TEBS G2.2 Standard Plus Brake Module

Function

The Knorr-Bremse electronic braking system for trailers (**TEBS G2.2**) combines, in one compact assembly, the electronic control unit, the sensor technology and the pneumatic control.

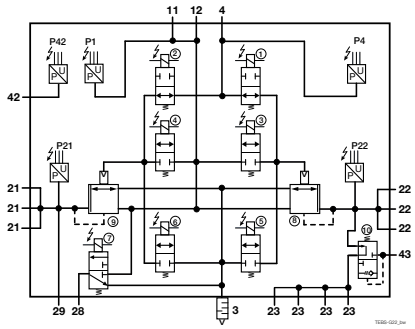
The braking functions of anti-lock and load sensing control are both electronically managed within the module as integrated features. This provides more accurate and consistent control of the generated braking force including reduced hysteresis compared to a conventional braking system, thereby improving 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 offering four delivery ports to the spring brake chambers.

The TEBS G2.2 Brake Module is capable of working on trailers coupled to towing vehicles equipped with pneumatic only braking, pneumatic braking plus ABS or EBS systems. To achieve the full capability of the module the trailer should be connected to an EBS equipped towing vehicle fitted with an ISO 7638 7-pin connector.

Standard Symbol as DIN ISO 1219

TEBS G 2.2



The TEBS G2.2 Standard Plus Brake Module offers the following features in common with the TEBS G2.2 Standard brake module (see PD-214-300, Document No. Y136107):

- the modules are available with push-to-connect (PTC) fittings.
- all electrical connections face downwards for ease of accessibility.
- integrated emergency valve to provide the automatic brake function. The integrated emergency valve vents the spring brakes directly at the module ensuring faster response. The emergency valve also performs the anti-compounding function.

In addition the TEBS G2.2 Standard Plus Brake Module offers the following new features:

- software upgrade to support the iLvl suspension control system (see PD-214-F010, Document No. Y172340).
- additional electrical inputs on pins 7 and 8 , replacing the stoplamp supplies on the TEBS G2.2 Standard brake module, i.e. theStandard Plus does not have stop lamp powering capability.

The service-proven anti-roll system, RSP (Roll Stability Program), is included as standard in all TEBS G2.2 Brake Modules.

Technical Features

Operating pressure:	10.5 bar
Max. permissible pressure:	12.5 bar
Operating temperature range:	-40 °C to +65 °C
Maximum temperature:	+110 °C for 1 hour (non-operational)
Weight:	5.7 kg approx.
Nominal Voltage:	9 to 32 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 R13/11 Supplement 8, when the towing vehicle is equipped with a electrical interface of one of the following specifications:

ISO 7638: 1985	5 Pin
ISO 7638: 1997 Part 1 (24 V)	5 Pin
ISO 7638: 1997 Part 1 (24 V)	7 Pin

Standard Auxiliary Functions

The following auxiliary functions may be configured to the associated auxiliary connections of the TEBS G2.2 Standard Plus Brake Module:

Outputs:

- **Tilt Angle:** This signal can be utilised to switch off a lifting device for the tipping body. See PD-214-F201, Document No. Y136126.
- **Fully Automatic Lift Axle Control:** The module can control up to two lift axle control valves, each valve may then be connected to 1 or 2 lifting axles. See PD-214-F101, Document No. Y136118.
- **Speed Pulse (SP):** When the vehicle exceeds a predetermined threshold speed, a signal of programmable duration is activated. This signal causes the Raise / Lower valve to automatically switch to the "drive" position. See PD-214-F106, Document No. Y136123.
- **Integrated Speed Switch (ISS):** This signal may be used to fulfil numerous operational requirements such as locking of steering axles etc. See PD-214-F107, Document No. Y136124.
- **Steering Axle Lock (SAL):** This signal can be utilised to lock the steering axle in the 'straight-ahead' condition. It is similar to ISS but can also be triggered from an input, e.g. Back-up Light (Reversing Lamps). See PD-214-F251, Document No. Y136130.
- **24 V Supply:** provides a permanent power supply that may be used to power additional brake and running gear systems / functions on the trailer. See PD-214-F006, Document No. Y136112.
- **ABS active:** Typically this function may be used to directly control a retarder installed on the trailer. See PD-214-F004, Document No. Y136110.
- **RSP active:** When the Roll Stability Program (RSP) of the trailer is active, a 24 V or a pneumatic output (depending on configuration) is transmitted by the brake module. See PD-214-F005, Document No. Y136111.
- **SLR:** When a function of TEBS causes the brakes to be applied a Stop Lamp Request signal can be generated. See PD-214-F401, Document No. Y137240.
- **P_{out}:** Brake modules that have the P_{28} function available, which can be programmed to provide a pneumatic output for any of the above functions or a constant pressure supply. See PD-214-F006, Document No. Y136112.
- **iLvl valve:** When iLvl is configured in ECU*talk*® the iLvl valve outputs are automatically assigned to pins 1 and 2 (AUXIO1 and AUXIO2). See PD-214-F010, Document No. Y172340.

