

# Molded Case Circuit Breakers

## COMPACT® NSE75 Motor Circuit Protector

### Motor Circuit Protector

The new type NSE75HC circuit breaker for motor circuit protection takes full advantage of exceptional current limitation with an extremely low clearing time, let-through current and  $I^2t$ . This allows type-2 coordination with most of the contactors.

The COMPACT® NSE circuit breaker is supplied with an instantaneous-only trip unit. This provides short-circuit protection as a part of a combination motor controller where overload protection is performed by other relays coordinated with the contactors.

COMPACT® NS circuit breakers offer long-term safety and the best probability of continuous energy supply with convenience of operation:

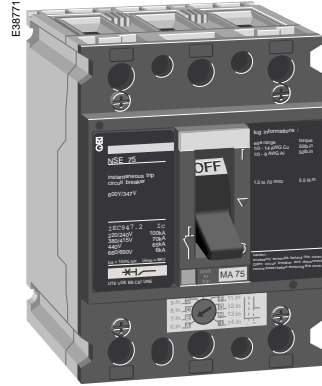
- Compliance with most standards and agreements worldwide
- Suitability for isolation with positive break indication
- Moisture and fungus protection
- Reinforced insulation
- Snap-in field-installable accessories
- Reverse feeding
- Maintenance-free operation

### Compliance with Standards

USA	UL 489
Canada	CSA C22.2 No. 5.1
Mexico	NOM J265/266
International	IEC 947-1 to 3
Europe	EN 60947
France	NF EN 60947-2
Germany	VDE 0660
Great Britain	BS 4752
Italy	CEI EN 60947-2

### Interrupting Ratings (RMS sym. kAmps)

		NSE75HC							
UL 489 Recognized and CSA 22.2 No. 5 Certified		In combination with a contactor and overload relay (see page 3)							
IEC 947-2 Certified		$I_{cu}$							
	AC 50/60 Hz	220/240 V	100						
		380/415 V	70						
		440 V	65						
		690 V	6						
		$I_{cs}$	(% $I_{cu}$ )	100%					
Rated current (A)	$I_n$	40°C	3	7	15	30	50	75	
Magnetic range (A)	$I_m$	(3 to 11 x $I_n$ )	9-33	21-77	45-165	90-330	150-550	225-825	



### MAG-LOC™ Feature

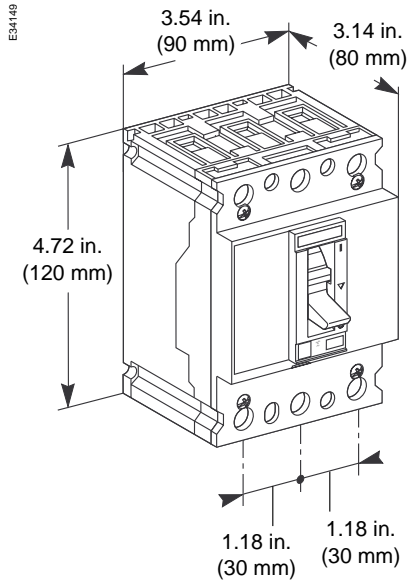
The MAG-LOC adjustment range limiter allows a user to limit the adjustment of the instantaneous-trip setting within the range of three to eleven times the rated current. Once the range has been set, replace the cover and install a cover seal to prevent tampering. This feature allows adjustment within a predefined, customized range of short-circuit protection.



