**APRIL 2019** Doc. No. Y011366 (EN- Rev. 006)

### ES205. TEBS4 Brake Module

#### **Function**

The electronic braking system for trailers (**TEBS**) combines, in one compact **Brake Module**, the electronic control unit, the sensor technology and the pneumatic control.

The braking functions of anti-lock and load sensing control are both electronically managed within the module as integrated features. This provides more accurate and consistent control of the generated braking force including reduced hysteresis compared to a conventional braking system, thereby improving tractor-trailer compatibility, optimising the brake pad wear and helping to reduce the overall operating costs of the trailer.

The anti-compounding function is also housed within the module.

As an additional option, the function Roll Stability Program (RSP) is available. Should a driver underestimate the vehicle speed

when carrying out a manoeuvre, particularly when the trailer is laden with a high centre of gravity, there is a real danger that the trailer will become unstable and roll over. Even if the driver becomes aware of the condition of the trailer, it is normally too late to prevent an accident.

The RSP function of TEBS helps to avoid this by automatically applying the brakes of selected trailer wheels. By monitoring lateral acceleration, load and speed, the system is able to determine when an unstable condition is imminent. Should this condition arise, the brakes are automatically applied to reduce vehicle speed and hence lateral acceleration, thereby enhancing vehicle stability. When the threat of instability is no longer present, the brakes are automatically released and the system reverts to normal operation. RSP is available as an option within TEBS and can be realised without any additional components having to be installed on the trailer. Operation of the TEBS and RSP function is independent of the specifications of the tractor.

RSP is available for semi-trailers, centre-axle, and drawbar trailers.

The following auxiliary functions may be configured to the associated auxiliary connections of the TEBS:

#### 1. Standard Auxiliary Functions:

#### 1.1 Outputs

- Fully Automatic Lift Axle Control: The ECU provides an electrical signal for the Knorr-Bremse lift axle control valve AE114. and ensures that the legal requirements are fulfilled by preventing overloading of the axles. The TEBS electronics can control up to two lift axle control valves, each valve may then be connected to 1 or 2 lifting axles
- **RtR ("Reset to Ride"):** In conventional suspension control systems, the raise/lower valve is often not reset to the drive position before the vehicle is moved and damage can be caused to the suspension and brakes. To prevent this happening, the TEBS ECU can be programmed to supply an electrical signal to a raise/lower valve with suitable functionality such that when the vehicle exceeds a pre-determined threshold speed, this signal causes the raise/lower valve to automatically switch to the drive position.
- ISS (Integrated Speed Switch): The TEBS provides an electrical output signal when a pre-programmed vehicle speed has been reached. This signal may be used to fulfil numerous operational requirements such as locking of steering axles etc. The signal can be programmed to switch from 0 V to 24V or 24V to 0 V. The hysteresis, i.e. the difference between switch on and switch off speeds, can be adjusted to 10%, 20%, 40% or 80%.
- **24 V Supply:** Provides a permanent power supply that may be used to power additional brake and running gear systems / functions on the trailer.







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- **ABS active:** When the ABS of the trailer is active, a 24V signal is transmitted by the ECU. Typically this function may be used to switch off a retarder installed on the trailer while ABS is active.
- **RSP active:** When the RSP of the trailer is active, a 24V signal is transmitted by the ECU.
- **TOC (Trailer Occurrence Counter):** Every kilometre travelled, the ECU transmits a 24V signal for a period of time and this may be used to trigger an external mileage counter.

