

**Available executions**

Execution No.	Material ID	Cylinder No.	Attribute 1: Gas pressure regulation		Attribute 2: Gas supply system	
			iGPR	GVU	NG	NG+VOC
001	PAAD368722	5-8		X	X	
002	PAAD368724	5-8		X		X
003	PAAD368684	5-8	X		X	
004	PAAD368688	5-8	X			X

SURFACE PROTECTION SEE GROUP 03/44

TOLERANCING PRINCIPLE ISO8015

**NOTE**

The above executions can be configured using the Engine Configurator. Detailed guidance for the executions is provided within the Marine Installation Manual (MIM). If a specific execution of interest is not shown in the above table, then it may still be under development or not available. For further information or in case of a project-specific request, WinGD must be contacted directly.

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Prod.	X62DF-S1.0											
	X62DF-S2.0											
Change History												
	-	sna102				new Design						
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis		Activity Code	E	C		



FUEL GAS SYSTEM  
MIDS master drawing

separate BOM available

Dimension

Scale	-		NX	Units [mm] [kg]	Basic Material	Net Weight	0.001		
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				Qty per	A4	Item ID	PTAA026118		Drawing Page/s

SEQ NO	QTY	Item ID	Item Name	Dimension	Standard-ID	Basic Material	Net Weight
001	1	PAAD368678	GAS FUEL SYSTEM	Gas Supply System: NG			0.001
003	1	PAAD278947	FLUSHING INSTRUCTION PIPING				0.001
004	1	PAAD149646	ENGINE SAFETY CONCEPT	DF ENGINE SAFETY CONCEPT			0.001

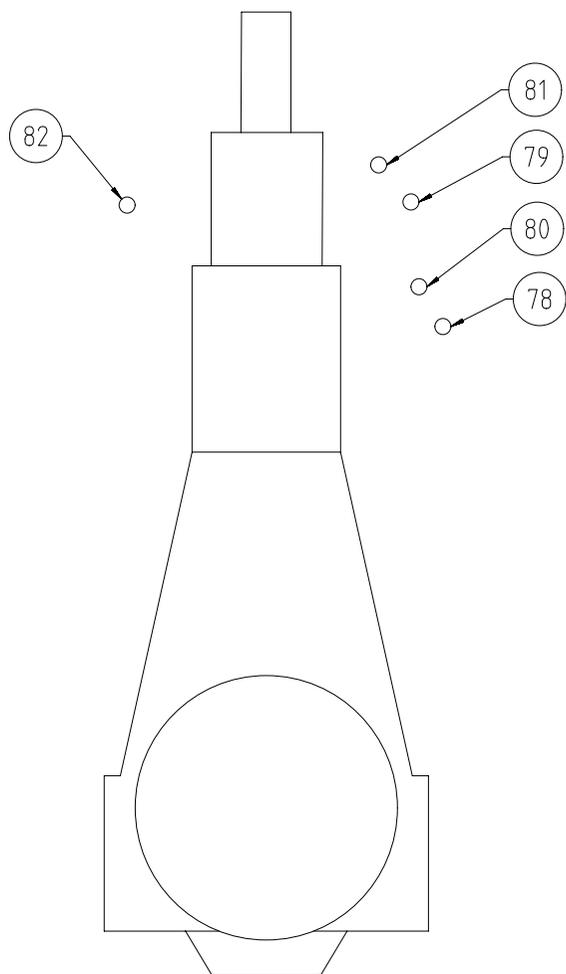
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Prod.	5,6,7,8 X62DF-S1.0							
	5,6,7,8 X62DF-S2.0							
Change History								
	-	sde101	mhu019	26.02.2021		-	-	-
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Activity Code	E C

	GAS FUEL SYSTEM
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<b>Bill Of Material</b>		Dimension		Gas Pressure Regulation: GVU					
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		Main Design	Yes	Design Group	9727	Q-Code	XXXXX	Standard	WDS
		Qty per	Engine	A4	Item ID	PAAD368722		BOM Page/s	01/01

X62DF-S1.0



SPECIFICATIONS which must be met:

78	<p>INLET - Gas supply</p> <p>INNER GAS PIPE</p> <p><u>Gas quality:</u> According to specification in the Marine Installation Manual (MIM).</p> <p><u>Gas pressure:</u> Controlled by GUV, load depended.</p> <p><u>Mass flow:</u> According to GTD.</p> <p><u>Gas temperature:</u> 0 - 60°C</p> <p>NOTE: Regarding gas temperature vs. ventilation air temperature and methods to avoid / handle condensation in the annular space, refer to the specification for connection 81 and remarks on page 3.</p> <p><u>Pipe connection:</u> Inner pipe connected to the gas supply line from GUV via flange connection (for counter-flange execution refer to the "Pipe Connection Plan").</p> <p>OUTER PIPE (annular space) - ventilation air outlet</p> <p><u>Ventilation air quantity and quality:</u> Refer to the connection 81, "INLET - Ventilation air annular space".</p> <p><u>Pipe connection:</u> Outer pipe is connected to the annular space of the supply pipe from GUV via flange connection (for counter-flange execution refer to the "Pipe Connection Plan").</p> <p>Gas detection: A gas detector must be installed in the double wall pipe a distance of max. 2 m to the engine inlet connection.</p>
79	<p>OUTLET - Gas / Inert gas release, engine side</p> <ul style="list-style-type: none"> <li>- Can be connected to gas / inert gas release, system side (connection 80), but must not be connected to other venting pipes.</li> <li>- No additional valves allowed in the venting pipeline.</li> <li>- Gas release to safe area outside of engine room.</li> <li>- At the end of the vent pipe, safety devices (e.g. flame arrestors) must be installed according to respective class specification and requirement.</li> </ul>
80	<p>OUTLET - Gas / Inert gas release, system side</p> <ul style="list-style-type: none"> <li>- Can be connected to gas / inert gas release, engine side (connection 79), but must not be connected to other venting pipes.</li> <li>- No additional valves allowed in the venting pipeline.</li> <li>- Gas release to safe area outside of engine room.</li> <li>- At the end of the vent pipe, safety devices (e.g. flame arrestors) must be installed according to respective class specification and requirement.</li> </ul>
81	<p>INLET - Ventilation air annular space</p> <ul style="list-style-type: none"> <li>- Location and execution according to "2-S Dual Fuel Engine Safety Concept" as linked in the Marine Installation Manual (MIM).</li> <li>- Ventilation air dew point must be lower than the gas temperature. If the ambient air is not sufficiently dry, dry air must be supplied. Refer to the remarks / proposals on page 3.</li> <li>- Sufficient ventilation air (min. 30 air exchanges per hour) must be sucked by an extraction fan from a safe area into the annular space of ME internal and external piping.</li> <li>- Volume of ventilation air on engine side: refer to table 2 on page 3.</li> <li>- Volume of ventilation air on GUV side: refer to table 1 on page 2.</li> </ul>
82	<p>OUTLET - Gas monitoring, piston underside</p> <ul style="list-style-type: none"> <li>- Must not be connected to other venting pipes</li> <li>- Gas release to safe area outside of engine room</li> <li>- At the end of the vent pipe, safety devices (e.g. flame arrestors) have to be installed according to respective class specification and requirement.</li> </ul>

Prod.	X62DF-S1.0																			
Change History	A	sna102	mhu019	24.08.2022	QNA002266	Drawing Updated				4	3									
	-	sde101	mhu019	26.02.2021		-				-	-									
Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Approved	Activity Code	E	C											

**GAS FUEL SYSTEM**

Gas Supply System: NG

Scale		Units [mm] [kg]		Basic Material		Net Weight		0.001	
Main Design		Design Group		9727		Q-Code		XXXXX	
Qty per		A2		Item ID		PAAD368678		Drawing Page/s	
								1/4	

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

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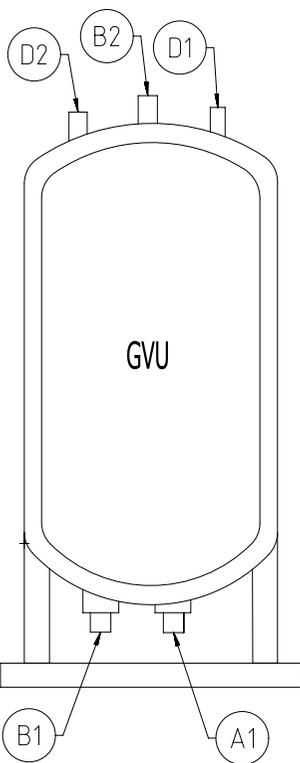
SPECIFICATION requirements for GUV connections

D1	<p>OUTLET - Gas / Inert gas release</p> <p><u>Inerting / gas venting procedure / flow path:</u> Inert gas inlet in the tank room connection &gt; the piping between the tank room connection and GUV inlet (connection A1) &gt; the GUV internal piping between inlet (connection A1) and venting outlet (connection D1) &gt; gas / inert gas release to outside of engine room.</p> <p><u>Pipe connection:</u> Connected to a venting line for gas / inert gas release outside of engine room.</p>
D2	<p>OUTLET - Ventilation air annular space</p> <p><u>Ventilation procedure / flow path:</u> Ventilation air from a safe area &gt; the annular space of the piping between the air suction connection and GUV inlet (connection A1) &gt; the GUV enclosure / room - air release via GUV air ventilation outlet (connection D2).</p> <p><u>Pipe connection:</u> Connected to a ventilation line with extraction fan to suck the ventilation air and release to outside of engine room. The ventilation fan suction capacity has to be sufficient for 30 air exchanges per hour. The ventilation line must be equipped with a gas detector.</p>

A1	<p>INLET - Gas / Ventilation air to GUV</p> <p>INNER GAS PIPE <u>Gas quality:</u> According to specification in the Marine Installation Manual (MIM). <u>Gas pressure:</u> Design pressure based on GTD requirement for the selected rating and selected minimum LHV plus system pressure drop. Operational variation via engine control system is possible. <u>Permissible gas pressure fluctuation:</u> ± 0.6 bar (across all frequencies). <u>Mass flow:</u> According to GTD. <u>Gas temperature:</u> Aligned with the specification on page 1. <u>Pipe connection:</u> Inner pipe is connected to the gas supply line from gas storage / handling system via welding connection</p> <p>OUTER PIPE (annular space) - ventilation air inlet - Location and execution according to "2-S Dual Fuel Safety Concept" as linked in the MIM. - Ventilation air dew point must be lower than the gas temperature. - Sufficient ventilation air (min. requirement of 30 air exchanges per hour) must be sucked by the extraction fan from a safe area into the annular space of ME internal and external piping. <u>Pipe connection:</u> Outer pipe connected to the annular space of the supply pipe via welding connection.</p>
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B1	<p>OUTLET - Gas / Ventilation air to engine</p> <p>INNER GAS PIPE <u>Gas pressure:</u> Adjusted by the GUV gas pressure regulating valve according to engine demand. <u>Pipe connection:</u> Inner pipe connected to the gas supply line either via welding or flange connection.</p> <p>OUTER PIPE (annular space) <u>Pipe connection:</u> Outer pipe connected to the annular space of the supply line either via welding connection. The connection pipe to the engine must be kept as short as possible and never longer than 30 m.</p>
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B2	<p>INLET - Inert gas</p> <p><u>Inerting procedure / flow path:</u> GUV inert gas inlet (connection B2) &gt; GUV piping &gt; Piping between GUV outlet (connection B1) and gas / inert gas release on engine (outlet connection 79 and 80). <u>Inert gas quality:</u> According to specification in the Marine Installation Manual (MIM). <u>Inert gas pressure:</u> Can be selected between 5 - 15 bar(g). Once the set-pressure is selected, deviation of ±10% is allowed. <u>Inert gas consumption:</u> According to guidance in MIM. <u>Pipe connection:</u> Connected to the inert gas supply system.</p>
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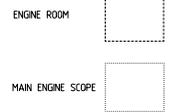
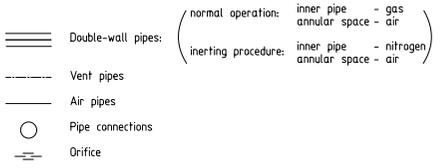


Cyl. Number	GUV Type	GUV INNER PIPE VOLUME	GUV ENCLOSURE VOLUME
5 cylinder	DN100	57.8 l	2270 l
6 cylinder	DN100	57.8 l	2270 l
7 cylinder	DN100	57.8 l	2270 l
8 cylinder	DN100	57.8 l	2270 l

Table 1: GUV-ED VOLUME (values to be used for calculating inerting gas consumption and ventilation air flow.)

