Hyundai Diesel Commercial Vehicles - Emissions Control

Hyundai Hong Kong Company Limited

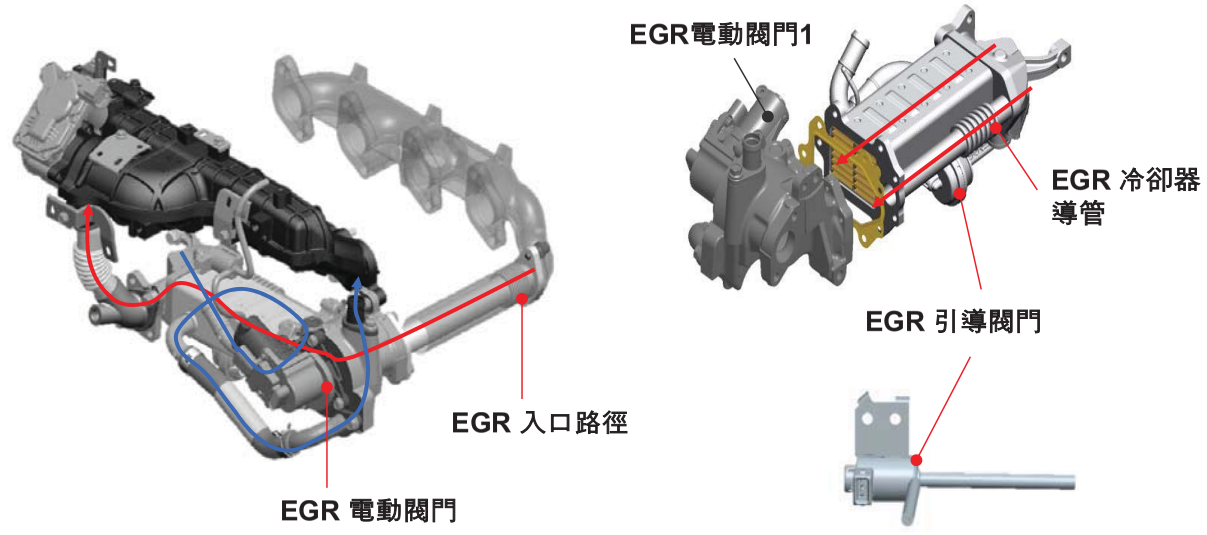
1. **Grand Starex Euro VI** 後處理系統 **SCR (**選擇性催化還原器**)** 介紹
2. **H-1 Van Euro VI** 後處理系統 **LNT (**稀燃氮氧化物捕集器**)** 介紹
3. 後處理系統 **DPF (**懸浮粒子過濾器**)** 介紹
4. 個案分享

Specification

Item	Description		Remark
Vehicle Specifications	H-1	Grand Starex	-
Model Name	A2 D4CB (Inline DOHC)		-
Emission	EURO VI	EURO VI	-
Engine Displacement (cc)	2,497		-
Max. Power Output (ps/rpm)	136/3600, 170/3600	170/3300	-
Max Torque (kg·m/rpm)	35/2000, 45/2000	43/1750	-
EMS	Denso		-
Aftertreatment	DOC + DPF+LNT	DOC + DPF + SCR	-
Injector	G4S		Φ0.126×8
Max Injection Pressure	2,000bar		-
High-Pressure Pump	HP3		-
Turbocharger	Electronic Controlled Turbo-Charger		VGT
Engine Oil Capacity (L)	7 (when exchanging oil filter)		C3 5W30

後處理系統 – EGR (廢氣循環系統)

