Scope of Supply

General

The offered scope of supply comprises the delivery of two (2) SGT5-PAC 4000F, including two (2) SGT5-4000F gas turbines, two (2) SGen5-1200A generators and associated auxiliary equipments based on the technical description and comments issued in Siemens technical offer.

The scope of supply is completely described in this section. Any hints on equipment, numbers of components etc. given in other sections are not binding even if the wording suggests something different.

N.A.T.O.

Gas Turbine Package

Gas Turbine	Quantity
Gas turbine type	SGT5-4000F
Number of offered gas turbines	2
Each core gas turbine mainly comprising:	
- Ring combustor	1
- Turbine	1
- Compressor	1
- Bearings	2
Loose supplied gas turbine parts, mainly comprising:	
- Burners	1 set per gas turbine
- Intermediate shaft	1 per gas turbine
- Gas turbine instrumentation and actuation	1 set per gas turbine
- Gas turbine insulation	1 set per gas turbine
- Shaft turning gear	1 per gas turbine

The gas turbine will be subjected to tests, as defined in Supplier's quality assurance specification. Kindly refer to section "Standard QA Programs" for more details.

Gas Turbine Auxiliaries	Quantity
Base Module, comprising the auxiliary packages for	1 per gas turbine
- Fuel gas and ignition gas within separate compartment	
- Lube oil with plate type heat exchanger 2x100%	
- Hydraulic oil supply for valves and actuators	
- Hydraulic clearance optimization	
Natural Gas Flow Metering for Performance Test (loose supply only)	1 per plant
Natural Gas Draining System	1 per gas turbine

Dual Fuel Module, comprising the auxiliary packages for - Fuel oil (with 2x100% fuel oil pumps) - Purge water - NOx (with 2x100% NOx water pumps)	1 per gas turbine
Sealing Air Supply System	1 per gas turbine
Advanced Compressor Cleaning System, including piping connection to cleaning water nozzle system	1 per plant (common for both GTs)

Gas Turbine Systems	**Quantity**
Air Intake System - Filter system with pulse filter stage - Inlet air filter house including weather hood, bird screen, weather louvre, internal support structure, instrumentation, lighting, power sockets, access ladders, platforms and doors - Interconnecting duct work with expansion joint, manhole, damper and silencer - Anti-Icing System - Electrical hoist for maintenance (250kg) - Dehumidifier for gas turbine standstill - Nozzle system for compressor cleaning inside air inlet plenum	1 per gas turbine
Exhaust Gas System - Exhaust gas diffuser - Compensator between gas turbine and exhaust gas diffuser	1 per gas turbine

Gas Turbine Control System	**Quantity**
Control System Type	SPPA-T3000
Turbine Controller - Redundant automation processor for closed-loop control functions - I/O modules, as per I/O	1 per gas turbine
Turbine Failsafe Protection and Trip System - Failsafe system for protection and trip functions	1 per gas turbine

N.M.T.P. MP

- Turbine Function Group Automatic and Operational Protection System	1 per gas turbine
– Redundant automation processor for open-loop control functions, sequence control functions and operational protection functions	
– I/O modules, as per I/O	
I&C Cables	1 set
– Turbine related special instrument cables at turbine and on skids (from sensor to junction box)	
– Turbine related special control cables (flame monitoring cable)	
Application Server	1
– Redundant server for operating, monitoring, engineering function	
Turbine Operating / Monitoring / Engineering System	1 per gas turbine
– Operator terminal with 2x 24" LCD monitor, keyboard and mouse	
– Printer, DIN A4 color laser	
Turbine Network Bus System	1 set
– SPPA-T3000 bus system with necessary network components	
– Fiber optic bus cable to plant central control room, maximum length	300 m
Signal Interface with Plant Distributed Control System	1 set
– Terminal points for hardwired signal exchange	
– Maximum number of signals per turbine package	30
– Terminal point for bus signal exchange (with OPC)	
– Maximum number of signals per turbine package	500
WIN_TS Diagnostic System	1 set
– WIN_TS analysis system hardware + peripherals	
– Software module for gas turbine special condition monitoring	
– Vibration analysis	

N.A.T.O. MG

Gas Turbine Electrical Equipment	Quantity
Power Control Center (UBA01 / UBA02)	2 per gas turbine
AC Power Supply System	
– Low voltage switchgear, AC MCC (BFE / BME)	2 per gas turbine
DC Power Supply System	
– DC voltage distribution (BUB / BUC)	2 per gas turbine
– Battery (BTA)	1 per gas turbine
– Battery charger (BTL)	2 per gas turbine
– DC/DC converter (BUK)	2 per gas turbine

Gas Detection and Fire Protection System	Quantity
Gas Detection System	1 per gas turbine
– Gas detectors, horns and beacons, control unit Covering following areas: Gas turbine Enclosure Fuel gas skid	
Fire Detection System for Gas Turbine Unit	1 per gas turbine
– Fire detection and control system with local panel Covering following areas: Gas turbine enclosure and fuel gas skid annex Base Module Power Control Center Dual Fuel Module Generator Bearings	
Fire Extinguishing System	1 per gas turbine
– Battery of high pressure bottles for CO_2 and direction valve station – Piping system from bottle rack / storage system to spray nozzles inside the enclosure incl. supports	

Covering following areas:

Gas Turbine Enclosure

Fuel Gas Skid Enclosure

PCCs

Noise Protection Measures	**Quantity**
Noise Enclosure for Gas Turbine - Structural steel, with corrosion protection - Noise abatement panels, galvanized - Internal service platforms and ladders, galvanized - Doors with safety windows - Internal lighting, including emergency lighting	1 per gas turbine
Ventilation System for Gas Turbine Enclosure - Air intake openings with protective grills, dampers and silencer - Air handling unit, equipped with back draft dampers, fans including mechanical redundancy, and silencers	1 per gas turbine

Generator

Gas Turbine Generator	Quantity
Generator type	SGen5-1200A
Number of offered generators	2

Core generator, each mainly comprising:

- **Stator**, consisting of

Base frame	1
Stator core, made up of dynamo sheet segments, stacked and pressed together with insulated non-magnetic through bolts	1
Stator winding, three-phase, double layer type, made up from transposed solid strands with MICALASTIC® post-impregnation	

- **Rotor**, consisting of

Shaft from one piece forging; rotor winding made up of silver alloyed low oxygen copper conductors with radial cooling	1
Rotor retaining rings; one piece construction, made up of non-magnetic steel, which is not susceptible to stress corrosion cracking and is shrunk onto the rotor body	2
Single-flow axial fans arranged on the rotor shaft for circulation of the cooling medium	2
Steel slip rings arranged on generator shaft	2

- **Bearings**, consisting of

Sliding contact bearings with jacking oil device; insulated towards ground, designed for external bearing lube and jacking oil supply (turbine scope)	2

- **Thermocouples** (Type K)

Triplex TC embedded in metal of each generator bearing	1

- **Resistance Temperature Detectors** (Platinum, 100 ohms at 0 °C)

Slot RTDs embedded in armature windings acc. IEC 60034-3	6
Duplex RTDs in the generator warm air cooler inlet	1

Duplex RTDs in the generator cold air cooler outlet	2+2

Further equipment:

- **Cooler cover**, consisting of

Sound proof cover, attached to generator cover	1
Cooler elements, air-to-water (25% each)	4
Liquid level detectors	2

- **Stator sound proof enclosure** 1

- **Bushings suitable for mounting current transformers** 6

- All instruments wired to plugs or junction boxes	
- Rotor grounding brushes	1 set
- Provision for vibration monitoring at bearings	1 set
- Space heater	1 set
- Special tools for rotor removal, installation, erection and maintenance, one per site per style (detailed list see Sec. Special Tools Generator)	1 set
- Anchor bolts and nuts	1 set
- Leveling plates and primary bearing plates	1 set
- Generator instruction and installation book (per site per style)	1 set (electronic format)

- **Tests**

The generator will be subjected to tests conducted under static conditions, as defined in Supplier's quality assurance specification. Kindly refer to section "Standard QA Programs".

Type test certificates of a similar frame size can be reviewed at supplier's manufacturing facility.

