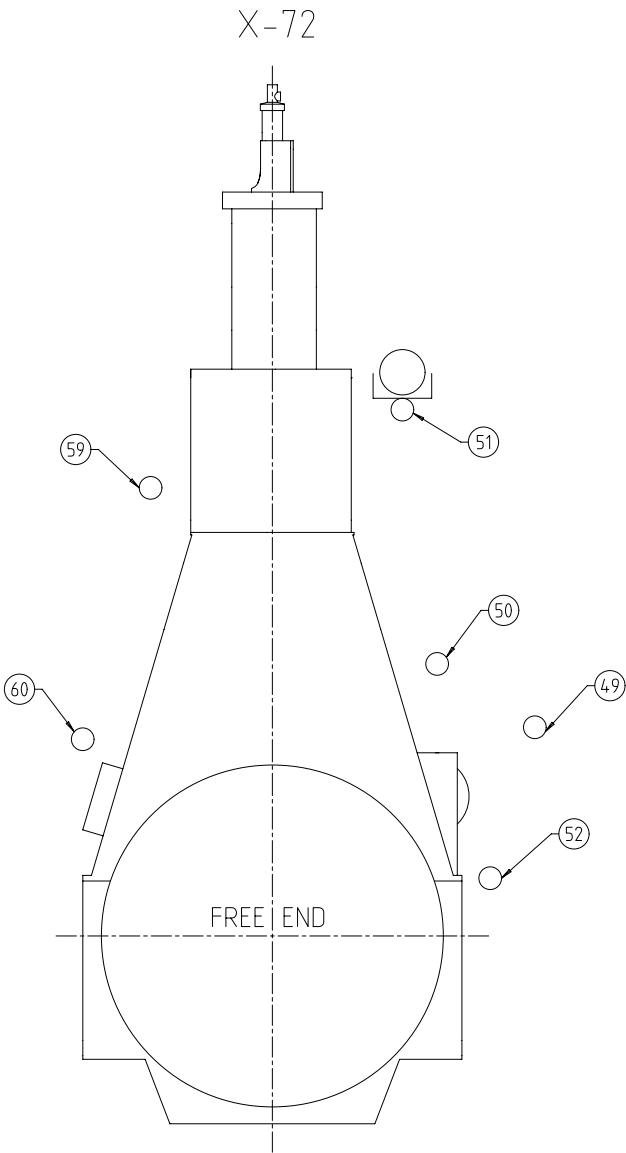


CONFIDENTIAL - DIMENSIONAL DRAWING - Confidential

SPECIFICATION which must be met





- 49 INLET - Fuel oil
- E 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
- E
- 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)
- E
- Dirty fuel: Mixed drain (LO,F0) 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)
- E
- 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	PAAD103066	MIXING UNIT			DAAD032414				0,001		
QTY	SEQ NO	Material ID	Material Name			Dimension, Occ		Standard or Drawing	Basic Material Material Standard	Weight GR./NET		
Free space for lic									Q-Code	Main Drw.		
									XXXXXX			
									Standard ISO; JIS			
Modif.	B	EAAD085468	05.02.2015	C	EAAD085894	16.07.2015	D	EAAD089659	03.10.2018	E	EAAD091789	03.12.2019
	Number		Drawn date	Number		Drawn date	Number		Drawn date	Number		Drawn date
 Winterthur Gas & Diesel			Product 5-8X72			FUEL OIL SYSTEM HFO&MDO&MGO Brennstoffsystem						
Units	mm kg	NX				Basic Material					Net Weight 0,001	
Made	18.10.2012	asex06 A.Sekulic		Scale	-		Size	Page	Material	PAAD081235		
Chkd	07.12.2012	wwr001 Wroblewski		Design Group		A2	1/2					
Appd	10.12.2012	bha009 Haag		9723		Drawing ID		DAAD026823			Rev. E	

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) (E)
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 X72 (R1 rated)	power	(kW)	18050	21660	25270	28880
	speed	(rpm)	84			

Proposal for dimensioning *4)		volume	(l)	acc. to separate drawing			
Mixing unit	volume	(m³)	26	31	36	42	
HFO settling tank	volume	(m³)	26	31	36	42	
HFO service tank	volume	(m³)	28	34	40	45	
MDO/MGO service tank	volume	(m³)	2.8	3.4	4	4.5	
MDO/MGO drain tank *11)	volume	(m³)	65	65	65	80	
Nominal pipe diameter	A	DN	65	65	65	80	
	B	DN	40	50	50	50	
	C	DN	50	50	65	65	
	D	DN	80	80	100	100	
	E	DN	65	65	80	80	

