HYDAC INTERNATIONAL

5 Accessories

The right accessories are needed to turn control devices, visualization solutions and expansion modules into customized complete solutions.

Whether it is the wiring and connectors, the mounting accessories for installing devices, or the relevant proven operating elements that you need – the wide range of products from HYDAC always offers the right solution for every application.

The range of accessories from HYDAC also includes starter packages, termination boards, as well as test rigs and presentation boards for training and development purposes.

5.1 Cable Harnesses, Cabling and Connection Technology

- Cable Harnesses for Controllers
- Cable Harnesses for Displays
- Connection Blocks
- Installation Accessories

5.2 Accessories for Training, Development, Testing and Servicing

- Starter Kits for CODESYS®
- Starter Kits for C Programming
- JTAG Adapters
- Break-Out Box (BOB)
- Controller Test Rigs
- Manual Controller Test Rig (MTB)
- Remote Controlled Controller Test Rig (RTB)
- Accessories for MTB/RTB

5.3 Sensors
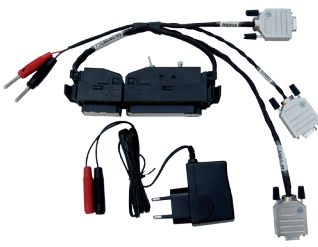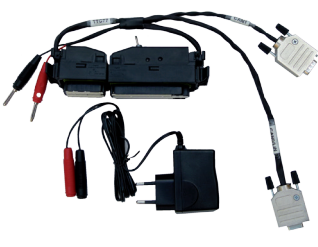
- Sensors for Applications with increased functional Safety / Diagnostics
- Electronic Pressure Transmitters
- Electronic Pressure Switches
- Electronic Temperature Transmitters
- Electronic Temperature Switches
- Sensors for Distance and Position
- Level Sensors
- Flow Rate Transmitters / Flow Switches
- Speed sensors
- Sensors for potentially explosive Atmospheres
- Condition Monitoring Products
- Service Unit
- Monitoring and display Units

5.4 Operating Elements, Pilot Control Units and Radio Controls

HYDAC INTERNATIONAL
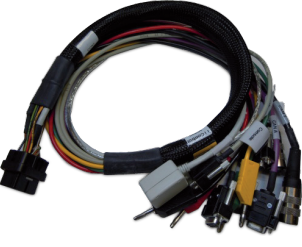
5.1 | Cable Harnesses for Controllers

Type	Part no.
ZBS AK-080-0.8-2s Connection cable 80 cm and 80 Pins (28 + 52 pole, i.e. HY-TTC 50 / 60 / 77 / 90 / 94) with mating connector on both ends HY-TTC 50/ 60/ 77/ 90/ 94	**6127440**
ZBS AK-080-1.5-2s Connection cable 150 cm and 80 Pins (28 + 52 pole, i.e. HY-TTC 50 / 60 / 77 / 90 / 94) with mating connector on both ends	**6127481**
ZBS AK-080-3.0-1s Cable harness for HY-TTC 50 / 60 / 90 / 94 3 m flying lead with mating connector on one end	**6081986**
ZBS AK-080-3.0-1s-TTC77 Cable harness for HY-TTC 77 3 m flying lead with mating connector on one end	**6139188**

HYDAC | INTERNATIONAL
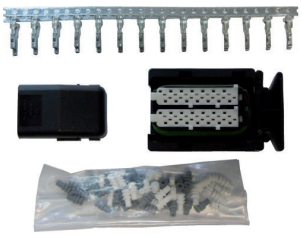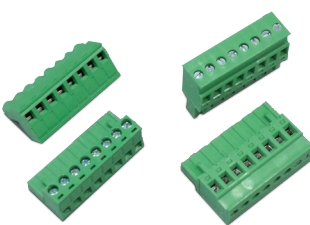
Cable Harnesses for Controllers

Type	Part no.
ZBS AK-060-3.0-1s HY-TTC 200 cable harness 60 pole 3 m flying lead **Note:** For full connection, both **ZBS AK-060-3.0-1s** and **ZBS AK-094-3.0-1s** are required.	**6081989**
ZBS AK-094-3.0-1s HY-TTC 200 cable harness 94 pole 3 m flying lead **Note:** For full connection, both **ZBS AK-060-3.0-1s** and **ZBS AK-094-3.0-1s** are required.	**6081990**
ZBS AK-048-3.0-1s HY-TTC 30X cable harness 48 pole 3 m flying lead	**on request**
ZBS AKP-080-0.5-2s Programming cable (CAN) for the 16-Bit controllers HY-TTC 50 / 60 / 90 / 94 including power supply for direct "stand alone" operation. Features such as indicator lamps for U-BAT and K15 as well as a switch for K15 and a button to reset the controller provide additional functionality. A useful accessory for commissioning and service.	**on request**
ZBS AKP-080-0.5-2s-TTC77 Programming cable (CAN) for the controller HY-TTC 77 including power supply for direct "stand alone" operation. Features such as indicator lamps for U-BAT and K15 as well as a switch for K15 provide additional functionality. A useful accessory for commissioning and service.	**on request**

HYDAC INTERNATIONAL

Cable Harnesses for Displays

Type	Part no.
ZBS AKV-015-1.0-2s HY-eVision^2 10.4 Cable harness for power supply with USB	**6137851**
ZBS AKV-034-1.0-2s HY-eVision^2 7.0 Cable harness for power supply with USB and camera connection	**6137854**
ZBS AKP-030-1.0-2s HY-eVision^2 10.4 Programming cable harness	**922240**
ZBS AKP-034-1.0-2s HY-eVision^2 7.0 Programming cable harness	**922277**
ZBS AK-034-3.0-1s HY-eVision^2 7.0 Cable harness 34 pole 3 m flying lead	**6127483**

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Connection Blocks

Type	Part no.
ZBS AS-028 HY-TTC 50 family, connection kit 28 pole **Note:** The complete order includes: **ZBS AS-028** and **ZBS AS-052**	**6082667**
ZBS AS-052 HY-TTC 50 family, connection kit 52 pole **Note:** The complete order includes: **ZBS AS-028** and **ZBS AS-052**	**6082668**
ZBS AS-060 HY-TTC 200 and HY-Vision connection kit 60 pole **Note:** The complete order includes: **ZBS AS-060** and **ZBS AS-094**	**6091033**
ZBS AS-094 HY-TTC 200 and HY-Vision connection kit 94 pole **Note:** The complete order includes: **ZBS AS-060** and **ZBS AS-094**	**6091034**
ZBS AS-034 HY-eVision^2 7.0 connection kit Pins are supplied	**6114948**
ZBS MTB-AS-032 ECU connection block Plug terminal for a useable row ZBS MTB-RACK and ZBS RTB-RACK to connect a controller	**on request**

HYDAC INTERNATIONAL

Installation Accessories
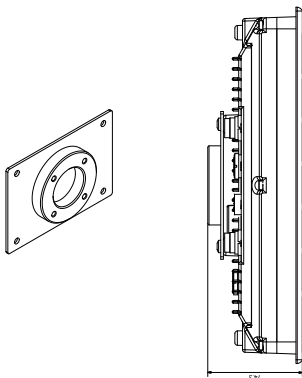
Type	Part no.
ZBS RM-10.4 RAM-Mount; mounting bracket for HY-eVision^2 10.4	**6137801**
ZBS RM-07.0 RAM-Mount; mounting bracket for HY-eVision^2 7.0	**6137777**
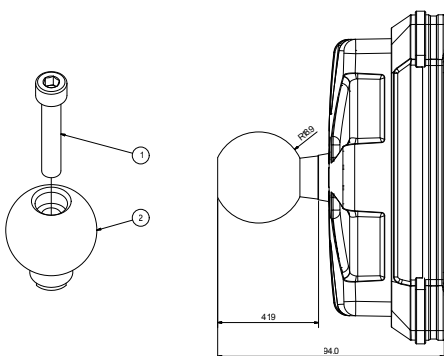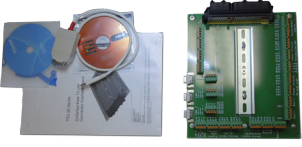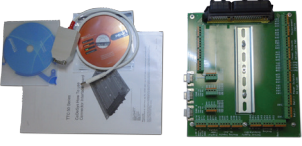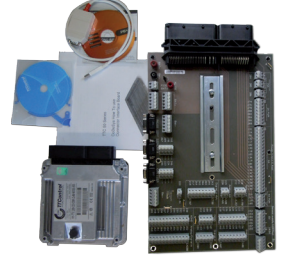
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HYDAC INTERNATIONAL

5.2 | Accessories
for Training, Development,
Testing and Servicing
Starter Kits for CODESYS®

Type	Part no.
HY-TTC 60 CODESYS® Starter kit	**922197**
HY-TTC 90 CODESYS® Starter kit	**922169**
HY-TTC 94 CODESYS® Starter kit	**923617**
HY-TTC 200 CODESYS® Starter kit	**921138**

