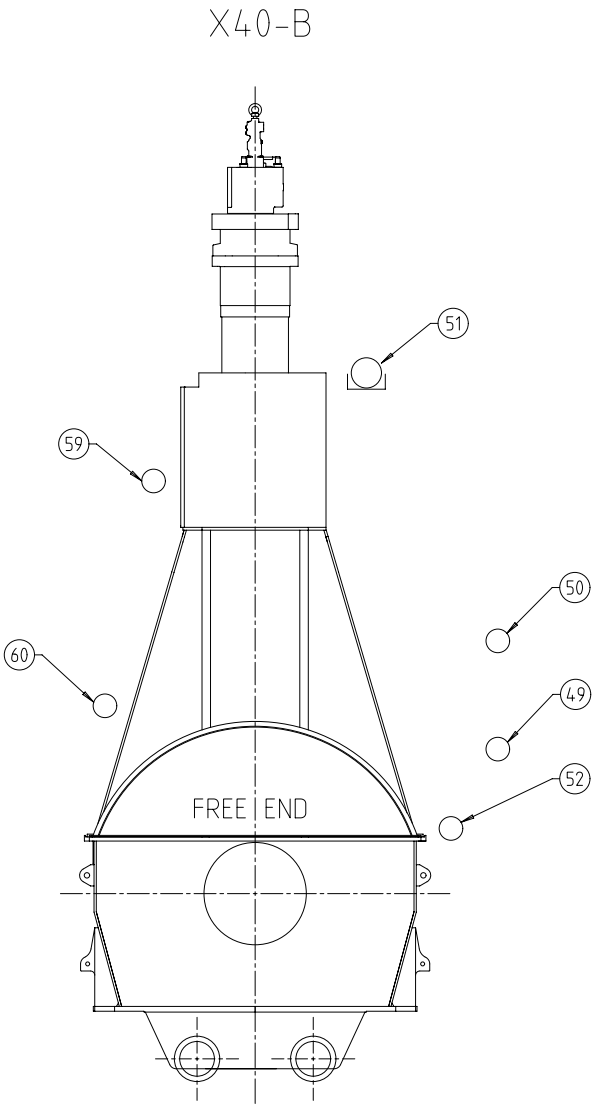




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SPECIFICATION which must be met

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



|    |   |
|----|---|
| 49 | INLET - Fuel oil  |
| E  | Fuel oil quality at engine inlet: according to specification in Marine Installation Manual (MIM)<br><br>Pressure at engine inlet: stopped engine: 10 bar<br>running engine: 7-10 bar<br><br>Volume flow: according to GTD<br><br>Viscosity:<br>- Viscosity for HFO: 10-20 cSt (recommendation: 13-17 cSt)<br>- Viscosity MDO/MGO: 2-20 cSt<br><br>Filtration:<br>- At least one filter unit close to the engine inlet.<br>- One filter unit with max. 10 micron (absolute, sphere passing mesh) in the fuel system (either in feed- or booster circuit)<br>- Bypass filter in parallel to the main fuel oil filter with max. 25 micron (absolute, sphere passing mesh)<br><br>Fuel change-over:<br>- Max. temperature gradient during fuel change-over: 2 °C/min<br>- Fuel amount on engine side: mentioned in table 1 on page 2.<br>- Fuel amount on system side: according to project specific system layout. |
| 50 | OUTLET - Fuel return  |
| E  | - Normal operation condition: Returning to mixing unit.<br>- 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,FO) from rail-unit, not for re-use<br>- Free flow by gravity to sludge oil tank or appropriate tank.<br>- 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:<br>'Normal drainage'<br>Expected (design) fuel return from the fuel pump and injection control side during normal operation.<br>'Leakage'<br>Unexpected fuel return from an emergency situation only (e.g. high pressure pipe damage).<br><br>- Clean fuel must be collected in a drain tank (or appropriate tank) by gravity free flow<br>- Piping must be insulated and heated (50-95°C)   |
| 59 | INLET - Heating medium for fuel oil trace heating<br>- Connected to steam or thermal oil supply   |

