



# COMBIPERM type P1

INSTRUCTION MANUAL

Original manual  
Type P1 Brake  
Document 20231648 USA 00








## 1 Preface

The hardware 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:

	➤ Dangerous situation which <b>will cause death or serious injury</b> if this safety warning is ignored.
	➤ Hazardous situation which <b>may cause death or serious injury</b> if this safety warning is ignored.
	➤ Hazardous situation which <b>may cause minor or moderate injury</b> if this safety warning is ignored.
	➤ Situation which <b>may cause property damage</b> if this safety warning is ignored.
<b><u>RESTRICTION</u></b>	➤ Used when the following statements depend on certain conditions or are only valid for certain ranges of values.
	➤ 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.

	<p>Further documentation can be found at <a href="https://www.kebamerica.com">https://www.kebamerica.com</a></p> <p><a href="https://www.kebamerica.com">Document search on www.kebamerica.com</a></p>	
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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 2: 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 <a href="#">Terms and Conditions</a>	
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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

<b>AC</b>	Alternating current.
<b>Aggressive Fumes/Liquids</b>	Gasses or liquids that are chemically reactive and may cause corrosion in exposed machine parts.
<b>Air Gap</b>	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 and the flat spring may be damaged. If the air gap is too narrow, the brake may not release correctly.
<b>Application</b>	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.
<b>Armature</b>	The component of the brake which rotates with the driven shaft/surface and presses against the magnet to engage the brake. The armature consists of an armature plate which moves across the air gap to engage or disengage the brake, and a flat spring which connects the armature plate to a hub or driven surface.
<b>AWG / Wire Gauge</b>	American Wire Gauge. A measure of the thickness of a wire using standardized sizes.
<b>Branch Circuit Protection</b>	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.
<b>CE</b>	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.
<b>CEC</b>	Canadian Electric Code. Safety standard for electrical installations used in Canada.
<b>Control Device/Interface</b>	The COMBIPERM 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.
<b>CSA</b>	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.
<b>Customer</b>	The corporation or individual who purchased the COMBIPERM brake.
<b>DC</b>	Direct current.
<b>Device / KEB Device</b>	The COMBIPERM brake described in this manual.
<b>Drive Shaft</b>	A mechanical component for transmitting torque and rotation from a motor to other parts of a mechanical system.

<b>Driven Shaft/Surface</b>	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.
<b>Dry running</b>	Operation in dry environments with no danger of dripping or splashing liquids.
<b>EC Declaration of Conformity</b>	Declaration that the device conforms to EU standards of safety.
<b>Equipotential Bonding</b>	A practice of intentionally electrically connecting all exposed metal items not designed to carry electricity in a room as protection from electric shock.
<b>Flange</b>	An external flat rim or ridge for attaching an external object to the device.
<b>Flat spring</b>	The component of the brake between the armature and the hub or load-side mounting surface. The flat spring pulls the armature away from the friction surface allowing free rotation of the armature and driven shaft/surface.
<b>Friction Surface</b>	The component of the brake which is attached to the fixed mounted magnet and presses against the armature to provide braking torque via friction.
<b>KEB Automation KG</b>	Parent company of KEB America, Inc. Also referred to as KEB.
<b>Load</b>	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.
<b>Load-side Mounting Surface</b>	The mounting surface to which the armature is attached; typically the load being driven by the motor. Opposite the motor-side mounting surface.
<b>Machine Manufacturer</b>	The manufacturer of the application in which the COMBIPERM brake is installed. Not KEB America, Inc.
<b>Magnet</b>	The component of the brake which contains the magnetic components. The magnet is fixed to the motor-side mounting surface and does not rotate.
<b>Motor-side Mounting Surface</b>	The mounting surface to which the magnet side of the brake is attached. Commonly this mounting surface is the motor itself, but not always. Opposite the load-side mounting surface.
<b>Mounting Surface</b>	A surface to which the COMBIPERM device is physically attached. The COMBIPERM 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. Mounting surfaces are typically referred to as either motor-side or load-side.
<b>NEC</b>	US National Electric Code. Safety standard for electrical installations used in the United States.

<b>Product / KEB Product</b>	See Device.
<b>Recommended tightening torque</b>	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.
<b>Run-out</b>	An inaccuracy of rotating mechanical systems whereby the shaft does not rotate precisely in line with the main axis. Always present but must be minimized.
<b>Specified Application</b>	The specific application for which the COMBIPERM device was ordered, is usually (but not always) the same as the Application in which the device is being used.
<b>System Integrator</b>	The technician installing the COMBIPERM brake into the application.
<b>Torque Tab</b>	Tab extending from the magnet which can be fastened to the motor-side mounting surface using a screw. An alternative to a flange.
<b>UL</b>	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.

## Standards for COMBIPERM P1

The COMBIPERM installation must comply with all relevant safety standards. The following standards are relevant to the installation and operation of the COMBIPERM type P1 Brake or type PC Clutch.

- **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.

## 2 COMBIPERM Safety Instructions

The COMBIPERM 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 operating COMBIPERM brakes and clutches. 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

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#### 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 electromechanical 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 COMBIPERM P1 section for details.

## 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 COMBIPERM 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.
  - Never bridge branch circuit protection devices.
- 

Carefully observe the following safety guidelines during the electrical installation.

- Observe all relevant safety standards for the device.
  - See the Standards for COMBIPERM P1 section for details.
- 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.

## 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.

- 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.