Inputs:

The TEBS G2.2 Standard Plus Brake Modules can be programmed to receive inputs on various connectors. See page 5 for more information on the connections. Typical inputs are described below:

- **Brake pad wear control (PW) :** Input is received that the wear limit of at least one brake has been reached. See PD-214-F351, Document No. Y136131.
- **TH:** Traction Help actuated by a manual switch. See PD-214-F102, Document No. Y136119.
- **MH:** Manoeuvring Help actuated by a manual switch. See PD-214-F103, Document No. Y136120.
- **LL_ALL / LL_LAC1 / LL_LAC2_:** These functions lower lift axles as a result of a signal from a manual switch. See PD-214-F101, Document No. Y136118.
- **LLTH - Advanced Lift Axle Control:** This is a combined function which offers lift axle lowering and traction help via the same input. See PD-214-F101 and PD-214-F102, Document Nos. Y136118 and Y136119.
- **Road Laying Function (RLF):** This function is typically used when the trailer is working with a road laying machine. See PD-214-F203, Document No. Y136128.
- **Body Lift Sensor (BLS):** This sensor is used with tipping trailers. See PD-214-F201, Document No. Y136126 and PD-214-F202, Document No. Y136127.
- **Trailer Brake Release (TBR):** This function is typically used with extendable trailers. See PD-214-F301, Document No. Y137238.
- **Trailer Suspension Release (TSR):** This input is used when raise/lower valves are installed. See PD-214-F108, Document No. Y137237.
- **Back-up Light:** This takes an input from the reversing lamps and is typically used with the Steering Axle Lock function. See PD-214-F251, Document No. Y136130.
- **iLvl Level sensor:** When iLvl is configured in ECU*talk*® the level sensor is automatically assigned to pins 5 and 6 (SENS_IN1 and SENS_SUP). See PD-214-F010, Document No. Y172340.

Auxiliary Design Language (ADL) - Non-standard Auxiliary Functions

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 file known as ADL (Auxiliary Design Language) produced by Knorr-Bremse. See PD-214-F950, Document No. Y136136.

Legal Requirements

TEBS G2.2 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. The system also fulfils the requirements of the ECE Regulation 13/11 Supplement 8 with respect to the prescribed requirements for vehicles with an electric control line and electric control transmission:

Approval	ECE Report No.	Knorr-Bremse Document No.
ABS approval	EB 154	Y038142
Electronics approval	EB 155	Y038143
RSP approval	EB 166	Y080682
Use of AC574AY Relay Valve with long pipes	EB 154 extension	Y158131

Options

All TEBS G2.2 Standard Plus variants offer:

- ABS configurations 2S/2M only.
- RSP.
- Operating voltage range 9 - 32 Volts.
- Four pneumatic ports to the spring brake actuators.
- Internal J1939 CAN (5 V TI CAN).
- Configuration of different braking characteristics for the CAN and pneumatic brake demands.
- Integrated automatic brake function.
- The choice of a programmable pneumatic output from Port 28 (P_{28}).

The following table shows possible variants which differ concerning the options provided:

Part Number[1)]	Type Number	P_{28}	PTC Fittings	Stop Lamp Powering	IAM Part No.[2)]
K055372	ES2090	Yes	Yes	No	K055379
K055379			No		

1) The part number of the module will carry two suffices, firstly "V##" which represents the software revision of the product, e.g. V01, V02 etc., and secondly "N##" which defines the packaging requirements of different market sectors, e.g. N00, N50, N99, etc. Example: K055372V02N99 - is supplied with software to revision 02 and packaged as described below. Note: The N99 variant will be shipped in a box containing the data labels II39797F, II39796F and K112780N00. These data labels may also be ordered separately. The N49 variant is for OE use only and the N99 variant is for IAM use only.
2) IAM versions (which require configuration) have a grey top cover, whereas OE versions have a black top cover.

