

SURFACE PROTECTION SEE GROUP 0344

TOLERANCING PRINCIPLE ISO8015

GENERAL TOLERANCES ACCORDING TO ISO2768-mK

Available executions

Execution No.	Material ID	Cylinder No.	Attribute 1: Gas pressure regulation		Attribute 2: Gas supply system	
			iGPR	GVU	NG	NG+VOC
1	PAAD283526	6-12	X		X	

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.									
Change History									
	-	sde101	mhu019	10.11.2021	CNAA000934	new Design		-	-
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Approved	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	PTAA016715		Drawing Page/s	1/1			

SEQ NO	QTY	Item ID	Item Name	Dimension	Standard-ID	Basic Material	Net Weight
1	1	PAAD282495	FUEL GAS SYSTEM				0.001
2	1	PAAD278947	FLUSHING INSTRUCTION PIPING				0.001
3	1	PAAD149646	ENGINE SAFETY CONCEPT DF ENGINE SAFETY CONCEPT				0.001

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Prod.	6,7,8,9,10,11,12 X92DF							
	6,7,8,9,10,11,12 X92DF-2.0							
Change History								
	A	sde101	nm019	10.11.2021	010000939	Main Design/Drawing Introduced	4	3
	-	dki021	mhu019	26.01.2018		-	-	-
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis	Approved	Activity Code

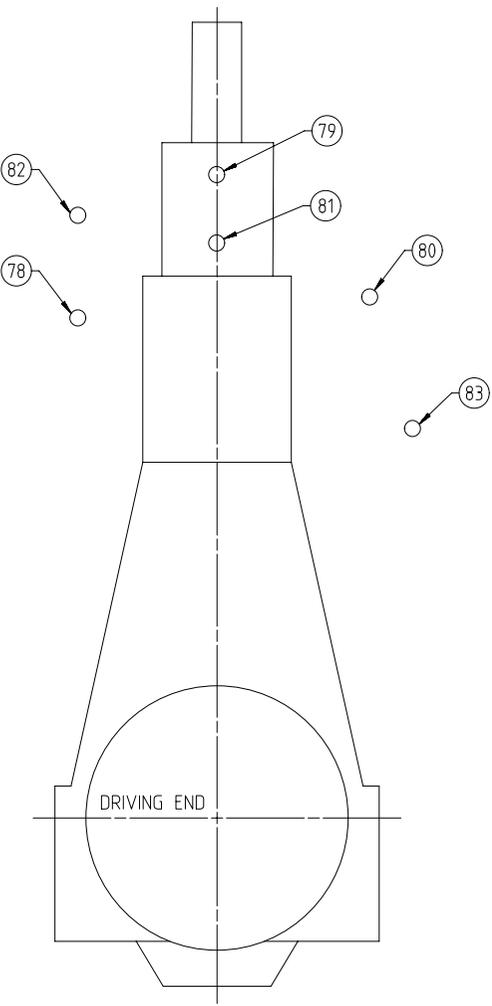
	FUEL GAS SYSTEM
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Bill Of Material		Dimension						
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	Main Design	Yes	Design Group	9727	Q-Code	XXXXX	Standard	WDS
	Qty per	Engine	A4	Item ID	PAAD283526		BOM Page/s	01/01

SPECIFICATIONS which must be met:

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

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



78
(K)
INLET - Gas supply
INNER GAS PIPE
Gas quality: According to the specification in the MIM.
Gas pressure: Design pressure based on GTD requirement for the selected rating and selected minimum LHV plus system pressure drop. Operational variation via the engine control system possible.
Permissible gas pressure fluctuation: ± 0.6 bar (across all frequencies).
Mass flow: According to GTD.
For the 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 piping to the iGPR right after the master gas fuel supply valve to enable purging of the whole system and engine piping
Inert gas quality: According to the specification in the 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 the engine inlet.
Interruption of the gas supply: The main gas supply line to each consumer or set of consumers must be equipped with a manually operated stop valve and an automatically operated "master gas valve". The stop valve and the "master gas valve" can be installed either in series or can be executed as a combined manually and automatically operated valve. The valves must be located in the part of the piping, which is situated outside of the machinery space that contains gas.

