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

Net Weight						SEQ NO	Material ID	Material Name / Dimension, Occ	Standard or Drawing	Basic Material / Material Standard	Weight GR./NET
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	PAAD284588	Exhaust System with two turbochargers	DAAD096825		0,001
-	-	-	1	1	1	001	PAAD284570	Exhaust System with one turbocharger	DAAD096819		0,001
Quantity PER ENGINE											
PAAD284862	PAAD284860	PAAD284859	PAAD284858	PAAD284857	PAAD284856						
Material ID											

Approved

Free space for lic.

Q-Code XXXXX

Standard ISO; JIS

Main Drw. H

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
A	EAAD090535	10.04.2019						

WIN GD Winterthur Gas & Diesel

Product W5-8X72

Exhaust System
Abgassystem

Units	mm kg	NX	Basic Material	Net Weight

SURFACE PROTECTION SEE GROUP 0344

TOLERANCING PRINCIPLE ISO8015

GENERAL TOLERANCES ACCORDING TO ISO2768-mK

Made	02.02.2018	dki021 DH.Kim	Scale -	Size A3	Page 1/1	Material ID
Chkd	14.02.2018	wwa008 Wang	Design Group 9726	Drawing ID DAAD096918		Rev. A
Appd	28.02.2018	mhu019 Hug				

DID - DIMENSIONAL DRAWING - Confidential

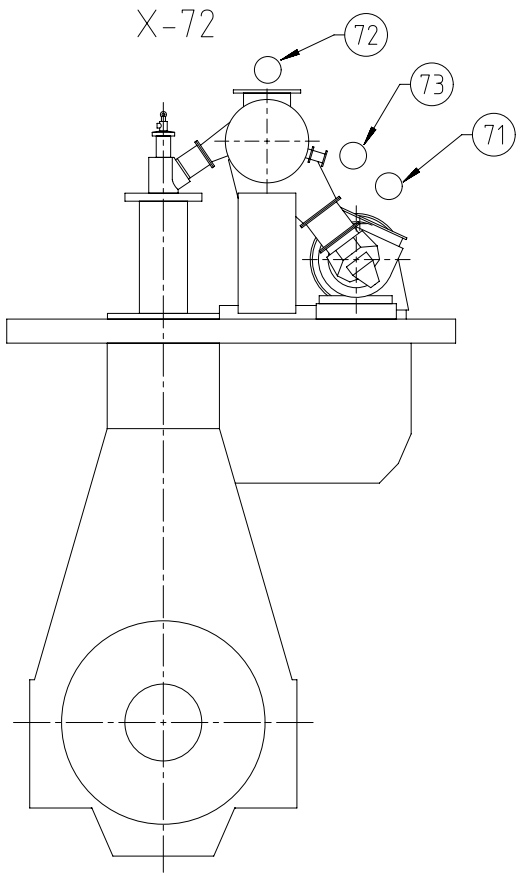
Specifications which must be met:

(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 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) 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.

Approved

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
A	EAAD089374	11.05.2018	B EAAD090105	11.01.2019	C EAAD090535	05.04.2019		

Free space for lic.

Q-Code XXXXX

Standard ISO; JIS

Main Drw.

