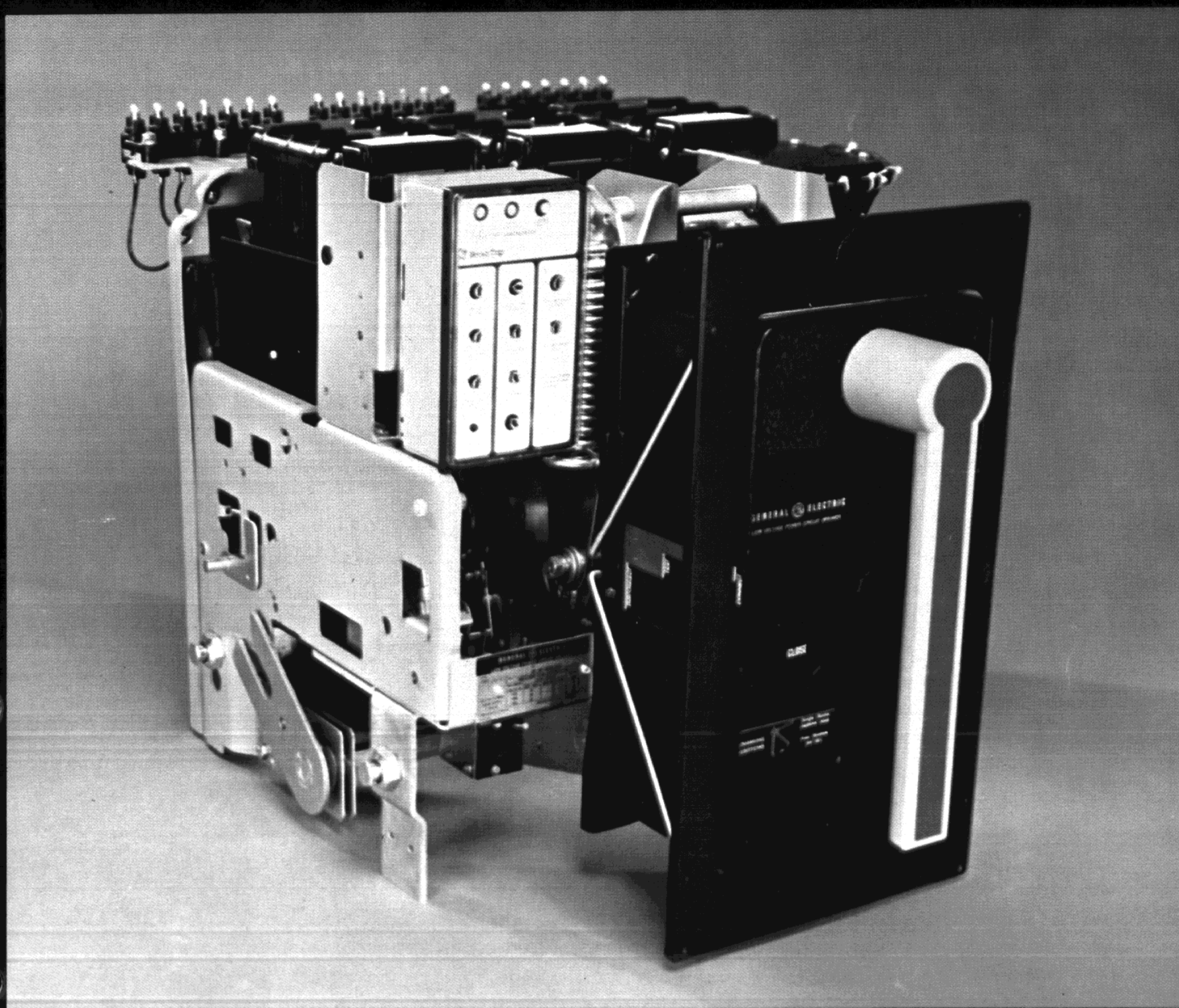


Introducing
MicroVersaTrip®



Type AKR

Low Voltage Power Circuit Breakers



GENERAL  ELECTRIC

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70-4000A.
600V ac 50/60 Hz.
40-6000A.
250V dc

Type AKR low-voltage power circuit breakers are intended for use in commercial, industrial, and utility applications. Built to withstand intense

AKR-3/3A-50
AKR-30 thru AKRT-50,
including AKJ/AKJT-50
AKR-75, 100

GEK-7310
GEK-64459
GEK-64460

- Five Frame Sizes: AKR-30, -50, AKRT-50, AKR-75, -100
- Solid State Trip Device for Ac Ratings:
MicroVersaTrip[®]
- Electromechanical Trip Devices for Dc Ratings:
Types EC-1, EC-1B, EC-2A
- Overcurrent Trip Indication Targets with
MicroVersaTrip
- Easy Access to Major Components
- Multi-Contact Design
- Stored Energy Closing — Manual & Electrical
- Complete Line of Accessories
- Short-Circuit Ratings Through 200,000 Amperes
- Metal Frame Construction Provides Rigidity and
Endurance

Power Sensor Test Set
Power Sensor Hi-Current Testing
ECS/SST Test Set TAK-TS1
ECS/SST Test Set TAK-TS2
ECS/SST Hi-Current Testing
MicroVersaTrip Test Set, TVTS1

GEK-7301
GEK-7309
GEK-64454
GEK-73300
GEK-64455
GEK-64464

AKR-30, 50, AKRT-50	GEF-4527	AK-25 AK-50	GEF-4149 GEF-4150
AKR-75, 100	GEF-4552	AK-75 AK-100	GEF-4395 GEF-4396

Order from General Electric Company, Distribution Unit, Hoerle Bldg., Plainville, CT 06062.

Breaker Selection & Application Installation & Operation Instructions:

GEA-8733

AK-25, 50, AKT-50, AK-75, 100	GEK-7302
AKR-30, 50, AKRT-50	GEI-86150
AKR-75, 100	GEI-86151
AKJ-50, AKJT-50	GEI-86152
SST Conversion Kits:	
AK-15, 25	GEI-86153
AK-50, AKT-50	GEI-86154
AK-75, 100	GEI-86155
EC-1, 1B, 2A Trip Devices	GEI-86157

AK-25	GEI-50299
AK-50, AKT-50, AK-75, 100:	
Basic Manual	GEK-7303
ECS/SST Supplement (for AK-75, 100)	GEI-86135

Trip Device	Trip Elements ①	Trip Characteristic (EC Devices only)	Curve
EC-1	LSI	(See Curves)	GES-6000A
EC-1B	LI	1BB-3	GES-6003
	LI	1CC-3	GES-6004
	LSI	(See Curves)	GES-6005
EC-2/2A	LI	1A-3	GES-6010
	LI	1B-3	GES-6011
	LI	1C-3	GES-6012
Power Sensor	LSI	—	GES-6021A
	G	—	GES-6031 ②
ECS	LSI	—	GES-6032
SST	LSI	—	GES-6033
	G	—	GES-6034,6035
Micro-VersaTrip	LSI	—	GES-6193, 6199
	G	—	GES-6195


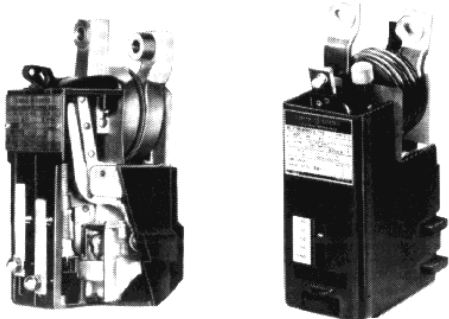
① L = Long Time I = Instantaneous
S = Short Time G = Ground Fault

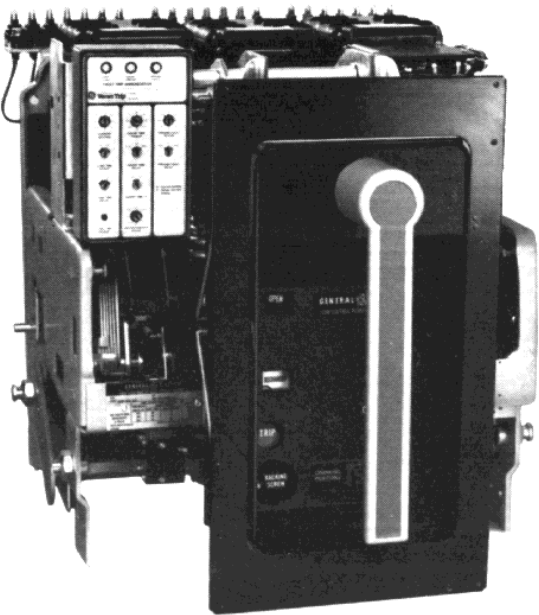
② Use GES-6030 for PS-1 units manufactured prior to May 1973

Type AKR
Breakers

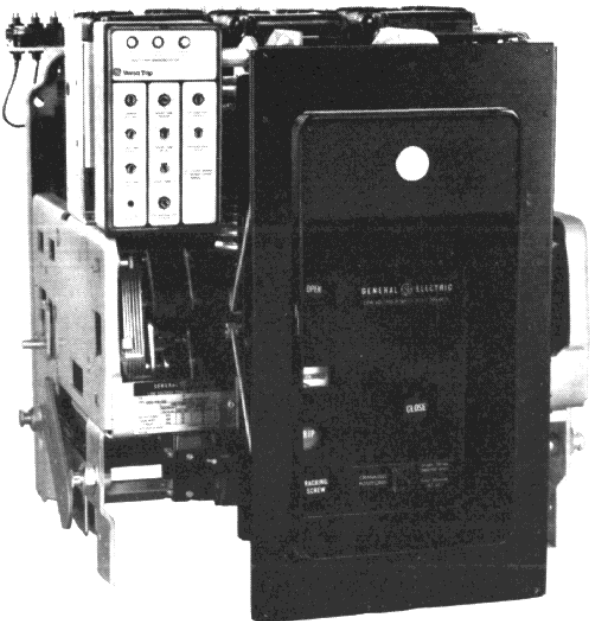
Quick Selector
Breaker/Trip
Device Combinations

AMPERE RATINGS AND OVERCURRENT TRIP DEVICES

Breaker Type	600V. ac 50/60 Hz.		250V. dc	
	Frame Size (Amps)	Solid State Trip Device	Frame Size (Amps)	Electromechanical Trip Device
AKR-30	800		800	
AKR-50	1600		2000	
AKRT-50	2000		—	
AKR-75	3200		4000	
AKR-100	4000		6000	



AKR-6D-30
Manually Operated

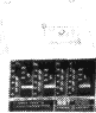
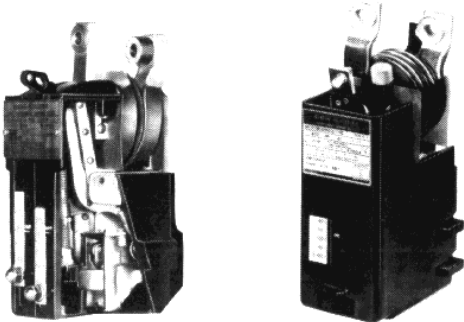
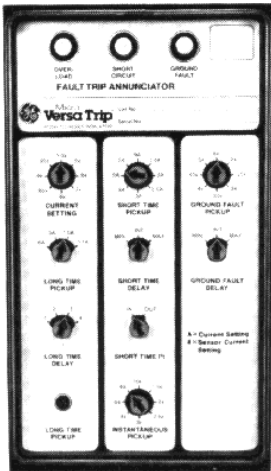
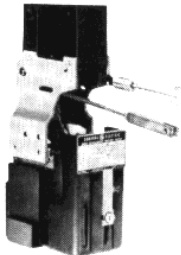


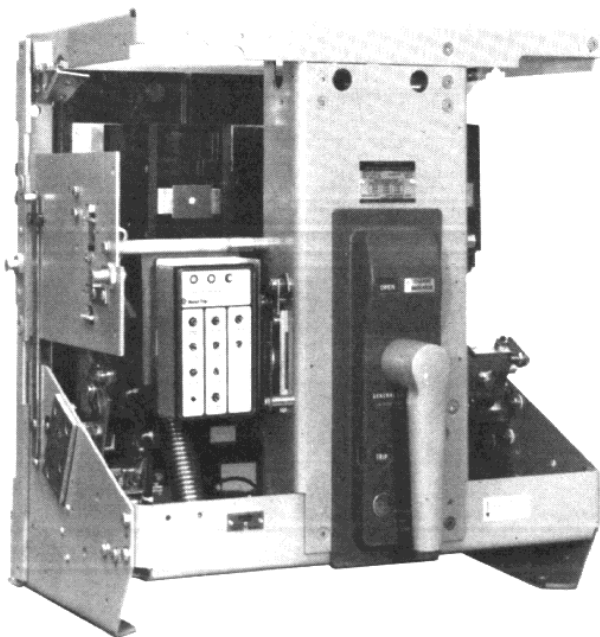
AKR-6D-50
Electrically Operated

Replacement
Breakers

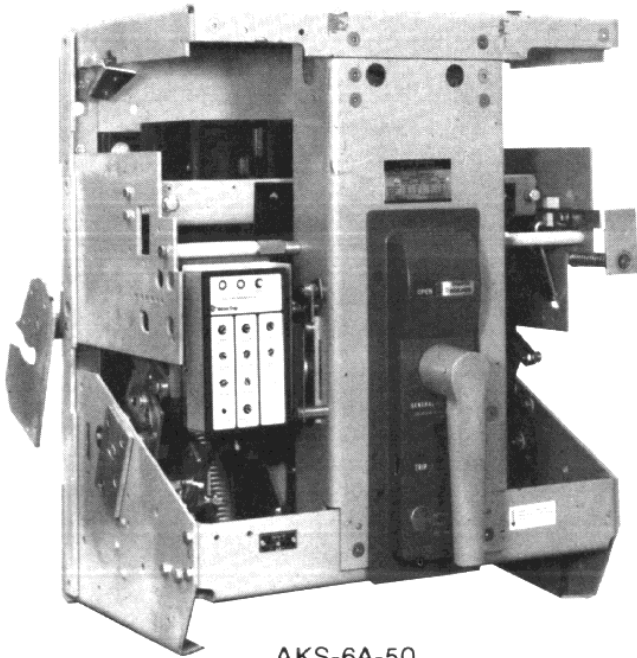
Quick Selector
Breaker/Trip
Device Combinations

AMPERE RATINGS AND OVERCURRENT TRIP DEVICES

Breaker Type	600V. ac 50/60 Hz.		250V. dc	
	Frame Size (Amps)	Solid State Trip Device	Frame Size (Amps)	Electromechanical Trip Device
AK-25	600		600	
AKST-50	1600		2000	
AKST-50	2000		—	
AKR-75	3000		4000	
AKR-100	4000		6000	



