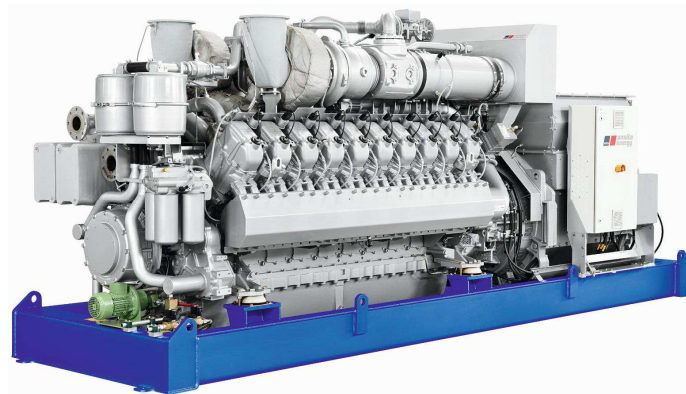


## MTU 12V4000L64FNER TR 0,4kV MIP Standalone



### Technical Specification

and

### Scope of Supply

mtu 12V4000 GS  
GG12V4000D1

Customer:	Project
Project:	074270145
MTU Order:	1121368
	23.12.2022



## I. System Description

Product type	GG12V4000D1 mtu 12V4000 GS
Application Group	3A - Heavy duty, unrestricted, ICXN

### Power as per MTU Sales Program

Power per genset (ISO 8528)	1.560	kW
Engine speed	1.500	rpm
Intake air temperature	35	°C
Coolant temperature	58	°C
Altitude	100	m

### On-site Power

Power per genset (ISO 8528)	1.560	kW
Engine speed	1.500	rpm
Intake air temperature	35	°C
Coolant temperature	58	°C
Altitude	100	m

### Requirements

Frequency	50 Hz
Gas type	Natural gas
Generator voltage	400 V
EngineType	12V4000L64FNER
Generator model	Stamford
Island operation	Yes
Grid guideline	No requirements
Methanzahl	>= 80

### Technical Data:

#### 1. DATA-RELEVANT DESIGN

Technical data sheet	-	074270145_270148_Q01_1_12L64_1427_50_500_EN_SI_V1 *)
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#### 2. POWER-RELATED DATA, ELECTRICAL

Electrical power, 100% CP	kWeI	1427 *)
Engine power ISO 3046-1 – 100% CP	kW	1464 *)

\* = 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

<b>Criteria</b>	<b>Selection</b>	<b>for Product No.</b>
Application group	3A - Heavy duty, unrestricted, ICXN	1-10,
Instruction for exhaust emission	See technical data	1-10,
Power	See technical data	1-10,
PowerUnit	kW	1-10,
Speed	1500 rpm	1-10,
Frequency	50 Hz	1-10,
Generator voltage	400 V	1-10,
Engine type	12V4000L64FNER	1-10,
EPS	12.5	1-10,
Generator manufacturer	Stamford	1-10,
Gas type	Natural gas	1-10,
Country of operation	outside Germany	1-10,
Island operation capability	Yes	1-10,
Raw emission engine	< 500mg NOx at 5% O2	1-10,
Qualitative NOx measurement (NOx sensor)	without qualitative NOx measurement (NOx sensor)	1-10,
Operating mode	Island parallel operation	1-10,
Build type	Genset without heat recovery (GB)	1-10,
Fast start capability	without fast start capability	1-10,
Auxiliary drive voltage	400 V	1-10,
Control panel	MIP	1-10,
Operation in combination	Yes	1-10,
grid type generator	TN-S-grid	1-10,
grid type auxiliary supply	TN-S-grid	1-10,
Altitude	Altitude up to 1000 m	1-10,
Ambient temperature MIP	>=45°C up to 55°C	1-10,
High temperature extraction	without extraction of high temperature circuit	1-10,
Flexible connections	with flexible connections	1-10,
Acceptance Testing	Factory acceptance	1-10,
Packing	Standard commercial	1-10,
Shipment	FCA Augsburg	1-10,
Application fine	Electricity supply stationary	1-10,

### III. Scope of Supply

valid for  
engine No.

