BODAS Test box
TB3 series 10

RE 95092
Edition: 07.2013
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- Universal test box for BODAS RC controllers

Features

- Suitable for BODAS controllers RC of series 20, 21, 22 and 30
- Box housing for convenient transport with integrated lid compartment for cable and other accessories
- Integrated frequency generators and option of connecting external frequency generators
- Integrated switches and connections for external switch signals
- Integrated potentiometers and connections for external analog signals
- Option of connecting proportional solenoids
- Switching outputs and analog outputs
- Serial data interface or CAN (dependent upon the series of the RC controller) for diagnostics, parameter setting, display of process variables and programming
- CAN bus interfaces
- 2-mm bridges for individual wiring of potentiometers and analog inputs
- 4-mm laboratory connector system

Contents

Ordering code

01	02		03
TB	**3**	**/**	**10**

Type

01	Test box	**TB**

Design

02	For BODAS controllers RC of series 20, 21, 22 and 30	**3**

Series

03	Series 1, Index 0	**10**

Main components

Included in the standard delivery of the BODAS test box TB3/10 for controllers RC series 20, 21, 22 and 30:

- TB3/10 in a transport case
- 2 bridge connectors (4 mm)
- 51 bridge connectors (2 mm)

The BODAS test box TB3/10 is used to simulate vehicle and equipment functions for development and test purposes in conjunction with BODAS controllers RC.
The BODAS test box TB3/10 is a development complement. It is just suitable for internal use or for usage in laboratory.
The BODAS test box TB3/10 is not suitable for an operational application in a machine.
The BODAS test box TB3/10 has been developed specifically for the BODAS controllers RC series 20, 21, 22 and 30.
The permissible voltages, currents and frequencies correspond to the constraints of the BODAS controllers RC (see data sheet RE 95200, RE 95201, RE 95202, RE 95203, RE 95220).
The BODAS test box TB3/10 is not intended for private purposes.
The designated use includes, that you have completely read and understood the operating instructions and especially chapter 2 "Fundamental safety instructions".

Required components

You will need the following items to use the test box TB3 with the BODAS controllers RC series 20, 21 and 22:

- one test box TB3
- power supply unit (12/24 VDC) to power the test box and controller from a central point
- TAK1 adapter cable to connect the BODAS controller RC of series 20 or 21.
- TAK2 adapter cable to connect the BODAS controller RC of series 22.
- proportional solenoids with 4-mm connectors to connect to the PWM outputs to simulate the connected load.

You will need the following items to use the test box TB3 with the BODAS controllers RC series 30, RC36-20, RC28-14, RC20-10 or RC12-10 and:

- two test boxes TB3
- power supply unit (12/24 VDC) to power the test box and controller from a central point
- adapter kit RC36-20/30 or adapter kit RC28-14/30 (comprises adapter cable TAK4 and TB3 templates) to connect with the BODAS controllers RC36-20, RC28-14, RC20-10 or RC12-10.
- proportional solenoids with 4-mm connectors to connect to the PWM outputs to simulate the connected load.

Optional accessories:

- Voltage and/or current measuring devices
- BODAS-service connecting cable to communicate with the serial interface or CAN interface of a PC or laptop

The cables listed above are available from Rexroth under the following material numbers:

TAK1 adapter cable	R902076455
TAK2 adapter cable	R902109508
Adapter kit RC36-20/30 (TAK4 and two templates)	R902109578
Adapter kit RC28-14/30, RC20-10/30, RC12-10/30 (TAK4 and two templates)	R917008171
CAN USB adapter	R902602780
BODAS-service connecting cable	R902109422
BODAS-service	see data sheet 95086)
BODAS-design	see data sheet 95112)
C-API	see data sheet 95115)

Description

The test box TB3/10 is used to simulate vehicle and equipment functions for development and test purposes in conjunction with BODAS controllers RC.
The test box TB3/10 is useful for

- software development using BODAS controllers RC,
- parameter setting of BODAS controllers RC with BODAS-design or BODAS-service
- and diagnostics.

