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Bulletin 4973774 Printed in U.S.A. 12/11

Johnson Matthey Stationary Emissions Control Modulex™ Catalytic Converters

Emission Solutions | Johnson Matthey

In Partnership with Cummins Emission Solutions and the Cummins Distribution Network

Solutions for Stationary Engines—RICE NESHAP Compliance in 2013

Team up with the global leader in emissions control for hassle free management of your RICE NESHAP requirements

As owner/operators of stationary engines, Johnson Matthey in partnership with Cummins Emission Solutions, represent the highest quality in emissions control systems. We strive to ensure that your engines operate at peak efficiency while complying with more and more stringent environmental standards for air quality.

The EPA's RICE NESHAP regulation, which stands for Reciprocating Internal Combustion Engine National Emission Standards for Hazardous Air Pollutants, becomes effective in 2013.

Distributed through the trusted Cummins distribution network, we offer you the latest generation of Johnson Matthey Modulex™ HAPs catalytic converter/silencers, and the HAPGuard™ exhaust monitor, as well as technical support, to ensure compliance with RICE NESHAP.

Compliance can be complicated, but you can count on us to manage your emission solution while you focus on your core business.

About RICE NESHAP

The first RICE NESHAP regulation was enacted in 2004 by the U.S. Environmental Protection Agency (EPA) for existing >500 H gas engines at major pollution sources. In 2008, the RICE NESHAP regulation started to affect new engines.

The 2010 RICE NESHAP (40 CFR Part 63, Subpart ZZZZ) sets limits for emissions of formaldehyde, acetaldehyde, acrolein, methanol and nearly 200 other toxic compounds from stationary diesel and gas engines, focusing on formaldehyde as the regulated emission.

However, the EPA has determined that carbon monoxide (CO) is an appropriate surrogate for formaldehyde. Since testing for CO has many advantages over testing for HAPs most of the emission standards have been finalized using CO as the only regulated pollutant.

The vast majority of existing stationary engines are regulated in some fashion by the 2010 RICE NESHAP. These engines must be in compliance by:

- Non-Emergency Diesel (CI) Engines by May 13, 2013.
- Non-Emergency Gas (SI) Engines by October 13, 2013.

The startup, shutdown and malfunction (SSM) requirements for RICE NESHAP have been in effect since 2010. Existing emergency stationary RICE located at residential, institutional, or commercial area sources of HAPs emissions are exempt from the 2013 requirements.

The 2010 RICE NESHAP is summarized in Table 1.

Table 1: RICE NESHAP for Existing Stationary Gas and Diesel Engines

Gas Engine Standards (effective October 2013)

Type of Engine	100 to 500 Hp Non-Emergency Engine Located at Major Sources	> 500 Hp that Operate > 24 Hrs/Yr Located at New/ Reconstucted/Existing Major Source or Existing Area Sources
2SLB (2-stroke lean burn)	225 ppmvd CO @ 15% O_2	No MACT standard due to insufficient data
4SLB (4-stroke lean burn)	47 ppmvd CO @ 15% O_2	47 ppmvd CO @ 15% O_2 or 93% CO reduction
4SRB (4-stroke rich burn)	10.3 ppmvd formaldehyde @ 15% O_2	2.7 ppmvd formaldehyde @ 15% O_2 or 76% formaldehyde reduction or 350 ppbvd formaldehyde @ 15% O_2
Landfill/digester gas	177 ppmvd CO @ 15% O_2	

Diesel Engine Standards (effective May 2013)

Engine Size	Non-Emergency Engines Located at Major Sources	Non-Emergency Engines Located at Area Sources
100 to 300 Hp	230 ppmvd CO @ 15% O_2	
300 to 500 Hp	49 ppmvd CO @ 15% O_2 or 70% reduction	49 ppmvd CO @ 15% O_2 or 70% reduction
> 500 Hp	23 ppmvd CO @ 15% O_2 or 70% reduction	23 ppmvd CO @ 15% O_2 or 70% reduction

Major Source: Any stationary source or group of stationary sources located within a contiguous area and under common control emits or has the potential to emit considering controls, in the aggregate ≥ 10 TPY of a single HAP or ≥ 25 TPY of two or more HAPs.

