HAVELLS

Type 2 Co-ordination CHARTS

HGS - Contactors, Overload Relays & MPCBs

Motor Control Solutions for higher Saftey, Reliability & Performance

3 Pole Contactor
Ratings - 9 A to 800 A (AC-3)

Thermal Overload Relay
Ratings - 0.12 A to 800 A

Push button MPCB
Ratings - 0.1 A to 32 A
Thermal Magnetic

Rotary MPCB - Frame-1
Ratings - 0.1 A to 63 A
Thermal Magnetic &
Magnetic Trip only

Rotary MPCB - Frame-2
Ratings - 11 A to 63 A
Thermal Magnetic &
Magnetic Trip only

Loadline MCCBs

G Frame
Ratings - 16 A to 160 A
Thermal Magnetic

A Frame
Ratings - 25 A to 250 A
Thermal Magnetic

ML1 Frame
Ratings - 63 A to 125 A
Thermal Magnetic

HID1 Frame
Ratings - 40 A to 160 A
Thermal Magnetic

L Frame
Ratings - 200 A to 630 A
Thermal Magnetic

L Frame
Ratings - 250 A to 630 A
ETU

HiBreak Fuse

DIN Type - 6 A to 630 A
BS Type - 2 A to 800 A

Kompact *plus* SDF

Ratings - 32 A to 800 A

Havells Global Series

Magnetic Contactors, Overload Relays & MPCBs

Designed for demanding applications & Tropical conditions

Contactor HGS 9 - 800 AF

3 Pole Power Contactors

- **Wide Operating Band Coils**
- Finger proof IP 20 terminals
- **Suitable for AC-4 (Inching & Plugging, e.g. Crane Duty) and other critical application**
- CE Marking & Compliance to IS/IEC 60947-4-1
- High Electrical and Mechancial Durability with Higher operating frequency (Operations / Hour)
- **Electrical Durability Curves available**
- Low Power Dissipation
- Low VA Burden coils with Class H Insulation
- Dust free Cover as in-built
- Terminal Barrier and Shrouds
- Nut Retaining Washers
- In-built Auxiliary Contacts
- Removable Arc-chutes ≥ 115 A Ratings
- DIN Channel Mounting up to 100 A, Fr-4

Contactor (HGS)				
Overload Relay (HGST)				
	18 AF	**40 AF**	**65 AF**	**100 AF**
HGS Rated Current	9 A, 12 A, 18 A, 22 A	25 A, 32 A, 40 A	50 A, 65 A	75 A, 85 A, 100 A
Rated Operational Voltage	690 V	690 V	690 V	690 V
HGST Setting Current	0.12 A - 18 A	7 A - 40 A	7 A - 65 A	17 A - 100 A

Thermal Overload Relays HGST 9 - 800 AF

HGS Global Series

Overload Relays

- Trip Class - 10A
- Mounting Possibilities - Direct and Separate both
- Automatic Reset or Manual Reset - Settable Button
- Test Button - Can also be used as Emergency Stop Button
- **Phase loss Protection - Differential Tripping Mechanism (Double Slide Construction)**
  - Accelerated tripping on Single Phasing Condition (40% - 60% Faster)
- Finger proof IP20 terminals
- Sealable Protection Cover to prevent Unintended change in Protection settings

150 AF	265 AF	500 AF	800 AF
115 A, 130 A, 150 A	185 A, 225 A, 265 A	300 A, 400 A, 500 A	630 A, 800 A
1000 V	1000 V	1000 V	1000 V
48 A - 150 A	48 A - 265 A	90 A - 500 A	378 A - 800 A

Definations

General Terms used in this catalogue:

Switchgear
General term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy

Controlgear
General term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for the control of electric energy consuming equipment

Starter Components used in this catalogue:

Mechanical Contactor
Mechanical switching device having only one position of rest, operated otherwise than by hand, capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions

Thermal Overload Relay or Release
Inverse time-delay overload relay or release depending for its operation (including its timedelay) on the thermal action of the current flowing in the relay or release

Short Circuit Protection Devices used in this catalogue:

Short-Circuit Protective Device (SCPD)
Device intended to protect a circuit or parts of a circuit against short-circuit currents by interrupting them

Fuse
Device that, by the fusing of one or more of its specifically designed and proportioned components, opens the circuit in which it is inserted by breaking the current when this exceeds a given value for a sufficient time

