

**MAHLE**



## Emission Control Line

Maximum efficiency for  
minimal environmental impact



**BrainBee**<sup>®</sup>  
WORKSHOP SOLUTIONS

# BRAIN BEE Emission

*The BRAIN BEE Emission Line fits all your needs for emission testing. It includes gas analysers and opacimeters for monitoring the exhaust system of petrol/diesel engined cars and also motorcycles. These devices do far more than standard measuring tools and are ideal for official inspections and tests on the composition of emissions. They comply with applicable national regulations.*

Maximum  
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## Exhaust gas analysers

Exhaust gas analysers from BRAIN BEE are designed for measuring the different exhaust gas concentrations in all engine types. They can be used for monitoring emissions in legally required inspections, for routine automotive servicing and also for repair.

## Opacimeters

Our opacimeters for diesel engines are small and compact. Equipped with a 12V power supply, the units are user friendly for workshops and also for mobile applications.

## Particle Counters

A new technology that allows a great improvement in air quality.

Our particle counters are exceptionally accurate in measurement and extremely durable.

Designed to maximize the return of investment, they can be used immediately for the measurement of diesel engine emissions, but they're also ready for future regulations for gasoline engines.

## RPM counter

The universal RPM counter for petrol and diesel engines transfers its real-time data values to the tester via Bluetooth or USB.

RPM's and temperature are acquired from the device's standard sensors. Optionally, the device can collect vehicle RPM and temperature data using the OBD connector (EOBD-300 EVO wireless connector).

## Modular and flexible: Our Emission Line

- Modularity: you can configure your personal station by choosing BRAIN BEE instruments, and connect them easily to the PC station
- Open system: compatible with all common commercial software and hardware systems
- Plug and play solution: we completely pre-configure and test all our exhaust examination testers
- Highest measuring accuracy
- Approved by several national regulations (in continuous development)



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# Emission Line PMU 400

*Thanks to the adoption of CPC technology - Condensation Particle Counter - BRAIN BEE offers the market an extremely innovative product ready to adapt to all the evolutions and scenarios that may occur in the coming years. This, combined with special care in the choice of materials and sensors, makes the PMU 400 the most versatile and interesting Particulate Counter of the moment.*

The new  
frontier in  
Emissions  
Control is  
signed by  
BRAIN BEE

## The Particulate

Particulate emitted from the latest internal combustion engines (both diesel and petrol) have a negative impact on air quality and health. Vehicles with a particulate filter that is not in perfect condition (tampered or broken), emits high concentrations of nanoparticles. These can easily enter the human body through the breath and the long-term effects of exposure to these particles are alarming.

The single nano-particle has a size at least 100 times smaller than the wavelength of visible light, so they're so small that cannot be counted or measured with traditional opacimeters.

## CPC Technology

MAHLE has chosen to adopt the CPC - Condensation Particle Counter technology, which in addition to being particularly robust, allows high measurement accuracy even at low concentrations (difficult to obtain with other technologies).

This allows to dilute the sample coming from the exhaust pipe, with clean air (free of particulates) up to 200 times, in order to limit the deposition of particulate and dirt in the most delicate parts of the instrument (laser-scattering measuring bench), and to obtain long service intervals and simple maintenance operations.

PMU 400 is a particularly reliable instrument in measuring, while not giving up on the great ease of use by the operator.

Finally, this technology makes it possible to face the future evolutions of the anti-pollution regulations, which will require more stringent limits and greater measurement accuracy, as it will be easy to adapt the device, also thanks to the software developed by MAHLE.



PMU 400 can be used both as a stand alone station, and perfectly integrated with other Emission Line BRAIN BEE stations, using the same software interface.



### Advantages at a glance

- Innovative and ready for any future scenario
- New design, forerunner to the Emission Line of the future
- Guaranteed modularity: designed to be included in existing configurations
- Extreme precision of result, but maintaining absolute simplicity of use
- Few minutes to finish the test
- Robust and easy to service

Solid and compact: high-quality materials guarantee durability of the instrument, while the small dimensions, together with the practical ergonomic handle, keep it easy to handle.

