COMBISTOP

INSTRUCTION MANUAL | Type 38 SPRING SET BRAKE

Original manual
COMBISTOP type 38
Document 20243560 000 00

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1 Preface

The hardware and software described in this document are products of KEB America, Inc. The information contained in this document is valid at the time of publishing. KEB reserves the right to update this document in response to misprints, mistakes or technical changes.

1.1 Warning Signs and Key Symbols

Certain procedures within this document can cause safety hazards during the installation or operation of the device. Refer to the safety warnings in this document when performing these procedures. Safety signs are also located on the device where applicable. A safety warning is marked by one of the following warning signs:

⚠ DANGER	➢ Dangerous situation which **will cause death or serious injury** if this safety warning is ignored.
⚠ WARNING	➢ Hazardous situation which **may cause death or serious injury** if this safety warning is ignored.
⚠ CAUTION	➢ Hazardous situation which **may cause minor or moderate injury** if this safety warning is ignored.
NOTICE	➢ Situation which **may cause property damage** if this safety warning is ignored.
RESTRICTION	➢ Used when the following statements depend on certain conditions or are only valid for certain ranges of values.
i	➢ Used for informational messages or recommended procedures.

1.2 More Symbols

1. Numbered lists indicate action steps.
- Enumerations are marked with dots.

→ Thin arrows indicate cross references to another chapter or another page.

Further documentation can be found at https://www.kebamerica.com

Document search on www.kebamerica.com/em-documents/

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1.3 Laws and Requirements

KEB Automation KG has certified the product against the US, Canadian and European standards. Additionally KEB Automation KG provides the EC declaration of conformity that the product complies with the essential safety requirements.

The UL, CSA and CE marks are located on the name plate when applicable. The EC declaration of conformity can be downloaded on demand via our website.

→ Further information is provided in Appendix A: Certification.

1.4 Warranty

KEB Automation KG provides a limited warranty on all products. This warranty can be found in the terms and conditions at our website.

KEB America, Inc. Terms and Conditions

Terms and Conditions

Further agreements or specifications require written confirmation from KEB America, Inc.

1.5 Support and Liability

It is not possible to cover every potential application of our device in a single manual. If you require further information or if problems occur which are not covered in this document, you can request the necessary information via KEB America, Inc. or the local KEB Automation KG agency.

The use of our products in the target application is beyond our control and therefore exclusively the responsibility of the machine manufacturer, system integrator or customer.

The information contained in this document, as well as any user-specific advice in spoken or written form or generated through testing, is provided to best of our knowledge and is considered for informational purposes only. KEB America, Inc. bears no responsibility or liability for the accuracy of the information listed above, nor for any violation of industrial property rights committed by a third-party in relation to this information.

Selection of the most suitable product for any given application is the responsibility of the machine manufacturer, system integrator or customer.

Evaluation of the product can only be performed by the machine manufacturer in combination with the application. Any tests performed must be repeated every time any part of the hardware or software is modified, or any time the unit adjustment is changed.

1.6 Copyright

The customer may use the information contained within this document for internal purposes only. Copyright of this document is held by KEB America, Inc. and remains valid in its entirety.

Other wordmarks or/and logos are trademarks (™) or registered trademarks (®) of their respective owners and are listed in a footnote at the first occurrence.

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Glossary

AC	Alternating current.
Aggressive Fumes/Liquids	Gasses or liquids that are chemically reactive and may cause corrosion in exposed machine parts.
Air Gap	The gap between the armature and the magnet. This air gap must be precisely calibrated to a specific width, denoted as X. If the air gap is too wide, the braking torque is reduced. If the air gap is too narrow, the brake may not release correctly.
Application	The machine/system in which the KEB device is to be used. For brakes the application is typically the motor to which the brake is attached.
Armature	The component of the brake which rotates with the driven shaft/surface and presses against the magnet to engage the brake.
AWG / Wire Gauge	American Wire Gauge. A measure of the thickness of a wire using standardized sizes.
Branch Circuit Protection	Circuit protection for the portion of the electrical distribution system that extends beyond the final branch circuit protection device. A branch circuit is used to run motors or other appliances, and is what is commonly found inside a building.
CE	European safety standards for products in the European Economic Area. Manufacturers self-test products against these standards to maintain CE certification. The CE mark indicates a product meets EEA safety standards.
CEC	Canadian Electric Code. Safety standard for electrical installations used in Canada.
Control Device/Interface	The COMBISTOP brake is controlled electronically by a control device. This can be as simple as a switch, or as complex as a full suite of control software.
CSA	Canadian Standards Authority, also known as CSA Group. Organization that tests and certifies products according to Canadian safety standards. The CSA mark indicates a product meets Canadian safety standards.
Customer	The corporation or individual who purchased the COMBISTOP brake.
DC	Direct current.
Device / KEB Device	The COMBISTOP brake described in this manual.
Drive Shaft	A mechanical component for transmitting torque and rotation from a motor to other parts of a mechanical system.

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Driven Shaft/Surface	A rotating component of a mechanical system which is driven by a drive shaft. Typically connected to the drive shaft via a clutch to allow the driven shaft/surface to be engaged when needed. The driven shaft/surface refers to the component directly connected to the drive shaft. See Load for a broader term for all parts of the system driven by the motor.
Dry running	Operation in dry environments with no danger of dripping or splashing liquids.
EC Declaration of Conformity	Declaration that the device conforms to EU standards of safety.
Equipotential Bonding	A practice of intentionally electrically connecting all exposed metal items not designed to carry electricity in a room as protection from electric shock.
Flange	An external flat rim or ridge for attaching an external object to the device.
Friction Surface	The component of the brake against which the friction lining presses to provide braking torque. This can be the mounting surface directly, or it can be a flange or friction disk provided by KEB.
KEB Automation KG	Parent company of KEB America, Inc. Also referred to as KEB.
Load	The components of a mechanical system driven by a motor. The load refers to the entire system powered by the motor. See Driven Shaft/Surface for the individual component connected directly to the drive shaft.
Machine Manufacturer	The manufacturer of the application in which the COMBISTOP brake is installed. Not KEB America, Inc.
Magnet	The component of the brake which contains the magnetic components.
Mounting Surface	A surface to which the COMBISTOP device is physically attached. The COMBISTOP is typically attached to the mounting surface with the recommended socket-head screws, but other fastening methods may be used as appropriate to the application.
NEC	US National Electric Code. Safety standard for electrical installations used in the United States.
Product / KEB Product	See Device.
Recommended tightening torque	The torque required to fully screw a socket head screw into a mounting surface. The recommended tightening torque depends on the type of screw used as well as the material, thread depth and locking components (if any) used in the mounting surface. Refer to the machine manufacturer for details on recommended tightening torques for specific mounting surfaces.
Run-out	An inacuracy of rotating mechanical systems whereby the shaft does not rotate precisely in line with the main axis. Always present but must be minimized.

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Specified Application	The specific application for which the COMBISTOP device was ordered, is usually (but not always) the same as the Application in which the device is being used.
System Integrator	The technician installing the COMBISTOP brake into the application.
UL	Independent Standardization Company that tests and certifies products according to defined and industry leading safety standards. The UL mark indicates a product meets UL safety standards.

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Standards for COMBISTOP type 38 Brakes

The COMBISTOP installation must comply with all relevant safety standards. The following standards are relevant to the installation and operation of the COMBISTOP type 38 Brake.

- **Directive 2006/42/EC (annex I)**
  - Region: EU
  - Essential health and safety requirements for the design and construction of machinery.
- **C22.1-18: Canadian Electric Code, Part 1 (CEC)**
  - Region: Canada
  - Electric safety code detailing safety standards for electric installations in Canada.
- **NFPA 70: National Electric Code (NEC)**
  - Region: US
  - Electric safety code detailing safety standards for electric installations in the United States.
- **NFPA 79: Electrical Standard for Industrial Machinery**
  - Region: US
  - Industrial safety code detailing safety standards for industrial machinery to protect against fire and electrical hazards.
- **OSHA 1910.137**
  - Region: US
  - Personal safety code detailing appropriate personal protective equipment for working on electrical installations.
- **OSHA 1910.269**
  - Region: US
  - Occupational safety code detailing safety standards for electrical power generation, transmission, and distribution.

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2 Safety Instructions

The COMBISTOP is designed and constructed with state-of-the-art technology in accordance with recognized safety rules and regulations. Improper use of this device may cause hazards to life and limb of the user or third-parties, or damage to the application and other material property.

The following safety instructions have been created by KEB America, Inc. for the COMBISTOP type 38 brake. These instructions can be supplemented by local, country- or application-specific safety instructions where relevant.

Violation of the safety instructions in this manual will result in the loss of any liability claims.

NOTICE

Stay Safe! Stay Informed!

- Read the instruction manual prior to operating the device!
- Follow all safety and warning instructions!
- If you are unsure of any part of these instructions, please contact KEB prior to operating the device!