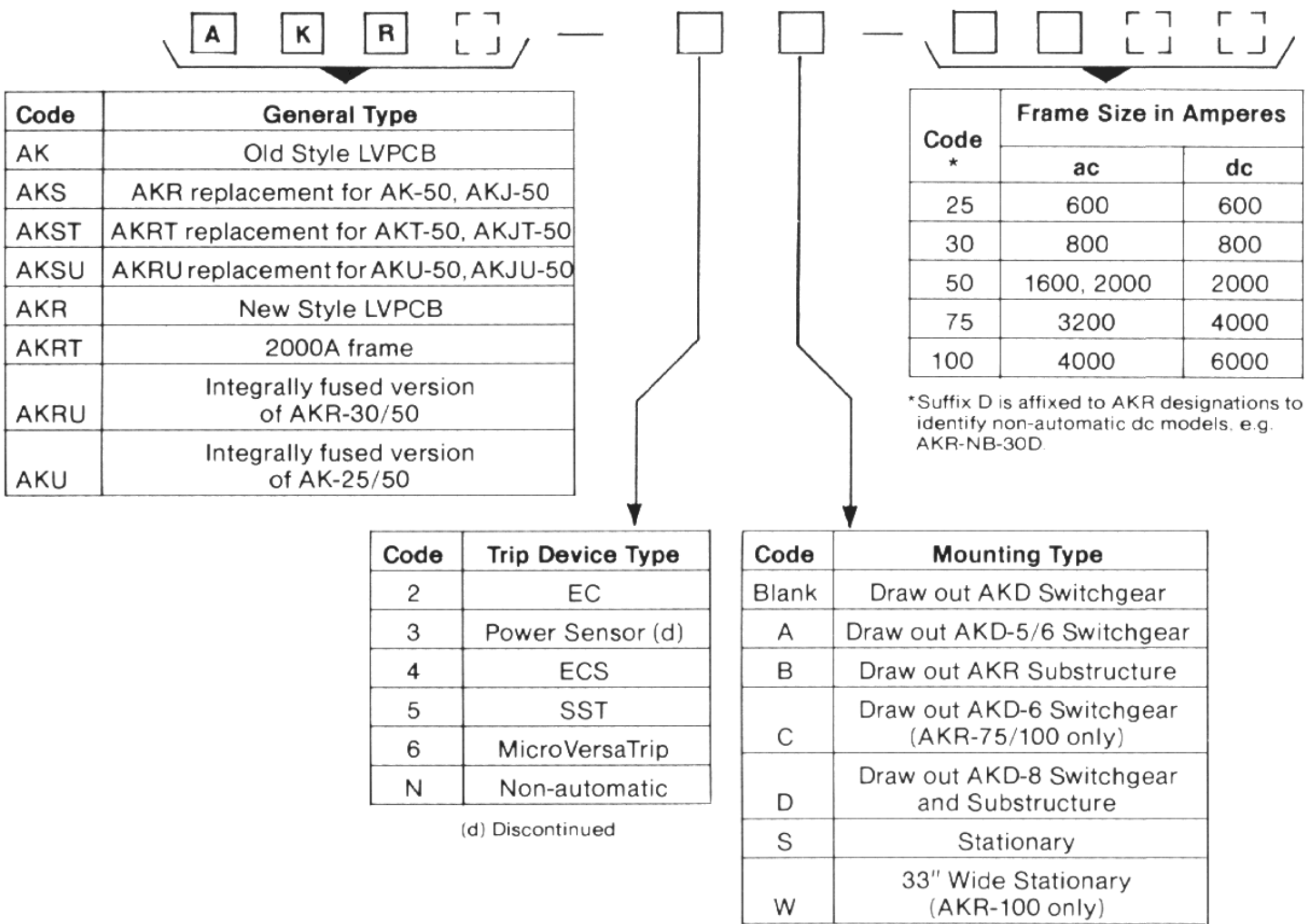
AKR-6A-75
Manually Operated



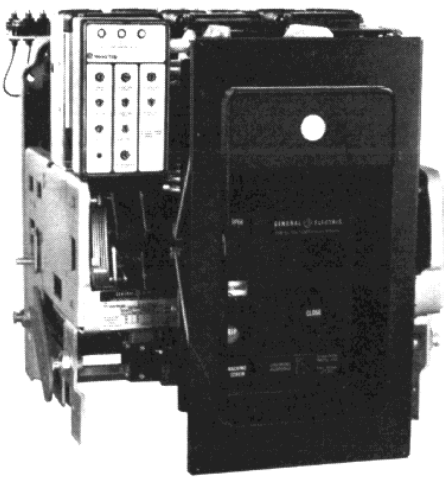
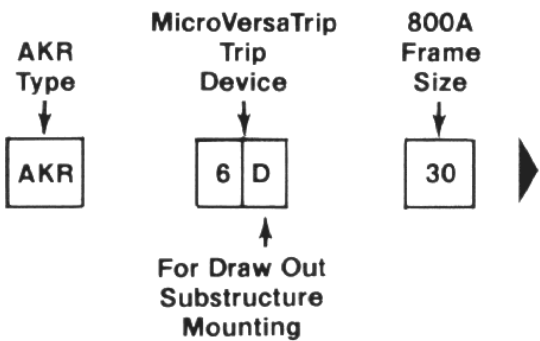
AKS-6A-50
Manually Operated

Type AKR Breakers

LEGEND-BREAKER DESIGNATIONS



Example of Nameplate Designation



AKR-6D-50
Electrically Operated

The closing mechanisms of low voltage power circuit breakers may be either the manually or electrically operated type. Manual is for local control, electrical for remote operation.

Both mechanisms employ the stored energy principle by interposing an energy storage spring between the operator and the breaker contacts. This provides a constant closing speed not influenced by the operator or control power voltage level, promoting reduced maintenance and increased contact and breaker life.

Manual Closing

The manually operated AKR-30, 50 and AKRT-50 frame models have front-mounted handles. The closing springs are charged by any number of handle strokes from one to four, depending on the angle through which the handle is rotated. Upon completion of the charging

action, the springs are held "propped" in the fully charged position and discharge only upon receipt of a closing signal. Normal closing is initiated by depressing a mechanical CLOSE button on the escutcheon. A maintenance handle is provided for the slow-closing motion required during contact adjustment procedures. A control solenoid for remote closing is optionally available.

AKR-75 and -100 manual breakers require four handle strokes to charge the springs; unlike the smaller AKR frame sizes above, the breaker's contacts close during the fourth handle stroke — initiation of closing by separate CLOSE button does not apply.

Manually operated AK-25 models are closed by first rotating the handle counter-clockwise approximately 100 degrees; this resets the mechanism and partially charges the closing spring. Returning

the handle clockwise to the normal position completes the spring charging and drives the toggle mechanism over center, closing the contacts.

Electrical Closing

All electrically operated AKR breaker types utilize a motor to automatically keep the closing springs in a charged state; upon receipt of a closing signal, a control solenoid releases the springs, closing the breaker's contacts. An electrical CLOSE pushbutton is mounted on the breaker escutcheon when specified. A manual closing handle is provided for maintenance purposes.

All electrically operated breakers close in 5 cycles. Spring charging requires approximately 3 seconds.

Electrically operated AK-25 breakers employ a solenoid to actuate the toggle mechanism.

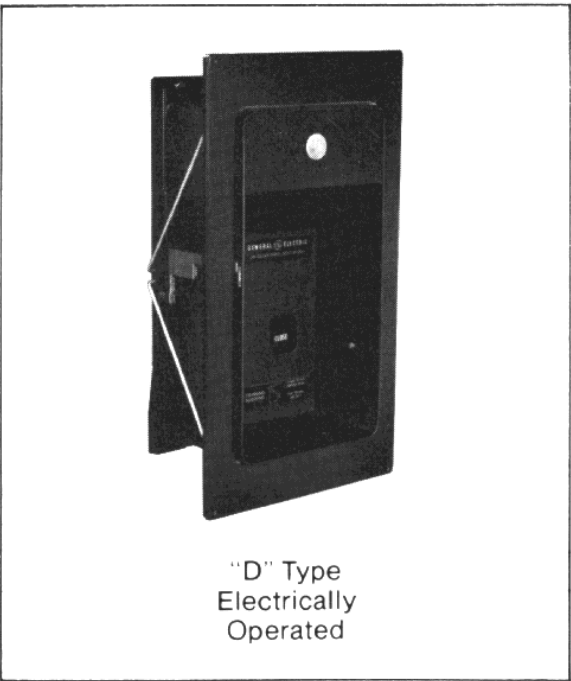
Type AKR Breakers

Description

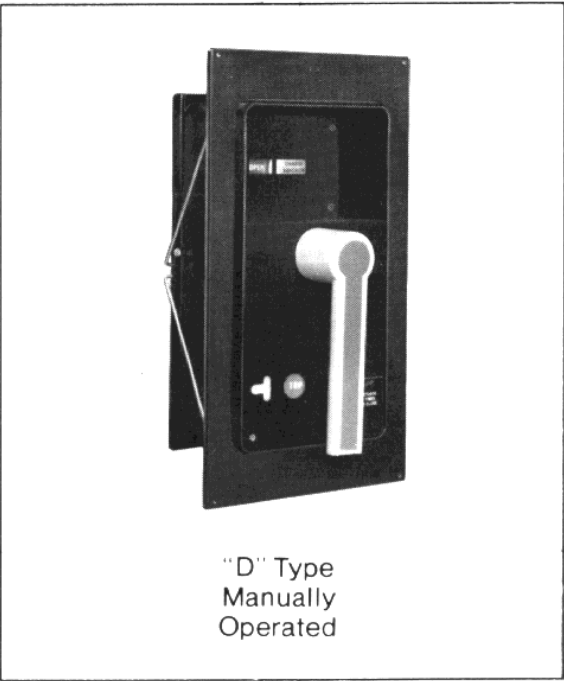
Opening

All breakers, manual and electrical, are equipped with a mechanical TRIP button located on the breaker escutcheon. When specified, electrical breakers include a shunt trip device for remote opening.

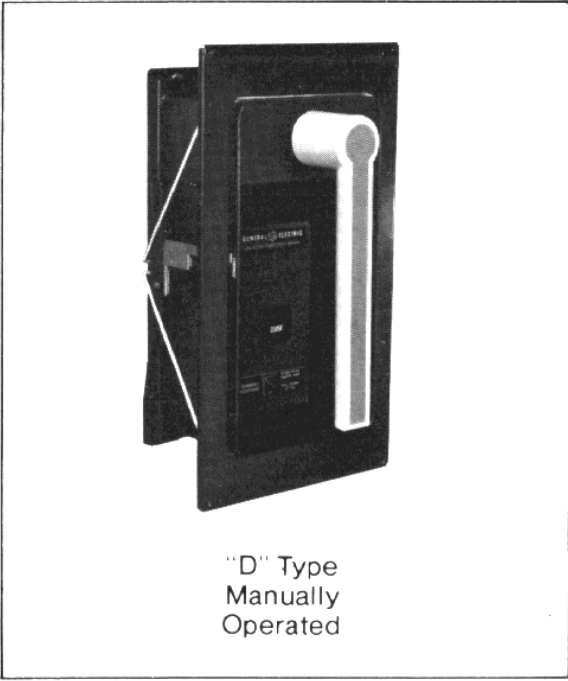
OPERATING MECHANISMS



"D" Type
Electrically
Operated



"D" Type
Manually
Operated



"D" Type
Manually
Operated

AKR-30, 50 & AKRT-50 Escutcheons

AKR-75 & 100 Escutcheons

Overcurrent Trip Devices

Overcurrent trip devices are the solid-state MicroVersaTrip for ac applications, and the electromechanical EC type for dc systems. Each may be ordered with various combinations of long-time, short-time, and instantaneous tripping elements. In addition, MicroVersaTrip offers optional integral ground fault protection.

All trip devices sense current in each pole of the breaker. EC trip elements are adjustable on a per-pole basis. The solid-state devices employ a protection programmer unit which sets the current detection level of all poles with a single knob adjustment. Tapped current sensors are available with MicroVersaTrip and provide additional flexibility by extending this adjustment range.

Target Indicators

Target indicators are available on MicroVersaTrip equipped devices. An overload, short circuit, and ground fault set of indicators is furnished as standard whenever ground fault protection is furnished. Each target is an electrically operated plunger which pops out when the breaker trips on overload, short circuit, or ground fault. These fault indicators require no external power to operate and remain in the indicated position after the breaker has cleared the fault. They are located across the top of the programmer and are reset manually. Optionally available are target-mounted contacts for remote electrical fault indication.

Ground Fault Protection

A ground fault is unintentional grounding of a phase

conductor. This condition may produce arcing or non-arcing current levels less than that required to activate the conventional overcurrent trip device. Two options are available to protect against this hazardous condition.

MICROVERSATRIP —

Provides ground fault protection as an integral part of the breaker. Supplied with adjustable pick up and time delay.

GROUND BREAK® — A component system for separate mounting.

