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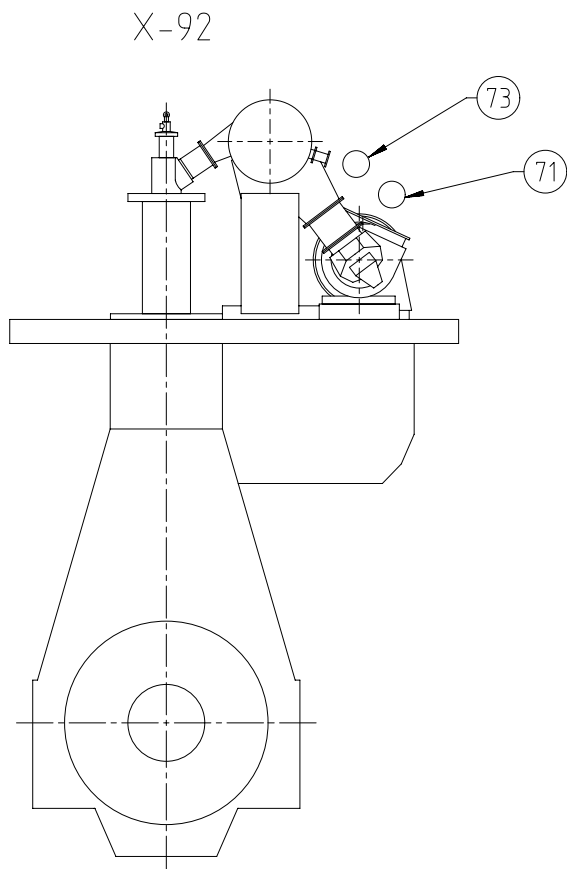
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# Specifications which must be met:

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.



