

# EMI 21

## Injection quantity indicator



### Special features

- Use in the gasoline and diesel field possible
- Standard measuring range up to 600 mm<sup>3</sup>/injection
- Very high accuracy<sup>1)</sup>:
  - ± 0,05 mm<sup>3</sup> at Q = 0,2 – 50 mm<sup>3</sup>
  - ± 0,1% o.R. at Q = 50 – 600 mm<sup>3</sup>
- Optional measurement ranges:  
1500/5000/10000 mm<sup>3</sup>/injection
- 5 injection events can be measured (optional 10)
- Minimum injection distance 250 µs
- Low thermal settling time ≤ 20 sec.
- Simple operation
- Easy adaptation of different test samples
- Compact setup
- Control electronics as 19" rack module
- High reliability
- Designed for the use in rough production environment

1) Reproducibility against scale, averaged over 1000 injections (measured with calibration fluid Shell 1404)

best testing – best quality

**moehwald**  
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## EMI 21 Injection quantity indicator

### General

The EMI 21 is used as an optimal measuring device for investigations of new injection systems with multiple injections.

The requirement to optimize the combustion process, and hence exhaust emission values, by means of ever more precise fuel metering in the engine at ever shorter intervals is the challenge for new fuel injection systems.

This necessitates world class measuring systems right from the basic development stage through to subsequent testing.

Based on these requirements the EMI 21 was developed to recognize and exactly measure each injection, including very short injection distances and the individual injection events.

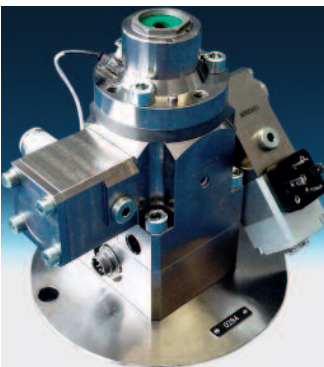
### Measurement principle

The quantity which should be measured is injected in a measuring chamber. The chamber is locked by a solenoid valve and a displacement piston, whereby the piston is connected to a highly accurate electronic displacement measuring system. By the pressure of the fluid the piston is moved down whereby the volume is calculated using the cross-section of the piston and the measured travel distance. With the additional acquisition of pressure and temperature, the exact injection quantity is determined by means of a compensation algorithm.

After completion of the injection, the chamber is drained through the solenoid valve.

### Setup

#### EMI 21 Measuring head



- Measuring chamber with piston
- Solenoid valve
- Draining throttle
- Pressure sensor
- Temperature sensor
- LVDT-displacement sensor

#### EMI 21 Electronics

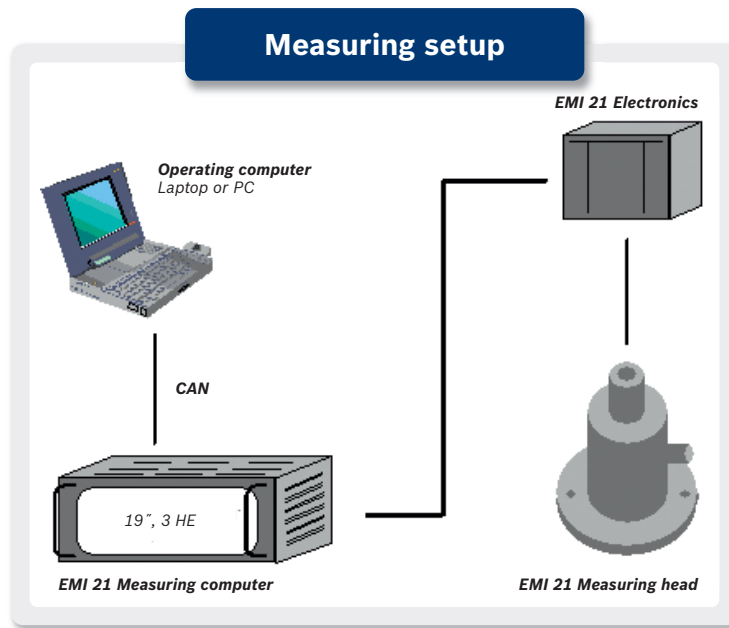


- Amplifier of the displacement sensor
- ADC-displacement sensor

#### EMI 21 Measuring computer

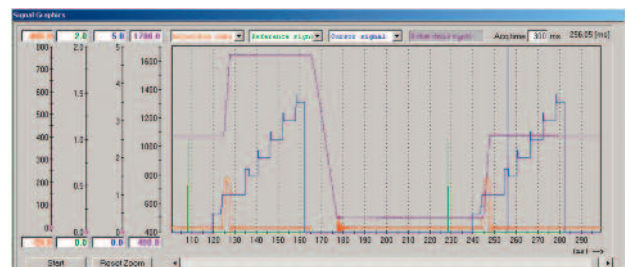


- Power stages
- Amplifiers for pressure sensor and temperature sensors
- 4 channel ADC
- Signal preconditioning
- External trigger for zero pulse
- Measuring processor



## Operating software

The EMI 21 is connected to the operating computer via CAN-Bus. The software is used for operation, measuring data acquisition and error diagnosis. The recorded values are stored in the operating computer for evaluation. Various display modes allow e.g. a table display as well as a graphical display of the piston lift. With a programming interface (DLL) the EMI 21 can be easily implemented in a test bench environment.



