10 micron (absolute, sphere passing mesh) close to engine inlet.</p>
(77)	<p>OUTLET - Pilot fuel oil</p> <p>- Normal operation condition: Returning to pilot fuel feed pump</p> <p>- Back pressure at engine outlet: max. 1.5 bar(g)</p>

(49)	<p>INLET - Fuel oil</p> <p>Fuel oil quality at engine inlet: according to specification in Marine Installation Manual (MIM)</p> <p>Pressure at engine inlet: stopped engine: 10 bar running engine: 7-10 bar</p> <p>Volume flow: according to GTD</p> <p>Viscosity: - Viscosity for HFO: 10-20 cSt (recommendation: 13-17 cSt) - Viscosity MDO/MGO: 2-20 cSt</p> <p>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).</p> <p>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.</p>
(50)	<p>OUTLET - Fuel return</p> <p>- Normal operation condition: Returning to mixing unit.</p> <p>- Fuel oil change over while engine not in service: returning to service tank.</p>
(51)	<p>OUTLET - Drain rail-unit (dirty)</p> <p>- Dirty fuel: Mixed drain (LO,FO) from rail-unit, not for re-use</p> <p>- Free flow by gravity to sludge oil tank or appropriate tank.</p> <p>- Pipe insulated and heated up (50-95 °C)</p>
(52)	<p>OUTLET - Fuel return, pressureless (clean)</p> <p>- This pressureless fuel return consists of the following 2 types of clean fuel, namely: <u>'Normal drainage'</u> Expected (design) fuel return from the fuel pump and injection control side during normal operation. <u>'Leakage'</u> Unexpected fuel return from an emergency situation only (e.g. high pressure pipe damage).</p> <p>- Clean fuel must be collected in a drain tank (or appropriate tank) by gravity free flow</p> <p>- Piping must be insulated and heated (50-95°C)</p>
(59)	<p>INLET - Heating medium for fuel oil trace heating</p> <p>- Connected to steam or thermal oil supply</p>
(60)	<p>OUTLET - Heating medium for fuel oil trace heating</p> <p>- Connected to condensate manifold or thermal oil return</p>



Prod.	X52DF-S1.0																			
Change History	A	sde101	mhu019	01.09.2021	QMA000231	drawing updated				4	3									
	-	dk021	mhu019	23.04.2021		-				-	-									
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis		Approved	Activity Code	E	C									
WINGD		Winterthur Gas & Diesel		FUEL OIL SYSTEM HFO&MDO&MGO																
separate BOM available																	Dimension			
Scale	-	NX		Units [mm] [kg]	Basic Material		Net Weight		0.000											
SURFACE PROTECTION SEE GROUP 0344				Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and renounces these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.																
TOLERANCING PRINCIPLE ISO8015				Main Design		Design Group		9723		Q-Code		XXXXX		Standard		WDS				
GENERAL TOLERANCES ACCORDING TO ISO2768-mK				Qty per		A2		Item ID		PAAD380484		Drawing Page/s		1/3						

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)
(53)	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 X52DF-S10 (R1 rated)	power	(kW)	7500	9000	10500	12000
	speed	(rpm)	120			

Proposal for dimensioning *4)

