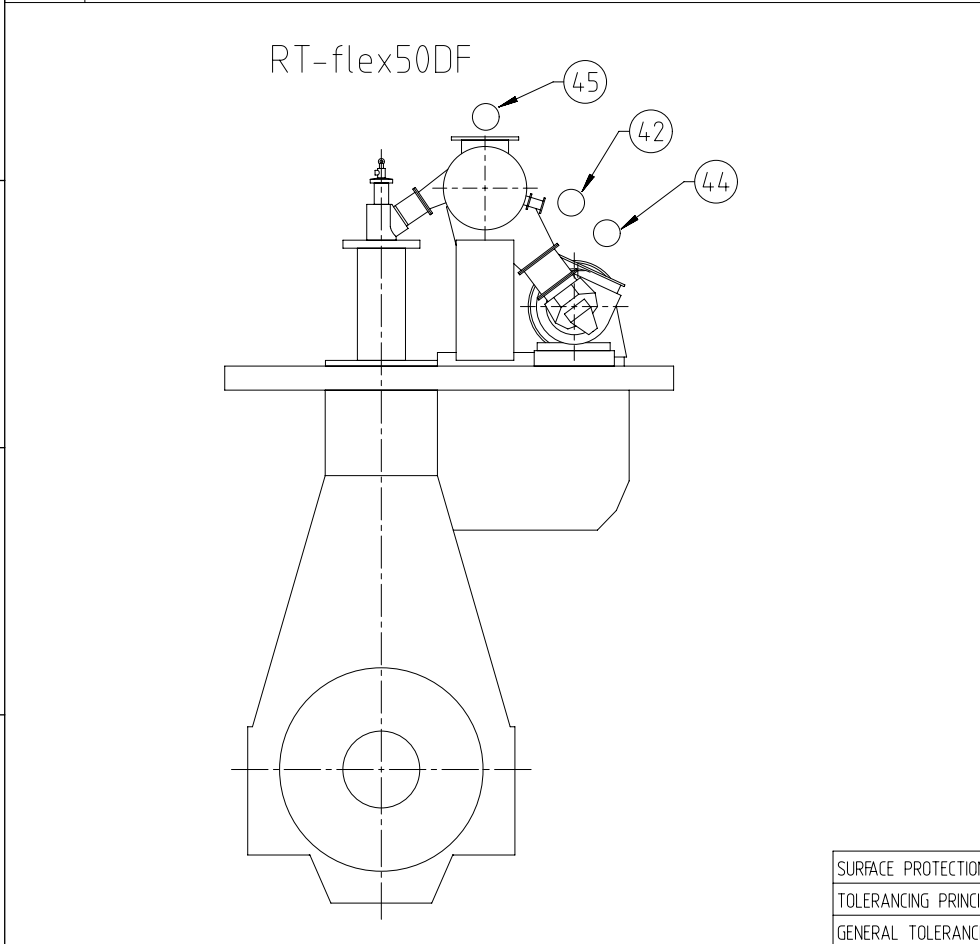




CONFIDENTIAL - DIMENSIONAL DRAWING - Confidential

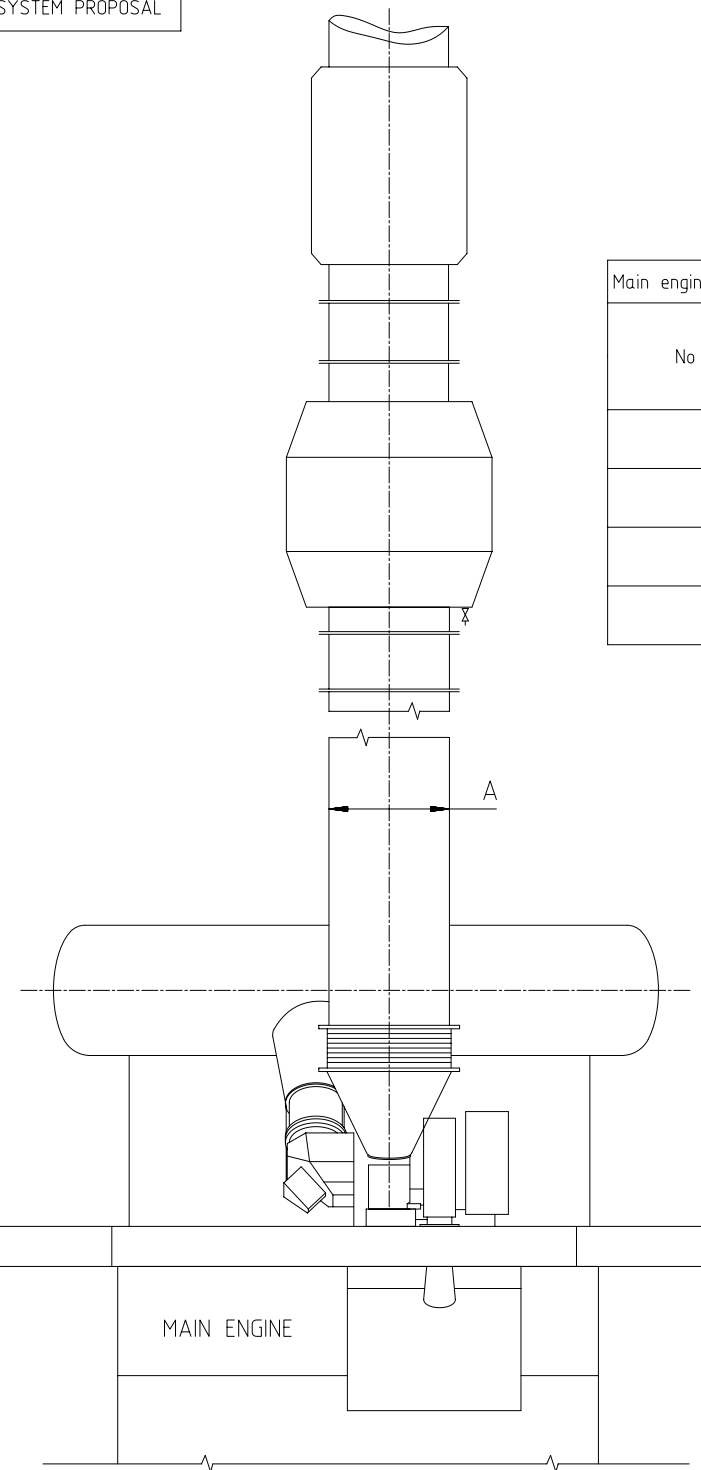
Specifications which must be met:

45	<p>OUTLET - Exhaust gas by-pass</p> <ul style="list-style-type: none"> - The installation of a by-pass line between exhaust gas manifold and turbocharger may be requested by owner and class if only one turbocharger is installed. Its purpose is to allow engine operation even after a turbocharger failure. - Blinded off during normal operation.
42	<p>OUTLET - Exhaust gas manifold waste gate</p> <ul style="list-style-type: none"> - Size and layout of connection flange is provided in the "Pipe Connection Plan" - Pipe diameter according to parameter "B" on page 2. - Waste gate connection pipe to main exhaust gas pipe must be kept as short as possible to avoid swirl and extensive back pressure.