## 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 COMBIPERM P1 for details.



## 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.

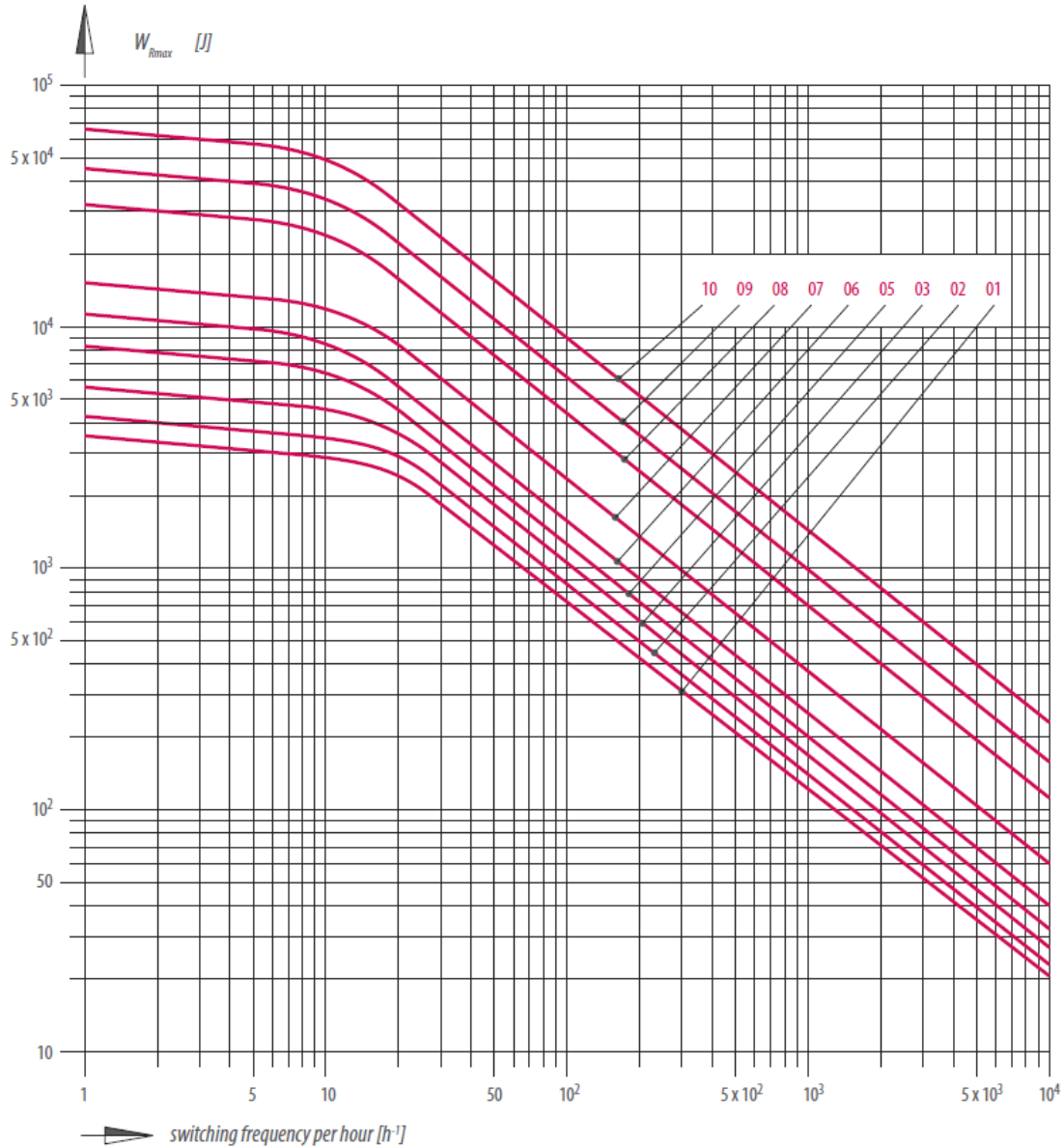


Figure 1 Permissible Friction Work  $W_{rmax}$  [J] by Switching Frequency



- The Values for  $W_{rmax}$  listed above are accurate for a drive speed of 3000 rpm. The actual  $W_{rmax}$  may be higher or lower than the displayed values for drive speeds above or below 3000 rpm.

### 3 Product Description

#### 3.1 Scope of this Manual

This manual describes how to properly install and operate the KEB COMBIPERM brake and applies to the following brake types:



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

COMBIPERM Brake Type P1		
Brake Type	Description	Sizes
COMBIPERM Type P1 with flange; flange mounted		
P1.110	Magnet with round flange, armature only	01-10
P1.210	Magnet with square flange, armature only	01-10
P1.120	Magnet with round flange, hub/armature assembly with internal hub	01-10
P1.220	Magnet with square flange, hub/armature assembly with internal hub	01-10
P1.130	Magnet with round flange, hub/armature assembly with external hub	01-10
P1.230	Magnet with square flange, hub/armature assembly with external hub	01-10
COMBIPERM type P1 without flange; back mounted		
P1.310	Magnet without flange, armature only	01-10
P1.320	Magnet without flange, hub/armature assembly with internal hub	01-10
P1.330	Magnet without flange, hub/armature assembly with external hub	01-10

### 3.2 COMBIPERM Brake Type P1 Overview

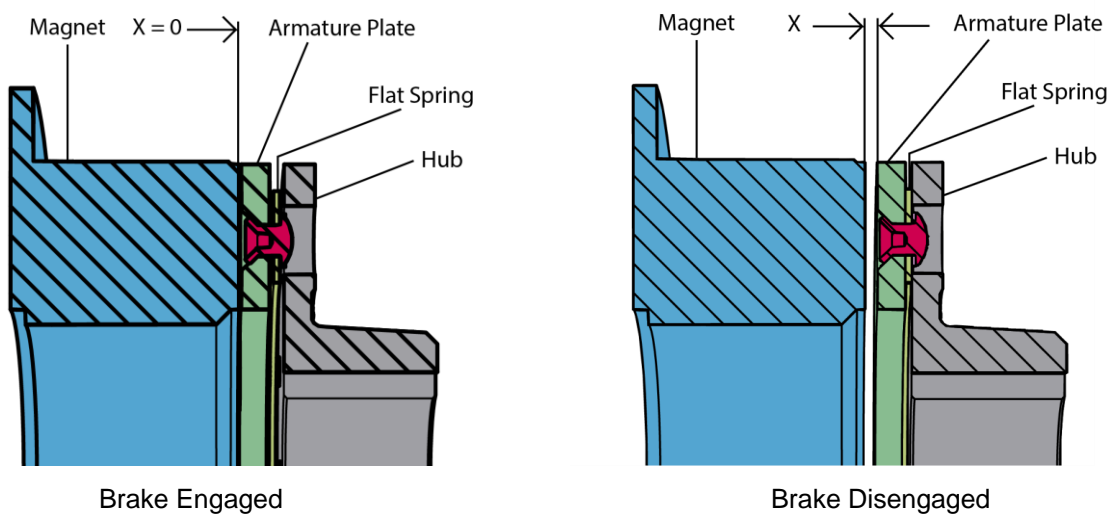
The COMBIPERM type P1 brake is a permanent magnet engaged / electro-magnetically released brake for dry operation.

