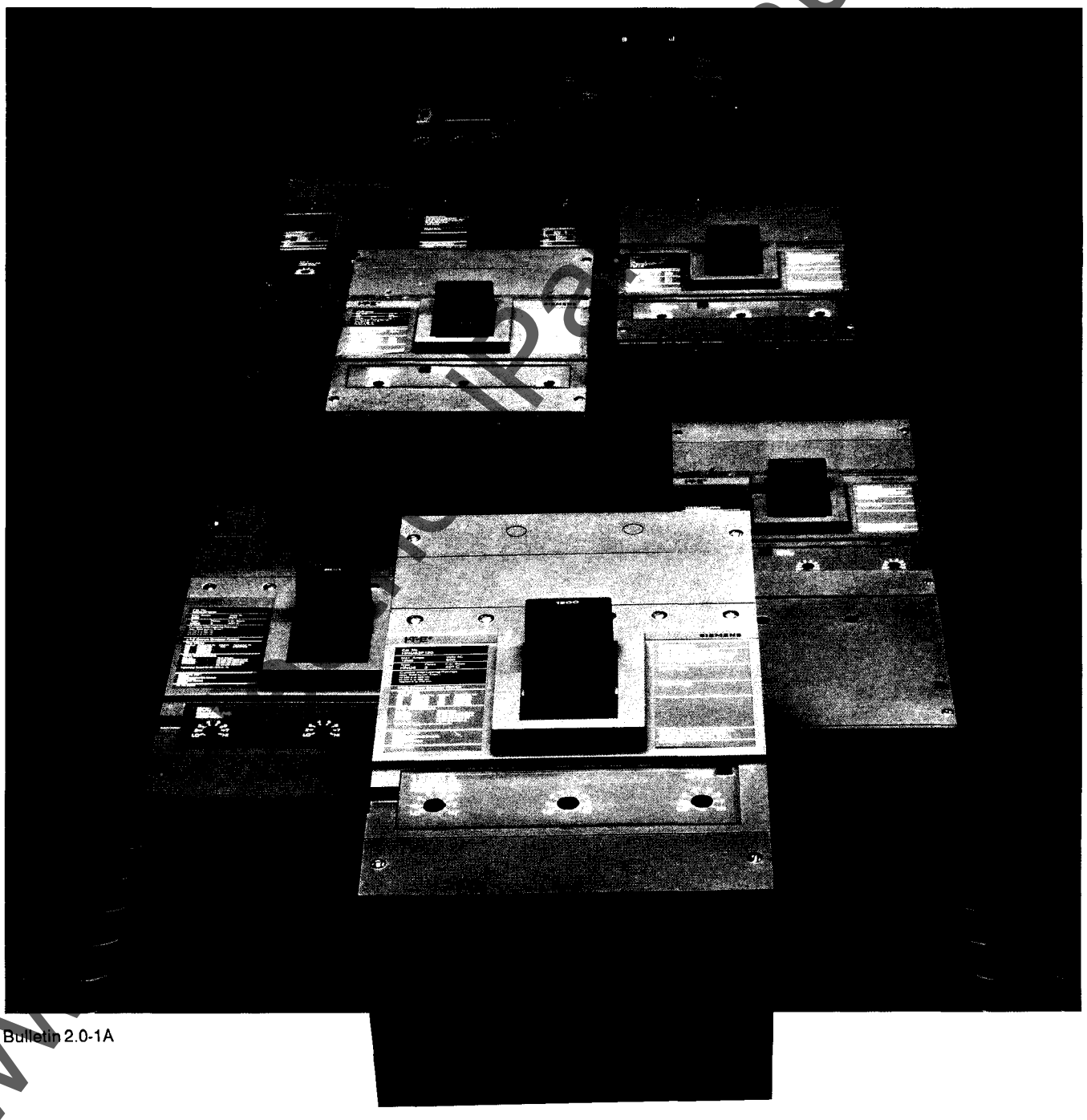
SIEMENS

I-T-E® Sentron™ Series Circuit Breakers

Selection and Application Guide



Bulletin 2.0-1A

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Evolving Electrical Systems Result in Higher Fault Currents

Electrical engineers agree that the average electrical system has changed a great deal in the past few decades. In many cases, industrial users and utilities are using fewer, larger, lower-impedance transformers in an effort to achieve greater system efficiencies. A byproduct of this system evolution has been a significant increase in average fault current levels.

In fact, it is no longer unusual for an electrical system to have extremely high available short circuit currents—up to 200,000 RMS symmetrical amperes. Making changes in an electrical distribution system for expansion, modernization or whatever reason, may lead to increased short circuit current availability.

Because average potential fault levels are higher, circuit breakers need higher than average interrupting ratings.

I-T-E Sentron Series molded case circuit breakers set a new industry standard in circuit protection. They provide some of the highest interrupting ratings on the market. And they're available ***now***, covering 15 to 1200 amperes in standard, high-capacity and current-limiting in both electromechanical and solid state type breakers.

Other manufacturers have talked about them, but it took Siemens engineering know-how for I-T-E electrical products to ***deliver*** these higher interrupting ratings in one complete family.

Maybe that's because we are the unsurpassed leader in circuit breaker technology. We have the experience. Since first manufacturing circuit breakers based on the inverse time element principle in 1888, we've pushed circuit breaker technology to its limits.

As a division of Siemens Energy & Automation, our technical knowledge continues to pace the industry. "Blow-apart" contact technology used in the Sentron Series was patented by our engineers and has been employed in I-T-E E-frame and F-frame circuit breakers since 1975.

In 1980, we introduced Sentron, a line of fuseless current-limiting circuit breakers. These breakers incorporated special interrupters, based on the "blow-apart" principle, but refined for ultra-high interrupting abilities.

This design led to Sentron Series, an entire family of breakers that incorporate current-limiting technology to achieve higher interrupting ratings.

Sentron marks a major step in developing a circuit breaker especially for today's electrical environment. These circuit breakers meet the requirements of modern construction technology by virtue of their higher protective levels and their enhanced application flexibility.

The Power Lab at our Product Development Center in Atlanta houses the industry's most highly advanced testing and instrumentation capabilities for short circuit testing. There we test the limits of our circuit protection and electrical distribution products. So our circuit breakers will perform as promised.

Electrical distribution equipment is the core of any commercial or industrial complex. The circuit breaker is an integral component of that equipment. It must be reliable.

And the circuit breaker is the heart of many Siemens products. Perhaps this is the key to our expertise. It must satisfy our own rigid requirements to provide essential protection in switchboards, panelboards, power switching centers, secondary unit substations and motor control centers.

That's why we approach problems from a system viewpoint. Because our capability covers all phases of electrical system design, we understand the need for flexibility in equipment selection and application throughout all stages of distribution. And we pass the benefits of our knowledge to our customers.

Sentron circuit breakers, in standard, high-capacity and current-limiting in both electro-mechanical and solid state varieties. The new standard of circuit protection for the modern distribution system.

SentronSeries circuit breakers provide higher interrupting ratings for applications ranging from 15 to 1200 amperes continuous current.

Color Label Code

Sentron Series circuit breakers are easily recognized by their distinctive appearance.

An all new labeling scheme utilizes color-coding as a visual indication of the interrupting category of each circuit breaker.

These colors and their corresponding interrupting categories are as follows:

- Blue—Standard interrupting capacity
- Black—High-Capacity
- Red—Current-Limiting

The I-T-E circuit breaker technology has a heritage of leadership that can be traced to 1888, when Henry Cutter founded Cutter Electrical Manufacturing Company and introduced circuit breakers based on the inverse time element principle. Cutter went on to develop the first shock-proof circuit breaker for the U.S. Navy in 1917, establishing a reputation for inventive design.

We continued to lead the industry with innovative circuit protective products, as evidenced by our introduction of the first instantaneous-only molded case circuit breaker for motor short circuit protection. But I-T-E technology didn't stop progressing there.

More recent innovations have included the Sentron breaker, a fuseless, current-limiting design specifically for high available short circuit environments. The Sentron breaker achieved higher interrupting ratings through an additional set of current-limiting contacts. Our experience with this design led to further refinement of I-T-E "blow-apart" technology.

The result was an optimized "blow-apart" contact design with which we were able to achieve much higher standard interrupting ratings. And establish a new industry benchmark with the Sentron family.

Other highly advanced innovations in the I-T-E product line include Sensitrip III® digital circuit breakers, which provide true RMS sensing capability for the highest degree of accuracy yet. The electronics of Sensitrip III allows shaping of a circuit breaker's performance curve to meet virtually any system requirement, and yet retain the thermal-magnetic breaker's ability to react to true RMS currents on the system.

Backed by the development resources of a state-of-the-art power laboratory, I-T-E products lead the industry. It's not surprising that we now offer standard circuit breakers capable of safeguarding distribution systems from extremely high fault currents. Sentron Series molded case circuit breakers are available ***today*** for all applications.

State-of-the-art Technology Applied in Sentron Series

Sentron Series molded case circuit breakers make use of the "blow-apart" contact principle patented by Siemens engineers. Derived from basic physics, this principle is based on the electro-magnetic repulsion of adjacent conductors transporting current in opposite directions.

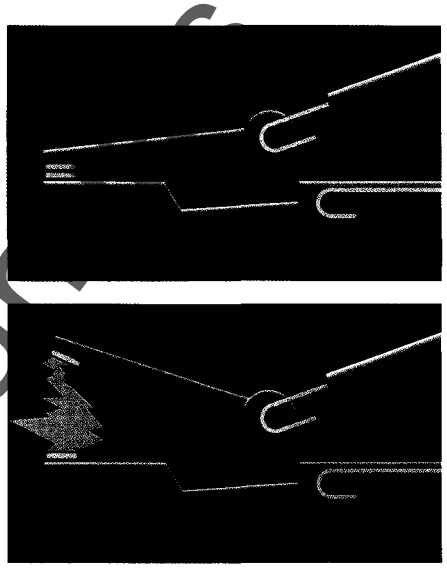
In these circuit breakers, contacts which carry current are arranged so as to create opposing magnetic fields. The contact arms—one stationary and one moveable—are positioned closely to one another. As the fault current rises, magnetic repulsion forces the contacts to separate. This forced separation immediately establishes an arc. The arc acts as a major source of current impedance, restricting fault energy to lower levels for fast extinguishing in the arc chamber.

