

Independent PEMS testing and the EQUA Air Quality Index

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Emissions Analytics' credentials

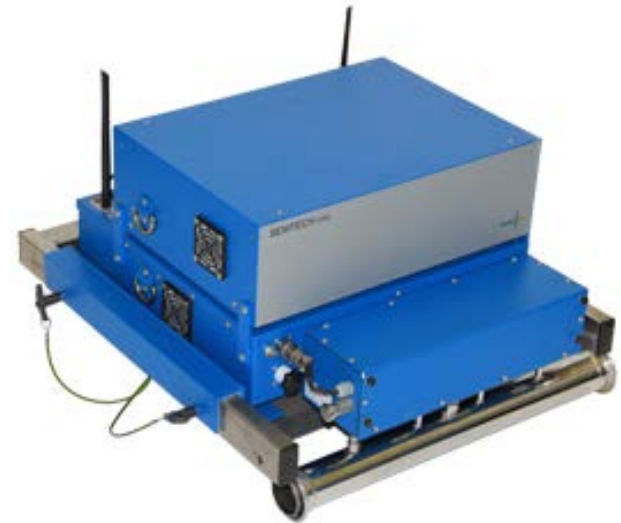


- Founded in 2011
- Headquartered in UK, with operations in London, Los Angeles and Stuttgart
- Specialist in PEMS testing and data analysis
- 1200+ vehicles tested
- Largest commercially available database of real-world emissions data
- Works with OEMs, Tier 1/2 suppliers, fuel and chemical companies, regulators, consultancies, consumer media

EXPERIENCE OF PEMS EQUIPMENT

Equipment

- SEMTECH-DS, -Ecostar and -LDV
- Portable Emissions Measurement System connects to tailpipe
 - Captures emissions for CO₂, CO, NO, NO₂, total hydrocarbons
 - At 1 Hertz
- Air temperature, pressure, humidity
- GPS for speed and altitude
- Engine data via CANBUS
- Fuel economy derived via carbon balance
- Weight addition 100+ kg



Strengths and weaknesses



	Strengths	Weaknesses
Hardware and software	Fits in any car Real-world size and weight	Multiple points of failure Software issues
Operation	Safe for on-road use Can be used intensively Does not affect aerodynamics	Requires focused training Support infrastructure
Data quality	Second-by-second data acquisition Independent of vehicle Good correlation to dyno and meter	Bad data even when test a “success” Repeatability of low concentrations Limit to signal detection

Example



REAL-WORLD TEST METHODS

Emissions Analytics concept



- Reproducibility must be weighed against authenticity
 - Aim to drive same cycle identically each time
 - Control what you can – driver, vehicle conditioning, driving style
 - Careful QA of data
 - Normalise out as much of remaining variability as possible
-
- Approximate to laboratory
 - Use better economics of testing to test more cars
 - Trading slight deterioration in precision for greater sample size
 - Greater overall confidence

Alternative testing concepts

- Alternative approaches to testing are valid but have different characteristics

	Emissions Analytics	Real Driving Emissions	World Light Duty Transient Cycle
Cycle definition	Explicitly defined	Undefined with aggregate and dynamic constraints	Explicitly defined
Route definition	Actual mix of urban, rural and motorway	Defined by speed ranges	Actual mix of sub-cycles
Conduct	Independent	By OEM	By OEM
Repeatability	Repeated common elements with consistency requirement	One shot with boundary conditions	One shot with validity requirements
Vehicle set-up	Standard defined conditions	Scope for variability	Should be well defined
Normalisation	Based on dynamic characteristics	CO2 windows or power binning	None, but on dyno

Repeatability

- Light duty vehicle testing
- Employing Emissions Analytics' testing concept
- Before normalisation

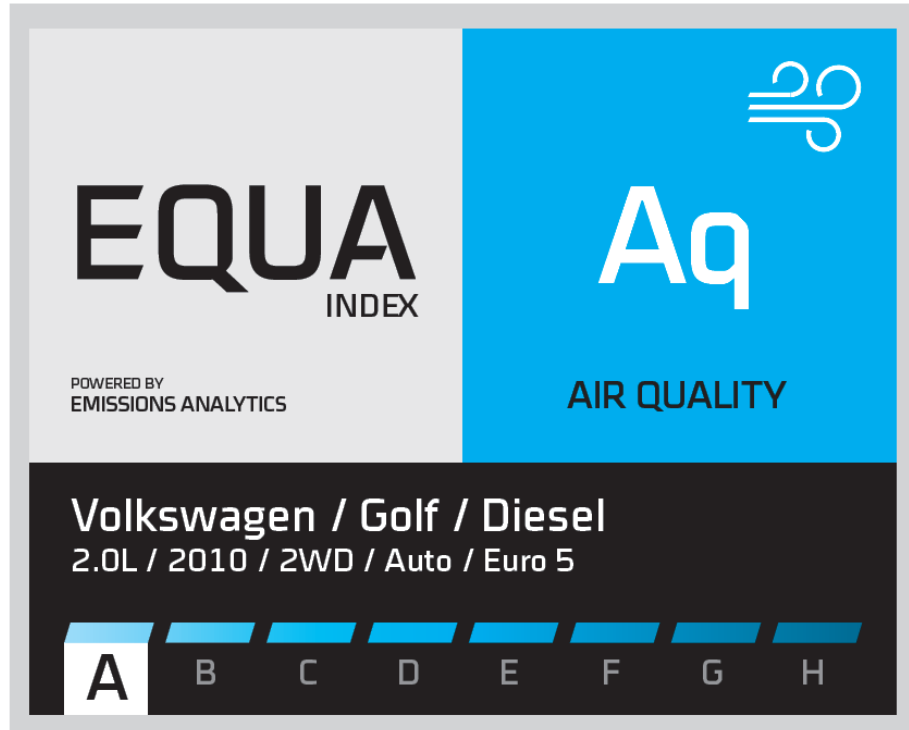
	Track	Road
Fuel economy, CO ₂	<3%	<5%
Nitrogen oxides	<10%	<25%

