


A  
B  
C  
D  
E  
F

TC Amount	1				X	X	X
	2	X	X	X			
SCR	Without			X			X
	LP SCR		X			X	
	HP SCR	X			X		

Net Weight													
0,001	0,001	0,001	0,001	0,001	0,001	0,001							
1	-	-	1	-	-	-	004	PAAD219316	SCR TURBOCHARGER PROTECTION	DAAD075623			0,001
1	-	-	1	-	-	-	003	PAAD219883	SCR PIPING GUIDE	DAAD064155			0,001
1	1	1	-	-	-	-	002	PAAD179742	Exhaust System with two turbochargers	DAAD062283			0,001
-	-	-	1	1	1	-	001	PAAD179740	Exhaust System with one turbocharger	DAAD062282			0,001

Quantity PER ENGINE						SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET
PAAD324936	PAAD324935	PAAD179763	PAAD324934	PAAD324933	PAAD179762						Q-Code XXXXX Standard ISO; JIS	Main Drw. H
Free space for lic.	Modif.	A	EAAD090535	09.04.2019								
	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date



Product  
W5-8X72DF

Exhaust System  
Abgassystem

Units mm kg NX

Basic Material

Net Weight

SURFACE PROTECTION SEE GROUP 0344	Made	01.04.2015	mhu019 M.Hug	Scale	-	Size	A3	Page	1/1	Material ID	
TOLERANCING PRINCIPLE ISO8015	Chkd	19.06.2015	ihe003 Herceg	Design Group		Drawing ID	DAAD062284	Rev.	A		
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	19.06.2015	abr030 Brückl		9726						

Approved  
DIM - DIMENSIONAL DRAWING - Confidential

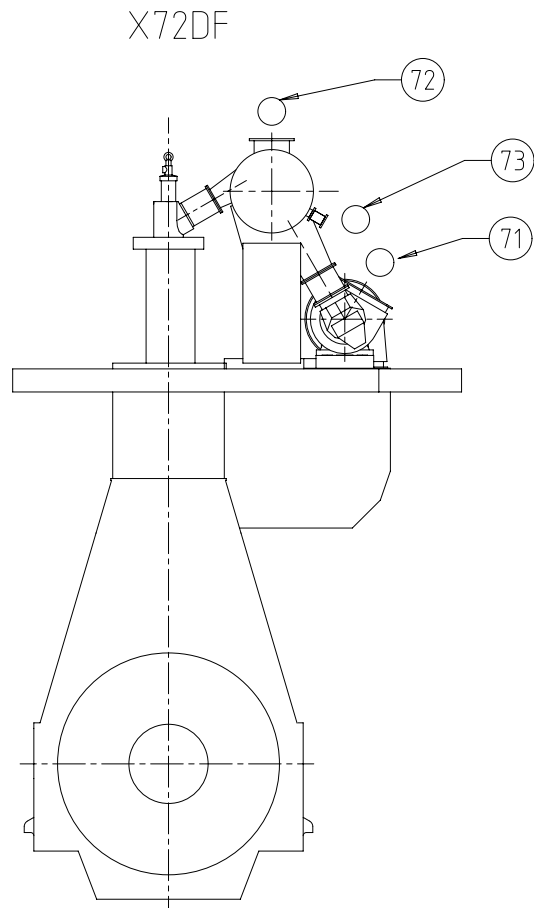
Specifications which must be met:

**72** OUTLET - Exhaust gas by-pass

- 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.

**73** OUTLET - Exhaust gas manifold waste gate

- 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.



**71** 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
- The radius of pipe bends must not be smaller than 1.5 x DN.
- Pipe dimensions laid out according to the recommended gas velocities provided in 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.
- A continuous (extensive) exhaust gas flow into the engine room must be avoided.
- 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.

