

PRODUCT PRESENTATION

MTU ONSITE ENERGY DIESEL GENERATOT SET 275 – 715kVA

BASED SERIES 1600



AGENDA

01. Philosophy
02. Product Overview
03. Generator Set Ratings
04. Standard Scope
05. Optional Scope and Accessories





01 PHILOSOPHY MTU gensets

Our genset system design combines product quality and technical innovation with commercial viability



PHILOSOPHY

Our job:Electricity, heat and cooling anywhere and at any timeOur motivation:Efficiency through sustainable, innovative and custom-made
solutions for our customer



Just like MTU engines, our gensets are:

- *extra-ordinarily reliable*
- exceptionally economical
- have out-standing load take-up characteristics
- *designed for easy maintenance*





02 PRODUCT OVERVIEW



MTU ONSITE ENERGY DIESEL GENSET POWER RANGE



Series 2000 50Hz: 770-1285 kVA 60Hz: 630-1240 kW_{el} Series 1600 50Hz: 275-715 kVA 60Hz: 230-600 kW_A





Series 4000 50Hz: 1290-3075 kVA 60Hz: 1180-3315 kW_{el}



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MTU ENGINE SERIES 1600

- First Major Overhaul 12,000 h (Prime Power)
- Bore 122 mm
- Stroke
- Cylinder Displacement
- Common Rail Injection System 1,600 bar
- Single-stage Turbocharging
- Electronic Engine Management MTU-ADEC
- Emissions Level

MTU-ADE EPA Tier 3

EU IIIA

TA Luft

150 mm

1.75 ltr



12V 1600G



MTU ENGINE ADVANTAGES

- Modular architecture of the engine
- Robust design for a long lifetime
- High stiffness, low power train bending
- Best in class NVH behavior

- Variable fan position
- Maximum commonality within the engine family
- Turbo charging optimized for gendrive
 / off-highway application



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03 GENERATOR SET RATINGS

50Hz: 275-715 kVA 60Hz: 230-600 kWel*

*all 60Hz models on request



DEFINITIONS

Emergency Standby Power (ESP) and Prime Power (PRP or PP)

Application group	Standby power (ESP) 3D	Prime power (PRP) 3B			
Mode of operation	Standby operation with variable load	Continuous operation with variable load			
Load factor	< 85 %	< 75 %			
Operating hours	max. 500/year	unrestricted			
Rating definition DIN ISO 8528 SAEJ1995 / J1349	Fuel stop power (IFN)	10 % overload capacity (ICXN)			

Genset Rating Units (kVA and kW_{el})

The units of the genset ratings differ due to historical reasons. For 50Hz Genset the rating is given in kVA and states the apparent power. 60Hz Gensets are rated in kWel, which is the real power. The two can be converted into one another knowing the phase angle. $1kVA = 1kW_{el} * cos(\phi)$, usually $cos(\phi) = 0.8$





SERIES 1600 RATINGS

The second		
	Prime Power	Emergency Standby
6R (Inline Configuration) 50Hz 60Hz	275 - 300 kVA 250 - 275 kW _{el}	300 - 330 kVA 275 - 300 kW _{el}
8V (90°V Configuration) 50Hz 60Hz	365 - 400 kVA* 325 - 365 kW _{el}	400 - 440 kVA* 350 - 400 kW _{el}
10V (90°V Configuration) 50Hz 60Hz	450 - 500 kVA 400 - 450 kW _{el}	500 - 550 kVA 450 - 500 kW _{el}
12V (90°V Configuration) 50Hz 60Hz	590 - 650 kVA 500 - 550 kW _{el}	650 - 715 kVA 550 - 600 kW _{el}

* SOS Spring 2012

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SYSTEM DESIGNATION (1/2)

Туре	Application	Performance	Fuel Type	Frequency	Project Type
D – Diesel Generator Set	C - Combined Heat and Power	Rated Power*	B - Biogas	5 - 50 Hz	C - Custom Product
G – Gas Generator Set	B - Baseload (Continuous)		D - Diesel	6 - 60 Hz	S - Standard Product
	P - Prime Power	A HIN	N - Natural Gas		
	R - Reduced CHP		S - Sewage Gas		
	S - Standby Power		V - Various Fuels		
*at 25 °C / 100m in kV	/A (50Hz) or kW _{el} (60Hz)				
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SYSTEM DESIGNATION (2/2)



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DETAILED RATINGS S1600 50 Hz