- 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

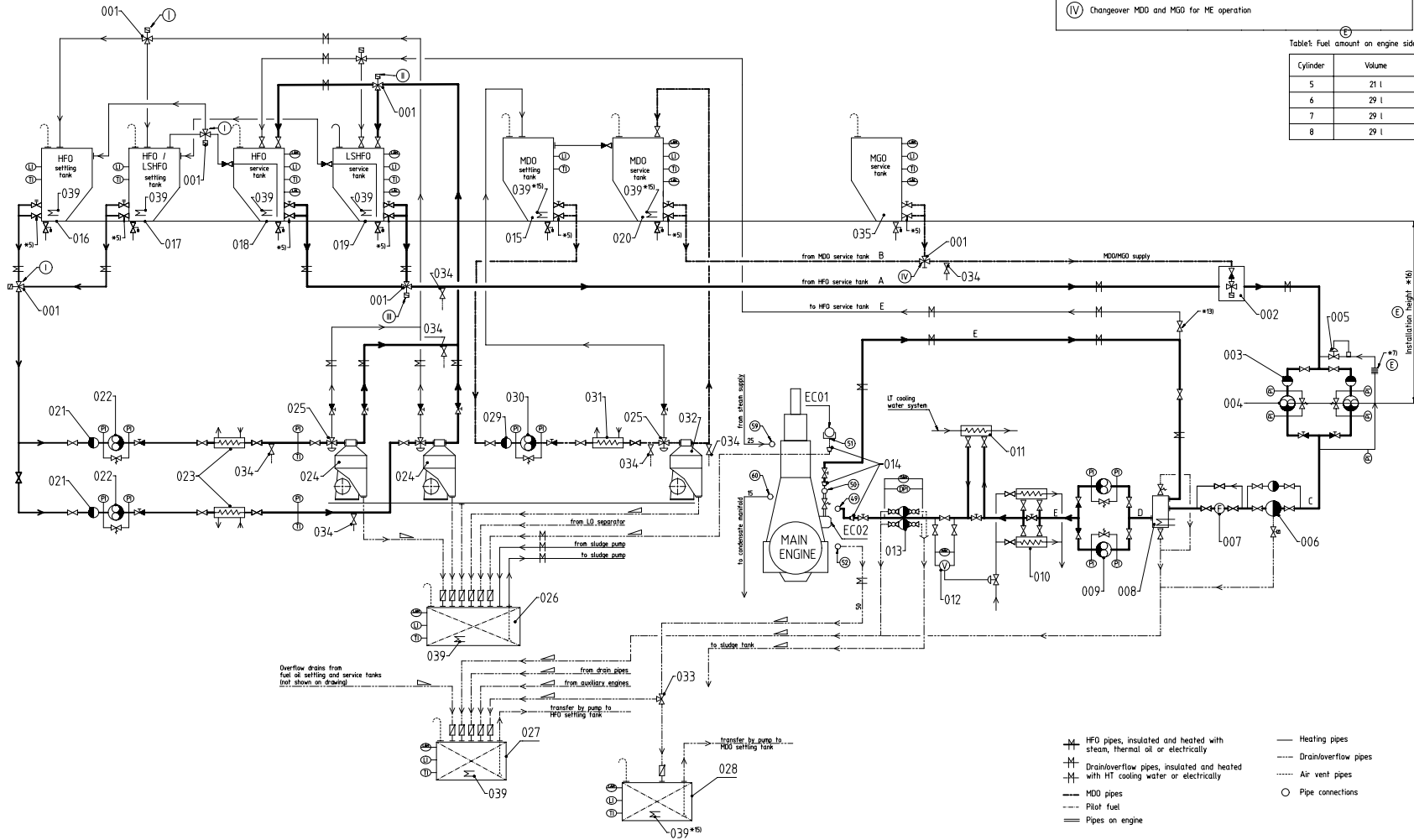
Table 1: Fuel amount on engine side

Cylinder	Volume
5	21 l
6	29 l
7	29 l
8	29 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 (E)
011	MDO/MGO heat exchanger (E)
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) (E)
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
039	Heating coil