Fused Breakers

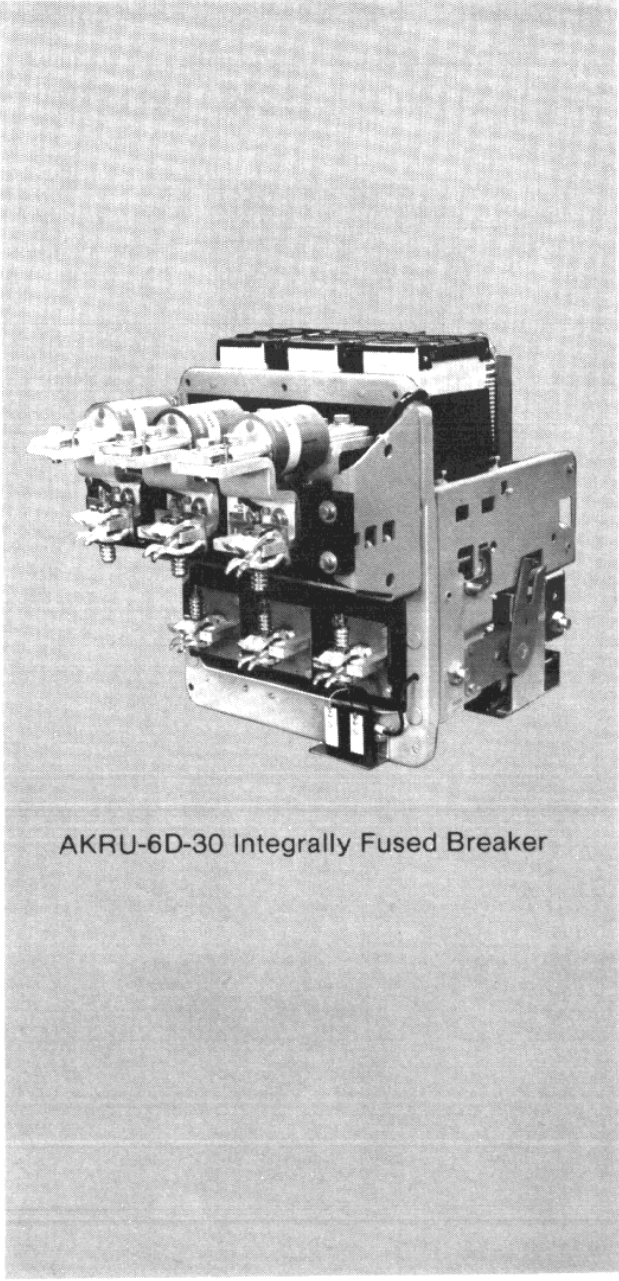
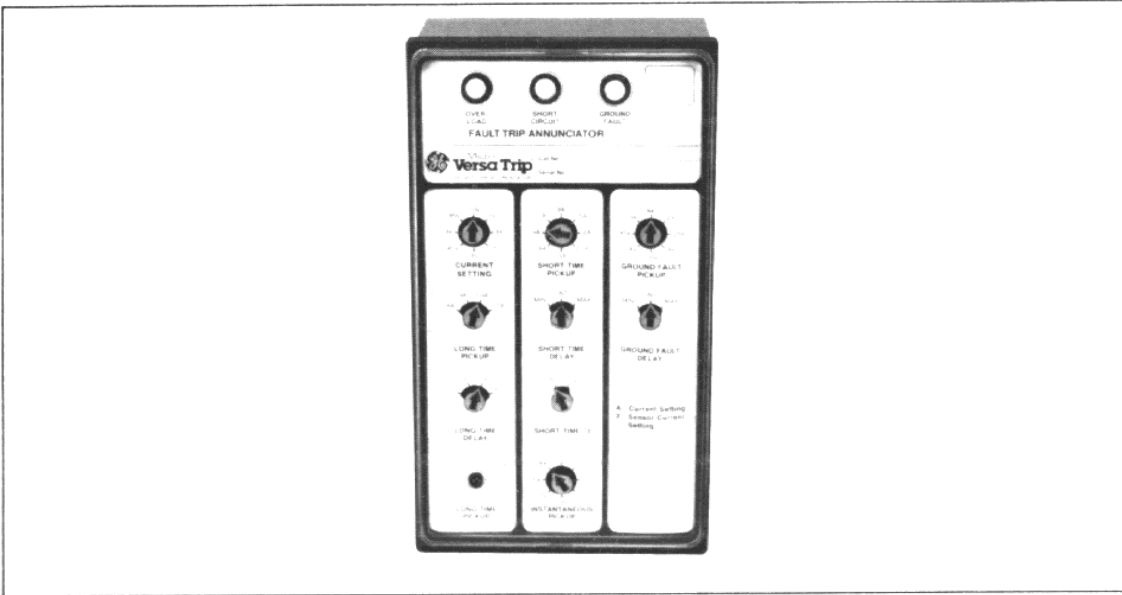
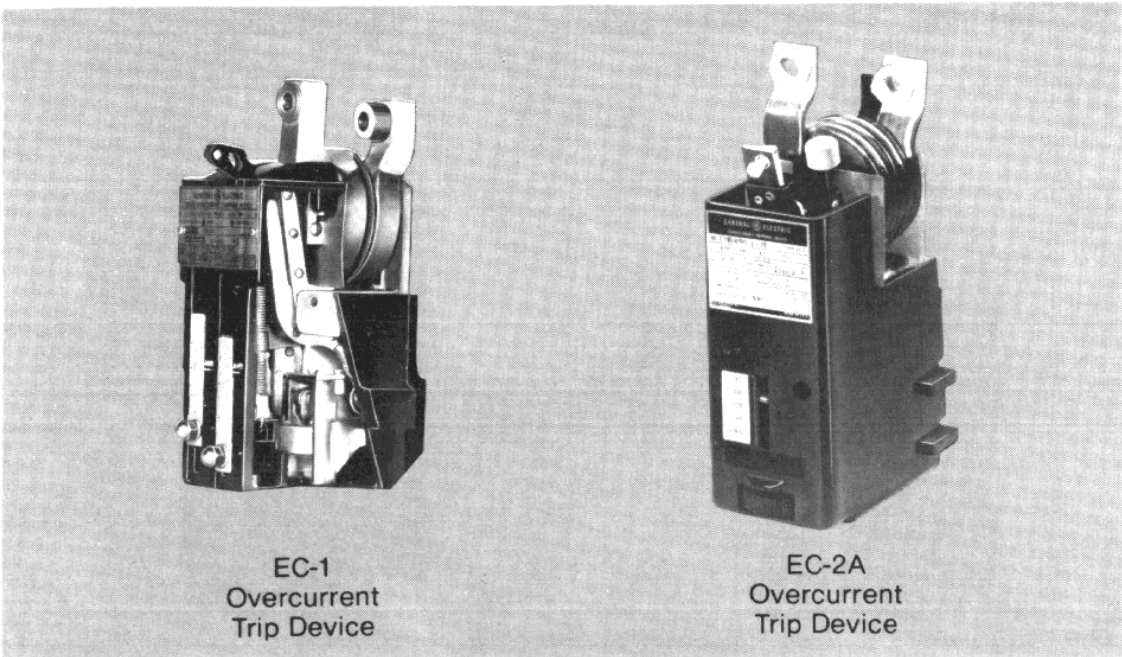
Fused Low Voltage Power Circuit Breakers provide protection for systems with available fault current to 200,000 amperes RMS symmetrical. Current limiting fuses are provided as an integral part of fused draw out breakers in the 800 and 1600 ampere frame

Type AKR Breakers

Description

sizes. The 3200 and 4000 ampere frames are available with coordinated fuses separately mounted in a draw out fuse carriage or "fuse rollout element."

An open fuse lockout device is an integral part of all fused power circuit breakers. This device prevents single phasing by monitoring the fuses. Should any fuse blow, this direct-acting device trips the breaker, opening all three poles simultaneously. Individual phase indicators pinpoint the blown fuse. The breaker remains locked out until the device is reset.



AKR breakers may be applied as individual units or grouped in load center or switchgear line-ups. Mounting types are stationary or draw out.

Stationary Mounting

Breaker only. For use in stationary switchboards and other equipments requiring stationary mounted breakers.

Draw Out General Purpose Enclosure NEMA 1

For indoor use. A complete one-high, AKD-5 type, closed-door draw out steel housing containing a draw out breaker. The unit is wall-mounted in the AKR-30 and -50 sizes, floor-mounted for the AKR-75 and -100.

The draw out operation features four positions. In the CONNECTED position the primary and secondary disconnects are fully engaged. The breaker must be tripped before it can be racked in or out of this position. When in the TEST position the primary contacts are disconnected but secondary contacts remain engaged. This allows complete breaker operation without energizing the primary circuit. In the DISCONNECTED position neither primary nor secondary contacts are made. Breakers may be racked between these three positions with the compartment door closed. Each position is clearly identified by a rotary indicator visible through an opening in the door.

With the door open, the breaker can be pulled manually out from the DISCONNECTED to the WITHDRAWN position; here the breaker is completely out of its compartment, ready for removal.

The draw out mechanism is externally operated by a removable racking handle. Two

mechanism types are employed. A breaker-mounted, screw/traveling nut type serves the AKR-30 and -50 frames; for these the racking handle is inserted through an opening in the breaker escutcheon. The equipment-mounted AKD-5 type mechanism is employed on the AKR-75 and -100 models; here the racking handle is inserted through an opening in the left side of the door. In both types the breaker is supported by two pins protruding from each side of its frame, these engaging slots in the telescoping rails fastened to the enclosure walls.

Draw Out AKR Substructures

By definition, an AKR substructure is the equipment-mounted component of a closed-door draw out breaker unit. Serving as the stationary receptacle, it provides means for mounting and connecting (both primary and secondary) the draw out breaker (removable element). The basic substructure is an open type, self-contained, factory-aligned framework designed for convenient mounting in individual breaker compartments of switch-gear equipments. In conjunction with a line of accessories, it offers the equipment builder all the mechanical and electrical components necessary to outfit a compartment for closed-door draw out AKR breakers.

All AKR substructure breakers (draw out mounting letter "B") are equipped with an extended ("deep") escutcheon compared to that of the AKD-5 ("A" type) models. This configuration allows the breaker to be racked between the CONNECTED and DISCONNECTED positions without having to open the compartment door; the latter does

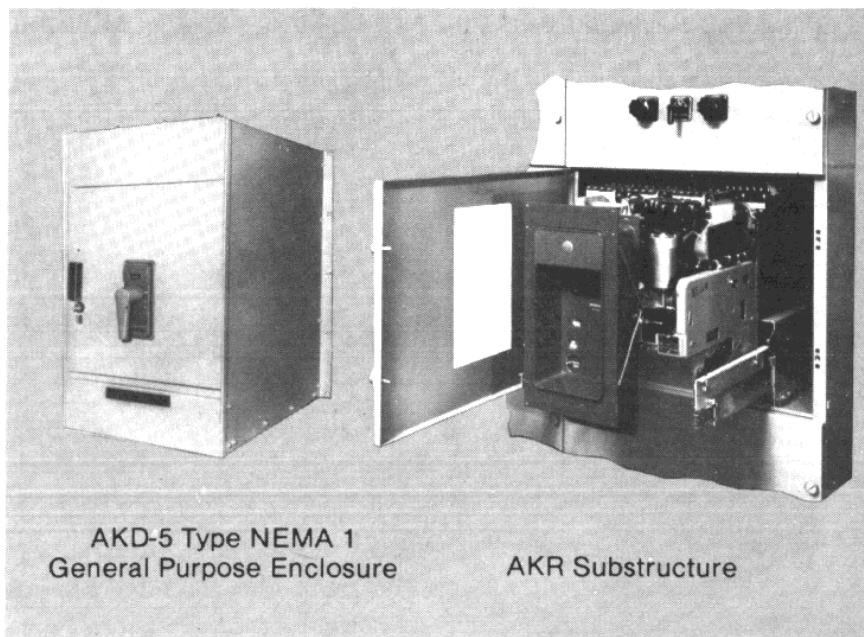
not move with the breaker as in AKD-5.

On substructures 800 and 2000A, the breaker is supported on telescoping slide rails similar to the AKD-5 draw out arrangement. On substructures for the larger AKR-75 and -100 frames, the breaker is bolted to a roller-mounted tray.

On all frame sizes the draw out mechanism is breaker-mounted. The racking handle is inserted thru the breaker escutcheon on frame sizes 800-2000A, thru the compartment door for the AKR-75 and -100. As the rackout handle is turned, it rotates slotted racking arms or cams on each side of the breaker frame. The cams engage fixed pins mounted on both side plates of the substructure, moving the breaker in and out. In operation, the substructure moves the breaker through the same four positions and functions in the same manner as described in the second and third paragraphs under Draw out General Purpose Enclosure. Breaker position is registered directly by markings which appear on the left side of the escutcheon as it emerges through the door cutout.

Type AKR Breakers

Enclosures and Mounting

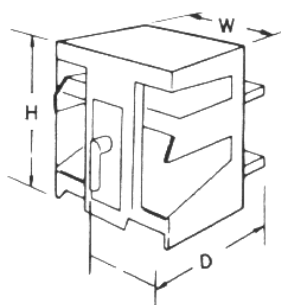


These over-all breaker dimensions are approximate and should be used for estimating purposes only. Refer to appropriate outline drawings for detailed information.

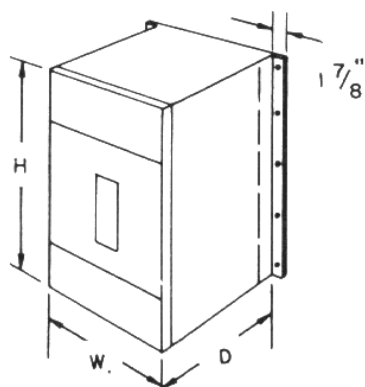
Type AKR Breakers

Dimensions

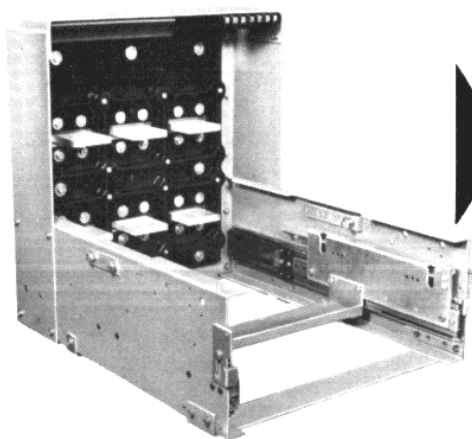
Stationary Breaker



General Purpose Enclosure AKD-5 Type



Draw Out Substructure



Breaker Type		Dimensions in Inches			Outline Drawing
		H	W	D	
AK-25	Manual	20-1/4	13	15-1/16	695C116
	Electrical			12-9/16	
AKR-30	Manual	20-1/8	17	24-3/16	139C4300
	Electrical			21-5/16	139C4301
AKJ-50, AKJT-50	Manual	24-1/2	22	22-7/16	139C4675
	Electrical			19-9/16	139C4676
AKR-50, AKRT-50	Manual	20-1/4	17	24-1/16	139C4701
	Electrical			21-5/16	139C4762
AKR-75, AKR-100	Manual	27	25	29	139C4560
	Electrical			26-1/16	139C4561
AKR-30		40-3/8	22-1/2	34	0149C6761
AKR-50				245C764	
AKR-75		64	30-1/2	48	0134C3052
AKR-100		64	38-1/2	48	

AKR-30, 50 enclosures have flanges for wall mounting.
AKR-75, 100 enclosures are floor mounted.

AKR Substructure Breakers			AKR Substructures			
Breaker Type	Outline Drawing		Outline Drawing	Com-part-ment Depth (inches)	Substructure	
	Manual Operation	Electrical Operation			H ①	W ②
AKR-30, 30H	139C4976	139C4975	139C5001 SH, 1 & 3	26	22 1/4"	21 1/4"
			139C5001 SH, 1 & 3	33		
AKR-50, 50H, AKRT-50H	139C4978	139C4977	139C5001 SH, 1 & 3	26		
				33		
AKRU-30 300-1600A Fuses	139C4980	139C4979	139C5001 SH, 2 & 3	33		
AKRU-50 800-2000A Fuses	139C4982	139C4981		33		
AKRU-50 2500A Fuses	139C4984	139C4983		33		
AKR-75	139C4572	139C4573		33	29 3/4"	29"
AKR-100	139C4574	139C4575	139C4595	33		

① H dimension includes secondary disconnect blocks (not shown).

② W dimension includes provision for key interlock.

Type AKR Breakers

Rating Data
70-4000 Amperes
600 Volts ac 50/60 Hz.
40-6000 Amperes
250 Volts dc

NOTE: For complete details on breaker application such as motor applications, fused breakers, overcurrent trip details, etc., refer to Bulletin GEA-8733, Selection and Application of Low-voltage Power Circuit Breakers.

Table 1 – 50/60 Hz. ac Current Ratings

Rated Voltage (Nominal) ac	Breaker Type	Frame Size in Amperes	Short Circuit Ratings – RMS Symmetrical KA		
			Short Time	With Instantaneous Trip	Without Instantaneous Trip
600	AK-25	600	22	22	22
	AKR-30	800	30	30	30
	AKR-30H		42	42	42
	AKS/AKJ/AKR-50	1600	42	42	42
	AKS/AKJ/AKR-50H		65	65	65
	AKST/AKJT/AKRT-50	2000	65	65	65
	AKR-75	3200	65	65	65
	AKR-100	4000	85	85	85
480	AK-25	600	22	30	22
	AKR-30	800	30	30	30
	AKR-30H		42	42	42
	AKS/AKJ/AKR-50	1600	50	50	50
	AKS/AKJ/AKR-50H		65	65	65
	AKST/AKJT/AKRT-50	2000	65	65	65
	AKR-75	3200	65	65	65
	AKR-100	4000	85	85	85
240	AK-25	600	22	42	22
	AKR-30	800	30	42	30
	AKR-30H		42	50	42
	AKS/AKJ/AKR-50	1600	50	65	50
	AKS/AKJ/AKR-50H		65	65	65
	AKST/AKJT/AKRT-50	2000	65	65	65
	AKR-75	3200	65	85	65
	AKR-100	4000	85	130	85

Table 2 – Overcurrent Trip Device Current Ratings in Amperes

Breaker Frame	50/60 Hz. ac		dc
	MicroVersaTrip		EC ④
	Fixed Sensor Rating	Tapped Sensor Range	Device Rating
AK-25	NOT AVAILABLE	(70-100-150-225) or (200-300-400-600)	40, 50, 70, 90, 100, 125, 150, 175, 200, 225, 250, 300, 350, 400, 500, 600
AKR-30	100, 150, 225, 300, 400 800 800	(100-150-225-300) or (300-400-600-800)	100, 125, 150, 175, 200, 225, 250, 300, 350, 400, 500, 600 800
AKJ/AKR-50	300, 400, 600, 800, 1200, 1600	(300-400-600-800) or (600-800-1200-1600)	200, 225, 250, 300, 350, 400, 500, 600, 800, 1000, 1200, 1600, 2000
AKJT/AKRT-50	800, 1200, 1600, 2000	(800-1200-1600-2000)	-----
AKR-75	1200, 1600, 2000, 3000, 3200	(1200-1600-2000-3200)	2000, 2500, 3000, 4000
AKR-100	1600, 2000, 3000, 4000	(1600-2000-3000-4000)	200, 2500, 3000, 4000, 5000, 6000

Table 3 – Fused Breaker Ratings –
Maximum 600v. ac 50/60 Hz.

