


A  
B  
C  
D  
E  
F

A  
B  
C  
D  
E  
F

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

Net Weight			0,001	0,001	0,001	Quantity PER ENGINE	SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
1	1	1											
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	PAAD328932	FUEL OIL SYSTEM MGO only, int. pilot fuel supply	DAAD117020		0,001					
-	1	-	002	PAAD328908	FUEL OIL SYSTEM MDO&MGO only, int. pilot fuel supply	DAAD117007		0,001					
1	-	-	001	PAAD328840	FUEL OIL SYSTEM HFO&MDO&MGO, ext. pilot fuel supply	DAAD116946		0,001					

Material ID	Free space for lic.	Q-Code	Main Drw.
PAAD328954 PAAD328953 PAAD328952		XXXXX	H
Modif.	Number	Drawn date	Number
Modif.	Number	Drawn date	Number
Modif.	Number	Drawn date	Number



Product  
W6-9X82DF

FUEL OIL SYSTEM  
Brennstoffsystem

SURFACE PROTECTION SEE GROUP 0344	Made	31.05.2019	dk1021	DH.Kim	Scale	-	Size	A3	Page	1/1	Material ID	DAAD117036	Rev.	-
TOLERANCING PRINCIPLE ISO8015	Chkd	10.07.2019	wwa008	Wang	Design Group	9723	Drawing ID							
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	11.07.2019	mhu019	Hug										

Approved  
DIM - DIMENSIONAL DRAWING - Confidential

# SPECIFICATIONS which must be met

**76** INLET - Pilot fuel oil  
 Fuel oil quality at engine inlet: MDO or MGO  
 Pressure at engine inlet: 7.0 - 8.0 bar  
 Volume flow: according to GTD  
 Viscosity:  
 - Viscosity MDO/MGO: 2-17 cSt  
 Filtration:  
 - One filter unit with max. 10 micron (absolute, sphere passing mesh) close to engine inlet.

**77** OUTLET - Pilot fuel oil  
 - Normal operation condition: Returning to pilot fuel feed pump  
 - Back pressure at engine outlet: max. 1.5 bar(g)

**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 the table 1 "Fuel Content" on the second page.  
 - Fuel amount on system side: According to project specific system layout.

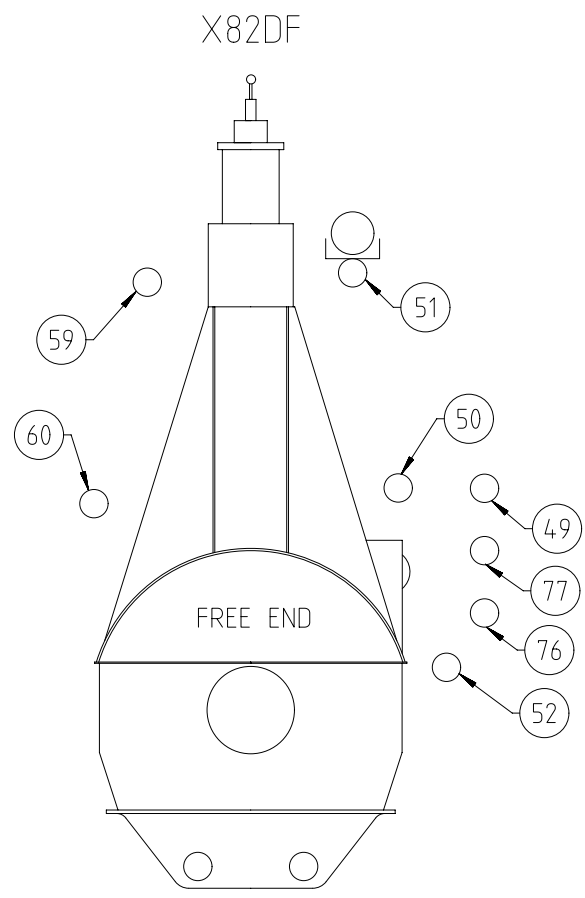
**50** OUTLET - Fuel oil return  
 - Normal operation condition: Returning to mixing unit.  
 - Fuel oil change over while engine not in service: returning to service tank.

**51** OUTLET - Fuel leakage rail-unit (dirty)  
 - Dirty fuel: Fuel leakage 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 leakage fuel pump and injection control (clean)  
 - Clean fuel:  
 Normal leakage from fuel pump and injection control side.  
 Normal leakage from pilot fuel pump unit.  
 Additional leakage in emergency situation (e.g. high pressure pipe damage).  
 - Free flow by gravity to FO overflow tank or appropriate tank.  
 - Pipe insulated and heated up (50-95 °C).