WIN GD Winterthur Gas & Diesel

Product 5-8X72

Exhaust System with one turbocharger

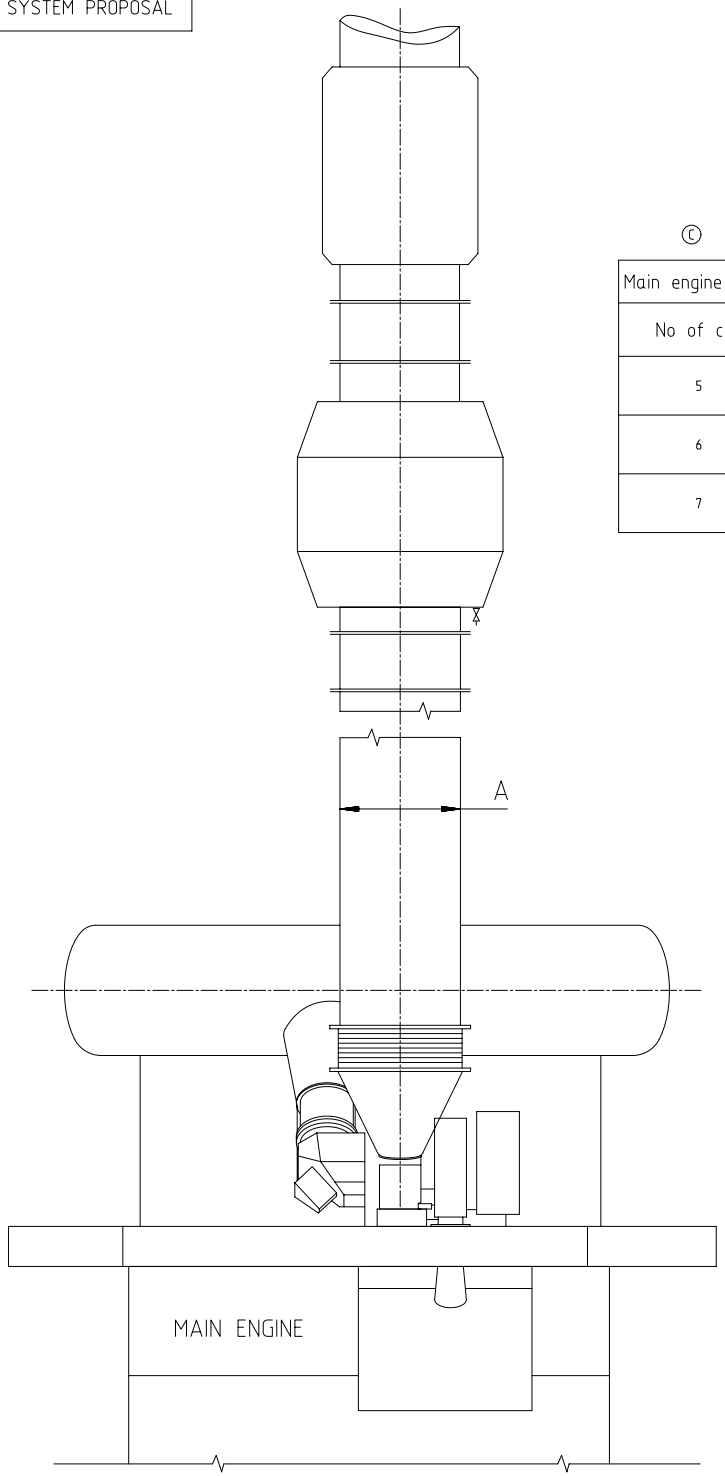
Units	mm kg	NX	Basic Material	Net Weight 0,001

Made	31.01.2018	dki021	DH.Kim	Scale -	Size A3	Page 1/2	Material ID PAAD284570
Chkd	14.02.2018	wwa008	Wang	Design Group 9726	Drawing ID DAAD096819		Rev. C
Appd	28.02.2018	mhu019	Hug				