2.1 Target Audience

This manual is intended exclusively for the use of qualified electrical/mechanical technicians. Qualified technicians for the purpose of this document must meet the following:

- Must have fully read and understood the safety instructions contained in this manual.
- Must be familiar with the installation and assembly of electrical products.
- Must be familiar with the installation and operation of the product as specified in this manual.

  → See the Installation and Operation chapters for details.
- Must fully understand the specified application of the product.

  → See the Specified Application section for details.
- Must be familiar with the hazards and risks of mechanical brake technology.
- Must be familiar with appropriate electrical and safety codes:
  - **US:** NFPA 70 National Electric Code (NEC)
  - **Canada:** Canadian Electric Code, C22 Part 1 (CEC)
- Must be familiar with national safety regulations (e.g. OSHA Title 29 CFR):

  → See the Standards for COMBISTOP type 38 Brakes section for details.

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2.2 Specified Application

The operational reliability of the brake is only guaranteed when the device is used for the specified application. In this context, specified application means the purpose for which the brake was ordered and configured.

Any use of the brake outside of this specified application is considered at the user's own risk. Such unintended uses may pose unforeseeable risks or hazards. KEB America, Inc. retains no liability for any damage or injury resulting from the use of a COMBISTOP brake outside of the specified application.

2.3 General Safety Guidelines

Carefully observe the following safety guidelines before installation or operation of the device.

- Only trained personnel should operate the brake.
- Immediately remove the brake from operation in case of a malfunction.
- Malfunctions should be corrected by trained personnel before returning the brake to operation.
- Never use the brake in potentially explosive environments.
- The brake may not be modified or altered in any way not intended by KEB America, Inc.

2.4 Electrical Safety Guidelines

⚠ DANGER

Rick of electrical shock!

- ➢ Turn off the power supply and secure it against switching on prior to any work on the device.
- ➢ Wait until the system has come to a complete stop prior to any work on the device.
- ➢ Never bridge branch circuit protection devices.

- Observe all relevant safety standards during the electrical installation.

  → See the Standards for COMBISTOP type 38 Brakes section for details specific to the product.

- Use only wire gauges and fuses rated for the power requirements of the device.
- Ensure new or existing circuits meet NEC or applicable local requirements.
- The device must be appropriately grounded by a connector from the magnet and the fixed installation.
- When using components without isolated inputs/outputs, equipotential bonding must be used between the connected components to prevent damage to the device.
- Do not exceed specified electrical voltage and currant limits.

  → See Appendix 1: Technical Specifications for details.

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2.5 Installation and Operation Safety Guidelines

⚠ WARNING

Moving parts can crush and cut!

➢ Contact with rotating or moving parts may cause serious injury. Ensure adequate protection around the brake to prevent accidental contact!

⚠ CAUTION

Hot Surfaces!

➢ The heat generated during the operation of the brake may cause burns on contact with skin. Always wear appropriate protective equipment!

Do not start the device until you have confirmed that the installation complies with the following safety standards.

- Ensure there is sufficient protection against foreign particles entering the air gap. These particles may impede the motion of the armature.
- Ensure there is sufficient thermal protection such that the brake does not exceed or fall below the listed temperature limits for the device.

  → See Appendix 1: Technical Specifications for details.
- Ensure there is protection against accidental contact with rotating or moving parts.
- Ensure there is sufficient protection from environmental factors such as moisture or aggressive gases that may compromise the integrity of the friction surface or armature.

2.6 Maintenance Safety Guidelines

⚠ DANGER

Risk of electrical shock!

➢ Turn off the power supply and secure it against switching on prior to any maintenance on the brake.

⚠ WARNING

Moving parts can crush and cut!

➢ Contact with rotation or moving parts may cause serious injury. Wait until the drive has come to a complete stop before performing any maintenance.
➢ Secure the drive against accidental movement prior to performing any maintenance.

⚠ CAUTION

Hot Surfaces!

➢ The heat generated during the operation of the brake may cause burns on contact with skin. Always wear appropriate protective equipment.

Carefully observe the following safety guidelines before performing maintenance on the brake.

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- Ensure the device is powered off and has come to a complete stop before performing any maintenance.
- Secure the brake so it cannot be switched on accidentally during maintenance.
- Disconnect the brake from the load before maintenance to avoid uncontrolled movements.
- Ensure there is sufficient protection against foreign particles entering the air gap during maintenance.
- Ensure there is sufficient protection against moisture or aggressive gasses that may compromise the integrity of the friction surface or armature.
- Ensure the friction lining does not come into contact with cleaning agents or solvents.

2.7 Personal Protective Equipment

When installing or performing maintenance on the brake, use the following personal protective equipment:

- Long-sleeved protective clothing
- Safety gloves
- Safety shoes
- Safety goggles

The personal protective equipment must be provided by the operating company and must comply with any applicable safety regulations.

→ See Standards for COMBISTOP type 38 Brakes for details.

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2.8 Permissible Friction Work

When operating the brake adhere to the friction work values specified below, taking the speed and frequency of operation into account. Exceeding these specifications may result in thermal overload of the lining and a strong decrease in braking torque.

NOTICE

- The WRmax table below is only valid for standard brakes with a secondary friction surface of cast steel.
- Rust-free secondary friction surfaces or speeds higher than specified will reduce the permissible friction work. If rated torque is reduced by optional adjustment screws, the permissible work will increase.

Permissible Friction Work Values	
Size Range	**Speed**
00 – 07	3000 rpm
08 – 11	1500 rpm

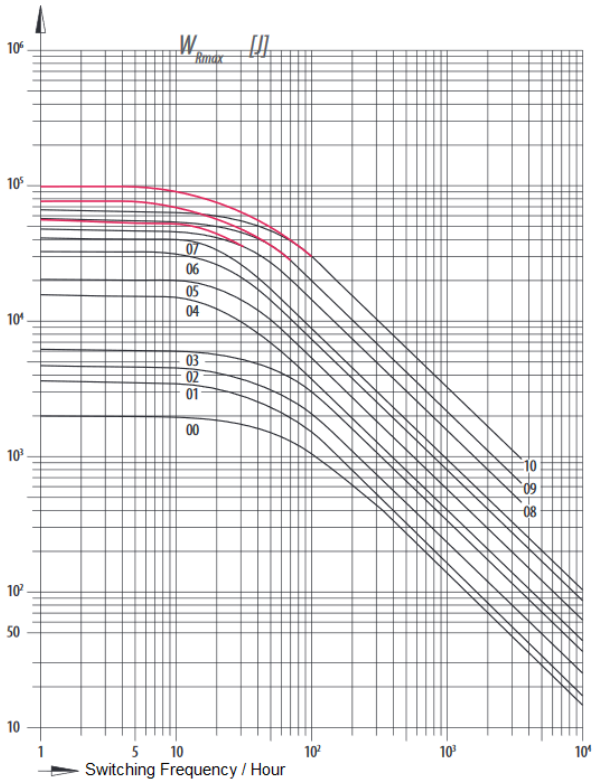

Figure 1 Friction Switching Frequency
Red line for brake without friction disk

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3 Product Description

3.1 Scope of this Manual

This manual provides all information required to properly install and operate the KEB COMBISTOP type 38 Spring Set Brake. This manual applies to the following brake types:

- COMBISTOP type 38.11N
  - Without hand release for dynamic applications (regular rated torque)
- COMBISTOP type 38.13N
  - With hand release for dynamic applications (regular rated torque)
- COMBISTOP type 38.11H
  - Without hand release for static applications (enhanced rated torque)
- COMBISTOP type 38.13H
  - With hand release for static applications (enhanced rated torque)

- The type designation can be found on the type plate attached to the lead wires and in the model number of the device.
- Device part numbers follow the format XX.YY.ZZZ where
  - XX = Size
  - YY = Type
  - ZZZ = Design

3.2 Description

The COMBISTOP type 38 brake is an electromagnetically activated dual-surface spring-applied brake for dry operation. The brake is engaged when powered OFF, and disengaged when powered ON.

The braking force is generated when the brake is powered OFF by pressure springs which press the armature and friction lining against the friction surface. The friction lining will move axially on the hub. This allows the armature to apply pressure to the flange or friction surface through the friction lining to provide braking torque.

After applying the nominal DC voltage to power the brake ON, the electromagnet attracts the armature against the spring force, releasing the friction lining and disengaging the brake.

Using the optional hand release lever the brake can be manually disengaged in the case of a power failure or other malfunction.

