

Installation Instructions for the HKDDC Circuit Breaker and Molded Case Switch



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⚠WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH, SEVERE PERSONAL INJURY, OR SUBSTANTIAL PROPERTY DAMAGE CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

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The user is cautioned to observe all recommendations, warnings, and cautions relating to the safety of personnel and equipment as well as all general and local health and safety laws, codes, and procedures.

The recommendations and information contained herein are based on Eaton experience and judgment, but should not be considered to be all-inclusive or covering every application or circumstance which may arise. If any questions arise, contact Eaton for further information or instructions.



Figure 1. Type HKDDC Series C DC Circuit Breaker Frame With KT Trip Unit Installed.

1. Introduction

General Information

In this document, the term circuit breaker includes molded case switches. The K-Frame Series C DC circuit breaker (Fig. 1) type HKDDC is rated 600 Vdc maximum and from 100A to 400A continuous current using type KT thermal-magnetic trip units. Refer to Table 1 for all available trip unit ratings. The circuit breaker is listed in accordance with Underwriters Laboratories, Inc. Standard UL 489. The type HKDDC circuit breaker is for use in grounded and ungrounded applications where multiple poles are connected in series (Figures 2-5). A 3-pole breaker may be wired as a 2-pole with rated voltage and interruption based on the number of poles wired in series. For grounded isolated load configurations, the interruption rating is based on number of poles in series that break the ungrounded leg of the power supply.

This instruction leaflet (IL) gives procedures for installation and field testing of the type HKDDC Series C DC circuit breaker.

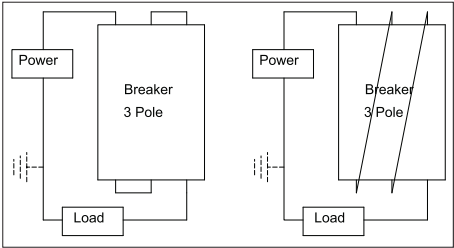


Figure 2. Load Connected to Power Source. Grounded or Ungrounded Systems.

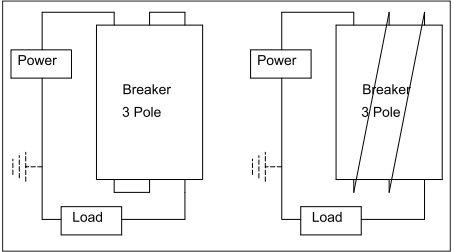


Figure 3. Load Isolated from Power Source. Grounded or Ungrounded Systems. If System Voltage Exceeds 300 Vdc, then Ungrounded Systems Only.

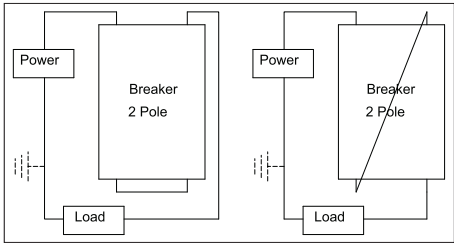


Figure 4. Load Connected to Power Source. Grounded or Ungrounded Systems.

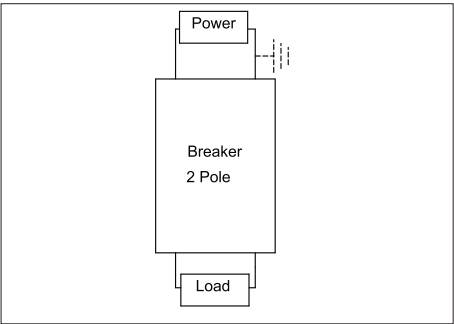


Figure 5. Load Isolated from Power Source. Grounded or Ungrounded Systems. If System Voltage Exceeds 125 Vdc, then Ungrounded Systems Only.

Table 1. Available Trip Unit Ratings.

Circuit Breaker Types	Trip Unit Types Thermal-Magnetic Amperes I_n	
	Fixed Thermal	Adjustable Magnetic Multiples of I_n ①
HKDDC	100	5 to 10
	125	
	150	
	175	
	200	
	225	
	250	
	300	
	350	
	400	

① For adjustable thermal trip units, the magnetic setting is a multiple of the maximum thermal setting. For Vdc applications, the magnetic tripping values may exceed the Vac values by 42%.

2. Installation

The installation procedure consists of inspecting the circuit breaker and, as applicable, installing the trip unit and rating plug, accessories, interphase barriers and terminals; mounting the circuit breaker; connecting the line and load conductors; torquing terminals; and attaching terminal shields. Circuit breaker frames, trip units, accessories, mounting hardware, and unmounted terminals may be supplied in separate packages. To install the circuit breaker, perform the following steps.

