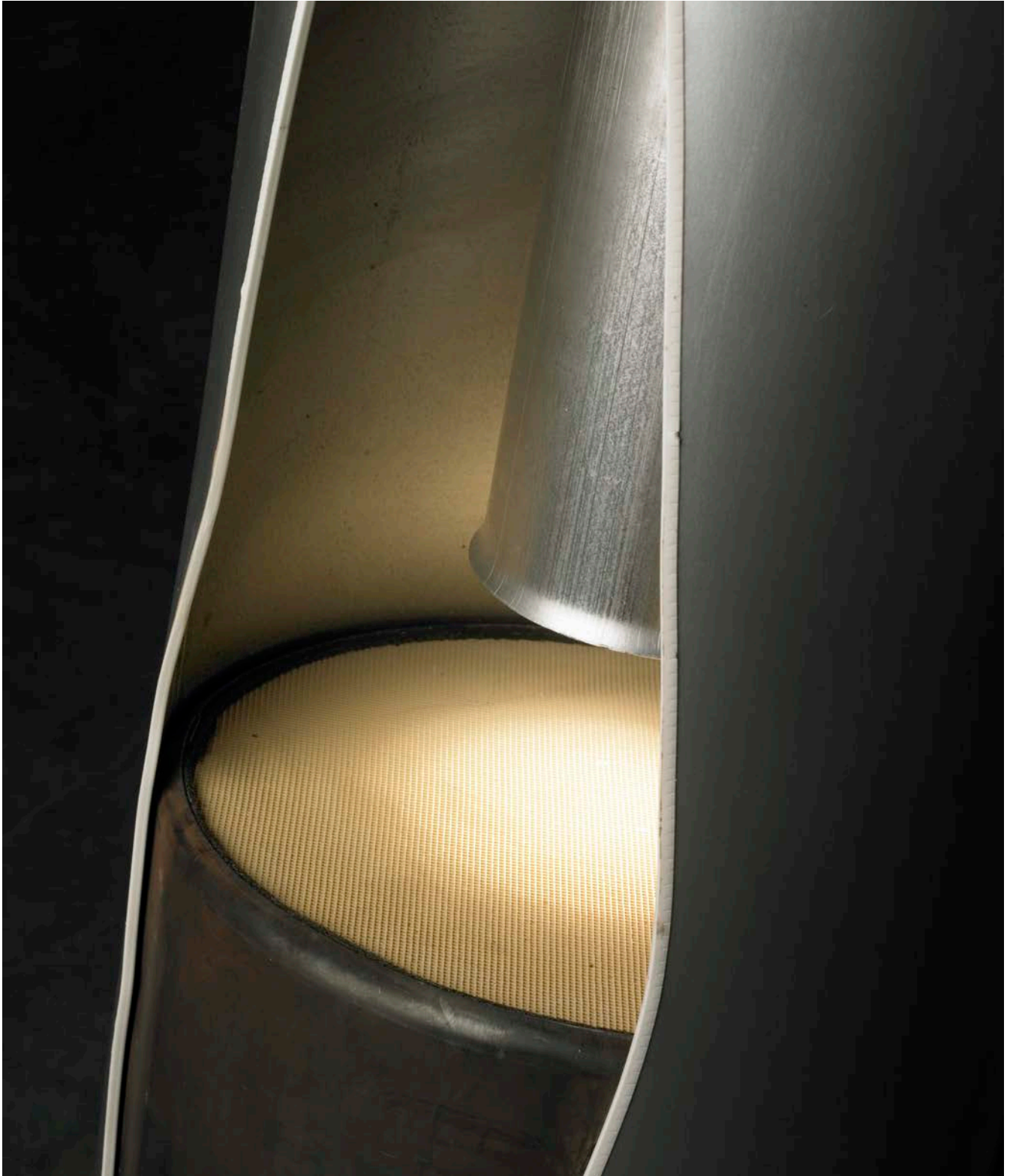