**SQUARE D**  
GROUPE SCHNEIDER

## Installation and Connection

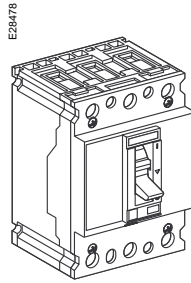
### Dimensions



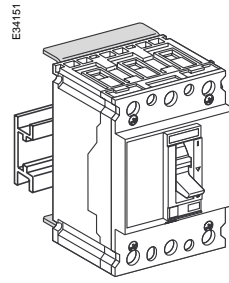
### Weight

NSE75	3-Pole	2.21 lb (1.0 kg)
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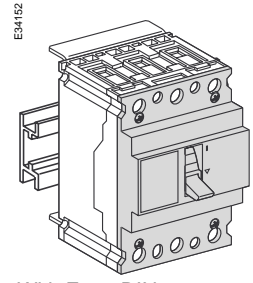
### Installation



Fixed Circuit Breaker

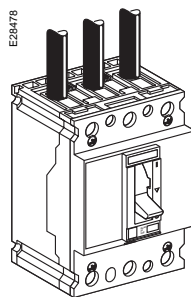


On DIN rail with Optional Adapter



With Front DIN Accessory Cover

### Cable Connection



### Cable Range

#14 AWG–1/0 AWG Cu  
 #8 AWG–1/0 AWG Al  
 1.5–50 mm<sup>2</sup>

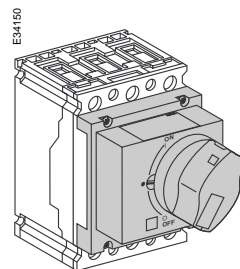
## Auxiliary Devices for Indication and Control

### Rotary Handles:

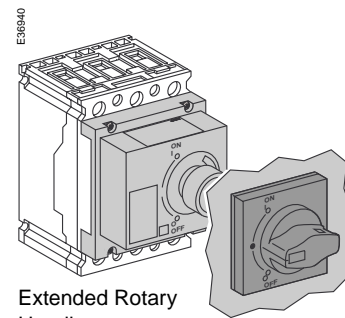
- Direct or extended rotary handle
- Black front and toggle or red toggle with yellow bezel (for machine tools or emergency switch as per IEC 204 and VDE 0113)
- All rotary handles can be padlocked in off “disconnected” position

### Door locking available as an option, recommended for motor control centers:

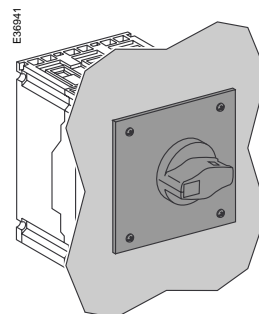
- Cable-operated handle
- Gray painted on chrome handle
- Available in 3.5 (1.07 m) or 10 ft. (3.5 m) lengths to provide the ultimate in mounting flexibility
- Handle can be padlocked (up to three locks) in off position
- Door can be locked closed by placing lock on handle
- Padlocking and keylocking devices
- Maximum of one SPDT auxiliary switch + one alarm switch for tripping position
- Shunt trip and undervoltage releases



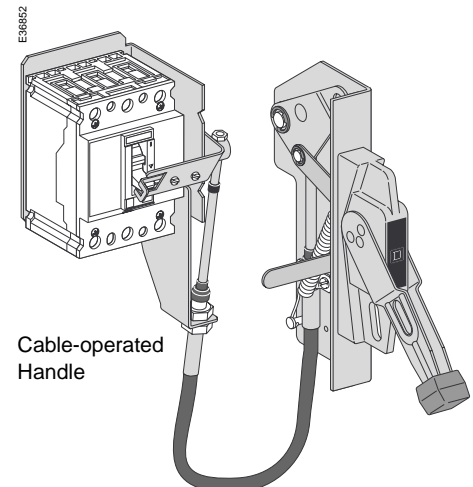
Rotary Handle



Extended Rotary Handle



Direct Rotary Handle MCC Type



Cable-operated Handle

## UL Listed Combinations as per UL 508

The circuit breaker and contactor combinations, shown below, are Listed per UL 508 and are suitable for use on circuits capable of delivering no more than 100 kA RMS maximum at 480 Vac and 25 kA RMS maximum at 600 Vac.

