Net Weight	Quantity	SEQ NO	Material ID	Material Name	Dimension/Occ.Dimension	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
0.005								
	1	005	107.428.377.500	DISTILLATE FUELS		107.428.377		0.001
	1	004	107.246.880.500	CONCEPT GUIDANCE		107.246.880		0.001
	1	003	107.341.991.500	INSTRUCTION FOR FLUSHING		107.341.991		0.001
	1	002	107.246.303.500	MIXING UNIT		107.246.303		0.001
	1	001	PAAD039601	FUEL OIL SYSTEM		DAAD016279		0.001

PER ENGINE

Material ID: PAAD040241

Free space for lic.

Q-Code: XXXXX

Standard: ISO JIS

Main Drw.: H

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
–	EAAD082835	27.04.2011						

WÄRTSILÄ

Product: RT-flex48T-D

FUEL OIL SYSTEM
INSTALLATION DRAWINGS
Brennstoffsystem

Units: mm kg | IDE

Basic Material | Net Weight

SURFACE PROTECTION SEE GROUP 0344

TOLERANCING PRINCIPLE ISO8015

GENERAL TOLERANCES ACCORDING TO ISO2768-mK

Made	14.04.2011	sfe006 Feuerstein
Chkd	02.05.2011	mhu019 Hug
Appd	03.05.2011	dst009 Stroedecke

Scale 1:1 | Design Group 9723

Size A3 | Page 1/1 | Material ID

Drawing ID: DAAD016468 | Rev. –

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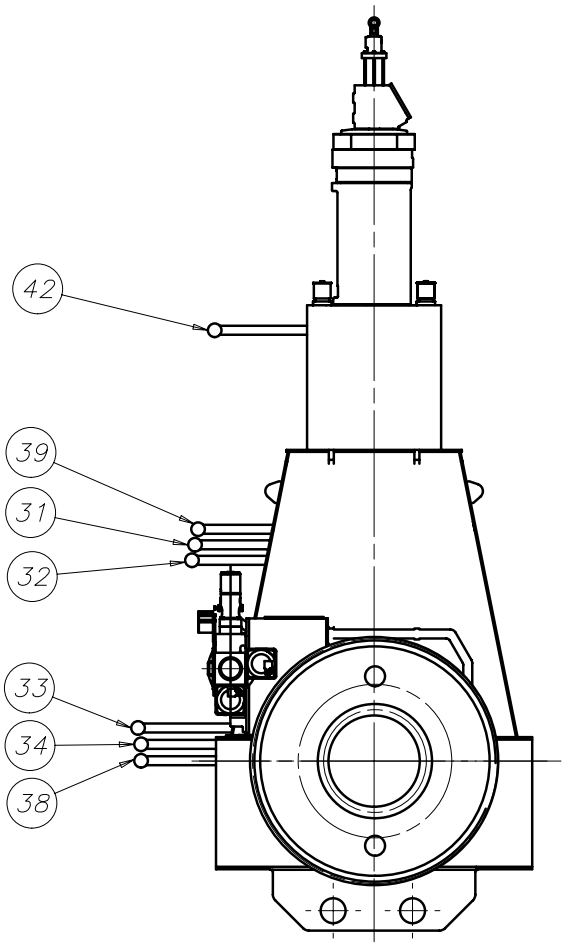
(38)	OUTLET - Heating medium for fuel oil trace heating - Connected to condensate manifold or thermal oil return
(39)	OUTLET - Heating medium for fuel oil trace heating - Connected to condensate manifold or thermal oil return
(42)	INLET - Heating medium for fuel oil trace heating - Connected to steam or thermal oil supply

RT-flex48T-D

DRIVING END



FUEL SIDE

EXHAUST SIDE

Specifications that need to be met:

(31) INLET - Fuel oil
- At least one fuel oil filter unit close to the engine inlet.
- Fuel oil quality at engine inlet according to specification in Marine Installation Manual(MIM)

- Inlet pressure:	stopped engine 10 bar running engine 7-10 bar
- Viscosity for HFO:	10-20 cSt(recommendation: 13-17 cSt)
- Viscosity MGO/MDO:	2-20 cSt
- Max. temperature gradient during FO change-over:	2°C/min
- Filtration:	one filter unit with max. 10 micron absolute in the fuel oil system (sphere passing mesh)
- Volume flow:	according to GTD

(32) OUTLET - Fuel oil return
- Normal operation condition: Returning to mixing tank.
- Fuel oil change-over while engine not in service: Returning to service tank.

