

COMBIVERT F5

INSTRUCTION MANUAL | BRAKE TRANSISTOR MONITOR

Original manual
Brake Transistor Monitor
Document 20231183 USA 00
Material No. 00F5LUZ-K004








1 Preface

The hardware described in this document is a product 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:

	<ul style="list-style-type: none"> ➤ Dangerous situation which will cause death or serious injury if this safety warning is ignored.
	<ul style="list-style-type: none"> ➤ Hazardous situation which may cause death or serious injury if this safety warning is ignored.
	<ul style="list-style-type: none"> ➤ Hazardous situation which may cause minor or moderate injury if this safety warning is ignored.
	<ul style="list-style-type: none"> ➤ Situation which may cause property damage if this safety warning is ignored.
<i>RESTRICTION</i>	<ul style="list-style-type: none"> ➤ Used when the following statements depend on certain conditions or are only valid for certain ranges of values.
	<ul style="list-style-type: none"> ➤ Used for informational messages or recommended procedures.

1.2 More Symbols

- ▶ Arrow icons begin 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 https://www.kebamerica.com</p> <p>Document search on www.kebamerica.com</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.

1.4 Warranty

KEB America Inc. 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	
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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 specified 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

Application	The machine or device in which the KEB product is being installed.	Device, the	See KEB Product
Brake Resistor	Resistor used to absorb excess energy resulting from the moving elevator, returning to the DC bus of the drive.	KEB Product	The KEB device described in this manual
Brake Transistor	Transistor which commutates the excess energy in the DC bus of the drive into the braking resistor.	Machine Manufacturer	The manufacturer of the application to which the KEB product is attached
Brake Transistor Monitor	External monitor installed in the elevator control to prevent overheating of the brake resistor in the event of a brake transistor failure	System	See Application
Customer	The purchaser of the KEB product	System Integrator	The technician installing the KEB product into the application

Standards for Brake Transistor Monitor

The Brake Transistor Monitor installation must comply with all relevant safety standards. The following standards are relevant to the installation and operation of the F5 Elevator Drive with Brake Transistor Monitor.

- **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.
- **B44.1-19/ASME A17.5-2019**
 - Region: US and Canada
 - Elevator and Escalator Electrical Equipment

2 Safety Instructions

The Brake Transistor Monitor 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 Brake Transistor Monitor. 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 chapter 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 electrical drive 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)
 - **US & Canada:** B44.1-19/ASME A17.5-2019 Elevator and Escalator Electrical Equipment
- Must be familiar with national safety regulations (e.g. OSHA Title 29 CFR):
 - See the Standards for Brake Transistor Monitor section for details.

2.2 Specified Application

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

Any use of the monitor 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 Brake Transistor Monitor outside of the specified application.

2.3 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 Brake Transistor Monitor section for details specific to the product.
- Use only wire gauges rated for the power requirements of the device.
- Ensure new or existing circuits meet NEC or applicable local requirements.
- For low voltage conductors that are in direct contact with conductors of the high voltage supply circuit (in accordance with UL61800-5-1), all low voltage conductors must include other protective measures, e.g. double insulation or shielding bonded to earth ground.
- When using components without isolated inputs/outputs, equipotential bonding must be used between the connected components. Failure to provide adequate equipotential bonding may result in the destruction of the components by equalizing currents.

3 Product Description

3.1 Scope of this Manual

This manual describes the installation and function of the KEB Brake Transistor Monitor.

- **Model Number : 00F5090-BTW9**

3.2 Overview

The KEB Brake Transistor Monitor is designed to monitor the status and health of the Brake transistor of the connected AC drive.

Brake transistors are generally robust and appropriately sized for loads in excess of continuous duty. However, certain external conditions (environment, voltage supply, etc.) may lead to failure of the Brake transistor. In the event of Brake transistor failure with a short circuit, a continuous current can flow to the Brake resistor. Brake resistors are often sized for intermittent duty of the drive (the normal use case) and are not rated to withstand continuous operation.

CAUTION

-
- Continuous current can cause the resistor to overheat and potentially catch fire resulting in damage to the equipment or dangerous safety hazards.
-

The KEB Brake Transistor Monitor is specifically designed to check whether or not the Brake transistor has short circuited, and if so to disengage the Brake resistor by one of two methods. The Brake Transistor Monitor checks whether the output voltage from the Brake transistor switches off at least once in a 64mSec period. If the Brake transistor output remains on for longer than this time, the Monitor detects a failure and opens a normally-closed pilot contact (K1/K2) which can be used to disconnect the current to the Brake resistor. The current can be disconnected either on the AC line feeding into the drive, or the DC connection to the Brake resistor.

