

A  
B  
C  
D  
E  
F

A  
B  
C  
D  
E  
F

TC Amount	1		X
	2	X	

Net Weight		0,002	0,002									
1	1	003	PAAD327310	SPECIFICATION For waste gate selection	DAAD116127		0,001					
1	-	002	PAAD366996	Exhaust System with two turbochargers	DAAD136050		0,001					
-	1	001	PAAD366989	Exhaust System with one turbocharger	DAAD136049		0,001					
Quantity PER ENGINE		SEQ NO	Material ID	Material Name	Dimension, Occ	Standard or Drawing	Basic Material Material Standard	Weight GR./NET				
PAAD367018	PAAD367013	Free space for lic.					Q-Code XXXXXX	Main Drw. H				
Modif.	○	○	○	○	○	○	○	○				
Material ID	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date				
		Product W5-8X62DF-S1.0		Exhaust System Abgassystem								
Units	mm kg	NX		Basic Material			Net Weight					
SURFACE PROTECTION SEE GROUP 0344		Made	26.02.2021 dki021 DH.Kim		Scale	-	Size	A3	Page	1/1	Material ID	
TOLERANCING PRINCIPLE ISO8015		Chkd	26.02.2021 jpi101 Pickup		Design Group		9726		Drawing ID		DAAD136063	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	26.02.2021 mhu019 Hug						Rev.		-	

Approved  
DIM - DIMENSIONAL DRAWING - Confidential

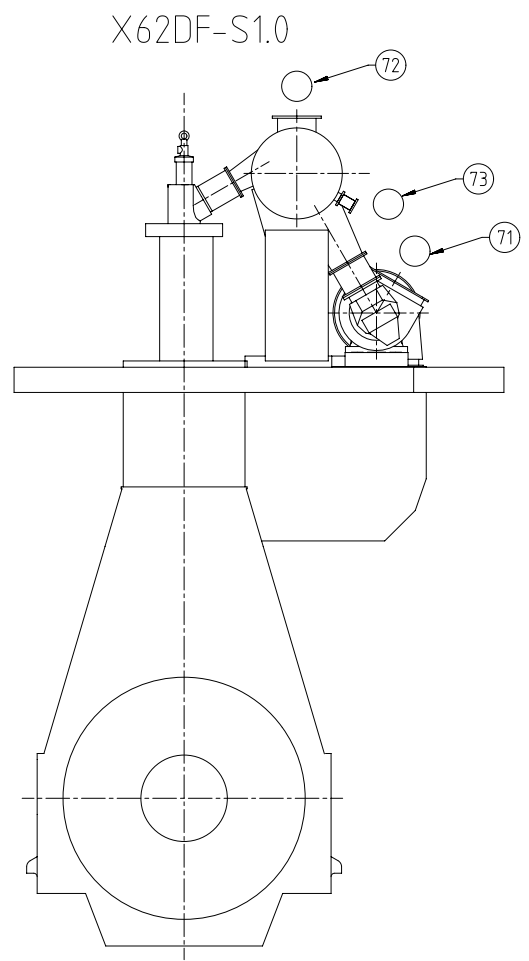
Specification which must be met:

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.