Additional Parts:

Silencer	K000847K50 (two required per module)
Side Cover	K092404K50
Port Filters	K004904K50 (contains 10 conical filters for Ports 11 and 12) K108643K50 (contains 20 flat filters for Port 4)
Blanking plug for 8 mm pipe	96210008
Blanking plug for 12 mm pipe	96210012
Blanking plug for 15 mm pipe	96210015
Self-adhesive TEBS label	K112780N00 (supplied with the TEBS Module for mounting on the trailer)
Information sticker	II39796F (TEBS power supply)
EBS-System Plate	II39797F

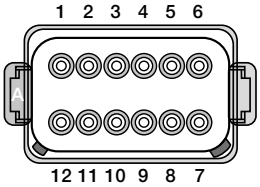
Pneumatic Connections

Port	Thread	Qty	Used for	PTC Fittings (to suit pipe size)
11	M22x1.5	1	Supply from Reservoir	15x1.5
12				
21	M16x1.5	3	Delivery to brake chambers to wheel speed sensor D	12x1.5
22			Delivery to brake chambers to wheel speed sensor C	
23		4	Delivery to parking brake	8x1
28		1	Programmable pneumatic signal	
4			Brake demand (Yellow Line)	
42			Air spring pressure	
43			Park/Shunt Valve	

Electrical Connections

See PD-214-F006, Document No. Y136112 for details of all of the Input and Output configurations.

In - Out Connector

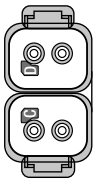


Pin Number	Function
1	AUXIO 1
2	AUXIO 2
3	AUXIO 3
4	Sensor Ground
5	Sensor Input 1 [SENS_IN1] (tri-state or analogue input)
6	Sensor Supply [SENS_SUP] (tri-state or analogue input)
7	TRI_IN (tri-state input)
8	DIG_IN (digital input)
9	J1939 CAN (5 V) Low
10	J1939 CAN (5 V) High
11	AuxRet 3
12	AuxRet 12 (Return for AUXIO 1 & 2)

Power Connector

Pin Number	Function
1	Battery Supply (+)
2	Electronic Supply (+)
3	Electronic Ground (-)
4	Battery Ground (-)
5	Warning Lamp
6	ISO 11992 CAN (24 V) High
7	ISO 11992 CAN (24 V) Low

Wheel Speed Sensor Connector



System	Connector	Function
2S/2M	S-C	Wheel Speed Sensor
	S-D	

Note:

If no connections on the In-Out Connector are used, a blanking plug must be installed to prevent the ingress of moisture to the ECU.

Configureable Tri-State Input:

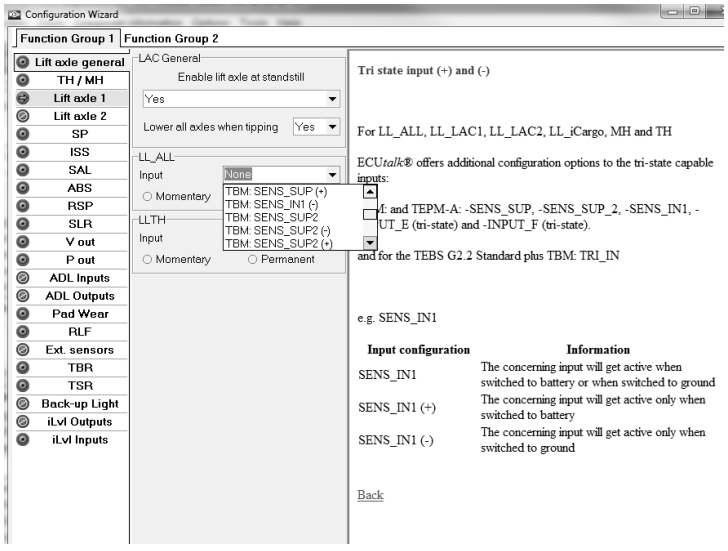
For LL_ALL, LL_LAC1, LL_LAC2, LL_iCargo, MH and TH ECU*talk*® offers additional configuration options to the tri-state capable inputs:

TEBS G2.2 Standard Plus: -SENS_SUP, -SENS_IN1, TRI_IN.