Breaker Type	Frame Size Amperes	① CLF Fuse Rating Amperes		Inter- rupting Rating RMS Symmet- rical KA
		Min.	Max.	
AKU-25	600	300	1200	200
AKRU-30	800	300	1600	200
AKRU-50	1600	450	2500	200
AKR-75 ②	3200	2000	3000	200
AKR-100 ②	4000	2000	4000	200

Table 4 – 250v. dc Current Ratings –
with EC Trip Device Only

Breaker Type	Frame Size Amperes	Short Circuit KA
AK-25	600	25
AKR-30	800	25
AKR-50	2000	50
AKR-75	4000	75
AKR-100	6000	100

Table 5 – Minimum EC Trip Ratings
– Amperes at 250v. dc.

Breaker Type	With Instantaneous Trip	With Short Time Trip Characteristic ③		
		2C	2B	2A
AK-25	40	175	200	250
AKR-30	100	175	200	250
AKR-50	200	350	400	500
		2CC	2BB	2AA
AKR-75				
AKR-100	2000	2000	2000	2000

- ① The maximum fuse rating is the largest fuse which tests show will result in proper performance of the breaker and fuse in combination under short circuit conditions. Only GE type CLF fuses should be used for proper coordination.
- ② Fuses are mounted on separate fuse roll-out element.
- ③ Refer to time-current curves GES-6000 (for EC-1) and GES-6005 (for EC-1B).
- ④ Observe Table 5 minimum overcurrent trip ratings.

MicroVersaTrip is a trip device developed for AKR low-voltage power circuit breakers. It incorporates the newest technological advancements in overcurrent protection for the ultimate in reliability, long life, and flexibility.

Operation is fully automatic and normally no external logic or control power inputs are required.

The MicroVersaTrip system for low voltage power circuit breakers consists of five parts, a plug-in protection programmer, a flux shift trip device, and three current sensors.

Protection Programmer

Self-powered solid-state logic unit. Incorporates rotary adjustment knobs for up to nine functions as well

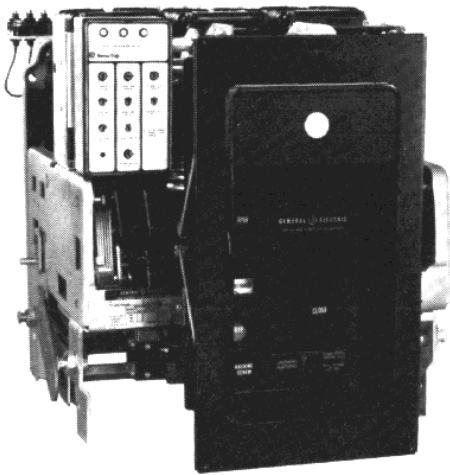
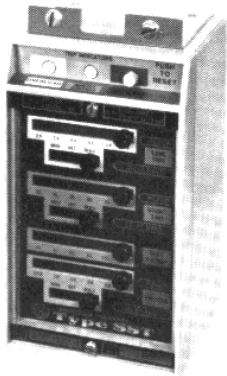
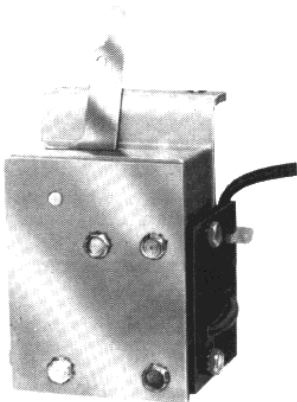
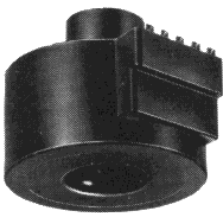
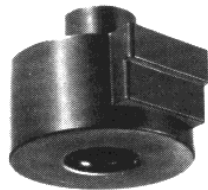
as targets for mechanical fault trip indication. A portable test set with 110 volt ac input is available for field testing.

Flux-shift Trip Device

Low energy positive action tripping device. Automatically powered and controlled by the protection programmer.

Type AKR Breakers with MicroVersaTrip Trip Device

100-4000 Amperes
600V. ac 50/60 Hz.



MICROVERSATRIP TRIP CHARACTERISTICS

Frame Size	Maximum Rating (Amps)	(X) Fixed Sensors	(X) Tapped Sensors	Current Setting (Multiple of Sensor Current Rating) (X)	Long-time		Short-time		Adjustable Instantaneous Pickup (Multiple of Sensor Current Rating) (X)	Short-time I ² t ① (Seconds)	Ground Fault	
					Pickup (Multiple of Current Rating) (A)	Delay ① (Seconds)	Pickup (Multiple of Current Rating) (C)	Delay ② Seconds			Pickup (Multiple of Sensor Current Rating) (X)	Delay ② (Seconds)
		Sensor Current Rating (Amps)										
AKR-30	800	100, 150, 225, 300, 400, 600, 800	100, 150, 225, 300 or 300, 400, 600, 800	.5, .6, .7, .8, .85, .9, .95, 1.0 (X)	.8, .9, 1.0, 1.1 (A)	2.5, 5, 10, 21	1.5, 2, 2.5, 3, 4, 5, 7, 9 (C)	0.10, 0.22, 0.36	1.5, 2, 2.5, 3, 4, 6, 8, 10 (X)	0.4	.2, .25, .3, .35, .4, .45, .5, 6 (X)	0.10, 0.22, 0.36
AKR-50	1600	300, 400, 600, 800, 1200, 1600	300, 400, 600, 800 or 600, 800, 1200, 1600	..	..	..	..	..	..	..	..	..
AKRT-50	2000	800, 1200, 1600, 2000	800, 1200, 1600, 2000	..	..	..	..	..	..	..	..	..
AKR-75	3200	1200, 1600, 2000, 3200	1200, 1600, 2000, 3200	..	..	..	..	..	1.5, 2, 2.5, 3, 4, 5, 7, 9	..	.2, .22, .24, .26, .28, .30, .34, .37	..
AKR-100	4000	1600, 2000, 3000, 4000	1600, 2000, 3000, 4000	..	..	..	..	..	..	..	.2, .22, .24, .26, .28, .3	..

① Time delay shown at 600% of ampere setting at lower limit of each band.

② Time delay shown at lower limit of each band.
All pickup tolerances are ± 10%.
Ground Fault pickup not to exceed 1200 amperes.

Programmable Micro-Electronic Processor

Forms the basis of the MicroVersaTrip protection programmer. This miniaturization of circuitry provides the increased flexibility required to incorporate nine adjustable time-current functions, three mechanical fault indicators (local and remote), a long-time pickup LED indicator (local and remote) and zone selective interlocking. All adjustable programmer functions are automatic and self-contained requiring no external relaying, power supply

or accessories. This compilation of functions provides the basis for the most flexible and useful breaker design presently available anywhere.

Specially Treated P.C. Cards

Each printed circuit card is given a protective conformal epoxy coating to prevent moisture absorption, fungus growth and signal leakage. All electronics are housed within a metallic enclosure designed to protect against hi-fault interruption arcs, magnetic interference, dust and other contaminants.

Gold-Plated Rotary Switch Adjustments

Provide highly reliable fixed point field programmable controls for greater repetitive accuracy and more precise MicroVersaTrip trip unit settings. Gold-plated surfaces on all electrical connectors and adjustments assure long-lasting and positive electrical contact.

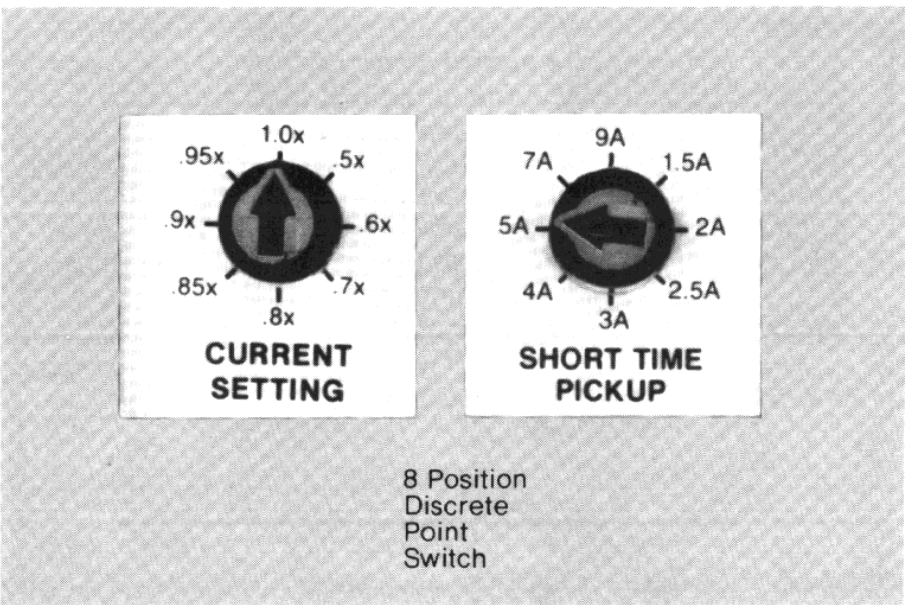
Integral Circuitry

is designed to reduce system down time by analyzing any overcurrent fault and visually identifying its cause as an

MicroVersaTrip

Programmer Characteristics

overload, short circuit or ground fault. Both local and remote indication is available. A long-time pickup timing indicator is also provided as an aid in testing and identifying an overcurrent condition in process.



Wide Range of Ampere Adjustment

is provided in four levels:

- 1. The programmer current setting is supplied with a 50-100 percent adjustment range — standard
- 2. The programmer long-time pickup setting provides an 80-110 percent pickup adjustment range — standard
- 3. Fixed current sensors, offering set current ratings, are available up to the maximum frame size of the breaker — standard
- 4. Tapped current sensors offer the ability of varying the ampere rating as much as 3:1 — optional

For example, an AKR breaker rated 800 amperes can be tapped down to 300 amperes. It can then be adjusted to 50 percent of 300 amperes, or 150 amperes, by the ampere setting. This point could now be set down to a pickup level of 120 amperes with the long-time pickup adjustment.

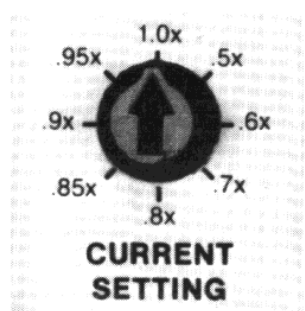
TRIP FUNCTION CHARACTERISTICS AKR WITH MICROVERSATRIP

		Optional Features												
		BASIC FUNCTIONS				ADD TO BASIC FUNCTIONS								
		STD.-or-S-or-H-or-M	L	T	G-or-GR	A1-or-A2-or-A3-or-A	Z1-or-Z2-or-Z							
LONG TIME	• Adjustable Current Setting	X	X	X	X									
	• Adj Long-Time Pickup	X	X	X	X									
	• Adj Long-Time Delay	X	X	X	X									
	• Long-Time Timing Light	X	X	X	X									
	• Remote Long-Time Timing Light													
SHORT TIME	• Adj Short-Time Pickup		X	X	X									
	• Adj Short-Time Delay		X	X	X									
	• Short-Time I ² t Switch ①					X								
INSTANTANEOUS	• Adj Instantaneous Pickup	X	X											
	• Adj High Range Instantaneous				X									
GROUND FAULT	• Adj Ground Fault Pickup — 1 PH, 2-W—3 PH, 3-W — Ground Return							X	X					
	• Adj Ground Fault Delay							X	X					
OTHER FUNCTIONS	• Trip Indication Targets — Overload & Short Circuit — local only — local and remote — O/L, S/C and Ground Fault — local only — local and remote								X	X	X	X		
	• Zone Selective Interlock — Ground Fault — Short Time												X	X
													X	X

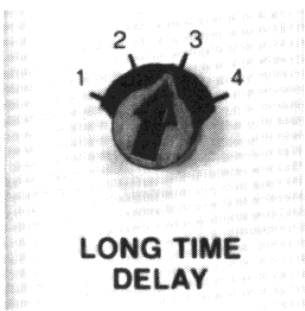
① Short-Time Delay is required

MicroVersaTrip

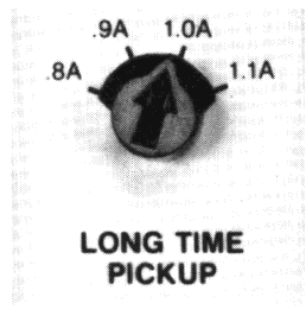
The Long-Time Functions



Current Setting
The adjustable current setting varies the level of current the breaker will carry indefinitely without tripping (when long time pickup is set at 1.1C). Adjustable in 8 steps from 50-100% of sensor current rating, changing this setting has the same effect as changing the trip unit in an interchangeable trip circuit breaker. Standard with MicroVersaTrip.



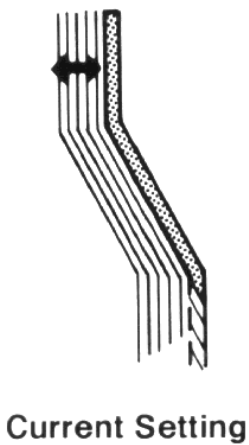
Long-Time Delay
The long-time delay adjustment varies the time it will take the breaker to trip under sustained overload conditions. It provides the function of withstanding momentary overloads such as motor starting, welding, or other overcurrent conditions without interrupting the service. Standard with MicroVersa-Trip.



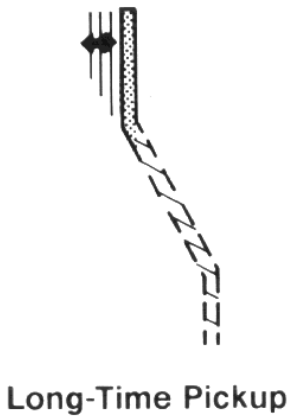
Long-Time Pickup
The long-time pickup adjustment provides fine tuning capability of the breaker current setting. This pickup level is adjustable in four steps from 80-110% of the current setting. Changing this setting does not affect any other portion of the time-current curve. Standard with MicroVersaTrip.



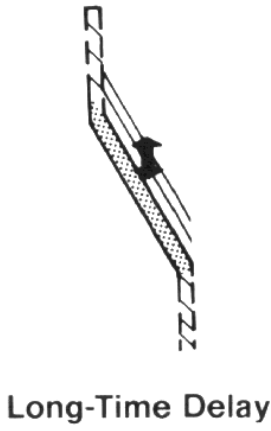
Long-Time Pickup Light
The long-time pickup light provides visual indication that the breaker is experiencing an overload condition. Indication is provided by a light-emitting diode (LED) which is only activated prior to trip-out and during long-time time-out. Saves test and system start up time. Available in local only or local and remote modes. Standard with MicroVersa-Trip.



Current Setting



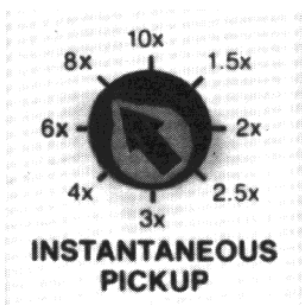
Long-Time Pickup



Long-Time Delay

MicroVersaTrip

The Instantaneous Functions



Instantaneous Pickup

The instantaneous trip point determines the level at which the breaker will trip without intentional time delay (0.025 seconds or less). This immediate interruption occurs only as a result of a severe overcurrent condition, thereby minimizing damage to the electrical system and equipment. Four types of instantaneous trip functions are available:

Standard

The base breaker is provided with an instantaneous pickup setting adjustable in 8 steps from 1.5X to 10X (through 2000A) or 9X (3200-4000A). Each setting is a multiple of sensor rating or tap setting.