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

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

81
(K)
INLET - Ventilation air annular space
- Location and execution according to the "2-S Dual-Fuel Safety Concept" as linked in the MIM.
- The ventilation air dew point must be lower than the gas temperature. If the ambient air is not sufficiently dry, then dry air must be supplied. Please refer to the remarks and 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 the main engine's internal and external piping.
- For the volume of the ventilation air on the engine side, refer to Table 1 on page 2.

Prod.	X92DF									
	X92DF-2.0									
Change History	K	sde101	mhu019	01.12.2021	0A000089	Drawing Updated			4	3
	J	sde101	mhu019	26.04.2021	EAAD095579	Legacy information. See corresponding ChangeNotice			4	3
	I	asc102	sth017	20.10.2020	EAAD095056	Legacy information. See corresponding ChangeNotice			4	3
	-	dkl021	mhu019	26.01.2018					-	-
Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis				Approved	Activity Code

WIN GD
Winterthur Gas & Diesel

FUEL GAS SYSTEM
Gas Pressure Regulation: iGPR

Dimension

Scale - NX Units [mm] [kg] Basic Material Net Weight 0.001

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TOLERANCING PRINCIPLE ISO8015		Main Design	Design Group 9727 Q-Code XXXXX Standard WDS
GENERAL TOLERANCES ACCORDING TO ISO2768-mK		Qty per	A2 Item ID PAAD282495 Drawing Pages 1/3

SYSTEM PROPOSAL

NOTE \otimes
Further installation details and variants can be found listed in the Marine Installation Manual (MIM), which provides also the acronyms used in this drawing set. The piping symbols are explained by the piping symbol key as included in the drawing set. "Various Installation Items".

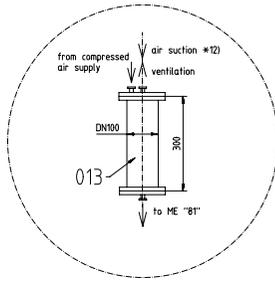
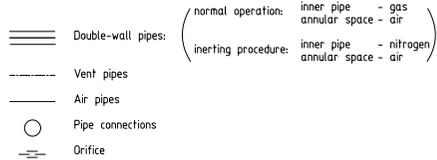


Table 1: Volume of ME internal gas piping

Cylinder	Volume of inner pipe (l)*	Volume of annular space (l)*
6 cyl.	415 l	220 l
7 cyl.	485 l	245 l
8 cyl.	560 l	270 l
9 cyl.	640 l	290 l
10 cyl.	720 l	315 l
11 cyl.	810 l	340 l
12 cyl.	910 l	365 l

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



Pos.	System Components *2) \otimes
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 *22) *14)
007	Engine room ventilation fan
008	Purging valve
009	Flow indicator
010	Condensate water trap
011	Gas detector engine room *7.2)
012	Venting valve
013	Venting box
014	Shut-off valve, compressed air supply
015	Non-return valve
016	Shut-off valve (double well execution)
018	Intermediate piece
019	Gas detector ship side *7.4)
020	Gas detector engine side *7.1)
021	Manual shut-off valve engine gas supply *20)
022	Manual shut-off valve ancillary gas supply
023	Pressure regulating valve ancillary gas supply
024	Pressure regulating valve annular space air supply
025	Inert gas supply system *17)

Pos.	Engine Components *3) \otimes
EC01	Gas filter
EC02	Flowmeter
EC03	Shut-off valve
EC04	Inert gas shut-off valve
EC05	Pressure regulating valve
EC06	Vent / purging valve
EC07	Shut-off valve gas rail pipe
EC08	Gas detector piston underside
EC09	Vent valve

Pos.	Engine Connections *4) \otimes
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 *16)