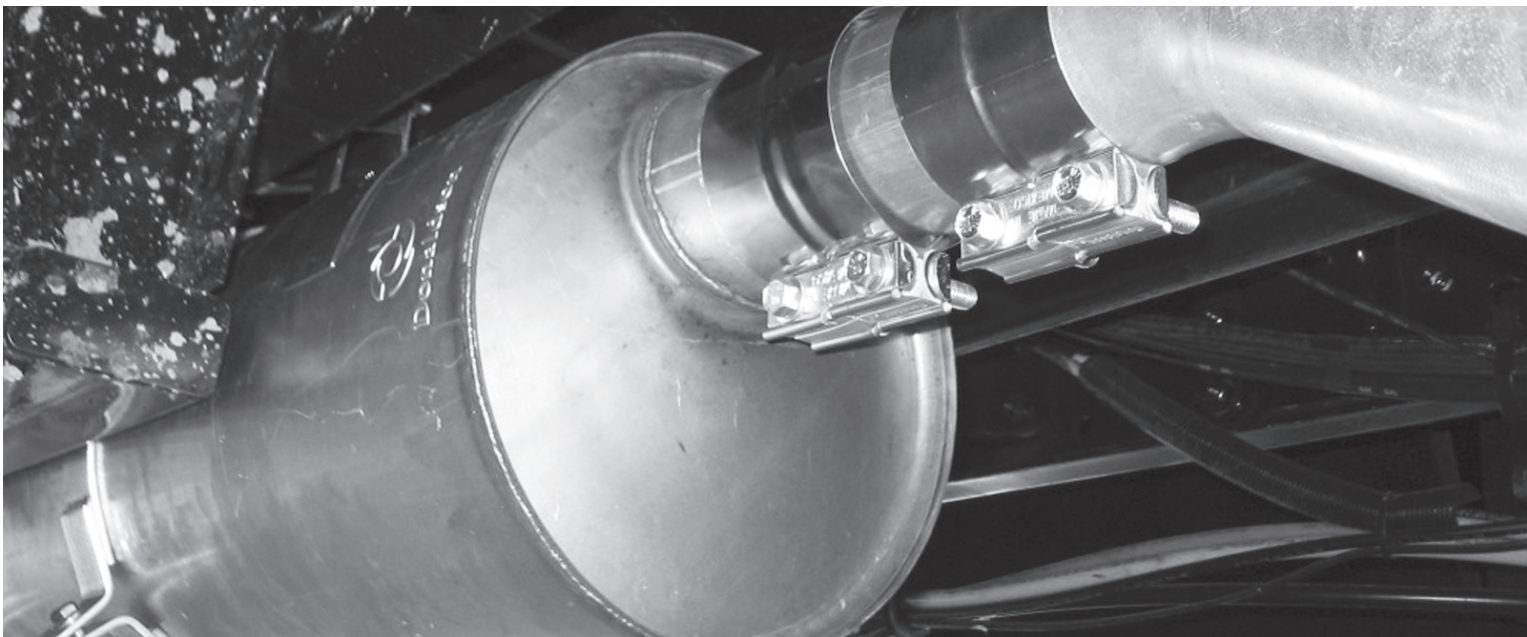




