Net Weight 0,001	Net Weight 0,001							
1	-	002	PAAD270876	EXHAUST/VENTILATION SYSTEM with two turbocharger	DAAD091702		0,001
-	1	001	PAAD255284	EXHAUST/VENTILATION SYSTEM with one turbocharger	DAAD087883		0,001
Quantity PER ENGINE		SEQ NO	Material ID	Material Name Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET

A

Material ID PAAD270873	Material ID PAAD255392	Free space for lic.	Q-Code XXXXX	Main Drw. H
			Standard ISO; JIS	

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
A	EAAD088420	30.08.2017						

WIN GD
Winterthur Gas & Diesel

Product W5-8X52DF

EXHAUST/VENTILATION SYSTEM

Units mm kg	NX	Basic Material	Net Weight

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

Made	25.07.2017 dki021 DH.Kim	Scale -	Size A3	Page 1/1	Material ID
Chkd	28.07.2017 wwa008 Wang	Design Group 9726	Drawing ID DAAD087933		Rev. A
Appd	28.07.2017 mhu019 Hug				

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DID - DIMENSIONAL DRAWING - Confidential

Specifications which must be met:

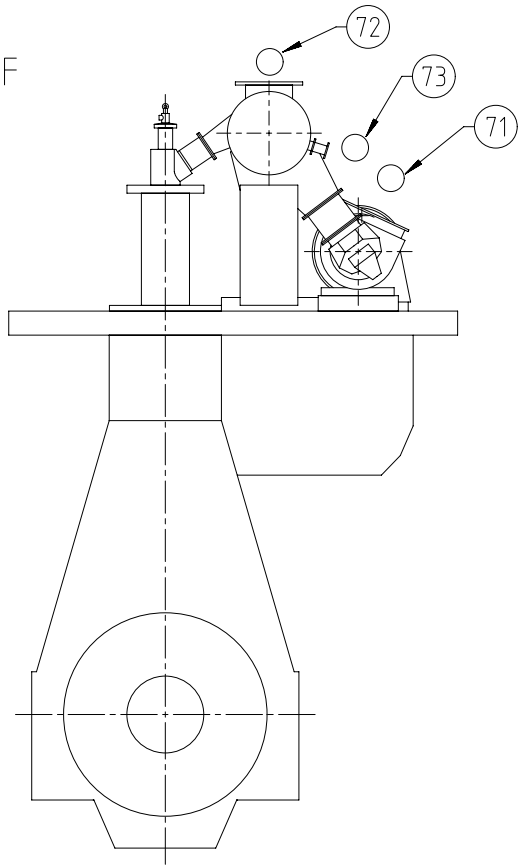
(72) OUTLET - Exhaust gas by-pass

- 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 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.

X52DF



(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
- 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 claculated 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.

Approved

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
A	EAAD088733	22.12.2017	B EAAD089573	01.10.2018	C EAAD090535	05.04.2019		

Free space for lic.

Q-Code XXXXX

Standard ISO; JIS

Main Drw.