|  |            |                   |                     |   |            |  |            |                     |            |                                     |                   |            |
|--|------------|-------------------|---------------------|---|------------|--|------------|---------------------|------------|-------------------------------------|-------------------|------------|
| 1  | 008        | PAAD059949        |                     | MIXING UNIT   |            | DAAD020383   |            |                     |            | 0,001                               |                   |            |
| QTY  | SEQ NO     | Material ID       |                     | Material Name   |            | Dimension, Occ                                     |            | Standard or Drawing |            | Basic Material<br>Material Standard | Weight<br>GR./NET |            |
| Free space<br>for lic.   |            |                   |                     |   |            |  |            |                     |            | Q-Code<br>XXXXXX                    | Main<br>Drw.      |            |
|  |            |                   |                     |   |            |  |            |                     |            | Standard<br>ISO; JIS                |                   |            |
| Modif.   | B          | EAAD085468        | 05.02.2015          | C   | EAAD085894 | 16.07.2015   | D          | EAAD089659          | 03.10.2018 | E                                   | EAAD091789        | 02.12.2019 |
|  |            | Number            | Drawn date          |   | Number     | Drawn date   |            | Number              | Drawn date |                                     | Number            | Drawn date |
| <br>Winterthur Gas & Diesel |            |                   | Product<br>5-8X40-B |   |            | FUEL OIL SYSTEM<br>HFO&MDO&MGO<br>Brennstoffsystem |            |                     |            |                                     |                   |            |
| Units  | mm kg      | NX                |                     |  |            | Basic Material                                     |            |                     |            |                                     | Net Weight 0,001  |            |
| Made<br>Chkd   | 06.09.2011 | Imux02 L.Müller   |                     | Scale   | -          | Size   | A2         | Page                | 1/2        | Material<br>ID                      | PAAD059948        |            |
|  | 10.10.2011 | wwr001 Wroblewski |                     | Design Group  | 9723       | Drawing<br>ID                                      | DAAD020382 |                     |            |                                     | Rev.              | E          |
| Appd   | 10.10.2011 | dst009 Strödecke  |                     |   |            |  |            |                     |            |                                     |                   |            |

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

Tablet: Fuel amount on engine side

| Cylinder | Volume |
|----------|--------|
| 5        | 3 l    |
| 6        | 3 l    |
| 7        | 3 l    |
| 8        | 3 l    |

| 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 X40-B<br>(R1 rated) | power | (kW)  | 5675 | 6810 | 7945 | 9080 |
|                                 | speed | (rpm) | 146  |      |      |      |

