B-GB23.36
Rev. 00 - 22.10.2015 - en

Description

Brake control module
BCM-081-1

KNORR-BREMSE

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Revision history

Meanings of changes N and R

Type of change		Explanation
N Change **has no** consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change **has** consequences: Preceding revisions are **nil and void**!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3

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1 General information

DANGER
Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
  - to remove and install the unit,
  - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.

NOTE
This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.

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1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:

DANGER
Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.

WARNING
Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.

CAUTION
Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:

DANGER
Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.

NOTE
Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.

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2 Introduction

This Description contains particulars specific to the unit and discusses installation, removal, function testing and maintenance of the unit on board.

2.1 Related documents

B-GA14.37	Description of brake panel BRT861-001
B-OJ21.21	Description of ballcock SK-DN8
GD15904	Regulation "Packing, handling, transport and storage"

The "System Description" valid for the project must be taken into account.

The "Installation drawing" that goes with the unit, as well as the "Technical Information" or the "Data sheet for the installation drawing" must be consulted for technical particulars.

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3 Basic safety information

3.1 Validity

WARNING
Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item number:

II88913/1

NOTE
Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

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3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.

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4 Technical description

The brake control module is an integral part of the electropneumatic air brake and converts incoming brake application and release signals into corresponding pneumatic brake application and release pressures for the brake and spring actuator cylinders.