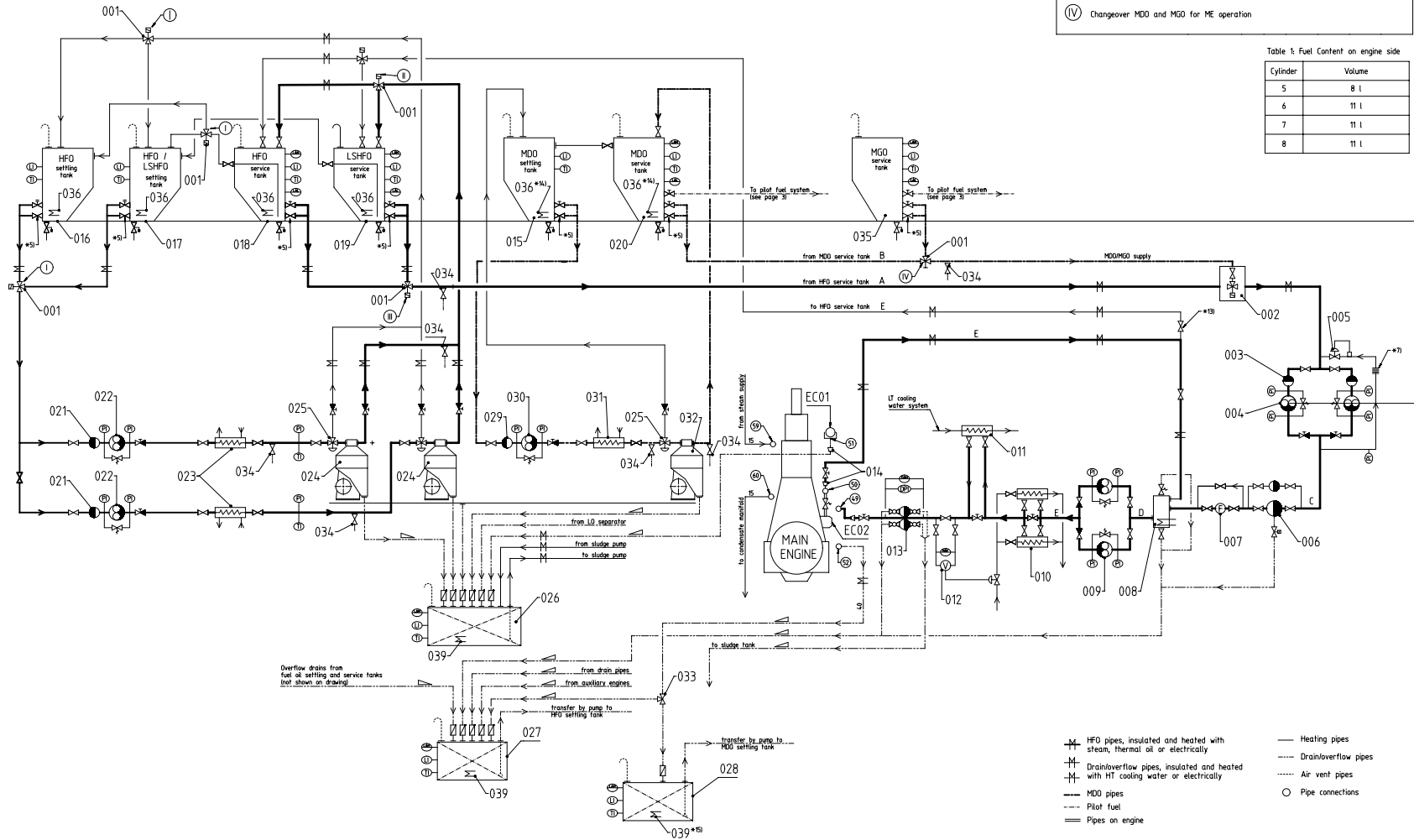
Mixing unit	volume	(l)	acc. to separate drawing			
HFO settling tank	volume	(m³)	12	14	16	16
HFO service tank	volume	(m³)	12	14	16	16
MDO/MGO service tank	volume	(m³)	12	14	16	16
MDO/MGO drain tank *11)	volume	(m³)	12	14	16	16

Nominal pipe diameter	A	DN	40	40	50	50
	B	DN	32	32	32	32
	C	DN	32	4.0	4.0	4.0
	D	DN	50	65	65	65
	E	DN	50	50	50	50

- 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	8 l
6	11 l
7	11 l
8	11 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	Viscometer
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 *11) *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 *9)
034	Fuel sampling cock *8)
035	MGO service tank
036	Heating coil

- All heaters to be fitted with thermometers, relief valves, drains and drip trays (not shown on drawing).
- Steam traces 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 GTD.
- *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 vent 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.

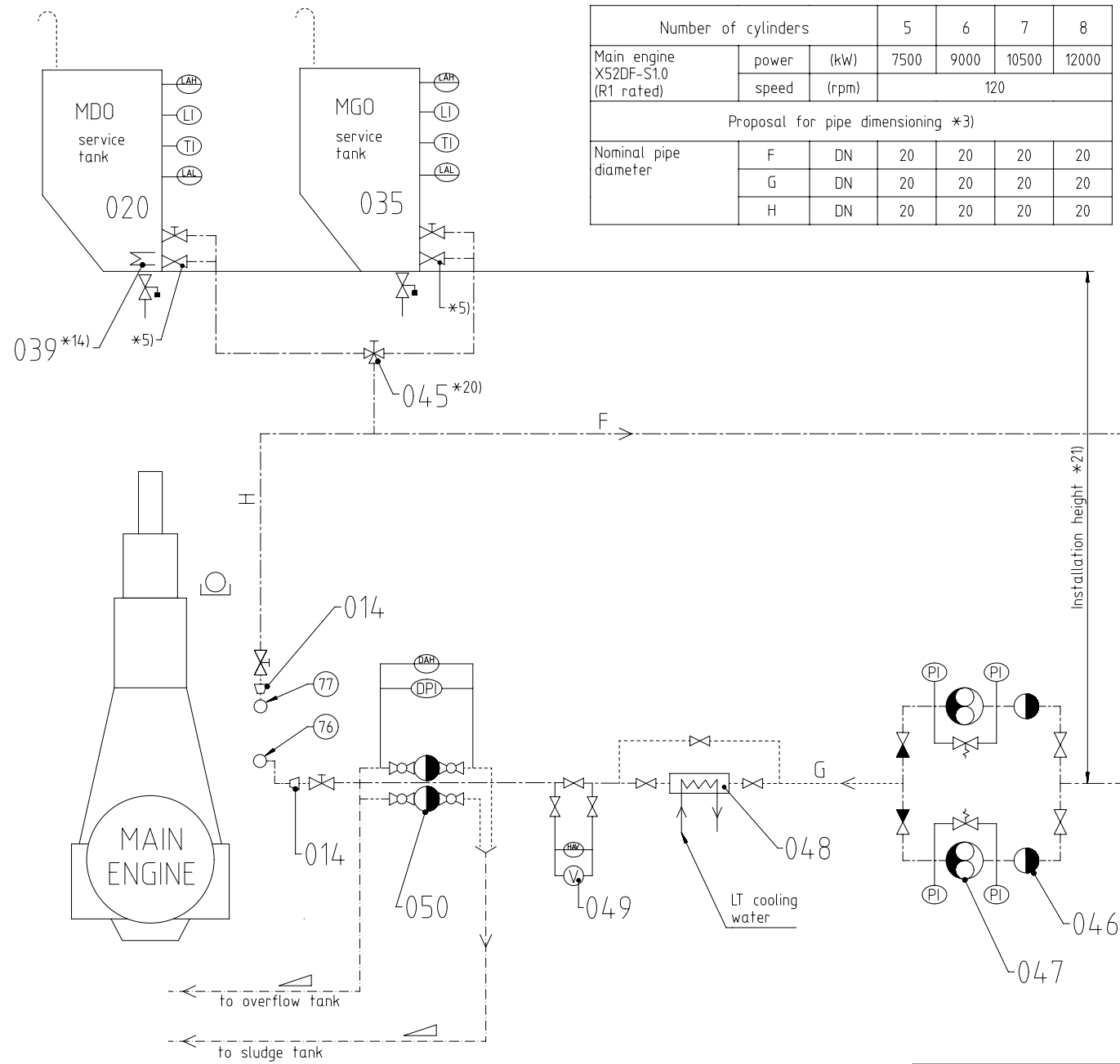
- HFO pipes, insulated and heated with steam, thermal oil or electrically
- Heating pipes
- Drain/overflow pipes, insulated and heated with HT cooling water or electrically
- Drain/overflow pipes
- MDO pipes
- Air vent pipes
- Pilot fuel
- Pipes on engine
- Pipe connections