The single-pivot design allows the moveable contact to separate completely from the stationary one without restrictions—even before the mechanism unlatches to trip the circuit breaker. In other words, with Sentron Series, the "blow-apart" contacts open first and then the mechanism trips. This design allows clearing of the fault faster than previous generations of circuit breakers.

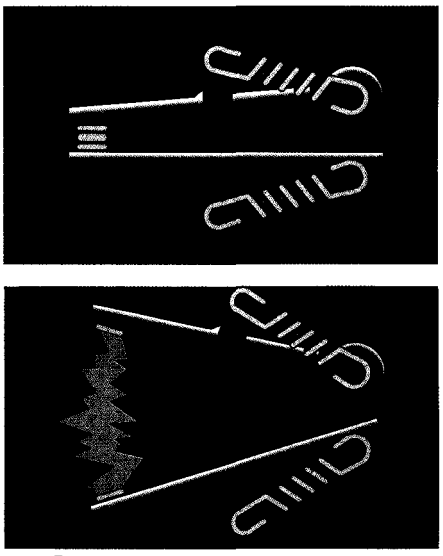
A short circuit forces the contacts to separate quickly. The higher the fault current, the faster this action occurs, clearing the circuit to give optimum protection for sensitive electrical components.

Protection of downstream equipment threatened by very high fault levels is further enhanced with Sentron current-limiting circuit breakers. These circuit breakers are also based on the "blow-apart" contact principle, but in the 125 through 600 ampere frames have an extra pair of current-limiting contacts that feature ***two*** moveable arms. By virtue of their dual-pivot design, these contacts separate even more quickly under high fault current conditions.

Again, the current is traveling in opposite directions through the contact arms, creating a state of magnetic repulsion. As the current

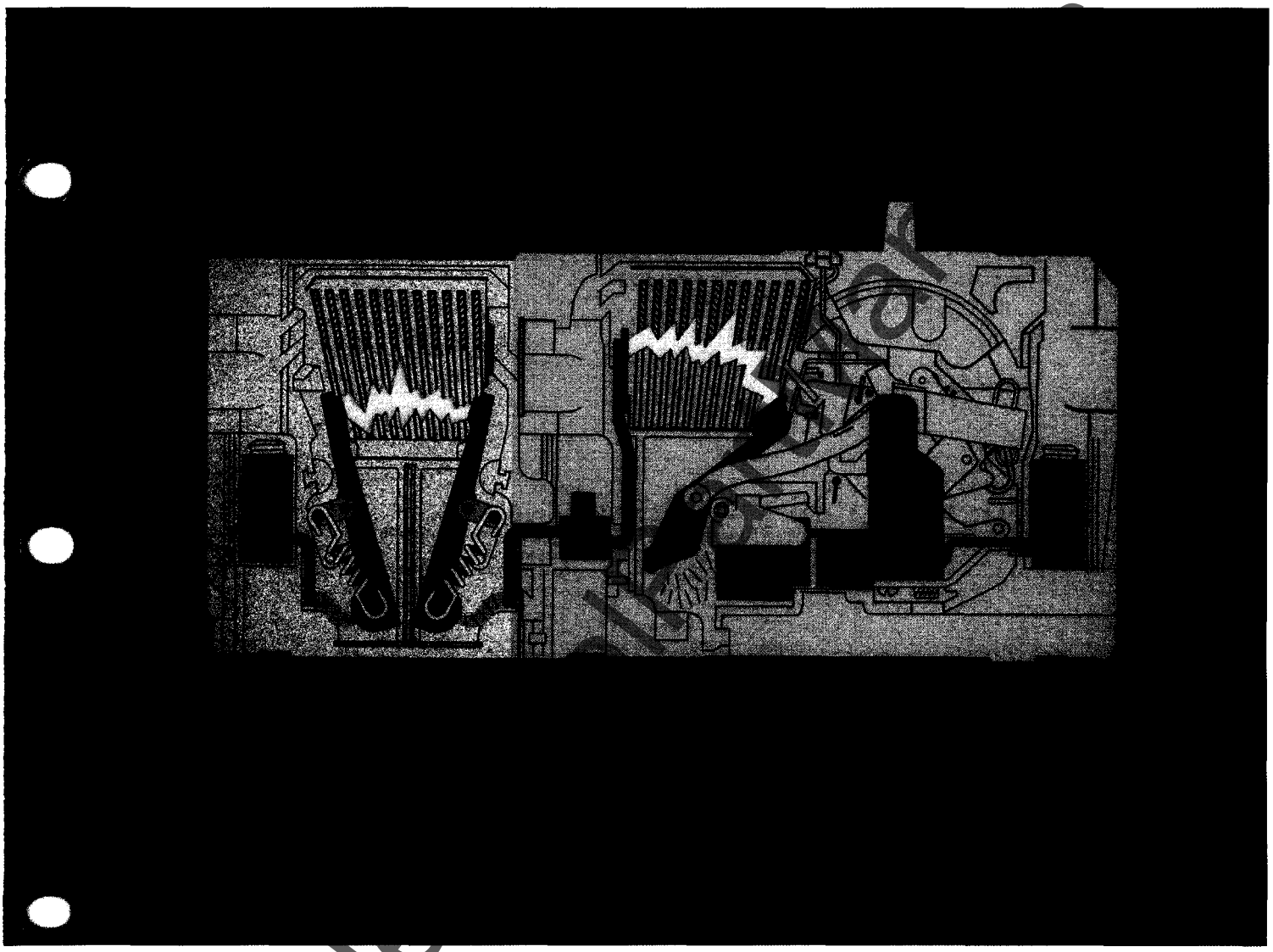


Single-Pivot



Dual-Pivot

"Blow-apart" technology enhances interrupting ratings Optimized, single- and dual-pivot contact designs limit fault-current to protect downstream components

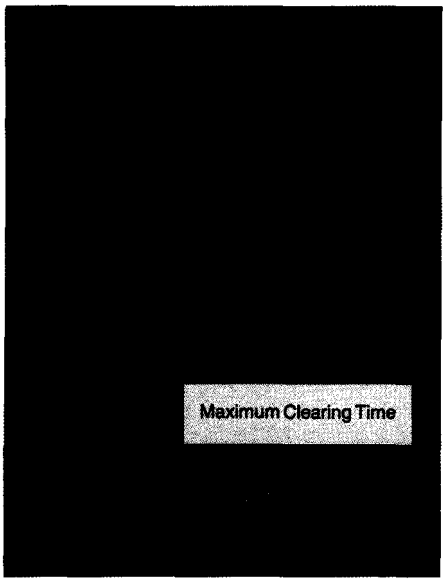


increases, a strong magnetic force is generated around the contact arms. At a prescribed value, the repulsion force overcomes the contact-closing pressure. An arc develops between the contacts and introduces high impedance into the faulted circuit. All of this action occurs in milliseconds to limit the let-through current. Energy let-through is so slight that optimum protection is provided for downstream components.

I-T-E Sentron current-limiting circuit breakers have been proven in field applications since 1980. Today, interrupting ratings are even higher to protect against short circuit currents to 200,000 RMS symmetrical amperes.

Cut-away illustration of a Sentron Series current-limiting circuit breaker incorporating both the single-pivot and dual-pivot "blow-apart" contacts.


Minimum
Maximum
Maximum Clearing Time
250 Amp Circuit Breaker
600V
480V
240V



Traditional Circuit Breaker

The typical time-current curve for a Sentron Series circuit breaker (represented at left) is different than that for a traditional circuit breaker (above). With Sentron Series, high fault currents result in faster instantaneous operation.

In general, time current characteristic curves represent the time-current relationship of circuit breakers based on the inverse time principle. Here we use them to illustrate the fast operation of Sentron Series circuit breakers.

Section 1. The sloping band curves show the time delay required for the circuit breaker to trip due to an overload. These minimum and maximum sloping curves represent the boundaries of the calibration limits established by manufacturing tolerances and meet Underwriters Laboratories requirements. For a given current, at rated ambient temperature, a circuit breaker will clear the circuit automatically at some total time within the maximum and minimum values.

Section 2. The sharp break and vertical lines on the graph represent instantaneous tripping due to very high overloads or short circuits and indicate the speed with which these breakers operate.

Time current curves for Sentron circuit breakers are similar to those of traditional thermal-magnetic circuit breakers. But because these breakers employ I-T-E "blow-apart" contacts, high fault currents result in even faster instantaneous clearing operation. The time-current relationship of Sentron breakers is now the standard for speed of interruption among molded case circuit breakers. The significance of this technology is clear: better protection.

In their current-limiting range of operation, Sentron circuit breakers trip so quickly that energy let-through will always be less than the let-through energy of a ½-cycle wave of the symmetrical prospective current. That means optimum protection for other electrical components located downstream.

Built-in trip-free mechanisms ensure that I-T-E circuit breakers cannot be held closed against a fault. And the common trip bar prevents single-phasing by opening all phases when a fault occurs on any one phase.

Digital Electronics Allow Shaping of Time Current Curves

For the ultimate in application flexibility, Sentron Series with Sensitrip electronic tripping incorporate solid state capabilities that allow even more precise control of overload current. These breakers actually accept a programmed time current characteristic curve that will meet any protective requirements.

These circuit breakers offer adjustable settings for such functions as continuous current, instantaneous trip points, short-time delay pickup, ground fault pickups and ground fault time delays. That means superior repeatable accuracy, adjustability and precision.

True RMS sensing, the ability to measure the actual shape of the current waveform, ensures that the Sensitrip III line will perform reliably, time and time again. Our digital circuit breakers have proven performance in using this ability to bring trip/don't trip margins closer than ever before.

A microcomputer in our digital circuit breakers senses true RMS current by sampling the current waveform 41.7 times per cycle. It "reads" this data and compares it to what has been pre-programmed into the circuit breaker's operating logic. Once this data is acquired, the microcomputer informs the circuit breaker when to trip.

The true RMS ability of Sensitrip III helps ensure that nuisance tripping is minimized.

Accuracy of ± 5% means a finely tuned electrical protection scheme. Sensitrip III solid state circuit breakers give precise control for a wide variety of application requirements.

Invest in flexibility. No longer do changing system requirements mean ordering and replacing interchangeable trip units. The trip current adjustments of Sensitrip III are as easy as turning a knob.

The New Standard in Circuit Breakers

As electrical systems expand, so must the abilities of the modern molded case circuit breaker. At Siemens we're answering needs of the modern distribution system with the I-T-E Sentron Series circuit breakers.

Using "blow-apart" technology patented by our engineers to achieve the highest interrupting ratings available, Sentron Series circuit breakers are ideal for use in today's high fault current environment.