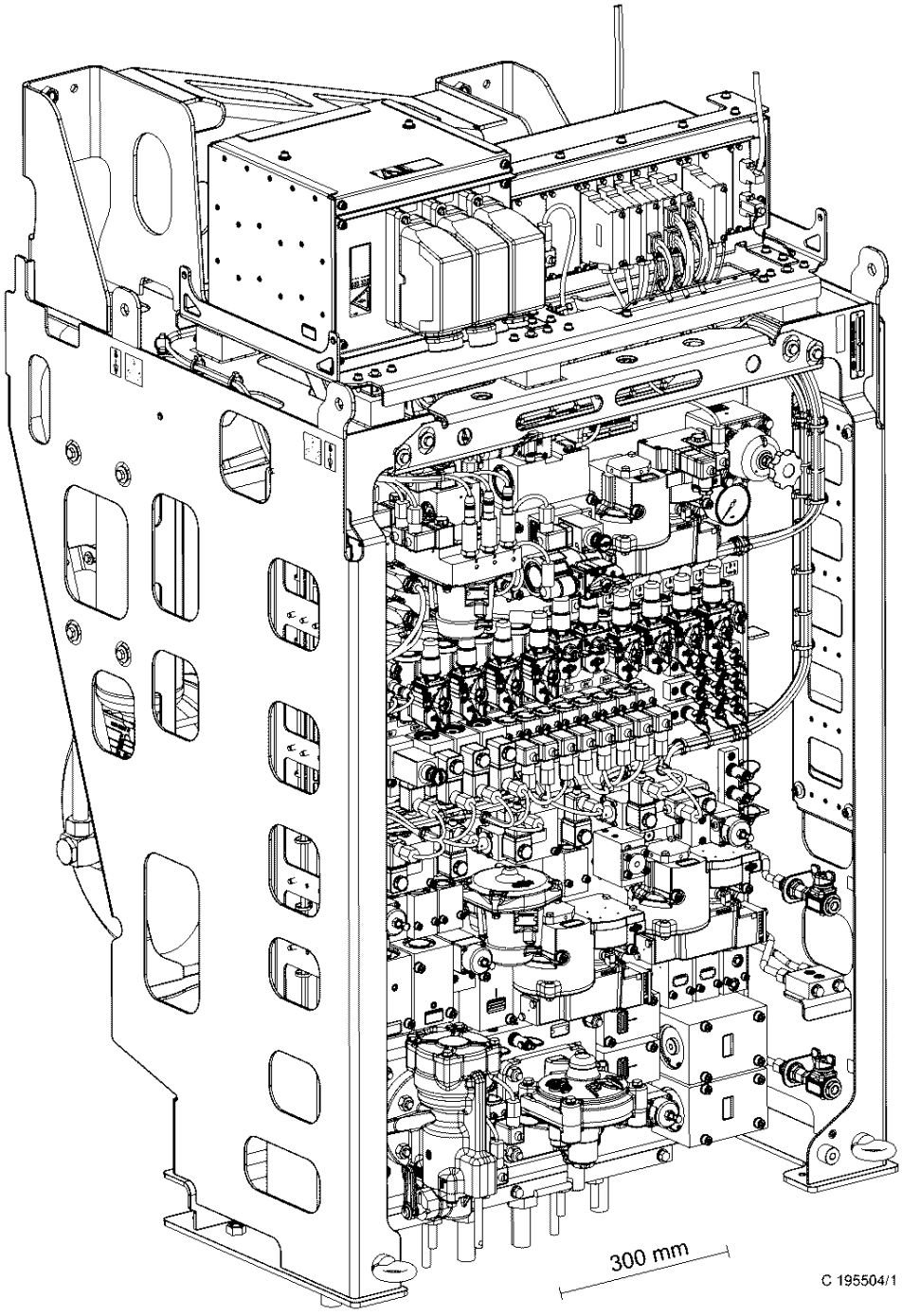

Figure 1 Brake control module BCM-081-1

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4.1 Technical features

The module is distinguished by the following features:

- Straightforward construction
- All functional assemblies are mounted in a compact arrangement on or in a frame.
- The module is quick and easy to exchange.
- Faults can be identified quickly because all functions are united in the module.

For technical particulars to be considered in connection with the unit, please refer to the "Technical Information" or the "Data sheet for the installation drawing".

4.2 Construction

See Figure 2, Figure 3, Figure 4 and Figure 5

The brake control module consists of a combination of several pneumatic and electropneumatic components. These are attached to a common frame (a). The functional interaction of the components is ensured through the piping on the underside of the frame (a).

The module consists essentially of the following components:

- Frame (a)
- Piping (b)
- Brake panel (c)
- Electromechanical assembly (e)
- Bracket (g)
- Air reservoirs (A21, A22, A23 and A24)
- Brake control unit (D37)
- Ballcocks (Z14/1 and Z14/2)

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The module has the following ports:

- BE - Port, IAPR
- BP - Port, BP brake pipe
- BU1 - Port, reserve brake pipe to brake controller of indirect brake
- BU2 - Port, reserve brake pipe to brake controller of indirect brake
- C1 - Port, brake cylinder at bogie 1
- C2 - Port, brake cylinder at bogie 2
- D1 - Direct brake control pressure line
- D2 - Direct brake control pressure line
- ER - Port, equalizing reservoir pipe
- MR - Port, main reservoir pipe
- PC-BU - Port, indirect brake control pressure line
- PI - Port, spring actuator
- PS1 - Port, precontrol pressure from brake controller of direct brake
- PS2 - Port, precontrol pressure from brake controller of direct brake

The ports are designed as free pipe ends. The brake controller (D37) is an integral part of the electromechanical system (e). The module is electrically connected via the interfacing connectors (-X1, -X2 and -X3) on the electromechanical system (e). The module ground terminal (i) is located on the front side of the frame (a).

Two screw plugs (A23* and A24*) for draining the air reservoirs (A23 and A24) are fitted to the drainage bar (l).

Air reservoir (A21) is vented/drained via the ballcock (Z14/2) and air reservoir (A22) via the ballcock (Z14/1).

The frame (a) is fitted with 4 hoisting points (p) for transportation, which are labelled with pictograms. Customer eyebolts can be attached to the hoisting points (p).

The unit is fastened to the vehicle via the two mounting holes Y in the base plate of the frame (a) and the mounting holes X in the upper region of the frame (a).

NOTE
The documents listed in Table 1 deal with the construction of the component assemblies used in the unit.