Input configuration	Information
SENS_IN1	The concerning input will get active when switched to battery or when switched to ground
SENS_IN1 (+)	The concerning input will get active only when switched to battery
SENS_IN1 (-)	The concerning input will get active only when switched to ground

Note:

Usage of Rocker switch necessary for parallel configuration of SENS_IN1 (+) and SENS_IN1 (-) to avoid short circuits possible with two separate switches.



Pneumatic Backup

If all electrical power supplies to the TEBS G2.2 Brake Module are lost the system reverts to the Pneumatic Backup mode which provides the facility for the trailer to maintain normal pneumatic braking albeit without the load sensing and anti-lock functions.

The TEBS G2.2 Standard Plus Brake Module has the ability to switch itself to the Pneumatic Backup mode and does so if the trailer reservoir pressure drops below 2.5 bar. The module will switch back to normal operation when the reservoir pressure is restored.

The TEBS G2.2 Standard Plus Brake Module also switches to Pneumatic Backup mode whenever the trailer is stationary and the service brake pressure is greater than 4.5 bar. This is to reduce electrical power consumption. The module will switch back to normal operation as soon as service brake pressure drops below 4.25 bar.

Braking with CAN demand only (Pneumatic "control" line missing)

When coupled to a tractor that supports ISO 11992 CAN communication with a 7 pin ISO 7638 connector, the TEBS module checks the "service brake demand" from the EBS 11 CAN message against the pneumatic "control" line brake demand measured at P4 on the TEBS module, if the "service brake demand" from EBS 11 is greater than 1 Bar for 1 Second without a corresponding signal at P4 the TEBS module detects a failure and alerts the driver by means of the yellow warning lamp. The brake performance in this condition is unchanged and will be controlled from the "service brake demand", however it is very important that the failure of the pneumatic control line is resolved promptly to avoid that a subsequent failure of the ISO 11992 CAN results in no braking on the trailer. Typical causes for the failure are the yellow coupling between the tractor and trailer not being connected or the pipe being constricted in some way e.g. blockage or kink.

Note:

A rupture of yellow line will be detected by the so called "Trailer Control Valve" in the tractor and then the tractor will dump the pressure in the "red line" causing the emergency braking function of the trailer to be activated during the brake event.

Installation and Mounting

General installation guidelines

- The protective covers for the electrical connections of the TEBS G2.2 Brake Module must be fitted at all times when the vehicle is in use.
- During assembly the ports and electrical connections of the TEBS G2.2 Brake Module and cabling must be protected against the ingress of contamination, e.g. sand blasting particles.
- The TEBS G2.2 module must never be stored or transported with the exhaust ports pointing upwards.
- If a TEBS G2.2 module has been damaged in transit or during the assembly, e.g. dropped on the floor, it must not, under any circumstances, be fitted to the vehicle.

Note:

If at any time the vehicle is to be welded using an electric welding tool the following has to be observed:

- Remove the "Power" and "In-Out" connectors from the module(s).
- Remove the wheel speed sensor connectors, ensure that when reassembling the sensors they are reconnected to the correct positions. Knorr-Bremse recommends that an End of Line (EOL) test is run using the diagnostic program ECU*talk*® following reassembly of the wheel speed sensors to ensure correct fitment.

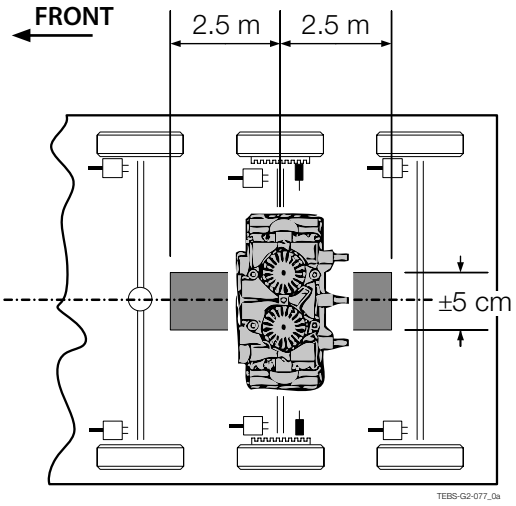
Installation of the TEBS G2.2 Brake Module

The following provides a guide to the installation of the TEBS G2.2 Brake Module.