In most cases, these circuit breakers are physically interchangeable with our present breaker line. In all cases, Sentron circuit breakers provide significantly higher interrupting ratings.

For example, the 125-ampere frame in our previous standard line has an interrupting rating of 25 kA at 240 volts. Our Sentron Series circuit breaker in the same frame size is rated 65 kA at 240 volts, an increase of 260% over the previous generation.

In the Sentron high-capacity line, a 125-ampere frame circuit breaker will interrupt 100 kA at 240 volts at a price that is only a fraction more than its standard counterpart. And because all 125-amp frames meet the UL requirement for true current limitation, Siemens believes it's the best circuit protection value available.

We're setting new industry standards with increased interrupting ability. Yet because all Sentron Series circuit breakers through 600 amperes will physically fit existing panelboards and switchboards, they are installed without any modification of the existing electrical distribution system.*

Sentron circuit breakers can be used for dedicated current paths to afford that extra protection or may be used in UL listed series connected systems. It makes sense to save money by buying only the circuit protection needed.

Every I-T-E molded case circuit breaker is engineered for high performance, accuracy and repeatability to meet all protection requirements. And our advanced research and testing capabilities ensure performance reliability.

*Always be sure that the apparatus in which the breaker is installed has a rating equivalent to that of the breaker.

Adapting Sentron Series Circuit Breakers

The I-T-E Sentron Series circuit breakers offer further application flexibility through the convenience of field-addable external accessories. Field-addable external accessories include handle operators, handle blocking devices, handle extensions and padlocking devices, among others.

For many auxiliary devices, Siemens is the only manufacturer that offers UL listed field-addable accessories to adapt a breaker as small as the 125-amp frame. These accessories include shunt trips, undervoltage trips, auxiliary switches and/or alarm switches. All accessories are available singly or in combinations to meet design requirements.

We also offer a wide range of individual enclosures for protection from various environments.

Many other special applications such as 50°C calibration, DC interruption ratings, and use on 400 Hz systems can also be addressed easily with Sentron Series circuit breakers.

Sentron Series circuit breakers boast major increases in interrupting ratings, yet remain physically interchangeable with previous I-T-E circuit breaker generations.

Current Limiting Breakers

The I-T-E Sentron Series current-limiting circuit breakers employ the same proven "blow-apart" contact principle as our standard and high-capacity Sentron circuit breakers, but react even faster because of an extra set of "current-limiting" contacts. (800 and 1200 ampere breakers *do not* utilize the extra set of contacts). We first incorporated extra current-limiting contacts into I-T-E circuit breakers introduced in 1980. Refining this technology has led to even higher interrupting ratings in the current-limiting range of operation.

Unlike the regular "blow-apart" contacts having one moveable and one stationary arm, the current-limiting contacts are both moveable. The second set of contacts operates only under high fault conditions. The higher the fault current, the faster and more effective the repulsion.

These circuit breakers provide particular safety advantages because they minimize let-through energy. Under short circuit conditions, high available fault current can burn out equipment and wiring and cause extensive damage due to both thermal and magnetic stress.

Today's electrical distribution systems tend to have higher available fault current—as high as 200,000 RMS symmetrical amperes in some commercial and industrial distribution systems. That's a very significant change from previous system levels. Sentron circuit breakers limit that energy, subjecting an electrical system to less thermal and magnetic stress, and protecting downstream equipment from excessively high currents.

Sentron Series current-limiting circuit breakers CONTROL fault currents in every frame size.

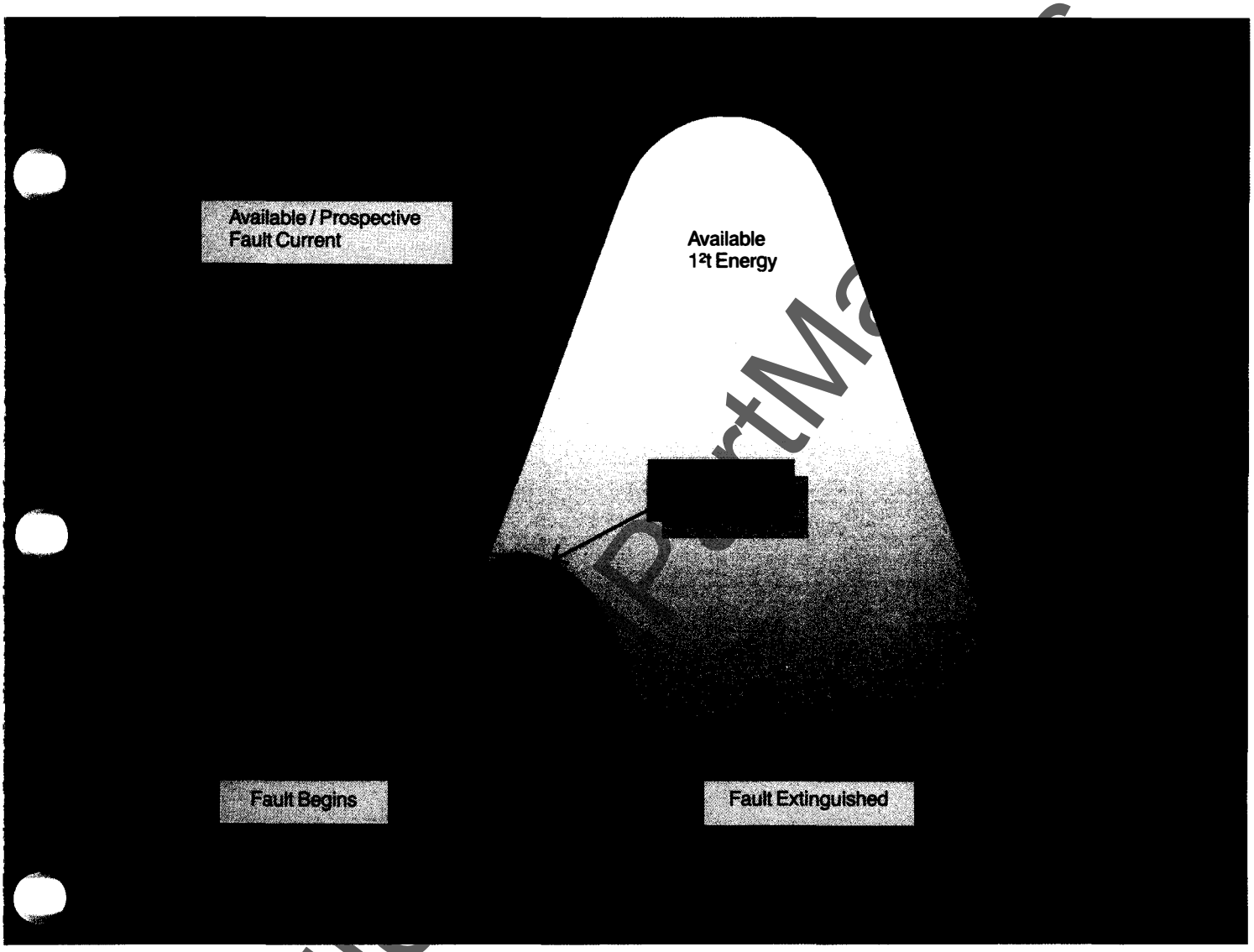
A New Approach to System Design

Using Sentron Series current-limiting circuit breakers can reduce the likelihood of equipment damage or personnel harm caused by high fault current. Without the inconvenience of fuses—like stocking and replacing. Plus we assure repeatability and safety from the danger of single-phasing.

Sentron current-limiting breakers limit the let-through energy seen beyond their point of use in an electrical distribution system. Because I-T-E current-limiting breakers limit let-through energy, it is possible to use lesser rated breakers downstream. Without risking components to the adverse effects of that energy.

UL listed series connected circuit breaker combinations are making specification of systems which employ current-limiting circuit breakers easier and faster than ever. And designing an electrical system to take advantage of series connected components saves money.

At the Siemens Product Development Center, we've invested a great deal of time and research into series-tested combinations. For convenience, we can supply information on how to apply series breaker combinations to realize cost savings in the design of a particular distribution system with I-T-E products.



Profile of current-limiting segment of Sentron Series.

125A Frame

The I-T-E Sentron 125-amp frame circuit breaker protects systems from fault currents up to 65 kA at 240 volts. Our high-capacity type breakers protect up to 100 kA; and current-limiting breakers up to 200 kA.

Plus I-T-E ED-frame circuit breakers offer flexibility through field-addable shunt trip, undervoltage trip, auxiliary switch and alarm switch accessories—an industry exclusive in this frame size. With I-T-E circuit breakers, the options are unlimited.

All Sentron ED-frame circuit breakers exhibit current-limiting capabilities. Selecting the amount of protection needed, in all ratings, means gaining the benefits of current limitation. And taking advantage of series-tested combinations allows optimum protection at an economical price.

ED-frame breakers are a standard for commercial, industrial and OEM applications. Their advanced characteristics make them uniquely suited for applications in panelboards, switchboards, motor control centers and other key distribution products.

I-T-E Sentron Series 125-amp Frame

Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)	250V DC A.I.R. (kA)
Std.	ED4	65	18	—	30
Std.	ED6	65	25	18	30
Hi-IC	HED4	100	42	—	30
Hi-IC	HED6	100	30	18	30
C.L.	CED6	200	200	100	30

NOTE: All E-frame and C-prefix breakers are non-interchangeable thermal-magnetic trip designs.