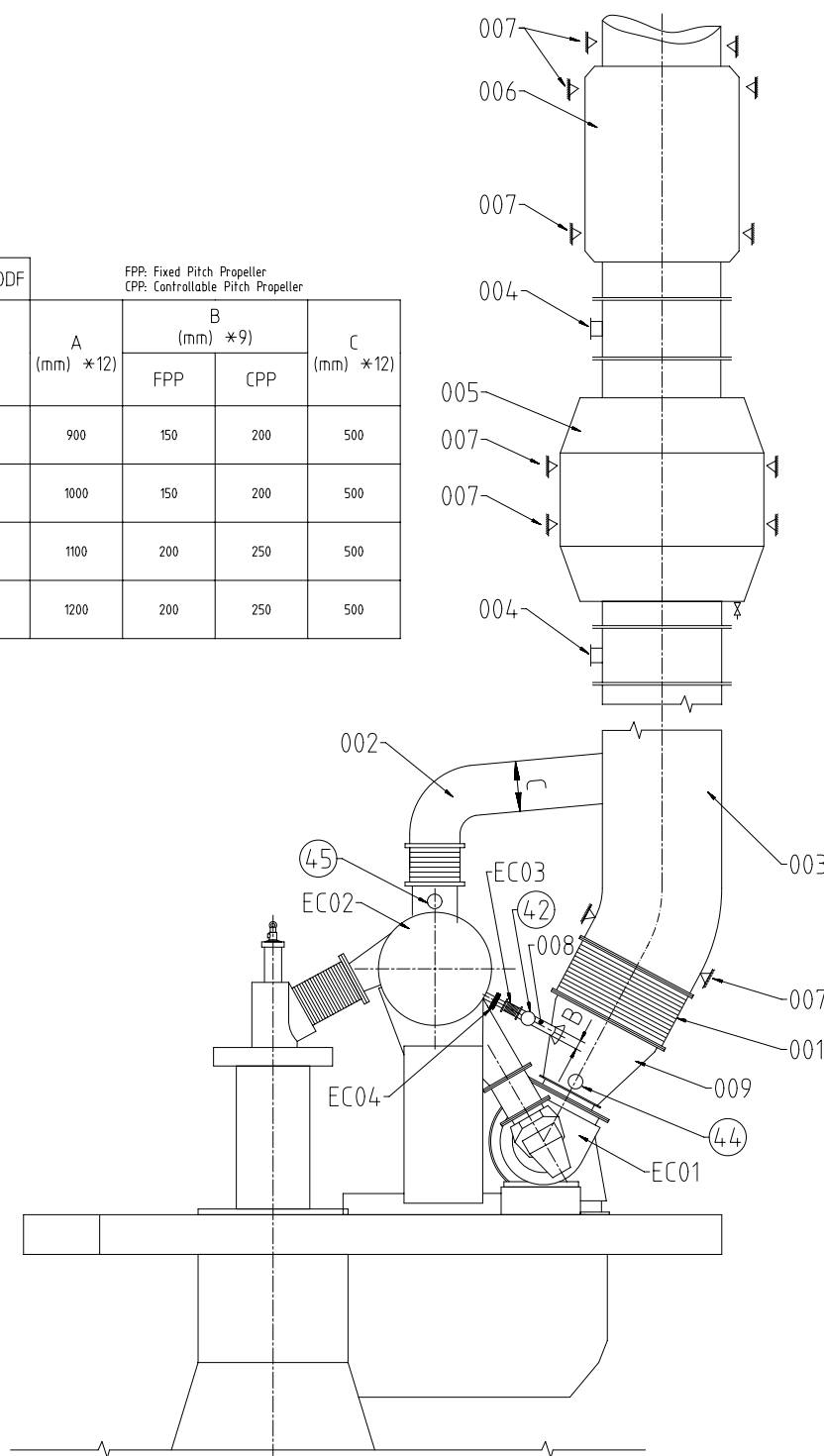


44	<p>OUTLET - Exhaust gas turbocharger</p> <ul style="list-style-type: none"> - Exhaust gas temperature and volume flow: according to GTD - The total back pressure of the exhaust gas system must be kept in the admissible range of: Design maximum (new condition) in gas mode and in diesel mode without exhaust gas treatment system: 30 mbar Design maximum (new condition) in diesel mode with exhaust gas treatment system: 60 mbar Operational maximum in gas mode: 45 mbar Operational maximum (fouled condition) in diesel mode without exhaust gas treatment system: 50 mbar Operational maximum (fouled condition) in diesel mode with exhaust gas treatment system: 80 mbar - Pipe dimensions laid out according to the recommended gas velocities provided in the the Marine Installation Manual (MIM) and by GTD. - The exhaust piping must be arranged in a way to avoid gases from accumulating. - The piping layout must consider the thermal expansion and vibration from turbocharger (TC) and main engine (ME). Thermal expansion of the ME to be calculated according to the formula in MIM, TC specific thermal expansion are provided by the TC supplier. - Explosion relief devices with flameless pressure relief (rupture discs or spring loaded valves) must be installed in accordance with class requirements. For installations with rupture discs an opening control signal must be sent to the Alarm and Monitoring System. - Supports (fixation points) for carrying piping and exhaust gas system components deadweight must be installed in sufficient size and amount. Inadmissible tensions in the piping and forces acting on the turbocharger are not acceptable. - Exhaust gas pipes of several engines must not be connected. - Drains in adequate size and amount must be installed in the exhaust gas piping. - When the noise level on the bridge wing exceeds the class requirement (normally 60 - 70 dB(A)) a silencer must be applied.