The 3.5 m heated pipe allows you to operate with comfort even on trucks or in any working situation.

The work software allows you to integrate PMU 400 with any existing Emission Line station.

The display clearly shows all the stages of the test as provided by the legislator, allowing you to easily fulfil all the steps that allow the quick closing of the test.

#### Measuring range

Particulate size	23 ÷ 200	nm	
D50	23	nm	
Particulate Concentration (metrologically relevant)	0 ÷ 5M	#/ccm	Res. 100
Concentration (for diagnostic purposes)	0 ÷ 30M	#/ccm	Res. 100

#### Type-approval

- Belgium, Germany, Netherlands (in progress)

# AGS-690



## Advantages at a glance

- The RPM counter is incorporated via an induction clamp, capacitive clamp or optional wireless module MGT-300 EVO (via bluetooth)
- Connection to a PC can be Serial, USB or Bluetooth (BT-100)

The AGS-690 analyses the gas from the exhaust pipe using the probe. By using the specified Emission software, users benefit from every feature of the analyser. In addition, the user can easily switch from routine measurements to a legally specified test. Using high-precision technology, the AGS-690 analyses the absorption of the different elements CO, CO<sub>2</sub> and HC, and thereby determines their concentrations. Optionally Oxygen and NO<sub>x</sub> concentrations can be measured via electrochemical sensors.

The condensate separator assembly is precision-molded to minimise the gas path and shorten maintenance times. The separation filter has two parts: a mesh filter and a coalescing filter. The design enables the continuous exit of condensate forming in the separator via a single-shaft and twin-head pump. In addition to the gas and air inlet for the autozero phase, the AGS-690 also features a special inlet for calibrating from a gas sample cylinder.

### Measuring fields

CO	0 ÷ 9,99	% vol	Res. 0.01
CO <sub>2</sub>	0 ÷ 19,9	% vol	Res. 0.1
HC hexane	0 ÷ 9,999	ppm vol	Res. 1
O <sub>2</sub>	0 ÷ 25	% vol	Res. 0.01
NO <sub>x</sub>	0 ÷ 5,000	ppm vol	Res. 1
Lambda	0.5 ÷ 5		Res. 0.001
Revolutions Inductance/capacitance	300 ÷ 9,990	rpm	Res. 10
Oil temperature	20 ÷ 150	°C	Res. 1

## Type-approval for Europe

- M Metrology Marking: MID (Measuring Instrument Directive) 2014/32/EU NMI 0122 B+D

## Additional National Type-Approvals

- Italy, Morocco

# AGS-688



## Advantages at a glance

- The RPM counter is incorporated via an induction clamp, capacitive clamp or optional wireless module MGT-300 EVO (via bluetooth)
- Connection to a PC can be Serial, USB or Bluetooth (BT-100)
- The AGS-688 enables connection to the opacimeter via the OMNIBUS port. In this case, the analyser converts into a smoke density meter for diesel engines

The flexible AGS-688 gas analyser can operate easily in a workshop location and also function as an independent mobile device. Emissions are sampled at the exhaust pipe using the specially designed probe. With the intuitive interface users can easily switch between modes, i.e. from independent measurements to a legally specified test. The AGS-688 features six backlit LCD displays, clearly showing the readings of ongoing tests. When analysis is complete, the user can directly print out the test results or optionally send them to a connected computer. The integrated condensate separator is designed to prevent an obstacle

in the gas flow and reduces maintenance costs. Its special design facilitates the continuous drainage of condensate that forms in the separator. The separation filter has two parts: a net filter and a coalescing filter. In addition to the gas and air inlet for the autozero phase, the AGS-688 also features a special inlet for calibration using a gas sample cylinder.

