Fusing Equipment
Catalog Data
CA132021EN

Effective October 2019
Supersedes March 2016

COOPER POWER SERIES

Companion II back-up current-limiting fuse

General

Eaton designs its Cooper Power™ series Companion™ II fuse to be conveniently applied as an add-on, back-up, current-limiting fuse. The Companion II back-up fuse will interrupt high fault current and at the same time, limit the amount of energy that is let-through to the protected equipment. This fuse is designed to be applied in series with an expulsion or other type of weak link fuse. This series connected fuse must be capable of interrupting both excessive overload currents and low to intermediate fault currents up through the minimum interrupting rating of the Companion II fuse. If the expulsion fuse is applied within the recommended guidelines (refer to Table 2), enough current will be let-through to melt the expulsion fuse. When the expulsion fuse is in a cutout, the resulting drop open action provides, in any fault situation, a positive blown fuse indication for operating personnel.

The majority of faults on distribution systems are of low magnitude (such as transformer overloads or incipient faults), and normally only the lower cost expulsion fuse melt and clear the fault. The available fault current on many overhead distribution systems, however, has grown beyond the interrupting ratings of the expulsion fuse. When the Companion II fuse is used, and a higher magnitude fault current occurs, the possibility of eventful transformer failure is greatly reduced.

The Companion II fuse offers major advantages over other back-up, current-limiting fuses in the industry. This design offers a small, compact, reliable fuse that is easier to handle in field installations. The modular design also offers greater flexibility in the selection of terminal options and the ability to re-use the terminals after a fuse operation.

Every Companion II fuse is I^2t tested. This assures operation of the fuse only at published minimum melt I^2t levels and above, guaranteeing that a Companion II fuse will not be susceptible to nuisance operations at lower I^2t levels. This patented quality-control test detects defects that cannot be identified by any other test procedure, including resistance checks and x-rays.

The standard 8.3 kV and 17.2 kV, 25 K Companion II fuse is also manufactured as a "Tandem ELF Ready" fuse and can be used in Eaton's Cooper Power series Tandem ELF™ fuse. The Tandem ELF fuse combines the series fuse link and Companion II fuse in one hookstick removable design which eliminates the need to separately connect the Companion II fuse. Refer to Catalog Section CA132028EN for more information on the Tandem ELF fuse.

Powering Business Worldwide

Minimizes equipment damage

The Companion II back-up current-limiting fuse will interrupt high magnitude fault currents while also limiting the amount of current and energy let-through to the transformer. The back-up current-limiting fuse will limit the let-through current to minimize the possibility of transformer tank rupture from high magnitude internal faults or to minimize damage to the tank or bushing that might result from bushing flashovers.

Enhanced power quality and improved service continuity

The operation of the Companion II back-up current-limiting fuse will enhance power quality of the system and improve service continuity during high magnitude faults. The duration of the voltage dip associated with system short circuits will be limited to the short melt time of the Companion II fuse. Immediately after melting, the arc voltage generated by the current-limiting fuse will support system voltage until the fault is interrupted by the fuse. For high fault currents, the duration of the voltage dip associated with the melt time of the Companion II fuse will be well within the allowable limits for sensitive electronic equipment as defined by CBEMA curves.

Surge durability and improved transformer protection

For high isokeraunic areas, a Companion II fuse (25 K or 40 K rated) may be used in series with a cutout mounted Eaton's Cooper Power series dual element link (Type X or Type D). When used this way, the overcurrent protection can withstand high surge currents that might be discharged through a surge arrester. The Lightning-Protected Transformer (LPT™-as shown in Figure 6) shows that when used this way, the surge arrester can be connected on the load side of the fuse and closer to the transformer. This shortens the lead length to the arrester and provides the best overvoltage protection. This would not be possible with similar ampere ratings of conventional type links because of the high probability of damage due to the lightning passing through the link.