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3.3 Parts List

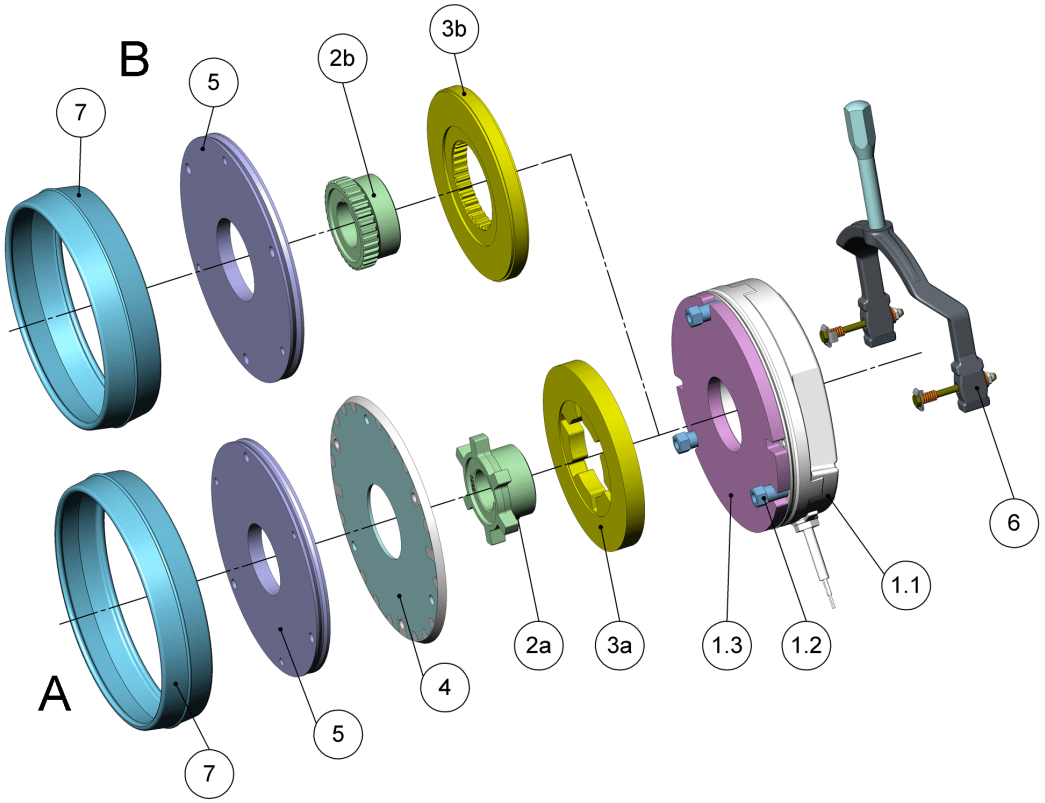

Figure 2 Brake Parts List

- A: Brake sizes 02 to 06
- B: Brake sizes 07 to 11

Number	Description
1	Magnet System
1.1	Magnet
1.2	Adjusting Spacer
1.3	Armature
2a	Fingered Hub (for size A brakes)
2b	Splined Hub (for size B brakes)
3a	Molded Friction Lining (for size A brakes)
3b	Splined Friction Lining with Aluminum Carrier (for size B brakes)
4	Friction Disk (Optional)
5	Flange (Optional)
6	Hand Release Lever (Optional)
7	Dust Protection Ring (Optional)

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- Flanges/Friction Disks are only required if the application does not have a suitable machined cast iron or steel mounting surface.
- Flanges and Friction Disks are mutually exclusive. You do not need to use both for a single brake.
- The brake has an IP20 protection rating without dust protection ring. This raises to IP44 with the optional dust protection ring.

3.4 Optional Safety Devices

3.4.1 Microswitch

A microswitch can be used to monitor the switching state of the armature and thus whether the brake is engaged or disengaged, or to monitor brake wear. A single microswitch cannot perform both functions so two microswitches are needed if you need to monitor both brake state and brake wear. The customer is responsible for connecting the electrical equipment required to monitor the signals from any installed microswitches.

When configured to monitor armature movement, the PLC or VFD control can be programmed to prevent the motor from starting until the brake is released to avoid wear and tear on the motor.

When configured to monitor wear, the microswitch can be adjusted to signal after Xn of wear to the friction lining.

→ For microswitch installation instructions, see section Microswitch.

3.4.2 Hand Release Lever

The hand release lever can be installed to provide manual release of the brake in the case of power outages or malfunctions. The COMBISTOP type 38 brake engages when powered off, so in the case of a power outage the brake will bring the system to a safe halt.

To use the hand release lever, pull directly away from the motor to disengage the brake. When the hand release lever is released, the brake will engage once more.

→ For hand release lever installation instructions, see section Hand Release Lever.

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4 Transport and Storage

The COMBISTOP brake is shipped to the customer by an authorized freight company.

4.1 Inspection on Delivery

The COMBISTOP brake should be fully inspected on delivery.

➢ Report any shipping damage to the device or packing to the shipping company and to KEB America, Inc.

4.2 Unloading and Moving the Device

Large sizes of the COMBISTOP brake can be too heavy to safely move by hand. Use appropriate lifting devices to transport large size COMBISTOP devices.

→ See Appendix 1: Technical Specifications for size and weight details.

4.3 Packaging

COMBISTOP brakes and clutches are shipped using biodegradable cardboard packaging. Packaging should be recycled or disposed of according to local regulations.

4.4 Temporary Storage

If the COMBISTOP brake is not installed immediately upon delivery it must be stored in a dry, environmentally appropriate location.

Excessive dust, moisture, or aggressive liquids or gasses can result in corrosion of the brake and can impair the function of the device when it is installed.

➢ KEB America, Inc. is not liable for any damage that results from improper storage of the COMBISTOP brake.

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5 Installation

The COMBISTOP type 38 brake is designed to be mounted on an existing motor or mounting surface over the drive shaft. The COMBISTOP uses the mounting surface as a friction surface for functioning of the brake. As such, the mounting surface must be rigidly fixed and incapable of angular motion. Friction surfaces made of cast iron or steel are best suited for the COMBISTOP type 38. If a suitable friction surface is not available, an optional flange or friction disk can be installed between the COMBISTOP and the mounting surface.

➢ Part numbers in this chapter refer to the part numbers listed in Figure 3 Brake Parts List

5.1 Before You Begin

Fill out the following pre-install checklist before you being installing the COMBISTOP brake.

☐ **Fully read and understand all installation safety guidelines.**
→ See section Installation and Operation Safety Guidelines for details.

☐ Ensure the power supply meets the output requirements of the specific brake being installed.
→ See Appendix 1: Technical Specifications for details.

☐ Ensure the brake is not damaged or corroded, and that no foreign material obstructs the air gap of the device. If corrosion is present thoroughly clean off any corrosion with appropriate cleaning materials.

☐ Ensure the friction surfaces are free of grease or oil. Clean all friction surfaces thoroughly before installing the brake. Use only sealed bearings when installing the brake.
○ Never use aggressive fluids to clean the friction surfaces. KEB America recommends using Acetone or similar brake cleaner.

☐ Ensure the installation location is protected from humidity or aggressive gasses/liquids which may degrade the friction surface.

☐ Ensure the installation location has adequate thermal protection to prevent the brake from freezing. Freezing of the armature will result in a loss of braking torque.

☐ Ensure the installation location is shielded against metal chips and other magnetic particles which may be attracted to the magnet and cause loss of braking torque.

☐ Ensure the teeth of the hub and friction lining are not damaged.

☐ Ensure the friction lining is easily moveable on the hub.

☐ Ensure the mounting bolt circle and surface meet the installation requirements for eccentricity and angular deviation.

→ See section Mounting Surface Requirements for details.

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5.2 Mounting Surface Requirements

The eccentricity of the mounting bolt circle and angular deviation of the mounting surface relative to the shaft end must not exceed the following values:

Size	02	03	04	05	06	07	08	09	10	11
Eccentricity (mm)	0.2	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6
Angular Deviation (mm)	0.04	0.04	0.05	0.05	0.06	0.06	0.08	0.08	0.08	0.1

5.3 Installing the Brake

The following steps detail installing the COMBISTOP brake. For visual examples of installing the brake and adjusting the air gap you can view a tutorial video at the following link.

Installation Video on Youtube

COMBISTOP Installation Video

The following images show a cross view of a fully assembled brake, both with flange and with friction disk.

