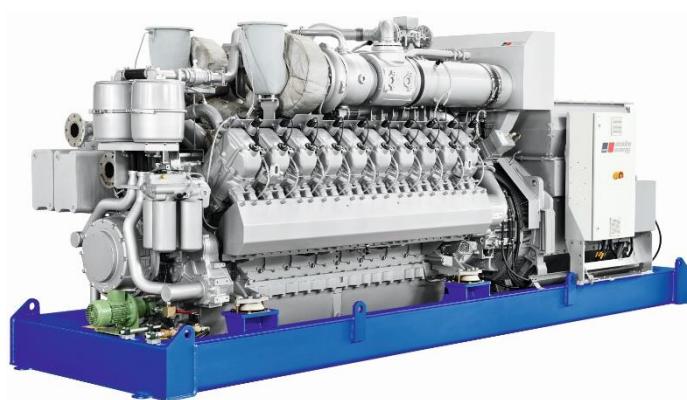




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12V4000L32



Technical Specification

and

Scope of Supply

MTU 12V4000 GS GG12V4000A1

Customer: MTU Onsite Energy GmbH

Project: 023230481

MTU Order: 1197589

03.02.2020



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System Description

Product type	GG12V4000A1
Application Group	MTU 12V4000 GS
	3A - Heavy duty service, unrestricted

Power values

	Unit	Nominal	On-site
Electrical power, 100% CP	kWel	1169	1169
Power factor (cos f)	-	1.0	1.0
Frequency	Hz	50	50
Voltage	V	400	400
Engine rated speed	rpm	1500	1500
Thermal output, engine (Engine block, engine lube oil, 1st stage intercooler) – 100% CP (± 8%)	kW	652	652
Thermal output, engine (Engine block, engine lube oil) – 100% CP (± 8%)	kW	652	652
Thermal Output in exhaust gas cooled (to reference temperature in °C) – 100% CP (± 8%)	kW	638	638
Reference temperature, cooling, exhaust gas	°C	120	120
Thermal output, 2. stage mixture cooler – 100% CP (± 8%)	kW	43	43
Output, thermal, total – 100% CP (± 8%)	kW	652	652
Energy input in accordance with ISO 3046 - 100% (± 5%)	kW	2747	2747
Intake air temperature	°C	35	45
Site altitude above sea level	m	100	400
Relative air humidity	%	60	35
Gas type: natural gas	-	X	X
Methane number (MN), min.	-	80	80
Cooling water temperature, inlet	°C	78	78
Cooling water temperature, outlet	°C	90	90
Mixture cooler, 2. stage water inlet temperature	°C	53	53
Nitrogen oxides (NOx), emissions (dry, referred to reference value residual oxygen)	mg/m³n	500	500
Carbon monoxide (CO) Emission (dry, referred to reference value residual oxygen)	mg/m³n	1000	1000
Reference value residual Oxygen	%	5	5

Technical Data:

1. DATA-RELEVANT DESIGN

Technical data sheet	-	93800050291
Technical description	-	MS13085
Planning drawing plant	-	93406008025
Planning drawing heat recovery unit	-	-
Flow chart (Piping and Instruments) German	-	93200008851
Flow chart (Piping and Instruments) English	-	-

Fuel, fluid and lubricants specification	-	A001072 *)
Load step diagram	-	DK-LS-0052 *)
Methane number derating diagram	-	DK-DR-0003
Combustion air derating diagram	-	DK-DR-0010
Foundation requirement	-	93800050291BI
Maintenance schedule	-	MS50228 *)
Overhaul schedule	-	MS50228 *)
Island mode capability	-	X
Extraction 1st stage intercooler (high temperature circuit)	-	-
Extraction 1st stage intercooler (connection in series 2. stage intercooler)	-	-
Built type	-	GB

2. POWER-RELATED DATA, ELECTRICAL

Voltage	V	400
Frequency	Hz	50
Grid regulations	-	BDEW
Electrical power, 100% CP	kWel	1169
Electrical power, 75% CP	kWel	877
Electrical power, min.	kWel	585
Engine power ISO 3046-1 – 100% CP	A	kW
Engine power ISO 3046-1 – 75% CP	A	kW
Engine power ISO 3046-1 – min.	A	kW
Power factor ($\cos \phi$)	-	1.0
Generator efficiency at $\cos \phi = 1$ – 100% CP	%	97.4
Generator efficiency at $\cos \phi = 1$ – 75% CP	%	97.3
Generator efficiency at $\cos \phi = 1$ – min.	%	96.7
Electrical efficiency, 100%	%	42.6
Electrical efficiency, 75%	%	41.4
Electrical efficiency, min.	%	38.9
Total efficiency incl. thermal output from exhaust, 100%	%	89.5
Total efficiency incl. thermal output from exhaust, 75%	%	89.1
Total efficiency incl. thermal output from exhaust, min.	%	88.0

3. POWER-RELATED DATA, THERMAL

Thermal output, engine (Engine block, engine lube oil, 1st stage intercooler) – 100% CP ($\pm 8\%$)	A	kW	652
Thermal output, engine (Engine block, engine lube oil, 1st stage intercooler) – 75% CP ($\pm 8\%$)	A	kW	487
Thermal output, engine (Engine block, engine lube oil, 1st stage intercooler) – min. ($\pm 8\%$)	A	kW	346
Thermal output, engine (Engine block, engine lube oil) – 100% CP ($\pm 8\%$)	A	kW	652
Thermal output, engine (Engine block, engine lube oil) – 75% CP ($\pm 8\%$)	A	kW	487
Thermal output, engine (Engine block, engine lube oil) – min. ($\pm 8\%$)	A	kW	346
Thermal Output in exhaust gas cooled (to reference temperature in °C) – 100% CP ($\pm 8\%$)	A	kW	638
Thermal Output in exhaust gas cooled (to reference temperature in °C) – 75% CP ($\pm 8\%$)	A	kW	524
Thermal Output in exhaust gas cooled (to reference temperature in °C) – min. ($\pm 8\%$)	A	kW	391
Reference temperature, cooling, exhaust gas	A	°C	120

Output, thermal, total – 100% CP ($\pm 8\%$)	A	kW	652
Output, thermal, total – 75% CP ($\pm 8\%$)	A	kW	487
Output, thermal, total – min. ($\pm 8\%$)	A	kW	346
Thermal output,	A	kW	-
1. stage mixture cooler – 100% CP ($\pm 8\%$)			
Thermal output,	A	kW	-
1. stage mixture cooler – 75% CP ($\pm 8\%$)			
Thermal output,	A	kW	-
1. stage mixture cooler – min. CP ($\pm 8\%$)			
Thermal output, 2. stage mixture cooler – 100% CP ($\pm 8\%$)	A	kW	43
Thermal output, 2. stage mixture cooler – 75% CP ($\pm 8\%$)	A	kW	29
Thermal output, 2. stage mixture cooler – min. ($\pm 8\%$)	A	kW	18