Table 1. Companion II Fuse Voltage Application

System Voltage (kV)		Recommended Companion II Rating (kV)	
Nominal	**Maximum**	**Four Wire Multi-grounded Neutral**	**Delta**
2.4	2.54	–	8.3
2.4/4.16	2.54/4.4	8.3	–
4.16	4.4	–	8.3
4.8	5.1	–	8.3
4.8/8.32	5.1/8.8	8.3	–
6.9	7.26	–	8.3
6.93/12.0	7.3/12.7	8.3	–
7.2	7.62	–	8.3
7.2/12.47	7.62/13.2	8.3	–
7.62	8.1	–	8.3
7.62/13.2	8.1/14.0	8.3	–
7.97	8.4	–	8.3
7.97/13.8	8.4/14.5	8.3	–
8.32	8.8	–	8.3
8.32/14.4	8.8/15.2	8.3	–
12/20.8	12.7/22.0	15.5	–
12.47	13.2*	–	15.5**
13.2/22.9	14/24.2	15.5	–
13.2	14*	–	15.5**
13.8	14.5*	–	15.5**
14.4/24.9	15 2/26.4	15.5	–
14.4	15.2*	–	15.5**
19.9/34 5	21.1/36.5	23	–
34.5	36.5*	–	23**
46	48.3*	–	23**

* Fuse voltage ratings recommended for these systems are based on simultaneous operation of the Companion II fuses for high current faults.

** For single-phase applications on delta systems, one fuse of this rating is required in each phase.

Table 2. Companion II Fuse-Fuse Link Coordination

	Coordinates With Fuse Links Up Through					
Companion II Fuse Rating	**Type K**	**Type T**	**Edison™ Type N**	**Edison Type S**	**Edison Type H**	**Edison Type D**
12 K	12	8	20	5	8	1.5
25 K	25	15	30	7	8	20
40 K	40	20	50	15	8	20
	Kearney™ Type X™	**Kearney Type QA™**	**Kearney Type 200™**	**Kearney Type KS™**		
12 K	2.5	15	10	3		
25 K	10	30	20	7		
40 K	15	50	30	15		

Table 3. Protective Characteristics

Voltage Rating (kV)	Companion II Rating*	Maximum Peak Arc Voltage (kV)	Minimum Melt I^2t (kA^2s)**	Maximum Let-Through I^2t (kA^2s)	Maximum Interrupting Current (kA)
8.3	12	25	2.6	18	50
	25	25	10.4	45	50
	40	25	33.9	140	50
15.5/17.2	12	43	2.6	18	43
	25	43	10.4	45	43
	40	43	33.9	140	43
23	12	64	2.6	18	31
	25	64	10.5	45	31

* Coordinates with NEMA® Type K fuse links up through designated rating (amperes). Contact your Eaton representative for coordination assistance with other types of expulsion fuse links.

** Minimum melt I^2t is for the back-up current-limiting fuse section only.

Application

Voltage selection

The Companion II fuse has voltage ratings compatible with most common distribution voltages.

Table 1 lists the most common distribution voltages, connections and the corresponding Companion II fuse voltage rating. For voltage ratings or connections other than those listed, consult your Eaton representative.

Current coordination

A 12 K Companion II fuse will coordinate with Type K fuse links rated 12 A or less. The 25 K Companion II fuse will coordinate with Type K fuse links rated 25 A or less, and the 40 K Companion II fuse will coordinate with Type K fuse links 40 A or less. Distribution systems using expulsion fuses other than Type K fuse links can also be coordinated with Companion II fuses (Table 2). Contact your local Eaton representative for any further assistance.

Arc voltage considerations

A Companion II fuse, when applied correctly, generates arc voltages well below arrester sparkover levels. The protective characteristics in Table 3 are the maximum peak-arc voltages for each Companion II fuse at rated voltage. Peak arc voltages will be lower when the fuses are used at system voltages lower than the fuse's rated voltage.

Let-through current

When an Companion II fuse operates, the current let through to the system is just a fraction of the system fault capability. Therefore, electrical and mechanical damage produced by faults is greatly reduced or eliminated. Table 3 lists the maximum I^2t let-through current for each Companion II fuse when operated at rated voltage.

Installation

A Companion II fuse can be added to new or existing distribution equipment installations to provide the energy limiting protection that is needed. The fuse can be mounted in open or enclosed cutout terminals as well as transformer bushing terminals. It can also be suspended in the drop leads or used with hot-line connectors. When installing a Companion II fuse, observe the following guidelines:

1. Arrester can be connected on either the source or load side.
2. Direct expulsion gases from cutouts away from any Companion II fuse mounted nearby as well as away from adjacent equipment.
3. Maintain normal system phase and ground spacings.
4. When installing a 25 K or larger Companion II fuse in a cutout's upper terminal, replace expendable caps with solid caps.

