




In this issue:

In this fifth news bulletin we bring you an overview of DENSO Diesel Common Rail Small Injection Quantity Learning, as useful background information to our latest film on  [click here](#).

Following the introduction of the new DENSO-C diagnostic tool in our December newsletter, we will be issuing some additional technical news bulletins in this period to provide further technical insight into DENSO Diesel systems – and the need for, and use of, diagnostics.

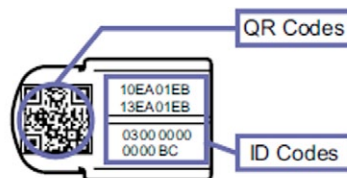


Replacing a Diesel Common Rail Injector:

When replacing a DENSO Diesel Common Rail Injector, marked with a compensation code, it is necessary to register the ID code, printed on the upper part of the injector, with a genuine OEM - or DENSO diagnostic tool, into the electronic control unit (ECU).



The injector compensation (ID) code is used to compensate injector production tolerances.

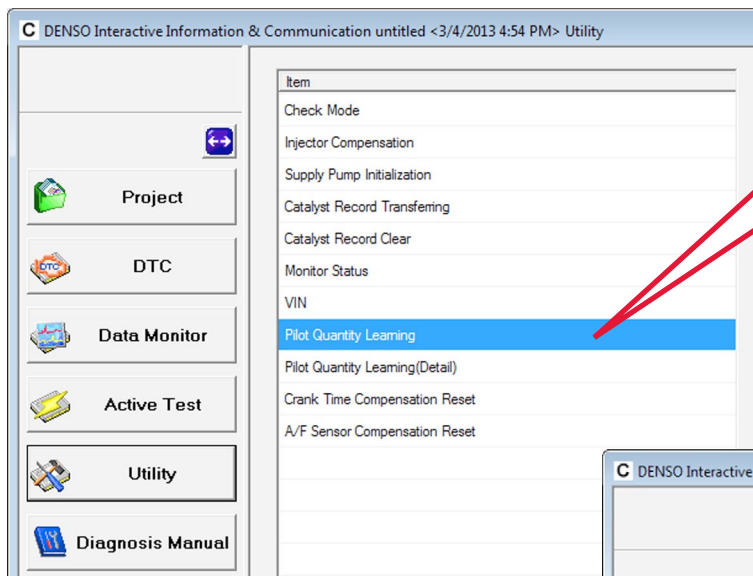


Some vehicles also require Small Injection Quantity Learning.

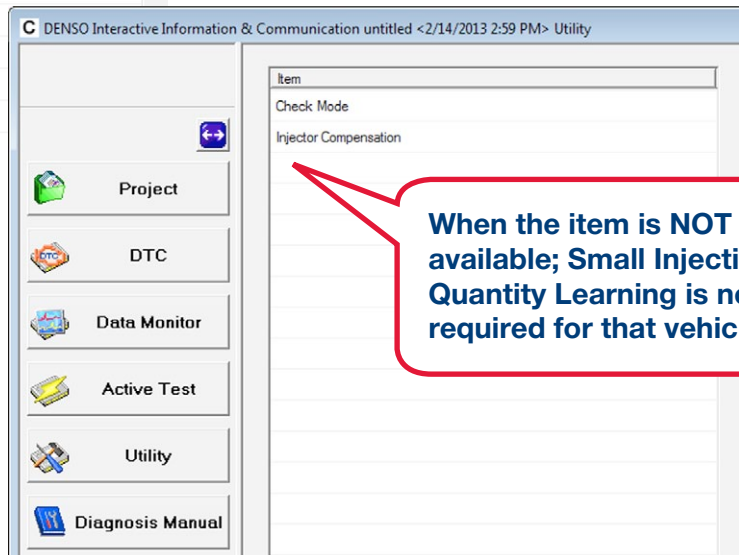
After the registration of the ID code into the ECU, it is necessary to consult with a genuine OEM - or DENSO diagnostic tool, to find out if it is necessary to perform Small Injection Quantity Learning.

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When the item is available; it is necessary to perform Small Injection Quantity Learning after the injector compensation (ID) code is registered



When the item is NOT available; Small Injection Quantity Learning is not required for that vehicle.

Small Injection Quantity Learning:

Injecting very small amounts of fuel gives a very large deviation in the injection. These amounts are normally injected by the pilot injection. ID-Codes cannot compensate these small injections due to the significant influence of the ageing of an injector.

The function, Small Injection Quantity Learning (available in genuine OEM - or DENSO diagnostic tools), will adjust the acceleration per cylinder in order to achieve maximum engine smoothness. In some cases the vehicle will execute automated Small Injection Quantity Learning during normal operation (for the lower common rail pressure ranges) every several thousand kilometres.