In the longitudinal direction, the deviation from centre of the bogie may be a maximum of ± 2.5 m however the maximum permitted pipe length of 5 m to the brake actuators must be observed.

Note:

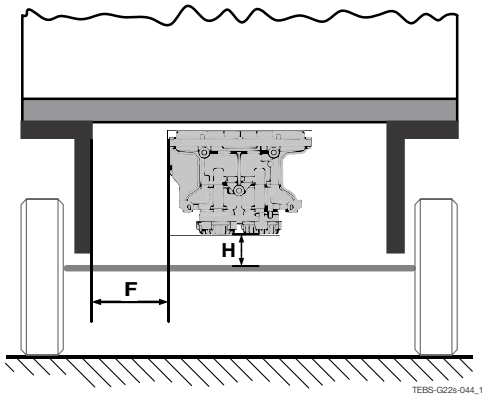
When a self-steering or command steered axle is fitted the 'centre of the bogie' is deemed to be between the fixed axles.



An ideal installation would be where the TEBS G2.2 Brake Module is laterally positioned within 5 cm of the centre of the trailer (see figure), this would result in the respective pipe lengths being approximately equal for each axle. However it is possible to mount the TEBS G2.2 Brake Module in other positions dependent on the design of the trailer and space available.

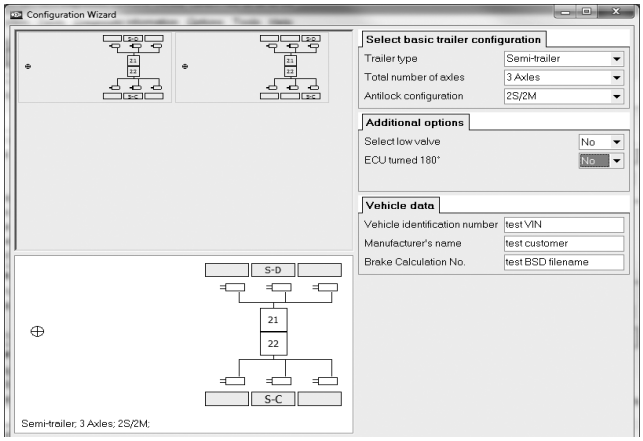
If the Roll Stability Program (RSP) is configured, special restrictions apply. See PD-214-F005, Document No. Y136111.

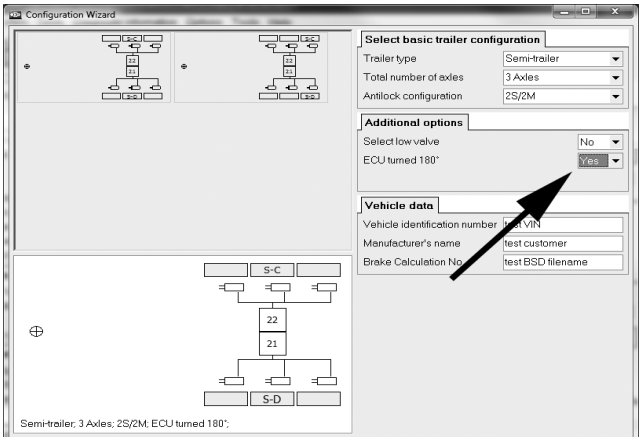
During installation, consideration must be given to being able to access the electrical connections and a minimum clearance must be observed (F > 50 mm) to ensure that cover can be removed. For the TEBS G2.2 Brake Module a clearance (H > 25 mm) must be ensured below the exhaust silencers at the base of the valve; this must be checked when the suspension is deflated and on its bump stops (see figure).



Orientation

It is normal to mount the TEBS G2.2 Brake Module with the mounting studs towards the rear of the vehicle with the brake actuators on the left side supplied by Port 22 and on the right side by Port 21 (the ports closest to the actuators). However, it is permissible to mount the module with the mounting studs towards the front of the vehicle providing that the orientation is changed in ECU*talk*® under the "Information" tab and "Change configuration". The actuators connections must then be reversed, i.e. the brake actuators on the left side supplied by Port 21 and the brake actuators on the right side supplied by Port 22.