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

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



1	008	PAAD328723	MIXING UNIT	DAAD116880		0,001	
QTY	SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
Free space for ill.						Q-Code XXXXX	Main Drw.
						Standard ISO; JIS	
Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number
 Winterthur Gas & Diesel			Product	6-9X82DF FUEL OIL SYSTEM HFO&MDO&MGO, ext. pilot FO supply Brennstoffsystem			
Units	mm kg	NX	Basic Material	Net Weight 0,001			
SURFACE PROTECTION SEE GROUP 0344		Made	31.05.2019 dki021 DH.Kim	Scale	-	Size	A2
TOLERANCING PRINCIPLE ISO8015		Chkd	10.07.2019 wwa008 Wang	Design Group		Page	1/3
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	11.07.2019 mhu019 Hug	7273	Material ID	DAAD116946	Rev. -

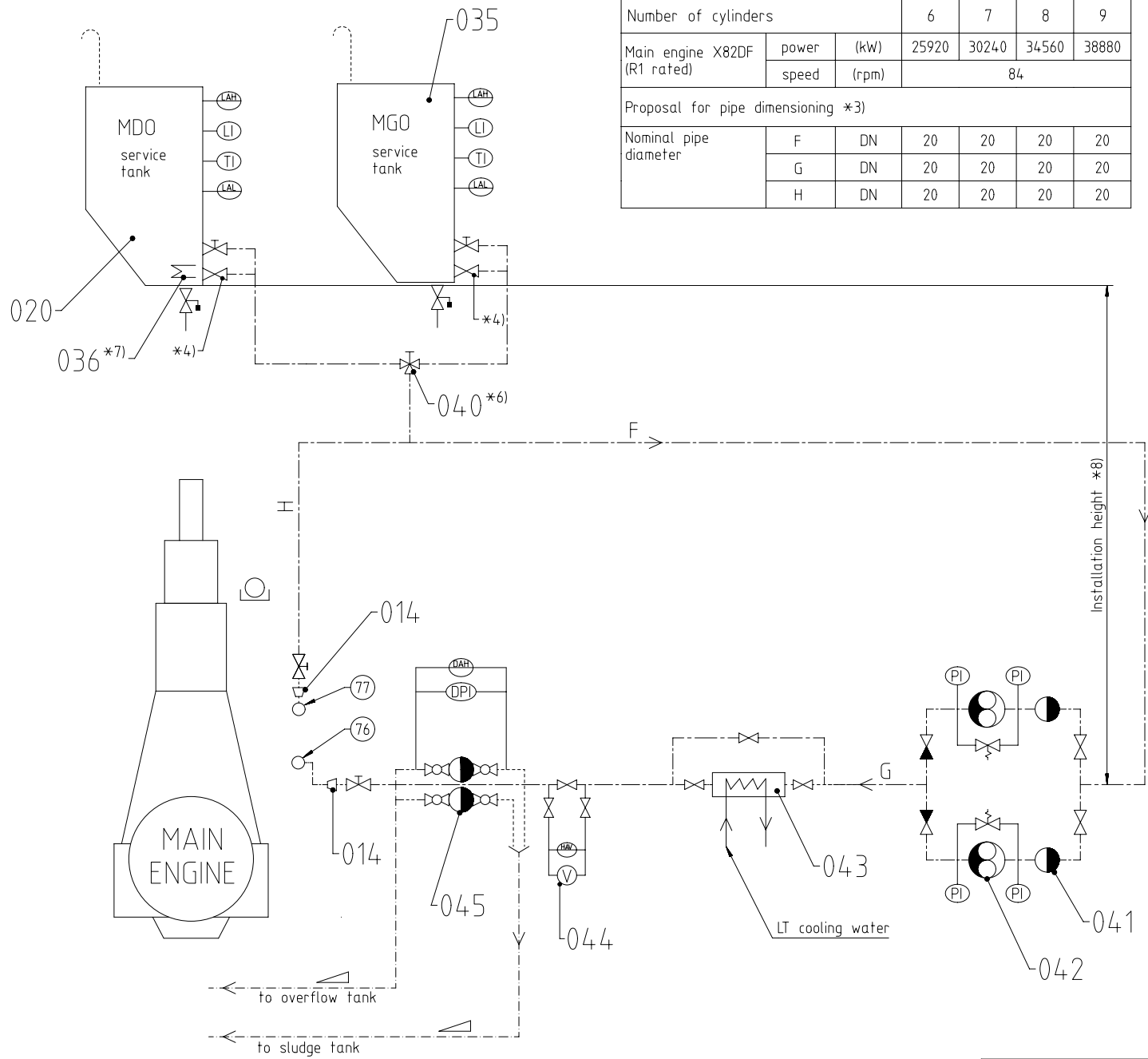


SYSTEM PROPOSAL - Pilot fuel supply

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

Number of cylinders		6	7	8	9	
Main engine X82DF (R1 rated)	power (kW)	25920	30240	34560	38880	
	speed (rpm)	84				
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