4. CONSUMPTION

Energy input in accordance with ISO 3046 - 100% ($\pm 5\%$)	A	kW	2747
Energy input in accordance with ISO 3046 - 75% ($\pm 5\%$)	A	kW	2119
Energy input in accordance with ISO 3046 - min. ($\pm 5\%$)	A	kW	1502
Lube oil consumption	R	dm ³ /h	0.27

5. COMBUSTION AIR / EXHAUST GAS

Combustion air volume flow – 100% CP – at Reference heating value		m ³ n/h	4614
Combustion air volume flow – 75% CP – at Reference heating value		m ³ n/h	3464
Combustion air volume flow – min. – at Reference heating value		m ³ n/h	2386
Combustion air mass flow - 100% CP – at Reference heating value		kg/h	5959
Combustion air mass flow - 75% CP – at Reference heating value		kg/h	4473
Combustion air mass flow - min. – at Reference heating value		kg/h	3081
Reference heating value fuel for combustion air		kWh/m ³ n	10.10
Exhaust volume flow, wet - 100 % CP		m ³ n/h	4764
Exhaust volume flow, wet - 75 % CP		m ³ n/h	3580
Exhaust volume flow, wet - min.		m ³ n/h	2469
Exhaust volume flow, dry - 100 % CP		m ³ n/h	4404
Exhaust volume flow, dry - 75 % CP		m ³ n/h	3301
Exhaust volume flow, dry - min.		m ³ n/h	2272
Exhaust mass flow, wet - 100 % CP		kg/h	6160
Exhaust mass flow, wet - 75 % CP		kg/h	4627
Exhaust mass flow, wet - min.		kg/h	3191
Exhaust temperature after turbocharger - 100 % CP		°C	457
Exhaust temperature after turbocharger - 75 % CP		°C	487
Exhaust temperature after turbocharger - min.		°C	515

6. GENERAL CONDITIONS AND FUELS

Relative air humidity	A	%	35 *)
Intake air temperature	A	°C	45 *)
Site altitude above sea level	A	m	400 *)
Barometric pressure	A	mbar	1000
Gas type: natural gas		-	X
Gas type: biogas		-	-
Range of heating value: design min.	L	kWh/m ³ n	10.0



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Range of heating value: design max.	L	kWh/m ³ n	10.5
Range of heating value: operation range min.	L	kWh/m ³ n	8.0
Range of heating value: operation range max.	L	kWh/m ³ n	11.0
Methane number (MN), min.	L	-	80
Gas type: Sewage gas	-	-	-
Gas type: Landfill gas	-	-	-

7. EXHAUST EMISSIONS

Nitrogen oxides (NOx), emissions (dry, referred to reference value residual oxygen)	L	mg/m ³ n	500
Carbon monoxide (CO) Emission (dry, referred to reference value residual oxygen)	L	mg/m ³ n	1000
HCHO (dry, at reference value residual oxygen)	L	mg/m ³ n	80
Reference value residual Oxygen	A	%	5

8. OTTO GAS ENGINE

Engine type	-	12V4000L32
Engine rated speed	A	rpm
Number of cylinders	-	12
Cylinder configuration: V angle	-	degrees (°)
Cylinder configuration: in-line vertical	-	-
Bore	mm	170
Stroke	mm	210
Displacement, total	liter	57.2
Compression ratio	-	12.1
Mean piston speed	m/s	10.5
Mean effective pressure (MEP) (at peak torque engine speed)	bar	16.8
Exhaust back pressure, min.	L	mbar
Exhaust back pressure, max.	L	mbar

9. GEARBOX

Transmission ratio	-	-
Geabox heat output (water cooled)	kW	-
Efficiency – 100% CL	-	-
Efficiency – 75% CL	-	-
Efficiency – min.	-	-

10. GENERATOR

Manufacturer	-	CU
Type	-	PE734E2Wdg312
Rating power (temperature rise class F)	kVA	1770
Temperature rise class	-	F
Insulation class	-	H
Winding pitch	-	2/3
Protection	-	IP 23
Max. admissible cos f inductive (overexcited)	L	0.80
Max. admissible cos f capacitive (underexcited)	L	1.0
Voltage tolerance	%	+/- 5
Frequency tolerance	%	+/- 5
Alternator specification	-	XG3734400009

11. COOLANT SYSTEM ENGINE (HIGH-

Customer:	MTU Onsite Energy GmbH	2 x AoE12V4000L32
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TEMPERATURE CIRCUIT)

Cooling water temperature, inlet	A	°C	78
Cooling water temperature, outlet	A	°C	90
Cooling equipment: coolant flow rate	A	m³/h	50.6
Pressure loss in coolant system	R	bar	2.63
Flow coefficient value (CV value)	A	m³/h	31.7
Pressure in cooling system, max.	L	bar	6.0

12. COOLANT SYSTEM (MIDDLE-TEMPERATURE CIRCUIT)

Mixture cooler, 1. stage water inlet temperature	A	°C	-
Intercooler 1nd stage: Water temperature (outlet)	A	°C	-
Intercooler 1nd stage: Coolant volumetric flow	A	m³/h	-
Intercooler 1nd stage: Coolant volumetric flow, min	L	m³/h	-
Intercooler 1nd stage: Pressure drop	A	bar	-
Intercooler 1nd stage: Flow coefficient value (CV value)	A	m³/h	-
Intercooler 1nd stage: Operation pressure, min	L	bar	-
Intercooler 1nd stage: Operation pressure, max (outlet)	L	bar	-

13. COOLANT SYSTEM (LOW-TEMPERATURE CIRCUIT)

Mixture cooler, 2. stage water inlet temperature	A	°C	53
Intercooler 2nd stage: Water temperature (outlet)	A	°C	54.8
Intercooler 2nd stage: Coolant volumetric flow	A	m³/h	22.5
Intercooler 2nd stage: Pressure drop	A	bar	0.24
Intercooler 2nd stage: Flow coefficient value (CV value)	A	m³/h	47.0
Intercooler 2nd stage: Operation pressure, max (outlet)	L	bar	6.0

14. EXHAUST GAS HEAT EXCHANGER

Exhaust gas heat exchanger: Cooling water temperature (inlet)		°C	-
Exhaust gas heat exchanger: Cooling water temperature (outlet)		°C	-
Exhaust gas heat exchanger: Coolant volumetric flow		m³/h	-
Exhaust gas heat exchanger: Coolant volumetric flow, min	L	m³/h	-
Exhaust gas heat exchanger: Pressure drop	A	bar	-
Exhaust gas heat exchanger: Flow coefficient value (CV value)	A	m³/h	-
Exhaust gas heat exchanger: Operation pressure, min	L	bar	-
Exhaust gas heat exchanger: Operation pressure, max.	L	bar	-
Exhaust gas temperature downstream of exhaust heat exchanger – 100% CP		°C	-

15. HEATING CIRCUIT INTERFACE

Heating circuit: engine coolant temperature, inlet	A	°C	-
Heating circuit: engine coolant temperature, outlet	A	°C	-
Heating water temperature, return	A	°C	-
Heating water temperature, feed side	A	°C	-
Heating water flow rate		m³/h	-
Heating circuit: Pressure Drop	A	bar	-
Heating circuit: Flow coefficient value (CV value)	A	m³/h	-
Heating circuit: Max. operation gauge pressure (heating water)	L	bar	-