WIN GD Winterthur Gas & Diesel

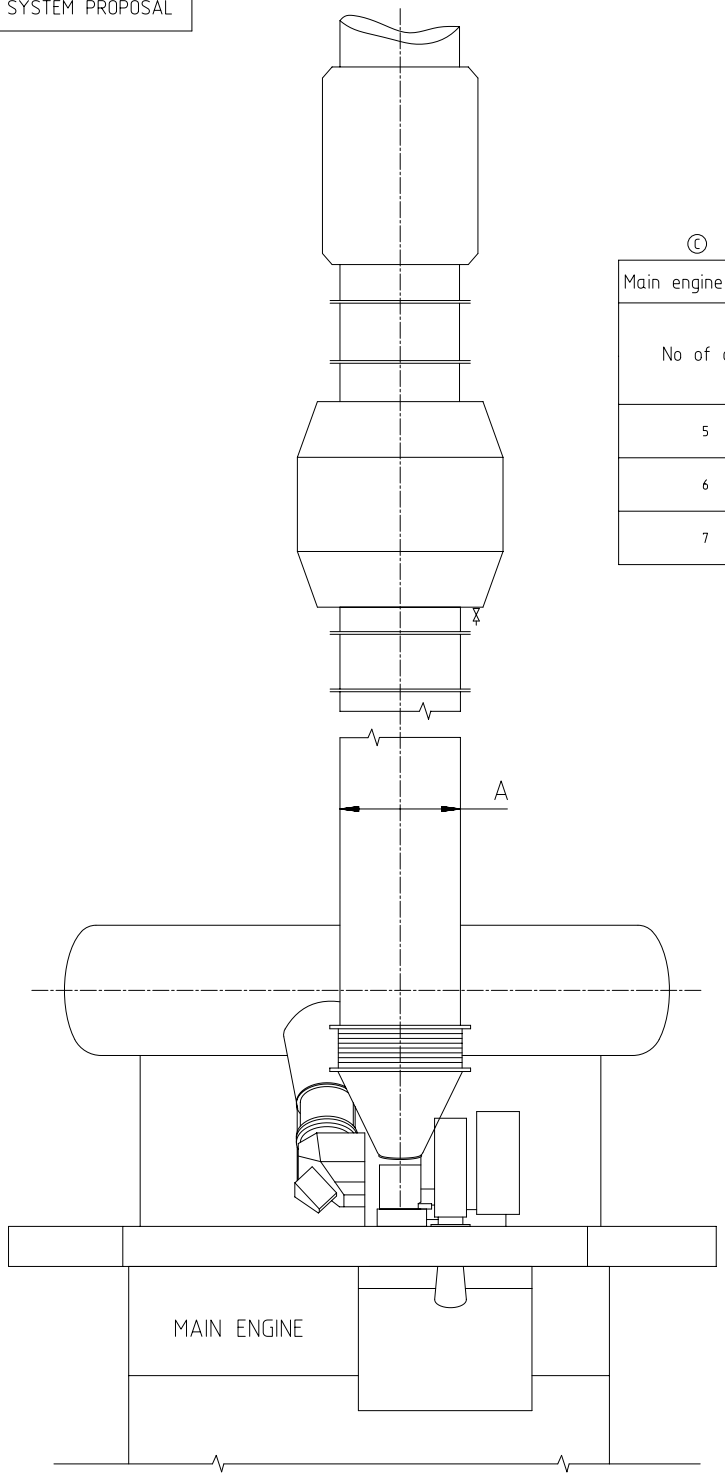
Product 5-7X52DF

Exhaust System with one turbocharger

Units mm kg	NX	Basic Material		Net Weight 0,001	
SURFACE PROTECTION SEE GROUP 0344	Made 03.02.2017 dki021 DH.Kim	Scale -	Size A3	Page 1/2	Material ID PAAD255284
TOLERANCING PRINCIPLE ISO8015	Chkd 28.07.2017 wwa008 Wang	Design Group 9726	Drawing ID DAAD087883		Rev. C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd 28.07.2017 mhu019 Hug				