System Nomenclature	Engine	3D (Standby)	3B (Prime)	50 Hz	60 Hz	Fuel Optimized	TAL	EPA	EPA without cert.
DS00715D5S	12V1600G80F	Х		Х		Х			
DP00650D5S	12V1600G20F		Х	Х		Х			
DP00650D5S	12V1600G20F		Х	Х			Х		
DS00650D5S	12V1600G70F	Х		Х		Х			
DP00590D5S	12V1600G10F		Х	Х		Х			
DP00590D5S	12V1600G10F		Х	Х			Х		
DS00550D5S	10V1600G80F	Х		Х		Х			
DP00500D5S	10V1600G20F		Х	Х		Х			
DP00500D5S	10V1600G20F		Х	Х			Х		
DS00500D5S	10V1600G70F	Х		Х		Х			
DP00450D5S	10V1600G10F		Х	Х		Х			
DP00450D5S	10V1600G10F		Х	Х			Х		
DS00440D5S	8V1600G80F	Х		Х		Х			
DP00400D5S	8V1600G20F		Х	Х		Х			
DP00400D5S	8V1600G20F		Х	Х			Х		
DS00400D5S	8V1600G70F	Х		Х		Х			
DP00365D5S	8V1600G10F		Х	Х		Х			
DP00365D5S	8V1600G10F		Х	Х			Х		
DS00330D5S	6R1600G80F	Х		Х		Х			
DP00300D5S	6R1600G20F		Х	Х		Х			
DP00300D5S	6R1600G20F		Х	Х			Х		
DS00300D5S	6R1600G70F	Х		Х		Х			
DP00275D5S	6R1600G10F		Х	Х		Х			
DP00275D5S	6R1600G10F		Х	Х			Х		



DETAILED RATINGS S1600 60 Hz

System Nomenclature	Engine	3D (Standby)	3B (Prime)	50 Hz	60 Hz	Fuel Optimized	TAL	EPA	EPA without cert.
DS00600D6S	12V1600G80S	Х			Х			Х	
DP00550D6S	12V1600G20S		Х		Х			Х	
DS00550D6S	12V1600G70S	Х			Х			Х	
DP00500D6S	12V1600G10S		Х		Х			Х	
DS00500D6S	10V1600G80S	Х			Х			Х	
DP00450D6S	10V1600G20S		Х		Х			Х	
DS00450D6S	10V1600G80S	Х			Х			Х	
DP00400D6S	10V1600G20S		Х		Х			Х	
DS00400D6S	8V1600G80S	Х			Х			Х	
DP00365D6S	8V1600G20S		Х		Х			Х	
DS00350D6S	8V1600G70S	Х			Х			Х	
DS00325D6S	8V1600G10S		Х		Х			Х	
DS00300D6S	6R1600G80S	Х			Х			Х	
DP00275D6S	6R1600G20S		Х		Х			Х	
DS00275D6S	6R1600G70S	Х			Х			Х	
DP00250D6S	6R1600G10S		Х		Х			Х	
DS00250D6S	6R1600G70S	Х			Х			Х	
DP00230D6S	6R1600G20S		Х		Х			Х	
DS00230D6S	6R1600G70S	Х			Х			Х	
DP00210D6S	6R1600G20S		Х		Х			Х	



04 STANDARD SCOPE FOR 50Hz MTU ONSITE ENERGY DIESEL GENERATOR SET

Scope for 60Hz models on request



STANDARD SCOPE S1600





GENERATOR (1/2)

Marathon Power Technology:

- Rugged product design
- High product reliability / durability
- Corporate commitment to support the MTU Power Technology Business
- Generators are specifically designed and harmonized on MTU requirements
- 1000 authorized service stations, worldwide
- Complete testing, documentation, test facilities
- Experienced in the necessary market applications





GENERATOR (2/2)

Alternator Configuration Standard Scope of Supply:

- Voltages:
 - 50Hz: 380V/400V/415V
- 4-lead generator
- IP20
- PMG
- Antimagnetic connection plate
- Meets IEC 34.1, NEMA MG-1, DIN 57530, VDE 0530, BS-5000
- Voltage Regulator:
 - 275-330kVA: SE350 analog voltage regulator, manually adjustable
 - 365-715kVA: DVR2000E, digital voltage regulator, different functions, can be programmed via computer



PMG = Permanent Magnet Generator



SINGLE FUEL PRE-FILTER WITH WATER SEPERATOR

Recommended For:

- Variations in fuel quality
- Condensation in tank

Benefits:

- Extended operation time
- Clear collection bowl

- Model: Racor
- Fuel pre-filter with:
 - 3 stage water separation
 - Self-venting water drain
 - Water level sensor





AIR CHARGE AIR COOLING (TD*)



Technical Features:

- Complete system solution with unit-mounted belt driven fan and piping
- Engine mounted fan drive
- Front-type radiator for jacket water and charge air cooling circuit
- Single-circuit cooling system with air charge air cooling
- Thermostat-controlled coolant circuit
- Coolant circulation pump and coolant thermostat for jacket water cooling system
- Coolant level sensor

Benefits:

- All-in-one solution: radiator completely installed for operation
- Back-pressure for air inlet and air outlet 200Pa



STANDARD AIR FILTER

Technical Features:

- Single-stage engine air filter
- Light to medium dust conditions
- Non-metallic, non-corrosive, tough materials
- Air filter housing and filter media are one unit
- Horizontal installation possible
- 72 to 3600 m³/h airflow through each filter
- Filter service indicator

Benefits:

- Compact design, vibration-resistant
- Improved reliability and durability
- Low weight and cost
- Easy and fast service
- Completely disposable







STANDARDS

General Standards:

- IP standards (international protection rating)
- ISO 8528 (classification for generator set)
- BS (British Standards)
- Lloyd (Transportation)
- CE Certified (compliance with EU legislation)

PC Board Design:

High power PCB based power electronics













05 OPTIONAL SCOPE AND ACCESSORIES



OPTIONAL SCOPE AND ACCESSORIES

These optional accessories are available to adapt the genset to working conditions and can be ordered in addition to the standard genset.

- Starting System
 - Batteries
 - Battery Charger
- Jacket Water Heater
- Lupe oil system
 - Lube Oil Extraction Pump**
- Fuel System
 - Fuel Pre-filter switchable
 - Fuel Return-Cooler

- <u>Combustion Air System</u>
 Heavy Duty Air Filter*
- Exhaust System
 - Exhaust Silencers
- Radiator Option
 - Duct Flange
- Tanks
 - Day tanks*
 - Sub-base *
- Enclosure*

- <u>Different Generator</u>
 <u>Options</u>
- Various Control Versions
 - Single-Island
 - Parallel-Island
- Transfer Switches
 - Circuit Breakers
 - ATS (on request)

** only 450-715kVA

only 275-440kVA



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STARTING SYSTEM BATTERIES

Required For:

• Starting the genset via the electrical starters

Technical Features:

- Lead-acid batteries with rack and cables
 - 2 x 12V
 - Minimum 5 starts
 - Delivered wet

Benefits:

Cost – Standard Size – Energy Density – Availability







STARTING SYSTEM **CHARGER**

Recommended For:

Charging batteries during down times of the generator set

Availability:

- Battery charger included in Control Version 2, 3 and 4
- Charger not included in Control Version 1 (needs to be ordered separately)



240W Single Output Industrial DIN RAIL Power Supply **DRP-240** series



Features :

- Universal AC input / Full range
- · Built in active PFC function
- Protections: Short circuit / Overload / Over voltage / Over temperature
- · Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- UL 508(industrial control equipment)approved
- · LED indicator for power on
- 100% full load burn-in test
- Fixed switching frequency at 100KHz
- 3 years warranty



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JACKET WATER HEATER

Recommended For:

Cold engine start-ups

Technical Features:

- Adjustable thermostat from 32-54 °C
- CE compliant
- Controls for automatic operation included
- Extended hose life and reduced heater maintenance due to reduced outlet temperature
- Enclosure: IP: 44



Benefits:

- Reduced electrical consumption on engine start-up
- Heating and circulation of coolant ensures:
 - Reduction in emissions
 - Easy starting without needless idling



LUBE OIL SYSTEM MANUAL EXRACTION PUMP

Recommended For:

• Simple oil removal during maintenance

Benefits:

- Simple mechanical method to remove the oil from the crankcase
- No electric pump needed

- Mechanical, semi-rotary hand pump
- Vertical installation position, suction connection at bottom



- 1 Assembly eyes
- 2 Pump outlet to used-oil tank
- 3 Pump hand lever
- 4 Vane pump housing
- 5 Pump intake from oil pan
- a Vane
- b Pressure chamber
- c Valve plate
- d Suction chamber
- e Suction valve seat



DOUBLE FUEL PRE-FILTER WITH WATER SEPERATOR SWITCHABLE

Recommended For:

- Bad fuel quality
- Continuous Genset operation

Technical Features:

- Same as Single Fuel Pre-Filter, BUT:
- Switchable Service during operation possible
- Model: Racor 751000FHX

Benefits:

- Switchable during operation
- Service during operation possible
- Even more extended operation time





FUEL RETURN-COOLER

Recommended For:

Small day tanks

Benefits:

- Avoid high temperature in fuel tank
- Increases plant safety
- Mounted and ready for operation

- Mounted between engine and fuel tank
- Cooling capability: 580 l/h
- No additional power needed, operated by radiator air flow





HEAVY DUTY AIR FILTER

Recommended For:

Medium to heavy dust conditions

- Two-stage engine air filter removes
 99.99% of particles
- Proven RadialSeal[™] technology
- Mounted filter service indicator, Service without tools possible
- Filter insert and filter element combined
- Outdoor use an optional inlet cap prevents moisture ingestion (e.g. rain or snow)
- Horizontal installation
- Vibration-resistant