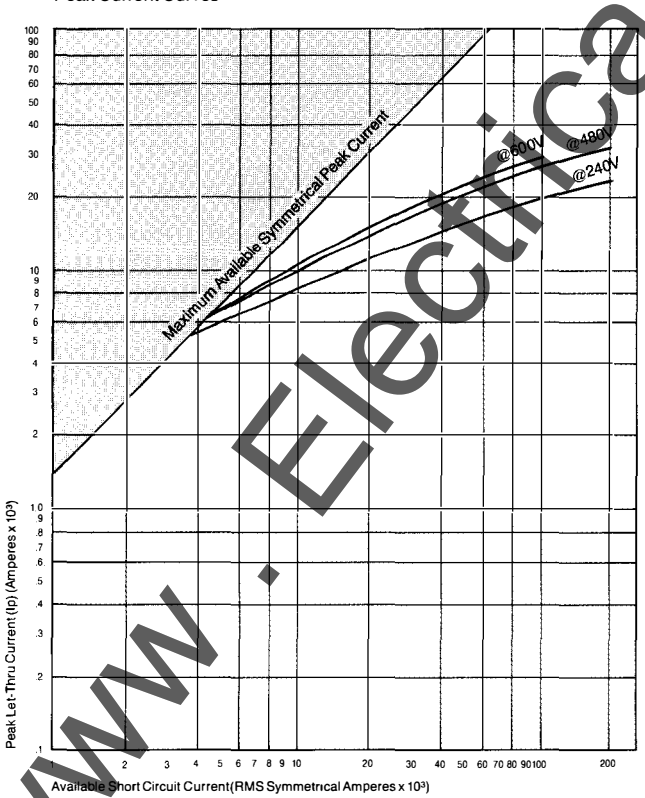
Accessories

Description	240V AC	480V AC	600V AC	DC
Undervoltage Trip	X	X	X	X
Shunt Trip	X	X	X	X
Auxiliary Switch	X	X	—	X
Alarm Switch	X	X	—	X
Motor Operator	X	—	—	—

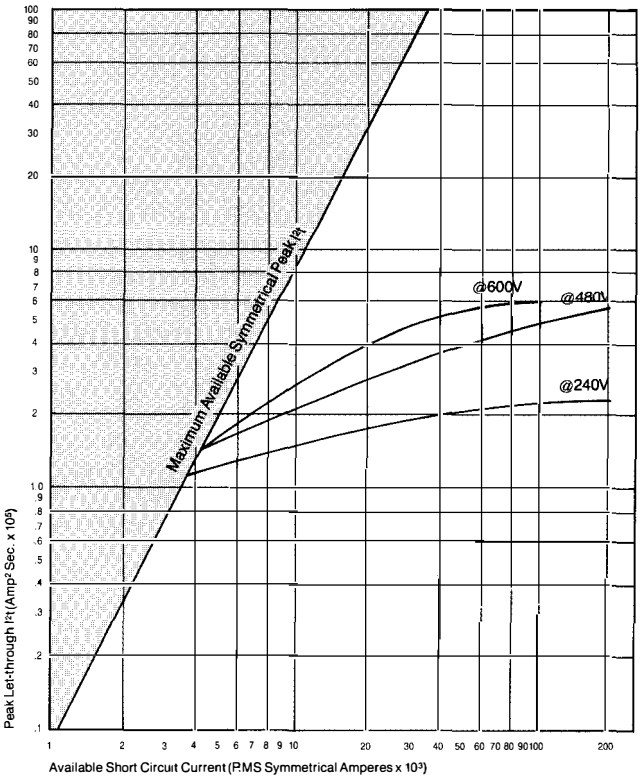
Also available:

Individual Enclosures	Handle Blocking Devices
Max-Flex™ Operating Handle	Handle Extensions
Rear Connecting Studs	Mounting Screw Kits
Plug-In Mounting Assemblies	Operating Handles
Mechanical Interlock	Compression Connectors

Type CED6 125A Frame
Peak Current Curves



Type CED6 125A Frame
I²t Curves



The I-T-E Sentron 250-amp frame circuit breakers interrupt fault currents as high as 65 kA at 240 volts in standard type circuit breakers, 100 kA in high-capacity types and 200 kA in our current-limiting line.

The Sentron FD-frame breaker has no equal in features and overall ratings. Plus we consistently exceed the others in all current-limiting applications.

And Sentron FD-frame circuit breakers can be used in economical series-tested combinations. That's because all FD-frame circuit breakers have current-limiting capabilities.

Sentron FD-frame circuit breakers suit more applications. Like commercial/industrial applications requiring rugged dependability. FD-frame breakers are well-suited for use in a wide array of electrical distribution applications.

And since the Sentron Series FD-frame is the *only* 250-amp frame breaker available in an optional electronic trip version, users have the widest possible choice of protection.

I-T-E Sentron Series 250-amp Frame

Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)	250V DC A.I.R. (kA)
Std.	FXD6	65	35	18	30
Std.	FD6	65	35	18	30
Hi-IC	HFD6	100	65	25	30
C.L.	CFD6	200	200	100	30

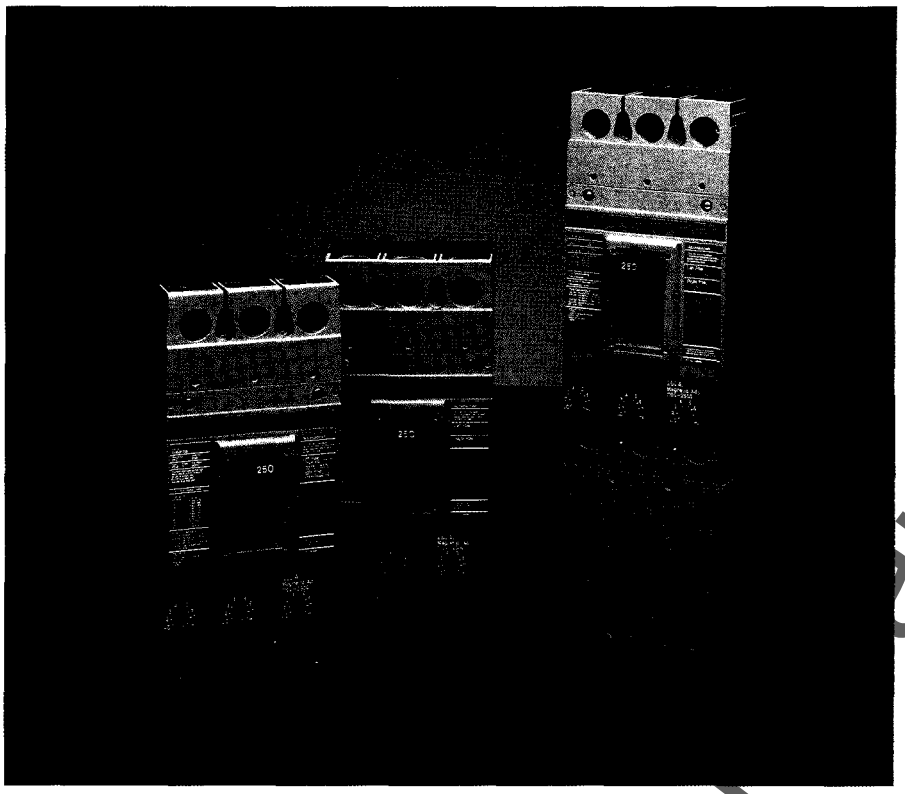
NOTE: All C-prefix breakers are non-interchangeable thermal-magnetic trip designs. All other breaker frames are interchangeable trip unless otherwise designated as non-interchangeable trip by an "X" in the catalog family.

Sensitrip III Solid State

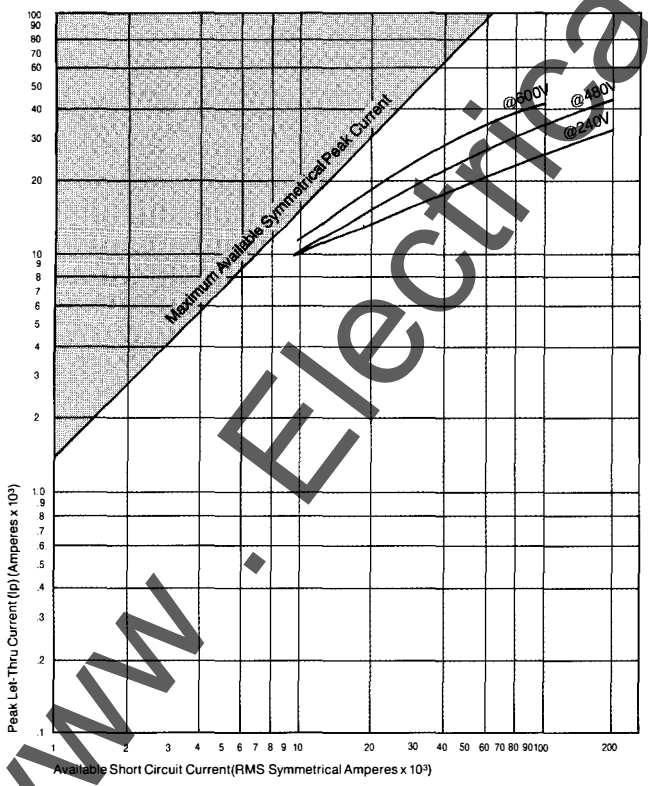
Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)
Std.	SFD6	65	35	18
Hi-IC	SHFD6	100	65	25
C.L.	SCFD6	200	200	100

Accessories

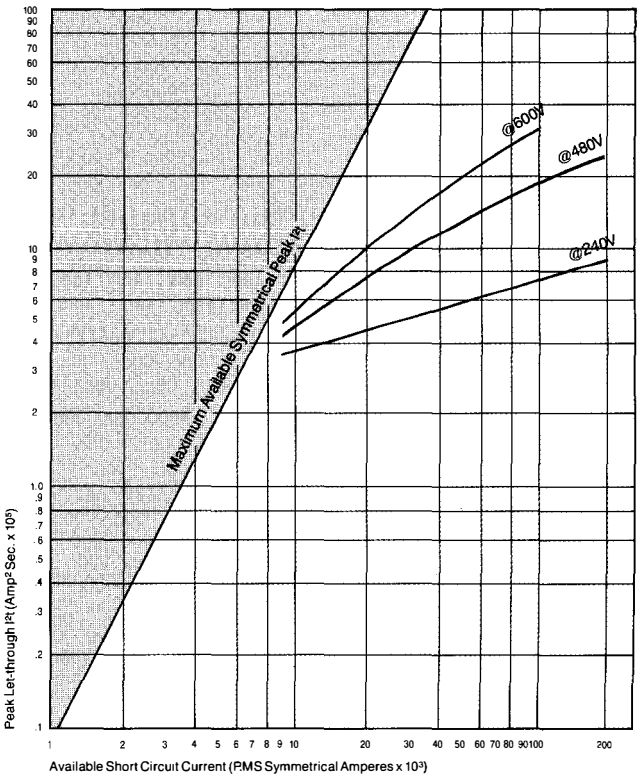
Description	240V AC	480V AC	600V	DC
Undervoltage Trip	X	X	X	X
Shunt Trip	X	X	X	X
Auxiliary Switch	X	X	—	X
Alarm Switch	X	X	—	X
Motor Operator	X	—	—	—
Also available:				
Individual Enclosures Max Flex Operating Handle Rear Connecting Studs Handle Blocking Devices		Handle Extensions Mounting Screw Kits Operating Handles Compression Connectors		



Type CFD6 250A Frame
Peak Current Curves



Type CFD6 250A Frame
I²t Curves



400A Frame

The I-T-E Sentron 400-amp frame circuit breaker provides protection up to 65 kA in standard type frames, 100 kA with high-capacity frames and 200 kA in the current-limiting line when used in 240 volt applications.