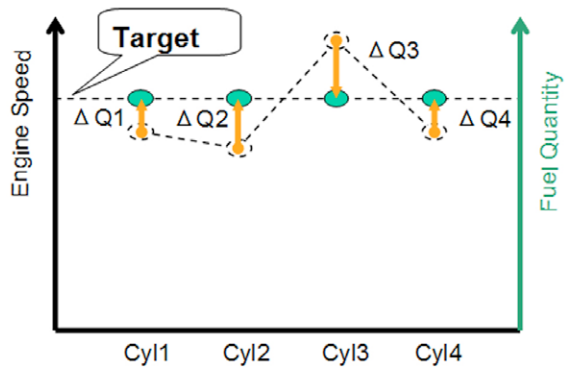
Other names:

Depending on the vehicle manufacturer, Small Injection Quantity Learning is sometimes known by other names:

- SQL: Small Quantity Learning
- IAC: Injection Amount Correction (Citroen, Opel, Mazda)
- PCL: Perform Pilot Correction Learn (Ford)
- IQC: Injection Quantity Correction (Mitsubishi, Subaru)
- PQL: Pilot Quantity Learning (Toyota)
- FCCB: Fuel Control for Cylinder Balance

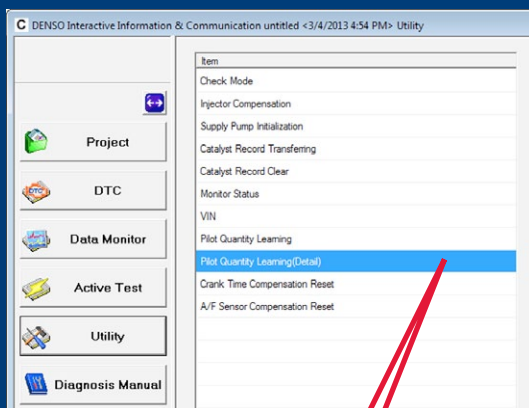
Risks if Small Injection Quantity Learning is not done:

- Increased soot emissions
- Clogged DPF (Diesel Particle Filter)
- Increased fuel consumption
- Knocking noise
- Cylinder head gasket damage
- DTC (Diagnostic Trouble Code)
- MIL (Check Engine Lamp) on



Did you know...?

Small Injection Quantity Learning requires the engine to be in 'perfect' condition. If there are problems in the engine, causing rpm fluctuations or maximum Small Injection Quantity Learning, this function will fail. In some vehicles there is an additional option available for Small Injection Quantity Learning. This additional Small Injection Quantity Learning (detail) should only be used when Small Injection Quantity Learning cannot complete.



Use this function only when Small Injection Quantity Learning cannot complete.

Signal	Value	Unit
✓ No.1 cylinder Injector at 35MPa	-0.055	ms
✓ No.2 cylinder Injector at 35MPa	-0.004	ms
✓ No.3 cylinder Injector at 35MPa	-0.047	ms
✓ No.1 cylinder Injector at 65MPa	-0.059	ms
✓ No.2 cylinder Injector at 65MPa	-0.027	ms
✓ No.3 cylinder Injector at 65MPa	-0.043	ms
✓ No.4 cylinder Injector at 65MPa	-0.031	ms
✓ No.1 cylinder Injector at 100MPa	-0.027	ms
✓ No.2 cylinder Injector at 100MPa	-0.012	ms
✓ No.3 cylinder Injector at 100MPa	-0.016	ms
✓ No.4 cylinder Injector at 100MPa	-0.008	ms
✓ No.1 cylinder Injector at 140MPa	-0.004	ms
✓ No.2 cylinder Injector at 140MPa	-0.015	ms
✓ No.3 cylinder Injector at 140MPa	0.004	ms
✓ No.4 cylinder Injector at 140MPa	0.008	ms
✓ Transmission Gear Engaged	N	
✓ Glow Plug Relay State - Commanded	Off	
✓ Glowplug	Off	
✓ MIL	Off	
✓ Charge Warning	Off	
✓ Cruise Active	Off	
✓ In Gear - Transmission Is Applying A Load To Engine (From Inputs And/Or Inferred)	FALSE	

Below the table, there are controls for 'Select Time Axis (sec)', 'Number of Graph' (set to 3), and 'Select Signal Group' (set to < User Defined >).

Diagnostics:

Depending on the vehicle manufacturer it may be possible to display the results of the Small Injection Quantity Learning via genuine OEM - or DENSO diagnostic software. In case of problems these Small Injection Quantity values can be used to start the trouble shooting.

NB During trouble shooting do not forget to check the injector compensation codes first.


In the next issue:

In the next (and last) news bulletin we will look in depth at the DENSO Diesel-specific system factors you need to be aware of whilst working on, and diagnosing, a DENSO Diesel common rail system.

Aspects that will be reviewed are:

- Diagnostic sample cases

Go online!

Over the coming weeks we will upload new videos on the DENSO Diagnostic YouTube channel to support these news bulletins. Why not take a look? To check out our films and subscribe to our  channel, [click here](#). **Thank you for watching!**



Scan the QR Code with your smartphone to open the DENSO Diagnostic YouTube channel and have a look at our latest technical movies.

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