Switch-disconnector
Switch which, in the open position, satisfies the isolating requirements specified for a disconnector

Circuit-breaker
Mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short-circuit

Motor Protective Switching Device (MPSD)
Manually operated motor starter additionally providing resettable short-circuit protection to the motor and the circuit

Types of Starters dealt in this Catalogue

Motor Starter
Combination of all the switching means necessary to start and stop a motor in combination with suitable overload protection

Direct-on-line Starter
Starter which connects the line voltage across the motor terminals in one step

Star-delta Starter
Starter for a three-phase induction motor such that in the starting position the stator windings are connected in star and in the final running position they are connected in delta

Major Faults / Unhealthy conditions which can be addressed using recommendations in this catalogue

Overcurrent
Current exceeding the rated current

Short-Circuit
Accidental or intentional conductive path between two or more conductive parts forcing the electric potential differences between these conductive parts to be equal to or close to zero

Overload
Operating conditions in an electrically undamaged circuit, which cause an overcurrent

Phase Loss
Absence of one of the Phases which leads to unbalanced and increased circulating current within closed delta windings leading to burn-out of lone winding.

Important definitions related to Currents

Rated Current (In)
For circuit-breakers, the rated current is the rated uninterrupted current (Iu) and is equal to the conventional free-air thermal current (Ith).

Overload Current Setting (Ir)
current setting of an adjustable overload release

Rated Operational Currents (Ie) or Rated Operational Powers
A rated operational current of a contactor or a starter is stated by the manufacturer and takes into account the rated operational voltage, the conventional free air or enclosed thermal current, the rated current of the overload relay, the rated frequency, the rated duty, the utilization category and the type of protective enclosure, if any.

Ultimate Short-circuit Breaking Capacity (Icu)
A breaking capacity for which the prescribed conditions according to a specified test sequence do not include the capability of the circuit-breaker to carry its rated current continuously

Service Short-circuit Breaking Capacity (Ics)
A breaking capacity for which the prescribed conditions according to a specified test sequence include the capability of the circuit-breaker to carry its rated current continuously

Rated Conditional Short-circuit Current (Iq, alternatively Icc)
The rated conditional short-circuit current of an equipment is the prospective current, stated by the manufacturer, which the equipment, protected by a short-circuit protective device specified by the manufacturer, can withstand satisfactorily for the operating time of this device under the test conditions specified in the relevant product standard. The details of the specified short-circuit protective device shall be stated by the manufacturer.

For alternating current, the rated conditional short-circuit current is expressed by the RMS value of the AC component.

Utilization Category

The utilization category of an equipment defines the intended application and shall be specified in the relevant product standard; it is characterized by one or more of the following service conditions:

- Current(s), expressed as multiple(s) of the rated operational current
- Voltage(s), expressed as multiple(s) of the rated operational voltage
- Power-factor or time-constant
- Short-circuit performance
- Selectivity
- Other service conditions, as applicable.

Examples of utilization categories for low-voltage switchgear and controlgear are given hereunder.

Kind of current	Utilization categories	Additional category designation	Typical load
AC	AC-1	General Use	AC-1 General use Non-inductive or slightly inductive loads
	AC-2		AC-2 Slip-ring motors or mixed resistive and inductive loads, including moderate overloads
	AC-3		Squirrel-cage motors d: starting, switching off motors during running, reversing
	AC-3e		Squirrel-cage motors with higher locked rotor current e: starting, switching off motors during running, reversing
	AC-4		Squirrel-cage motors d: starting, plugging, inching
	AC-5a	Ballast	Ballast Discharge lamps
	AC-5b	Incandescent	AC incandescent lamps
	AC-6a		Transformers
	AC-6b		Capacitor banks
	AC-7a		Slightly inductive loads for household appliances and similar applications
	AC-7b		Motor-loads for household applications
	AC-8a		Hermetic refrigerant compressor motor b control with manual resetting of overload releases
	AC-8b		Hermetic refrigerant compressor motor b control with automatic resetting of overload releases
DC	DC-1		Non-inductive or slightly inductive loads
	DC-2		Shunt-motors: starting, plugging, inching, dynamic breaking of DC motors
	DC-3		Series-motors: starting, plugging, inching, dynamic breaking of DC motors
	DC-4	Incandescent	DC incandescent lamps

Note :
AC-3 category may be used for occasional inching (jogging) or plugging for limited time periods such as machine set-up; during such limited time periods, the number of such operations should not exceed five per minute or more than ten in a 10-min period.