SYSTEM PROPOSAL - Pilot fuel supply

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

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 X52DF-S1.0 (R1 rated)	power (kW)	7500	9000	10500	12000	
	speed (rpm)	120				
Proposal for pipe dimensioning *3)						
Nominal pipe diameter	F	DN	20	20	20	20
	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 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").

*14) A heating coil in the MDO tank is required when DMB is used. Target heating temperature: 40 °C.

*20) Just 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.

SURFACE PROTECTION SEE GROUP 0344				Change	A	sde101	mhu019	01.09.2021	QNA000231	drawing updated		4	3	
TOLERANCING PRINCIPLE ISO8015				Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis		Approved	Activity Code	E	C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK				Copyright Wartsila Gas & Diesel Ltd. All rights reserved. By taking possession of this drawing the recipient acknowledges and assumes these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose not covered in any way nor made accessible to third parties without the prior written consent of Wartsila Gas & Diesel Ltd.		mm	kg	-	NX	A2	Item ID	PAAD380484	Drawing Pages	3/3

SEQ NO	QTY	Item ID	Item Name	Dimension	Standard-ID	Basic Material	Net Weight
008	1	PAAD222763	MIXING UNIT				0.001

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Prod.	X52DF-S1.0							
Change History								
	A	sde101	mhu019	01.09.2021	CNAA000231	drawing updated		4 3
	-	dkl021	mhu019	23.04.2021		-		- -
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Approved	Activity Code

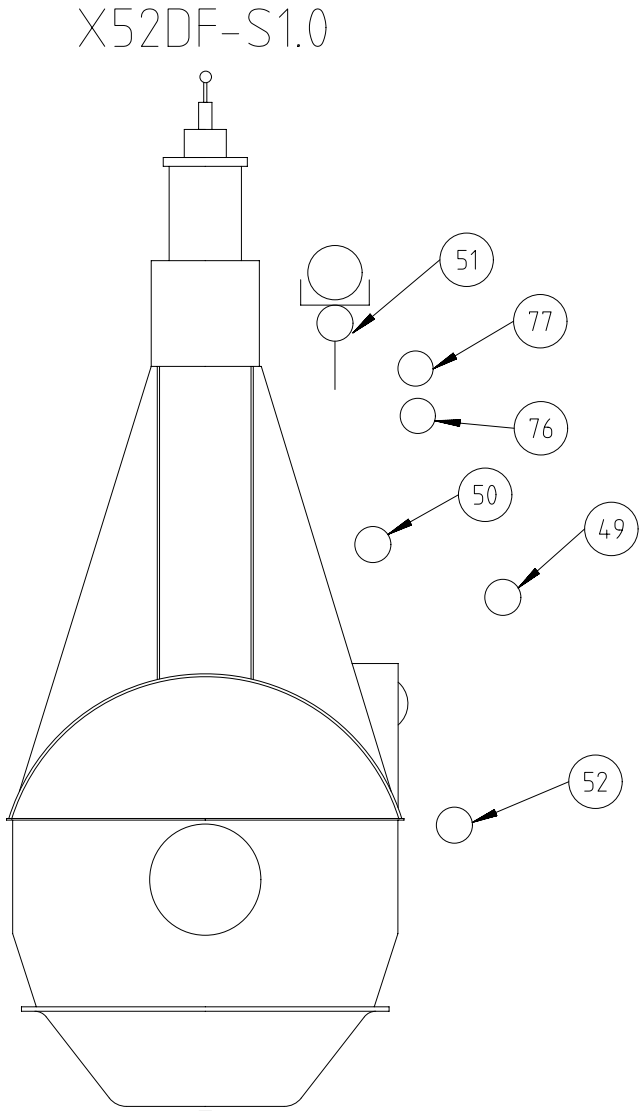
	<h2>FUEL OIL SYSTEM</h2> <h3>HFO&MDO&MGO</h3>
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Bill Of Material		Dimension	
<small>Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the document the recipient recognizes and honours these rights. Neither the whole nor any part of this document may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.</small>		Units	[m] [kg]
		Main Design	Design Group
		Qty per	Item ID
		Basic Material	Net Weight
		9723	0
		Q-Code	XXXXX
		Standard	WDS
		PAAD380484	BOM Page/s
		A4	01/01