Wheel Speed Sensor Connection

When the TEBS G2.2 Brake Module is installed, irrespective of its orientation, the Wheel Speed Sensors should be connected as below:

Connection S-C	connect the Wheel Speed Sensor fitted to the side of the axle on which the brake actuators are supplied by Port 22 on the module.
Connection S-D	connect the Wheel Speed Sensor fitted to the side of the axle on which the brake actuators are supplied by Port 21 on the module.

Note:
Wheel Speed Sensors must not be installed on driven axles.

Cables

For information on suitable cables see PD-272-025, Document No. Y142784 and for cable installation guidelines see PD-272-005, Document No. Y136137.

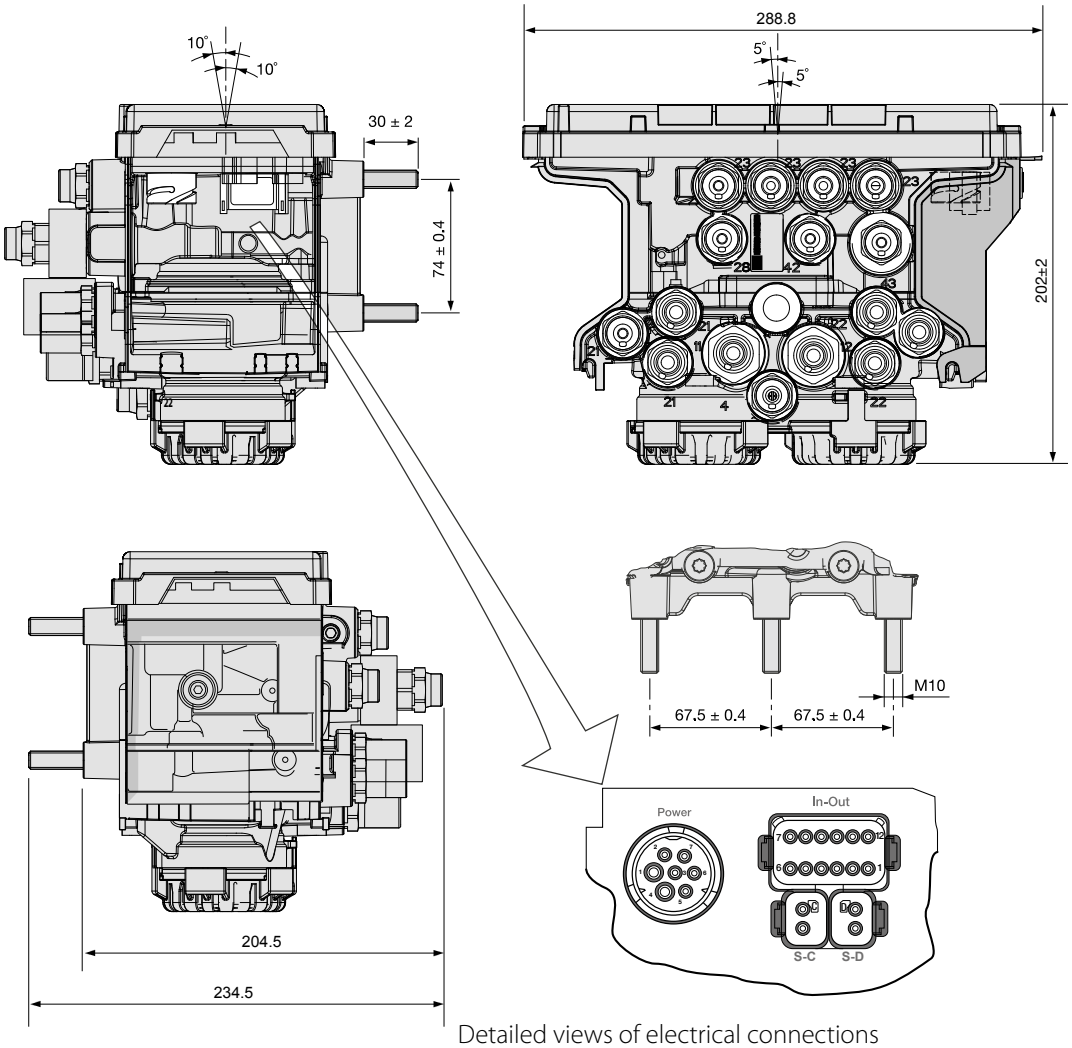
Pipe sizes

The following table defines the minimum bore of piping to be used to connect the reservoir to the module and the module to the respective brake actuators.