A Cost-Effective Emissions Retrofit Solution  
with No Maintenance –

## **Diesel Oxidation Catalyst (DOC)**





## DOCs or DOC Mufflers A cost-effective solution for Emission Reduction

Donaldson's DOC retrofit emissions products are a proven, reliable solution for reducing diesel emissions.

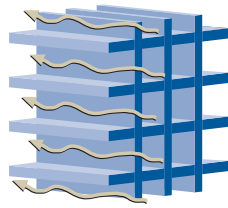
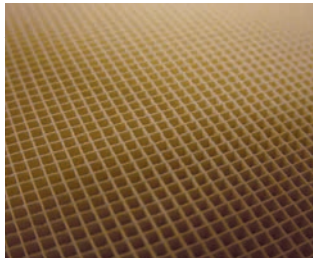
The DOC Muffler is a direct replacement for most original equipment mufflers; the DOCs are to be installed ahead of your existing muffler.

These products offer a cost-effective emissions solution designed for four stroke, on-road, 1988-2006 model year engines rated from 150-550 horsepower.





*Diesel oxidation catalysts (DOCs) have thousands of small open channels. DOC technology is a flow-through emissions technology.*



## Broad Engine Coverage

- Four-stroke diesel engines for on-road applications with engine horsepower ranges of 150-550 hp
- Take-apart style DOC Muffler models ideal for older vehicles (1988-1990) that tend to generate greater emissions. This design provides easy access to the catalyst in the event of face plugging from engine malfunction

## Easy to Install

- DOC Mufflers are direct replacements for most OEM mufflers, DOCs are designed to be installed in-line into the existing exhaust system between the muffler and the turbocharger
- No maintenance requirement

## Compliant

- Verified by U.S. EPA Voluntary Retrofit Program
- Verified for CARB's Diesel Risk Reduction Program (DRRP) for model year 1988-2002
- Removes 15-30% of diesel particulate matter (PM)
- Meets U.S. Federal noise regulations
- Meets Engine OE backpressure limits

## Acceptable Fuel Types

- Low Sulfur Diesel (LSD - < 500 ppm sulfur)
- Ultra Low Sulfur Diesel (ULSD - < 15 ppm sulfur)
- Biodiesel – maximum B20 blend (20% biodiesel/80% petrol diesel). Biodiesel blend stock must meet ASTM D 6751 and blend with ASTM D 975 (1-D or 2-D)

## Durable and Warranted

- Meets U.S. EPA and CARB warranty requirements
- Constructed of aluminized-409 grade stainless steel for strength and corrosion resistance

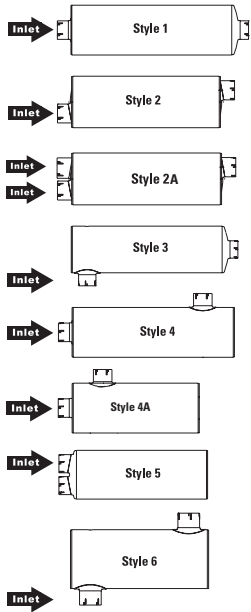
## Engineered for Performance

- Patented flow distribution devices enhance catalyst performance, deliver uniform airflow and temperatures across the catalyst, and reduce exhaust backpressure

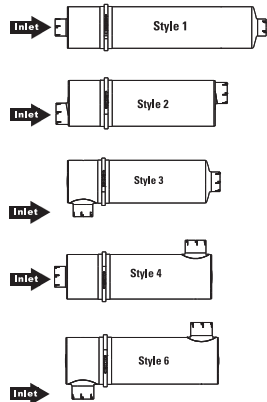
# DOC Muffler Tables

ID = Inner Diameter Dia. = Diameter (Dimensions shown in inches)

## 1 Piece DOC Mufflers



## Take-apart DOC Mufflers



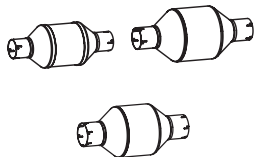
- 1 - Spiracle Crankcase Filtration System must be used with a DOC Muffler to meet CARB Level 1
- 2 - Oval muffler