Above note mentioned in IEC 60947-4-1, under Table-1, transpires that Switching device selected basis AC-3 rating has to be suitable for Inching and Plugging, i.e. AC-4 as well.

HGS Contactor is suitable for AC-4 Utilization Category as well.

Prima Series

IE3 & IE2 Motors

Havells is a leading manufacturer of low voltage induction motors in India, We manufacture wide range of energy efficient motors 100% in-house, our state-of-the-art manufacturing facility located at Neemrana, Rajasthan; it is one of the largest LV motor plant in India, here we manufacture energy efficient IE2 & IE3 Motors ranging from 0.18 kW to 315 kW (0.25 HP to 425 HP).

Havells IE2 & IE3 efficient motors confirm to IEC 60034/IS12615 :2018 Standards, these motors have been successfully working across all sectors and in all possible applications, Havells IE2 & IE3 Motors are preferred choice of various Industries due to their performance and reliability.

Havells is committed to manufacturing excellence and providing world class quality products at affordable prices. Havells offers a complete solution which is not only safe and reliable but also saves energy. We will continue the same tradition with our motors also.

Havells IE2 and IE3 LV safe area motors for various applications

The IE Efficiency classes defined as:

IE2-High Efficiency

IE3 – Premium Efficiency

Havells LV IE2 and IE3 Motor general specifications :

• Voltage	:	Rated voltage ≤1000 V
• Output	:	Rated output 0.37 kW to 315 kW
• No of Poles	:	2, 4, 6 & 8 poles
• Frame Dimensions	:	Meet frame size to output relation as covered in IS:1231 & IS/IEC 60072-1
• Ambient Temperature	:	Designed for an ambient temperature not exceeding 50 ^{0}C and altitude not exceeding 1000 metre.
• Balance Voltage	:	Designed for operation on virtually sinusoidal and balanced Voltage conditions as defined in 7.2.1 of IS/IEC 60034-1
• Degree of protection	:	Degree of protection IP55
• Cooling Method	:	Method of cooling IC411 in accordance with IS 6362/IEC 60034-6

*Other non standard features also available as per applicaiton requirement

Advantages of Havells low voltage Induction Motors

- High efficiency
- Reduced lifecycle cost
- Short payback period
- Optimized cooling system for better operation and reduced noise
- Excellent aesthetic design
- Highly reliable under most demanding conditions

Cost effectiveness of energy efficient motors:

Saving concluded as follows:
kW =Output of motor
IE3=Efficiency of IE3 motor in %
IE2=Efficiency of IE2 motor in %
PD=Price Difference between two efficiencies;

$$X = \frac{kW}{IE2} - \frac{kW}{IE3}$$

Saving = (X x Working hours x Working days x Tariff x100)
Payback Period = (PD/Saving)x12 months

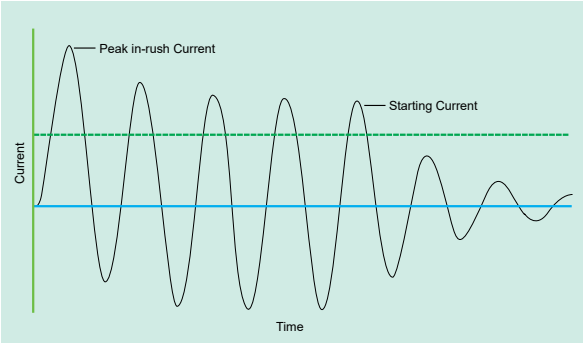
Standard efficiency values for IE2 / IE3 Motors as per IEC 60034 / IS 12615: 2018

