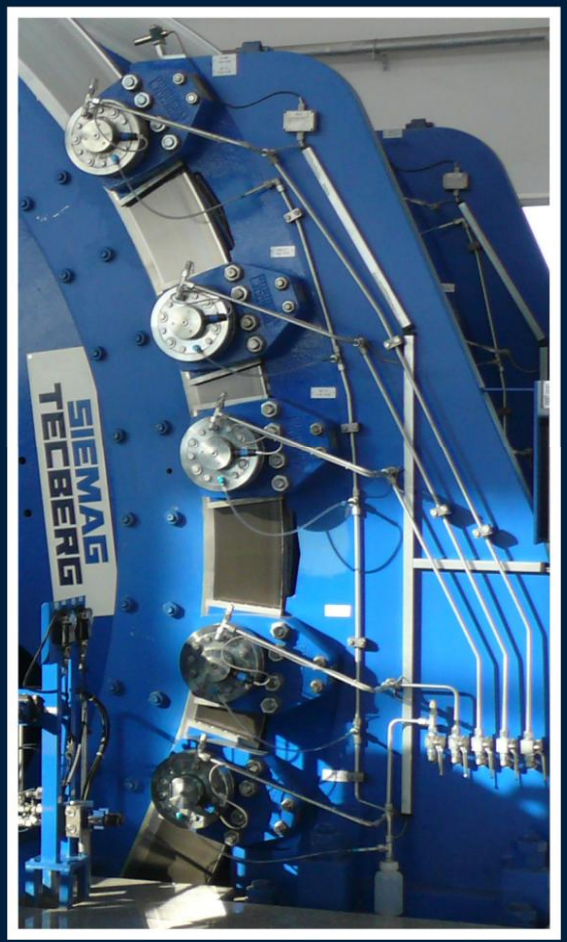
SIEMAG TECBERG

Operating Manual

Brake Unit BE100
with/without Flush Connection

Revision 1.3



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1 Information about this Manual

This chapter provides you with a short overview of the structure of this Operating Manual and describes how to use the manual most effectively. This manual is an integral part of the product and is supplied by the manufacturer of the machinery (installation), system and element (component) of the hoisting plant, later on referred to as MSE of the hoisting plant.

1.1 Purpose of this Documentation

This documentation is intended to familiarize the operator with the brake unit's safe operation and maintenance. It contains the necessary information for safe operation of the brake system.

The manual contains important information about residual risks in association with the operation of the MSE of the hoisting plant, how to avoid such risks, and information about possible malfunctions and their rectification.

1.2 Target Group

The manual is intended for all operators authorized by the asset owner.

1.3 Set of overall documentation

The complete documentation for the brake system consists of:

- Operating manual
- Electrical documentation
- Hydraulic documentation
- Appendix with Drawings
- Related documents

1.4 Abbreviations

Abbreviations	Description
MSE	Machinery(installation); System; Element(component)
FWL	Operation monitor with linear displacement sensor
FVM	Operation monitor with microswitches

Table 1: List of abbreviations

1.5 Manufacturer and Service

Manufacturer	SIEMAG TECBERG GmbH Kalteichering 28-32 35708 Haiger, Germany Phone: +49 2773 9161-0 Fax: +49 2773 9161-300 Web: www.siemag-tecberg.com Email: info@siemag-tecberg.de
Service	SIEMAG TECBERG GmbH, Germany

Table 2: Manufacturer details

1.6 Product Description

The hydraulically released, spring-loaded brake unit BE 100 is designed for use with hoists, cableways, cranes and passenger and freight elevators.

The brake unit can be used as a safety brake, service brake and parking brake. It is fully enclosed and is suitable for use under the toughest of operating conditions. One of its special technical features is its accurate adjustability.

The braking force is generated by disc spring assemblies. The disc springs are designed to be fatigue resistant for more than 2 million load cycles. The brake linings are made of asbestos-free material.

The braking force can be regulated hydraulically. A reduction of the pressure in the hydraulic system increases the braking force accordingly. This is of particular importance when the unit is used as a safety brake: In the event of a

malfunction, e.g. power failure, the remaining pressure in the system can be used to generate a previously set, or even an adjustable braking force, which ensures controlled stoppage.

The operational reliability of the brake unit can be permanently monitored for proper function, wear and spring breakage by means of displacement sensors or microswitches.

The braking force is infinitely adjustable. The disc spring stacks can be changed without having to remove the brake element. The design allows long periods between re-adjustments, as the wear limit is not prematurely reached because of graduated adjustment or backlash movements. The air gap can be measured at any time with a minimum of time and effort by means of displacement sensors.

Brake elements **with flushing connection** are additionally fitted with an inverted pressure and leakage connection. The second pressure/flushing connection (i.e. the upper connection) is intended for flushing the brake elements. Thanks to redundancy of connections a right-hand/left-hand design is not required. Existing BE 100 system and spare parts orders related thereto will come also in future without flushing connection.

In Germany, the brake unit is approved by the Board of Mining and is thus included in the „Directory of Approved Components for Shaft and Inclined Haulage Equipment“.

The brake unit consists of the following components:

- Brake posts and brake elements of the BE 100 Series
- Hydraulic system
- Electric brake control system.

The components are tailored to the hoist to guarantee safe braking, both in normal operation and in a safety braking situation, whereby the relevant regulations are always taken into consideration.

The braking force is introduced in a controlled manner to protect the hoists.

1.7 Working areas

1.7.1 Operational Personnel

The operator is a person authorized by the owner who operates the hoisting plant in normal operation.

The Operator bears the responsibility for the machine:

- Their instructions are to be obeyed,
- The operator must have the permission to reject adverse safety instructions of third parties.

The operator is responsible for wearing his personal protective equipment.

1.7.2 Installation Personnel

The installation of the MSE of the hoisting plant unit must be carried out under supervision of SIEMAG TECBERG personnel in accordance with local regulations and the safety guidelines in this manual.

1.7.3 Maintenance Personnel

The maintenance of the BE100 brake unit must be carried out periodically or after an operational disturbance and exclusively by trained personnel in accordance with local regulations and the safety guidelines in this manual.

1.8 Work Safety Regulations

This operating manual contains instructions to operate and maintain the BE100 brake unit.

Regulation	Description
BGV / UVV	Accident prevention regulations issued by the German Employer‘s Liability Insurance Association
BVOS	Mining Ordinance for Shaft and Inclined Haulage Installations
TAS	Technical Requirements for Shaft and Inclined Haulage Installations

Table 3: Applicable Work Safety Regulations

1.9 Compliance with Standards

Standard	Description	Date
TAS	Technical Requirements for Shaft and Inclined Haulage Installations	2005-12
BBergG	German Federal Mining Law	1980-08
ElBergVo	Mining Electrics Ordinance	
DIN EN 61800-3	EMC requirements and specific test methods (IEC 61800-3:2004 + A1:2011)	2005-07
DIN EN ISO 12944-4	Surface characteristics and preparation	1998-07
DIN EN 61082-1	Preparation of documents used in electro technology	2007-03
DIN EN 60947-5-1	Low-voltage switchgear and control gear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	2010-04
DIN EN ISO 13920	Welding - General tolerances for welded constructions - Dimensions for lengths and angles; shape and position	1996-11
DIN 15018-1	Cranes (principles relating to steel structures and calculation)	1984-11
DIN 18800	Steel structures (calculation and design)	2008-11
DIN EN ISO 1302	Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation	2002-06
TBN 200	SIEMAG TECBERG factory standard	2012-02

Table 4: Compliance with standards

1.10 Standards for lubricants and auxiliary

Standard	Description	Date
DIN 51524-2	Pressure fluids - Hydraulic oils - Part 2: HLP hydraulic	04/2006

Standard	Description	Date
	oils; Minimum requirements	
DIN 51524-2/B1	Pressure fluids - Hydraulic oils - Part 2: HLP hydraulic oils; Minimum requirements, Corrigenda to DIN 51524-2:2006-04	09/2006
DIN ISO 3448	Industrial liquid lubricants – ISO viscosity classification	02/2010
DIN 51818	Lubricants; consistency classification of lubricating greases; NLGI grades	12/1981
DIN 51517-3	Lubricants – Lubricating oils – Part 3: Lubricating oils CLP; Minimum requirements	08/2011
DIN 51502	Designation of lubricants and marking of lubricant containers, equipment and lubricating points	08/1990

Table 5: Standards for lubricants and auxiliary

1.11 Type plate

The type plate is attached on the steel framework and contains the following information on the product:

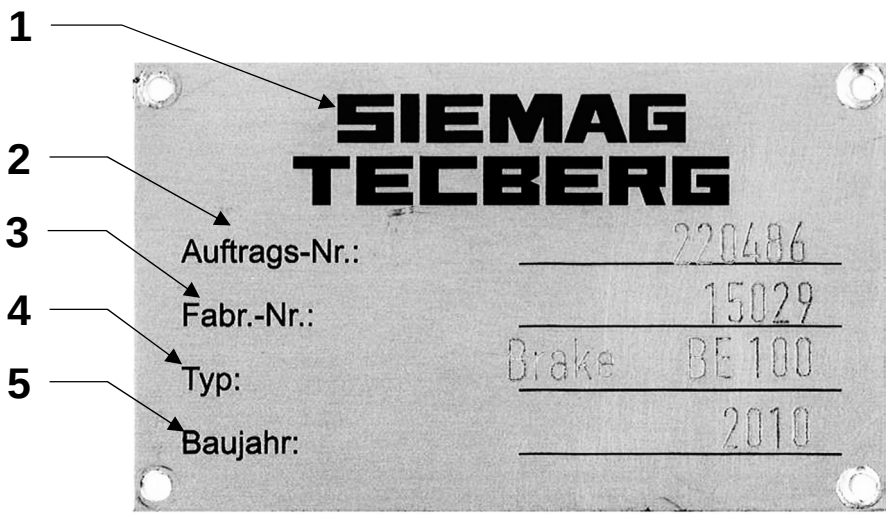


Figure 1: Type plate (**exemplified view**)

(1) Manufacturer
(2) Order number
(3) Serial number
(4) Type/Model
(5) Year

1.12 Technical data BE 100

(*) All data refer to 1 set of brake calliper = 2 brake elements	BE 100
Nominal application force (with x mm release gap)	2 x 100 kN (L=3,0 mm)
Brake force with friction coefficient µ=0,40	80 kN (L=3,0 mm)
Standard release gap (without / with wear)	2,0 - 3,0 mm
Range of possible release gaps (L)	1,0 ... 5,5 mm
Readjustment in case of x mm wear (standard)	x =1,0 mm
Hydraulic operating pressure	140 bar
Max. surface pressure of brake lining with min. release gap L	1,5 MPa = 150 N/cm2
Oil volume per x mm stroke	2 x 10,5 cm3 x L
Weight per caliper	2 x 175 kg
"Overall dimensions (L x W x H) incl. brake lining and operation controller"	460 x 360 x 340 mm
Brake lining (type/coefficient of friction)	asbestos-free / µ>= 0,4
Pressure oil connection	G 3/8“
Leak oil connection	G 1/4“
Flush connection	G 3/8“
Number and size of bolts	"4 x M33 and 2 x M24 - 10.9"
Distance from center brake element to outer edge brake disk	125 mm
Effective brake disk diameter(for brake calculation)	d_a brake disk - 250 mm
Approx. distance between contours of brake disk and brake stand	5 mm
Thickness of brake stand plate	Thickness of brake disk + 30 mm

Table 6: Technical Data BE 100

1.13 Performance data of one brake unit

Lifting distance L (air gap)	Application force	Braking force
[mm]	[kN]	[kN] (μ = 0,40, etha η = 1,0)
2,0	209,5	83,8
3,0	200,0	80,0
4,0	190,5	76,2
5,0	181,1	72,4
5,5	176,4	70,6

Table 7: Performance data of one brake unit (= 2 brake elements)

Usually, with new non-worn out brake linings, the lifting distance (travel) from the brake disc is set to 2 mm.

Taking into account the admissible brake lining wear (standard: 1 mm) the brake unit reaches its maximum nominal application force of 2 x 100 kN at a lifting distance of 3 mm.

In specific cases, each air gap may be set up to 5,5 mm, on condition that the respective calculation values are being considered in the brake calculation.

2 Safety Information

2.1 Product Safety Information

The BE100 has been designed and manufactured by SIEMAG TECBERG in accordance with state-of-the-art technology and recognized safety regulations. There is nevertheless a residual risk of hazards to the life and health of the operator and material damage to the machine and the shaft facility when using the friction winch.

When operating the MSE of the hoisting plant, hazardous voltages, high hydraulic pressures, moving and rotating parts are present, all of which could be a potential source of danger. It is therefore imperative that you comply with all of the safety instructions given in this manual. Failure to heed the safety instructions can result in death, serious injury and major material damage!

To avoid hazards, all operators of the BE100 must heed the following:

- Before putting the MSE of the hoisting plant into operation, all operators must be given adequate, professional training for this machine.
- Only duly qualified and authorized personnel may work on the MSE of the hoisting plant or in its vicinity.
- Before using the MSE of the hoisting plant for the first time, make sure that you are familiar with all warnings and safety instructions given in the documentation.
- All warning signs must be in a good legible condition and must be properly affixed to the MSE of the hoisting plant and its components.
- The MSE of the hoisting plant may only be used when it is in perfect technical condition, in compliance with this operating manual.
- The MSE of the hoisting plant must not be used for any purpose for which it is not intended (improper use).
- Safety equipment must be available to the operator at all times and must be in perfect working order.
- The MSE safety devices must not be damaged and must be in perfect working order.

Obligation to Read

The owner and the operator of the MSE of the hoisting plant have an obligation to read this operating manual and to heed the information and instructions given therein and to implement them accordingly.

All operators must read this operating manual prior to putting the machine into initial operation.

Safekeeping Obligation

This operating manual must be available to every operator at all times.

Safekeeping Location

At least one fully legible copy of this operating manual must be kept at the MSE of the hoisting plant in an easily accessible location.

2.2 Setup and Presentation of the Safety Instructions

The safety instructions in this manual are set up as follows:

⚠ DANGER

Type and source of the hazard.

Possible injury and consequences of the hazard!

· Measures for averting the danger and compliance with prohibitions.

Warning Levels

The following different warning levels appear throughout the manual and are labelled with the appropriate signal word accordingly:

DANGER	Imminent risk of potentially fatal injury
WARNING	Potential risk of fatal or serious injury
CAUTION	Potential risk of injury
ATTENTION	Potential risk of material damage

Below you will find examples of the four warning stages and/or their safety instructions:

The signal word DANGER is the highest warning level and indicates imminent danger. Failure to avoid this hazard will result in death, e. g.:

⚠ DANGER

Electric shock from exposed cables.

Risk of death as a result of electric shock and burns!

· Always keep a safe distance away from the cables and never, under any circumstances, touch the cables.

The signal word WARNING is the next lower warning level and indicates a potentially dangerous situation, which, if not avoided, could result in death or serious injury, e. g.:

⚠ WARNING

Risk of getting crushed under falling loads.

Risk of fatal or serious bodily injury due to crushing!

- Do not stand under suspended loads
- Always keep visual contact with suspended loads.

The signal word CAUTION is a warning level that indicates a potentially dangerous situation, which, if not avoided, could result in less serious or minor injury, e. g.:

⚠ CAUTION

Risk of injury due to falling

- Always keep all walkable areas of the machine clean.
- When walking on the machinery, always hold on with one hand.

The signal word NOTICE indicates a potentially damaging situation (material damage), which, if not avoided, can result in damage to the product or something in its vicinity, e. g.:

NOTICE

Risk of damage to the hydraulic outriggers.

- Do not initiate any movements at the front and back hydraulic outriggers until all transport locks (chains, bolts) have been removed. The high hydraulic forces would result in total destruction of these safeguards.

2.3 Proper Use/ Improper Use

2.3.1 Proper Use

The brake unit is a fully enclosed, hydraulic, passive brake. It is designed for use with hoists, cableways, cranes and passenger and freight elevators and can be used as a safety brake, service brake, and parking brake.

Proper use also includes strict compliance with all instructions given in the operating manual and adherence to the prescribed inspection and maintenance intervals.

- As regards the electro-magnetic behavior the system is designed for its use in an industrial environment. Private use is completely excluded.
- Use only genuine spare parts and accessories from SIEMAG TECBERG.
- Only use the MSE of the shaft hoisting installation for its intended utilization in a technical perfect condition and within the technical performance limits!
- Always adhere to the working instructions related to individual work processes and the regulations for the proper use of protective personal protection equipment.
- Modifications or alterations to the MSE of the hoisting plant may only be made after prior consultation with SIEMAG TECBERG and written authorization from the company SIEMAG TECBERG.
- Make sure that suitable tools and apparatus are available for the maintenance jobs.
- Only use appropriate tools and measuring appliances to carry tour the maintenance works.
- The schedule for maintenance is to be kept
- Employ only personnel, who have been approved and trained by the manufacturer, to inspect and repair the MSE of the hoisting plant.
-
- In the case of faults or malfunctions the MSE of the hoisting plant is immediately to be repaired by authorized personnel.
- Repair and maintenance works as well as replacement of the MSE of the shaft hoisting installation is subject to prior written approval of SIEMAG TECBERG GmbH. Only qualified and training personnel is authorized to execute such works.
- The use of the MSE of the shaft hoisting installation is exclusively considered to be in compliance with the intended utilization if spare and wear parts as well as auxiliary materials and utilities are used which have been approved by SIEMAG TECBERG GmbH.

2.3.2 Improper Use

Improper and inexpert use of the MSE of the hoisting plant can result in serious injury to people and major material damage. It is imperative that you comply with all of the safety instructions given in this manual.

The MSE of the hoisting plant must not be used in the following circumstances or for the following purposes:

- The technical capacity of the MSE of the hoisting plant must never be exceeded. The limits specified in “Technical data” must be strictly adhered to.
- Activities on the MSE of the hoisting plant by non-instructed personnel.
- Non-observance of operator’s instructions.
- Non-observance of the operating instructions.
- After unauthorized modification or changes made to the MSE of the hoisting plant and its components (without prior written authorization from the manufacturer).
- With deactivated or bypassed safety devices (e.g. limit switches, valves, signal transmitters, etc.).
- Utilization spare & wear parts as well as auxiliary materials and utilities not approved by the manufacturer.
- For any purpose not falling under the intended use.
- With safety devices, which
  - are incomplete,
  - are not properly installed,
  - are not fully functional,
  - have been temporarily removed or rendered inoperable.

The safety devices must be correctly installed and tested for proper function. Only authorized and trained specialist staff may check the security devices.

2.4 Residual Risks

2.4.1 Electrical System

The hoisting plant is operated with hazardous currents and must be adequately earthed.

Look out for live, unshielded and exposed cables.

- There is a risk of fatal danger by voltages up to 500V!

Electric shocks and burns can cause serious personal injury and material damage to the shaft.

2.4.2 Hydraulic System

The brake unit is operated with high hydraulic pressures. Make sure that all pressurized components are in perfect working order and are not leaking. Sudden loss of pressure and spurting hydraulic oil can cause serious personal injury and damage to the MSE of the hoisting plant.

2.4.3 Mechanical Components

Moving machinery can result in serious injury or property damage, e.g. hazards from entanglement, entrapment, punch, cuts and slippery.

These hazards always occur when people come into contact with moving machinery or hoisting ropes.

Warning! *Always wear close-fitting clothing. Loose clothing may be pulled into the moving machinery and result in serious injury.*

- Provide protective fencing and retaining systems around the MSE of the shaft hoisting installation and the working areas in order to limit the access to the hazardous areas.
- Ensure that non-authorized staff is not allowed to approach the MSE of the shaft hoisting installation and related working areas.

2.4.4 Temperature

The various hydraulic components can get very hot in the course of operation for longer periods of time. There is therefore a risk of sustaining burning injuries in the event of carelessness.

2.4.5 Supplies - Lubricants

Use only lubricant and hydraulic oil approved by the manufacturer to operate the machinery Incorrect and dirty supplies can damage the machinery. Highly inflammable supplies can cause fires, resulting in serious personal injury and damage to the mine shaft.

2.4.6 Defective Safety Devices

Never render safety devices inoperable. Do not make any modifications to them. Before putting the machinery into operation, find out the function and location of all safety devices (e.g. Emergency Stop buttons).

2.4.7 Exceedance of the Operating Range

The limits of the specified technical data must not be exceeded.

2.5 Preventive accident measures

Only authorized staff is allowed to stay within the shaft area housing the MSE of the shaft hoisting installation.

2.5.1 Preparatory maintenance measures

Prior to start any maintenance work determine the entire scope of maintenance works. Both the responsible maintenance staff for the electrical and mechanical part of the works shall define the instructions to release the maintenance activities, e.g.

- Secure the working area
- Move all moving machinery within the working area (e.g. the conveyance) in a locked safe position.
- Switch off all electrical appliances in the working area (e.g. the winder) and prevent unauthorized activation.
- Likewise secure monitoring appliances and peripheral electrical drives.
- Important instructions relating to maintenance works:
- The authorized staff is entitled to remove the safety devices. Upon termination of the works ensure that the devices are put into the original condition.
- There is a risk of staff falling from a height while working on the MSE

  of the hoisting plant. Ensure that the hazardous area and the working staff is protected against falling risks, e.g. cover working platforms and/or provide scaffolding and/or barriers.

- Prior to attach material or loads to any lifting machinery ensure that the carrying capacity is sufficient. In particular, take care of a safe attachment and distribution of masses while lifting or moving loads.

Take care to prevent loads from rotating. Only use approved attachments and lifting gears.

- Ensure that fire extinguishers are nearby while performing grinding or burning works.

2.5.2 Safety devices

Protect hazardous areas of platforms by using the following equipment:

- Covers / safety grating
- Ladders
- Safety railings

Depending on the works the following safety measures must be taken while working on the MSE of the hoisting plant:

- Ensure that railings, stairs, platforms, crossings, runways and coverings are in a proper condition and regularly check the systems for safety. Secure standing positions are a prerequisite to carry out repair works.
- Upon termination of repair and maintenance works place again all safety devices, railings, chains, guards, coverings, etc. in their position.
- Remove all tools, bolts, planks and other auxiliary material from the area where the repair works have been carried out.
- Ensure sufficient lighting of all under floor working areas or areas which are not easily accessible.