Style	Dimension (inches)							Engine Model Year & Type			
	Max HP Rating	Inlet I.D.	Outlet I.D.	Body Dia.	Body Length	Overall Length	Offset Tube	EPA <sup>(1)</sup>		CARB	
								1988-2006 CMX DOC	1991-2003 6400 DOC w/Spiracle	1991-2003 6100 DOC	1988-1990 6400 DOC Take-Apart
<b>1</b>	250	4.0	4.0	10.0	44.5	51.0		X009447	X010194	X010969	
	250	4.0	4.0	11.0	36.0	42.5		X009448	X010195	X010970	
	350	4.0	4.0	10.0	44.5	51.0		X009501	X010196	X010971	X009496
	400	4.0	4.0	11.0	36.0	42.5		X009477	X010197	X010972	X009484
	400	4.0	4.0	11.0	36.0	42.5		X011224			
	450	4.0	5.0	11.0	36.0	42.5		X009482	X010198	X010973	X009485
	450	4.0	5.0	10.0	44.5	51.0		X009500	X010199	X010974	X009497
	500	5.0	5.0	11.0	44.5	51.0		X011225			
	500	5.0	5.0	11.0	36.0	42.5		X009478	X010200	X010975	X009486
	525	5.0	5.0	10.0	44.5	51.0		X009499	X010201	X010976	X009498
550	5.0	5.0	11.0	44.5	51.0		X009476	X010202	X010977		
<b>2</b>	250	3.5	4.0	11.0	32.0	38.0		X009452	X010203	X010978	X009488
	250	3.5	4.0	8.25 x 11.5 <sup>2</sup>	30.0	36.5		X009444	X010204	X010979	
	250	4.0	4.0	11.0	32.0	38.0		X009449	X010205	X010980	
	400	3.5	4.0	11.0	32.0	38.0		X011222			
	400	4.0	4.0	11.0	32.0	38.0		X009483	X010207	X010982	X009487
	500	5.0	5.0	11.0	32.0	38.0		X009473	X010208	X010983	
	500	5.0	5.0	11.0	36.0	42.0					X009492
	500	5.0	5.0	11.0	36.0	42.0					X009492
<b>2a</b>	250	2.8	4.0	8.25 x 11.5 <sup>2</sup>	30.0	36.0		X009446	X010209	X010984	
<b>3</b>	250	4.0	4.0	11.0	36.0	39.5	3.8	X009450	X010211	X010986	
	250	4.0	5.0	10.0	44.5	48.0		X009459	X010210	X010985	
	400	4.0	4.0	11.0	36.0	39.5		X011221			
	400	4.0	4.0	11.0	36.0	39.5	3.8	X009479	X010213	X010988	X009489
	400	4.0	5.0	10.0	32.0	36.0	3.8	X009503	X010212	X010987	
	500	5.0	5.0	11.0	36.0	39.5	4.0	X009474	X010214	X010989	X009493
<b>4</b>	525	5.0	5.0	10.0	44.5	48.0	5.5	X009502	X010215	X010990	
	400	4.0	4.0	11.0	36.0	39.0	3.8	X009480	X010216	X010991	X009490
<b>4a</b>	450	5.0	5.0	11.0	36.0	39.0	4.0	X009475	X010217	X010992	X009494
	250	4.0	4.0	11.0	36.0	39.0	29.0	X009462	X010218	X010993	
<b>5</b>	300	4.0	5.0	11.0	36.0	39.0	29.0	X009461	X010219	X010994	
	350	5.0	5.0	11.0	36.0	39.0	29.0	X009463	X010220	X010995	
	250	4.0	4.0	11.0	30.0	33.8		X009451	X010221	X010996	
<b>6</b>	350	4.0	4.0	11.0	30.0	33.8				X010997	
	350	4.0	4.0	11.0	30.0	33.8		X009504	X010222		
	370	4.0	4.0	11.0	26.0	26.0	3.8(2x)	X011223			
	370	4.0	4.0	11.0	26.0	26.0	3.8(2x)	X009481	X010223	X010998	
	370	4.0	4.0	11.0	36.0	36.0	3.8(2x)			X010999	X009491
370	4.0	4.0	11.0	36.0	36.0					X009495	
400	5.0	5.0	11.0	36.0	36.0				X011000		

## Diesel Oxidation Catalysts (Doc's)

DOCs are designed to be installed in-line into the existing exhaust systems between the muffler and the turbocharger.