The rear side of the unit has connections for the power supply, for RPM and temperature probes, which can either in wired or wireless mode communicate to the PC.

## Measuring fields

CO	0 ÷ 9,99	% vol	Res. 0.01
CO <sub>2</sub>	0 ÷ 19,9	% vol	Res. 0.1
HC hexane	0 ÷ 9,999	ppm vol	Res. 1
O <sub>2</sub>	0 ÷ 25	% vol	Res. 0.01
NO <sub>x</sub>	0 ÷ 5,000	ppm vol	Res. 1
Lambda	0.5 ÷ 5		Res. 0.001
Revolutions Inductance/capacitance	300 ÷ 9,990	rpm	Res. 10
Oil temperature	20 ÷ 150	°C	Res. 1

## Type-approval for Europe

- M Metrology Marking: MID (Measuring Instrument Directive) 2014/32/EU NMI 0122 B+D

## Additional National Type-Approvals

- Brazil, Hong Kong, Italy, Morocco, Serbia

# AGS-200



## Advantages at a glance

- Automatic diagnostics: The program analyses the gas values and provides a list of individual readings
- Double lambda sensor test: With its oscilloscope feature, the unit analyses variations in the signal and calculates an operating efficiency value
- Cylinder head leak test: The program guides the user through the test and, by analysing the gases in the coolant expansion tank, is able to determine whether the cylinder head gasket is leaking or not

The AGS-200 exhaust gas analyser can be connected to a PC via serial port. The unit communicates automatically with the test vehicle for collecting and saving the required test data e.g. temperature and speed. With its minimal dimensions, this unit is ideal for mobile use and to integrate in your existing station. Provided with proprietary BRAIN BEE software running on a PC, it allows various diagnostic operations that help the operator in evaluating the vehicle's exhaust gas.

## Gas curve

The unit automatically records the gas readings at different engine speeds and plots the data in a chart. This chart can be used as a gas curve. It's the perfect equipment for road tests and workshop testing.

## Catalytic converter efficiency

The program guides the user through the test and calculates the efficiency of the catalytic converter for the different types of gas in percent – both pre and post the catalytic converter.

### Measuring fields

CO	0 ÷ 9,99	% vol	Res. 0.01
CO <sub>2</sub>	0 ÷ 19,9	% vol	Res. 0.1
HC hexane	0 ÷ 9,999	ppm vol	Res. 1
O <sub>2</sub>	0 ÷ 25	% vol	Res. 0.01
NO <sub>x</sub>	0 ÷ 5,000	ppm vol	Res. 1
Lambda	0.5 ÷ 5		Res. 0.001
Revolutions Inductance/capacitance	300 ÷ 9,990	rpm	Res. 10
Oil temperature	20 ÷ 150	°C	Res. 1

## Type-approval for Europe

- M Metrology Marking: MID (Measuring Instrument Directive) 2014/32/EU NMI 0122 B+D

## Additional National Type-Approvals

- Austria, Colombia, Czech Rep., Germany, Hungary, Italy, Peru, UK

# MGT-300 EVO



## Advantages at a glance

- Neural Network Technology: easily identifies and isolate noise, which could affect the accuracy of the measurement
- Extreme measurement precision

The MGT-300 EVO is BRAIN BEE's universal RPM counter that transmits engine RPM and temperature to the receiver via Bluetooth. MGT-300 EVO records the rotation frequency based on harmonics of the engine, according to battery charging signal or via a magnetic vibration sensor, and the engine temperature via the standard temperature sensor. The built-in rechargeable battery eliminates the previous need of the old RPM counter's for cables to connect to the car battery. The user-friendly software provides comprehensive, clearly organised information of the signal quality, current readings, and transmission quality of the signals to the receiver. Using the optional EOBD-300 EVO the engine speed can also be recorded via OBD interface via Bluetooth.

The MGT-300 EVO can be connected to a PC via a USB cable (included) or via Bluetooth.

