moehwald
Bosch Group

Modular injection pump test bench

MEP 2000

Special features:

- **Modular and flexible injection system test bench**
- **Modular concept that allows short change-over times when testing a wide range of diesel injection systems**
- **Can be used for testing both conventional and new injection systems**
- **License (QA) and application/development modules available**
- **High-precision measuring instruments**
- **Uses our Prisma NT software package which is specifically tailored to such applications**
- **Well-established basic test benches from Bosch with maintenance-free asynchronous motor**
- **Wide variety of options**
- **Simple and convenient to use**

***General*:**

The MEP 2000 modular injection system test bench is a test bench concept designed for testing both conventional and new diesel injection systems.
The modular design was developed with our customers firmly in mind. Our main consideration was to allow customers with a Bosch basic test bench (which they may even have already) to add various modules and thus test a wide range of injection systems.
All the different options make the MEP 2000 excellent for both testing and development tasks.
As far as performance and ease of maintenance are concerned, it far outstrips the other testing systems available on the market in this class and for a comparatively low price.
The MEP 2000 from MOEHWALD will help you to improve both quality and productivity.
This means keeping costs to a minimum while, at the same time, meeting ever more stringent environmental requirements.

Structure:

The concept behind the MEP 2000 can be broken down as follows:

- Basic test bench
- Basic equipment
- Bosch license modules
- Application modules
- Additional equipment

The MEP 2000 is based on the basic test bench EPS 818W or EPS 835 W.
The test bench can/may have to be equipped with a computer system for use with some injection systems.

EPS18w

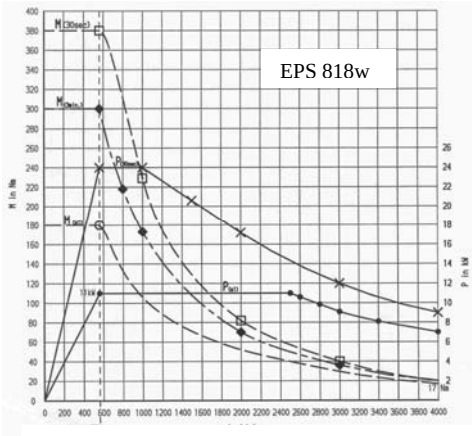
There are two basic test benches (EPS818w + EPS835w) with the MGT 801W operating panel available for the MEP 2000. They are equipped with powerful frequency-controlled asynchronous motors and integral testing oil hydraulic circuit.
Their main features are:

- High torque, even at low speeds
- Excellent speed stability due to extremely short drive unit response times
- Uniform drive due to large rotating mass
- Calibration fluid supply with low and high pressure and temperature stabilisation
- Integral position control
- Integral safety functions

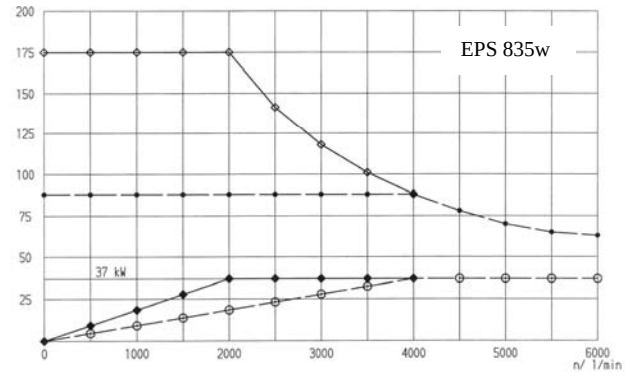
The EPS 818W and EPS 835W essentially differ in terms of their output and speed ranges.
For today's applications, the EPS 818W is normally sufficient for all of the modules described below, apart from the application modules for commercial vehicle common rail systems. For the large displaced volumes associated with commercial vehicle systems, the output of the EPS 818W test bench is insufficient for load points with high pressures and speeds. We therefore recommend the EPS 835W for such applications.

EPS 835w

	EPS 818 W	**EPS 835 W**
Speed range:	0 – 4000 rpm <+/- 1 rpm	0 – 6100 rpm <+/- 1 rpm
Position control accuracy	+/- 0.1 °	+/- 0.1 °
Nominal motor output/torque: see diagram	11	34
Moment of inertia for the complete drive unit 1.5 kgm^2	1.5	1.73
Calibration fluid low pressure pumping capacity	22	44
Calibration fluid high pressure pumping capacity	1.4	5.6
Temperature range	30 - 70	30 - 70



M_{3min} = 3 min. Lauf bei einer Motorgehäusetemperatur ≤ 25 °C
M_{30sec}/P_{30sec} = 30 sec. Lauf, Motorgehäusetemp. 60 °C, 30 min herunterkühlen.