### DOC



Max HP Rating <sup>(2)</sup>	Inlet I.D.	Outlet I.D.	Body Dia.	Body Length	Overall Length	Offset Tube	EPA		CARB	
							1988-2006 CMX DOC	1991-2003 6400 DOC w/Spiracle	1991-2003 6100 DOC	1988-1990 6400 DOC Take-Apart <sup>(4)</sup>
125	2.5	2.5	5.3	14.0	18.0		X009441	X010224		
175	2.5	2.5	6.3	14.3	18.3		X009442	X010225		
250	3.5	3.5	8.0	13.5	20.5		X009443	X010226	X011003	
400	4.0	4.0	10.0	16.0	23.5		X009458	X010227	X011004	
550	5.0	5.0	11.0	16.5	24.5		X009472	X010228	X011005	

# DOC School Bus Installation Guide

Vehicle Manufacturer	Engine Make	Engine Model	Bus Style	Vehicle Model Year	Tailpipe Installation Kit (4)	EPA	
						20%	20% - 26%
						1988-2006	1991 - 2003
						DOC Muffler (CMX)	DOC Muffler (6100)
<b>Am Tran</b>	International	DT360	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"	
		DT466	Conventional	1991-2004	X010907	Style 2 (oval), 3.5"/4"	
			Conventional	2005-2006	X010424	(2)	
			Front Engine/ Forward Control	1991-2004	X010907	Style 2 (oval), 3.5"/4"	
		DT466, DT530	Rear Engine	1991-2004	TBD	Style 5, 4"/4"	
		T444E	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"	
			Rear Engine	1991-2004	TBD	Style 5, 4"/4"	
		VT365	Conventional	2002-2005	X010424	(2)	
<b>Bluebird</b>	Caterpillar	3116, 3126	Conventional	1997-2000	X010902	Style 1, 10" body dia., 4"/4"	
		3116, 3126	Conventional	2001-2003	X010428	(2)	
		3116,3126 with TC2000 chassis not bi-flow	Rear Engine	1994-2001	X010425	Style 3, 11" body dia., 4"/4"	
		3126 w/ All American chassis	Front Engine/ Forward Control	2001-2004	X010429	(2)	
			Rear Engine	1999-2003	X010904	Style 5, 4"/4"	
		C7	Front Engine/ Forward Control	2002-2004	X010429	(2) / Style 1, 11" body dia., 4"/4"	
			Rear Engine	2002-2004	X010429	(2)	
		C7 / Vision	Conventional	2004-2006	X010429	(2)	
	Cummins	ISB	Rear Engine	1991-2004	X010904	Style 5, 4"/4"	
			Conventional	1997-2004	X010427	Style 1, 11" body dia., 4"/4"	
		ISC	Front Engine/ Forward Control	1992-1997	X010431	Style 1, 11" body dia., 5"/5"	
			Front Engine/ Forward Control	1998-2005	X010432	Style 1, 11" body dia., 4"/4"	
			Rear Engine	1991-2004	X010901	Style 5, 4"/4"	
		ISB w/ All American chassis	Front Engine/ Forward Control	1991-2004	X010903	Style 1, 10" body dia., 4"/4"	
		ISB w/ TC2000 chassis	Front Engine/ Forward Control	1991-2004	X010903	Style 1, 10" body dia., 4"/4"	
	International	DT360	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"	
		DT466	Conventional	1991-2004	X010907	Style 2 (oval), 3.5"/4"	
			Conventional	2005-2006	X010424	(2)	
		T444E	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"	
	<b>Carpenter</b>	International	DT360	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"
DT466			Conventional	1991-2004	X010907	Style 2 (oval), 3.5"/4"	
			Conventional	2005-2006	X010424	(2)	
			Front Engine/ Forward Control	1991-2004	X010907	Style 2 (oval), 3.5"/4"	
DT466, DT530			Rear Engine	1991-2004	TBD	Style 5, 4"/4"	
T444E			Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"	
			Rear Engine	1991-2004	TBD	Style 5, 4"/4"	
<b>Chevrolet</b>		6.5 Durmax	Conventional	All	X010885	Style 1, 8" body dia., 3.5"/3.5"	
<b>Ford</b>		6.0L, 7.3L	Conventional	All	X010886	Style 1, 8" body dia., 3.5"/3.5"	
<b>GMC</b>	Caterpillar	3126	Conventional	1999-2002	(3)	(3)	