(33) 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)

(34) **(C)** OUTLET - Fuel leakage fuel pump and injection control(clean)
- Clean fuel: Normal leakage from fuel pump and injection control side and additional leakage in emergency situation (e.g. high pressure pipe damage)
- Free flow by gravity to fuel oil drain tank or appropriate tank.
- Pipe insulated and heated up(50-95°C)

Free space for lic.

Q-Code XXXXX

Standard ISO JIS

Main Drw.

Approved

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
-	EAAD082835	07.04.2011	A EAAD083822	10.05.2012	B EAAD085468	06.10.2014	C EAAD085894	08.07.2015

WIN GD Winterthur Gas & Diesel

Product W-48

FUEL OIL SYSTEM
MAIN CIRCUIT
Brennstoffsystem
Hauptkreislauf

Units mm kg	IDE	Basic Material			Net Weight 0.001	
SURFACE PROTECTION SEE GROUP 0344	Made	12.04.2011 sfe006 Feuerstein	Scale –	Size A3	Page 1/2	Material ID PAAD039601
TOLERANCING PRINCIPLE ISO8015	Chkd	02.05.2011 mhu019 Hug	Design Group 9723	Drawing ID DAAD016279		Rev. C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	26.06.2012 dst009 Stroedecke				

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SYSTEM PROPOSAL

Number of cylinders				5	6	7	8
Main engine RT-flex48 (R1)	power		(kW)	7275	8730	10185	11640
	speed		(rpm)	127			
Mixing unit	capacity		(l)	acc. to separate drwg.			
Heavy fuel oil settling tank	capacity		(m^3)	12	14	16	19
Heavy fuel oil service tank	capacity		(m^3)	12	14	16	19
Marine diesel oil service tank	capacity		(m^3)	12	14	16	19
Sludge tank ~10% of all tanks	capacity		(m^3)	1.8	2.2	2.5	2.9
Nominal pipe diameter		A	DN	40	40	50	50
		B	DN	32	32	32	40
		C	DN	32	40	40	40
		D	DN	50	65	65	65
		E	DN	50	50	50	50

All capacities and the given diameters are valid for R1 (IMO)-rated engines and serve as an example. The given tank capacities are based on 8 h settling tank change-over intervals. For Rx-rated engines, please refer to design group 9730 "Fluid velocities and flow rates, recommended values for pipework of diesel plants" for selecting the appropriate pipe diameter.

(I) Both valves should be interconnected

(II) Changeover LSHFO and HFO for fuel treatment

(III) Changeover LSHFO and HFO for ME operation

Pos.	Description (C)
(31)	INLET - Fuel oil
(32)	OUTLET - Fuel oil return
(33)	OUTLET - Fuel leakage rail-unit(dirty)
(34)	OUTLET - Fuel leakage fuel pump and injection control(clean)
(38)	OUTLET - Heating medium for fuel oil trace heating
(39)	OUTLET - Heating medium for fuel oil trace heating
(42)	INLET - Heating medium for fuel oil trace heating

Remarks

*1) The return pipe may also be led to the HFO service tank.
*2) To be kept closed for normal engine operation. For draining only.
*3) Separator capacity related to viscosity: layout according to certified flow rate (CFR) recommended.
*4) Not needed for self adjusting separators.
*5) Applied if two different leakage/drain tanks are installed, i.e. the normal FO drain tank and in addition a separate tank to collect clean MDO/MGO, to enable switching between the tanks. (C)
*6) Installed as required (check with the pipe connection plan)

- Feed pumps (pos.004) shall be installed below MDO and HFO/LSHFO service tanks.
- All heaters to be fitted with thermometers, relief valves, drains and drip trays.
- 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.
- For "◯" marked positions please refer to the pipe connection drawings.
- Overflow and drain pipes for fuel tanks are not shown
- For info:
  Engine is equipped with following elements:

  EC01 Fuel rail unit
  EC02 Fuel supply unit

*7) The leakage rate of MDO/MGO is significantly higher than the leakage rate of HFO. Therefore, during long-term operation on MDO/MGO the collection of clean MDO/MGO in a separate leakage tank is highly recommended. (C)

*8) The tank inlet just to be equipped with a swing check valve to avoid inadmissible backpressure. (C)

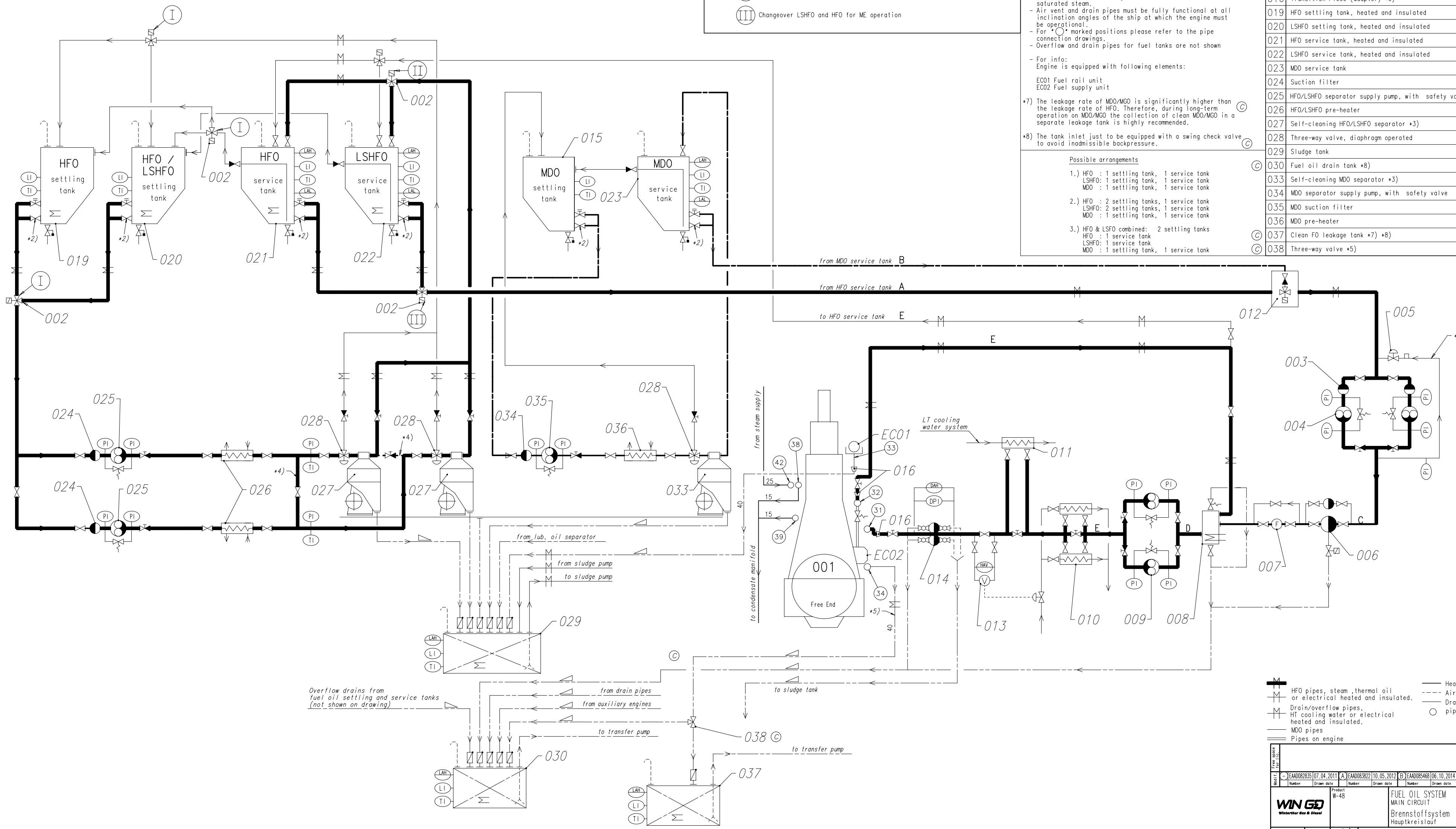
Possible arrangements (C)