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Free space for lic.	Q-Code XXXXX								Main Drw.		
	Standard ISO; JIS										
Modif.	A	EAAD090535	07.04.2019								
		Number	Drawn date		Number	Drawn date		Number	Drawn date		
		Product 5-8RT-flex50DF		Exhaust System with one turbocharger							
Units	mm kg	NX				Basic Material			Net Weight 0,001		
SURFACE PROTECTION SEE GROUP 0344		Made	21.02.2018	dk1021	DH.Kim		Scale	-	Size A3	Page 1/2	Material ID PAAD286660
TOLERANCING PRINCIPLE ISO8015		Chkd	19.04.2018	wwa008 Wang			Design Group	9726		Drawing ID DAAD097360	Rev. A
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	19.04.2018	hdo002 Dörre							



Main engine RT-flex50DF					FPP: Fixed Pitch Propeller CPP: Controllable Pitch Propeller	
No of cyl.	A (mm) ×12)	B (mm) ×9)		C (mm) ×12)		
		FPP	CPP			
5	900	150	200	500		
6	1000	150	200	500		
7	1100	200	250	500		
8	1200	200	250	500		




(A)	Pos. SYSTEM COMPONENTS *1)
	001 Compensator *4)
	002 Exhaust gas by-pass line *8)
	003 Exhaust gas pipe *13)
	004 Explosion relief *5)
	005 Boiler *11)
	006 Silencer (with spark arrester) *10)
	007 Support *6)
	008 Waste gate pipe
009 Transition piece *7)	

Pos.	ENGINE CONNECTIONS *2)
④④	OUTLET - Exhaust gas turbocharger
④⑤	OUTLET - Exhaust gas by-pass
④②	OUTLET - Exhaust gas manifold waste gate

Pos.	ENGINE COMPONENTS *3)
EC01	Turbocharger
EC02	Exhaust gas manifold
EC03	Waste gate compensator *4) *9)
EC04	Waste gate valve

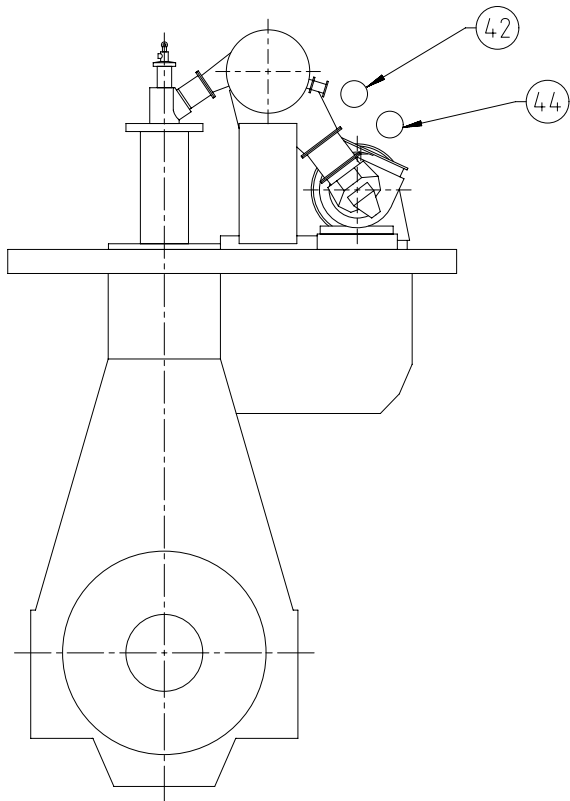
Remarks: (A)