N.R.G.U. MN

Generator Electrical Equipment	Quantity
Generator Equipment for Gas Turbine Generator	per generator
Generator neutral tie enclosure	1
Generator current transformers, line side	3 x 3 cores
Generator current transformers, neutral side	3 x 3 cores
Generator neutral earthing cubicle (BAB11)	1
Protection Equipment for Gas Turbine Generator	per generator
Generator protection (CHA)	1 set
Generator synchronization (CHA)	1 set
Starting Frequency Converter (SFC) for Gas Turbine Generator (CJT)	1 per generator
Line side and machine side B6C converter bridge	
DC link between line side and machine side converter	
Overvoltage protection on line side and machine side	
Speed control	
Compressor washing function	
Boiler purge function (for 10 minutes)	
Static Excitation Equipment (SEE) for Gas Turbine Generator (CJN)	1 per generator
Fully controlled converter bridge type B6C	
Equipment for rapid de-excitation	
DC side overvoltage protection	
2 channels, each with automatic and manual mode	
Power system stabilizer	
Transformer for Gas Turbine Generator	
SFC transformer with metal enclosure (MBJ)	1 per generator
SEE transformer with metal enclosure (MKC)	1 per generator

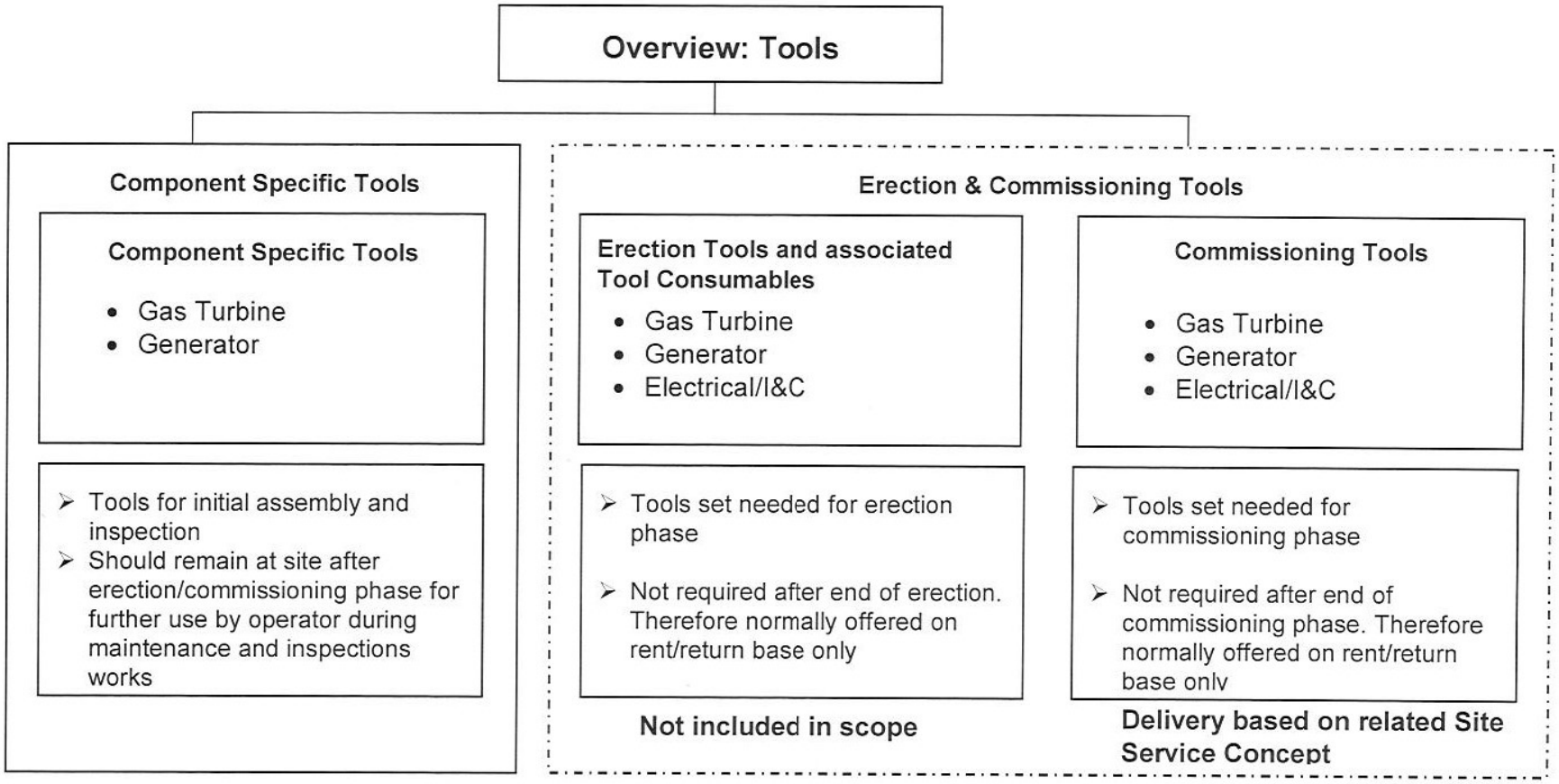
N.R.T.U.

Tools

General Explanation

The following graphic shows a general overview of Contractor's tool concept. Project specific consideration is given in the following sub-chapters within the scope of supply.

A.R.T.O. MM



Tools

Gas Turbine Specific Tools

Abbreviations

DG = Design Group / CC = Component Class / GPC = Generic Part Code

Component Specific Tools (CST) – Basic Equipment

The following Tools (CST) and relating foundation parts (CFB) are required for initial assembly as well as for maintenance and inspection of gas turbines.

No.	GPC	Designation	Qty (per plant)	Remarks
1.1	TLC11	Special wrenches, screw plugs	1	For disassembly / assembly of screw plugs on blade clearance measurement ports and on balancing weight ports
1.2	TLC12	Special tools, initial assembly	1	Special tools and special fixtures, necessary for initial assembly and inspection
1.3	TLC13	Wrenches for balancing weights	1	For loosening and tightening of the balancing weights
1.4	TLC21	Assembly device, compressor bearing area	1	For disassembly / assembly of compressor bearing cover
1.5	TLC23	Support, intermediate shaft	1	For supporting the intermediate shaft during the rotor is disassembled or disconnected
1.6	TLC25	Assembly device, turbine bearing area	1	For disassembly / assembly of the turbine bearing or the bearing pads
1.7	TLC42	Assembly devices, combustion system	1	Special tools for disassembly / assembly of burners Devices for inspection of the combustion chamber
1.8	TLC71	Support, rotor, compressor end	1	For supporting the rotor during change of the compressor bearing

Foundation Base Parts (CFB) – Basic Equipment

No.	GPC	Designation	Qty (per plant)	Remarks
3.2	TLG48	Base, rotor upending device	1	*for rotor inspection* Embedded into foundation Foundation plate, required for the fixation of the rotor upending device

V.R.T.C.

MT

Generator Specific Tools	Quantity
Tools for Erection and Major Inspection - Rotor installation tools, incl. slide plate, slide shoe, slide support - Rotor installation carriage - Hydraulic jacks, manual pumps and accessories	1 set for all units

Temporary Equipment

Temporary equipment is not listed in any scope of supply or services. It is and shall remain property of the Supplier and is intended for temporary use during execution of the project and on site.

Temporary equipment will be delivered by Supplier on a rent and return basis only and according to the terms of delivery (Incoterm code and named destination) as stated in the commercial part of the supply contract.

Overview of Suppliers Temporary Equipment

- **Temporary Testing Equipment**
  The temporary test equipment includes equipment to carry out necessary tests for components or systems provided by Supplier as described in the section "Performance and Verification Tests".

- **Other Temporary Equipment**
  Other temporary equipment includes further equipment, for example transportation support frames for gas turbine or generator.

- **Temporary Commissioning Equipment – offered optionally**
  The temporary commissioning equipment includes equipment to set in operation components or systems provided by Supplier's, except specific tools for turbine and generator as provided by Supplier and described in the section "Tools"

  Temporary commissionint equipment is not included in Supplier's base offer. It is offered optionally (refer to chapter 10).

A binding list of all temporary equipment provided by Supplier will be prepared during detail engineering phase.

N.M.T.O. MM

Scope of Services

Project-related Services

Project Management

Provision of experienced project management with specialists for technical and commercial project management execution, logistics activities, health and safety, quality management including administrative services for personnel, material and equipment

Project Scheduling

Provision of project scheduling, planning, controlling and progress reporting

Logistics

Provision of cargo transportation and shipping for offered equipment, including related logistic co-ordination and required transportation documents according to the terms of delivery (Incoterm code and named destinations) as stated in the commercial part of the supply contract

Licensing

Provision of documents and drawings for support of Purchaser's licensing and permit activities

Project Documentation	**Quantity**
Provision of project documentation	1 set per project
- Project progress report	electronic form
- Quality documentation (TQ)	electronic form
- Engineering & design documentation (TD)	electronic form
- Product documentation (TP)	electronic form
- Operating manuals (TO)	1 paper copy +electronic form
- Erection manuals (TE)	electronic form
- Commissioning manuals (TC)	electronic form

Site-related Services

Technical Field Assistance	Quantity
Provision of technical field assistance during erection and commissioning phase	not included [1]
Provision of special commissioning tools and test equipment required for execution of commissioning activities, on rent-and-return basis.	offered optionally [2]

[1] Kindly refer to separate offer.

[2] Refer to chapter 10. For provision of turbine and generator specific tools, refer to section "Scope of Supply".

Labeling	Quantity
Provision of list of labels	1
Provision of temporary identification labels on pre-installed equipment	as appropriate
Provision of manufacturing rating plates on large components	as appropriate
Provision of permanent identification labels stainless steel (loose supply)	1 set per site

Training

Offshore Training Program	Quantity
Offshore training of Owner's personnel, comprising - Operator MMI training	not included [1)]

Onshore Training Program	Quantity
Onshore training of Owner's personnel, comprising - Basic operation training	not included [1)]

[1)] Kindly refer to separate offer.

Terminal Points

General

The scope of contract shall be confined to the major terminal points as described with the following documents below:

- Terminal point list
- Interface drawings
- Interface flange list

Further interface details are also described within the single line diagram and the control system overview diagram, provided within section "Attached Documents".

It should be noted that minor terminal points, such as drains and vents, are not described in this section or the provided documents, however to be considered by the Purchaser as well.