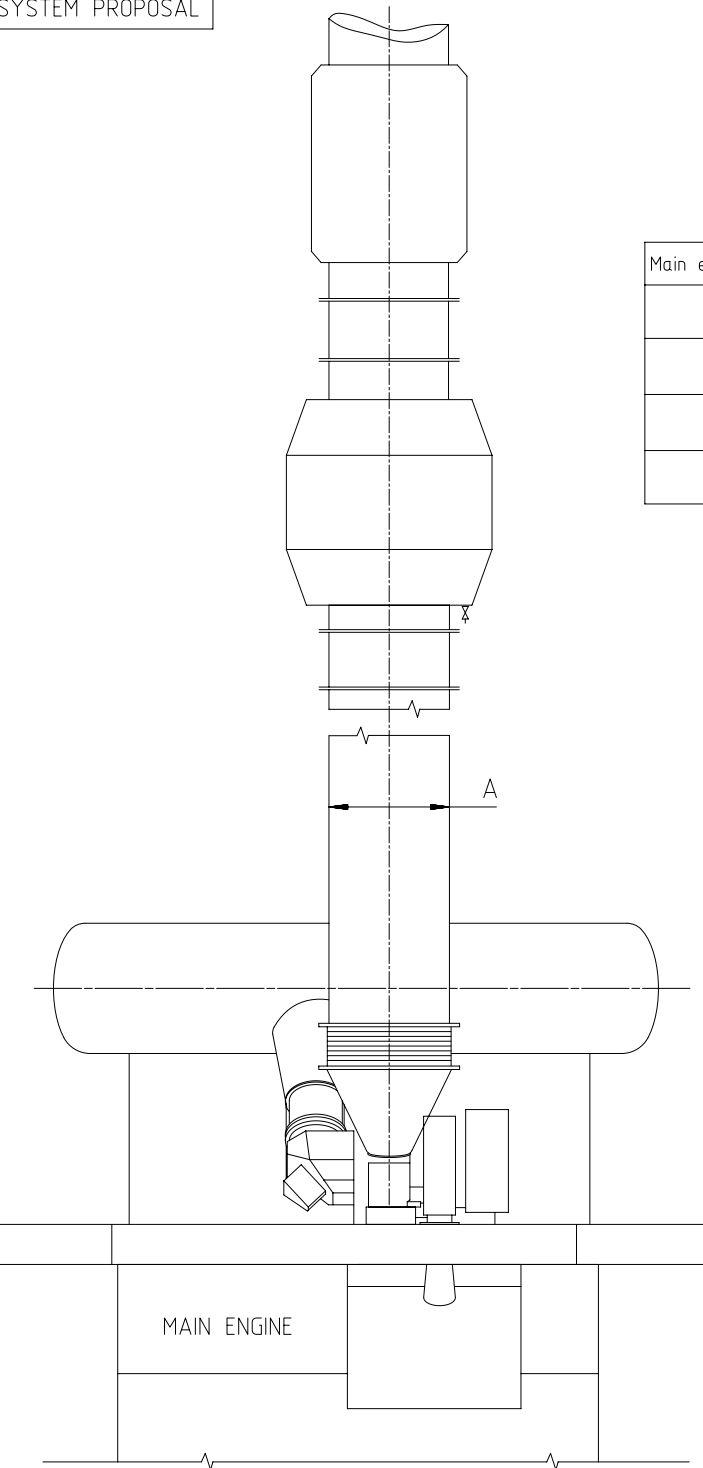


71 OUTLET - Exhaust gas turbocharger

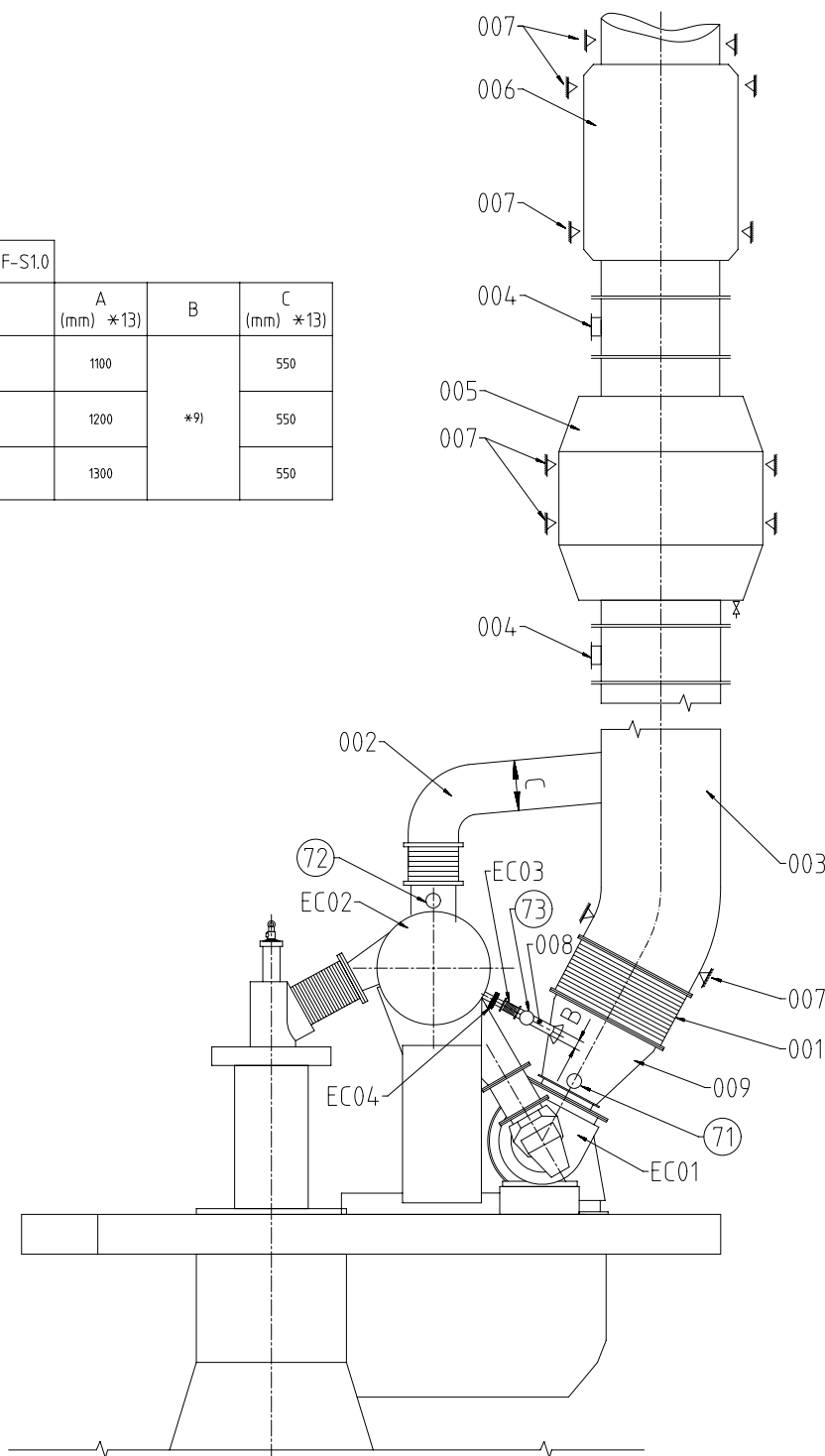
- Exhaust gas temperature and volume flow: according to GTD
- The total back pressure of the exhaust gas system must be kept in the admissible range of:  
Design maximum (new condition) in gas mode and in diesel mode without exhaust gas treatment system: 30 mbar  
Design maximum (new condition) in diesel mode with low pressure 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 low pressure 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 with cones, bends and pipe connections must be flow optimised and 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 is to be calculated according to the formula in MIM, TC specific thermal expansion are provided by the TC supplier.
- Explosion relief devices, examined and certified by the maker, with flameless pressure relief (rupture discs outside of the engine room or self-closing, spring loaded valves) must be selected and installed within the exhaust system in accordance with class requirements. The position and number of explosion relief devices must be determined by the system designer or the shipyard through calculation.
- A continuous (extensive) exhaust gas leakage 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 Draw.					
Standard ISO; JIS									
Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date	
Product 5-7X62DF-S1.0		Exhaust System with one turbocharger							
Units		mm	kg	NX	Basic Material		Net Weight 0,001		
SURFACE PROTECTION SEE GROUP 0344		Made	13.01.2021	dk1021	DH.Kim		Scale	-	
TOLERANCING PRINCIPLE ISO8015		Chkd	26.02.2021	jpi101 Pickup		Design Group	Size	A2	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	26.02.2021	mhu019 Hug		9726	Page	1/2	
		Drawing ID		DAAD136049		Material ID		PAAD366989	
		Rev.		-					

SYSTEM PROPOSAL



Main engine X62DF-S1.0			
No of Cyl.	A (mm) *13	B	C (mm) *13
5	1100	*9)	550
6	1200		550
7	1300		550