## Technical data

EMI 21-600	<b>Measuring range (per injection)</b>	from 0,2 – 600 mm <sup>3</sup> (max. quantity depends on injection frequency)
	<b>Reproducibility against scale, averaged over 1000 injections (measured with calibration fluid Shell 1404)</b>	range 0,2 – 50 mm <sup>3</sup> /injection: ± 0,05 mm <sup>3</sup> range 50 – 600 mm <sup>3</sup> /injection: ± 0,1 % of reading
	<b>Resolution</b>	0,008 mm <sup>3</sup>
	<b>Number of measurable injection events</b>	5 up to 10 events extendable
	<b>Injection distance preinjection to main injection</b>	min. 250 µs
	<b>Counterpressure</b>	6,5 – 100 bar
	<b>Maximum calibration fluid temperature in the measuring chamber of the EMI 21</b>	140 °C
	<b>Operating speed</b>	30 until 3000 injections/min
	<b>Operating temperatures</b>	function: -40 °C until +140 °C measuring accuracy: +40 °C until +130 °C
EMI 21-1500	<b>Measuring range (per injection) max. 300 injections/min.</b>	from 1 – 1500 mm <sup>3</sup> (max. quantity depends on injection frequency)
	<b>Measuring range (per injection) max. 1000 injections/min.</b>	from 1 – 1100 mm <sup>3</sup> (max. quantity depends on injection frequency)
	<b>Reproducibility against scale, averaged over 1000 injections (measured with calibration fluid Shell 1404)</b>	range 1 – 200 mm <sup>3</sup> /injection: ± 0,2 mm <sup>3</sup> range 200 – 1500 mm <sup>3</sup> /injection: ± 0,2 % of reading
	<b>Resolution</b>	0,020 mm <sup>3</sup>
	<b>Number of measurable injection events</b>	5 up to 10 events extendable
	<b>Injection distance preinjection to main injection</b>	about 350 µs
	<b>Counterpressure</b>	50 bar (standard), 6,5 – 100 bar (option)
	<b>Maximum calibration fluid temperature in the measuring chamber of the EMI 21</b>	140 °C
	<b>Operating speed</b>	30 until 3000 injections/min
	<b>Operating temperatures</b>	function: 0 °C until +140 °C measuring accuracy: +40 °C until +130 °C
EMI 21-5000	<b>Measuring range (per injection) max. 1000 injections/min.</b>	from 5 – 5000 mm <sup>3</sup> (max. quantity depends on injection frequency)
	<b>Reproducibility against scale, averaged over 1000 injections (measured with calibration fluid Shell 1404)</b>	range 5 – 500 mm <sup>3</sup> /injection: ± 1 mm <sup>3</sup> range 500 – 5000 mm <sup>3</sup> /injection: ± 0,2 % of reading
	<b>Resolution</b>	0,15 mm <sup>3</sup>
	<b>Number of measurable injection events</b>	5 up to 10 events extendable
	<b>Injection distance preinjection to main injection</b>	about 600 µs
	<b>Counterpressure</b>	20 bar (standard), 8 – 50 bar (option)
	<b>Maximum calibration fluid temperature in the measuring chamber of the EMI 21</b>	140 °C
		<b>Operating speed</b>
	<b>Operating temperatures</b>	function: 0 °C until +140 °C measuring accuracy: +40 °C until +130 °C
EMI 21-10000	<b>Measuring range (per injection) max. 500 injections/min.</b>	from 10 – 10.000 mm <sup>3</sup> (max. quantity depends on injection frequency)
	<b>Reproducibility against scale, averaged over 1000 injections (measured with calibration fluid Shell 1404)</b>	range 10 – 1000 mm <sup>3</sup> /injection: ± 5 mm <sup>3</sup> range 1000 – 10000 mm <sup>3</sup> /injection: ± 0,5 % of reading
	<b>Resolution</b>	3 mm <sup>3</sup>
	<b>Number of measurable injection events</b>	5 up to 10 events extendable
	<b>Injection distance preinjection to main injection</b>	about 800 µs
	<b>Counterpressure</b>	20 bar (standard), 8 – 50 bar (option)
	<b>Maximum calibration fluid temperature in the measuring chamber of the EMI 21</b>	140 °C
		<b>Operating speed</b>
	<b>Operating temperatures</b>	function: 0 °C until +140 °C measuring accuracy: +40 °C until +130 °C

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