Schematic outline view of the the GUV-ED type. For detailed dimensions of the GUV please refer to the GUV supplier layout drawing. Other designs are possible, e.g. GUV-OD type.

SYSTEM PROPOSAL



Pos.	System Components
001	Gas handling room / cargo machinery room
002	Extraction fan
003	Master gas fuel supply valve
004	Adjustable orifice
005	Pressure regulating valve
006	Master gas fuel engine valve *3) *14)
007	Engine room ventilation fan
008	Purging valve
009	Flow indicator
010	Condensate water trap
011	Gas detector
013	Venting box
014	Shut-off valve, compressed air supply
015	Non-return valve
016	Shut-off valve (double well execution)
017	Double-block and bleed valve
018	Intermediate piece
019	GVU (e.g. Wärtsilä enclosed type (GVU-ED) in vertical execution)
020	GVU extraction fan

Pos.	Engine Components
EC01	Vent / Purging Valve
EC02	Shut-off valve gas rail pipe
EC03	Vent valve
EC04	Gas detector piston underside

Pos.	Engine Connections**
(78)	INLET - Gas Supply
(79)	OUTLET - Gas / Inert gas release, engine side
(80)	OUTLET - Gas / Inert gas release, system side
(81)	INLET - Ventilation air annular space
(82)	OUTLET - Gas monitoring, piston underside

Table 2: Volume of ME internal gas piping

Cylinder	Volume of inner pipe (l)*	Volume of annular space (l)**
5 cyl.	145 l	95 l
6 cyl.	170 l	115 l
7 cyl.	195 l	130 l
8 cyl.	220 l	145 l

\* Reference data for inert gas and ventilation air calculation. Ship side piping shall be considered in addition.

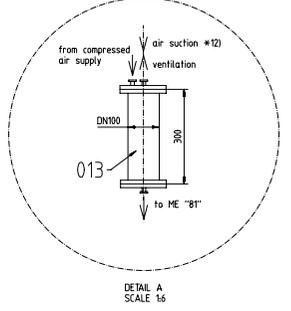
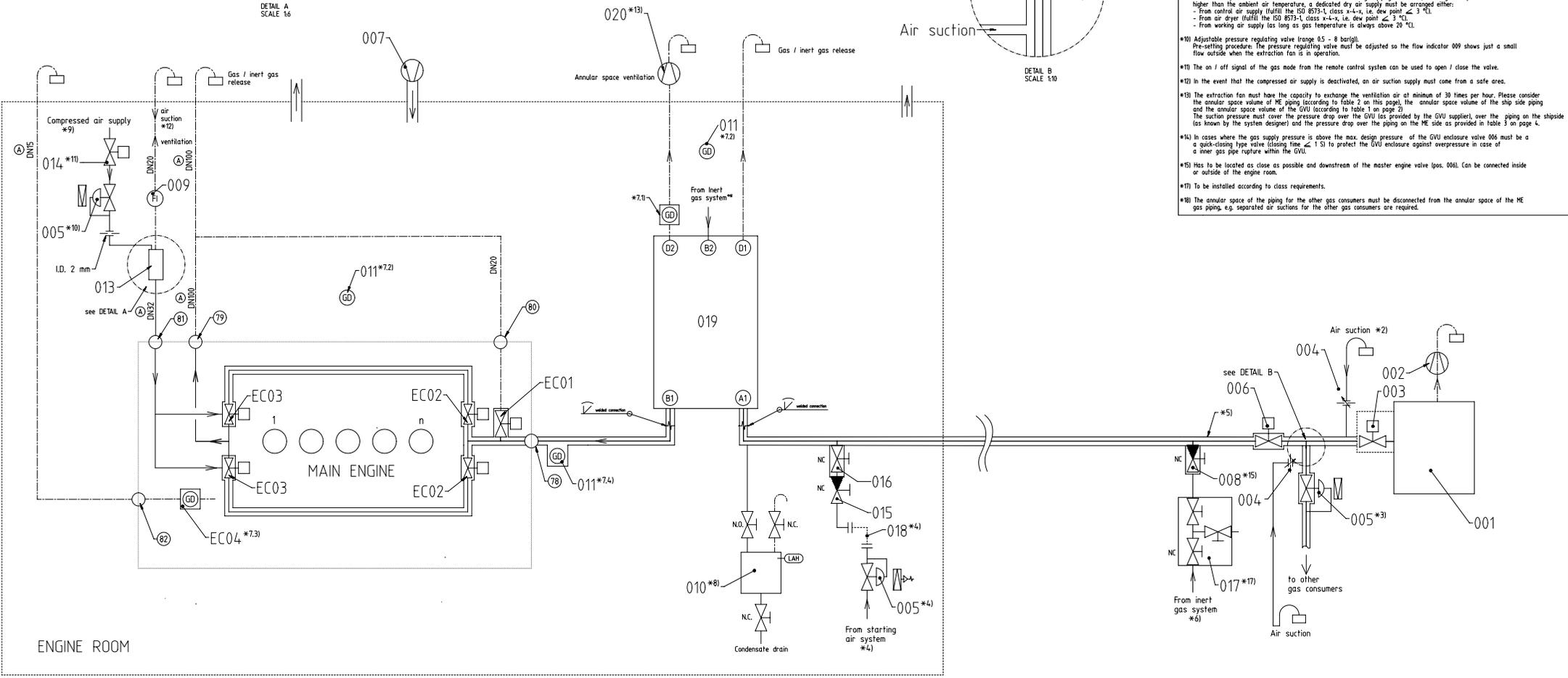
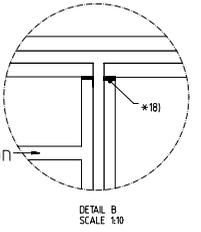


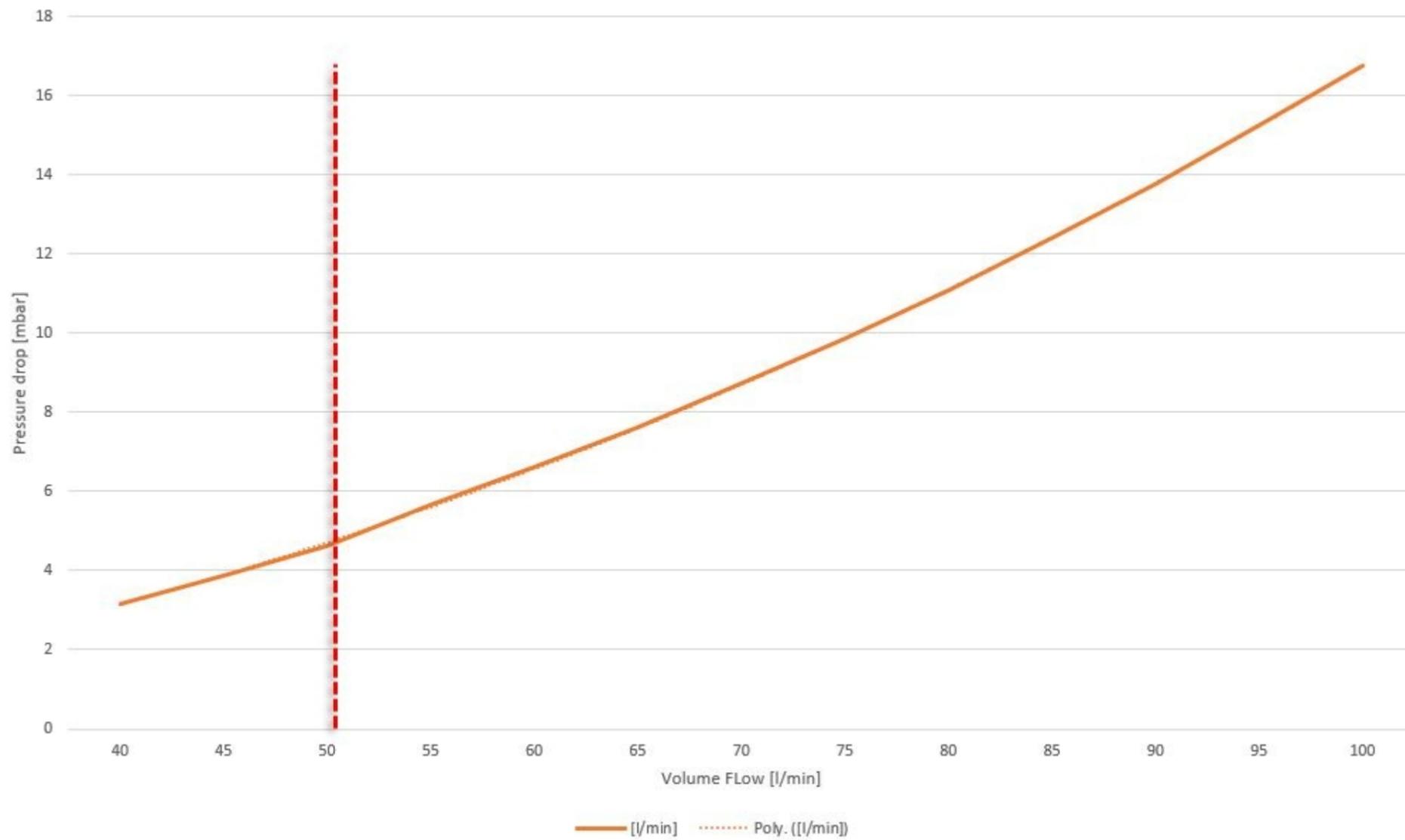
Table 1: Volume of ME internal gas piping

\* Reference data for inert gas and ventilation air calculation. Ship side piping shall be considered in addition.