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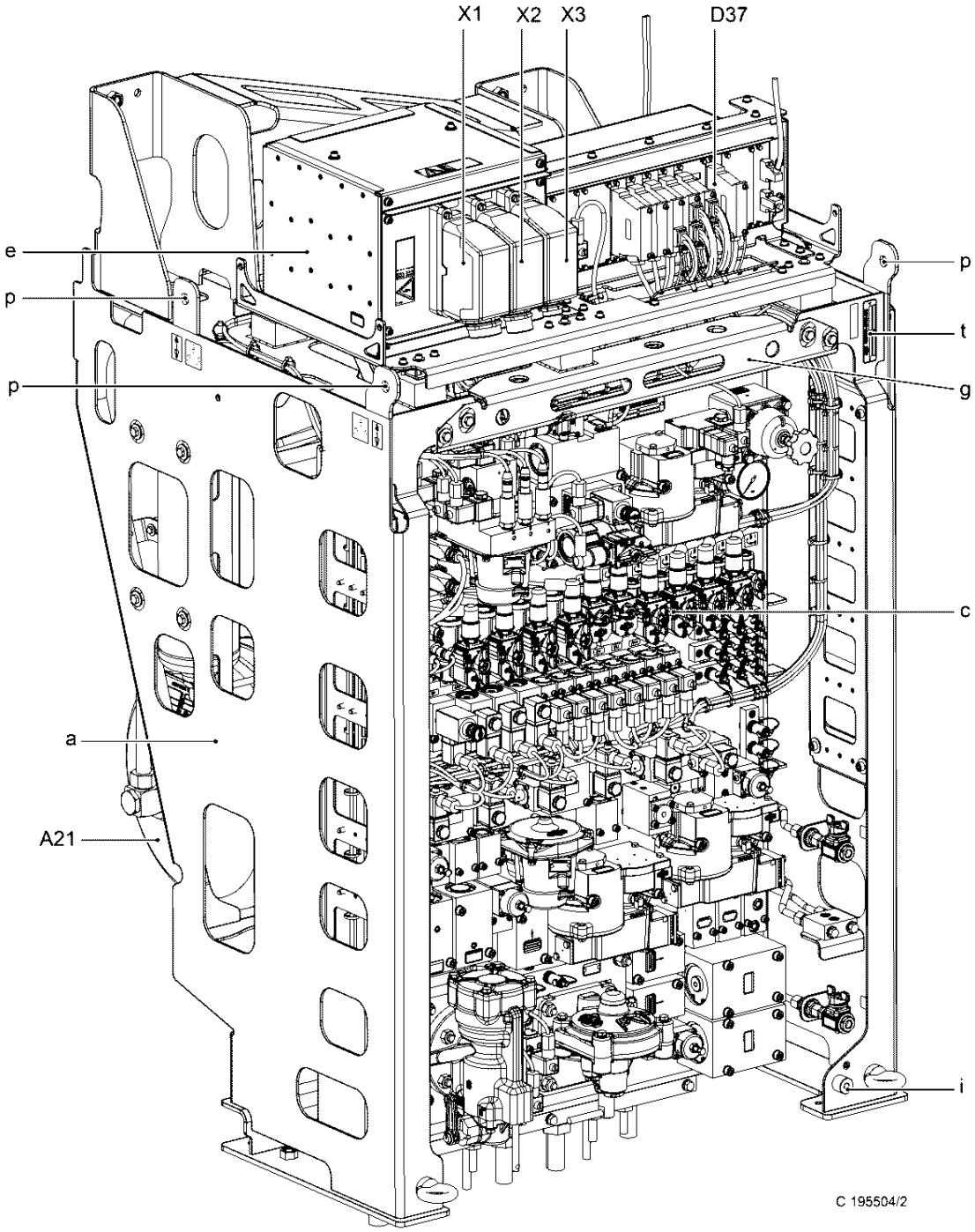

a	Frame	**t**	Name plate
c	Brake panel	**p**	Hoisting point
e	Electromechanical assembly	**A21**	Air reservoir
g	Bracket	**D37**	Brake control unit
i	Ground terminal	**X...**	Interfacing connector