HYDAC INTERNATIONAL

Starter Kits
for C programming

Type	Part no.
HY-TTC 60 C Starter kit	**on request**
HY-TTC 90 C Starter kit	**on request**
HY-TTC 94 C Starter kit	**on request**
HY-TTC 200 C Starter kit	**on request**

HYDAC INTERNATIONAL

JTAG Adapters

Type	Part no.
ZBS JTAG-01 TTC50FAM JTAG Adapter Board For HY-TTC 50 / 60 / 90 / 94 / 77	**on request**
ZBS JTAG-02 JTAG Adapter Board For HY-TTC 200	**on request**
ZBS JTAG-03 JTAG Adapter For HY-TTC 30x	**on request**

5

HYDAC INTERNATIONAL

Break-Out Box (BOB)

To simplify the commissioning process or to speed up field diagnostics on the machine, we can offer various break-out boxes which are compatible with our controllers. These boxes can be connected to the existing cable using the integrated, (approximately 0.8 mm long), connecting cable.
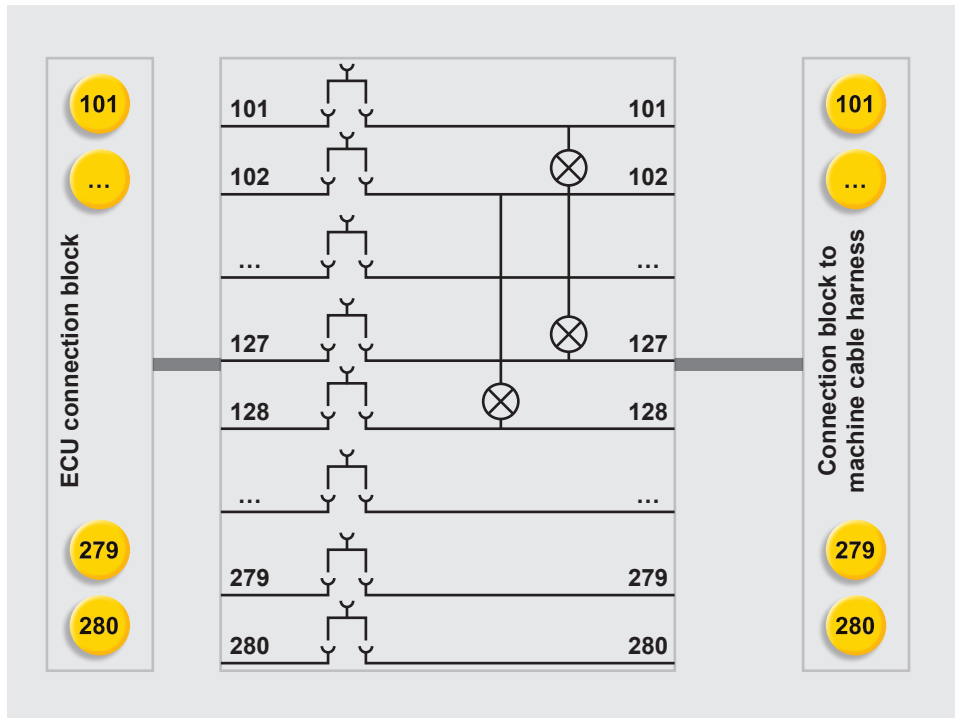
Using the 2 mm bridging connector with test points, the actual signal levels for each pin on the controller can be accessed. Additionally, by removing the bridging connector, external signals can be connected to the wiring harness.

HYDAC INTERNATIONAL

Break-Out Box (BOB)

Type	Part no.
ZBS BOB-K-080 Break-out box in carry case for HY-TTC 50 / 60 / 90 / 94 / 36X / 48X / 48XS	**on request**
ZBS BOB-K-048 Break-out box in carry case for HY-TTC 30X family	**on request**
ZBS BOB-TESTKIT-00-000 Test cables to supplement the break-out boxes, consisting of cables and jumper plugs in 2mm and 4mm technology.	**on request**

5

HYDAC INTERNATIONAL

Controller Test Rigs

To match the development of controller test rigs, HYDAC ELECTRONIC has expanded the testing and servicing capabilities of the HY-TTC family. Fast and reliable test procedures are a key factor when developing functional safety control software.

Crucially, the HYDAC controller test rig offers significant reductions in total development time. HYDAC's controller test rig is capable of simulating virtually any input condition or output state, which enables the simulation of the machine behavior.
The time saving is considerable because program errors are detected and eliminated prior to commissioning. On-site commissioning is therefore greatly reduced and confined to fine-tuning.

Configuration

The configuration of all controller test rigs can be customized. The connection is made via an universal connector. Each pin of the connector is firmly assigned to a module channel.
A wide range of plugable I/O modules is available allowing the test rig to emulate the individual client's target system.

Our input modules provide all standard sensor signals: voltage, current and frequency. Using the output modules, a resistive load can be applied to the channels of a controller. Configuration is carried out either manually via a selector switch or remotely via control software.

To simplify the ordering process, in the datasheets you will find an overview table which shows the choice of components suitable for the particular controller.

Automatic function

For fast, reliable, complete and repeatable test series, an automatic version of our controller test rigs is available. This equipment can be configured and controlled externally via PC based software. Moreover it is possible to evaluate, via the existing connection, the voltage and current measurements present in the modules. This allows fully automatic test runs to be created.

HYDAC INTERNATIONAL

Manual Controller
Test Rig Chassis (19" Rack)
ZBS MTB-RACK-43-VKG-A0-00-000
ZBS MTB-RACK-63-VKG-A0-00-000

Special features

- Can be used for all HY-TTC controllers
- All essential controller functions accessible
- Configuration can be altered simply using switches
- Cascadable
- Compact design in stable housing
- Max. 60 A / 960 W
- Suitable for 24 V and 12 V systems

Description

The MTB is a powerful tool for manual testing and verifying of ECU software during development. The test rig is modular in design and can therefore be adapted to the individual requirements of the application. Over 3 or 5 rows, the stable 19" rack provides the installation space for 15 or 27 modules in total. Three special modules for power supply, communications and internal sensor power supply are already installed in fixed module positions in the rack. These modules provide the battery supply, the communication interfaces (CAN, RS232, LIN), plus a sensor power supply.
The optional labeling set can be used to label the fully populated MTB, front and back, to suit all our controllers.

On the back, input terminals are available for battery voltage with max. 60A.
The ECU can also be installed directly here. To connect the ECU to the MTB there are plug-in connection terminals on the back. Each of these plug-in terminals is allocated to a fixed slot on the front which guarantees unambiguous assignment to the connected ECU pin.

Through the use of pluggable I/O modules, all essential ECU functions can be tested. This means that each of the I/O modules provides the drive for four controller pins. Configuration switches are used to drive the input and outputs individually.
In addition, the connection between controller pin and module channel can be broken via the break-out connection block. When disconnected, external signals or actuator can also be directly connected to a controller pin.

Technical data

Ambient conditions	
Power supply	230 V AC ±10%
Power consumption	max. 250 VA
Supply U_{BAT}	max. 60 A
Power dissipation	max. 960 W
Dimensions and weight	
Dimensions	450 x 550 x 280 mm
Weight	approx. 17 kg

Model code

ZBS MTB-RACK – 43 – VKG – AO – 00 – 000

4 = 4 rows in total (3 useable rows)
3 = Euro card height 3HE
V = Supply module, installed
K = Communication module
    CAN, RS232, LIN, installed
S = Supply pins module, installed

Device address
AO = 0, (0, 1, 2, 3)

Equipment option
00 = standard

Modification number
000 = standard

ZBS MTB-RACK – 63 – VKG – AO – 00 – 000

6 = 6 rows in total (5 useable rows)
3 = Euro card height 3HE
V = Supply module, installed
K = Communication module
    CAN, RS232, LIN, installed
S = Supply pins module, installed

Device address
AO = 0, (0, 1, 2, 3)

Equipment option
00 = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label
or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

5

Module configuration

ZBS MTB-RACK-43-VKG-A0-00-000

	0	1	2	3	4	5
2	Input or switch	Input or switch	Input or switch	Input or switch	Input or switch	Input, switch or CAN
	200 201 202 203	210 211 212 213	220 221 222 223	230 231 232 233	240 241 242 243	250 251 252 253
1	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	2x CAN 1x RS232 1x LIN
	100 101 102 103	110 111 112 113	120 121 122 123	130 131 132 133	140 141 142 143	150 151 152 153
0	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	Fuse Power-out	supply-pins
	000 001 002 003	010 011 012 013	020 021 022 023	030 031 032 033	040 041 042 043	050 051 052 053

