

Questionnaire: Heraeus Diesel Catalysts

Check list for Sample/ Quotation Order

In the following bullets we please you to provide us as much information as possible, so that we can provide you a perfect product. The more details we can get from you, the more precise we can work on your product and the better service we can provide to you.

All information is strictly confidential and will not be available for third party use.

Customer Name: _____

Date: _____

1. Engine Data

Company / Engine Model / Configuration: _____

Number of Cylinders: _____

Power [kW]: _____

Displacement [L]: _____

Horsepower @ RPM: _____

Fuel Type: _____

Fuel Injection: _____

Aspiration: _____

Compression Ratio: _____

Fuel Consumption (Full Load) [L/h]: _____

EGR Implementation / EGR rate [%]: / _____

Exhaust Gas Temperatures

engine out / T [°C]: _____

catalyst position(s) / T [°C]: _____

stack / T [°C]: _____

Exhaust Gas Flow [m³/h] @ 0°C, 1 atm: _____

2. Raw Emission Data:

If available please attach raw emission data out of applied test cycles.

Modal data via graph / chart, containing:

- testing cycle type
- data @ 1 Hz time resolution:
 - O₂, CO₂, THC, CO, NO_x, PM, etc. in [g/kWh], [ppm] or [%]
 - temperature in [°C]
 - engine speed / load in [%]

Otherwise please provide detailed information in Section 3.iii.

3. Legislation / Emission Standards:

i. **Emission regulations to meet:** _____
 (i.e. regarding CARB, EPA, EU regulation, etc.)

ii. **Type of designated testing cycle:** _____
 (i.e. ESC, ETC, WHSC, WHTC, etc.)

iii. **Tests performed / standard performance to meet:**

- **Performed testing cycle:** _____

- **Date of the test** _____

- **Duration of the test (KM)** _____

- **Status of the tested catalyst**

- **new / fresh catalyst**

- **used catalyst**

(lifetime / degreening conditions) _____

- **aged catalyst**

(aging conditions) _____

- **Total testing result in numbers [g/kwh] or [g/km]**

	raw emission	test result	internal target	regulation target
CO				
HC				
NOx				
PM				
—				
—				
—				

- **min. / max. temperature over test cycle [°C]** _____

- **min. / max. mass flow over test cycle [kg/h]** _____

4. Aftertreatment System, Technical Design

i. Aftertreatment System / Sample Request

Please mark which catalysts types are to be integrated in the designated aftertreatment system and for which you'd like to receive Heraeus samples and / or quotation data:

designated system part	request (Heraeus)	already existing	substrate type, substrate size, cpsi and PGM loading of existing catalyst
DOC <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
DPF <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
SCR <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
ASC <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	_____

requested system part	sample /pcs.	quotation /pcs.	annual volume	substrate type, substrate size, cpsi and PGM loading
DOC <input type="checkbox"/>	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
DPF <input type="checkbox"/>	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
SCR <input type="checkbox"/>	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
ASC <input type="checkbox"/>	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
Other: _____	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
Other: _____	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
Other: _____	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____
Other: _____	<input type="checkbox"/> / _____	<input type="checkbox"/> / _____	_____	_____

ii. System Design

Where are the catalysts to be placed in the system?

(catalyst sequence, close coupled, close to exit)

iii. Technical drawings

If available, please attach technical drawings of the applied and designated substrates and / or the complete exhaust gas system.