Pos.	SYSTEM COMPONENTS *1)
014	Transition Piece (adapter) *5)
020	MDO service tank
035	MGO service tank
036	Heating coil
040	Three way valve, pilot fuel supply, manually or remotely operated
041	Suction strainer (mesh size acc. to pump suppliers requirement)
042	Pilot fuel feed pump
043	Pilot fuel cooler and/or heater
044	Viscometer
045	Fuel oil filter, max. 10 micron (absolute, sphere passing mesh)



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.

\*4) Valve to be kept closed during normal engine operation. For draining only.

\*5) Installed as required (check with the "Pipe Connection Plan")

\*6) Just to be installed if different pilot fuel qualities are used to enable the changeover depending on the fuel in use.

\*7) A heating coil in the MDO tank is required when DMB is used. Target heating temperature: 40 °C

\*8) 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.

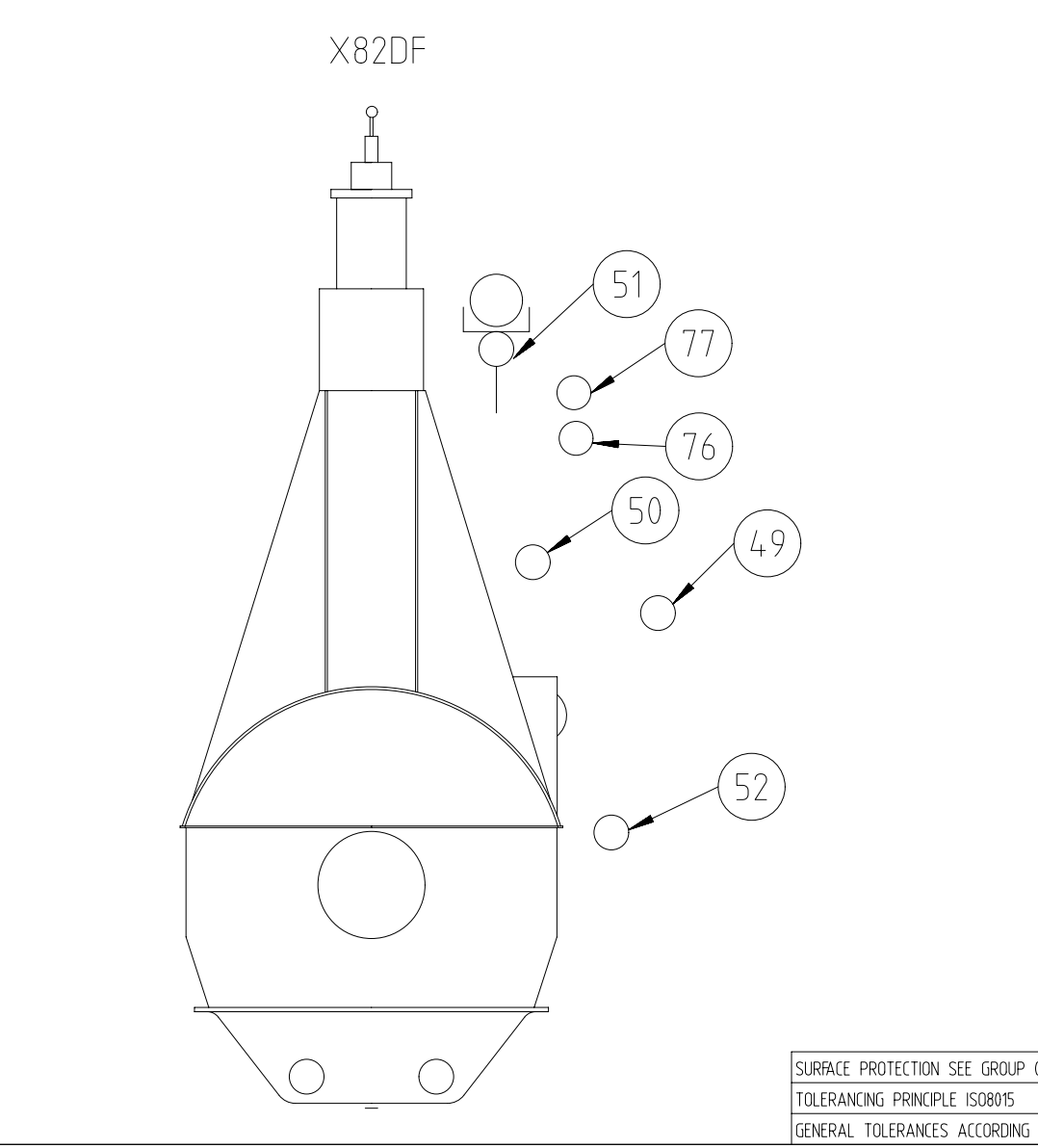
Free space for file		Q-Code XXXXX		Main Drw.				
Standard ISO; JIS								
Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
Product 6-9X82DF		FUEL OIL SYSTEM		HFO&MDO&MGO, ext. pilot FO supply		Brennstoffsystem		
Units mm kg NX		Basic Material		Net Weight 0,001				
SURFACE PROTECTION SEE GROUP 0344		Made 31.05.2019	dk1021	DH.Kim	Scale -	Size A2	Page 3/3	Material PAAD328840
TOLERANCING PRINCIPLE ISO8015		Chkd 10.07.2019	wwa008	Wang	Design Group 9723	Drawing ID DAAD116946	Rev. -	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd 11.07.2019	mhu019	Hug				