NOTICE

IF REQUIRED, INTERNAL ACCESSORY INSTALLATION IN ANY TYPE OF CIRCUIT BREAKER SHOULD BE DONE BEFORE THE CIRCUIT BREAKER IS MOUNTED AND CONNECTED. REFER TO INDIVIDUAL ACCESSORY INSTRUCTION LEAFLETS.

2-1. Make sure that the circuit breaker is suitable for the intended installation by comparing nameplate data with existing equipment ratings and system requirements. Inspect the circuit breaker for completeness, and check for damage before mounting. Uninstalled cover mounting hardware is supplied in a plastic bag with the circuit-breaker frame. (See Fig. 6.)

2-2. Remove installed cover screws and cover.

NOTICE

INSTRUCTIONS FOR INSTALLING THE TRIP UNIT AND ACCESSORIES IN THE K-FRAME CIRCUIT BREAKER ARE SUPPLIED WITH EACH ITEM.

2-3. If not already installed, mount trip unit and accessories (if required) in circuit breaker frame.

CAUTION

IF REMOVED AND REINSTALLED, THREAD-FORMING SCREWS WILL TRY TO REFORM THE THREADS IN THE BASE. CARE SHOULD BE TAKEN EVERY TIME A THREAD-FORMING SCREW IS USED TO ENSURE THE SCREW STARTS IN THE ORIGINAL THREADS. DAMAGED THREADS CAN RESULT IN IMPROPER CIRCUIT BREAKER COVER RETENTION.

2-4. Replace cover and install pan-head screws followed by thread-forming screws as shown in Fig. 7. Torque the cover screws to 18-23 lb-in (2-2.6 N.m.).

NOTICE

WHEN USING STEP-TYPE TERMINALS (CATALOG NO. TA401K, TA402K, TA400K OR T400K), THE TERMINAL COVER SUPPLIED WITH THE TERMINALS MUST BE INSTALLED ON THE CIRCUIT BREAKER AS SHOWN IN FIG. 8. WARNING LABEL SUPPLIED WITH THE KIT MUST BE ATTACHED TO THE CIRCUIT BREAKER FRONT COVER.

2-5. If not already installed, mount terminals as shown in Fig. 9. Secure the terminals to the circuit breaker using a 7/32 inch socket wrench and torque to 6-8 lb-ft (8-11 N.m). After mounting the circuit breaker and before installation of the conductors, the terminal mounting screw can be checked or retightened through the terminal when the conductor screw is removed. If Warning label is supplied with terminal, place on upper portion of circuit breaker cover.

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Table 2. Terminal Types

Terminal Cat. No.	Terminal Material Body	Screw Head Type	AWG Wire Range	Metric Wire Range	Wire Type	Torque Value lb-in (N.m.)
TA300K	Aluminum	Socket	3-350(1)	35-150	Cu/Al	275 (31.1)
TA350K	Aluminum	Socket	250-500(1)	150-240	Cu/Al	371 (42.4)
TA400K	Aluminum	Socket	3/0-250(2)	70-120	Cu/Al	275 (31.1)
TA401K	Aluminum	Socket	250(2) or 500(1)	120(2) or 240(1)	Cu/Al	275 & 375 (31 & 42)
TA402K	Aluminum	Socket	500-750(2)	240-300	Cu/Al	550 (62)
T300K	Copper	Socket	3-350(1)	35-150	Cu	275 (31.1)
T350K	Copper	Socket	250-500(1)	150-240	Cu	375 (42.4)
T400K	Copper	Socket	3/0-250(2)	70-120	Cu	275 (31.1)

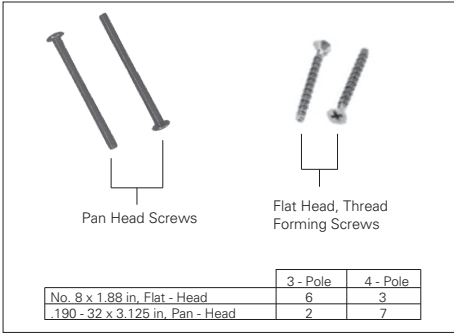


Figure 6. Cover Mounting Hardware.

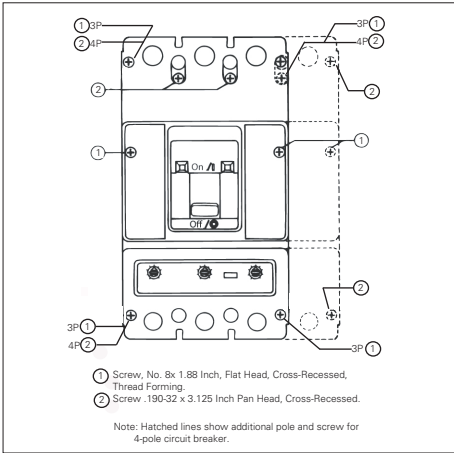


Figure 7. Cover Screw Installation Positions.

