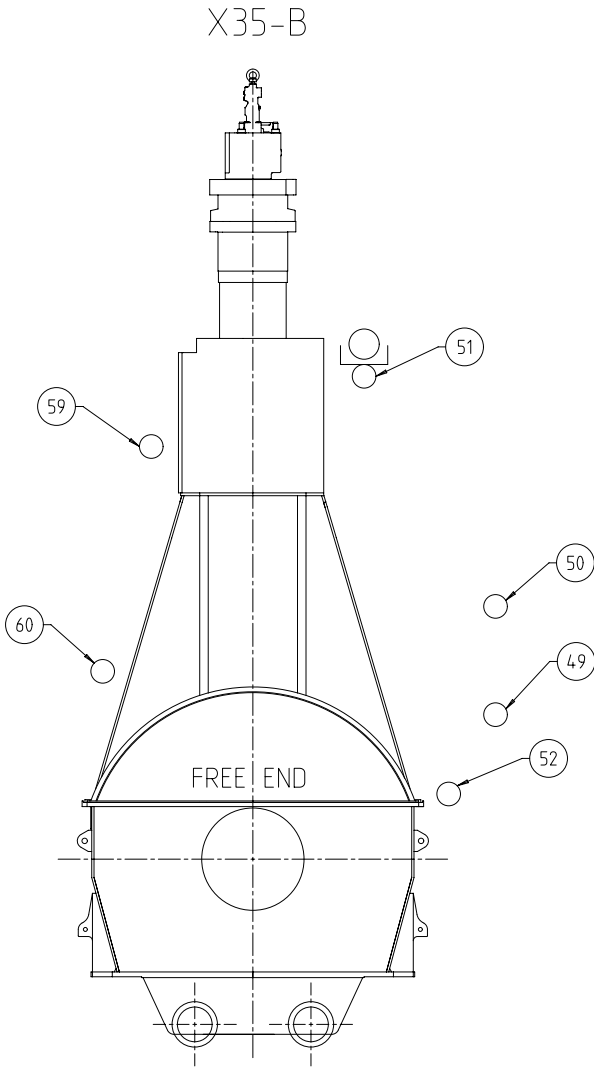


CONFIDENTIAL - DIMENSIONAL DRAWING - Confidential

SPECIFICATION which must be met





- 49 INLET - Fuel oil
- G 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
- G
- 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)
- G
- 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)
- G
- 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	PAAD028505	MIXING UNIT			DAAD012828				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 XXXXX		Main Drw.	
									Standard ISO; JIS			
Modif.	D	EAAD084051	22.01.2013	E	EAAD086063	26.08.2015	F	EAAD089659	03.10.2018	G	EAAD091789	02.12.2019
		Number	Drawn date		Number	Drawn date		Number	Drawn date		Number	Drawn date
 Winterthur Gas & Diesel			Product 5-8X35-B			FUEL OIL SYSTEM HFO&MDO&MGO Brennstoffsystem						
Units	mm kg	NX				Basic Material					Net Weight 0,001	
Made	22.12.2010	sfe006		Feuerstein		Scale	-		Size	A2	Page	1/2
Chkd	30.12.2010	dst009		Strödecke		Design Group		9723		Material ID	PAAD028371	
Appd	30.12.2010	dst009		Strödecke				Drawing ID		DAAD012785		Rev. G