SPECIFICATION which must be met:

- 76 INLET - Pilot fuel oil
 - Fuel quality, pressure and viscosity: same as the main fuel oil. (connection 49)
 - Volume flow: according to GTD.
- 77 OUTLET - Pilot fuel oil return
 - Normal operation condition: returning to FO supply pump suction.
 - Back pressure at ME outlet: max. 1.5 bar(g)

- 49 INLET - Fuel oil
 - Fuel oil quality: MDO with sulphur content: $\leq 0.5\%$
 - AND
 - MGO with sulphur content: $\leq 0.1\%$
 - Pressure at engine inlet: stopped engine: 10 bar
 - running engine: 7-10 bar
 - Volume flow: according to GTD
 - Viscosity MDO/MGO: 2-17 cSt
 - Filtration:
 - Main fuel oil filter with max. 10 micron (absolute, sphere passing mesh) close to engine inlet.
 - 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 upstream of the FO supply pump.
- 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.
- 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)

Free space for lic.								Q-Code XXXXXX	Main Drw.			
								Standard ISO; JIS				
Modif.	○		○		○		○					
	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date				
		Product 5-8X52DF-S1.0		FUEL OIL SYSTEM MDO&MGO only, int. pilot FO supply Brennstoffsystem								
Units	mm kg	NX		Basic Material				Net Weight 0,001				
SURFACE PROTECTION SEE GROUP 0344		Made	20.04.2021 dki021 DH.Kim		Scale	-	Size	A3	Page	1/2	Material ID	PAAD380487
TOLERANCING PRINCIPLE ISO8015		Chkd	23.04.2021 jpi101 Pickup		Design Group		9723		Drawing ID		DAAD142946	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	23.04.2021 mhu019 Hug						Rev.		-	

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UID - DIMENSIONAL DRAWING - Confidential

SYSTEM PROPOSAL - Combined main fuel oil and pilot fuel supply + MDO treatment

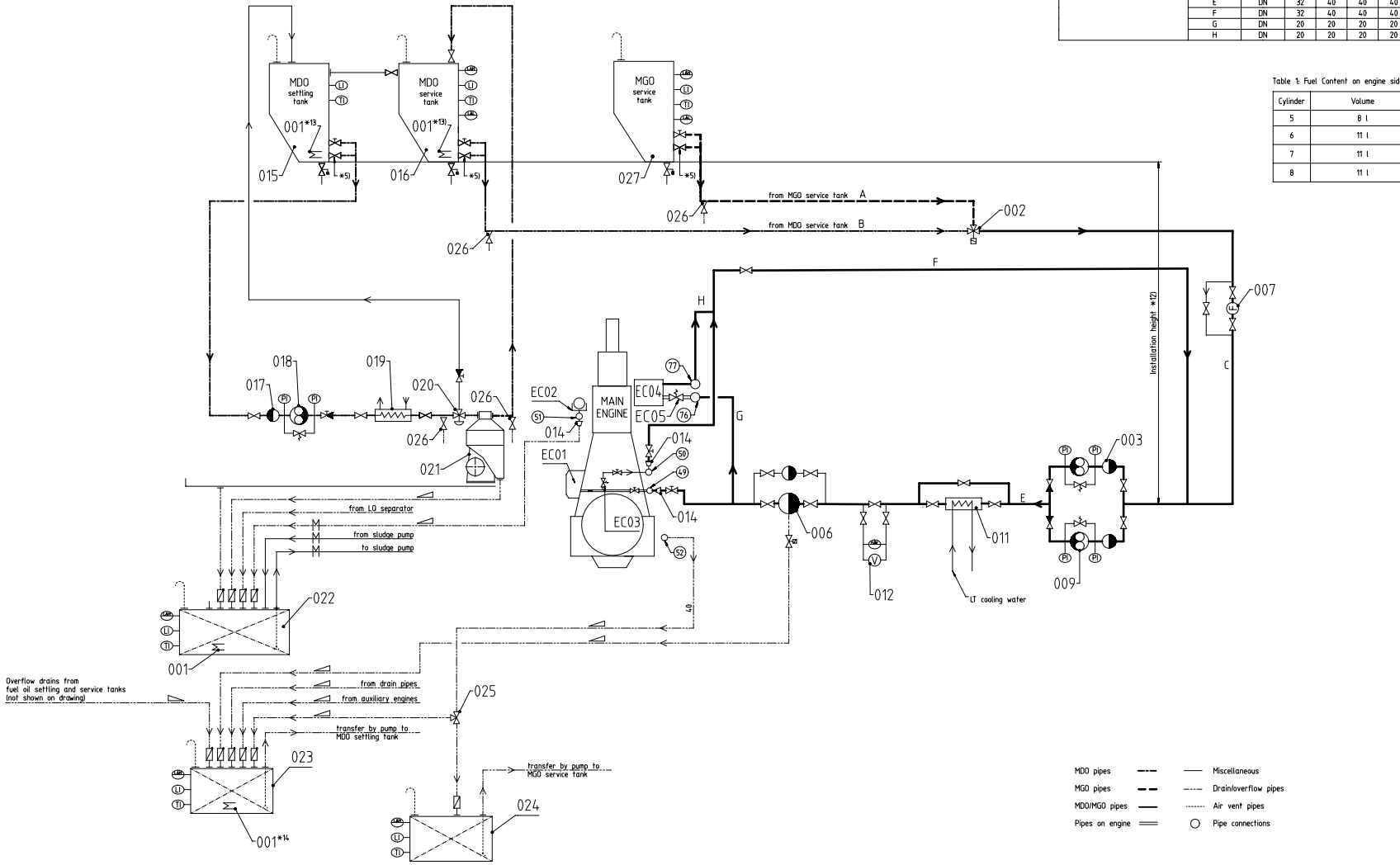
Pos.	ENGINE COMPONENTS *3)
EC01	Fuel supply unit
EC02	Fuel rail unit
EC03	Pressure retaining valve
EC04	Pilot fuel supply unit
EC05	Pressure reduction valve