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

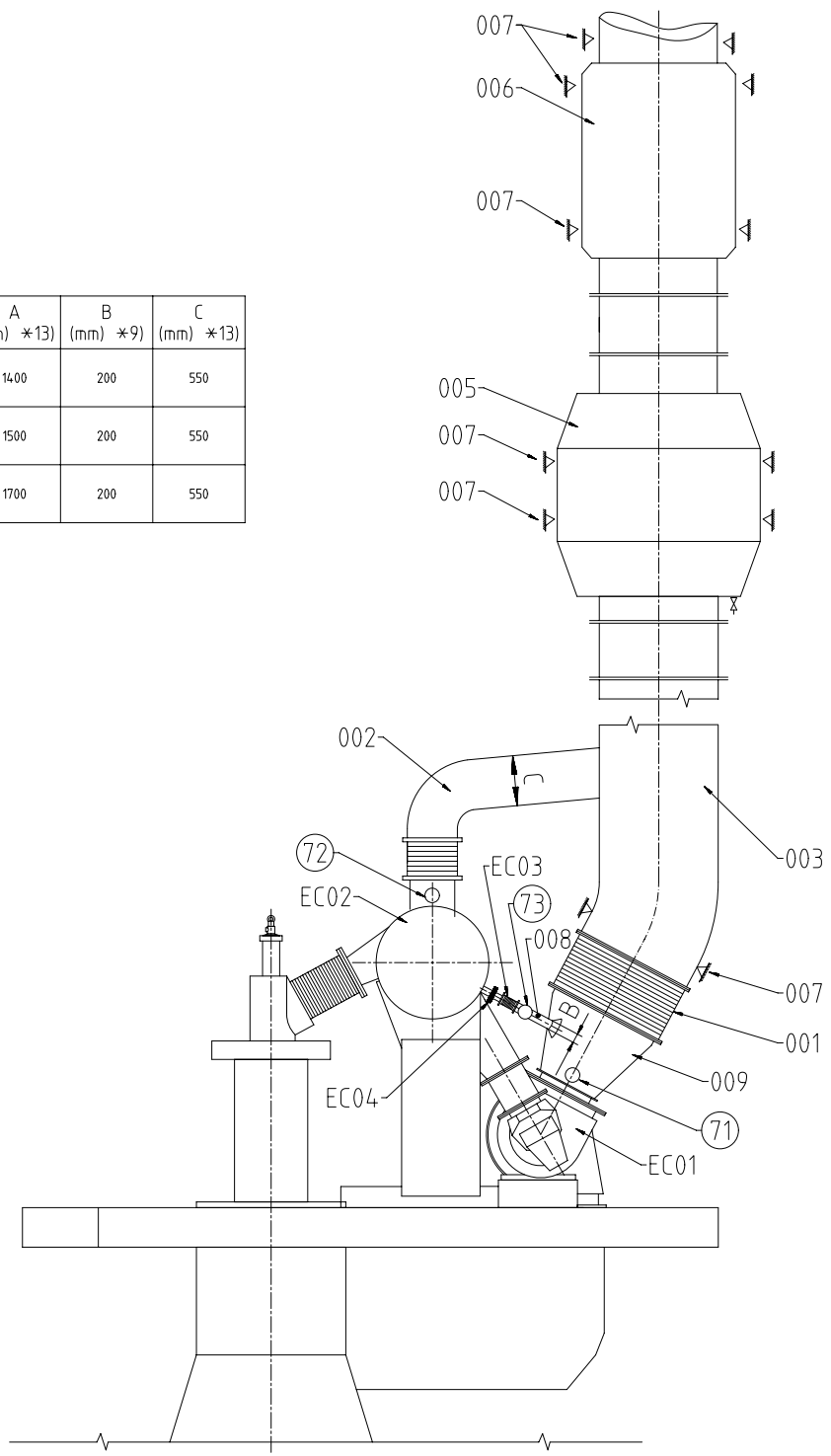
DID - DIMENSIONAL DRAWING - Confidential

SYSTEM PROPOSAL



Ⓒ

Main engine X-72			
No of cyl.	A (mm) *13)	B (mm) *9)	C (mm) *13)
5	1400	200	550
6	1500	200	550
7	1700	200	550



Pos.	SYSTEM COMPONENTS *1)
001	Compensator *4)
002	Exhaust gas by-pass line *8)
003	Exhaust gas pipe *12)
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).

*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 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.