16. ROOM VENTILATION

Room ventilation:		kW	71
Genset ventilation heat – 100% CL			
Room ventilation:	A	°C	35
Combustion air temperature			
Room ventilation:	L	°C	30
Combustion air temperature, min.			
Room ventilation:	L	°C	40
Combustion air temperature, max.			
Engine room temperature, min.	L	°C	15
Engine room: Temperature difference ventilation air (inlet/outlet), max.	L	K	20
Supply air volume flow rate (combustion+ventilation), max.	L	m³/h	14500

17. STARTING (ELECTRIC)

Starter, rated voltage (standard design)	R	VDC	24
Starter, rated power (standard design)	R	kW	9

18. CAPACITIES

Engine coolant (without external cooling system)	R	liter	200
On-engine cooling water capacity, mixture-cooler side (without cooling equipment)	R	liter	20
Engine oil capacity, initial filling (standard oil system)	R	liter	280
Gear oil filling capacity	R	liter	-
Heating water filling capacity	R	liter	-

19. GAS TRAIN

Gas train - normal size		DN	80
Gas pressure at inlet of gas train, min	L	mbar	130
Gas pressure at inlet of gas train, max.	L	mbar	250

20. ACOUSTICS

Engine sound level – 63 Hz (free-field sound-pressure level Lp, 1m distance, ISO 8528-10)	R	dB	78.1
Engine sound level – 125 Hz (free-field sound-pressure level Lp, 1m distance, ISO 8528-10)	R	dB	86.0
Engine sound level – 250 Hz (free-field sound-pressure level Lp, 1m distance, ISO 8528-10)	R	dB	88.4
Engine sound level – 500 Hz (free-field sound-pressure level Lp, 1m distance, ISO 8528-10)	R	dB	93.6
Engine sound level – 1000 Hz (free-field sound-pressure level Lp, 1m distance, ISO 8528-10)	R	dB	92.3
Engine sound level – 2000 Hz	R	dB	89.8

(free-field sound-pressure level Lp, 1m distance, ISO 8528-10)			
Engine sound level – 4000 Hz	R	dB	87.9
(free-field sound-pressure level Lp, 1m distance, ISO 8528-10)			
Engine sound level – 8000 Hz	R	dB	98.1
(free-field sound-pressure level Lp, 1m distance, ISO 8528-10)			
Sum of pressure levels	R	dB	101.2
Sum of pressure levels	R	dB(A)	100.4
Sound power level	R	dB(A)	119.7
Undampened exhaust noise – 63 Hz	R	dB	113.8
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 125 Hz	R	dB	114.9
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 250 Hz	R	dB	112.3
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 500 Hz	R	dB	102.2
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 1000 Hz	R	dB	92.6
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 2000 Hz	R	dB	91.4
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 4000 Hz	R	dB	88.3
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Undampened exhaust noise – 8000 Hz	R	dB	83.0
(free-field sound-pressure level Lp, 1m distance, ISO 6798)			
Sum of pressure Levels exhaust noise	R	dB	118.7
Sum of pressure Levels exhaust noise	R	dB(A)	106.0
Sound power Level exhaust noise	R	dB(A)	118.6

21. MASSES / DIMENSIONS

Plant length (with standard accessories)	R	mm	4700
Plant width (with standard accessories)	R	mm	2000
Plant height (with standard accessories)	R	mm	2300
System dry mass (with Standard accessories)	R	kg	12000
System mass, wet, (with standard accessories)	R	kg	12500
Length heat recovery unit	R	mm	-
Width heat recovery unit	R	mm	-
Height heat recovery unit	R	mm	-
Gross mass (dry mass) heat recovery unit	R	kg	-
Gross mass (wet mass) heat recovery unit	R	kg	-

* = contract value, L = limit value, G = guaranteed value, R = guideline value

Note: The timeliness of the technical specifications may change until the binding contract is closed. Changes due to further technical development cannot be excluded. MTU underlines that the latest status may be obtained through MTU's communication platform Business Portal unter "Applications & Products" – "Tools" → "TEN".

II. Selection Criteria for the Scope of Supply

Criteria	Selection	for Product No.
Application group	3A - continuous power	1-2,

Customer:	MTU Onsite Energy GmbH	2 x AoE12V4000L32
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Instruction for exhaust emission	See technical data	1-2,
Power	See technical data	1-2,
Speed	1500 rpm	1-2,
Frequency	50 Hz	1-2,
Generator voltage	400 V	1-2,
Engine type	12V4000L32	1-2,
Generator manufacturer	Stamford	1-2,
Gas type	Natural gas	1-2,
Island operation capability	Yes	1-2,
Operating mode	Island parallel operation	1-2,
Build type	Genset without heat recovery (GB)	1-2,
Cooling water-/Heating water temperatures	78/90	1-2,
Auxiliary drive voltage	400 V	1-2,
Control panel	MIP and MMC control system	1-2,
Operation in combination grid type generator	---	1-2,
grid type auxiliary supply	---	1-2,
Altitude	---	1-2,
Ambient temperature MIP	Altitude up to 1000 m	1-2,
High temperature extraction	>=40°C up to 55°C	1-2,
Country of operation	without extraction of high temperature circuit	1-2,
Flexible connections	outside Germany	1-2,
Acceptance Testing	with flexible connections	1-2,
Packing	Factory acceptance	1-2,
Shipment	Seaworthy	1-2,
	CFR ...	1-2,

Scope of Supply

	valid for engine No.
1 SYSTEM CONFIGURATION	1-2,
1.1 System Description	1-2,
Note Emission Compliance:	1-2,
The engines and/or systems, may only be certified to comply with the required country or region specific emission regulations. Where applicable, the engines and/or systems are only certified to those specific emission regulations/standards which are clearly stated in the respective RRPS/MTU defined technical specifications. It is the customer's sole responsibility to ensure that the export/import, installation and use of the engine and/or system complies with the applicable emissions regulations in the country or region where the engine and/or system will be used.	
Denomination	
GG12V4000A1-12VL32_N_50_400V_GB	
The compact design genset consist of the following basic assemblies:	1-2,
<ul style="list-style-type: none"> – Engine (including gas train) – Alternator and coupling – Base frame – MIP (MTU Interface Panel) as interface to engine management, control and diagnostic system 	
Engine and alternator are rigidly connected via a direct coupling and housing. The engine-alternator unit is isolated from the base frame via resilient mounts.	
The alternator is mounted on two rails to facilitate replacement of the coupling element.	
For further details, refer to the attached technical description of the scope of supply.	
With integrated coolant preheating including temperature control as well as lube oil pump as prelubricating and waste oil pump with safety valve for forced feed lubrication and piston cooling.	
The hardware and software in the MIP control cabinet ensure closed-loop genset control functions, open-loop control and monitoring features as well as the communication to and from external systems. A cogeneration control system with visualization and user interface is required in addition to MIP to operate the genset (e.g. MTU MMC or on site customer's control).	
Flexible connections	1-2,
Flexible connections are supplied to compensate thermal expansion and to provide vibrational isolation.	
Hose connections for lube oil supply and disposal and extended oil circulation volume	
Flexible connection for engine coolant circuit with flange connection	
Flexible connection for mixture coolant circuit with flange connection	
Exhaust bellow with flange connection and companion flange	1-2,

Genset preservation

1-2,

Standard corrosion protection is provided for long-distance transport and/or extended storage for maximum of 12 month from readiness for dispatch.