Gas Turbine Package

Gas Turbine	**Terminal Points**
General for the Gas Turbine	- Load-bearing points in the foundation have to be installed according to Supplier's definitions (provided during project execution phase). - For further terminal points refer to sections "Interface Drawings" and "Interface Flange List".
Gas Turbine Auxiliaries	**Terminal Points**
General for the Gas Turbine Auxiliaries	- Gas turbine auxiliaries have to be fixed to foundation or steelwork according to Supplier's erection manuals (provided during project execution phase). - For further terminal points refer to sections "Interface Drawings" and "Interface Flange List".
Gas Turbine Systems	**Terminal Points**
Air Intake System	- Limit of supply is the supporting frame of the filter house (approx. 11...14 m above ground). The support structure consists of six or eight supports (not in Siemens' scope), which have to be arranged according to Siemens' specification. - The duct load-bearing points in the foundation have to be installed according to Supplier's specification with corresponding earthing details - Drains at filter house and air intake duct - Power supply at control cabinet - I&C field signals at control cabinet - Pulse air pipes at filter house (pulse air requirements depending on supplier, e.g. 290 standard m3/h for one GT, 8 bar, clean, dry, free of oil, acc. to DIN/ISO 8573-1 grade

	131).
Exhaust Gas System	– Supporting structure load bearings at foundation have to be installed according to Supplier's specification – Earthing connections – Drains at component (shut-off valve included) – Outlet connection at Diffuser End
Gas Turbine Control System	**Terminal Points**
Field Signals	– Cable connection elements within junction boxes or at field sensors/instruments – Cable connection elements within the turbine control system cabinets inside the Power Control Center (PCC)
AC Uninterruppted Power Supply (UPS)	– Computer equipment – Peripheral devices
DCS Signal Interface: Hardwired	– Isolation amplifiers (analog signals, 4-20 mA) – Coupling relays with dry changeover contacts (binary signals, 24V DC) – Cable connection elements within the turbine control system cabinets inside the Power Control Center (PCC)
DCS Signal Interface: OPC Link	– OPC serial link, Ethernet, one-directional, non-redundant – Terminal point (RJ45) at the firewall inside the Application Server cabinet – OPC tunneler software e.g. "Matricon" for OPC client
DCS Signal Interface: Telecom System	– Remote access interface for turbine analysis during commissioning and warranty – Terminal point at Siemens CAG router inside the Application Server cabinet

N.A.T.O.

	- Broadband connection via VPN/cRSP with unlimited remote access 7 days a week / 24 hours a day
Gas Turbine Electrical Equipment According to Single Line Diagram	**Terminal Points** - Generator current transformer terminals - Terminals in Supplier's protection & synchronization cubicle for connection of cables to Other's equipment. - Terminals of static excitation equipment (SEE) transformer and starting frequency converter (SFC) transformer. - Terminals of SEE and SFC equipment. - Terminal blocks in Supplier's cubicles for connection of cables outside power control center. - Earthing points at supplied components. - Terminals of incoming feeders of turbine package LV switchgear.
Fire Protection System Fire Detection System	**Terminal Points** - Local control panel of CO_2 fire fighting system for electrical power feed in and signal exchange with Gas Turbine I&C system and plant fire protection system
Noise Protection Measures Noise Enclosure for Gas Turbine	**Terminal Points** - Connection of enclosure structural steel to the foundation (special fixing parts included if required, excluding dowels, bolts, nuts) - Junction boxes located outside of the enclosure for electrical power supply of lighting - Junction boxes located outside of the enclosure for exchange of field signals with the gas turbine I&C system

N.R.T.D.

Ventilation System for Gas Turbine Enclosure	- Exhaust air discharge of air handling units / fans through penetration in turbine building wall - Junction boxes located outside of the enclosure for electrical power supply of ventilation - Junction boxes located outside of the enclosure for exchange of field signals with the gas turbine I&C system

Generator Package

Gas Turbine Generator	Terminal Points
General for the Gas Turbine Generator	- Load-bearing points in the foundation have to be installed according to Supplier's definitions (provided during project execution phase). - For further terminal points refer to sections "Interface Drawings" and "Interface Flange List".

Generator Electrical Equipment	Terminal Points
According to Single Line Diagram	- Refer to the terminal points of the gas turbine electrical equipment and to the single line diagram provided.

Interface Drawings

Gas Turbine Package

GENERAL

The information given in the following interface drawings is not subject to verification and non fulfillment of it is not subject to any kind of rights or remedies of the Purchaser whatsoever.

The drawings show the preliminary interfaces of Supplier's offered equipment, and have been provided to support Purchaser's further layout of the project.

The drawing bases on Supplier's standard design and specifics for the offered equipment. Project-specific details may change due to development progress during project engineering phase and due to feedback during manufacturing. Furthermore please note, that optional offered equipment and minor items (such as vents, drains, instrument lines, etc.) are not considered in these drawings.

Regarding equipment supplied by Purchaser, shown design and specifics are assumed by Supplier. In case of differences or wrong assumptions, Purchaser should provide correction for further evaluation by Supplier and modification of the proposal or contract.

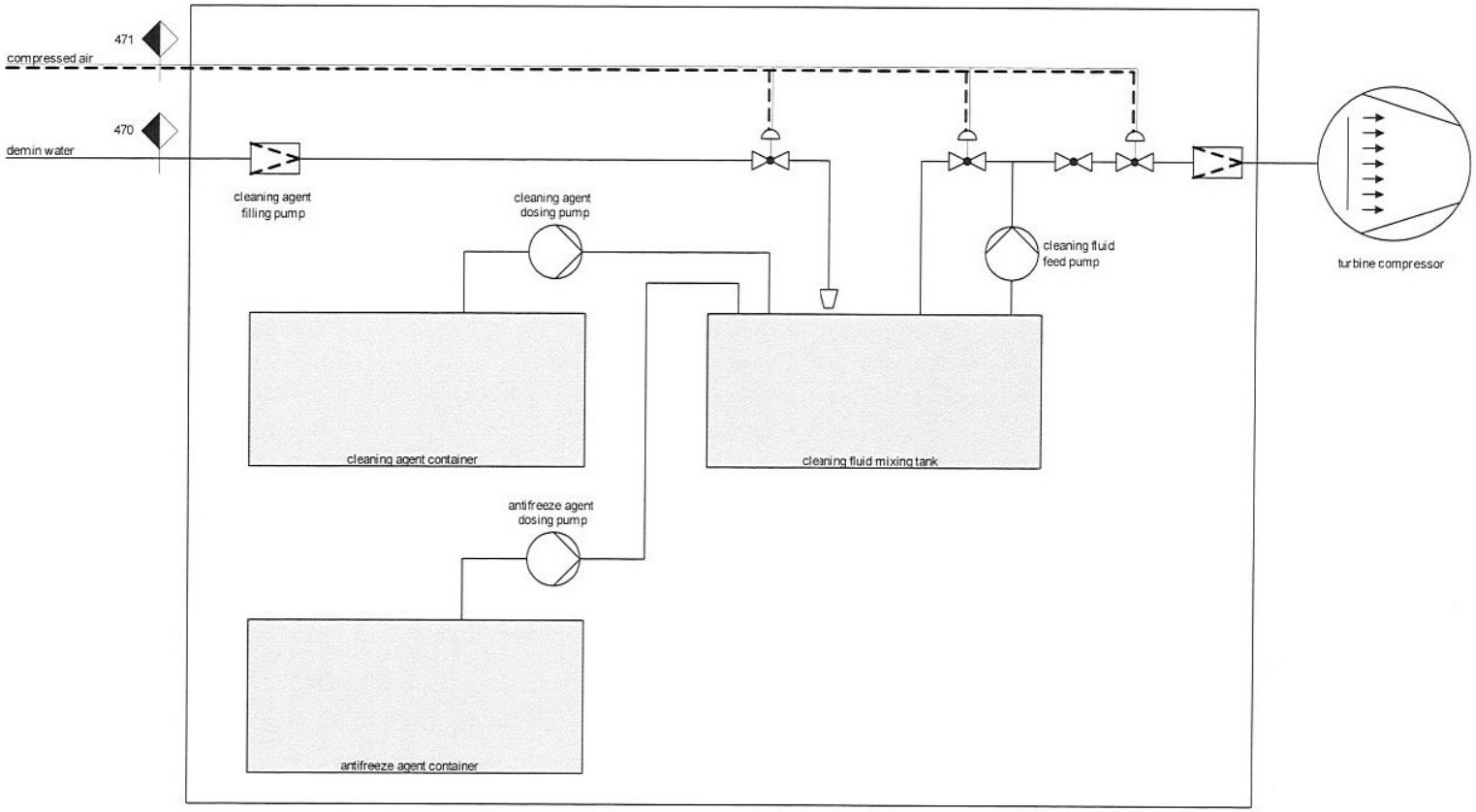
LEGEND

terminal point

For further details, please refer to interface flange list.