DID - DIMENSIONAL DRAWING - Confidential

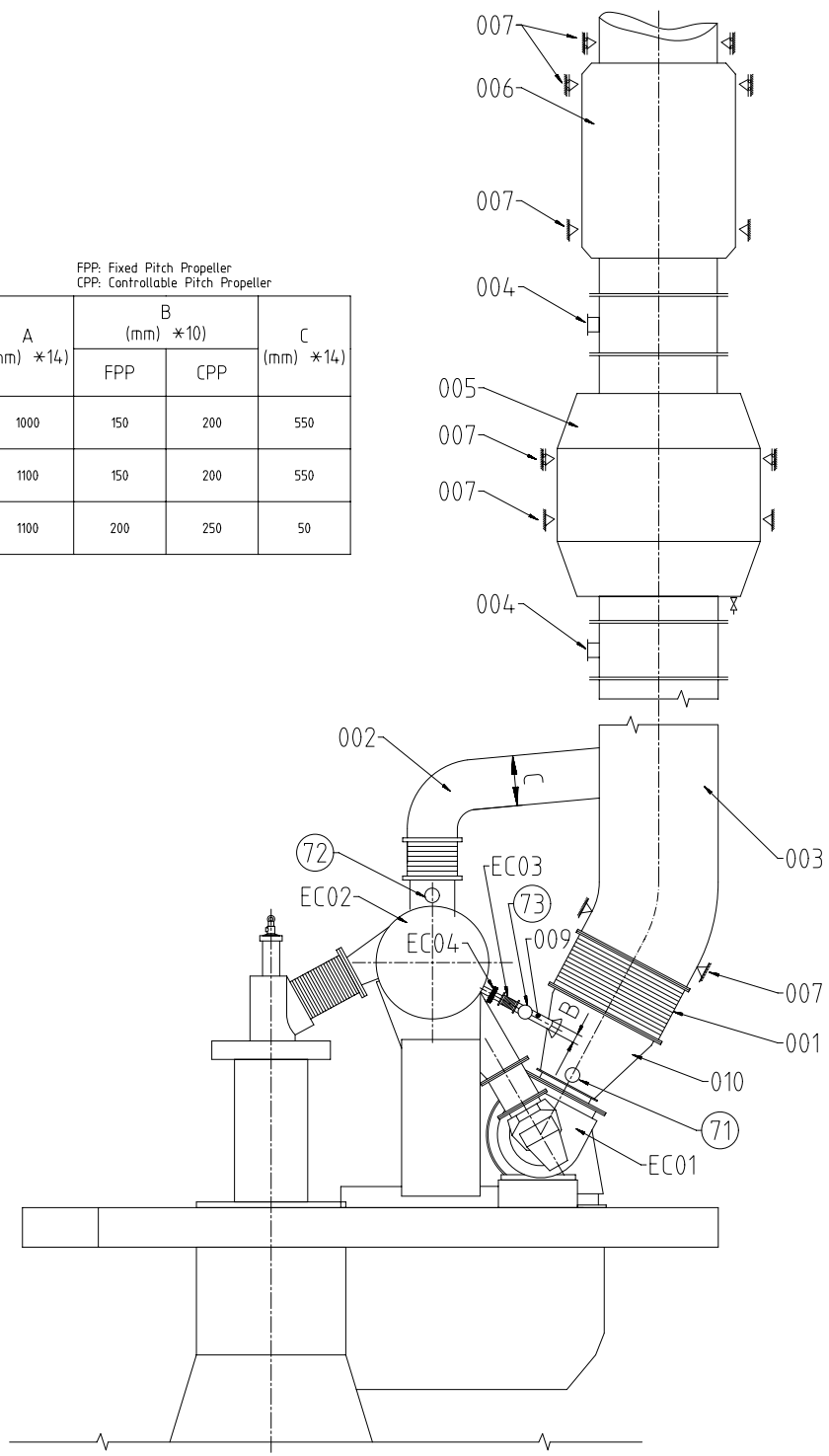
SYSTEM PROPOSAL



Ⓒ

Main engine X52DF				
No of cyl.	A (mm) *14)	B (mm) *10)		C (mm) *14)
		FPP	CPP	
5	1000	150	200	550
6	1100	150	200	550
7	1100	200	250	50

FPP: Fixed Pitch Propeller
CPP: Controllable Pitch Propeller



Pos.	SYSTEM COMPONENTS *1)
001	Compensator *9)
002	Exhaust gas by-pass *8)
003	Exhaust gas pipe *11)
004	Explosion relief device (rupture discs or spring loaded valves) *5)
005	Boiler *13)
006	Silencer (with spark arrester) *12)
007	Support *4)
009	Waste gate pipe
010	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 *9) *10)
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 by delivered by the engine builder, i.e. already equipped on engine side

*4) Installed as fixed or sliding type in accordance with requirements. In between fixed supports a compensator (bellow) must be installed. Final amount and position have to be determined by the shipyard under consideration of the system layout and requirements based on installation specific calculation.

*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.

*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) 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).

*10) Pipe dimension on engine side (before compensator) is one nominal pipe size smaller.

*11) The radius of pipe bends should be not smaller than 1.5 x DN.

*12) Optional, installed as required to meet noise requirements.

*13) Optional.

*14) 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 Ic. | Q-Code XXXXX | Standard ISO; JIS | Main Drw.

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
A	EAAD088733	22.12.2017	B EAAD089573	01.10.2018	C EAAD090535	05.04.2019		

WIN GD Winterthur Gas & Diesel

Product 5-7X52DF

Exhaust System with one turbocharger

Units mm kg | NX | Basic Material | Net Weight 0,001

SURFACE PROTECTION SEE GROUP 0344	Made	03.02.2017	dki021	DH.Kim	Scale -	Size A1
TOLERANCING PRINCIPLE ISO8015	Chkd	28.07.2017	wwa008	Wang	Design Group 9726	Page 2/2
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	28.07.2017	mhu019	Hug	Drawing ID DAAD087883	Material ID PAAD255284

