TTControl
HYDAC INTERNATIONAL

HY-TTC 500 Family

Freely Programmable High-End Off-Highway Control Units

Key Benefits

- High Performance: 32 bit dual-core lockstep CPU with 180MHz and floating point unit, 12 bit ADCs
- Extensive I/O set with multiple software configuration options per pin
- Open programming environment C, CODESYS® V3.x and CODESYS® V3.x Safety SIL 2
- IEC 61508 (SIL 2) and EN ISO 13849 (PL d) TÜV certified
- Connectivity: Up to 7 CAN interfaces
- Ethernet
- Up to 2.3 MB RAM / 11 MB Flash

The HY-TTC 500 product family is a high-end electronic control solution satisfying all upcoming needs. The controller with its powerful TMS570 dual core lockstep CPU is designed for use in demanding safety-relevant mobile applications. The three product variants HY-TTC 580, HY-TTC 540 and the HY-TTC 510 fulfill safety requirements up to SIL 2 (IEC 61508) / PL d (ISO 13849).
They are part of a complete and compatible product family and can be programmed either in C or in CODESYS® Safety SIL 2.

Flexibility and Usability

The extensive I/O set with various configuration options makes the HY-TTC 500 controllers suitable for a wide range of high-end applications: For example, a group of 8 I/O pins can be individually configured for use as PVG output, voltage output, digital output or analog input.

Commissioning time can be improved by using Ethernet for download and debugging purposes.

Safety

A high percentage of the run-time tests that are needed to achieve the diagnostic coverage required for SIL 2 / PL d is performed in hardware by the dual-core lockstep CPU and its safety companion.

This keeps much more processing power available for the application in comparison with solutions that implement the safety measures in software.

The available memory protection mechanisms allow to execute safety and non-safety software on the same ECU without interference. The time-consuming validation of non-safety software is therefore no longer necessary. Via CODESYS® safe data communication is achieved by the standardized CANopen® Safety protocol of the control units. In case of a safety-relevant failure, outputs can be shut-off in (up to 3) groups allowing limp-home functionality.

The safety certified CODESYS® Safety SIL 2 with its validated compiler and code generator speeds up application development significantly.

Application Fields

- Large construction / material handling machines
- Large municipal vehicles
- Large agricultural machines

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Connectivity

While in smaller machines a single HY-TTC 500 controller can take over the control of the whole vehicle, in more demanding applications several ECUs will be necessary. For these machines the ideal master ECU not only supports multiple CAN interfaces, but also connectivity for all other commonly used communication technologies: Therefore the HY-TTC 580 is equipped with 7 CAN channels, Ethernet, RS232 and LIN.

Robustness and Performance

The freely programmable high-end control units with a powerful dual-core ARM Cortex®-R4 lockstep processor are protected by a compact, automotive-style housing suited for harsh environments.

Variant Overview

<table>
<tr><th></th><th>HY-TTC 580</th><th>HY-TTC 540</th><th>HY-TTC 510</th></tr>
<tr><td rowspan="5">CPU core</td><td colspan="3">32 bit TI TMS570, ARM cortex-R4F based,
dual-core lockstep CPU and memory protection for safety-relevant applications, 180 MHz</td></tr>
<tr><td colspan="3">3 MB int. flash, 256 kB int. RAM, 2 MB ext. RAM</td></tr>
<tr><td>8 MB ext. flash</td><td colspan="2"></td></tr>
<tr><td colspan="3">64 kB ext. EEPROM</td></tr>
<tr><td colspan="3">Safety Companion</td></tr>
<tr><td rowspan="4">Interfaces</td><td>7 x CAN, up to 1 Mbit/s</td><td>4 x CAN, up to 1 Mbit/s</td><td>3 x CAN, up to 1 Mbit/s</td></tr>
<tr><td>1 x Ethernet, up to 10 Mbit/s for download and debugging</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>1 x RS-232</td></tr>
<tr><td>1 x LIN serial interface</td></tr>
<tr><td>Number I/Os</td><td>36 inputs / 60 outputs (36 x PWM)</td><td>52 inputs / 44 outputs (28 x PWM)</td><td>44 inputs / 40 outputs (16 x PWM)</td></tr>
<tr><td rowspan="2">Sensor Supply</td><td colspan="3">1 x sensor supply 5 - 10 V / max. 2.5 W / configurable by SW in 1 V steps</td></tr>
<tr><td colspan="3">2 x sensor supplies 5 V / max. 500 mA</td></tr>
<tr><td>RTC</td><td>1 x RTC</td><td colspan="2"></td></tr>
<tr><td>Internal</td><td colspan="3">Internal monitoring of board temperature, sensor supply and supply voltage Power-On via K15 or Wakeup-Pin</td></tr>
<tr><td rowspan="2">Software</td><td colspan="3">C-Programming / CODESYS® Safety SIL 2 / CODESYS®</td></tr>
<tr><td colspan="3">CODESYS® V3 including support for CANopen® Master</td></tr>
<tr><td>Functional Safety</td><td colspan="3">IEC 61508 SIL 2 / EN ISO 13849 PL d</td></tr>
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TTControl Italy, Brixen
Phone: +39 0472 26 80-11

TTControl Austria, Vienna
Phone: +43 1 585 34 34-0

products@ttcontrol.com www.ttcontrol.com