ZBS MTB-RACK-63-VKG-A0-00-000

	0	1	2	3	4	5
7	Input or switch	Input or switch	Input or switch	Input or switch	Input or switch	Input, switch or CAN
	700 701 702 703	710 711 712 714	720 721 722 723	730 731 732 733	740 741 742 743	750 751 752 753
6	Input or switch	Input or switch	Input or switch	Input or switch	Input or switch	Input, switch or CAN
	600 601 602 603	610 611 612 613	620 621 622 623	630 631 632 633	640 641 642 643	650 651 652 653
5	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or CAN
	500 501 502 503	510 511 512 513	520 521 522 523	530 531 532 533	540 541 542 543	550 551 552 553
4	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	2x CAN 1x RS232 1x LIN
	400 401 402 403	410 411 412 413	420 421 422 423	430 431 432 433	440 441 442 443	450 451 452 453
3	Input, switch or output	Input, switch or output	Input, switch or output	Input, switch or output	Fuse Power-out	supply-pins
	300 301 302 303	310 311 312 313	320 321 322 323	330 331 332 333	340 341 342 343	350 351 352 353

Block circuit diagram

ZBS MTB-RACK-43-VKG-A0-00-000

ZBS MTB-RACK-63-VKG-A0-00-000

One CAN channel illustrated
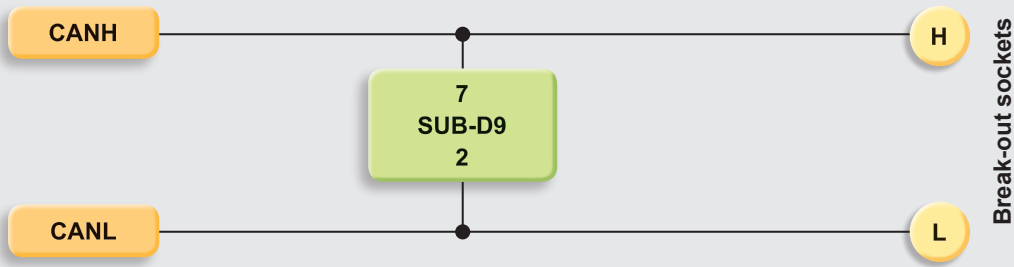
One power supply channel illustrated
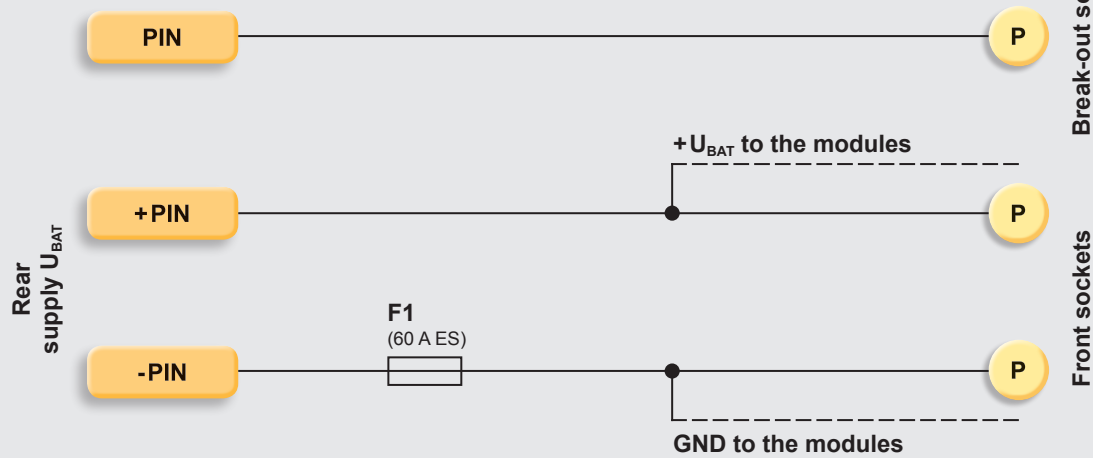
Overview

Controller	Rack 4.3	Rack 6.3	MTB IN	MTB INSW	MTB OUT	Blind covers	ZBS AK-080	ZBS AK-060 ZBS AK-094	ZBS AK-048
HYTTC 50	1x		4x	2x	6x	3x	1x		
HY-TTC 60	1x		6x	2x	6x	1x	1x		
HY-TTC 90/94	1x		6x	2x	6x	1x	1x		
HY-TTC 77		1x	8x	2x	7x	8x	1x		
HY-TTC 200		1x	7x	2x	9x	7x		1x	
HY-TTC 30X-H	1x		4x		4x	7x			1x
HY-TTC 30X-I	1x		7x		1x	7x			1x
HY-TTC 30X-O	1x		4x		4x	7x			1x
HY-TTC 36X	1x		5x	2x	3x	5x	1x		
HY-TTC 48X/48XS	1x		6x	2x	4x	3x	1x		

Note

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC | INTERNATIONAL

Universal Input Module
for Manual Controller Test Rig
ZBS MTB-IN-00-000

Special features

- Up to 4 controller pins on one module
- Digital signals, high and low-side
- Frequency signals
- Voltage signals
- Current signals
- External signal supply possible

Description

The Universal Input Module allows a signal to be applied to the input of an ECU. Almost any output signals from a sensor can be simulated with this module. By using a multi-stage selector switch, the type of signal can be selected. A proportional control provides adjustment of the required signal value.

Possible signal types are digital switching states, frequency, voltage and current signals. The module can be used to drive both digital and analog inputs.

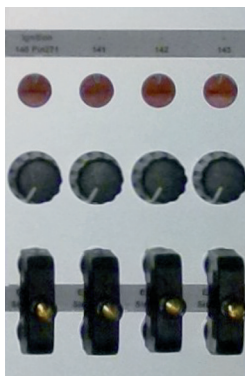The real-time signal level can be measured at the break-out plug. This jumper plug connects the pin of the controller with the electronics of the module. When disconnected, external sensors can also be directly connected to the controller.

Technical data

Functions	
Functions	0: Switch low-side active (switching to GND)
	1: Switch high-side active (switching to +U_{BAT})
	2: Rpm 1 Hz – 6.5 kHz low-side active
	3: Rpm 1 Hz – 6.5 kHz high-side active
	4: Current source 0..25 mA
	5: Voltage 0 .. 5 V
	6: Voltage 0 .. 16 V
	7: Voltage 0 .. 32 V (only for 24 V operation)
	8: Dual voltage 0..5 V, slave-slot inverted
	9: Dual voltage 0.5 .. 4.5 V, slave-slot inverted
	10: Dual voltage 0.5 .. 4.5 V master, slave-slot 0.5 .. 2.5 V (following)
	11: dual curren 0 .. 25 mA, slave-slot inverted
	12: Dual rpm +/-1 Hz .. 2.0 kHz low-side active, slave signal with 90 °, phase shift (direction dependent)
	13: Dual rpm +/-1 Hz .. 2.0 kHz high-side active, slave signal with 90 °, phase shift (direction dependent)
	14: Dual switch master = HS, slave = HS inverted (switching to +U_{Bat})
	15: Dual switch master = LS, slave = LS inverted (switching to GND)

Dimensions	
Dimensions	71 x 129 x 210 mm
Weight	285 g

5

Block circuit diagram

ZBS MTB-IN-00-000

Model code

ZBS MTB – IN – <u>00</u> – <u>000</u>

Equipment option
00 = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC | INTERNATIONAL

Switch Input Module
for Manual Controller Test Rig
ZBS MTB-INSW-00-000

Special features

- Up to 4 controller pins on one module
- High and low-side switches
- External signal supply possible

Description

The Switch Input Module allows a digital signal to be applied to the input of an ECU. By using a multi-stage selector switch, the type of signal (high-side or low-side) can be selected. The connection to the pre-selected signal is via a switch.

In contrast to the MTB-IN-00-000 input module, this input module can be used to drive purely digital inputs.

The real-time signal level can be measured at the break-out plug. This jumper plug connects the pin of the controller with the electronics of the module. When this plug is disconnected, external sensors can also be directly connected to the controller.
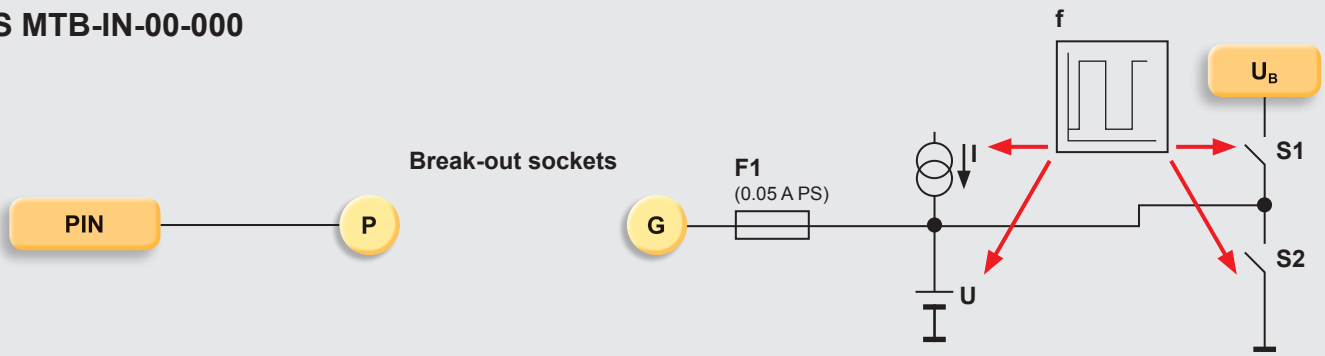
Technical data

