

EU emissions standards for on-site power generation



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The European Union (EU) has established categories of allowable emissions in nonroad diesel engines called Stages I, II, IIIA, IIIB and IV. Each increasing Stage specifies lesser amounts of four specific pollutants that are permitted based on the number of grams per kilowatt-hour of the compounds present in diesel exhaust.

These regulations primarily affect portable diesel generator sets (18 kWm to 560 kWm) and other nonroad and industrial engines. At the present time, the EU does not regulate emissions from stationary diesel generator sets such as those used for prime, peak shaving, load shedding or emergency standby power. All nonroad equipment, such as rental generator sets, are required to meet Stage II requirements effective 1 January 2007.

In the EU, four main constituents in diesel exhaust are controlled:

- Nitrogen oxides (NO_x) – NO_x is a combustion by-product that combines in the atmosphere to

create ozone and smog. It is controlled by reducing the combustion temperature inside the cylinder.

- Hydrocarbons (HC) – Essentially unburned fuel, HC also contributes to ozone and smog production. HC is a minor constituent in diesel exhaust. It is controlled by improving combustion efficiency.
- Carbon monoxide (CO) – CO is also a minor constituent of diesel exhaust. It is controlled by improving combustion efficiency.
- Particulate matter (PM) – PM is made up of soot particles in diesel exhaust from unburned carbon. It is controlled by optimizing the combustion temperature and improving combustion efficiency.

For Stage IV and beyond, some nonroad diesel engines will require selective catalytic reduction (SCR) aftertreatment systems to reduce NO_x, HC and CO to regulated levels. Stage IV PM reduction will require regenerative filters on the exhaust to trap and eventually oxidize the soot particles.

Nonroad emissions regulations schedule / EU

Portable nonroad gensets (i.e., rental) are required to meet Stage II beginning 1 January 2007; Stage IIIA is noted at red bars. The EU does not regulate stationary prime or emergency standby installations.

Genset Power:

kVA (50 Hz Standby)	kWm	(HP)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
18-33	18 - 36	(24 - 48)	8.0 / 1.5 / 5.5 / 0.8				(7.5) / 5.5 / 0.6							
38-55	37 - 55	(49 - 74)	7.0 / 1.3 / 5.0 / 0.4							(4.7) / 5.0 / 0.4				
66	56 - 74	(75 - 99)	6.0 / 1.0 / 5.0 / 0.3				(4.0) / 5.0 / 0.3							
138-550	130 - 560	(174 - 751)	6.0 / 1.0 / 3.5 / 0.2				(4.0) / 3.5 / 0.2							

■ Stage II ■ Stage IIIA

NO_x/HC/CO/PM (g/kW-hr) (NO_x+HC)/CO/PM (g/kW-hr)

[Conversion: (g/kW-hr) x 0.7457 = g/bhp-hr]

Separate NO_x and HC standards separated by a "/". Combined NO_x and HC standards denoted in parenthesis "()".

The right technology matters

The Cummins Quantum system is a series of integrated technologies that has transformed the emissions and performance profile of the diesel engine. Through this technological breakthrough, Cummins Power Generation has been able to meet stringent emissions regulations through EU Stage II and Stage IIIA predominantly without the use of exhaust aftertreatments or other power-consuming strategies.

The Cummins Quantum system optimizes engine control, combustion chemistry, in-cylinder design improvements and fuel delivery to prevent the formation of pollutants – primarily NO_x and PM. The Cummins Quantum system reduces emissions without sacrificing engine performance or reliability, or complicating maintenance.

Additional resources:

www.cumminspower.com/emissions
www.dieselnet.com/standards/eu/offroad.html
www.cleanairworld.org

“As a recognized industry leader, Cummins Power Generation has been working closely with the EU and supports its efforts to strengthen emissions regulations for nonroad and stationary diesel engines. Cummins Power Generation was the first manufacturer to offer EU-compliant generator sets.

“Cummins Power Generation’s design strategy for meeting new emissions standards has been to focus on our existing electronic-controlled engine platforms

and new in-cylinder design enhancements. We believe this has been the best approach to higher performance, better fuel efficiency and higher reliability than designs that rely on costly exhaust aftertreatments. This design strategy has helped us become one of the few manufacturers that can offer the marketplace a full line of EU-compliant products.”

Tom Linebarger
 President, Cummins Power Generation

Cummins Power Generation Stage-certified products by application

Genset Standby kVA	Engine kWm Band	Engine HP Band	EU Stage								
			2007			2008			2009		
			Requirement	Engine model	CPG	Requirement	Engine model	CPG	Requirement	Engine model	CPG
18-33 kVA	18 - 36	24 - 48	II	A series 4B3.3	EU Stage II	II	A series 4B3.3	EU Stage II	II	A series 4B3.3	EU Stage II
38- 55 kVA	37 - 55	49 - 74	II	4B3.3	EU Stage II	II	4B3.3	EU Stage IIIA	II	4B3.3	EU Stage IIIA
66 kVA	56 - 74	75 - 99	II	QSB5	EU Stage IIIA	II	QSB3	EU Stage IIIA	II	QSB3	EU Stage IIIA
70-110 kVA	75 - 129	100 - 173	II	QSB5	EU Stage IIIA	II	QSB3/QSB5	EU Stage IIIA	II	QSB3/QSB5	EU Stage IIIA
138-550 kVA	130 - 560	174 - 751	II	QSB5 QSB7 QSL9	EU Stage IIIA	II	QSB5 QSB7 QSL9	EU Stage IIIA	II	QSB5 QSB7 QSL9	EU Stage IIIA
				QSM11 QSX15	EU Stage II		QSM11 QSX15	EU Stage II		QSM11 QSX15	EU Stage II
600 - 2250 kVA	561-1939	752 - 2600	NA	QSK19 QSK23 QST30 QSK50 QSK60	EPA Tier 2	NA	QSK19 QSK23 QST30 QSK38 QSK50 QSK60	EPA Tier 2	NA	QSK19 QSK23 QST30 QSK38 QSK50 QSK60	EPA Tier 2
> 2250 kVA	> 1940	>2600	NA	QSK60	EPA Tier 1	NA	QSK60 QSK78	EPA Tier 1	NA	QSK60 QSK78	EPA Tier 1

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