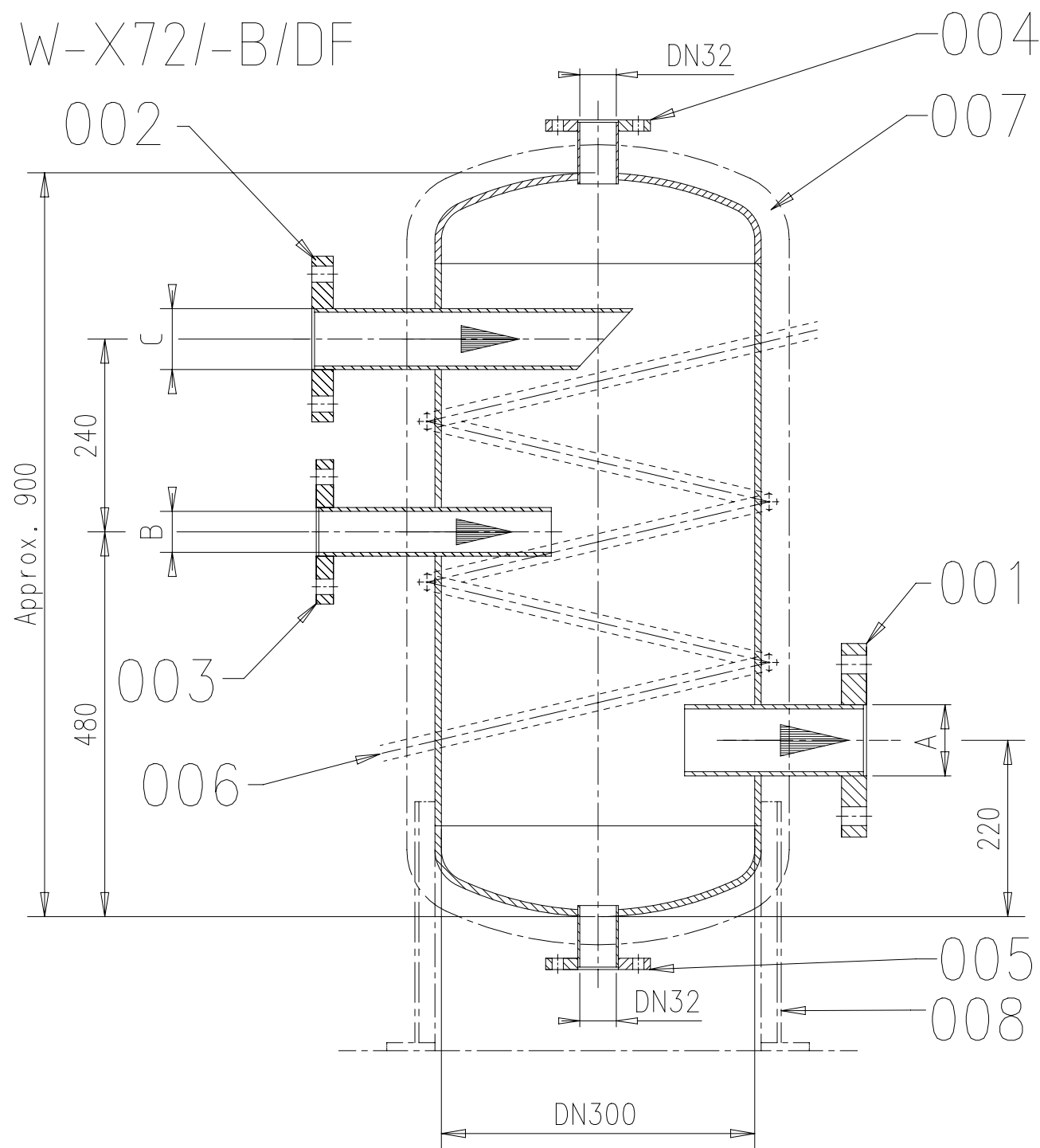
- Remarks (E)
- All heaters to be fitted with thermometers, relief valves, drains and drip trays. Not shown on drawings.
 - Steam tracers on main engine are laid out for 7 bar saturated steam.
 - Air vent and drain pipes must be fully functional at all inclination angles of the ship at which the engine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

- *1) To be 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 8 h settling tank change-over intervals. To make the layout for the project specific rating please refer to design group 9739 "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 an MDO/MGO collection 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 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
- Air vent pipes
- MDO pipes
- Pilot fuel
- Pipes on engine

WIND		FUEL OIL SYSTEM	
HFO/MDO/MGO		Brennstoffsystem	
Rev.	001	Rev.	001
Rev.	001	Rev.	001
Rev.	001	Rev.	001
Rev.	001	Rev.	001



Nominal pipe diameters (DN)

No. of cyl.	A	B	C
	DN	DN	DN
4	65	50	65
5	80	50	65
6	80	50	65
7	100	65	80
8	100	65	80



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

SURFACE PROTECTION SEE GROUP 0344
TOLERANCING PRINCIPLE ISO8015
GENERAL TOLERANCES ACCORDING TO ISO2768-mK

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 XXXXXX	Main Drw.
								Standard ISO; JIS	
Modif.	A	EAAD087849	14.06.2017						
		Number	Drawn date		Number	Drawn date		Number	Drawn date
 Winterthur Gas & Diesel			Product W-72		MIXING UNIT TO FUEL OIL SYSTEM				
Units	mm kg	NX		Basic Material					Net Weight 0.001
Made	19.10.2012	asex06	A.Sekulic	Scale	-	Size	A3	Page	1/1
Chkd	07.12.2012	wwr001	Wroblewski	Design Group	9723	Material ID	PAAD103066		
Appd	10.12.2012	bha009	Haag			Drawing ID	DAAD032414		

MIDS WinGD X72 FUEL-OIL-SYSTEM

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2016-10-06	DRAWING SET	First web upload
2017-08-18	DAAD032414	Mixing unit drg – new revision
2018-10-02	DAAD032418 DAAD026823	Main drg - new revision System drg - new revision
2020-09-30	DAAD026823	System drg – new revision

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