Free space for lic.							Q-Code XXXXXX	Main Drw.			
							Standard ISO; JIS				
Modif.	<b>A</b>	EAAD089112	26.04.2018	<b>B</b>	EAAD089872	19.10.2018	<b>C</b>	EAAD090535	05.04.2019		
		Number	Drawn date		Number	Drawn date		Number	Drawn date	Number	Drawn date
		Product 5-8X72DF			Exhaust System with one turbocharger						
Units	mm kg	NX				Basic Material			Net Weight 0,001		
SURFACE PROTECTION SEE GROUP 0344		Made	04.01.2015 mhu019 M.Hug		Scale	-		Size	A3	Page	1/2
TOLERANCING PRINCIPLE ISO8015		Chkd	19.06.2015 ihe003 Herceg		Design Group		9726		Material ID		PAAD179740
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	19.06.2015 abr030 Brückl		Drawing ID		DAAD062282		Rev.		C

UID - DIMENSIONAL DRAWING - Confidential

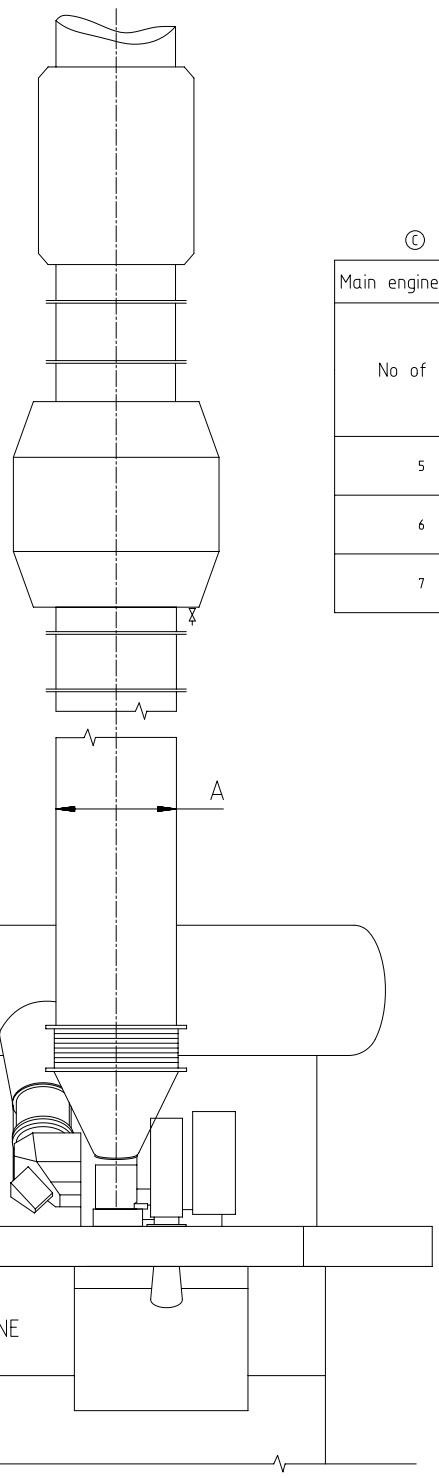
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C