The magnet side of the brake is attached to a fixed mounting surface (typically the motor), and the hub/armature assembly is attached to the rotating shaft or surface such that an air gap of width  $X$  exists between the magnet and armature assembly.

In normal powered-off status a permanent magnetic field is used to attract the armature plate across the air gap and onto the magnet surface providing braking torque. This stretches the flat spring between the fixed hub/mounting surface and the moveable armature plate. The result is a frictionally engaged, torsional backlash-free connection.

When the brake is powered on by a correctly polarized DC voltage, an electromagnet neutralizes the permanent magnetic field and the flat spring pulls the armature plate away from the friction surface allowing free rotation.

Figure 2 Brake Operation



### 3.2.1 P1 Parts List

#### 3.2.1.1 Brake without Hub

Associated Models:

- P1.110
- P1.210
- P1.310

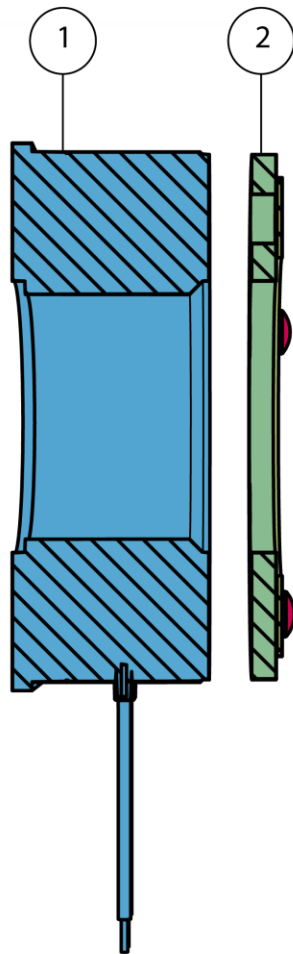


Figure 3 Brake without Hub

Number	Description
1	Magnet
2	Armature

### 3.2.1.2 Brake with Internal Hub

Associated Models:

- P1.120
- P1.220
- P1.320

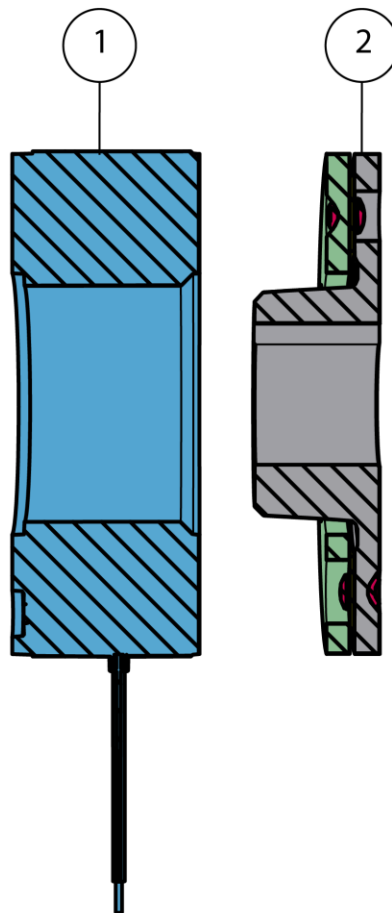


Figure 4 Brake with Internal Hub

Number	Description
1	Magnet
2	Armature with Internal Hub

### 3.2.1.3 Brake with External Hub

Associated Models:

- P1.130
- P1.230
- P1.330

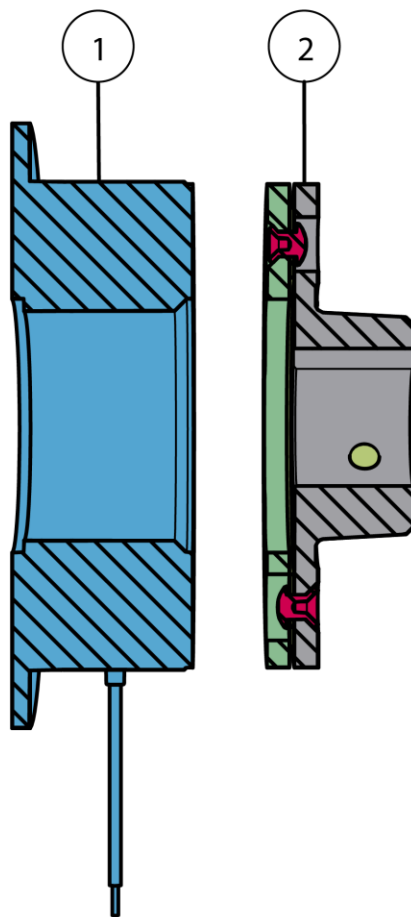


Figure 5 Brake with External Hub

Number	Description
1	Magnet
2	Armature with External Hub

## 4 Transport and Storage

The COMBIPERM brake is shipped to the customer by an authorized shipping company.

### 4.1 Inspection on Delivery

The COMBIPERM 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 COMBIPERM brake can be too heavy to safely move by hand. Use appropriate lifting devices to transport large size COMBIPERM devices.

### 4.3 Packaging

COMBIPERM 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 COMBIPERM 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 COMBIPERM brake.
-

## 5 Installation

The COMBIPERM brake is designed to be installed onto an existing motor or drive shaft, then connected to the load via a driven shaft or surface. The load can be another rotor, a belt pulley, or any other appropriate device as specified by the customer.



- 
- Machine parts made of magnetic material which are installed near to the COMBIPERM P1, can weaken the torque and result in a change of the release voltage range. Carefully select the installation location with this in mind.
- 

### 5.1 Before You Begin

Fill out the following pre-install checklist before you begin installing the COMBIPERM 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 an automotive 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.
- Machine parts made of magnetic material near the magnet can weaken the torque and cause a change in the release voltage range. Note any magnetic material near the installation location and adjust the air gap accordingly.
  - See the Checking and Adjusting the Air Gap section for details on adjusting the air gap.
- When using armatures without an attached hub:
  - Machine clearance holes in mounting surface for rivet heads.
  - Mounting bolts must be used with Schnorr-lock washers.
  - Machined threads in mounting surface must be free of burrs without chamfer to ensure the armature plate sits flat without flat spring deflection.