#### 1.2 Inputs:

The TEBS ECU has the ability to evaluate and/or react to three sensor inputs as follows:

- Brake Pad Wear control: When an input is received that the wear limit of at least one brake has been reached, the information is stored by the ECU and can be displayed by a Magic Eye or the information can be accessed at a later date via PC diagnostocs or TIM. In addition, an electrical signal will be transmitted to the towing vehicle via pin 5 of the ISO 7638 connector causing the yellow warning lamp to flash each time the system is initially powered and the vehicle is stationary. A CAN signal is also transmitted via pins 6 and 7 of the ISO 7638 which may be used in the driver's information display (if the towing vehicle has such a device).
- **Traction Assist:** Raises the front lift axle when the trailer is laden to increase the imposed load on the towing vehicle's drive axle to improve traction. Axle overload and speed restrictions apply when this function in operational.
- **Disable Lift Axle Control:** Signals the lift axle(s) to lower when raised; this allows manual activation via a signal transmitted by the towing vehicle or by an electrical switch mounted on the trailer. This can be used to assist manoeuvring or for rolling road testing.

#### 2. Non-Standard Auxiliary Functions (via ADL):

Should a customer require a function, other than those normally available, it is possible to create a non-standard function by the use of a special program file known as Auxiliary Design Language (ADL) produced by Knorr-Bremse.

Should such a function be required, contact must be made through the local Knorr-Bremse representative. When available, the special file needed to fulfil the function can be written to the ECU via the PC Diagnostic Program.

#### 3. Stop Lamp powering:

To obtain full functionality, any trailer electronic braking system requires a permanent power supply (achieved by using the legally specified ISO 7638 connection in 5 or 7 pin format); this ensures load sensing, anti-lock control (ABS) and all auxiliary functions are automatically maintained. In the event of a failure of this power supply, whilst trailer braking will be maintained via the pneumatic back-up function, all electronically controlled functionality would no longer be active. Continued operation of the vehicle without electrical power to the ECU and so without load sensing and ABS, may therefore result in tyre flat spotting, trailer instability and higher brake operating temperatures leading to increased brake pad wear. To overcome this problem, the TEBS ECU can be installed so that it will continue to operate by taking power from the Stop Lamp circuit and thereby load sensing and anti-lock functions remain active.

#### Note:

Stop Lamp powering should only be considered as a back-up function to ensure some safety features are retained. Operation of the vehicle over a longer period without a fully functioning ISO 7638 connector is not legal.

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#### **Technical Features**

Operating pressure:	10.0 bar
Max. permissable pressure:	12.5 bar
Operating temperature range:	-40 °C to +65 °C
Weight:	ES2050, ES2053 5.7 kg approx.
Nominal voltage:	24 V DC

#### **Towing vehicle requirements**

Trailers fitted with an Electronic Braking System (TEBS) only comply with the legal requirements of Regulations 98/12/EC and ECE Regulation 13/09 Supplement 08, when the towing vehicle is equipped with an electrical interface of the following specification:

ISO 7638: 19	985	5 Pin
ISO 7638: 19	997 Part 1 (24 V)	5 Pin
ISO 7638: 19	997 Part 1 (24 V)	7 Pin

#### **Range Overview**

		ype No. Possible ABS Configuration	Auxiliary Functions				
Part No. Type N	Type No.		X1 connector <sup>1)</sup> Total Auxiliaries: 2		X2 connector		RSP
			Max. Out	Max. In	Max. Out	Max. In	
II39798 <sup>3)</sup>	ES2050	2S-4S/2M	1	1 <sup>2)</sup>	3	2	No
II39782 <sup>3)</sup>		2S-4S/2M	1	1 <sup>2)</sup>	3	2	Yes
II39782N504)	ESZUSS	4S/3M	1	1 <sup>2)</sup>	1 <sup>5)</sup>	2	Yes

<sup>1)</sup> Only possible if TIM or Magic Eye are not used; maximum number of configurable Auxiliaries on X1 connector: 2

<sup>2)</sup> No "Traction Help", no "Disable Lift Axle Control"

<sup>3)</sup> The part number may have the suffix F004 in which case the Module will be supplied with a system plate and an information sticker.

<sup>4)</sup> Replaces II36419 - ES2050 and II39783F - ES2041. The part number will carry a suffix "N50" which defines that it is supplied with packaging.