With its higher interrupting capacities, this frame exceeds all competition in current-limiting applications. And the reliability we build into each circuit breaker is verified repeatedly at all stages of manufacturing.

Distribution systems are better protected and application options are greater. Sentron circuit breakers deliver real value.

JD-frame circuit breakers provide protection for motor control centers, bus plugs, power panel boards and switchboards, as well as machine tool and resistance welder control panels, just to name a few.

Plus the option of Sensitrip III electronic protection provides even more application flexibility.

I-T-E Sentron Series 400-amp Frame

Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)	250V DC A.I.R. (kA)
Std.	JXD2	65	—	—	30
Std.	JXD6	65	35	25	30
Std.	JD6	65	35	25	30
Hi-IC	HJD6	100	65	35	30
C.L.	CJD6	200	150	100	30

NOTE: All C-prefix breakers are non-interchangeable thermal-magnetic trip designs. All other breaker frames are interchangeable trip unless otherwise designated as non-interchangeable trip by an "X" in the catalog family.

Sensitrip III Solid State

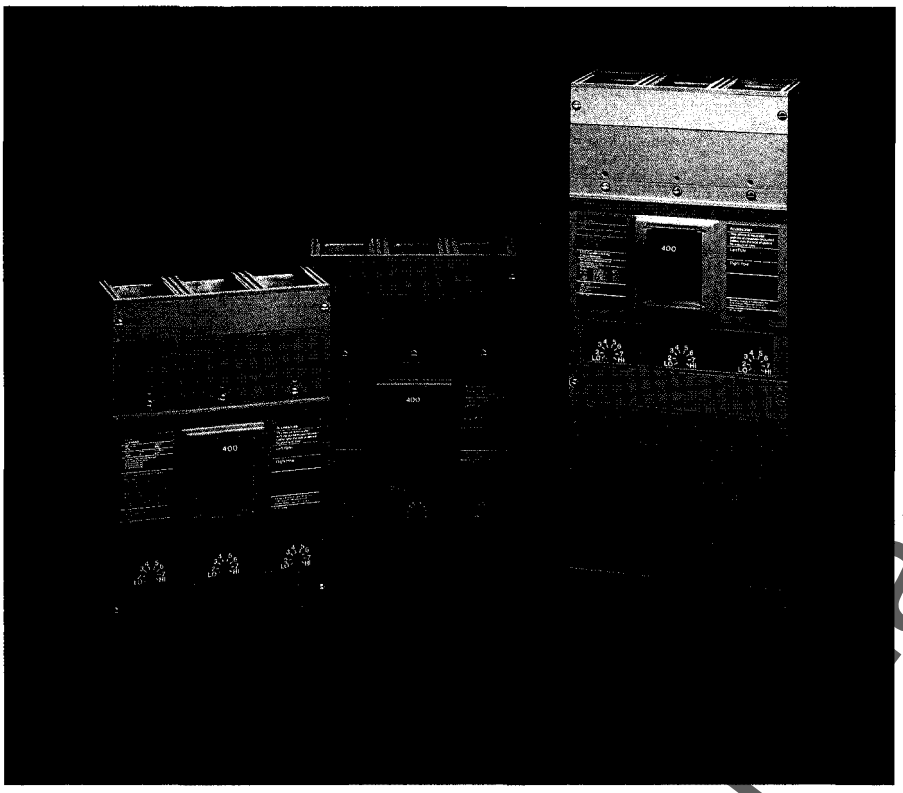
Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)
Std.	SJD6	65	35	25
Hi-IC	SHJD6	100	65	35
C.L.	SCJD6	200	150	100

Accessories

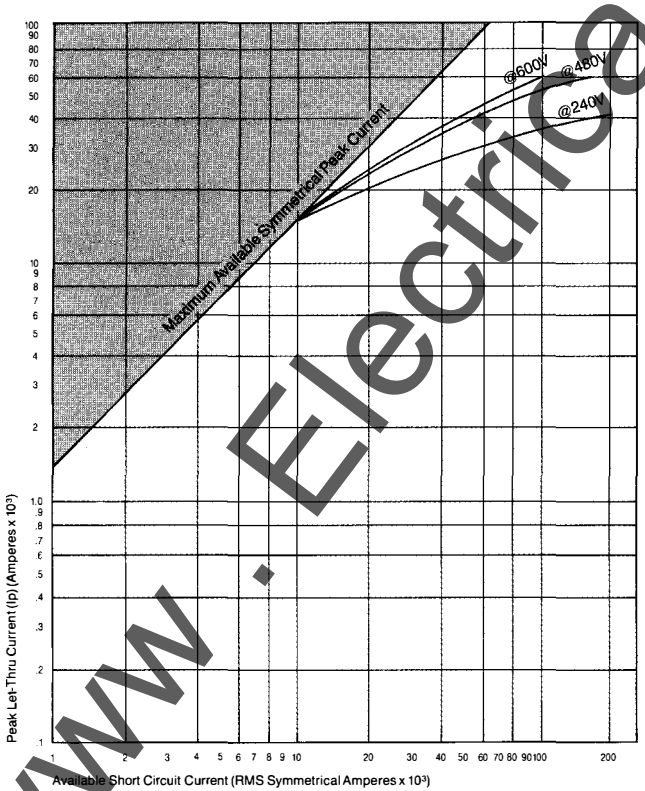
Description	240V AC	480V AC	600V AC	DC
Undervoltage Trip	X	X	X	X
Shunt Trip	X	X	X	X
Auxiliary Switch	X	X	—	X
Alarm Switch	X	X	—	X
Motor Operator	X	—	—	—

Also available:

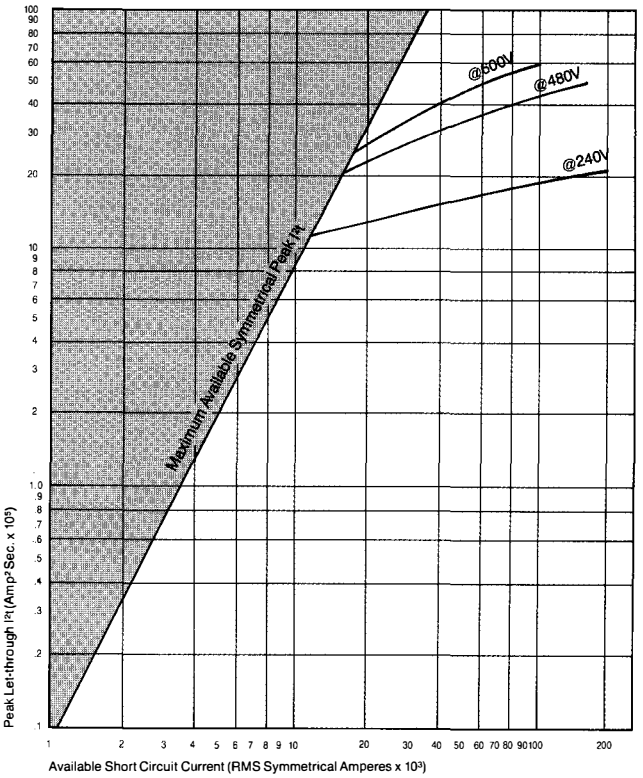
Individual Enclosures
Max-Flex™ Operating Handle
Rear Connecting Studs
Plug-In Mounting Assemblies
Mechanical Interlock
Padlocking Devices
Handle Blocking Devices
Handle Extensions
Mounting Screw Kits
Operating Handles
Compression Connectors



Type CJD6 400A Frame
Peak Current Curves



Type CJD6 400A Frame
I²t Curves



600A Frame

The I-T-E Sentron 600-amp frame circuit breaker, when used in 240 volt applications, interrupts fault currents up to 65 kA in standard type, 100 kA in high-capacity type and 200 kA in the current-limiting frames.

The LD-frame consistently exceeds the competition in the current-limiting range with its higher interrupting ratings—the new industry standard.

And Sentron circuit breakers through the 600-ampere frame size will physically fit existing panelboards and switchboards. No modifications are necessary.

LD-frame circuit breakers protect branch and feeder circuits where higher interrupting capacity is required. They are suitable for use in the same broad family of distribution devices as the rest of the Sentron Series

Once again, this frame is complimented by the true RMS sensing capabilities available in the optional electronic version of the LD-frame.

I-T-E Sentron Series 600-amp Frame

Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)	250V DC A.I.R. (kA)
Std.	LXD6	65	35	25	30
Std.	LD6	65	35	25	30
Hi-IC	HLD6	100	65	35	30
C.L.	CLD6	200	150	100	30

NOTE: All C-prefix breakers are non-interchangeable thermal-magnetic trip designs. All other breaker frames are interchangeable trip unless otherwise designated as non-interchangeable trip by an "X" in the catalog family.