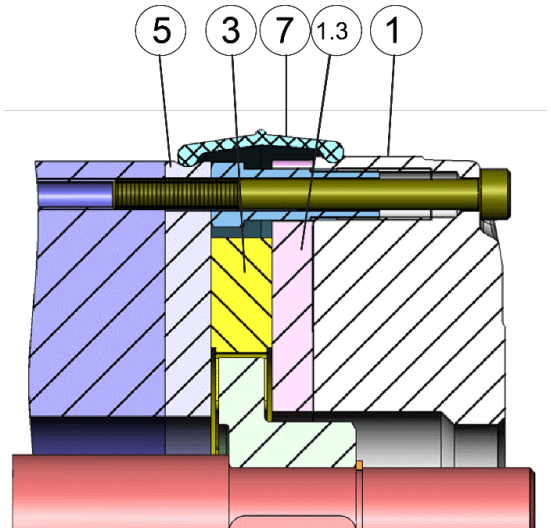

Figure 3 Brake with Flange

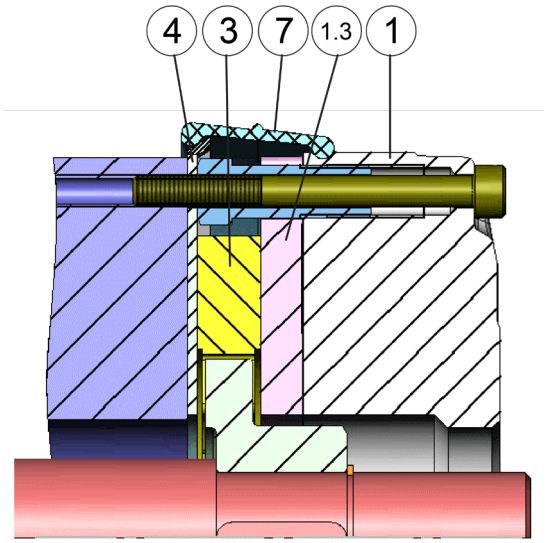

Figure 4 Brake with Friction Disk

1. If using a friction disk (4) or flange (5), install the disk/flange directly onto the motor bearing assembly or other mounting surface.
2. If using a dust protection ring (7), install the ring onto the friction disk/flange.
3. Slide the hub (2) onto the drive shaft as shown below.

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4. Secure the hub to the drive shaft axially, using set screws, retaining ring, or another method required by the specified application.

- Ensure the hub cannot run against the friction surface!
- KEB America, Inc. recommends leaving a space of 0.5mm to 1mm between hub and friction surface to prevent friction and wear and tear on the hub.

  → See Figure 7

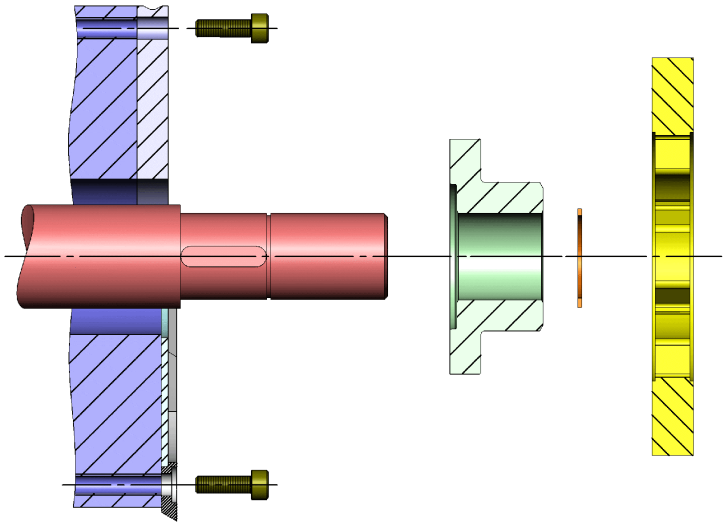

Figure 5 Mounting the Hub

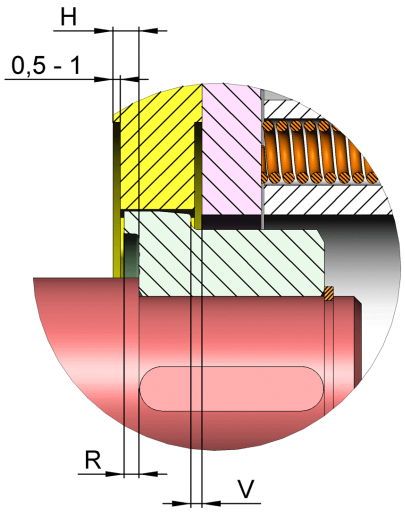

Figure 6 Gap between Hub and Friction Surface

5. Carefully slide the friction lining (3) onto the hub splines or fingers (2). The friction lining must be free to move axially on the hub.
6. Slide the magnet system (1) onto the shaft until the hollow spacers contact the flange/friction surface as shown below.

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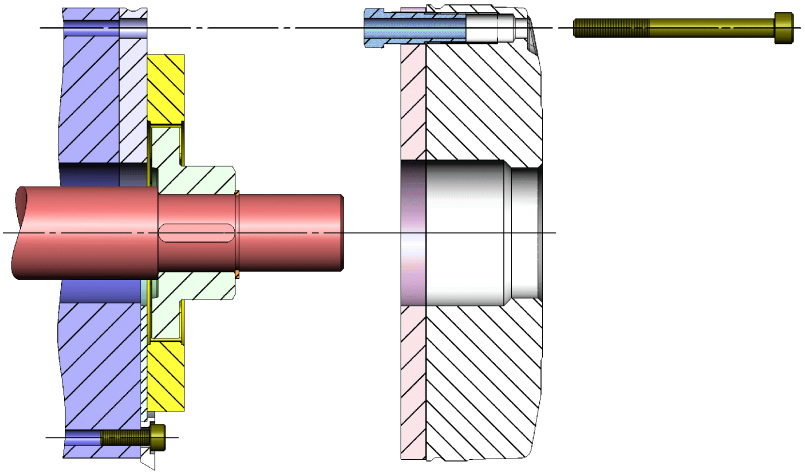

> ➢ Do not adjust the hollow spacers or the brake may not function correctly!

7. Attach the magnet system (1) to the mounting surface using socket head screws. Fasten the screws using the recommended tightening torque. The following table shows screw number and sizes for each size of COMBISTOP brake.

Size	02	03	04	05	06	07	08	09	10	11
# of Screws	3	3	3	3	3	3	3	3	6	6
Screw Size	M4x40	M5x45	M6x55	M6x60	M8x70	M8x80	M8x90	M10x110	M10x120	M12x150
Min Class	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8

8. Use a feeler gauge (F) to check the air gap X between the magnet and armature. If the air gap is larger than the nominal air gap (Xn) you must adjust the air gap.

→ See section Adjusting the Air Gap.

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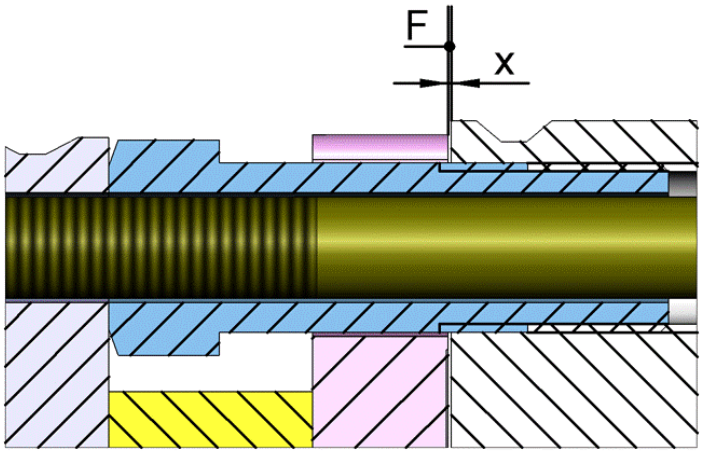

Figure 7 Air Gap

Size	02	03	04	05	06	07	08	09	10	11
Xn [mm]	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6

9. Connect the COMBISTOP brake lead lines to an appropriate DC voltage to test brake function. The brake will release when voltage is applied, and engage when the voltage supply is powered off.
10. The COMBISTOP brake is now ready for use.

Refer to the following chapter for instructions on installing optional components.

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5.4 Electrical Connection

The COMBISTOP type 38 brake is delivered with factory-preassembled connecting cables and a factory-set microswitch (if ordered) for brake engagement monitoring. The signals ON/Off and Brake Open/Closed are evaluated by the customer.

⚠ DANGER

Risk of electrical shock!

- Before each start-up of the system, check electrical equipment for visible defects such as loose connections or damaged insulation.
- Have an electrician remedy any defects before powering on the brake.

NOTICE

Risk of Damage to Brake!

- Before connecting the electrical equipment check the available supply voltage and verify it is within the nominal DC voltage for the brake.
- Powering the brake outside of the nominal DC voltage will damage the brake.

The COMBISTOP type 38 brake must be powered by a nominal DC voltage. If such a voltage is not available, an AC to DC rectifier is available for purchase from KEB America, Inc.

The nominal DC voltage can be found on the name plate of the device as well as in Appendix B: Technical Specifications.

Refer to the sections below for installing an AC to DC rectifier. For brakes with rectifiers, the brake can be switched on or off on the AC or DC side of the rectifier. AC side switching offers reduced wear on the relay switching contacts but slower brake engagement time. DC side switching requires a contactor to support the high voltages which are present during switch off, resulting in increased contactor wear but significantly faster engagement time.

NOTICE

Risk of Damage to Brake!

- When switching off the brake on the DC side, excessive voltages will occur. These voltages may damage the brake coil and the switching contact if the contact is not adequately protected.
- KEB Rectifiers offer internal protection. Additionally, external MOVs can be used to limit the voltage. Contact KEB America for further information.

5.4.1 Connecting the Brake with Rectifier

To connect the brake to an AC voltage source, a rectifier must be installed upstream of the brake. For more details on KEB rectifiers, refer to the COMBITRON rectifier manuals.