Functions	
Functions	0: switch low-side active (switching to GND)
	1: switch high-side active (switching to $+U_{BAT}$)
Dimensions	
Dimensions	71 x 129 x 210 mm
Weight	250 g

Block circuit diagram

ZBS MTB-INSW-00-000
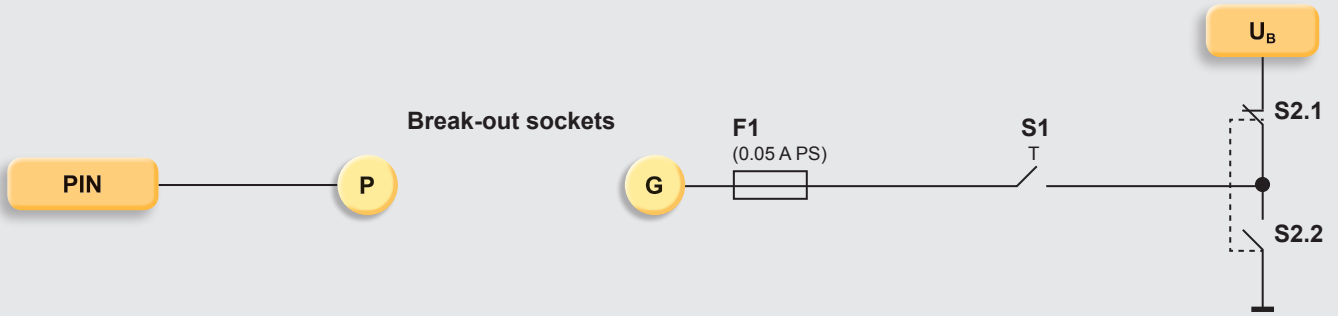
Model code

ZBS MTB – INSW – 00 – 000

Equipment option
00   = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC | INTERNATIONAL

Universal Output Module
for Manual Controller Test Rig
ZBS MTB-OUT-00-000

Special features

- 4 controller pins on one module
- Resistive load can be applied; High and low-side
- Status monitoring with LED
- Short circuit switched to U_{Bat} or GND for maximum current limiting function
- External actuator connection possible

Description

The Universal Output Module provides a means of applying a purely resistive or complex real load, or alternatively a fault signal, to the output of a controller. The battery voltage (U_{Bat}) and the ground signal (GND) sockets are available for this. Both signals are protected with an electronic fuse element.

The real-time output condition is indicated via an LED.

The real-time signal level can be measured at the break-out plug. This jumper plug connects the pin of the controller with the electronics of the module. When disconnected, external actuator can also be directly connected to the controller.

Technical data

Functions	
Functions	1: Low side load (resistance 30 Ω to GND): jumper plug between R and GND 2: High-side load (resistance 30 Ω to $+U_{BAT}$): jumper plug between R and $+U_{BAT}$
Resistive load	30 Ω
Electronic fuse element 5A for U_{Bat} and GND	
LED for status monitoring; ON for U_{out} > 9V	
Dimensions	
Dimensions	71 x 129 x 210 mm
Weight	225 g

5

Block circuit diagram for a slot (PIN)

ZBS MTB-OUT-00-000

F1 (5 A PS) **U**_B

+

Bridge for LS output

Break-out sockets **G**

Bridge for HS output **F2** (5 A PS)

PIN **P**

-

R_L **30 Ohm**
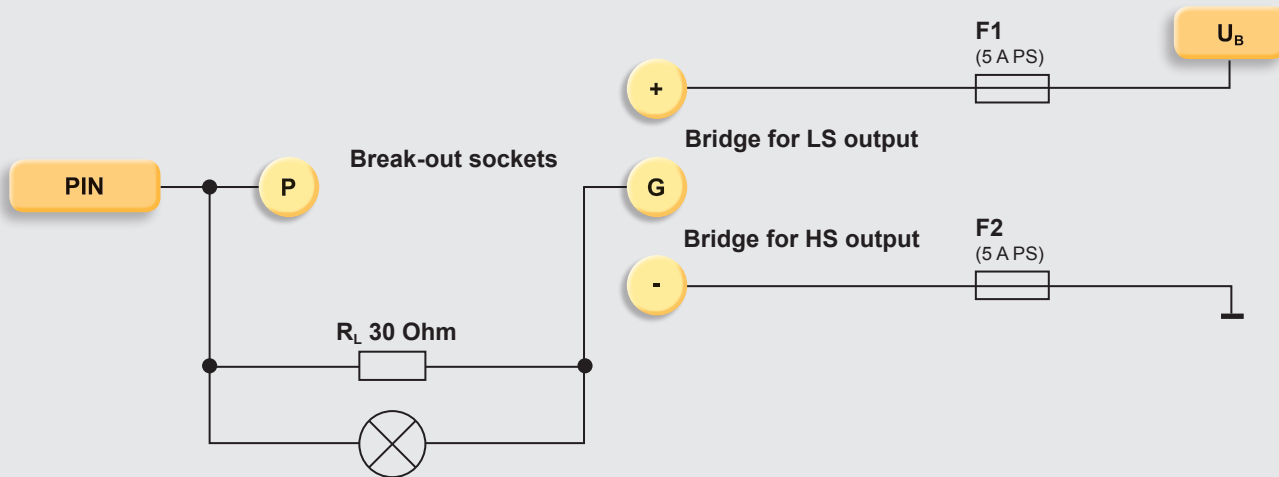
Model code

ZBS MTB – OUT – <u>00</u> – <u>000</u>

Equipment option
00 = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC TECHNOLOGY CORPORATION ELECTRONIC DIVISION

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Bethlehem, PA 18017
Tel. (610) 266-0100
E-Mail: electronics@hydacusa.com
Internet: www.hydacusa.com

HYDAC INTERNATIONAL

Remote Controlled Controller Test Rig Chassis (19" Rack)
ZBS RTB-RACK-43-VGKS-A0-00-000
ZBS RTB-RACK-63-VGKS-A0-00-000

Special features

- Can be used for all HY-TTC controllers
- All essential controller functions accessible
- The configuration can be changed directly or remotely
- Can be completely remotely controlled via CAN
- Error mode test via CAN
- Values shown in display
- 15 device-configurations can be saved
- Cascadable
- Compact design in stable housing
- Max. 60 A / 960 W
- Suitable for 24 V and 12 V systems

Description

The RTB is an intelligent, powerful tool for testing and verifying controller software during development. The test rig is modular in design and can therefore be adapted to the individual requirements of the application. The RTB is cascadable via addressing.

Over 3 or 5 rows, the stable 19" rack provides the installation space for 14 or 26 modules in total. Four modules for power supply, communications and internal power supply are already installed in fixed module positions in the rack. These modules provide the battery supply, reference points (GND) for analog and digital signals, the communication interfaces (CAN, RS232, LIN), plus a sensor power supply. The optional labeling set can be used to label the fully populated RTB on the back, to suit all our controllers.

On the back, input terminals are available for battery voltage with max. 60 A. The ECU can also be installed directly here. To connect the ECU to the RTB there are plug-in connection terminals on the rear. Each of these plug-in terminals is allocated to a fixed slot on the front which guarantees unambiguous assignment to the connected ECU pin.

Through the use of pluggable I/O modules, all essential controller functions can be tested. This means that each of the I/O modules provides the drive for four controller pins. In addition, the connection between controller pin and module channel can be broken via the break-out connection block. When disconnected, external actuators or sensors can also be directly connected to a controller pin. Configuration switches are used to drive the input and outputs individually.

Automatic function

The test rig can be configured and remotely controlled via the CAN interface located on the back. The software required for this is not included and must be ordered separately from HYDAC ELECTRONICS. However, all functions can also be activated directly on the test rig. The communication module can store up to 15 configurations directly on the test rig. Once stored, a configuration can be re-activated at any time to adapt the test rig quickly and simply to the project to be processed.

Technical data

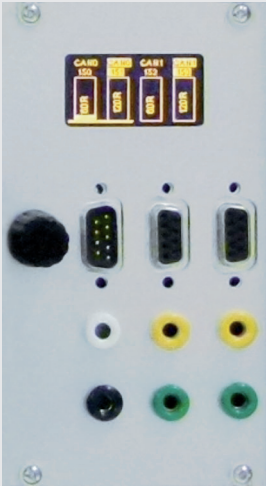| Ambient conditions	
Power supply	230 V AC ±10 %
Power consumption	max. 250 VA
Supply U_{BAT}	max. 60 A
Power dissipation	max. 960 W
Dimensions and weight	
Dimensions	450 x 550 x 280 mm
Weight	approx. 17 kg

Communication module, permanently installed in RACK

The data interfaces of the connected controller can be tested using the communications module. Specifically using the CAN interface, it is possible to enable termination resistors and to switch short circuits to other states.

In addition to the communications test, this module can be used to upload a saved configuration, or to start the device self-test.

Sensor supply simulation module, permanently installed in the RACK

The sensor supply simulation module allows the sensor power supply supplied by the ECU to be tested. It is thus possible to measure the real-time voltage as well as the current. In addition different error signals can be switched.