## DOC School Bus Installation Guide - Continued

Vehicle Manufacturer	Engine Make	Engine Model	Bus Style	Vehicle Model Year	Tailpipe Installation Kit <sup>4</sup>	EPA		
						20%	20% - 26%	
						1988-2006	1991 - 2003	
						DOC Muffler (CMX)	DOC Muffler (6100)	
International	Ford/International	7.3L (dual inlet)	Conventional	1989-1994	X010887	Style 2a (oval), 2.8"/4"		
	International	DT360	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"		
			Conventional	1991-2004	X010907	Style 2 (oval), 3.5"/4"		
			Conventional	2005-2006	X010424	(2)		
			Front Engine/Forward Control	1991-2004	X010907	Style 2 (oval), 3.5"/4"		
		T444E	Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"		
		VT365	Conventional	2002-2005	X010424	(2)		
Thomas Built/Freightliner	Caterpillar	3126	Front Engine/Forward Control	1997-2004	X010440	Style 1, 11" body dia., 4"/4"		
			Rear Engine/Right Hand Exhaust	2001-2004	X010442	(2)		
		31163126	Conventional	1997-2000	X010436	Style 2, 11" body dia., 4"/4"		
		3116, 3126	Rear Engine/Right Hand Exhaust	1996-2004	X010442	Style 1, 11" body dia., 4"/4"		
			Rear Engine/Right Hand Exhaust	1996-2004	X010442	Style 3, 11" body dia., 4"/4"		
		3116, 3126, C7	Rear Engine/Left Hand Exhaust	1996-2000	X010442	Style 3, 11" body dia., 4"/4"		
		3126, C7	Rear Engine/Left Hand Exhaust	2001-2004	X010442	Style 3, 11" body dia., 4"/4"		
		3126, C-7	Conventional	2001-2002	X010440	(6) / (2)		
		3126, C-7	Conventional	2003-2006	X010440	(2)		
		Cummins	ISB	Conventional	1999-2002	X010435	Style 2, 11" body dia., 4"/4"	
				Conventional	2003-2004	X010435	(2)	
				Front Engine/Forward Control	1994-1997	X010439	Style 1, 11" body dia., 4"/4"	
				Front Engine/Forward Control	1998-2004	X010440	Style 1, 11" body dia., 4"/4"	
				Rear Engine/Left Hand Exhaust	1994-2000	X010441	Style 3, 11" body dia., 4"/4"	
	International			DT360	Conventional	1991-2004	X010907	Style 2 (oval), 3.5"/4"
	International	DT466	Conventional	1991-2004	X010907	Style 2 (oval), 3.5"/4"		
			Conventional	2005-2006	X010424	(2)		
			Conventional	1991-2005	X010907	Style 2 (oval), 3.5"/4"		
	Mercedes	MBE900	Conventional	2004	X010438	Style 1, 11" body dia., 4"/4"		
			Conventional	2002-2003	X010437	Style 2, 11" body dia., 4"/4"		
			Conventional	2005-2006	X010905	Style 1, 11" body dia., 4"/4"		
			Rear Engine/Left Hand Exhaust	2004	X010442	Style 3, 11" body dia., 4"/4"		

<sup>2</sup> Vehicle originally equipped with a DOC. Purchase Spiracle Kits or upgraded technology.