The connection to a rectifier depends on whether the brake will be switched on or off on the AC side or the DC side of the rectifier.

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5.4.1.1 AC Side Switching

The rectifier brake circuit must be protected with fuses independent from the motor circuit. A 2 amp class CC fuse is recommended for Fbrk in the diagrams below. The contact rating of the relay or contactor should be minimum 5 amps with the minimum voltage based on the applied AC voltage. 125VAC for 120V supply and 250VAC for 208 and 230V supplies.

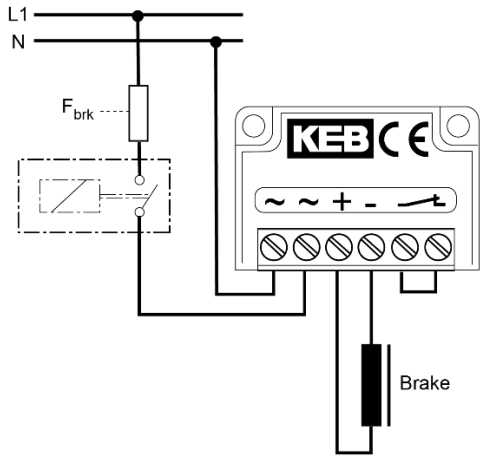

Figure 8 Rectifier Wiring: Independent Supply

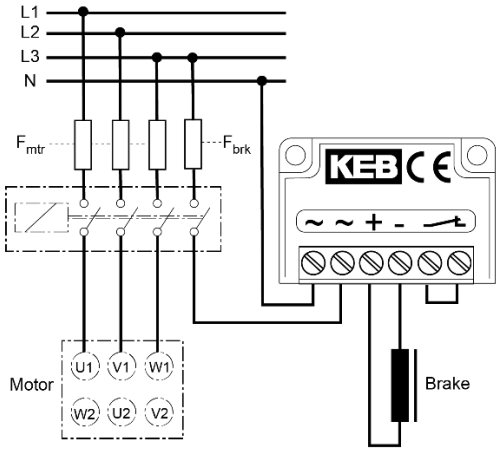

Figure 9 Rectifier Wiring: Motor Supply

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5.4.1.2 DC Side Switching

The rectifier brake circuit must be protected with fuses independent from the motor circuit. A 2 amp class CC fuse is recommended for Fbrk in the diagram below. The contact rating of the AC side relay or contactor (Kbrk_ac) should be minimum 5 amps with the minimum voltage based on the applied AC voltage. 125VAC for 120V supply, 250VAC for 208V or 230V supplies, and 600VAC for 400 or 480V supplies. The DC side contactor (Kbrk_dc) must be a three way phase power contactor rated for 600VAC and minimum of 16 amps inductive. All three contacts are wired in series as indicated in figure 11.

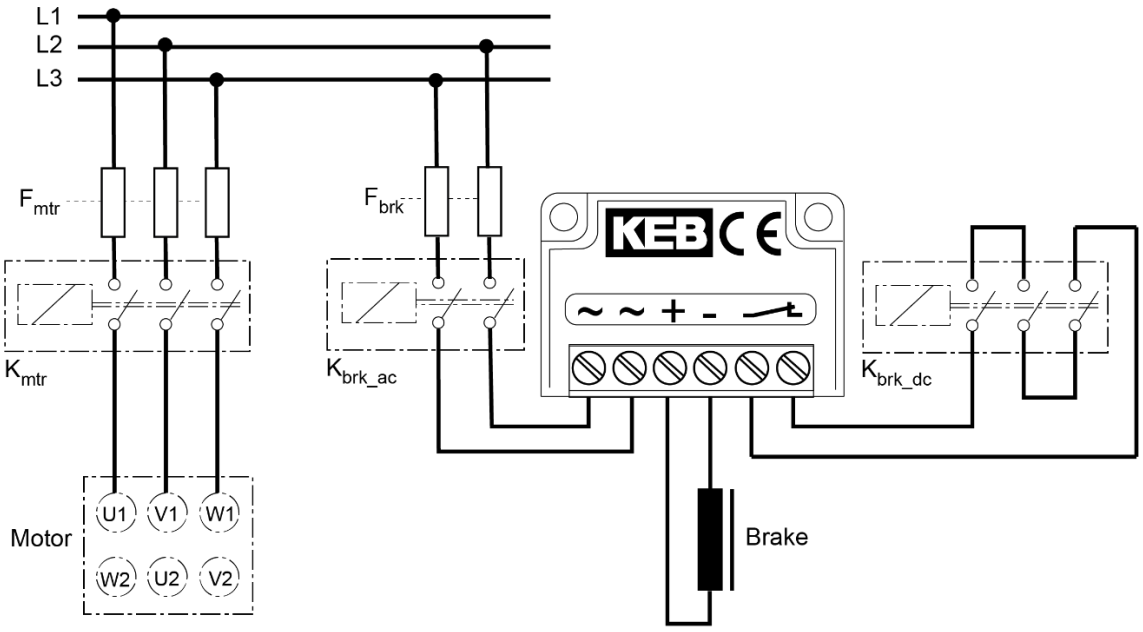

Figure 10 Rectifier Wiring Figure [3]

5.5 Uninstallation of the Brake

The brake is uninstalled in reverse order of installation.

→ See section Installing the Brake.

5.5.1 Brake Disposal

- Separate the brake according to materials used prior to disposal!
- Dispose of brake components in accordance with applicable environmental regulations.

The following key numbers can be used when disposing of electromagnetic brake components. These key numbers are subject to change depending on the disassembly process.

Component	Category	Key Number
Magnet with coil, cables, and all other steel parts	Steel scrap	EAK 12 01 02
Aluminum components	Nonferrous metals including copper	EAK 16 01 18
Lining	Brake linings	EAK 16 01 12

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6 Optional Components

6.1 Hand Release Lever

The following image shows the parts for the hand release lever.

- The parts and design of the hand release lever depends on the design of the brake (N or H) and the size of the brake.
- Refer to the following table to see which parts are included for each size/design of COMBISTOP.