•EGR 廢氣線路
* EGR 冷卻線路

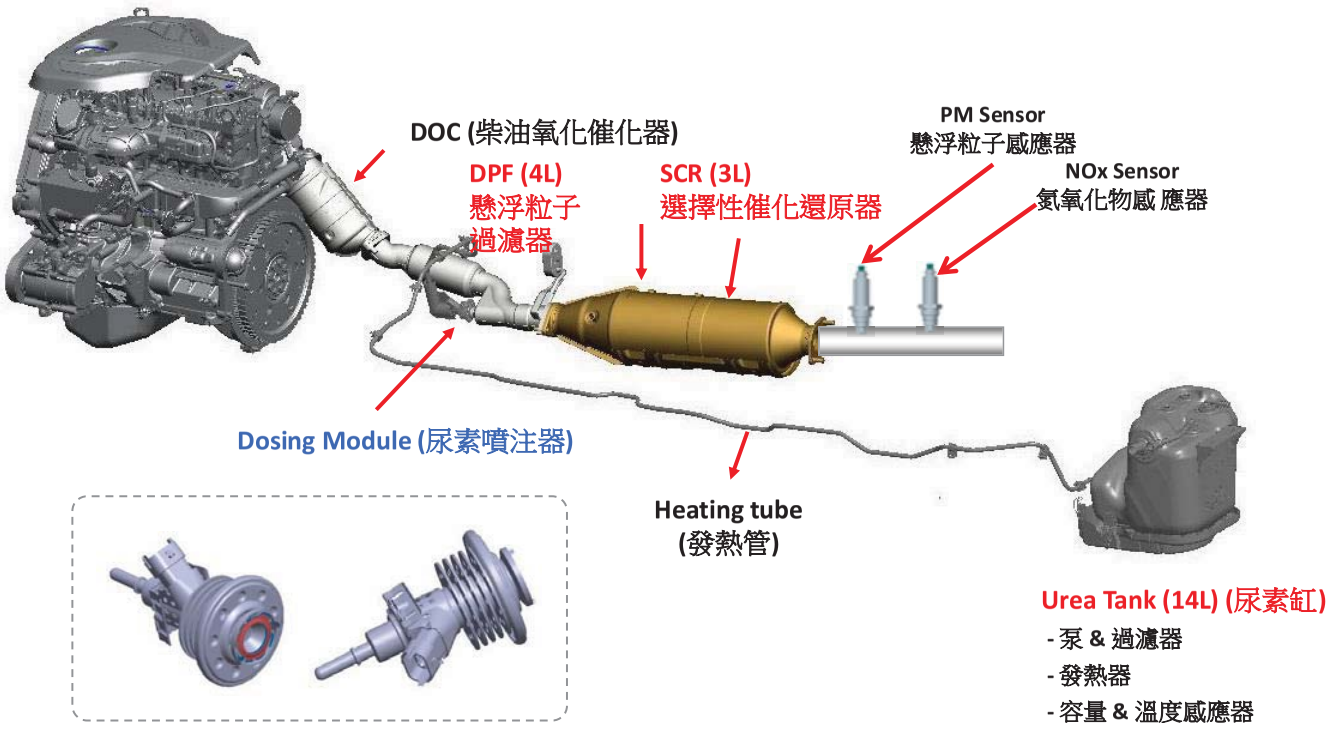


- 廢氣循環系統(EGR) 將廢氣再次導入氣缸燃燒, 從而降低燃燒以壓抑氮氧化物的產生。

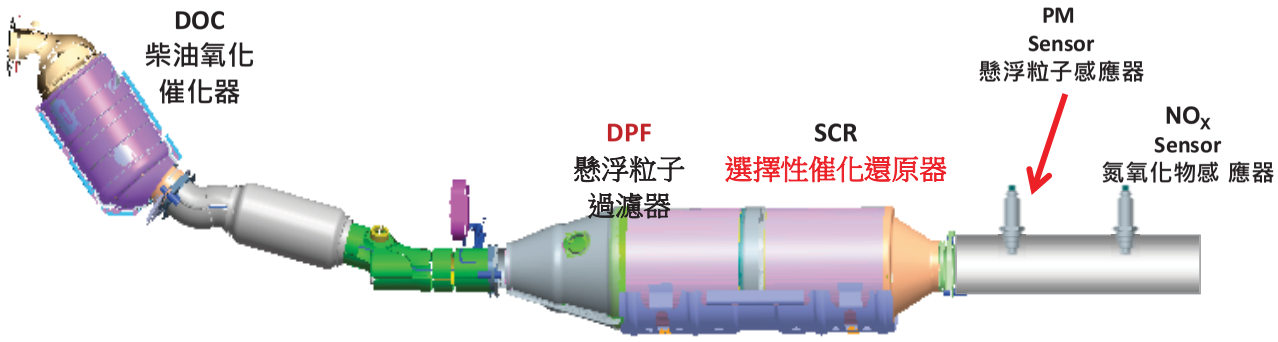
Hyundai Grand Starex / H-1 Premium - Emission Control
Selective Catalytic Reduction (SCR)

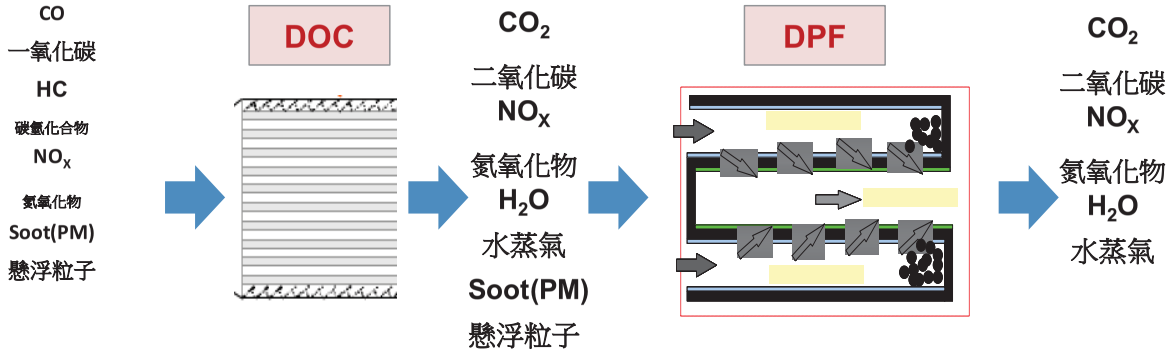
Hyundai Hong Kong Company Limited

Grand Starex EURO VI 後處理系統 – DOC +DPF+SCR

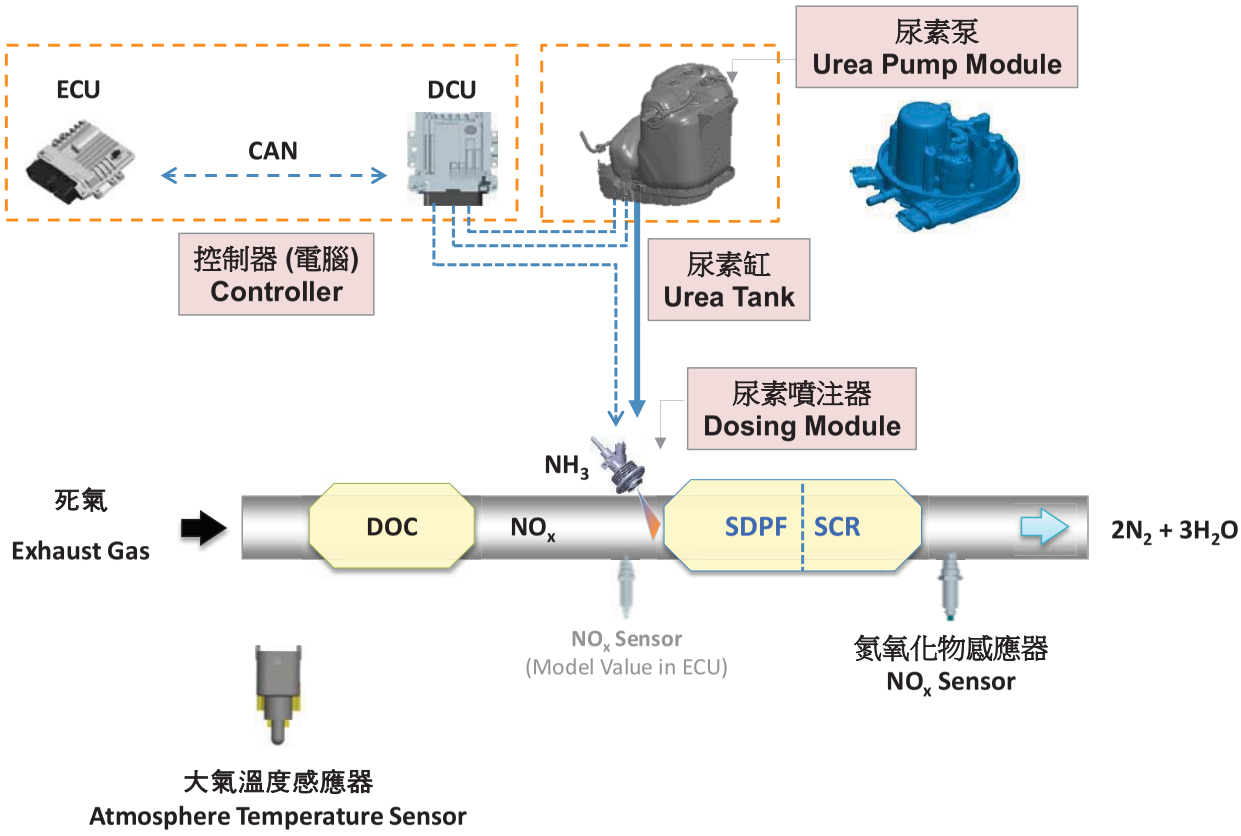


後處理系統 - DOC + DPF +SCR



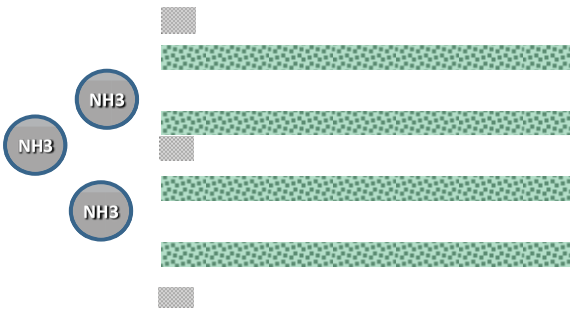


後處理系統 - SCR(系統構圖)