2.5.3 Emergency Switches

Each emergency switch is manually activated by pressing it down.

Only put the MSE of the hoisting plant into operation if:

1. the cause of the fault is eliminated
2. each activated emergency switch is unlocked.

Only trained and qualified staff is authorized to remedy faults on the machine.

NOTE
Ensure to know very well where the emergency switches of the shaft hoisting installation are located!

With regard to the location of emergency switches please refer to the documentation of the electrical system!

2.6 Safety Compliant Behavior

2.6.1 Mine Shafts

There are generally particular risks associated with working in and around mine shafts.

- Always work with great attention and extreme caution.

The applicable national, regional and local laws, mining regulations and provisions with regard to accident prevention, health and safety, environmental protection and the handling of hazardous substances must be heeded and complied with.

2.6.2 Safety braking

The safety braking can be manually released on the operator's desk.

The shaft hoisting installation shall only be put into operation if

1. the cause of the fault is eliminated
2. each activated emergency switch is unlocked.

Only trained and qualified staff is authorized to remedy faults on the machine.

IMPORTANT! *With regard to the location of emergency switches please refer to the documentation of the electrical system!*

2.6.3 How to handle Hoist Ropes

The safety of staff directly depends on the proper condition of the hoist ropes:

- NEVER use damaged hoist ropes!

2.6.4 Emergency Information

- Make sure that all concerned parties know the location(s) of and how to operate the firefighting equipment!
- The fire alarm and firefighting procedures must be heeded!
- All emergency measures are to be made well-known.
- Escape routes, emergency exits and assembly stations are to be made well-known and marked.
- The location of the first aid box(es) is to be made well-known and marked.

2.7 Organizational Matters, Personnel

In this manual, differentiation is made between the owner, the operator of the machine and supervisor described herein. These groups have different tasks and functions and must correctly fulfill these tasks and functions to ensure trouble-free and safe operation of the hoisting plant and to protect the operator from residual risks while using the MSE of the hoisting plant.

2.7.1 Owner

The manufacturer delivers the machine to the owner and defines certain tasks and conditions for the operation of the MSE of the hoisting plant. As the manufacturer's contractual partner, the owner is legally obliged to fulfill these tasks and conditions.

Before Initial Operation

Before putting the MSE of the hoisting plant into operation for the first time, a workplace hazard analysis must be conducted for all operators, taking the following into consideration:

- The specific workplace conditions. These include, among other things:
  - Potential sources of danger for the operator at the location at which the MSE of the hoisting plant is to be used.
  - Applicable national, regional and local laws, regulations and provisions with regard to accident prevention, health and safety, environmental protection and the handling of hazardous substances.
  - Compliance with the applicability and regulations regarding personal safety gear for the operator.
  - Compliance with road traffic regulations when transporting the MSE of the hoisting plant.

- The Operator must make this operating manual available to ever operator of the MSE of the hoisting plant.

During Operation

To ensure subsequent safe and economic operation of the MSE of the hoisting plant, the operator has the following obligations:

- Observance of and compliance with all of the manufacturer's instructions.
- Read the latest version of the operating manual and ensure that it is available to the operator at all times.
- Proper instruction, certification, supervision and training of the operators.
- Ensure availability and use of personal protection equipment (PPE).
- Planning, execution and monitoring of all safety measures needed for trouble-free and safe use of the MSE of the hoisting plant.
- Proper use of the MSE of the hoisting plant.
- Ensure that all warning signs are mounted at the MSE of the hoisting plant and are fully legible, and that they are kept in a legible condition.
- Ensure that no modifications or conversions of any kind are undertaken on the MSE of the hoisting plant.

Record-Keeping Requirement

Information about the operation and safety of the MSE of the hoisting plant must be documented.

2.7.2 Operator

Operators are those people authorized by the owner to operate and maintain the MSE of the hoisting plant. An operator must have the required technical and professional qualifications – approved for mining purposes – to perform these tasks (e.g. certified electricians, engineers, machine fitters, or machine mechanics).

Before Initial Operation

Before putting the MSE of the hoisting plant into operation for the first time, the operator must be properly trained for his duties and must be given instruction on the machine. He must know the possible residual risks and hazards associated with the machinery and must be familiar with his work environment. He has, among others, the following obligations:

- The operator must comply with local accident prevention regulations and internal operating regulations issued by the owner of the machinery.
- The operator must read this operating manual and must comply with all of the instructions and information contained herein.
- He must familiarize himself with the functions of all equipment and operating elements.

During Operation

The operators authorized by the owner are – within the framework of their duties – responsible for trouble-free and safe handling and operation of the MSE of the hoisting plant. This means, among other things that:

- Operators must wear/use their personal protection gear on their own authority.
- They may only use the MSE of the hoisting plant for the purpose for which it is intended and when all safety devices are in proper working order.
- They must not undertake any modifications or conversions to the MSE of the hoisting plant.
- In the event of faults and malfunctions they must inform the manufacturer's service technicians or customer service department.

2.7.3 Operator Duties

- Only use the MSE of the hoisting plant when it is in technically perfect condition – in compliance with the instructions in this operating manual.
- Only use the MSE of the hoisting plant when all safety devices are present and are in proper working order (e.g. Emergency Stop switches).
- Familiarize yourself with the functions of all equipment and operating elements. Pay attention to control and monitoring indicators.
- Do not undertake any modifications or conversions of any kind on the MSE of the hoisting plant.
- Do not change the settings of control elements, safety devices, valves, etc..

3 Functional description

The brake force generators BE100 are mounted to the brake posts.

3.1 Brake system, field of application

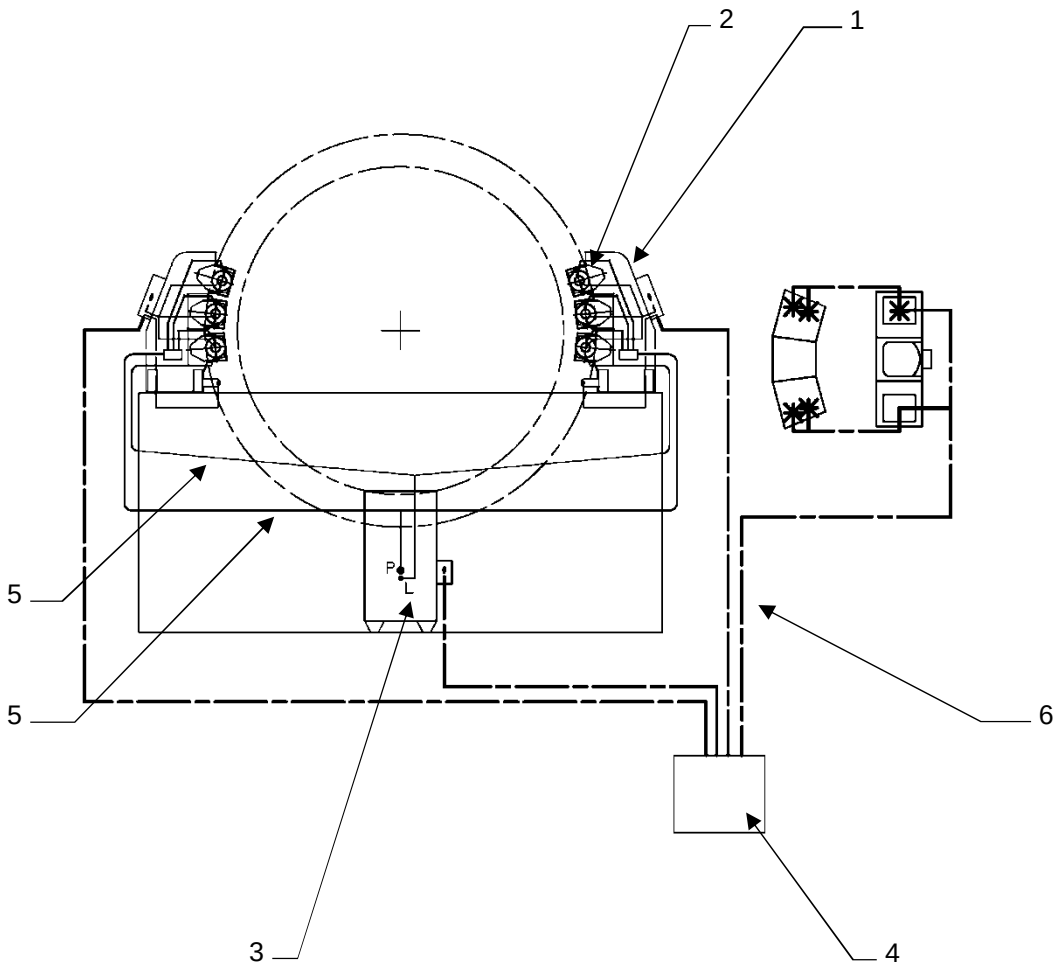


Figure 2: Brake unit

1 Brake post
2 Brake force generators (brake element)
3 Hydraulic unit
4 Electrical control unit
5 Pipes
6 Electrical cabling

The brake unit BE100 is a disc brake without linkage, working as a so-called outlet brake, i.e. the brake force is generated automatically and positively by spring force, and controlled and measured out by counterforce; this antagonistic force is produced by the remaining oil pressure and the hydraulic and electrical control systems.

Two brake force generators (= 2 brake elements = 1 brake unit) arranged facing each other transmit the brake force directly to the brake disc; the asbestos-free brake lining installed makes sure that the required friction coefficient of ≥ 0,4 is observed.

The brake force generators - in his case the brake units BE100 - form an integral part of the brake system described herein (see Fig. 2).

- The brake force generators BE100 (2) are mounted to the brake posts (1). The brake force is generated by disc springs assemblies and is controlled by hydraulic pressure.
- The hydraulic unit (3) supplies the necessary oil pressure for the service brake and the safety brake.
- The electrical control unit (4) monitors and controls all safety-related functions.
- Pipes (5) connect the hydraulic control unit with the brake units mounted to the brake posts
- The electrical cabling (6) connects the terminal boxes of the brake posts, of the hydraulic control unit and of the control station with the electrical control unit.

The brake unit BE100 has been specifically developed for winders in the mining industry. However, it can also be used in any similar field of application.

3.2 Design and operation of a brake element BE100

3.2.1 Overview

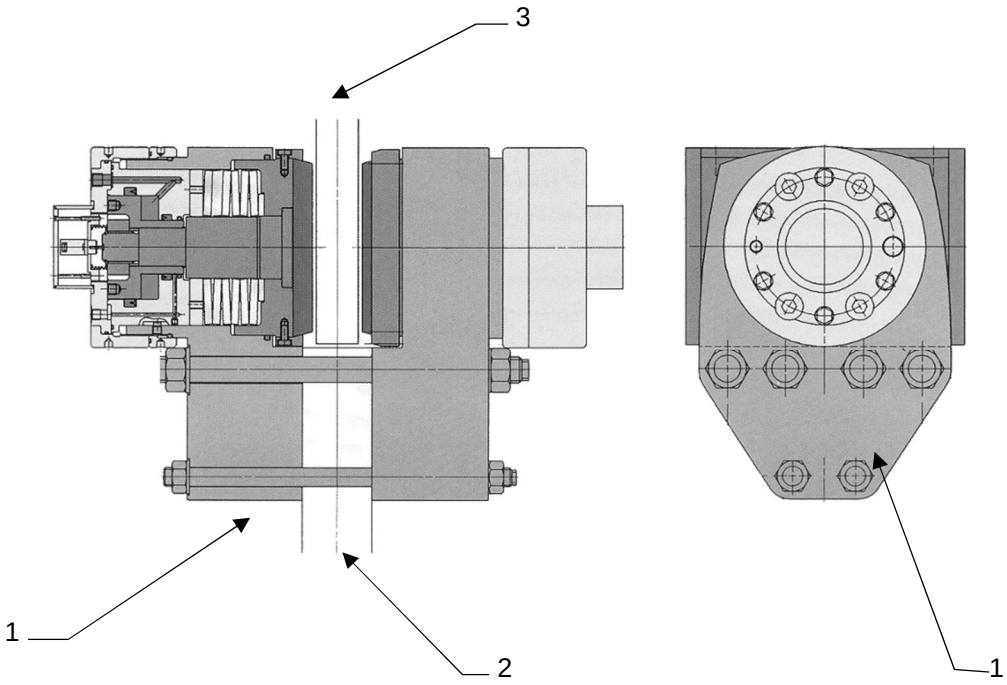


Figure 3: Layout brake element BE100

1 Brake element
2 Brake post
3 Brake disc

The brake element BE100 mainly consists of the following components:

- fixed housing
- adjustable and lockable component parts
- movable assembly.

The movable part can be shifted axially through spring force or oil pressure, respectively, thus generating different braking forces.

3.2.2 Fixed Housing (BE 100 wihout flush connection)

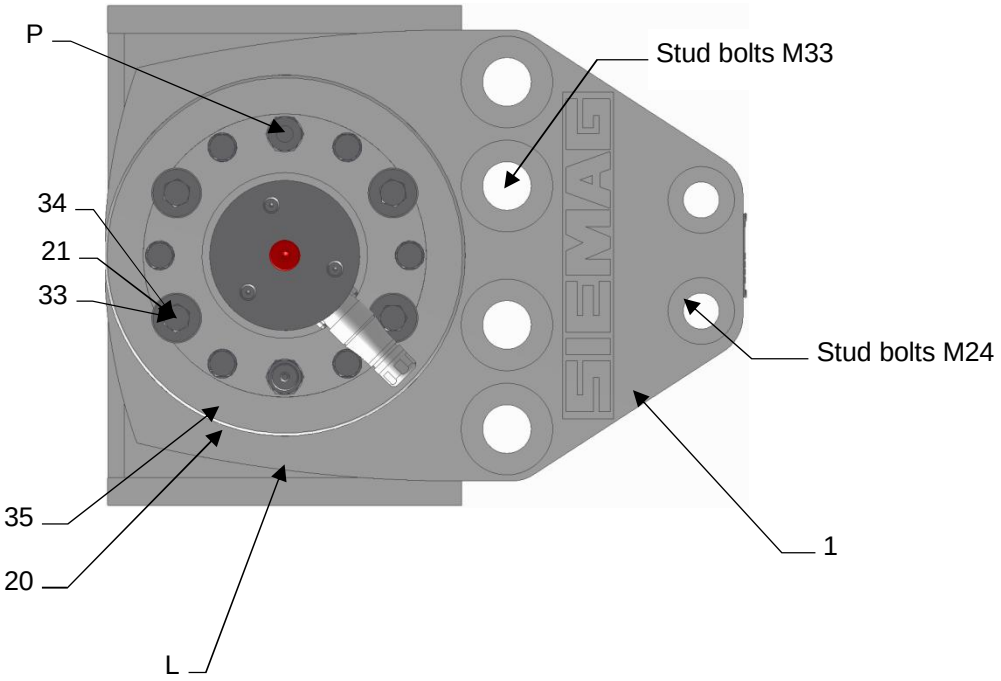


Figure 4: Housing of BE100 with flush connection

1	Housing	33	Lock washer
20	Hexagon head bolt	34	Lock washer
35	Spring lock washer	P	Pressure oil connection 3/8“
21	Hexagon head bolt	L	Leakage oil connection 1/4“

The housing (1) is the base element carrying all functional parts. It is mounted to the brake post with the aid of four M33 and two M24 stud bolts (25 + 26) subjected to controlled preloading, transmitting the braking force to the brake post through frictional connection.

3.2.3 Fixed Housing (BE 100 with flush connection)

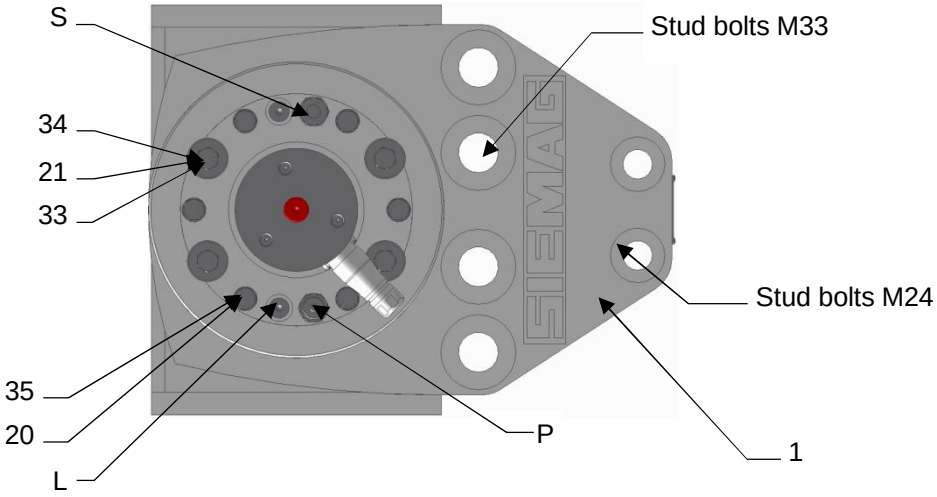


Figure 5: Housing of BE100 with flush connection

1	Housing	34	Lock washer
20	Hexagon head bolt	P	Pressure oil connection 3/8“
35	Spring lock washer	S	Flush oil connection 3/8“
21	Hexagon head bolt	L	Leakage oil connection 1/4“
33	Lock washer		

The housing (1) is the base element carrying all functional parts. It is mounted to the brake post with the aid of four M33 and two M24 stud bolts (25 + 26) subjected to controlled preloading, transmitting the braking force to the brake post through frictional connection.

3.2.4 Adjustable and lockable component parts

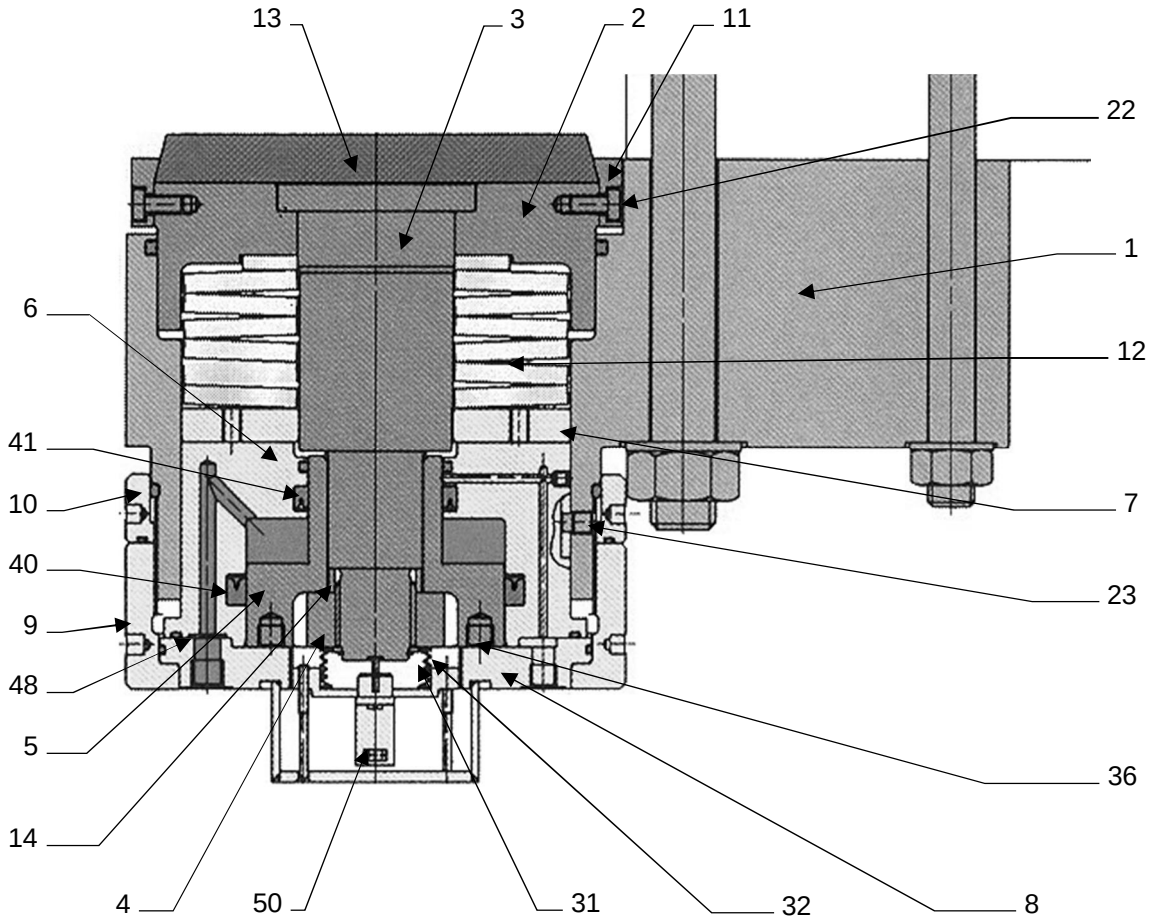


Figure 6: overview parts

1	Housing	13	Brake lining
2	Lining carrier	14	Distance sleeve
3	Center bolt	22	Bolt cylinder
4	Round nut	23	Stud bolt
5	Piston	31	Locking ring
6	Cylinder	32	Locking plate
7	Backing disc	36	Locking pin
8	Cover	37	Lining retainers
9	Adjusting sleeve	40	Groove ring large
10	Threaded ring	41	Groove ring small
11	Lining retainers	48	O-ring
12	Disc spring assembly	50	Operation monitor

- The housing (1) is the base element carrying all functional parts. It is mounted to the brake post with the aid of four M33 and two M24 stud bolts (25 + 26) subjected to controlled preloading, transmitting the braking force to the brake post through frictional connection.

- The cylinder (6) is guided outside in the housing and bolted down to the cover (8) by six hexagon head bolts (20 + 35). The cover inner surface is the stopping face for the piston (5).
- The adjusting sleeve (9), linking the cover (8) with the housing (1), serves for infinitely adjusting the hydraulic part of the brake element together with the brake lining in the desired axial direction.
- Four hexagon head bolts (21) with lock washers (33, 34) prevent the cylinder cover and the adjusting sleeve (9) from turning, and lock them with zero backlash.
- The threaded ring (10) locks the adjusting sleeve (9), thus neutralising its thread backlash. At the same time, it seals the brake element against the ingress of dirt and moisture.
-

1.1.1.1 **Movable assembly**

- The brake lining carrier (2) is fitted with bolted-on lining retainers (11 + 37, 22 + 38) bearing the brake lining (13). The lining carrier (2) is connected tightly with the centre bolt (3) and guided in the housing.
- The round nut (4) at the end of the centre bolt connects the piston (5) via a distance sleeve (14) with the centre bolt. It is locked against turning or becoming loose, by a special-type locking ring (31), locking plate (32) and locking pin (36).
- This movable part of the BE100 is guided in the cylinder (6) or in the housing (1), respectively.