1.) HFO : 1 settling tank, 1 service tank
LSHFO: 1 settling tank, 1 service tank
MDO : 1 settling tank, 1 service tank

2.) HFO : 2 settling tanks, 1 service tank
LSHFO: 2 settling tanks, 1 service tank
MDO : 1 settling tank, 1 service tank

3.) HFO & LSFO combined: 2 settling tanks (C)
HFO : 1 service tank
LSHFO: 1 service tank
MDO : 1 settling tank, 1 service tank (C)

Pos.	Description
001	Main engine (R1-Rating)
002	Three way valve, manually or remotely operated
003	Fuel oil suction filter, heated (trace heating acceptable)
004	Low pressure feed pump
005	Pressure regulating valve
006	Automatic self-cleaning filter 10 micorn, heated (trace heating acceptable)
007	Flowmeter
008	Mixing unit, heated and insulated (according to separate drawing)
009	High pressure booster pump
010	Fuel oil endheater
011	FW - fuel oil cooler
012	Automatic fuel change-over unit
013	Viscosimeter
014	Fuel oil filter 60 micron, heated (trace heating acceptable)
015	MDO settling tank
016	Transition Piece (adapter) *6)
019	HFO settling tank, heated and insulated
020	LSHFO setting tank, heated and insulated
021	HFO service tank, heated and insulated
022	LSHFO service tank, heated and insulated
023	MDO service tank
024	Suction filter
025	HFO/LSHFO separator supply pump, with safety valve
026	HFO/LSHFO pre-heater
027	Self-cleaning HFO/LSHFO separator *3)
028	Three-way valve, diaphragm operated
029	Sludge tank
030	Fuel oil drain tank *8) (C)
033	Self-cleaning MDO separator *3)
034	MDO separator supply pump, with safety valve
035	MDO suction filter
036	MDO pre-heater
037	Clean FO leakage tank *7) *8) (C)
038	Three-way valve *5) (C)



HFO pipes, steam ,thermal oil or electrical heated and insulated.
Drain/overflow pipes, HT cooling water or electrical heated and insulated.
MDO pipes
Pipes on engine
Heating pipes
Air vent pipes
Drain/overflow pipes
◯ pipe connections

Modif. (–) EAAD082835	07.04.2011	(A) EAAD083822	10.05.2012	(B) EAAD085468	06.10.2014	(C) EAAD085894	08.07.2015
Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date

Q-Code XXXXX
Standard ISO JIS
Main Drw.

Winterthur Gas & Diesel

Product W-48

FUEL OIL SYSTEM
MAIN CIRCUIT
Brennstoffsystem
Hauptkreislauf

Units	mm kg
IDE	
Basic Material	
Net Weight	0.001
Made	12.04.2011 sfe006 Feuerstein
Chkd	02.05.2011 mhu019 Hug
Appd	26.06.2012 dst009 Stroedecke
Scale	–
Design Group	9723
Size	A0
Page	2/2
Material ID	PAAD039601
Drawing ID	DAAD016279
Rev.	C