Pos.	ENGINE CONNECTIONS *2)
(49)	INLET - Fuel oil
(50)	OUTLET - Fuel return
(51)	OUTLET - Drain rail-unit (dirty)
(52)	OUTLET - Fuel return, pressureless (clean)
(76)	INLET - Pilot fuel oil
(77)	OUTLET - Pilot fuel oil return

Number of cylinders		5	6	7	8
Main engine XS2DF-S10 (R1 rated)	power (kW)	7500	9000	10500	12000
	speed (rpm)	120			
Proposal for dimensioning *4)					
Mixing unit	volume (l)	acc. to separate drawing			
MDO service tank	volume (m³)	12	14	16	16
MDO/MGO drain tank	volume (m³)	12	14	16	16
Nominal pipe diameter	A DN	40	40	40	50
	B DN	40	40	40	50
	C DN	40	40	40	50
	E DN	32	40	40	40
	F DN	32	40	40	40
	G DN	20	20	20	20
	H DN	20	20	20	20
	I DN	20	20	20	20

Table 1: Fuel Content on engine side

Cylinder	Volume
5	8 l
6	11 l
7	11 l
8	11 l



Pos.	SYSTEM COMPONENTS *1)
001	Heating coil
002	Change-over valve
003	Suction strainer (mesh size according to pump suppliers requirement)
006	Automatic self-cleaning filter, 10 micron (absolute sphere passing mesh size)
007	Flowmeter
009	FO supply pump
011	MDO/MGO heat exchanger
012	Viscometer
014	Transition piece (adapter) *10)
015	MDO settling tank, heated and insulated
016	MDO service tank
017	Suction strainer (mesh size acc. to pump suppliers requirement)
018	MDO separator supply pump, with safety valve
019	MDO pre-heater
020	Three-way valve, diaphragm operated
021	Self-cleaning MDO separator *6)
022	Sludge tank
023	Fuel oil drain tank *1)
024	MGO clean leakage tank *1)
025	Three-way valve for switching between fuel drain tank and MDO/MGO clean leakage tank *9)
026	Fuel sampling cock *8)
027	MGO service tank

- 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 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 "Fluid velocities and flow rates, recommended values for pipework of diesel plants". Rating specific flow rates are provided by GTO.
- *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.
- *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 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 tank inlet only to be equipped with a swing check valve to avoid inadmissible backpressure.
- *12) 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
- *13) A heating coil in the MDO tank is required when DMB is used.
target heating temperature: 40 °C.

MDO pipes - - - - - Miscellaneous
MGO pipes - - - - - Drain/overflow pipes
MDO/MGO pipes - - - - - Air vent pipes
Pipes on engine = = = = = Pipe connections

Overflow drains from fuel oil settling and service tanks (not shown on drawing)