Free space for Nr.									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	Number Drawn date

WIN GD Winterthur Gas & Diesel

Product 5-8X72

Exhaust System with one turbocharger

Units	mm kg	NX	Basic Material	Net Weight 0,001
SURFACE PROTECTION SEE GROUP 0344	Made	31.01.2018	dki021	DH.Kim
TOLERANCING PRINCIPLE ISO8015	Chkd	14.02.2018	wwa008	Wang
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	28.02.2018	mhu019	Hug

Scale - | Design Group 9726 | Size A1 | Page 2/2 | Material ID PAAD284570 | Drawing ID DAAD096819 | Rev. C

Approved

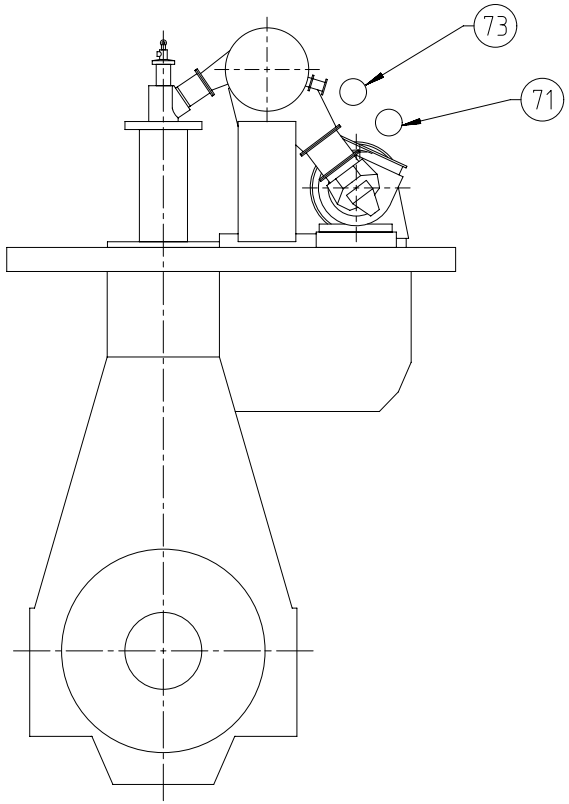
DO - DIMENSIONAL DRAWING - Confidential

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.

X-72



(71) (C) 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) 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 turbochargers must be installed.

Approved

Free space for lic.		Q-Code XXXXX	Main Drw.
		Standard ISO; JIS	

Modif.	Number	Drawn date	Number	Drawn date	Number	Drawn date	Number	Drawn date
(A)	EAAD089374	11.05.2018	(B) EAAD090105	11.01.2019	(C) EAAD090535	05.04.2019		