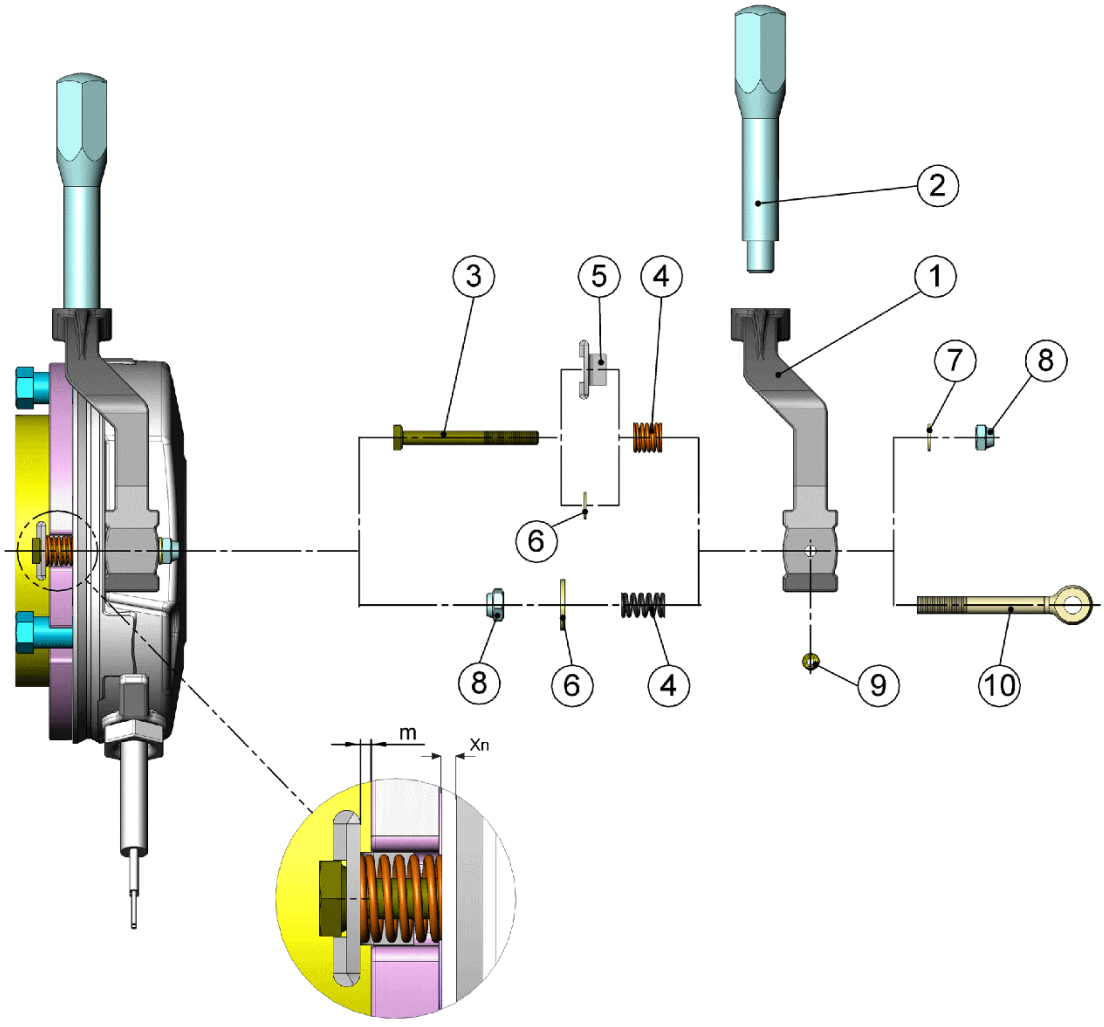

Figure 11 Hand Release Lever Parts

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Number	Description	Number Included										
	Size	02	03	04	05	05	06	06	07	08	09	10
	Designation	N/H	N/H	N/H	N	H	N	H	N/H	N/H	N/H	N/H
1	Hand Release Yoke	1	1	1	1	1	1	1	1	1	1	1
2	Handle	1	1	1	1	1	1	1	1	1	1	1
3	Hex-head Screw	2	2	2	2	2	2	2	2			
4	Pressure Spring	2	2	2	2	2	2	2	2	2	2	2
5	Locking Plate	2	2	2	2		2					
6	Washer					2		2	2	2	2	2
7	Washer	2	2	2	2	2	2	2	2			
8	Hex Nut	2	2	2	2	2	2	2	2	2	2	2
9	Coiled Spring Pin									2	2	2
10	Eye Bolt									2	2	2
m	Adjustment Dimension [mm]	0.8	1.0	1.4	1.5	1.5	1.8	1.8	2.0	2.0	2.3	2.7
Xn	Air gap readjustment [mm]	0.4/0.4	0.5/0.4	0.6/0.7	0.6	0.7	1.0	0.9	1.0/1.0	1.2/1.1	1.2/1.1	1.5/1.8

6.1.1 Installing the Hand Release Lever

1. Screw the handle (2) onto the hand release yoke (1).
2. Attach the springs, washers, locking plates and nuts to the provided holes in the magnet as shown in the image on the previous page.
    - For small sized brakes (02 – 07 size) attach components 3, 5 or 6, and 4 as shown in the upper line of the image.
    - For large sized brakes (08 – 10) attach components 8, 6 and 4 as show in the lower line of the image.
3. Slide the hand release yoke (1) onto the screw (3 or 10) and fasten with the hex nuts (8) and washers (6 or 7)
    - For small sized brakes (02 – 07 size) attach the hand release yoke with components 7 and 8 as shown in the upper line of the image.
    - For large sized brakes (08 – 10 size) attach the hand release yoke with components 9 and 10 as shown in the lower line of the image.
4. Power ON the magnet and adjust the hex nuts (8) until the gap between locking plate/washer (5/6) and armature is equal to the adjustment dimension m.

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⚠ CAUTION

Loss of Braking Torque!

- For the safe operation of the brake, the proper adjustment of dimension m is mandatory!
- Operation of the brake with dimension m smaller than the listed dimension will result in loss of braking torque.
- Do not operate the brake with wear beyond Xn as listed above!

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- The adjustment dimension m on the previous table applies to the listed rated torque, nominal air gap, and rated voltage for the brake. If you are operating the brake with different values than those listed in this manual, contact KEB America, Inc. for adjusted m dimensions.

5. Verify the air gap X is set to the adjusted dimension as shown on the table above.

   → Refer to section Adjusting the Air Gap.

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6.2 Microswitch

A microswitch is factory-installed to the brake as well as factory-set and secured, if ordered with the brake. Use the following instructions to replace a faulty or damaged microswitch.

The customer is responsible for connecting any electrical equipment to the microswitch as well as evaluating the signals sent by the microswitch. The drive control should not allow the motor to start until the brake is disengaged and the shaft can rotate freely.

⚠ CAUTION

Brake Malfunction!

- Changing microswitch settings may cause brake or motor malfunctions!

⚠ WARNING

Moving Parts may Crush or Cut!

- Carefully secure the shaft and disconnect the load before replacing the Microswitch to prevent any movement from the shaft while performing work on the brake.

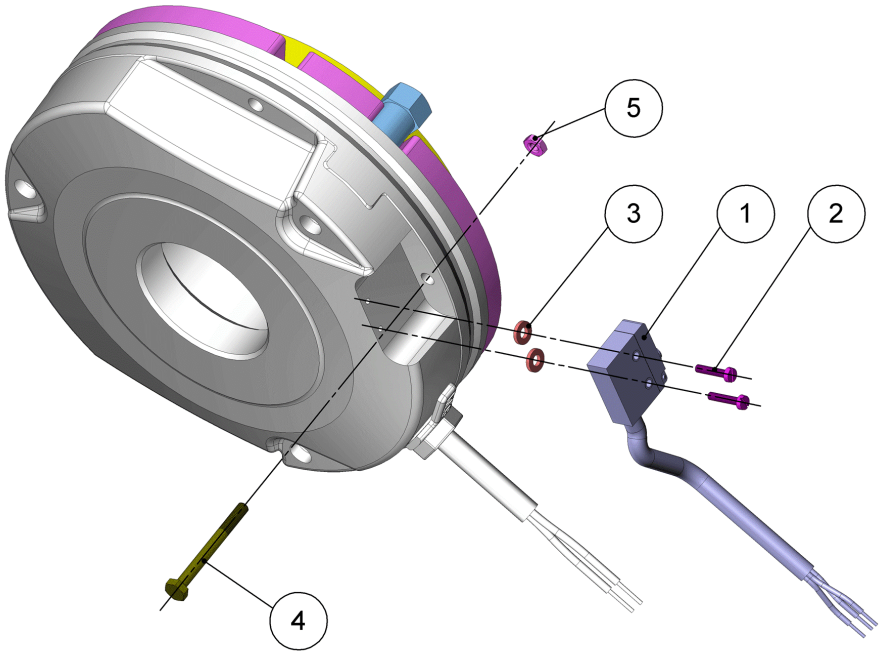

Figure 12 Microswitch Parts

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- The image shown above is one example of microswitch assembly. Consult KEB America, Inc. for detailed information for your specific brake.

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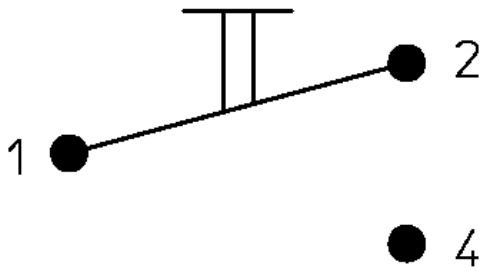
Number	Description
1	Microswitch
2	Socket-head Screw
3	Washer
4	Hex-head Screw (plunger)
5	Hex locking nut

6.2.1 Microswitch Replacement

1. Remove the two socket-head screws (2).
2. Remove the microswitch (1)
3. Attach the new microswitch (1) to the magnet with the two socket-head screws (2).
4. Connect the microswitch as a normally open contact using the following connection diagram.



Microswitch Connections

1: Ground (black)

2: Normally closed contact (brown)

3: Normally open contact (red)

5. After installation, verify the switching point for the microswitch by repeatedly powering the brake ON and OFF. Verify the two switching states. If necessay adjust the microswitch.
   - Brake Energized: ON signal (microswitch closed)
   - Brake De-Energized: OFF signal (microswitch open)

   → See section Adjusting the Microswitch Settings.

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6.2.2 Adjusting the Microswitch Settings

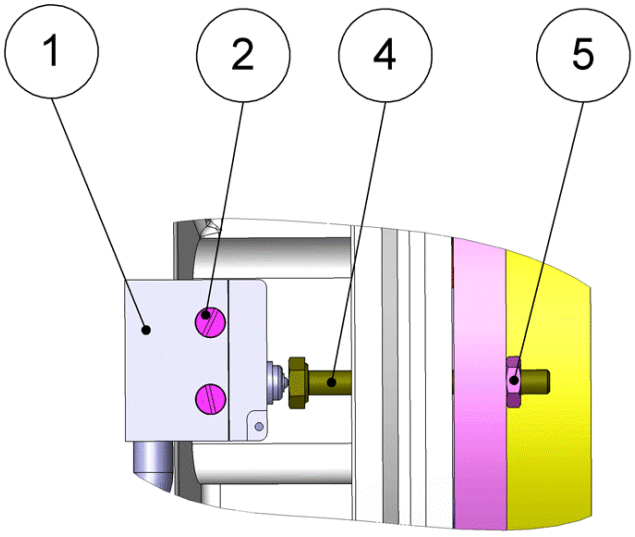
⚠ WARNING

Moving Parts may Crush or Cut!