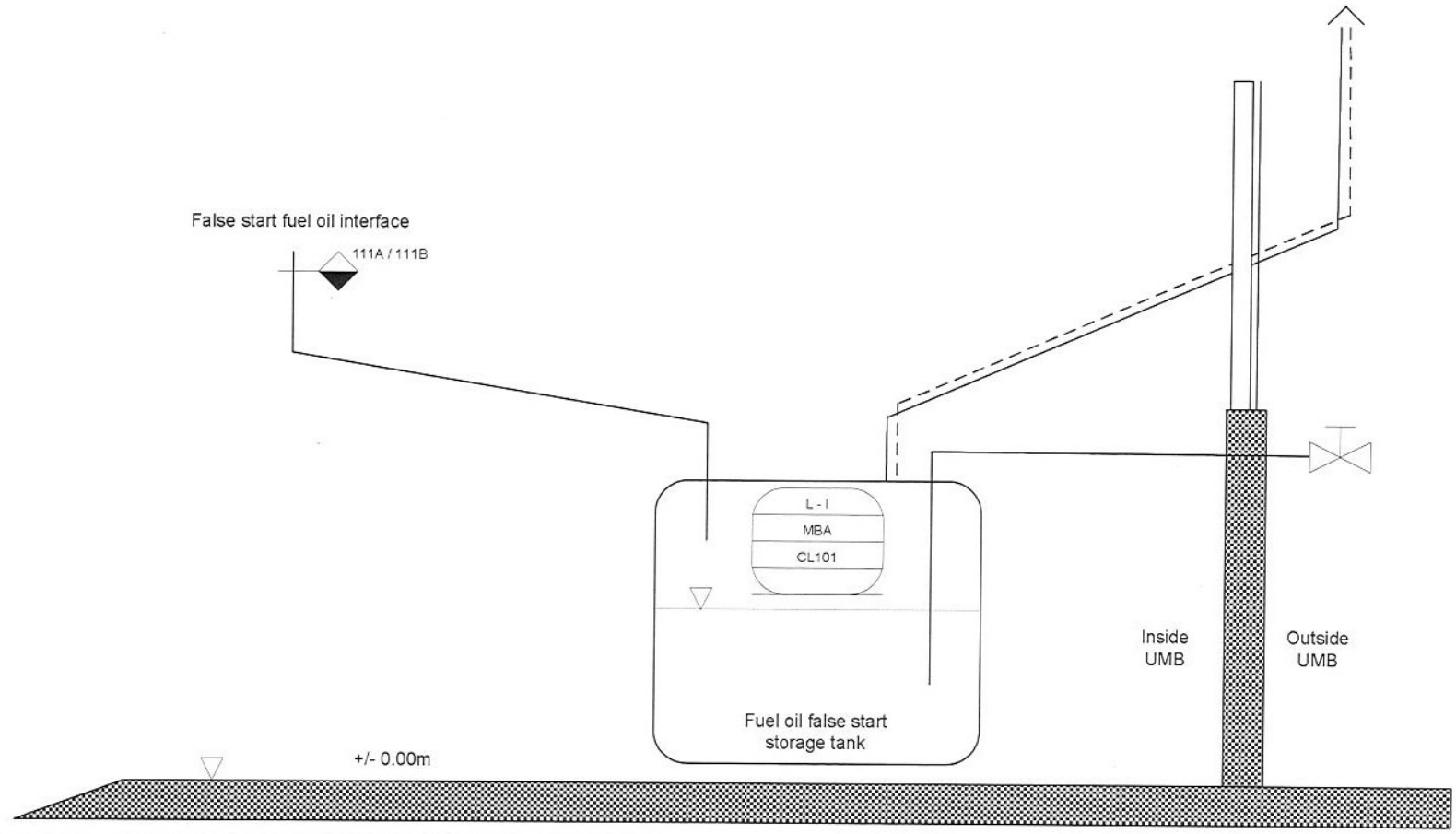
MBA30 Advanced Compressor Cleaning System

For further details, please refer to interface flange list.



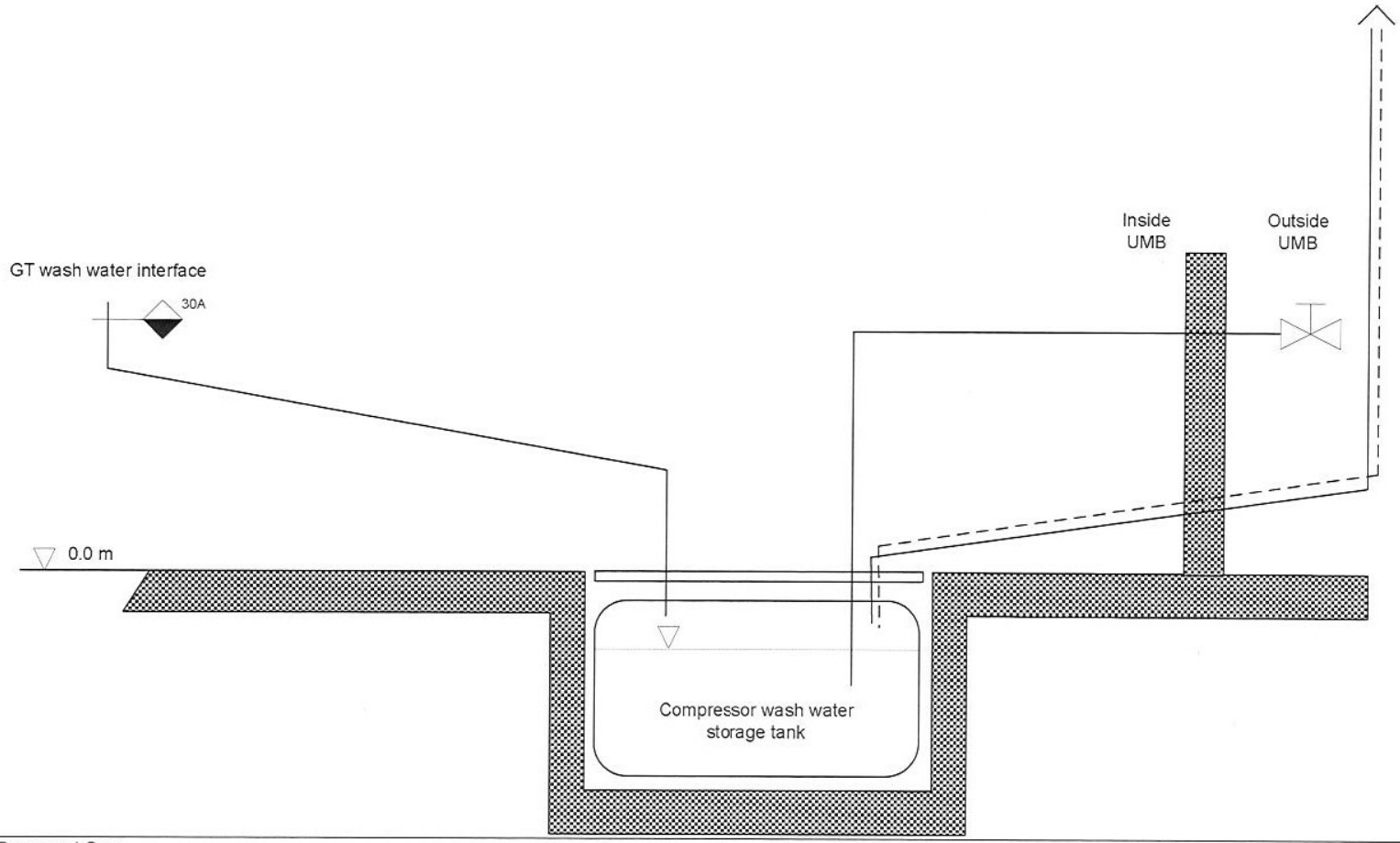
MBA25 Fuel Oil False Start Storage Tank

For further details, please refer to interface flange list.



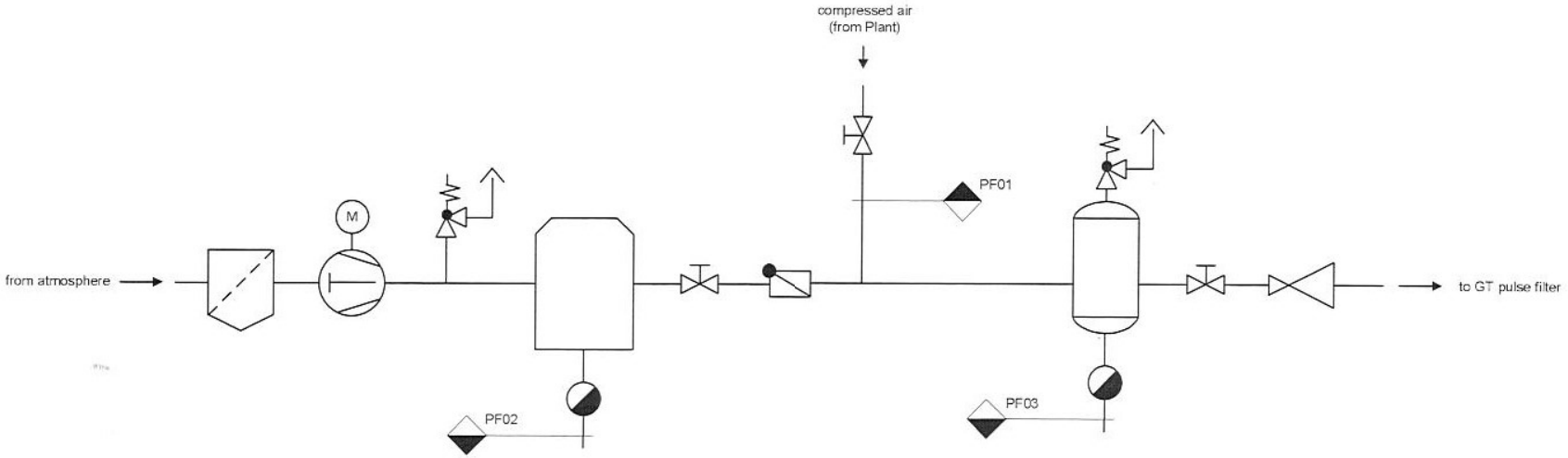
MBA25 Compressor Wash Water Storage Tank

For further details, please refer to interface flange list.