Area Source: Not a major source | EPA estimates there are > 900,000 stationary CI engines installed | EPA estimates there are > 330,000 stationary SI engines installed.

RICE NESHAP Regulation: For specific requirements refer to the Federal Register Vol. 76, No. 46 or the EPA's "Reg Nav" tool at: http://www.epa.gov/ttn/atw/rice/output/qy=uiz.html.

About Us

Cummins Emission Solutions (CES)

Cummins Emission Solutions, a subsidiary of Cummins Inc. and business in the Components segment, is a global leader in designing, manufacturing and integrating exhaust after treatment technology and solutions for the commercial on and off highway medium duty, heavy duty and high horsepower engine markets. Dedicated to innovation and dependability in meeting global emission regulations, Cummins Emission Solutions develops and produces various emission solutions. These solutions include custom engineering systems and integrated controls, oxidation catalysts, particulate filters, oxides of nitrogen (NOx) reduction systems such as selective catalytic reduction and NOx absorbers, and engineered components such as dosers and sensors. With key operations in Indiana, Wisconsin, China, India, the United Kingdom, Brazil and South Africa, Cummins Emission Solutions serves both OEM and engine first fit and retrofit customers.

Johnson Matthey's Stationary Emissions Control (SEC) Group

Johnson Matthey's global-leading SEC group has been supplying catalytic emissions control for stationary applications for more than 40 years. With a total systems approach to solving customer's emissions challenges to reduce HAPs, PM, CO, HCs, PM and VOCs, the SEC group is dedicated to providing high-quality, cost-effective products. They include Modulex™ converters and silencers, Selective Catalytic Reduction (SCR) systems, CRT® diesel particulate filter systems and oxidation catalysts for process industry applications. Johnson Matthey manufactures its own catalysts as well as designs its own housings, giving Johnson Matthey SEC complete product control. SEC is dedicated to the research, development and application of catalyst technology to improve the quality of life by reducing air pollution.

HAPGuard™ Exhaust Temperature & Pressure Monitor

Engine exhaust monitoring is required by the RICE NESHAP to insure that the catalytic converter is operating properly to keep your engine in compliance. We offer the HAPGuard monitor, which measures the pressure and temperature of the engine exhaust before and after the catalytic converter.

- Alerts you if the catalyst inlet temperature is out of the EPA-specified ranges for rich burn and lean burn engines:
  - —Rich Burn: 750°F < $T_{Catalyst\ Inlet}$ < 1250°F
  - —Lean Burn: 450°F < $T_{Catalyst\ Inlet}$ < 1350°F
- Warns you if the pressure drop across the catalyst is not within 2" w.c. of the value established during initial testing at 100% load.
- The HAPGuard™ monitor is engine tested and proven effective.

HAPGuard™ Monitor.

Table 2: HAPGuard™ Functionality

	Displayed on HMI Screen	Factory Set Points	User Configurable	Datalogged*
Measured				
Pre-DOC temperature (-328°F to +2282°F)	Yes	N/A	N/A	Yes
Pre-DOC pressure (0 to 100" w.c.)	Yes	N/A	N/A	Yes
Post-DOC pressure (0 to 100" w.c.)	Yes	N/A	N/A	Yes
Calculated Values				
Differential pressure ("w.c.)	Yes	N/A	N/A	Yes
Engine runtime (min.)	Yes	N/A	N/A	totalized on screen
4-hour rolling average temperature (°F)	Yes	N/A	N/A	Yes
Initial DP set point ("w.c. w/engine @ 100%)	Yes	N/A	Yes	No
Warnings				
4-hour rolling average temperature out of range	Yes	450°F < temp., < 1250°F	No	Yes
Differential pressure out of range ("w.c.)	Yes	plus/minus 2" w.c. of baseline	No	Yes

* At least 2 years of data will be stored.