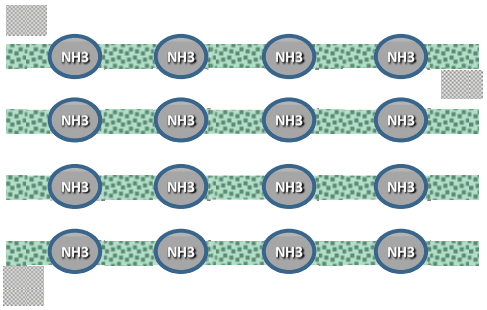


後處理系統 - (SCR) 選擇性催化還原器

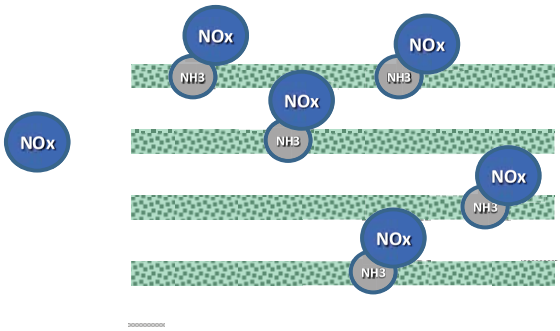
① 尿素注入



② 吸收NH_3 (氨, 又名: 阿摩尼亞)



③ 氮氧化物 淨化



[SCR 的化學反應]

SCR Reactions

$6\,NO + 4\,NH_3 \rightarrow 5\,N_2 + 6\,H_2O$

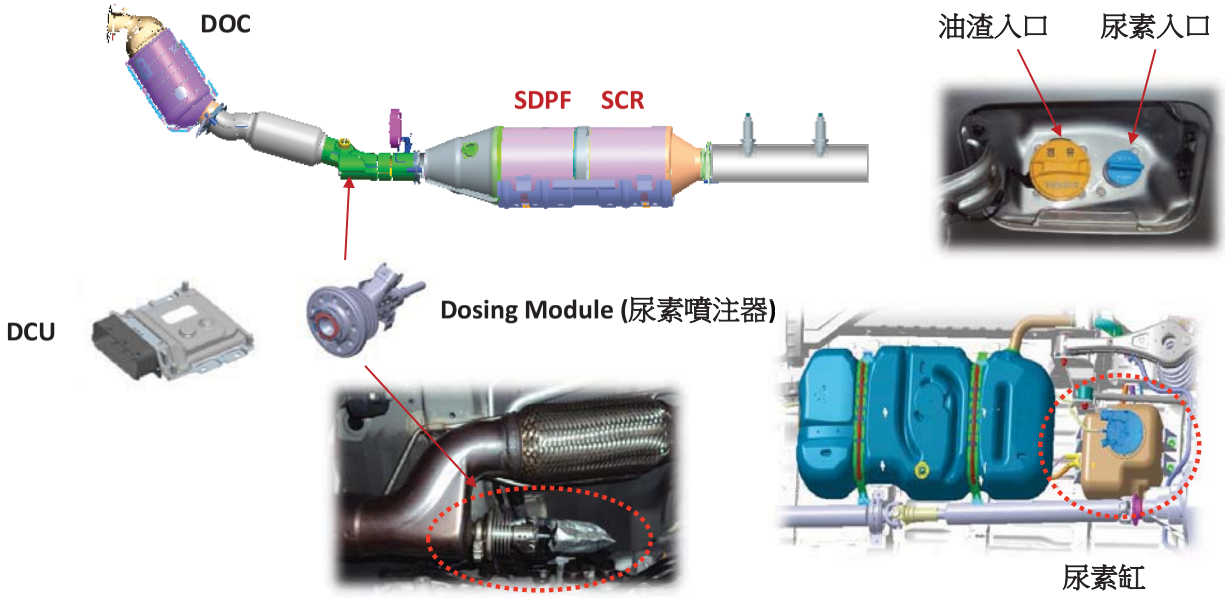
$4\,NO + 4\,NH_3 + O_2 \rightarrow 4\,N_2 + 6\,H_2O$