<sup>5)</sup> Two of the X2 Auxiliary Outputs are required to power the external ABS Modulator Valve (BR9234 - see PD-200-200, Document No. Y011362) in the 4S/3M system

#### Service Parts:

K102802K50	Connector Cover
K108643K50	Port Filter (contains 20 Filters)
K101835K50	Silencer Kit (two kits required per module)
K101836K50	Blanking Plug for X2 Connector
K103003K50	Blanking Plug for WSS Connector

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#### Dimensions



### Information sticker, TEBS power supply

Part No.: II39796F Size [mm]: 150 x 100



#### EBS-System Plate <sup>1)</sup>:

Part No.: II39797F Size [mm]: 170 x 110



<sup>1)</sup> The System Plate is a sticker which can be printed via the ECU*talk*<sup>®</sup> software and a laser printer. **Caution!** A laser printer must be used but do not print more than 5 stickers at a time.



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#### **Range Overview**



Pin	Diagnosis via K-Line or TIM or Magic Eye	Diagnosis via CAN
1	Diagnostics	Input C – signal
2	Diagnostics – ground	ground
3	ISO 11992 CAN low	(ISO 7638: 1,5 mm² WH / BN)
4	Modulator – ground	(ISO 7638: 1,5 mm² WH / GN)
5	ISO 11992 CAN high	(ISO 7638: 1,5 mm² WH / GN)
6	Modulator - 24 V	(ISO 7638: 4,0 mm² RD)
7	ECU – ground	(ISO 7638: 1,5 mm² YE)
8	Warning Lamp	(ISO 7638: 1,5 mm² WH)
9	ECU - 24 V	(ISO 7638: 1,5 mm² BK)
10	Diagnostics – 24 V	AUX 4 (24 V)
11	Stop Lamp – ground	(ISO 1185: 1,0 mm² BN)
12	Stop Lamp – 24 V	(ISO 1185 1,0 mm² YE)

Х1 - со	X1 - connector - Code 'B'								
		1	2	3	4	5	6		
		• 12	•	● 10	9	• 8	•	لير	

Pin	2S / 2M 4S / 2M	4S / 3M			
1	AUX 1 (24 V)	External ABS Modulator (BR9234) – Hold Valve (1,0 mm <sup>2</sup> YE)			
2	AUX 2 (24 V)	External ABS Modulator (BR9234) – Release Valve (1,0 mm <sup>2</sup> BK)			
3	AUX 3	(24 V)			
4	Input sup	oply (5 V)			
5	Input A – signal				
6	Input A – ground				
7	Input B – ground				
8	Input B – signal				
9	-				
10	-				
11	ground				
12	ground	External ABS Modulator (BR9234) – Ground (1,0 mm2 WH)			

#### **Range Overview**

Port	Qty	Used for	Port Thread		
1.1 <sup>1)</sup>	1	Supply to reconvoir			
1.21)	1	supply to reservoir			
1-2	1	To AE431. park/shunt valve	M22 x 1.5		
21	3	Delivery to brake chambers, right side			
22	3	Delivery to brake chambers, left side			
22	1	Test connector			
23	1	Delivery to spring portions of spring brakes, right side			
24	1	Delivery to spring portions of spring brakes, left side M16 x 1.5			
4	1	Brake demand - Control (Yellow) Line			
42	1	Air suspension bag pressure			

<sup>1)</sup> If only one supply port is required, 1.1 must be used and 1.2 must be plugged.

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#### **Additional Documentation**

Documentation is available from your Knorr-Bremse technical sales representative and/or on the Knorr-Bremse website www.knorr-bremsecvs.com which gives detailed information about the electronic braking system such as a system description and detailed installation instructions.