EXHAUST SILENCER

Recommended For:

Sound reduction in critical applications

Benefit:

- The noise is reduced efficiently
- Comes with Exhaust Flex & Connections

- Silencer for Open Power Unit (no enclosures!)
- Noise reduction:
 - -10dBA Silencer (Industrial)
 - -30dBA Silencer (Critical)
 - -40dBA Silencer (Hospital)





GENERATOR OPTIONS

Options:

- Winding RTD PT100 sensors (temperature)
- Anti condensation heater
- Parallel current transformer
- Digital Voltage regulator
- Drip Cover IP23
- Bearing RTD (Resistor Temperature Device)





GENERATOR OPTIONS ANTI CONDENSATION HEATER

Recommended for:

- Areas with high humidity
- High changes in ambient temperatured

Technical features:

Will be heated automatically

Advantages:

- Better starting
- Less wear
- No corrosion





DUCT FLANGE

Recommended For:

Installation of an exhaust duct on radiator's air outlet

Benefits:

 Easy installation of customer air exhaust duct



CONTROLLER

Technical Features:

- Different Controler Versions:
 - V1: customer interface for connection of own controller (Terminal box)
 - V2: Single Genset without mains
 - V3a: Single genset for operation with ATS*
 - V3b: Single genset with electrical driven circuit breakers (1 or 2 interlocked)
 - V4: Genset in parallel island operation with LSM



*ATS to be provided by customer

ATS = Automatic Transfer Switch

LSM = Load Sharing Module

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GENSET CONTROLER VERSIONS AND FUNCTIONS

- Version 1: Customer interface (terminal box containing terminal strip and smart connect)
- Version 2: The single genset is always connected on a de-energised network. There is no provision for parallel operation with the mains or other gensets
- Version 3a: The ATS (Automatic Transfer Switch) includes the supervision of the mains and in case of main failure an emergency start of the genset is possible
- Version 3b: The single genset operates with two electrically (interlocked) breakers, which are controlled by the genset control unit. Additionally the genset can be started by a remote signal. The switchover from genset operation to mains is made with a short interruption of the supply
- Version 4: Genset monitoring and parallel operation from up to 15 aggregates. After a remote start signal the genset starts, synchronizes and switches on automatically





CONTROLLER OPTIONS

- AEM (Analoge Expansion Module) for further analoge signals like bearing temperature
- CEM (Contact Expansion Module) for further digital signals like switches
- DVR 2000EC for power factor regulating



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CIRCUIT BREAKER

Recommended For:

 Every genset needs a circuit breaker to connect/disconnect the consumer an/or grid

Benefits:

- Flexible connection capabilities
- Protection of genset

- 3 pole
- Manually- or electrically-operated
- IEC 60947-2 / CE approved
- Short circuit and overcurrent protection
- Genset mounted





SUB-BASE TANKS

Recommended For:

Decentred fuel tank (satellite operation)

Benefit:

- Installation underneath the genset (no additional space needed)
- Separate fuel supply for up to 3 days

Technical Features:

- Double-walled tank
- Different sizes available:
 - 12 h Tank
 - 24 h Tank
 - 48 h Tank
 - 72 h Tank

* NPT = "National Pipe Thread"





DAY TANK

Recommended For:

 Main fuel tank at different elevation then engine (e.g. under ground)

Benefit:

 The use of the day tank leads to natural pressure on fuel pump

- Double-walled tank
- Installation beside genset (loose delivery)
- Tank capacity approx. 190 litre (275-330kVA) / 380 litre (365-440kVA)
- Use together with fuel return cooler to avoid high temperatures in day tank





ENCLOSURE

Recommended For:

Outside use of genset

Benefit:

- Genset can be used in various weather conditions outdoors (rain, snow etc.)
- Reduced noise during operation

- Rubber Sealed Doors with drip rails
- Aluminium Hinges
- Lockable doors
- Air intake Louvers
- Flabber Rain Cap





ENCLOSURE – DESIGN

Enclosures:

Level 1 – Standard (Internal Critical Silencer) Level 2 – Basic Sound Attenuation

approx. 85 dB(A)*

Level 3 – Maximum Sound Attenuation approx. 75 dB(A)*

Technical Features:

- Modular design allows additional scoops to all enclosure
- Large access doors for easy inspection and service
- Aluminium: anti-corrosive protection for rough ambient conditions (e.g. maritime air)



Level 1 Enclosure (Standard)



Level 3 Enclose (Maximum Sound Attenuation)

* in 7m distance

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GENERAL

- Quality Documents
 - Test records
 - ISO certification
 - Test procedures
 - Build checklist
- CE Compliance
- Overhaul Literature



I Net



POWER ANYTIME. ANYWHERE





THANK YOU FOR YOUR ATTENTION