WIN GD Winterthur Gas & Diesel

Product 5-8X72

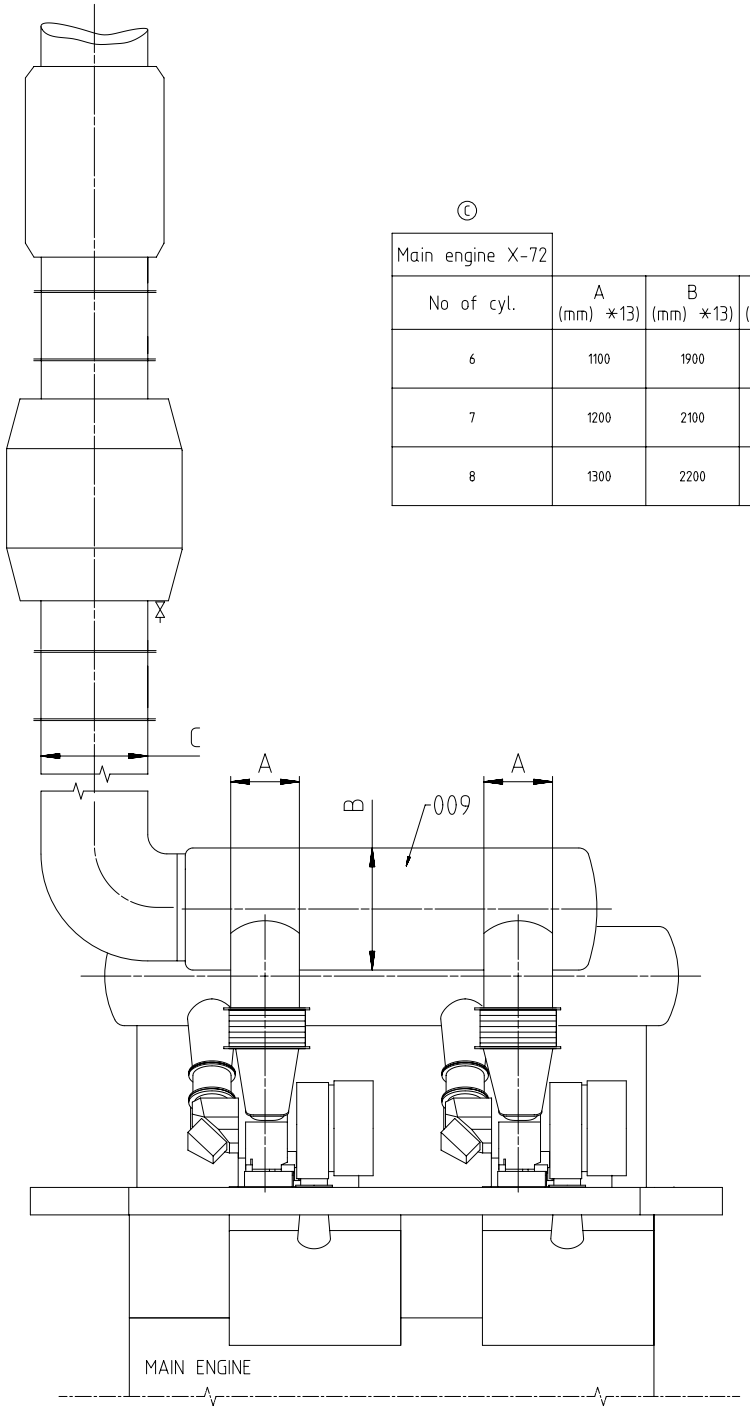
Exhaust System with two turbochargers

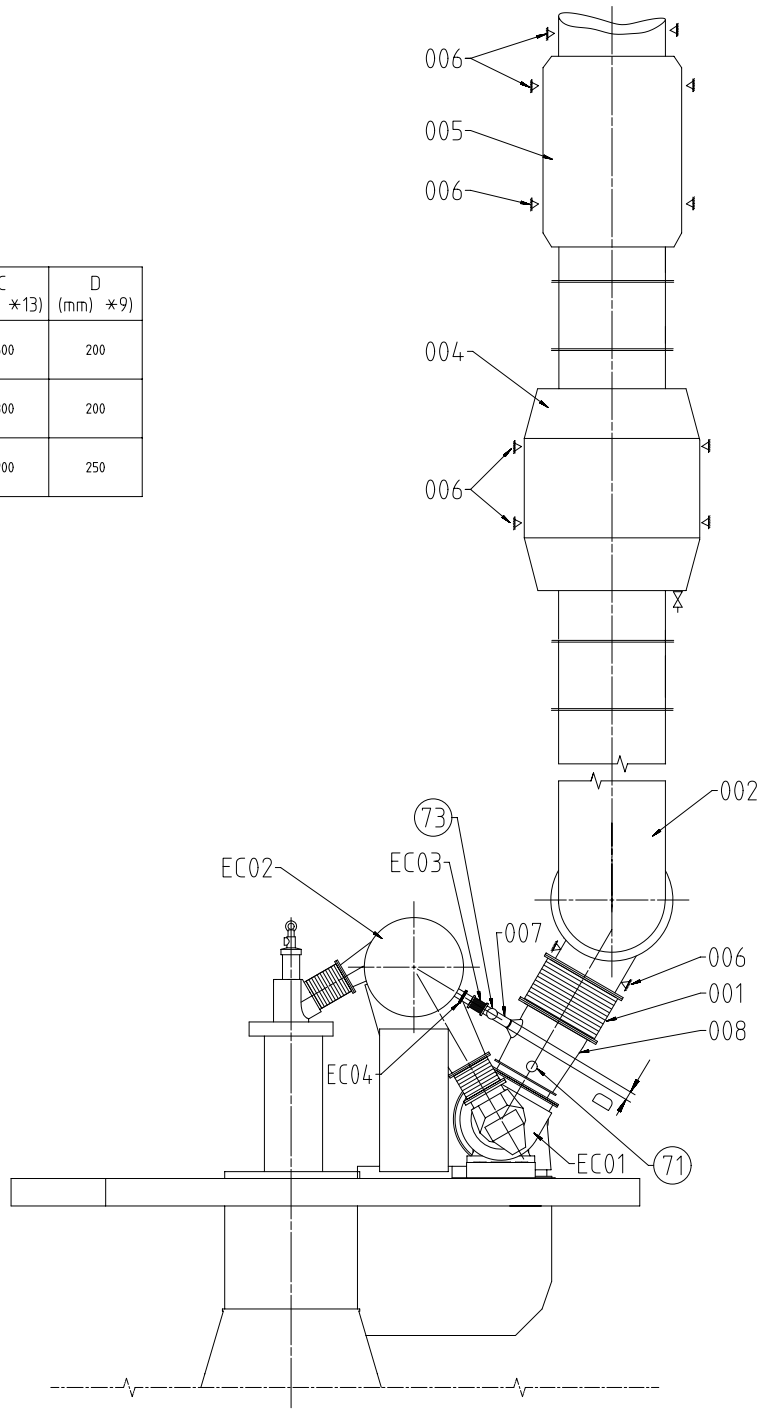
Units	mm kg	NX	Basic Material	Net Weight 0,001