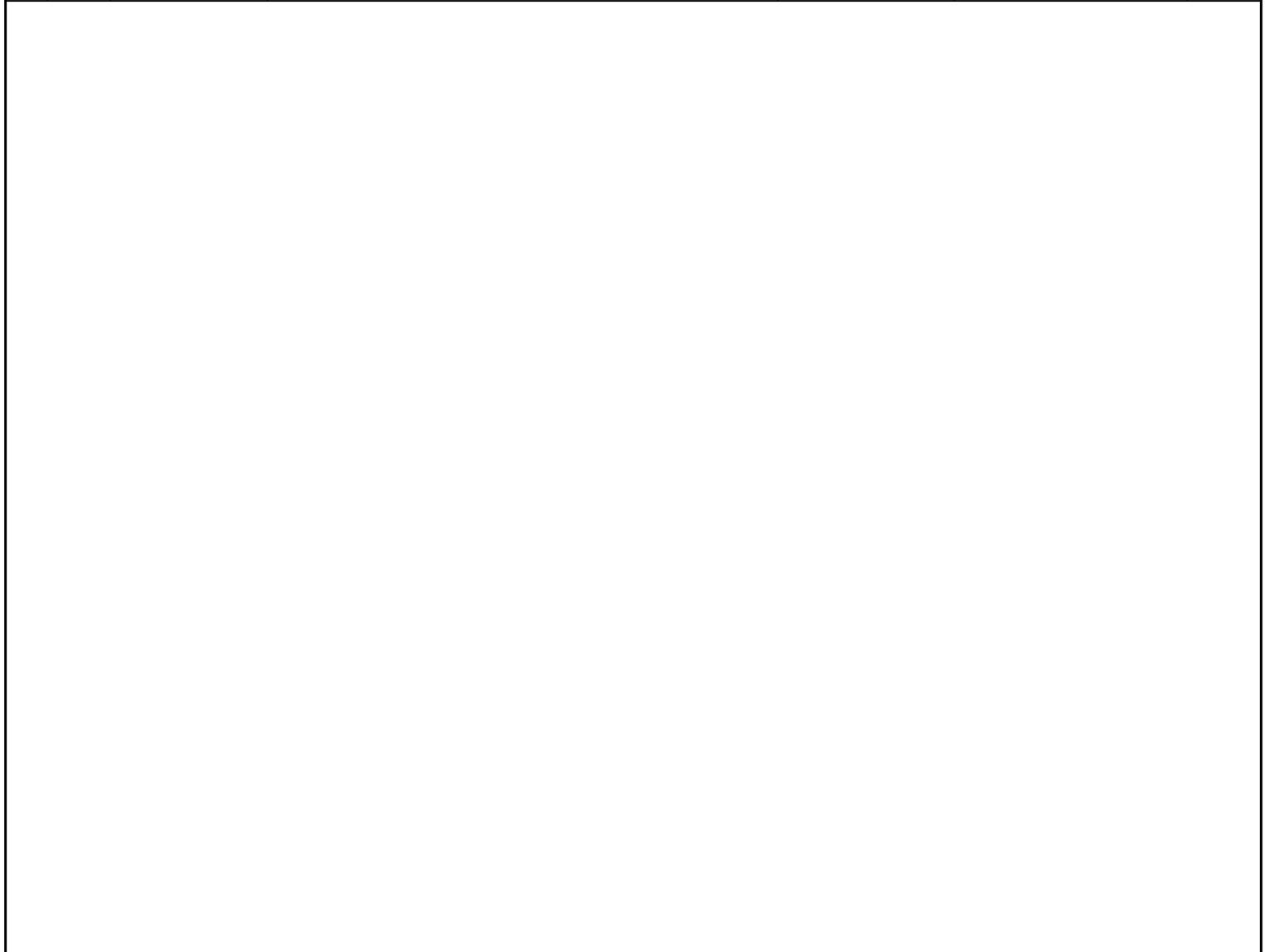
- \*1) For the exact position and pipe connection execution refer to the "Pipe Connection Plan".
- \*2) Air suction must be from a safe area, with an adjustable orifice fitted to the air inlet. The orifice is regulated to ensure adequate ventilation for the ME gas piping.
- \*3) Conditional requirement - Only to be installed if there is a branch pipe to the other gas consumers.
- \*4) Compressed air supply is required for leakage testing of gas fuel system pipelines and components. Air is supplied from the starting air system, then air pressure is reduced by the regulating valve (005) to the design gas pressure. The intermediate piece (018) must be removed during normal ME operation (only to be installed for commissioning / maintenance) and the connection blinded off.
- \*5) Piping between the gas handling / cargo room and engine: Supplied by the shipyard and is connected to the inlet flange on the engine side (layout of the counter-flange is provided in the "Pipe Connection Plan"). Pipe section installed below the main deck in engine room or cargo machinery room. Double-wall pipe with inner pipe diameter of DN80 and outer pipe diameter of DN100 is recommended. Pipe section installed above the main deck / ventilation duct. Single-wall pipe with diameter of DN80 is recommended, if the position fulfils the rule requirements of non-hazard zone.
- \*6) Inert gas quality: According to the specification in the Marine Installation Manual (MIM) inert gas consumption: Calculated according to the guidance in MIM under consideration of the GVU volume as provided in table 2 on page 2, the ME inner pipe volume as provided in table 2 of this page and the volume in the system piping. Inert gas pressure: Can be selected between 5 and 15 barg. Once set-pressure is selected, deviation of ±10% is allowed, though not below 5 bar.
- \*7) Gas detection for annular space, with feedback to engine control system: Mandatory.
- \*7.2) Gas detection in engine room above ME and GVU: Required according to class rules.
- \*7.3) Gas detection for piston underside (PUS), with feedback to engine control system: Mandatory.
- \*7.4) Gas detection for annular space, on system side: Mandatory, to be installed with a distance of max. 2 m to engine inlet.
- \*8) Conditional requirement - If the gas temperature is not always higher than the ambient air temperature, condensate may accumulate in annular space. In this case, condensate traps must be arranged at the low points of the ship side gas piping. If the condensate water trap LAH is triggered, the trap must be manually drained. To do this, the inlet valve (indicated N.O. on the drawing) must be closed. Then the venting valve and drain valve (indicated N.C. on the drawing) is opened. When the trap has been drained, all valves are to be returned to their normal position.
- \*9) Conditional requirement - No condensate is allowed in the ME gas piping. Therefore, if the gas temperature is not higher than the ambient air temperature, a dedicated dry air supply must be arranged either:
  - From control air supply (fulfill the ISO 8573-1, class 4+4+, i.e. dew point ≤ 3 °C).
  - From air dryer (fulfill the ISO 8573-1, class 4+4+, i.e. dew point ≤ 3 °C).
  - From working air supply (as long as gas temperature is always above 20 °C).
- \*10) Adjustable pressure regulating valve (range 0.5 - 8 barg). Pre-setting procedure: The pressure regulating valve must be adjusted so the flow indicator 009 shows just a small flow outside when the extraction fan is in operation.
- \*11) The on / off signal of the gas node from the remote control system can be used to open / close the valve.
- \*12) In the event that the compressed air supply is deactivated, an air suction supply must come from a safe area.
- \*13) The extraction fan must have the capacity to exchange the ventilation air at minimum of 30 times per hour. Please consider the annular space volume of ME piping (according to table 2 on this page), the annular space volume of the ship side piping and the annular space volume of the GVU (according to table 1 on page 2). The suction pressure must cover the pressure drop over the GVU (as provided by the GVU supplier), over the piping on the shipside (as known by the system designer) and the pressure drop over the piping on the ME side as provided in table 3 on page 4.
- \*14) In cases where the gas supply pressure is above the max. design pressure of the GVU enclosure valve 006 must be a quick-closing type valve (closing time ≤ 1.5) to protect the GVU enclosure against overpressure in case of a inner gas pipe rupture within the GVU.
- \*15) This to be located as close as possible and downstream of the master engine valve (pos. 006). Can be connected inside or outside of the engine room.
- \*17) To be installed according to class requirements.
- \*18) The annular space of the piping for the other gas consumers must be disconnected from the annular space of the ME gas piping, e.g. separated air suction for the other gas consumers are required.

Table 3: Pressure drop over the annular space on engine side



SURFACE PROTECTION SEE GROUP 0344		Change	A	sna102	mhu019	24.08.2022	CNAA002266	Drawing Updated			4	3		
TOLERANCING PRINCIPLE ISO8015		Rev.		Creator	Approver	Approval Date	Change ID	Change Synopsis			Approved	Activity Code	E	C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and honours these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.					[mm]	[kg]	-	A3	Item ID	PAAD368678	Drawing Page/s	4 / 4

SEQ NO	QTY	Item ID	Item Name	Dimension	Standard-ID	Basic Material	Net Weight
002	1	PAAD368672	GAS FUEL SYSTEM	Gas Supply System: NG+VOC			0.001
003	1	PAAD278947	FLUSHING INSTRUCTION PIPING				0.001
004	1	PAAD149646	ENGINE SAFETY CONCEPT	DF ENGINE SAFETY CONCEPT			0.001



Prod.	5,6,7,8 X62DF-S1.0							
	5,6,7,8 X62DF-S2.0							
Change History								
	-	sde101	mhu019	26.02.2021		-	-	-
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Activity Code	E C

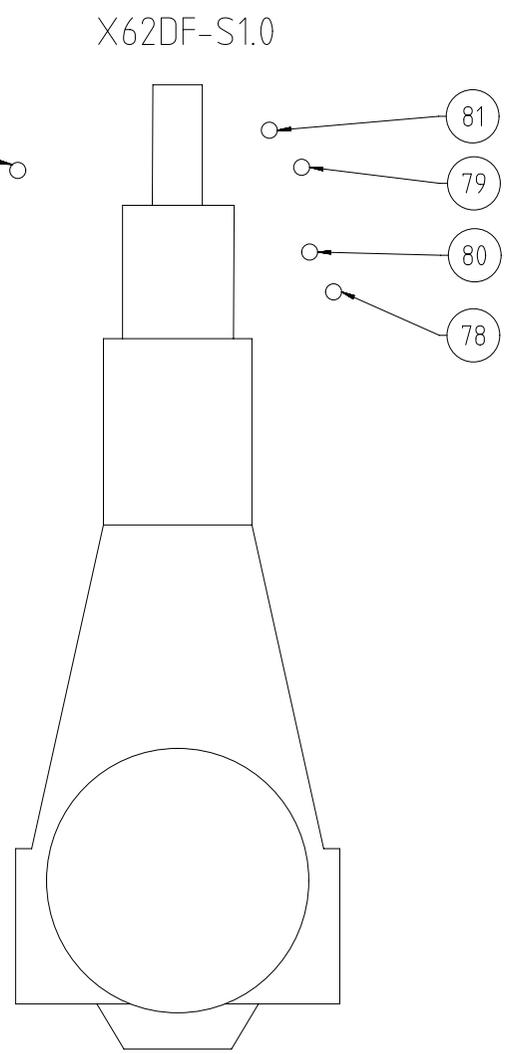
	GAS FUEL SYSTEM
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<b>Bill Of Material</b>		Dimension		Gas Pressure Regulation: GVU				
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Main Design		Yes	Design Group	9727	Q-Code	XXXXX	Standard	WDS
Qty per	Engine	A4	Item ID	<b>PAAD368724</b>			BOM Page/s	01/01

SPECIFICATIONS which must be met:

81	<p>INLET - Ventilation air annular space</p> <ul style="list-style-type: none"> <li>- Location and execution according to "2-S Dual Fuel Engine Safety Concept" as linked in the Marine Installation Manual (MIM).</li> <li>- Sufficient ventilation air (min. 30 air exchanges per hour) must be sucked by the extraction fan from a safe area into the annular space of ME internal and external piping.</li> <li>- Volume of ventilation air on engine side: refer to table 2 on page 3.</li> <li>- Volume of ventilation air on GVU side: refer to table 1 on page 2.</li> </ul>
82	<p>OUTLET - Gas monitoring, piston underside</p> <ul style="list-style-type: none"> <li>- Must not be connected to other venting pipes.</li> <li>- Gas release to safe area outside of engine room.</li> <li>- At the end of the vent pipe, safety devices (e.g. flame arrestors) have to be installed according to respective class specification and requirement.</li> </ul>

78	<p>INLET - Gas supply</p> <p>INNER GAS PIPE</p> <p><u>Gas quality:</u> According to project specific definition</p> <p><u>Gas pressure:</u> Controlled by GVU, load depended</p> <p><u>Mass flow:</u> According to project specific definition</p> <p><u>Gas temperature:</u> 40 - 60 °C for pure NG and for the mixture of NG and VOC up to max. 25% of VOC.</p> <p><u>Pipe connection:</u> Inner pipe connected to the gas supply pipe from GVU via flange connection. For execution of the flange refer to the "Pipe Connection Plan"</p> <p><u>Inert gas supply:</u> An inert gas supply must be connected upstream to the GVU directly after the master gas fuel supply valve to enable purging of the entire system (In the Wärtsilä Fuel Gas Supply System the inert gas supply connection as well as the master gas fuel supply valve are already included).</p> <p><u>Inert gas quality:</u> According to specification in Marine Installation Manual (MIM).</p> <p><u>Inert gas pressure:</u> Can be selected between 5 and 15 bar(g). Once set-pressure is selected, deviation of ±10% is allowed, though not below 5 bar.</p> <p><u>Inert gas volume engine side:</u> Provided in table 1 on page 3.</p> <p>OUTER PIPE (annular space) - annular space ventilation air outlet</p> <p><u>Ventilation air quantity and quality:</u> same specification as for connection 81, "INLET - Ventilation air annular space".</p> <p><u>Pipe connection:</u> Outer pipe connected to the annular space of the gas supply pipe / GVU via flange connection. For execution of the flange please refer to the "Pipe Connection Plan"</p> <p><u>Gas Detection:</u> A gas detector must be installed in the double wall pipe with a distance of max. 2 m to the engine inlet connection.</p>
79	<p>OUTLET - Gas / Inert gas release, engine side</p> <ul style="list-style-type: none"> <li>- Can be connected to gas / inert gas release, system side (connection 80), but must not be connected to other venting pipes.</li> <li>- No additional valves allowed in the venting pipeline.</li> <li>- Gas release to safe area outside of engine room.</li> <li>- At the end of the vent pipe, safety devices (e.g. flame arrestors) must be installed according to respective class specification and requirement.</li> </ul>
80	<p>OUTLET - Gas / Inert gas release, system side</p> <ul style="list-style-type: none"> <li>- Can be connected to gas / inert gas release, engine side (connection 79), but must not be connected to other venting pipes.</li> <li>- No additional valves allowed in the venting pipeline.</li> <li>- Gas release to safe area outside of engine room.</li> <li>- At the end of the vent pipe, safety devices (e.g. flame arrestors) must be installed according to respective class specification and requirement.</li> </ul>