Installation examples are shown in Figures 1 through 6.

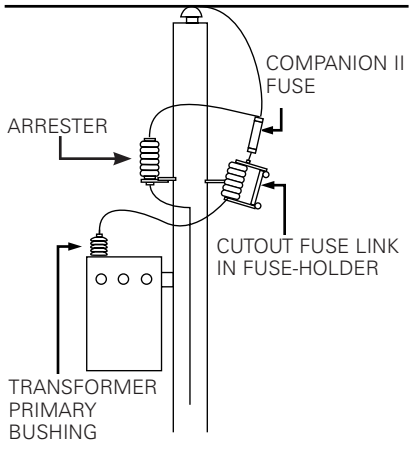


Figure 1. Source side cutout installation.

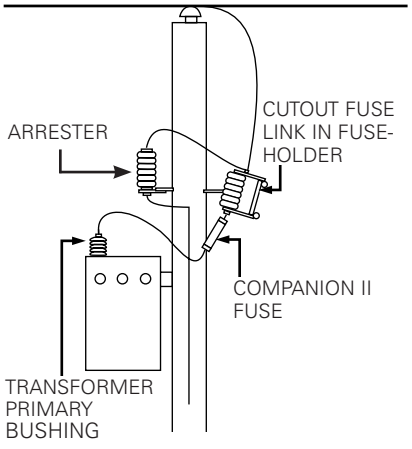


Figure 2. Load side cutout installation.

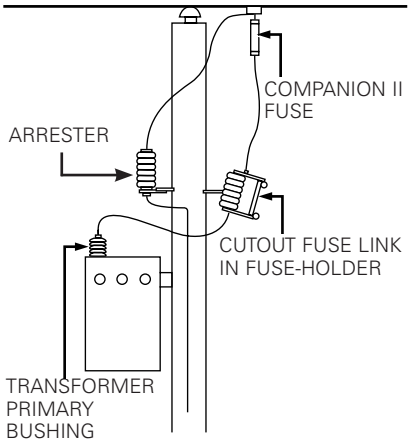


Figure 3. Hot-line/bail installation.

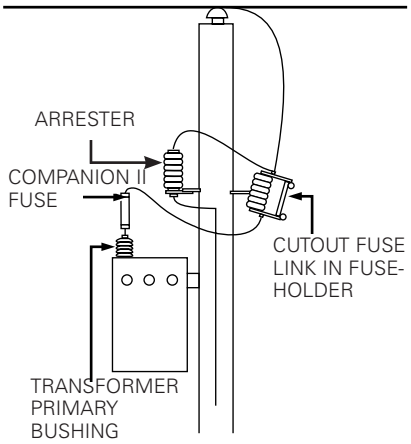


Figure 4. Bushing mount installation.

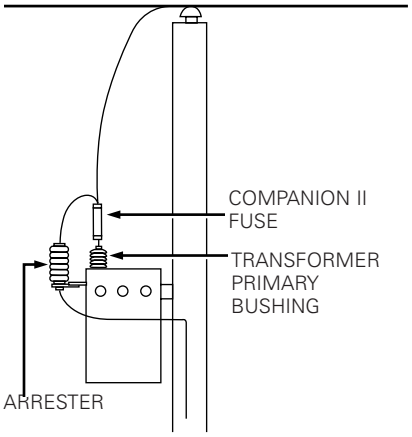


Figure 5. Completely Self-Protected (CSP) transformer installation.

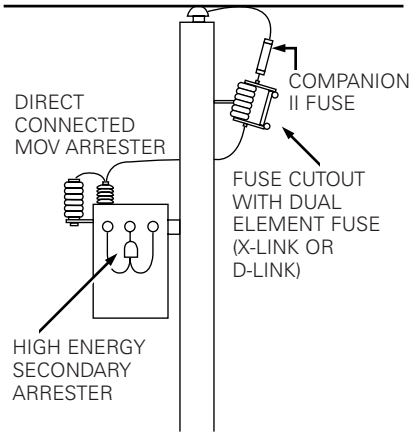


Figure 6. Lightning-protected transformer (LPT) installation.