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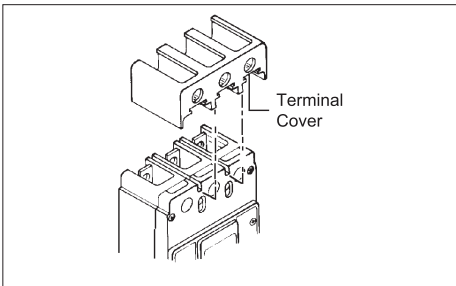


Figure 8. Terminal Cover Installation.

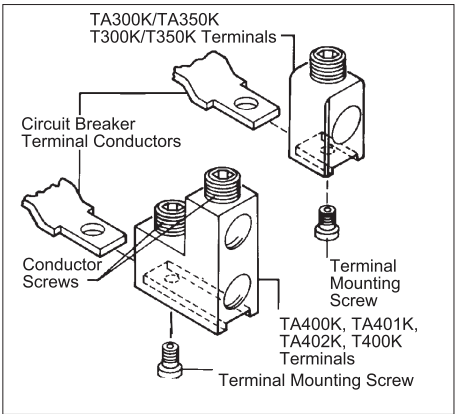


Figure 9. Terminal Installation.

WARNING

BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY.

NOTICE

DEPENDING ON THE EQUIPMENT CONFIGURATION, THE CIRCUIT BREAKER CAN BE MOUNTED USING DIFFERENT STYLES OF HARDWARE. THE FOLLOWING STEPS DESCRIBE HOW TO MOUNT THE CIRCUIT BREAKER USING STANDARD HARDWARE. WHEN SPECIAL HARDWARE IS NEEDED (FOR EXAMPLE, WITH THE ELECTRICAL OPERATOR), THE INSTRUCTION LEAFLET DESCRIBING THE ACCESSORY ALSO DESCRIBES THE SPECIAL MOUNTING ARRANGEMENTS.

- 2-6. To mount the circuit breaker, perform the following steps:
- a. For individual surface mounting, drill mounting panel using the drilling plan shown in Fig. 10. For panelboard mounting, only load end support mounting holes are required. For dead front cover applications, cut out cover to correct escutcheon dimensions, see Fig. 11.
 - b. If circuit breaker includes factory or field installed internal accessories, make sure that accessory wiring can be reached when the circuit breaker is mounted.

NOTICE

LABELS WITH ACCESSORY CONNECTION SCHEMATIC DIAGRAMS ARE PROVIDED ON THE SIDE OF THE CIRCUIT BREAKER. A NOTE SHOULD BE MADE OF THE DIAGRAMS IF THE LABELS CANNOT BE SEEN WHEN THE CIRCUIT BREAKER IS MOUNTED.

- c. Position circuit breaker on mounting surface.
- d. Install circuit breaker mounting screws, washers, and nuts. Tighten screws firmly, but do not exceed 28 pound-inches (3 N.m).

CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY OF TERMINAL OVERHEATING. OVERHEATING CAN CAUSE NUISANCE TRIPPING AND DAMAGE TO THE CIRCUIT BREAKER.

When a dual conductor terminal (Catalog No. TA400K, TA401K, or T400K) is installed on the circuit breaker and a single conductor is used, the conductor should be installed in the terminal opening nearest to the circuit breaker terminal mounting conductor.

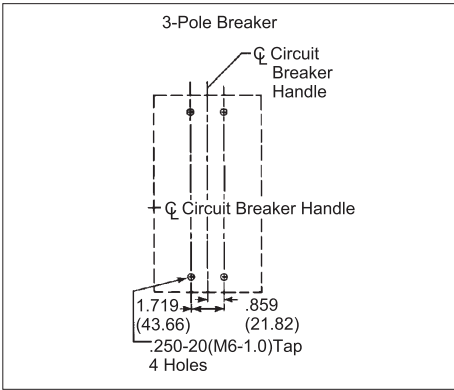


Figure 10. Circuit Breaker Mounting Bolt Drilling.

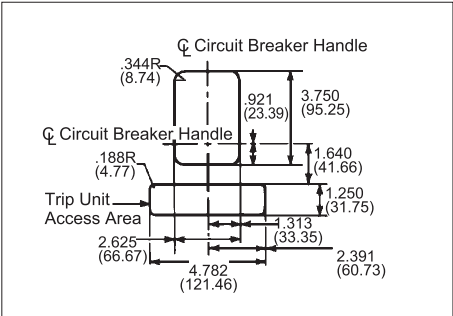


Figure 11. Circuit Breaker Escutcheon Dimensions for 3-Pole Circuit Breakers.