Figure 2 Brake control module BCM-081-1

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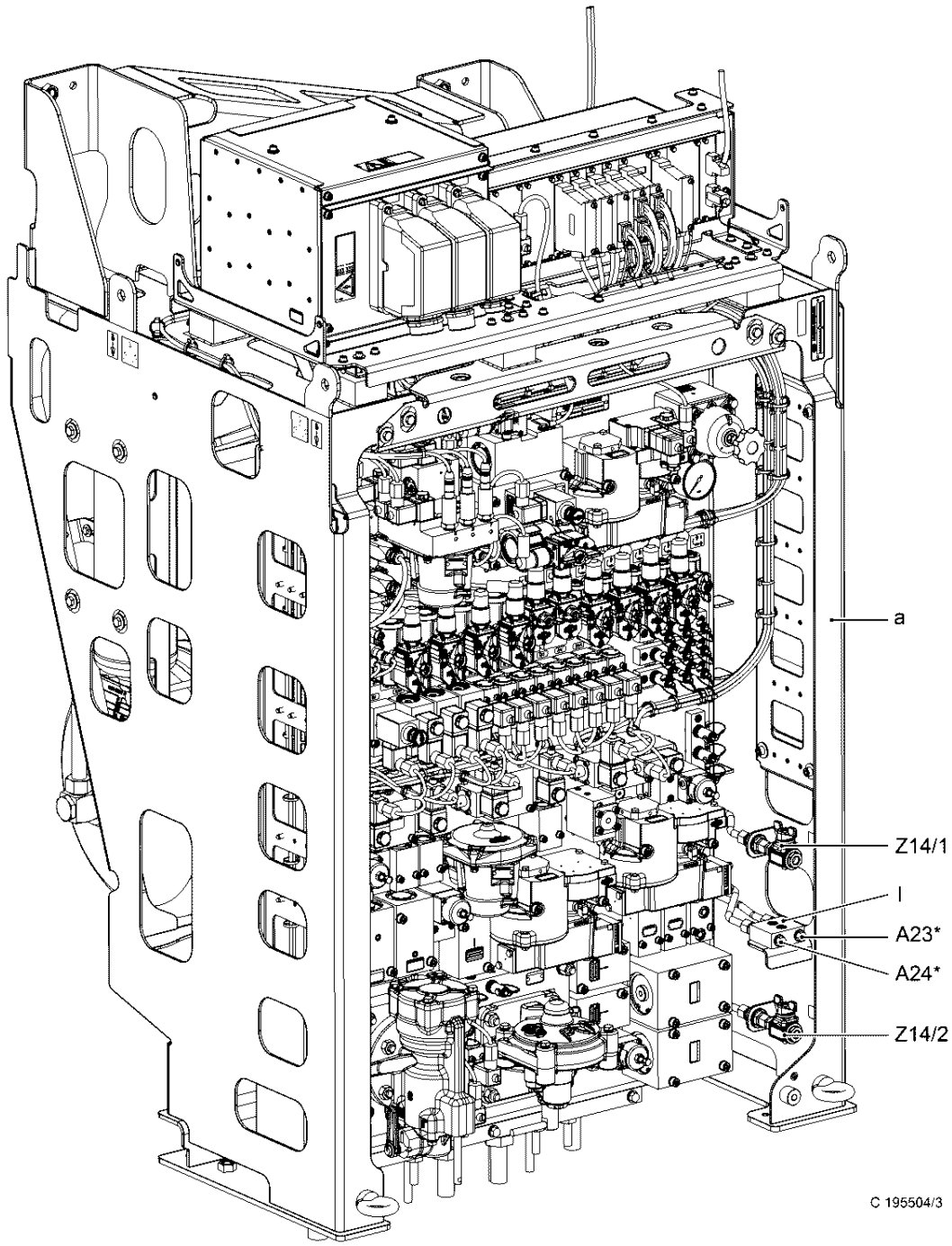

a Frame
c Brake panel
I Drainage bar
Z14/1 Ballcock
Z14/2 Ballcock
A23* Drain plug for air reservoir A23
A24* Drain plug for air reservoir A24

Figure 3 Brake control module BCM-081-1 (Drain)