kW	2-Pole			4 Pole			6 Pole			8 Pole		
	Frame Size	Efficiency %		Frame	Efficiency %		Frame	Efficiency %		Frame	Efficiency %	
		IE2	IE3	Size	IE2	IE3	Size	IE2	IE3	Size	IE2	IE3
0.37	71	69.5	73.8	71	72.7	77.3	71	67.6	73.5	90S	56.1	69.3
0.55	71	74.1	77.8	80	77.1	80.8	80	73.1	77.2	90L	61.7	73
0.75	80	77.4	80.7	80	79.6	82.5	90S	75.9	78.9	100L	66.2	75
1.1	80	79.6	82.7	90S	81.4	84.1	90L	78.1	81	100L	70.8	77.7
1.5	90S	81.3	84.2	90L	82.8	85.3	100L	79.8	82.5	112M	74.1	79.7
2.2	90L	83.2	85.9	100L	84.3	86.7	112M	81.8	84.3	132S	77.6	81.9
3.7	100L	85.5	87.8	112M	86.3	88.4	132S	84.3	86.5	160M	81.4	84.5
5.5	132S	87	89.2	132S	87.7	89.6	132M	86	88	160M	83.8	86.2
7.5	132S	88.1	90.1	132M	88.7	90.4	160M	87.2	89.1	160L	85.3	87.3
11	160M	89.4	91.2	160M	89.8	91.4	160L	88.7	90.3	180L	86.9	88.6
15	160M	90.3	91.9	160L	90.6	92.1	180L	89.7	91.2	200L	88	89.6
18.5	160L	90.9	92.4	180M	91.2	92.6	200L	90.4	91.7	225S	88.6	90.1
22	180M	91.3	92.7	180L	91.6	93	200L	90.9	92.2	225M	89.1	90.6
30	200L	92	93.3	200L	92.3	93.6	225M	91.7	92.9	250M	89.8	91.3
37	200L	92.5	93.7	225S	92.7	93.9	250M	92.2	93.3	280S	90.3	91.8
45	225M	92.9	94	225M	93.1	94.2	280S	92.7	93.7	280M	90.7	92.2
55	250M	93.2	94.3	250M	93.5	94.6	280M	93.1	94.1	315S	91	92.5
75	280S	93.8	94.7	280S	94	95	315S	93.7	94.6	315M	91.6	93.1
90	280M	94.1	95	280M	94.2	95.2	315M	94	94.9	315L	91.9	93.4
110	315S	94.3	95.2	315S	94.5	95.4	315M	94.3	95.1	315L	92.3	93.7
125	315M	94.5	95.3	315M	94.6	95.5	315M	94.4	95.2	355M	92.5	93.9
132	315M	94.6	95.4	315M	94.7	95.6	315L	94.6	95.4	355M	92.6	94
160	315L	94.8	95.6	315L	94.9	95.8	355M	94.8	95.6	355M	93	94.3
200	315L	95	95.8	315L	95.1	96	355M	95	95.8	355L	93.5	94.6
250	355M	95	95.8	355M	95.1	96	355L	95	95.8	-	-	-
315	355L	95	95.8	355L	95.1	96	355L	95	95.8	-	-	-

Effect of Improved Efficiency of Motors on Selection of Switchgear

As the efficiency of the Motor Improves

- In-rush Current Increases
- Starting current Increases
- Full Load Current Reduces Marginally



This leads to :

- Higher starting current Increases Thermal Stress and may result in Overload Tripping
- Higher Inrush may result in Nuisance tripping of MCCB / MPCB or blow-out of the fuses
- Higher Starting Current / Inrush also lead to higher voltage drops leading to opening of electromagnetic Switching devices

In view of this, it is required that :

- Switching devices have adequate thermal Capacity, making capacity and breaking capacities
- MCCBs / MPCBs are selected in such a way that worst case Peak in-rush current of Motor in case of Direct on line Starters and change-over current in case of Open transition star-delta starters is always lower than MCCB magnetic Tripping thresholds and repulsion thresholds.
- Overload Relays are selected matching with Starting time* of the motor.

*Starting time depends on load inertia

Introduction to Type-2 Co-ordination

Co-ordination means to operate in tandem to deliver intended function.

When it comes to Motor Control Centres, having multiple motor feeders and each motor feeder equipped with Starter backed up by suitable Short Circuit Protection device (SCPD), it is very important that Switching device, Overload Protection device and SCPD operate in well co-ordinated manner to ensure **HUMAN** Safety, Installation Safety and Device Safety.

Lack of Co-ordination between all these devices can lead to major **SAFETY** issues leading to injury to Human or even loss of Human life due to possible explosion of Motor feeder compartments. It can also lead to long down times in a typical industrial plant leading to major monetary losses.