Sensitrip III Solid State

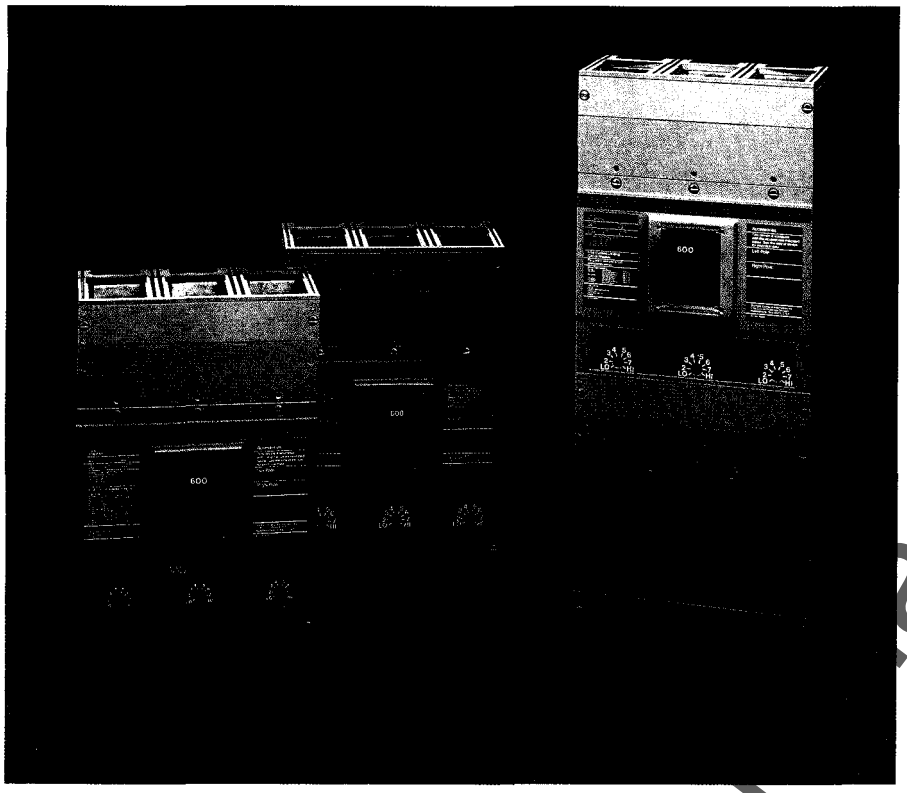
Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)
Std.	SLD6	65	35	25
Hi-IC	SHLD6	100	65	35
C.L.	SCLD6	200	150	100

Accessories

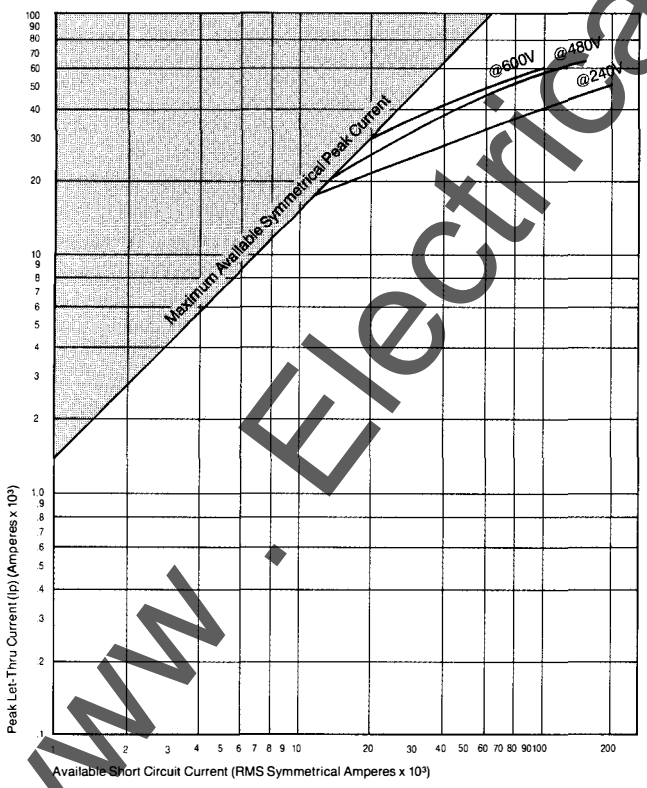
Description	240V AC	480V AC	600V AC	DC
Undervoltage Trip	X	X	X	X
Shunt Trip	X	X	X	X
Auxiliary Switch	X	X	—	X
Alarm Switch	X	X	—	X
Motor Operator	X	—	—	—

Also available:

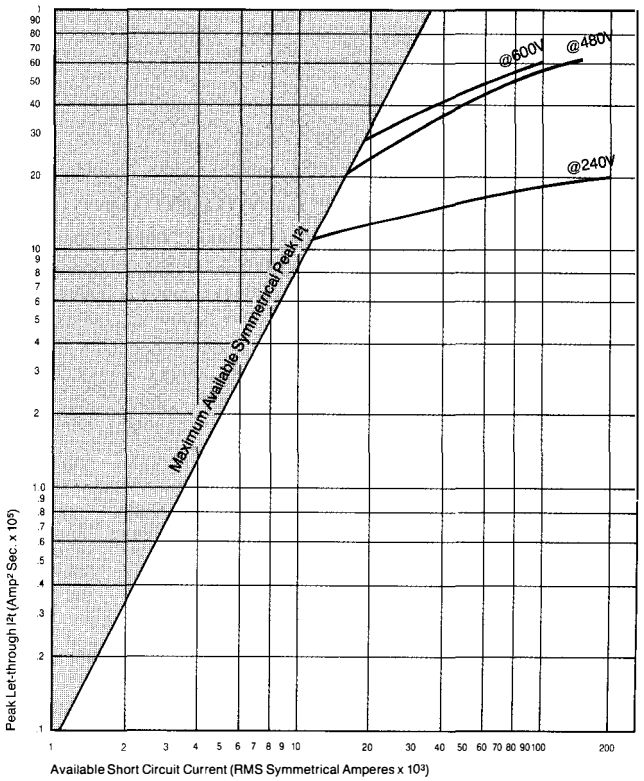
Individual Enclosures
Max-Flex™ Operating Handle
Rear Connecting Studs
Plug-In Mounting Assemblies
Mechanical Interlock
Padlocking Devices
Handle Blocking Devices
Handle Extensions
Mounting Screw Kits
Operating Handles
Compression Connectors



Type CLD6 600A Frame
Peak Current Curves



Type CLD6 600A Frame
I²t Curves



When used in 240 volt applications, the I-T-E Sentron 800-amp frame circuit breaker provides coverage up to 65 kA in standard type circuit breakers, 100 kA in high-capacity types and 200 kA in the current-limiting line.

Some of our competitors do not even offer an 800-amp frame. They require using a more expensive 1200-amp continuous current circuit breaker to cover applications between 600 and 800 amperes. I-T-E circuit breakers can meet needs to the amp.

MD-frame circuit breakers provide better service entrance protection. They are ideal for main distribution feeder circuits where high available fault current exists.

In addition to the advantage available with the optional electronic version of this breaker, the MD-frame also offers users a choice of standard 80%, or *optional 100% rated frames in 240, 480 and 600 volt ratings.*

I-T-E Sentron Series 800-amp Frame

Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)	250V DC A.I.R. (kA)
Std.	MD6	65	50	25	30
Hi-IC	HMD6	100	65	50	30
C.L.	CMD6	200	100	50	30

NOTE: All C-prefix breakers are non-interchangeable thermal-magnetic trip designs. All other breaker frames are interchangeable trip unless otherwise designated as non-interchangeable trip by an "X" in the catalog family.

Sensitrip III Solid State

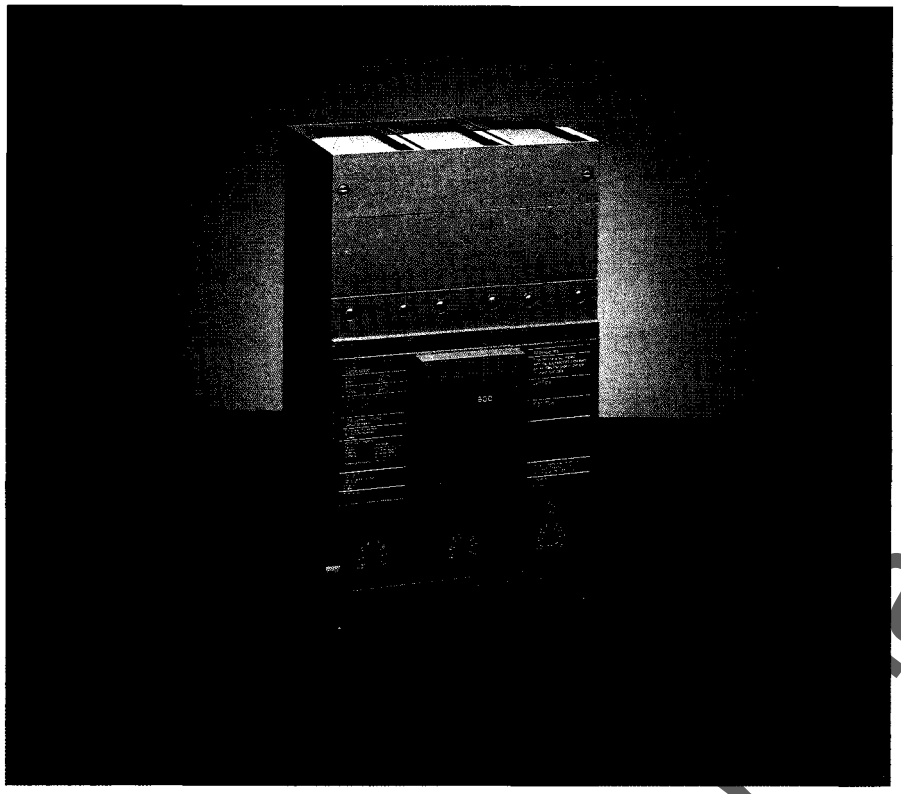
Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)
Std.	SMD6	65	50	25
Hi-IC	SHMD6	100	65	50
C.L.	SCMD6	200	100	50

Accessories

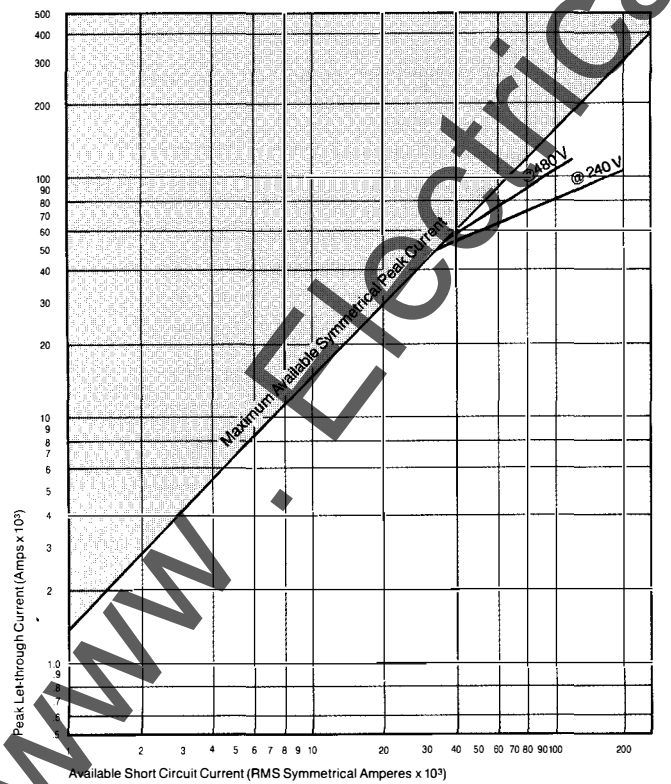
Description	240V AC	480V AC	600V AC	DC
Undervoltage Trip	X	X	X	X
Shunt Trip	X	X	X	X
Auxiliary Switch	X	X	—	X
Alarm Switch	X	X	—	X
Motor Operator	X	—	—	—