<sup>3</sup> Kit currently unavailable.

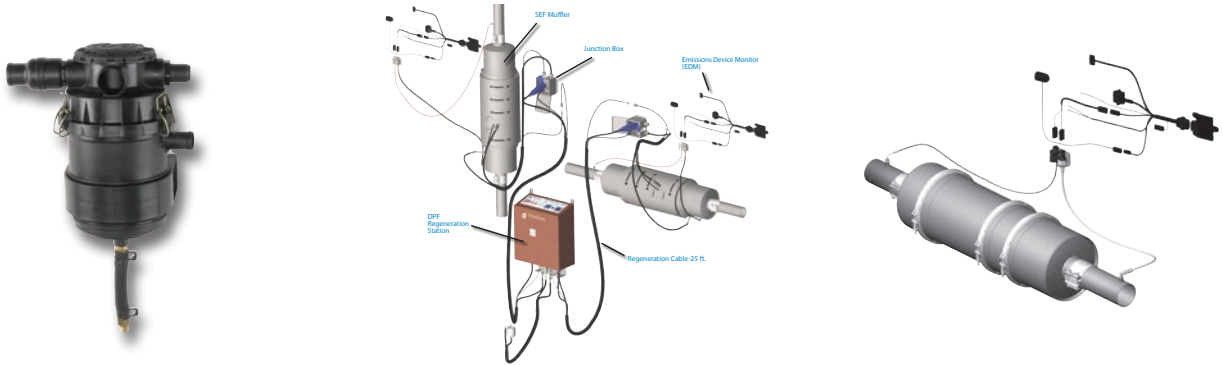
<sup>4</sup> Installation kit must be ordered with DOC from Product Line.

<sup>5</sup> Muffler Style 1 - 4" inlet and outlet.

<sup>6</sup> Muffler Style 1 Inlet / Style 2 outlet.

# Retrofit Emissions Solutions for Diesel-Powered Vehicles

Donaldson was the first to introduce tailpipe and crankcase retrofit solutions and a DPF Cleaning System in support of the U.S. EPA & California ARB voluntary diesel retrofit programs.



*Spiracle Crankcase Filtration System allows closure of the engine crankcase vent eliminating blow-by gases and fumes that would normally vent to atmosphere.*

*SEF Muffler System (vertical and horizontal views)*

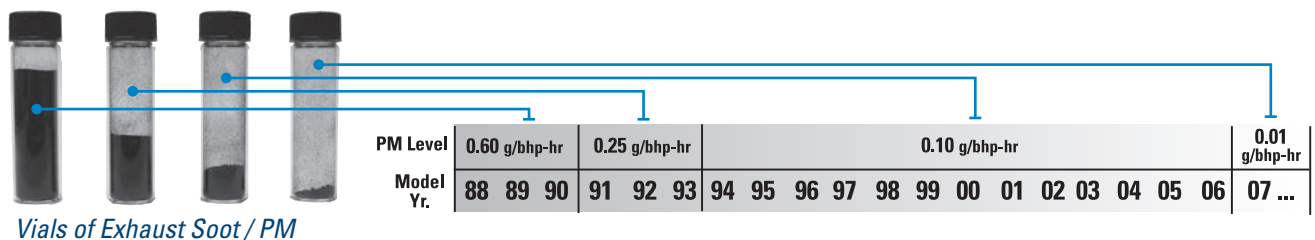
*Passive technology solutions: DOC Mufflers, LNF Mufflers, and LXF Mufflers*