1.1.1.2 **Special features**

- The cylinder (6) is guided with narrow clearance outside in the housing, it is locked against turning with a stud bolt (23). After unscrewing the stud bolt, the cylinder together with cover can be turned by 180°, thus making the "left-hand element" a "right-hand element". The pressurized-oil inlet channel (R 3/8", at top) and the leakage oil drain (R ¼", at bottom) determine its mounting position.
- Brake elements with flushing connection can either be used as right-hand or left-hand elements without needing a direct (internal) re-arrangement of the brake elements.
- The disc spring assembly (12) generates the braking force. One end of the assembly acts on the lining base, while the other one, resting on the backing disc (7), props up on the fixed cylinder (6). All assemblies are precisely calibrated using a calibration plate, i.e. with a given fitting space inside the housing, they are precisely calibrated to a spring force of 100 kN, when the air gap is 3 mm. All spring assemblies are thus interchangeable.

The size of the disc springs used ensures a theoretic fatigue strength of more than 2 million load cycles, which is equivalent to permanent strength.

- The brake lining (13) has been tested and approved by the German mining authority. It consists of an asbestos-free plastic and fibre compound with a high thermal load capacity and a minimum friction coefficient of 0,4.
- The seals (40 - 48) are rugged and easy to maintain articles. With this set of seals, each brake element is hermetically sealed against the ingress of dirt, splash and spray water.
- The groove rings (40, 41) and the O-ring (48) seal the pressure oil chamber, whereas all other seals have only a static or a dirt scraping function.
- The operation monitor (50) or (51) monitors the movement of the centre bolt (3) and thus the effective air gap between brake lining and brake disc in axial direction, and it transmits signals necessary for the electrical brake control system

The following service positions are monitored:

- Brake lifted
- Brake lining worn
- Spring fracture

There are two different types of operation monitors, type FWM with microswitches and type FWL with one linear displacement sensor. More details are described in chapter 3.2.5.

3.2.5 Sealings

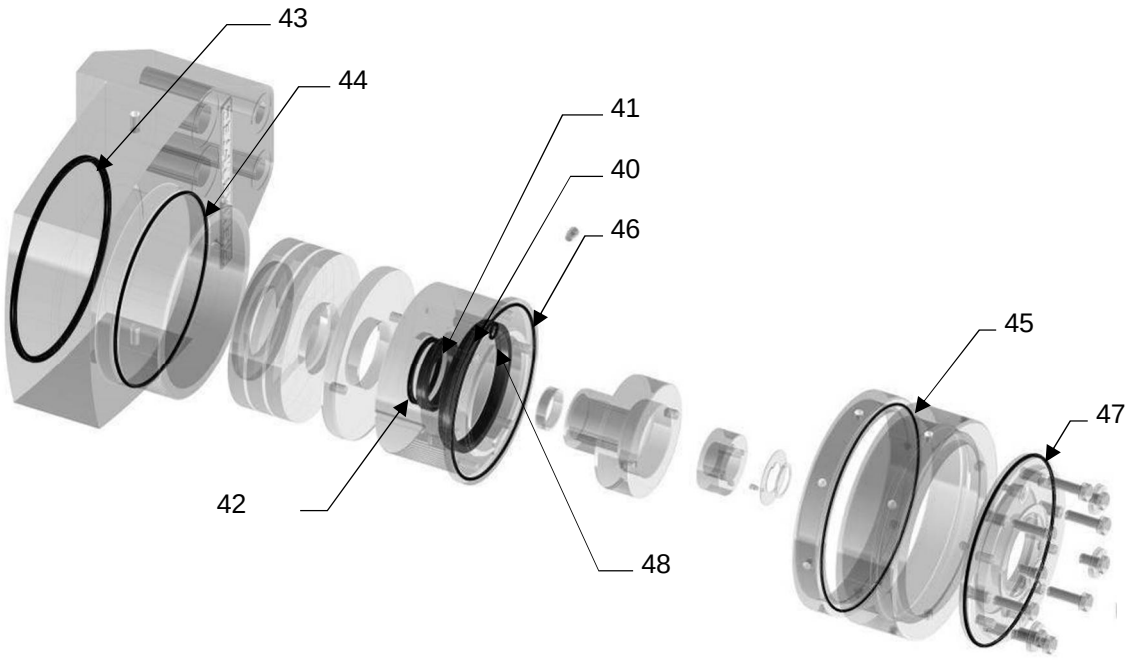


Figure 7 : Sealings

40	Groove ring large	45	O-ring 240
41	Groove ring small	46	O-ring 202
42	Quad-ring small	47	O-ring 200
43	Quad-ring large	48	Kant-seal ring
44	O-ring 225		

- The gaskets (40) through (48) are robust and low-maintenance and hermetically seal each brake element to prevent dirt, water splashes and water spray from getting in.
- The groove rings (40) and (41) and the Kant-seal-ring (48) seal off the pressure oil chambers, while all of the other gaskets solely perform static or protective tasks.

3.2.6 Operation monitor with microswitches (FWM)

Layout

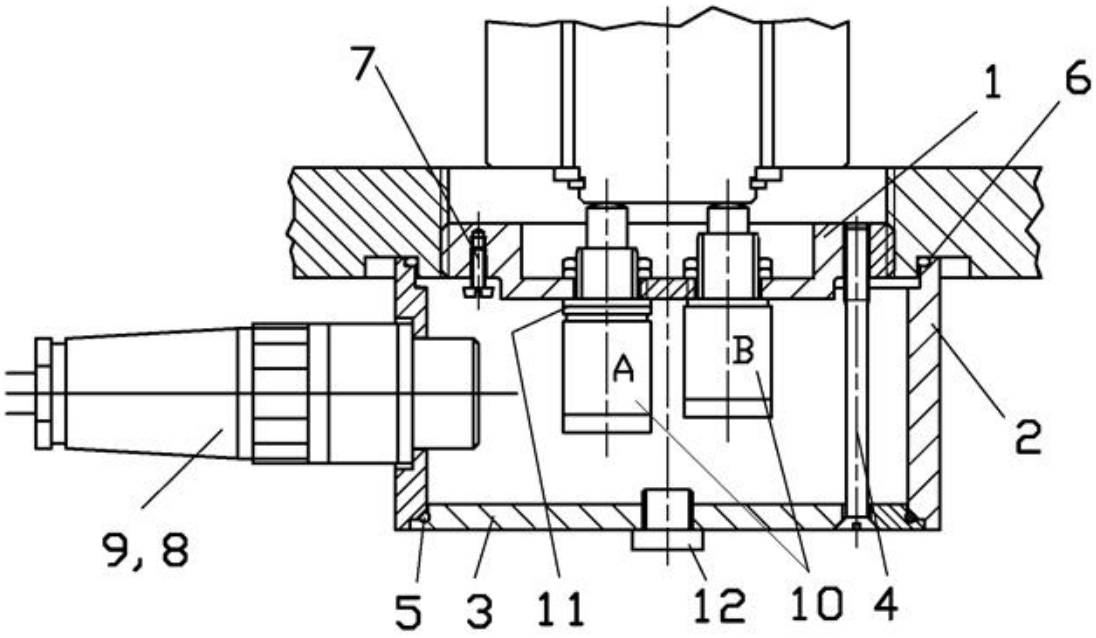


Figure 8: Spare parts FWM

(see drawing 4 and 5)

1	Threaded ring	6	O-ring
2	Housing	10	Microswitch
3	Cover	11	Spacer
5	O-ring		

This operation monitor consists of the following main components:

- Threaded ring (1), housing (2), cover (3), round plug connectors (8, 9), microswitches (10), spacer discs (11)
- The threaded ring (1) is the carrier element for the two microswitches (10).
- • The housing (2) and the cover (3) serve as protective enclosure, they close at the same time the opening in the brake element.
- The cover (3) is closed in the middle with a plug. This is the location, where the dial gauge together with its adapter (see chapter 8.1 "Tool Set") may be connected for measuring and control purposes.
- O-rings (5, 6) seal the operation monitor towards the brake element.

Function

This operation monitor is fitted with 2 microswitches in the middle of the threaded ring (1). Both microswitches function as a make or brake contact element, they transmit simple switching pulses to the control unit. They are of identical design, however, they are differently identified as A and B.

Microswitch "A" has a double function:

- It monitors the service states "Brake lifted" and "Disc spring fracture". It is set so that the switching command (audible click) is given after the centre bolt has been lifted by the distance L0, with unworn brake linings. In normal case, L0 is 2 mm; the exact value is indicated in the Brake Calculation.
- A spring fracture is assumed if microswitch A signals "Brake lifted" before the necessary minimum release pressure (approx. 100 bar) has been reached. (Scanning of pressure of the electric control unit on the pressure switch of the hydraulic brake control system).

Microswitch "B" monitors the wear of the brake lining.

- This switch is practically always pushed in, it opens only if the allowable limit of wear is exceeded. This requires spacers under microswitch A. The total thickness of the spacers is equal to the maximum admissible lifting distance L_{max}..

Example 1

Lifting distance with new brake lining: L_0 = 2,0 mm

Max. air gap
(here: wear = 1,0 mm): L_{max} = 2,0 + 1,0 = 3,0 mm
= total thickness of the spacers

Example 2

Lifting distance with new brake lining: L_0 = 3,0 mm

Max. air gap
(here: wear = 1,0 mm): L_{max} = 3,0 + 1,0 = 4,0 mm
= total thickness of the spacers

3.2.7 Operation monitor with linear displacement sensor (FWL)

Layout

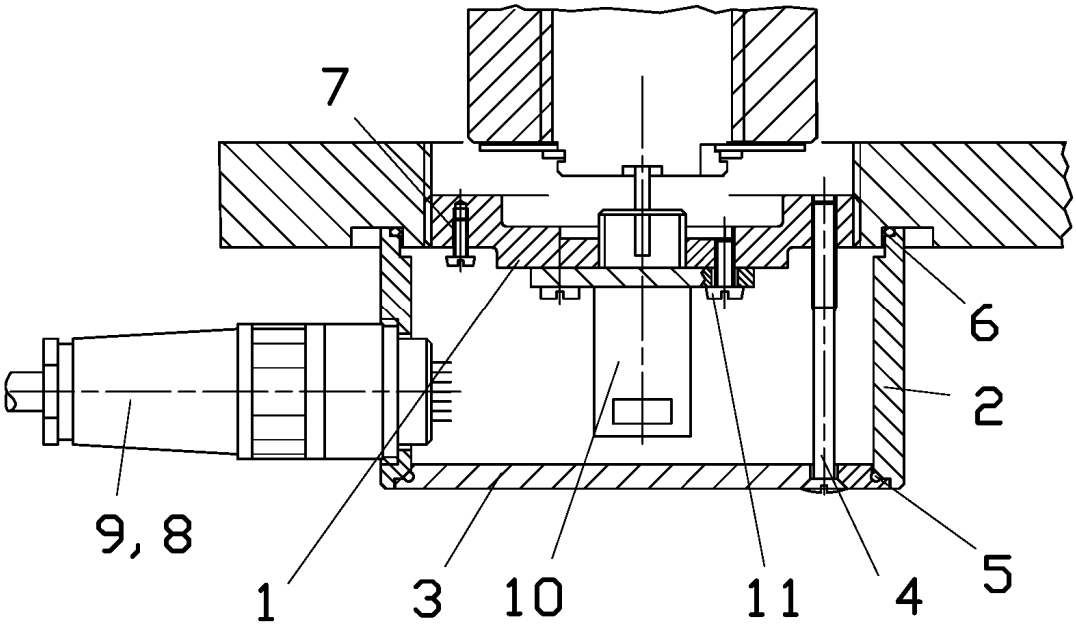


Figure 9: Spare parts FWL

(Please refer to drawing nr. 6 and 7)

1	Threaded ring	8	Cord plug pin terminal
2	Housing	9	Cord plug socket
3	Cover	10	Linear displacement sensor (FWL) (red)
5	O-ring	11	Spacers
6	O-ring		

This operation monitor consist of the following main components:

- Threaded ring (1), housing (2), cover (3), round connector (8, 9), linear displacement sensor (10)
- The threaded ring (1) is the carrier element of the linear displacement sensor.
- The housing(2) and the cover serve as protective enclosure, they close at the same time the opening inside the brake element.
- O-rings (5, 6) seal the operation monitor towards the brake element.

Function

The operation monitor is provided with a linear displacement sensor in the form of potentiometer located in the middle of the threaded ring (1). This potentiometer signals position-dependent voltage values (Volt).

The electronics of the electric control system process the voltage values and generates switch pulses as described before for the microswitches.

The following operating states are monitored:

- Brake lifted
- Wear of brake lining
- Disc spring fracture.

4 Transport and Storage

of SIEMAG TECBERG - plant components

Unless otherwise contractually stipulated packaging is in compliance with the HPE packaging directives (Bundesverband Holzpackmittel, Paletten, Exportverpackung e.V. [German Federation for Wood Packaging, Pallets & Export Packaging]).

- The components supplied by SIEMAG TECBERG are packed according to their specific requirements (see table "Packaging").
- Upon receipt of the consignment, the equipment has to be checked for transport damages. If any damages are detected, SIEMAG TECBERG must be notified immediately. Furthermore, the packing lists have to be checked for conformity with the parts supplied. SIEMAG TECBERG has to be notified immediately about any component missing.
- Wherever possible, the packages should remain packed.
- The packed components may only be transported or handled by means of adequate devices (cranes, fork lifters). Ropes/ slings may only be fastened at the points marked on the cases or on the components.
- Man-made damages caused by improper handling are not included in our responsibility calculations and performance guarantees. Consequently the rules defined below must be strictly observed in order to avoid damages and corresponding risks of bad customer relations, economic loss and claims.
- In case of questions concerning transport, set-up and installation of the system, please contact the manufacturer SIEMAG TECBERG GmbH!

Note Observe indicated transport weights ! Respect national, regional and local safety and accident prevention regulations!

4.1 Transport

4.2 Transport safety information

⚠ WARNING

Falling objects!

Risk of fatal or serious bodily injury due to crushing!

- Always keep visual contact with suspended loads.
- Prevent objects from falling down!
- Do not overload load rings!
- Use appropriate load handling and lifting equipment!
- Adhere to work instructions!
- Keep out of load handling and lifting areas whenever possible!

The machine components will be transported by SIEMAG TECBERG GmbH experts or by experts who have been duly authorized and instructed by SIEMAG TECBERG GmbH. The transport units are secured onto pallets and the center of gravity is marked.

⚠ WARNING

Crush hazard caused by uncontrolled movements of heavy machine parts (e.g. falling) and transport equipment.

Risk of fatal or serious bodily injury due to crushing!

- Only use lifting equipment and ground conveyors with sufficient bearing capacity for transporting the packaging units!
- Fasten all equipment (e.g. ropes) for lifting and moving machine parts firmly and securely to the provided attachment points!
- Do not stay below suspended loads!
- Keep a clear view of the loads!
- Move the suspended loads carefully to the intended installation position!
- First carefully lift the load to check whether the center of gravity shifts.
- During transport, wear personal protective equipment (in particular hard hat, gloves and safety boots).
- During transport, observe the valid national, regional and local safety and accident prevention regulations!

⚠ WARNING

Crush hazard caused by transport units or loads falling off the forklift due to insufficient bearing capacity and/or insufficient fork length.

Danger of life and serious bodily injury caused by crushing of limbs!

- Only use forklifts with sufficient bearing capacity for transporting the packaging units!
- In case of smooth transport units, place slip-resistant mats between transport unit and fork mounts!
- If necessary, fasten the transport unit!
- Ensure that the fork length is sufficient for lifting the transport unit!

In addition, the following must be observed for the transport procedure:

- During transport, wear personal protective equipment (in particular hard hat, gloves and safety boots).
- Support loads that are installed or dismantled and whose weight cannot be carried with suitable equipment (ropes or pulleys)!
- Check by means of visual inspection whether the attachment equipment is undamaged and in good condition!
- Prevent rubbing of ropes and lifting belts on sharp edges and corners by using special equipment, e.g. by using padding layers from softer material, protective corners, scantlings!
- Screw hooks and ringbolts completely in!
- Repair or use no damaged or bent hooks and ringbolts!

4.3 Transport of equipment

The following has to be observed during transport of mechanical and electrical equipment:

- Equipment to be shipped under deck of the sea-going vessel.
- Intermediate storage has to take place in covered buildings only.
- For land transport of equipment only closed trucks or fully covered rail wagons have to be used.

When transporting and storing, please observe the pictorial markings for handling packages (Fig. 1):

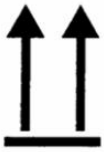
					
Vor Nässe schützen	Vor Hitze(Sonnen-einstrahlung) schützen	Schwerpunkt	Anschlagen hier	Zerbrechliches Packgut	Oben
Беречь от излучения	Беречь от солнечных лучей	Центр тяжести	Место строповки	Хрупкое. Осторожно	Верх
Keep dry	Keep away from heat	Center of gravity	Sling here	FRAGILE – handle with care	This way up
防潮防湿	放热和阳光直射	重心	在此绑挂	易碎物品	朝上

Table 8: Examples of markings for handling I

				
Sperrschicht nicht beschädigen	Elektrostatisch gefährdetes Bauelement	Zulässiger Temperaturbereich	Zulässige Stapellast	Vor Hitze und radioaktiven Strahlen schützen
Не повреждать изоляцион-ный слой	Чувствитель-но к электро-татическому электричест-ву	Ограничение температуры	Штабелиро-вание ограничено	Защищать от радиоактивных источников
Do not destroy barrier	Electrostatic sensitive device	Temperature limitations	Stacking limitation	Keep away from heat and radioactive sources
不要破坏阻隔层	对静电敏感元件	允许温度范围	允许堆叠重量	放热和放射辐射

Table 9: Examples of markings for handling II

If the center of gravity does not lie in the center of the case use sling ropes of different lengths, flat or round lifting slings, which can be subjected to different loads. In such cases, ensure that the crane hook is positioned above the marking of the center of gravity.

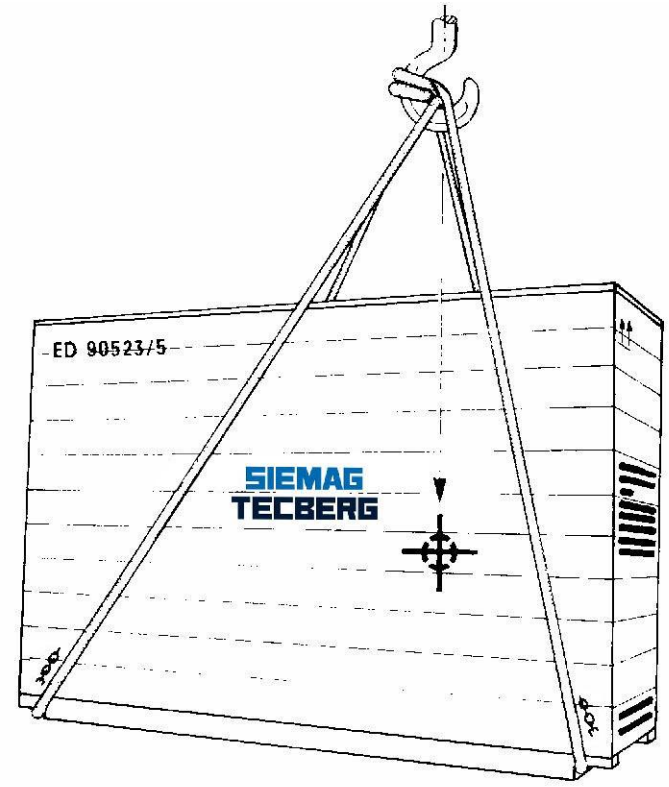


Fig. 10: Off-center center of gravity

Note

Observe the differnt length of the slings in Fig. 10
The crane hook is positioned above the center of gravity

4.4 Storage of equipment until installation

The complete scope of equipment is to be stored in closed buildings which have to be lockable, dry, heated and well-ventilated.

TYPE OF PACKING	TYPE OF EQUIPMENT
Cases: seaworthy construction IMDG goods, packing according to specifica¬tions	Normal machines mechanical parts susceptible to mechanical damages, danger of theft or loss, IMDG goods or accessories.
Cases: preservation by wrapping into aluminium compound foil by adding de-hydrating agents, pressure sensitive foils, valvoline-tectyl for unpainted mechanical components	Machines or accessories, mechanical and electrical parts susceptible to mechanical damages or corrosion; rather long trans¬port and storage times
Double cases: floating packing, stuffing according to weight and sensitiveness; preservation by sealing in aluminium compound foil by adding dehydrating agents	Goods which are extremely susceptible to shocks or vibrations, e.g. electronical equipment, computers, special control cabinets, laboratory equipment etc
Without packing	Totally insensitive equipment, e.g. T-beams
Bundles: straps of squared timber and clamping screws	
Slides, squared timber structures with or without casings, partial packing	
Crates Open wooden constructions	Corrosion-resisting equipment, devices and containers which cannot be packed on slides. Ladders, scaffold and elements, grids, pipe conduits or similar (if required, to be covered with PVC foil); parts which are dimensioned too small are to be packed in cases

Table 10: Storage according type of packing

- The equipment is to be stored in a way that the package numbers and the shipping note numbers can be well identified.
- Any damages on the packing are to be repaired prior to storage.
- Stacking of packages is not permitted.
- The packages should remain closed if possible.

The scope of supply is divided into three storage classes and has to be stored according to the corresponding specification.

4.4.1 Storage class No. 1: closed, air-conditioned room

The equipment is to be stored in a completely closed, air-conditioned room with a temperature between 15 °C and 25 °C and a relative humidity of air of 30 to 40 %. The air pressure should not be less than 730 mm Hg.

Type of packing:

- Seaworthy packing for a period of 12 months
- Crates, bundles and sliders. Partly crated and covered with foil.