		V040770
Lustomer News	ECU <i>taik</i> ® Download	Y049770
nformation Document	TEBS4 Homologation Document	C16427
nstallation Instructions	TEBS4 Y002324	
Product Data	ABS Relay Modulator Valves (PD-200-200)	Y011362
Product Data	Cables for Trailer ABS and EBS (PD-272-000)	Y095697
Product information	Electronic Braking System for Trailers	P-3528
Product News	ECU <i>talk</i> ® Vista compatibility	Y055547
Service Information	Identification of TEBS Module	Y018096
Service News	TEBS4 Installation/Storage/Maintenance	Y025056
Service News	TEBS4 Update Package SW521.17	Y052195
Jser Manual	ECU <i>talk</i> ® Diagnostics	Y031901

#### Legal Requirements

TEBS has been approved in accordance with the requirements of Annex XIV of the Directive 98/12/EC and Annex 19 of ECE Regulation 13 with respect to ABS performance (see approval report EB 130 and the information document C16427/E).

The system also fulfils the requirements of the ECE regulation 13/09 Supplement 8 with respect to the prescribed requirements for vehicles with an electric control line and electric control transmission. (See approval report No. EB 133 and the information document C16428/E).

#### Diagnostics

#### Universal Diagnostic Interface (UDIF)

#### Function

In order to configure the TEBS, carry out End Of Line testing and system checks, special hardware and software is required.

The hardware consists of a diagnostic interface and cables to connect TEBS electronics to the PC. Two different versions of software are available; a full version for the trailer manufacturer and a diagnostic version specifically designed for workshops. The software ECU*talk*<sup>®</sup> can be downloaded free of charge from the Internet. To use the software a PIN is required, which can be purchased over the Internet after appropriate training has been completed.



#### Options

The later generations of TEBS do not require a specific diagnostic connection at the side of the trailer as PC diagnostic can be carried out via pins 6 and 7 of the ISO 7638 interface (CAN connection).

This diagnostic interface can be connected to the TEBS via an adapter cable, which is also connected to a standard ISO 7638 connection (5 pin or 7 pin) to power the TEBS.

Pos.	Name	Part No.	Type No.	Remarks
1	Diagnostic Set UDIF	II39809F	EZ1031	Including connection cable Z005474 (9-pin sub-D-plug and 9-pin sub-D-socket)
2	Adapter cable	II39808F	EZ1034	See PD-272-030, Document No. Y107796
3	Diagnostic cable	II39812F	EZ1032	See PD-272-030, Document No. Y107796
4	Connection cable	Z007887		Optional for USB-connection to PC
5	Diagnostic software	-	_	Download from www.knorr-bremseCVS.com





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#### **Diagnostics** (contd.)

#### Trailer Information Module (TIM) (II39810F - EZ1035)

#### **Function**

The Trailer Information Module (TIM) is a trailer mounted display for direct reading of diagnostic and trailer related information. It may also be used as a hand held diagnostic tool. It enables access to information available within the TEBS ECU without using PC diagnostics.

The display is made up of 4 lines each having 20 characters. Operation is simple by means of three buttons (see picture). In addition to diagnostic and checking functions, TIM offers access to the following information:

- Active/stored faults
- System voltage
- Pad Wear
- Mileage
- Frequency of RSP activity
- Axle Load

#### Note:

As with Magic Eye, when using a TIM, no Input C or Output AUX 4 / Output AUX 5 functionality is possible via the X-connector as an external diagnostic connection is required.

#### **Technical features**

Operating temperature range:	-20 °C to +70 °C
Weight:	EZ1035 0.4 kg approx
Nominal voltage:	24 V DC

#### **Options**

Pos.	Name	Part No.	Type No.	Remarks
1 Connection cable	K007525	EK31071)	ISO 7638 + CAN and ISO1185, see PD-272-020, Document No. Y107795	
	Connection cable	II40394F	EK31091)	ISO 7638 + CAN, see PD-272-020, Document No. Y107795
2	TIM	II39810F	EZ1035	Cable length = 1m



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1) A Mounting Kit (Part No: K005378), consisting of a closure cap, a spring ring and a nut, may be used.





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#### **Revision Details**

Rev. 006	April 2019	New Layout



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