$NO + NO_2 + 2\,NH_3 \rightarrow 2\,N_2 + 3\,H_2O$

$6\,NO_2 + 8\,NH_3 \rightarrow 7\,N_2 + 12\,H_2O$

$2\,NO_2 + 4\,NH_3 + O_2 \rightarrow 3\,N_2 + 6\,H_2O$

後處理系統 - (SCR) 選擇性催化還原器



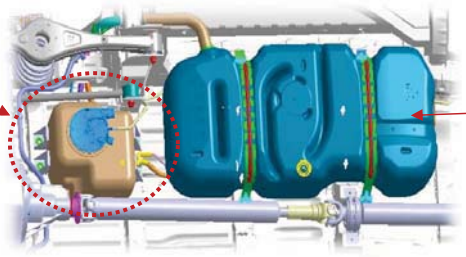
※ DCU :尿素噴注控制電腦

後處理系統 - (SCR) 選擇性催化還原器

▶ **Urea 尿素**

▶ **Urea Tank 尿素缸**

Urea Cap 尿素入口蓋

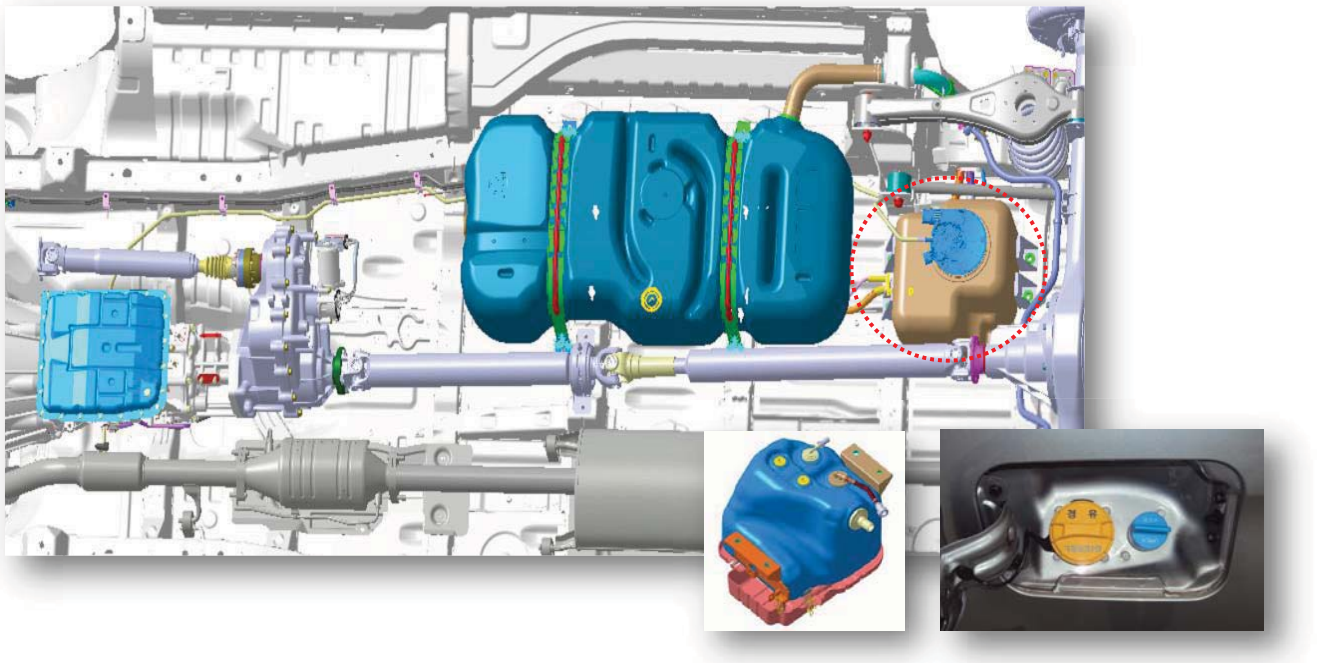


Fuel Tank
油缸

▶ **在儀表板顯示的警告字句**

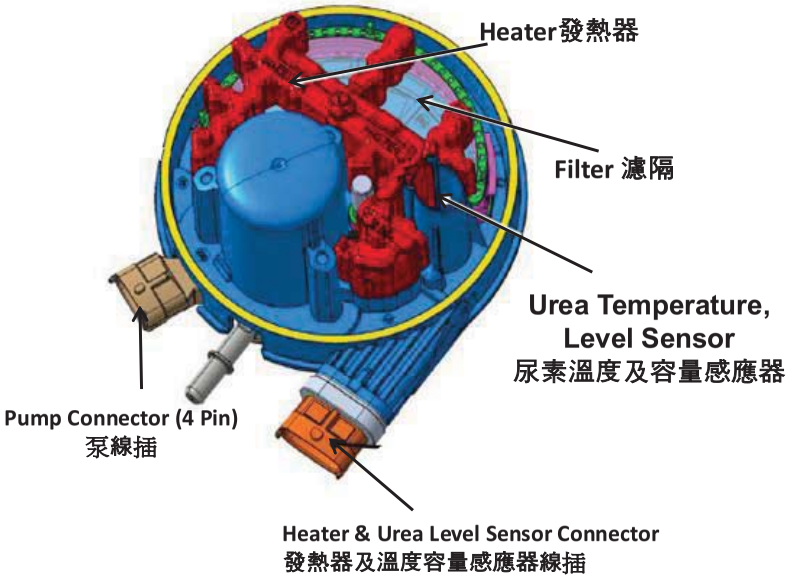
- 當尿素不足或注入不合適的尿素時, 警告燈及警告字句會出現。
- 尿素凝固溫度: -11℃

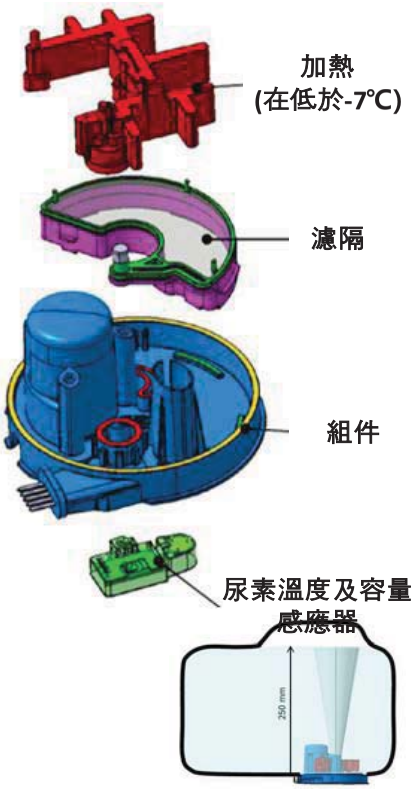
後處理系統 - (SCR) 選擇性催化還原器



- 尿素缸容量: **14L**
- 駕駛距離與1公升的尿素比重: **600 ~ 800** 公里。
- 發熱管: 防止尿素凝固.

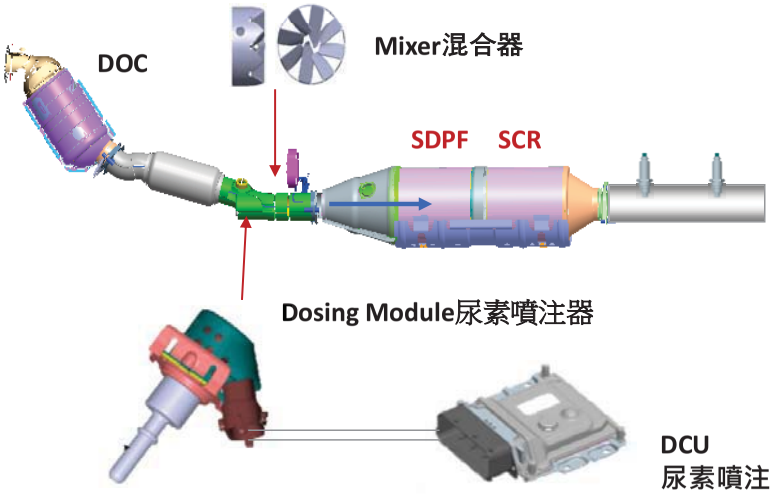
後處理系統 - (SCR) 選擇性催化還原器





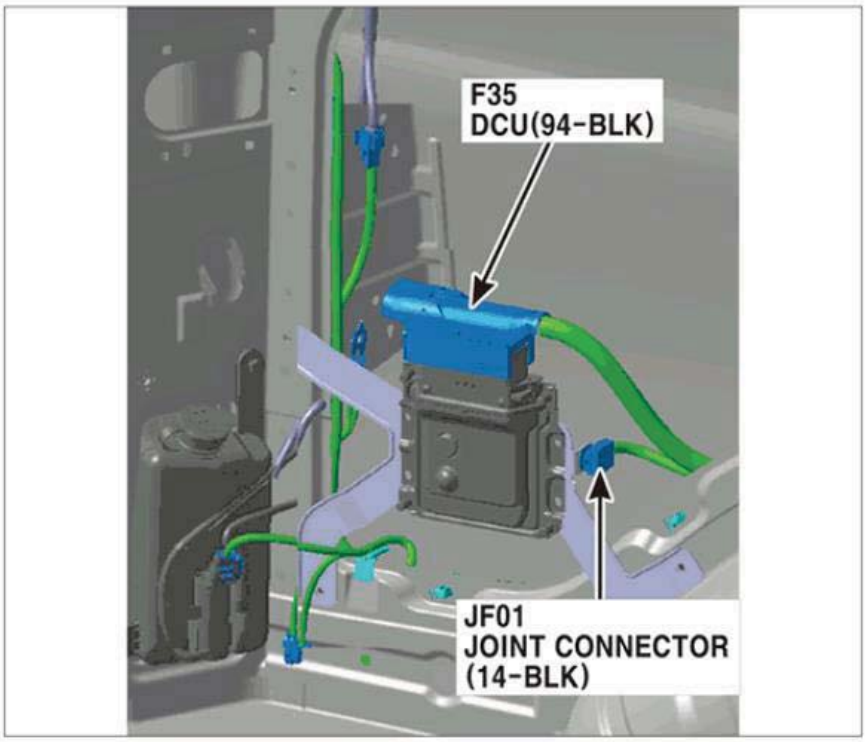
- 尿素會在引擎運作後, 排氣溫度90℃ 或以上以5 bar 泵入
- 當引擎關閉後, 尿素將返回尿素缸