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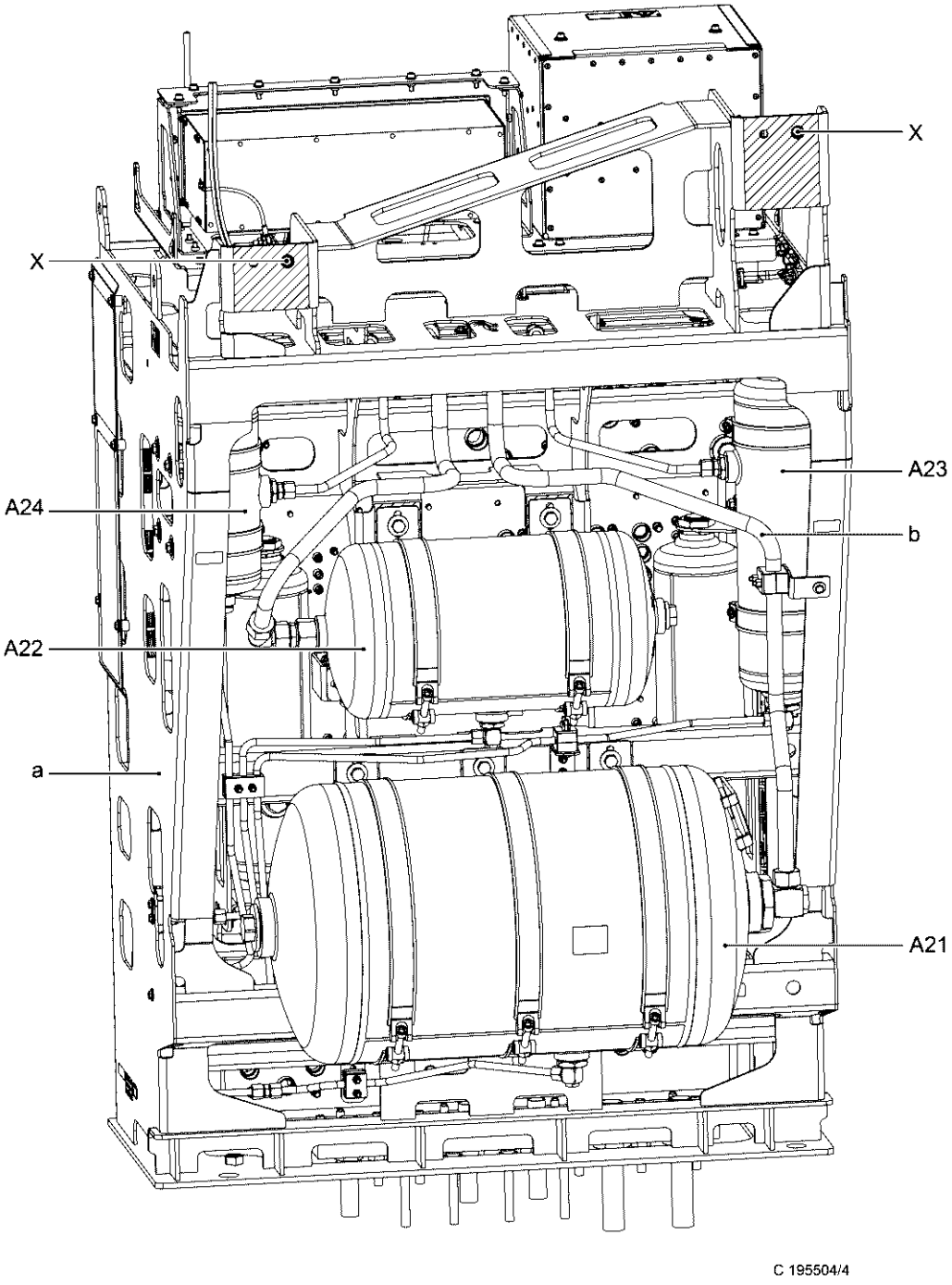

a Frame
b Piping
X Mounting hole
A21 Air reservoir
A22 Air reservoir
A23 Air reservoir
A24 Air reservoir

Figure 4 Brake control module BCM-081-1 (rear view)