B

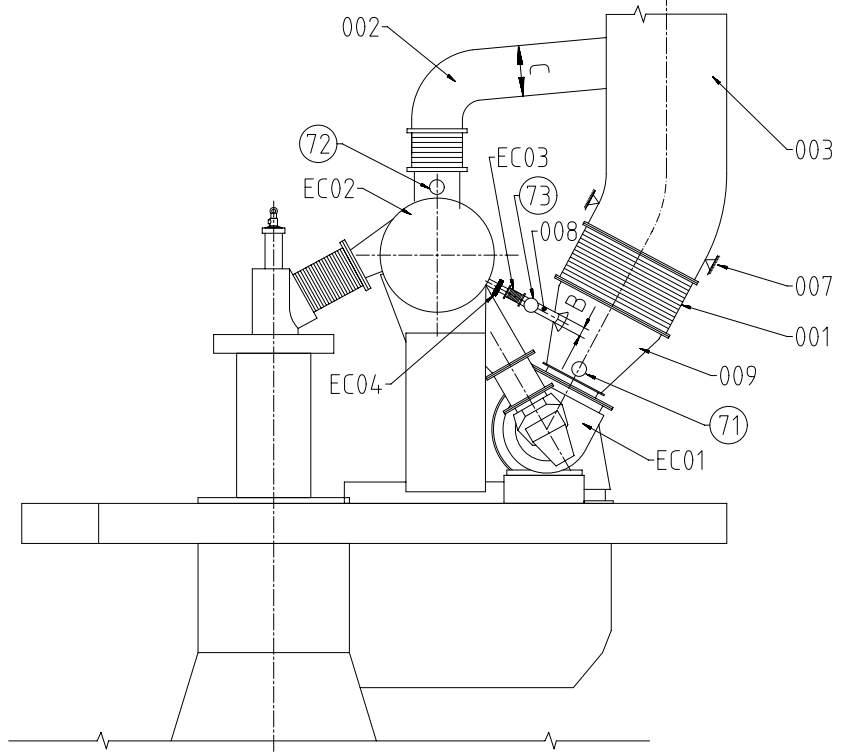
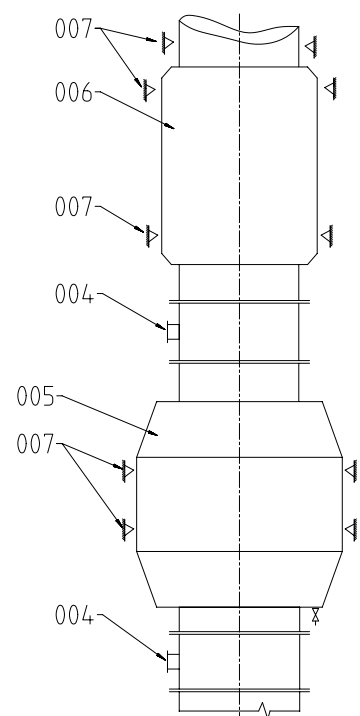
A

SYSTEM PROPOSAL



Ⓒ

No of cyl.	A (mm) *12)	B (mm) *9)		C (mm) *12)
		FPP	CPP	
		FPP: Fixed Pitch Propeller CPP: Controllable Pitch Propeller		
5	1400	250	250	550
6	1500	250	300	550
7	1600	250	300	550



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)
⑦1	OUTLET - Exhaust gas turbocharger
⑦2	OUTLET - Exhaust gas by-pass
⑦3	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

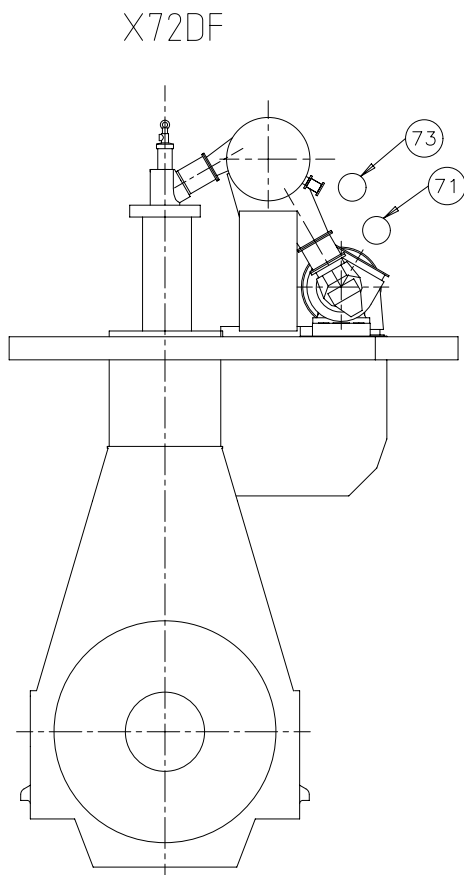
- Remarks: Ⓒ
- Drain plugs and drain cocks to be installed where necessary.
  - \*1) Refer to the "Pipe Connection Plan" for the execution and location of the engine pipe connections.
  - \*2) To be delivered by external supplier and to be installed by the shipyard.
  - \*3) To be delivered by the engine 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 device (rupture discs or self-closing spring loaded valve) to be selected in accordance with class requirements and/or specification of the shipowner. Final amount and position must be defined by the system designer/shipyard under consideration of the system layout and requirements determined by calculation. For installation with rupture discs it is required to either send an opening control signal to the safety system, which trigger an engine shutdown to avoid a continuous exhaust gas flow into the engine room, or to apply a duct leading the exhaust to the outside.
  - \*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 ≤ 40°.
  - \*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 x DN