Circuit Breaker Type	Catalog No.	Rating (A)	Magnetic (A)	LC1 or LC2 Contactor Type	Overload Relay Full-load Range (A)	Class 10	Class 20
NSE75HC	NEHL36015M03	15	45-165	D09 or D12	4-6	LR2D1310	LR2D1510
NSE75HC	NEHL36015M03	15	45-165	D09 or D12	5.5-8	LR2D1312	LR2D1512
NSE75HC	NEHL36015M03	15	45-165	D09 or D12	7-9	LR2D1314	LR2D1514
NSE75HC	NEHL36015M03	15	45-165	D12	9-12	LR2D1316	LR2D1516
NSE75HC	NEHL36015M04	30	90-330	D18 or D25	12-17.5	LR2D1321	LR2D1521
NSE75HC	NEHL36015M04	30	90-330	D25	17-22	LR2D1322	LR2D1522
NSE75HC	NEHL36015M05	50	150-550	D32	17-25	LR2D1322	LR2D1522
NSE75HC	NEHL36015M05	50	150-550	D32	23-28	LR2D2353	LR2D2553
NSE75HC	NEHL36015M05	50	150-550	D40	23-30	LR2D3353	LR2D3553
NSE75HC	NEHL36015M05	50	150-550	D40	30-37	LR2D3355	LR2D3555
NSE75HC	NEHL36015M05	50	150-550	D40	37-40	LR2D3357	LR2D3557

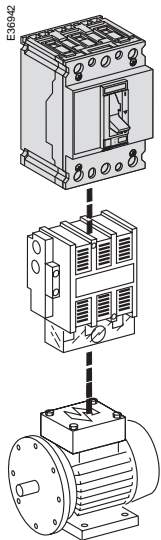
Horsepower (three phase)				Circuit Breaker Rating (A)	Contactor LC1 or LC2
200 V	230-240 V	440-460 V	550-600 V		
2	2	5	7-1/2	15	D09
3	3	7-1/2	10	15	D12
5	5	10	15	30	D18
5	7-1/2	15	20	30	D25
7-1/2	10	20	25	50	D32
10	10	30	30	50	D40

## Full-load Motor Running Currents

In amperes corresponding to various ac horsepower ratings (cf table 42.2 UL 508).

Horsepower	110-120 Volts			220-240 Volts			380-415 Volts		440-480 Volts			550-600 Volts		
	Single Phase	Two Phase	Three Phase	Single Phase	Two Phase	Three Phase	Single Phase	Three Phase	Single Phase	Two Phase	Three Phase	Single Phase	Two Phase	Three Phase
1/10	3.0	—	—	1.5	—	—	1.0	—	—	—	—	—	—	—
1/8	3.8	—	—	1.9	—	—	1.2	—	—	—	—	—	—	—
1/6	4.4	—	—	2.2	—	—	1.4	—	—	—	—	—	—	—
1/4	5.8	—	—	2.9	—	—	1.8	—	—	—	—	—	—	—
1/3	7.2	—	—	3.6	—	—	2.3	—	—	—	—	—	—	—
1/2	9.8	4.0	4.0	4.9	2.0	2.0	3.2	1.3	2.5	1.0	1.0	2.0	0.8	0.8
3/4	13.8	4.8	5.6	6.9	2.4	2.8	4.5	1.8	3.5	1.2	1.4	2.8	1.0	1.1
1	16.0	6.4	7.2	8.0	3.2	3.6	5.1	2.3	4.0	1.6	1.8	3.2	1.3	1.4
1-1/2	20.0	9.0	10.4	10.0	4.5	5.2	6.4	3.3	5.0	2.3	2.6	4.0	1.8	2.1
2	24.0	11.8	13.6	12.0	5.9	6.8	7.7	4.3	6.0	3.0	3.4	4.8	2.4	2.8
3	34.0	16.6	19.2	17.0	8.3	9.6	10.9	6.1	8.5	4.2	4.8	6.8	3.3	3.9
5	56.0	26.4	30.4	28.0	13.2	15.2	17.9	9.7	14.0	6.6	7.6	11.2	5.3	6.1
7-1/2	80.0	38.0	44.0	40.0	19.0	22.0	27.0	14.0	21.0	9.0	11.0	16.0	8.0	9.0
10	100.0	48.0	56.0	50.0	24.0	28.0	33.0	18.0	26.0	12.0	14.0	20.0	10.0	11.0
15	135.0	72.0	84.0	68.0	36.0	42.0	44.0	27.0	34.0	18.0	21.0	27.0	14.0	17.0
20	—	94.0	108.0	88.0	47.0	54.0	56.0	34.0	44.0	23.0	27.0	35.0	19.0	22.0
25	—	118.0	136.0	110.0	59.0	68.0	70.0	44.0	55.0	29.0	34.0	44.0	24.0	27.0
30	—	138.0	160.0	136.0	69.0	80.0	87.0	51.0	68.0	35.0	40.0	54.0	28.0	32.0