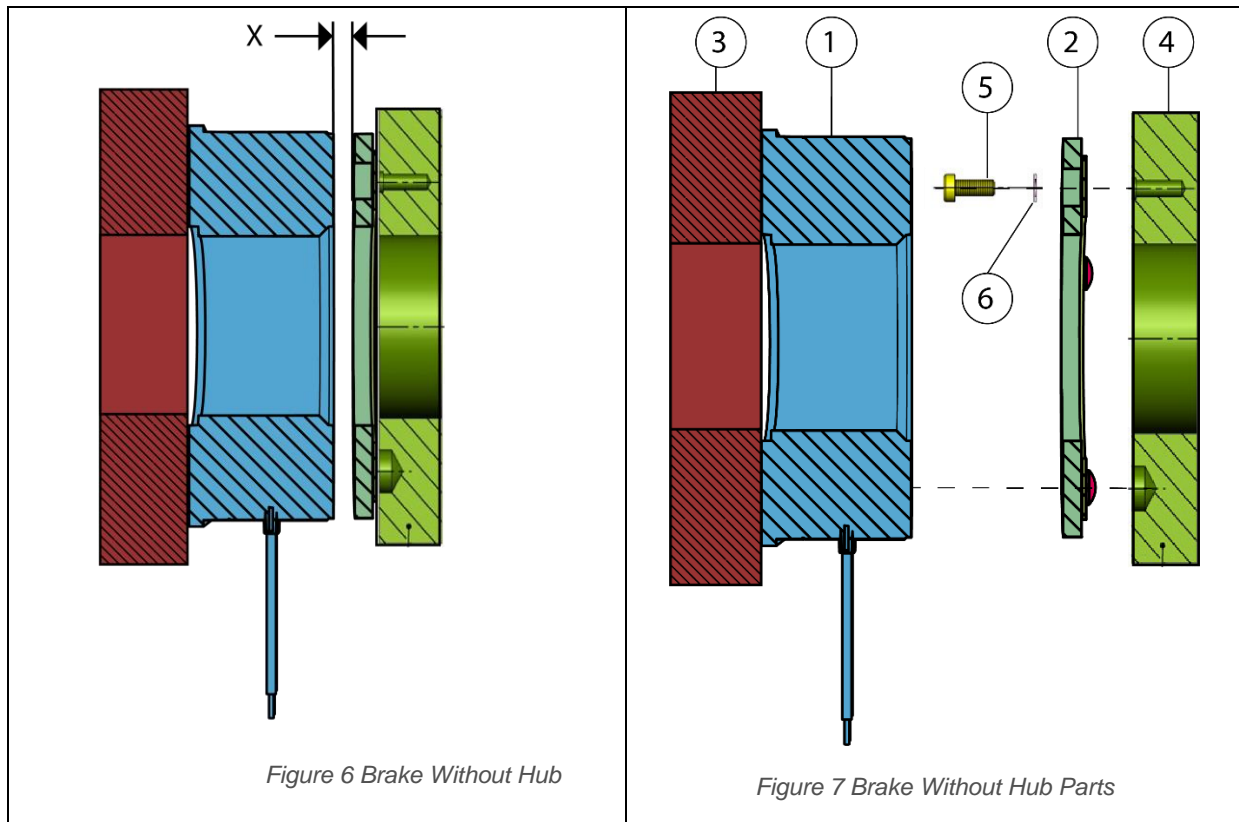
## 5.2 Type P1 Brake Installation

Use the following instructions to install Type P1 brakes. Instructions vary depending on whether the brake has a hub, and whether the hub neck is outside or inside the magnet. Refer to the appropriate section for the brake you are installing.

### 5.2.1 Installation of Brakes without Hubs

Associated Models:

- P1.110
- P1.210
- P1.310



- X Air gap between magnet and armature
- 1 Magnet
- 2 Armature
- 3\* Motor-side mounting surface
- \* Provided by the customer

- 4\* Load-side mounting surface
- 5\* Socket-head Screws (e.g. DIN 6912, 8.8)
- 6\* Schnorr-lock washers

**NOTICE**

**Risk of damage to the brake!**

- Ensure the brake is powered on prior to mounting the armature to avoid overexpansion of the flat spring.
- Note the polarity of the connecting wires:
  - Red: +
  - Black: -

Component numbers in the following instructions refer to Figure 7 Brake Without Hub Parts above:

1. Fit the magnet (1) over the drive shaft with the flange or mounting surface facing the motor (3).
2. Ensure the magnet (1) is precisely centered over the drive shaft. You can center the magnet via its outside or inside diameter.

**NOTICE**

**Risk of damage to the brake!**

- The magnet and armature must be precisely centered on the drive shaft. Improperly centered brakes suffer excess wear and will fail prematurely.

The following table lists the maximum allowable concentricity offset between:

1. The drive shaft center and the magnet center.
2. The magnet center and armature plate center.

Brake Size	01	02	03	05	06	07	08	09	10
1: Max Shaft to Magnet Offset [mm]	0.03	0.03	0.05	0.05	0.08	0.08	0.08	0.1	0.1
2: Max Magnet to Armature Offset [mm]	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3



- Ensure the brake components are fixed and there is no axial shaft movement.

3. Fasten the magnet (1) to the motor (3) using socket head screws (5) through either the flange or the magnet face depending on model.

**NOTICE****Risk of damage to the brake!**

- Note the screw-in depth for magnets without flanges (300 series). Screws tightened beyond this depth can damage the magnet!
- See the 300 series magnet dimensions for depth details.

4. Place the armature (2) on the load-side mounting surface (4).
5. Place the socket head screws (5) and Schnorr-lock washers (6) in the bore holes on the load-side mounting surface (4) and lightly fasten the washers.
6. Carefully align the armature (2) to the center of the drive shaft then tighten the socket head screws (5) with the recommended tightening torque.
7. Mount the armature (2) and attached mounting surface (4) on the drive shaft such that there is an air gap of width X between the armature and the magnet (1).
  - Verify the air gap width X with a feeler gauge of proper width or horseshoe shim.

