

# IPC-450P

## Piezo test control system for common-rail systems

### OVERVIEW OF INJECTOR PUMP CONTROL (IPC)

The operation of common-rail systems under test conditions takes high demands to measuring and testing technology regarding the reproducibility and reliability. The IPC product family from Bosch Engineering GmbH was specially designed for development, endurance testing and quality assurance.

Due to different fields of applications it is possible that the IPC runs with single components of common-rail systems, such as high-pressure pumps, as well as entire common-rail systems including injectors and actuators of the high-pressure control circuit. IPC test control units are modular build of a control unit and power stage unit, and therefore enable adaption to the respective test requirements. The wiring harness included in the scope of delivery connects the sensors and actuators of the common-rail system with the test control unit. The scope of delivery also includes PC software that serves as a graphic configuration and operation interface. Communication with the test control unit takes place via a USB connection or CAN interface.



IPC-450P

### Functions

- ▶ Drive and control of complete common-rail systems, including rail pressure control
- ▶ Modular system design; scalable number of piezo power stages
- ▶ Parallel operation of six piezo power stages; freely configurable up to 9 partial injections per 720° CrS
- ▶ Switching between charge and voltage regulation can be parameterized
- ▶ Charge voltage individually adjustable for each injector
- ▶ Current-Gradient-Control: Parameterizable presetting of the current gradient
- ▶ “Flanken-Ende-Timing” (Last-Pulse-Timing)
- ▶ Voltage-Degeneration-Feedback-Control
- ▶ Internal revolution speed simulator
- ▶ Control functionality implemented in FPGA => flexible changes of control methods can be implemented in SW
- ▶ Integrated diagnostics functionality
- ▶ Overvoltage protection and overcurrent shutdown
- ▶ 8 – 28 V operation
- ▶ Active air-cooling
- ▶ User-friendly calibration software
- ▶ Integrated measurement data acquisition
- ▶ CAN interface for remote operation (optional)
- ▶ CE compliant

### IPC-450P TEST CONTROL UNIT

The IPC-450P consists of a plug-in module with common-rail high-pressure system control and closed-loop control functionality (1 and 2 actuators) and communication interfaces (USB and CAN). Three power stage modules with two power stages each for injector actuation enable actuation of up to six piezo injectors (CRI3). As a special feature the IPC-450P enables the parallel operation of piezo power stages. The flexibility gained through simultaneous injector actuation opens up additional degrees of freedom for test planning and offers considerably shortened test times. Up to 9 partial injections per 720° CrS are possible on each power stage.

## TECHNICAL FEATURES

| IPC-450P                                  |   |
|---|---|
| Dimensions (H x W x D)                    | 320 x 450 x 435 mm<br>19", 7 RU, 84 HP  |
| Supply voltage                            | 8 – 28 V  |
| Crankshaft speed                          | 60 – 6,000 rpm  |
| Number of piezo injectors                 | max. 6  |
| Angle system                              | 720° CrS (usable range depending on the position and duration of the control at the end of the segment) |
| Speed input                               | Crankshaft (inductive sensor) and camshaft signal (0 to 5 V); 60-2 method; alternative use of a VDÜ     |
| Number of injections                      | max. 9 per 720° CrS   |
| Minimum time between Injections (tiDiff)  | 100 µs  |
| Minimum actuation period                  | 110 µs  |
| Injection angle                           | +90 to max. -630° CrS (before TDC)  |
| Positioning accuracy of angle             | +/- 0.1° CrS  |
| Buffer voltage                            | max. 270 V / 94 µF  |
| Piezo voltage                             | 120 – 230 V (typical)   |
| Charging/discharging current              | +/- 20 A  |
| Current quantization                      | 10 mA   |
| Charging time                             | 90 – 800 µs (typical)   |
| Discharging time                          | 90 – 800 µs (typical)   |
| Voltage resolution                        | 0.15 V  |
| Actuation period                          | 110 – 3,000 µs (typical; limited to max. 10 ms)   |
| Injector Voltage regulation               | +/- 2 V (typical)   |
| Charge regulation measurement accuracy    | +/- 3,6 % (typical)   |
| Charge measurement resolution             | 2 µC  |
| Perm. ambient temperature                 | 5 °C – 40 °C  |
| PWM frequency                             | 100 Hz – 1 kHz  |
| Control interface                         | USB, CAN (optional)   |
| Complies with provisions of EU directives | 2014/30/EU (EMC)<br>2011/65/EU (RoHS)<br>2014/35/EU (Low Voltage)                                       |

The IPC-450P features a CrS/CaS input (60-2 pattern) to ensure angle-synchronous actuation.

## SCOPE OF DELIVERY

### IPC-450P test control unit

Common-rail test control unit for max. 6 piezo injectors (CRI3); up to 9 partial injections per 720° CrS; simultaneous and parallel power stage actuation; 8 – 28 V voltage supply; high-pressure control 1 and 2 actuator; replication of voltage regulation (Gen1) and charge regulation (Gen2); Design: 19", 7 RU, 84 HP

### IPC-CT450P control software

IPC-450P control software; setup file for parameters, measurement and service software for Windows operating system; measurement data acquisition and onboard data storage

### KBPB-IPC450P-SET wiring harness set

Wiring harness set (CON1, CON2, CON3, CON4) for operating a IPC-450P CR control unit on component test benches; operation of 6 piezo injectors; without adapters; adapters can be ordered separately:

- IPC-450P adapter set for injector type 3.20  
KC-IPC450P-SET 3.20, F037.B00.517-01
- IPC-450P adapter set for high pressure  
KC-IPC450P-SET HD, F037.B00.518-01
- IPC-450P adapter set for injector type 3.27  
KC-IPC450P-SET 3.27, F037.B00.573-01
- IPC-450P adapter set for injector type 3.20 & high pressure  
KC-IPC450P-SET 3.20 + HD, F037.B00.572-01
- IPC-450P adapter set complete  
KC-IPC450P-SET Gesamt, F037.B00.574-01

### Documentation and installation file

Device-, GUI- and function-documentation and installation files for IPC-CT control software.

## Ordering data

|  |                              |
|--|------------------------------|
| Article description                            | IPC450 Piezo CE              |
| Item number                                    | F037.B00.411-01              |
| Price and delivery time / individual solutions | <a href="#">upon request</a> |

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