from LQ separator

from sludge pump to sludge pump

from drain pipes

from auxiliary engines

transfer by pump to MDO settling tank

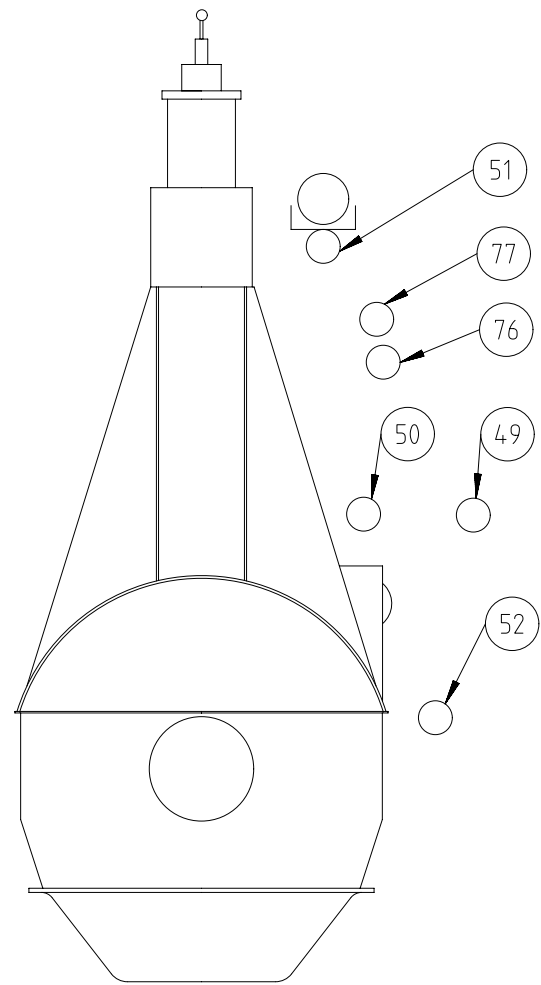
transfer by pump to MGO service tank

		U-Code: X300XX Standard: ISO, JIS	
Project: 5-BXS2DF-S10 Title: FUEL OIL SYSTEM Description: MDO&MGO only, int. pilot FO supply System: Brennstoffsystem	Date: 20.04.2021 Design: 2/2 Scale: 1:1 Drawing: PAAD3804.87 Revision: 1 Date: 20.04.2021 Design: 1/2 Scale: 1:1 Drawing: DAAD142946	No. 10 Date: 20.04.2021 Design: 2/2 Scale: 1:1 Drawing: PAAD3804.87	No. 10 Date: 20.04.2021 Design: 1/2 Scale: 1:1 Drawing: DAAD142946

SPECIFICATION which must be met:

- ⑦⑥ INLET - Pilot fuel oil
 - Fuel quality, pressure, and viscosity: same as specified for the main fuel oil (connection 49)
 - Volume flow: according to GTD.
- ⑦⑦ OUTLET - Pilot fuel oil return
 - Normal operation condition: returning to FO supply pump suction.
 - Back pressure at ME outlet: max. 1.5 bar(g).

X52DF-S1.0



- ④⑨ INLET - Fuel oil
 - Fuel oil quality: MGO
 - Sulphur content: $\leq 0.1\%$
 - Pressure at engine inlet: stopped engine: 10 bar
running engine: 7-10 bar
 - Volume flow: according to GTD
 - Viscosity MGO: 2-17 cSt
 - Filtration:
 - Main fuel oil filter with max. 10 micron (absolute, sphere passing mesh) close to engine inlet.
 - Bypass filter in parallel to the main fuel oil filter with max. 25 micron (absolute, sphere passing mesh).
- ⑤① OUTLET - Fuel return
 - Normal operation condition: Returning to service tank.
 - Back pressure related to the static height of the service tank to ME outlet: max. 1.8 bar(g)
- 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.
- 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)

Free space for lic.	XXXXXX						Q-Code	Main Drw.
	ISO; JIS							
Modif.	○	○	○	○	○	○	○	
	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
		Product 5-8X52DF-S1.0		FUEL OIL SYSTEM				
				MGO only, int. pilot FO supply				
				Brennstoffsystem				
Units	mm kg	NX		Basic Material		Net Weight 0,001		
SURFACE PROTECTION SEE GROUP 0344		Made	20.04.2021 dki021 DH.Kim		Scale	-	Drawing ID DAAD142948	
TOLERANCING PRINCIPLE ISO8015		Chkd	23.04.2021 jpi101 Pickup		Design Group	A3 1/2		
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	23.04.2021 mhu019 Hug		9723	Material ID PAAD380491		
Rev. -								

SYSTEM PROPOSAL - Combined main fuel oil and pilot fuel supply (for operation on MGO only)

Pos.	Engine Components *3)
EC01	Fuel supply unit
EC02	Fuel rail unit
EC03	Pressure retaining valve
EC04	Pilot fuel supply unit
EC05	Pressure reduction valve

Pos.	System Components *2)
001	Suction strainer (mesh size according to pump suppliers requirement)
002	Supply pump
004	Flowmeter
005	MGO heat exchanger
006	Viscometer
007	Automatic self-cleaning filter, 10 micron (absolute sphere passing mesh size)
008	Fuel oil sampling cock *8)
009	Transition piece (adapter) *7)
010	Fuel drain tank
011	Sludge tank
012	MGO service tank

Pos.	Engine Connections *1)
49	INLET - Fuel oil
50	OUTLET - Fuel return
51	OUTLET - Drain rail-unit (dirty)
52	OUTLET - Fuel return, pressureless (clean)
76	INLET - Pilot fuel oil
77	OUTLET - Pilot fuel oil return

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) Refer to the "Pipe Connection Plan" for the execution and location of the engine pipe connections.

*2) To be installed by the shipyard.

*3) To be delivered by the engine builder, 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. To make the layout in regard to the project specific rating please refer to design group 9730 "Fluid velocities and flow rates, recommended values for pipework of diesel plants" for selecting the appropriate pipe diameter. Rating specific flow rates are provided by GTO.