Free space for use	Q-Code XXXXXX Standard ISO, JIS	Main Dwg.
Mod. A EAAD089112 26.04.2018	B EAAD089872 19.10.2018	C EAAD090535 05.04.2019
Number Drawn date	Number Drawn date	Number Drawn date
Product 5-8X72DF		Exhaust System with one turbocharger
Units: mm kg NX	Basic Material	Net Weight 0,001
Made 04.01.2015 mhu019 M.Hug	Scale -	Size Page 2/2 Material PAAD179740
Chd 19.06.2015 the003 Hencag	Design Group	Drawing ID DAAD062282 Rev. C
Appd 19.06.2015 abo030 Brackl	9726	

Specifications which must be met:

- 73) OUTLET - Exhaust gas manifold waste gate
- Size of connection flange described in the pipe connection plan.
  - Pipe diameter according to value B, defined on page 2.
  - Waste gate connection pipe to main exhaust gas pipe should be kept as short as possible to avoid swirl and extensive back pressure.

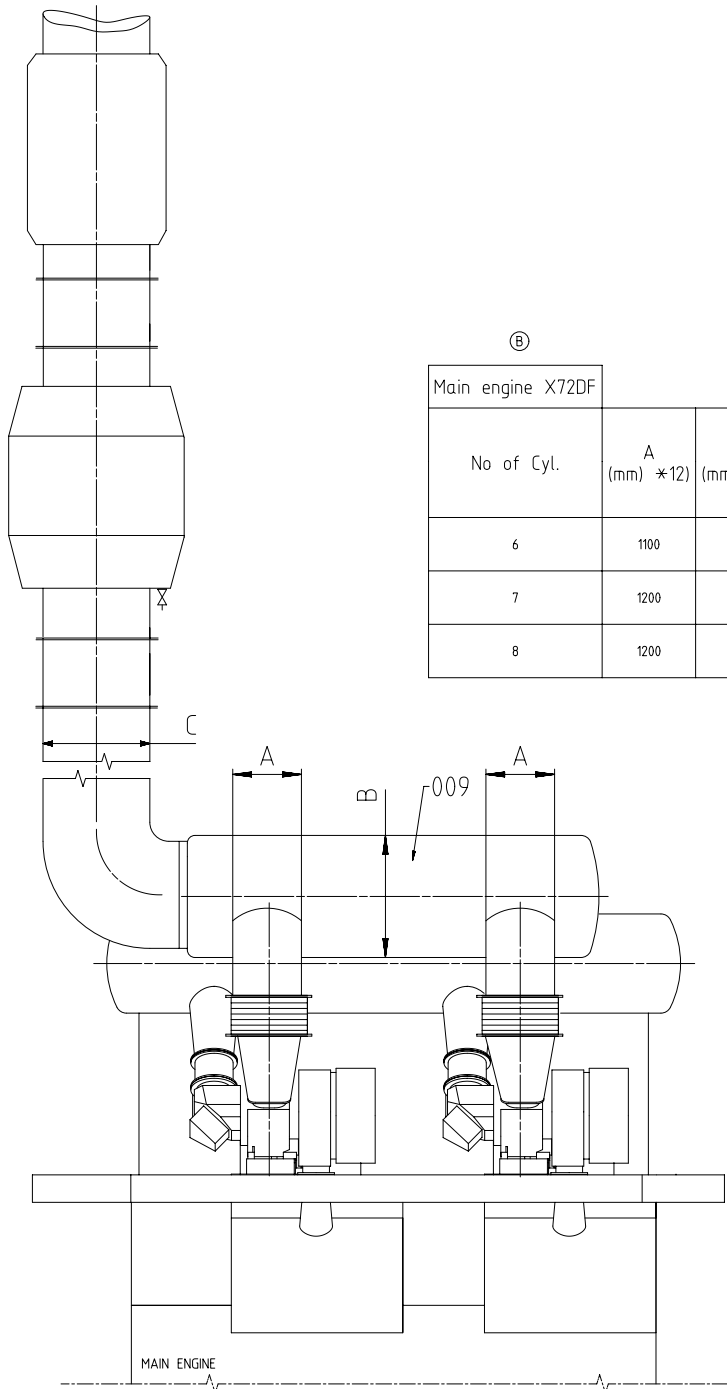
- 71) OUTLET - Exhaust gas turbocharger
- B) - Exhaust gas temperature and volume flow: according to GTD
- The total back pressure of the exhaust gas system must be kept in the admissible range of:  
 Design maximum (new condition) in gas mode and in diesel mode without exhaust gas treatment system: 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 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.
  - A continuous (extensive) exhaust gas flow into the engine room must be avoided.
  - Supports (fixation points) for carrying piping and exhaust gas system components deadweight must be installed in sufficient size and amount. In admissible 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 XXXXXX	Main Drw.				
								Standard ISO; JIS					
Modif.	A	EAAD089112	26.04.2018	B	EAAD090535	07.04.2019							
		Number	Drawn date		Number	Drawn date		Number	Drawn date				
					Product 5-8X72DF		Exhaust System with two turbochargers						
Units	mm kg	NX		Basic Material		Net Weight 0,001							
SURFACE PROTECTION SEE GROUP 0344		Made	01.02.2015 mhu019 M.Hug		Scale	-	Size	A3	Page	1/2	Material ID	PAAD179742	
TOLERANCING PRINCIPLE ISO8015		Chkd	19.06.2015 ihe003 Herceg		Design Group		9726		Drawing ID	DAAD062283		Rev.	B
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	19.06.2015 abr030 Brückl										