The specified preservation period applies to unopened packing and dry, normal storage conditions as follows:

- Frost-free, closed, heated, clean rooms
- Storage temperature between 10°C and 40°C.
- Monthly average relative humidity not above 65%
- Re-preservation required after 12 months

Safety standards

1-2,

MTU Onsite Energy GmbH within its system borders of the scope of supply delivers all required safety components according to the valid Safety Standard DIN EN ISO 13849 (Safety of Machinery - Safety-related Parts of Control Systems). For the peripheral system not included in MTU's scope of supply, the principal has to make sure that any required safety component also complies to DIN EN ISO 13849 (refer also to "Component Quality Guideline DIN EN ISO 13849" attached).

Further applied harmonized standards:

EN ISO 12100:2010

EN ISO 8528-13:2016

EN 1679-1:1998+A1:2011

EN 60204-1:2006

Antifreeze measures

1-2,

In case of frost damages MTU-OEG will not be liable for components, which after delivery have not been filled with a suited antifreeze according to MTU-OEG specifications. The client must make sure that functioning heating mechanisms reliably prevent freezing.

Remaining and site conditions

1-2,

Continuous power, no overload capability, refers to mains parallel operation, at nominal speed and standard reference conditions according to technical datasheet.

The nominal power output specified in the datasheet is available at site altitudes up to 400 m above sea level without power reduction. For further details, refer to the attached datasheet.

In case of knocking due to low methane number or increased mixture temperature the ignition timing of the affected cylinders is adjusted. If knocking persists, the power output is reduced automatically

Definition of operating modes

1-2,

Parallel island mode

1-2,

By definition, an island parallel mode refers to a design in which two gas engine genset (linked via a common busbar) must ensure the continuous power supply to certain consumers without being connected to the public grid. The resulting loads of the respective consumers will be switched on or off in steps.

In all operation modes, the admissible load steps approved by MTU Onsite Energy must not be exceeded and the transient recovery times must not be fallen short of.

1-2,

Other site conditions for isolated or mains backup operation

- Consumer structure
- Operating conditions
- Performance characteristic

- Load steps and tolerances
are applicable in accordance with the attached specification DK-LS-1001.

These operating modes might require an extended CHP plant control system and a higher-level I&C system (e.g. for load management). The review of the project-related requirements for the given operating mode as well as the components are not included in the scope of supply of MTU Onsite Energy.

1.2 Starting Aids

- Without

Denomination	
PROTECTIVE CAP	FOR STARTER
PROTECTIVE CAP	FOR STARTER
STRAIN RELIEF-MIT PROFILSCHIENE	- 1 STARTER

1.3 Base Frame

Base frame designed as welded steel profile structure including lifting eyes; with integrated safety oil sump for the oil volume contained in the engine, with oil leakage monitoring.

Denomination	
BASE FRAME	FOR GENSET
SLIDE RAIL	
ALTERNATOR MOUNT	
ENGINE MOUNT	
LEAK SENSOR	FOR OIL PAN

1.4 Vibration Isolation

The engine-alternator unit is mounted on the base frame with resilient mounts. This design isolates the vibrations generated by the engine and/or alternator from the base frame.
To minimize the remaining residual vibration level, resilient mats are provided between base frame and foundation (sylomer straps, supplied as loose parts, for installation on site).

Denomination	
BASE FRAME MOUNTING	
BASE FRAME MOUNTING	

2 ENGINE CONFIGURATION

2.1 Engine System

Series 4000 four-stroke turbocharged Otto gas engine with mixture cooling - compact, high-performance, reliable, maintenance-friendly and extremely economical.

Lean mixture technology, state-of-the-art electronic ignition system with individual ignition timing and automatic ignition power control, anti-knock control as well as highly responsive mixture and load control ensure economical and safe genset operation with optimum use of the energy input.

Basis

- counter-clockwise rotation engine
- coolant cooled
- lean mixture supercharging
- two-stage mixture cooling
- open combustion chamber
- microprocessor-controlled high-voltage ignition system
- exhaust turbocharging
- two cooling system circuits
- piston cooling

Core engine

- Gray cast iron crankcase with assembly holes, gray cast iron oil pan,
- Forged crankshaft, forged connecting rods,
- Individual, cylinder heads with four valves each

1. Crank drive

The crank drive is installed in the crankcase. It is supported in sleeve bearings and locked in axial direction. Engine oil from the crankcase is used to lubricate the bearings, vibration damper and pistons. Carefully matched components ensure high performance and minimum wear.

Crankcase with oil pan

The oil pan is attached to the bottom of the crankcase; gearcase, coolant distribution housing and flywheel housing are bolted to the front.

The cylinder heads and engine lifting points are mounted left and right on the top decks.

Technical data

- Single-cast crankcase
- Integral coolant ducting
- Main oil gallery integrated in top cover
- Replaceable, wet cylinder liners
- Split sleeve bearings for crankshaft
- Sleeve bearings for camshaft
- Crankshaft bearing caps secured vertically and horizontally
- Integrated oil supply for piston cooling
- Crankcase ventilation (closed circuit)
- Large inspection port covers

Benefits

- High rigidity
- Low noise and vibration levels

Pistons

- Piston with integral cooling duct
- Piston cooling through oil-spray nozzles

Connecting rods

- Forged
- Machined as one piece, providing high rigidity and weight optimization

Crankshaft

- Forged
- Bolted counterweights
- Pressed-on crankshaft gear
- Low-wear sleeve bearing, oil supply from lube oil system
- Locked in axial direction

Flywheel (driving end)

- PTO flange

- Ring gear for starter pinion

Crank drive benefits:

- High performance
- Minimum weight
- Long service life

2. Cylinder head with add-on components

The cylinder heads with valve drive and spark plug are mounted on the crankcase.

Coolant for cylinder head cooling as well as engine oil for valve gear lubrication are supplied from the crankcase.

Technical data

- Individual cylinder heads
- Two inlet and exhaust valves
- Centrally arranged spark plug

Benefits

- Designed for high ignition pressures
- Low exhaust emissions
- Long maintenance intervals

3. Mixture formation, turbocharging

1-2,

Venturi gas mixer with gas supply through electronically controlled metering valve.