“S” Suffix

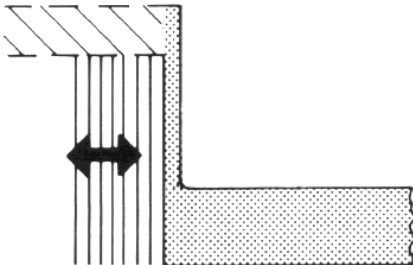
The “S” suffix short-time function is provided with adjustable short-time pickup, adjustable short-time delay and an instantaneous pickup adjustment comparable to the one described above with the standard breaker.

“H” Suffix

The “H” suffix short-time function is provided with adjustable short-time pickup, adjustable short-time delay and a hi-level instantaneous. The hi-level instantaneous setting is adjustable in four steps from 40 to 100 percent of the circuit breaker frame short-time rating permitting maximum use of the breakers' short-time capability. This high level instantaneous function increases system protection without losing selectivity.

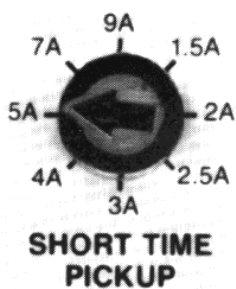
“M” Suffix

Instantaneous unit is not supplied — available only when short-time unit is supplied.



MicroVersaTrip

The Short-Time Functions



Short-Time Pickup

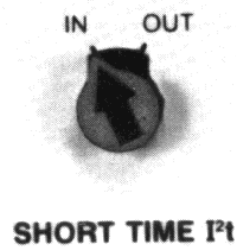
The short-time pickup adjustment controls the level of high current the breaker can carry for short periods of time without tripping. Permits downstream breakers to clear short-circuit faults without tripping out the up-stream protective device.

Available as an option with the "S" (adjustable short-time plus adjustable instantaneous) or "H" (adjustable short-time plus adjustable high level instantaneous) suffix letters.



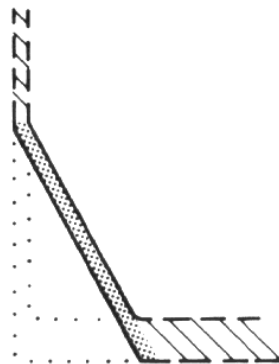
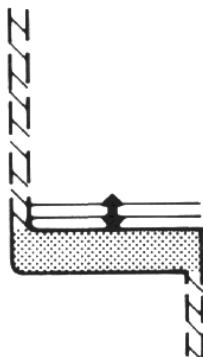
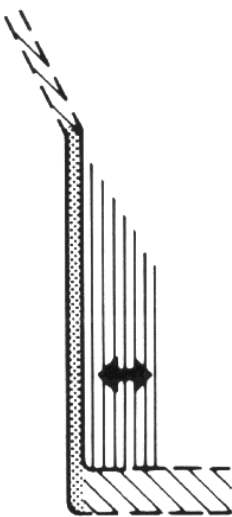
Short-Time Delay

The short-time delay adjustment is used in conjunction with the short-time pickup setting to provide a further refinement of coordination between circuit breakers. It establishes the time interval the breaker will wait before responding to the short-circuit current level selected on the short-time trip point adjustment. Optional with the "S" or "H" suffix letters.



Short-Time I²t Switch

The short-time I²t switch provides the ability of introducing an I²t ramp function in the short-time characteristic. This provides maximum coordination with downstream devices such as thermal-magnetic breakers and fuses whose time-current curves do not easily relate to the square shape sensing characteristics common to solid state trip devices. The I²t curve is designed to withstand a 12X current level for 0.1 second, the magnetizing current level for transformers and motors. Provided with the "L" suffix when ordered with the "S" or "H" suffix letters.



Because of the highly intermittent and erratic nature of arcing ground faults, a memory circuit has been incorporated in all MicroVersa-Trip ground fault sensing circuits as standard. The memory circuit integrates arcing fault current with time, essentially summing the intermittent ground current spikes.

In the diagrams to the right, it can be seen how the memory function works. Diagram A

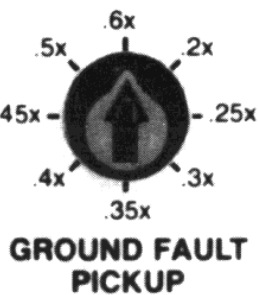
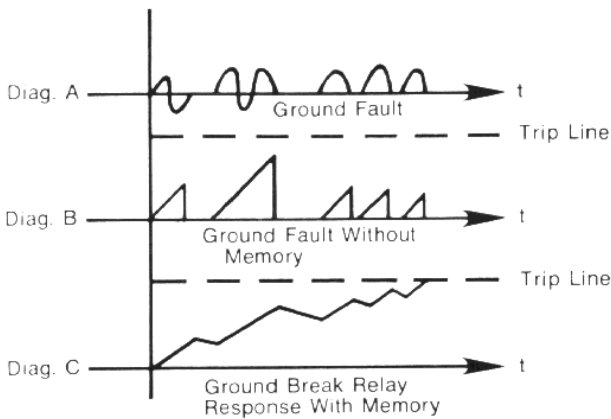
shows a typical ground fault with half-cycles, whole cycles and multiple cycles missing, as normally occurs. Diagram B shows trip response of a typical ground fault function which does not include memory. The breaker never trips because the time delay circuits are reset with every missing cycle. Diagram C shows response of MicroVersaTrip ground fault circuits to the same ground fault; the circuit's memory carries through

the missing cycles and generates a trip signal after the preset time delay.

Two types of integral ground fault protection are available: "G" for single phase-two wire, or three phase-three wire systems; a separate neutral CT is required for single phase-three wire, or three phase-four wire systems; or type "GR" for applications where ground return sensing is permissible.

MicroVersaTrip

The Ground Fault Functions



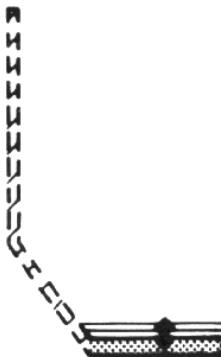
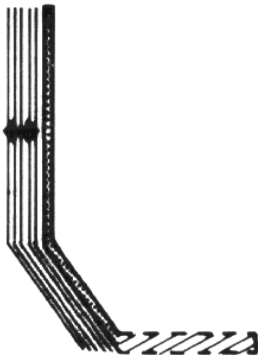
Ground Fault Pickup

The ground fault pickup adjustment controls the level of ground fault current at which circuit interruption will occur. To comply with the 1978 National Electrical Code (NEC 230-95), no trip point exceeds 1200 amperes. The common square knee of the curve has been replaced with an I^2t function to facilitate coordination with downstream devices such as thermal-magnetic breakers and fuses whose time-current curves do not easily relate to the square-shape sensing characteristics common to solid state trip devices.



Ground Fault Delay

The ground fault delay adjustment is used to add a pre-determined delay in time to the trip point once the ground fault pickup level has been reached. This provides tripping selectivity between main and feeder or other downstream breakers.



Fault Trip Indicators

Designed to reduce system downtime by analyzing any overcurrent fault and identifying its cause. Mechanical pop-out type indicators are available on the programmer as type "A" for identifying overload or short circuit overcurrent faults when breakers are ordered without integral ground fault protection. Type "A3" indicators are available to identify overload, short circuit and ground fault trips—for breakers supplied with integral ground fault protection.

Remote fault indication is available in the form of a mechanical contact which may be incorporated directly into the customer's control circuitry. One N.O. contact is supplied per indicator. Each contact is rated 0.5 amp. at 125VDC, or 1.0 amp. at 120 VAC. Both local and remote indicators are provided with suffix types "A2" (overload and short circuit) and "A" (overload, short circuit and ground fault).

Zone Selective Interlocking

The standard means of obtaining selectivity between main and feeder breakers is by incorporating programmers with time-coordinated trip characteristics. This consists of setting the furthest downstream breaker with a small time delay, and progressively increasing the time delay as you get closer to the main protective device. The disadvantage in this method is that the system must now endure the stress of the high current fault until time-out occurs.

In the Zone Selective Interlock system, the breaker which senses the fault proceeds to trip immediately. It also sends a signal to all "upstream" breakers to block them from tripping. The "upstream" breakers respond to the fault by timed tripping on their set band. Timed tripping provides backup protection for the downstream devices.

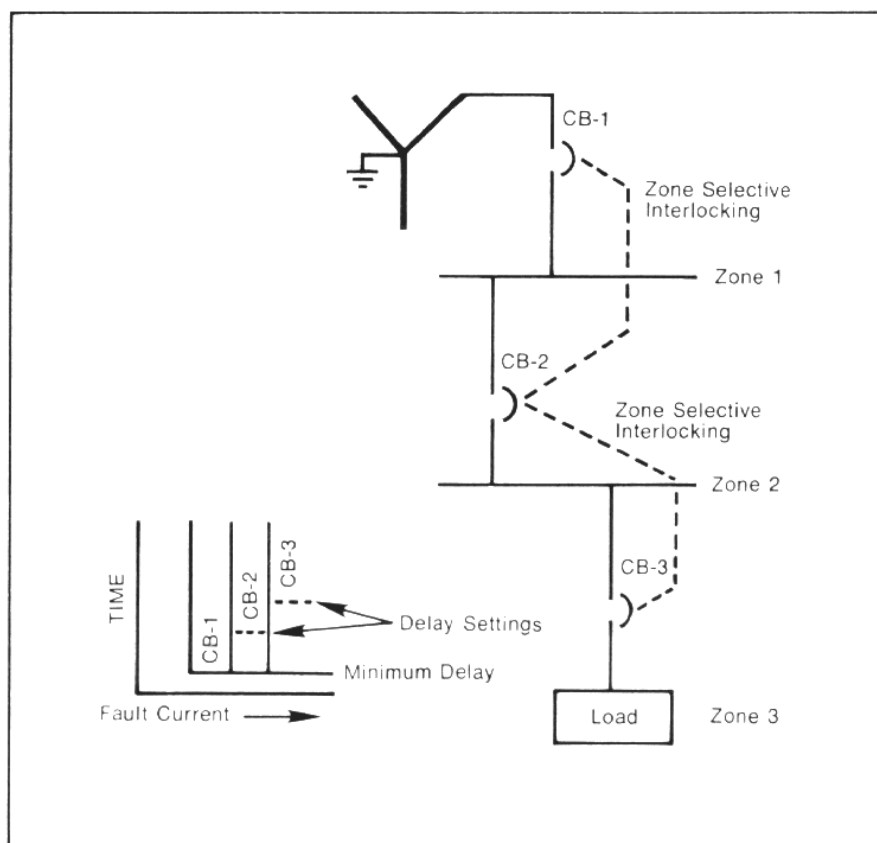
Zone Selective Interlocking is available for the short-time function (Z2), the ground fault function (Z1) or both (Z) (switch ST and GF).

Test Set

A full function test set has been developed for use with MicroVersaTrip. It can be used to check the time-current characteristics of the programmer at an infinite number of points along its curves. Checkout of the programmer diagnostic circuitry and zone selective interlocking for the ground fault and short-time functions are also possible. The test set is also suitable for testing the current sensor continuity and flux shifter. It comes equipped with elapsed time meter, digital current meter, output jacks for oscilloscope and all required controls and interfacing plugs. The test set is a rugged, lightweight, portable device designed specifically to avoid the possible hazards of in-service testing.

MicroVersaTrip

More Programmer Options



Test Set TVTS1

Type EC overcurrent trip devices are magnetically operated, using a series coil (or single conductor and an associated magnetic structure) to provide tripping force. Three basic characteristics: long time delay, short time delay and instantaneous, can be used in various combinations to suit the application.

Long Time Delay is accomplished with a positive-displacement oil piston. Sealing of the assembly eliminates variations caused by atmospheric contamination, and

silicone oil minimizes variations in time delay due to changes in ambient temperature.

Short Time Delay is accomplished with a rugged mechanical escapement.

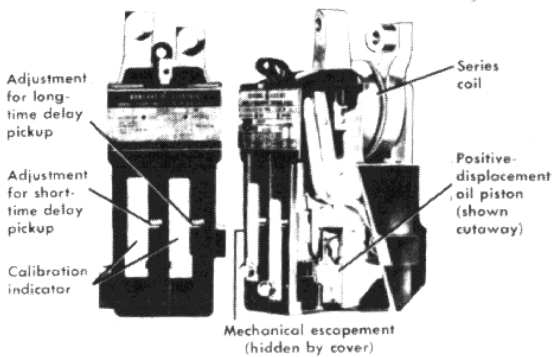
Instantaneous tripping is obtained when a tension spring yields to the force exerted on the magnetic armature at short circuit current levels, permitting the armature to move independently of the time delay piston.

AKR breakers with EC trips are for use on DC system voltages, and are available in ratings of 40-6000 amperes. One EC trip device is mounted in each breaker pole and contains functional adjustments, overcurrent detection and tripping hardware.

EC trip devices are available as type EC-2A (standard for frames through 2000A), EC-1 (optional for frames through 2000A) and EC-1B (standard for 4000 and 6000A frames). Trip characteristics are described in the table below.

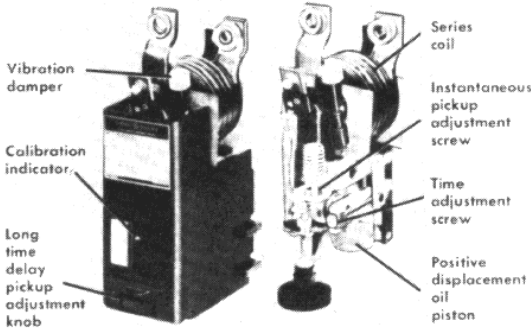
Type AKR Breakers With EC Trip Devices

40-6000A.
250V. dc



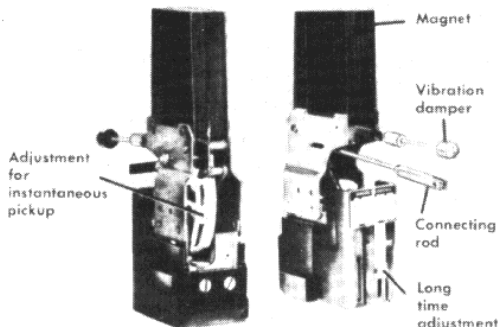
Type EC-2A

Trip Device for 600-2000 amp frame breakers. Available in combinations of long time and instantaneous elements, or instantaneous alone.



Type EC-1

Trip Device for 600-2000 amp frame breakers. Combines long time and short time elements for intentional delay up to the short time rating of the breaker. Instantaneous may be added.



Type EC-1B

Trip Device for 4000 and 6000 amp frame breakers. Combines long time and short time elements for intentional delay up to the short time rating of the breaker. Instantaneous may be added.