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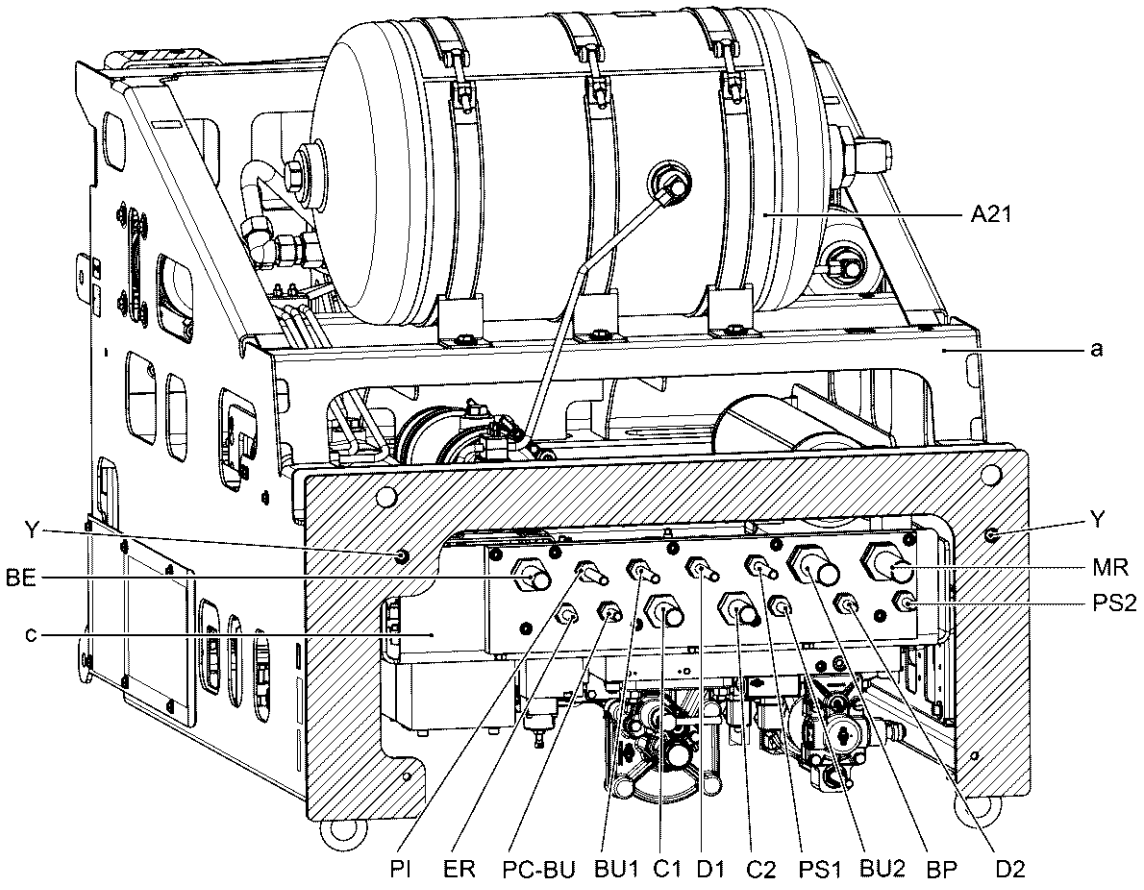

a	Frame
c	Brake panel
Y	Mounting hole
A21	Air reservoir

Ports:

BE	IAPR port
BP	BP brake pipe port
BU1	Port, reserve brake pipe to brake controller of indirect brake
BU2	Port, reserve brake pipe to brake controller of indirect brake
C1	Port, brake cylinder at bogie 1
C2	Port, brake cylinder at bogie 2
D1	Direct brake control pressure line
D2	Direct brake control pressure line
ER	Port, equalizing reservoir pipe
MR	Port, main reservoir pipe
PI	Air supply port - spring actuator
PC-BU	Indirect brake control pressure line port
PS1	Port, precontrol pressure from brake controller of direct brake
PS2	Port, precontrol pressure from brake controller of direct brake

Figure 5 Brake control module BCM-081-1 (ports)

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4.3 Working principle

See Figure 2, Figure 3, Figure 4 and Figure 5

The working principle of the unit is discussed in the project-specific “System Description”.