#### 1 SYSTEM CONFIGURATION

1-10,

##### 1.1 System Description

1-10,

###### Note Emission Compliance:

1-10,

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.

The compact design genset consist of the following basic assemblies:

1-10,

- 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

1-10,

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

1-10,

###### Genset preservation

1-10,

valid for  
engine No.

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

1-10,

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

1-10,

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

1-10,

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

1-10,

#### Parallel island mode

1-10,

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.

1-10,

Other site conditions for isolated or mains backup operation

valid for  
engine No.

- 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.

<b>1.2</b>	<b>Starting Aids</b>	1-10,
	<b>Set starter batteries</b>	1-10,
	– Maintenance-free starter batteries with steel rack for installation on site. Including connectors, terminals and pole caps. Supplied loose, for assembly on site.	
<b>1.3</b>	<b>Base Frame</b>	1-10,
	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.	1-10,
<b>1.4</b>	<b>Vibration Isolation</b>	1-10,
	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.	1-10,
	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).	
<b>2</b>	<b>ENGINE CONFIGURATION</b>	1-10,
<b>2.1</b>	<b>Engine System</b>	1-10,
	Series 4000 four-stroke turbocharged Otto gas engine with mixture cooling - compact, high-performance, reliable, maintenance-friendly and extremely economical.	1-10,
	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.	
	<b>Basis</b>	
	– counter-clockwise rotation engine	
	– coolant cooled	
	– lean mixture supercharging	
	– two-stage mixture cooling	

valid for  
engine No.

- 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

valid for  
engine No.

- 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

valid for  
engine No.

- Long maintenance intervals

### 3. Mixture formation, turbocharging

1-10,

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

1-10,

- 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

valid for  
engine No.

- 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-L64-FN-12,5-35/58-500-S	
GAS ENGINE-12V4000L64 - N - 12,5 - TEMPLA	
DUMMY	FOR GAS ENGINE-12V4000L64 - N - 90
DUMMY	FOR GAS ENGINE-ANSAUGLUFT TEMP: 35
DUMMY	FOR GAS ENGINE-GMK EINT TEMP: 58
DUMMY	FOR GAS ENGINE-EMISSIONEN: 500MG/M3 I.N.
DUMMY	FOR GAS ENGINE-FASTSTART: NEIN
DUMMY	FOR GAS ENGINE-BLACKSTART: NEIN
DUMMY	FOR GAS ENGINE-OIL AND GAS: NEIN
DUMMY	FOR GAS ENGINE-NOX SENSOR: NEIN

DUMMY	FOR GAS ENGINE-REGELENERGIE: PRIM
DUMMY	FOR GAS ENGINE-RMP: 1500
DUMMY	FOR GAS ENGINE-EPSILON: 12,5
DUMMY	FOR GAS ENGINE-KW / ZYLINDER: 130
DUMMY	FOR GAS ENGINE-MIT HOEHEHNPAKET: NEIN
DUMMY	FOR GAS ENGINE-ATL MIT DREHZAHLSENS: JA
GROUND CABLE-GASMOTOR - GRUNDR OHNE GETRIEB	

## 2.2 Exhaust System 1-10,

The exhaust system consists of the following: 1-10,

- 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

## 2.3 Fuel System 1-10,

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. 1-10,

- Flow direction gas control path: left to right 1-10,

The gas train consists of aluminum pressure die casting, sealing material NBR and completely pre-assembled. 1-10,

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.