Also available:

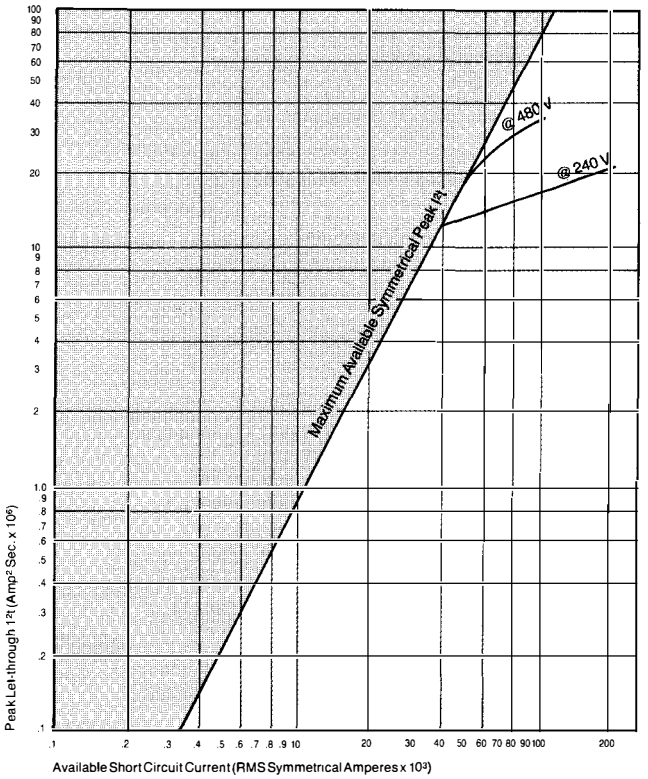
Individual Enclosures	Handle Blocking Devices
Max-Flex™ Operating Handle	Mounting Screw Kits
Rear Connecting Studs	Back Mounting Plates
Plug-In Mounting Assemblies	Operating Handles
Padlocking Devices	Compression Connectors



Type CMD 800A Frame
Peak Current Curves



Type CMD 800A Frame
I²t Curves



The I-T-E Sentron Series 1200-amp frame circuit breaker, when used in 240 volt applications, interrupts up to 65 kA in standard type circuit breakers, 100 kA in high-capacity and 200 kA in current-limiting types.

Like other frames in the Sentron family, the ND-frame breaker has raised the standard for interrupting ratings. We've upgraded the industry standard with the Sentron Series line covering 125 amps to 1200 amps. And they're all available now.

And like the FD, JD, LD and MD-frames, the ND-frame is available with all the advantages of true RMS sensing in the optional Sensitrip III electronic version.

A 100% rated frame also compliments the wide choice of options available to users.

ND-frame circuit breakers provide protection for service entrance and main distribution feeders in switchboards. They also protect branch and feeder breakers in high fault current applications, plus a myriad of other applications where performance is critical.

I-T-E Sentron Series 1200-amp Frame

Interrupting Class	Breaker Type	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)	250V DC A.I.R. (kA)
Std.	ND6	65	50	25	30
Hi-IC	HND6	100	65	50	30
C.L.	CND6	200	100	50	30

NOTE: All C-prefix breakers are non-interchangeable thermal-magnetic trip designs. All other breaker frames are interchangeable trip unless otherwise designated as non-interchangeable trip by an "X" in the catalog family.

Sensitrip III Solid State

Interrupting Class	Breaker Family	240V AC A.I.R. (kA)	480V AC A.I.R. (kA)	600V AC A.I.R. (kA)
Std.	SND6	65	50	25
Hi-IC	SHND6	100	65	50
C.L.	SCND6	200	100	50

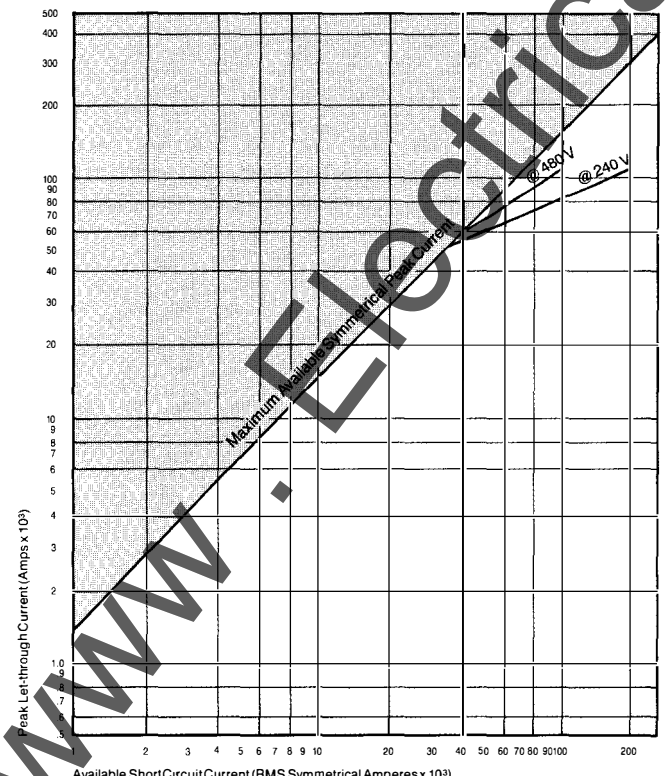
Accessories

Description	240V AC	480V AC	600V AC	DC
Undervoltage Trip	X	X	X	X
Shunt Trip	X	X	X	X
Auxiliary Switch	X	X	—	X
Alarm Switch	X	X	—	X
Motor Operator	X	—	—	—

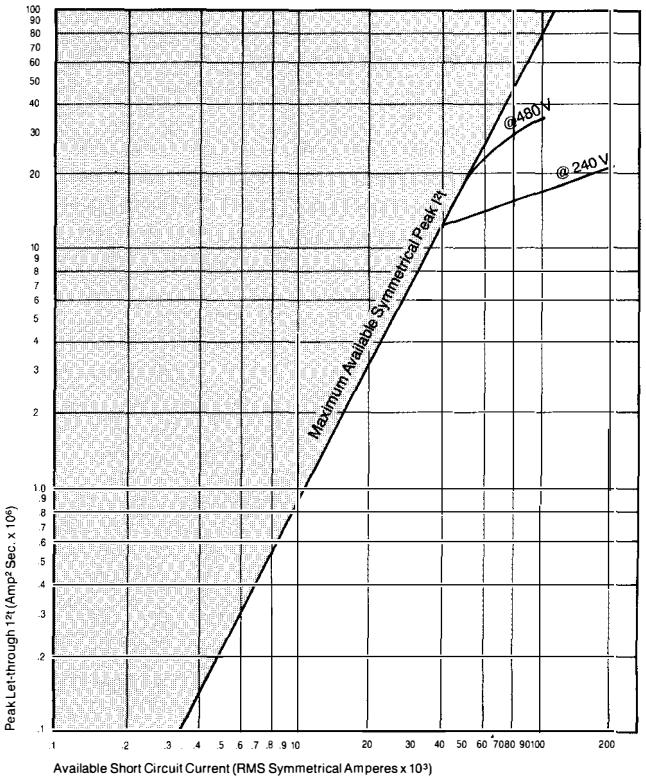
Also available:

Individual Enclosures	Padlocking Devices
Max-Flex™ Operating Handle	Handle Blocking Devices
Rear Connecting Studs	Mounting Screw Kits
Plug-In Mounting Assemblies	Operating Handles
Mechanical Interlock	Compression Connectors

Type CND 1200A Frame
Peak Current Curves



Type CND 1200A Frame
I²t Curves



Internal Accessories

The I-T-E Sentron package is even more attractive when viewed with the scope of accessories available with our circuit breakers. These accessories allow easy modification of circuit breakers, without need for a UL-qualified assembler nor the months of lead time required to have an accessory factory-installed.

For convenience, our UL listed accessories for 125 through 1200 ampere frames are field-addable, easy to install and order. This is not the case with many accessories from other manufacturers. And we're the only manufacturer yet to offer field-addable shunt trip, undervoltage trip, auxiliary switch and alarm switch accessories for the 125-ampere frame.

Internal accessories include our shunt trip device that allows one or more circuit breakers to be tripped at the push of a button from a remote control point. Operating through an auxiliary switch contact, current cannot be maintained on the shunt trip coil once the breaker opens. The mechanism is engineered for reliability, ensuring that trip coil life expectancy is very high.

The I-T-E undervoltage trip automatically opens a circuit breaker when voltage drops to a predetermined value (35% to 70% of the line voltage). The operation is instantaneous, and the circuit breaker cannot be reclosed until the voltage returns to 85% of line voltage. The undervoltage trip, which is continuously energized, must be operating before the circuit breaker can be closed.

Siemens manufactures a broad line of auxiliary switches for applications requiring remote "on" and "off" indication or electrical interlocking. Each switch contains two contacts having a common connection. One is open and the other closed when the circuit breaker is open, and vice-versa.

Our alarm switches offer provisions for immediate audio or visual indication of a tripped breaker due to overload, short circuit, shunt trip or undervoltage trip conditions. They are particularly useful in automated plants where operators must be signalled about changes in the electrical distribution system. This switch features a closed contact when the circuit breaker is tripped automatically. In other words, this switch does not function when the breaker is operated manually. Its contact is opened when the circuit breaker is reset.