The test box TB3/10 allows you to simulate all the conditions of the overall system and to perform far-reaching functional tests of your control outside of the vehicle. This reduces the development time of software and increases the safety and comfort. The test box TB3/10 was developed specifically for the BODAS controllers RC. All inputs and outputs from these controllers can be configured via the test box TB3/10.
A controller RC36-20/30 needs to be connected with two BODAS test boxes TB3/10.
The permissible voltages, currents, and frequencies correspond to the constraints of the BODAS controllers. The test box TB3/10 offers interfaces for connecting proportional solenoids and all inputs of the controller. This allows for a complete simulation of the application – from the control of proportional solenoids to cable break.
The test box TB3/10 provides various input signals for the BODAS controller RC.
If necessary, you can also generate the test signals with signal generators or speed sensors and feed these into the TB3/10 test box through the sockets provided. The signals are transmitted to the BODAS controller RC.
The output signals from the BODAS RC controller can be picked up and measured at the TB3/10 test box. These are indicated by LEDs.

The diagnostics interface allows connecting a PC or laptop with the PC software BODAS-service or BODAS-design.
CAN bus interfaces can be used to communicate with other bus users, e.g. with additional BODAS controllers RC or a joystick.
The power supply and switch inputs are protected against over-current.
The test box is easy to transport, because of the transport case including a space in the cap for cables and other complements.

Controls and indicators

Controls / connections	TB3 label	Number	Function	Chapter
Switch for voltage supply to controller and TB3 test box	TB3 supply	1	On / Off	7.1
Switch for ignition simulation	Ignition switch	1	On / Off	8.5.1
Switch for supplying the outputs on the controller	Supply outputs	1	On / Off	
Switches for switch inputs	Digital inputs	14	Supply voltage (+) / open / ground (–)	8.3.1
Connection for switch inputs		14	Switch signal measurement or external switch signal input	
Connection for analog inputs	Analog inputs	11	Voltage input 0 to 5 V	8.3.2
			Plug board with 2 mm bridges Voltage measurement or external voltage infeed	
Connection for analog inputs (on RC/20 and RC/21: in part current inputs, designations explained below)		4	Voltage input 0...8 V [1] Current input 0...20 mA [3]	
			Plug board with 2 mm bridges Voltage measurement or external voltage infeed (on RC/20 and RC/21 accordingly for current)	
Potentiometer for analog inputs (5 kΩ)		15	Simulation of analog inputs	
Connection for temperature inputs	Temperature	2	Plug board with 2 mm bridges Measurement of resistance or connecting an external resistor	
Potentiometer for temperature inputs (2 kΩ)	Temperature inputs	2	Temperature sensor simulation [1] (precision potentiometer)	
Frequency generators	Frequency generator	4	Speed measuring simulation (1.7 Hz - 9.1 kHz, square-wave signal) Setting and output of internally generated or input frequency signal, optionally processable as DSM signal: direction data, error signal generation	8.1
		2	Speed measuring simulation (1.7 Hz - 4.55 kHz, square-wave signal) Setting and output of internally generated or input frequency signal, for HDD2 simulation two signals with a phase shift of ± 90° for direction of rotation detection	
Connection for frequency inputs	Frequency inputs	5	Input of an internally generated or external frequency signal (transmission via 4 mm lab measurement cables)	
Connection for current measurement input at PWM outputs	PWM Lowside	6	Current measurement inputs for PWM outputs, connection for return wire from proportional solenoids [2]	8.4.2
LED for current measurement inputs		6	Current measurement inputs indicator [4]	
LED and connection for switching outputs (Highside)	Digital output Highside	4	Indicator and measurement of switching outputs [1] [4]	8.4.2
LED and connection for switching outputs (Lowside)	Digital output Lowside	4	Indicator and measurement of switching outputs [1] [4]	
LED and connection for "Low power" switching outputs (Highside)	Digital low power	2	Indicator and measurement of "Low power" switching [1] [4]	

