



One-stop automation

## **Automation technology on the test rig Test rig control for brake pedal switches at CASCO SCHOELLER GmbH**

Hardly any other sector places higher demands on the automation of test systems accompanying production and development than the automotive industry does. For the developers and manufacturers of hardware and software solutions in this area, it is therefore especially important to gather and evaluate experience and know-how from applications realised previously and to re-use them in new applications. Only in this way can a continuous increase in the reliability and quality of test rig automation systems be achieved. To nevertheless be able to offer low-cost solutions, automation specialists must take targeted recourse to standard product, which they then adapt to the specific demands of the application concerned.

### **Continuous enhancement through flexible modular solutions**

ECKELMANN AG develops and manufactures complete automated test systems for reliability, function, accuracy and endurance testing facilities. The service depth covers the full spectrum from consulting through the mechanical and electrical structure and programming to commissioning and after-sales service. A suitable automation concept is drawn up for customers who already have test rigs.

As numerous control and operating processes run in repeatedly similar ways, independently of the specific field of application, ECKELMANN has defined function blocks and has grouped them in the E•XACT module library. These modules were conceived so that they can be adapted easily to the diverse range of possible testing tasks. As a recognised member of the Alliance Programme of National Instruments Germany, ECKELMANN relies mainly on the LabVIEW development environment when creating test software. However, field bus module and data acquisition cards from NI are also used.

The hardware platforms on which these modules are implemented can also be chosen depending on the size, complexity and technical environment of the test applications. This is why three different basic models serve as the basis for test rig automation:

- PC with I/O and system bus cards (GPIB, RS 485, CAN, etc.) and configurable standard software
- PC with field bus and application-optimised test software, if necessary with realtime-enabled additional module
- Realtime-enabled microprocessor hardware with field bus and application-optimised testing software

As add-ons, these basic models can be extended with frame grabber cards for image processing tasks such as completeness checking, measurement, position recognition and surface checking.



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### **Adaptation of test rig automation to suit the needs of a sector**

After having realised several projects, ECKELMANN possesses solid experience in adapting its system technology to the practical requirements in a highly diverse range of sectors. The E•XACT hardware and software modules were continuously improved in the course of this tailored implementation of endurance and function testing systems in parallel with production and development. Besides automating test rigs for reliability and function tests of domestic appliances, among other things ECKELMANN has also automated systems for testing the charging and discharging behaviour of rechargeable device batteries in long-term experiments, function tests of miniature circuit-breakers and endurance tests of electric motors.

Finally, particularly sophisticated applications have come into being for customers from the automotive supply industry. Among other things, applications were also produced for the Frankfurt-based automobile supplier CASCO SCHOELLER GmbH, for whom ECKELMANN AG developed and delivered the test rig control for a final inspection unit for the production of brake pedal switches.

### **Testing of brake pedal switches**

CASCO SCHOELLER is a member of the international “CASCO Products Corporation“ group of companies, which has been on the market for more than eighty years as a manufacturer of electromechanical components for the automotive industry. CASCO delivers cigarette lighters, power sockets, sensors, switches and voltage transformers for almost all renowned automobile makers.



Fig. Setup of the brake pedal test rig



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The application for CASCO SCHOELLER GmbH is a test system that runs in parallel with production and which is based on a client/server design. The functions of brake pedal switches featuring the four switching functions "close/open" and "open/close" are checked within precisely defined tolerance limits and units failing the test are sorted out. The actual test rig consists of a bench setup that is about one metre wide, one metre long and two metres high. The brake pedal switch is inserted manually in a mount. A light curtain in front of the test system's three open sides detects when the operator's hand leaves the test system and the test can be started. The test object is clamped in its mount pneumatically after the test has been started. The test voltage is now activated. Via a stepper motor with a spindle, mechanical actuation is simulated and the switching force to be applied is measured via a load cell. If the result of testing is positive, a laser printer marks the switch with a numeric code and the test object is discharged to the OK box by means of a pneumatic pusher.

The process is controlled, and measured values are recorded, via a PC, largely programmed graphically with the NI LabVIEW 6i development tool under the Windows NT operating system. The application software offers all the possibilities of convenient operation, visualisation and logging. Test reports for individual test objects, accompanying slips for a packed unit or reports on the tests of several test objects can be printed on a printer.



Fig. Operating and evaluating with LabView



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For the brake pedal switch, testing encompasses locally resolved measurement of the switching states for the circuit of the brake light (14V/10A) and the cruise control circuit (14V/20mA). An MIO card (PCI-6034E) from NI was chosen for measurement. Data acquisition is triggered via the electric motor's incremental encoder, which simulates pressing in. Every second, 6,000 measurements are recorded with a local resolution of 5µm. During evaluation, eight criteria are checked and, out of these, up to fifteen test results, among other things the cause of a fault in plain language, are generated. In this way, about 5,000 tests can be performed every day.

Besides performing data acquisition, the PC must also take care of sequentially controlling the test process. The modular field point system from NI is used for this purpose. The FP-DIO modules are linked to the PC via the serial interface (RS 232). They monitor the light curtain and control the CNC for the two electric axes.

The test data is stored in an Access database on the test PC. It has a storage capacity of about ten days. Once every day, the current measured data is stored automatically in a database table for long-term archiving on an NT server. The test rig's user interface (client) can be installed on external PCs in the LAN or WAN. Therefore, not only is offline access via the Access database possible, but also online monitoring of test operations in production from practically any computer in the intranet that has an installed user interface. The concept of online checking of every testing station accompanying production is therefore consistently realised. Through the intranet, this can supply transparency right through to the end customer, for example.

### **Automation competence typical of the sector**

The testing system described has now been commissioned successfully. ECKELMANN AG is currently realising further projects for test rig automation at CASCO-SCHOELLER GmbH for function tests of cigarette lighters. However, automation solutions have also been developed, and are being developed, for other customers in the automotive supply sector. For example, we are currently developing a housing force displacement test rig for Continental Teves AG.

Across all kinds of test rigs and all sector-specific requirements, the re-use and enhancement of partial solutions already realised in a modular system have proven to be a process of modern test rig automation that both saves costs and assures quality.

We would like to thank Casco Schoeller for their amiable support.