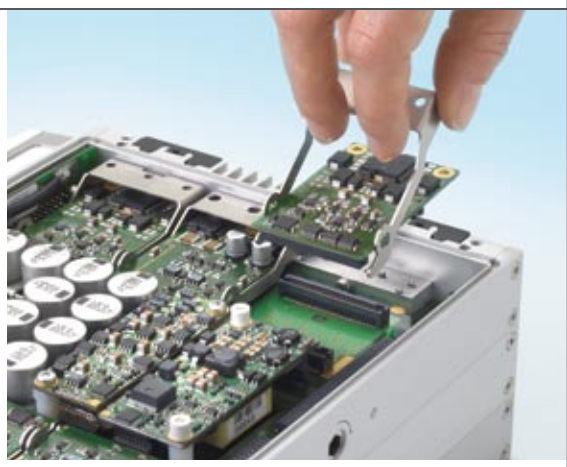
# RapidPro: Connection Guaranteed

A continuously growing selection of interface modules for connecting sensors and actuators directly to dSPACE prototyping systems


dSPACE's RapidPro is a highly flexible, yet compact system for connecting sensors and actuators. First launched in 2005, the portfolio of signal conditioning and power stage modules has been expanded ever since, so that today there is a comprehensive range of modules for very different applications. This out-of-the-box approach means that dSPACE customers can avoid expensive in-house developments. And the range is still growing.

*Smaller than a playing card: a 1-slot RapidPro module. The modules are easy to configure and quick to replace when requirements change.*

## The RapidPro Concept: Flexibility is Key

Compactness, flexibility, and off-the-shelf availability: These are the key concepts of dSPACE's RapidPro hardware, introduced in 2005. Since then numerous customers have been using the system to implement the sensor and actuator connections for their prototyping systems. The key to success is the enormous range of hardware- and software-configurable RapidPro modules, which can be plugged on simply, and quickly replaced whenever required. Each module provides a particular signal conditioning or power stage functionality. The standard components can be combined to form an individual system that is easy to modify whenever project requirements change. This has been a great labor-saver for numerous customers, since the only alternative to the convenient RapidPro concept is often to develop special circuits themselves – involving higher costs, more time, and greater project risks. Quite often this task was delegated to service providers with the necessary specialized knowledge. When the project was completed, the system was exactly in tune with the project requirements. There was no flexibility, however, so new requirements that arose during the project could not be met completely. In addition, it was often not possible to reuse the system in new development projects with modified sensor-actuator environments.
The solution is RapidPro: an elegant, flexible, compact system with a proven track record in numerous customer projects, which is continuously being extended by new modules for current applications.

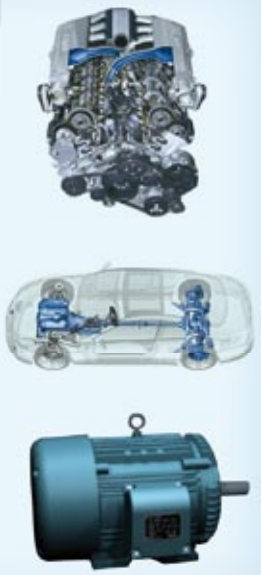
## RapidPro Modules: Constantly Expanding Portfolio

RapidPro covers many automotive application areas because its modules can be combined flexibly to match the available installation space. In addition to multi-purpose module functionalities such as analog in/out, digital in/out and sensor supply, application-specific modules are also available. For example, for engine management there are special modules to capture the camshaft position and crankshaft position, to connect the lambda probes and knock sensors, and to generate the injection pulses and ignition pulses (see table). For applications in electrical drives and valves, there are half-bridge and full-bridge modules which can deliver peak currents of up to 60 A. In cases where required functionalities differ from standard functionalities, dSPACE offers an engineering service for customer-specific requirements. The latest additions to the portfolio are modules for connection to Denso lambda probes and for the fast, digital control of actuators. A module for universal control of brushless electric motors is under development and will be available within 2009.

## Easy Module Configuration

The broad range of sensor interfaces and actuator interfaces demands a high level of flexibility during signal adaptation. This is achieved by a wide selection of specific signal conditioning modules and power stage modules. Due to the comprehensive configurability of the hardware and software, these modules can also be adapted to the necessary interfaces. Elements such as filters, voltage dividers, and pull-up/down resistors can be inserted on the modules wherever required. Settings such as the voltage ranges, signal inversion, and special behavior modes can be made easily via the software. Module-specific diagnostic messages and

| RapidPro Modules: Signal Conditioning and Power Stages | Application Examples | | | | |
|---|---|---|---|---|---|
| | Engine Management | Transmission | Chassis | Body | Electric Motors and Valves |
| SC-SENS 4/1 sensor connection | X | X | X | X | X |
| SC-AI 4/1 analog inputs | X | X | X | X | |
| SC-AI 10/1 analog inputs | X | X | X | X | |
| SC-DI 8/1 digital inputs | X | X | X | X | X |
| SC-CCDI 6/1 crankshaft/camshaft position capture | X | | | | |
| SC-DO 8/1 digital outputs | X | | X | X | |
| SC-DO 8/2 digital outputs push/pull | X | | X | X | X |
| SC-EGOS 2/1 Bosch lambda probe connection | X | | | | |
| SC-UHEGO 2/1 DENSO lambda probe connection | X | | | | |
| SC-KNOCK 4/1 knock sensor connection | X | | | | |
| SC-TC 8/1 thermoelement sensor connection | X | | | | |
| PS-FBD 2/1 full-bridge driver | X | X | X | X | X |
| PS-LSD 6/1 low-side driver | X | X | X | X | |
| PS-HSD 6/1 high-side driver | X | X | | | |
| PS-HCFBD 1/1 high-current, full-bridge driver | | X | | X | X |
| PS-HCHBD 1/1 high-current, half-bridge driver | X | X | X | | X |
| PS-DINJ 2/1 direct injection | X | | | | |



*The RapidPro hardware is equipped for a wide variety of applications.*

error messages are output, and the pinout list is generated as an aid for configuring the cable harness.

## Looking Ahead

The RapidPro module for universal control of brushless electric motors currently under development will be launched in 2009 to provide special support for electrifying auxiliary aggregates such as oil pumps and water pumps via brushless DC motors. Further RapidPro modules are planned. ■

*RapidPro has an extremely compact, highly scalable enclosure design that provides the optimum dimensions for any application size.*