Pos.	SYSTEM COMPONENTS *1)
001	Compensator *4)
002	Exhaust gas by-pass line *8)
003	Exhaust gas pipe *12)
004	Explosion relief device (rupture discs or spring loaded valves) *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 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) When rupture discs are installed outside of the engine room, preventative measures must be taken to ensure that exhaust gas does not continuously flow to the outside after rupture. This can be achieved with an exhaust gas duct leading to the open deck, or in the case of a twin-engine installation by sending a control signal that triggers a shutdown of the engine. If either of these options are not possible, a self-closing, spring loaded valve must be used. This would remove the peak pressure of an explosion, while ensuring that the exhaust gas does not continuously flow outside.
- \*6) The piping of the exhaust gas system must be structurally supported to withstand the mass and to minimise vibrations across the system. It is suggested that this is achieved by supports which are connected to the ship hull or otherwise. The type of these supports (fixed or sliding type), their 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) Guidance regarding the selection of the waste gate pipe size is provided by the drawing "DAAD11612" as linked on the main drawing of this design group. The waste gate pipe on the shipside is one nominal pipe size larger than the waste gate pipe on the engine side (before the compensator).
- \*10) Optional, installed as required to meet noise requirements.
- \*11) Optional.
- \*12) The radius of pipe bends should be not smaller than 1.5 x DN.
- \*13) 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.

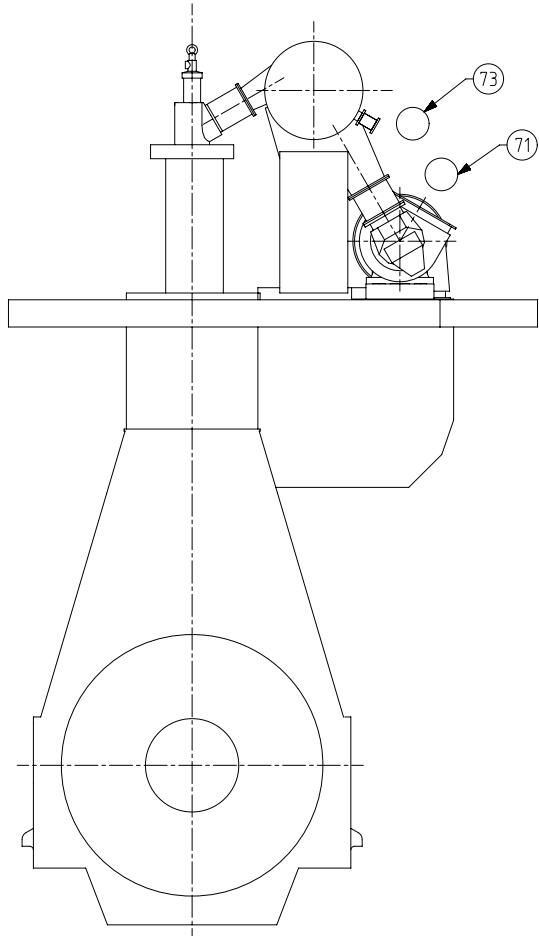
	Product	5-7x62DF-S1.0	Exhaust System with one turbocharger	Main Drw.
	Drawing ID	DAAD136049		
Units: mm kg	NX	Scale: -	Size: A1	Page: 2/2
SURFACE PROTECTION SEE GROUP 0344	Made: 13.01.2021 dki021 DH.Kim	Design Group	Material ID	Net Weight 0,001
TOLERANCING PRINCIPLE ISO8015	Chd: 26.02.2021 jgr101 Pickup	Drawing ID	9726	PAAD366989
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd: 26.02.2021 mhu019 Hug	Design Group	9726	DAAD136049

Specification which must be met:

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.