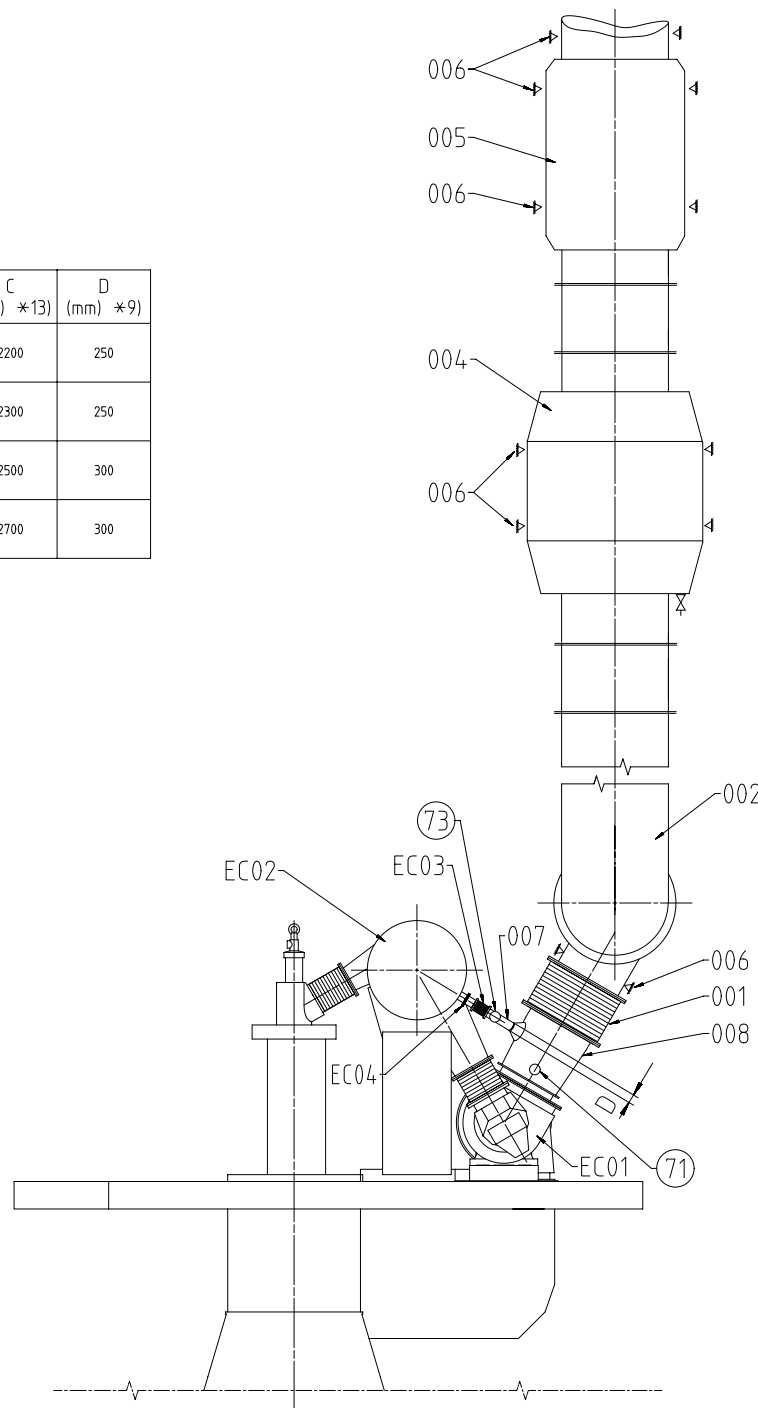
71

## OUTLET - Exhaust gas turbocharger

C

- 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) without exhaust gas treatment system: 30 mbar  
Design maximum (new condition) with exhaust gas treatment system: 60 mbar  
Operational maximum (fouled condition) without exhaust gas treatment system: 50 mbar  
Operational maximum (fouled condition) 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.
- 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	EAAD089374	11.05.2018	B	EAAD090105	11.01.2019	C	EAAD090535	05.04.2019			
		Number	Drawn date		Number	Drawn date		Number	Drawn date		Drawn date	
Product 6-12X92		Exhaust System with two turbochargers										
Units	mm kg	NX		Basic Material		Net Weight 0,001						