Mixture cooling

- Two-stage mixture cooling
- 1st stage is either integrated as high temperature stage (HT) in the engine cooling system or designed as HT circuit integrated in the heating system
- 2nd stage is designed as low temperature stage (LT) with external cooling circuit

Charging

- Mixture compression by exhaust turbocharger
- Throttles between mixture coolers and mixture distribution lines

4. Engine cooling system with 2 separate circuits

- HT circuit with integrated oil cooling, first-stage mixture cooling and cylinder cooling
- Integrated coolant preheating

5. Starting equipment

1-2,

- Electrical starter
- Two starters (16V and 20V)

6. Ignition system

- Microprocessor-controlled high-voltage ignition system with low-voltage distribution, no moving parts, wear-free
- Automatic ignition power control
- One ignition coil per cylinder
- High-performance sparkplugs

7. Engine monitoring

Measurement and monitoring of the following values:

- Engine oil pressure, engine oil temperature and engine oil level
- Coolant pressure and coolant temperature before and after engine
- Intake air pressure and intake air temperature

- Mixture pressure and mixture temperature
- Crankshaft speed, camshaft speed, turbocharger speed
- Crankcase pressure
- Exhaust bulk temperature
- Cylinder exhaust temperatures

8. Control

Engine governor

- Controls the starting, stopping and emergency stop sequence
- Monitors the engine operating parameters
- Controls throttles and sets gas mixture for requested speed/power
- Monitors the first gas solenoid valve the gas train to the engine

Engine monitoring

- Evaluation unit for PT 1000 temperature sensor to determine and monitor exhaust temperatures of individual cylinders
- Monitors the second gas solenoid valve the gas train to the engine

Ignition system

- Cylinder-selective adjustment of ignition voltage and ignition timing

Anti-knock control AKR

- Controls the cylinders with regard to the knock characteristics.

Gas control valve

- Controls the required amount of gas

Denomination
GAS ENGINE-12V4000L32 - FN - 35/53 - 12,1
GROUND CABLE

2.2 Exhaust System

1-2,

The exhaust system consists of the following:

1-2,

- 1 turbocharger 8V, 12V, 16V
- 2 turbochargers 20V, two exhaust pipes / outlets,
- Uncooled, insulated exhaust manifolds in engine Vee, arrangement ensures protection against accidental contact

Denomination
EXH PIPE BELLOWs COMPLETE
EXH PIPE BELLOWs COMPLETE

2.3 Fuel System

1-2,

The gas train is supplied in accordance with the pressure equipment directive (DGRL as amended), with CE declaration of conformity in accordance with DGRL. One hose connection is supplied loose for installation on site.

1-2,

- Flow direction gas control path: left to right

1-2,

The gas train consists of aluminum pressure die casting, sealing material NBR and completely pre-assembled.

1-2,

Components of the gas train include:

- Gas filter
- Double solenoid valve
- Balanced pressure regulator
- Valve tightness check
- Pressure monitor
- Flexible stainless steel hose assembly for direct connection of the gas train to the gas control valve

Cabling between MIP and gas train according to the basic MTU wiring diagrams.

Denomination
GAS CONTROL PATH-LI-RE
GAS CONTROL PATH-LI-RE
GAS HOSE
GAS HOSE

2.4 Oil System

1-2,

Lubrication Oil System

1-2,

The lubrication oil system consists of the following:

- Engine-mounted gear-type lube oil pump with safety valve for forced-feed lubrication and piston cooling and connection to an extended lube-oil circulation volume
- Lube oil heat exchanger, engine-mounted
- Paper-type lube oil filter with exchangeable filter cartridges
- Oil float switch with Reed contacts to control the solenoid valve to control automatic oil replenishment system
- Oil level dipstick
- Crankcase ventilation via oil separator with discharge to the mixture line before the turbocharger
- Connections for oil replenishment and oil extraction

The lube oil system comprises an integrated waste oil pump, which is used for **emptying and prelubricating** the genset. Pipe connections on site:

- Oil sump under the genset (without WHG approval)
- Waste-oil/oil priming pump with three-way solenoid valve mounted on the base frame
- Oil sump under the pump assembly (without WHG approval)
- Solenoid valve for fresh-oil replenishment and prepared for an extended oil volume

Denomination
OIL SUPPLY BASIC SCOPE-SERIE SCHREZINGER
SET OF HOSE LINES FOR LUBE OIL SYSTEM
SET OF HOSE LINES FOR LUBE OIL SYSTEM
SET OF HOSE LINES FOR LUBE OIL SYSTEM-HOHLSCHEIBE
SET OF HOSE LINES FOR LUBE OIL SYSTEM
SET OF HOSE LINES FOR LUBE OIL SYSTEM-HOHLSCHEIBE
HOSE COMPLETE
HOSE COMPLETE

HOSE	COMPLETE
HOSE	COMPLETE
2/2-WAY VALVE	FOR LUBE OIL SYSTEM
3/2-WAY VALVE	FOR LUBE OIL SYSTEM
OIL PUMP UNIT-SERIE SCHREZINGER	

2.5 Air Intake System

1-2,

Intake air system

1-2,

The Air Intake System includes the following:

- Air intake through dry-type air filters mounted on engine or intake housing
- Intake air filters designed as dry-type filter cartridges
- 1 intake air filter 8V, 12V, 16V
- 2 intake air filters incl. intake housing 20V
- incl. service indicator and sensor for automatic pollution monitoring

Denomination
AIR FILTER COMPLETE
AIR FILTER COMPLETE

4 GENERATOR CONFIGURATION

1-2,

4.1 Generator Specification

1-2,

Highly efficient, self-excited brushless synchronous alternator

1-2,

General data:

- Housing
- 2/3-pitch winding to prevent high harmonic neutral currents and reduction of 3rd order harmonics
- 2-bearing alternator, lubricatable bearing
- Dynamically balanced as per BS 6861-1 stage 2,5
- Self ventilated alternator IC 0A1
- Protection class IP23
- Alternator terminal box for main and auxiliary power circuit (for medium voltage alternators: medium and lower voltage separated)
- Outlet for power cable at left from drive end view, including non magnetic inlet cover
- Alternator suitable for operation mode S1, for mains parallel operation and in parallel or island operation among other alternators
- Excitation system: PMG (permanent magnet machine)
- Sustained short circuit current at 3-pole terminal short circuit is minimum 3 times rated current for 10 seconds
- Maximum overspeed 2250 rpm, for maximum 2 minutes
- Digital voltage regulator
- Protection transformer xxx/1A 5P10
- Measuring transformer xxx/1A
- 2 times PT100 winding temperature monitoring for each phase integrated in stator winding
- 1 time PT100 bearing temperature monitoring per bearing
- Alternator anti condensation heater integrated

Norms and regulations:

- IEC 60034-1
- EN 61000-6-2 Criteria B
- BS 5000-3
- ISO 8528-3
- AS 1359

Regulations for static and dynamic grid support (grid guideline)

1-2,

The alternator does not comply with eventual regulations for static and dynamic grid support

Denomination
GENERATOR
RESILIENT COUPLING
BELL HOUSING

4.2 Power Transmission

1-2,

The torque produced by the engine is transmitted to the alternator via a highly resilient flange coupling. 1-2,

5 CONTROL PANEL CONFIGURATION

1-2,

5.1 Genset Control

1-2,

The MIP with cooling unit (instead of fan) is designed for an control panel temperature of 10°C to 55°C 1-2,

Denomination
COOLING UNIT MIP 50HZ
CABLE DUCT-C-PROFIL GR
GROUND CABLE
GROUND CABLE
CABLE ROUTING
CONTROL CABINET FOR GENSET-V3.7

Alarm indicator flash light

1,

Alarm indicator flashlight. Supplied loose for assembly on site.