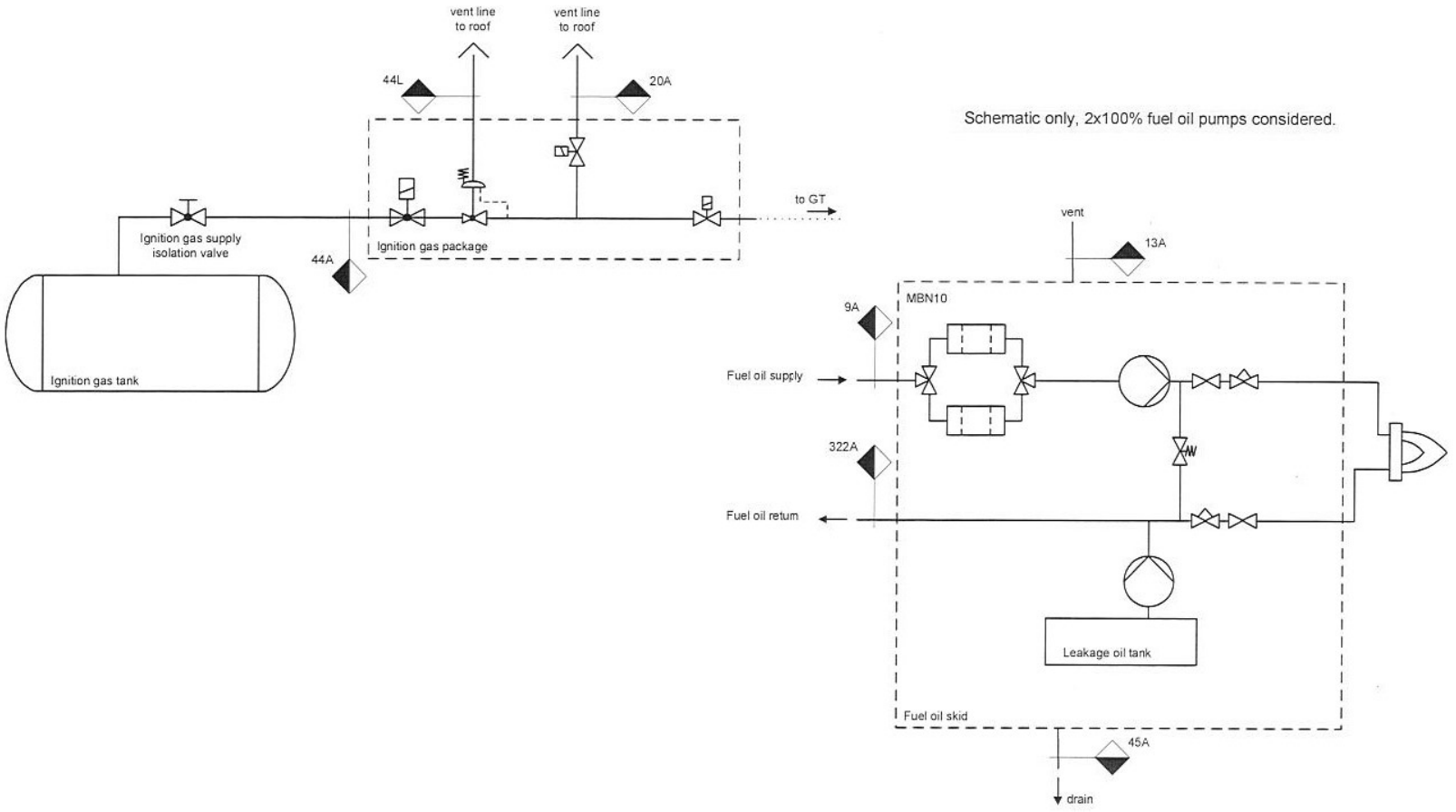
MBL30 Pulse Filter Compressed Air System

For further details, please refer to interface flange list.



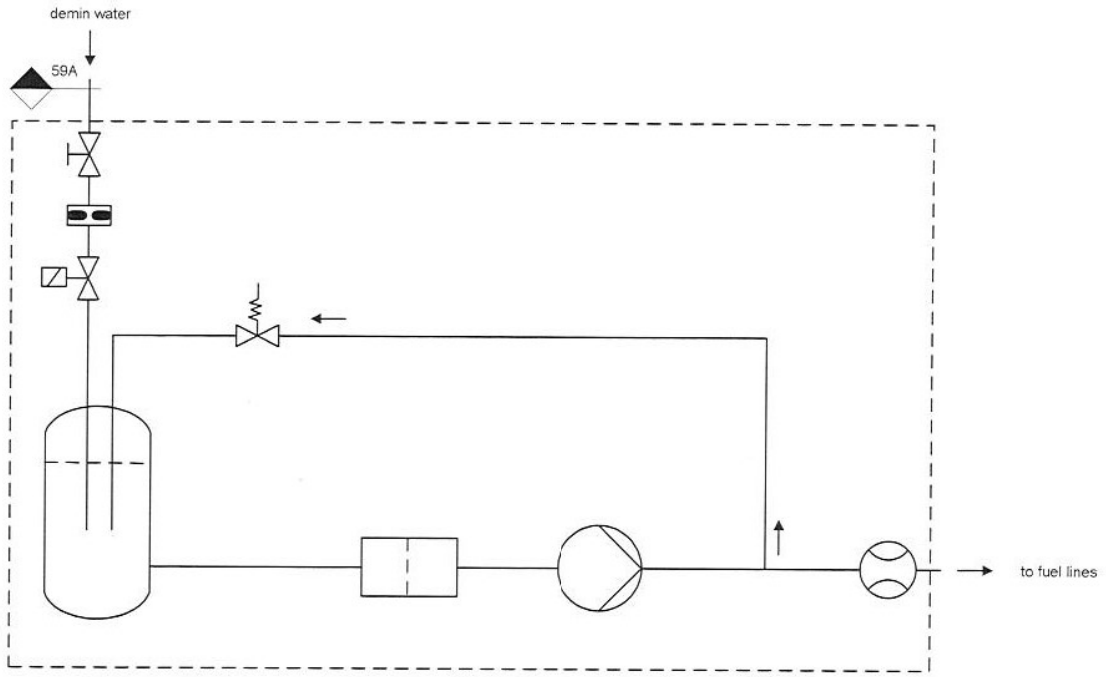
MBN10 Fuel Oil System

For further details, please refer to interface flange list.