- Drain plugs and drain cocks to be installed where necessary.
- *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) Dimension of expansion piece (compensator) must be defined by the shipyard taking into account the thermal growth of exhaust manifold and exhaust pipe.
Vibrations of the pipe after the compensator must be lower than 45 mm/s RMS (root mean square).
- *5) Type of devices (rupture discs or spring loaded valves) selected in accordance with class requirements.
Final amount and positions have to be defined by the shipyard under consideration of system layout and requirements based on installation specific calculation.
- *6) Installed as fixed or sliding type in accordance with the requirements.
Final amount and position have to be defined by the shipyard under consideration of system layout and requirements based on installation specific calculation.
- *7) Area ratio between outlet/inlet diameter = 1.1-1.6
Taper angle $\leq 40^\circ$
- *8) Optional, needs just to be installed if requested by owner and class to ensure engine operation even after a turbocharger failure.
- *9) Pipe dimension on engine side (before compensator) is one nominal pipe size smaller.
- *10) Optional, installed as required to meet noise requirements.
- *11) Optional.
- *12) The provided dimensions refer to an R1 rated engine and serve just as proposal. To make the project specific layout, data as provided by GTD and by the turbocharger supplier must be taken into account.
- *13) The radius of pipe bends should be not smaller than $15 \times DN$

Free space for St.	G-Code		XXXXXX		Main Dwg.
	Standard		ISO; JIS		
Mod.	A-EAAD090535		07.04.2019		
	Number	Drawn date	Number	Drawn date	Number
	Number	Drawn date	Number	Drawn date	Number
 WIN GD Weather Gas & Diesel			Product 5-BRT-flex50DF Exhaust System with one turbocharger		
Units	mm kg	NX	Basic Material		Net weight 0,001
Mo	21.02.2018	dk1021	DH.Kim	Scale -	Size A1
Mo	19.04.2018	aww1008	Wang	Design Group	Page 2/2
Am	19.04.2018	hd0002	Dörre	Drawing ID	PAAD286660
				9726	DAAD097360
					Rev. A

Specifications which must be met:

RT-flex50DF



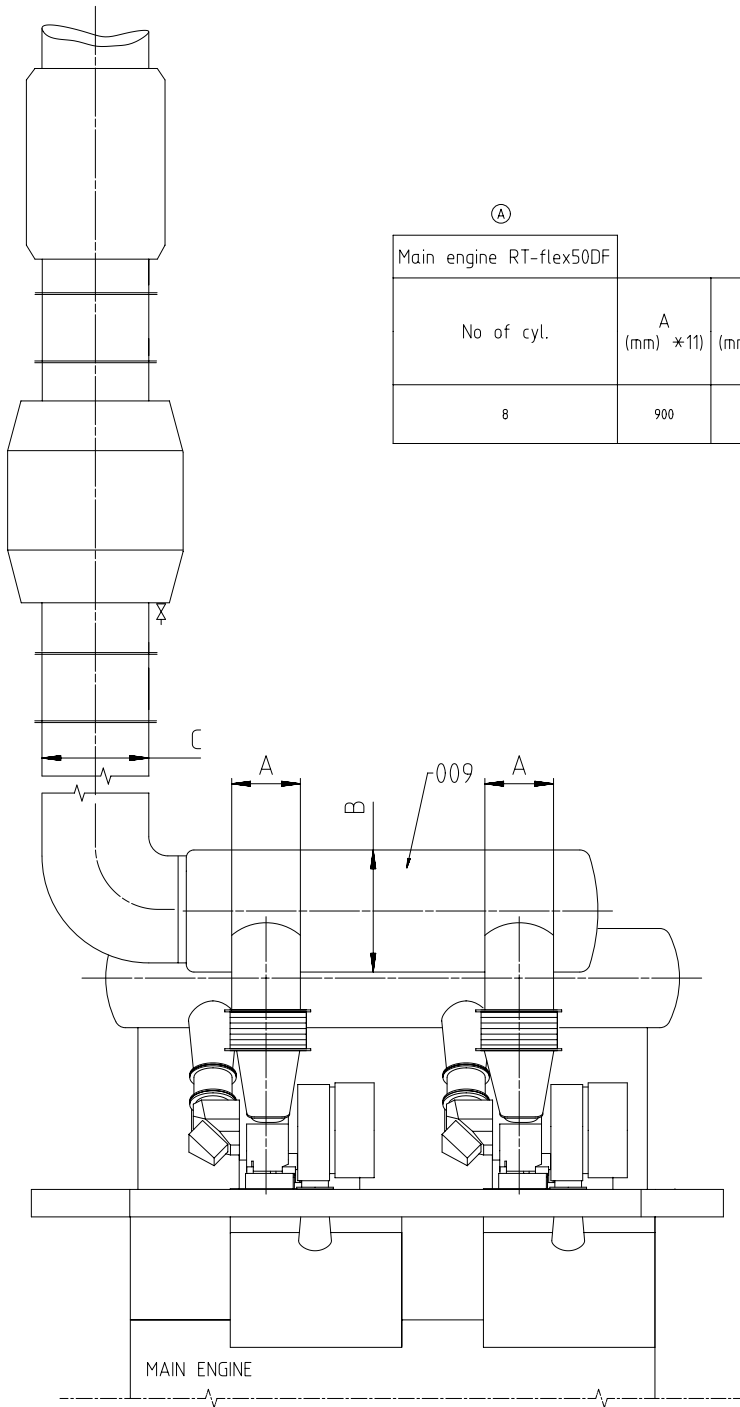
44

A

OUTLET - Exhaust gas turbocharger

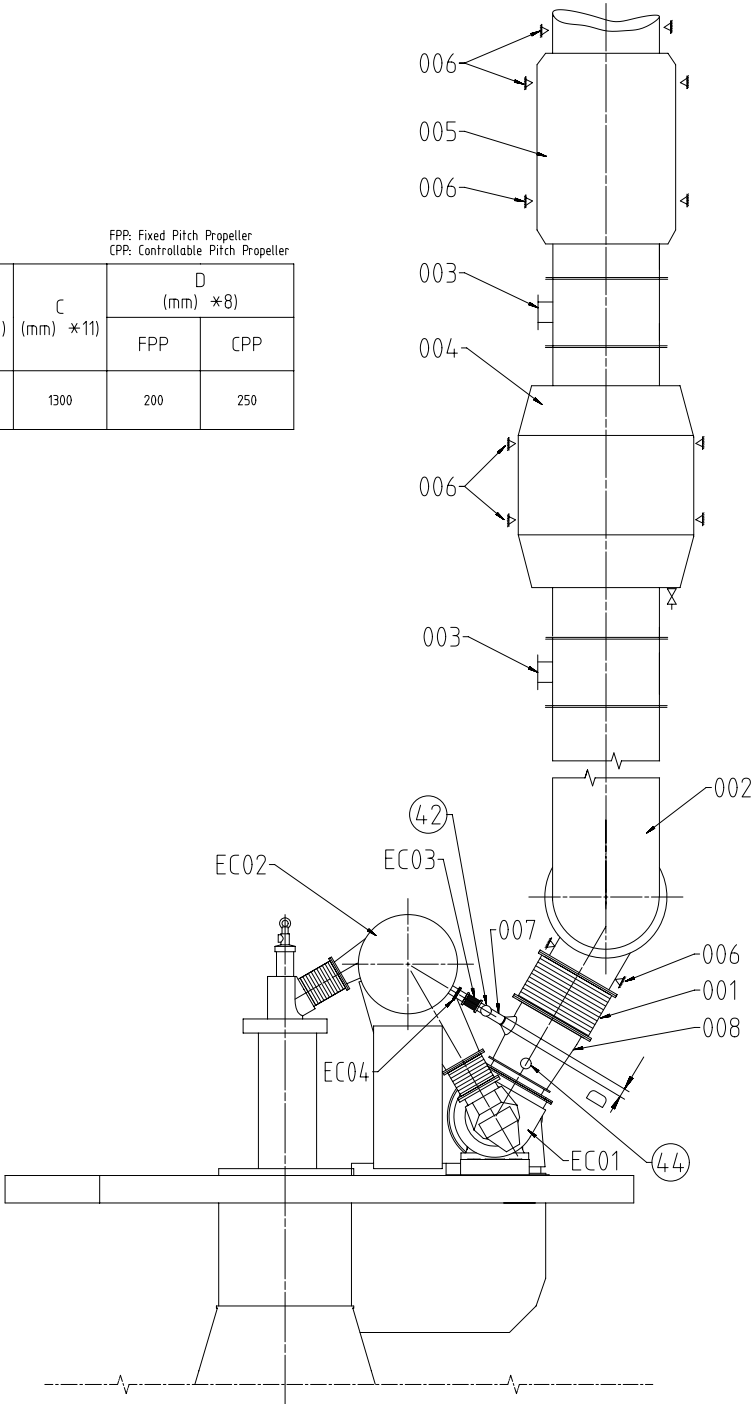
- Exhaust gas temperature and volume flow: according to GTD
- The total back pressure of the exhaust gas system must be kept in the admissible range of:
Design maximum (new condition) in gas mode and in diesel mode without exhaust gas treatment system: 30 mbar
Design maximum (new condition) in diesel mode with exhaust gas treatment system: 60 mbar
Operational maximum in gas mode: 45 mbar
Operational maximum (fouled condition) in diesel mode without exhaust gas treatment system: 50 mbar
Operational maximum (fouled condition) in diesel mode with exhaust gas treatment system: 80 mbar
- Pipe dimensions laid out according to the recommended gas velocities provided in the the Marine Installation Manual (MIM) and by GTD.
- The exhaust piping must be arranged in a way to avoid gases from accumulating.
- The piping layout must consider the thermal expansion and vibration from turbocharger (TC) and main engine (ME). Thermal expansion of the ME to be calculated according to the formula in MIM, TC specific thermal expansion are provided by the TC supplier.
- Explosion relief devices with flameless pressure relief (rupture discs or spring loaded valves) must be installed in accordance with class requirements. For installations with rupture discs an opening control signal must be sent to the Alarm and Monitoring System.
- Supports (fixation points) for carrying piping and exhaust gas system components deadweight must be installed in sufficient size and amount. Inadmissible tensions in the piping and forces acting on the turbocharger are not acceptable.
- Exhaust gas pipes of several engines must not be connected.
- Drains in adequate size and amount must be installed in the exhaust gas piping.
- When the noise level on the bridge wing exceeds the class requirement (normally 60 - 70 dB(A)) a silencer must be applied.
- An exhaust gas collector after the turbocharger must be installed.