Denomination
FLASHLIGHT
FLASHING LAMP-0412-WERMA

-Übersetzung fehlt --

2,

Denomination
FLASHLIGHT
FLASHING LAMP-0412-WERMA
TEMP. SENSOR IN ENGINE ROOM-BR0400 - BR4000

TEMP. SENSOR IN ENGINE ROOM-BR0400 - BR4000
WIRING HARNESS-STD; MIP 3.7

6 AUTOMATION CONFIGURATION

1-2)

6.1 Automation Description

1-2)

Denomination
SWITCHGEAR CABINET FOR GENSET
SWITCHGEAR CABINET FOR MMC-DUMMY MMC
SWITCHGEAR CABINET FOR GENSET
SWITCHGEAR CABINET FOR MMC-DUMMY MMC
MMC 4000 BASIC-V3

MIP and MMC

1-2)

The MIP (MTU Interface Panel) contains the genset control including alternator monitoring and synchronization equipment and is the standard interface between genset control system and MMC (MTU Module Control)

The MMC contains the cogeneration control system including mains monitoring, visualization and user interface. On site, the MMC control cabinet is attached separately on the floor.

The MIP (MTU Interface Panel) mainly includes the following components:

- Control elements (EMERGENCY STOP button)
- PLC central unit (Programmable Logic Control with various interfaces and input / output modules)
- EMM (Generator and mains protection, synchronizer) VDEW conformity
- Communication with ADEC engine controller and engine monitoring EMU via hardware signals and CAN bus
- Control of genset mounted auxiliary drives
- Basic-Hardware-Interfaces for connection to external systems
 - Measured line voltage (synchronization / power system protection)
 - Bus bar voltage (synchronization / power system protection)
 - Generator circuit-breaker checkback (On, Off, alarm)
 - Mains circuit-breaker checkback (On, Off, alarm)
 - Differential protection, ground fault protection external
 - Mains protection from outside
 - Mains failure test from outside
 - Manual EMERGENCY STOP feedback circuit from outside
 - Generator voltage at medium voltage

– Output signals:

- Generator circuit-breaker activation (MCB On, MCB Off)
- Mains circuit-breaker activation (MCB On, MCB Off)
- Start request for auxiliary drives, general
- Open back-up switch
- Manual EMERGENCY STOP to outside

PLC (Programmable Logic Control)

Integrated functions:

- Recording of all measured data (analog and digital) of the basic scope
- Start / Stop procedure
- Control of genset mounted auxiliary drives

- Further control functions (power control)
- Evaluation of all alarm and status messages
- Monitoring of analog values
- Backup of parameters, measuring and operating data

Monitoring functions

Generator protection:

- Overfrequency (ANSI: 81, IEC: f>)
- Underfrequency (ANSI: 81, IEC: f<)
- Overtension (ANSI: 59, IEC: U>)
- Undervoltage (ANSI: 27, IEC: U<)
- Normally dependent overcurrent (ANSI: 51, IEC: I>t>)
- Overcurrent (ANSI: 50, IEC: I>>)
- Overload (ANSI: 32F, IEC: Pf>>)
- Reverse power (ANSI: 32R/F, IEC: Pr>, Pf>)
- Unbalanced load (ANSI: 46, IEC: I2>)

Synchronization functions

- Synchronization (ANSI: 25, IEC: --)

The MMC (MTU Module Control) mainly includes the following components:

- IPC (Industrial PC with 15" touch display) for visualization and user interface
- Control elements (key-operated switches, pushbuttons, EMERGENCY STOP button)
- Peripheral assemblies of the PLC control with digital and analog inputs and outputs
- Battery charger for providing the control voltage
- Basic-Interfaces for connection to external systems
 - Operating mode requirements (three inputs for the selection of operating modes: variable setpoint, fixed value 1 and 2)
 - Three external EMERGENCY STOP buttons
 - "Active power setpoint" (4-20 mA corresponds to 0-100 %) for variable setpoint operating mode
 - Status messages: Operational readiness for external selection, engine is running, group alarm
 - WAN interface for connection to the MTU remote monitoring system

PLC (Programmable Logic Control)

The PLC uses the Ethernet to communicate with the IPC.

Integrated functions:

- Recording of all measured data (analog and digital) of the basic scope and the selected options
- Optionally selected control of the external auxiliary drives
- Optionally selected control functions
- Evaluation of all alarm and status messages (storage and display at the IPC)
- Monitoring of analog values
- Backup of parameters, measuring and operating data

Monitoring Functions

Mains protection:

- Overfrequency (ANSI: 81, IEC: f>)
- Underfrequency (ANSI: 81, IEC: f<)
- Overtension (ANSI: 59, IEC: U>)
- Undervoltage (ANSI: 27, IEC: U<)

Control cabinet dimensions (WxHxD)

Control cabinet dimensions for MMC basic scope:

- 800 x 2000 x 600 mm

Deviating cabinet dimensions depending on selected options.

For further details refer to enclosed technical description MS61037.

Operating conditions

- Air humidity: 10 to 80 %, non-condensing 1-2)
- Control cabinet IP54
- Ambient temperature up to 40 °C 1-2)
- Installation height above msl (mean sea level) 1000 m 1-2)

6.2 Power mode

Floating power control

The power set point signal is provided from external (4-20mA signal or Bus-interface) variable between minimum and maximum value.

Fix value 1+2

The default power set point is adjusted via touch screen or from external (bus connection).