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

Table: Fuel amount on engine side	
Cylinder	Volume
5	2 l
6	2 l
7	2 l
8	2 l

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

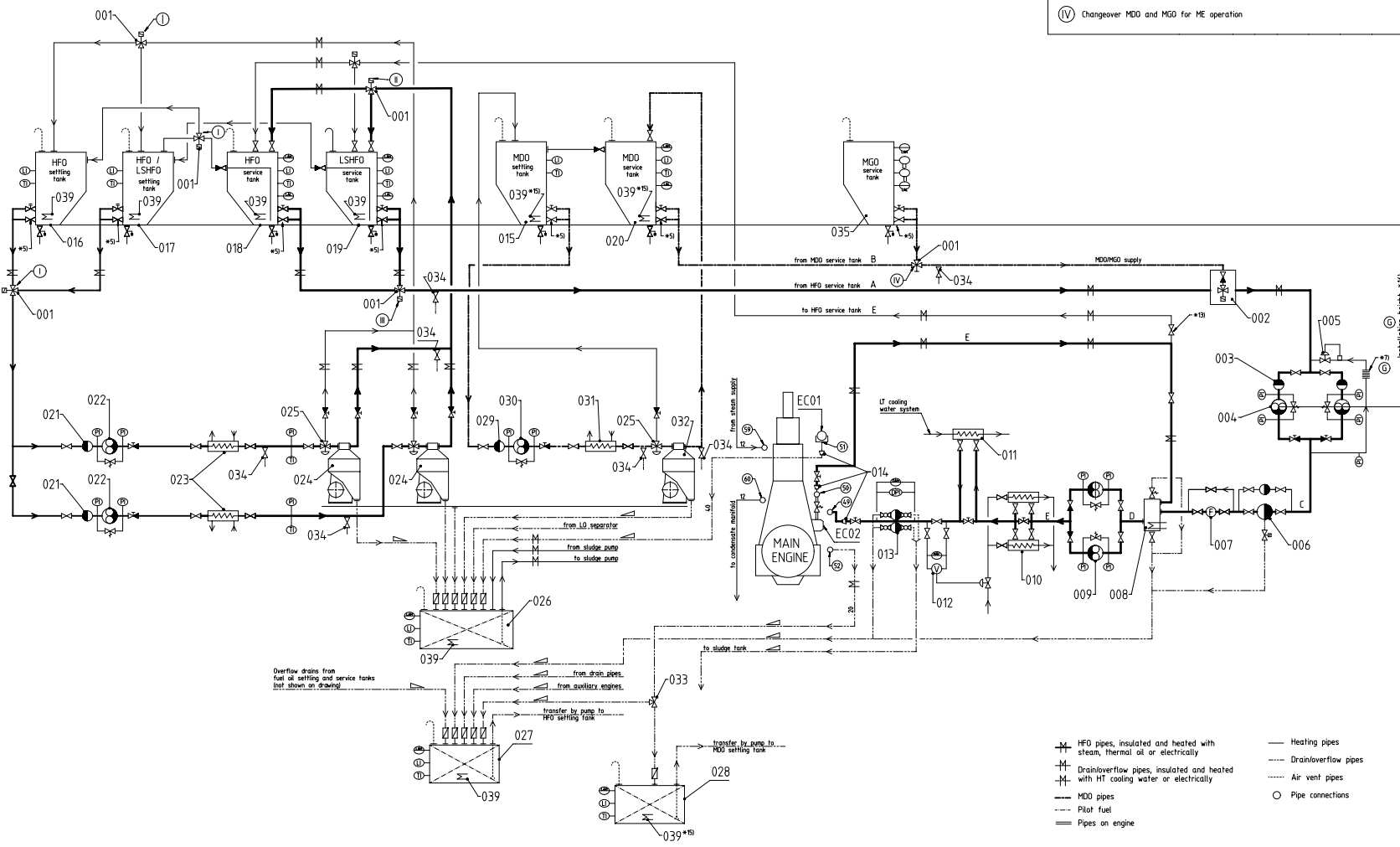
Number of cylinders			5	6	7	8
Main engine X35-B (R1 rated)	power	(kW)	4350	5220	6090	6960
	speed	(rpm)	167			

Proposal for dimensioning *4)						
Mixing unit	volume	(l)	acc. to separate drawing			
HFO settling tank	volume	(m³)	7	8	10	11
HFO service tank	volume	(m³)	7	8	10	11
MDO/MGO service tank	volume	(m³)	8	9	10	12
MDO/MGO drain tank *11)	volume	(m³)	0.8	0.9	1	1.2
Nominal pipe diameter	A	DN	32	32	32	32
	B	DN	32	32	32	32
	C	DN	32	32	32	32
	D	DN	32	32	4.0	4.0
	E	DN	32	32	4.0	4.0