Terminal options

The Companion II fuse is available with several types of terminal options. Any combination of spline stud, parallel-groove, spade or eyebolt connector is available. A universal adapter is available for installations that require angled installation of the fuse to meet clearance requirements. In addition to end terminals, an optional hot-line clamp is available for easy connection to overhead lines.

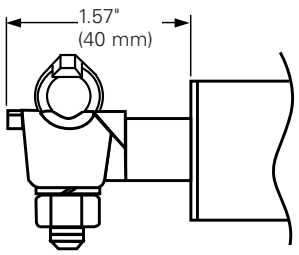


Figure 7. Eyebolt terminal (#8 through 2/0). (-B)

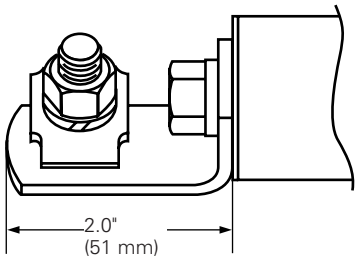


Figure 8. Parallel-groove terminal. (#6 through 2/0) (-C)

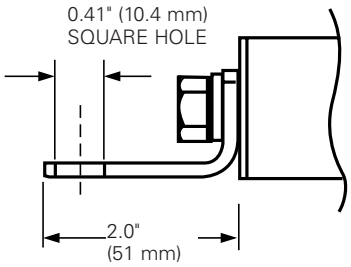


Figure 9. Spade terminal. (-D)

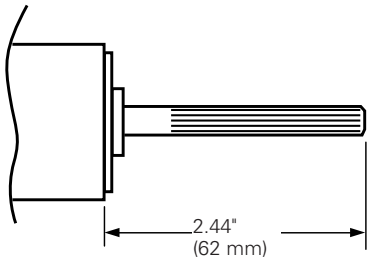


Figure 10. Spline stud terminal. (-G)

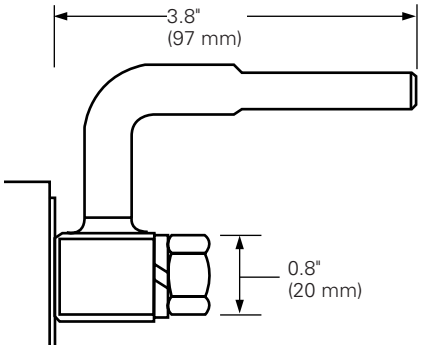
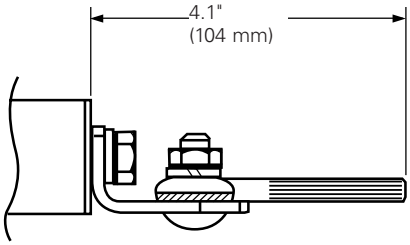


Figure 11. Offset adapter terminal. (-J)



Note: Stud is rotatable by 180°.

Figure 12. Universal adapter terminal. (-L)

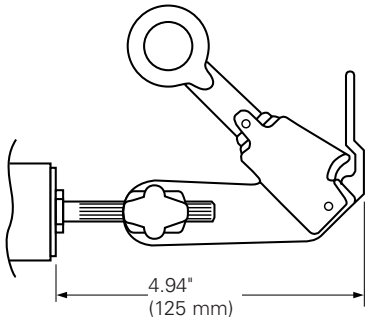


Figure 13. Hot-line clamp. (-M)

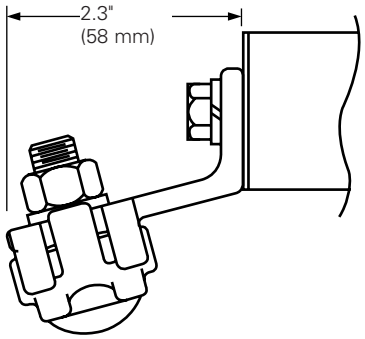


Figure 14. Large parallel-groove terminal (250 MCM). (-N)

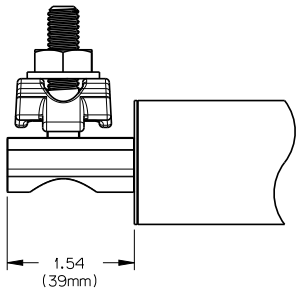


Figure 15. Medium parallel-groove terminal (#8-2/0 cable sizes). (-P)

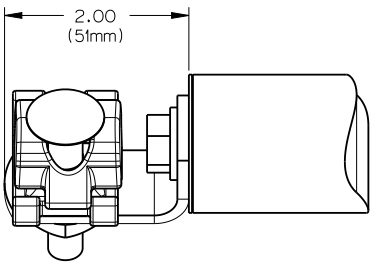


Figure 16. Parallel-groove terminal (#8 through 2/0 cable sizes). (-Q)

Note: Parallel-groove connector is shipped in a bag with fuse (not installed) as shown above.