3.3 Defined Use

The KEB Brake Transistor Monitor is designed for use with KEB COMBIVERT F5 AC motor controls. Use with other third party motor controls is beyond the specific application of the Brake Transistor Monitor. Consult KEB for further information.

4 Technical Data

4.1 Operating Conditions

4.1.1 Climatic Environment Conditions

Storage	Standard	Class	Descriptions
Surrounding temperature	EN 60721-3-1	1K4	-25 to 55 °C
Relative humidity	EN 60721-3-1	1K3	5 to 95 % (without condensation)
Storage height	–	–	Max. 3000 m above sea level
Transport	Standard	Class	Descriptions
Surrounding temperature	EN 60721-3-2	2K3	-25 to 70 °C
Relative humidity	EN 60721-3-2	2K3	95 % at 40 °C (without condensation)
Operation	Standard	Class	Descriptions
Surrounding temperature	EN 60721-3-3	3K3	-10 to 45 °C (extended from 5 to 40 °C)
Relative humidity	EN 60721-3-3	3K3	5 to 85 % (without condensation)
Version and degree of protection	EN 60529	IP20	Protection against foreign material > ø12.5 mm No protection against water Non-conductive pollution, occasional condensation when the unit is out of service.
Site altitude	–	–	Max. 2000 m above sea level

Table 1: Climatic environment conditions

4.1.2 Mechanical Ambient Conditions

Storage	Standard	Class	Description
Vibration limits	EN 60721-3-1	1M1	Vibration amplitude 0.3 mm (2 to 9 Hz) Acceleration amplitude 1 m/s ² (9 to 200 Hz)
Shock limit values	EN 60721-3-1	1M1	40 m/s ² , 22 ms
Transport	Standard	Class	Description
Vibration limits	EN 60721-3-2	2M1	Vibration amplitude 3.5 mm (2 to 9 Hz) Acceleration amplitude 10 m/s ² (9 to 200 Hz) (Acceleration amplitude 15 m/s ² (200 to 500 Hz))
Shock limit values	EN 60721-3-2	2M1	100 m/s ² , 11 ms
Operation	Standard	Class	Description
Vibration limits	EN 60721-3-3	3M4	Vibration amplitude 3.5 mm (2 to 9 Hz) Acceleration amplitude 10 m/s ² (9 to 200 Hz)
	EN 61800-5-1		Vibration amplitude 0.075 mm (10 to 57 Hz) Acceleration amplitude 10 m/s ² (57 to 150 Hz)
Shock limit values	EN 60721-3-3	3M4	100 m/s ²

Table 2: Mechanical ambient conditions

4.1.3 Electrical Operating Conditions

4.1.3.1 Device Classification

Requirement	Standard	Class	Description
Overvoltage category	EN 61800-5-1	III	-
	EN 60664-1	III	-
Pollution degree	EN 60664-1	II	Non-conductive pollution, occasional condensation when PDS is out of service

Table 3: Device classification

4.1.3.2 Electromagnetic Compatibility

EMC Emitted Interference	Standard	Class	Description
Conducted emissions	EN 61800-3	C2	-
Radiated emissions	EN 61800-3	C2	-
Immunity	Standard	Level	Description
Static discharges	EN 61000-4-2	8kV 4kV	AD (air discharge) CD (contact discharge)
Burst – Port for process measurement control lines and signal interfaces	EN 61000-4-4	2kV	-
Burst – Power ports	EN 61000-4-5	4kV	-
Surge – Power ports	EN 61000-4-5	1kV 2kV	Phase-phase Phase-ground
Immunity to conducted disturbances induced by radio-frequency fields	EN 6100-4-6	10V	0.15 to 80 MHz
Electromagnetic fields	EN 61000-4-3	10V/m 3V/m 1V/m	80 MHz to 1 GHz 1.2 to 2 GHz 2 to 2.7 GHz

Table 4: Electromagnetic compatibility

4.2 Rated Values

Characteristic	Value
Supply Voltage	24V (18 to 30V)
Supply Current	10mA @ 24VDC
Contact Rating (K1 / K2)	Pilot Duty 2A DC Maximum 30VDC 2A AC Maximum 120VAC
Monitor Input BR+ / BR-	350 to 800VDC 840VDC maximum
On time to trigger contact state change	>64ms

Table 5: Rated values



- If the control voltage applied to contacts K1 and K2 is 120VAC, the safe insulation between the 24VDC supply and the contacts K1/K2 is reduced to basic insulation. As a result the entire 24V control circuit of the drive is reduced to basic insulation according to UL61800-5-1.