SURFACE PROTECTION SEE GROUP 0344	Made	31.01.2018	dki021	DH.Kim	Scale -	Size A3	Page 1/2	Material ID PAAD284588
TOLERANCING PRINCIPLE ISO8015	Chkd	14.02.2018	wwa008	Wang	Design Group 9726	Drawing ID DAAD096825		Rev. C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	28.02.2018	mhu019	Hug				

DID - DIMENSIONAL DRAWING - Confidential

SYSTEM PROPOSAL





Ⓒ

Main engine X-72				
No of cyl.	A (mm) *13)	B (mm) *13)	C (mm) *13)	D (mm) *9)
6	1100	1900	1600	200
7	1200	2100	1800	200
8	1300	2200	1900	250

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.

*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.

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	EAAD089374	11.05.2018	B EAAD090105	11.01.2019	C EAAD090535	05.04.2019		

WIN GD Winterthur Gas & Diesel

Product 5-8X72

Exhaust System with two turbochargers

Units	mm kg	NX	Basic Material	Net Weight 0,001
SURFACE PROTECTION SEE GROUP 0344	Made	31.01.2018 dki021 DH.Kim	Scale -	Size A1 Page 2/2 Material ID PAAD284588
TOLERANCING PRINCIPLE ISO8015	Chkd	14.02.2018 wwa008 Wang	Design Group 9726	Drawing ID DAAD096825 Rev. C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK	Appd	28.02.2018 mhu019 Hug		

Approved

DIMENSIONAL DRAWING - Confidential

MIDS - WinGD X72 - EXHAUST SYSTEM (DG9726)

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2018-04-19	DRAWING SET	First web upload
2018-05-18	DAAD096819 DAAD096825	System drgs – new revision
2019-01-16	DAAD096819 DAAD096825	System drgs – new revision
2019-09-18	DAAD096918 DAAD096819 DAAD096825	Main and system drgs – new revision

Winterthur Gas & Diesel Ltd.
Winterthur Gas & Diesel AG.
Winterthur Gas & Diesel S.A.

Schützenstrasse 3
PO Box 414, CH-8401
Winterthur, Switzerland

Tel. +41 (0)52 264 8844
Fax +41 (0)52 264 8866