Pipe size for the connection between the air reservoir and the module		
Plastic pipe	Minimum inside diameter 12 mm It is recommended that both Supply ports are used and each is connected to the reservoir.	
Pipe size for the connection between the module and the service brake actuators		**Maximum length**
Plastic pipe	Minimum inside diameter 9 mm	5 m
Rubber hose	Minimum inside diameter 11 mm	

Dimensions

TEBS G2.2 - Standard Plus (K055372)



Detailed views of electrical connections

Note:
For information on individual connections and pin function, see table on page 5.

Parameterisation

Before a trailer can be used on the road its braking performance must have been verified by a testing authority and be type approved. Part of this process is the requirement to fulfil the prescribed compatibility limits which means a number of braking parameters must be specified. This is normally achieved by means of a brake calculation taking into account the physical characteristics of the trailer and the recorded performance of braking components defining the respective brake chamber pressures to fulfil laden and unladen requirements. For the TEBS G2.2 equipped trailer this would be carried out using the Knorr-Bremse brake calculation program BSD which has been specifically developed for this purpose. The main parameters which control the braking performance of the trailer are:

- Laden and unladen air spring pressures.
- Laden and unladen axle loads.
- Laden and unladen brake actuator delivery pressures for a control line pressure of 6.5 bar.
- Coupling head pressure when braking should commence.
- Inshot pressure generated when braking should commence.
- Dynamic tyre size.

The diagnostic program ECU*talk*® is the primary means by which the parameters can be written to the TEBS G2.2 Brake Module. This can be achieved by either entering individual parameters into the required fields or by reading the parameter values from a file produced by the brake calculation program BSD; the latter option being more reliable as the possibility of error has been removed. When a TEBS G2.2 module is produced, default parameters are defined so that, in the event that a trailer is inadvertently not parameterised, a level of braking performance will always be available. When a data set of parameters is written to the TEBS G2.2 Brake Module the operators PIN will also be written and stored as a finger print to identify who carried out the parameterisation.

Knorr-Bremse makes available four levels of PIN code access to PC Diagnostics ECU*talk*® as follows:

- Full version for OEMs.
- EOL version for OEMs.
- Service Plus for workshops.
- Service Version for workshops.

Load Sensing Plate

Following installation and parameterisation of the TEBS G2.2 Brake Module it is possible to generate a load sensing plate by using the diagnostic program ECU*talk*®. Legislation requires that such a plate is fitted to all trailers. The plate generated by ECU*talk*® will not only contain information to carry out a check of the load sensing settings but also define additional TEBS G2 Brake Module configuration data and trailer related information. See PD-214-F002, Document No. Y136109.

Diagnostics

The Knorr-Bremse diagnostic program ECU*talk*® is the primary means by which diagnosis of the TEBS G2.2 Brake Module can be undertaken. For further details see PD-214-F355, Document No. Y136135.

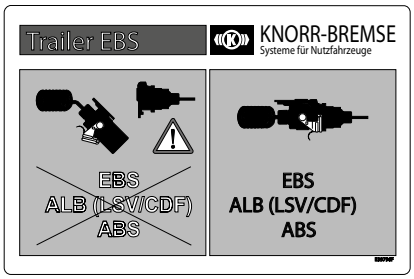
Note:
For more information on ECU*talk*® see the Product Information Document No. Y051496 available at www.Knorr-BremseCVS.com.

Labels

Information sticker, TEBS power supply

Part No.: **II39796F**

Size [mm]: 150 x 100



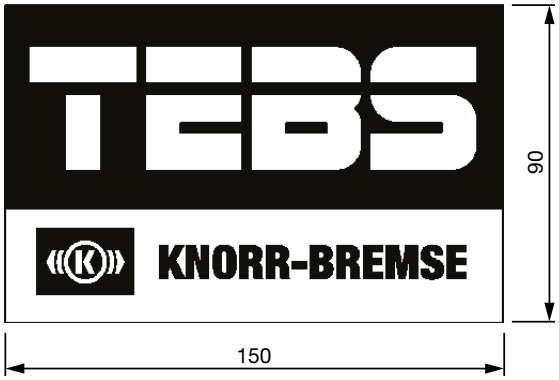
EBS-System Plate [1]:

Part No.: **II39797F**

Size [mm]: 170 x 110

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

K112780



Revision Details

Rev. 005	January 2019	New Layout

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