Rev. C

Approved

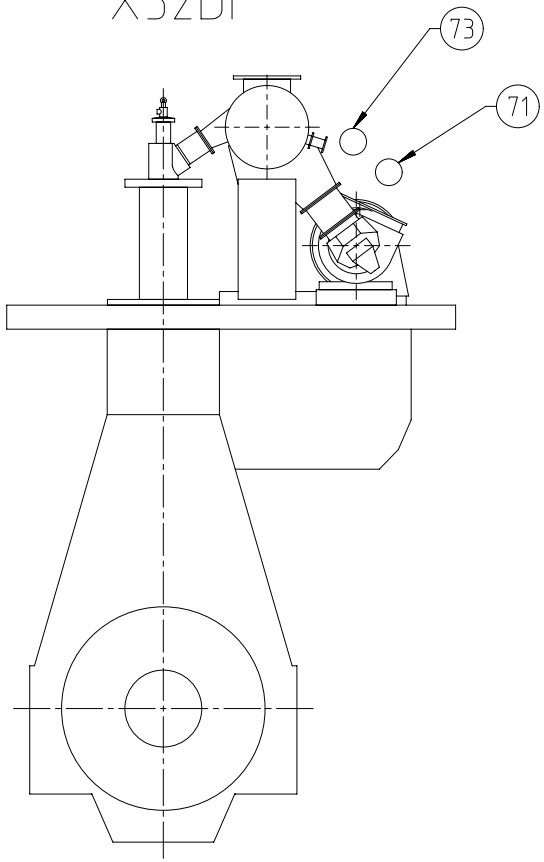
3DD - DIMENSIONAL DRAWING - Confidential

Specifications which must be met:

(73) Exhaust gas manifold waste gate outlet

- 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.

X52DF



(71) (B) Exhaust gas turbocharger outlet

- 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 claculated 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.
- An exhaust gas collector after the turbocharger must be installed.

Free space for lic.

Q-Code: XXXXX
Standard: ISO; JIS
Main Drw.

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
A	EAAD089573	01.10.2018	B EAAD090535	05.04.2019				