This is where IEC 60947-4-1 Comes to rescue the interest of the end customer and suggests different type of Co-ordination as follows:

IEC 60947-4-1 states as follows:

Two types of co-ordination are permissible, "1" or "2". The test conditions for both are given in IEC 60947-4-1.

Type "1" co-ordination requires that, under short-circuit conditions, the contactor or starter shall cause no danger to persons or installation and may not be suitable for further service without repair and replacement of parts.

Type "2" co-ordination requires that, under short-circuit conditions, the contactor or starter shall cause no danger to persons or installation and shall be suitable for further use. The risk of contact welding is recognized, in which case the manufacturer shall indicate the measures to be taken as regards the maintenance of the equipment.

NOTE : Use of SCPD not in compliance with the manufacturer's recommendations can invalidate the co-ordination.

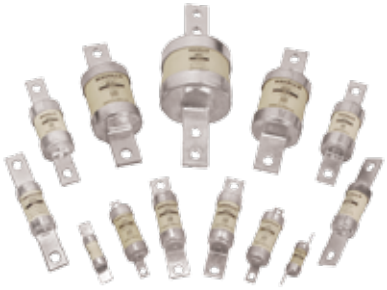
Infrences:

Type 1 Co-ordination	This is the method that is mostly used in general. • Low device cost • In case reliability for the operation and maintenance is not compulsory, • The starter may have to be repaired before re-operating the motor. **Result:** • The equipment's operating time may be quite long • Skilled personnel are required for inspection, repair, parts and others Application example: Air-conditioning device in commercial buildings
Type 2 Co-ordination	Reliability for operation and maintenance can be secured. **Result** • Reduction of equipment's operating time • Shorten response time for short-circuit accidents Application example: Escalators

It is imperative that while designing Motor Feeders (i.e. Selecting Motor Starter components like Contactor, Overload Relays and Suitable SCPD, manufacturers recommendations are followed for improved Safety, Reliability and availability

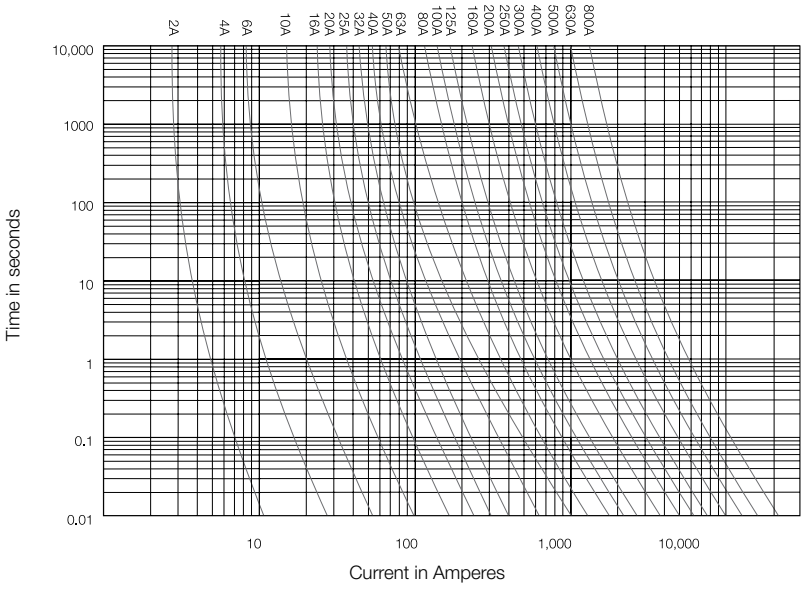
Co-ordination type	Risk Involved			Implications on			Overall Impact
	Human Safety	Installation Safety	Starter Safety	Human Safety	Installation	Starter	
No Co-ordination Concept	Very high Risk	Very high Risk	Very high Risk	Death / Injury	• Fire / Explosion • Downtime • Huge Loss of Production	• Explosion • Significant Damage to Contactor, Overload Relays etc. • Loss of Switching & Protection Function	• Loss of Safety Standards • Huge Monetary Losses
Type-1 Co-ordination	Safety ensured	Safety ensured	High Risk	Improved Safety No Risk of Death / Injury	• No Fire / No Explosion • Some down time due to replacement of Starter components • Some loss of Production	• No Fire / No Explosion • Replacement of Starter components is required • Some loss of Production	• Safety Ensured • Monetary losses reduced
Type-2 Co-ordination	Safety ensured	Safety ensured	Safety ensured	Improved Safety No Risk of Death / Injury	• No Fire / No Explosion • Minimum down time since Contactor and Relay remain Reusable. • In case Fuse is used as SCPD, replacement of all3 Fuses will be required.	• No Fire / No Explosion • Replacement of Starter components is not required. • Minimal loss of Production	• Safety Ensured • Monetary losses almost eliminated