The SG-030 (specified for motorcycles) records RPM using phono-metric measurements. Due to highly precision it can also be used in particularly complicated situations (ex. for trucks).

## Signal recording options:

1. Vibration sensor
2. Alternator harmonics
3. EOBD connector (EOBD-300 EVO) for speed and temperature.

## Measuring fields

RPM	300 ÷ 9,990	rpm	Res. 10
Temperature	20 ÷ 200	°C	Res. 1

## Certifications

- Dekra
- Ministero Trasporti Italia

# OPA-300



## Advantages at a glance

- Open system: compatible with all common commercial software and hardware systems
- Plug and play solution: we fully pre-configure all our exhaust examination testers. Ready to use

The OPA-300 is designed for flexibility and ease of use and can be connected to a PC via serial interface. The user-friendly BRAIN BEE software guides even untrained users safely and intuitive through the emission testing process.

Like many other devices in this series, the OPA-300 opacimeter can also be incorporated in various BRAIN BEE emission

control configurations, enabling users to set up a testing station based on their individual requirements.

It can also be integrated in existing stations (on a BRAIN BEE trolley for example), and therefore fits harmoniously and stylistically in workshops that use BRAIN BEE equipment.

### Measuring fields

Light transmission	0 ÷ 99,9	%	Res. 0.1
Light transmission	0 ÷ 9,99	m <sup>-1</sup>	Res. 0.01
Rev counter	300 ÷ 9,990	RPM heat.	Res. 10
Oil temperature	20 ÷ 150	°C	Res. 1
Smoke temperature	20 ÷ 400	°C	Res. 1

## Compliance

- ISO 11614 Standards

## National Type-Approvals

- Bulgaria, France, Italy, Morocco, Netherlands, Romania, Serbia

# OPA-100



## Advantages at a glance

- Guaranteed modularity: Designed to integrate in your customized testing station. This ensures flexibility and meets your specific needs
- Extreme measurement precision

Small and compact: Thanks to its small dimensions, 12V power supply and comfortable ergonomic handle, the OPA-100 is ideal for mobile use. The opacimeter can be connected to a PC via serial port.

The measuring device has an integrated heated measuring chamber with a length of 20 millimeters. The unit tests according to the reference method, whereby

a second opacified glass is used as a measurement reference.

The exhaust probe includes additional adapters for passenger cars and trucks.

With the specially developed BRAIN BEE software, you can use the OPA-100 to work with all brands and models.

### Measuring fields

Light transmission	0 ÷ 99,9	%	Res. 0.1
Light transmission	0 ÷ 9,99	m <sup>-1</sup>	Res. 0.01
Rev counter	300 ÷ 9,990	RPM heat.	Res. 10
Oil temperature	20 ÷ 150	°C	Res. 1
Smoke temperature	20 ÷ 400	°C	Res. 1

## Compliance

- ISO 11614 Standards

## National Type-Approvals

- Austria, Brazil, Bulgaria, Colombia, Czech Rep., Germany, Hong Kong, Hungary, Italy, Netherlands, Peru, Portugal, Romania, Spain, UK

# BRAIN BEE Emission Control Configurations

*Not all configurations and devices are available in all markets.*



**AGS-200** Exhaust gas analyser

Code: 1010500010XX

**MGT-300 EVO** Rev counter

Code: 1030700044XX



**AGS-688** Exhaust gas analyser

Code: 1030500042XX

**MGT-300 EVO** Rev counter

Code: 1030700044XX



**AGS-690** Exhaust gas analyser

Code: 1030500044XX

**MGT-300 EVO** Rev counter

Code: 1030700044XX



**OPA-100** Opacimeter

Code: 1030400002XX

**MGT-300 EVO** Rev counter

Code: 1030700044XX



**OPA-300** Opacimeter

Code: 1030400021XX

**MGT-300 EVO** Rev counter

Code: 1030700044XX



**AU Mobile**

Special for AU 5.1 | German market

**OPA-100 | AGS-200 | MGT-300 EVO  
VCI100 | PC**



### OMNIBUS-800

Special for AU 5.1  
German market

- OPA-100
- AGS-200
- MGT-300 EVO
- PSI-50
- TRO-220 Trolley XL
- VCI100 OBD Scantool
- Personal Computer
- Monitor 24"
- Printer
- Mouse