Block circuit diagram

ZBS RTB-RACK-43-VGKS-A0-00-000
ZBS RTB-RACK-63-VGKS-A0-00-000

Communication module, permanently installed in RACK

One CAN channel illustrated

Rail 1

F1 (0.75 A PS) F2 (0.75 A PS)

S5 S6 S1

CANH

7 SUB-D9 2

Break-out sockets

H

S2 S3 S4

120R 120R

CANL

L

S7 S8

F3 (0.75 A PS) F4 (0.75 A PS)

Rail 2
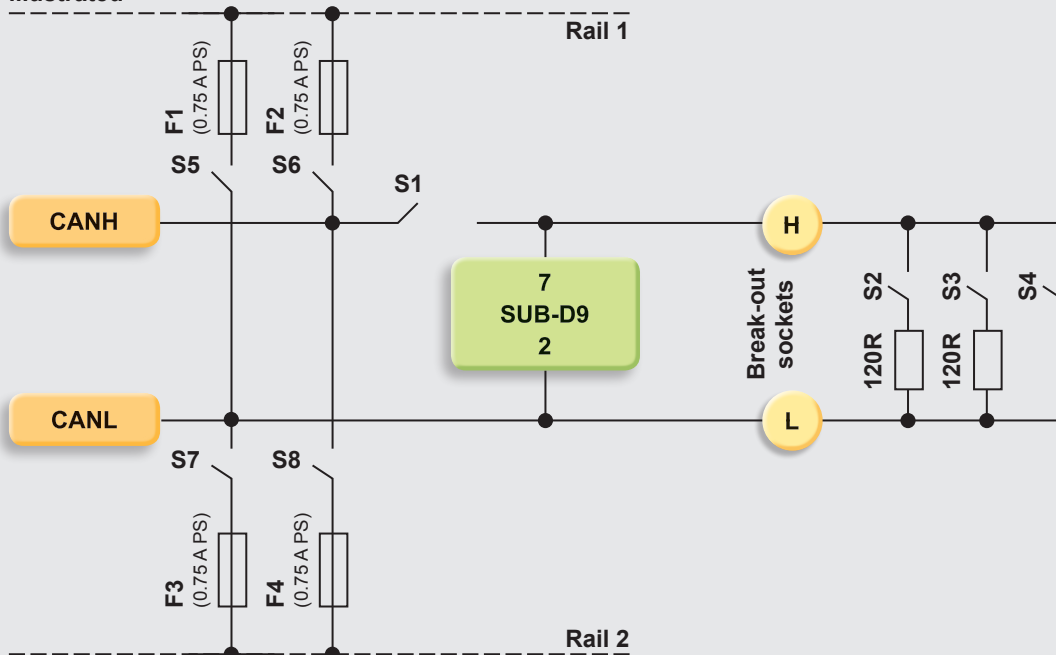
Sensors for Supply Simulation Module

One power supply channel illustrated

Rail 1

F1 (0.75 A PS)

S1

PIN

F2 (0.75 A PS) S2

A P

V

Break-out sockets

G

F4 (0.75 A PS)

A

V V V V

Rx

S3

F3 (0.75 A PS)

Rail 2

Rail 1

U_B U_B

SRH1 SRH2

SRL1 SRL2

F1 (50..60 A ES) S1

+PIN

+U_{BAT} to the modules

P

Rear supply U_{BAT}

-PIN

P

GND to the modules

Front sockets

Rail 2
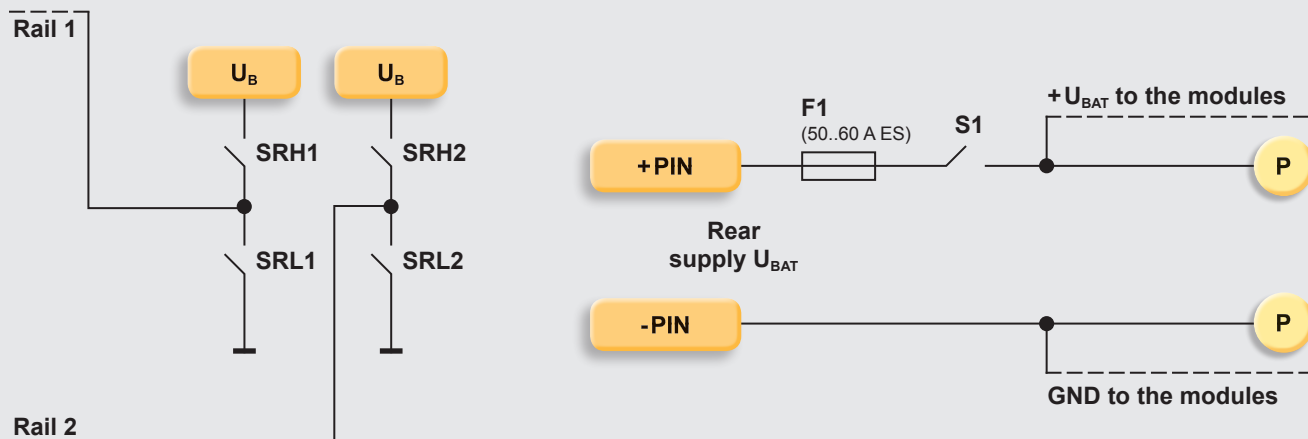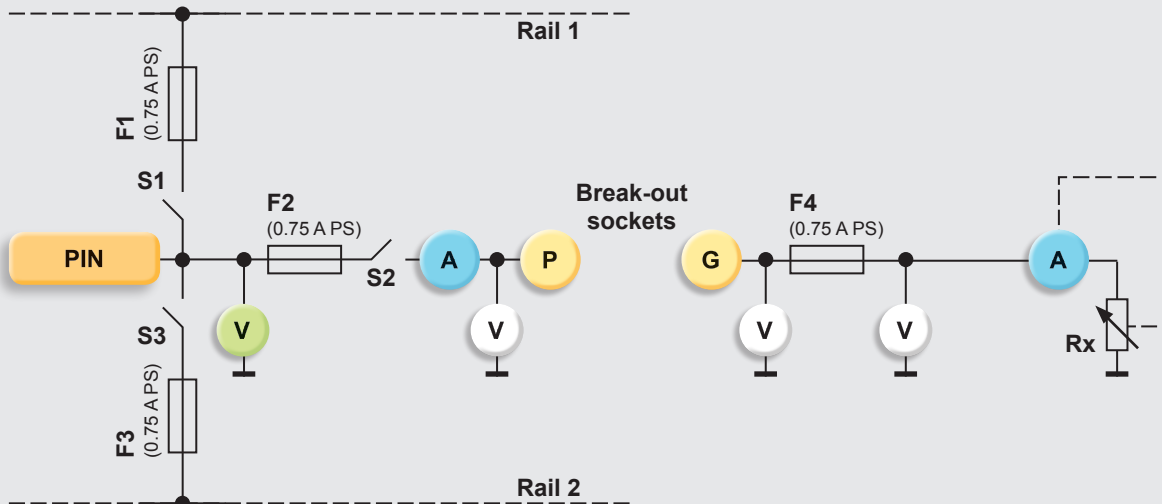
5

Model code

ZBS RTB-RACK – 43 – VGKS – <u>AO</u> – <u>00</u> – <u>000</u>

4 = 4 rows in total (3 useable rows)
3 = Euro card height 3HE

V = Supply module, installed
G = Supply-pins module
K = Communication module
   2x CAN, 1x RS232, 1x LIN, installed
S = Sensors for Supply Simulation Module, installed

Device address
AO = 0

Equipment option
00 = standard

Modification number
000 = standard

ZBS RTB-RACK – 63 – VGKS – <u>AO</u> – <u>00</u> – <u>000</u>

6 = 6 rows in total (5 useable rows)
3 = Euro card height 3HE

V = Supply module, installed
G = Supply-pins module
K = Communication module
   2x CAN, 1x RS232, 1x LIN, installed
S = Sensors for Supply Simulation Module, installed

Device address
AO = 0, (0, 1, 2, 3)

Equipment option
00 = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label
or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

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Module configuration

ZBS RTB-RACK-43-VGKS-A0-00-000

	0	1	2	3	4	5
2	Input or Output	Input or Output	Input or Output	Input or Output	Input or Output	Sensor Supply Simulation
	200 201 202 203	210 211 212 213	220 221 222 223	230 231 232 233	240 241 242 243	250 251 252 253
1	Input or Output	Input or Output	Input or Output	Input or Output	Input or Output	2x CAN 1x RS232 1x LIN
	100 101 102 103	110 111 112 113	120 121 122 123	130 131 132 133	140 141 142 143	150 151 152 153
0	Input or Output	Input or Output	Input or Output	Input or Output	Fuse Power-out	supply-pins
	000 001 002 003	010 011 012 013	020 021 022 023	030 031 032 033	040 041 042 043	050 051 052 053