Prod.	X62DF-S1.0 X62DF-S2.0																			
Change History	A	sna102	mhu019	24.08.2022	QNA002266	Drawing Updated		4	3											
	-	sde101	mhu019	26.02.2021		-		-	-											
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis		Approved	Activity Code	E	C									
		<p>GAS FUEL SYSTEM</p> <p>Gas Pressure Regulation: GVU</p>																		
Dimension																			Gas Supply System: NG+VOC	
Scale	-			NX	Units [mm] [kg]	Basic Material		Net Weight		0.001										
SURFACE PROTECTION SEE GROUP 0344					<small>Copyright Winterthur Gas &amp; Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and assumes these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas &amp; Diesel Ltd.</small>															
TOLERANCING PRINCIPLE ISO8015					Main Design		Design Group		9727		Q-Code XXXXX		Standard		WDS					
GENERAL TOLERANCES ACCORDING TO ISO2768-mK					Qty per		A2		Item ID		PAAD368672		Drawing Pages		1/4					

SPECIFICATION requirements for GUV connections

D1	<p>OUTLET - Gas / Inert gas release</p> <p><u>Inerting / gas venting procedure / flow path:</u> Inert gas inlet in the fuel gas supply system ▷ the piping between the fuel gas supply system connection and GUV inlet (connection A1) ▷ the GUV internal piping between inlet (connection A1) and venting outlet (connection D1) ▷ gas / inert gas release to outside of engine room. <u>Pipe connection:</u> Connected to a venting line for gas / inert gas release to a safe area outside of engine room.</p>
D2	<p>OUTLET - Ventilation air annular space</p> <p><u>Ventilation procedure / flow path:</u> Ventilation air from a safe area ▷ the annular space of the piping between the air suction connection and GUV inlet (connection A1) ▷ the GUV enclosure / room ▷ air release via GUV air ventilation outlet (connection D2). <u>Pipe connection:</u> Connected to a ventilation line with an extraction fan to suck the ventilation air and release to outside of engine room. The ventilation fan suction capacity has to be sufficient to be sufficient for 30 air exchanges per hour. The ventilation line must be equipped with a gas detector.</p>

INLET - Gas / Ventilation air to GUV

**INNER GAS PIPE**  
Gas quality: According to project specific definition.  
Gas pressure: Project specific as defined by the system designer, considering the heat value of the fuel gas mixture (NG+VOC). The minimum required NG pressure needed for a reliable ME operation is provided by GTD.  
Permissible gas pressure fluctuation: ± 0.6 bar (across all frequencies).  
Mass flow: According to project specific definition.  
Gas temperature: Aligned with the specification on page 1.  
Pipe connection: Inner pipe connected to the fuel supply pipe from the fuel gas supply system (FGSS) via welding connection.

**OUTER PIPE (annular space) - ventilation air inlet**  
 - Disconnected / separated by a blind flange from the annular space of the fuel gas supply system (Wärtsilä fuel gas supply system utilizes the vacuum concept for inner pipe leakage detection)  
 - A dedicated air suction pipe with orifice must be connected to the annular space of the GUV. Sufficient ventilation air (min. requirement of 30 air exchanges per hour) must be sucked by extraction fan from a safe area  
Pipe connection: Outer pipe connected to the blind flange via welding connection.

OUTLET - Gas / Ventilation air from the engine

**INNER GAS PIPE**  
Gas pressure: Adjusted by the GUV gas pressure regulating valve according to engine demand.  
Pipe connection: Inner pipe is connected to the gas supply line via welding connection.

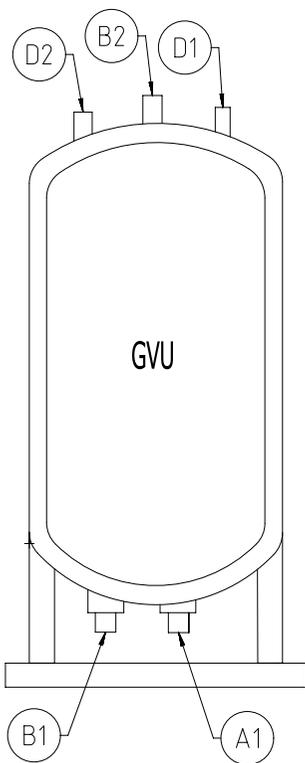
**OUTER PIPE (annular space)**  
Pipe connection: Outer pipe is connected to the annular space of the supply line via welding connection. The connection pipe to the engine must be kept as short as possible and never longer than 30 m.

INLET - Inert gas

Inerting procedure / flow path:  
GUV inert gas inlet (connection B2) ▷ GUV piping ▷ Piping between GUV outlet (connection B1) and gas / inert gas release on engine.  
Inert gas quality: According to specification in the Marine Installation Manual (MIM)  
Inert gas pressure: Can be selected between 5 - 15 bar(g). Once the set-pressure is selected, deviation of ±10% is allowed.  
Inert gas consumption: According to guidance in MIM  
Pipe connection: Connected to the inert gas supply system.

Cyl. Number	GUV Type	GUV INNER PIPE VOLUME	GUV ENCLOSURE VOLUME
5 cylinder	DN100	57.8 l	2270 l
6 cylinder	DN100	57.8 l	2270 l
7 cylinder	DN100	57.8 l	2270 l
8 cylinder	DN100	57.8 l	2270 l

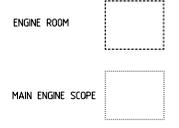
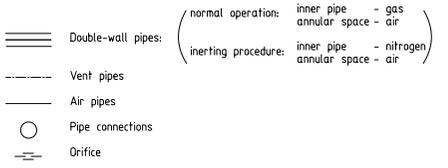
Table 1: GUV-ED VOLUME (values to be used for calculating inerting gas consumption and ventilation air flow.)



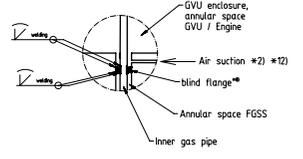
Schematic outline view of the the GUV-ED type. For detailed dimensions of the GUV please refer to the GUV supplier layout drawing.

Other designs are possible, e.g. GUV-OD type.

SYSTEM PROPOSAL



DETAIL A SCALE 1:10



Pos.	System Components
001	Fuel gas supply system (FGSS)
002	Extraction fan
003	Non-return valve
004	Adjustable orifice
005	Pressure regulating valve
006	Engine room ventilation fan
007	Gas detector engine room #7.2
008	Shut-off valve (double well execution)
009	GUV (Wärtsilä enclosed type (GUV-ED) )
010	Intermediate piece
011	Gas detector annular space, ship side (GUV) #7.1
012	Gas detector engine side #7.4

Pos.	Engine Components
EC01	Vent / Purging Valve
EC02	Shut-off valve gas rail pipe
EC03	Vent valve
EC04	Gas detector piston underside

Pos.	Engine Connections**
(78)	INLET - Gas Supply
(79)	OUTLET - Gas / Inert gas release, engine side
(81)	INLET - Ventilation air annular space
(80)	OUTLET - Gas / Inert gas release, system side
(82)	OUTLET - Gas monitoring, piston underside

Table 2: Volume of ME internal gas piping

Cylinder	Volume of inner pipe (l)*	Volume of annular space (l)**
5 cyl.	145 l	95 l
6 cyl.	170 l	115 l
7 cyl.	195 l	130 l
8 cyl.	220 l	145 l

\* Reference data for inert gas and ventilation air calculation.  
Ship side piping shall be considered in addition.

- Remarks:
- #1) For the exact position and pipe connection execution please refer to the "Pipe Connection Plan".
  - #2) Air suction must be from a safe area.
  - #3) Inert gas quality: According to the specification in the Marine Installation Manual (MM) inert gas consumptions calculated according to the guidance in MM under consideration of the GUV volume as provided in table 1 on page 2, the ME inner pipe volume as provided in table 2 of this page and the volume in the system piping.
  - #4) Compressed air supply is required for leakage testing of gas fuel system pipelines and components. Air is supplied from the starting air system, then air pressure is reduced by the regulating valve (005) to the design gas pressure. The intermediate piece (010) must be removed during normal ME operation (only to be installed for commissioning / maintenance) and the connection blinded off.
  - #5) In order to keep the temperature of the fuel gas mixture (NG-VOC) in the specified range of 40 - 60 °C insulation must be applied on the piping from the GUV to ME inlet and on ME side.
  - #6) Inert gas consumption is calculated according to the guidance in the MM.
  - #7.1) Gas detection for annular space, with feedback to engine control system. Mandatory.
  - #7.2) Gas detection in engine room, above ME and GUV. Required according to class rules.
  - #7.3) Gas detector for piston underside (PUS), with feedback to engine control system. Mandatory.
  - #7.4) Gas detection for annular space, on engine side. Mandatory, to be installed with a distance of max. 2 m to engine inlet.
  - #8) A blind flange has to be installed in the double wall pipe just before the inlet to the GUV enclosure to separate the annular space of the FGSS from the annular space of the GUV / main engine (refer to view "Detail A").
  - #9) The master gas fuel supply valve, inert gas inlet and venting outlet is integrated in the Wärtsilä Fuel Gas Supply System. If these components / connections are not included they must be considered on system side.
  - #10) Piping between the GUV and engine. Supplied by the shipyard and is connected to the inlet flange on the engine side (layout of the counter-flange is provided in the "Pipe Connection Plan"). Pipe section installed below the main deck, in engine room or cargo machinery room. Double-wall pipe with inner pipe diameter of DN80 and outer pipe diameter of DN100 is recommended.
  - #11) The extraction fan must have the capacity to exchange the ventilation air at minimum of 30 times per hour. Please consider the annular volume from ME piping (from Table 1) and the additional annular volume from the ship side piping. The suction pressure must cover the pressure drop over the GUV (as provided by the GUV supplier), over the piping on the shipside (as known by the system designer) and the pressure drop over the piping on the ME side as provided in table 3 on page 4.
  - #12) Mandatory, to suck sufficient suction air from a safe area to the GUV enclosure. The air suction pipe to be equipped with an adjustable orifice to ensure adequate ventilation.