後處理系統 - (SCR) 選擇性催化還原器

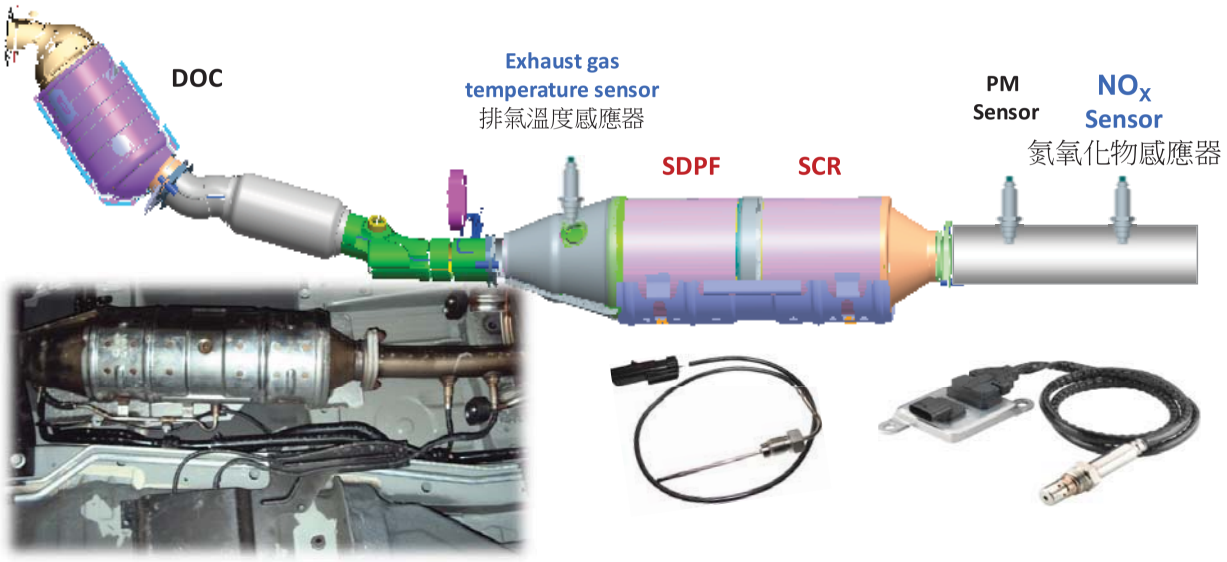


- 注入尿素因應選擇性催化還原器 (SCR) 所需份量
- - 噴注壓力: 5 bar (由尿素泵提供), 以4 Hz噴射。
- - 混合器: 將尿素分散達到混合均勻。

PHOTO.164



後處理系統 - 催化器_ SCR : NOX Sensor 氮氧化物感應器
Exhaust gas temperature sensor 排氣溫度感應器



- 用作監察 SCR系統。
-監察不正常的尿素 → 亮起警告燈。
-以排氣溫度計算尿素噴汪時間及份量
(噴注在200℃ 或以上進行).
- 純化作用會在排氣溫度在250℃ ~ 450℃達到最佳效率。

後處理系統 - 催化器_ SCR : Urea Warning Lamp 尿素警告燈

- Level 1 : 耗盡距離 <2400km (4L)

- Level 2 : 耗盡距離< 1600km (2L)

- Level 3 : 耗盡距離< 800km(1L)

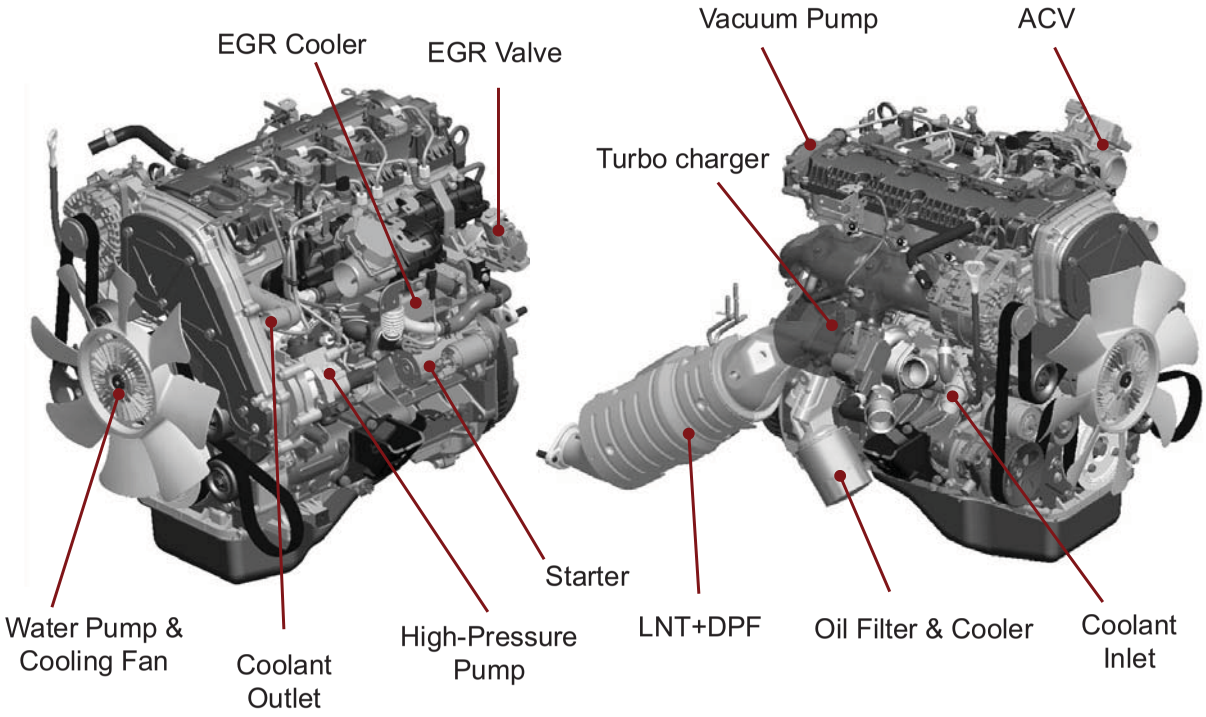
- Level 4 : 耗盡

HYUNDAI

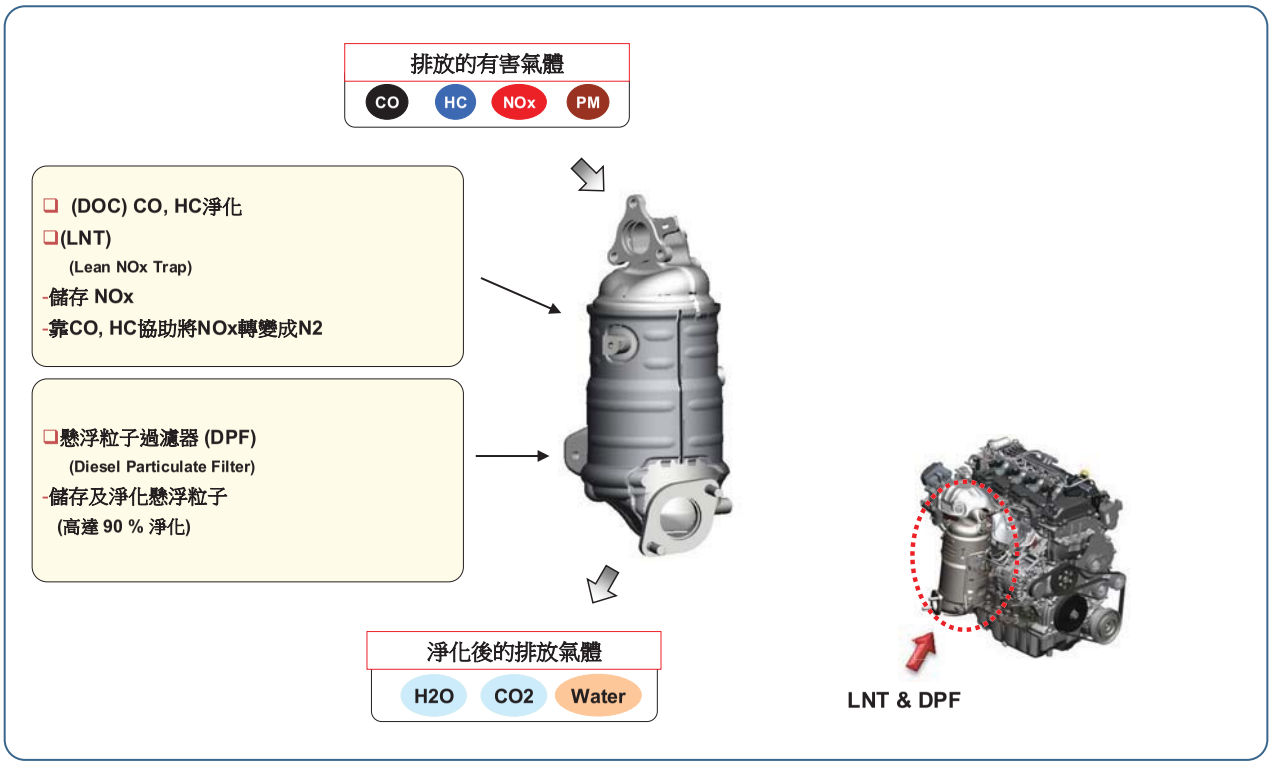
Hyundai H-1 Van - Emission Control
Lean NOx Trap (LNT)