HAPGuard™ Monitor Technical Specifications

Power Supply
- Input voltage: 24VDC
- Permissible range: 20.4VDC to 28.8VDC with less than 10% ripple

Graphic Display Screen
- LCD type: STN, LCD display
- Illumination backlight: white LED, software-controlled
- Display resolution: 128 x 64 pixels; viewing area 2.4"

Keypad
- Key type metal dome, sealed membrane switch; 20 keys

Removable Memory
- Micro SD card: data logged at 5-min. intervals with up to 5 years of data storage capacity; export .csv files to Excel

Miscellaneous
- Real-time clock functions (date and time)
- Battery replacement: coin-type 3V, lithium battery, CR2450

Weight/Dimensions
- Weight: 2.27 kg (5.0 lbs.)
- Size: 240 x 223 x 150mm (9.52 x 8.85 x 5.95")

Environment
- Operational temperature: 0 to 50ºC (32 to 122ºF)
- Storage temperature: –20 to 60ºC (–4 to 140ºF)
- Relative humidity: (RH) 10% to 95% (non-condensing)

Mounting Method
- Panel mount IP65 rated enclosure

Applications

RICE NESHAP affects diesel and gas engines used in a variety of industries including chemical and petrochemical, gas production, processing and storage, municipal water pumping and a number of manufacturing processes. They are used to generate power for electricity demand, gas compression and pumping.

Products for RICE NESHAP

There are many reasons for engine owners/operators to choose Johnson Matthey for complete and cost-effective RICE NESHAP compliance.

Proven Experience

At Johnson Matthey, our 30+ years of experience in the development and application of catalysts for stationary engines is unmatched. We are the only company that has world-class expertise in both catalyst science and converter housing design. Our original hatchback catalytic converter, the first converter to allow easy access to the catalyst element, revolutionized the industry. Sustainable since 1817, we have staying power and our continuous improvement programs bring you the latest generation of converters for your RICE NESHAP applications.

At Cummins Emission Solutions (CES), we have unrivalved engine knowledge and significant expertise in the application of emissions control technology to engine exhaust. With an extensive distribution network, CES brings strong market presence and an immediate ability to assist engine owners and operators in complying with the RICE NESHAP regulation.

Engines used in pumping.

Proven Technology

Our new modular Modulex™ catalytic converters and converter silencers contain platinum catalysts, which are optimally sized for each engine to achieve the CO reductions required by the RICE NESHAP regulation. Our proven field experience with these catalysts and the efficient modular design allows us to provide you with the most cost effective solution. Each HAPs converter/silencer has an access hatch to allow you to add, replace or clean the catalyst element.

- Each Modulex catalytic converter is optimally sized specifically for your engine.
- Our quality and service are unmatched and we back every Johnson Matthey Modulex HAPs Converter with highly responsive field service and technical support.

Engines used in power generation.

Proven Reliability

A key component of Johnson Matthey Modulex HAPs converters is the catalyst itself. The high performance catalyst elements are constructed of stainless steel foil that is brazed to give extraordinary strength and prevent unraveling or telescoping. They are coated with platinum, the most active element for catalytic destruction of HAPs and CO. We design, develop and manufacture the catalyst.

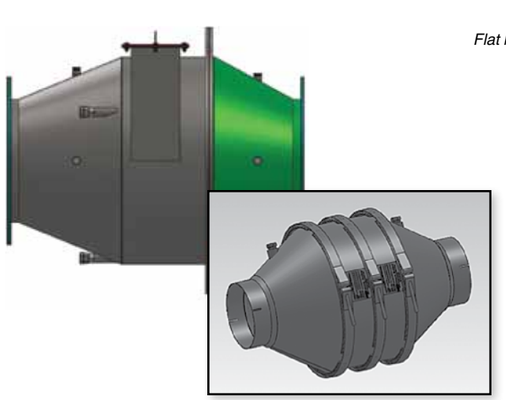
HAPs Catalyst Features and Benefits

- Easy to clean, replace or maintain
- Contains platinum for the highest performance and reliability
- Brazed metallic substrate prevents "telescoping"
- Available in 100 cell density to prevent soot plugging
- Multiple sizes available for quick catalyst replacement and minimal downtime

Modulex™ Converter Features and Benefits

- Efficient modular design
- Catalyst access hatch for element cleaning or replacement
- Silencing: Critical (25-30 dBA) or Hospital (30-35 dBA) Grade
- Low back pressure design 4 to 5" w.c. un-silenced, 14" w.c. with silencer
- Carbon or stainless steel