NOTE
The documents listed in Table 1 deal with the working principle of the component assemblies used in the unit.

Part No.	Component assembly	Document
A21	Air reservoir	C158455/X208
A22	Air reservoir	C181538
A23	Air reservoir	C59028/3X210
A24	Air reservoir	C162365/X
-	Brake panel	B-GA14.47
Z14/1 Z14/2	Ballcock	B-OJ21.21

Table 1 Documents referenced to component assemblies

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5 Removal and installation

DANGER
Beware of a moving vehicle!
A vehicle allowed to move inadvertently will cause personal injury.
It is vital to observe the working rules for arresting a vehicle.

5.1 Installation

CAUTION
Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.

CAUTION
Beware of disregarding the installation instructions!
Safety will be diminished and functions restricted.
Installation instructions and installation drawings must be taken into account.

CAUTION
Beware of installing untested units!
Safety will be diminished and functions restricted.
Make sure that units are always tested before they are installed.
The system must have been tested and found to be in order before the vehicle is cleared for service.

NOTE
Only allowed to be installed are units that
- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.

NOTE
It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

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5.1.1 Requirements

WARNING
Beware of unsuitable lifting gear!
Falling objects will cause personal injuries and damage to equipment.
Do not dwell under hanging loads.
Use suitable lifting tackle.
Attach the lifting gear to balance the unit in its centre of gravity.
Use the allowed points and surfaces for picking up and putting down the unit (see installation drawing).
Use lifting gear that is suited to the weight of the unit.
Observe all the rules and safety regulations for using and handling lifting gear.

NOTE
The brake control module weighs approx. 550 kg.

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricants are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- RENOLIT L20 grease (order number: ID No. 506043)

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5.1.2 Procedure

DANGER
Ports plugged or clogged!
Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.

WARNING
Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.

NOTE
When lifting the module, take care to ensure an even distribution of the load across the 4 hoisting points (p).

- Attach suitable lifting tackle to the module at the hoisting points (p).
- Take the covers off the ports on the unit and off the on-board compressed air pipes.
- Thoroughly clean the ports.
- Position and align the module at the installation location using a crossbar.
- Lubricate the threads of the fasteners with a **thin** film of STABURAGS NBU 30 PTM grease.
- Attach the unit to the onboard mounting bracket in the correct mounting position, using the fasteners in the mounting holes X and Y.
- Remove the crossbar and lifting tackle from the unit.
- Connect the onboard compressed air pipes to the ports as shown in the pneumatic diagram.
- Lubricate the threads of the on-board grounding screws with a **thin** film of RENOLIT L20 grease.
- Attach the onboard ground conductor to ground terminal (i) of the frame (a).
- Plug the onboard power sockets into the interfacing connectors (X1, X2 and X3) and secure by the fasteners.
- Connect the supply of compressed air.
- Connect the power supply.

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5.1.3 Leakage testing

WARNING
Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.
Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal

WARNING
Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.

CAUTION
Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

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5.2.1 Requirements

WARNING
Beware of unsuitable lifting gear!
Falling objects will cause personal injuries and damage to equipment.
Do not dwell under hanging loads.
Use suitable lifting tackle.
Attach the lifting gear to balance the unit in its centre of gravity.
Use the allowed points and surfaces for picking up and putting down the unit (see installation drawing).
Use lifting gear that is suited to the weight of the unit.
Observe all the rules and safety regulations for using and handling lifting gear.

NOTE
The brake control module weighs approx. 550 kg.

The unit can be removed with standard tools.

5.2.2 Procedure

WARNING
Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- Release the fasteners securing the onboard power sockets, and unplug the onboard power sockets from the interfacing connectors (X1, X2 and X3).
- Disconnect the onboard ground conductor from ground terminal (i) of the frame (a).
- Detach the onboard compressed air pipes from the ports on the module.

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NOTE
When lifting the module, take care to ensure an even distribution of the load across the 4 hoisting points (p).