## 2.4 Oil System 1-10,

### Lubrication Oil System 1-10,

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

## 2.5 Air Intake System 1-10,

### Intake air system 1-10,

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
- Tube extension for air intake for gas engine 1-10,

## 3 GENERATOR CONFIGURATION 1-10,

### 3.1 Generator Specification 1-10,

Highly efficient, self-excited brushless synchronous alternator 1-10,

**General data:**

- Housing
- 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)**

1-10,

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

Denomination
GENERATOR-1935KVA - 0,4KV - 50HZ
ACCESSORIES FOR ALTERNATOR-BR4000 - CUMMINS
RESILIENT COUPLING-AC10.2SN - F2.21.300 - 150
BELL HOUSING-BR4000

- 3.2 Power Transmission** 1-10,  
The torque produced by the engine is transmitted to the alternator via a highly resilient flange coupling. 1-10,

## **5 CONTROL PANEL CONFIGURATION** 1-10,

- 5.1 Genset Control** 1-10,  
The MTU Interface Panel (MIP) contains the genset control including alternator and mains monitoring, synchronization equipment and is the standard interface between genset control system and the required cogeneration control system including visualization, which is mandatorily required (e.g. e.g. MTU MMC or on site customer's control according to MIP interface description MS13097) 1-10,

The MIP includes the following components and control functions:

Communication with the engine governor via hardware signals and CAN-bus.  
Communication with the customer's plant via hardware signals and Ethernet.  
Control elements (EMERGENCY STOP button).  
Integrated safety chains for machinery EMERGENCY STOP and manual EMERGENCY STOP.  
Alternator current transducer wired within the scope of supply.  
Alternator voltage wired within the scope of supply in case of low voltage.

### **Alternator protection**

- Overfrequency (ANSI: 81, IEC: f>)
- Underfrequency (ANSI: 81, IEC: f<)
- Overvoltage (ANSI: 59, IEC: U>)
- Undervoltage (ANSI: 27, IEC: U<)
- Phase overcurrent (ANSI: 51, IEC: I>)
- Short-circuit current (ANSI: 50, IEC: I>>)
- Overload (ANSI: 32F, IEC: Pf>>)
- Reduced power (ANSI: 32R/F, IEC: Pr>, Pf>)
- Load unbalance (ANSI: 46, IEC: I2>)

### **Alternator monitoring/measurement**

- Alternator active power – P (kW)
- Alternator reactive power – Q (kVAr)
- Alternator apparent power– S (kVA)

- Alternator frequency
- Alternator voltage U12, U23, U31
- Alternator current L1, L2, L3
- Alternator power factor cosphi
- Alternator active energy (kWh)

**Busbar monitoring/measurement**

- Busbar voltage U12, U23, U31
- Busbar frequency

**Mains monitoring/measurement**

- Mains voltage U12, U23, U31
- Mains frequency

**Synchronization**

- Alternator circuit breaker (ACB): Floating contact only, power circuitry in customer's system.
- Mains circuit breaker (MCB): Floating contact only, power circuitry in customer's system.

**Performance range****Alternator temperature monitoring**

- Winding temperature monitoring U1/V1/W1 and limit value monitoring (including wiring in scope of supply)
- Bearing temperature monitoring driving end/non-driving end and limit value monitoring (including cabling in scope of supply)

**Alternator features**

- Control of the alternator space heater (power circuitry including wiring in scope of supply)
- Control of the voltage alternator (including wiring in scope of supply)
- Control of the alternator de-excitation (power circuitry including wiring in scope of supply)

**Gas system (monitoring and safety features)**

- Gas pressure min / max (safety feature)
- Control of the gas-tightness test (power circuitry in scope of supply)
- Control of the gas solenoid valves (power circuitries in scope of supply)

**General control functions**

- Control of the auxiliary drives (floating contact or software signal)
- Control to open the backup switches (floating contact or software signal)
- Control of the lube oil solenoid valves (power circuitry including wiring in scope of supply)

- Control of the waste-oil/prelubricating pump (power circuitry including wiring in scope of supply)
- Control of the waste-oil solenoid valve (power circuitry including wiring in scope of supply)
- Control of the heating elements of the engine coolant preheating (power circuitry including wiring in scope of supply)

For further details, refer to the MIP 4000 interface description MS13097.