Delivery components:

- Spare brake pad lining
- Spare seal kit
- Operation monitors

4.4.2 Storage class No. 2: closed store

The equipment must be stored in closed buildings offering a minimum temperature of 5 °C and a permanent air circulation, without any condensation of water.
The relative humidity of air should not exceed 80 %.

Type of packing for storage:

- Seaworthy packing for a period of 12 months
- Crates, bundles and sliders. Partly crated and covered with foil.

Delivery components:

- Brake elements
- Set of tools

4.4.3 Storage class No. 3: closed store

The equipment must be stored in closed buildings with a permanent air circulation, without any condensation of water. The relative humidity of air should not exceed 80 %.

Type of packing for storage:

- Seaworthy packing for a period of 12 months

- Crates, bundles and sliders. Partly crated and covered with foil.

Delivery components:

- Spare brake disc assembly

4.5 Storage and care after unpacking

Wherever possible, the packages should remain packed.

Open packages and unpacked components should be stored in a clean and ventilated place where the relative humidity of air does not exceed 75 %.

Unpainted (machined) surface such as brake disks, machine sole plates, shaft extensions etc should be inspected and, if necessary, protected using suitable anti-rust coating, for example Tectyl.

For the components assigned to storage classes No. 1 and 2, the corresponding storing regulations specified in these chapters are to be given priority.

Normally, the seaworthy packing should not be opened. However, if the packaging has been damaged or opened, the corrosion protection period for the components is reduced as follows:

STORAGE CONDITION	STORAGE PERIOD
dry, air-conditioned rooms	max. 12 months
rooms with slight condensation	max. 8 months
moist rooms with condensation (sheds)	max. 4 months

Table 11: Storage conditions and periods

Note ***All components delivered with storage class No. 1 and No. 2 must remain in stock according to the regulations of this class.***

4.6 Anti-corrosion agents

Observe the warnings and safety instructions on the packing or on the sheet enclosed when working with anti-corrosion agents.

Valvo rust-preventive **SAE 30 W** is an anti-corrosion oil which is also suitable for the preservation of tools. If the equipment is stored in a covered building, this agent gives a 5 to 6 months protection against corrosion.

Tectyl 472 offers protection for approx. 3 months for unpacked parts stored indoors (devices, tools, spare parts). Experience has shown that protection lasts for approx. 6 months for preserved, in- stalled sleeve bearings of electrical machines or preserved, closed oil pipes stored indoors or assembled. Tectyl 472 is oilsoluble. If, for example, a sleeve bearing preserved with Tectyl 472, is filled with oil, Tectyl 472 dissolves without affecting the lubricating proper- ties of the oil. Of longer-lasting protection is required repeat the treatment. Tectyl 472 can be applied by painting, spraying or im- mersion.

Tectyl 506 offers a 2 years protection (outdoors) an, depending on the thickness of the layer, a 2 to 4 years protection against corro- sion (indoors). It can be applied by painting or spraying.

Multiple function spray disperses moisture, penetrates rust and loosens parts which have got stuck. Multiple function spray offers protection for approx. 1 year (indoors or covered outdoors) and 1 to 2 months (not covered outdoors). If longer-lasting protection is required the treatment must be repeated.

4.7 Requirements for sub - supplier products

Please refer to the attached documentation of sub-suppliers.

4.8 Brake Element - Transportation using load hooks

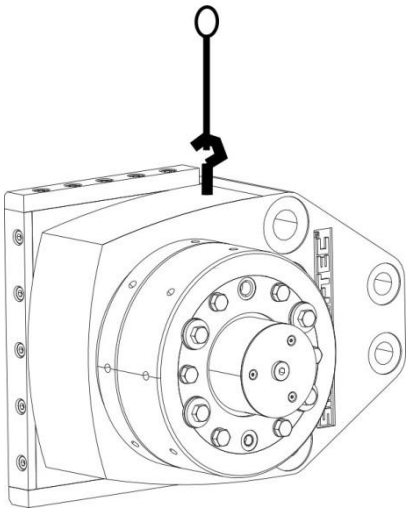


Figure 11: Load hook

Note

To facilitate mounting threaded holes are located on both sides of the housing (brake unit) to accommodate load hooks.

- Use appropiate load handling and lifting equipment!
- Use provided transport hooks.

Item	Weight
Brake unit	175 kg

Table 12: Load hook

5 Mounting of Brake Units

The brake units and appertaining peripheral components are mounted by qualified SIEMAG TECBERG personnel or by qualified and instructed staff authorized by SIEMAG TECBERG GmbH to do carry out such work.

Mounting of the brake units will be realized in accordance with SIEMAG TECBERG erection and mounting instructions provided with the layout and installation drawings.

⚠ DANGER

Unsecured conveyance.

Risk of falls with the result of fatal injuries.

- Secure hoisting engine and/or conveyance before beginning of work on brake, control and brake hydraulics.

⚠ WARNING

Risk of crash
Braking effect is highly reduced by contamination (oil, fat or colour) of brake pads and brake disc.

Risk of fatal or serious injury due to crashing into ground or structure

- DO NOT reuse brake pads that are contaminated with oil, grease or paint.
- Replace brake pads.
- Clean brake disc.
- Protect brake linings and brake disk against contamination.

⚠ CAUTION

Hot surface!

Hot surface can cause severe burns!

- DO NOT touch brake unit immediately after brake operation!
- Before servicing the brake unit let all components, e.g. brake element, brake pad and brake disc cool down!

5.1 Assembly of a Brake Element

Note

Spring assemblies are calibrated, bundled and marked. Remove the bundling wire only immediately before fitting the assembly. Do not mix disc springs with those of other assemblies.
Pay attention to the position and direction of sealing lips.
Be careful not to damage the sealing lips, use special tool.
The open side of the groove ring points towards the pressure chamber. Always replace the locking ring (31), locking plate (32) and locking pin (36).

(Please refer to Fig. 2 and 3 and 5 in chapter 13 „Attachments“))

Figure 3 is an explosion view, depicting the parts and their fitting order.

To reassemble, proceed as follows:

1. The housing (1), being the central unit, must be prepared ready for installation. Clean and grease carefully the bore hole for mounting of internals.
2. Place the quad-ring (43) into the groove provided.
3. Assemble the lining carrier (2), centre bolt (3) and lining retainers (11 + 37) to a single assembly. Press (approx. 2 t) the centre bolt into the mounting hole, thereby paying attention to right-angled position relative to the lining surface. Avoid tilting.
4. Screw down the lining retainers (11) by using fillister-head screws (22 + 38). Tighten the fillister-head screws of the inner lining retainer. Grease all machined faces, except for the lining carrier face.
5. Insert the pre-assembled lining carrier into the housing (1). To facilitate fitting of the other parts, place the housing on a flat plate.
6. Slide the disc spring assembly (12) with calibrating disc downwards over the centre bolt (3) shank.
7. Fit backing disc (7).
8. Prepare cylinder (6) for installation. Slide carefully groove ring seals (40, 41) into the relevant recesses.
9. Fit quad-ring (42).
10. Drive the **expanders (27 and 29)** in the holes of the **cylinder (6)**.
11. Push the piston (5) into the cylinder（4）.

12. Insert the **„piston and cylinder unit“** into the brake element housing.
13. Fit spacer sleeve (14).
14. Screw round nut (4) on to the centre bolt thread up to the stop on the spacer sleeve (14) and tighten it hand-tight by using a face spanner (see A2.10 "Tool Set").
15. Insert locking pin (36) into one of the holes at the face end of round nut (4).
16. Push locking washer (32) over the centre bolt (3) threaded shank and punch mark with a hammer blow the position of the locking bore on the locking washer. Pay attention to proper seating of the locking lug.
17. Drill a locking hole 5 mm dia. into the locking washer and finish fit the latter.
18. Insert locking ring (31) into the radial groove of the centre bolt, by using expanding nippers (see A2.10 "Tool Set").
19. Insert O-rings (46 and 48) into the groove or recess of cylinder (6) and bolt down cylinder cover (8) by using hexagon head bolts (20) and spring washer (35).

Note *The pressurized-oil connection R 3/8" of the cover must be in alignment with the relevant bore in the cylinder. Be careful when tightening the bolts (20) at the right and left-hand side next to the pressure seal (48). Since the seal must not be squeezed, tighten the bolts stepwise, alternately.*

20. Move the **cylinder cover (8)** with cylinder until the pressure-oil or flushing connection, respectively, is placed at the top. Then insert the **locking pin (23)**.
21. Turn cylinder cover (8) together with cylinder until the pressure-oil connection lies at top. Then turn in locking pin (23).
22. Fit O-ring (44) and screw threaded ring (10) until it bears against the housing.
23. Fit O-ring (45) and O-ring (47). O-ring (47) must be tensioned when fitted, it must not turn up (with the inside out) on turning of the adjusting sleeve (9).
24. Fit adjusting sleeve (9) over the cylinder cover (8) and screw it to the housing (1) until a sensible resistance of the disc spring assembly can be felt.

Note *The adjusting sleeve must be easily turnable by hand. Check air gap towards the cover collar. Thread must be thoroughly greased.*

25. Tighten firmly four hexagon head bolts (21) with centring disc (33) and locking ring (34) as an anti- rotation lock.
26. After installation, clean the brake element by removing grease and other dirt, especially on the lining carrier (2) inner surface and on the lining retainers (11 + 37).

27. Then install the brake lining (13) and adjust is necessary. Tighten firmly the screws of the lining retainers.

5.2 Disassembly of a Brake Element

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- DO NOT open the brake element unless the adjusting sleeve (9) has been completely turned back and the operating pressure is 0 bar!
- Disc spring assemblies must be completely un-tensioned!

Note

Note position of disc springs for later replacement disc springs.

When disassembling a brake element, proceed in the reverse sequence of operations as followed in assembling the unit.

5.3 Operation monitors

5.3.1 Operation monitor with microswitches(FWM)

Note

The microswitches may only be set while the brake elements are released. If the microswitches have been set with the brake elements being applied, the brake elements will be destroyed when the brake is released!

(Please refer to Fig. 4 and 5 in chapter 13 „Attachments“)

Setting of operation monitor

Proceed as follows:

1. Mount the microswitches with the appropriate spacers onto the threaded ring.
2. Screw the microswitches far enough into the brake element cover until the switching operation of both switches is heard.
3. For safety’s sake, turn the threaded ring another ¼ turn.
4. Wire the microswitches to the connector panel and close them off with the housing, cover and plug.

5.3.2 Operation monitor with linear displacement sensor (FWL)

(Refer to Fig. 6 and 7in chapter 13 „Attachments“)

Setting of operation monitor

Proceed as follows:

1. After the displacement sensor has been fitted on the threaded ring,
2. Screw the latter into the cover of the brake element until the signal "brake lifted" is produced while the brake is released.
3. Wire the displacement sensor with connector base and close it off with housing and cover.

5.4 Mounting of BE100 to the brake post

Note

The brake elements may only be mounted to or removed from the brake posts by qualified experts or adequately trained service staff.
For mounting the brake elements to the brake post make sure that the contact faces on the brake post and on the brake elements are absolutely free from rust, grease and any other impurities.

Proceed as follows:

1. Bolt down the brake elements, using stud bolts M 24 (2 pcs.) and M33 (4 pcs.), inserting these in pairs opposite.
2. Before tightening the bolts make sure that there is enough clearance between the lining carrier (2) and the web plate of the brake post and that free extension of the lining carrier is possible.
3. For final preloading of the stud bolts use a torque amplifier and preload controlled.

For tightening torques / forces for stud bolts (25, 26) see table 8 below:

	Stud bolt	Einstellwerte
Threads greased with (MoS2) (μ = 0,06…0,10)	M24 - 10.9	670 Nm
	M33 - 10.9	1.770 Nm
Preloaded hydraulically	M24 - 10.9	225 kN
	M33 - 10.9	450 kN

Table 13: Tightening torques / forces for stud bolts(25, 26)

5.5 Exchange of BE 100 on the Brake Post

Note *The brake must be applied prior to dismounting any of the brake elements! This means the brake system must be depressurized!*

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- DO NOT open the brake element unless the adjusting sleeve (9) has been completely turned back and the operating pressure is 0 bar!
- Disc spring assemblies must be completely un-tensioned!

Proceed as follows:

1. Apply the brake, oil pressure = 0 bar
2. Lock the winder against turning, if the required static safety is no longer guaranteed after a brake post has been dismounted
3. Bolt hydraulic pump down to the manifold of the brake post.
4. Open the stop valve of the pressure line towards the brake element that is to be exchanged; isolate the other brake elements
5. Untighten threaded ring (10) using hook spanner and screw it out somewhat
6. Lift brake element, using the hand pump, until the adjusting sleeve (9) can be turned
7. Turn out adjusting sleeve until the disc spring assembly is completely unloaded
8. Reduce oil pressure via the drain plug of the pump to zero.
9. Disconnect pipe couplings from cylinder cover (8) and adjusting sleeve (9)
10. Remove operation monitors (50/51) and collect residual oil
11. Remove stud bolts M24 (26) and M33 (25) (refer to sect. 5.4)
12. Check the new brake unit BE100 for tight fit and cleanliness of brake linings

13. Take care that the contact faces on the brake elements BE100 and the brake post are absolutely free from rust, colour, grease and any other impurities.
14. Untighten threaded ring (10) and screw it out.
15. Turn out adjusting sleeve (9) until the disc spring assembly is completely unloaded
16. Mount the brake elements onto the brake post (for tightening torques refer to sect. 5.4)
17. Mount the operation monitors
18. Mount the pressure and leak-oil lines (BE 100 with flushing connection – additionally mount a flushing line)
19. Set the air gap (refer to 5.6)
20. Measure and record the spring forces (refer to 5.7)
21. Replace other brake elements as described above.
22. Re-open all stop valves
23. Screw off the hydraulic pump.
24. Release winder.
25. Vent the brake system (refer to sect. 5.8)

5.6 Setting of air gap

The air gap between brake lining and brake disc must be precisely set to the value determined by brake calculation. In normal case, L0 is 2 mm; the exact value is indicated in the brake calculation

Precise setting requires the use of following tools:

- Set of hand pumps for lifting the brake elements (see 7.1, Item 1)
- Hook spanner for turning the adjusting sleeve and the threaded ring (7.1, Item 2.1)
- Set of measuring tools for determining the lifting distance (7.1, Item 3) (only required for operation monitors with microswitches (FWM)).

5.6.1 Setting Procedure for BE 100 with Micro Switches (FWM)

Note *The brake must be applied prior to measuring the air gap !*

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- DO NOT open the brake element unless the adjusting sleeve (9) has been completely turned back and the operating pressure is 0 bar!
- Disc spring assemblies must be completely untensioned!

Proceed as follows:

1. Bolt hydraulic pump down to the manifold of the brake post.
2. Open the stop valve of the pressure line towards the brake unit that is to be set; isolate the other brake units
3. Untighten threaded ring (10) using hook spanner and screw it out somewhat
4. Undo the anti-rotation device (parts 21, 33, 34)
5. Remove the plug in the middle of the operation monitor and screw in the dial gauge with adapter
6. Push the plunger of the dial gauge up to the face of the centre bolt and fix it with locking pin to the adapter
7. Set the dial gauge pointer to „0“
8. Lift brake unit completely up to the stop, using the hydraulic pump, and read the lifting distance on the dial gauge.
9. Determine the differential value to the value preset in the brake calculation (normally 2 mm) and turn the adjusting sleeve (9) either forwards or backwards, as appropriate

Note *The following table is used as orientation for the setting.*

Settings		
1/2 turn corresponds to 1,5 mm 1/4 turn corresponds to 0,75 mm 1/8 turn corresponds to 0,375 mm		
The threaded ring is fitted with 8 drilled holes for the hook spanner, i.e. the angle between two neighbouring holes is 45°.		
0,1 mm corresponds to 1/30 turn	= 12°	= approx. 1/4 hole pitch
0,2 mm corresponds to 1/15 turn	= 24°	= approx. 1/2 hole pitch
0,3 mm corresponds to 1/10 turn	= 36°	= approx. 3/4 hole pitch
0,4 mm corresponds to 1/7,5 turn	= 48°	= approx. 1 hole pitch
0,5 mm corresponds to 1/6 turn	= 60°	= 1 + 1/3 hole pitch

Table 14: Value for adjusting sleeve

10. Relieve lifting pressure via the drain plug of the pump until the brake lining bears pressureless against the brake disc. Read on the dial gauge the lifting distance to the brake disc. The lifting distance should coincide with that resulting from the brake calculation, with a tolerance of ±0.1 mm.
11. If necessary, repeat the setting operation
12. After setting has been completed turn the threaded ring (10) up to the adjusting sleeve (9) and tighten it by using the hook spanner. Tighten firmly the anti-rotation lock (parts 21, 33, 34).
13. Then re-open all stop valves towards the other brake units and screw off the hydraulic pump

Note

Adjustment of the brake lifting distance to a nominal value of 2 mm does not imply that the same distance must be available for each position of the brake disc. Due to the beat of the brake disc and the non-parallel brake ring surfaces, this distance may change even in case of exacting work tolerances.

It is advisable to check the spring forces during the setting operation, in order to have these first test values as basic or comparative values for later measurements (refer to sect. 5.7).

5.6.2 Setting procedure for brake units BE100 with linear displacement (FWL)

Note *The brake must be applied prior to measuring the air gap !*

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- DO NOT open the brake element unless the adjusting sleeve (9) has been completely turned back and the operating pressure is 0 bar!
- Disc spring assemblies must be completely un-tensioned!

Proceed as follows:

1. Bolt hydraulic pump down to the manifold of the brake post.
2. Open the stop valve of the pressure line towards the brake element that is to be set; isolate the other brake elements
3. Untighten threaded ring (10) using hook spanner and screw it out somewhat
4. Undo the anti-rotation device (parts 21, 33, 34)
5. Read the lifting distance on the operator panel.
6. Lift brake unit completely up to the stop, using the hydraulic pump, and read again the lifting distance on the dial gauge. The reading must be "0".
7. Determine the differential value to the value preset in the brake calculation (normally 2 mm) and turn the adjusting sleeve either forwards or backwards (refer to table in sect. A2.6 a)
8. Relieve lifting pressure via the drain plug of the pump until the brake lining bears pressureless against the brake disc. Read on the dial gauge the lifting distance to the brake disc. The lifting distance should coincide with that resulting from the brake calculation, with a tolerance of ±0.1 mm.
9. If necessary, repeat the setting operation
10. After setting has been completed turn the threaded ring (10) up to the adjusting sleeve (9) and tighten it by using the hook spanner. Tighten firmly the anti-rotation lock (parts 21, 33, 34).
11. Then re-open all stop valves towards the other brake units and screw off the hydraulic pump.

Note

Adjustment of the brake lifting distance to a nominal value of 2 mm does not imply that the same distance must be available for each position of the brake disc. Due to the beat of the brake disc and the non-parallel brake ring surfaces, this distance may change even in case of exacting work tolerances.

It is advisable to check the spring forces during the setting operation, in order to have these first test values as basic or comparative values for later measurements (refer to sect. 5.7).

5.7 Checking of Spring Forces

We recommend overhauling the disc brake system once per year and, while doing so, checking the condition of the disc springs, among other things.

Note

Adjust air gaps before the spring forces are measured (please refer to sect.5.6).

- The objective of measuring the spring forces is to assess whether the spring force has changed and whether it can be expected that the minimum braking force of the disc brake system is ensured until the next overhaul.
- The minimum braking force is attained when all the brake elements have reached an efficiency of 90% (please refer to the brake calculation).

5.7.1 Checking procedure for brake units BE100 with microswitches (FWM)

Check "pressure relief" = "extension of piston" (Brakes)

1. Lift brake element as far as possible, up to the stop (140 bar), install dial gauge and turn gauge pointer to zero (also refer to section 7.1, tool set - item 03).
2. Slowly reduce the oil pressure via the oil drain plug of the hand pump and align the values to the given reference values for the respective piston displacement.

Check "pressure build-up = retraction of piston" (Lifting of brake)

1. Reduce the pressure until the maximum piston value indicated in the table is exceeded.
2. Then increase the pressure slowly and record the pressure values for the respective piston strokes indicated in the table.

Note *These values are not to be taken into account when assessing brake safety. Nevertheless, they can make it possible to detect irregularities, such as increased inner friction, defects on the moving parts and seals etc.*

The spring constant of the springs is 4.7 kN/mm, corresponding to 4,0 bar oil pressure per mm spring distance.

In the event of any deviations, repeat the whole measuring procedure for safety's sake in order to preclude errors of measurement and to replace any differences in readings by mean values.

To finish off, remove dial gauge and adapter. Tighten screw plug of the operation monitor.

Adjust and check all other brake units one after the other following these procedures.

Note ***If - despite repeated measurements - the actual values are still deviating from the preset ones, the disc spring assembly needs to be replaced.***

5.7.2 Checking procedure for brake unit BE100 with linear displacement sensor (FWL)

Checking of spring forces as described under sect. 6 .7.1 (Checking procedure for brake units BE100 with microswitches (FWM)).

Here, however, no dial gauge needs to be installed, since the distance is being measured by the linear displacement sensor.

Both checks "pressure relief" and "pressure build-up" to be made as described above.

Note ***The notes and remarks mentioned in sect. 6 .7.1 (Checking procedure for brake units BE100 with microswitches (FWM)) are to be observed !***

5.8 Venting

Before start-up, all brake units must be repeatedly vented very carefully on the test point (minimess) connections (screwed joints) fitted above the brake elements.

The brake element is completely vented when air or air/oil bubbles do not longer emerge.

Repeat the venting operation after some time.

5.9 Checking and testing

Before start-up, the following general checks concerning the complete brake system should be made:

- Functional test of brake unit
- Leak test
- Measurement of air gap between brake lining and brake disc
- Inspection of operation monitors (correct wiring of all elements, correct setting of microswitches / linear displacement sensor)
- Check of anti-rotation locks for correct tightening; threaded ring (10), hexagon headed screw (21)

- Have all brake units been vented? Has the complete brake system been vented?
- Have all stud bolts (26 + 26) been preloaded using the preset torque (refer to Table 8 in sect. 6.4)
- Are the anchor bolts of the brake post tightened sufficiently?
- Are the brake linings and brake discs free from dirt, dust, grease, oil, and other impurities?

The oil pressure values for the "Checking of spring forces" should be determined at this time at the latest (refer to sect. 6.7).