- Attach suitable lifting tackle to the module at the hoisting points (p).
- Unscrew and remove the fasteners from the mounting holes X and Y on the module.
- Use the crossbar to remove the module from its mounting position and set it down securely.
- Remove the crossbar and lifting tackle from the unit.
- Cover up the ports on the unit.
- Cover up the onboard compressed air pipes unless a replacement unit is going to be fitted immediately after removal.
- Protect the onboard electric connecting cables and power sockets and the onboard ground cable from damage.

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6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

NOTE
Inspect the component assemblies as directed in the applicable documents (see Table 1).

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

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6.2 Servicing

See Figure 3 and Figure 4

Drain the air reservoirs (A21 and A22) via the ballcocks (Z14/1 and Z14/2).

Drain the air reservoirs (A23 and A24) via the two screw plugs (A23* and A24*) fitted to the drainage bar (I).

NOTE
The documents listed in Table 1 contain information about servicing the component assemblies.

6.2.1 Interval

Activity	Interval
Draining the air reservoirs (A21, A22, A23, A24)	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*

* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.

6.2.2 Special tools

Not required

6.2.3 Procedure

WARNING
Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.

CAUTION
Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

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The following lubricants are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)

Draining the air reservoirs (A21, A22, A23 and A24)

- Turn off the supply of compressed air, and vent all the compressed air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Place condensate collecting vessels beneath the ballcocks (Z14/1 and Z14/2).
- Place condensate collecting vessels beneath the screw plugs (A23* and A24*).
- Carefully open the ballcocks (Z14/1 and Z14/2) far enough to let the compressed air discharge from air reservoirs (A21 and A22).
- After entirely venting the air reservoirs (A21 and A22), open the ballcocks (Z14/1 and Z14/2) wide.
- Carefully release the screw plugs (A23* and A24*) far enough to allow compressed air to discharge from the air reservoirs (A23 and A24).
- Completely unscrew the screw plugs (A23* and A24*) from the drainage bar (l) after entirely venting the air reservoirs (A23 and A24).
- Drain off the condensate into the vessels placed in readiness and dispose of the condensate in an environmentally correct manner.
- Close the ballcocks (Z14/1 and Z14/2) again after the condensate has been drained.
- Lubricate the sealing rings of screw plugs (A23* and A24*) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the threads of the screw plugs (A23* and A24*) with a **thin** film of STABURAGS NBU 30 PTM grease.
- After fully draining the condensate, screw the screw plugs (A23* and A24*) back into the drainage bar (l).
- Connect the supply of compressed air.

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6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

NOTE
The documents listed in Table 1 contain information about repairing the component assemblies.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

NOTE
The documents listed in Table 1 contain information about overhauling the component assemblies.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*

* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.

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7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

NOTE
The documents listed in Table 1 contain information about debugging the component assemblies.

7.1 Special tools

Not required

7.2 Procedure

NOTE
If the problem can be traced to specific component assemblies with the help of the pneumatic diagram, then the Descriptions relating to those component assemblies (see Table 1) will be required as support for debugging.

Problem	Cause	Remedy	See
Invalid or no output pressures	Brake control module not being activated pneumatically	Test the brake control module for correct pneumatic control.	
	Brake control module not being activated electrically	Check the electric connections to the brake control module.	
		Test the brake control module for correct electric control.	
	Individual units not being activated electrically	Check the plug connections to the component assemblies.	
		Test the component assembly for correct electric control.	
	Brake control module defective	Remove the brake control module and submit for repair.	Section 5.2
Compressed air discharging constantly from the ports of the brake control module	Connections leaking	Tighten the connections (apply the specified tightening torque!) and test for leakage.	Section 5.1.3
	Brake control module defective	Remove the brake control module and submit for repair.	Section 5.2

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Problem	Cause	Remedy	See
Compressed air discharging constantly from the ports of the component assemblies	Seals defective	Remove the unit, exchange the seals, install the unit and test for leakage.	Related documents Table 1
	Fastening screws loose	Tighten the fastening screws (apply the specified tightening torque!) and test the compressed air connections for leakage.	Related documents Table 1
	Connections leaking	Tighten the connections (apply the specified tightening torque!) and test the compressed air connections for leakage.	Related documents Table 1

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8 Disposal

CAUTION
Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

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