1 2 3 4 5 6 7 8

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 the table 1 "Fuel Content" on the second page.  
 - Fuel amount on system side: According to project specific system layout.



- 50** OUTLET - Fuel oil return  
 - Normal operation condition: returning to upstream of the FO supply pump.
- 51** OUTLET - Fuel leakage rail-unit (dirty)  
 - Dirty fuel: Fuel leakage from rail-unit, not for re-use.  
 - Free flow by gravity to sludge oil tank or appropriate tank.
- 52** OUTLET - Fuel leakage fuel pump and injection control (clean)  
 - Clean fuel:  
 Normal leakage from fuel pump and injection control side.  
 Normal leakage from pilot fuel pump unit.  
 Additional leakage in emergency situation (e.g. high pressure pipe damage).  
 - Free flow by gravity to FO overflow tank or appropriate tank.

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 6-9X82DF		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	31.05.2019 dki021 DH.Kim		Scale	-	Size	A3	Page	1/2	Material ID	PAAD328908	
TOLERANCING PRINCIPLE ISO8015		Chkd	10.07.2019 wwa008 Wang		Design Group		9723		Drawing ID	DAAD117007		Rev.	-
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	11.07.2019 mhu019 Hug										

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 DIM - 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

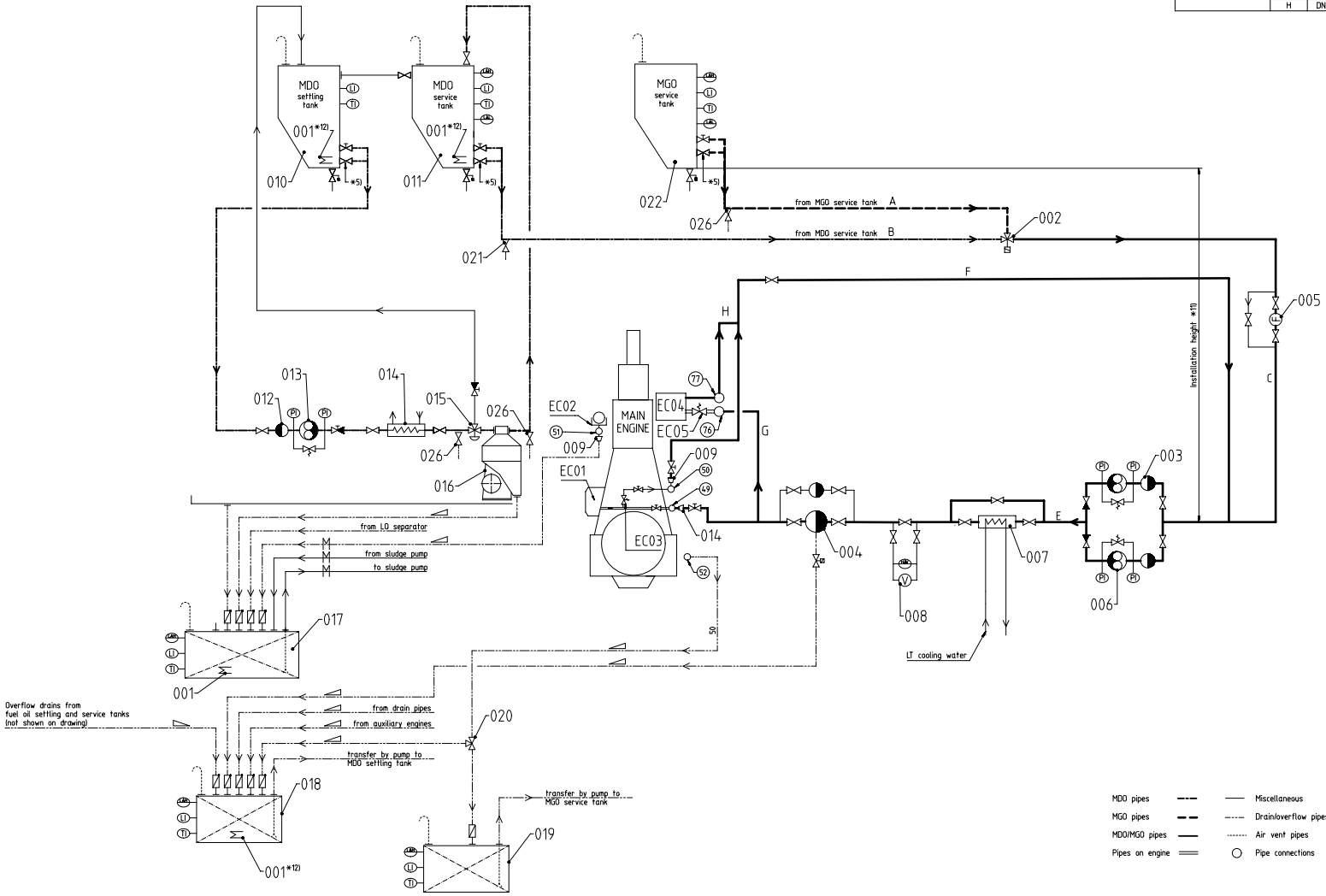
Pos.	ENGINE CONNECTIONS *2)
(4)	INLET - Fuel oil
(5)	OUTLET - Fuel oil return
(6)	OUTLET - Fuel leakage rail-unit (dirty)
(7)	OUTLET - Fuel leakage fuel pump and injection control (clean)
(8)	INLET - Pilot fuel oil
(9)	OUTLET - Pilot fuel oil return

Table 1: Fuel content on engine side

Cylinder	Volume
6	115 l
7	115 l
8	115 l
9	160 l

Number of cylinders		6	7	8	9
Main engine X82DF (R1 rated)	power (kW)	25920	30240	34560	38880
	speed (rpm)	84			
Proposal for dimensioning *4)					
Mixing unit	capacity (l)	acc. to separate drawing			