EQUA AIR QUALITY INDEX

EQUA Air Quality Index



- Vehicle rating scheme based on their real-world NO_x emissions, launched in April 2016
 - Initially on cars, but soon to extend to light commercial vehicles
 - Non-statutory complement to new Real Driving Emissions regulations
 - But will also
 - Discriminate between high and low emitters, rather than just pass/fail
 - Be updated for each model year to keep up with new calibrations
 - Ratings are published and into the public domain for free
 - Manufacturers and consumer media can adopt as independent, voluntary standard
 - Similar to New Car Assessment Programme (Euro NCAP, Global NCAP)
- Robust, independent standard needed to measure and incentivise actions to bring about air quality improvements



Rating bands

Rating	Lower bound (g/km, exclusive)	Upper bound (g/km, exclusive)	External reference point
A	0.00	0.08	Meets Euro 6 limit for diesels, and meets Euro 4 limit for gasoline
B	0.08	0.12	Meets 1.5 Conformity Factor under Euro 6 Real Driving Emissions regulation
C	0.12	0.18	Meets Euro 5 limit for diesels (and similar to 2.1 Conformity Factor under Euro 6 Real Driving Emissions regulation)
D	0.18	0.25	Meets Euro 4 limit for diesels
E	0.25	0.50	Meets Euro 3 limit for diesels
F	0.50	0.75	No comparable Euro standard: roughly equal to 6-8 times Euro 6 limit
G	0.75	1.00	Roughly equal to 8-12 times Euro 6 limit
H	1.00	None	Roughly equal to 12+ times Euro 6 limit

Diesels with A ratings



EQUA
INDEX

Aq
AIR QUALITY

POWERED BY
EMISSIONS ANALYTICS

Audi A5 / Diesel / 2014
2.0 litre / 161 bhp / 2WD / Manual / Euro 6

A B C D E F G H

BETTER WORSE

EQUA
INDEX

Aq
AIR QUALITY

POWERED BY
EMISSIONS ANALYTICS

Volkswagen Golf SV / Diesel / 2015
2.0 litre / 148 bhp / 2WD / Automatic / Euro 6

A B C D E F G H

BETTER WORSE

EQUA
INDEX

Aq
AIR QUALITY

POWERED BY
EMISSIONS ANALYTICS

Volkswagen Scirocco / Diesel / 2015
2.0 litre / 148 bhp / 2WD / Manual / Euro 6

A B C D E F G H

BETTER WORSE

EQUA
INDEX

Aq
AIR QUALITY

POWERED BY
EMISSIONS ANALYTICS

Skoda Superb / Diesel / 2016
2.0 litre / 148 bhp / 2WD / Manual / Euro 6

A B C D E F G H

BETTER WORSE

EQUA
INDEX

Aq
AIR QUALITY

POWERED BY
EMISSIONS ANALYTICS

Volkswagen Touran / Diesel / 2016
1.6 litre / 108 bhp / 2WD / Manual / Euro 6

A B C D E F G H

BETTER WORSE

EQUA
INDEX

Aq
AIR QUALITY

POWERED BY
EMISSIONS ANALYTICS

Volkswagen Passat / Diesel / 2016
1.6 litre / 118 bhp / 2WD / Manual / Euro 6

A B C D E F G H

BETTER WORSE

THE EQUA AIR QUALITY INDEX

The EQUA Air Quality Index clearly identifies vehicles emitting the lowest quantities of nitrogen oxides (NOx) on a scale from A (best) to H (worst).

A comprehensive list of all ratings issued so far can be accessed below. These are free for download, distribution and publication in the format provided.

View the top Euro 6 diesels currently on sale
[EQUA Euro 6 Diesel](#)

View the top Euro 6 petrol and hybrids currently on sale
[EQUA Euro 6 Petrol and Hybrids](#)

[View all Euro 5 vehicles](#)



Euro 6

Show entries

Search:

Manufacturer ▲	Model ▲	Fuel Type ▲	Model Year ▲	Engine size litres ▲	Power bhp ▲	Driven Wheels ▲	Transmission ▲	Regulatory Stage ▲	EQUA Index ▲	Download ▲	Download ▲
Audi	A1	Petrol	2015	1.4	123	2	Manual	Euro 6	A	PDF	JPG
Audi	A3	Petrol	2015	1.4	148	2	Automatic	Euro 6	A	PDF	JPG
Audi	A4	Diesel	2016	2.0	148	2	Manual	Euro 6	C	PDF	JPG
Audi	A4	Petrol	2016	2.0	187	2	Automatic	Euro 6	A	PDF	JPG
Audi	A5	Diesel	2014	2.0	161	2	Manual	Euro 6	A	PDF	JPG

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