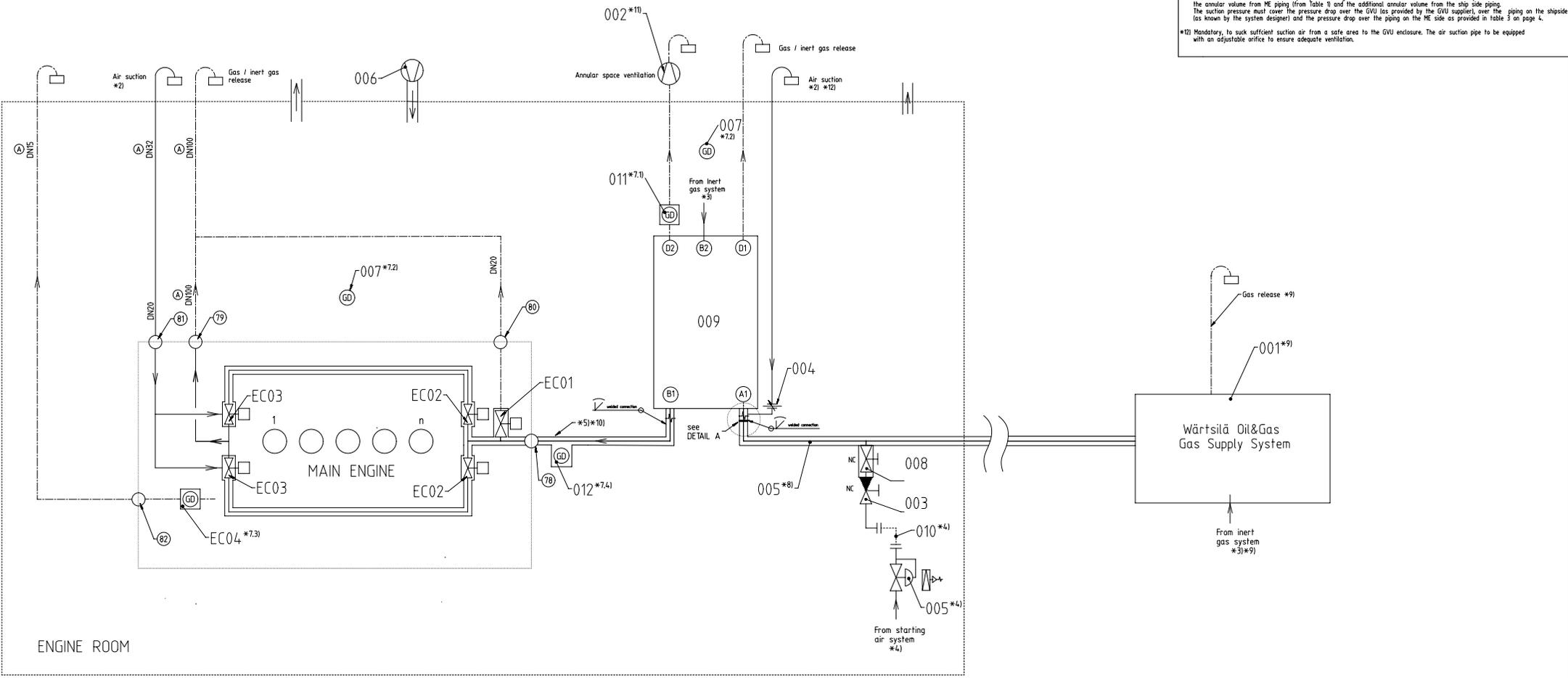
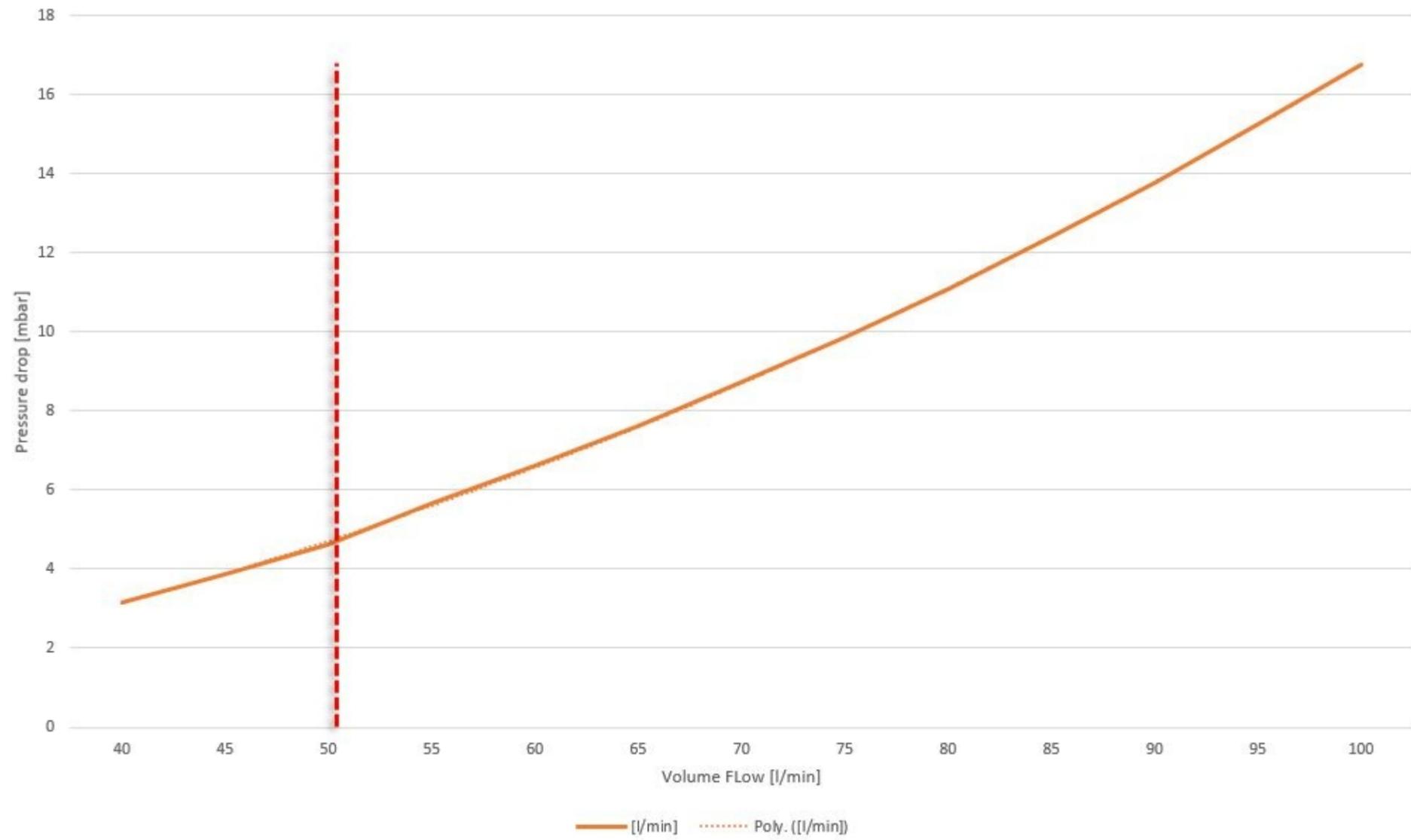


Table 3: Pressure drop over the annular space on engine side



SURFACE PROTECTION SEE GROUP 0344		Change	A	sna102	mhu019	24.08.2022	CNAA002266	Drawing Updated			4	3		
TOLERANCING PRINCIPLE ISO8015		Rev.		Creator	Approver	Approval Date	Change ID	Change Synopsis			Approved	Activity Code	E	C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and honours these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.					[mm]	[kg]	-	A3	Item ID	PAAD368672	Drawing Page/s	4 / 4

SEQ NO	QTY	Item ID	Item Name	Dimension	Standard-ID	Basic Material	Net Weight
001	1	PAAD368681	GAS FUEL SYSTEM	NG			0.001
003	1	PAAD278947	FLUSHING INSTRUCTION PIPING				0.001
004	1	PAAD149646	ENGINE SAFETY CONCEPT DF ENGINE SAFETY CONCEPT				0.001



Prod.	5,6,7,8 X62DF-S1.0 5,6,7,8 X62DF-S2.0							
Change History								
	-	sde101	mhu019	26.02.2021		-		-
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Activity Code	E C

	GAS FUEL SYSTEM
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<b>Bill Of Material</b>		Dimension	
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	Main Design	Yes	Design Group 9727 Q-Code XXXXX
	Qty per	Engine A4	Item ID <b>PAAD368684</b>
			Net Weight 0.001 Standard WDS BOM Page/s 01/01

SPECIFICATIONS which must be met:

**82** OUTLET - Gas monitoring, piston underside  
 - Must not be connected to other venting pipes.  
 - Gas release to safe area outside of engine room.  
 - At the end of the vent pipe, safety devices e.g. flame arrestors have to be installed according to respective class specification and requirement.

**83** INLET - Inert gas filling flowmeter  
Pipe connection: Only to be used / connected for maintenance of the flowmeter. To be kept close / blinded off during normal operation  
Inert gas quality: According to specification in Marine Installation Manual (MIM).

**78** INLET - Gas supply  
 INNER GAS PIPE  
Gas quality: According to specification in the Marine Installation Manual (MIM).  
Gas pressure: Design pressure based on GTD requirement for the selected rating and selected minimum LHV plus system pressure drop. Operational variation via engine control system possible.  
Permissible gas pressure fluctuation: ± 0.6 bar (across all frequencies).  
Mass flow: According to GTD.  
Gas temperature: 0 - 60°C  
 NOTE: regarding gas temperature vs. ventilation air temperature and methods to avoid / handle condensation in the annular space, refer to the specification for connection 81 and remarks on page 2.  
Pipe connection: Inner pipe connected to the gas supply line from gas storage / handling system via flange connection (please refer to the "Pipe Connection Plan").

Inert gas supply: An inert gas supply must be connected upstream to the iGPR right after the master gas fuel supply valve to enable purging of the whole system+engine piping  
Inert gas quality: According to specification in Marine Installation Manual (MIM).  
Inert gas pressure: Can be selected between 3 and 15 bar(g). Once set-pressure is selected, deviation of ±10% is allowed, though not below 3 bar.  
Inert gas volume engine side: Provided in table 1 on page 2.

OUTER PIPE (annular space) - ventilation air outlet  
Ventilation air quantity and quality: refer to the connection 81, "INLET - Ventilation air annular space".  
Pipe connection: Outer pipe is connected to the annular space of the supply pipe via flange connection (please refer to the "Pipe Connection Plan").

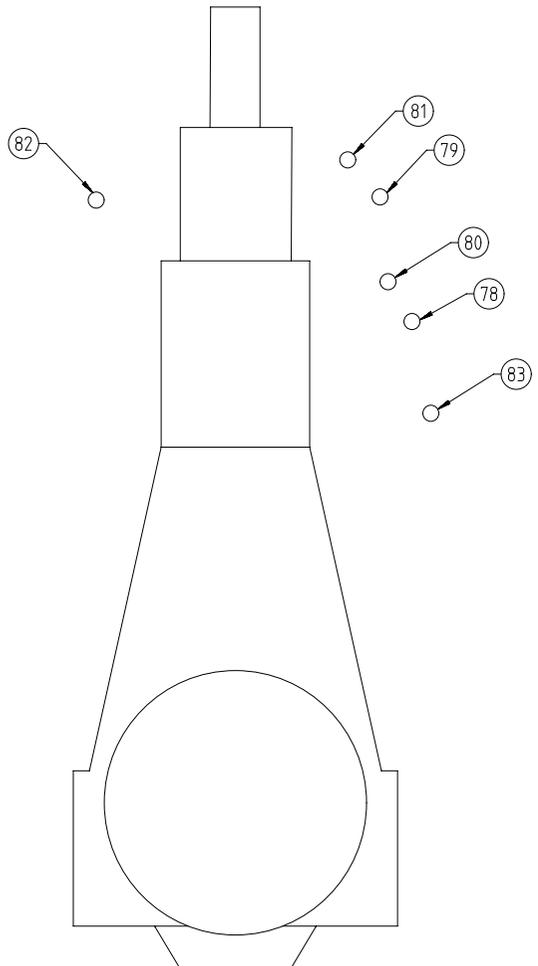
Gas detection: A gas detector must be installed in the venting line, at a max. distance of 2 m from the engine inlet, and has to be placed right next to the outer pipe (annular space) connection on the side closest to / furthest from the engine inlet.  
 Interruption of gas supply: The main gas supply line to each consumer or set of consumer must be equipped with a manually operated stop valve and an automatically operated "master gas valve" coupled in series or executed as a combined manually and automatically operated valve. The valves shall be situated in the part of the piping that is outside the machinery space containing gas.

**79** OUTLET - Gas / Inert gas release, engine driving end  
 - Can be connected to gas / inert gas release, engine free end (connection 80), but must not be connected to other venting pipes.  
 - No additional valves allowed in the venting pipeline.  
 - Gas release to safe area outside of engine room.  
 - At the end of the vent pipe, safety devices e.g. flame arrestors must be installed according to respective class specification and requirement.

**80** OUTLET - Gas / Inert gas release, engine free end  
 - Can be connected to gas / inert gas release, engine driving end (connection 79), but must not be connected to other venting pipes.  
 - No additional valves allowed in the venting pipeline.  
 - Gas release to safe area outside of engine room.  
 - At the end of the vent pipe, safety devices e.g. flame arrestors must be installed according to respective class specification and requirement.

**81** INLET - Ventilation air annular space  
 - Location and execution according to "2-S Dual Fuel Safety Concept" as linked in MIM.  
 - Ventilation air dew point must be lower than the gas temperature. If the ambient air is not sufficiently dry, dry air must be supplied. Please refer to the remarks / proposals on page 2.  
 - Sufficient ventilation air (min. 30 air exchanges per hour) must be sucked by the extraction fan from a safe area into the annular space of ME internal and external piping.  
 - Volume for ventilation air on engine side: refer to table 1 on page 2.