## IEC Rated Combinations as per IEC 947-4



A circuit supplying a motor may include one, two, three or four switchgear or control gear devices fulfilling one or more functions.

When several devices are used, they must be coordinated to ensure optimum operation of the motor.

Protection of a motor circuit involves a number of parameters that depend on:

- The application (type of machine driven, operating safety, starting frequency, etc.)
- The level of service continuity imposed by the load or the application
- The applicable standards to ensure protection of life and property

The necessary electrical functions include:

- Protection (motor-dedicated for overloads)
- Control (generally with high endurance levels)
- Isolation

### Two Types of Coordination

The standard defines tests at different current levels. The purpose of these tests is to place the switchgear and control gear in extreme conditions. Depending on the state of the components following the tests, the standard defines two types of coordination.

■ **Type-1:** Deterioration of the contactor and the relay is acceptable under two conditions:

- No danger to operating personnel
- No danger to any components other than the contactor and the relay

■ **Type-2:** Only minor welding of the contactor or starter contacts is permissible and the contacts must be easily separated.

Following Type-2 coordination tests, the switchgear and control gear functions must be fully operational.

### Type-2 Coordination Characteristics

The standard defines in detail the points which must be considered to ensure effective coordination (Type-2).

■ Complete compatibility between:

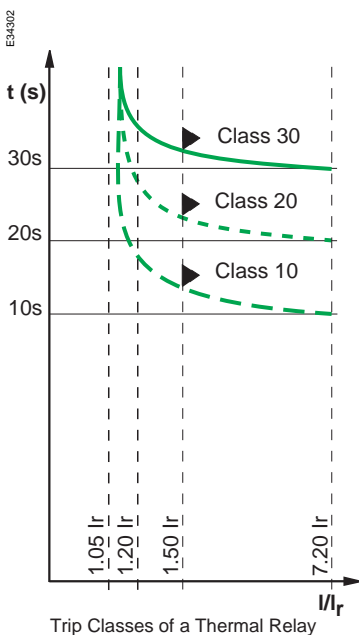
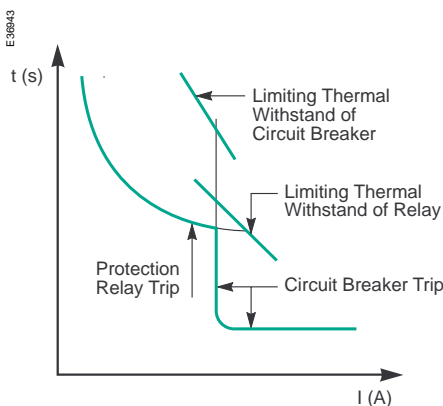
The thermal relay and the magnetic release of the circuit breaker. As shown in the figure at left, the stress limit of the thermal relay must be to the right of the magnetic threshold.

The upper limit of the thermal relay (according to class) and the thermal stress limit of the circuit breaker.

■ The rated breaking capacity of the contactor must be greater than the magnetic setting of the circuit breaker. If this is not the case, the contactor must be able to occasionally break an independent fault current higher than or equal to the magnetic protection setting ( $I_{rm}$ ) of the circuit breaker.