X62DF-S1.0

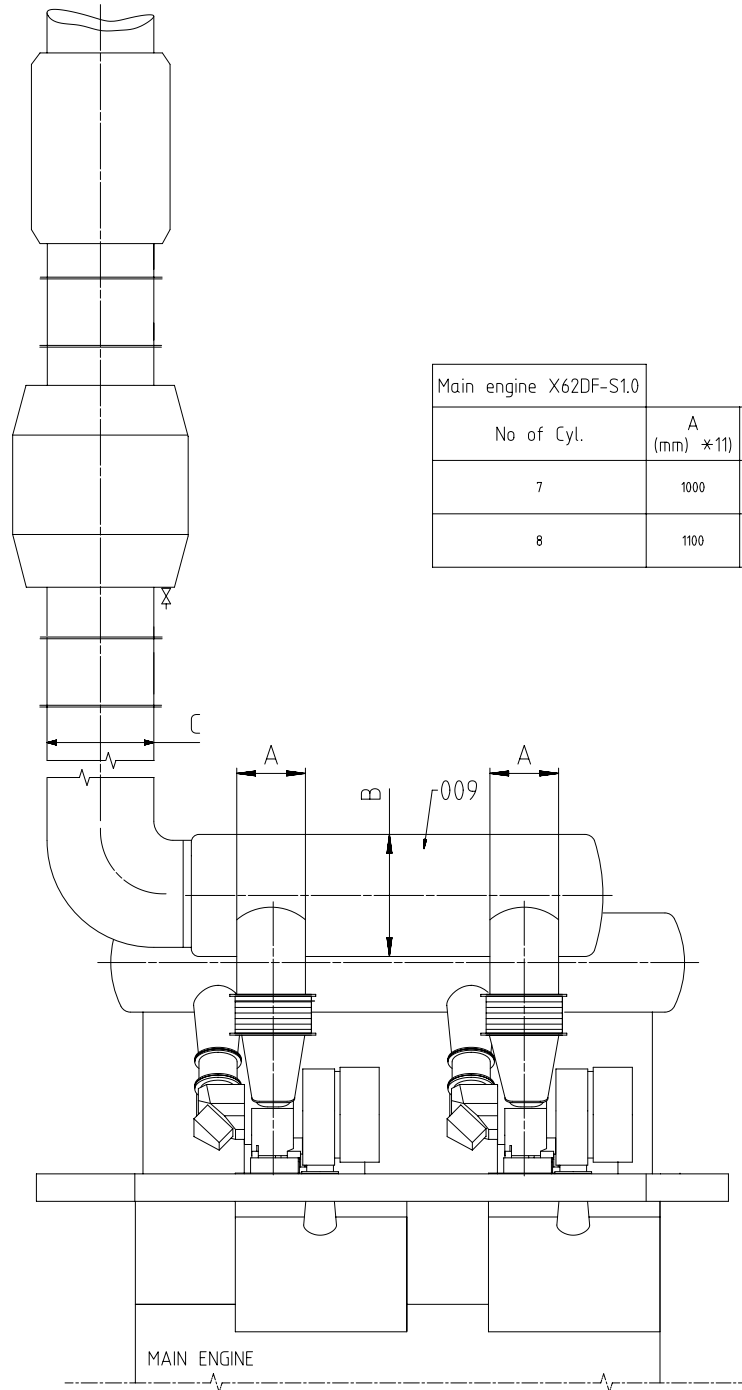


71 OUTLET - Exhaust gas turbocharger

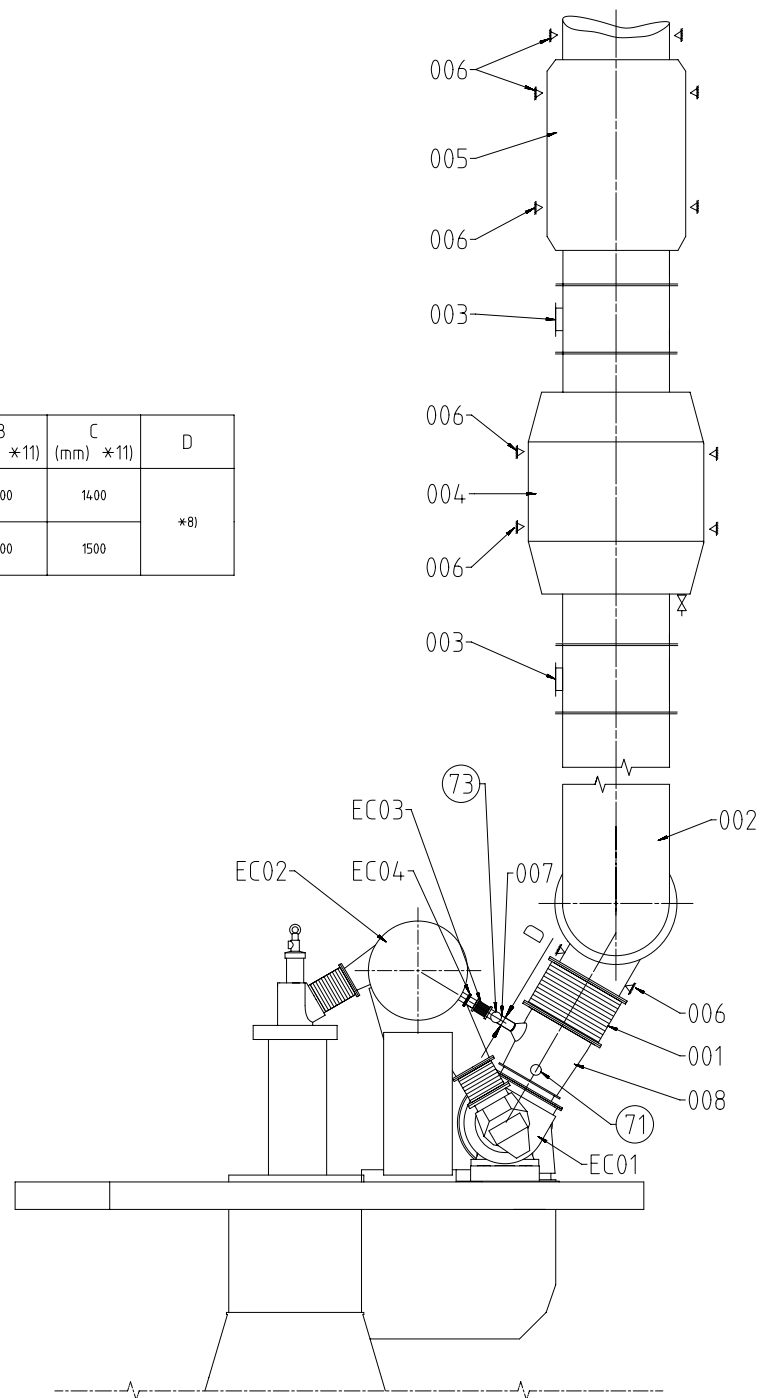
- Exhaust gas temperature and volume flow: according to GTD
- The total back pressure of the exhaust gas system must be kept in the admissible range of:  
Design maximum (new condition) in gas mode and in diesel mode without exhaust gas treatment system: 30 mbar  
Design maximum (new condition) in diesel mode with low pressure 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 low pressure 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 with cones, bends and pipe connections must be flow optimised and 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 is to be calculated according to the formula in MIM, TC specific thermal expansion are provided by the TC supplier.
- Explosion relief devices, examined and certified by the maker, with flameless pressure relief (rupture discs outside of the engine room or self-closing, spring loaded valves) must be selected and installed within the exhaust system in accordance with class requirements. The position and number of explosion relief devices must be determined by the system designer or the shipyard through calculation.
- A continuous (extensive) exhaust gas leakage 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 file		Q-Code XXXXXX		Main Drw.									
Standard ISO; JIS													
Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date					
Product 7-8X62DF-S1.0		Exhaust System with two turbocharger											
Units mm kg NX		Basic Material		Net Weight 0,001									
SURFACE PROTECTION SEE GROUP 0344		Made	13.01.2021	dk1021	DH.Kim	Scale	-	Size	A2	Page	1/2	Material ID	PAAD366996
TOLERANCING PRINCIPLE ISO8015		Chkd	26.02.2021	jpi101	Pickup	Design Group		9726	Drawing ID		DAAD136050	Rev.	-