### Configuration 1

- AGS-690
- OPA-300
- MGT-300 EVO
- TRO-070 (2pz)



### Configuration 2

- AGS-688
- OPA-100
- MGT-300 EVO
- PSI-51
- TRO-060



### Configuration 3

- AGS-200
- OPA-100
- MGT-300 EVO
- PSI-50
- TRO-060

For Germany, available also  
AU 5.1 version with VCI100  
OBD Scantool



### Configuration 4

- AGS-688
- OPA-300
- MGT-300 EVO
- PSI-51
- TRO-060



### Configuration 5

- AGS-690
- OPA-300
- MGT-300 EVO
- PSI-51
- TRO-060

# Overview

Exhaust Gas Analyser	AGS-690	AGS-688	AGS-200
Measuring chamber	Amb2 sensors	Amb2 sensors	Amb2 sensors
Gas sampling	4 l/min.	4 l/min.	4 l/min.
Condensate drain	Automatic and continuous	Automatic and continuous	Automatic and continuous
Leak test	Semi-automated	Semi-automated	Semi-automated
Minimum flow check	Automatic	Automatic	Automatic
Checks sensor for remaining O <sub>2</sub>	Automatic (< 5mv)	Automatic (< 5mv)	Automatic (< 5mv)
Protective filters of measurement heads for water/gas from pump	Attached externally to prevent the unit from opening and the seal from being lost	Attached externally to prevent the unit from opening and the seal from being lost	Internal
Automatic ambient pressure compensation	850 ÷ 1060 hPa	850 ÷ 1060 hPa	850 ÷ 1060 hPa
Calibration	With gas sample cylinder	With gas sample cylinder	With gas sample cylinder
Zero position	Automatic	Automatic	Automatic
Time for heating to 20 °C	10 Minutes	10 Minutes	10 Minutes
Response time for CO, CO <sub>2</sub> and HC	< 10 Seconds	< 10 Seconds	< 10 Seconds
Response time for O <sub>2</sub>	< 60 Seconds	< 60 Seconds	< 60 Seconds
Printer	No	Integrated thermal printer with 24 columns	No
Display	No	6 LCD units	No
Connections	<p>Rpm measurement via cable for inductance or capacitance clamp</p> <p>Oil inlet temperature from Pt100 sensor (Din 43760)</p> <p>Rpm/oil temperature received via RS-232 cable, wireless frequency 433 MHz (optional)</p> <p>Serial ports: PC USB B (slave mode); PC RS-232 (9600,N,8,1); PC in RS-485 network (9600,8,N,1)</p> <p>Software programming/updates via RS-232 cable</p>	<p>Rpm measurement via cable for inductance or capacitance clamp</p> <p>Oil inlet temperature from Pt100 sensor (Din 43760)</p> <p>Rpm/oil temperature received via RS-232 cable, wireless frequency 433 MHz (optional)</p> <p>Serial ports: PC USB B (slave mode); PC RS-232 (9600,N,8,1); PC in RS-485 network (9600,8,N,1)</p> <p>Software programming/updates via RS-232 cable</p> <p>User interface to OPA-100 opacimeter possible</p>	<p>Rpm measurement via cable for inductance or capacitance clamp</p> <p>Oil inlet temperature from Pt100 sensor (Din 43760)</p> <p>Rpm/oil temperature received via RS-232 cable, wireless frequency 433 MHz</p> <p>Serial ports: in RS-485 network</p> <p>Software programming/updates via RS-232 cable</p>
Power supply	12 V DC typical (11–15 V DC)	12 V DC typical (11–15 V DC)	12 V DC typical (11–15 V DC)
Consumption	1.5 A DC	1.5 A DC	1.5 A DC
Operating temperature	5 ÷ 40 °C	5 ÷ 40 °C	5 ÷ 40 °C
Dimensions	360 x 280 x 288 mm	434 x 190 x 291 mm	220 x 140 x 430 mm
Weight	5 kg	5 kg	5 kg