SURFACE PROTECTION SEE GROUP 0344		Made	02.02.2018 dki021 DH.Kim		Scale	-	Size	A3	Page	1/2	Material ID	PAAD284909
TOLERANCING PRINCIPLE ISO8015		Chkd	14.02.2018 wwa008 Wang		Design Group	9726		Drawing ID	DAAD096931		Rev.	C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	28.02.2018 mhu019 Hug									





C				
Main engine X-92				
No of cyl.	A (mm) ×13)	B (mm) ×13)	C (mm) ×13)	D (mm) ×9)
6	1500	2600	2200	250
7	1600	2800	2300	250
8	1700	3000	2500	300
9	1800	3100	2700	300

Pos.	ENGINE CONNECTIONS *2)
71	OUTLET - Exhaust gas turbocharger
73	OUTLET - Exhaust gas manifold waste gate

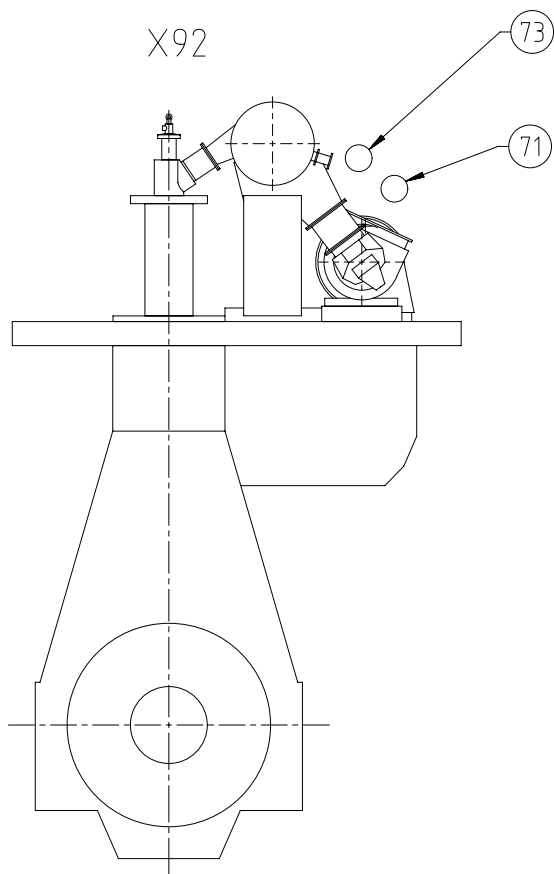
Pos.	ENGINE COMPONENTS *3)
EC01	Turbocharger
EC02	Exhaust gas manifold
EC03	Waste gate compensator *4) *9)
EC04	Waste gate valve