6 Dismantling

Dismantling activities shall only be realized by a company specialized in performing such work.

The works must only be carried out by appropriately qualified and instructed staff.

Auxiliary materials and utilities shall be properly disposed in compliance with environmental protection regulations.

If material is not intended for recycling or re-sale, the instructions relating to proper storage must be adhered to (chapter 4).

Please also refer to chapter 2 “Safety Information “

7 Troubleshooting and Fault Rectification

Fault		Possible Cause	Remedy
Brake is not releasing	1-1	Valve at the unit is closed.	Open the valve
	1-2	Brake is not connected at the unit.	Connect the brake.
	1-3	Insufficient oil pressure.	Check the pump. Check the hydraulic oil level.
	1-4	Faulty gaskets at the brake unit (possibly recognizable by an unusually high amount of leaking oil).	Change the gaskets.
Brake is releasing slowly	2-1	Air in the hydraulic system	Bleed the system at the highest point and at the brake (if a flushing connection is available, initiate the flushing process)
	2-2	Abnormal constriction in the hydraulic system because a valve is in the wrong position.	Check the installation direction of the valves.
	2-3	Abnormal constriction in the hydraulic system due to dirt in the system.	Check the system and clean it, if necessary
	2-4	Air gap between the brake pad and the disc is too big.	Adjust the air gap.
	2-5	Oil viscosity is too high.	Check the oil type and oil temperature.
	2-5	Oil viscosity is too low (excess leaking at the pump and valve).	Check the oil type and oil temperature.
	2-6	Faulty gaskets in the brake.	Change the gaskets; check the pump and the valves.
	2-7	Leak in the hydraulic unit.	Change the gaskets; check the pump and the valves.
	2-8	Unsuitable or aged hydraulic fluid .	Empty the hydraulic system and refill it with suitable hydraulic oil.
	2-9	Low fluid level.	Top up the hydraulic oil
	2-10	Drop in pressure due to aged, faulty or unsuitable hydraulic hoses.	Replace faulty hydraulic hoses.
Brake is not being applied.	3-1	Valve at the unit is closed.	Open the valve
	3-2	Brake is not connected to the unit.	Connect the brake.

Fault		Possible Cause	Remedy
	3-3	Pipe or hoselines at the hydraulic system are bent, crushed, or buckled.	Check the lines and exchange them if necessary.
	3-4	Brake is faulty, brake pad is jammed.	Overhaul the brake.
Brake is being applied slowly.	4-1	Air in the hydraulic system.	Bleed the system at the highest point and at the brake. (if flushing connection available, start flushing process)
	4-2	Air gap between the brake pad and the disc is too big.	Adjust the air gap.
	4-3	Abnormal constriction in the hydraulic system because a valve is in the wrong position.	Check the installation direction of the valves.
	4-4	Abnormal constriction in the hydraulic system due to dirt in the system.	Check the system and clean it, if necessary (if flushing connection available, start flushing process)
	4-5	Oil viscosity is too high.	Check the oil type and oil temperature.
Unusually long braking time, or braking distance is too long, or insufficient braking force.	5-1	Load is too heavy or speed is too fast.	Do not exceed the permissible load and permissible speed.
	5-2	Air gap is too big.	Re-adjust the air gap.
	5-3	Oil, grease, paint, or similar on the brake pad or disc.	Change the brake pads. Clean the disc with brake cleaner or a degreaser. Check the brake system for leaks.
	5-4	Not all of the brakes are being triggered.	Check the valves.
	5-5	Fautly spring stack.	Exchange the complete spring stack.
	5-6	Brake pad is damaged.	Change the brake pads.
Leaks.	6-1	Worn gaskets.	Change all gaskets. Check the sealing surfaces.
Uneven pad lining wear.	7-1	Brake is incorrectly aligned.	Check the alignment, correct it if necessary.
	7-2	Brake disc is fluttering or the shaft is running out too far.	Change the brake disc. Check the shaft and the bearings.

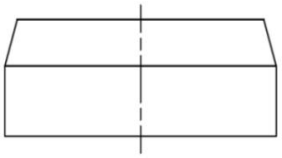
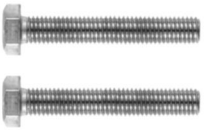
Fault		Possible Cause	Remedy
Abnormally high brake pad lining wear	8-1	Excessive load/use.	Check the complete brake system (electric brake system, speed monitor, etc.). Load, speed and frequency of use must not exceed the permissible limits.
	8-2	Air gap is too small.	Adjust the air gap.
	8-3	The brake is not releasing properly.	Check the oil pressure. Check that all moving parts can move freely. Check the position and alignment of the disc spring stack.
Unusual brake noise (screeching or squeeking noise, crunching or scratching noise).	9-1	Unsuitable pads/liners	Replace with a genuine Siemag spare part
	9-2	Brake disc looks polished / brake pads glazed	Re-machine the brake disc / change the brake pads
	9-3	Brake pads linings are worn / pad holder is grinding against the brake disc	Check the brake disc and re-machine it or change it /change the brake pads
	9-4	Foreign object in the brake pad	Change the brake pads and check the brake disc
	9-5	Excessive fluctuations of the brake disc thickness / lateral run-out	Check the brake disc and re-machine it or change it. Check the bearings
	9-6	Brake pads are loose	Check the screws at the pad holders, re-tighten them to the specified tightness
Jerking	10-1	Unsuitable pads	Replace with a genuine Siemag spare part
	10-2	Oil, grease, paint, or similar on the brake pad or disc.	Change the brake pads. Clean the disc with brake cleaner or a degreaser. Check the brake system for leaks.
	10-3	Brake pads are loose.	Check the screws at the pad holders, re-tighten them to the specified tightness
	10-4	Housing / pad holder guide worn out	Check the brake, change it if necessary.
	10-5	Excessive fluctuations of the brake disc thickness / lateral run-	Check the brake disc and re-

Fault		Possible Cause	Remedy
		out	machine it or change it. Check the bearings
	10-6	Disc springs are fatigued	Check the disc spring stack, change it if necessary.

Table 15: Troubleshooting and fault rectification

8 Tool Set

The tools listed below are required for start up and maintenance work. Keep this set of tools handy and ready for use, and keep it separate from other tools.

Item	Description	Qty.	Rem.	Figure
1	Hand pump including accessories	1	Z	
2	1 Set. Erection and mounting tools (2.1 – 2.9)	1	S	
2.1	Hook spanner (for adjusting sleeve and threaded ring)	1	S	
2.2	Face spanner (for undoing/tightening round nut)	1	S	
2.3	Expansion pliers (for locking ring)	1	S	
2.4	Fitting cone (for dismounting the piston)	1	S	
2.5	Mounting bolts M12 x 150 (for dismounting piston and backup washer)	2	S	
2.6	Special impact socket (SW 50, for hexagon nut M33)	1	S	

Item	Description	Qty.	Rem.	Figure
2.7	Special pliers for piston seals	1	S	
2.8	Impact socket (SW 36, for hexagon nut M24)	1	S	
2.9	Impact socket extension	1	S	
2.10	Torque wrench (40 – 280 Nm)	1	Z	
2.11	Torque amplifier (sufficient for 2.500 Nm)	1	Z	
3	1 Set: Measuring tools for operation monitor with microswitches (for measuring spring forces and air gap)	1 Set	Z	

Table 16: Tool set

S: Standard tool set
Z: Optional

9 Maintenance

Note *Maintenance jobs must only be done by the operating company's duly authorized, qualified personnel.*
Always have inspections and repairs done by SIEMAG TECBERG GmbH Customer Service. Use only genuine SIEMAG TECBERG GmbH spare parts.

9.1 Safety Instructions for Doing Maintenance Jobs

⚠ DANGER

Unsecured means of transportation.

Risk of falling, resulting in death or serious injury.

- Before beginning any work on the brake, controller and brake hydraulics, lock the means of transportation or the hoist into place.

⚠ WARNING

Risk of crash!
Greatly reduced braking action if the brake pads and brake disc are contaminated with oil, grease or paint. A crash could result in serious or even fatal injury!

- Do not re-use dirty brake pads.
- Change the brake pads. Clean the brake disc.
- Protect the brake pads and brake disc to prevent them from getting dirty.

⚠ CAUTION

Hot surfaces!

Risk of getting burned and sustaining injury.

- Do not touch the components
- Before doing any work at the brake, let the brake element, brake pad and brake disc cool down.

9.2 Maintenance schedule

The service plan table 12 depicts an overview of all service work on the brake unit BE100, together with the time intervals of such work.

It should be considered as a suggestion; it may be extended by adding other aspects or by varying the time intervals on the basis of experience in practical operation.

Maintenance Work/Checks	Daily	Weekly	Monthly	Yearly
General inspection (cleanliness)				
Routine control of the brake response				
Unusual noise				
Oil leakages				
Cleanliness of brake disc and brake linings: no pollutions by lubricants, remains of paintings or protective covers, rust and other.				
Visual inspection of the brake discs (scores, ridges etc)				
Safety braking!				
Oil level in the tank of the hydraulic unit				
Filter clogging, possibly replacement of filter				
Wear of brake lining				
Quantity of oil leakages				
Venting of pressure lines				
Bolts on the brake element (tight fit)				
Stud bolts on brake element (tight fit)				
Anchor bolts of the brake post (tight fit)				
Screwed pipe joints, pipes between the brake elements and the hydraulic unit (tightness, tight and vibration-free fit of fastening clips and pipe couplings)				
Checking of air gap				
Measuring of run out of brake disc				
Bolts on the brake element (tightening torques)				
Stud bolts on brake element (tightening torques)				
Anchor bolts of the brake post (tightening torques)				
Setting of air gap				
Checking of spring forces				
Checking of seals, possibly replacement of seals				
Checking of braking performance				
Checking of oil quality				
Checking / testing of operation monitors				
Checking / testing of hydraulic unit				

Table 17: Maintenace schedule

9.3 Maintenance Instructions

Some general maintenance work and checks should be performed at certain time intervals, so as to ensure trouble-free operation of the disc brake system.

9.3.1 Daily

- General inspection (cleanliness)
- Routine control of the brake response
- Unusual noise
- Oil leakages
- Cleanliness of brake disc and brake linings
- Visual inspection of the brake discs (scores, ridges etc)
- We recommend to perform safety braking once a day

This work does not involve much trouble, it can be easily performed by the winder operator. Any unusual changes found must be immediately reported to the service personnel and the cause of any such changes must be remedied.

9.3.2 Weekly

- All checks and controls mentioned under "Daily"
- Oil level in the tank of the hydraulic unit
- Filter clogging, possibly replacement of filter
- Wear of brake lining
- Quantity of oil leakages
- Venting of pressure lines or flush lines

Although the oil level in the tank, filter clogging and the wear of brake lining is all electrically monitored, it is recommended to add oil, if necessary, and to replace a clogged filter in good time.

The wear of brake lining is also electrically monitored, however, it should be recognized at an early time, so as to enable making the necessary preparations for the change of brake linings and having replacement parts at hand.

Residual air coming from the brake system could accumulate in the brake elements especially after start up and after repair work has been done. This

residual air must be vented from time to time via the test-point (minimess) valves above the brake elements (refer to chapter 5.8).

9.3.3 Monthly

- All checks and controls mentioned under "Weekly"
- Bolts on the brake element (tight fit)
- Stud bolts on brake element (tight fit)
- Anchor bolts of the brake post (tight fit)
- Screwed pipe joints, pipes between the brake elements and the hydraulic unit (tightness, tight and vibration-free fit of fastening clips and pipe couplings)
- Checking of air gap
- Measuring of run out of brake disc
- Flushing of all BE100 (BE 100 with flush connection

9.3.4 Annually

- All checks and controls mentioned under "Monthly"
- Bolts on the brake element (tightening torques)
- Stud bolts on brake element (tightening torques)
- Anchor bolts of the brake post (tightening torques)
- Setting of air gap
- Checking of spring forces
- Checking of seals, possibly replacement of seals
- Checking of braking actions
- Checking of oil quality
- Checking / testing of operation monitors
- Checking / testing of hydraulic unit

Note **Sect.9.2 includes a table of the above mentioned maintenance works.**

9.4 Special Maintenance Work

This work includes, above all, the exchange of damaged or worn parts, setting of the air gap and of the operation monitors and checking of the disc spring forces.

These special works must be performed by specialists or by appropriately trained service personnel.

9.4.1 Checking of brake linings

Brake Lining Wear Limit

NOTE
Safe operation can no longer be guaranteed if the brake linings are worn down beyond the wear limit. Therefore, always change the brake linings when the wear limit is reached.

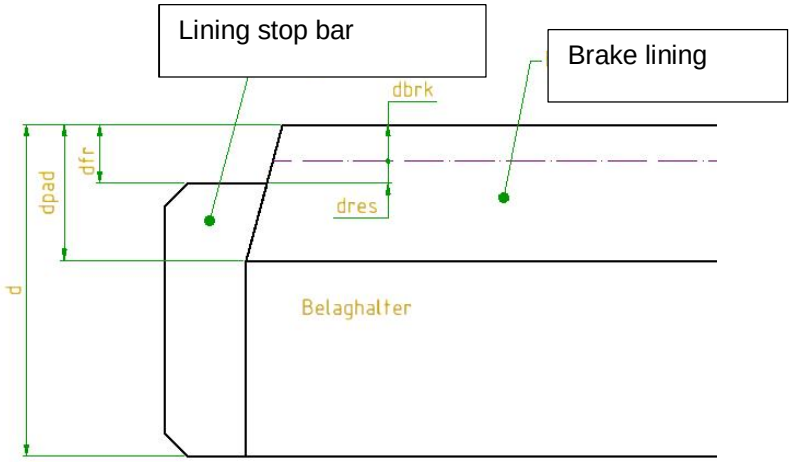


Figure 12: Brake pad: Check lining thickness

Dimension	Value	Comment
dpad	47.5 mm	Thickness of the brake pad lining
dfr	12.0 mm	Protrusion of new lining
dbrk	7.0 mm	Wear range
dres	5.0 mm	Wear limit

Table 18: Brake pad: Check lining thickness

Visual Inspection

Note If visual inspection brings to light shortcomings, the brake pads/linings must be checked by a specialist.

Checkpoint	Comment
Lining wear	For new brake pad linings, the projection of the linings (measured from the pad holder) is 12 mm. The wear limit is reached with the projection (measured from the lining retainer or pad carrier) is less than 5 mm. The brake linings must then be changed.
Surface	Check the brake pads and brake disc for scuffing, surface cracks and glazed braking surfaces.
Contact pattern	Check the brake pads and brake disc for uniform, full-surface contact pattern.
Contamination	There must not be any contaminants, such as lubricants, rust or other dirt on the brake pads and brake disc. Remove any paint or protective coating residues.
Screws	Check the screws at the lining holder and lining retainers

Table 19: Visual inspection of the brake pads/linings

9.4.2 Exchange of brake lining

A brake lining must be exchanged if the lining is worn out so much that the brake element cannot be readjusted any longer (refer to sect. 6.6 "Setting of air gap").

Note *In normal case, the other linings are then rather worn out as well, so it is advisable to exchange all linings.*
New brake linings must in any case be run in by actuating the brake several times. Do not run the brake disc hot.

If it proves impossible to exchange one individual brake lining, either take down the brake element or move the complete brake post off the brake disc.

We know from experience that it is rather difficult to remove brake linings after some years of operation; therefore, to make things easier, we advise to dismantle the brake element or the brake post prior to changing the linings.

Sequence of operations if a brake post is to be dismantled:

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when

disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- The brake must be applied prior to changing the brake linings, system must be depressurised.

Proceed as follows:

1. Lock the winder against turning, if the required static safety is no longer guaranteed when a brake post has been dismantled
2. Close all stop valves in the pressure lines on the brake posts that are not going to be replaced, i.e. the brake elements of these brake posts stay applied = depressurized
3. Lift the brake, i.e. the brake posts that were not locked before are released = the brake is not applied here!
4. Then close all stop valves on this brake post
5. Depressurize hydraulic system
6. Disconnect all bolted pipe joints between hydraulic unit and brake post
7. Detach brake post foot bolts
8. Pull off the brake post by using the winder house crane and place it down at a suitable location
9. Screw off the lining retainer (11 or 37)
10. Take out brake lining (one brake lining has a weight of some 3.5 kg)
11. Fit new brake lining with zero backlash, adapt its size if necessary
12. Screw down lining retainer
13. Repeat this procedure for changing other brake linings
14. Check linings for tight fit and cleanliness
15. Reinstall brake post, reconnect pipes and reopen stop valves
16. Reopen stop valves of the other brake posts
17. Enable winder
18. •Check air gap, reset if necessary (refer to sect 6.6).

Sequence of operations if the brake lining can / is to be removed laterally:

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- The brake must be applied prior to changing the brake linings, system must be depressurised.

Proceed as follows:

1. Lock the winder against turning, if the required static safety is no longer guaranteed after release of one brake unit
2. Screw hydraulic pump onto the manifold of the brake post
3. Open the pressure line towards the brake element to be adjusted, shut off the other brake elements
4. Lift the brake unit, where the lining is to be exchanged, by using the hydraulic pump
5. Screw off the lining retainer (11 or 37)
6. Take out brake lining (one brake lining has a weight of some 3.5 kg)
7. Fit new brake lining with zero backlash, adapt its size if necessary
8. Screw down lining retainer
9. Check the lining for tight fit and cleanliness
10. Reduce the pressure to zero using the oil drain plug on the hydraulic pump, so that the brake unit bears against the brake disc
11. Reopen all stop valves
12. Repeat this procedure for changing other brake linings
13. Unscrew hydraulic pump
14. Enable winder
15. Check air gap, reset if necessary (refer to sect 6.6).

9.4.3 Exchange of disc spring assembly

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- The brake must be applied prior to changing the brake linings, system must be depressurised.

Note

This work may only be performed by specialists or by appropriately trained service personnel. Do not remove adjusting sleeve unless the spring force has been neutralized.
Never mix up disc springs of different assemblies, since each assembly was calibrated exactly with the appertaining calibration plate.
To reassemble record the position of each disc spring
Always replace the locking ring (31), locking plate (32) and locking pin (36).
Oil new springs and clean and grease well contact faces of cylinders and of backing disc.

A disc spring assembly can be exchanged without removing the brake element from the brake post.

Sequence of operations:

1. Apply the brake, oil pressure 0 bar
2. Close stop valves of supply lines to the brake elements
3. Connect hand pump set (refer to sect. 8 "Tool set") to the manifold of the brake post
4. Open stop valves of supply lines to the brake element with the faulty spring assembly
5. Untighten threaded ring (10) by using the hook spanner and turn it somewhat out
6. Lift brake element with hand pump until adjusting sleeve (9) can be turned
7. Turn out adjusting sleeve until the spring assembly is completely unloaded
8. Reduce the pressure to zero using the oil drain plug on the hydraulic pump, so that the brake unit bears against the brake disc
9. Disconnect pipe couplings from cylinder cover (8) and adjusting sleeve (9)
10. Remove operation monitors (50/51) and collect residual oil
11. Remove lock(31), (32), (36) of the round nut (4) and screw off the round nut by using a face spanner
12. Pull the complete hydraulic part including cylinder cover, cylinder and piston out of the housing (approx. weight 35 kg)
13. Pull out backing disc (7) with fitting pins (see tools list)
14. Take out disc spring assembly (12) including calibration plate and replace it by a new complete assembly.
15. For reassembly, proceed in the reverse sequence of operations.

Note

After exchange of a spring assembly, proceed with installation work as described (refer to sect. 6.6 -6.9).
The test values attained should be recorded and used as basic and reference values for overhaul work at a later time.

9.4.4 Exchange of piston

⚠ WARNING

Hazard to suddenly released forces!
Disc spring assemblies are under tension. Risk of injury when disassembling the brake units and when opening the housing.

Risk of fatal or serious injury due impact forces!

- The brake must be applied prior to changing the brake linings, system must be depressurised.

Note

This work may only be performed by specialists or by appropriately trained service personnel.

Do not remove adjusting sleeve unless the spring force has been neutralized. Always replace the locking ring (31), locking plate (32) and locking pin (36). Clean and grease well the new piston sliding and contact faces towards cylinder and the centre bolt. When fitting, pay attention to sucking sliding seat.

For exchange of a piston, the brake element does not have to be removed from the brake post.

Sequence of operations:

1. Apply the brake, oil pressure 0 bar
2. Close stop valves of supply lines to the brake elements
3. Connect hand pump set (refer to sect. 8 "Tool set") to the manifold of the brake post
4. Open stop valves of supply lines to the brake element with the faulty piston
5. Untighten threaded ring (10) by using the hook spanner and turn it somewhat out
6. Lift brake element with hand pump until adjusting sleeve (9) can be turned without force
7. Turn out adjusting sleeve until the spring assembly is completely unloaded !
8. Reduce the pressure to zero using the oil drain plug on the hydraulic pump, so that the brake unit bears against the brake disc
9. Detach the pipe fittings on the cylinder cover (8) and remove adjusting sleeve (9).
10. Remove cylinder cover (8) with operation monitor (50/51)

11. Remove lock(31), (32), (36) of the round nut (4) and screw off the round nut by using a face spanner
12. Pull out piston (5) with fitting pins (see list of tools)
13. Collect residual oil
14. For reassembly, proceed in the reverse sequence of operations.

Note *After exchange of the piston, proceed with installation work according to sect. 6.8 (Venting). While exchanging the piston, it is recommended to check the seals and replace them, if necessary.*
After the round nut has been fitted and locked, the piston must be able to be axially shifted by approx. 1 - 2 mm.

9.4.5 Exchange of sealings

Note *This work may only be performed by specialists or by appropriately trained service personnel.*

- The volume of work involved in the exchange of seals depends on the position of the seal to be exchanged.It is thus recommended to exchange single seals only in exceptional cases. Normally, the complete set of seals should be exchanged..
- The Quad ring seal (43) is provided with a special wear resisting coating for a long service life. Therefore, this seal normally does not need to be exchanged.

Note *The exchange of this seal requires dismantling and disassembly of the complete brake element. In this case please contact Siemag Tecberg GmbH service.*

- All other seals can be exchanged by proceeding according to sect. 8.4.2 to 9.4.4 depending on their position.