**NOTICE****Risk of damage to the brake!**

- Ensure the armature is mounted precisely level with the magnet! Tilted or misaligned mounting of the armature will damage the brake during operation.

Brake Size	01	02	03	05	06	07	08	09	10
Max Acceptable Runout Between Mounting Surface and Shaft [mm]	0.03	0.03	0.03	0.05	0.05	0.05	0.07	0.1	0.15

8. Secure the load-side mounting surface (4) axially to the drive shaft using a fastening mechanism appropriate to the application.
9. Check the air gap width X between the magnet (1) and the armature (2) with a feeler gauge. Adjust as necessary.
  - See section Checking and Adjusting the Air Gap for details.

The COMBIPERM type P1 brake is now ready for use.

**5.2.1.1 Uninstallation**

To uninstall the brake, follow the above instructions in reverse order.

### 5.2.2 Installation of Brakes with Internal Hubs

Associated Models:

- P1.120
- P1.220
- P1.320-

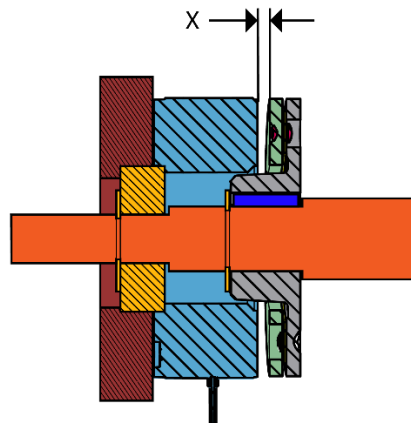


Figure 8 Brake with Internal Hub

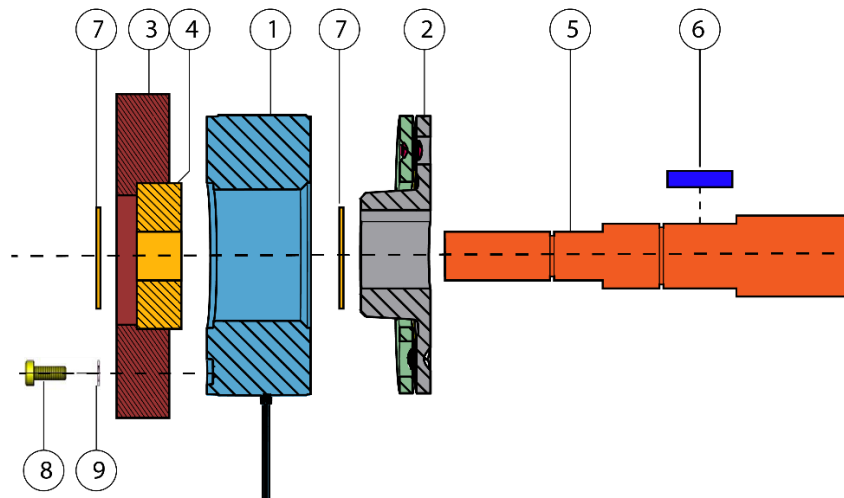


Figure 9 Brake with Internal Hub Parts

X Air gap between magnet and armature

- |                                |    |   |
|--------------------------------|----|---|
| 1 Magnet                       | 6* | Feather key for drive shaft             |
| 2 Armature with Internal Hub   | 7* | Retaining ring                          |
| 3* Motor-side mounting surface | 8* | Socket-head screws (e.g. DIN 6912, 8,8) |
| 4* Motor ball-bearing          | 9* | Schnor-lock washer                      |
| 5* Drive shaft                 | *  | Provided by customer                    |

**NOTICE**

**Risk of damage to the brake!**

- Ensure the brake is powered on prior to mounting the armature to avoid overexpansion of the flat spring.
- Note the polarity of the connecting wires:
  - Red: +
  - Black: -

Component numbers in the following instructions refer to Figure 9 Brake with Internal Hub Parts above:

1. Place the armature and hub assembly (2) over the drive shaft (5) with mounted feather key (6).
2. Secure the armature (2) to the drive shaft (5) with a retaining ring (7).
3. Fit the magnet (1) to the motor-side mounting surface (3).
4. Ensure the magnet (1) is precisely centered over the drive shaft opening. You can center the magnet via its outside or inside diameter.

**NOTICE**

**Risk of damage to the brake!**

- The magnet and armature must be precisely centered on the drive shaft. Improperly centered brakes suffer excess wear and will fail prematurely.

The following table lists the maximum allowable concentricity offset between:

1. The drive shaft center and the magnet center.
2. The magnet center and armature plate center.

Brake Size	01	02	03	05	06	07	08	09	10
1: Max Shaft to Magnet Offset [mm]	0.03	0.03	0.05	0.05	0.08	0.08	0.08	0.1	0.1
2: Max Magnet to Armature Offset [mm]	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3



- Ensure the brake components are fixed and there is no axial shaft movement.

5. Fasten the magnet (1) to the motor-side mounting surface (3) using socket head screws (8) and Schnorr-lock washers through either the magnet flange or the magnet face depending on model.

**NOTICE**

---

**Risk of damage to the brake!**

- Note the screw-in depth for magnets without flanges (300 series). Screws tightened beyond this depth can damage the magnet!
  - See the 300 series magnet dimensions for depth details.
- 

6. Insert the drive shaft (5) with attached armature (2) through the magnet (1) and attached mounting surface (3) such that an air gap of width X naturally occurs between magnet and armature.
  - Verify the air gap width X with a feeler gauge of proper width or horseshoe shim.

**NOTICE**

---

**Risk of damage to the brake!**

- Ensure the armature is mounted precisely level with the magnet! Tilted or misaligned mounting of the armature will damage the brake when in use.
- 

7. Secure the drive shaft in place with a retaining ring (7).
8. Check the air gap X between the magnet (1) and the armature (2). Adjust as necessary.
  - See section Checking and Adjusting the Air Gap for details.

The COMBIPERM type P1 brake is now ready for use.