MDO service tank	capacity (m³)	4.3	50	57	64
MGO service tank	capacity (m³)	4.3	50	57	64
Nominal pipe diameter	A	DN 65	80	80	80
	B	DN 65	80	80	80
	C	DN 65	80	80	80
	E	DN 65	65	65	80
	F	DN 65	65	65	80
	G	DN 20	20	20	20
	H	DN 20	20	20	20

Pos.	SYSTEM COMPONENTS *1)
001	Heating coil
002	Change-over valve
003	Suction strainer (mesh size according to pump suppliers requirement)
004	Automatic self-cleaning filter, 10 micron (absolute sphere passing mesh size)
005	Flowmeter
006	FO supply pump
007	Fuel oil cooler and/or heater
008	Viscometer
009	Transition piece (adapter) *9)
010	MDO settling tank, heated and insulated
011	MDO service tank
012	Suction strainer (mesh size acc. to pump suppliers requirement)
013	MDO separator supply pump, with safety valve
014	MDO pre-heater
015	Three-way valve, diaphragm operated
016	Self-cleaning MDO separator *6)
017	Sludge tank
018	Fuel oil drain tank *10)
019	MGO clean leakage tank *10)
020	Three-way valve for switching between fuel drain tank and MDO/MGO clean leakage tank *8)
021	Fuel sampling cock *7)
022	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 delivered by external suppliers 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) 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 5 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 GFD.
- \*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) Recommended position for fuel oil sampling to check fuel oil quality.
- \*8) 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.
- \*9) Installed as required (check with "Pipe Connection Plan").
- \*10) The tank inlet only to be equipped with a swing check valve to avoid inadmissible backpressure.
- \*11) The location of the pumps' 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.
- \*12) A heating coil in the MDO tank is required when DMB is used.  
Target heating temperature: 40 °C