WIN GD Winterthur Gas & Diesel

Product: 5-8X52DF

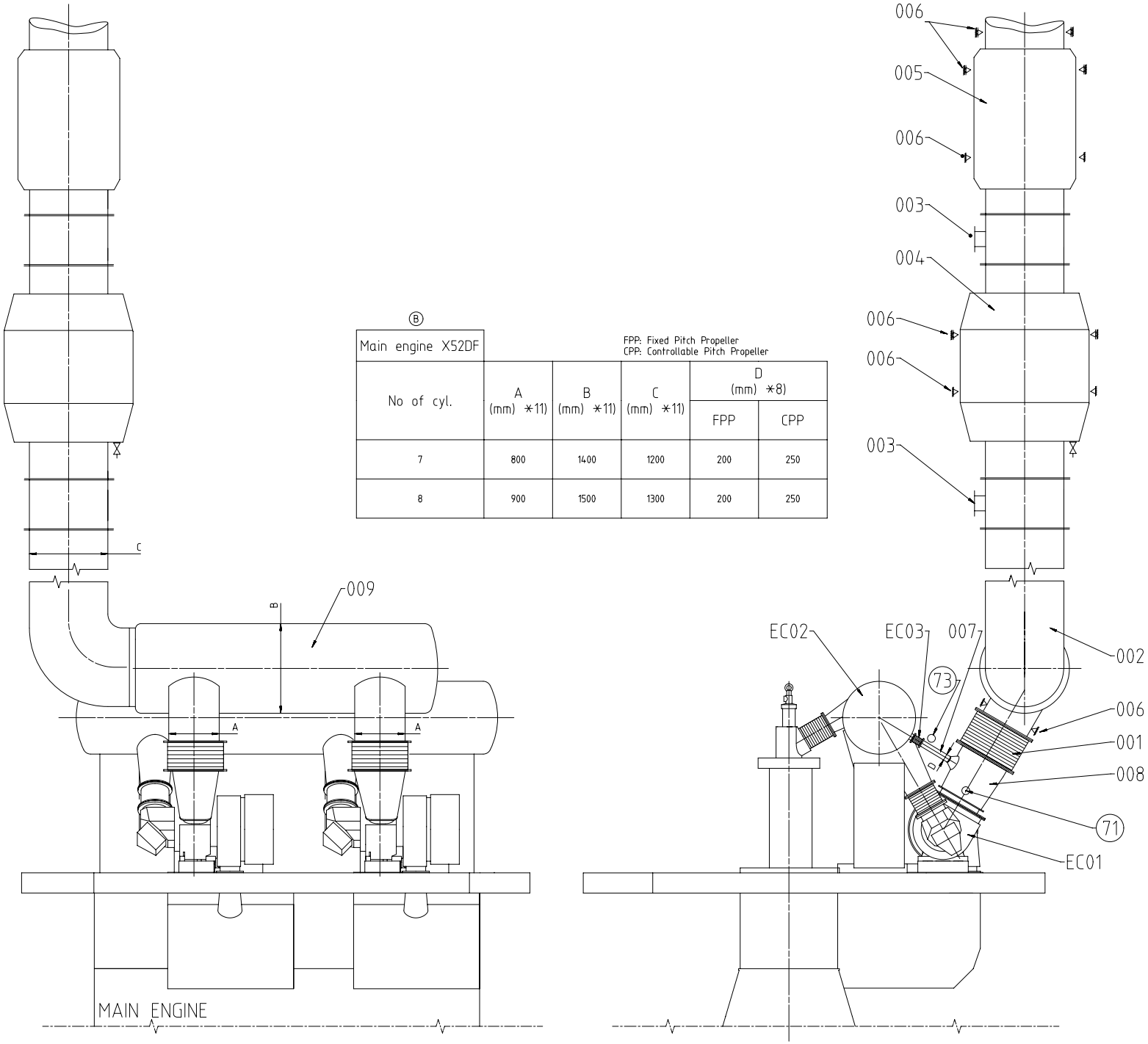
EXHAUST SYSTEM
with two turbochargers

Units mm kg	NX		Basic Material			Net Weight 0,001
SURFACE PROTECTION SEE GROUP 0344	Made 25.07.2017 dki021 DH.Kim		Scale -	Size A3	Page 1/2	Material ID PAAD270876
TOLERANCING PRINCIPLE ISO8015	Chkd 28.07.2017 wwa008 Wang		Design Group 9726	Drawing ID DAAD091702		Rev. B
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd 28.07.2017 mhu019 Hug					

Approved

DID - DIMENSIONAL DRAWING - Confidential

SYSTEM PROPOSAL



Ⓑ

Main engine X52DF				FPP: Fixed Pitch Propeller CPP: Controllable Pitch Propeller	
No of cyl.	A (mm) *11)	B (mm) *11)	C (mm) *11)	D (mm) *8)	
				FPP	CPP
7	800	1400	1200	200	250
8	900	1500	1300	200	250

Pos.	Description
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)
(71)	Exhaust gas turbocharger outlet
(73)	Exhaust gas manifold waste gate outlet
Pos.	ENGINE COMPONENTS *3)
EC01	Turbocharger
EC02	Exhaust gas manifold
EC03	Waste gate compensator *4) *8)

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 requirements. In between fixed supports a compensator (bellow) must be installed. Final amount and position have to be determined by the shipyard under consideration of the system layout and requirements based on installation specific calculation.

*7) Area ratio between outlet/inlet diameter = 1.1...1.6Taper angle = ≤ 40°

*8) Pipe dimension on engine side (before compensator) is one nominal pipe size smaller.

*9) Optional, installed as requested to meet noice requiements.

*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 Nr.									Q-Code XXXXX	Main Drw.
Modif.	A EAAD089573	01.10.2018	B EAAD090535	05.04.2019					Standard ISO; JIS	
	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date		

WIN GD Winterthur Gas & Diesel

Product 5-8X52DF

EXHAUST SYSTEM with two turbochargers

Units	mm kg	NX	Basic Material	Net Weight 0,001
SURFACE PROTECTION SEE GROUP 0344				
TOLERANCING PRINCIPLE ISO8015				
GENERAL TOLERANCES ACCORDING TO ISO2768-mK				

Made	25.07.2017	dki021	DH.Kim	Scale	-	Size A1	Page 2/2	Material ID PAAD270876
Chkd	28.07.2017	wwa008	Wang	Design Group	9726	Drawing ID DAAD091702		Rev. B
Appd	28.07.2017	mhu019	Hug					

3D - DIMENSIONAL DRAWING - confidential

Approved

MIDS_WinGD-X52DF_EXHAUST-SYSTEM (DG9726)

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2017-08-07	DRAWING SET	First web upload
2017-09-01	DAAD087933	Main drg – new revision
2017-12-22	DAAD087883	System drg – new revision
2018-10-01	DAAD091702 DAAD087883	System drgs – new revision
2019-09-18	DAAD091702 DAAD087883	System drgs – new revision

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