5 Installation

5.1 Mounting

5.1.1 Dimensions

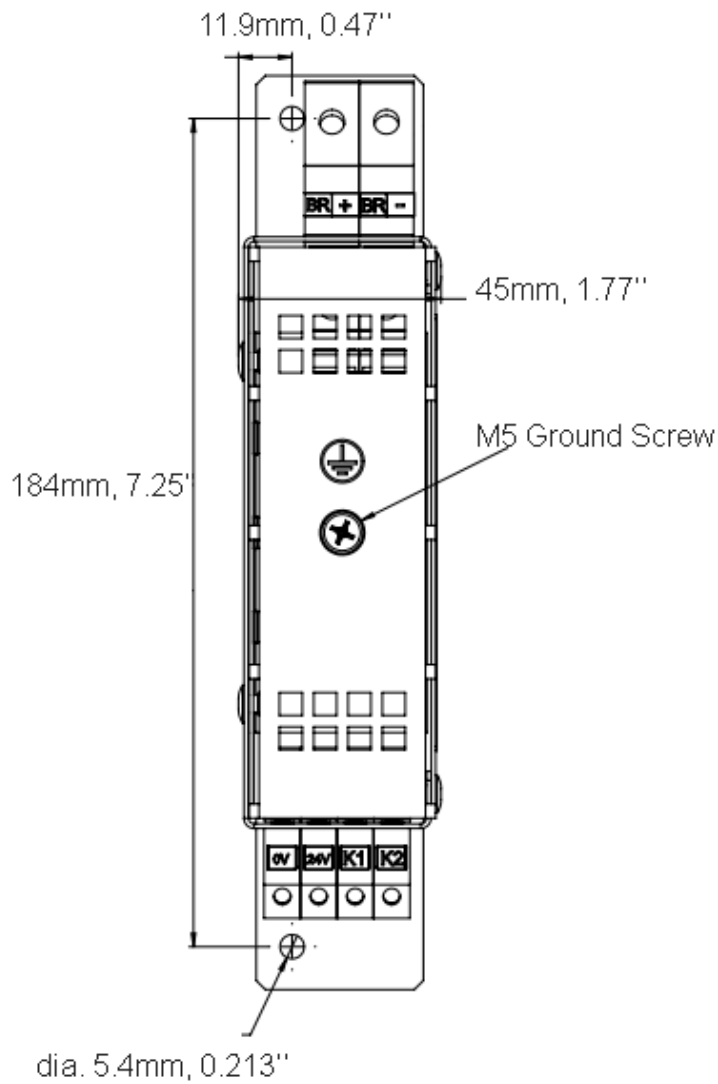


Figure 1: Dimensions

5.1.2 Mounting

Mount the Brake Transistor Monitor into the F5 elevator drive control cabinet, ensuring the monitor is mounted an appropriate distance from any other control elements as shown in the following table.

Mounting Distance	Dimension	Distance (mm)	Distance (inch)
	A	150	6
	B	50	2
	C	30	1.2
	D	0	0
	X*	50	2
	* Distance to preceding elements in the control cabinet door		