Figure 1: Modulex™ B Converter



Modulex™ C Converter

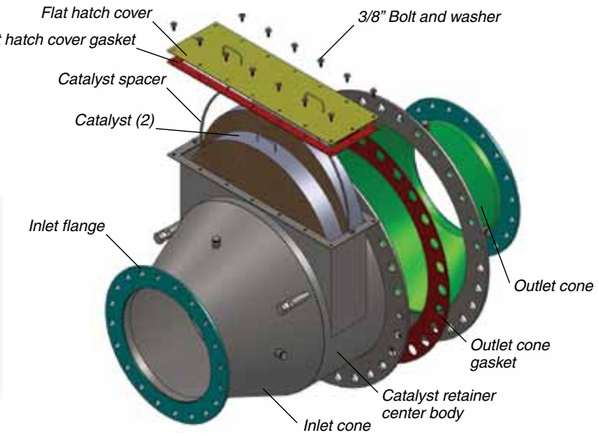
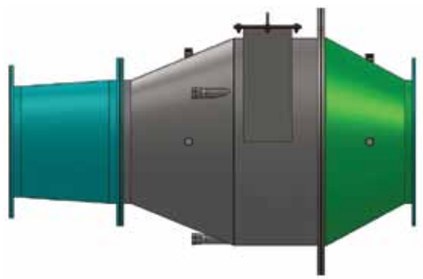


Figure 2: Modulex™ B Converter with Extension Flange



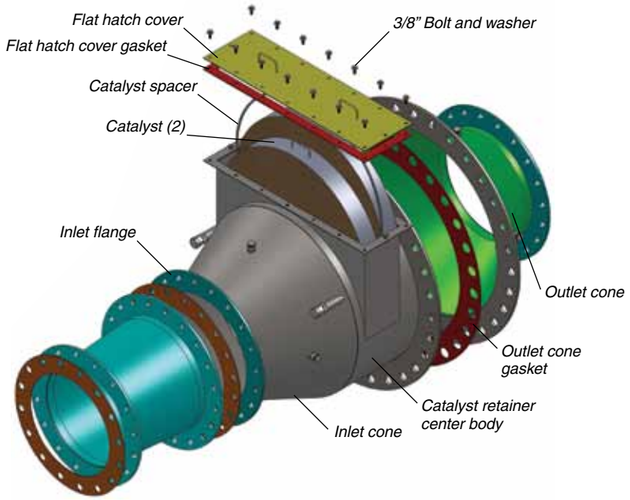


Figure 3: Modulex™ Q Converter with Silencer

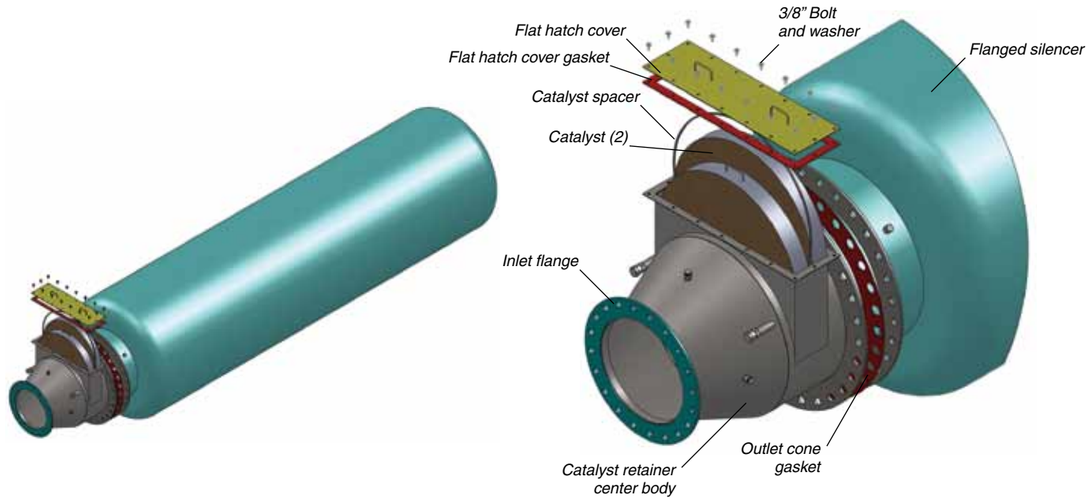
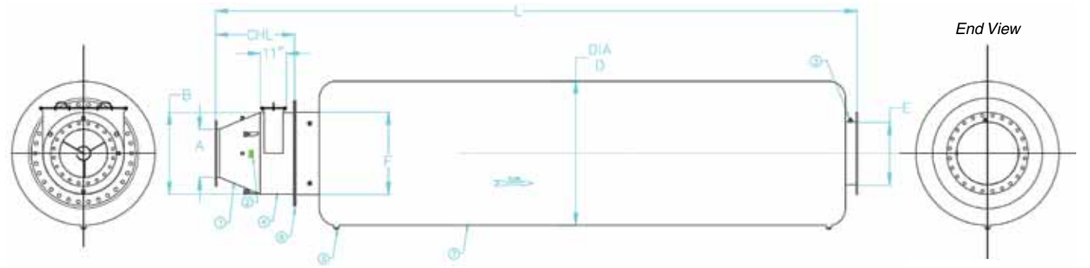