- Remarks: (C)
- 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).
- \*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  $\leq 40^\circ$
- \*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. When waste heat recovery (WHR) with steam and/or power driven turbine is applied a large exhaust gas bypass flow rate is expected. In that case a silencer must be installed after the boiler in order to keep the noise level within the permissible range.
- \*12) The radius of pipe bends should be not smaller than  $1.5 \times DN$ .
- \*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.

Free space for ID	G-Code XXXXXX										Min Dwg.											
	Standard ISO; JS																					
Mod.	A		EAAD099374		11.05.2018		B		EAAD099105		11.01.2019		C		EAAD099535		05.04.2019		D			
	Number		Drain date		Number		Drain date		Number		Drain date		Number		Drain date		Number		Drain date			
<div>  <div> <div>Product 6-TX92</div> <div>Exhaust System with two turbochargers</div> </div> </div>																						
Units		mm kg		NX				Basic Material										Net Weight 0.001				
Made		02.02.2018		dk1021		DH.Kim		Scale		-		Size		A1		Page 2/2		Material ID		PAAD284909		
Chased		14.02.2018		wws008		Wang		Design Group		9726		Drawing ID		DAAD096931				Rev.		C		
-App		28.02.2018		mhu019		Hug																

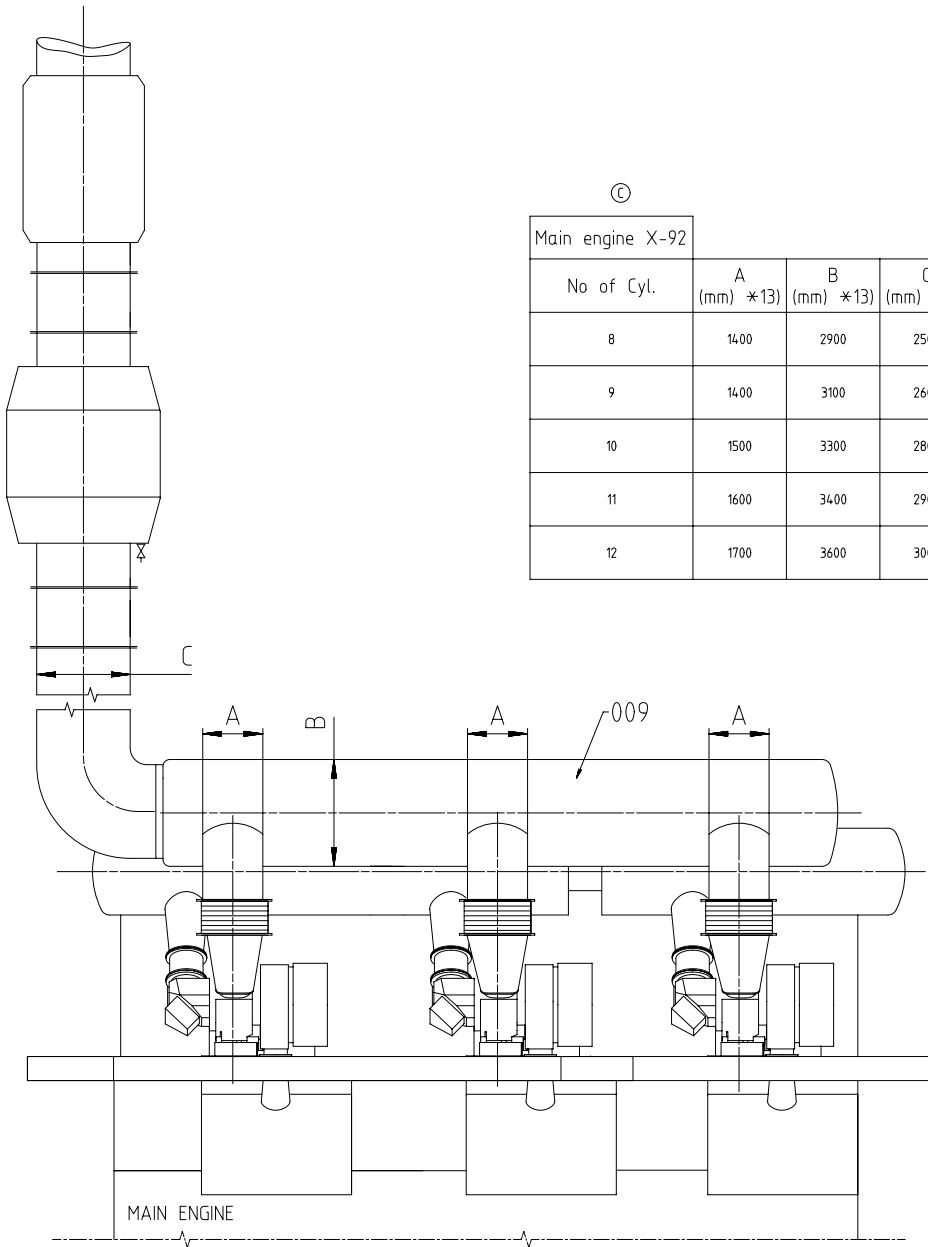
# Specifications which must be met:

- 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.