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

- Remote access via Internet (DSL/UMTS/LTE) with on-site router – the firewall box is loose and must be fitted on site. 1-10,

**Isolated operation** 1-10,

- Without connection to common control system

Multiple genset operation - Usage of common functions, when operating multiple gensets in parallel 1-10,

**Grid type generator feed/supply** 1-10,

- TN-S-grid generator feed/supply 1-10,

**Grid type auxiliaries supply** 1-10,

- TN-S-grid type auxiliaries supply 1-10,

- The cable harness between MIP and generator will be extended by 1.0 m 1-10,

## 8 HEAT EXTRACTION 1-10,

### 8.1 Heat Extraction Jacket Water 1-10,

Heat recovery from jacket water is not included in the scope of supply. 1-10,

Automatic 3-way-valve for engine cooling including counter flanges, gaskets, bolts and nuts. Delivered loose. 1-10,

For details please refer to the attachment MS61022 1-10,

## 9 PLANT CONFIGURATION 1-10,

### 9.1 Intercooler System - Plant 1-10,

3-way-valve mixture cooling with electric actuator including counter flanges, gaskets, bolts and nuts. Delivered loose. 1-10,

For details please refer to the attachment MS61021 1-10,

<b>9.4</b>	<b>Oil System - Plant</b>	1-10,
	MMC configuration for the recommended MTU - extended lube oil system in accordance with MS61031. The MMC contains all described hardware and software components. Different requirements departing from this standard cannot be considered and need to be quoted separately.	1-10,
<b>11</b>	<b>MISCELLANEOUS</b>	1-10,
<b>11.1</b>	<b>Documentation</b>	1-10,
	<b>Standard Publications in English-Language</b>	1-10,
	Set of standard operating, maintenance documentation and test run certificate	
	– Hardcopy	
	<b>Supplementary documentation</b>	1-10,
	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	
	<b>Partly completed machinery</b>	1-10,
	<b>The selected Scope of Supply is defined as a partly completed machinery.</b>	
	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.	
	Rolls-Royce Solutions issues a declaration of incorporation when partly completed machinery is supplied.	
	<b>Declaration of incorporation, dependence on scope of supply:</b>	
	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)	
	Third Language:	1-10,

- 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

## 11.2 Painting 1-10,

Standard painting of the genset components as follows:

- Engine, alternator RAL 7001
- Base frame RAL 5002
- Control cabinet / MIS / MIP RAL 7035
- Option Head Recovery Module RAL 9005

## 11.3 Packing 1-10,

### Standard packing 1-10,

- Genset covered with plastic sheet, accessories packed in carton or wooden box
- Requirements for Packing / Handling / Storage and Transportation can be found in MTU-specification M060813 valid for gas series 500 and series 4000 and to be considered accordingly. 1-10,

## 11.4 EXCLUSIONS 1-10,

Please mind: 1-10,

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 lose 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

## 12 FUNCTIONAL TESTING

1-10,

### 12.1 Acceptance Testing

1-10,

The genset is tested in according to document MS60162 on the test bench using natural gas as gaseous fuel; the test run includes NOx and CO emission measurements. The measured values and operating parameters are documented in the acceptance protocol.

1-10,

Denomination
GENSET ACCEPT. RUN STANDARD-NACH TD-LEISTUNG
OPERATING MODE-IPB-INSELPARALLELBETRIEB
FUNCTIONAL TEST RUN FOR CONTROL-NUR MIP OHNE MMC
ACCEPTANCE EXTENDED TEST RUN-2-TAGE - 4-SCHICHTEN - 26H
FUNCTIONAL TEST RUN FOR CONTROL-NUR MIP OHNE MMC

Power node 100 %

1-10,

Power nodes 75% and 50%

1-10,

Denomination
ACCEPTANCE-LASTPUNKT-75%
ACCEPTANCE-LASTPUNKT-50%



## 13 SHIPPING CONDITIONS

1-10,

### 13.1 Freight

1-10,

FCA Augsburg (Incoterms 2010)

1-10,

1\*

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\* only once per order

Customer:  
MTU Order: 1121368  
Responsible: Anton Berchtold

MTU 12VL64FNER TR 0,4kV MIP Standalone  
23.12.2022  
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