6.3 Operating mode

Multiple genset operation - Usage of common functions, when operating multiple gensets in parallel

1-2)

1-2)

Isolated operation

- Connection to external common control system

1-2)

6.4 Electrical integration

Grid type generator feed/supply

- TN-S-grid generator feed/supply 1-2)

Grid type auxiliaries supply

- TN-S-grid type auxiliaries supply 1-2)

System structure

- Low voltage-site without stepup-transformer 1-2)

Additional protection devices

1-2)

1-2)

6.5 control of circuit breaker

Generator circuit breaker

- Control: via dry contact 1-2)

- Control of an external power breaker 1-2)

Mains circuit breaker	1-2)
– Without control	1-2)
Backup-function (in case of generator circuit breaker failure)	1-2)
– Basic function: backup-function acting on mains circuit breaker	1-2)
– Additional function: Backup-function not until "drag operation" (standard)	1-2)
6.6 Connection to Common Control System	1-2)
Connection to external common control	1-2)
– Common control functions	
6.7 Auxiliary systems	1-2)
ENGINE COOLING WATER SYSTEM	1-2)
Control engine cooling water pump	1-2)
– Without	1-2)
Signal input for temperature sensor	1-2)
– Position sensor: engine cooling temperature after plate heat exchanger	
Warming-up ramp	1-2)
– Activate warm-up ramp	
HEATING WATER SYSTEM	1-2)
Control heating water pump	1-2)
– Without	1-2)
Heating water control	1-2)
– Control via analog control signal	1-2)
– Supply voltage 24 VAC	1-2)
– Control signal 0-10V	1-2)
– Signal input temperature sensor for control	1-2)
– Position sensor: heating water temperature inlet	1-2)
MIXTURE COOLING WATER SYSTEM	1-2)
– Control via analog control signal	1-2)
– Supply voltage 24 VAC	1-2)

– Control signal 0-10V 1-2)

– Position sensor: mixture cooling water - temperature after regulating valve 1-2)

TEMPERATURE CONTROL SYSTEM FOR ENGINE ROOM 1-2)

Control for engine room ventilation 1-2)

– Signal input temperature sensor for engine room control
– Position sensor: temperature engine room

GAS/FIRE ALARM SYSTEM 1-2)

Gas alarm system 1-2)

– Signal input for external gas alarm device

Fire alarm system 1-2)

– Signal input for external fire detection system

Signaling 1-2)

– Signal output to extern at gas-/fire alarm

LUBE OIL SYSTEM 1-2)

FUEL SYSTEM 1-2)

Operation mode gas 1-2)

– Single gas operation

6.8 SPECIAL FUNCTIONS ELECTRICAL EQUIPMENT 1-2)

Counter / meter evaluation 1-2)

– Without 1-2)

6.9 SOFTWARE CONFIGURATION 1-2)

Software interfaces 1-2)

– Ethernet (UDP) 1-2)

Remote access 1-2)

– Remote access via internet (DSL/UMTS/LTE) with customer router 1-2)

For details please refer to documentation „Remote diagnostic system” MS60053. 1-2)

Visualization 1-2)

– Additional third language: without 1-2)

6.10 SWITCH BOARD CONFIGURATION MMC 1-2)

Painting of cabinet 1-2)

– RAL 7035

Denomination
PAINT FOR SWITCH CABINET-RAL 7035

Labeling

- Labeling: MMC

1-2)

Denomination
INSCRIPTION TOP-BESCHRIFTUNG, STANDARD

Size of panel

- Size of panel: W800 x H2000 x D600 mm

1-2)

Denomination
HOUSING FOR SWITCH CABINET-800X2000X600

Panel door

- Door hinge right

1-2)

Denomination
DOOR HINGE FOR SWITCH CABINET-RECHTS

- With Door locking device

1-2)

Denomination
LOCKING DEVICE FOR SWITCH CABINET

Pedestal

- Height of pedestal: 100 mm

1-2)

Denomination
SOCLE-800X400X100
BASE FOR SWITCH CABINET
SOCLE-800X400X100
BASE FOR SWITCH CABINET

Side panels

- With both side panels

1-2)

Denomination
SIDE WALL FOR SWITCH CABINET-2000X600
BOUNDARY CONDITIONS FOR SWITCH CABINET- UMGEBUNGSTEMP. MIN >= +10°C
BOUNDARY CONDITIONS FOR SWITCH CABINET- UMGEBUNGSTEMP. MAX UNTER 40

Air conditioning

- Without cooling unit

1-2)

Fan

- Fan size 105 m³/h

1-2)

Denomination

FAN-AND-FILTER UNIT FOR SWITCH CABINET-230 VAC,
204X204MM

Air outlet

- 1 outlet filter in door, at the top centered (max. IP54)

1-2)

Denomination

OUTLET FILTER FOR SWITCH CABINET-204X204 MM

Lock

- Standard with dual-bit lock

1-2)

Denomination

CLOSURE FOR SWITCH CABINET

Scope

- Standard lamp in cabinet
- Support roll for door

1-2)

Denomination

LAMP FOR SWITCH CABINET

- Control battery

1)

Denomination

CONTROL BATTERY

--Übersetzung fehlt --

2)

Denomination

CONTROL BATTERY

Cable inlets

- Control cable total: at the top through cover (flange plate)

1-2)

1-2)

Denomination

CABLE ENTRY FOR CONTROL CABLE
CABLE SET FOR CONTROL-X2X-LEITUNG, TEILKONFEKT. 25 M
CONTROL CABLE
GENSET ACCEPT. RUN FOR CONTROL
CERTIFICATE ELECTROTECHNICAL

7 EXHAUST AFTERTREATMENT 1-2,

7.1 Aftertreatment Specification 1-2,

Optionally an oxidation catalyst per genset is available to reduce the carbon monoxide and formaldehyde emissions, supplied loose for installation on site.

9 HEAT EXTRACTION 1-2,

9.1 Heat Extraction Jacket Water 1-2,

Heat recovery from jacket water is not included in the scope of supply.

1-2,

Denomination
CONNECTION LINE FOR ENGINE COOLANT
CONNECTION LINE FOR ENGINE COOLANT
CABLING FOR GENSET-MIT AGGREGATE KABELBAUM
CORRUGATED TUBING FOR MIXTURE COOLER
CORRUGATED TUBING FOR MIXTURE COOLER

10 PLANT CONFIGURATION 1-2,

10.1 Intercooler System - Plant 1-2,

Denomination
COOLANT MIXTURE PUMP-NB32-125/136 A-F-A-BQQV
COOLANT MIXTURE PUMP-NB32-125/136 A-F-A-BQQV
PRESSURE EXP.TANK
VALVE F.PRESSURE EXP.TANK
VENT VALVE
PRESSURE EXP.TANK
VALVE F.PRESSURE EXP.TANK
VENT VALVE

3-way-valve mixture cooling with electric actuator including counter flanges, gaskets, bolts and nuts.
Delivered loose.

1-2,

For details please refer to the attachment MS61021

1-2,

Drawing item number GMK4000_VG_1

1,

Denomination
THREE-WAY VALVE-8V+12V4000
3/2-WAY VALVE F.MIX.COOLING CIRC.-VXF42.50-40

-Übersetzung fehlt --

2,

Denomination	
THREE-WAY VALVE-8V+12V4000	
3/2-WAY VALVE	F.MIX.COOLING CIRC.-VXF42.50-40
DRIVE	FOR VALVE-SAX61.03
DRIVE	FOR VALVE-SAX61.03
CONNECTING FLANGE	COMPLETE
CONNECTING FLANGE	COMPLETE

10.3 Heating water system plant

1-2,

Denomination	
PRESSURE EXP.TANK	
VALVE	F.PRESSURE EXP.TANK
VENT VALVE	
PRESSURE EXP.TANK	
VALVE	F.PRESSURE EXP.TANK
VENT VALVE	
COOLANT PUMP-NB40-160/171 A-F2-A-BQQV	
COOLANT PUMP-NB40-160/171 A-F2-A-BQQV	

3-way-valve heating water with electric actuator including counter flanges, gaskets, bolts and nuts.
Delivered loose.