Stern-Verbindung
M_{s1}/Nm = Langzeit-Lauf
P_{s1}/ kW = Langzeit-Lauf

Delta-Verbindung
M_{s1}/Nm = Langzeit-Lauf
P_{s1}/ kW = Langzeit-Lauf

Devices for the Test Bench

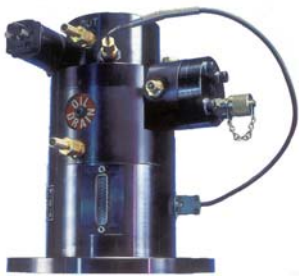
Here is a list of the devices that we have integrated into such testing systems. Of course, other devices and systems can also be integrated into the hardware and software. Our systems are inspired by your innovations!

KMM measuring system

Continuous flow rate measuring system for measuring the flow through each individual cylinder. The measurement is taken using Pierburg measuring cells. The measurements are displayed as numerical values or as a bar chart on the associated monitor. A further separate test cell is integrated for measuring the overflow rate. The system also offers the option of correcting the measured values for a temperature of 40 °C.
Various versions of the KMM are available (according to the number of measuring cells) - 6/8/10/12 measuring cells. The KMM measuring system normally includes a control cabinet that can house other control and display units, such as the test bench operator panel.

Measuring range:	0.1 – 45 l/h;	3 – 3000 mm^3/stroke
Measuring accuracy:	0.1 – 1 l/h ± 2 %;	1 – 30 l/h ± 1 %
Overflow measurement:	15-400 l/h	
Measured value refresh rate:		

EMI2



The EMI 2, consisting of a mechanical and electrical unit, is used to measure individual injection volumes in injection systems. The pre, main and post-injection volumes during each injection operation are recorded with a high level of accuracy as instantaneous, mean or cumulative values. The measured values can thus be displayed as a volume or calculated mass. This device can be operated either manually or fully automatically from an external computer.

Measuring range	0 -600 mm^3/stroke (∅17 mm piston)
Resolution	± 0.05 mm^3
Accuracy	± 0.1 % FS
Back-pressure	up to 100 bar
Max. fluid temperature	130 ° C (in the measuring chamber)
Injection frequency	30 – 3000/min

Number of measurable partial injections: 3

EMI21

The EMI 21 is a newly-developed injection rate indicator based on the same measuring principle as the EMI 2. The mechanical/hydraulic systems, hardware and software have all been modified substantially in order to improve the system. There is also no longer a display unit as with the EMI 2. Instead, the device is linked via an interface directly to a laptop or other computer.

Measuring range	0 -600 mm^3/stroke (∅17 mm piston)
Resolution	± 0.008 mm^3
Accuracy	0.2 – 50mm^3/injection: ±0.05 mm^3
	50 – 600 mm^3/inj.: ± 1 ‰ of meas. value
Back-pressure	up to 100 bar
Max. fluid temperature	140 ° C (in the measuring chamber)
Injection frequency	up to 3000/min

Number of measurable partial injections: 5 (may be upgraded to 10)

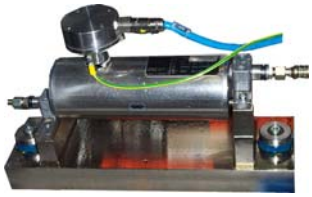
EVI

Indicator for displaying the injection progress. The injector is fixed to the EVI using a special adapter, and injects into the fuel-filled pipe. This leads to an increase in pressure that is proportional to the injection rate and is measured in the vicinity of the jet. The injection rate and the injection start, end, interval and duration are all output.

Coriolis mass flowmeter

This measuring device is used to measure the mass flow rate of large volumes (important for CR applications in which the air bubble can invalidate the result obtained with conventional methods). The result can also be output as a volumetric flow via the density measurement in the device. The associated measuring conditions are stabilised with back-pressure by operating the device. Various versions of the device are available to suit specific applications.