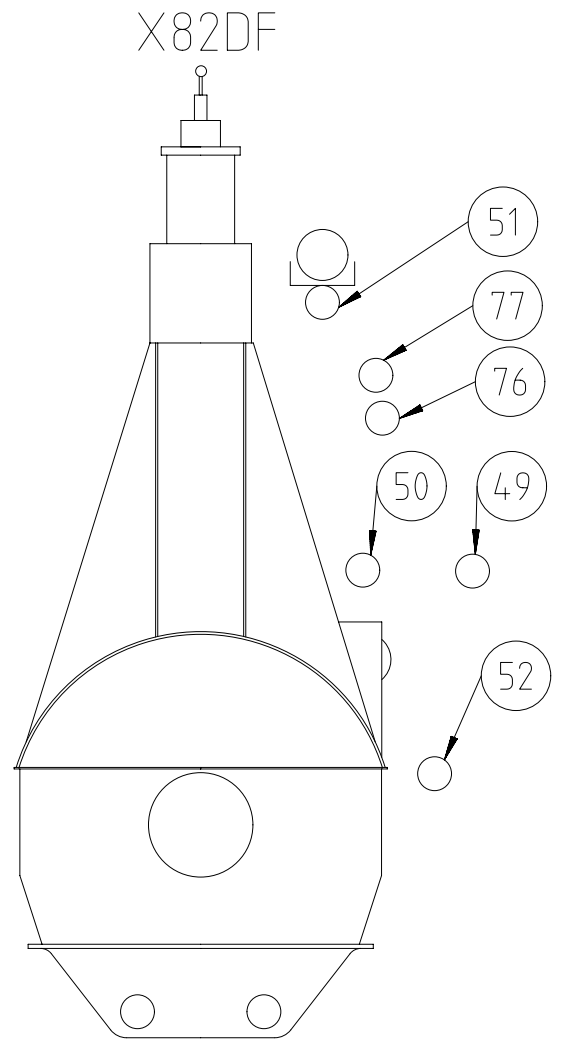
- MDO pipes - - - - - Miscellaneous
- MGO pipes - - - - - Drain/overflow pipes
- MDO/MGO pipes - - - - - Air vent pipes
- Pipes on engine - - - - - Pipe connections

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

		FUEL OIL SYSTEM MDO/MGO only, int. pilot FO supply Brennstoffsystem	
Date: 31.05.2019 Drawn: 01/2019 Checked: 01/2019 Design Group: 9723	No: 412 Rev: 001 Drawn date: 01/2019 Checked date: 01/2019 Design date: 01/2019	Scale: 1:1 Sheet: 1/2 Total sheets: 2	No: PAAD328908 Rev: 001 Drawn date: 01/2019 Checked date: 01/2019

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).



- 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).
- 50 OUTLET - Fuel oil 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 - Fuel leakage rail-unit (dirty)
  - Dirty fuel: fuel leakage from rail-unit, not for re-use.
  - Free flow by gravity to sludge oil tank or appropriate tank.
- 52 OUTLET - Fuel leakage fuel pump and injection control (clean)
  - Clean fuel:
  - Normal leakage from fuel pump and injection control side.
  - Normal leakage from pilot fuel pump unit.
  - Additional leakage in emergency situation (e.g. high pressure pipe damage)
  - Free flow by gravity to FO overflow tank or appropriate tank.

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				
 Winterthur Gas & Diesel		Product 6-9X82DF		FUEL OIL SYSTEM MGO only Brennstoffsystem								
Units	mm kg	NX		Basic Material			Net Weight 0,001					
SURFACE PROTECTION SEE GROUP 0344		Made	31.05.2019 dki021 DH.Kim		Scale	-	Size	A3	Page	1/2	Material ID	PAAD328932
TOLERANCING PRINCIPLE ISO8015		Chkd	10.07.2019 wwa008 Wang		Design Group		9723		Drawing ID	DAAD117020		
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	11.07.2019 mhu019 Hug						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 cooler
006	Viscometer
007	Automatic self-cleaning filter, 10 micron (absolute sphere passing mesh size)
008	Fuel oil sampling cock *7)
009	Transition piece (adapter) *6)
010	Fuel drain tank
011	Sludge tank
012	MGO service tank