Figure 2: Mounting Dimensions

5.2 Electrical Installation

5.2.1 Terminals

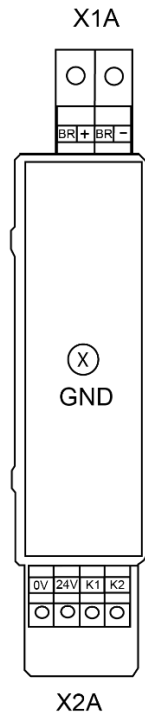


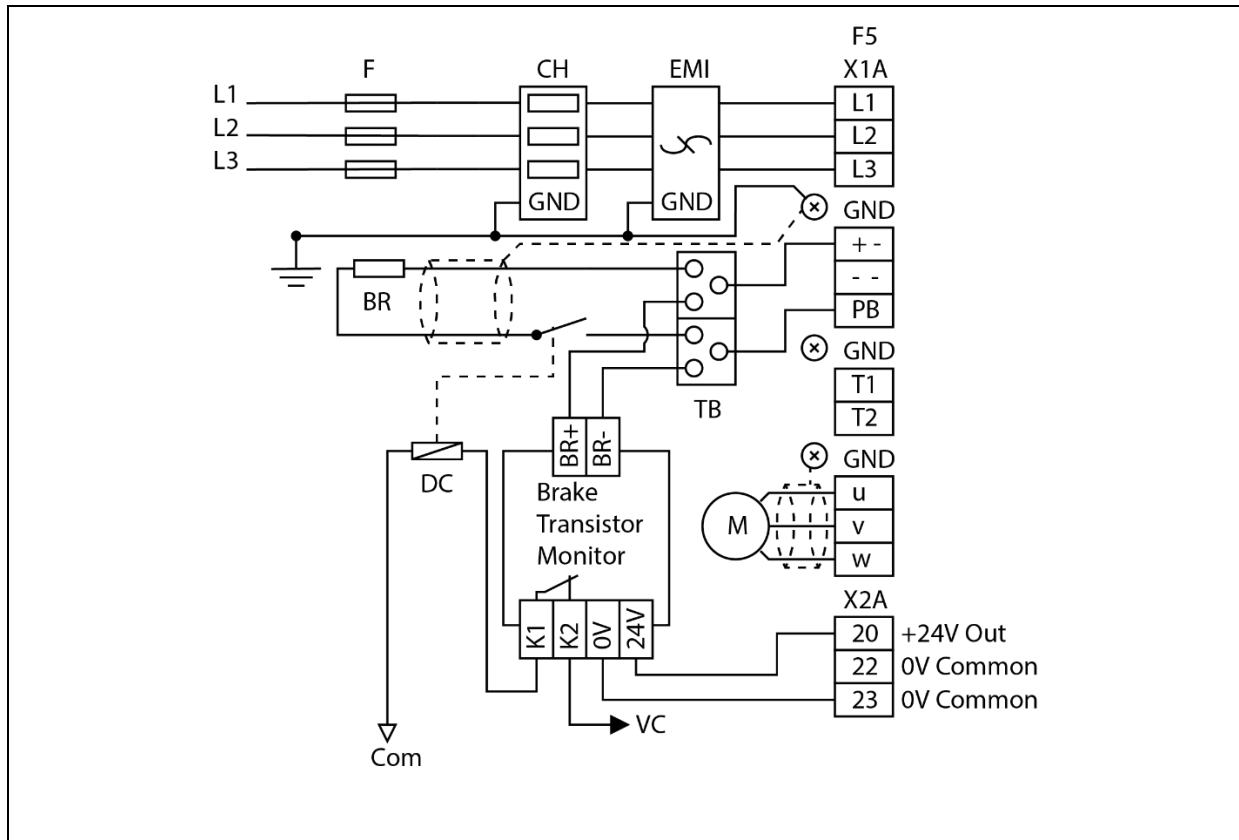
Figure 3: Terminals

High Voltage Connection X1A			
Terminal	Function	Connection	Tightening Torque
BR+	Connection to Brake Resistor	Stranded conductor with wire-end ferrule. 0.5 to 16 mm ² UL stranded conductor. 20 to 4 AWG	2.0 Nm 18 in lbs
BR-			
Earth/Ground Connection			
Terminal	Function	Connection	Tightening Torque
GND,	Connection to Ground	M5 screw Use UL listed ring style crimp connector. Recommended wire gauge 4.0mm ² or 12 AWG	2.0 Nm 18 in lbs
Control Connection X2A			
Terminal	Function	Connection	Tightening Torque
0V	DC Power Supply	Stranded conductor with wire-end ferrule. 0.13 to 4 mm ² UL stranded conductor. 26 to 10 AWG	0.8 Nm 7.0 in lbs
24V			
K1	Normally-Closed Contact Pilot Duty Rated		
K2			