ZBS RTB-RACK-63-VGKS-A0-00-000

	0	1	2	3	4	5
7	Input or Output	Input or Output	Input or Output	Input or Output	Input or Output	Input or CAN
	700 701 702 703	710 711 712 714	720 721 722 723	730 731 732 733	740 741 742 743	750 751 752 753
6	Input or Output	Input or Output	Input or Output	Input or Output	Input or Output	Input or CAN
	600 601 602 603	610 611 612 613	620 621 622 623	630 631 632 633	640 641 642 643	650 651 652 653
5	Input or Output	Input or Output	Input or Output	Input or Output	Input or Output	Sensor Supply Simulation
	500 501 502 503	510 511 512 513	520 521 522 523	530 531 532 533	540 541 542 543	550 551 552 553
4	Input or Output	Input or Output	Input or Output	Input or Output	Input or Output	2x CAN 1x RS232 1x LIN
	400 401 402 403	410 411 412 413	420 421 422 423	430 431 432 433	440 441 442 443	450 451 452 453
3	Input or Output	Input or Output	Input or Output	Input or Output	Fuse Power-out	supply-pins
	300 301 302 303	310 311 312 313	320 321 322 323	330 331 332 333	340 341 342 343	350 351 352 353

5

Overview

Controller	Rack 4.3	Rack 6.3	MTB IN	MTB OUT	Blind covers	ZBS AK-080	ZBS AK-060 ZBS AK-094	ZBS AK-048
HYTTC 50	1 x		6 x	6 x	2 x	1 x		
HY-TTC 60	1 x		8 x	6 x		1 x		
HY-TTC 90/94	1 x		8 x	6 x		1 x		
HY-TTC 77		1 x	10 x	7 x	9 x	1 x		
HY-TTC 200		1 x	9 x	9 x	8 x		1 x	
HY-TTC 30X-H	1 x		4 x	4 x	6 x			1 x
HY-TTC 30X-I	1 x		7 x	1 x	6 x			1 x
HY-TTC 30X-O	1 x		4 x	4 x	6 x			1 x
HY-TTC 36X	1 x		7 x	3 x	4 x	1 x		
HY-TTC 48X/48XS	1 x		8 x	4 x	2 x	1 x		

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC | INTERNATIONAL

Universal
Input Module for RTB
ZBS RTB-IN-00-000

Special features

- Up to 4 controller pins on one module
- Digital signals, high and low-side
- Frequency signals
- Voltage signals
- Current signals
- External signal supply possible
- 2 alternative functions can be configured

Description

The Universal Input Module allows a signal to be applied to the input of a ECU. Almost any output signals from a sensor can be simulated with this module via a selection menu. The type of signal can be selected from the selection menu. An incremental control provides adjustment of the required signal value.

Possible signal types are digital switching states, frequency, voltage and current signals. The module can be used to drive both digital and analog inputs. To test signals with increased requirements of functional safety, two channels can also be configured as "master-slave". For this type of operation, various antivalent signal types are available.

The real-time signal level can be measured at the break-out plugs. This jumper plug connects the pin of the controller with the electronics of the module. When this plug is disconnected, external sensors can also be directly connected to the controller.

When disconnected, external signals or actuators can also be directly connected to a controller pin.

Technical data

Functions	
Voltage source	0 .. 36.0 V
Current source	0 .. 25.5 mA
Resistance	38 .. 50 kΩ
High-side switch to $+U_B$	
Low-side switch to GND	
High-side rpm[1]	1 .. 24,000 min^{-1}
Low-side rpm[1]	1 .. 24,000 min^{-1}
High-side-PWM[1]	0.1 .. 99.9 % at 1 .. 24,000 Hz
Low-side-PWM[1]	0.1 .. 99.9 % at 1 .. 24,000 Hz
Bosch-ABS sensor	1 .. 550 Hz
Short circuit to Rail1 or Rail2	
Wirebreak	
"Master-slave" mode	Dual Switch Master = HS, Slave = HS following
	Dual Switch Master = HS, Slave = HS inverted
	Dual Switch Master = LS, Slave = LS following
	Dual Switch Master = LS, Slave = LS inverted
	Dual Switch Master = HS, Slave = LS following
	Dual Switch Master = HS, Slave = LS inverted
	Dual Switch Master = LS, Slave = HS following
	Dual Switch Master = LS, Slave = HS inverted
	Dual Voltage Slave-Slot following (factor = 0.5)
	Dual Voltage Slave-Slot inverted
	Dual Current Slave-Slot following (factor = 0.5)
	Dual Current Slave-Slot inverted
	Incremental encoder HS 1 .. 24,000 min^{-1}
	Incremental encoder LS 1 .. 24,000 min^{-1}
	Incremental encoder Voltage 1 .. 4,000 Hz
Dimensions and weight	
Dimensions	71 x 129 x 210 mm
Weight	315 g

[1] When controlled remotely, alternative frequencies between 0.1..2,400 Hz are also possible.

Block circuit diagram

ZBS RTB-IN-00-000

Model code

ZBS RTB – IN – 00 – 000

Equipment option
00   = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

5

HYDAC INTERNATIONAL

Universal
Output Module for RTB
ZBS RTB-OUT-00-000

Special features

- 4 controller pins on one module
- Resistive load can be applied; High and low-side
- Level monitoring via display
- Error signals (short circuit) can be switched to U_{Bat} or GND for maximum current limiting function
- Connection to external actuator possible
- 2 alternative functions can be configured

Description

The Universal Output Module provides a means of applying a purely resistive or complex real load, or alternatively a fault signal, to the output of a controller. Battery voltage (U_{Bat}) and ground signal (GND) or internal potential sockets are available for this. All signals are protected with an electronic fuse element.

The real-time output level is displayed in the display for each channel (slot).

The real-time signal level can be measured at the break-out plugs. This jumper plug connects the pin of the controller with the electronics of the module. When the plug is disconnected, external actuators can also be directly connected to the controller.

Technical data

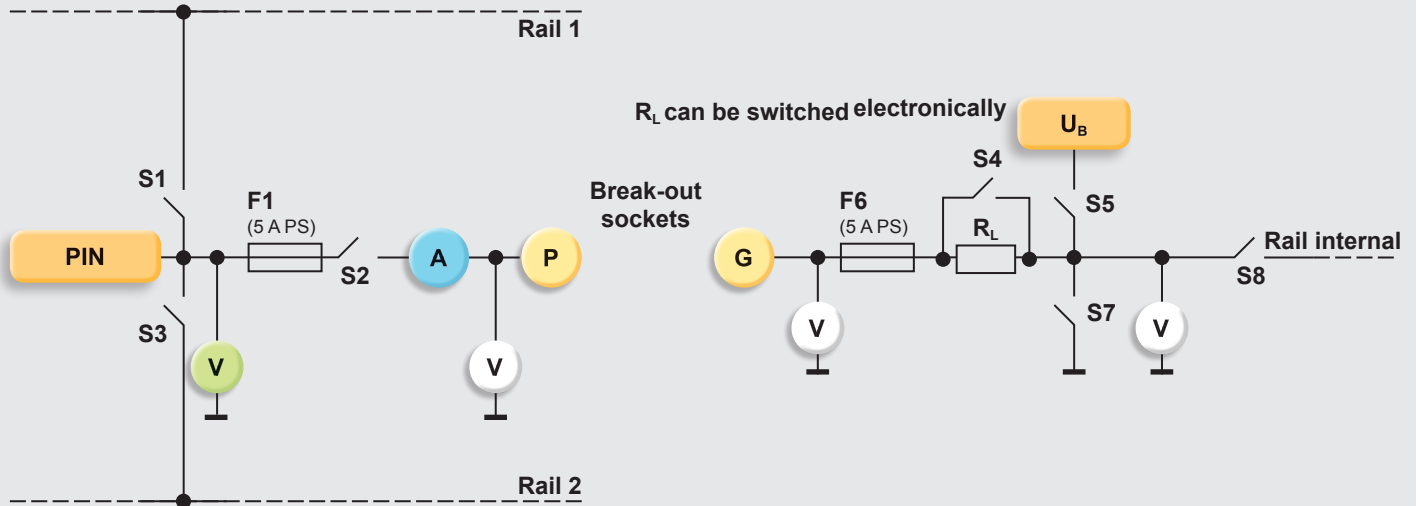| Functions	
HS output with internal 30 Ω-load (24 V system)	
LS output with internal 30 Ω-load (24 V system)	
HS output with internal 7.5 Ω-load (12 V system)	
LS output with internal 7.5 Ω-load (12 V system)	
HS output with ext. load	
LS output with ext. load	
Connection to Rail1 or Rail2 or to internal rail	
Wirebreak	
Dimensions and weight	
Dimensions	71 x 129 x 210 mm
Weight	410 g

5

Block circuit diagram

ZBS RTB-OUT-00-000

Rail 1

R_L can be switched electronically

U_B

S1

F1
(5 A PS)

Break-out
sockets

F6
(5 A PS)

S4

S5

PIN

S2

A

P

G

R_L

Rail internal

S8

S3

V

V

V

S7

V

Rail 2

Model code

ZBS RTB – OUT – 00 – 000

Equipment option
00   = standard

Modification number
000 = standard

Note

On instruments with a different modification number, please read the label
or the technical amendment details supplied with the instrument.