*6) To be kept closed during normal engine operation. For draining only.

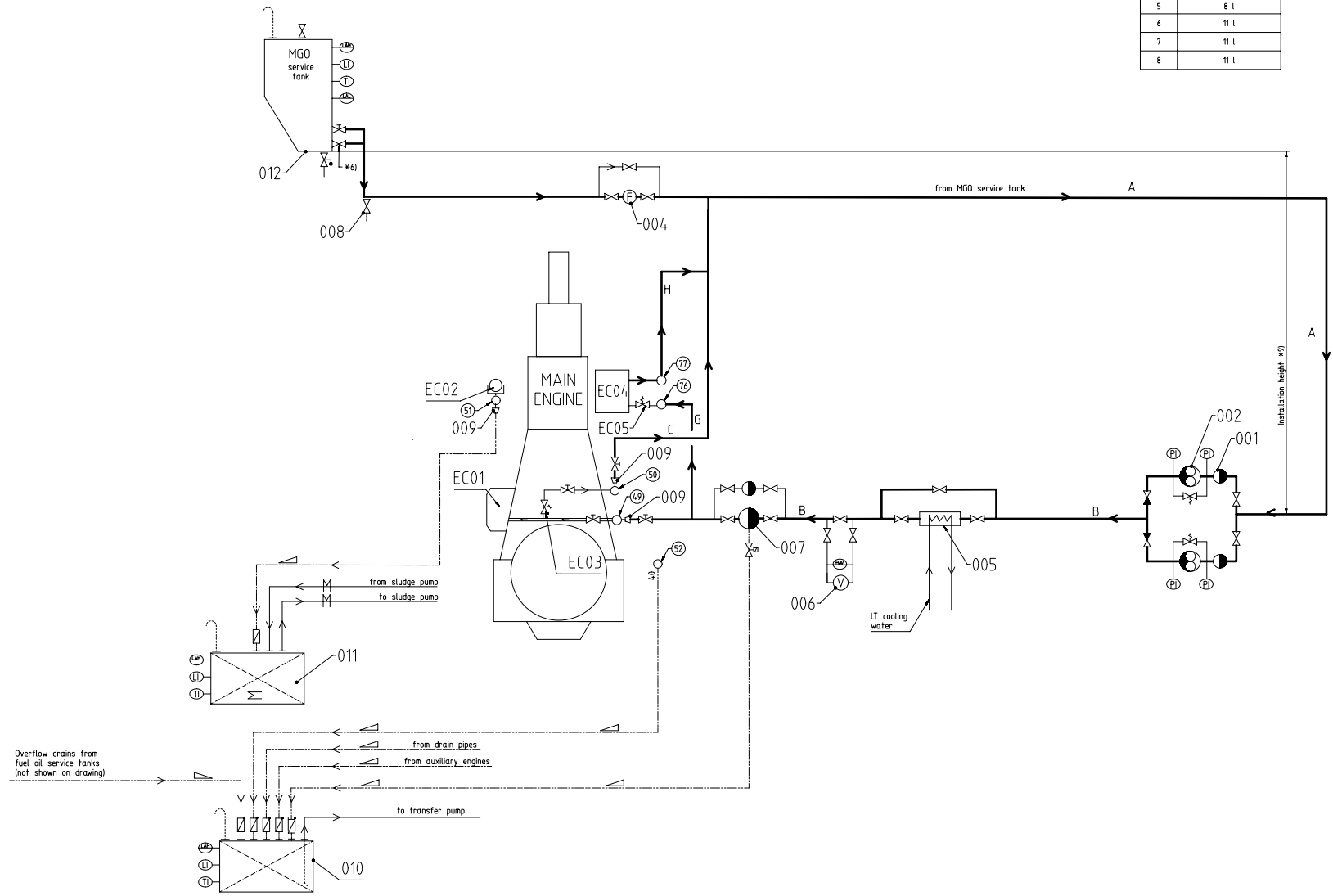
*7) Installed as required (check with the "Pipe Connection Plan")

*8) Recommended position for fuel oil sampling to check fuel oil quality.

*9) 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.

Table 1: Fuel Content on engine side

Cylinder	Volume
5	8 l
6	11 l
7	11 l
8	11 l



Number of cylinders	5	6	7	8	
Main engine XS2DF-S10 (R1 rated)	power (kW)	7500	9000	10500	12000
	speed (rpm)	120			

Proposal for dimensioning *4)

MDO service tank	volume (m³)	12	14	16	16
MDO drain tank	volume (m³)	1.2	1.4	1.6	1.6

Nominal pipe diameter	A	B	C	G	H
	DN	32	40	40	40
	DN	32	40	40	40
	DN	20	20	20	20
	DN	20	20	20	20

— MGO pipes
 — Pipes on engine
 --- Drain / overflow pipes
 Air vent pipes
 ○ Pipe connections