■ Good performance of both devices under breaking stresses (e.g., neither the contactor nor the thermal relay must suffer damage in the event of a short-circuit)

■ The circuit breaker itself must have an adequate breaking capacity. The breaking capacity of the circuit breaker must be greater than the maximum short-circuit which may occur at this level of the installation.



### Trip Classes of a Thermal Relay

The four trip classes of a thermal relay are 10A, 10, 20 and 30 (maximum tripping times at  $7.2 I_n$ ).

Classes 10 and 10A are the most commonly used. Classes 20 and 30 are reserved for motors with difficult starting conditions.

The diagram at left, and the table below can be used to select a thermal relay suited to the motor starting time.

Class	$1.05 I_n$	$1.2 I_n$	$1.5 I_n$	$7.2 I_n$
10A	$t > 2 \text{ h}$	$t < 2 \text{ h}$	$t < 2 \text{ min.}$	$2 \leq t \leq 10 \text{ s}$
10	$t > 2 \text{ h}$	$t < 2 \text{ h}$	$t < 4 \text{ min.}$	$4 \leq t \leq 10 \text{ s}$
20	$t > 2 \text{ h}$	$t < 2 \text{ h}$	$t < 8 \text{ min.}$	$6 \leq t \leq 20 \text{ s}$
30	$t > 2 \text{ h}$	$t < 2 \text{ h}$	$t < 12 \text{ min.}$	$9 \leq t \leq 30 \text{ s}$

## Circuit Breaker-Contactor-Relay Coordination as per IEC 947-4

### Breaking Performance $I_q$ (kA RMS)

220/240 V	100
380/415 V	70
440 V	65
500 V	25
525 V	25
660/690 V	6

The tables below indicate, depending on the supply voltage and rated power of the motor, the devices to be used according to the required coordination:

- COMPACT® NSE75HC circuit breaker by MERLIN GERIN®
- Contactor and protection relay by TELEMECANIQUE®

### Starting Time

The devices below are for a Class 10A overload relay for motors with normal starting time. For motors with long starting times, use the equivalent Class 20 relay (LR2-D15 instead of LR2-D13, LR2-D35 instead of LR2-D33).