**5.2.2.1 Uninstallation**

To uninstall the brake, follow the above instructions in reverse order.

### 5.2.3 Installation of Brakes with External Hubs

Associated Models:

- P1.130
- P1.230
- P1.330

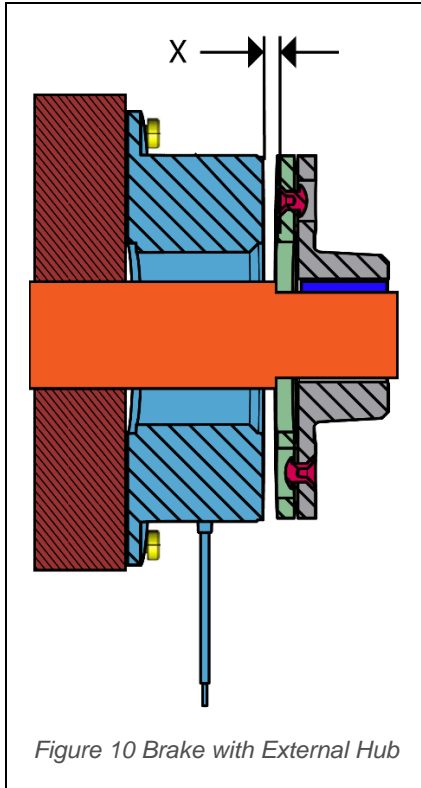


Figure 10 Brake with External Hub

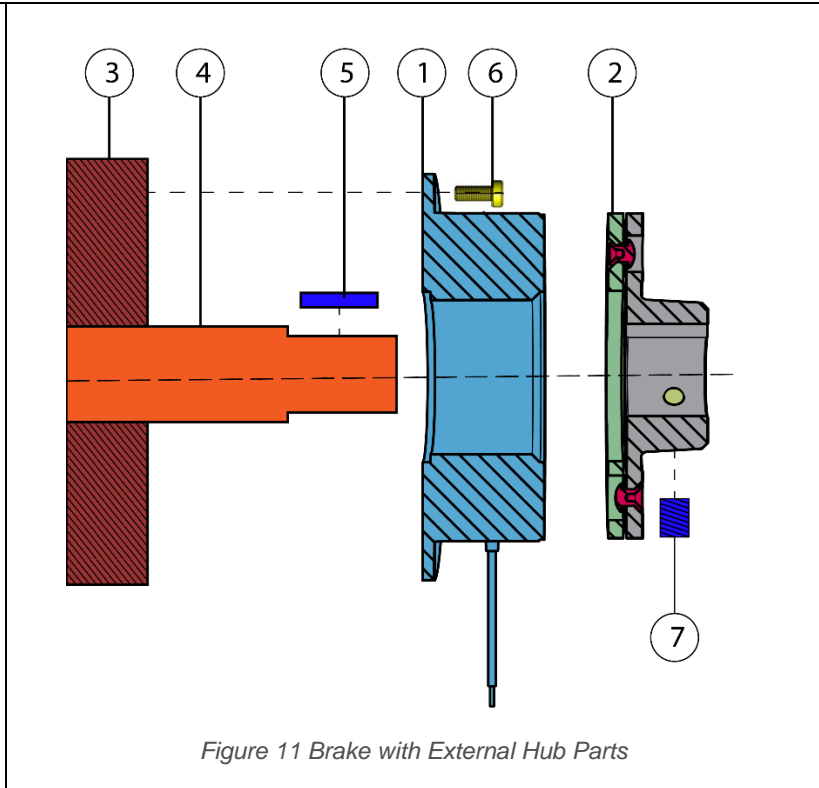


Figure 11 Brake with External Hub Parts

X	Air gap between magnet and armature		
1	Magnet	5*	Feather key for drive shaft
2	Armature	6*	Socket-head screws (e.g. DIN 6912, 8.8)
3*	Motor-side mounting surface	7	Set screw
4*	Drive shaft	*	Provided by the customer

**NOTICE**

**Risk of damage to the brake!**

- Ensure the brake is powered on prior to mounting the armature to avoid overexpansion of the flat spring.
- Note the polarity of the connecting wires:
  - Red: +
  - Black: -

Component numbers in the following instructions refer to Figure 11 Brake with External Hub Parts above:

1. Fit the magnet (1) over the drive shaft (4) with the flange or mounting surface facing the motor (3).
2. Ensure the magnet (1) is precisely centered over the drive shaft (4). You can center the magnet via its outside or inside diameter.

**NOTICE**

**Risk of damage to the brake!**

- The magnet and armature must be precisely centered on the drive shaft. Improperly centered brakes suffer excess wear and will fail prematurely.

The following table lists the maximum allowable concentricity offset between:

1. The drive shaft center and the magnet center.
2. The magnet center and armature plate center.

Brake Size	01	02	03	05	06	07	08	09	10
1: Max Shaft to Magnet Offset [mm]	0.03	0.03	0.05	0.05	0.08	0.08	0.08	0.1	0.1
2: Max Magnet to Armature Offset [mm]	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3



- Ensure the brake components are fixed and there is no axial shaft movement.

3. Fasten the magnet (1) to the motor-side mounting surface (3) using socket head screws (6) through either the flange or the magnet face depending on model.



**NOTICE****Risk of damage to the brake!**

- Note the screw-in depth for magnets without flanges (300 series). Screws tightened beyond this depth can damage the magnet!
- See the 300 series magnet dimensions for depth details.

4. Place the armature (2) onto the drive shaft (4) with mounted feather key (5).
5. Secure the armature (1) to the drive shaft (3) using a set screw (7) or a shaft-end disk such that there is an air gap of width X between the armature and the magnet (1)
  - Verify the air gap width X with a feeler gauge of proper width or horseshoe shim.

**NOTICE****Risk of damage to the brake!**

- Ensure the armature is mounted precisely level with the magnet! Tilted or misaligned mounting of the armature will damage the brake when in use.

6. Check the air gap X between the magnet (1) and the armature (2). Adjust as necessary.
  - See section Checking and Adjusting the Air Gap for details.

The COMBIPERM type P1 brake is now ready for use.