Adjustment Ranges for EC Trip Devices

Trip Device	Long Time		Short Time		Instantaneous Pickup
	Pickup ①	Delay ②	Pickup	Delay ③	
EC-2A	80-160% X (± 10%)	(1A) MAX. — adj. 15-38 sec. or (1B) INTER — adj. 7.5-18 sec. or (1C) MIN. — adj. 3.3-8.2 sec.	---	-----	4-9X, 6-12X, 9-15X or 80-250% X ④
EC-1	80-160% X (± 10%)	(1A) MAX. — 30 sec. or (1B) INTER. — 15 sec. or (1C) MIN — 5 sec.	2-5X, 3-7X or 4-10X	(2A) MAX. — 23 sec. or (2B) INTER. — 15 sec. or (2C) MIN — 07 sec.	High Set up to 15X, Non-Adjustable
EC-1B	80-160% X (± 15%)	(1BB) Max. — 4.5 sec. or (1CC) MIN — 2 sec.	2-5X, 3-7X or 4-10X	(2AA) MAX — 20 sec. or (2BB) INTER — 13 sec. or (2CC) MIN — 07 sec.	4-9X, 6-12X, 9-15X or 80-250% X ④

- ① X = Trip device ampere rating. If trip devices are set above 100% for coordination purposes, such settings do not increase the breaker's continuous current rating.
- ② At lower limit of band at 6 times pickup setting.
- ③ At lower limit of band at 2½ times pickup setting.
- ④ Low-set instantaneous. Not available in combination with long time delay.

Shunt Trip

Offers remote electrical tripping of breaker. Usually controlled by a switch or pushbutton, it may also be used in conjunction with protective relays for automatic tripping.

The shunt trip coil is rated for intermittent duty. When factory installed it is supplied with a cutoff switch which automatically removes control power following a breaker trip.

Selective Trip (Type EC-1)

Applied to circuit breakers in series so that only the breaker nearest the over-current fault opens. Allows for added system coordination.

Undervoltage Trip (UV)

Protects against harmful drops in line voltage by automatically tripping the breaker. This device is set to pickup at approximately 85% of bus voltage and drop out between 30% and 60%.

The UV device is also available with an optional static time-delay unit. This offers a field adjustable 2 to 6 second delay between under-voltage fault and breaker trip to prevent potential nuisance tripping due to momentary loss of voltage.

The time-delay unit is mounted external to the breaker. It is rated 125 or 250 V. DC or 208/240 VAC, 50 or 60 Hz. For any other AC source voltage, a control

power transformer with a 240 volt secondary rated at least 100 VA is required.

Key Interlock Provision

Prevents operation of a remote function unless the breaker has been tripped. Provision is made to accept a lock assembly furnished by purchaser (GEE or Kirk).

Auxiliary Switch

Used for remote indication of breaker main contact position. Available in groupings of four contacts (two stages) or ten contacts (five stages). Each stage is composed of one "a" Type (N.O.) contact and one "b" Type (N.C.) contact. All contacts feature rugged double break construction.

Type AKR Breakers

Accessories

Reverse Current Device

Used with D-c breakers. Designed to trip the breaker if current reverses direction.

Neutral Connector

For use in general-purpose enclosures, provides termination for system neutral.

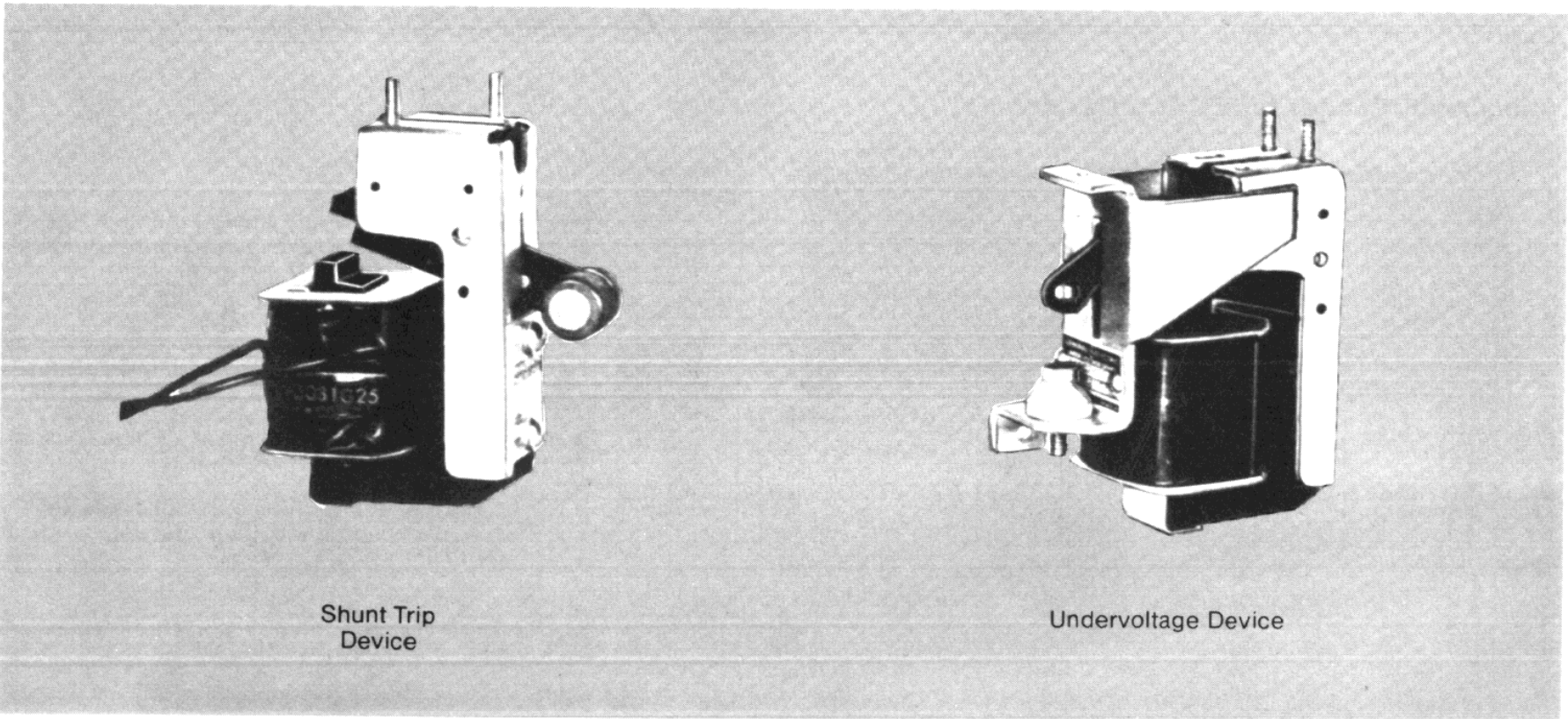
CONTROL VOLTAGE			Shunt Trip Amperes	
Nominal		Operating Range	Inrush	Sustained
Dc	48	28-56	4.5	4.5
	125	70-140	1.9	1.9
	250	140-280	1.0	1.0
60 Hz. Ac	120	104-127	12.3	10.8
	208	175-225	3.2	2.6
	240	208-254	3.9	3.4
	480	416-508	3.4	3.1
	575	475-625	2.8	2.5

Control Voltage		UV Coil Amperes	
		Inrush	Sustained
Dc	48	0.20	0.20
	125	0.07	0.07
	250	0.04	0.04
60 Hz. Ac	120	0.66	0.24
	208	0.51	0.17
	240	0.37	0.12
	480	0.23	0.08
50 Hz. Ac	120	0.75	0.25
	208	0.30	0.10
	240	0.34	0.11
	480	0.20	0.07

CB Main Contacts	Auxiliary Switch Position	
	"a" Contact	"b" Contact
	Open or Tripped	Closed
Open or Tripped	Open	Closed
Closed	Closed	Open

Control Voltage		Auxiliary Switch Interrupting Ratings (Amperes)			
		Non-Inductive		Inductive	
Dc	125	11	①	6.3	①
	250	2		1.8	
Ac	115	75	①	50	①
	240	50	①	25	①
	480	25	①	12	①

① Limited to 20A continuous rating of switch on all breakers and to 5A continuous rating of #16 wire on draw out breakers



Operations Counter

A 5-digit, non-resettable counter actuated by the breaker cam shaft. Mounts on breaker.

Bell Alarm With Lockout

The bell alarm operates one "a" and one "b" contact; or, two "a's" or two "b's". It is activated when the breaker is tripped by any means (automatic) other than the manual trip button or the shunt trip device.

The contacts may be used for remote indication of an automatic trip.

The lockout feature is available to mechanically lock the breaker "open" when the device is activated. "Reset" is accomplished through opera-

tion of the manual trip button or shunt trip device.

The bell alarm is available without the lockout feature when so specified.

Electric Lockout

The electric lockout device provides a means of electrically interlocking breakers so that two cannot be closed at the same time. This electro-mechanical device consists of a coil whose winding must be energized to close the breaker. Once the breaker is closed, loss of voltage will not trip the breaker. A bypass interlock is provided for initial startup. Refer to the UV device for ratings and coil characteristics.

Auxiliary switches for

cross-interlocking breakers must be ordered separately.

Remote Close Solenoid for Manually-Operated AKR-30, 50, AKRT-50 Breakers

Provides a means to electrically close the above breakers from a remote location. May be controlled by a switch or pushbutton for five-cycle closing. Breaker must be charged locally. Available ratings:

MicroVersaTrip Test Set Cat. No. TVTS1

A portable instrument for field checking the performance of MicroVersaTrip solid-state trip devices.

Type AKR Breakers

Accessories

Verifies the following:

- Pick-up calibrations and time-delay; characteristics of various trip elements;
- Ability of the flux-shift trip device to trip the breaker;
- Target indicator operation;
- Phase sensor continuity.

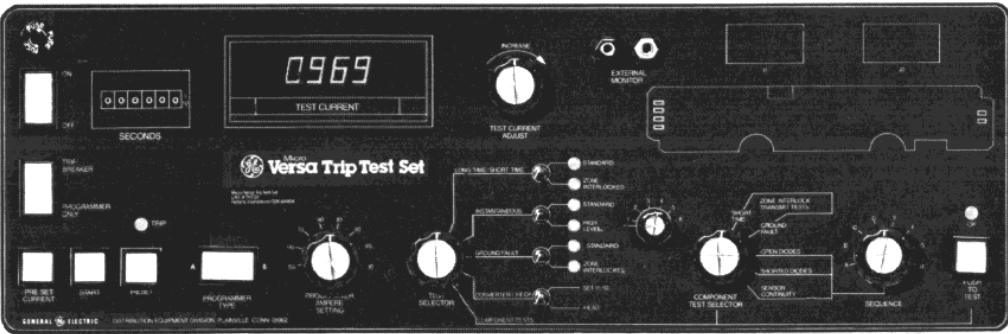
Required input: 105-125V ac 50/60Hz.

Closing Mechanism Operating Amperes

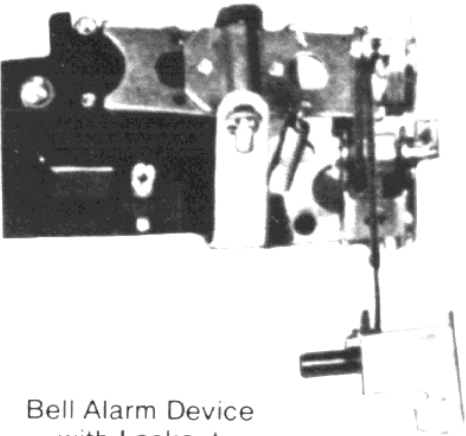
Breaker Frame	120 Volt, 60 Hz (Operating Range 104-127 VAC)			240 Volt, 60 Hz (Operating Range 208-254 VAC)			125 Volt, Dc (Operating Range 100-140 VDC)			250 Volt, Dc (Operating Range 200-280 VDC)		
	Inrush	Sus-tained	Recom-mended Fuse Size	Inrush	Sus-tained	Recom-mended Fuse Size	Inrush	Sus-tained	Recom-mended Fuse Size	Inrush	Sus-tained	Recom-mended Fuse Size
AKR-30 AKR-50 AKRT-50	25	5	6	12	3	6	27	5	6	13	3	6
AKR-75 AKR-100	25	8.1	10	12	3.5	10	27	7	10	13	3.2	10
AK-25	153	78	30	68	28	15	44	44	10	24	24	6
AK-50 AKT-50 AK-75	9	4	6	4	2.6	6	30	4	6	15	2	6
AK-100	9	4	10	4	3.2	10	30	5	10	15	2.5	10

Control Voltage		Bell Alarm Contact Ratings (amperes)	
		Inrush	Contin-uous
Dc	125	2.5	2.5
	250	0.9	0.9
60 Hz. Ac	120	30	10
	240 480	15 7	5 3

Control Voltage		Amperes	
		Inrush	Sus-tained
Dc	48	2.7	0.58
	125	1.3	0.32
	250	0.68	0.15
60 Hz. Ac	120	2	0.4
	240	1	0.2



Test Set TVTS1



Bell Alarm Device with Lockout

How to Order

For details on breaker application, refer to the bulletins and time current curves referenced within these pages.

To assure prompt shipment and avoid unnecessary delays, orders for Low Voltage Power Circuit Breakers must include the following information:

A. Quantity

B. Type — Include complete nomenclature (i.e., AKR-6D-50, etc.):

C. Number of poles.

D. Voltage Rating — If a-c, specify frequency.

E. Breaker Ampere Rating — (frame size).

F. Method of Operation — Manual or electrical. If electrical, specify voltage and, if a-c, frequency of closing and tripping sources.

G. Type of Enclosure or Mounting — i.e., draw out substructure, draw out general purpose enclosure or stationary.

H. Type of Overcurrent Trip Device —

1. MicroVersaTrip — specify:

a) **Fixed or tapped sensors.** If tapped sensors, high or low range

b) **Trip element combinations from page 13.**

Standard functions include:

Adjustable current setting
Adjustable long-time pick up

Adjustable long-time delay
Long-time timing light

Adjustable instantaneous
Optional functions include:

Remote long-time timing light

Short-time pick up and delay

Short-time I²t switch

High-range instantaneous

Ground fault pick up and delay

Zone selective interlocking

Fault indication targets, local and remote

2. EC (Electromechanical)

Specify:

a) **Quantity per breaker**

b) **Trip ampre rating**

c) **Type:**

(1) *Dual magnetic* (long time and instantaneous) — Unless otherwise specified, characteristics will be supplied as follows: For AKR-30, 50 and AKRT-50, long-time characteristic 1B and instantaneous setting 12X; for AKR-75 & 100, long-time characteristic ICC and instantaneous setting 12X.

(2) *Instantaneous-magnetic* (instantaneous only) — Specify pickup setting.

(3) *Selective* (long time & short time (optional)) — Specify time bands and settings.

I. Accessories — Specify those required per breaker (i.e., shunt trip, bell alarm, etc.). Specify ratings as required.

J. Terminal Facilities —

1. For breakers in General Purpose Enclosures specify size and number of cables per stud.

2. For AKR-75 & 100 stationary breakers, specify whether studs are to be horizontal or vertical. Unless otherwise specified, the breakers will be supplied with upper studs horizontal and lower studs vertical.

Basic Prices

The basic prices include the following:

Manually Operated Breakers

Stored-energy manual closing mechanism.
Trip-free breaker, mounted on a metal base, with:
Revolving pistol-grip operating handle.
Overcurrent trip device with LI elements.
Trip button (mechanical, breaker mounted).
Position indicator.

Provision for up to three padlocks (for locking breaker in the trip-free position).

Bolted-type terminal connectors — with draw out general-purpose enclosures only.

Maintenance closing handle (not required for AKR-75 & 100).

Electrically Operated

Except for omission of pistol-grip operating handle, same as manually operated breaker above, plus:

Motor-operated, stored-energy operating mechanism (except AK-25, which is solenoid-operated).

Control devices.

Shunt trip device.

Four-circuit auxiliary switch.

Close button, escutcheon mounted, momentary

contact (when specified).

Maintenance closing

handle.