9.4.6 Annual Inspection

In practice, a general overhaul of the disc brake system once a year has proved useful, in the course of which following work and checks should be made, in addition to general checks:

- Control and setting of air gaps of brake elements
- Checking of spring forces and comparing them with the previous measurements
- Checking of braking deceleration at emergency braking and at different load conditions (brake diagram)
- Checking of anchor bolts of the brake post and stud bolts of the BE100 for correct tightening torques.

Note

These works must be done by qualified service personnel equipped with the necessary special tools and test instruments.

In this case, please contact SIEMAG TECBERG GmbH Customer Service.

For further checks and controls, please refer to chapter 9.2 and 9.3.

9.4.7 Flushing the brake elements (without fixed flush connection)

Note

The following instructions only refer to the brake element BE 100 with flush connection.

Only flush one brake element at a time. NEVER flush simultaneously several brake elements!

When flushing the brake elements, always flush ALL elements, one

after the other!

How to proceed:

1. Apply the brake, oil pressure = 0 bar.

2. Lock the winder to prevent turning if the static safety is not sufficient while flushing.
3. Close **the main supply line** of the non-flushed brake posts.
4. Open **the return flow line** of the brake element to flush and run the hydraulic unit for a period of about 5 minutes (flushing up to the brake post).
5. Close the shut-off valve of each brake element on the brake post to flush.
6. Open the flush connection of the brake element to flush: Important: Use tissue to collect leakage oil and properly dispose it.
7. Attach the flush line to the brake element.
8. Connect the oil pan (capacity 20 l) with the flush line.
9. Switch on the hydraulic unit. Important: Manually control the hydraulic unit!
10. Slowly open the ball cock of the brake element to flush and remove about 2 liters of hydraulic oil.
11. Upon termination of the flushing procedures, close the ball valve and switch off the hydraulic unit.
12. Remove the flush line. Apply and firmly tighten the sealing screw.
13. Vent the brake elements as described in chapter 5.8.
14. Repeat the procedure under 6-13 for all brake elements of the brake post.
15. IMPORTANT: When the oil level drops below the minimum level, immediately refill to obtain the indicated oil level.
16. Upon termination of flushing all brake elements, open the shut-off valves and close the return line between brake post and brake unit.
17. Carefully vent the elements after each flushing procedure (see chapter 5.8).

9.4.8 Flushing the brake elements (with fixed flush connection)

Note

The following instructions only refer to the brake element BE 100 with flush connection.

Only flush one brake element at a time. NEVER flush simultaneously several brake elements!

When flushing the brake elements, always flush ALL elements, one

after the other!

How to proceed:

1. Apply the brake, oil pressure = 0 bar.

2. Lock the winder to prevent turning if the static safety is not sufficient while flushing.
3. Close **the main supply line** of the non-flushed brake posts.
4. Open **the return flow line** of the brake element to flush and run the hydraulic unit for a period of about 5 minutes (flushing up to the brake post).
5. Flush all brake elements, one after the other, by opening the ball valve (duration of flushing the brake element: approximately 1 minute).
6. Switch off the hydraulic unit.
7. Close the ball valve of the return line.
8. Proceed to flush all other brake posts as described above under item 3.
9. Upon termination of flushing all brake elements, open all shut-off valves and close the return line between brake post and brake unit.
10. Carefully vent the elements after each flushing procedure (see chapter 5.8).

10 Spare Parts

10.1 Spare Parts Overview

Based on experience, it is recommended to keep a sufficient quantity of these parts available in stock.

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd
00	1 unit	2-3	00	Brake unit BE100 (with or without flush connection; with brake lining, without operation monitor)	1 unit	1 unit (b)
01	1 set	2-3	12	Disc spring assembly	= 2 elements	2 sets (c)
02	1 unit	2-3	00	Brake lining	2 sets	2 units (d)
03	1 set	2-3	31, 32, 34, 35, 36	Locking / safety elements	2 units	2 sets
04	1 set	2-3	40 bis 48	Seals	2 sets	2 sets
05	1 set	4	5, 6, 8, 9, 10, 11	Spare parts for operation monitor with microswitches (FWM)	2 sets	2 sets
06	1 unit	4	10	Microswitch (black)	2 sets	4 units
07	1 set	6	5, 6, 8, 9, 10	Spare parts for operation monitor with linear displacement sensor	4 units	2 sets
08	1 unit	6	10	Linear displacement sensor (red)	2 sets	2 sets

Table 20: List of spare parts for BE100

10.2 Note

a) This list of spare parts has proved suitable for a perfect operation over several years. We recommend increasing the above quantities according to the total number of brake units installed.

b) Keeping a complete spare brake unit in stock offers the advantage that a faulty unit can be readily replaced, and repair work can be carried out irrespective of the winding operation.

c) A failure of disc springs occurs very rarely, however, it cannot be totally ruled out.

d) If a brake lining is worn out too much we urgently recommend replacing all linings, since we know from experience that at this moment the other linings are rather worn out as well and need to be changed within short.

An additional aspect to be considered: There is a continuous improvement of properties of the linings, thanks to the progress in the development of asbestos-free materials. It is thus not recommended to replace individual worn linings by new ones, since they might have different friction coefficients, thus producing different braking forces on the different brake elements.

10.2.1 Brake Unit BE 100

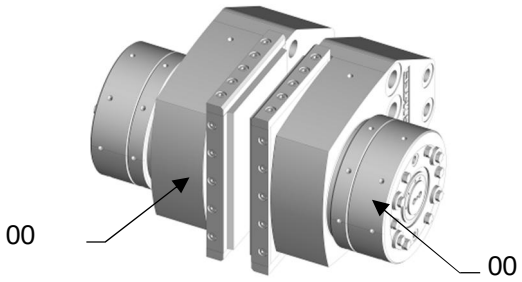


Figure 13: Spare Parts for brake unit BE100

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
00	1 Unit	2	00	Brake unit BE100 (without flush connection; .with brake lining, without operation monitor)	1 unit = 2 elements	1 unit (b)
00	1 Unit	2.1	00	Brake unit BE100 (with flush connection; .with brake lining, without operation monitor)	1 unit = 2 elements	1 unit (b)

Table 21: Spare Parts for brake unit BE100

10.2.2 Disc Spring Assembly

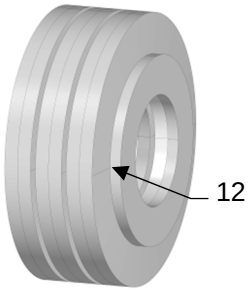


Figure 14: Spare Part Disc Spring Assembly

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
01	1 Set	2-3	12	Disc spring assembly	2 Sets	2 Sets(c)

Table 22: Spare Parts Disc Spring Assembly

10.2.3 Brake Lining

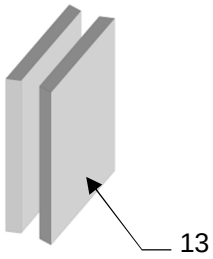


Figure 15: Spare Part Brake Lining

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
02	1 Unit	2-3	13	Brake lining	2 Unit	2 Sets (d)

Table 23: Spare Parts Brake Lining

10.2.4 Locking Elements

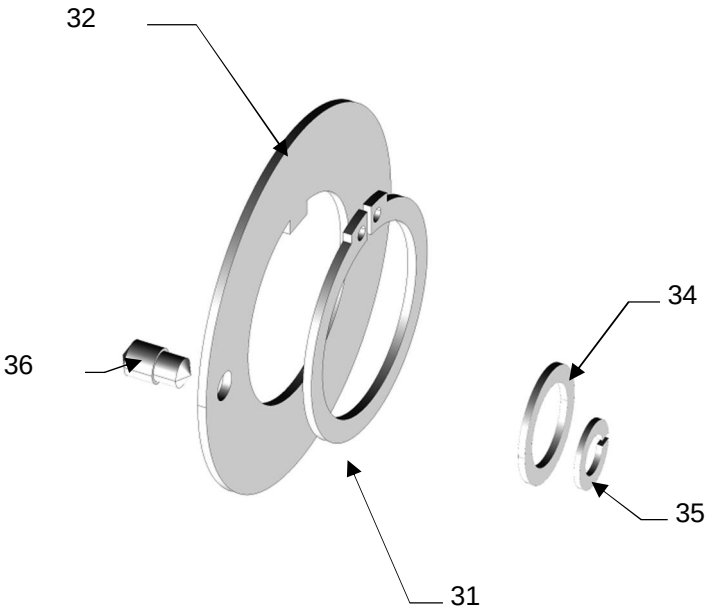


Figure 16: Spare parts Locking Elements

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
03	1 Sets	2-3		Locking elements	2 Sets	2 Sets
			31	Locking ring		
			32	Locking plate		
			34	Lock washer		
			35	Spring lock washer		
			36	Locking pin		

Table 24: Spare Parts Locking elements

10.2.5 Sealings

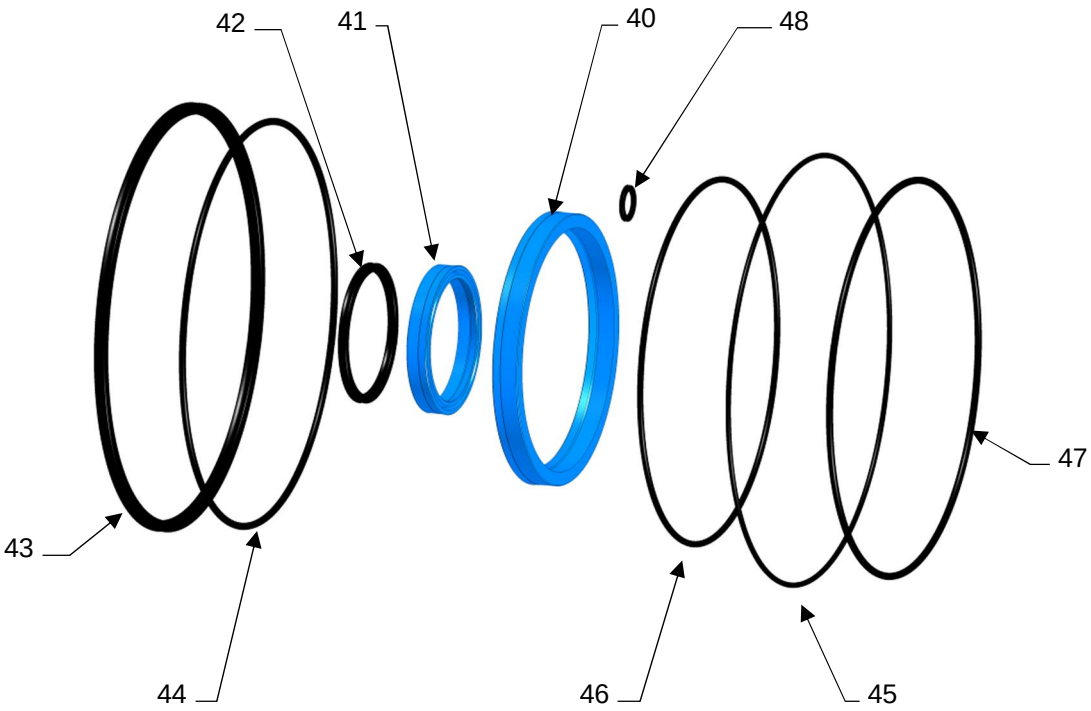


Figure 17: Spare parts Sealings

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
04	1 Set	2-3		Sealings	2 Sets	2 Sets
			40	Groove ring large		
			41	Groove ring small		
			42	Quad-ring small		
			43	Quad-ring large		
			44	O-ring 225		
			45	O-ring 240		
			46	O-ring 202		
			47	O-ring 200		
			48	Kant-Seal Ring		

Table 25: Spare Parts Sealings

10.2.6 Operation monitor with microswitches (FWM))

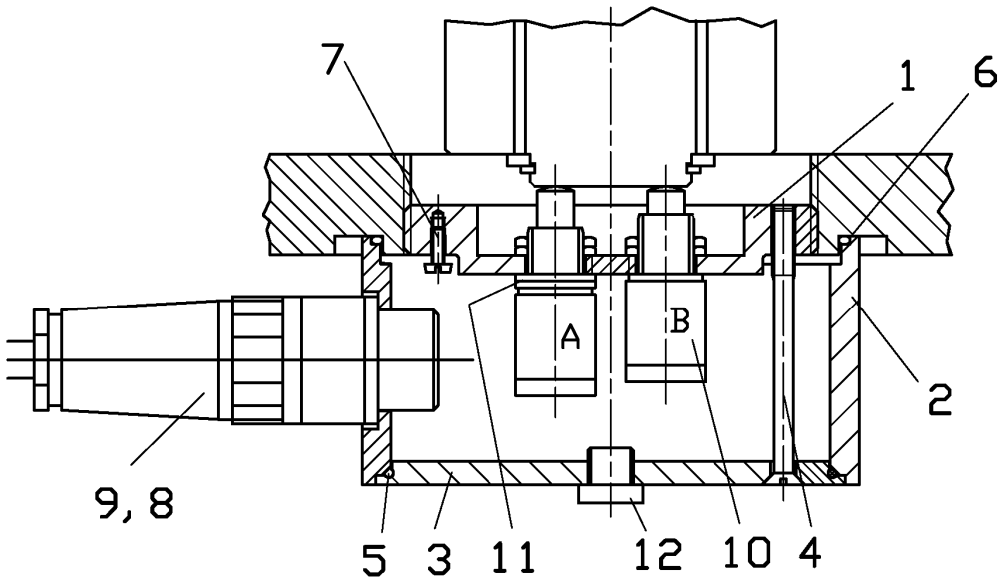


Figure 18: Spare parts FWM

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
05	1 Set	4		Spare parts for operation monitor with microswitches (FWM)	2 Sets	2 Sets
			5	O-ring		
			6	O-ring		
			8	Cord plug Pin terminal		
			9	Cord plug Socket		
			10	Microswitch (black)		
			11	Spacer		
06	1 Unit	4	10	Microswitch (black)	4 Units	4 Units

Table 26: Spare Parts FWM

10.2.7 Operation monitor with linear displacement sensor (FWL)

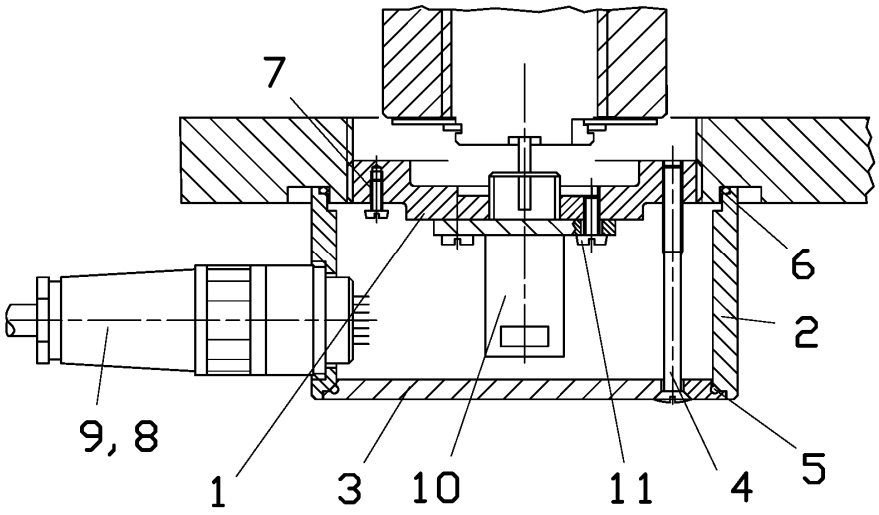


Figure 19: Spare parts FWL

No.	Quantity	Drawing	Item no.	Description	Qty. required per brake unit	Minimum qty. recom'd (a)
07	1 Set	6		Spare parts for Operation monitor with linear displacement sensor (FWL)	2 Sets	2 Sets
			5	O-ring		
			6	O-ring		
			8	Cord plug Pin terminal		
			9	Cord plug Socket		
			10	Linear displacement sensor (FWL) (red)		
08	1 Unit	6	10	Linear displacement sensor (FWL) (red)	2 Units	2 Units

Table 27: Spare Parts FWL

11 Disposal

The machinery or machine components must be disposed of in compliance with the applicable national waste disposal and recycling regulations.

11.1 Disposal of Sub-Assemblies

With the exception of the electrical equipment, the machine is made mainly of steel (with some aluminium and copper too).

Boxes, crates, bundles and sliders consist mainly of wood.
Wrapping material consists mainly of plastic, oil paper and corrugated cardboard constructions.

Properly separate and dispose of all parts in accordance with existing regulations and current requirements, e.g.:

- Electrical/electronic waste (circuit boards),
- Plastic waste (housings, wrapping),
- Sheet metal, steel, copper, aluminum (duly sorted by type).
- Wood (e. g. boxes, grates etc.)

11.2 Disposal Sites

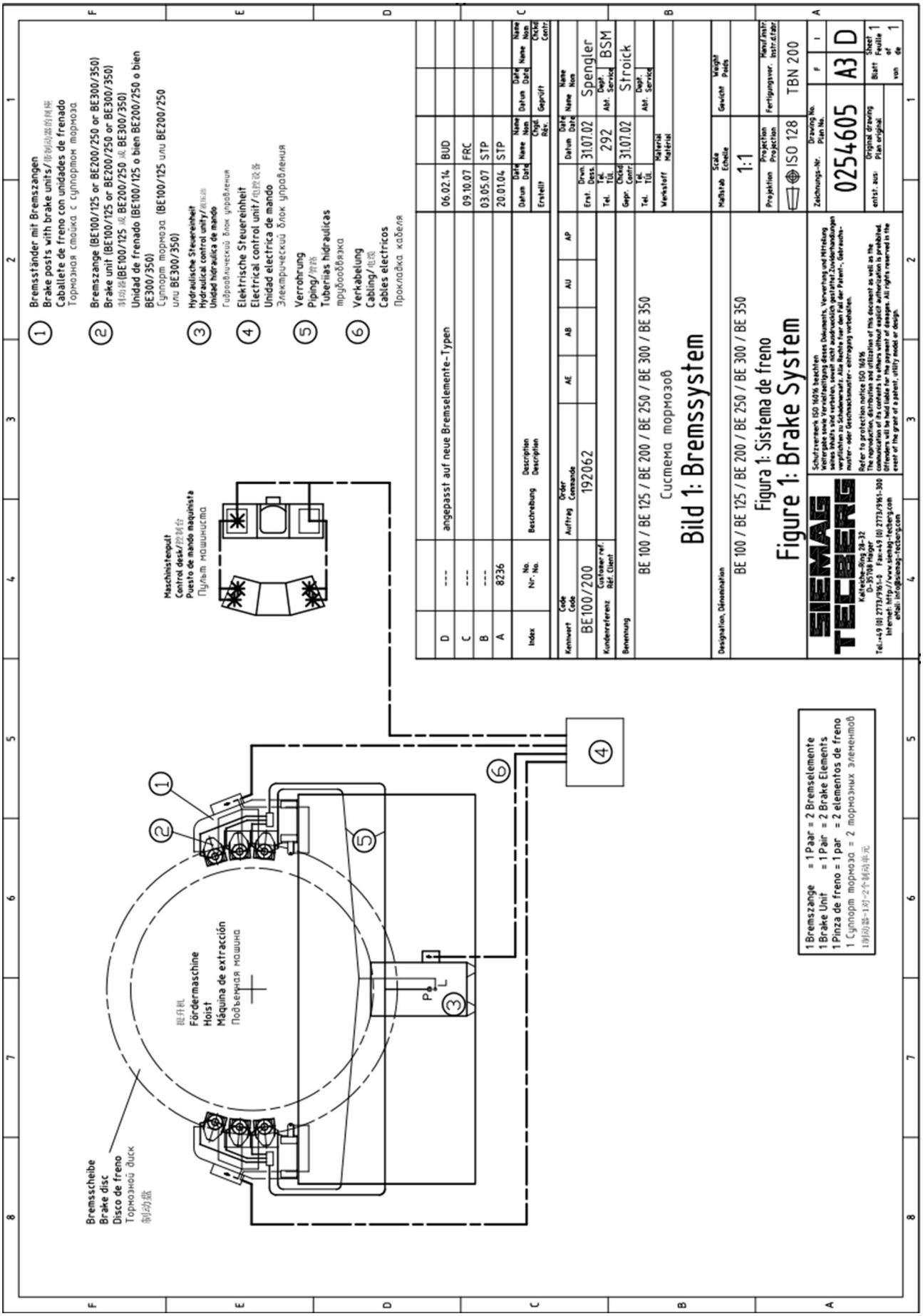
Oils, solvents and cleaning agents, and contaminated cleaning tools (brushes, cloths, etc.) must be disposed of in compliance with local regulations, according to the applicable waste code and in accordance with the instructions given in the manufacturer’s safety data sheets.