Ordering information

Selecting a catalog number

New Installation

To order a Companion II fuse, first choose a fuse voltage and current rating from the **Application Section** on page 3. After selecting the fuse size choose the appropriate Base Catalog Number from Tables 4, 5 or 6 and add the appropriate terminal options from Table 7.

Table 4. 8.3 kV Companion II Fuse

Current Rating	Interrupting Rating (kA-Sym)	Companion II Fuse Catalog Number	
		Base Catalog Number	Terminal Code* Digits 10 and 11**
12 K	50	FAH8KV12K--R1	Refer to Table 7
25 K	50	FAH8KV25K--R1	Refer to Table 7
40 K	50	FAH8KV40K--R1	Refer to Table 7

* To order Companion II fuse without terminal options, move R1 to digits 10 and 11. See Example above.

** Terminal Codes must appear in descending order of the alphabet.

Table 5. 15.5/17.2 kV Companion II Fuse

Current Rating	Interrupting Rating (kA-Sym)	Companion II Fuse Catalog Number	
		Base Catalog Number	Terminal Code* Digits 11 and 12**
12 K	43	FAH17KV12K--R1	Refer to Table 7
25 K	43	FAH17KV25K--R1	Refer to Table 7
40 K	43	FAH17KV40K--R1	Refer to Table 7

* To order Companion II fuse without terminal options, move R1 to digits 11 and 12. See example above.

** Terminal Codes must appear in descending order of the alphabet.

Table 6. 23 kV Companion II Fuse

Current Rating	Interrupting Rating (kA-Sym)	Companion II Fuse Catalog Number	
		Base Catalog Number	Terminal Code* Digits 11 and 12**
12 K	31	FAH23KV12K_R1	Refer to Table 7
25 K	31	FAH23KV25K_R1	Refer to Table 7

* To order Companion II fuse without any terminal options, move R1 to digits 11 and 12. See example above..

** Terminal Codes must appear in descending order of the alphabet.

Replacement fuse ordering

To order a replacement fuse, choose the appropriate base catalog number from Table 4, 5, or 6.

Examples:

To order an 8.3 kV, 25 K rated fuse with spline stud and eyebolt terminal, the part number would be:

FAH8KV25KBGR1

To order an 8.3 kV, 25 K replacement fuse only the part number would be:

FAH8KV25KR1

Companion II terminal hardware

To order replacement terminal hardware separately choose two appropriate terminal codes from Table 7. After selecting the appropriate Terminal Codes order catalog number:

Terminal Code	Terminal Code	**HWKT**

Note: Terminal codes must appear in descending order of the alphabet.

Example:

To order a hardware kit including an eyebolt terminal and spline stud, the catalog number would be:

BGHWKT

Table 7. Terminal Options*

Terminal Code	Description
B	Eyebolt (#8 - 2/0 cable sizes)
C	Parallel-Groove (#6 - 2/0 cable sizes)
D	Spade Adapter
G	Spline Stud
J	Offset Adapter
L	Universal Adapter
M	Hot Line Clamp-Bronze (#4 - 2/0 cable sizes)
N	Large Parallel-Groove (#8 - 250 mcm cable sizes)
P	Medium Parallel-Groove (#8 - 2/0 cable sizes)
Q	Parallel-Groove Terminal (#8 - 2/0 cable sizes) **Note:** Parallel-groove connector is shipped in a bag with fuse (not installed).