Table 6: Terminal Connections

5.2.2 Wiring Diagrams

5.2.2.1 DC Brake Resistor Contactor



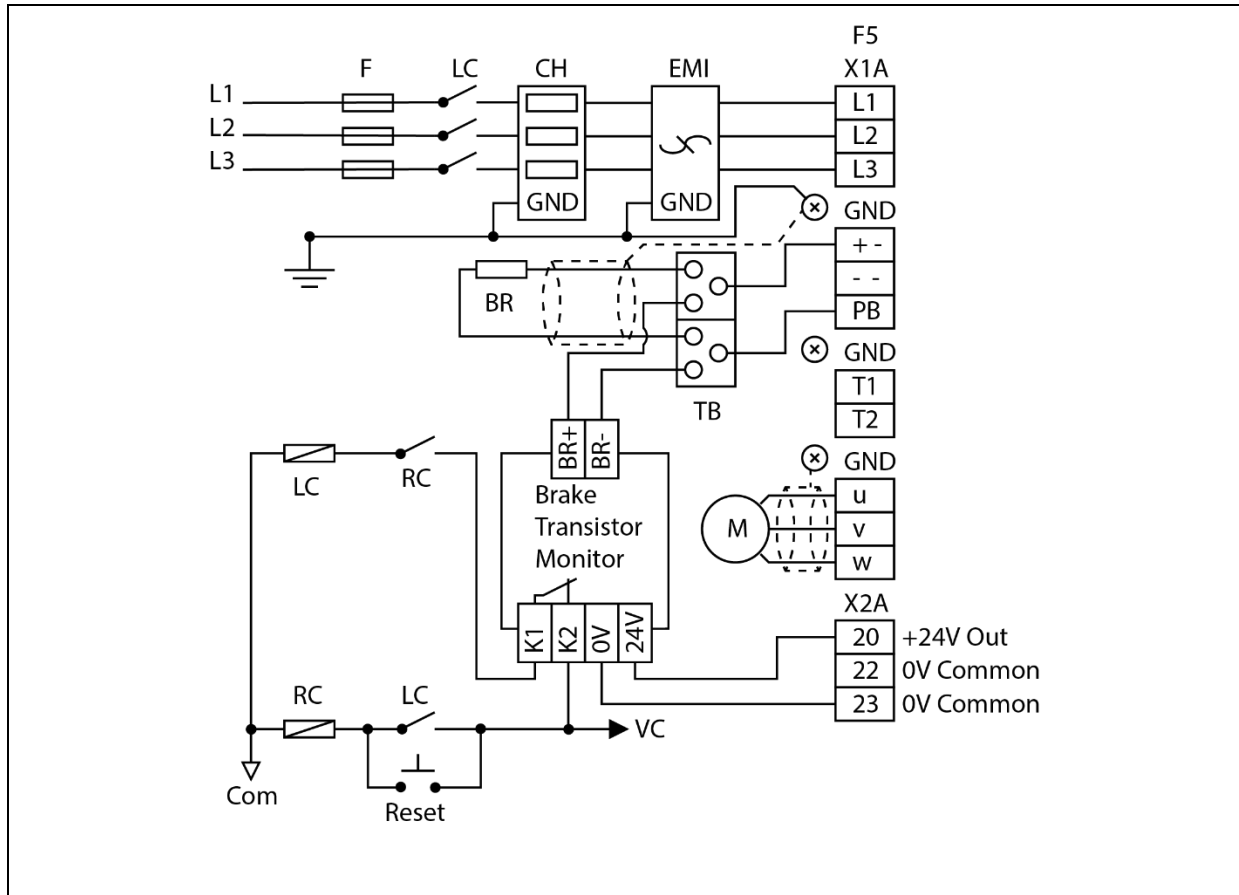
Key

F	Branch-Circuit Fuses	CH	Line Choke
EMI	EMI Filter	F5	F5 Series AC Drive
TB	Distribution / Connection Block	BR	Brake Resistor
DC	DC Contactor	VC	Control Voltage
Com	Control Voltage Common		



- The terminals on the Drive and the Brake Transistor Monitor are rated for single conductor only. Two conductors shall not be joined to one terminal.
- To connect the Brake Transistor Monitor, an external distribution or connection block (TB) must be used to connect the Brake resistor and the Brake Transistor Monitor in parallel.

5.2.2.2 AC Line Contactor



Key

F	Branch-Circuit Fuses	CH	Line Choke
EMI	EMI Filter	F5	F5 Series AC Drive
TB	Distribution / Connection Block	BR	Brake Resistor
LC	Line Contactor	RC	Reset Relay – Latching Circuit
VC	Control Voltage	Com	Control Voltage Common



- The terminals on the Drive and the Brake Transistor Monitor are rated for single conductor only. Two conductors shall not be joined to one terminal.
- To connect the Brake Transistor Monitor, an external distribution or connection block (TB) must be used to connect the Brake resistor and the Brake Transistor Monitor in parallel.

6 Appendix

6.1 Appendix 1: Recommended Distribution Block TB

- Used for the parallel connection of the brake resistor and the Brake Transistor Monitor.
- Two single-phase distribution blocks are required.

nVent ERIFLEX UD-80A 569010

<https://www.erico.com/part.asp?part=UD-80A>

KEB Material Number 0090503-5001

6.2 Appendix 2: Recommended DC Contactor

- Used to disconnect the BR- connection to the brake resistor.

GIGAVAC® GV250 Series Contactor

https://www.gigavac.com/sites/default/files/catalog/spec_sheet/gv250.pdf

KEB Material Number 0090215-2601

6.3 Revision History

Chapter	Change	Date
All	Initial Publication	6/11/2020

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