12 Figures

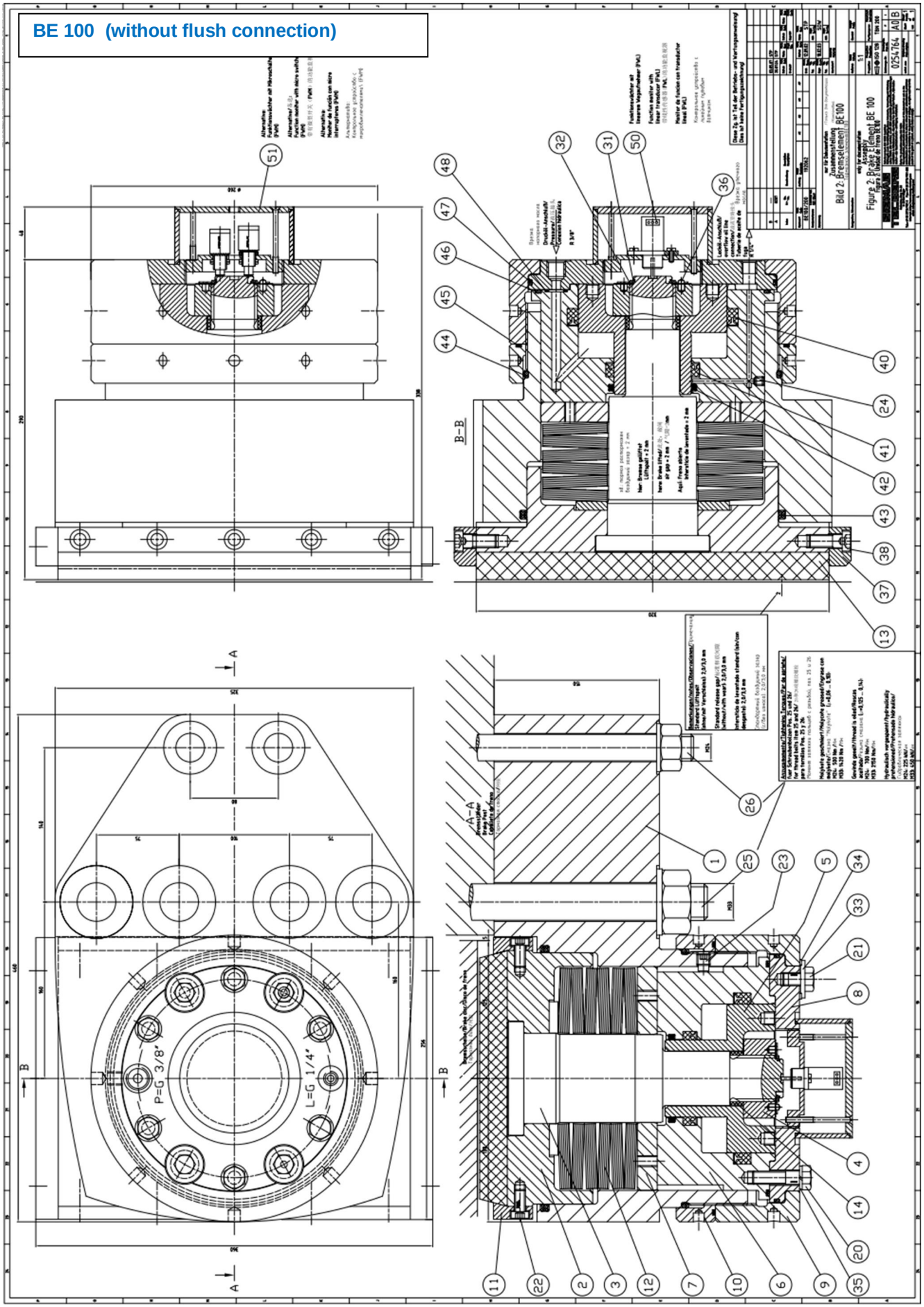
13 Table

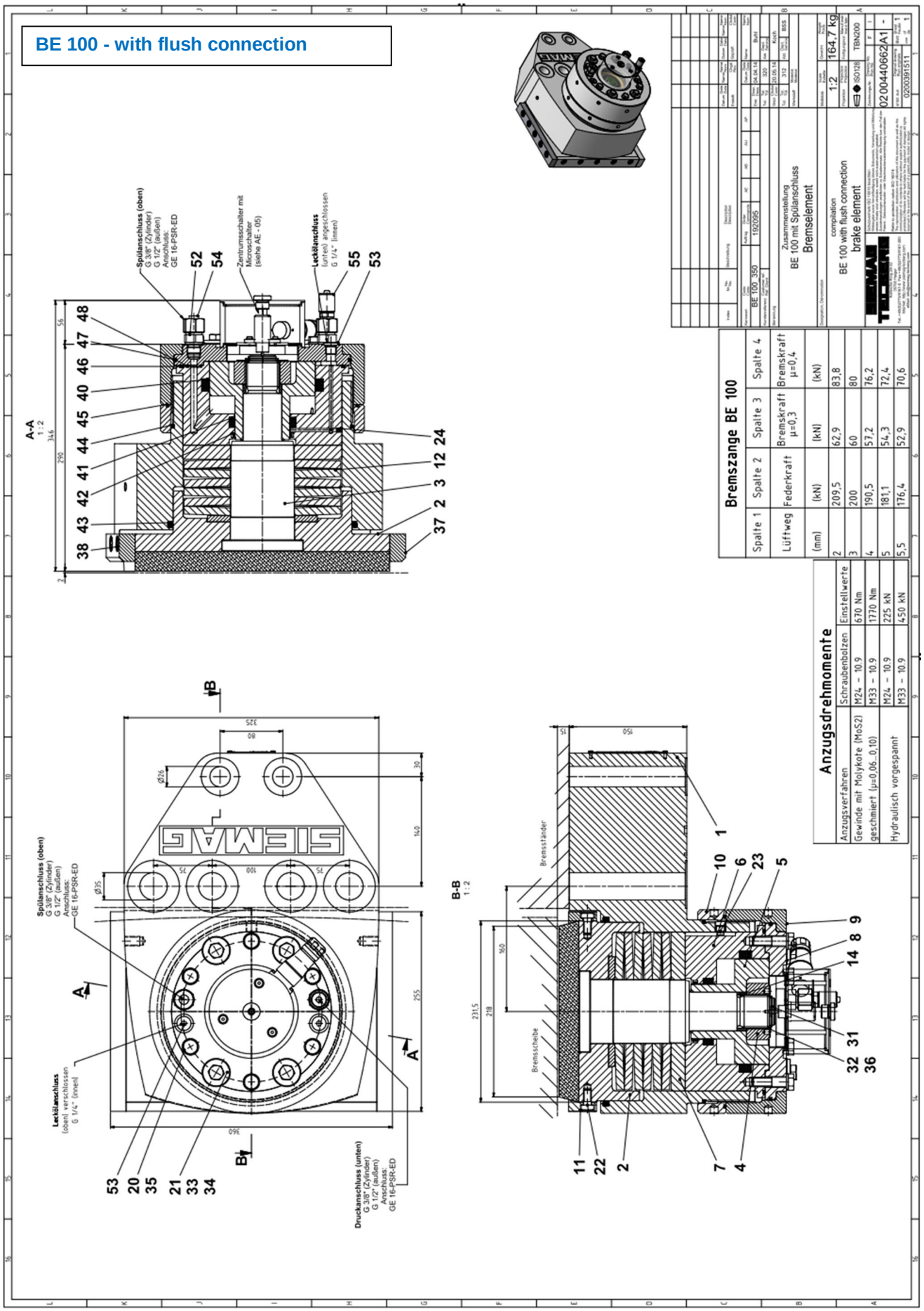
14 Attachments

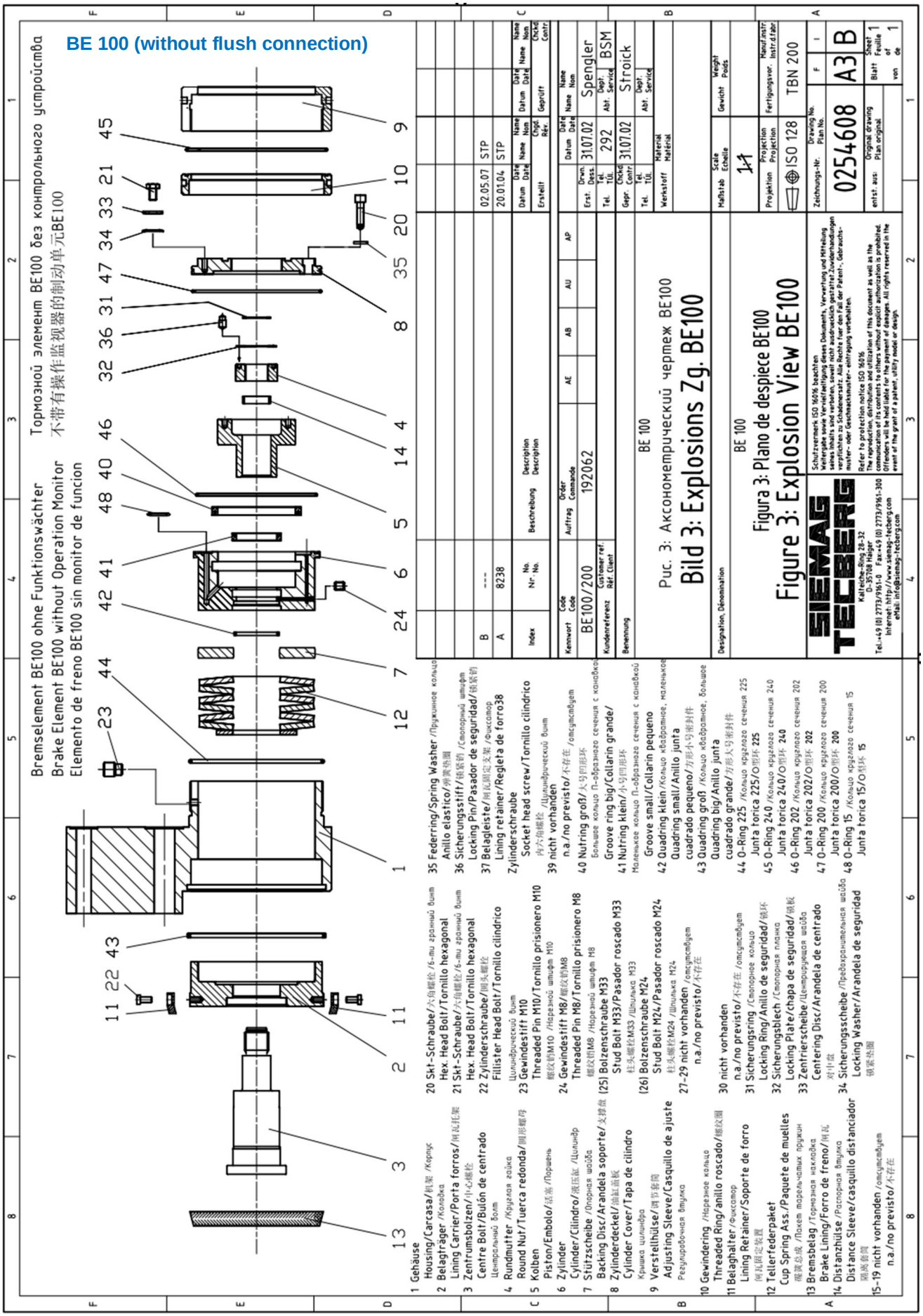
Description	Document –ID	Revision
Drawing 1: Brake system	0254605/3	
Drawing 2: Brake unit BE100	0254764/0	
Drawing 3: Explosion view of BE100	0254608/3	
Drawing 4: Operation monitor with microswitches (FWM)	0254606/3	
Drawing 5: Terminal diagram FWM	0254609/3	
Drawing 6: Operation monitor with linear transducer (FWL)	0254607/3	
Drawing 7: Terminal diagram FWL	0254610/3	
Data sheet of brake unit BE100 /BE125/ BE 200		

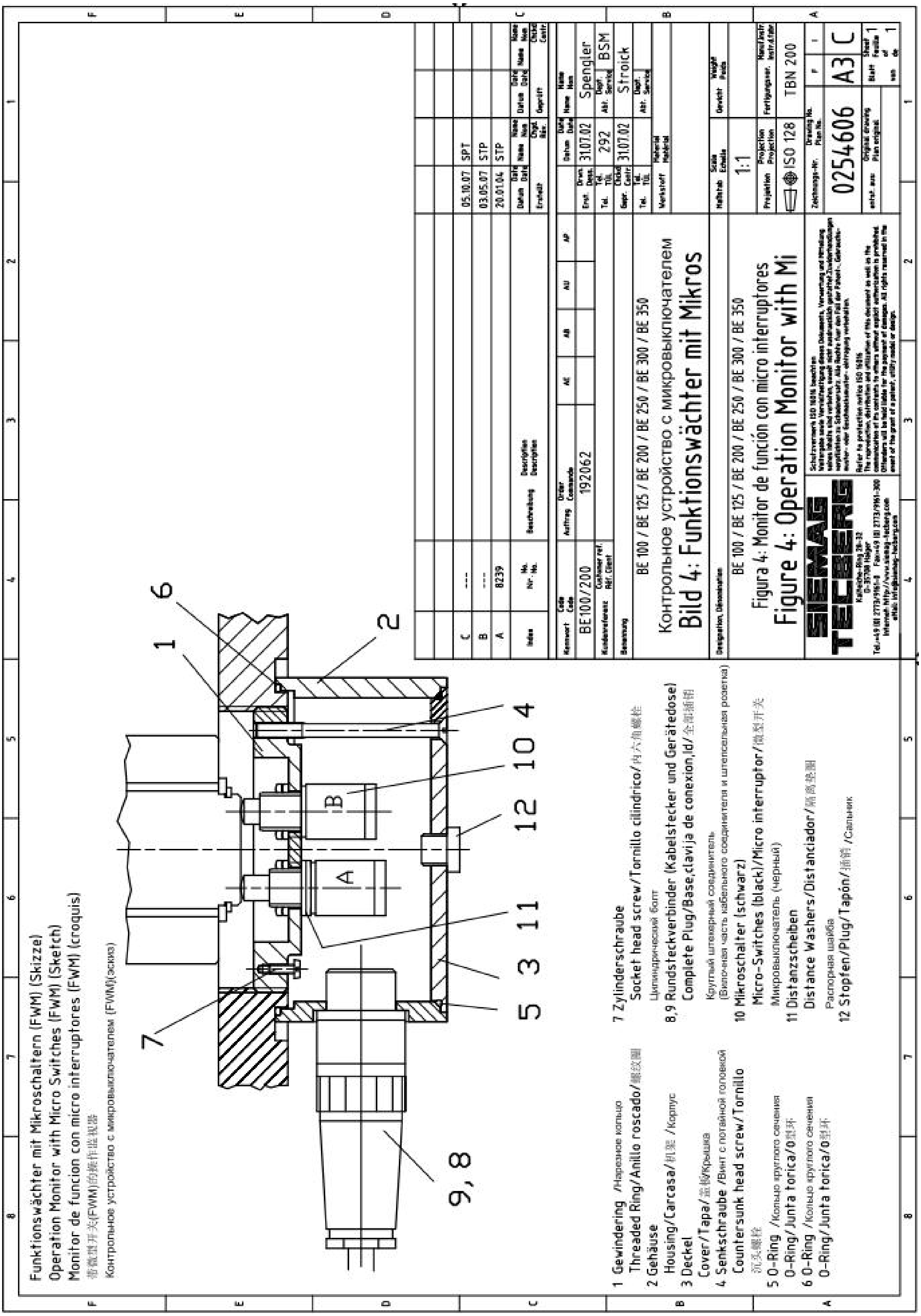

Bremsständer mit Bremszangen
Brake posts with brake units/
Caballete de freno con unidades de frenado
Тормозная стойка с суппортом тормоза
Bremszange (BE100/125 or BE200/250 or BE300/350)
Brake unit (BE100/125 or BE200/250 or BE300/350)
Unidad de frenado (BE100/125 o bien BE200/250 o bien BE300/350)
Суппорт тормоза (BE100/125 или BE200/250 или BE300/350)
Hydraulische Steuereinheit
Hydraulical control unit/
Unidad hidraulica de mando
Гидроблок управления
Elektrische Steuereinheit
Electrical control unit/
Unidad electrica de mando
Электрический блок управления
Verrohrung
Piping/
Tuberias hidraulicas
трубопроводы
Verkabelung
Cabling/
Cables electricos
Прокладка кабеля
Maschinenpult
Control desk/
Puesto de mando maquinista
Пульт машиниста
Bremsscheibe
Brake disc
Disco de freno
Тормозной диск
Fördermaschine
Hoist
Máquina de extracción
Подъемная машина
1 Bremszange = 1 Paar = 2 Bremselemente
1 Brake Unit = 1 Pair = 2 Brake Elements
1 Pinza de freno = 1 par = 2 elementos de freno
1 Суппорт тормоза = 2 тормозных элемента
BE 100 / BE 125 / BE 200 / BE 250 / BE 300 / BE 350
Cистема тормозов
Bild 1: Bremssystem
Figure 1: Brake System
Figura 1: Sistema de freno
BE 100 / BE 125 / BE 200 / BE 250 / BE 300 / BE 350
BE100/200
192062
angepasst auf neue Bremselemente-Typen
1:1
ISO 128
TBN 200
0254605
A3 D
Spengler
Stroick
BSM

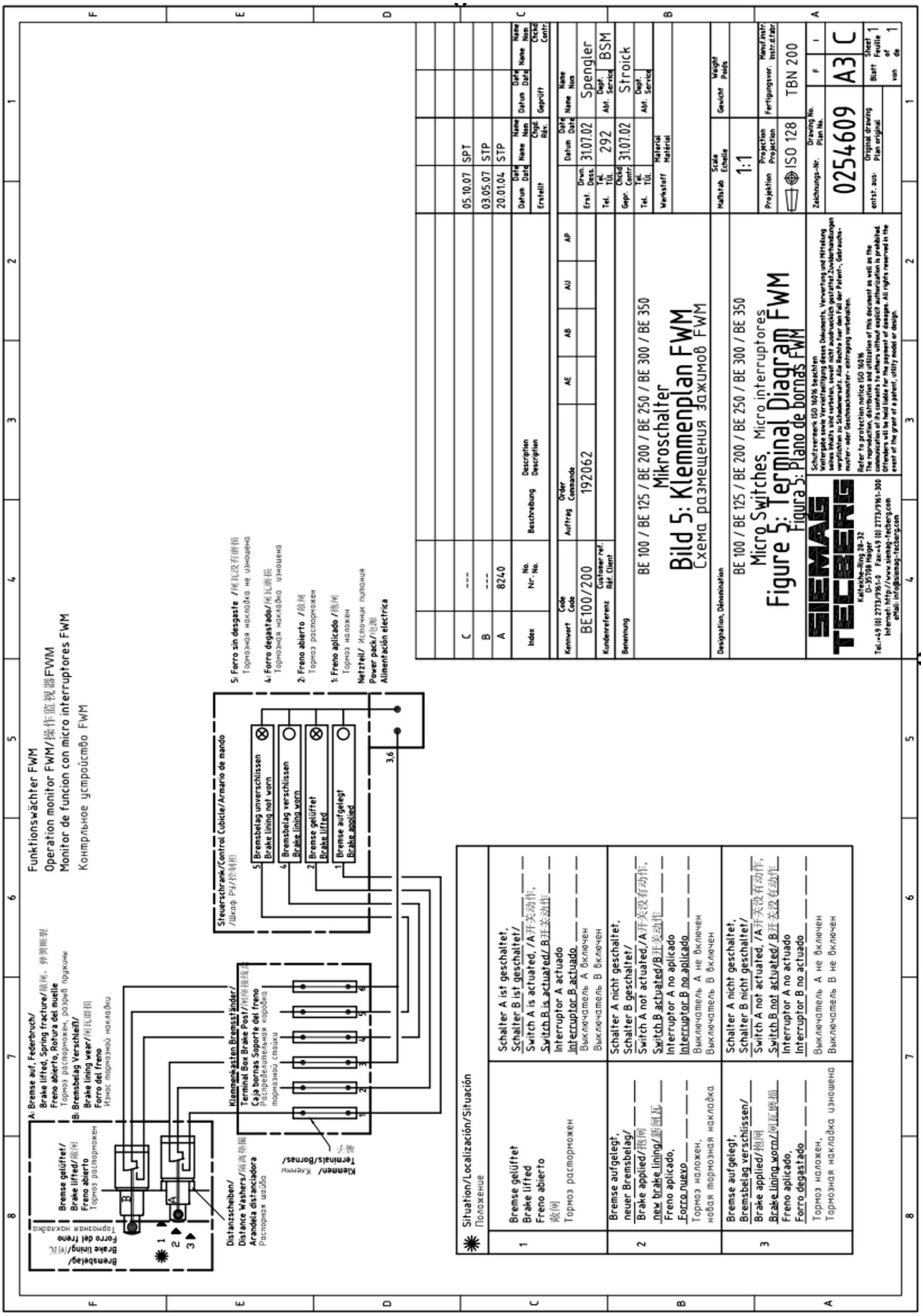
BE 100 (without flush connection)



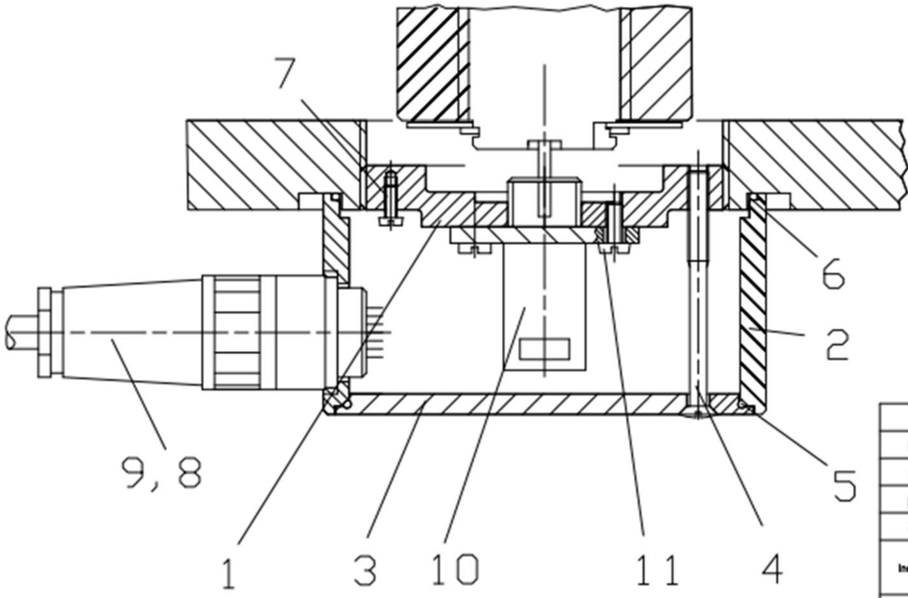

BE 100 - with flush connection
Spülanschluss (oben)
G 3/8" (Zylinder)
G 1/2" (außen)
Anschluss:
GE 16-PSR-ED
Zentrumsschalter mit
Microschalter
(siehe AE - 05)
Leckölanschluss
(unten) angeschlossen
G 1/4" - innen)
A-A
1 : 2
52 54 55 53
48 47 46 40 45 44 41 42 43 38
24 12 3 2 37
B-B
1 : 2
Bremsstander
Bremsscheibe
1 10 6 23 5 9 8 14 31 32 36
11 22 2 7 4
Leckölanschluss
(oben) verschlossen
G 1/4" (innen)
Druckanschluss (unten)
G 3/8" (Zylinder)
G 1/2" (außen)
Anschluss:
GE 16-PSR-ED
53 20 35 21 33 34
Bremszange BE 100
Spalte 1 Spalte 2 Spalte 3 Spalte 4
Lüftweg Federkraft Bremskraft μ=0,3 Bremskraft μ=0,4
(mm) (kN) (kN) (kN)
2 209,5 62,9 83,8
3 200 60 80
4 190,5 57,2 76,2
5 181,1 54,3 72,4
5,5 176,4 52,9 70,6
Anzugsdrehmomente
Anzugsverfahren Schraubenbolzen Einstellwerte
Gewinde mit Molykote (MoS2) geschmiert (μ=0,06..0,10) M24 – 10.9 670 Nm
M33 – 10.9 1770 Nm
Hydraulisch vorgespannt M24 – 10.9 225 kN
M33 – 10.9 450 kN
Zusammenstellung
BE 100 mit Spülanschluss
Bremselement
compilation
BE 100 with flush connection
brake element
BE 100_350
192095
1:2
164,7 kg
ISO128
TBN200
02004406621A1 -
02003915111