1-2,

For details please refer to the attachment MS61021

1-2,

Drawing item number HW4000_VG_3

1,

Denomination	
THREE-WAY VALVE-12V4000	
3/2-WAY VALVE	F.HOT WATER SYSTEM-VXF42.80-80

-Übersetzung fehlt --

2,

Denomination	
THREE-WAY VALVE-12V4000	
3/2-WAY VALVE	F.HOT WATER SYSTEM-VXF42.80-80
DRIVE	FOR VALVE-SAX61.03
DRIVE	FOR VALVE-SAX61.03
CONNECTING FLANGE	F.HOT WATER SYSTEM
CONNECTING FLANGE	F.HOT WATER SYSTEM

10.4 Oil System - Plant

1-2,

Denomination	
LUBE OIL PUMP-2KW, 1-5BAR, 50L/MIN, 400V, 5A	



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LUBE OIL PUMP-2KW, 1-5BAR, 50L/MIN, 400V, 5A

10.6 Gas System - Plant

1-2,

Denomination
GAS QUANTITY METER
GAS QUANTITY METER
GAS PRESS-RD STATION-FÜR PAKISTAN
GAS PRESS-RD STATION-FÜR PAKISTAN

10.7 Exhaust System - Plant

1-2,

Denomination
EXHAUST SILENCER-ASD4000_BG_7A
EXHAUST SILENCER FOR CONNECTION PIPE
EXHAUST SILENCER-ASD4000_BG_7A
EXHAUST SILENCER FOR CONNECTION PIPE

11 SERVICES AND AFTER SALES SUPPLY

1-2,

11.2 After Sales Supply

1-2,

Denomination
SPARE PARTS FOR 12V
SPARE PARTS
SPARE PARTS FOR 12V
SPARE PARTS
TOOL KIT SMALL
TOOL KIT SMALL

12 MISCELLANEOUS

1-2,

12.1 Documentation

1-2,

Standard Publications in English-Language

Set of standard operating, maintenance documentation and test run certificate

- Hardcopy
- CD-Rom

Supplementary documentation

1-2,

This delivery specification is only valid together with the following enclosures:

- Technical guideline Gas system emissions MS61026
- Assembly Instructions M060775
- Installation Conditions MS65032
- Billing rates
- Component Quality Guideline DIN EN ISO 13849

Denomination



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DOCUMENTATION	
DOCUMENTATION	
CD ROM	DOCUMENTATION
CD ROM	DOCUMENTATION

1-2,

Partly completed machinery

The selected Scope of Supply is defined as a partly completed machinery.

Based on the requirements of the machinery directive (EC Directive 2006/42/EC) and other EC directives applicable for MTU products, the following components

- Gas detection system
- Fire detection system
- MMC

are all required to meet the conformity (completed machinery) based on these EC directives.

MTU Onsite Energy issues a declaration of incorporation when partly completed machinery is supplied.

Declaration of incorporation, dependence on scope of supply:

The following directives have been taken into account:

2006/42/EC (Machinery Directive)

DIN EN ISO 12100 (Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology)

DIN EN ISO 13849-1 (Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design)

Denomination
SCOPE OF SUPPLY-BR0400 - BR4000

Third Language:

1-2,

- Genset name plate in German and English
- Automation Visualization in German, English and the selected third language
- Electrical drawing in the selected third language
- MMC operating key switches in German, English and the selected third language
- Genset safety labels in German, English and the selected third language
- Engine name plate in English
- Alternator name plate in English

Denomination
LABELLING KIT FOR GENSET-BR400 - BR4000
LABELLING KIT F.TRANS.W.LIFT.GEAR
LABELLING KIT FOR GENSET-BR400 - BR4000
LABELLING KIT FOR GENSET-BR400 - BR4000
LABELLING KIT F/ENGINE ROOM-S4000+S0400
LABELLING KIT F/ENGINE ROOM-S4000+S0400

12.2 Painting

1-2,

Standard painting of the genset components as follows:

1-2,

- Engine, alternator RAL 7001

Customer: MTU Onsite Energy GmbH

2 x AoE12V4000L32

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Responsible: Achim Bierbaum

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- Base frame RAL 5002
- Control cabinet / MIS / MIP RAL 7035
- Option Head Recovery Module RAL 9005

12.3 Packing

Seaworthy packing

- Genset on wooden based skid and covered with plastic sheet suitable for containerized shipment,
MMC on pallet, accessories packed in wooden case

Denomination
SEAWORTHY PACKING-L32 12V

12.4 EXCLUSIONS

Please mind:

Additional auxiliary systems are required to complete the system ready for operation on-site.

Since costs will depend on the local conditions and requirements of the particular installation site, these items are – unless specifically mentioned above or in attached specifications* - not included in our offer:

- Components to be installed at plant site, for e.g.: fuel supply, lube oil supply and disposal; air ventilation; cooling systems with radiators, pumps, expansion vessels etc.; preheating units; transformers; silencer, sound enclosure, exhaust systems; load banks or any other
- Mechanical and electrical erection i.e. any piping, ducting and cabling for the auxiliary systems at plant site, foundations or other civil works
- Overall plant load management systems in case of multiple gensets plant
- Commissioning of other components than offered
- Gas pressure reduction / increase unit for constant flow pressure or gas treatment systems if required
- Heat insulation on genset or supplied loose items
- Generator circuit breaker, switchboard, auxiliary drive panel, power cables
- Batteries with starting cables or mains starting unit
- Earthing material/connections and lightning protection
- Installation materials, civil works and tanks (water / lube oil)
- Operating media, including first filling
- Engineering, supervision and technical support for not contracted scope / specifications
- Any necessary permits / working permits
- Special synchronization devices as per local standard
- Any necessary certificates, reports or approvals as required in the country of operation
- All external connections

13 MISCELLANEOUS AUTOMATION

1-2)

13.1 Documentation

1-2)

- Electrical drawings delivered inside of MMC in German-Language

1-2)

14 FUNCTIONAL TESTING

1-2,

14.1 Acceptance Testing

1-2,

The genset is tested in according to document DK-IB-0012 on the test bench using natural gas as gaseous fuel; the test run includes NOx and CO emission measurements. The measured values and

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operating parameters are documented in the acceptance protocol.

Denomination
GENSET ACCEPT. RUN STANDARD-NACH ISO-LEISTUNG
OPERATING MODE-IPB-INSELPARALLELBETRIEB

Power node 100 % 1-2,

Denomination
ACCEPTANCE-LASTPUNKT-100% - ISO-P

15 SHIPPING CONDITIONS 1-2,

15.1 Freight 1-2,

CFR ... (Incoterms 2010) 1-2,

Denomination
UPON REQUEST

16 EXTENDED COVERAGE 1-2,

16.1 Extended Coverage 1-2,

Denomination
EC 12 months

1*

* only once per order

Customer: MTU Onsite Energy GmbH
MTU Order: 1197589
Responsible: Achim Bierbaum

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