- Remarks:** \otimes
- *1) For the exact position and pipe connection execution, please refer to the "Pipe Connection Plan".
 - *2) To be installed by the shipyard.
 - *3) To be delivered by the engine builder, i.e. already equipped on the engine side.
 - *4) Compressed air supply is required for leakage testing of the 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 (006) must be removed during normal ME operation (only to be installed for commissioning / maintenance) and the connection blocked 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 (layout of the counter-flange is provided in the "Pipe Connection Plan"). Pipe section installed below the main deck in the engine room air cargo machinery room. Double-wall pipe with inner pipe diameter of DN50 and outer pipe diameter of DN60 is recommended. Pipe section installed above the main deck on weather deck. Single-wall pipe with diameter of DN65 is recommended, if the position fulfills the rule requirements of the non-hazard zone.
 - *6) Inert gas quality: According to the specification in the MIM.
 - *7.1) Gas detection for annular space with feedback to the engine control system: Mandatory. Must be installed with a distance of max. 2m to engine inlet.
 - *7.2) Gas detection in the engine room above the ME and the GPR: Required according to the "WinGD 2-S Dual-Fuel Engine Safety Concept".
 - *7.3) Gas detection for piston underside (PUS) with feedback to the engine control system: Mandatory.
 - *7.4) Gas detection for annular space on the ship side (optional) - to distinguish between system and engine side leaks. If the optional gas detector is not installed, the ventilation line with the extraction fan must 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 the 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 outlet valve (marked N.C. 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. For the tank size, it is recommended to consider the volume under tropical conditions; the larger the tank capacity, the lower the drainage requirement. Recommended drainage is two times per day.
 - *9) Conditional requirement: No condensate is allowed in the main engine's 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 the control air supply (must comply with the ISO 6733-1, class 4+5, i.e. dew point \leq 3 °C).
 - From the air dryer (must comply with the ISO 6733-1, class 4+5, i.e. dew point \leq 3 °C).
 - From the working air supply (as long as the gas temperature is always above 10 °C).
 - *10) Adjustable pressure regulating valve range 0.5 - 8 barg. Pre-calling procedure: The pressure regulating valve must be adjusted so that 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 made 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 a minimum of 30 times per hour. Please consider the annular volume from the main engine's piping (see 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 GPR on the ME side as provided in Table 2 on page 3.
 - *14) To restrict the amount of vented gas, it is recommended that valve 006 closes in a reasonably short time.
 - *15) The purging valve must be located as close as possible and downstream of the master engine valve (pos. 006). The purging valve can be connected inside or outside of the engine room. Due to class rules (order flag state), it may be necessary to install a different arrangement, which contains instead of the "purging valve (008)" alone, an extended arrangement (e.g. with a double-block and bleed valve in addition. In that case, the non-return functionality and the remote control function must be integrated accordingly.
 - *16) Connection only temporarily used or opened for maintenance of the flowmeter. To be disconnected during normal operation.
 - *17) It includes all components for inert gas storage and handling, i.e. the tank, the pressure regulation, etc.)
 - *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) Inert gas consumption: (calculated according to the formula as provided in the MIM. It must consider the volume of the main engine's internal gas piping, as provided in Table 1.)
Inert gas pressure: (to be selected between 3 and 15 barg). Once set-pressure is selected, deviation of \pm 10% is allowed, though not below 3 barg).
 - *20) If the "Manual shut-off valve engine gas supply (021)" is fitted, then it must be installed outside of the machinery space which contains gas consumers and it must be placed as near as possible by the gas heating installation. Alternatively, a combined manually and automatically operated "master gas fuel engine valve (006)" can be installed and may replace in this regard the separate "Manual shut-off valve engine gas supply (021)". If the "Manual shut-off valve engine gas supply (021)" and the "master gas fuel engine valve (006)" are not fitted, then a combined manually and automatically operated "master gas fuel supply valve (003)" must be installed.
 - *21) 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 main engine's gas piping.
 - *22) Conditional requirement - The master gas fuel engine valve must only be installed if there is a branch pipe to the other gas consumers.