Accessories

Suitable accessories can be found in the Accessories section.

Note

The information in this brochure
relates to the operating conditions
and applications described.

For applications and operating
conditions not described, please contact
the relevant technical department.

Subject to technical modifications.

5

**HYDAC TECHNOLOGY CORPORATION
ELECTRONIC DIVISION**

90 Southland Drive
Bethlehem, PA 18017
Tel. (610) 266-0100
E-Mail: electronics@hydacusa.com
Internet: www.hydacusa.com

HYDAC INTERNATIONAL

Accessories for MTB/RTB

Type	Part no.
ZBS MTB-MBP-314 Blind cover, (3 HE 14 TE 2.5 mm)	**on request**
ZBS MTB-BS-TTCxx xx: 50 / 60 / 77 / 90 / 94 / 200 / 30X-H / 30X-I / 30X-O / 30X-P / 36X / 37X / 48X / 48XS Labeling kit for front and rear **ZBS MTB-BS-BLANK** unmarked (can be labeled)	**on request**

HYDAC INTERNATIONAL

5.3 | Sensors

The range of sensors includes products for measuring pressure, temperature, distance, position, level, flow volume, speed as well as contamination and oil condition. In addition to products for standard applications, the product portfolio also covers special applications such as potentially explosive atmospheres or applications with increased requirements in respect of functional safety.
Almost all these products are developed, manufactured and marketed by HYDAC ELECTRONIC. Suitability for the application is tested on HYDAC test rigs.
As a Tier 1 automotive supplier, HYDAC ELECTRONIC is certified in accordance with the rigorous quality standard ISO/TS 16949 and therefore fulfills the very high requirements regarding product quality, production processes and continuous improvement processes.
Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet from the sensor product catalog.

Sensors for Applications with increased functional Safety / Diagnostics

Functional Safety PL d, Cat 2 SIL 2	HDA 4700	HDA 8700	HLS 100	HLS 200	HLT 1000
Measured variable	Pressure	Pressure	Position	Position	Position / distance
Accuracy (max. error)	0.5	0.5			0.5
Measurement principle	Thin-film strain gauge	Thin-film strain gauge	Hall sensors	IR-light barriers	Magneto-striction
Number of outputs	2	1	1	2	1
Output	Analog	Analog	PWM	P-switch outputs	Analog
CANopen	✓				✓
Available as individual units	✓				✓
OEM product for large volume production		✓	✓	✓	
PL d	✓	✓	✓	✓	✓
Category	3	2	2	2	2
SIL 2		✓	✓		✓
Diagnostics-capable	✓	✓	✓	✓	✓

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Pressure Transmitters

Electronic pressure transmitters	HDA 4800	HDA 4700	HDA 4400	HDA 4300	HDA 4100	HDA 3800	HDA 7400	HDA 8700	HDA 8400	HDA 9000
Accuracy (max. error)	0.25	0.5	1.0	1.0	1.0	0.3	1.0	0.5	1.0	1.0
Low pressure (up to 40 bar)	✓	✓	✓	✓	✓	✓				✓
High pressure (from 40 bar)	✓	✓	✓			✓	✓	✓	✓	✓
Relative pressure	✓	✓	✓	✓		✓	✓	✓	✓	✓
Absolute pressure					✓					
Number of switching outputs	2	2	2	2	2	2	4	2	2	2
Analog output	✓	✓	✓	✓		✓	✓			
Available as individual units	✓	✓	✓	✓	✓	✓	✓			
OEM product for large volume production							✓	✓	✓	✓
Flush membrane		✓	✓	✓			✓			
CANopen Version		✓					✓			
ECE type authorization (approved for road vehicles)								✓	✓	
Approval for potentially explosive atmospheres		✓	✓	✓	✓					
Approvals for shipping		✓	✓	✓	✓					
UL Approval	✓	✓	✓	✓	✓		✓	✓	✓	
Increased functional safety		✓						✓		

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

5

Electronic Pressure Switches

Electronic pressure switches	EDS 3400	EDS 3300	EDS 3100	EDS 300	EDS 8000	EDS 601	EDS 1700	EDS 4400	EDS 4300	EDS 4100	EDS 820	EDS 810	EDS 710	EDS 410
Accuracy (max. error)	1.0	1.0	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Low pressure (up to 40 bar)		✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓
High pressure (from 40 bar)	✓			✓	✓	✓	✓	✓			✓	✓	✓	✓
Relative pressure	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Absolute pressure			✓							✓				
Number of switching outputs	2	2	2	2	2	2	4	2	2	2	2	2	1	2
Analog output	✓	✓	✓	✓		✓	✓							
Digital display	✓	✓	✓	✓	✓	✓	✓							
Programmable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Factory-set (not field-adjustable)								✓	✓	✓		✓	✓	✓
DESINA-compliant	✓	✓	✓											
VDMA Menu Navigation	✓	✓	✓		✓									
Available as individual units	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
OEM product for large volume production								✓	✓	✓		✓	✓	✓
Flush membrane	✓	✓												
IO Link Interface	✓	✓	✓								✓			
ECE type authorization (approved for road vehicles)												✓		
Approval for potentially explosive atmospheres								✓	✓	✓				
Approvals for shipping				✓										
UL Approval	✓	✓	✓		✓							✓		

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Temperature Transmitters

Electronic temperature transmitters	ETS 4100		ETS 4500		ETS 7000	HTT 8000
Accuracy % (max. error)	0.8		2.0		2.0	3.0
Temperature range -25 .. +100 °C	✓		✓		✓	✓
Pressure resistant to 125 bar		✓		✓	✓	✓
Pressure resistant to 600 bar	✓		✓			
Probe length in mm	6	50-350	10.7	50-350	10	16
Analog output	✓		✓		✓	✓
Available as individual units	✓		✓		✓	
OEM product for large volume production						✓
Approval for potentially explosive atmospheres			✓			

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Temperature Switches

Electronic temperature switches	ETS 3200	ETS 3800	ETS 320	ETS 380	ETS 1700	HTS 8000
Accuracy (max. error)	1 °C	1 °C	1 °C	1 °C	1 °C	3 %
Pressure resistant to 600 bar	✓		✓			
Integrated probe	✓		✓			✓
Separate probe		✓		✓	✓	
Number of switching outputs	2	2	2	2	4	2
Analog output	✓	✓	✓	✓	✓	
Digital display	✓	✓	✓	✓	✓	
Programmable	✓	✓	✓	✓	✓	
In-Tank	✓					
Factory-set (not field-adjustable)						✓
VDMA Menu Navigation	✓	✓				
Available as individual units	✓	✓	✓	✓	✓	
OEM product for large volume production						✓
IO Link Interface	✓	✓				
UL Approval	✓	✓				

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Sensors for Distance and Position

Sensors for distance and position	HLT 1000-R2	HLT 2100-R1	HLT 2500-F1	HLT 2500-L2	HLS 528	IES 2010 / 2015 / 2020	IWE 40	HLS 100	HLS 200
Measurement range in mm	50 to 2,500	50 to 4,000	50 to 4,000	50 to 4,000	up to 6,000				
For cylinder installation	✔	✔							
Number of switching outputs						2	2	1 (PWM)	2
Analog output	✔	✔	✔	✔	✔		✔		
CANopen Version	✔	✔	✔	✔					
Device Net		✔	✔	✔					
Profibus		✔	✔	✔					
EtherCAT		✔	✔	✔					
SSI		✔	✔	✔					
Available as individual units	✔	✔	✔	✔	✔				
OEM product for large volume production						✔	✔	✔	✔
Increased functional safety	✔							✔	✔

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Level Sensors

	ENS 3000	HNS 526	HNT 1000	HNS 3000
Measurement principle	capacitive	ultrasound-based	magnetostrictive	magnetostrictive
Measuring range	250 to 730	280 to 6,400	250 to 2,500	250 to 2,500
With temperature probe	✔			✔
Mechanical connection	Screw connection	M30x1	G 3/4	G 3/4
Electrical connection	M12x1	M12x1	M12x1 cable outlet	M12x1
Number of switching outputs	1, 2 + 4	1 + 2		1, 2 + 4
Analog output	✔	✔	✔	✔
CANopen Version			✔	
VDMA Menu Navigation	✔	✔		✔
IO Link Interface	✔			✔
UL Approval	✔			
Target Applications	Industry	Industry	Industry, mobile	Industry, mobile

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Flow Rate Transmitters / Flow Switches

Flow rate transmitters, flow switches	EVS 3110	EVS 3100	HFS 2100	HFS 2500	HFT 2100	HFT 2500
Accuracy (max. error) in %	2	2	10	5	10	3
Measurement principle	Turbine	Turbine	Float principle	Float principle	Float principle	Float principle
Pressure-resistant	✓	✓	✓	✓	✓	✓
Water-based media	✓			✓		✓
Oil / viscous fluids		✓	✓		✓	
Direction of flow optional	✓	✓				
Installation position optional	✓	✓	✓	✓	✓	✓
Max. number of switching contacts			2	2		
Analog output	✓	✓			✓	✓
Display			✓	✓		
ATEX approval			✓	✓		