Overflow drains from fuel oil service tanks (not shown on drawing)

from drain pipes

from auxiliary engines

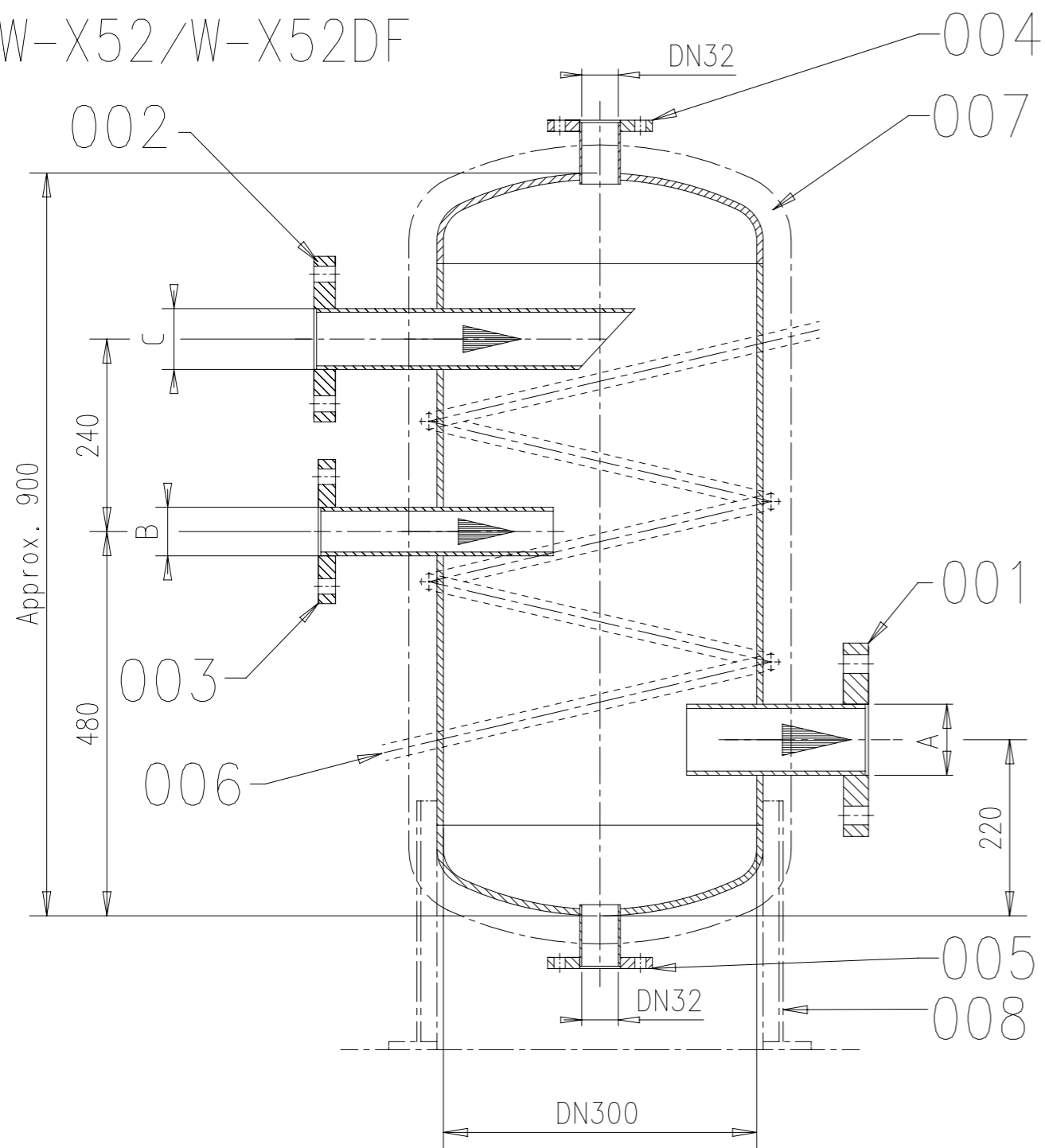
to transfer pump

DATE: 20.04.2021	BY: [Signature]	SCALE: 1:2	PROJECT: PAAD3804.01
DATE: 21.04.2021	BY: [Signature]	SCALE: 1:2	PROJECT: PAAD3804.01
DATE: 21.04.2021	BY: [Signature]	SCALE: 1:2	PROJECT: PAAD3804.01

WINGO
 5-BXS2DF-S10
 FUEL OIL SYSTEM
 MGO only, int. pilot FO supply
 Brennstoffsystem

DAAD142948

W-X52/W-X52DF



Nominal pipe diameters (DN)

No. of cyl.	A	B	C
	DN	DN	DN
4	50	32	50
5	50	40	50
6	50	40	50
7	50	40	50
8	65	50	65

*2)

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

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.

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

Modif.	A	EAAD087849	14.06.2017						
		Number	Drawn date			Number	Drawn date		



Winterthur Gas & Diesel

Product W-52

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		Scale	-	Size	A3	Page	1/1	Material ID	PAAD222763
TOLERANCING PRINCIPLE ISO8015		Chkd	30.03.2016	mhu019 Hug		Design Group		9723	Drawing ID
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	30.03.2016	dst009 Strödecke		DAAD076916			

MIDS - WinGD X52DF-S1.0/-S2.0 – Fuel System (DG9723)

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2021-05-10	DRAWING SET	First web upload
2021-11-03	PAAD380484	System drg – new revision

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