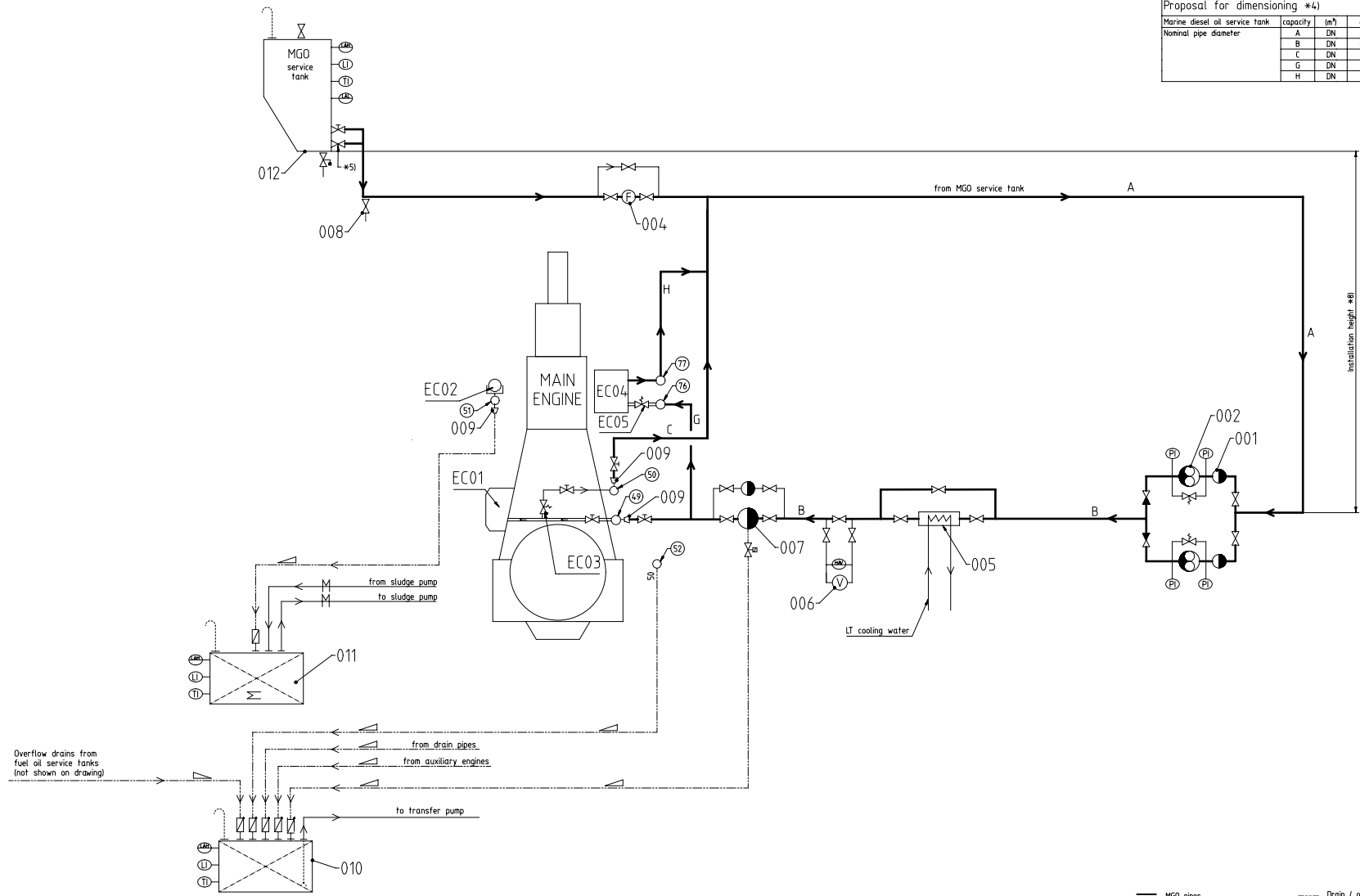
Pos.	Engine Connections *1)
(9)	INLET - Fuel oil
(10)	OUTLET - Fuel oil return
(5)	OUTLET - Fuel leakage rail-unit (dirty)
(6)	OUTLET - Fuel leakage fuel pump and injection control (clean)
(7)	INLET - Pilot fuel oil
(7)	OUTLET - Pilot fuel oil return

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

Number of cylinders		6	7	8	9
Main engine X82DF (R1 rated)	power (kW)	25920	30240	34560	38880
	speed (rpm)	84			

Proposal for dimensioning *4)					
Marine diesel oil service tank	capacity (m³)	43	50	57	64
	A DN	65	80	80	80
	B DN	65	65	65	80
	C DN	65	65	65	80
Nominal pipe diameter	D DN	20	20	20	20
	G DN	20	20	20	20
	H DN	20	20	20	20
	I DN	20	20	20	20

- \*1) Refer to the "Pipe Connection Plan" for the execution and location of the engine pipe connections.
- \*2) To be delivered by external supplier and 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 9739 "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 GTD.
- \*5) To be kept closed during normal engine operation, for draining only.
- \*6) Installed as required (check with the "Pipe Connection Plan").
- \*7) Recommended position for fuel oil sampling to check fuel oil quality.
- \*8) 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.