X62DF-S1.0



Prod.	X62DF-S1.0		X62DF-S2.0											
Change History	A	sna102	mhu019	24.08.2022	QNA4002266	Drawing Updated		4	3					
	-	sde101	mhu019	26.02.2021		-		-	-					
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Approved	Activity Code	E	C				
<b>WIN GD</b> Winterthur Gas & Diesel		GAS FUEL SYSTEM Gas Pressure Regulation: iGPR												
Dimension											Gas Supply System: NG			
Scale	-	NX		Units [mm] [kg]	Basic Material		Net Weight		0.001					
SURFACE PROTECTION SEE GROUP 0344				Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and assumes these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.										
TOLERANCING PRINCIPLE ISO8015				Main Design	Design Group		9727		Q-Code XXXXX		Standard		WDS	
GENERAL TOLERANCES ACCORDING TO ISO2768-mK				Qty per	A2	Item ID	PAAD368681		Drawing Page/s		1/3			

SYSTEM PROPOSAL

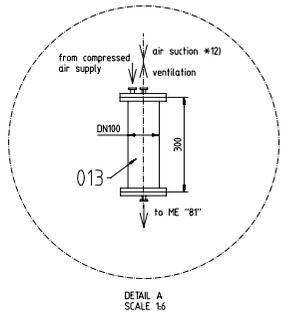
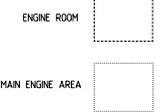
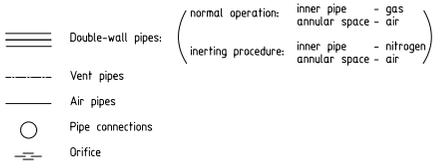


Table 1: Volume of ME internal gas piping

Cylinder	Volume of inner pipe (l)*	Volume of annular space (l)*
5 cyl.	190 l	110 l
6 cyl.	215 l	120 l
7 cyl.	240 l	130 l
8 cyl.	265 l	140 l

\* Reference data for inert gas and ventilation air calculation. Ship side piping shall be considered in addition.

Pos.	System Components
001	Gas handling room/cargo machinery room
002	Extraction fan
003	Master gas fuel supply valve
004	Adjustable orifice
005	Pressure regulating valve air supply for pressure test
006	Master gas fuel engine valve *3)
007	Engine room ventilation fan
008	Purging valve
009	Flow indicator
010	Condensate water trap
011	Gas detector engine room *7.2)
012	Bleeding / vent valve
013	Venting box
014	Shut-off valve, compressed air supply
015	Non-return valve
016	Shut-off valve (double well execution)
017	Double-block and bleed valve
018	intermediate piece
019	Gas detector ship side *7.4)
020	Gas detector engine side *7.1)
021	Manual stop valve engine gas supply *20)
022	Manual stop valve ancillary gas supply
023	Pressure regulating valve ancillary gas supply
024	Pressure regulating valve annular space air supply

Pos.	Engine Components
EC01	Gas filter
EC02	Flowmeter
EC03	Shut-off valve
EC04	Pressure regulating valve
EC05	Bleeding / vent valve
EC06	Shut-off valve gas rail pipe
EC07	Gas detector piston underside
EC08	Vent valve
EC09	Inert gas shut-off valve

Pos.	Engine Connections*9)
78)	INLET - Gas Supply
79)	OUTLET - Gas / Inert gas release, engine driving end
80)	OUTLET - Gas / Inert gas release, engine free end
81)	INLET - Ventilation air annular space
82)	OUTLET - Gas monitoring, piston underside
83)	INLET - Inert gas filling flowmeter *19)

- Remarks:
- \*1) The exact position and pipe connection execution please refer to the "Pipe Connection Plan".
  - \*2) Air suction must be from a safe area, with an adjustable orifice fitted to the air inlet. The orifice is regulated to ensure adequate ventilation for the ME gas piping.
  - \*3) Conditional requirement - Only to be installed if there is a branch pipe to the other gas consumers.
  - \*4) Compressed air supply is required for leakage testing of gas fuel system pipelines and components. Air is supplied from the starting air system then air pressure is reduced by the regulating valve (005) to the design gas pressure. The intermediate piece (018) must be removed during normal ME operation (only to be installed for commissioning / maintenance) and the connection closed off.
  - \*5) Piping between the gas handling / cargo room and engine is supplied by the shipyard and is connected to the inlet flange on the engine side (beyond of the cooler-flange is provided in the "Pipe Connection Plan").  
Pipe section installed below the main deck in engine room or cargo machinery room.  
Double-wall pipe with inner pipe diameter of DN50 and outer pipe diameter of DN80 is recommended.  
Pipe section installed above the main deck / weather deck.  
Single-wall pipe with diameter of DN50 is recommended, if the position fulfills the rule requirements of non-hazard zone.
  - \*6) Inert gas quality: According to the specification in MIM.
  - \*7.1) Gas detection for annular space, with feedback to engine control system, mandatory.  
Must be installed with a distance of max. 2m to engine inlet.
  - \*7.2) Gas detection in engine room above ME and IGFB: Required according to WinGD "2-S Dual-Fuel Engine Safety Concept".
  - \*7.3) Gas detection for piston underside (PUS), with feedback to engine control system, mandatory.
  - \*7.4) Gas detection for annular space, on ship side. Optional - to distinguish between system and engine side leaks.  
If the optional gas detector is not installed, the ventilation line with extraction fan has to be connected to gas detector 020.
  - \*8) Conditional requirement - If the gas temperature is not always higher than the ambient air temperature, condensate may accumulate in annular space. In this case, condensate traps must be arranged at the low points of the ship side gas piping. If the condensate water trap LAH is triggered, the trap must be manually drained. To do this, the inlet valve (marked N.O. on the drawing) must be closed. Then the venting valve and drain valve (marked N.C. on the drawing) is opened. When the trap has been drained, all valves are to be returned to their normal position.
  - \*9) Conditional requirement - No condensate is allowed in the ME gas piping. Therefore, if the gas temperature is not higher than the ambient air temperature, a dedicated dry air supply must be arranged either:  
- from control air supply (fulfill the ISO 8573-1, class x-4-x, i.e. dew point <= 3 °C),  
- from dryer (fulfill the ISO 8573-1, class x-4-x, i.e. dew point <= 3 °C),  
- from working air supply (as long as gas temperature is always above 20 °C).
  - \*10) Adjustable pressure regulating valve range 0.5 - 8 barg(1).  
Pre-setting procedure: The pressure regulating valve must be adjusted so the flow indicator 009 shows just a small flow outside when the extraction fan is in operation.
  - \*11) The on / off signal of the gas mode from the remote control system can be used to open / close the valve.
  - \*12) In cases that the compressed air supply is deactivated, an air suction supply must come from a safe area.
  - \*13) The extraction fan must have the capacity to exchange the ventilation air at minimum of 30 times per hour. Please consider the annular volume from ME piping (from Table 1) and the additional annular volume from the ship side piping. The suction pressure must cover the pressure drop over the piping on the shipside (as known by the system designer) and the pressure drop over the piping and IGFB on the ME side as provided in Table 2 on page 3.
  - \*15) Has to be located as close as possible and downstream of the master engine valve (pos. 006). Can be connected inside or outside of the engine room.
  - \*16) Inert gas consumption: Calculated according to the guidance in the Marine Installation Manual (MIM) under consideration of the in Table 1 provided ME inner pipe volume.  
Inert gas pressure: Can be selected between 3 and 15 barg(1) (once set-pressure is selected, deviation of ± 10% is allowed, though not below 3 bar).
  - \*17) To be installed according to class requirements.
  - \*18) The annular space of the piping for the other gas consumers must be disconnected from the annular space of the ME gas piping, e.g. separated air suction for the other gas consumers are required.
  - \*19) Connection only temporary used / opened for maintenance of the flowmeter. To be disconnected during normal operation.
  - \*20) To be installed outside of the machinery space containing gas consumers and to be placed as near as possible to the installation for heating the gas, if fitted. If the master gas fuel engine valve (006) is installed it can be executed as combined manually and automatically operated valve or if only the master gas fuel supply valve (003) is installed it can be combined with it accordingly.

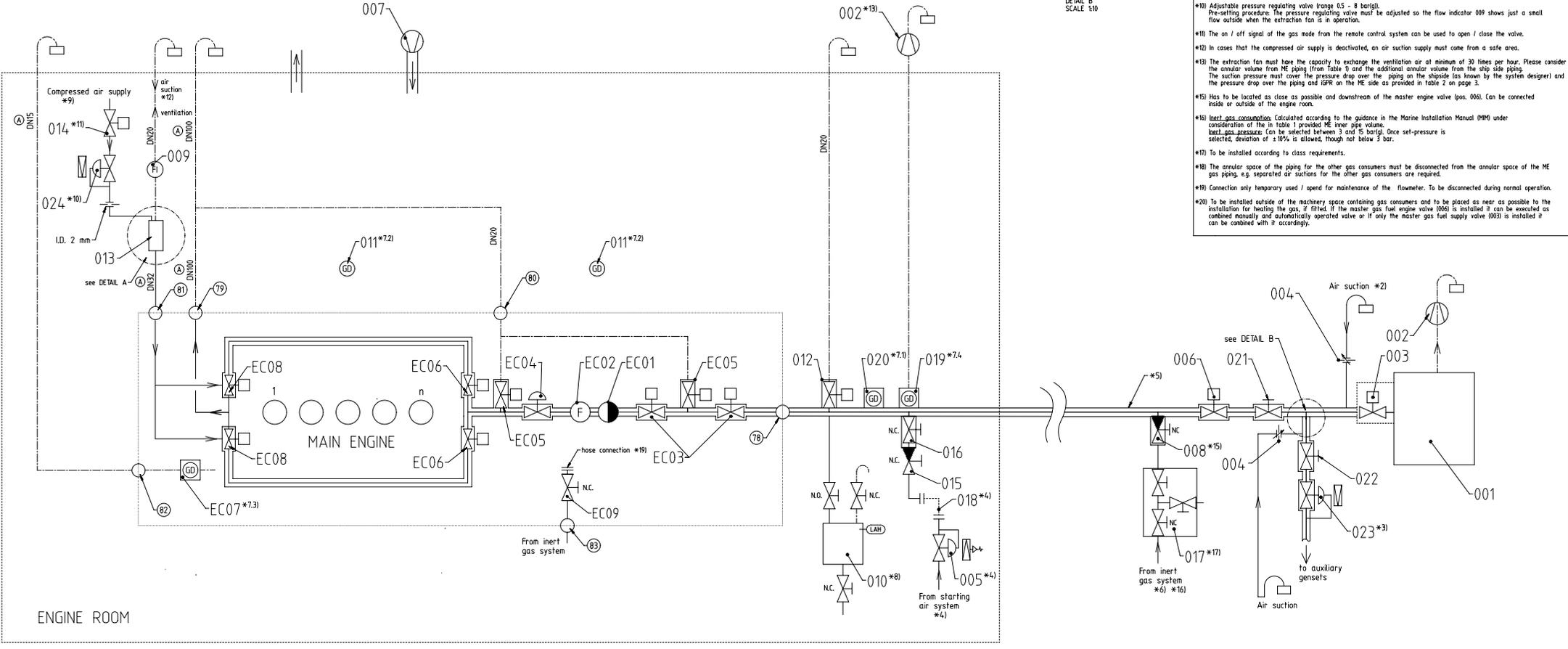
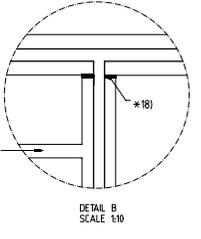
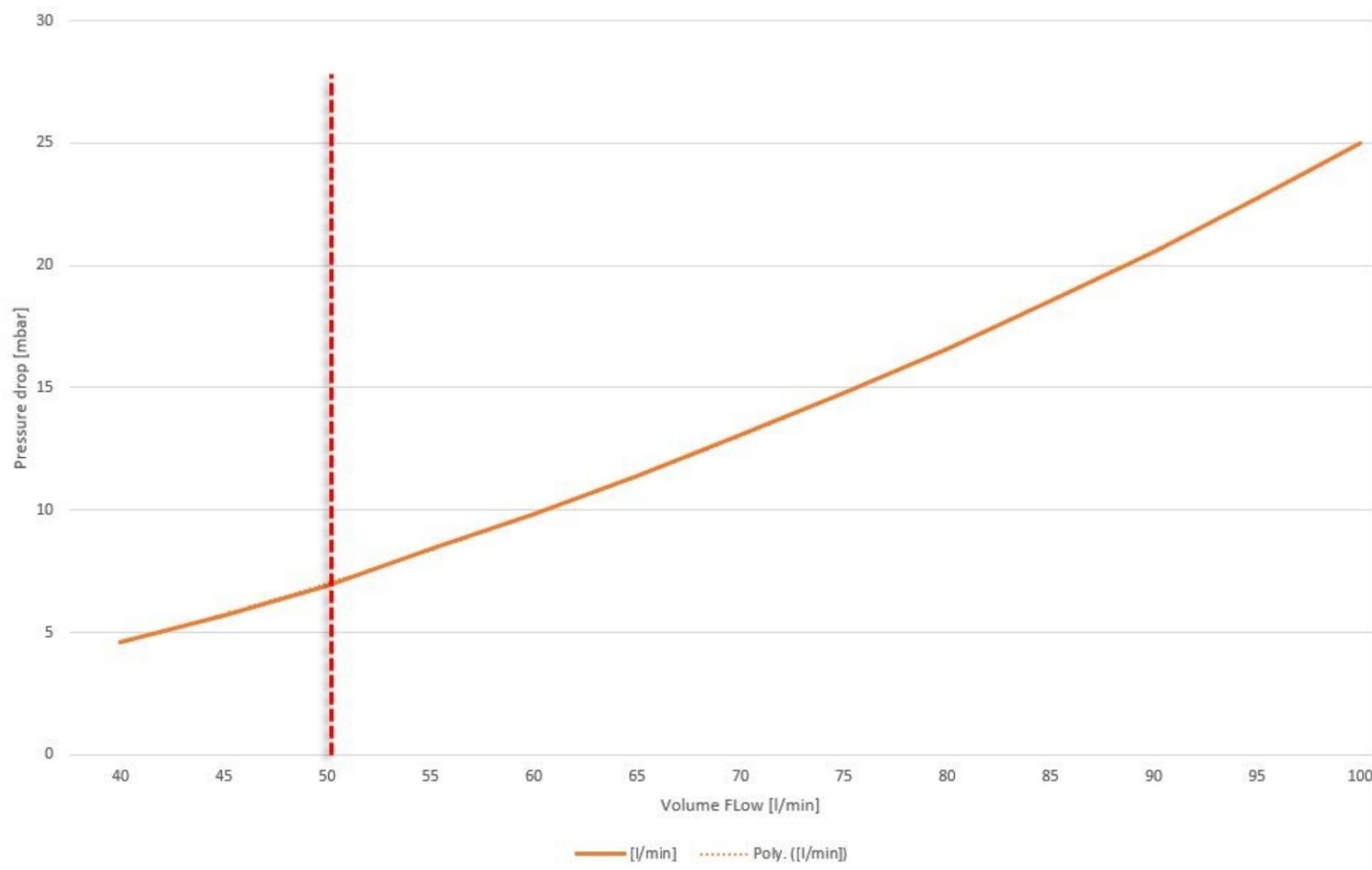