**5.2.3.1 Uninstallation**

To uninstall the brake, follow the above instructions in reverse order.

### 5.3 Electrical Installation

The COMBIPERM brake is delivered with pre-assembled connecting cables. The standard rated voltage is +24V DC, however 12, 36 and 48V devices are also common.




---

#### Risk of electric shock!

- Before connection of electrical cables, and before start-up of the brake, inspect the electrical equipment for visible defects such as loose connections or damaged insulation.
- Repair any defective cables prior to energizing the brake.




---

#### Risk of damage to the brake!

- Before connecting the electrical equipment, carefully check that the voltage of the power supply matches the operating voltage of the brake. The supply voltage of the brake can be found on the nameplate.
- COMBIPERM brakes and clutches are rated and tested to remain operational from +6% to -10% of the listed voltage, according to DIN VDE 0580.

1. Fully read and comprehend all electrical safety guidelines.
  - See section Electrical Safety Guidelines for details.
2. Connect the brake to the control device with the provided cables, as appropriate to the application, noting the polarity of the connectors.
  - Red: +
  - Black: -



- 
- It is possible to reverse the polarity of the voltage applied to the brake magnet to increase the holding torque of the brake. The increased torque is dependent on the application and specific design of the brake.
-

## 6 Operation

### 6.1 Before You Begin

Perform the following inspection of the brake prior to starting the device.

- Fully read and comprehend the operational safety guidelines.**
  - See section Installation and Operation Safety Guidelines for details.
- Ensure the brake is not damaged or corroded, and that no foreign material obstructs the air gap of the device.
- Ensure the friction surfaces are free of grease or oil. If necessary, clean all friction surfaces thoroughly before installing the brake.
  - Never use aggressive fluids to clean the friction surfaces. KEB America recommends using an industrial brake cleaner such as Acetone to clean friction surfaces.
- Check the release function of the brake by switching the brake from energized to de-energized and back.
- Complete the burnishing procedure for the brake, if the brake is newly installed or has been idle for too long.
  - See the Performing the Burnishing Process section for instructions on performing the burnishing process.

### NOTICE

---

#### Loss of braking efficiency!

- If the brake is damaged or corroded or if the device no longer switches correctly, do not put the brake into operation!
- 

### 6.2 Burnishing Process

You must perform the burnishing process prior to operating the brake for the first time, and after the brake has been idle for an extended period of time. Instructions on the burnishing process can be found in the Maintenance and Troubleshooting chapter.

- See the Performing the Burnishing Process section for more detail.

### 6.3 Operating the Brake

The COMBIPERM brake is electrically controlled, with no manual operating options.

The COMBIPERM can be controlled by a switch or via a control device.

## 7 Maintenance and Troubleshooting

### 7.1 Maintenance

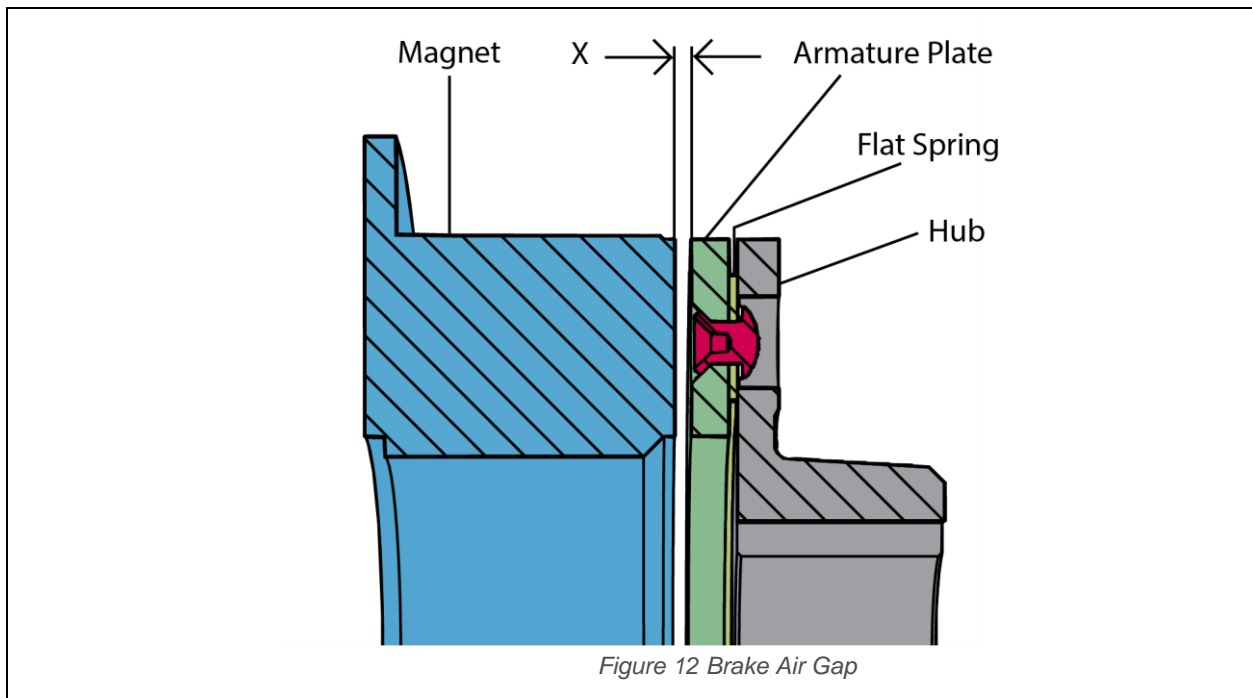
The COMBIPERM brake is designed to require little routine maintenance. The two common maintenance procedures that must be performed at regular intervals are adjusting the air gap, and performing the burnishing process. If the brake has reached the end of its life cycle, or if the device malfunctions and cannot be repaired, the brake may need to be replaced. See the following sections for instructions on performing the two maintenance procedures, as well as for replacing the brake if it becomes necessary. The exact intervals for air gap adjustment, burnishing, and brake replacement depend on the application and duty cycle of the brake.

#### 7.1.1 Checking and Adjusting the Air Gap

As a result of naturally occurring wear during operation the air gap between magnet and armature will increase slowly over time. The air gap width  $X$  must not increase beyond a certain maximum based on the size of the brake, denoted as  $X_{max}$ .