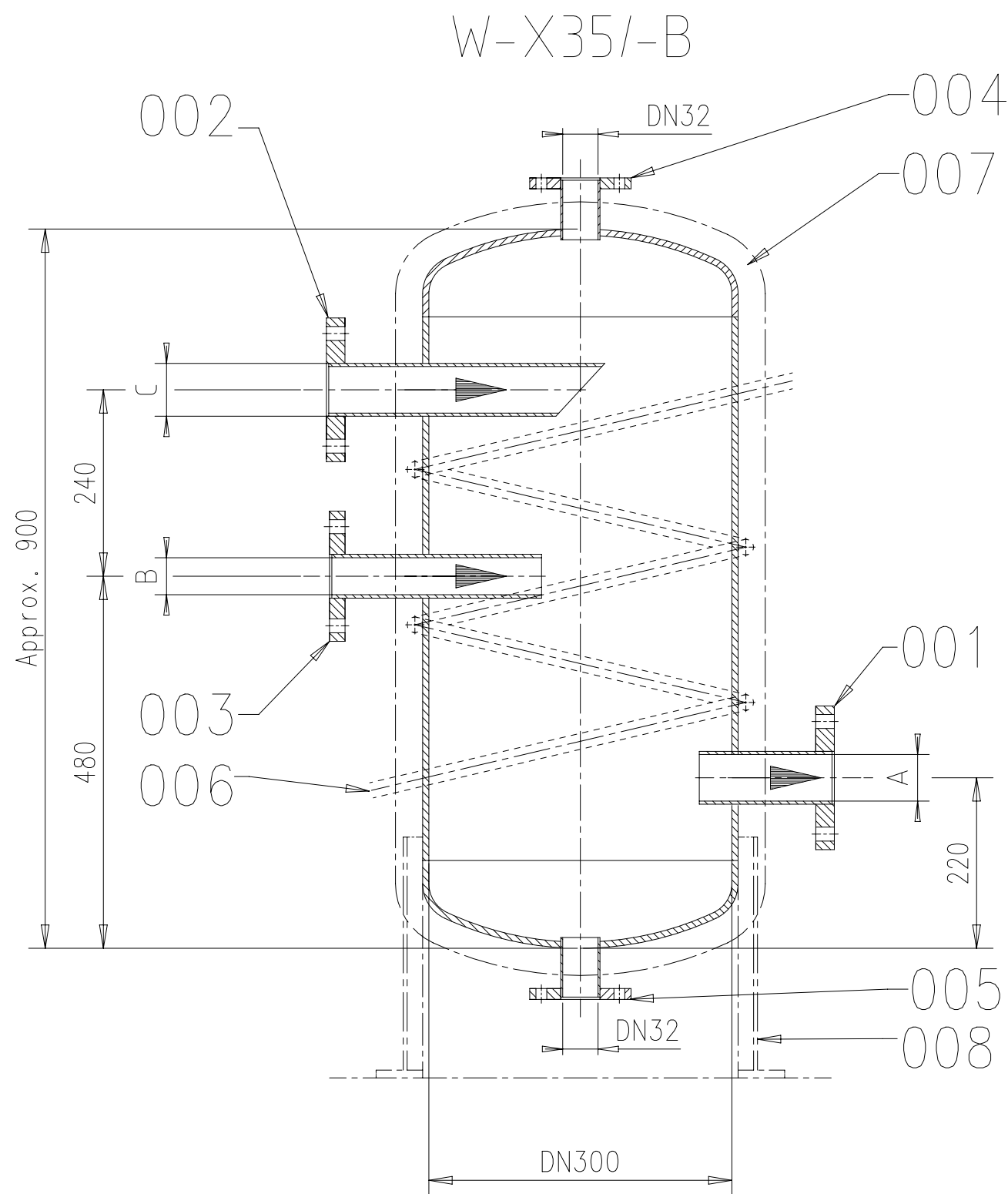
- I Both valves to be interconnected
- II Changeover LSHFO and HFO for fuel treatment
- III Changeover LSHFO and HFO for ME operation
- IV Changeover MDO and MGO for ME operation

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
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 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 "Fluid 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 tank 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: 4.0 °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
- Air vent pipes
- MDO pipes
- Pilot fuel
- Pipes on engine



Nominal pipe diameters (DN)

No. of cyls.	A	B	C
	DN	DN	DN
5	32	32	32
6	40	32	40
7	40	40	40
8	40	40	40

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.
- \*2) Shown on drawing.

Free space for lic.								Q-Code XXXXXX	Main Drw.									
								Standard ISO; JIS										
Modif.	<input checked="" type="radio"/> A	EAAD087849	14.06.2017	<input type="radio"/>			<input type="radio"/>			<input type="radio"/>								
		Number	Drawn date		Number	Drawn date		Number	Drawn date		Number	Drawn date						
<div>WIN GD</div> <div>Winterthur Gas &amp; Diesel</div>			Product W-35			MIXING UNIT TO FUEL OIL SYSTEM												
Units		mm kg	NX			Basic Material					Net Weight 0.001							
Made	22.12.2010		sfe006		Feuerstein		Scale		-		Size	A3	Page	1/1	Material ID	PAAD028505		
Chkd	30.12.2010		dst009		Strödecke		Design Group		9723		Drawing ID	DAAD012828					Rev.	A
Appd	30.12.2010		dst009		Strödecke													

## MIDS - WinGD X35-B – Fuel Oil System

### TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2017-02-17	DRAWING SET	First web upload
2017-08-18	DAAD012828	Mixing unit drg – new revision
2018-10-03	DAAD012790 DAAD012785	Main drg – new revision System drg – new revision
2020-09-30	DAAD012785	System drg – new revision

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