Table 2: Pressure drop over the annular space on engine side (iGPR + piping)



SURFACE PROTECTION SEE GROUP 0344		Change	A	sna102	mhu019	24.08.2022	CNAA002266	Drawing Updated			4	3		
TOLERANCING PRINCIPLE ISO8015		Rev.		Creator	Approver	Approval Date	Change ID	Change Synopsis			Approved	Activity Code	E	C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and honours these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.					[mm] [kg]	-	NX	A3	Item ID	PAAD368681	Drawing Page/s	3/3

SEQ NO	QTY	Item ID	Item Name	Dimension	Standard-ID	Basic Material	Net Weight
002	1	PAAD368683	GAS FUEL SYSTEM	NG/VOC			0.001
003	1	PAAD278947	FLUSHING INSTRUCTION PIPING				0.001
004	1	PAAD149646	ENGINE SAFETY CONCEPT DF ENGINE SAFETY CONCEPT				0.001

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Prod.	5,6,7,8 X62DF-S1.0		5,6,7,8 X62DF-S2.0					
Change History								
	-	sde101	mhu019	26.02.2021		-	-	-
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Activity Code	E C

	GAS FUEL SYSTEM
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<b>Bill Of Material</b>		Dimension					
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	Main Design	Yes	Design Group	9727	Q-Code	XXXXX	Standard WDS
	Qty per	Engine	A4	Item ID	PAAD368688		BOM Page/s 01/01

SPECIFICATIONS which must be met:

**(82)** OUTLET - Gas monitoring, piston underside  
 - Must not be connected to other venting pipes.  
 - Gas release to safe area outside of engine room.  
 - At the end of the vent pipe, safety devices e.g. flame arrestors have to be installed according to respective class specification and requirement.

**(83)** INLET - Inert gas filling flowmeter  
Pipe connection: Only to be used / connected for maintenance of the flowmeter. To be kept close / blinded off during normal operation  
Inert gas quality: According to specification in Marine Installation Manual (MIM).

**(78)** INLET - Gas supply  
 INNER GAS PIPE  
Gas quality: According to project specific definition  
Gas pressure: Project specific as defined by the system designer, considering the heat value of the fuel gas mixture (NG+VOC). The minimum required NG pressure needed for an reliable ME operation is provided by GTD.  
Permissible gas pressure fluctuation: ± 0.6 bar (across all frequencies).  
Mass flow: according to project specific definition  
Gas temperature:  
 40 - 60 °C for pure NG and for the mixture of NG and VOC up to max. 25% of VOC.  
Pipe connection: Inner pipe connected to the gas supply system via adapter piece.  
Inert gas supply: An inert gas supply must be connected upstream to the iGPR right after the master gas fuel supply valve to enable purging of the whole system+engine piping (in the Wärtsilä Fuel Supply System both componets are already included).  
Inert gas quality: According to specification in Marine Installation Manual (MIM).  
Inert gas pressure: Can be selected between 3 and 15 bar(g). Once set-pressure is selected, deviation of ± 10% is allowed, though not below 3 bar.  
Inert gas volume engine side: Provided in table 1 on page 2.

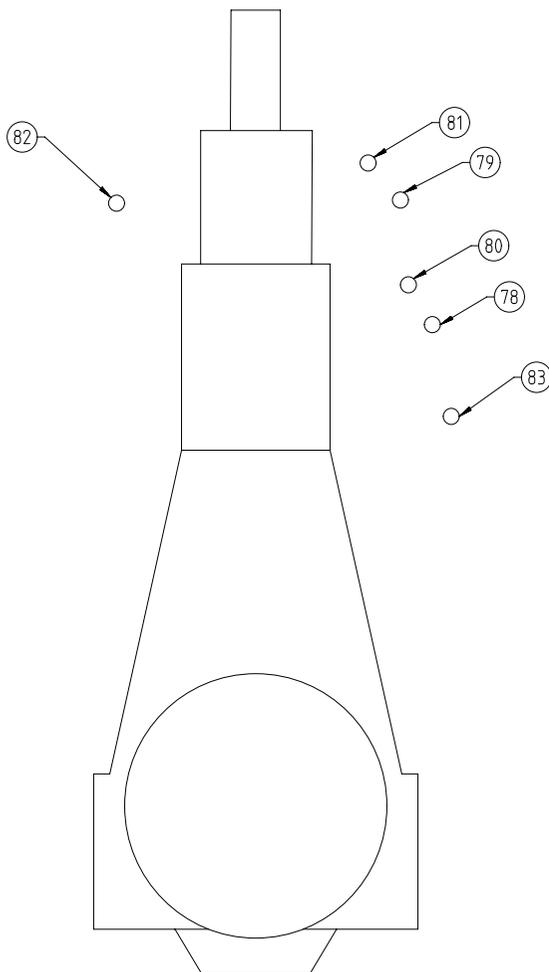
OUTER PIPE (annular space) - annular space ventilation air outlet  
Ventilation air quantity and quality: same specification as for connection 81, "INLET - Ventilation air annular space".  
Pipe connection: Outer pipe connected to the annular space venting via an adapter piece.  
 Gas detection: A gas detector must be installed in the venting line, at a max. distance of 2 m from the engine inlet, and has to be placed right next to the outer pipe (annular space) connection on the side closest to / furthest from the engine inlet.  
 Interruption of gas supply: The main gas supply line to each consumer or set of consumer must be equipped with a manually operated stop valve and an automatically operated "master gas valve" coupled in series or executed as a combined manually and automatically operated valve. The valves shall be situated in the part of the piping that is outside the machinery space containing gas.

**(79)** OUTLET - Gas / Inert gas release, engine driving end  
 - Can be connected to gas / inert gas release, engine free end (connection 80), but must not be connected to other venting pipes.  
 - No additional valves allowed in the venting pipeline.  
 - Gas release to safe area outside of engine room.  
 - At the end of the vent pipe, safety devices e.g. flame arrestors must be installed according to respective class specification and requirement.

**(80)** OUTLET - Gas / Inert gas release, engine free end  
 - Can be connected to gas / inert gas release, engine driving end (connection 79), but must not be connected to other venting pipes.  
 - No additional valves allowed in the venting pipeline.  
 - Gas release to safe area outside of engine room.  
 - At the end of the vent pipe, safety devices e.g. flame arrestors must be installed according to respective class specification and requirement.

**(81)** INLET - Ventilation air annular space  
 - Air suction from a gas safe area  
 - Execution of the air suction pipe according to the concept as provided in the "2-S Dual Fuel Safety Concept" (linked on the main drawing of this design group)  
 - Ventilation air flow on ME side: min. 30 air exchanges per hour  
 Annular space volume for calculation of extraction fans capacity: see table 1 on page 2.

X62DF-S1.0



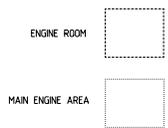
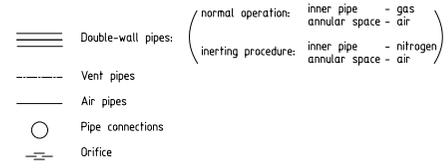
Prod.	X62DF-S1.0													
	X62DF-S2.0													
Change History	A	sna102	mhu019	24.08.2022	QNA002266	Drawing Updated					4	3		
	-	sde101	mhu019	26.02.2021							-	-		
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis					Approved	Activity Code	E	C

<b>WIN GD</b> Winterthur Gas & Diesel		GAS FUEL SYSTEM Gas Pressure Regulation: iGPR										
Dimension											Gas Supply System: NG+VOC	
Scale	-	NX		Units [mm] [kg]	Basic Material			Net Weight			0.001	
Main Design					Design Group	9727	Q-Code	XXXXX		Standard	WDS	
Qty per					A2	Item ID	PAAD368683			Drawing Page/s	1/3	

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

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SYSTEM PROPOSAL



Pos.	System Components
001	Fuel Gas Supply System (FGSS)
002	Extraction fan
003	Engine room ventilation fan
004	Gas detector engine room *4.2)
005	Adapter piece *6)
006	Shut-off valve (double-wall execution)
007	Non-return valve
008	Intermediate piece
009	Bleeding valve
010	Gas detector annular space, gas supply pipe
011	Pressure reduction valve

Pos.	Engine Components
EC01	Gas filter
EC02	Flowmeter
EC03	Shut-off valve
EC04	Vent valve
EC05	Pressure regulating valve
EC06	Bleeding / vent valve
EC07	Shut-off valve gas rail pipe
EC08	Gas detector piston underside
EC09	Inert gas shut-off valve

Pos.	Engine Connections**
(78)	INLET - Gas Supply
(79)	OUTLET - Gas / Inert gas release, engine driving end
(80)	OUTLET - Gas / Inert gas release, engine free end
(81)	INLET - Ventilation air annular space
(82)	OUTLET - Gas monitoring, piston underside
(83)	INLET - Inert gas filling flowmeter *10)

**Remarks:**

\*1) The exact position and pipe connection execution please refer to the "Pipe Connection Plan".