## Retrofit Solutions Feature Comparison

Product Family	Spiracle™ CFS	LNF/LXF Mufflers	SEF Mufflers	DOC Mufflers
<b>Technology</b>	Barrier	Partial Filter + Wall Flow (passive)	Flow Through + SiC Wall Flow (active)	Flow Through (passive)
<b>PM Efficiency (%)</b>	100%	90+%	90+%	20-30%
with Spiracle CFS	--			25-49%
<b>Engine MY Coverage</b>		1993-2006	1993-2006	1988-2006
<b>BACT/BART Level</b>		Level 3+ (>90%)	Level 3+ (>90%)	Up to Level 1 (>25%)
<b>EGT<sup>(1)</sup> Sensitivity</b>	None	Medium	N/A or Unknown	None
<b>Fuel Type</b>	N/A	ULSD/Up to B20	Any	Any
<b>Maintenance</b>	Filter replacement and annual blow-by flow testing	Soot/Ash Cleaning	Periodic on-board regeneration and ash cleaning	None

<sup>(1)</sup> EGT - Exhaust Gas Temperature. Proper application of the wall flow (high efficiency solutions) requires EGT knowledge for the operating vehicle.

## PM Regulations Changes - On-Road



# Verifications

California ARB Site: <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>

U.S. EPA Diesel Retrofit Web Site: <http://epa.gov/cleandiesel/verification/verif-list.htm>

## LXF Muffler (Level 3+)

- CARB EO DE-09-014-02 (2011)
- CARB EO DE-09-014-01 (2010)
- CARB EO DE-09-014 (2009)

## LNF Muffler (Level 3+)

- CARB EO DE-09-009-03 (2010)
- CARB EO DE-09-009-02 (2010)
- CARB EO DE-00-009-01 (2009)
- CARB EO DE-09-009 (2009)

## SEF Muffler (Level 3+)

- CARB EO DE-09-003 (2009)
- DOC Muffler Series 6000/6400 + Spiracle CFS
- CARB EO DE-04-010-02 (2011)
- CARB EO DE-10-001 (2011)

## DOC Muffler Series 6100

- CARB EO DE-10-002 (2011)
- EPA (Aug 2003)

## DOC Muffler Series 6100 + Spiracle CFS

- CARB EO DE-10-003 (2011)
- EPA (Aug 2001), Amended (2011)

## DOC Muffler Series 6400 + Spiracle CFS

- EPA (Aug 2011)

## Formerly Verified in California (due to rule changes)

### LTF Muffler with and without Spiracle CFS

- CARB EO DE-06-004 - Level 3 (2006)
- CARB EO DE-06-005 - Level 3 (2006)

### DPF Muffler

- CARB EO DE-04-005-04 - Level 3 (2008)
- CARB EO DE-04-005-03 - Level 3 (2008)
- CARB EO DE-04-005-02 - Level 3 (2005)
- CARB EO DE-04-005-01 - Level 3 (2004)
- CARB EO DE-04-005 - Level 3 (2004)

### DMF Muffler

- CARB EO DE-05-012 - Level 2+ (2005)

### DMF Muffler with Spiracle CFS

- CARB EO DE-05-013 - Level 2+(2005)

## "Total Emissions" Approach to Eliminate Crankcase Emissions

Medium- and heavy-duty turbocharged diesel engines have open crankcase vents because blow-by contaminants can foul turbocharger and aftercooler components if unfiltered. The Donaldson Spiracle™



Crankcase Filtration System eliminates harmful and unwanted crankcase emissions and allows the crankcase to be closed without degrading performance.

Other Spiracle Crankcase Filtration System benefits include reducing in-cabin emissions and under hood odors/fumes. It also reduces engine oil consumption and maintains a cleaner engine compartment. For more information, go to [www.donaldson.com/en/exhaust/support/datalibrary/061798.pdf](http://www.donaldson.com/en/exhaust/support/datalibrary/061798.pdf)

DOC Muffler + Spiracle CFS Kits are available. Contact Donaldson or visit [www.donaldson.com/emissions](http://www.donaldson.com/emissions).



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[www.donaldson.com/emissions](http://www.donaldson.com/emissions)

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