Approved  
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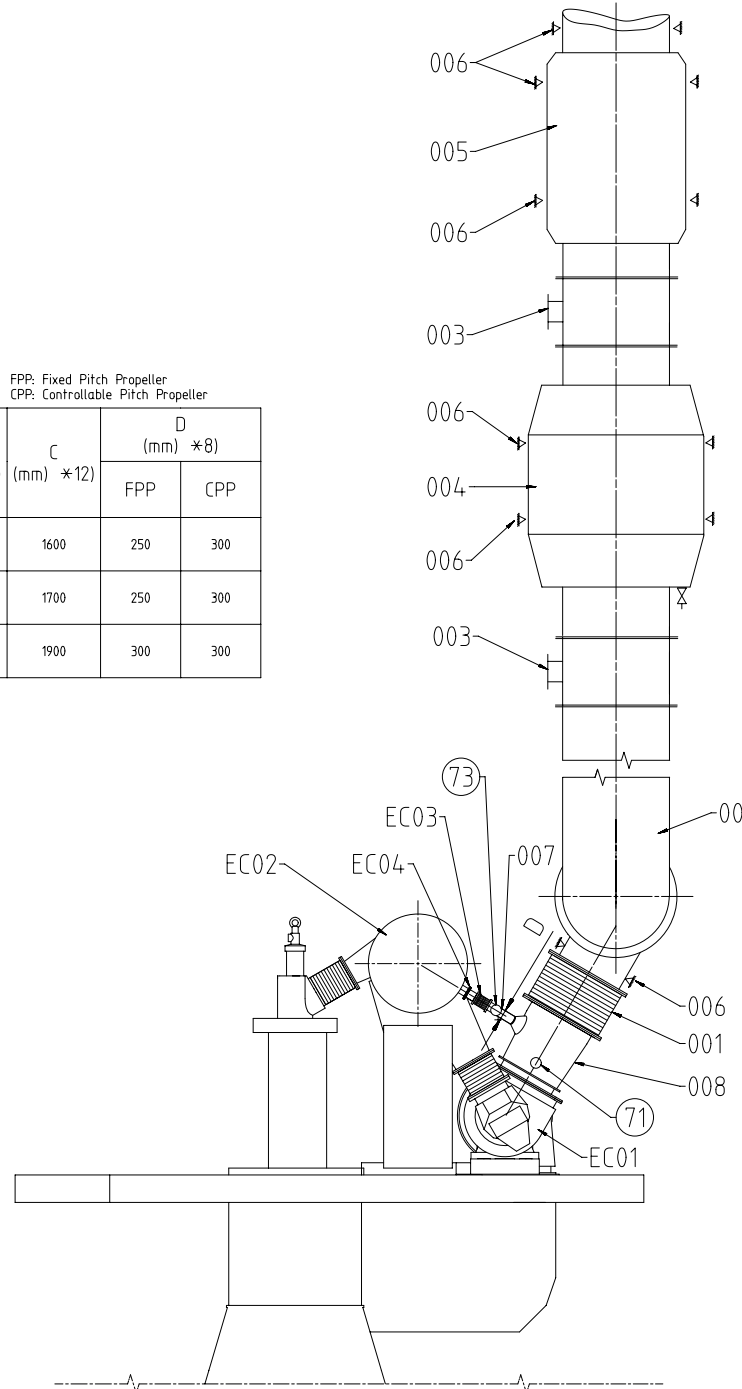
SYSTEM PROPOSAL