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	26.02.2021	mhu019	Hug								

SYSTEM PROPOSAL



Main engine X62DF-S1.0				
No of Cyl.	A (mm) *11	B (mm) *11	C (mm) *11	D
7	1000	1700	1400	*8)
8	1100	1800	1500	



Pos.	SYSTEM COMPONENTS *1)
001	Compensator *4)
002	Exhaust gas pipe *12)
003	Explosion relief device (rupture discs or spring loaded valves) *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)
73	OUTLET - Exhaust gas turbocharger
	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 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) When rupture discs are installed outside of the engine room, preventative measures must be taken to ensure that exhaust gas does not continuously flow to the outside after rupture. This can be achieved with an exhaust gas duct leading to the open deck, or in the case of a twin-engine installation by sending a control signal that triggers a shutdown of the engine. If either of these options are not possible, a self-closing, spring loaded valve must be used. This would remove the peak pressure of an explosion, while ensuring that the exhaust gas does not continuously flow outside.
  - \*6) The piping of the exhaust gas system must be structurally supported to withstand the mass and to minimise vibrations across the system. It is suggested that this is achieved by supports which are connected to the ship hull or otherwise. The type of these supports (fixed or sliding type), their 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) Guidance regarding the selection of the waste gate pipe size is provided by the drawing "DAAD116127" as linked on the main drawing of this design group. The waste gate pipe on the shipside is one nominal pipe size larger than the waste gate pipe on the engine side (before the compensator).
  - \*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 15 x DN