*To order single terminal connector hardware kit

Terminal Code	**HWKT**

(Example: JHWKT-Offset Adapter Hardware Kit)

Dimensions and weights

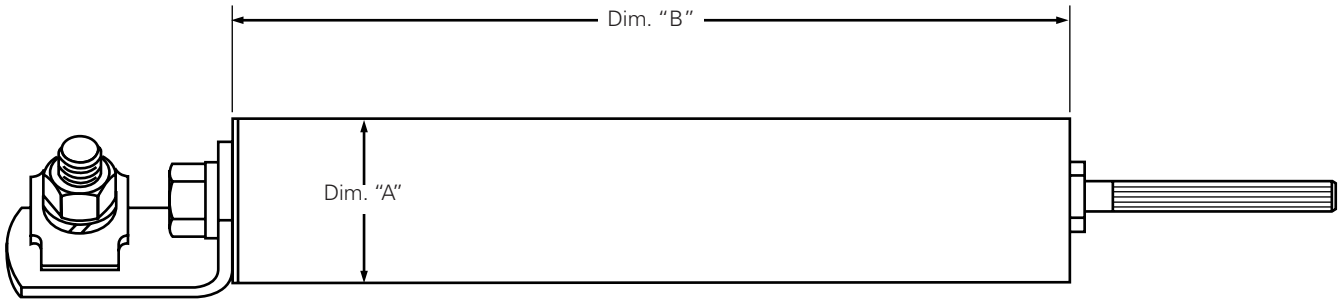


Figure 17. Fuse body dimensions (shown with parallel-groove and spline stud terminal options).

Table 8. Fuse Dimensions and Weights

Voltage Rating	Ampere Rating	DIM "A" in.	(mm)	DIM " B" in.	(mm)	Weight lbs. (kg)
8.3 kV	12 K	1.48	(37.6)	7.50	(190.5)	1.1 (0.5)
	25 K	1.48	(37.6)	7.50	(190.5)	1.1 (0.5)
	40 K	2.00	(50.8)	8.45	(214.6)	2.3 (1.0)
17.2 kV	12 K	1.48	(37.6)	9.40	(238.8)	1.3 (0.6)
	25 K	2.00	(50.8)	10.20	(259.1)	2.6 (1.2)
	40 K	2.06	(52.3)	13.66	(347.0)	3.6 (1.6)
23 kV	12 K	1.48	(37.6)	10.50	(266.7)	1.3 (0.6)
	25 K	2.06	(52.3)	13.66	(347.0)	3.6 (1.6)

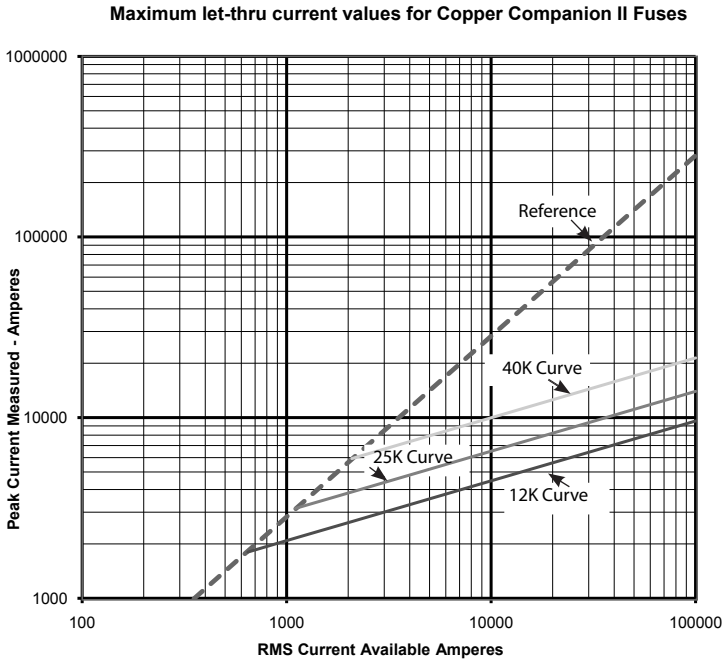


Figure 18. Maximum let-thru curve for Companion II fuses.

Additional Information

Refer to the following reference literature for additional information:

MN132009EN	Companion II Back-up Current-Limiting Fuse Installation Instructions
R240-91-165	Companion II Fuse Time Current Characteristic Curves
CP-9716	Companion II Fuse Certified Test Report
CA132028EN	Tandem ELF™ Current-Limiting Dropout Fuse Catalog
MN132029EN	Tandem ELF Current-Limiting Dropout Fuse Installation Instructions
R240-91-46	Tandem ELF Fuse Time Current Characteristic Curves
R240-30-6	Recommended D-Link Primary Fusing for Distribution Transformers

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