Standard: DI3: 20 to 250 kg/h accurate to ± 0.15% of measurement
DI6: 75 to 1000 kg/h accurate to ± 0.15% of measurement



Basic computer equipment:

Hardware and software for operating the test bench speed control and the KMM flow rate measuring system with sequential control for automatically approaching various load points and recording the measured flow rates.
Comprising:
19” industrial PC, Pentium; 17” SVGA monitor (19” rack mount); CD-ROM drive; network adapter; TCL Superport/8 x RS 232; pull-out keyboard; printer; interfaces for test bench and KMM, EMI, etc.
Prisma NT basic software package.
The calculated values are displayed graphically in the form of bar charts.
This equipment is normally integrated into a cabinet, but a desk-top version is also available.

TWM 2000

Trigger angle measuring device – a device for generating triggers and a pulse train. The angle or speed can be displayed digitally. Analyses or converts sensor signals.

Test control devices

For activating certain systems according to the application, e.g. for operating various CR systems in CR applications.

Variable speed transformation

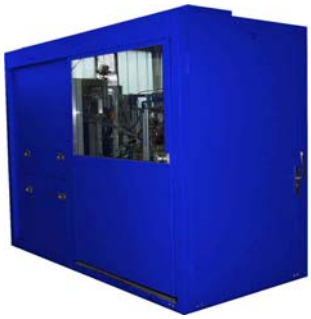
Simulates trigger wheels for the motor control device, and returns synchronous signals for the flowmeters (KMM, EMI). The ratio between the pump speed and motor speed can be set as required within broad ranges.
It converts an input frequency (from the pump test bench) into a proportional output frequency for the motor control device and the measuring system.

RTR 2000 Temperature control device for regulating the temperature in the return from diesel injection pump test benches. It is used, in particular, with distributor pumps, PDEs and PLDs. The control principle is based on a timed changeover valve with an extremely high cut-in speed for two separate calibration fluid infeeds.
Control range: 20 ° C – 80 ° C accurate to ± 0.2 %

RWM 2000 Device for measuring the controlled distance in diesel in-line injection pumps. The device consists of a magnetic incremental position encoder and an analysis circuit. The position encoder is mounted on the pump concerned using pump-specific mounts, and is connected to the pump's control rod.
Measuring range: 0 – 25 mm accurate to ± 0.01 mm

LDA 2000 Device for activating the boost pressure. This is used whenever alternating pressures with high setting accuracy are required. Primary applications are pumps with boost pressure-related volume stop (LDA). The device consists of a compressed air setting unit with a display unit. Pressure regulator: Overpressure 0 – 2.5 bar (relative), partial vacuum (optional) 0 – 700 mbar (relative), control precision: ± 3 mbar

Noise protection or safety cabin Cabin containing the test bench that has both noise protection and safety features. The cabin has folding doors on the front, sliding elements on the side and an exhaust air fan.



Splash protection Rather than a noise protection cabin, the test benches may be equipped with a splash-proof hood for safety purposes (not noise protection), particularly for use with high-pressure injection systems.

Transformer Needed if the machines are not operated on a 400V/230V – 50 Hz supply.

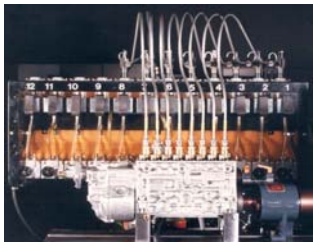
Cooling water return cooler Device for cooling down the operator's cooling water supply if the temperature is too high for operating the test bench.

"Bosch License" Module

Bosch license module means that the test bench equipment correlates with the Bosch production measuring instruments, and the results of a comparison are recognised, e.g. from the quality control stage. The high-precision modules are also used in development and application.

In-line pump module

Requirement: The test bench, KMM and basic computer equipment are required. The test samples are in-line pumps up to P pump size that can be tested according to Bosch TKU requirements. The module consists of the add-on software package for in-line pumps, a special data acquisition unit with speed, inlet pressure and relative boost pressure measurement, control path and angle of adjustment measurement plus the associated measuring sensors such as control path and angle of adjustment measuring devices and device for activating the boost pressure.