Hyundai Hong Kong Company Limited

H-1 Van Euro-6 DOC+LNT+DPF

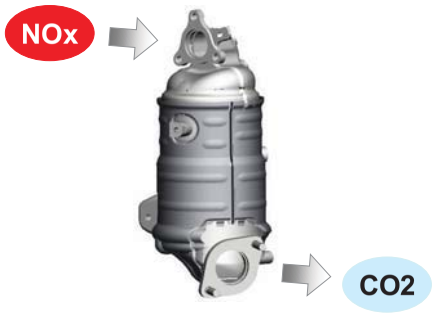


H-1 EURO VI van 後處理系統 - 催化器 (LNT:稀燃氮氧化物捕集器)



後處理系統 - 催化器 (LNT:稀燃氮氧化物捕集器) – 氮氧化物 (Nox)淨化

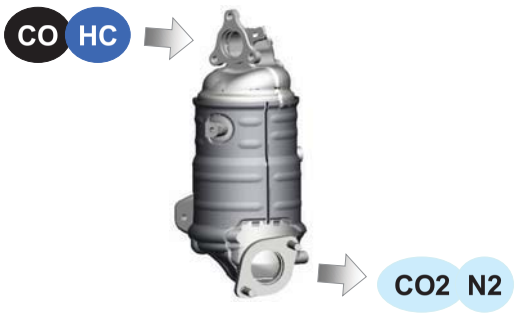
吸收Nox



$BaCO_3 \rightarrow Ba(NO_3)_2$

- NOx 經過催化器後會氧化(NO2)
- 與鋇產生反應 (BaCO3) 及存入硝酸鹽 (NO3)
- 排出CO2

排出N2



$Ba(NO3)_2 \rightarrow BaCO_3$

- 使用銠將硝酸鹽轉化為氮
- 排出CO2和N2

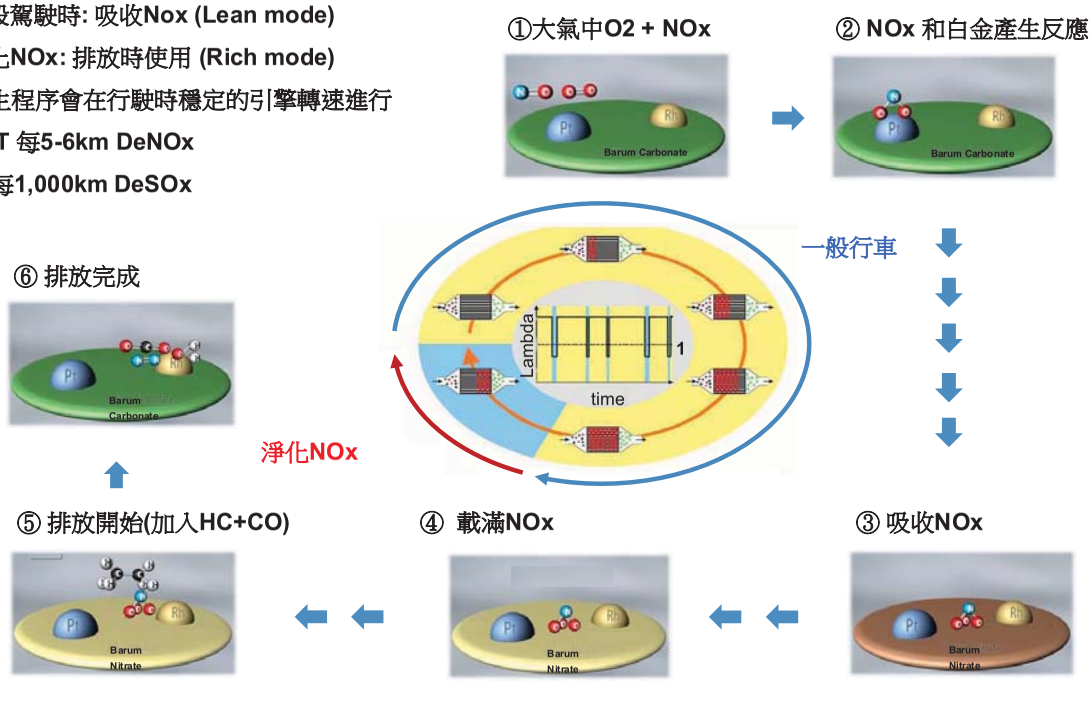
後處理系統 - 催化器 (LNT:稀燃氮氧化物捕集器) – 再生程序

- 一般駕駛時: 吸收Nox (Lean mode)
- 淨化NOx: 排放時使用 (Rich mode)

再生程序會在行駛時穩定的引擎轉速進行

LNT 每5-6km DeNOx

每1,000km DeSOx



後處理系統 - 催化器 (LNT:稀燃氮氧化物捕集器) – 再生程序控制

計算Nox吸收量

↓ 吸收量 > 設定數

Nox 再生程序
(Rich mode)

↓

計算Nox排放量

↓

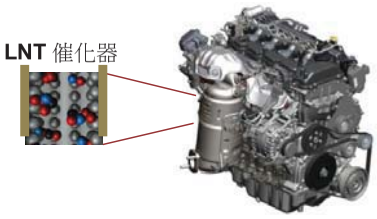
再生程序完成

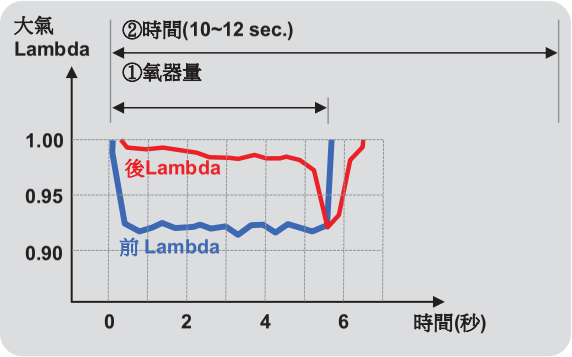
再生程序完成與否取決於
①氧器量
② 時間
(10~12 sec.)