- 2-7. Connect line and load conductors and accessory leads.
- 2-8. If required, install terminal shield on circuit breaker cover with mounting screws provided.
- 2-9. After the circuit breaker is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line/load terminals are given in Table 2 and on the circuit breaker nameplate.

Manual Operation

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP button in the trip unit. The circuit breaker handle has three positions, two of which are shown on the cover with raised lettering to indicate ON and OFF. On the sliding handle barrier, ON, OFF, and trip are also shown by a color-coded strip for each circuit breaker handle position: red for ON, white for tripped, and green for OFF. (See Fig. 12).

Circuit Breaker Reset

After an automatic or accessory initiated trip, or a manual PUSH-TO-TRIP operation, the circuit breaker is reset by moving the circuit breaker handle to the extreme OFF position.

NOTICE

IN THE EVENT OF A THERMAL TRIP IN A THERMAL MAGNETIC TYPE TRIP UNIT, THE CIRCUIT BREAKER CANNOT BE RESET UNTIL THE THERMAL ELEMENT IN THE TRIP UNIT COOLS. NO CIRCUIT BREAKER SHOULD BE RECLOSED UNTIL THE CAUSE OF TRIP IS KNOWN AND THE SITUATION RECTIFIED.

PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the circuit breaker tripping function and is used to periodically exercise the operating mechanism in thermal-magnetic trip units. The button is designed to be operated by a small screwdriver.

Trip Units

For additional information on thermal-magnetic trip units, refer to I.L. 29C603 (IL supplied with trip unit.)

3. Inspection and Field Testing

Series C molded case circuit breakers are designed to provide years of almost maintenance-free operation. The following procedure describes how to inspect and test a circuit breaker in service.

Inspection

Circuit breakers in service should be inspected periodically. The inspection should include the following checks 3-1 through 3-8.

⚠ WARNING

BEFORE INSPECTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THAT THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠ CAUTION

MAKE SURE THAT CLEANING AGENTS OR SOLVENTS USED TO CLEAN THE CIRCUIT BREAKER ARE SUITABLE FOR THE JOB. SOME COMMERCIAL CLEANING AGENTS WILL DAMAGE THE NAMEPLATES OR MOLDED PARTS.

3-1. Remove dust, dirt, soot, grease, or moisture from the surface of the circuit breaker using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into circuit breaker. If contamination is found, look for the source and eliminate the problem.

3-2. Switch circuit breaker to ON and OFF several times to be sure that the mechanical linkages are free and do not bind. If mechanical linkages are not free, replace circuit breaker.

3-3. With the circuit breaker in the ON position, press the PUSH TO-TRIP button to mechanically trip the circuit breaker. Trip, reset, and switch circuit breaker ON several times. If mechanism does not reset each time the circuit breaker is tripped, replace the circuit breaker.

3-4. Check base, cover, and operating handle for cracks, chipping, and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.

3-5. Check terminals and connectors for looseness or signs of overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing.

If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be cleaned or replaced. Before re-energizing the circuit breaker, all terminations and cable should be refurbished to the condition when originally installed.

3-6. Check circuit breaker mounting hardware, and tighten if necessary.

3-7. Check area where circuit breaker is installed for any safety hazards, including personal safety and fire hazards. Exposure to certain types of chemicals can cause deterioration of electrical connections.

Field Testing

Any field testing should be done in accordance with applicable NEMA Standards.

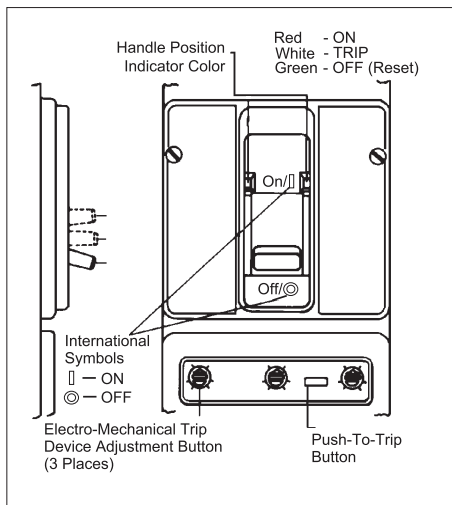


Figure 12. Circuit Breaker Manual Controls.

Notes:

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The instructions for installation, testing, maintenance, or repair herein are provided for the use of the product in general commercial applications and may not be appropriate for use in nuclear applications. Additional instructions may be available upon specific request to replace, amend, or supplement these instructions to qualify them for use with the product in safety-related applications in a nuclear facility.

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