### Type-1

Motor		380/415 V		415 V		440 V		500/525 V		660/690 V		Circuit Breaker Type	Cal (A)	Contactor Type	Thermal Relay Type	Thermal Current $I_{rth}$
P(kW)	I(A)	P(kW)	I(A)	P(kW)	I(A)	P(kW)	I(A)	P(kW)	I(A)	P(kW)	I(A)					
—	—	0.37	1.2	0.37	1.1	0.37	1.0	0.55	1.2	0.75	1.2	NSE75HC	3	LC1-D09	LR2-D13 06	1/1.6
—	—	0.55	1.6	0.55	1.5	0.55	1.4	0.75	1.5	1.10	1.5	NSE75HC	3	LC1-D09	LR2-D13 06	1.25/2
0.37	1.8	0.75	2.0	0.75	1.8	0.75	1.7	—	—	—	—	NSE75HC	3	LC1-D09	LR2-D13 07	1.6/2.5
—	—	—	—	—	—	1.10	2.4	1.10	2.0	1.50	2.0	NSE75HC	3	LC1-D09	LR2-D13 07	1.6/2.5
—	—	—	—	1.10	2.5	—	—	1.50	2.6	—	—	NSE75HC	7	LC1-D09	LR2-D13 08	2.5/4
0.55	2.8	1.10	2.6	1.50	3.5	1.50	3.1	—	—	2.20	2.8	NSE75HC	7	LC1-D09	LR2-D13 08	2.5/4
—	—	—	—	—	—	—	—	—	—	3.00	3.8	NSE75HC	7	LC1-D09	LR2-D13 08	2.5/4
1.10	4.4	2.20	5.0	2.20	4.8	2.20	4.5	3.00	5.0	4.00	4.9	NSE75HC	7	LC1-D09	LR2-D13 10	4/6
1.50	6.1	3.00	6.6	3.00	6.5	3.00	5.8	4.00	6.5	5.50	6.6	NSE75HC	15	LC1-D09	LR2-D13 12	5.5/8
2.20	8.7	4.00	8.5	4.00	8.2	4.00	7.9	5.50	9.0	—	—	NSE75HC	15	LC1-D09	LR2-D13 14	7/10
—	—	—	—	—	—	—	—	—	—	7.50	8.9	NSE75HC	15	LC1-D12	LR2-D13 14	7/10
3.00	11.5	5.50	11.5	5.50	11.0	5.50	10.4	7.50	12.0	—	—	NSE75HC	15	LC1-D12	LR2-D13 16	9/13
4.00	14.5	7.50	15.5	7.50	14.0	7.50	13.7	—	—	—	—	NSE75HC	30	LC1-D18	LR2-D13 21	12/18
—	—	—	—	9.00	17.0	9.00	16.9	9.00	14.0	—	—	NSE75HC	30	LC1-D18	LR2-D13 21	12/18
—	—	—	—	—	—	—	—	10.00	15.0	—	—	NSE75HC	30	LC1-D18	LR2-D13 21	12/18
—	—	—	—	—	—	—	—	—	—	10.00	11.5	NSE75HC	30	LC1-D18	LR2-D13 16	9/13
5.50	20.0	11.00	22.0	11.00	21.0	11.00	20.1	11.00	18.4	—	—	NSE75HC	30	LC1-D25	LR2-D13 22	17/25
—	—	—	—	—	—	—	—	—	—	15.00	17.0	NSE75HC	30	LC1-D25	LR2-D13 21	12/18
—	—	—	—	—	—	—	—	—	—	18.50	21.3	NSE75HC	50	LC1-D32	LR2-D13 22	17/25
7.50	28.0	15.00	30.0	15.00	28.0	15.00	26.5	18.50	28.5	—	—	NSE75HC	50	LC1-D32	LR2-D33 53	23/32
—	—	—	—	—	—	—	—	22.00	33.0	30.00	34.6	NSE75HC	50	LC1-D40	LR2-D33 55	30/40
11.00	39.0	18.50	37.0	22.00	40.0	22.00	39.0	—	—	—	—	NSE75HC	50	LC1-D40	LR2-D33 57	37/50
—	—	22.00	44.0	25.00	47.0	—	—	30.00	45.0	33.00	39.0	NSE75HC	50	LC1-D50	LR2-D33 57	37/50
15.00	52.0	—	—	—	—	30.00	51.5	—	—	—	—	NSE75HC	50	LC1-D50	LR2-D33 59	48/65
—	—	—	—	—	—	—	—	—	—	37.00	42.0	NSE75HC	50	LC1-D65	LR2-D33 57	37/50
18.50	64.0	30.00	60.0	—	—	37.00	64.0	37.00	55.0	—	—	NSE75HC	75	LC1-D65	LR2-D33 59	48/65
—	—	—	—	37.00	66.0	—	—	—	—	—	—	NSE75HC	75	LC1-D65	LR2-D33 61	55/70
—	—	—	—	—	—	—	—	—	—	45.00	49.0	NSE75HC	75	LC1-D80	LR2-D33 57	37/50