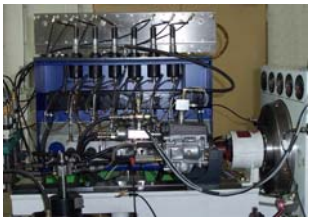


Distributor pump module

Requirement: The test bench, KMM and basic computer equipment are required. The test samples are mechanical distributor pumps that can be tested according to Bosch TKU requirements. The module consists of the add-on software package for mechanical distributor pumps, a special data acquisition unit with speed, inlet pressure, relative boost pressure measurement, injection adjuster path, feed pumping pressure and angle of adjustment measurement plus the associated measuring sensors such as injection adjuster path and angle of adjustment measuring devices and device for activating the boost pressure. A RTR (return temperature regulator) is also needed for distributor pumps in order to conform to the close tolerances in the calibration fluid temperature range.

VP29/30/44 module

Requirement: The test bench, KMM and basic computer equipment are required. The test samples are type 29/30/44 electronic distributor pumps that can be tested according to Bosch TKU requirements. The module consists of the Prisma NT add-on software for the VP29/30/44 and an SMP bus with special cable harness. A RTR (return temperature regulator) is also needed for distributor pumps in order to conform to the close tolerances in the calibration fluid temperature range.



CRP 2000 module

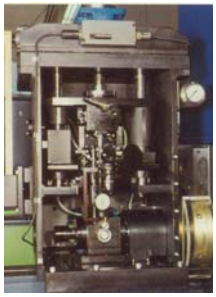
Requirement: The test bench is required. The test samples are passenger car and truck common rail pumps that can be tested according to Bosch TKU requirements. The module consists of the Prisma NT add-on software for common rail pumps and the test bench structure, which contains the clamps, pipes, measuring devices and electronics. At the very heart of the test set-up is the Coriolis mass flow meter, which is used to determine the efficiency of the pumps.

Application Modules

Application modules are test set-ups only for application, development and laboratory usage. The test results are not comparable to those obtained with Bosch production test benches. The main advantage of these test benches is their flexibility. They can easily be modified to suit customers' requirements.

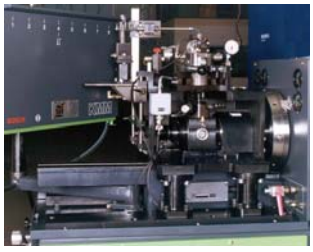
PDE application module PD 4000

Requirement: The test bench, KMM and RTR are required. The test samples are truck UI systems. The module consists of a mechanical clamping device with cam box, clamping parts and A dimension adjustment. A peak value measuring device may also be connected. The UI volume is then measured via a measuring cell on the KMM. The system can be optionally upgraded with a computer.



PLD application module PL 4000

Requirement: The test bench and RTR are required. The test samples are NKW PLD systems. The module consists of a mechanical clamping device with cam box and clamping parts. The KMM or EMI is normally used as the flowmeter. A high pressure measuring device may also be connected. The system can also be optionally upgraded with a computer.

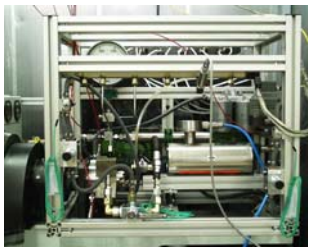


Common rail application module for the entire system CA 4000

Requirement: The test bench and computer system are required. The test sample is the complete common rail system with motor equipment. The module has a hydraulic and mechanical structure that is extremely flexible and can be adapted to a wide range of systems. It is constructed as a quick-change module, and can thus be quickly and easily removed from the test bench in order to carry out other testing tasks. The hardware and testing equipment are customer-specific and can be selected from a variety of options or recommended by the customer from his own experience.

Common rail module for the pump

Requirement: The test bench and computer system are required. The test sample is the common rail pump. The module has a hydraulic and mechanical structure similar to that of the CA 4000 layout, although it is specially tailored for testing pumps (e.g. with Coriolis mass flowmeter). It is also constructed as a quick-change module, and can thus be quickly and easily removed from the test bench in order to carry out other testing tasks. The hardware and testing equipment are customer-specific and can be selected from a variety of options or specified by the customer from his own experience.



Common rail module for the injector

Requirement: The test bench and computer system are required. The test sample is the common rail injector. The module has a hydraulic and mechanical structure similar to that of the CA 4000 layout, although it is specially tailored for testing injectors (e.g. with injection rate indicator). It is also constructed as a quick-change module, and can thus be quickly and easily removed from the test bench in order to carry out other testing tasks. The hardware and testing equipment are customer-specific and can be selected from a variety of options or specified by the customer from his own experience.

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