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

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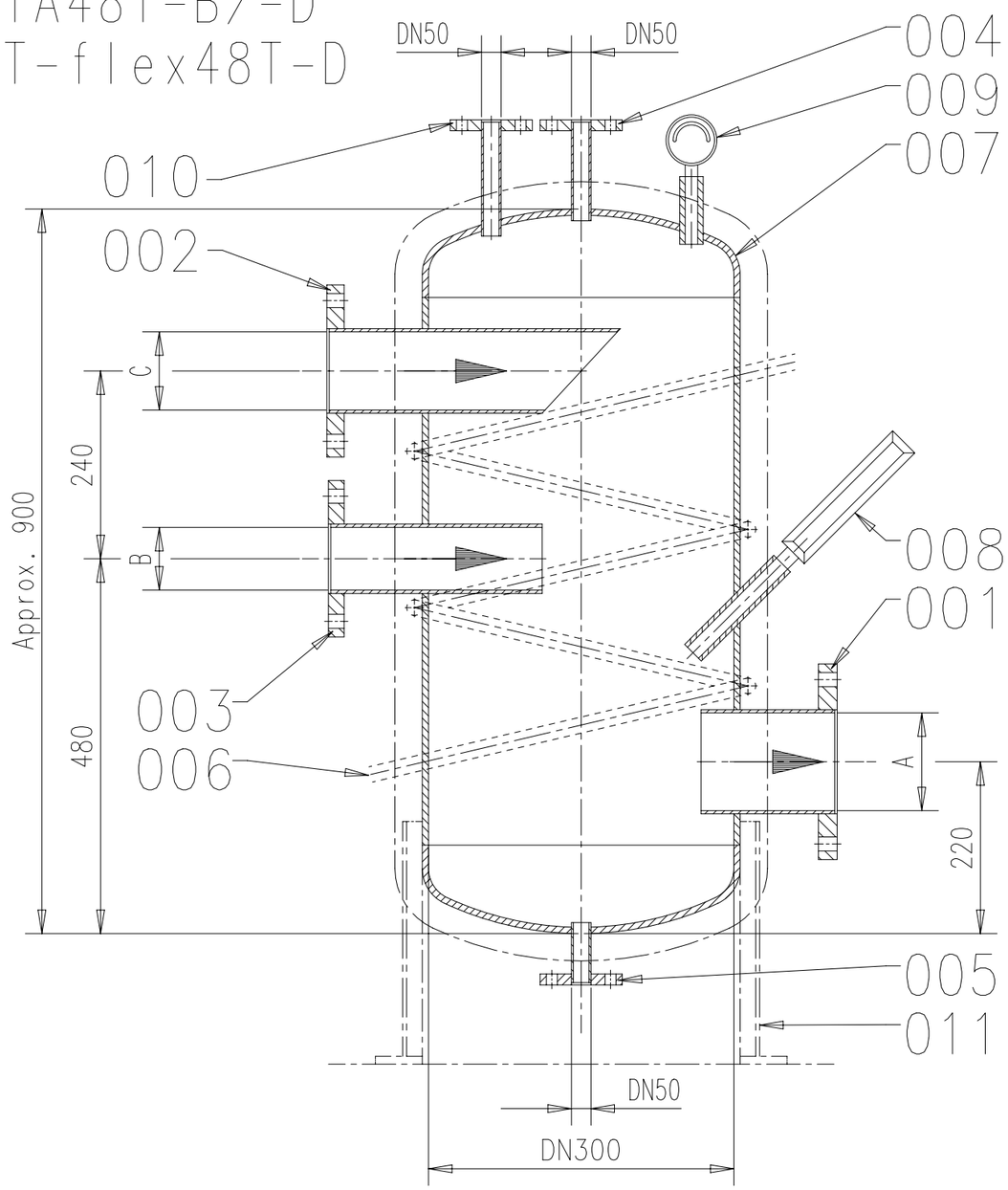
RTA48T-B/-D
RT-flex48T-D



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	Thermometer *1)
009	Pressure gauge *1)
010	Safety valve connection *1)
011	Mounting brackets *2)

Remarks:

- Configuration and dimensioning of the mixing unit have to comply with the relevant classification society/rules.

*1) Only required if not already present in the system near the mixing unit.

*2) Mounting brackets for fixation on floor plate. The mixing unit must under no circumstances be fitted unsupported.

Table 1: Nominal pipe diameter (DN)

	No. of cyls.				
	5	6	7	8	
A	50	65	65	65	
B	32	40	40	40	
C	40	50	50	50	

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

Free space for lic.				Q-Code XXXXX	Main Drw.
				Standard ISO; JIS	
Modif.	A EAAD087849	14.06.2017			
	Number	Drawn date	Number	Drawn date	Number Drawn date Number Drawn date

WIN GD Winterthur Gas & Diesel

Product W-48

MIXING UNIT
TO FUEL OIL SYSTEM

Units mm kg	NX		Basic Material		Net Weight 0.001
SURFACE PROTECTION SEE GROUP 0344	Made	23.06.1998 S.Stylianou	Scale -	Size A3	Page 1/1
TOLERANCING PRINCIPLE ISO8015	Chkd		Design Group 9723	Material ID 107.246.303.500	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	23.06.1998 WCH001 Service User		Drawing ID 107.246.303	Rev. A

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MIDS_WinGD-RT-flex48T-D_FUEL-OIL-SYSTEM

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2017-08-21	DRAWING SET	First web upload

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