RPM Counter	MGT-300 EVO
Display	LCD 3.5", 320 x 240 mm, 700 Nit (cd/m <sup>2</sup> )
Keypad	Soft touch keypad
Battery	Lithium-ion, rechargeable
Interfaces	USB 2.0 Bluetooth
Dimensions	200 X 100 x 30 mm
Weight	0,385 kg

Particles counter	PMU 400
Measuring bench	APB Sensors (CPC)
Sampling line	3,5m, heated
Sample flow	1 l/min.
Daily test	Semiautomatic with external HEPA filter
Low flow monitoring	Automatic
Filters for dilution air and pump protection	Attached externally to prevent the unit from opening and the seal from being lost
Working fluid	External in 250cc bottle, with quick coupling and fluid protection system
Working fluid duration	> 1000 official test or 1 year
Ambient pressure automatic compensation	750 ÷ 1060 hPa
Autozero	Automatic
Warmup time at 20 °C	< 10 Minutes
Response time (T0-95)	< 15 Seconds
Display	LCD 4.3" integrated
Connections	USB-B for standard connection to PC   USB-B for service use   USB-A for Bluetooth adapter (option)
Power supply	12 VDC - 250W max
Working temperature range	0 ÷ 40 °C
Dimensions	470 x 300 x 280 mm
Weight	14 Kg (included heated sampling line)

Opacimeters	OPA-100	OPA-300
Light source	With green Led diode	With green Led diode
Light receptor	Photodiode	Photodiode
Measuring chamber pressure monitoring	Automatic	Automatic
Stabilisation of measuring chamber temperature at 90 °C	Yes	Yes
Monitoring of glass cover cleaning system	Automatic	Automatic
Zero position	Automatic	Automatic
Time for heating to 20 °C	10 Minutes	10 Minutes
Receives rpm and temperature	Via cable or wireless device	Via cable or wireless device
Connections	Serial port RS-232 Serial port in RS-485 network	Serial port RS-232 Serial port in RS-485 network
Power supply	12 V DC typical (11–15 V DC)	12 V DC typical (11–15 V DC)
Consumption	1 A DC, 5 A DC with heater switched on	1 A DC, 5 A DC with heater switched on
Operating temperature	0 ÷ 40 °C	0 ÷ 40 °C
Dimensions	360 X 280 x 288 mm	200 x 140 x 430 mm
Weight	5 kg	5 kg

Accessories	PMU 400	AGS-690	AGS-688	AGS-200	OPA-300	OPA-100	MGT-300
1010750038XX TRO-060 Trolley		■	■	■	■	■	■
1010700025XX OMNI-010 Cable Communication/Power Supply 0.4 M				■	■	■	
1010700065XX OMNI-011 Cable Communication/Power Supply 0.75 M				■	■	■	
1010700028XX OMNI-030 Cable Communication/Power Supply 6 M				■	■	■	
1010700135XX OMNI-050 Cable Communication/Power Supply 2 M		■	■				
1010700136XX OMNI-060 Cable Communication/Power Supply 6 M		■	■				
1010500001XX NOx-010 sensor for AGS		■	■	■			
1030700029XX EOBD-300 EVO							■
1010700165XX SG-030 RPM Motorcycle Probe							■
1010601163XX BT-100 USB Kit Bluetooth Module		■	■	■	■	■	■
1010601410XX BT-100 Bluetooth Module		■	■	■	■	■	
1010450000XX PMU 400 Bluetooth Adapter	■						

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