External Accessories

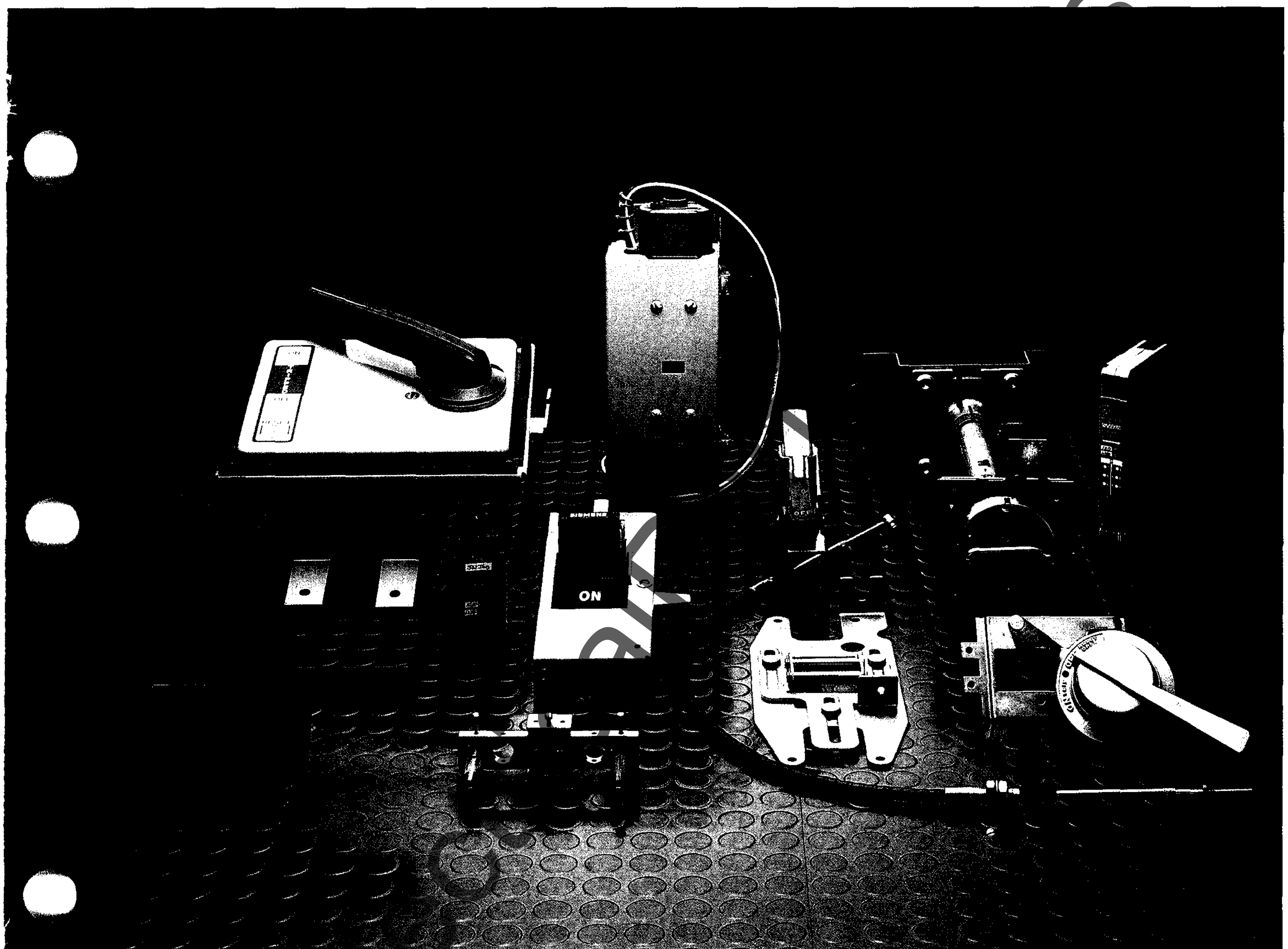
Our field-addable external accessories lend extra flexibility and save installation time and money. Few manufacturers offer such a complete line.

And we are constantly looking for ways to improve on these designs. Our newest external accessory is the Max-Flex™ handle operator which uses a single sturdy cable in place of typical rigid links. The cable is flexible, allowing the circuit breaker to be mounted almost anywhere at any angle, on almost any convenient surface.

The Max-Flex handle operator works with I-T-E circuit breakers from 125 to 1200 amperes continuous current, and can be ordered in lengths up to 20 feet. It comes standard in 3- and 4-foot lengths.

I-T-E circuit breakers are easily adaptable with a complete line of external accessories including:

- Plug-in mounting assemblies
- Mounting clips
- Mounting screw kits
- External operating handles
- Handle blocking devices
- Padlocking devices
- Rear-connecting studs
- Mounting plates
- Filler plates
- Handle extensions
- Mechanical interlocks
- Motor operators
- Compression Connectors


ON

General Specifications

I-T-E molded case circuit breakers shall be provided for the protection of all electrical circuits.

Other makes of molded case circuit breakers will not be accepted until approved by this office.

All circuit breakers shall be listed by Underwriters Laboratories, Inc., conform to applicable requirements of NEMA Standard Publication No. AB1-1986 and meet appropriate classifications of Federal Specifications W-C375B/Gen.

All circuit breakers shall have a quick-make, quick-break, over center toggle mechanism and the handle mechanism shall be trip-free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. Multi-pole circuit breakers shall be common-trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings are to be clearly visible.

(Choose either thermal magnetic or solid state sensing specifications.)

Thermal Magnetic Specifications

Automatic operation of all circuit breakers shall be obtained by means of thermal magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Circuit breakers shall be calibrated to carry 100% rated current in a 40 degrees centigrade environment. Circuit breakers shall be compensating in that, as the ambient temperature increases over 40 degrees centigrade, the circuit breaker automatically derates itself so as to better protect its associated conductor. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes 250A and above.

Solid State Sensing Specifications

Solid state sensing shall measure true RMS current with capability to measure through to the 21st harmonic. Automatic operation of all circuit breaker frames 250A and larger shall be obtained by means of solid state tripping elements providing inverse time delay and (instantaneous) or (short-time delay) circuit protection.

Continuous current rating shall be adjustable from 20% to 100% of trip unit rating. Long-time delay shall be adjustable. The instantaneous trip shall be adjustable from 3 to 10 times continuous current setting.

The optional short-time pick-up trip shall be adjustable from 3 to 10 times the continuous current setting with an adjustable short-time delay and an adjustable short-time I^2t function.

Circuit breaker frames 800A and larger and where indicated on the drawings shall be 100% equipment rated.

Integral Ground Fault Option

Main and feeder circuit breakers as indicated on the drawings shall be provided with integral ground fault protection. Ground fault pickup shall be adjustable from 25% to 85% of circuit breaker maximum continuous current rating, but in no case greater than 1200 amps. Ground fault time delay shall be adjustable to 6, 18 or 30 cycles.

(add here for current limiting specifications)

Current Limiting Specifications

Where indicated on the drawings, and in the panelboard and switchboard schedules, I-T-E Sentron Series current-limiting circuit breakers are to be furnished. Current-limiting circuit breakers shall limit the let-through I^2t to a value less than the I^2t of one-half cycle wave of the symmetrical prospective current without any fusible elements when operating within its current limiting range.

(add here for instantaneous magnetic trip only specifications)

Instantaneous Magnetic Trip Only Specifications

Where indicated on the drawings and in the combination motor starter/motor control center schedule, furnish instantaneous magnetic trip only circuit breakers for motor short circuit protection. The magnetic trips shall be adjustable and accessible from the front of all these circuit breakers.

The interrupting ratings of the circuit breakers shall be as indicated in the specifications shown on the drawings in the panelboard/switchboard schedules, or as shown on the single line drawing. The interrupting ratings of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to the UL listed integrated short circuit current rating specified for the panelboards and switchboards.

(add here for series connected combination specifications)

Series Connected Combination Specifications

However, the minimum interrupting ratings of circuit breakers used as feeders and branches shall be in accordance with prescribed UL recognized series connected circuit breaker combinations. All electrical equipment using these UL recognized circuit breaker combinations shall be clearly marked indicating same.

Circuit breaker modifications, if any, are as specified under "other" such as panelboards, switchboards and/or motor controls.

Ordering your Sentron Series Circuit Breakers

Each standard I-T-E molded case circuit breaker catalog number consists of five parts. The proper Sentron Series circuit breaker for a particular application can easily be ordered by following these steps:

Breaker type	Number of poles	Type of breaker in this frame size (i.e., interrupting category) Letter designations for part 3 are defined as follows:	Continuous current ampere rating of circuit breaker	Special circuit breaker identifier suffix; e.g., automatic switches

B = 40 degrees centigrade complete circuit breaker*

M = 50 degrees centigrade complete circuit breaker

F = frame

T = trip unit calibrated for 40 degrees centigrade

W = trip unit calibrated for 50 degrees centigrade

S = molded case switch

Sensitrip III Circuit Breakers

The continuous current function and long time adjustment are standard on all Sensitrip III circuit breakers. Use the Catalog Number Building diagram to create the correct catalog number for the Sensitrip III circuit breaker required for a particular application.

Sensitrip III

Frame Size (Amperes)	Breaker Type: Blue Label	Black Label	Red Label	Sensitrip III Indicator	Continuous Current Ratings	Suffix Letter*
250	SFD6	SHFD6	SCFD6	9	150, 250	G, NT, NGT
400	SJD6	SHJD6	SCJD6	9	200, 300, 400	G, NT, NGT
600	SLD6	SHLD6	SCLD6	9	300, 400, 500, 600	G, NT, NGT
800	SMD6	SHMD6	SCMD6	9	600, 700, 800	G, NT, NGT
1200	SND6	SHND6	SCND6	9	800, 1000, 1200	G, NT, NGT

Suffix Letter Code	Continuous Current Adjustment (standard)	Long Time Delay (standard)	Adjustable Instantaneous Setting	Short Time Pick-Up	Short Time Delay	Short Time I^2t Pick-Up	Ground Fault Pick-Up	Ground Fault Delay
No Letter	X	X	X					
Letter - G	X	X	X				X	X
Letters - NT	X	X	X	X	X	X		
Letters - NGT	X	X	X	X	X	X	X	X

Frame Rating	Breaker Type	Ampere Rating Available: 150	200	250	300	400	500	600	700	800	1000	1200	RMS Symmetrical Amperes Interrupting Rating (VAC): 240	480	600
250	SFD6	X		X									65	35	18
	SHFD6	X		X									100	65	25
	SCFD6	X		X									200	200	100
400	SJD6		X		X	X							65	35	25
	SHJD6		X		X	X							100	65	35
	SCJD6		X		X	X							200	150	100
600	SLD6				X	X	X	X					65	35	25
	SHLD6				X	X	X	X					100	65	35
	SCLD6				X	X	X	X					200	150	100
800	SMD6							X	X	X			65	50	25
	SHMD6							X	X	X			100	65	50
	SCMD6							X	X	X			200	200	50
1200	SND6									X	X	X	65	50	25
	SHND6									X	X	X	100	65	50
	SCND6									X	X	X	200	100	50

*For 100% rated circuit breaker, add the suffix "H" to the catalog number.

SIEMENS

Siemens Energy
& Automation, Inc.
I-T-E Circuit Protection Division
3333 State Bridge Rd.
Alpharetta, GA 30201

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