控制 by ECU


噴注器(提供 CO, HC)

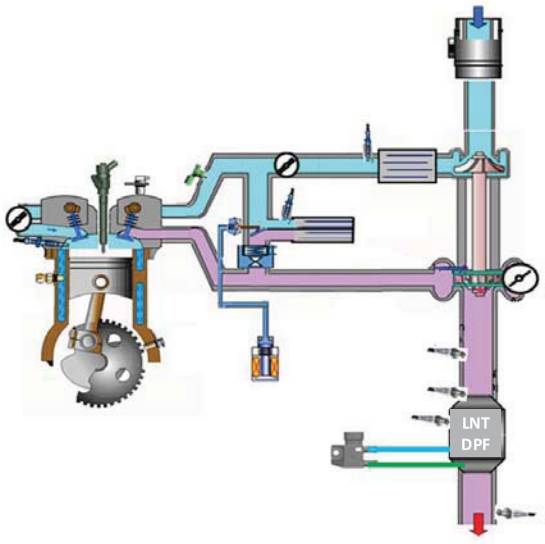

氧氣感應器 應用在(1, 2)





懸浮粒子過濾器 DPF 排放程序 (分解- PM)

✓ 進入排放模式 在 DPF 再生程序之後n (Post-injection)



DPF 再生

▪ Regeneration at every 500 km

↓

DPF 再生完成

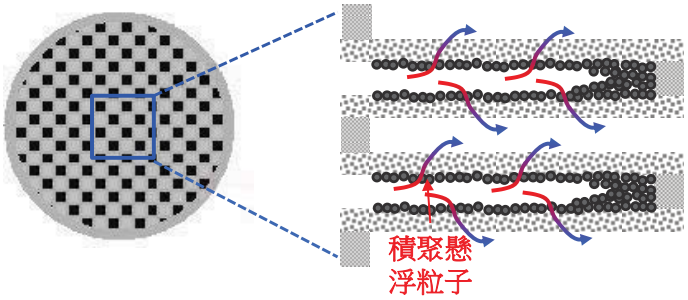
↓

排放程序 (分解-PM)

- 進行 Post-injection (低於 λ=0.95)
- 重複 Lean/Rich Mode
- 每500 km進行
- 590~700 ℃

懸浮粒子過濾器 DPF 再生 – 懸浮粒子(PM)淨化

- **DPF 再生程序**



- 提升排氣溫度

Item	再生狀態
積聚重量	16.0 g.
距離	每500 km進行一次
引擎運作時間	每15 小時 進行一次.

後處理系統 - 催化器 (DPF Warning Lamp懸浮粒子過濾器警告燈)

警告	狀況	警告燈	警告內容	處理方法
Level 1 (DPF Warning)	DPF再生程序重複失誤3次	長著	-	需要駕駛者自行進行再生程序
Level 2 (DPF Service)	DPF堵塞或儲蓄感應器失效	閃爍	排氣系統需要檢查	需前往維修中心檢查

- 當警告燈長著時: 以時速60 Km/h或以上行走25分鐘, 從而令DPF 系統進入再生 程序。
  → 當再生程序完成後, 警告燈將會熄滅。
- 當警告燈閃爍時: 表示DPF 再生程序或系統出現錯誤。

歐盟6 引擎用的機油

Lubricant			Volume (l / US qt.)	Classification
Engine oil *1 *2 (drain and refill) Recommends Shell HELIX Motor oils	Diesel	A2 2.5	7.4 (7.82)	[redacted] With DPF*3 : ACEA C2 / C3
	[redacted]			
Manual transmission fluid	A2 2.5 Diesel		2.2 ~ 2.3 (2.32 ~ 2.43)	API Service GL-4 SAE 75W/85
	[redacted]		(2.06 ~ 2.16)	
Automatic transmission fluid	A2 2.5 Diesel		10.0 (10.60)	APOLLOIL ATF RED-1
	[redacted]			[redacted] brands approved by Hyundai Motor Co.

*1 : Refer to the recommended SAE viscosity numbers on page 9-6.
*2 : Engine oils labeled Energy Conserving Oil are now available. Along with other additional benefits, they contribute to fuel economy by reducing the amount of fuel necessary to overcome engine friction. Often, these improvements are difficult to measure in everyday driving, but in a year's time, they can offer significant cost and energy savings.
*3 : DPF : Diesel Particulate Filter
*4 : If the API service SM engine oil is not available in your country, you are able to use API service SL.

Lubricant			Volume (l / US qt.)	Classification
Power steering			0.9~1.0 (0.95~1.06)	PSF-3
Coolant	Wagon	Diesel	13 (13.74)	Mixture of antifreeze and water (Ethylene glycol base coolant for aluminium radiator)
		[redacted]		
	Van	Diesel	10 (10.75)	
		[redacted]		
Brake fluid			0.7~0.8 (0.7~0.8)	FMVSS116 DOT-3 or DOT-4
Rear axle oil			2.1 (2.23)	The temperate zone (-30°C~30°C) : API GL-4 (SAE 90) The torrid zone (30°C~) : API GL-4 (SAE 140) The frigid zone (~-30°C) : API GL-5 (SAE 80)
Urea			14.0 (14.79)	ISO 22241 or DIN70070
Fuel			75 (19.81 US gal.)	-

DPF再生: 偈油增多現象

因DPF再生時，需要加噴油渣，而H-1/STAREX是使用氣缸燃油噴嘴進行，柴油多多少少會從密氣環進入偈油系統，令偈油因被稀釋而出現增多情況。此是正常現象。只需留意及準時更偈油即可。

Differential pressure sensor standard value

2018 > D 2.5 TCI-A2(Euro-6) > Fuel System > Engine Control System > DPF Differential Pressure Sensor > S... Language

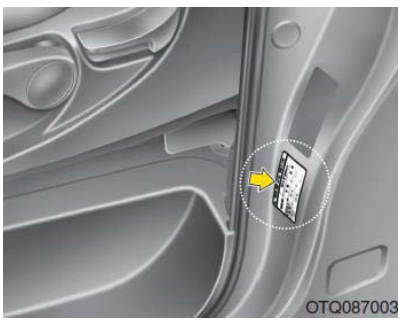
SPECIFICATION

Differential Pressure [ΔP] [kPa (kg/cm² / psi)]	Output Voltage (V)
0	1.00
10 (0.1 / 1.45)	1.35
20 (0.2 / 2.90)	1.70
30 (0.3 / 4.35)	2.05
40 (0.4 / 5.80)	2.40
50 (0.5 / 7.25)	2.75
60 (0.6 / 8.70)	3.10
70 (0.7 / 10.10)	3.45
80 (0.8 / 11.60)	3.80
90 (0.9 / 13.00)	4.15
100 (1.0 / 14.50)	4.50

輪呔呔氣

輪呔氣壓建議(下圖)。避免氣壓過多或不足

前輪 42psi(磅)	後輪 51psi(磅) [47psi Grand Starex]



輪呔氣壓量數據表設於司機位門柱(如圖所示)。建議每一個月跟進一次，在凍車時跟進輪呔氣壓為佳。

當呔氣警告燈亮起時，請盡快檢查及補充輪呔氣壓。請保持引擎發動中進行補充呔氣直至警告燈熄滅。

注意請勿在引擎發動中放呔氣，會導致呔氣警告燈亮起。

Case study #1 DTC P22AC00 Sensor Positive Current Control Ciruit Low Bank 1 Sensor 2

If open or short to ground in signal circuit of rear lambda sensor is detected, ECM sets DTC P22AC00.