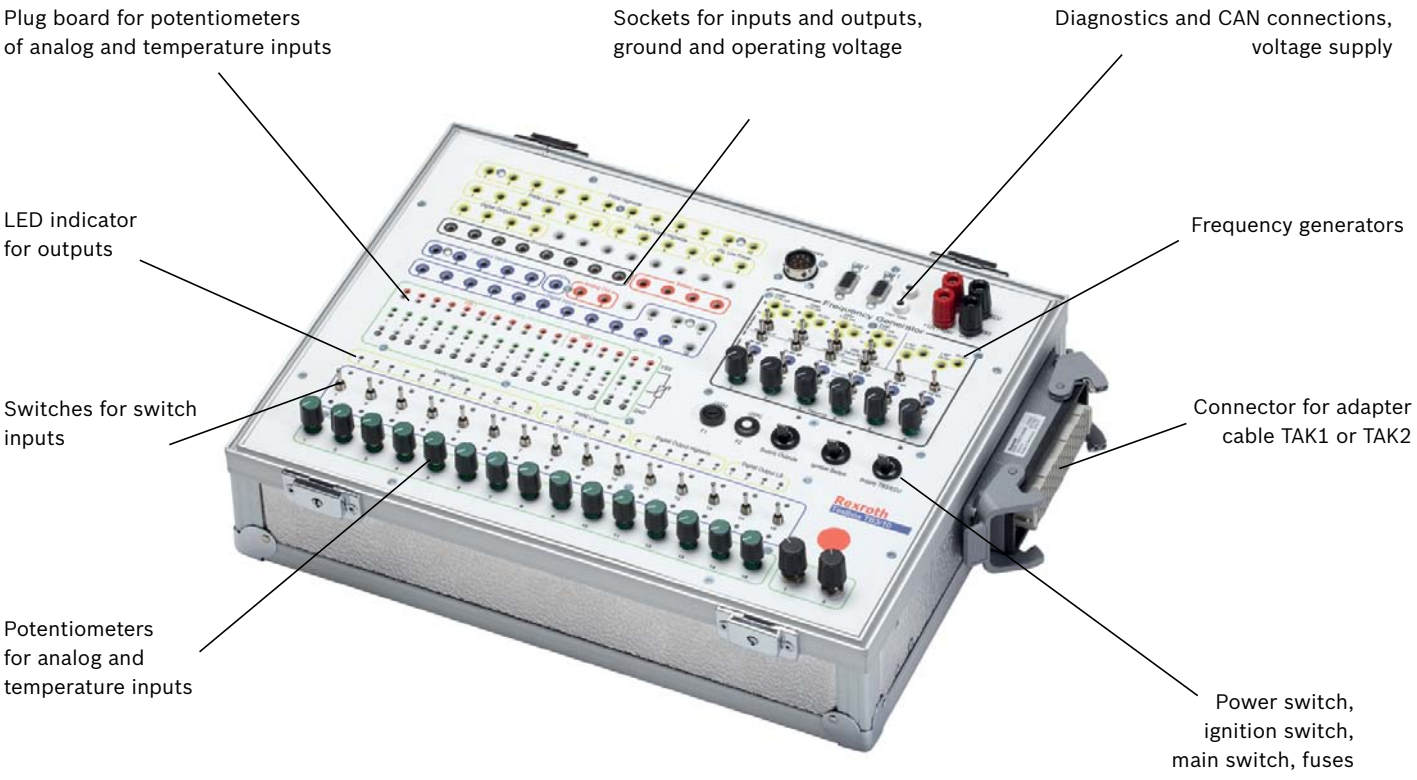
Controls / connections	TB3 label	Number	Function	Chapter
Connection for current outputs to proportional solenoids (Highside) (on RC/20 and RC/21 as switching outputs, designations explained below)	PWM Highside	12	Output current measurement, proportional solenoid outputs	8.4.1
LED for current outputs (Highside)		12	Current outputs indicator [4]	
Connection for analog outputs (voltage)	Analog out	2	Measurement of output voltage	8.4.4
Connection for BODAS-service diagnostic cable, Cannon Trident, 8-pin	Diagnosis	1	Communication / Service / Programming (RS232 and CAN1)	-
Connection for CAN bus, SUB 9-pin	CAN1, CAN2	2	Communication Pin 7: CAN high, Pin 2: CAN low	8.5
Connection for power supply unit (12V or 24V DC)	+ 12 V/+ 24 V ECU, TB3	2	Power supply for test box and controller	8.3.2 6.2 6.3 7.1
Connection for power supply unit (ground)	GND ECU, TB3	2	Central ground	
Battery voltage connection (voltage according to the supply)	Battery	4	Voltage supply of external signal transmitters, solenoids or for enabling or disabling (depending on series) the output stages (INH)	8.3.3
Ground connection	Ground	8	Reference potential for external sensor or measuring devices	
Connection for internal activation or deactivation (depending on series), Inhibit	INH	1	Internal activation / deactivation of power outputs RC/20, RC/30: level > 5V, activation of output stages RC/21, RC/22: level > 5V, deactivation of output stages	8.4.5
Circuit breaker	F2 (20 A)	1	Fuses for battery sockets 4 in connector panel	-
Glass tube fuse	F1 (10 A)	1	Fuse TB3 internal	-
Connector plug for the adapter cable to the BODAS RC controller, Harting HAN108DD	---	1	Connection for adapter cable TAK1	4.2 6.2