### Type-2

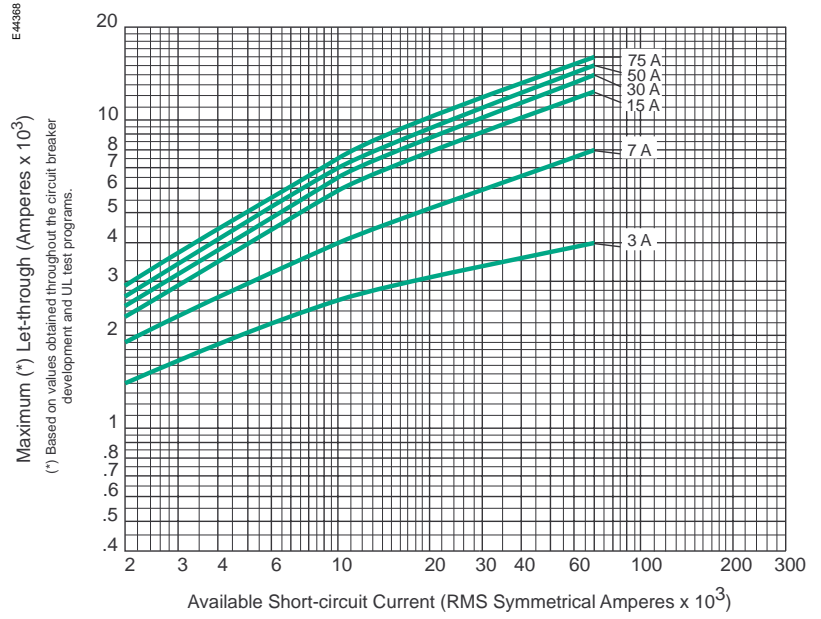
This performance is certified following tests performed by ASEFA (French Test Platforms Committee) for LOVAG.

- Standard:** IEC 947-4.1  
**Starting:** Normal: LRD2 Class 10A, other Class 10  
 Heavy: Class 20—Replaces LR2D.3 thermal relays by LR2D.5.  
**Rated Voltage:** 480 Vac  
**Breaking Performance  $I_q$ :** 65 kA eff/RMS

Motor P (kW)	Hp/CV	I (A) at 460 V	$I_e$ max.	Circuit Breaker Type	Cal (A)	$I_{rm}$ (A)	Contactor Type	Thermal Relay Type	$I_{rth}$
0.37	1/2	1.0	1.6	NSE75HC	3	12	LC1-D09	LR2-D13 06	1/1.6
0.55	3/4	1.4	1.6	NSE75HC	3	18	LC1-D09	LR2-D13 06	1/1.6
0.75	1	1.8	2.5	NSE75HC	3	21	LC1-D09	LR2-D13 07	1.6/2.5
1.10	1-1/2	2.6	2.5	NSE75HC	3	33	LC1-D09	LR2-D13 07	1.6/2.5
1.50	2	3.4	4.0	NSE75HC	7	42	LC1-D18	LR2-D13 08	2.5/4
2.20	3	4.8	6.0	NSE75HC	7	56	LC1-D25	LR2-D13 10	4/6
3.00	4	6.5	10.0	NSE75HC	15	75	LC1-D32	LR2-D13 12	7/10
4.00	5-1/2	8.2	10.0	NSE75HC	15	105	LC1-D32	LR2-D13 12	7/10
5.50	7-1/2	11.0	12.5	NSE75HC	15	135	LC1-D32	LR2-D13 16	9/13
7.50	10	14.0	18.0	NSE75HC	30	180	LC1-D32	LR2-D13 21	12/18
10.00	13-1/2	19.0	25.0	NSE75HC	30	240	LC1-D40	LR2-D33 22	17/25
11.00	15	21.0	25.0	NSE75HC	30	270	LC1-D40	LR2-D33 22	17/25
15.00	20	27.0	32.0	NSE75HC	50	350	LC1-D40	LR2-D33 53	23/32
18.50	25	34.0	40.0	NSE75HC	50	400	LC1-D50	LR2-D33 55	30/40
22.00	30	40.0	40.0	NSE75HC	50	500	LC1-D50	LR2-D33 55	30/40
30.00	40	52.0	63.0	NSE75HC	75	675	LC1-D65	LR2-D33 59	48/65
37.00	50	65.0	65.0	NSE75HC	75	825	LC1-D80	LR2-D33 59	48/65

# $I_p$ and $I^2t$ Curves at 480 V

## Maximum Peak Let-through Current (Amperes)



## Maximum Let-through $I^2t$ (Amperes<sup>2</sup> Seconds)