- Carefully secure the shaft and disconnect the load before checking the Microswitch to prevent any movement from the shaft while performing work on the brake.

i

- The procedure shown below is one example of microswitch adjustment. Consult KEB America, Inc. for detailed information for your specific brake.



1. Loosen the hex-head lock-nut (5).
2. Turn the hex-head screw (4) towards the microswitch (1) until it contacts the microswitch tappet.
3. Connect the measuring instrument to terminal 1 and 4 of the microswitch.
4. Turn the hex-head screw (4) towards the microswitch (1) until the normally open contact is closed (ON signal).
5. Turn the hex-head screw (4) the opposite direction until the normally open contact opens (OFF signal).
6. Lock the hex-head screw (4) into position with the hex-head lock-nut (5).
7. Repeatedly power the brake ON and OFF to verify the function of the microswitch. Repeat steps 1-6 if the microswitch still does not signal properly.

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7 Operation

The operation of the COMBISTOP brake is performed by the control device provided by the customer. The COMBISTOP brake can be manually controlled with the optional Hand Release Lever.

7.1 Before You Begin

Prior to the initial start-up of the system, go through the following checklist to ensure the brake will function properly.

- ☐ Ensure the ordered voltage and performance data match the brake label data.
- ☐ Check to see if the brake is damaged or if there are foreign particles contaminating the area of operation or the brake air gap.
- ☐ Clean friction surfaces with an industrial brake cleaner such as Acetone.
- ☐ Ensure the air gap is properly adjusted and that the brake releases when switched ON.
- ☐ Perform the Running In Process.

  → See section Running-In Process.

⚠ CAUTION

Loss of Braking Torque!
- ➢ If the brake is damaged or contaminated, or if the switching function can no longer be guaranteed, do not put the brake into operation!

7.1.1 Running-In Process

⚠ CAUTION

Limited Braking Torque!
- ➢ The nominal braking torque is not reached until a burnishing or “running-in” period is completed.

To reach the nominal braking torque after installation or maintenance you must perform a burnishing or “running-in” process.

1. Without the motor connected to the load, run the motor up to 1750 RPM.
2. Engage the brake, stopping the motor fully.
3. Repeat steps 1-2 five times.

Alternate running in process.

1. Rotate the brake while engaged at 30 RPM for 1 min.
2. Disengage and then re-engage the brake.
3. Perform steps 1-2 five times.

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7.2 Manual Operation

The brake can be disengaged manually using the optional hand release lever.

⚠ CAUTION

Loss of Braking Torque!

- Before using the hand release lever, mechanically secure the load against unintended movements. Extra care should be given for vertical applications i.e. lifts, cranes, winches.

To disengage the brake using the hand release lever, steadily pull the lever directly away from the mounting surface until the brake is released, as shown below.

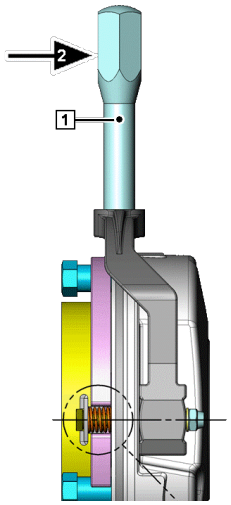

Figure 13 Hand Release Lever Operation

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8 Maintenance and Troubleshooting

⚠ CAUTION

Moving parts can crush or cut!

- Before performing maintenance or troubleshooting the brake, mechanically secure the load against unintended movements. Extra care should be given for vertical applications i.e. lifts, cranes, winches.

8.1 Maintenance

The COMBISTOP type 38 brake is almost maintenance-free. As a result of wear occurring during operation, the air gap between magnet and armature increases and the friction lining wears away.

The air gap should be checked at routine maintenance intervals. If the air gap is measured larger than the maximum air gap Xn, the air gap should be re-adjusted to the nominal air gap X, or as close as possible. If the air gap cannot be adjusted to within Xn by the re-adjustment procedure, the friction lining should be replaced and the air gap adjusted again.

The following sections describe checking and adjusting the air gap and replacing the friction lining.

8.1.1 Checking the Air Gap

The air gap between magnet and armature should be checked at routine maintenance intervals, and when installing the brake.

The operational air gap width is denoted X, while the maximum air gap is denoted Xn.

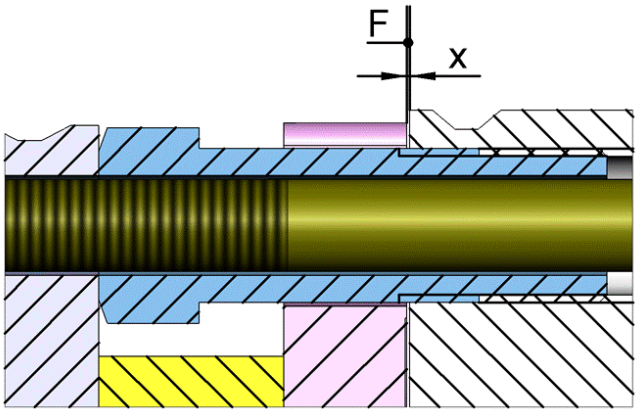

Figure 14 Checking the Air Gap

1. Using a feeler gauge (F) check the air gap X. If the air gap is larger than Xn, the air gap must be readjusted to X.

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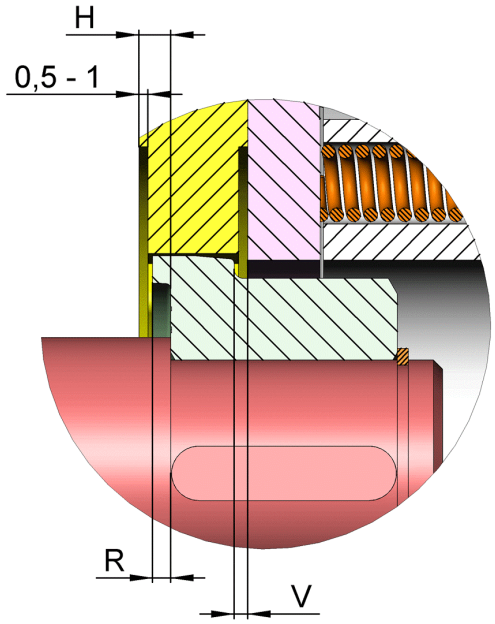

Figure 15 Wear Dimensions

- The optimal air gap is denoted X and shown on the previous page.
- The maximum permissable wear on the friction lining before the armature will contact the hub is denoted V and shown above.
- The maximum air gap Xn is the maximum air gap at which the brake will function properly.
- The minimum permissable thickness of the friction lining before replacement is denoted Gmin.
- The hub counter bore is denoted R and shown above.

Size	X [mm]	V [mm]	Xn [mm]		Gmin [mm]	R [mm]
Design	N/H	N/H	N	H	N/H	N/H
02	0/2	2.0	0.4	0.4	5.5	0.5
03	0.2	1.5	0.5	04	6.5	1.5
04	0.2	2.5	06	0.5	8.0	1.5
05	0.2	2.0	0.8	0.7	10.0	2.0
06	0.3	2.0	0.9	0.7	10.0	2.0
07	0.3	4.0	1.0	0.9	10.0	-
08	0.4	5.0	1.2	0.9	11.0	-
09	0.4	6.0	1.4	1.1	12.0	-
10	0.5	8.0	1.5	1.3	14.0	-
11	0.6	8.0	1.5	1.3	22.0	-

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8.1.2 Adjusting the Air Gap

Use the following procedure to adjust the air gap. Any part numbers referenced refer to Figure 3 Brake Parts List.

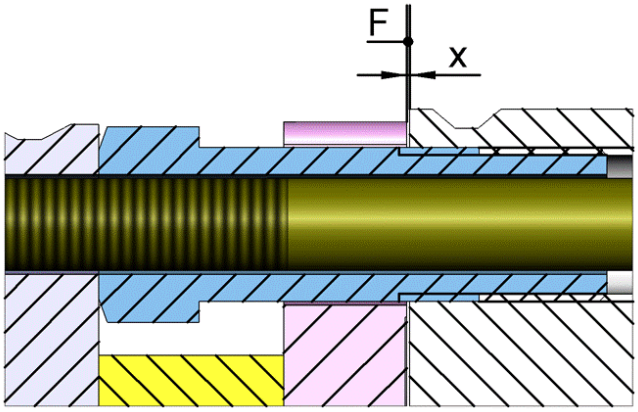

Figure 16 Adjust the Air Gap

1. Loosen but do not remove the socket-head screws connecting the magnet (1) to the mounting surface. Loosen just enough to remove pressure on the adjusting spacer.
2. Turn the adjusting spacers (1.2) to move away from mounting surface and into magnet assembly. Rotate each adjusting spacer about 1/2 turn, adjusting all spacers the same distance.
3. Insert feeler gauge at the correct gap thickness of X between the armature plate and magnet assembly. This is best done near the adjusting spacer.
4. Tighten the socket-head screws until pressure is felt on the feeler gauge.
5. Ease off pressure on the socket-head screws so you can still move the feeler gauge.
6. With feeler gauge inserted, turn the adjusting spacer to move toward the mounting surface and out of the magnet assembly until snug against the mounting surface.
7. Repeat steps 3-6 at three locations around the perimeter of the magnet assembly to ensure uniform air gap width.
   - The air gap must be uniform around the entire brake circumference.
   - If one spacer is tight or lose it means you do not have the spacers all level.
8. Test the air gap with a feeler gauge during this adjustment process. Continue adjusting the spacers until the air gap is at X, as shown on the table in the previous section.
   - The ideal air gap is width X, but if you cannot adjust the air gap to that width, the brake will continue to function as long as the air gap is below Xn.
9. If the air gap cannot be adjusted to below Xn, or if the friction lining falls below the minimum permissible thickness Gmin, the friction lining should be replaced.
10. Once the air gap is adjusted, check the socket-head screws to ensure they are secure, and return the brake to operation.