Chart 1: Modulex™ Q Converter/Silencer with Critical or Hospital Grade Silencer



Critical Grade—(25 to 30 dbA) HAPs Single Catalyst Service

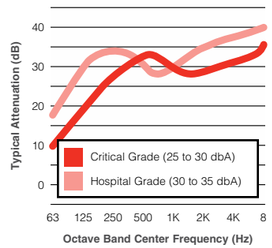
Model	Catalyst	Engine Model	Inlet ANSI Flange (A)	Catalyst Housing Dia. (B)	Catalyst Round Dia.	Catalyst Housing Length (CHL)	Flange (F)*	Outlet ANSI Flange (E)	Silencer Body Dia. (D)	Overall Length (L)	Total Weight
QX10	X10	QSK19-G3	10"	15"	14 1/2"	27"	16"	10"	24"	110 3/4"	487 lbs
QX20	X20	QST23-G7	12"	17 1/2"	17"	27"	18"	14"	30"	118 7/8"	812 lbs
QX30	X30	QST30-G5	14"	20"	19 1/2"	27"	20"	14"	30"	118 7/8"	840 lbs
QX40	X40	QSK38-G4	14"	22"	21 1/2"	29"	22"	16"	36"	130 5/8"	1021 lbs
QX50	X50	QSK50-G4	16"	24"	23 1/2"	29"	24"	18"	36"	140 5/8"	1129 lbs
QX70	X70	QSK60-G6, G14	18"	27"	26 1/2"	29"	28"	24"	48"	203 1/2"	2587 lbs
QX80	X80	QSK78-G6, G7, G8	20"	30 3/4"	30 1/4"	32"	32"	24"	48"	206 1/2"	2604 lbs

Hospital Grade—(30 to 35 dbA) HAPs Single Catalyst Service

Model	Catalyst	Engine Model	Inlet ANSI Flange (A)	Catalyst Housing Dia. (B)	Catalyst Round Dia.	Catalyst Housing Length (CHL)	Flange (F)*	Outlet ANSI Flange (E)	Silencer Body Dia. (D)	Overall Length (L)	Total Weight
QX10	X10	QSK19-G3	10"	15"	14 1/2"	27"	16"	10"	24"	96 1/2"	469 lbs
QX20	X20	QST23-G7	12"	17 1/2"	17"	27"	18"	14"	30"	121"	877 lbs
QX30	X30	QST30-G5	14"	20"	19 1/2"	27"	20"	14"	30"	121'"	905 lbs
QX40	X40	QSK38-G4	14"	22"	21 1/2"	29"	22"	16"	36"	134 1/2"	1055 lbs
QX50	X50	QSK50-G4	16"	24"	23 1/2"	29"	24"	18"	36"	146 1/2"	1424 lbs
QX70	X70	QSK60-G6, G14	18"	27"	26 1/2"	29"	28"	24"	48"	163 1/2"	2379 lbs
QX80	X80	QSK78-G6, G7, G8	20"	30 3/4"	30 1/4"	32"	32"	24"	48"	166 1/2"	2396 lbs

*Size based on standard ANSI flange.

Sound Attenuation Curves



The Modulex Q converter/silencer comes equipped with a silencer module to reduce engine exhaust noise. The Modulex Q can be used to replace the existing silencer. Depending on the level of noise reduction required, the critical grade silencer gives a sound attenuation of 25 to 30 dbA, whereas the hospital grade silencer reduces sound by 30 to 35 dbA.