Type AKR Breakers

Ordering Information

The solid-state SST over-current trip devices used on AKR breakers are also available in kit form for field retrofit of existing AK breakers. Designed for breakers applied on 50/60 Hz ac systems and originally equipped with types EC or Power Sensor trip devices, these kits offer the user the opportunity for convenient, on-site upgrading of

existing breakers by removing and replacing their obsolete trip devices with the full-featured, flexible SST system.

Each kit contains all the components, hardware, wiring and instructions necessary to completely convert both EC and Power Sensor breaker types. No special

tools are required. A post-conversion test check is performed using a standard high-current test set or the SST portable test sets TAK-TS1 or TAK-TS2.

Kits are available for the following breakers—for complete catalog numbers, prices and ordering information, see Handbook Section 7696.

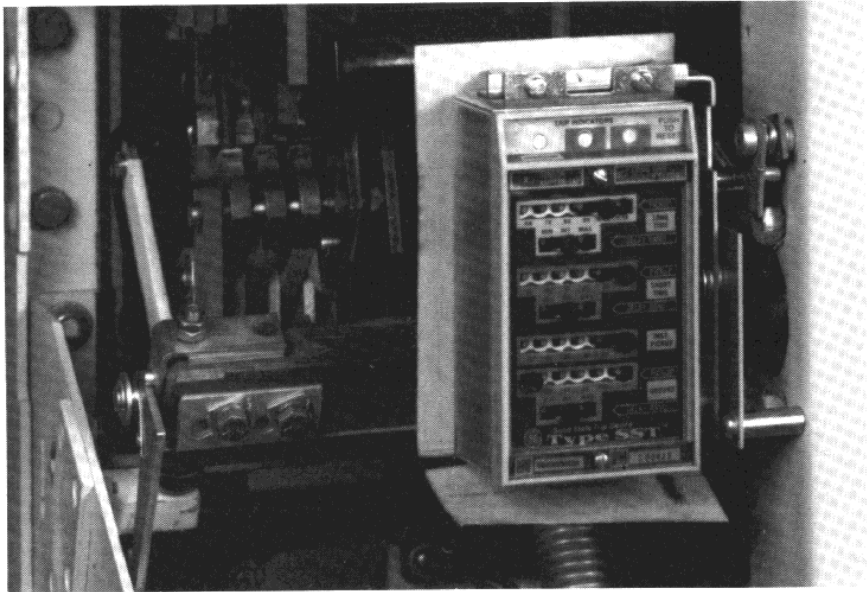
SST Conversion Kits for AK Breakers

70-4000A
600V ac 50/60 Hz.

Available Kits

Stationary Mounted	Draw Out Type	
	AKD	AKD-5
AK-2-15	AK-2-15	AK-2A-15
AK-2/3-25 —	AK-2/3-25 AKU-2/3-25	AK-2A/3A-25 AKU-2A/3A-25
AK-2/3-50/50H — AKT-2/3-50/50H	AK-2/3-50/50H AKU-2/3-50 AKT-2/3-50/50H	AK-2A/3A-50/50H AKU-2A/3A-50 AKT-2A/3A-50/50H
NA	AK-2/3-75	AK-2A/3A-75
NA	AK-2/3-100	AK-2A/3A-100

NA = Not Available



SST Programmer Unit Installed on AK Breaker

SST Trip Characteristics — Conversion Kits

Applicable time-current Curves: GES-6033B, 6034A, 6035B

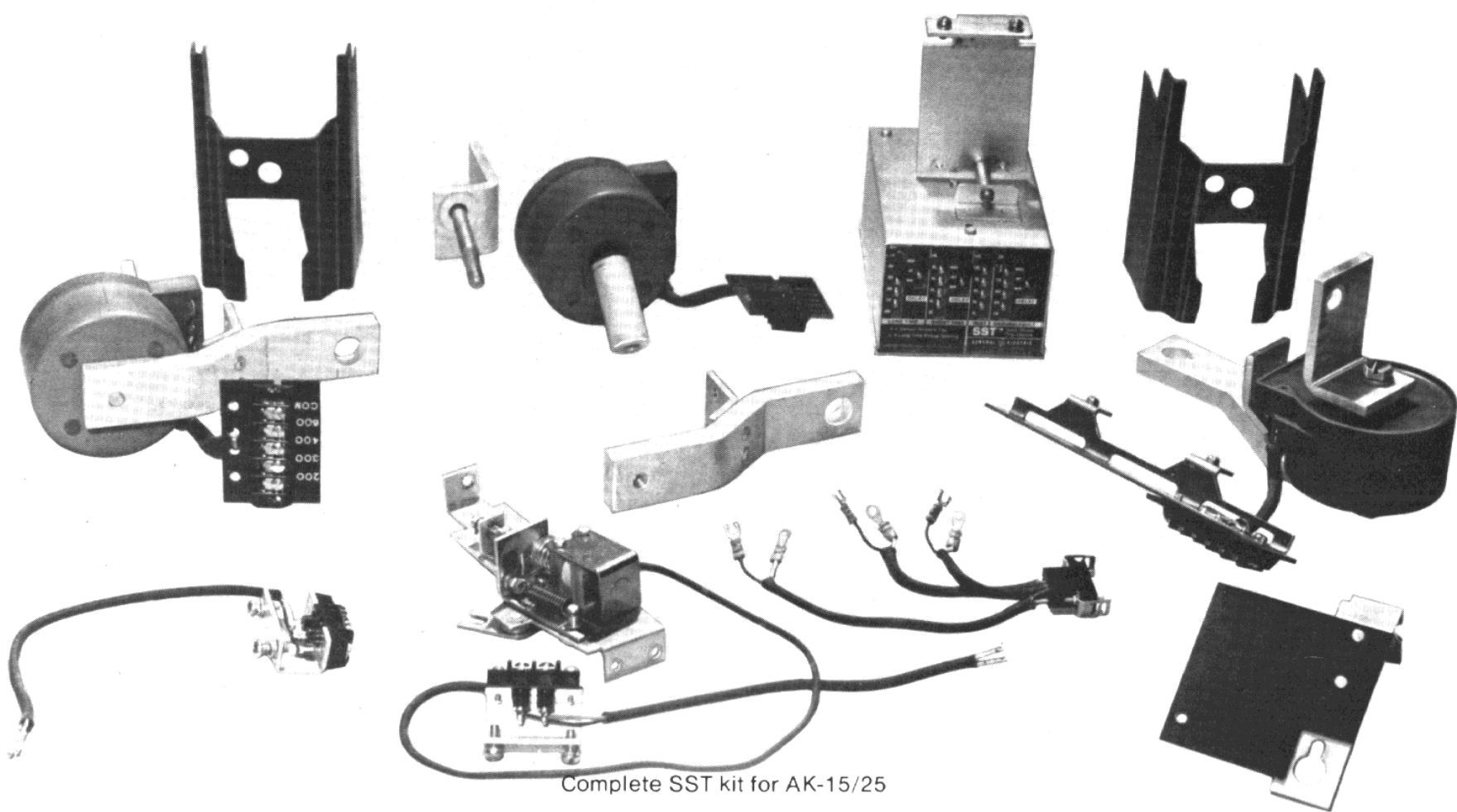
Breaker Frame Type	Frame Size (Am- peres)	Sensor Tapes (X) (Amperes)	SST Programmer Adjustment Range (Set Points)							
			Ground Fault		Long Time		Short Time		Instan- taneous Pickup	
			Pickup (Multiple of X)	Delay Band (Seconds)	Pickup (L) (Multiple of X)	Delay Band (Seconds)	Pickup (Multiple of L)	Delay Band (Seconds)		
AK-15	225	70, 100, 150, 225	.5, .6, .8, 1, 1.5, 2 (X)	Maximum 0.30	.6, .7, .8, .9, 1, 1.1 (X)	Maximum 22	1.75, 2, 2.25, 2.5, 3, 4 (L)	Maximum 0.35	4, 5, 6, 8, 10, 12 (L)	
AK-25	600	70, 100, 150, 225 or 200, 300, 400, 600		Intermed. 0.165		Intermed. 10	or	Intermed. 0.21		
AK-50	1600	300, 400, 600, 800 or 600, 800, 1200, 1600	.25, .3, .4, .5, .6, .7 (X)	Minimum 0.065		Minimum 4	3, 4, 5, 6, 8, 10 (L)	Minimum 0.095		
AKT-50	2000	800, 1200, 1600, 2000	.2, .25, .3, .4, .5, .6 (X)							
AK-75	3000	1200, 1600, 2000, 3000	.2, .22, .25, .3, .35, .37 (X)							
AK-100	4000	1600, 2000, 3000, 4000	.18, .2, .22, .25, .27, .3 (X)							
NOTES			①	②	④	②	③	②	④	②

- ① X = Sensor ampere tap = trip rating
② Pickup tolerance = ± 10%

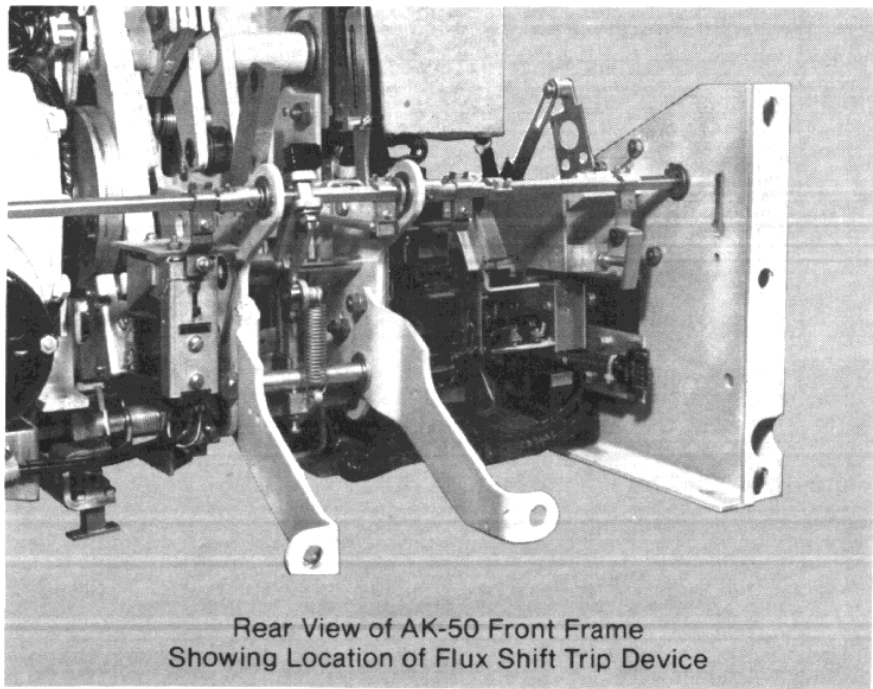
- ③ Time delay at lower limit of band @ 6L
④ Time delay at lower limit of band

SST Conversion
Kits for
AK Breakers

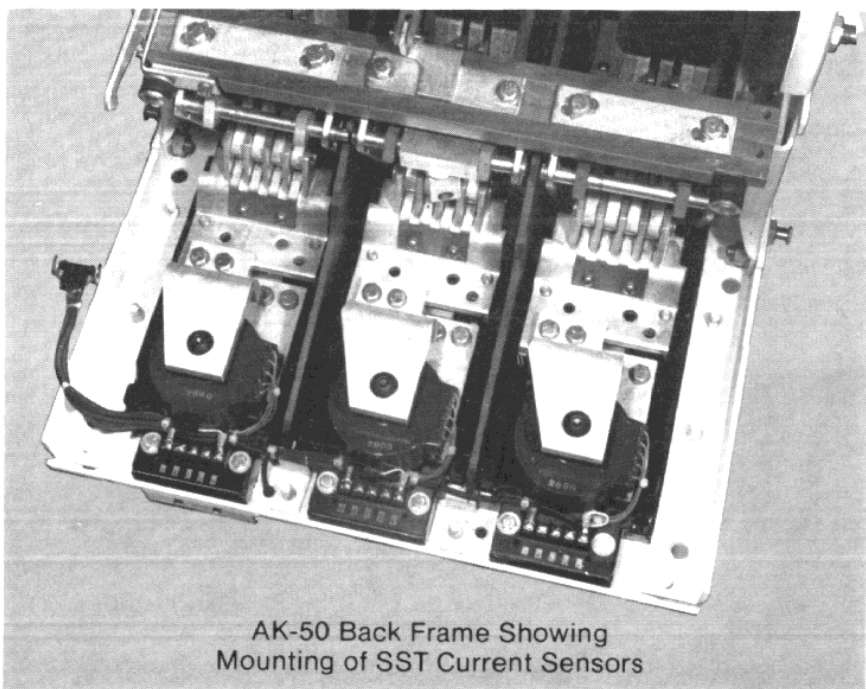
70-4000 A
600V ac 50/60 Hz.



Complete SST kit for AK-15/25



Rear View of AK-50 Front Frame
Showing Location of Flux Shift Trip Device



AK-50 Back Frame Showing
Mounting of SST Current Sensors

Application Information

Repetitive Duty

Circuit breakers are designed primarily to perform the function of circuit interruption under short-circuit conditions. Nevertheless modern circuit breaker mechanisms are capable of many operations under full-load operation and in-rush conditions such as encountered in motor starting applications. Industry standards have been established for the minimum

performance which is indicated in the table below. With adequate maintenance, GE breakers can be expected to exceed the standards.

Notes

Power operated circuit breakers, when operating under usual service conditions, shall be capable of operating the number of times specified in the above table. The operating conditions and the per-

missible effect of such operations upon the breaker are given in the following lettered paragraphs. For each column, all paragraphs listed in the column heading must be given consideration.

This standard applies to all parts of a circuit breaker that function during normal operation. It does not apply to other parts, such as overcurrent tripping devices, that function only during infrequent abnormal circuit conditions.

Repetitive Duty and Normal Maintenance

Circuit Breaker Frame Size (Amperes)	Number of Operations Between Servicing	Number of Operations Rated Continuous Current Switching (A) (C) (D) (E) (F) (G) (H) and (J)	Number of Operations No-Load Closing and Opening (A) (B) (C) (D) (E) (F) and (G)	Number of Operations In-Rush Current Switching (C) (D) (E) (F) (G) (I) and (J)
225	2500	4000	10000	2000
800	1750	2800	9700	1400
1600	500	800	3200	400
2000	500	800	3200	400
3200	250	400	1100	—
4000	250	400	1100	—

(A) Servicing consists of adjusting, cleaning, lubricating, tightening, etc., as recommended by the manufacturer. When current is interrupted, dressing of contacts may be required as well. The operations listed are on the basis of servicing at intervals of 6 months or less.

(B) When closing and opening no-load.

(C) With rated control voltage applied.

(D) Frequency of operation not to exceed 20 in 10 minutes or 30 in an hour. Rectifiers or other auxiliary devices may further limit the frequency of operation.

(E) Servicing at no greater intervals than shown in Column 2 above.

(F) No functional parts should have been replaced during the listed operations.

(G) The circuit breaker should be in a condition to carry its rated continuous current at rated maximum voltage and perform at least one opening operation at rated short-circuit current. After completion of this series of operations, functional part replacement and general servicing may be necessary.

(H) When closing and opening current up to the continuous current rating of the circuit breaker at voltages up to the rated maximum voltage and at 85% of the power factor or higher.

(I) When closing currents up to 600% and opening currents

up to 100% (80% power factor or higher) of the continuous current rating of the circuit breaker at voltages up to the rated maximum voltage.

When closing currents up to 600% and opening currents up to 600% (50% power factor or less) of the continuous current rating of the circuit breaker at voltages up to rated maximum voltage, the number of operations shown shall be reduced to 10% of the number listed.