5. General Catalytic Challenges / Catalyst Poisoning:

i. Fuel Quality:

- **Fuel Standard /Grade:** _____
- **Sulfur Content [ppm]:** _____
- **Fuel Specifics:** _____

ii. Oil Quality:

- **Oil Standard /Grade:** _____
- **Oil Specifics:** _____

iii. Other known, possible restrictions / problems:

6. Catalyst design:

a) DOC

i. Required functionality:

- **CRT catalyst**
high NO₂ yield, stable to aging
i.e. for CRT or fast-SCR
- **HCI catalyst**
high temperature stable HC-activity
i.e. for HC-injection
- **HC/CO catalyst**
i.e. for aftermarket applications
- **Other:**

ii. Specifications, if given:

- **Required PGM loading [g/ft³] / ratio (Pt/Pd):** _____
- **Required substrate size / type / material:**

- **Additional requirements / comments:**

iii. Catalyst Experience:

(coating type, PGM loading, substrate, size)

- **Comments:**

b) DPF

i. Designated regeneration strategy, if defined:

- **passive: CRT**
(continuous regenerating trap)
- **passive: FBC**
(fuel born catalyst)
- **active: HCl**
(temperature increase by hydrocarbon injection)
- **active: burner system**
(temperature increase by fuel burner)
- **other:**

ii. Coating Type @ DPF, if defined:

- **CRT**
(regeneration: 250°C-400°C)
- **CRT + Catalysed Soot Oxidation**
(regeneration: 250°C-600°C)
- **Catalysed Soot Oxidation**
(regeneration: 400°C-600°C)
- **SCR**
- **other:**

iii. Specifications, if given:

- **Required PGM loading [g/ft³] / ratio (Pt/Pd):** _____
- **Required filtration efficiency [%]:** _____
- **Max. backpressure [kPa] @ V [m³/h]:** _____

- **Required substrate size / type / material:** _____

- **Additional requirements / comments:**

iv. Catalyst Experience:

(coating type, PGM loading, substrate, size)

▪ **Comments:**

c) SCR

i. Designated SCR-application:

- **HC-SCR**
- **NH₃-SCR**

ii. Additional catalysts:

- **DOC**
(CRT catalyst, NO₂-production for fast-SCR)
- **ASC**
(Ammonia slip catalyst, NH₃-decomposition)

iii. SCR-system:

- **Please provide specific engine map or catalyst performance map, if available.**
- **Please provide some technical details of your SCR system**
(i.e. catalyst sequence: DOC/DPF/Hydrolysis/SCR/ASC)

- **Please provide some technical details of your urea dosing system, if applicable.**

- **Please attach a technical drawing, if available.**

iv. Specifications, if given:

- **Required substrate size / type / material:** _____

v. Additional requirements / performance data / comments:

- **Required NOx reduction [%]:** _____
- **Working temperature range [°C]:** _____
- **Expected peak temperature @ SCR-catalyst [°C]:** _____
- **HC concentration @ SCR-catalyst [ppm]:** _____
- **Sulphur concentration [ppm]:** _____
- **Comments:**

vi. Catalyst Experience:

(coating type, substrate, size)

- **Comments:**

7. New projects:

Please inform us, if you need support in any other project:

8. Contact data:

Company:

Name / Position:

Address:

Phone:

E-mail:

@

Date:

9. Glossary:

acronym / abbr.	authority / catalyst type / exhaust component / method / organisation
ASC	<i>ammonia slip catalyst</i>
CARB	<i>California Air Resources Board</i>
CO	<i>carbon monoxide</i>
cpsi	<i>cells per square inch</i>
CRT	<i>continuously regenerating trap</i>
DOC	<i>Diesel oxidation catalyst</i>
DPF	<i>Diesel particle filter</i>
EGR	<i>exhaust gas recirculation</i>
EPA	<i>Environmental Protection Agency</i>
ESC	<i>European steady state cycle</i>
ETC	<i>European transient cycle</i>
EU	<i>European Union</i>
FBC	<i>fuel born catalyst</i>
HC	<i>hydrocarbon</i>
HCI	<i>hydrocarbon injection</i>
max.	<i>maximal</i>
min.	<i>minimal</i>
pcs.	<i>pieces</i>
PGM	<i>precious group metal</i>
PM	<i>particulate matter</i>
RPM	<i>rounds per minute</i>
SCR	<i>selective catalytic reduction</i>
WHSC	<i>world harmonised steady state cycle</i>
WHTC	<i>world harmonised transient cycle</i>