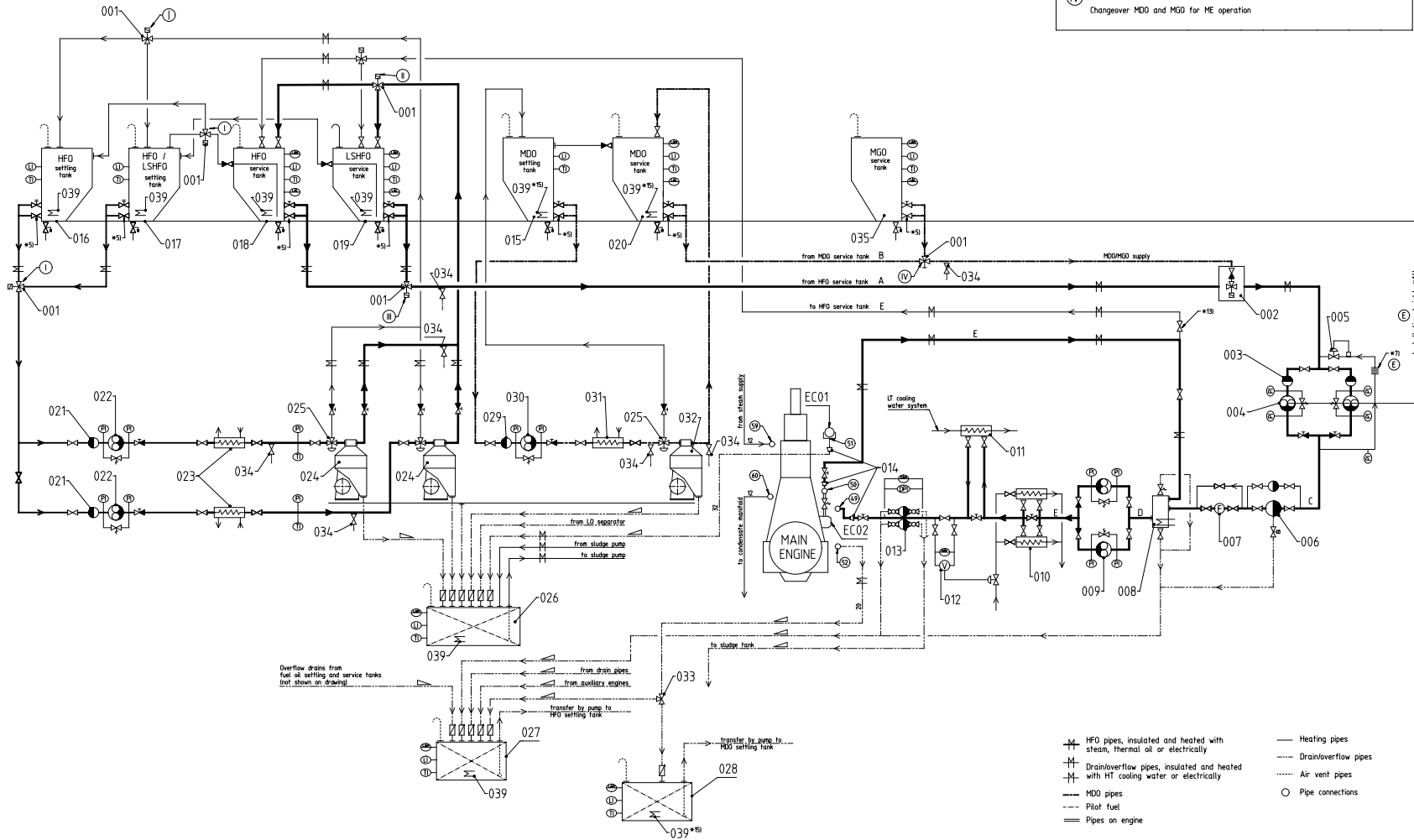
Proposal for dimensioning \*4)

| Mixing unit             | volume (l)       | acc. to separate drawing |
|-------------------------|------------------|--------------------------|
| HFO settling tank       | volume (m³)      | 9 11 12 14               |
| HFO service tank        | volume (m³)      | 9 11 12 14               |
| MDO/MGO service tank    | volume (m³)      | 10 12 13 15              |
| MDO/MGO drain tank *10) | volume (m³)      | 1 12 13 15               |
| Nominal pipe diameter   | A DN 32 32 40 40 |                          |
|                         | B DN 32 32 32 32 |                          |
|                         | C DN 32 32 32 40 |                          |
|                         | D DN 32 40 40 50 |                          |
|                         | E DN 32 32 40 40 |                          |

- 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 (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 *10) *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 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 "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 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 value 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 pipes.



WIND logo and project information:

Project: FUEL OIL SYSTEM  
Manufacturer: Brennstoffsystem

Approval stamps and dates:

- 06.09.2011
- 06.09.2011
- 06.09.2011
- 06.09.2011

Approval stamps and dates:

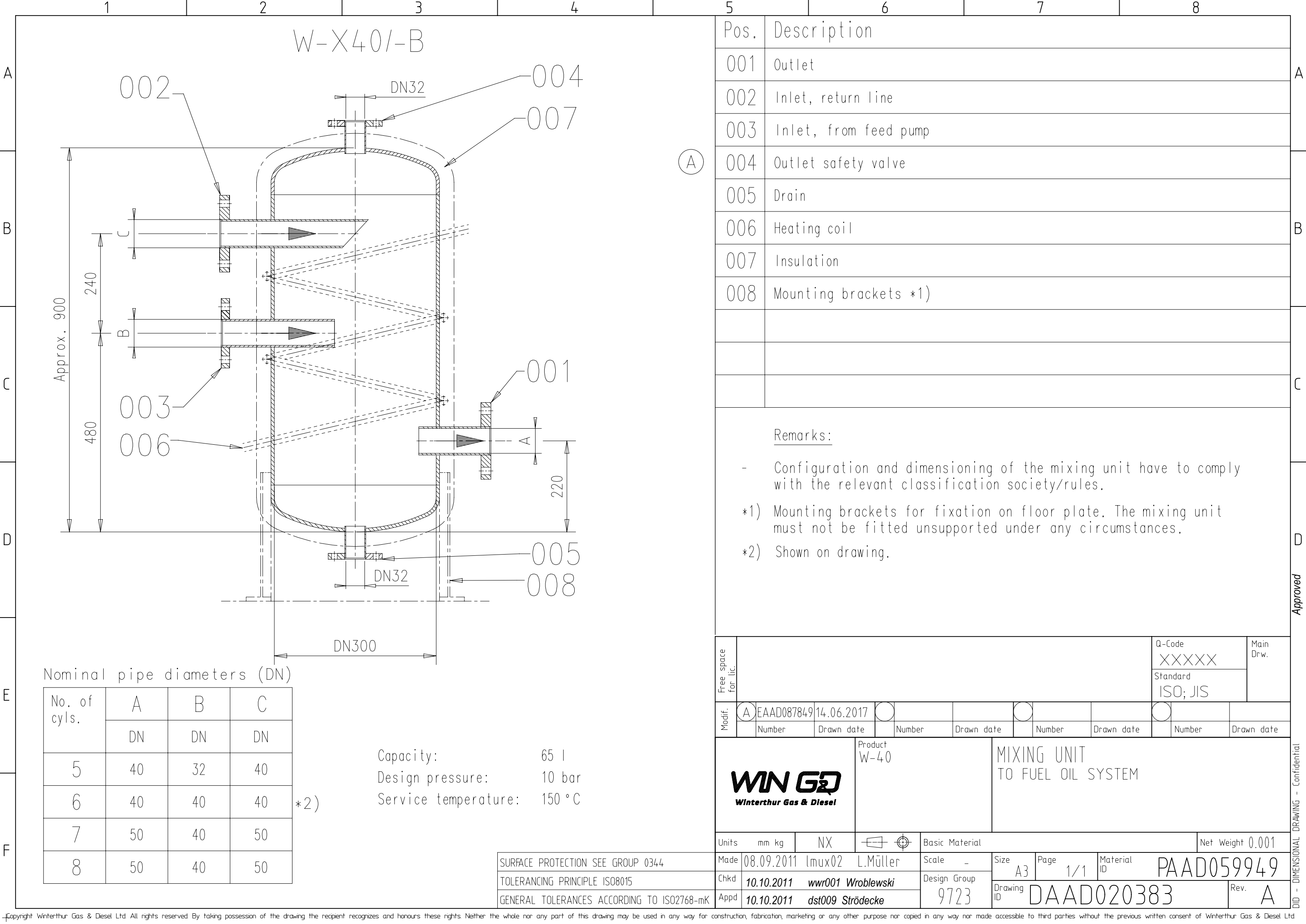
- 06.09.2011
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- 06.09.2011
- 06.09.2011
- 06.09.2011



## MIDS - WinGD X40-B – Fuel Oil System

### TRACK CHANGES

| DATE       | SUBJECT                  | DESCRIPTION  |
|------------|--------------------------|--|
| 2017-02-20 | DRAWING SET              | First web upload                                     |
| 2017-08-18 | DAAD020383               | Mixing unit – drawing replaced with new revision     |
| 2018-10-03 | DAAD020384<br>DAAD020382 | Main drg – new revision<br>System drg – new revision |
| 2020-09-30 | DAAD020382               | System drg – new revision                            |

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