With reference to the connector table observe he following information:
The designations on the TB3/10 test box are matched to the inputs and outputs on a BODAS controller RC series 22. For the BODAS controllers RC series 20 and 21 these do not correspond exactly.
As to the BODAS controller RC36-20/30 and RC28-14/30, RC20-10/30 as well as RC12-10/30 the correct designations of the inputs and outputs are ensured through the existing templates in the adapter kit.

The designations, which differ from the actual assignment if connecting a controller RC series 20 and 21, can be found in the appropriate operating instructions under "Connection designation for BODAS controllers RC series 20 and 21".

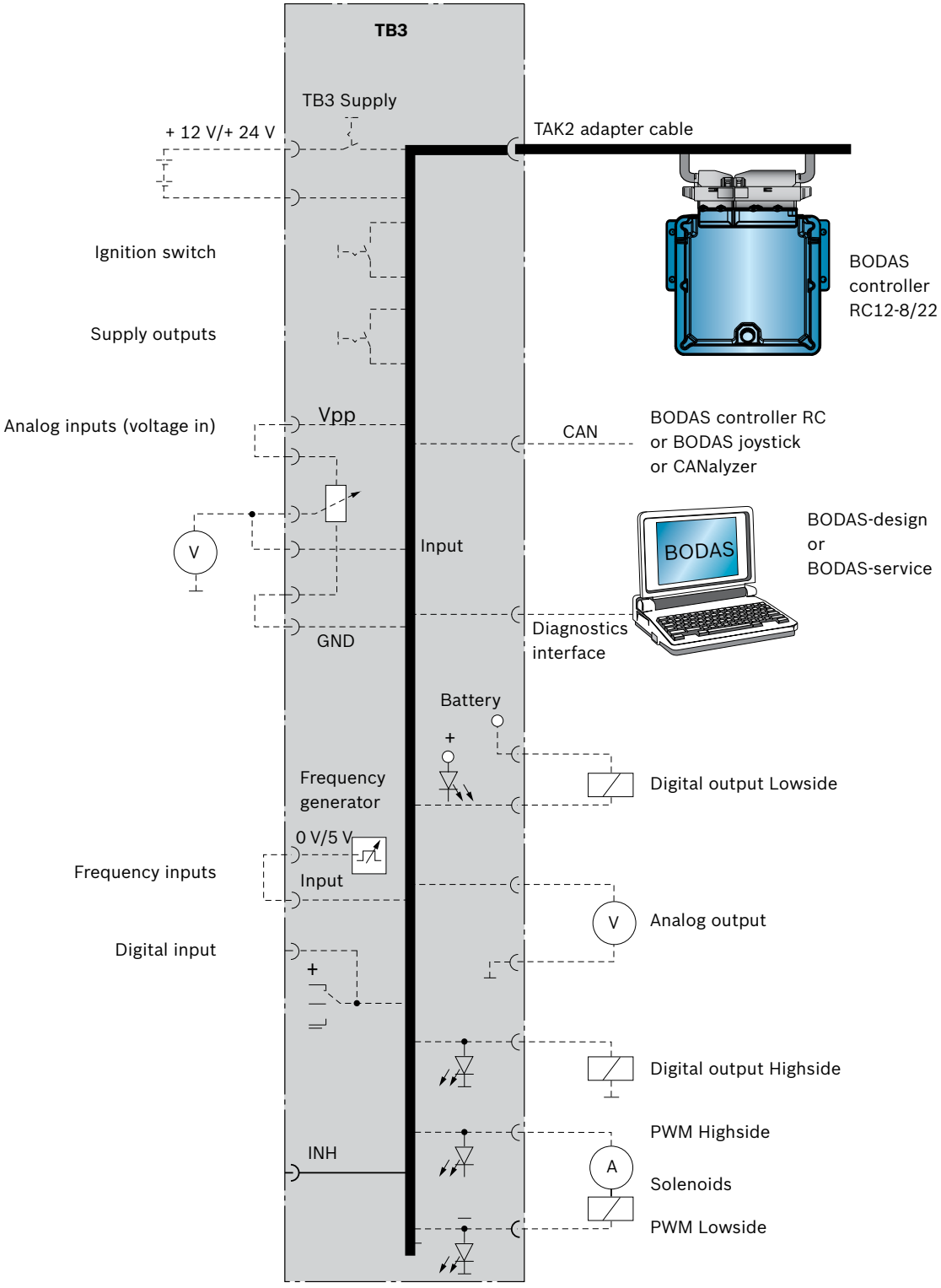
1) BODAS controller RC series 22 only
2) BODAS controller RC series 21 and 22 only
3) BODAS controller RC series 20 and 21 only
4) LEDs glow dimly when the power outputs are enabled. Even if no output is actuated.

Controls and connections



Connection example

This diagram shows an example of the connection options offered by the test box TB3.



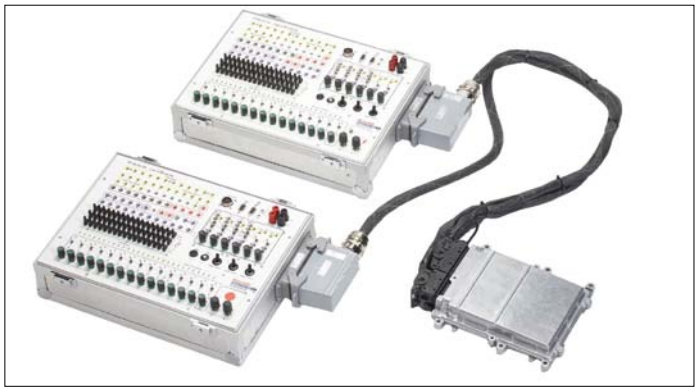
Assembly of BODAS adapter cable TAK

Adapter cable TAK1 for connecting a BODAS controller RC series 20 and 21 with the test box TB3 (R902109508).
Adapter cable TAK2 for connecting a BODAS controller RC series 22 with the test box TB3 (R902109508).