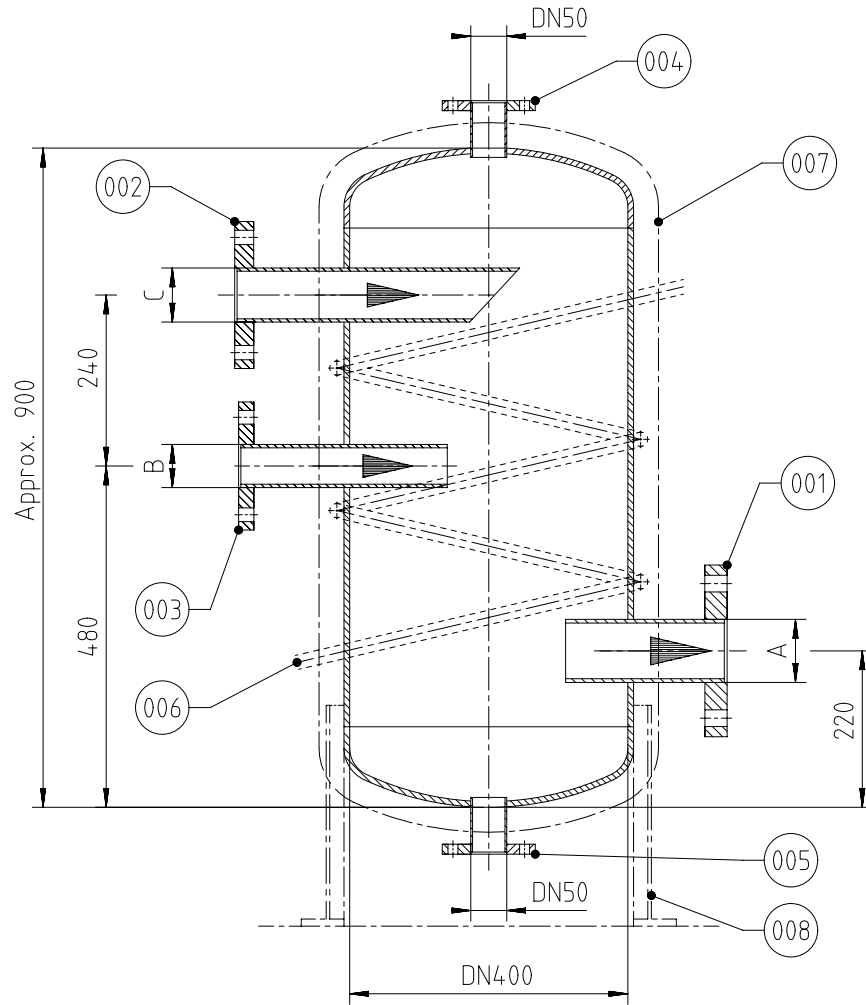


— MGO pipes  
 - - - - - Drain / overflow pipes  
 — Pipes on engine  
 ······ Air vent pipes  
 ○ Pipe connections

U-Code: XXXXXX Standard: ISO-JIS		U-Code: PAAD328932 Design Group: DAAD117020	
Project: 2-9X82DF Manufacturer: WIND	Title: FUEL OIL SYSTEM MGO only Brennstoffsystem	Date: 31.05.2019 Drawn: 01/21 Scale: 1:1 Sheet: 1/2	Date: 01.07.2019 Drawn: 01/21 Scale: 1:1 Sheet: 1/2



# X82-D/DF



No. of Cyl.	A	B	C
	DN	DN	DN
6	100	65	65
7	100	65	80
8	100	80	80
9	125	80	80

Capacity: 100 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.

Free space for lic.	Q-Code XXXXX						Main Drw.				
	Standard ISO; JIS										
Modif.	○	○	○	○	○	○					
	Number	Drawn date	Number	Drawn date	Number	Drawn date					
		Product 6-9X82-D 6-9X82DF		MIXING UNIT TO FUEL OIL SYSTEM							
		Units	mm kg	NX	Basic Material		Net Weight 0,001				
SURFACE PROTECTION SEE GROUP 0344		Made	28.05.2019 dki021 DH.Kim	Scale	-	Size	A3	Page	1/1	Material ID	PAAD328723
TOLERANCING PRINCIPLE ISO8015		Chkd	10.07.2019 wwa008 Wang	Design Group		9723		Drawing ID	DAAD116880		
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	11.07.2019 mhu019 Hug					Rev.	-		

## WinGD X82DF – Fuel Oil System (DG9723)

### TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2019-07-12	DRAWING SET	First web upload

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