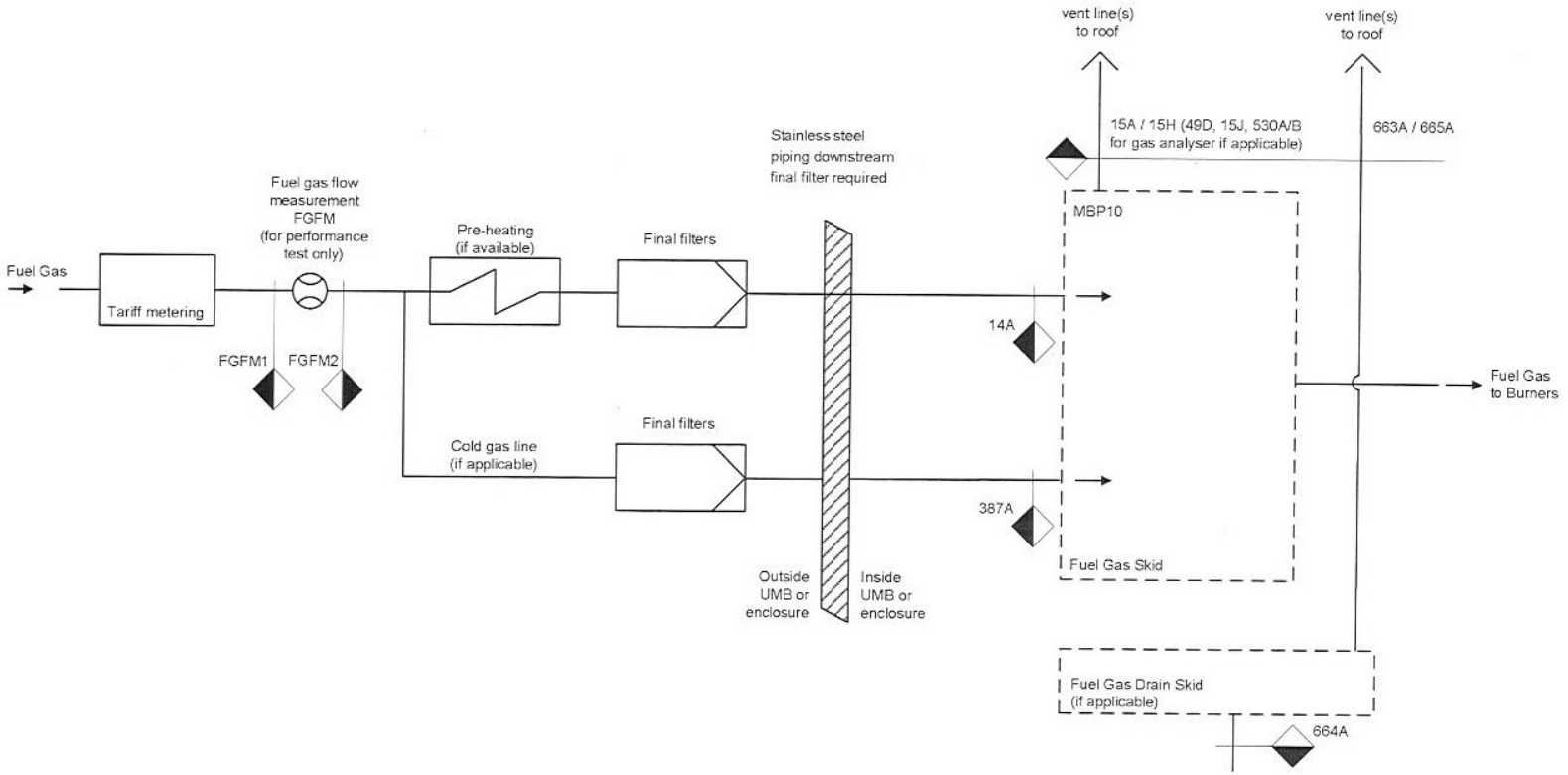
MBN80 Purge Water System

For further details, please refer to interface flange list.



MBP10 Fuel Gas System for Natural Gas

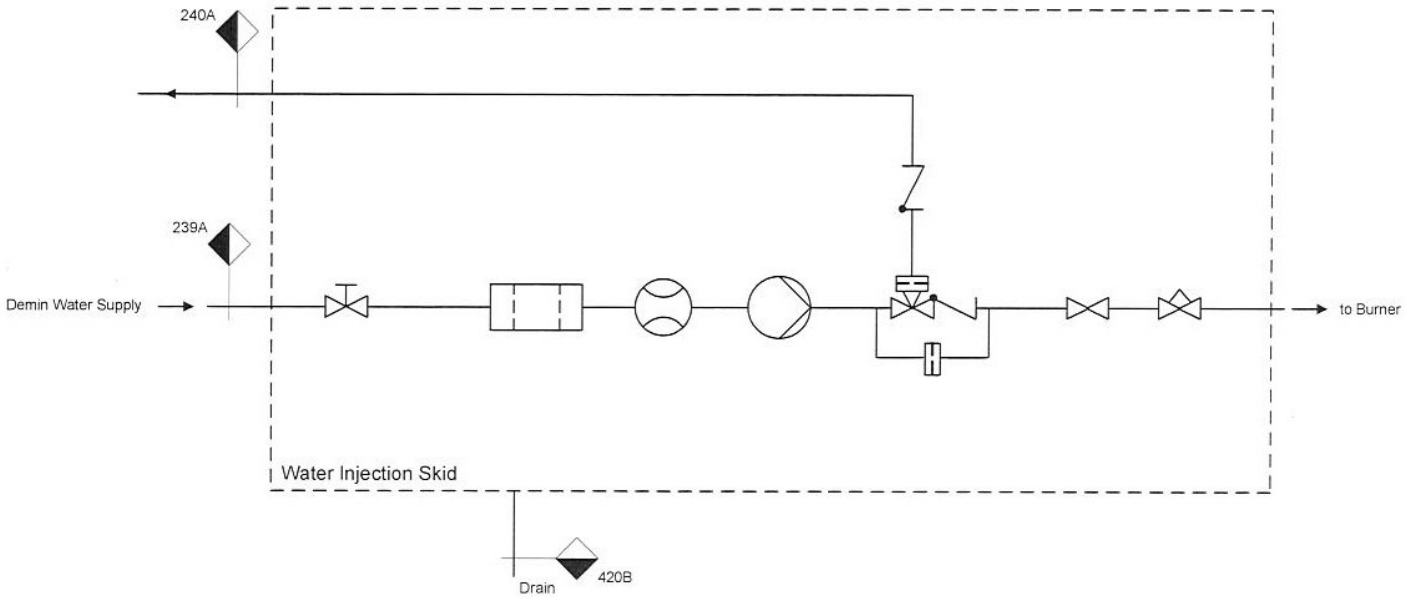
For further details, please refer to interface flange list.



MBU Water Injection System (NOx)

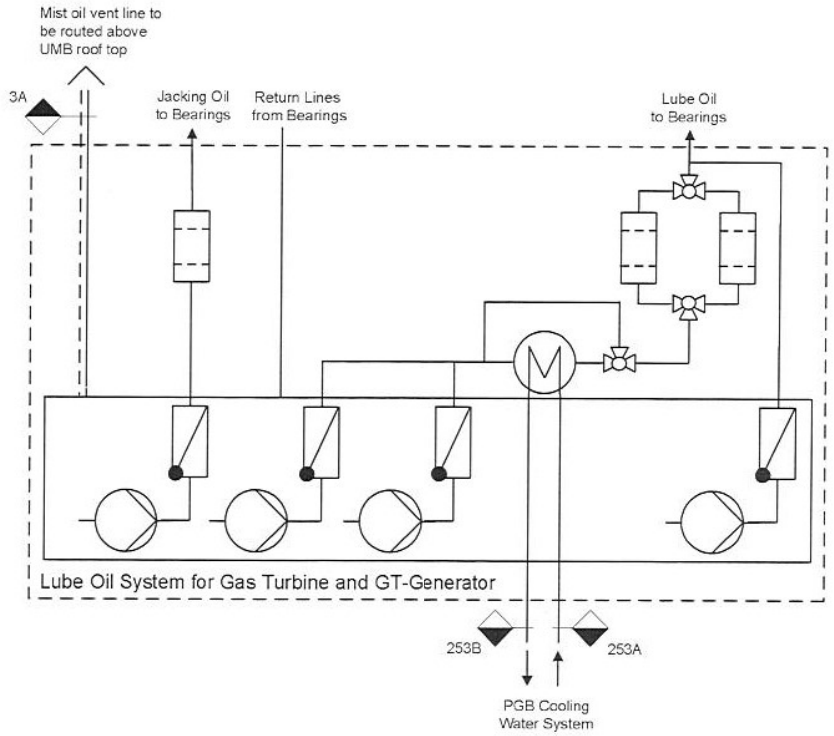
For further details, please refer to interface flange list.

Schematic only, 2x100% NOx water pumps considered.



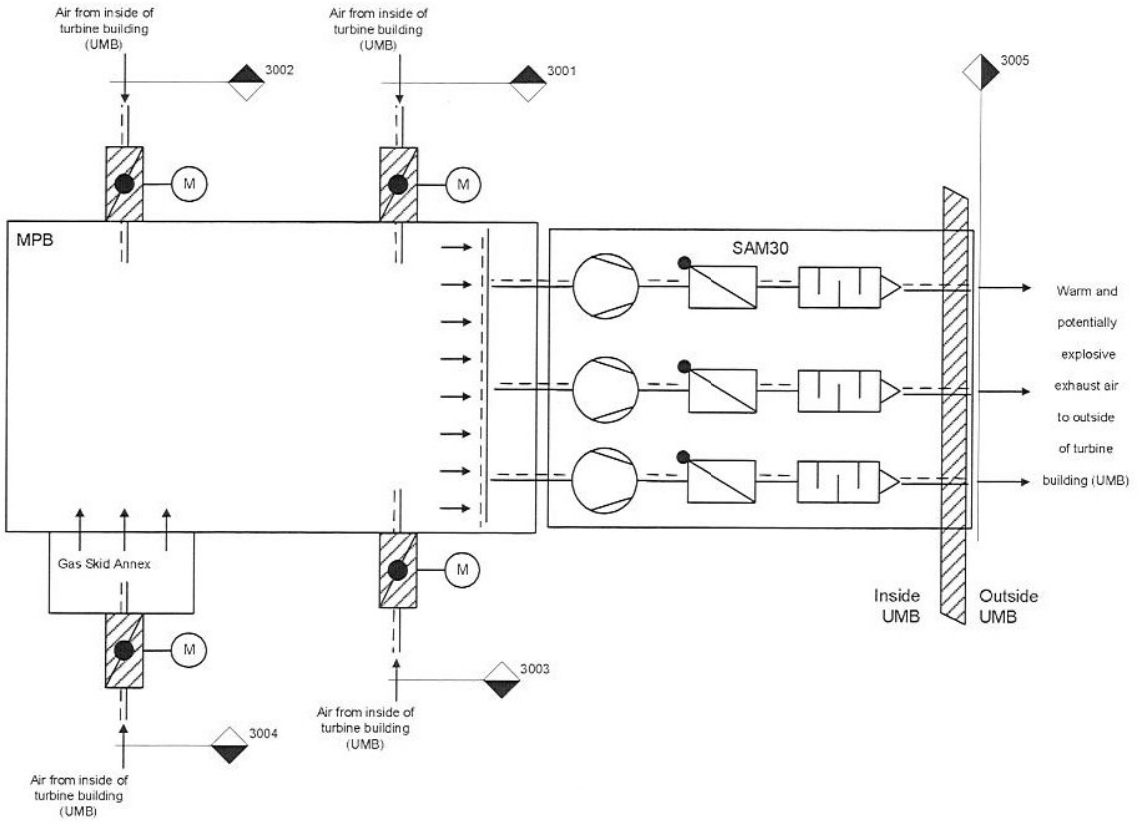
MBV Lube Oil System for Gas Turbine and Gas Turbine Generator

For further details, please refer to interface flange list.