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Speed Sensors

Speed sensors	HSS 110	HSS 120	HSS 130	HSS 210	HSS 220
Flange	✓	✓	✓		
Screw-in thread				✓	✓
Probe length in mm	18.4	30, 35, 45	16, 32	0 .. 50 can be set	0 .. 48 can be set
Oil / viscous fluids	✓	✓	✓	✓	✓
Salt water	✓	✓	✓		✓
Cleaning agent, salt spray	✓	✓			
Direction of rotation detection	✓	✓	✓	✓	✓
Available as individual units	✓	✓	✓	✓	✓
Outputs	1 NPN 1 PWM analog	2 NPN	2 NPN	2 Push-Pull	2 NPN
Protection class	IP 67 IP 6K9K	IP 67 IP 69K	IP 67 IP 69K	IP 67	IP 68

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

Sensors for potentially explosive Atmospheres

Sensors for potentially explosive atmospheres	HDA 4700	HDA 4400	HDA 4300	HDA 4100	EDS 4400	EDS 4300	EDS 4100	ETS 4500	HFS 2500	HFS 2100
Measured variable	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Temp.	Flow	Flow
Accuracy	0.5	1.0	1.0	1.0	1.0	1.0	1.0	2.0	5, 10	10
Available as individual units	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
OEM product for large volume production					✓	✓	✓			
Flush membrane	✓	✓	✓							
ATEX Intrinsically safe	✓	✓	✓	✓	✓	✓	✓		✓	✓
Flush membrane ATEX-Intrinsically safe	✓	✓	✓							
CSA Intrinsically safe	✓		✓	✓						
IECEx Intrinsically safe	✓	✓	✓	✓						
Flush membrane IECEx Intrinsically safe	✓	✓	✓							
ATEX, IECEx, CSA, flameproof enclosure	✓				✓			✓		
Flush membrane ATEX, IECEx, CSA, flameproof enclosure	✓									

Note: Not all feature combinations are possible. For precise information, please consult the relevant data sheet.

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Condition Monitoring Products

	CMU 1000	CSI B 2	HLB 1300	AS 1000	AS 3000	EY 1356
	Condition Monitoring Unit	**Interface module**				
Measurement channels	**32**					
Measurement inputs	**8 HSI / SMART 8 analog sensors 4 digital signals**					
Outputs	**2 analog signals 4 relays**					
Interface	Ethernet RS 232 USB					
Visualization	**CMWIN**					
Sensor			**Oil condition sensor**	**AquaSensor**	**AquaSensor**	**Contamination switch**
Measured variable			**rel. humidity temperature dielectric constants**	**Saturation level or temperature**	**Saturation level or temperature**	**Particles**
Output			**Analog HSI 2 switch output**	**Analog HSI 2 switch output**	**1 analog 2 switch output I/O Link**	**switching signal**

Service Unit

	HMG 500	HMG 510	HMG 3010	HDA 4748-H	ETS 4148-H	EVS 3108-H
Portable data recorder	✔	✔	✔			
Number of measurement inputs	**2**	**2**	**10**			
Interface		**USB**	**USB RS 232**			
Measurement inputs	**HSI**	**HSI**	**HSI Analog Frequency**			
Connection to CAN-bus			✔			
Visualization		**CMWIN**	**HMGWIN CMWIN**			
Automatic sensor detection, HSI				✔	✔	✔
Measured variable				**Pressure**	**Temp.**	**Flow rate**

Monitoring and Display Units

	HDA 5500
Monitoring and display unit	✔
Inputs	**3 analog**
Outputs	**Analog 4 relays**
Accuracy	**0.5**

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Operating Elements, Pilot Control Units and Radio Controls

For operating elements, pilot control units and radio controls please contact HYDAC Mobile Hydraulics.

Operating controls

Pilot control units

Radio remote controls

HYDAC TECHNOLOGY CORPORATION
Mobile Hydraulic Division

1660 Enterprise Parkway Suite E
Wooster,OH 44691
Tel. (610) 266-0100
Internet: www.hydacusa.com

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6 | Service

Services
in support of HYDAC Control Technology

The support of the customer in each phase of the business relationship
is one of the responsibilities which HYDAC has set itself.
Whether it is in initial planning, in the required risk analysis,
in the choice of components or the choice of architecture,
we are happy to help you with our experience in system development.

We also offer expert technical support if there are queries during the
development of the application as well as for problems in implementation
in the field.

To minimize our customers' dependency on support, HYDAC offers
a comprehensive training program – in predefined training blocks
or customized to specific areas of interest.

The functionality of the programmable control hardware from HYDAC
is provided by the software application.

By choosing the proven programming platform CODESYS®, which is
available free of charge, programming of our controllers is easy-to-learn.
The proven programming language C/C++ is also available as an option.

Program development can be approached in different ways:
- Application development by the customer himself
- Application development by a competent systems integrator
- Application development by HYDAC,
  possibly as provider of the complete system

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The Training Module for Control Technology

Know-how – an invaluable asset for every company.
HYDAC offers its customers expert help in developing this asset.

A comprehensive training portfolio ensures that participants can develop their knowledge base in a structured way while working with our products in control technology.

For information on individual modules and the particular topics covered,
please see the following table:

Subject	Contents
	Hardware training courses
The principles of the mobile controller	• Design and function of a mobile controller on the basis of block circuit diagrams • Features of the hardware • Input and output types and their characteristics • Implemented features of the hardware • Available communication interfaces
The controller hardware of the 16-bit platform with expansions	• Operating conditions • Characteristics of the inputs and outputs • Communication options • The differences between the available 16-bit controllers • The safety concept of the HY-TTC 90 • Programming options
The controller hardware of the 32-bit platform with expansions	• Operating conditions • Characteristics of the inputs and outputs • Communication options • The safety concept of the HY-TTC 200 • Implemented features of the hardware • Programming options
Visualization hardware training course	• Operating conditions • Characteristics and options • Communication options • Options in programming
	Programming training courses
Introduction to CODESYS® 2.3	• Installation of the development environment • Introduction to user interface • Options in program representation to IEC 61131-3 • Concept of the target systems • Download and debugging
Programming the 16-bit controllers in CODESYS® 2.3	• Setup of the hard and software • Settings in the control configuration • Transferring application to the instrument • Application and entry of inputs • Setting outputs • Utilizing communication interfaces • Debug options
Programming the 32-bit controllers in CODESYS® 2.3	• Setup of the hard and software • Settings in the control configuration • Transferring application to the controller • Application and entry of inputs • Setting outputs • Utilizing communication interfaces • Debug options
Programming the HY-eVision[2] using CODESYS® 3.x	• Installation of the development environment • Hardware and software setup • Creating new projects • Use of HY-eVision[2] features in an application • Applications download onto the HY-eVison[2] • Communication options in the application

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	Programming training courses
Programming the 16-bit controllers in C	• Installation and setup of the development environment • Configuring the controller • Utilizing the IO driver in C • Utilizing the communication interfaces in C • Compiling and transferring the application • Debug options
Programming the 32-bit controllers in C	• Installation and setup of the development environment • Configuring the controller • Utilizing the IO driver in C • Utilizing the communication interfaces in C • Compiling and transferring the application • Debug options
	Advanced training courses
Principles of the communication protocols	• Range of communication interfaces on the market • CAN and its higher protocols • Serial communication interfaces (RS, LIN, USB) • Secure communication options
CANopen IO expansions and their integration	• Integration of the IO expansion in a network • Parameterization of the IO expansion • Utilizing the inputs and outputs • What lies behind the object directory?
Using TTC tools	• Working with the TTC-Downloader • Use of the TTControl Service Tools (Remote Assistance)
Functional safety – Principles	• The "new" standard DIN EN ISO 1384 and its impact • Liability consequences • Procedure for a risk analysis • Implementing the requirements using HYDAC Electronic products

HYDAC regularly offers related training modules which have been put together from the modules described above to provide a structured build-up of knowledge.

Participation in the training module designed for new customers provides an ideal introduction to working with HYDAC control technology. It gives a technical overview of the hardware on offer and is a first step to understanding the CODESYS® programming environment and its use in control hardware.

The highly topical issue of functional safety is addressed and the feasibility of implementation is demonstrated in the form of examples.

The visualization hardware and programming using CoDeSys® is also part of this training course.

Taking part in this training module is recommended to anyone who appreciates having detailed knowledge of the technology he is applying.

HYDAC can also offer more advanced courses which are specially tailored to the customer's requirements.

Interested? Then please contact us.
We will be happy to advise you in creating your individual training program.

Functional safety – a hot topic

Everyone is talking about the introduction of the new Machinery Directive. Many are anxious about the introduction.

HYDAC is offering its customers expert support every step of the way towards safe application.

You will find detailed information in our "Safety Flyer" in the download section of our website **www.hydacusa.com**

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Note

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.