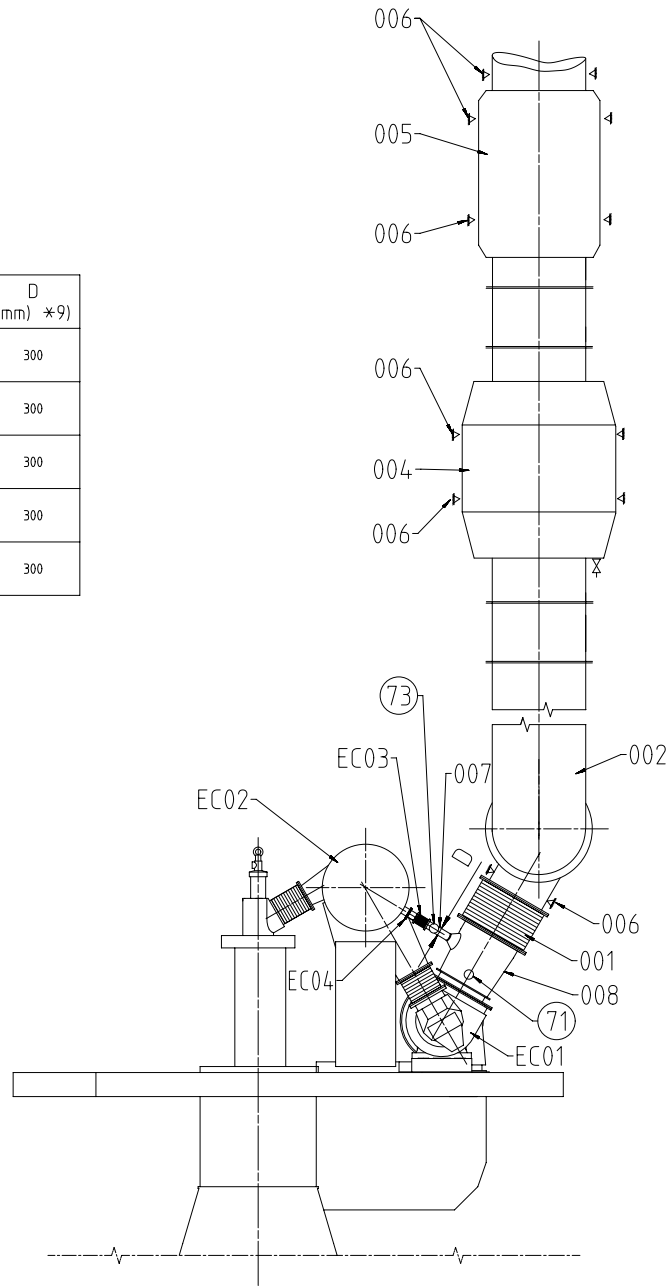
- 71
- OUTLET - Exhaust gas turbocharger
- C
- Exhaust gas temperature and volume flow: according to GTD
  - The total back pressure of the exhaust gas system must be kept in the admissible range of:  
Design maximum (new condition) without exhaust gas treatment system: 30 mbar  
Design maximum (new condition) with exhaust gas treatment system: 60 mbar  
Operational maximum (fouled condition) without exhaust gas treatment system: 50 mbar  
Operational maximum (fouled condition) 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.
  - 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 XXXXXX	Main Drw.		
								Standard ISO; JIS			
Modif.	A	EAAD089374	11.05.2018	B	EAAD090105	11.01.2019	C	EAAD090535	05.04.2019		
		Number	Drawn date		Number	Drawn date		Number	Drawn date	Number	Drawn date
		Product 6-12X92		Exhaust System with three turbochargers							
Units	mm kg	NX				Basic Material			Net Weight 0,001		
SURFACE PROTECTION SEE GROUP 0344		Made	05.02.2018 dki021 DH.Kim		Scale -		Size A3	Page 1/2	Material ID PAAD285159		
TOLERANCING PRINCIPLE ISO8015		Chkd	14.02.2018 wwa008 Wang		Design Group 9726		Drawing ID DAAD096988		Rev. C		
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Appd	28.02.2018 mhu019 Hug								



Ⓒ

Main engine X-92				
No of Cyl.	A (mm) *13)	B (mm) *13)	C (mm) *13)	D (mm) *9)
8	1400	2900	2500	300
9	1400	3100	2600	300
10	1500	3300	2800	300
11	1600	3400	2900	300
12	1700	3600	3000	300



Pos.	SYSTEM COMPONENTS *1)
001	Compensator *4)
002	Exhaust gas pipe *12)
004	Boiler *11)
005	Silencer (with spark arrester) *10)
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) *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).	
*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°	
*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. When waste heat recovery (WHR) with steam and/or power driven turbine is applied a large exhaust gas bypass flow rate is expected. In that case a silencer must be installed after the boiler in order to keep the noise level within the permissible range.	
*12) The radius of pipe bends should be not smaller than 15 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.	

Free space for Rev.	Q-Code XXXXXX Standard ISO, JIS	Main Drw.
Mod. A	EAA0089374	11.05.2018
Mod. B	EAA0090005	11.01.2019
Mod. C	EAA0090535	05.04.2019
Mod. D		
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Mod. TB		
Mod. TC		

## MIDS - WinGD X92 - EXHAUST SYSTEM (DG9726)

### TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2018-04-25	DRAWING SET	First web upload
2018-05-18	DAAD096988 DAAD096931	System drgs – new revisions
2019-01-16	DAAD096988 DAAD096931	System drgs – new revisions
2019-09-19	DAAD097026 DAAD096988 DAAD096931	Main and system drgs – new revisions

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