Ⓑ

No of Cyl.	Main engine X72DF				
	A (mm) *12	B (mm) *12	C (mm) *12	D (mm) *8	
				FPP	CPP
6	1100	1900	1600	250	300
7	1200	2100	1700	250	300
8	1200	2200	1900	300	300

FPP: Fixed Pitch Propeller  
CPP: Controllable Pitch Propeller



- | Pos.  | SYSTEM COMPONENTS *1)              |
|-------|------------------------------------|
| 001   | Compensator *4)                    |
| 002   | Exhaust gas pipe *11)              |
| 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)                   |
|------|--|
| Ⓐ 71 | OUTLET - Exhaust gas turbocharger        |
| Ⓒ 73 | 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: Ⓑ
- 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 device (rupture discs or self-closing spring loaded valve) to be selected in accordance with class requirements and/or specification of the shipowner. Final amount and position must be defined by the system designer / shipyard under consideration of the system layout and requirements determined by calculation. For installation with rupture discs it is required to either send an opening control signal to the safety system, which trigger an engine shutdown to avoid a continuous exhaust gas flow into the engine room, or to apply a duct leading the exhaust to the outside.
  - \*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 radius of pipe bends must not be smaller than 15 x DN.
  - \*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.

Free space for use	Q-Code XXXXX	Main Drw.
Standard ISO, JIS		
Mod. A EAAD09112 26.04.2018	B EAAD09055 07.04.2019	
Number Draw date	Number Draw date	Number Draw date
Product 5-8X72DF		Exhaust System with two turbochargers
WINGD Wärthner Gas & Diesel		

Units	mm kg	NX	Basic Material	Scale	-	Size	A1	Page	2/2	Material ID	PAAD179742	Net Weight	0,001
SURFACE PROTECTION SEE GROUP 0344													
TOLERANCING PRINCIPLE ISO8015													
GENERAL TOLERANCES ACCORDING TO ISO2768-mK													
Chd	19.06.2015	the003	Herczog	Design Group		9726	Drawing ID	DAAD062283		Rev.	B		
Appd	19.06.2015	abr030	Brückl										

## MIDS - WinGD-X72DF - EXHAUST-SYSTEM (DG9726)

### TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2016-11-02	DRAWING SET	First web upload
2018-04-20	DAAD062282 DAAD062283	System drgs - new revision
2018-10-18	DAAD062282	System drg - new revision
2019-09-18	DAAD062284 DAAD062282 DAAD062283	Main and system drgs - new revision

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