\*2) Compressed air supply is required for leakage testing of gas fuel system pipelines and components. Air is supplied from the starting air system, then air pressure is reduced by the regulating valve (011) to the design gas pressure. The intermediate piece (006) must be removed during normal ME operation (only to be installed for commissioning / maintenance) and the connection blinded off.

\*3) Inert gas quality according to the specification in the Marine Installation Manual (MIM).

\*4.1) Gas detection for annular space, with feedback to engine control system: mandatory. Must be installed with a distance of max. 2 m to engine inlet.

\*4.2) Gas detection in engine room above ME and IGPR: Required according to WinGD "2-S Dual-Fuel Engine Safety Concept".

\*4.3) Gas detection for piston underside (PUS), with feedback to engine control system: mandatory.

\*5) The extraction fan must have the capacity to exchange the ventilation air at minimum of 30 times per hour. Please consider the annular volume from ME piping (from Table 1) and the additional annular volume from the ship side piping. The suction pressure must cover the pressure drop over the piping on the shipside (as known by the system designer) and the pressure drop over the piping and IGPR on the ME side (as provided in table 2 on page 3).

\*6) The adapter piece (005) in between the FGSS (009) and ME connection flange has to be prepared by the shipyard / gas pipe supplier accordingly. It must provide the following functions:  
 - ME annular space ventilation air outlet with gas detector  
 - Separation of the ME annular space from the annular space of the FGSS.

\*7) In order to keep the temperature of the fuel gas mixture (ING-VOC) in the specified range of 4.0 - 60°C it is recommended to apply on the piping in the fuel gas supply line and on ME side insulation.

\*8) The master gas fuel supply valve, inert gas inlet and venting outlet is included the gas supply system.

\*9) Depending on the requirements / setup to be installed either on system side and / or included in the gas supply system.

\*10) Connection only temporary used / open for maintenance of the flowmeter. To be disconnected during normal operation.

\*11) Inert gas consumption: Calculated according to the guidance in the Marine Installation Manual (MIM) under consideration of the in table 1 provided ME inner pipe volume.  
 Inert gas pressure: Can be selected between 3 and 15 barg. Once set-pressure is selected, deviation of ±5% is allowed, though not below 2 bar.

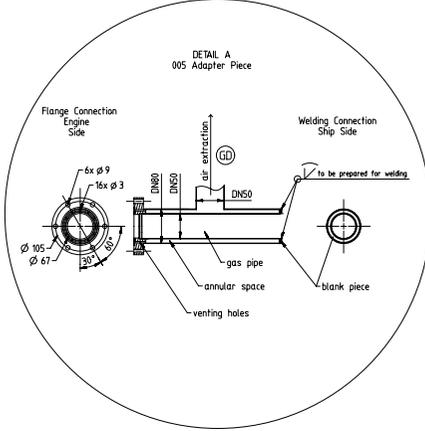


Table 1: Volume of ME internal gas piping

Cylinder	Volume of inner pipe (l)*	Volume of annular space (l)*
5 cyl.	190 l	110 l
6 cyl.	215 l	120 l
7 cyl.	240 l	130 l
8 cyl.	265 l	140 l

\* Reference data for inert gas and ventilation air calculation. Ship side piping shall be considered in addition.

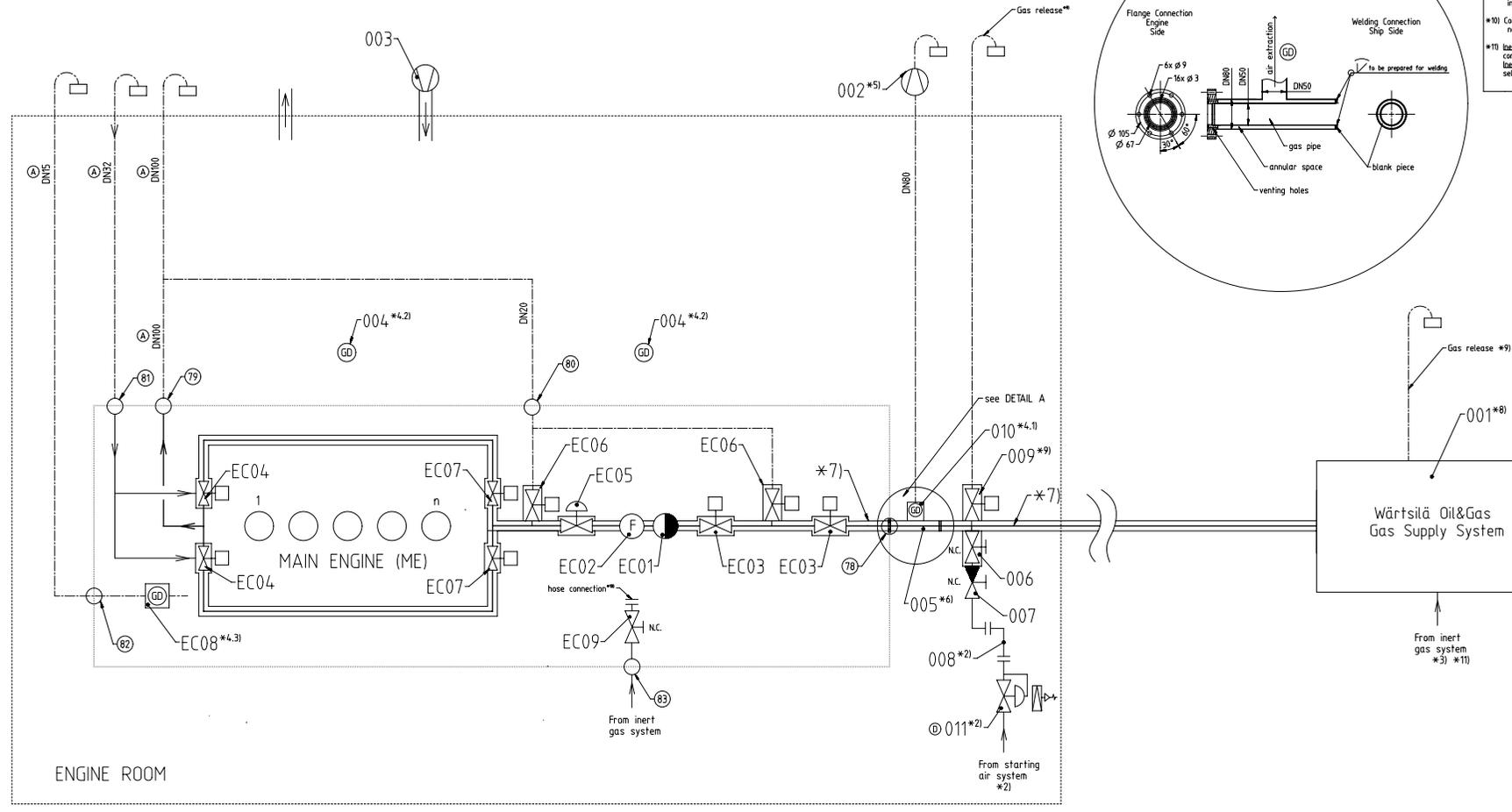
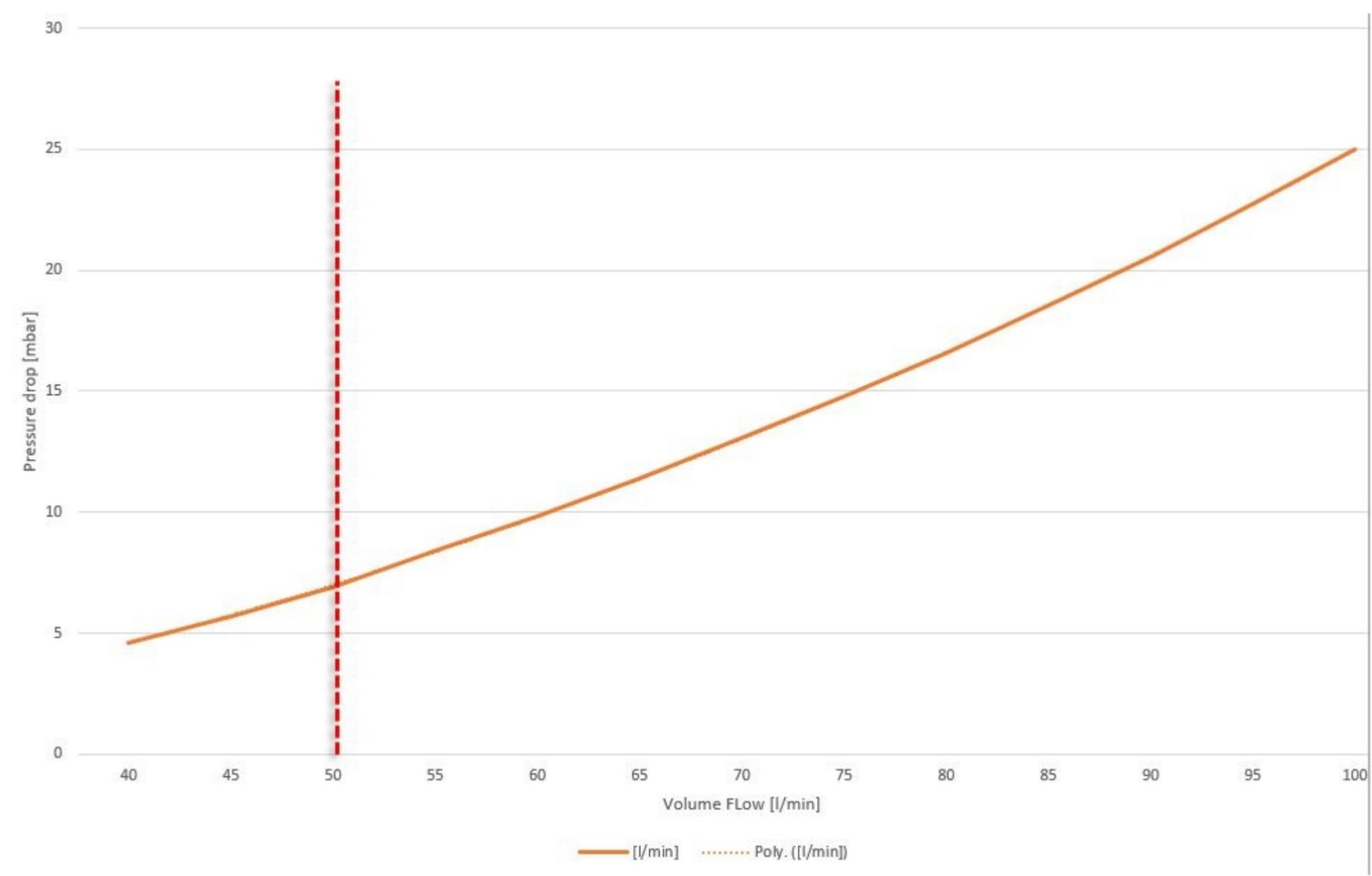


Table 2: Pressure drop over the annular space on engine side (iGPR + piping)



SURFACE PROTECTION SEE GROUP 0344		Change	A	sna102	mhu019	24.08.2022	CNAA002266	Drawing Updated			4	3		
TOLERANCING PRINCIPLE ISO8015		Rev.		Creator	Approver	Approval Date	Change ID	Change Synopsis			Approved	Activity Code	E	C
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Copyright Winterthur Gas & Diesel Ltd. All rights reserved. By taking possession of the drawing the recipient recognizes and honours these rights. Neither the whole nor any part of this drawing may be used in any way for construction, fabrication, marketing or any other purpose nor copied in any way nor made accessible to third parties without the previous written consent of Winterthur Gas & Diesel Ltd.					[mm] [kg]	-	NX	A3	Item ID	PAAD368683	Drawing Page/s	3/3

## MIDS - WinGD X62DF-S1.0\_GAS-FUEL-SYSTEM (DG9727)

### TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2021-03-01	DRAWING SET	First web upload
2022-08-26	PAAD368672 PAAD368678 PAAD368681 PAAD368683	System drgs – new revision
2023-01-30	PAAD368672 PAAD368678 PAAD368681 PAAD368683	System drgs – new revision

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