(J) If a fault operation occurs before the completion of the listed operations, servicing is recommended and possible functional part replacements may be necessary, depending on previous accumulated duty, fault magnitude, and expected future operations.

The following four-step procedure will serve as a guide in selecting a fused breaker:

- 1. Calculate the available short-circuit current at the point of application in terms of rms symmetrical amperes. (If the calculated available short-circuit current is below 200,000 amperes no further consideration need be given to this point.)
- 2. Determine the continuous current rating of the breaker on the basis of established practices considering the characteristics of the load and the protection to be provided for conductors.
- 3. Select the trip device characteristics based on the

load characteristics and the type of protection to be provided.

4. Determine the rating of the fuse which coordinated with the trip rating and characteristics selected (see coordination tables).

Guide Form Specifications:

Fused breakers shall have stored-energy closing mechanisms, racking mechanisms, mechanical interlocks, three over-current trip devices and rear-mounted current limiting fuses in series. All low-voltage power circuit breakers shall be equipped with an open fuse lockout device that is visible from the front of the

breaker and capable of indicating which fuses are blown, tripping all three phases of the breaker upon the fuse blowing and preventing the circuit breaker from being reclosed on a single phase condition.

The circuit breaker shall be of the draw out type capable of being racked to the disconnect position with the door closed. Interlocks will be provided to prevent connecting or disconnecting the circuit breaker unless the breaker is open. The breaker shall be prevented from being closed during any racking operation. A test position shall be provided to permit operating the breaker while it is disconnected from the power circuit.

Application Information

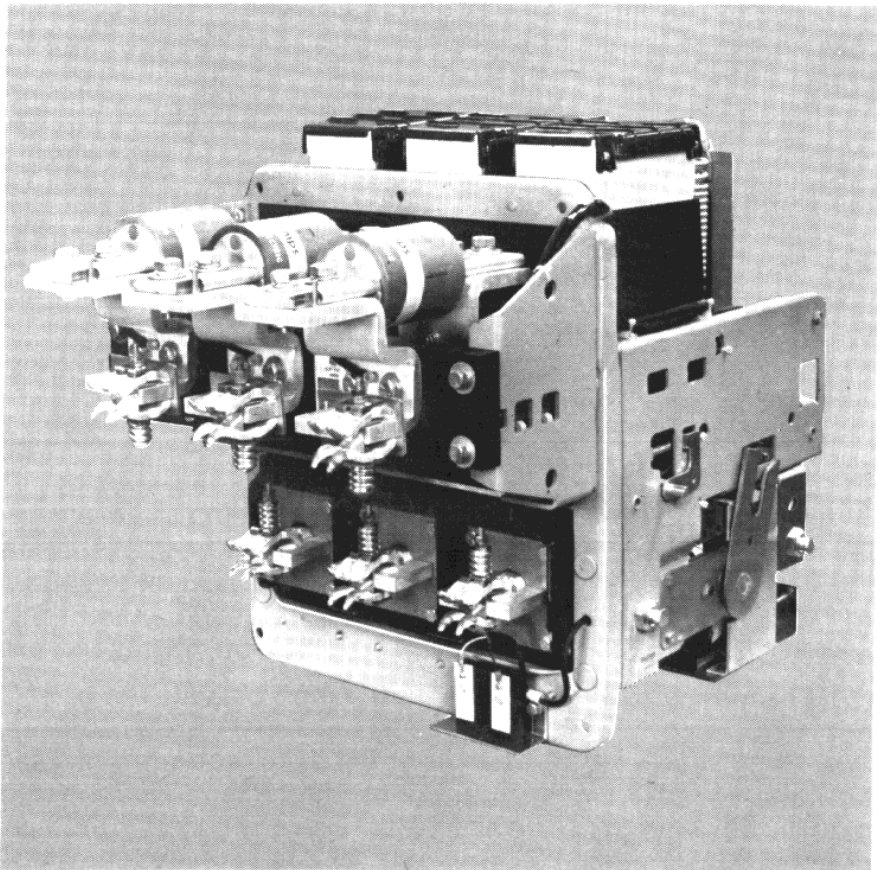
AKRU-Fused Breaker

Fused Breaker Ratings — Maximum 600v. ac 50/60 Hz.

Breaker Type	Frame Size Amperes	① CLF Fuse Rating Amperes		Inter-rupting Rating RMS Symmet-rical KA
		Min.	Max.	
AKU-25	600	300	1200	200
AKRU-30	800	300	1600	200
AKRU-50	1600	450	2500	200
AKR-75 ②	3200	2000	3000	200
AKR-100 ②	4000	2000	4000	200

① The maximum fuse rating is the largest fuse which tests show will result in proper performance of the breaker and fuse in combination under short circuit conditions. Only GE type CLF fuses should be used for proper coordination

② Fuses are mounted on separate fuse roll-out element.



Insulation (dielectric test)	kV
Breaker	2.2
Control Wiring	1.5
Closing Motor	0.9

**Operating Time (Cycles on 60 Hertz Base)
(all frame sizes)**

Closing Electrically	
Time from energizing closing circuit until contacts touch	5
Open (Maximum Clearing Time)	
With Instantaneous Overcurrent Trip	3
With Shunt Trip	3.5

Accessories
Undervoltage Tripping Device
Instantaneous Only — Pickup @ 85% rated control voltage, dropout between 30% and 60%. No adjustments.
With Optional Time-delay Unit — Separate static time-delay unit is mounted external to the breaker, requires 125/250 VDC or 208/240 VAC input. Provides adjustable dropout time from 2-6 seconds on complete loss of voltage.

Auxiliary Switch — Manual Breaker: 4 or 10 contacts (2 or 5 "a" and 2 or 5 "b") ① ②
Electrical Breaker: 6 or 12 contacts (3 or 6 "a" and 3 or 6 "b") ① ③
① Shunt Trip requires one "a" contact
② Remote close requires one "b" contact
③ Closing circuit requires one "b" contact

Bell Alarm Device (with or without lockout) — Hand/electrical reset, two contacts provided for remote indication — both NO, both NC or one of each.

Specifications

Type AKR Low Voltage Power Circuit Breakers
600 ac 50/60 Hz.

Designations

Draw Out Breaker Elements for AKD-8 Switchgear	
Frame Size (Amperes)	With MicroVersaTrip Solid State Trip
800	AKR-6D-30/30H AKRU-6D-30
1600	AKR-6D-50/50H AKRU-6D-50
2000	AKRT-6D-50H
3200	AKR-6D-75
4000	AKR-6D-100

Operating Currents

Mode	Rated Voltage		Voltage Range	Amperes Inrush/Sustained	
				AKR-30/50, AKRT/50	AKR-75/100
Closing	AC	120	104-127	25/5	25/8.1
		240	208-254	12/3	12/3.5
Tripping	DC	125	100-140	27/5	27/7
		250	200-280	13/3	13/3.2
	AC	120	104-127	12.3/10.8	
		240	208-254	3.9/3.4	
	DC	125	70-140	1.9/1.9	
		250	140-280	1.0/1.0	

Breaker Ratings

Frame Size Amperes	Breaker Type	System Nominal Voltage 60 Hz. AC	Three Phase Short-Circuit Rating RMS Symmetrical KA	
			With Instantaneous Trip	Without Instantaneous Trip†
800	AKR-30	600 480 240	30 30 42	30 30 30
	AKR-30H	600 480 240	42 42 50	42 42 42
1600	AKR-50	600 480 240	42 50 65	42 50 50
	AKR-50H	600 480 240	50 65 65	50 65 65
2000	AKRT-50H	600 480 240	42 65 65	42 65 50
3000, 3200	AKR-75	600 480 240	65 65 85	65 65 65
4000	AKR-100	600 480 240	85 85 130	85 85 85

† Short-time current ratings

Integrally Fused Breaker Ratings

Frame Size Amperes	Breaker Type	Rated Maximum Voltage 60 Hz. AC	CLF Fuse Rating Amperes		Interrupting Rating RMS Symmetrical KA
			Min.	Max.	
800	AKRU-30	600	300	1600	200
1600	AKRU-50	600	450	2500	200

Specifications

MICROVERSATRIP TRIP CHARACTERISTICS

Frame Size	Maximum Rating (Amps)	(X) Fixed Sensors	(X) Tapped Sensors	Current Setting (Multiple of Sensor Current Rating) (X)	Long-time		Short-time		Adjustable Instantaneous Pickup (Multiple of Sensor Current Rating) (X)	Short-time I ² t ① (Seconds)	Ground Fault	
		Sensor Current Rating (Amps)			Pickup (Multiple of Current Rating) (A)	Delay ① (Seconds)	Pickup (Multiple of Current Rating) (C)	Delay ② Seconds			Pickup (Multiple of Sensor Current Rating) (X)	Delay ② (Seconds)
AKR-30	800	100, 150, 225, 300, 400, 600, 800	100, 150, 225, 300 or 300, 400, 600, 800	.5, 6, 7, 8, 85, 9, 95, 10 (X)	8, 9, 10, 11 (A)	2.5, 5, 10, 21	1.5, 2, 2.5, 3, 4, 5, 7, 9 (C)	0.10, 0.22, 0.36	1.5, 2, 2.5, 3, 4, 6, 8, 10 (X)	0.4	2, 25, 3, 35, 4, 45, 5, 6 (X)	0.10, 0.22, 0.36
AKR-50	1600	300, 400, 600, 800, 1200, 1600	300, 400, 600, 800 or 600, 800, 1200, 1600	..								..
AKRT-50	2000	800, 1200, 1600, 2000	800, 1200, 1600, 2000	.	..			.
AKR-75	3200	1200, 1600, 2000, 3200	1200, 1600, 2000, 3200	.	..	..		.	1.5, 2, 2.5, 3, 4, 5, 7, 9		2, 22, 24, 26, 28, 30, 34, 37	.
AKR-100	4000	1600, 2000, 3000, 4000	1600, 2000, 3000, 4000	..	..	.	..			..	2, 22, 24, 26, 28, 3	

① Time delay shown at 600% of ampere setting at lower limit of each band.
② Time delay shown at lower limit of each band
All pickup tolerances are ± 10%
Ground Fault pickup not to exceed 1200 amperes

Average Weights — Pounds

Draw Out Breaker Element	NET		SHIPPING		Draw Out Breaker Element	NET		SHIPPING	
	Manual	Electrical	Manual	Electrical		Manual	Electrical	Manual	Electrical
AKR-30	200	205	225	230	AKR-75	420	435	470	485
AKRU-30	245	250	275	280	AKR-100 (25" wide)	525	540	575	590
AKR-50	210	215	235	240	AKR-100 (33" wide)	540	555	615	630
AKRU-50	255	260	285	290					
AKRT-50	215	220	240	245					

Guide Form Specifications

General

The individually mounted low-voltage power circuit breaker shall consist of an electrically and mechanically trip-free circuit breaker element.

The circuit breaker shall be of the draw out type capable of being racked to the disconnect position with the door closed.

Interlocks will be provided to prevent connecting or disconnecting the circuit breaker unless the breaker is open. The breaker shall be prevented from being closed during any racking operation. A test position shall be provided to permit operating the breaker while it is disconnected from the power circuit.

MicroVersaTrip trip devices shall include:

- All time current characteristic adjustments shall be of the fixed-point type, gold plated for maximum reliability and setting accuracy.
- All internal solid-state circuitry shall be epoxy conformal coated to resist environmental contamination.
- Fixed or tapped current transformers for application flexibility.
- Adjustable current setting of 0.5 to 1.0 of sensor tap.
- Adjustable long-time pick up of 0.8 to 1.1 of current setting.
- Adjustable long-time delay with four bands.
- Integral long-time timing light.
- Adjustable instantaneous.

Optional characteristics

- Short-time pick up and delay
- Short-time I²t switch
- High range instantaneous
- Remote long-time timing light
- Ground fault pick up and delay
- Overload, short circuit, and ground fault target indicators shall be self-powered and continue to give indication even when control power has been lost.
- Zone selective interlocking.

Guide Form
Specifications

Detailed

- This specification covers General Electric Company Low Voltage Power Circuit Breakers, types AKR, AKRT, or AKRU.
- The continuous current frame ratings shall be 800, 1600, 2000, 3200, 4000.
- Circuit breakers shall be manually or electrically operated.
- Control voltage for electrically operated breakers shall be:

- Volts:
AC _____ Cycles _____
3 ϕ -3W _____ 3 ϕ -4W _____
- Circuit breakers RMS symmetrical interrupting ratings:
240VAC KA _____
480VAC KA _____
600VAC KA _____
250VDC KA _____
- Overcurrent trip devices shall be solid-state type MicroVersaTrip.
- Each solid-state trip unit shall be equipped with the following field adjustable time-current characteristics:
 - Adjustable current, long-time pick up, and long-time delay
 - Integral long-time timing light
 - Instantaneous, standard or high range
 - Short-time pick up and delay
 - Short-time I²t adjustment
 - Ground fault pick up and delay
 - Target indicators, overload, short-circuit, and ground fault
 - Local and remote target indication.
- Each circuit breaker shall be equipped with the following accessories:
 - Shunt trip — Voltage _____
 - Undervoltage release —
Voltage _____
 - Undervoltage release with time delay —
Voltage _____
 - Overload bell alarm.
 - Lockout device.
 - Auxiliary Switch:
Number of contacts:
Normally open "a" type
Normally closed "b" type _____

Additional Information

Molded Case Circuit Breakers

Industrial Circuit Breakers
THQE Circuit Breakers and Terminations
VersaTrip® for Molded Case Circuit Breakers
Mag Break® Motor Circuit Protectors
Mine Duty Circuit Breakers
Testing and Maintenance of Molded Case Circuit Breakers

GEA-10665
GEA-9755
GET-6202
GEA-7498
GET-6207
GET-2963

Insulated Case Circuit Breakers

Power-Break® Insulated Case Circuit Breakers, Quick Selection
Power-Break + ® Insulated Case Circuit Breakers

GEA-9752
GEA-10666

Low Voltage Power Circuit Breakers

Type AKR Low Voltage Power Circuit Breakers
Application and Selection of Type AK Low Voltage Power Circuit Breakers
MicroVersaTrip Test Set
Renewal Parts Price Bulletin

GEA-10667
GEA-8733
GEK-64464
GEP-1675

Ground Fault Protective Products

Ground Fault Circuit Interrupters
Ground-Break® Systems

GEA-10664
GET-2964

Safety Switches

Spec-Setter™ Mill Duty Safety Switches
Spec-Setter™ Type TG General Duty Safety Switches
Spec-Setter™ Type TH Heavy Duty Safety Switches

GEA-9747
GEA-10674
GEA-10675

Disconnect Switches

Fusible Disconnects, Operating Handles, and Accessories
Type HPC High Pressure Contact Switches

GET-2954
GET-6205

Panelboard Components

Fusible Panelboard Units

GEA-7490

Circuit Breaker Load Centers

PowerMark + ® Circuit Breaker Load Centers—thru 600 amp
PowerMark + ® Riser Panels, Parallel Type
PowerMark + ® Riser Panels, Series Type
Lightning Protector
Meter Mod II and Mini Mod II Modular Metering
Load Center Renewal Parts

GEA-7484
GEA-9494
GIZ-2362-17
GEA-9756
GEA-9757
GEF-4453

For further information, contact your local General Electric Sales Office,
or write Marketing Communications,
Distribution Equipment Division, 41 Woodford Ave., Plainville, CT 06062

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call or write your local
General Electric
Sales Office or

Distribution Equipment
Division
41 Woodford Avenue
Plainville, CT 06062

Outside the U.S. and Canada write Expert Sales and Service
670 Lexington Avenue, New York, NY 10022

GEA 10265 9/80

GENERAL  **ELECTRIC**