If the friction surfaces are so worn that the air gap cannot be adjusted back within tolerance, the brake must be replaced.

See the following table for standard and maximum air gap widths by COMBIPERM sizes.



COMBIPERM P1 Air Gap Tolerances									
Size	01	02	03	05	06	07	08	09	10
Air Gap X [mm]	0.15	0.15	0.15	0.2	0.3	0.3	0.35	0.4	0.5
Air Gap Xmax [mm]	0.3	0.3	0.4	0.5	0.65	0.8	0.9	1.0	1.2

Use the following steps to check and adjust the air gap.

1. Use a feeler gauge to check the air gap width.
2. If the air gap is larger than Xmax for the brake size, you must adjust the air gap back to a width of X. Continue to step 3 to adjust the air gap.
  - If the air gap is smaller than Xmax, the air gap is still within tolerance and you can stop here.
3. Remove the armature from the driven shaft/surface by following the installation steps in reverse order.
  - See the Installation chapter for details.
4. Adjust the air gap by inserting shims between the load-side mounting surface and the armature, or by adjusting the hub position as appropriate for the application. These shims should serve to bring the armature closer to the magnet.
5. Reinstall the armature by following the installation steps.
  - See section Installation for details.
6. Check the air gap again with a feeler gauge.
  - If the air gap is not at width X, repeat steps 3-6 until the air gap is at width X.

### 7.1.2 Performing the Burnishing Process

The COMBIPERM Brake only reaches the rated braking torque after a burnishing process where the brake is engaged several times to provide initial wear to the friction surface. This burnishing process must be performed after first install, and any time the brake has been left idle for long periods of time.

An idle brake can become corroded due to humidity, or can become slick from oil residue. The burnishing process burnishes off these contaminants and returns the brake to full working order.

Use the following steps to perform the burnishing process:

1. Power on the magnet.
1. Rotate the drive/motor at 25 RPM.
2. Power off the magnet.
3. Allow the brake to slip for 1 second.

4. Power on the magnet for 1 second.
5. Repeat steps 3-5 for five cycles.
6. Stop the drive/motor.
7. Check the braking torque.

If the brake has not reached the rated braking torque, repeat this process until the rated braking torque has been reached.

### 7.1.3 Replacing the Brake

#### NOTICE

---

#### Loss of braking efficiency!

- The component parts of a brake are synchronized and cannot be individually replaced.
  - Before replacing a COMBIPERM brake, ensure you have a replacement device ready to install to avoid loss of operation time.
- 



When replacing the COMBIPERM brake, both magnet and armature must be replaced together.

Use the following steps to replace the brake:

1. Disconnect the power supply and control device from the brake.
2. Uninstall the brake by following the installation process in reverse order.  
→ See the Installation section for more details.
3. Install the new brake by following the installation process in correct order.
4. Reconnect the power supply and control device to the brake.
5. Perform the burnishing process for the new brake.  
→ See the Burnishing Process section for more details.

### 7.1.3.1 Disposal of COMBIPERM Components



- Separate the COMBIPERM brake components according to the materials used in construction.
- Dispose of electromagnetic brake components according to 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

## 7.2 Troubleshooting

The following are some common problems that may occur as well as the steps to take to resolve them.

**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
<b>Brake does not release</b>	Incorrect voltage	Ensure the correct voltage range is applied to the brake. See the type plate of the brake for details.
	Air gap too small	Check the air gap and the axial movement of the shaft.
	Foreign object between armature and magnet	Remove the foreign object. Clean the brake with non-greasing cleaning agents.
	Defective magnet coil or connecting cable	Replace the brake.
<b>Brake releases after a delay</b>	Incorrect voltage	Ensure the correct voltage range is applied to the brake. See the type plate of the brake for details.
<b>Brake does not engage or engagement is delayed.</b>	Brake is powered on.	Check the voltage supply and power off the brake.
	Air gap too large	Check air gap and the axial movement of the shaft. Replace the brake if necessary.
	Flat spring overstretched	Check flat spring. Replace the brake if necessary.



Problem	Potential Causes	Solution
<b>Limited to no braking function</b>	Friction surfaces contaminated	Clean the friction surfaces and perform the burnishing process. Replace the brake if necessary.
	Friction surfaces corroded due to humidity or aggressive gasses	Perform the burnishing process to wear away corroded surface. Replace the brake if needed.
	Brake frozen	Check the temperature of the brake and ensure the armature has not frozen to the friction surface. Install heating elements or temperature shielding as needed.
	Excessive braking energy of the brake	Replace the brake.
	Machine parts made of magnetic material too close to brake	Move magnetic machine parts away from the brake.

## 8 Appendix

### 8.1 Appendix 1: Technical Specifications

Electrical		
<b>Nominal Voltage</b>	24VDC	Optional other voltages available
<b>Insulation Class (DIN 0580)</b>	F	Optional insulation class H available
<b>Duty Time</b>	100%	
Mass		
<b>Model</b>	P1.110/210/310	P1.120/130/220/230/320/330
<b>Size</b>	Approximate mass of the brake [kg]	
<b>01</b>	0.07	0.08
<b>02</b>	0.1	0.2
<b>03</b>	0.2	0.3
<b>05</b>	0.3	0.4
<b>06</b>	0.5	0.6
<b>07</b>	0.9	1.0
<b>08</b>	1.6	1.8
<b>09</b>	2.9	3.1
<b>10</b>	5.4	6.0
Environmental		
<b>Safe operational range</b>	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.
<b>Max temperature</b>	-40°C - 120°C	May suffer loss of braking torque when operated within this range. Exceeding these values will damage the device.
<b>IP Rating</b>	IP20	“Finger safe,” not waterproof

## 8.2 Appendix 2: Certification

## EU DECLARATION OF CONFORMITY



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:	<b>Low voltage : 2014 / 35 / EU</b>
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:	<b>Hazardous Substances: 2011 / 65 / EU incl. changes 2015 / 863 / EU</b>
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.

### 8.3 Appendix 3: Revision History

Chapter	Change	Date
Instruction Manual	Initial publication	5/6/2020



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