SAM30 Air Handling Unit of Gas Turbine Enclosure, 3x 50%
MPB Gas Turbine Enclosure incl. Annex for Fuel Gas Skid

For further details, please refer to interface flange list.



Generator Package

GENERAL

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The drawings show the preliminary interfaces of Supplier's offered equipment, and have been provided to support Purchaser's further layout of the project.

The drawing bases on Supplier's standard design and specifics for the offered equipment. Project-specific details may change due to development progress during project engineering phase and due to feedback during manufacturing. Furthermore please note, that optional offered equipment and minor items (such as vents, drains, instrument lines, etc.) are not considered in these drawings.

Regarding equipment supplied by Purchaser, shown design and specifics are assumed by Supplier. In case of differences or wrong assumptions, Purchaser should provide correction for further evaluation by Supplier and modification of the proposal or contract.

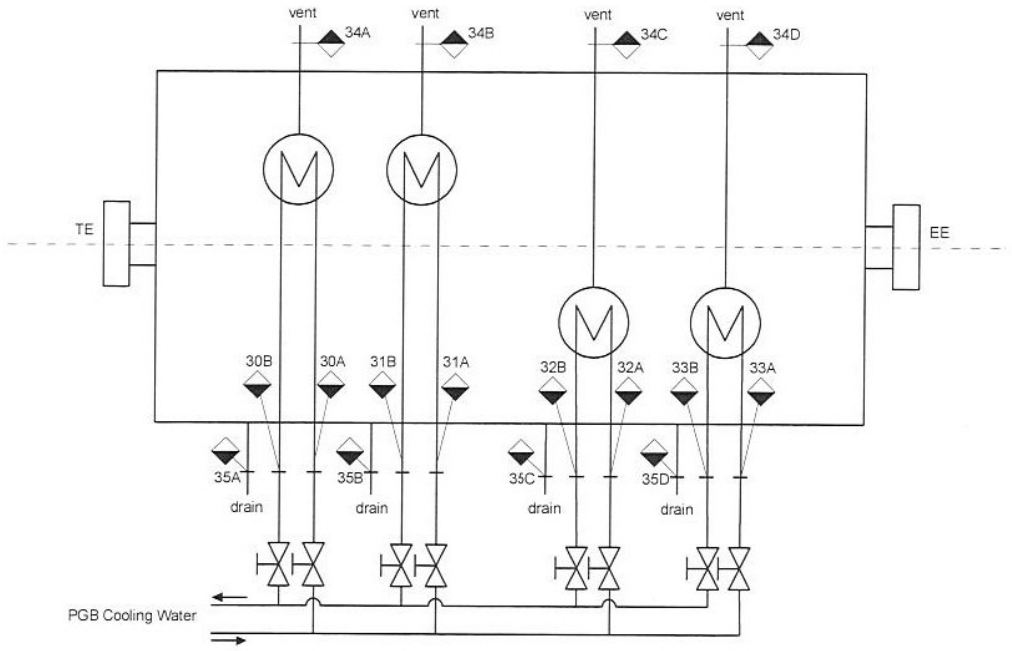
LEGEND

terminal point

MKA10 Generator Cooler, connected to PGB Cooling Water System

For further details, please refer to interface flange list.

Generator
SGen5-1200A



Device or valve to be installed downstream of cooler sections to allow symetrical adjustment of water flow.
Header to allow an equal distribution of water to all cooler sections .
One common temperature detector at cooling water inlet and 4 temp. detectors at cooling water outlet for supervision.

Interface Flange List

General

The information given in this document is not subject to verification and non fulfillment of it is not subject to any kind of rights or remedies of the customer whatsoever.

The data shown in this document does not include any forces or moments at the flanges, nevertheless these will be submitted during project execution and shall be considered for design.

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
		Gas Turbine Auxiliaries																
3A	MBV	Vent, lube oil tank	tbd later (80-100 / 3"-4")	DIN EN 1092-1, Type 11, B1	Yes	0.01			70	80						Lube oil vapour and air		MBV23

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
9A	MBN	Fuel oil supply to FO skid	150	DIN EN 1092-1, Type 11, B2	Yes	7	16	oper. range 4-7 barg	flash point - 15° and 60°	80	min. oper. temp.:	40				fuel oil	Offer Sect.1 "Media for GT"	MBN10
13A	MBN	Vent, FO leakage tank, FO skid	100	DIN EN 1092-1, Type 11, B2	Yes	< 0.5	0.5		140	150						fuel oil vapor and air		MBN10
14A	MBP	Natural gas supply to FG package	250	DIN EN 1092-1, Type 11, B2	Yes	47	47	pls. ref. to "Design Conditions" in Sec. 1	pls. ref. to "Design Conditions" in Sec. 1	210		pls. ref. to "Design Conditions" in Sec. 1				fuel gas	Offer Sect.1 "Media for GT"	MBP10
15A	MBP	Vent discharge from FG package	15	DIN EN 1092-1, Type 11, B2	Yes	47	47		pls. ref. to "Design Conditions" in Sec. 1	210						fuel gas		MBP10
15H	MBP	Vent at main FG line upstream emergency stop valve	25	DIN EN 1092-1, Type 11, B2	Yes	47	47		pls. ref. to "Design Conditions" in Sec. 1	210						fuel gas	Offer Sect.1 "Media for GT"	MBP10
20A	MBQ	Vent, ignition gas package	15	DIN EN 1092-1, Type 11, B2	Yes	16	24		140			0.001				propane or propane and butane		MBN10
30A	MBA	Drainage gas turbine to wash water storage tank	100	DIN EN 1092-1, Type 11, B1	Yes											cleaning agent and others		MBA25

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
37A	MBV	Drain, lube oil tank	50	DIN ISO 228	No	oil column			70	80						Lube oil		not shown (service point)
37B	MBV	Drain, lube oil filter	1"	DIN ISO 228	No	depressurized	6		70	80						Lube oil		not shown (service point)
37C	MBV	Drain, lube oil cooler, oil side	25 or 1"	DIN EN 1092-1, Type 11, B1 or DIN ISO 228	No	7.5			70	80		N/A				lube oil		not shown (service point)
44A	MBQ	Ignition gas to ignition gas package	25	DIN EN 1092-1, Type 11, B2	Yes	15	15	min. oper. press. 7 barg	140	140					Approx 27 Kg by 200 g/s per ignition. Recomm. press. 10-14 barg, (min. 7)	propane or propane and butane		MBN10
44L	MBQ	Vent, ignition gas package	3/4"	DIN ISO 228	No					140		0.2				propane or propane and butane		MBN10
45A	MBN	Drain, FO leakage tank, FO skid	1 + 1/4"	DIN ISO 228	No	N/A			60	80		n/a				fuel oil and demin water		MBN10

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
59A	MBN	Demin water inlet to purge water package	15	DIN EN 1092-1, Type 11, B1	Yes	2			60			0.3				demin water	Offer Sect.1 "Media for GT"	MBN80
60A	MBX	Drain, hydraulic oil tank	1"	DIN ISO 228	No	0			90				20			hydraulic oil		not shown (service point)
60B	MBX	Fill in, hydraulic oil tank	1"	DIN ISO 228	No	1			20				20			hydraulic oil		not shown (service point)
61A	MBX	N2 fill in, hydraulic oil accumulator	7/8"	14UNF	No	100			20				0.2			nitrogen		not shown (service point)
62A	MBX	N2 fill in, hydraulic oil accumulator	7/8"	14UNF	No	100			20				0.2			nitrogen		not shown (service point)
68A	MBA	Fill in demin water, mobile compr. cleaning skid	25	DIN EN 14420-7-25-DF-DR-BF	No	2			40						480 - 600 liter per washing step	demin water	Offer Sect.1 "Media for GT"	MBA18
68C	MBA	Barrel pump, suction detergent, mobile compr. cleaning skid	25	DIN EN 14420-7-25-DF-DR-BF	No	ATM									120 - 0 liter per washing step	cleaning agent	Offer Sect.1 "Media for GT"	MBA18