BE 100 (without flush connection)
Bremselement BE100 ohne Funktionswächter
Brake Element BE100 without Operation Monitor
Elemento de freno BE100 sin monitor de funcion
Тормозной элемент BE100 без контрольного устройства
不带有操作监视器的制动单元BE100
Puc. 3: Аксонометрический чертеж BE100
Bild 3: Explosions Zg. BE100
Figura 3: Plano de despiece BE100
Figure 3: Explosion View BE100
BE100/200
192062
BE 100
ISO 128
TBN 200
0254608
A3
Stroick
Spengler
BSM
31.07.02
292
1:1
1 Gehäuse
Housing/Carcasa/机架 /Корпус
2 Belagträger /Колодка
Lining Carrier/Porta forros/闸瓦托架
3 Zentrumsbolzen/中心螺栓
Centre Bolt/Bulón de centrado
Центральный болт
4 Rundmutter /Круглая гайка
Round Nut/Tuerca redonda/圆形螺母
5 Kolben
Piston/Embolo/活塞/Поршень
6 Zylinder
Cylinder/Cilindro/液压缸 /Цилиндр
7 Stützscheibe /Опорная шайба
Backing Disc/Arandela soporte/支撑盘
8 Zylinderdeckel/油缸盖板
Cylinder Cover/Tapa de cilindro
Крышка цилиндра
9 Verstellhülse/调节套筒
Adjusting Sleeve/Casquillo de ajuste
Регулировочная втулка
10 Gewindering /Нарезное кольцо
Threaded Ring/anillo roscado/螺纹圈
11 Belaghalter /Фиксатор
Lining Retainer/Soporte de forro
闸瓦固定架
12 Tellerfederpaket
Cup Spring Ass./Paquete de muelles
碟簧总成 /Пакет тарельчатых пружин
13 Bremsbelag /Тормозная накладка
Brake Lining/Forro de freno/闸瓦
14 Distanzhülse /Распорная втулка
Distance Sleeve/casquillo distanciador
隔离套筒
15-19 nicht vorhanden /отсутствует
n.a/no previsto/不存在
20 Skt-Schraube/六角螺栓 /6-ти гранный болт
Hex. Head Bolt/Tornillo hexagonal
21 Skt-Schraube/六角螺栓 /6-ти гранный болт
Hex. Head Bolt/Tornillo hexagonal
22 Zylinderschraube/圆头螺栓
Fillister Head Bolt/Tornillo cilindrico
Цилиндрический болт
23 Gewindestift M10
Threaded Pin M10/Tornillo prisionero M10
螺纹销M10 /Нарезной штифт M10
24 Gewindestift M8/螺纹销M8
Threaded Pin M8/Tornillo prisionero M8
螺纹销M8 /Нарезной штифт M8
(25) Bolzenschraube M33
Stud Bolt M33/Pasador roscado M33
柱头螺栓M33 /шпилька M33
(26) Bolzenschraube M24
Stud Bolt M24/Pasador roscado M24
柱头螺栓M24 /шпилька M24
27-29 nicht vorhanden /отсутствует
n.a/no previsto/不存在
30 nicht vorhanden
n.a/no previsto/不存在 /отсутствует
31 Sicherungsring /Стопорное кольцо
Locking Ring/Anillo de seguridad/锁环
32 Sicherungsblech /Стопорная планка
Locking Plate/chapa de seguridad/锁板
33 Zentrierscheibe/Центрирующая шайба
Centering Disc/Arandela de centrado
对中盘
34 Sicherungsscheibe /Предохранительная шайба
Locking Washer/Arandela de seguridad
锁紧垫圈
35 Federring/Spring Washer /Пружинное кольцо
Anillo elastico/弹簧垫圈
36 Sicherungsstift/锁紧销 /Стопорный штифт
Locking Pin/Pasador de seguridad/锁紧销
37 Belagleiste/闸瓦固定支架 /Фиксатор
Lining retainer/Regleta de forro38
Zylinderschraube
Socket head screw/Tornillo cilindrico
内六角螺栓 /Цилиндрический болт
39 nicht vorhanden
n.a/no previsto/不存在 /отсутствует
40 Nutring groß/大号凹形环
Большое кольцо П-образного сечения с конобко
Groove ring big/Collarin grande/
41 Nutring klein/小号凹形环
Маленькое кольцо П-образного сечения с конобкой
Groove small/Collarin pequeno
42 Quadring klein/Кольцо квадратное, маленькое
Quadring small/Anillo junta
cuadrado pequeno/方形小号密封件
43 Quadring groß /Кольцо квадратное, большое
Quadring big/Anillo junta
cuadrado grande/方形大号密封件
44 O-Ring 225 /Кольцо круглого сечения 225
Junta torica 225/O型环 225
45 O-Ring 240 /Кольцо круглого сечения 240
Junta torica 240/O型环 240
46 O-Ring 202 /Кольцо круглого сечения 202
Junta torica 202/O型环 202
47 O-Ring 200 /Кольцо круглого сечения 200
Junta torica 200/O型环 200
48 O-Ring 15 /Кольцо круглого сечения 15
Junta torica 15/O型环 15


Funktionswächter mit Mikroschaltern (FWM) (Skizze)
Operation Monitor with Micro Switches (FWM) (Sketch)
Monitor de funcion con micro interruptores (FWM) (croquis)
带微型开关(FWM)的操作监视器
Контрольное устройство с микровыключателем (FWM)(эскиз)
1 Gewindering /Нарезное кольцо
Threaded Ring/Anillo roscado/螺纹圈
2 Gehäuse
Housing/Carcasa/机架 /Корпус
3 Deckel
Cover/Tapa/盖板/Крышка
4 Senkschraube /Винт с потайной головкой
Countersunk head screw/Tornillo
沉头螺栓
5 O-Ring /Кольцо круглого сечения
O-Ring/Junta torica/O型环
6 O-Ring /Кольцо круглого сечения
O-Ring/Junta torica/O型环
7 Zylinderschraube
Socket head screw/Tornillo cilindrico/内六角螺栓
Цилиндрический болт
8,9 Rundsteckverbinder (Kabelstecker und Gerätedose)
Complete Plug/Base,clavija de conexion,ld/全部插销
Круглый штекерный соединитель
(Включая часть кабельного соединителя и штепсельная розетка)
10 Mikroschalter (schwarz)
Micro-Switches (black)/Micro interruptor/微型开关
Микровыключатель (черный)
11 Distanzscheiben
Distance Washers/Distanciador/隔离垫圈
Распорная шайба
12 Stopfen/Plug/Tapón/插销 /Сальник
BE100/200
1920622
Контрольное устройство с микровыключателем
Bild 4: Funktionswächter mit Mikros
BE 100 / BE 125 / BE 200 / BE 250 / BE 300 / BE 350
Figura 4: Monitor de función con micro interruptores
Figure 4: Operation Monitor with Mi
05.10.07 SPT
03.05.07 STP
20.01.04 STP
8239
31.07.02 Spengler
31.07.02 Stroick
292 BSM
1:1
ISO 128
TBN 200
0254606
A3 C
SIEMAG TECBERG


Funktionswächter FWM
Operation monitor FWM
Monitor de funcion con micro interruptores FWM
Контрольное устройство FWM
Steuerschrank/Control Cubicle/Armario de mando
Klemmenkasten Bremsständer/
Terminal Box Brake Post/
Caja bornas Soporte del freno
Bremsbelag unverschlissen
Brake lining not worn
Bremsbelag verschlissen
Brake lining worn
Bremse gelüftet
Brake lifted
Bremse aufgelegt
Brake applied
Netzteil/ Power pack/
Alimentación electrica
Situation/Localización/Situación
Bremse gelüftet
Brake lifted
Freno abierto
Bremse aufgelegt, neuer Bremsbelag/
Brake applied/ new brake lining/
Freno aplicado, Forro nuevo
Bremse aufgelegt, Bremsbelag verschlissen/
Brake applied/ Brake lining worn/
Freno aplicado, Forro degastado
Schalter A ist geschaltet,
Schalter B ist geschaltet/
Switch A is actuated,
Switch B is actuated/
Interruptor A actuado
Interruptor B actuado
Schalter A nicht geschaltet,
Schalter B geschaltet/
Switch A not actuated,
Switch B actuated/
Interruptor A no actuado
Interruptor B no aplicado
Schalter A nicht geschaltet,
Schalter B nicht geschaltet/
Switch A not actuated,
Switch B not actuated/
Interruptor A no actuado
Interruptor B no actuado
Distanzscheiben/
Distance Washers/
Arandela distanciadora
Klemmen/ Terminals/Bornas/
BE100/200
192062
31.07.02
Spengler
Stroick
BSM
BE 100 / BE 125 / BE 200 / BE 250 / BE 300 / BE 350
Mikroschalter
Bild 5: Klemmenplan FWM
Micro Switches, Micro interruptores
Figure 5: Terminal Diagram FWM
Figura 5: Plano de bornas FWM
SIEMAG TECBERG
1:1
ISO 128
TBN 200
0254609
A3
C

Funktionswächter mit linearem Wegaufnehmer (FWL) (Skizze)
Operation Monitor with linear transducer (FWL) (Sketch)
Monitor de funcion con transductor lineal (FWL) (croquis)
带线性传感器(FWL)的操作监视器
Контрольное устройство с линейным путевым датчиком {FWL}(эскиз)



1 Gewindering/Threaded Ring/Anillo rosc/ado/螺纹圈/Нарезное кольцо
2 Gehäuse/Housing/Carcasa/机架 /Корпус
3 Deckel/Cover/Tapa/盖板 /Крышка
4 Senkschraube /Болт с потайной головкой
Countersunk head screw/Tornillo/沉头螺栓
5 O-Ring /Кольцо круглого сечения
O-Ring/Junta torica/O型环
6 O-Ring /Кольцо круглого сечения
O-Ring/Junta torica/O型环
7 Zylinderschraube /Цилиндрический винт
Socket head screw/Tornillo cilindrico/内六角螺栓
8,9 Rundsteckverbinder (Kabelstecker und Gerätedose)
Complete Plug/Base,clavija de conexion,ld/插销
Круглый штекерный соединитель
(Вилочная часть кабельного соединителя и штепсельная розетка)
10 Linearer Wegaufnehmer (rot) /Линейный путевой датчик (красный)
linear transducer (red) / transductor/线性传感器
11 Schraube/bolt/Tornillo/螺栓 /Винт

Index	Nr. No.	Beschreibung Description	Datum Date	Name Nom
D	---	angepasst auf neue Bremselemente-Typen	06.02.14	BUD
C	---		05.10.07	SPT
B	---		03.05.07	STP
A	8241		20.01.04	STP

Erstellt / Chgd. Rév. — Geprüft / Chckd Contr.

Kennwort Code	Auftrag Order Commande	AE	AB	AU	AP
BE100/200	192062				

Kundenreferenz Customer ref. Réf. Client

	Datum Date	Name Nom
Erst. Drwn. Dess.	31.07.02	Spengler
Tel. TÜL	292	Abt. Dept. Service: BSM
Gepr. Chckd Contr.	31.07.02	Stroick
Tel. TÜL		Abt. Dept. Service

Werkstoff Material Matériel

Benennung
BE 100 / BE 125 / BE 200 / BE 300 / BE 350
Контрольное устройство с линейным путевым датчиком
Bild 6: Funktionswächter mit linear

Designation, Dénomination
BE 100 / BE 125 / BE 200 / BE 300 / BE 350
Figura 6: Monitor de función con transductor lineal
Figure 6: Operation Monitor with Li

Maßstab Scale Echelle: 1:1 — Gewicht Weight Poids
Projektion Projection: ISO 128 — Fertigungsvor. Manuf.instr. Instr.d.fabr: TBN 200

SIEMAG TECBERG
Kalteiche-Ring 28-32
D-35708 Haiger
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eMail: info@siemag-tecberg.com

Zeichnungs-Nr. Drawing No. Plan No.: 0254607 — F: A3 — I: D
entst. aus: Original drawing Plan original
Blatt Sheet Feuille 1 von of de 1

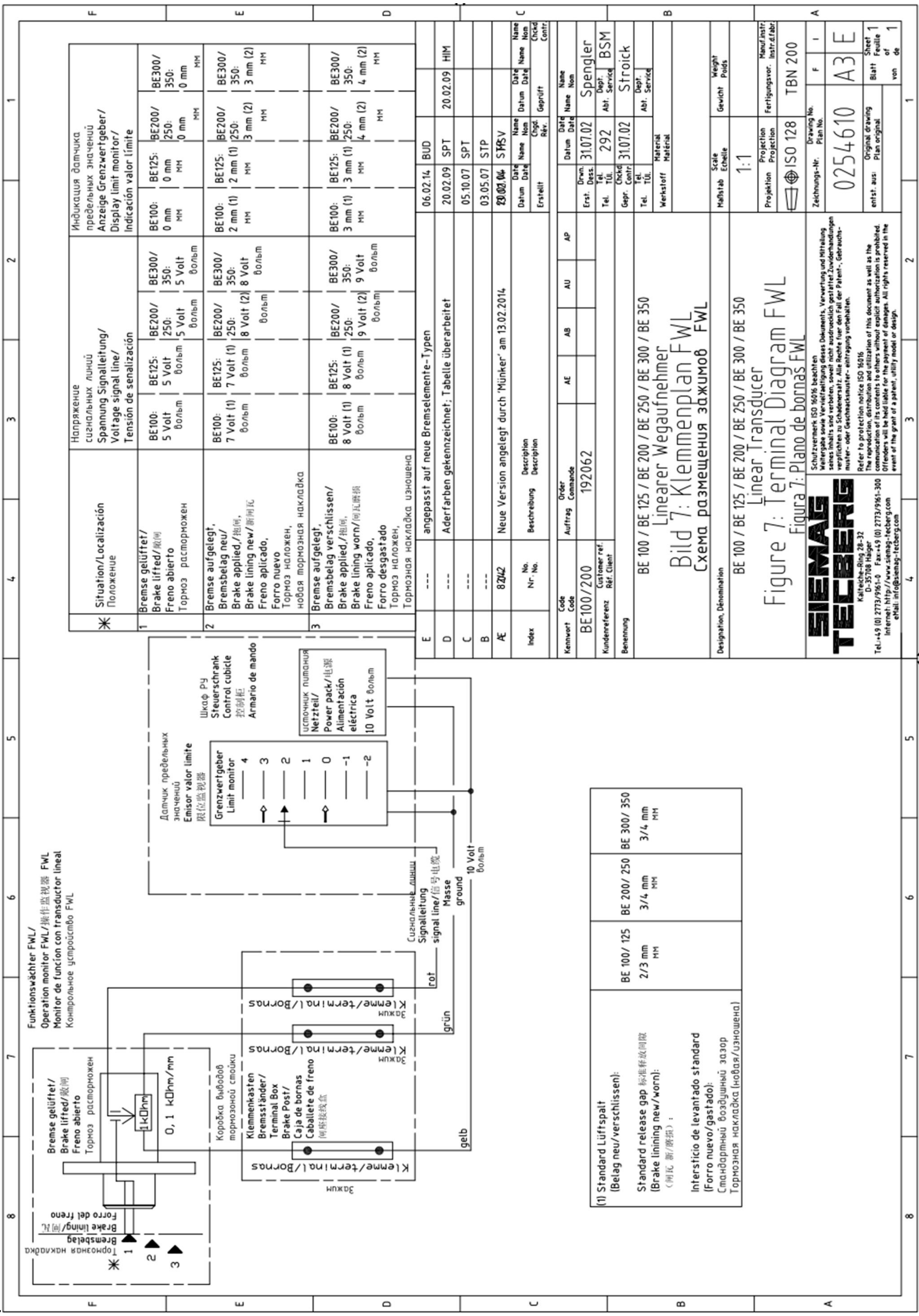
Figure 7: Terminal Diagram FWL
Bild 7: Klemmenplan FWL
Figura 7: Plano de bornas FWL
Схема размещения зажимов FWL
Linearer Wegaufnehmer
Linear Transducer
BE 100 / BE 125 / BE 200 / BE 250 / BE 300 / BE 350
Funktionswächter FWL/
Operation monitor FWL/
Monitor de funcion con transductor lineal
Контрольное устройство FWL
Grenzwertgeber
Limit monitor
Emisor valor límite
Steuerschrank
Control cubicle
Armario de mando
Netzteil/
Power pack/
Alimentación eléctrica
10 Volt
Signalleitung
signal line/
Masse
ground
10 Volt
rot
grün
gelb
Klemme/terminal/Bornas
Klemmenkasten
Bremsständer/
Terminal Box
Brake Post/
Caja de bornas
Caballete de freno
0, 1 kOhm/mm
1kOhm
Bremse gelüftet/
Brake lifted/
Freno abierto
Bremsbelag
Brake lining/
Forro del freno
Situation/Localización
Spannung Signalleitung/
Voltage signal line/
Tensión de senalización
Anzeige Grenzwertgeber/
Display limit monitor/
Indicación valor límite
Bremse aufgelegt,
Bremsbelag neu/
Brake applied,
Brake lining new/
Freno aplicado,
Forro nuevo
Bremse aufgelegt,
Bremsbelag verschlissen/
Brake applied,
Brake lining worn/
Freno aplicado,
Forro desgastado
BE100: 5 Volt
BE125: 5 Volt
BE200/250: 5 Volt
BE300/350: 5 Volt
BE100: 0 mm
BE125: 0 mm
BE200/250: 0 mm
BE300/350: 0 mm
BE100: 7 Volt (1)
BE125: 7 Volt (1)
BE200/250: 8 Volt (2)
BE300/350: 8 Volt
BE100: 2 mm (1)
BE125: 2 mm (1)
BE200/250: 3 mm (2)
BE300/350: 3 mm (2)
BE100: 8 Volt (1)
BE125: 8 Volt (1)
BE200/250: 9 Volt (2)
BE300/350: 9 Volt
BE100: 3 mm (1)
BE125: 3 mm (1)
BE200/250: 4 mm (2)
BE300/350: 4 mm (2)
(1) Standard Lüftspalt
(Belag neu/verschlissen):
Standard release gap
(Brake lining new/worn):
Intersticio de levantado standard
(Forro nuevo/gastado):
BE 100/ 125: 2/3 mm
BE 200/ 250: 3/4 mm
BE 300/ 350: 3/4 mm
angepasst auf neue Bremselemente-Typen
Aderfarben gekennzeichnet; Tabelle überarbeitet
Neue Version angelegt durch 'Münker' am 13.02.2014
06.02.14 BUD
20.02.09 SPT 20.02.09 HIM
05.10.07 SPT
03.05.07 STP
BE100/200
192062
Spengler
BSM
Stroick
31.07.02
292
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ISO 128
TBN 200
0254610
A3 E
Sheet 1 of 1
SIEMAG TECBERG
Kalteiche-Ring 28-32
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Tel.:+49 (0) 2773/9161-0 Fax:+49 (0) 2773/9161-300
Internet: http://www.siemag-tecberg.com
eMail: info@siemag-tecberg.com

(*) All data refer to 1 set of brake calliper = 2 brake elements	BE 100
Nominal application force (with x mm release gap)	2 x 100 kN (L=3,0 mm)
Brake force with friction coefficient µ=0,40	80 kN (L=3,0 mm)
Standard release gap (without / with wear)	2,0 - 3,0 mm
Range of possible release gaps (L)	1,0 ... 5,5 mm
Readjustment in case of x mm wear (standard)	x =1,0 mm
Hydraulic operating pressure	140 bar
Max. surface pressure of brake lining with min. release gap L	1,5 MPa = 150 N/cm2
Oil volume per x mm stroke	2 x 10,5 cm3 x L
Weight per caliper	2 x 175 kg
"Overall dimensions (L x W x H) incl. brake lining and operation controller"	460 x 360 x 340 mm
Brake lining (type/coefficient of friction)	asbestos-free / µ>= 0,4
Pressure oil connection	G 3/8“
Leak oil connection	G 1/4“
Flush connection	G 3/8“
Number and size of bolts	"4 x M33 and 2 x M24 - 10.9"
Distance from center brake element to outer edge brake disk	125 mm
Effective brake disk diameter(for brake calculation)	d_a brake disk - 250 mm
Approx. distance between contours of brake disk and brake stand	5 mm
Thickness of brake stand plate	Thickness of brake disk + 30 mm
Special features:	
infinitely variable, with zero backlash	yes
Brake element can be modified (left-hand, right-hand execution)	yes
Brake lining can be removed sideways	yes
Brake spring having a flat characteristic curve	yes: - 2x4,73 kN (=4,73%) per 1 mm stroke
Homologation by German Mining Authority	yes
Spring assembly can be changed without removing the brake element	yes
Operation monitoring with microswitche or linear position	yes

(*) All data refer to 1 set of brake calliper = 2 brake elements	**BE 100**
sensor is possible	

S

Deckblatt interner Revisionsstand

– nicht zur Veröffentlichung bestimmt –

Rev .-Nr.	Datum	Kapitel / Seite	Bemerkungen	Erstellt von	Technisch geprüft von	geprüft gemäß DIN EN 62079 von
1.0	2014-02-14	1-95	Aus Vorlage, Testprotokoll eingefügt	SCH		
1.0	2014-04-10	1-95		SCH		
1.0	2014-05-23	1-94	Testprotokoll gelöscht	SCH		
1.1	2014-06-06	1-92	5.4/Tab.8 angepasst	SCH	HED	
1.2	2015-02-18	1-109	Anpassung.Korrekturen tech.Daten	SCH		
1.3	2016-05-19	1-108	Titelseite Grafik geändert, mit Bezügen	SCH		