→ See Installing the Brake for details.

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8.1.3 Replacing the Friction Lining

⚠ CAUTION

Loss of Braking Torque!
- Take care when replacing the friction lining not to damage the hub.
- Take care not to damage the friction lining by misalignment or angled installation.
- The lining must not be contaminated. If the lining becomes contaminated it should be replaced not cleaned.
- When cleaning other brake components, allow them to fully dry before installing the friction lining!

Use the following procedure to replace the friction lining. Any part numbers referenced refer to Figure 3 Brake Parts List.

1. Remove the socket-head screws connecting the magnet to the mounting surface.
2. Remove the magnet system (1) from the hub (2).

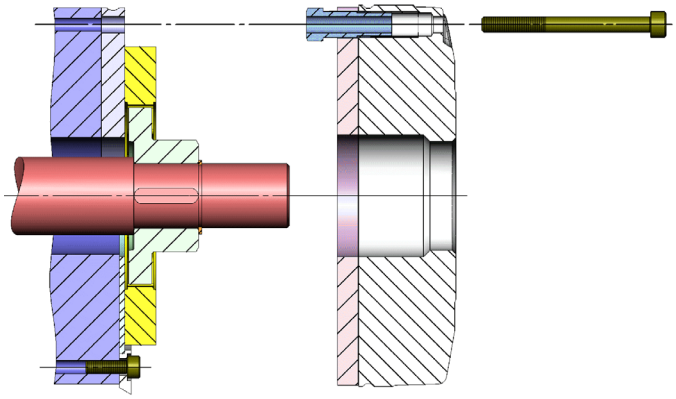

Figure 17 Removing the Magnet System

3. Remove the friction lining (3) from the hub (2).
4. Clean the new friction lining, armature, and secondary friction lining thoroughly with an alcohol based solvent and clean paper towel.
5. Slide the new friction lining onto the hub.
   - The friction lining must be easily moveable on the hub.
   - Take care the friction lining does not get damaged by misaligned or angled position.
6. Replace the magnet system onto the shaft and replace the socket-head screws.
7. Check the air gap X, and adjust if necessary.

   → See section Checking the Air Gap, and section Adjusting the Air Gap.

8.2 Torque Reduction

Some models of the COMBISTOP have the option to manually reduce the braking torque by adjusting the E-Ring or Set screws holding the springs in place. To reduce the braking torque, adjust the E-Ring or Set screws away from the magnet by ¼ turn at a time. The distances to adjust the E-Ring or Set screws for the desired torque reduction are given in the graph below, as well as the maximum permissible adjustment distances.

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- COMBISTOP sizes 2 – 6 use an adjustable E-Ring to reduce braking torque.
- COMBISTOP sizes 07 – 11 use set screws to reduce braking torque.

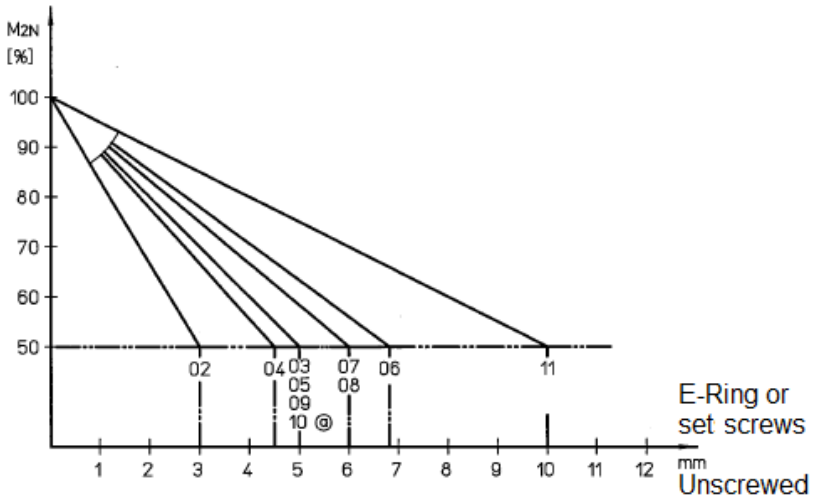
⚠ CAUTION

Imprecise Measurements

➢ The torque measurements listed in the graph below are approximations and will vary dependent on environmental variables. Take care to measure actual braking torque when adjusting the E-Ring or Set screws.

Torque Reduction for Type 38

02-06 via E-Ring Type 38
07-11 via Set screws



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8.3 Troubleshooting

The following are some common issues that may occur with the COMBISTOP type 38 brake, as well as steps to resolving these issues.

Before performing any troubleshooting, follow all relevant safety guidelines.

→ See section Maintenance Safety Guidelines for details.

➢ Contact your local KEB agency for any problems not covered by this manual, or if the troubleshooting steps listed do not fully resolve the problem.

Problem	Potential Causes	Solution
Brake Does Not Release	Incorrect voltage	Only operate the brake with the correct voltage (see brake label for details)
	Rectifier failure	Replace the rectifier.
	Air gap too large / maximum air gap reached	Adjust air gap or replace the friction lining. → See section.
	Foreign particles between armature and lining	Remove foreign particles. Use industrial brake cleaner to clean the brake.
	Magnet coil or connecting cable defective	Replace the brake.
	Excessive heating from high duty cycle	Install a high-speed circuit breaker (for example, KEB Powerbox)
Brake Does Not Engage	Damaged hub and lining interface	Replace the friction lining and hub.
	Friction surfaces contaminated	Clean the friction surfaces. Replace if necessary.
	Hub rubbing on armature	Relocate the hub position to adjusting dimension m. → See section Installing the Brake.
	Hand release m dimension too small	Readjust to proper adjusting dimension m. See section Installing the Hand Release Lever.
Brake Engagement Delay, Long Reaction Time	Brake is switched on the AC side of the rectifier.	Switch the brake on the DC side of the rectifier.
Microswitch Does Not Switch	The setting point of the microswitch has been changed.	Check the microswich and adjust as necessary, or replace the microswitch. → See section Adjusting the Microswitch Settings.

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9 Appendix

9.1 Appendix 1: Technical Specifications

Mass		
Model	38.11N	38.13N/23N/DEN/DEH
Size	Approximate mass of the brake [kg]	
02	1.0	1.1
03	1.5	1.8
04	3.0	3.1
05	4.6	4.8
06	7.2	7.4
07	10.5	11.2
08	16.8	17.8
09	26.5	28.0
10	40.0	41.7
11	85.0	85.0
Environmental		
Safe operational range	0°C – 40°C	Recommended safe temperature for optimal braking function. Use of the brake beyond this temperature range is not supported by KEB America, Inc.
Max temperature	-40°C - 120°C	May suffer loss of braking torque when operated within this range. Exceeding these values will damage the device.
IP Rating	IP20	“Finger safe,” not waterproof
	IP44 (with optional dust protection ring)	Protected from solid objects bigger than 1mm and water splashes from all directions.

➢ For more technical data including dimensions, rated torques, power input etc., refer to the KEB product catalogue.

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9.2 Appendix 2: Certification

Document No. / month.year: ce_mt_rns-mt-usa-a_en / 01.2019

Manufacturer:	KEB AMERICA, INC 5100 Valley Industrial Blvd.South USA – Shakopee, MN 55379 United States	
Product type:	spring applied fail safe brake electromagnet - clutch or brake clutch - brake - combinations in one housing Size Voltage category	COMBISTOP COMBINORM COMBIBOX 01 up to 14 75...440Vdc (50…690Vac)

The above given product is in accordance with the following directives of the European Union

Number:	**Low voltage : 2014 / 35 / EU**
Text:	Directive on the approximation of the laws of the Member States relating to all electrical equipment that has a voltage rating between 50V and 1000V AC or 75V and 1500V DC.
Number:	**Hazardous Substances: 2011 / 65 / EU incl. changes 2015 / 863 / EU**
Text:	Directive on the approximation of the laws of the Member States relating on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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9.3 Appendix 3: Revision History

Chapter	Change	Date
Manual	Initial Publication	

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