Free space for lic.	Q-Code XXXXX							Main Drw.					
	Standard ISO; JIS												
Modif.	A	EAAD090535	05.04.2019										
	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date					
WIN GD Winterthur Gas & Diesel		Product 5-8RT-flex50DF		Exhaust System with two turbochargers									
Units	mm kg	NX		Basic Material		Net Weight 0,001							
SURFACE PROTECTION SEE GROUP 0344		Made	21.02.2018 dki021 DH.Kim		Scale	-	Size	A3	Page	1/2	Material	PAAD286680	
TOLERANCING PRINCIPLE ISO8015		Chkd	19.04.2018 wwa008 Wang		Design Group		9726		Drawing ID		DAAD097368	Rev.	A
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	19.04.2018 hdo002 Dörre										





Main engine RT-flex50DF					
No of cyl.	A (mm) *11)	B (mm) *11)	C (mm) *11)	D (mm) *8)	
				FPP	CPP
8	900	1500	1300	200	250

FPP: Fixed Pitch Propeller
CPP: Controllable Pitch Propeller



Pos.	SYSTEM COMPONENTS *1)
001	Compensator *4)
002	Exhaust gas pipe *12)
003	Explosion relief *5)
004	Boiler *10)
005	Silencer (with spark arrester) *9)
006	Support *6)
007	Waste gate pipe
008	Transition piece *7)
009	Exhaust gas collector
Pos.	ENGINE CONNECTIONS *2)
44	OUTLET - Exhaust gas turbocharger
42	OUTLET - Exhaust gas manifold waste gate
Pos.	ENGINE COMPONENTS *3)
EC01	Turbocharger
EC02	Exhaust gas manifold
EC03	Waste gate compensator *4) *8)
EC04	Waste gate valve
Remarks:	A)
	- Drain plugs and drain cocks to be installed where necessary.
	*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) Dimension of expansion piece (compensator) must be defined by the shipyard taking into account the thermal growth of exhaust manifold and exhaust pipe. Vibrations of the pipe after the compensator must be lower than 45 mm/s RMS (root mean square).
	*5) Type of devices (rupture discs or spring loaded valves) selected in accordance with class requirements. Final amount and positions have to be defined by the shipyard under consideration of system layout and requirements based on installation specific calculation.
	*6) Installed as fixed or sliding type in accordance with the requirements. Final amount and position have to be defined by the shipyard under consideration of system layout and requirements based on installation specific calculation.
	*7) Area ratio between outlet/inlet diameter = 1.1..1.6 Taper angle $\leq 40^\circ$
	*8) Pipe dimension on engine side (before compensator) is one nominal pipe size smaller.
	*9) Optional, installed as required to meet noise requirements.
	*10) Optional.
	*11) The provided dimensions refer to an R1 rated engine and serve just as proposal. To make the project specific layout, data as provided by GTD and by the turbocharger supplier must be taken into account.
	*12) The radius of pipe bends should be not smaller than 1.5 x DN

Free space for file								Q-Code	XXXXXX	Main Drw.					
								Standard	ISO; JIS						
Mod.	A	EAAD090535	05.04.2019												
	Number		Drawn date		Number		Drawn date		Number		Drawn date				
				Product 5-BRT-flex50DF		Exhaust System with two turbochargers									
Units						Basic Material				Net weight 0,001					
Made	21.02.2018	dk1021	DH.Kim	Scale		-	Size	A1	Page	2/2	Material ID	PAAD286680	Rev.	A	
Chd	19.04.2018	wna008	Wang	Design Group		9726	Drawing ID						DAAD097368	Rev.	A
Appd	19.04.2018	hdo002	Dorre												
SURFACE PROTECTION SEE GROUP 0344															
TOLERANCING PRINCIPLE ISO8015															
GENERAL TOLERANCES ACCORDING TO ISO2768-mK															

MIDS_WinGD-RT-flex50DF_LEAKAGE-COLLECTION_and_WASHING-SYSTEM

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2017-02-24	DRAWING SET	First web upload
2019-04-20	DAAD042162 DAAD097368 DAAD097360	Main drg – new revision System drg - new revision System drg - new revision
2019-09-18	DAAD097368 DAAD097360	System drgs – new revision

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