Free space for stamp	Q-Code XXXXXX Standard ISO, JIS	Main Dwg.
Mod.:	Number	Drawn date
Mod.:	Number	Drawn date
Mod.:	Number	Drawn date
Mod.:	Number	Drawn date
Product 7-8X62DF-S1.0		Exhaust System with two turbocharger

Units	mm kg	NX	Basic Material	Scale	-	Size	A1	Page	2/2	Material ID	PAAD366996	Net Weight	0,001
DATE	13.01.2021	CHK	dk1021 DH.Kim	Scale	-	Size	A1	Page	2/2	Material ID	PAAD366996	Net Weight	0,001
DATE	26.02.2021	CHK	jar101 Pickup	Scale	-	Size	A1	Page	2/2	Material ID	PAAD366996	Net Weight	0,001
DATE	26.02.2021	CHK	mhu019 Hug	Scale	-	Size	A1	Page	2/2	Material ID	PAAD366996	Net Weight	0,001
GENERAL TOLERANCES ACCORDING TO ISO2768-mK											9726	Design Group	DAAD136050

### Valve sizes

Engines	X35				X40				RT-Flex50				X52				X52-S (A)				RT-flex58T-E and X62				X62-S (A)				X72				X82				X92														
Cylinders	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7	8	6	7	8	9	6	7	8	9	10	11	12								
Diesel	80	80	80	80	80	80	100	100	100	100	125	125	100	100	125	125	100	125	125	125	125	125	150	150	125	125	150	150	150	200	200	200	125	125	150	150	150	150	150	200	200	200	250	250	250	250	300	300	300	350	350
DF FPP	100	100	125	125	100	125	125	125	125	125	150	150	125	125	150	150	125	125	150	150	150	200	200	200	150	200	200	200	200	200	200	250	250	250	250	250															
DF CPP	125	125	125	150	125	150	150	150	150	150	200	200	150	150	200	200	150	150	200	200	200	200	250	250	200	200	200	250	200	250	250	250																			

### Flange dimensions on the manifold

Flange DN	200	200	200	200	200	200	200	200	250	250	250	250	250	250	250	250	250	250	250	250	300	300	300	300	300	300	300	300	300	300	300	300	400	400	400	400	450	450	450	450	450	450	450	450
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### Pipe dimensions after the valve for the yard connection

Valve DN	80	100	125	150	200	250	300	350	400	450	500
Pipe DN	100	125	150	200	250	300	350	400	450	500	600

List is valid for portfolio engines including B variants and DF  
 Engine sizes not listed here - on request  
 For LLT and DBT orifices will still have dimension D based on tuning sheets - SEE DG.0800

Free space for ILC											Q-Code XXXXX Standard ISO; JIS	Main Drw.			
Modif. (A)	EAAD092014	07.01.2020	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )			
Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date		
<b>WINGD</b> Winterthur Gas & Diesel		Product W-2S		SPECIFICATION EXHAUST WASTE GATE SELECTION Spezifikation Abgas-Abblaseventil Selektion											
Units	mm kg	NX	( )	Basic Material							Net Weight	0,001			
Made	13.05.2019	mi102 Lipska		Scale	1:1			Size	A2	Page	1/1		Material ID	PAAD327310	
Chkd	29.05.2019	rla101 Lapcevic		Design Group	8135			Drawing ID	DAAD116127					Rev.	A
Appd	04.06.2019	mgr026 Graf											GENERAL TOLERANCES ACCORDING TO ISO2768-mK		

## MIDS\_WinGD-X62DF-S1.0\_EXHAUST-SYSTEM

### TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2021-03-01	DRAWING SET	First web upload

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