DTC DETECTING CONDITION

Item		Detecting Condition		Possible Cause
DTC Strategy		⇨ Voltage monitoring		1. Poor connector connection 2. Open or short to ground in signal circuit of rear lambda sensor 3. Faulty rear lambda sensor
Enable Condition		⇨ Engine running		
Threshold Value	Case 1	⇨ Open in Nernst cell line ⇨ Output signal is below 0.2V ⇨ Short to ground in signal circuit (Pumping cell, Current adjust, Virtual ground, Nernst cell)		
	Case 2	⇨ Open in Pumping cell line		
Detecting Time	Case 1	⇨ 2000ms		
	Case 2	⇨ 5000ms		
Fail Safe		Engine OFF	⇨ No	
		EGR OFF	⇨ No	
		Torque Limit	⇨ No	
		MIL	⇨ On	

COMPONENT LOCATION

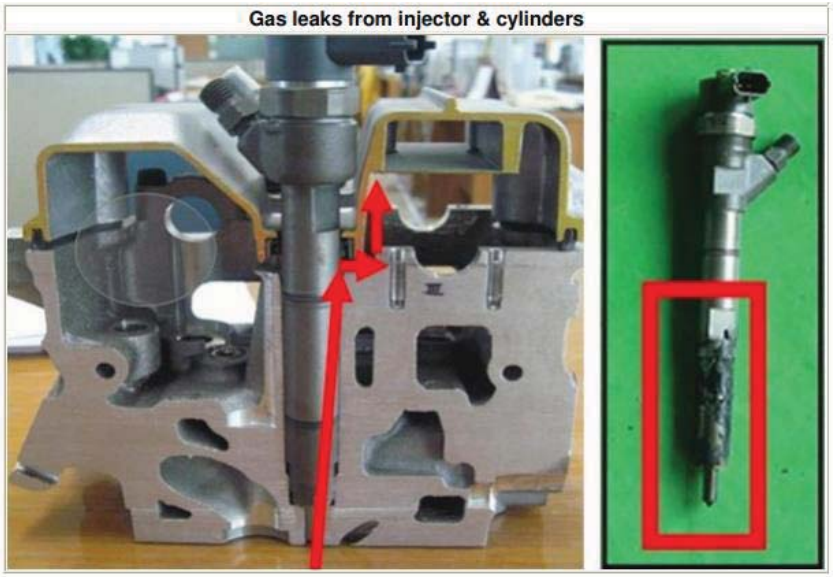
1. Rear Lambda Sensor Unit

Rear Lambda Sensor Unit		Terminal	Inspection Condition	Measured Value	Remarks
Pin No.	1	Nernst cell	⇨ Ignition "ON", Engine "OFF" ⇨ Voltage is measured on wiring side (connected)	Approx. 5V	Waveform (Fig.1)
	2	Heater Power		B+	-
	3	Virtual Ground		Approx. 4.6V	Waveform (Fig. 1)
	4	Current Adjust		Approx. 4.45V	Waveform (Fig. 1)
	5	Heater Control		Approx. 14V	Duty (Fig.2)
	6	Pumping Cell		Approx. 5.1V	Waveform (Fig. 1)


Oscilloscope
Sensor
Theme
Name
Review
User Setting
Reset
Start
Cursor
ViewAll
Save
A 99.4 ms B
10ms
Configuration
+20V
Nernst Voltage
Max : 7.2 V
Avg : 5.8 V
Min : 1.6 V
-5V
+20V
Current Adjust
Max : 7.4 V
Avg : 5.8 V
Min : 1.7 V
-5V
+20V
Viraul Ground
Max : 7.4 V
Avg : 5.6 V
Min : 1.7 V
-5V
+20V
Current Pump
Max : 7.2 V
Avg : 5.7 V
Min : 1.6 V
-5V
A
B
Fig.1


Oscilloscope
Sensor
Theme
Name
Review
User Setting
Reset
Start
Cursor
ViewAll
Save
A 22.08 ms B
2ms
Configuration
+20V
Heater Power
Max : 12.1 V
Avg : 11.9 V
Min : 11.4 V
-5V
+20V
Heater Control
Max : 12.2 V
Avg : 11.7 V
Min : 0.6 V
-5V
A
B
Fig.2

因為年份及里數已比較高，當客人的車輛需要更換Turbo時，
請同時檢查塵筆介子有沒有漏氣。



如有如塵筆介子有發現漏氣， 需量度偈油油壓或進一步檢查及清潔油底吸油管。
避免新Turbo因不夠潤滑再損壞。

歐盟四型 H-1 A engine EGR 簡單測試: (無診斷電腦的情況)
症狀: 難發動同引擎無力。
方法: 簡單使用一個金屬片封死EGR去生氣批入口如情況改善，
可判斷EGR摩打積死在全開或半開的狀態。

HYUNDAI

Q & A

Hyundai Hong Kong Company Limited

歐盟6 引擎用的機油

Lubricant			Volume (*l* / US qt.)	Classification
Engine oil *1 *2 (drain and refill) Recommends Shell HELIX Motor oils	Diesel	A2 2.5	7.4 (7.82)	[redacted] With DPF*3 : ACEA C2 / C3
		[redacted]	[redacted]	[redacted]
	[redacted]		[redacted]	[redacted]
Manual transmission fluid	A2 2.5 Diesel		2.2 ~ 2.3 (2.32 ~ 2.43)	API Service GL-4 SAE 75W/85
	[redacted]		1.95 ~ 2.05 (2.06 ~ 2.16)	
Automatic transmission fluid	A2 2.5 Diesel		10.0 (10.60)	APOLLOIL ATF RED-1
	[redacted]		[redacted]	[redacted] brands approved by Hyundai Motor Co.

*1 : Refer to the recommended SAE viscosity numbers on page 9-6.

*2 : Engine oils labeled Energy Conserving Oil are now available. Along with other additional benefits, they contribute to fuel economy by reducing the amount of fuel necessary to overcome engine friction. Often, these improvements are difficult to measure in everyday driving, but in a year's time, they can offer significant cost and energy savings.

*3 : DPF : Diesel Particulate Filter

*4 : If the API service SM engine oil is not available in your country, you are able to use API service SL.

Lubricant			Volume (*l* / US qt.)	Classification
Power steering			0.9~1.0 (0.95~1.06)	PSF-3
Coolant	Wagon	Diesel	13 (13.74)	Mixture of antifreeze and water (Ethylene glycol base coolant for aluminium radiator)
		[redacted]	[redacted]	
	Van	Diesel	10 (10.75)	
		[redacted]	[redacted]	
Brake fluid			0.7~0.8 (0.7~0.8)	FMVSS116 DOT-3 or DOT-4
Rear axle oil			2.1 (2.23)	The temperate zone (-30°C~30°C) : API GL-4 (SAE 90) The torrid zone (30°C~) : API GL-4 (SAE 140) The frigid zone (~-30°C) : API GL-5 (SAE 80)
Urea			14.0 (14.79)	ISO 22241 or DIN70070
Fuel			75 (19.81 US gal.)	-