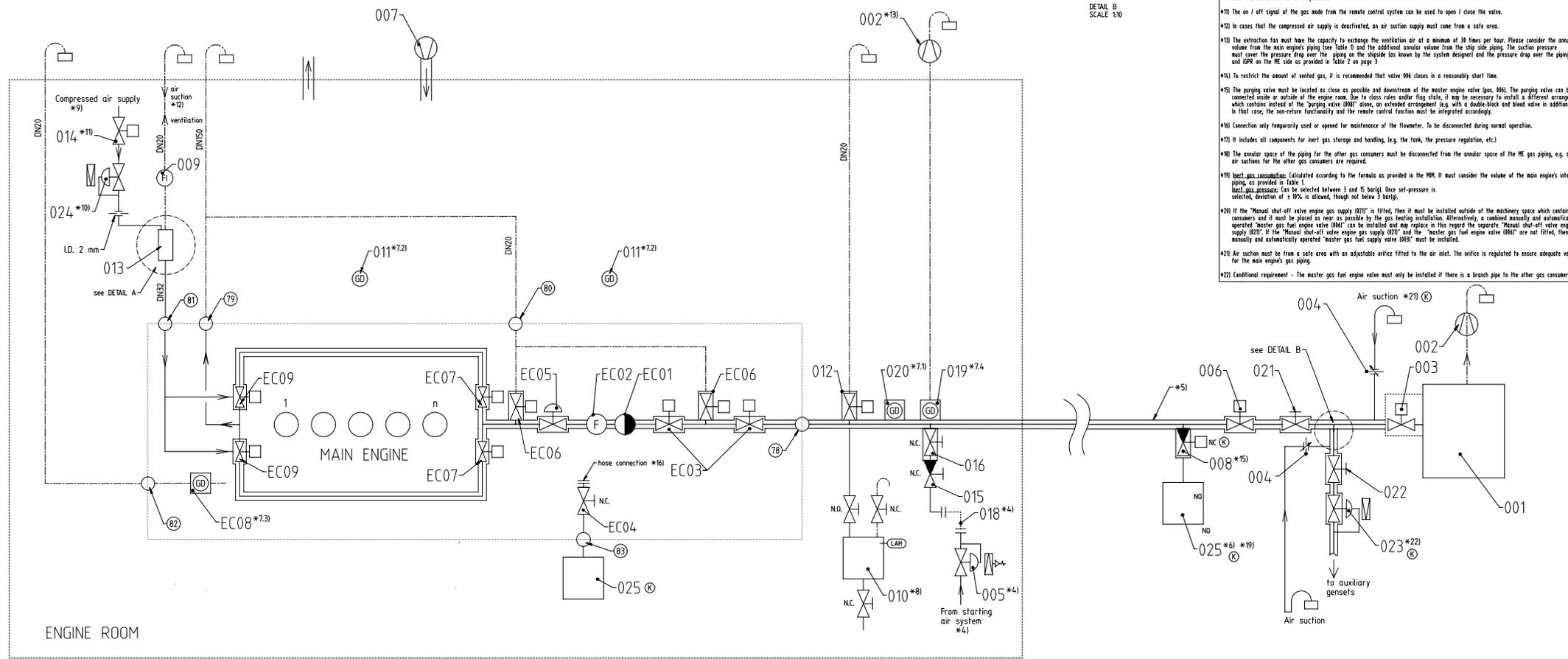
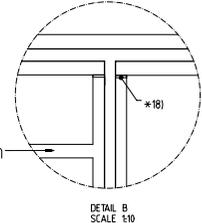
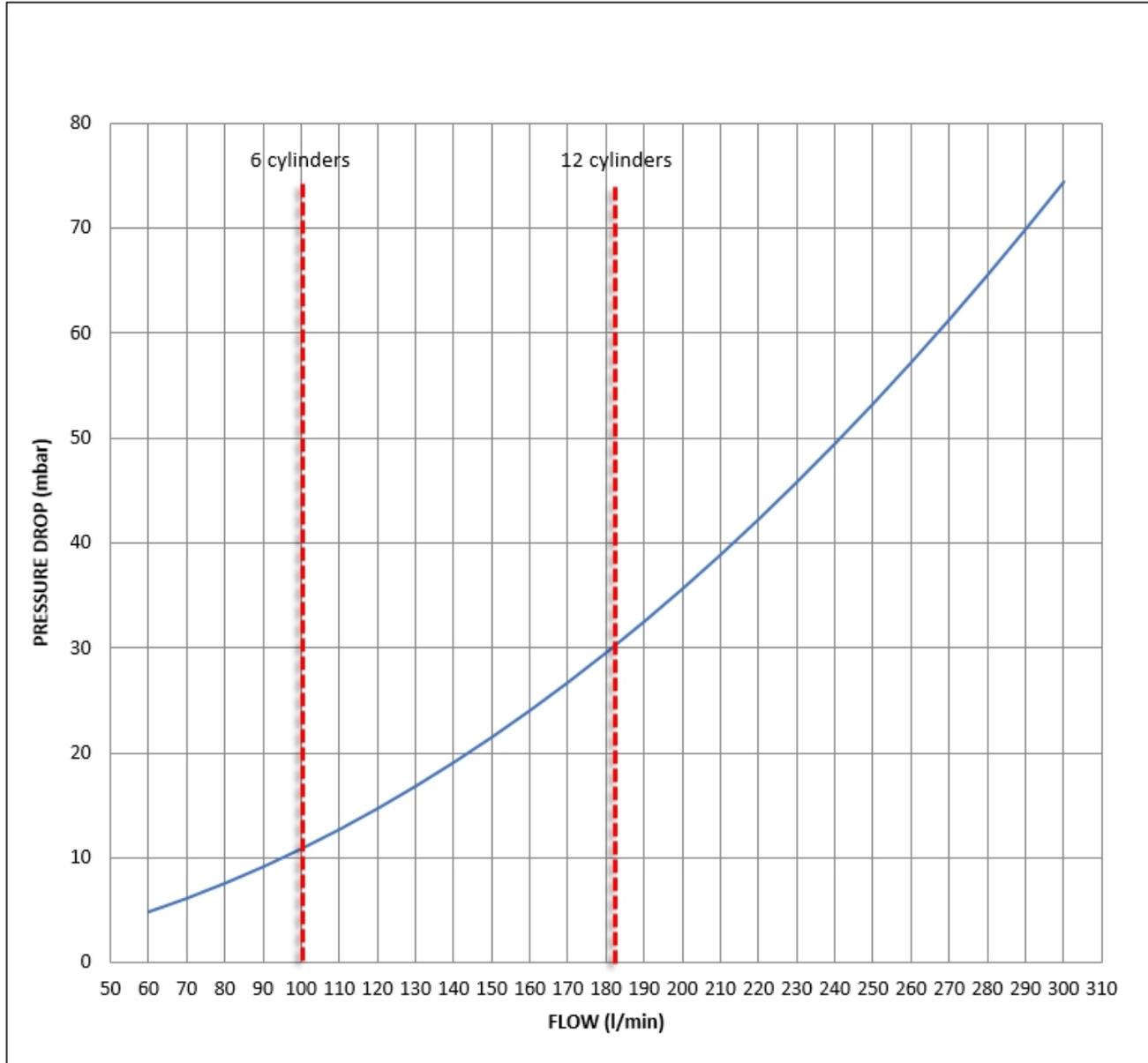


Table 2: Pressure drop over the annular space on engine side (iGPR + piping)



SURFACE PROTECTION SEE GROUP 0344	Change	K	sde101	mhu019	10.11.2021	CNA000939	Drawing Updated			4	3			
	Rev.	Creator	Approver	Approval Date	Change ID	Change Synopsis			Approved	Activity Code	E	C		
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GENERAL TOLERANCES ACCORDING TO ISO2768-mK			NX											

MIDS - WinGD-X92DF - FUEL-GAS-SYSTEM (DG9727)

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2018-01-29	DRAWING SET	First web upload
2018-04-25	DAAD095893	System drg - new revision
2018-10-01	DAAD095893	System drg - new revision
2019-01-31	DAAD095893	System drg - new revision
2019-04-10	DAAD095893	System drg - new revision
2019-08-23	DAAD095893	System drg - new revision
2020-02-28	DAAD095893	System drg - new revision
2020-08-19	DAAD095893	System drg - new revision
2020-09-08	DAAD095893	System drg - new revision
2020-10-21	DAAD095893	System drg - new revision
2021-04-27	DAAD095893	System drg - new revision
2021-12-06	PAAD283526 PAAD282495	Main and system drgs - new revision

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