▼ **Adapter cable TAK1/TAK2**

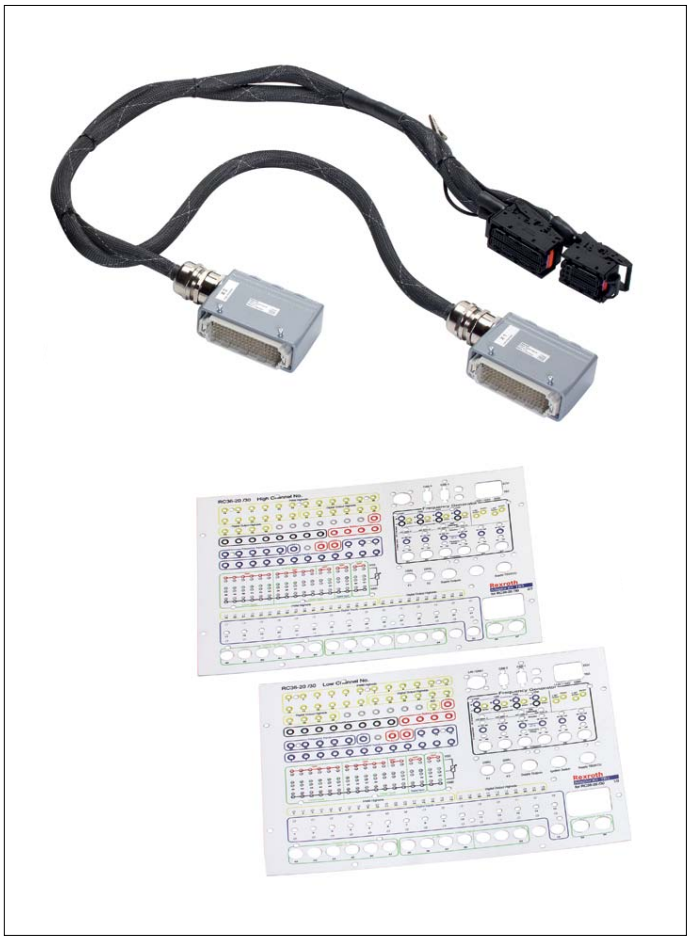
▼ **Controller RC series 20 connected via TAK1 with a BODAS test box TB3/10**

▼ **Controller RC36-20/30 connected via TAK4 with two BODAS test boxes TB3/10.**



Adapter kit RC36-20/30 or RC28-14/30, RC20-10/30, RC12-10/30 (TAK4 and two templates) for connecting a BODAS controller RC36-20/30, RC28-14/30, RC20-10/30 or RC12-10/30 with two test boxes TB3 R902109578

▼ **Adapter kit for BODAS controller RC series 30**



Indication

- The BODAS TAK1/2 resp. the adapter kit RC series 30 does not provide EMC protection via shielding or twisting.
- The BODAS TAK1/2 resp. the adapter kit RC series 30 has the protection class IP 20.
- The BODAS TAK1/2 resp. the adapter kit RC series 30 is designed for operating and storage temperatures between 0°C and +40°C.

Safety instructions

General instructions

- The proposed circuits do not imply any technical liability for the system on the part of Bosch Rexroth.
- The BODAS test box TB3 must be connected while in a voltage-free state.
- Before switching on the BODAS controller with the BODAS test box TB3, ensure that no safety-critical situations could arise through control of the outputs.
- Incorrect connections could cause unexpected signals at the outputs of the BODAS test box TB3.
- It is not permissible to open the BODAS test box or to modify or repair the BODAS test box. Modifications or repairs to the wiring could result in dangerous malfunctions. Repairs to the BODAS test box TB3 may only be performed by Bosch Rexroth or by an authorized partner.
- To switch off the system in emergencies, the power supply to the electronics must be disconnected with a safety switch. The safety switch must be installed in an easily accessible position for the operator. The system must be designed in such a way that actuating the safety switch ensures safe braking.

Notes on the installation point and position

- A sufficiently large distance to radio systems must be maintained.
- All connectors must be unplugged from the electronics during electrical welding and painting operations.

Notes on transport and storage

- If it is dropped, the BODAS test box TB3 must not be used any longer as invisible damage could have a negative impact on reliability.

Further information

- Observe the operating manual 95092-B.
- Further information about the BODAS test box TB3 can be found at www.boschrexroth.com/mobile-electronics.
- Visit our web page regularly to inform about current product information and updates.
- The BODAS test box TB3 must be disposed according the national regulations of your country.

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