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
83A	MBA	Drain, wash water tank, mobile compr. cleaning skid	15	DIN ISO 228	No	ATM										cleaning agent		not shown (service point)
111A	MBA	Drain, fuel oil after false start, FO skid	25	DIN EN 1092-1, Type 11, B1	Yes											fuel oil		MBA25
111B	MBA	Drain, fuel oil after false start, FO skid	25	DIN EN 1092-1, Type 11, B1	Yes											fuel oil		MBA25
192A	MBN	Drain, purge water package	1"	DIN ISO 228	No	0.1			< 60			1.6				demin water		not shown (service point)
205C	MBX	Drain, condensate reservoir, pneumatic package	1/2"		No											condensate		not shown (service point)
205G	MBX	Drain for condensate in pressure storage tank, pneumatic package	1/2"	DIN ISO 228-1	No											condensate		not shown (service point)
217A	MBN	Vent, purge water package	40		No	ambient			< 60							demin water		not shown (service point)
239A	MBU	NOx water injection, feed line to package	150	DIN EN 1092-1, Type 11, B1	Yes	8	16		55	70		24				demin water	Offer Sect.1 "Media for GT"	MBU

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
240A	MBU	NOx water injection, minimum capacity flow (return)	40	DIN EN 1092-1, Type 11, B2	Yes	3			55	70		4				demin water		MBU
253A	MBV	Supply cooling water to lube oil cooler	150	DIN EN 1092-1, Type 11, B1	Yes	12	16	Min. oper. press. 8 barg	46				34		Diff. press. across cooler max. 0.8 barg	demin water		MBV23
253B	MBV	Return cooling water from lube oil cooler	150	DIN EN 1092-1, Type 11, B1	Yes	12	16	Min. oper. press. 8 barg					34	1.550		demin water		MBV23
259A	MBV	Air / instrument air connection for rapid drain lube oil	1/2"	DIN ISO 228	No		6		70	80						Lube oil		not shown (service point)
322A	MBN	FO return from FO package	100	DIN EN 1092-1, Type 11, B2	Yes	3	16	permitted back pressure of return line max. 2 bar	flash point - 15° and 60°	80		25				fuel oil and demin water		MBN10
386A	MBN	N2 fill in accumulator 1, FO package	7/8"	14UNF	No	N/A	N/A		60	80		N/A				nitrogen		not shown (service point)
386B	MBN	N2 fill in accumulator 2, FO package	7/8"	14UNF	No	N/A	N/A		60	80		N/A				nitrogen		not shown (service point)

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
420B	MBU	Drain, NOx water injection package	1/2"	DIN ISO 228	No											demin water		MBU
452A	MBV	Drain lube oil filter	1"	DIN ISO 228	No		6		70	80						Lube oil		not shown (service point)
470	MBA	Demin water inlet to ACCS	25	DIN EN 1092-1, Type 11, B1	Yes	2				40					online 360-450 liter offline 720-900/ +900 liter	demin water	Offer Sect.1 "Media for GT"	
471	MBA	Compressed air inlet to ACCS	25	DIN EN 1092-1, Type 11, B1	No	10	10								10 l/s for 120 s, (at 6 barg)	compressed air	DIN ISO 8573-1	
472	MBA	Cleaning agent inlet to ACCS	25	DIN EN 14420-7	No	>1	>1								online 90-0 liter offline 180-0 liter	cleaning agent		
473	MBA	Anti freeze agent inlet to ACCS	25	DIN EN 14420-7	No	>1	>1								online 0-126/ 157,5 liter offline 0-252/ 315 liter	antifreeze agent cleaning agent		

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
480	MBA	Drain ACCS	25	DIN EN 14420-7	No	>1	>1			40						cleaning agent		
570A	MBN	Drain Fuel Oil Filter, FO package	1"	DIN ISO 228 F	No	geodetic			60	80		N/A				fuel oil		not shown (service point)
571A	MBN	Drain Fuel Oil Filter, FO package	1"	DIN ISO 228 F	No	geodetic			60	80		N/A				fuel oil		not shown (service point)
640A	MBV	Charge connection, bladder accumulator (N2), gas turbine HCO	7/8"	14UNF	No	180	330		55	80	typical temp. range 15 -55, min 5 Cel					nitrogen		not shown (service point)
663A	MBP	Vent, collector	15	DIN EN 1092-1, Type 11, B2	Yes	34	34		50							fuel gas		MBP10
664A	MBP	Drain, collector fuel gas drain package	15	DIN EN 1092-1, Type 11, B2	Yes	34	34		50							Conden-sate and compo-nent of fuel oil		MBP10

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
665A	MBP	Pressure relief collector fuel gas drain package	1/2"		No	34	34		50							fuel gas		MBP10
666A	MBV	Drain, lube oil cooler, oil side	25 or 1"	DIN EN 1092-1, Type 11, B1 or DIN ISO 228	No	7.5										lube oil		not shown (service point)
669A	MBV	Drain lube oil cooler , water side	25 or 1"	DIN EN 1092-1, Type 11, B1 or DIN ISO 228	No	12			appr. 70	appr. 80	final cooler design in case of order					demin water		not shown (service point)
696A	MBV	Drain lube oil cooler , water side	25 or 1"	DIN EN 1092-1, Type 11, B1 or DIN ISO 228	No	12			appr. 70	appr. 80	final cooler design in case of order					demin water		not shown (service point)
717A	MBV	Drain, lube oil piping	3/4"	DIN ISO 228	No		6		50	80						Lube oil		not shown (service point)
1015A	MBV	Overflow safety valve lube oil cooler, water side	tbd later (1/2" - 1")		No	12			appr. 70	appr. 80	final cooler design in case of order					demin water		not shown (service point)

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
1016A	MBV	Overflow safety valve lube oil cooler, water side	tbd later (1/2" - 1")		No	12			appr. 70	appr. 80	final cooler design in case of order					demin water		not shown (service point)
FGFM1	MBP	Fuel gas measurement inlet	tbd later (dep. on FG press. e.g. 250 / 10")		Yes		Depen-ding on press. at Custo-mer TP		60	60		pls. ref. to "Design Conditions" in Sec. 1				fuel gas		MBP10
FGFM2	MBP	Fuel gas measurement outlet	tbd later (dep. on FG press. e.g. 250 / 10")		Yes		Depen-ding on press. at Custo-mer TP		60	60		pls. ref. to "Design Conditions" in Sec. 1				fuel gas		MBP10
AI01	MBL	Drain filter house	>= 100													rain water		not shown (service point)
AI02	MBL	Drain filter house	>= 100													rain water		not shown (service point)

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
AI03	MBL	Drain filter house clean air plenum	>= 50													water		not shown (service point)
AI04	MBL	Drain, inlet duct	G2"													water with small amounts of cleaner		not shown (service point)
PF01	MBL	Pulsfilter-System: compressed air from plant	50			10			80				84			air	DIN/ISO 8573-1 grade 131	MBL30
PF02	MBL	Pulsfilter-System: drain (Compressor Station)				10			80							water, oil contamina ted		MBL30
PF03	MBL	Pulsfilter-System: drain (Compressor Station)				10			80							water, oil contamina ted		MBL30
1000	MBR	Diffuser end (connection to HRSG)		special					620							GT hot exhaust gas		not shown

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
1001B	MBR	Drain, diffuser exit	>50	DIN ISO 228					620							water, chemi-cally contami-nated		not shown (service point)
3001	SAM	Air inlet GT enclosure ventilation							45				10000			fresh air from inside turbine building		SAM30
3002	SAM	Air inlet GT enclosure ventilation							45				10000			fresh air from inside turbine building		SAM30
3003	SAM	Air inlet GT enclosure ventilation							45				10000			fresh air from inside turbine building		SAM30
3004	SAM	Air inlet GT enclosure ventilation							45				10000			fresh air from inside turbine building		SAM30
3005	SAM	Air exhaust GT enclosure ventilation							55				40000			exhaust air to outside of turbine building		SAM30

Flange No.	KKS	Description	DN	Standard	Counter flange	Max. Oper. Pressure	Max. Pressure	Notes (Pressure)	Max. Oper. Temp.	Max. Temp.	Notes (Temp.)	Max. Oper. Mass Flow	Max. Oper. Vol. Flow	Heat Load	Notes (General)	Medium	Medium Quality	Interface Drwg.
				DIN / ANSI	Yes/No	[barg]	[barg]	[barg]	[°C]	[°C]	[°C]	[kg/s]	[l/s]	[kW]				
30A	MKA	Generator cooling water inlet	80	DIN	YES	8	12		60	90			12 - 15			cooling water	demin water / glycol	
30B	MKA	Generator cooling water oulet	80	DIN	YES	8	12		80	90			12 - 15	800 - 1000		cooling water	demin water / glycol	
31A	MKA	Generator cooling water inlet	80	DIN	YES	8	12		60	90			12 - 15			cooling water	demin water / glycol	
31B	MKA	Generator cooling water oulet	80	DIN	YES	8	12		80	90			12 - 15	800 - 1000		cooling water	demin water / glycol	
32A	MKA	Generator cooling water inlet	80	DIN	YES	8	12		60	90			12 - 15			cooling water	demin water / glycol	
32B	MKA	Generator cooling water oulet	80	DIN	YES	8	12		80	90			12 - 15	800 - 1000		cooling water	demin water / glycol	
33A	MKA	Generator cooling water oulet	80	DIN	YES	8	12		80	90			12 - 15	800 - 1000		cooling water	demin water / glycol	
33B	MKA	Generator cooling water oulet	80	DIN	YES	8	12		80	90			12 - 15	800 - 1000		cooling water	demin water / glycol	
34A - 34D	MKA	Generator cooler vent	G1/2	DIN	NO		10			90						air		