Selection of Fuses and CBs for Motor feeders



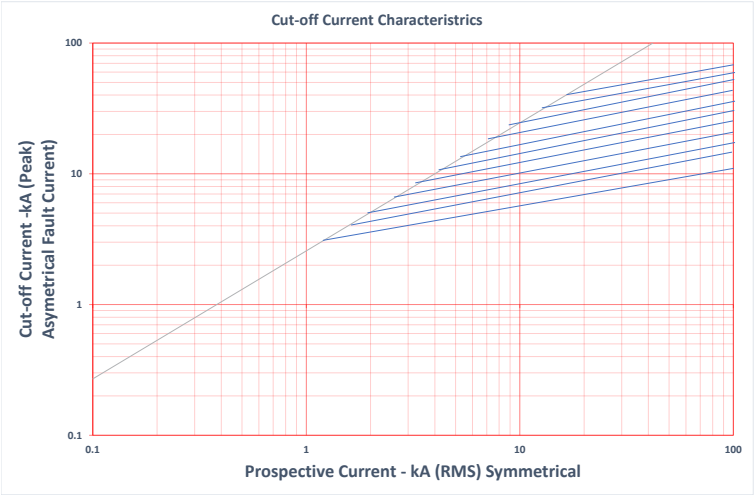
Historically, Fuses have been widely used as a Short Circuit Protection device in Motor Feeders. Fuses have been considered as a best protection device since ages. As we know fuses operate on heating effect of electric current and have inverse time current characteristics and is an excellent Current limiting device.

There are 2 types of Characteristics of Fuses which are used for selection in any applications.



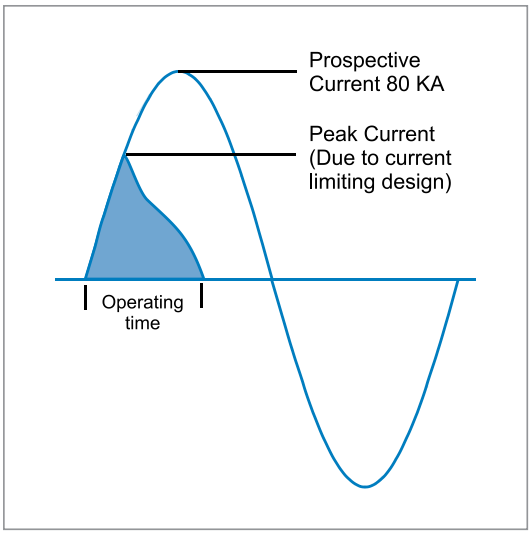
Time current characteristics:

This indicates Operating time w.r.t. Current in the circuit. It can be seen that as the current increases, operating time reduces.



Current limiting Characteristics:

This indicates for given fault current (RMS value), what is the maximum Peak current that fuse will limit it to. This in simple terms means that fuse when present in circuit and fault current going beyond current limiting range, Fuses act as current limiting device and does not allow the current to reach to otherwise attainable prospective peak current. This can be better explained with Fault current sine wave shown hereunder.



What is current limiting device: Any device when present in Circuit and if short circuit occurs, does not allow the current to reach to Prospective Peak current and thus limits the Electrodynamic stresses, Thermal Stress and Electromagnetic Stresses on Installation components.

For example : For a fault current of 50kA RMS, maximum Peak prospective current can reach to 2.2 X 50 kA = 110 kA.

This means, thermal stress will be proportional to 50 kA Squared and Electrodynamic stresses will be proportional to 110 kA Squared.

However, when suitable rating of fuse is inserted in circuit, fuse will limit the current to cut-off current to far lower value than 110 kA (e.g. for typically 100A fuse, cut-off current will be 20kA and equivalent RMS current will be 10kA). This will lead to far lower Thermal stress (Now Proportional to 20kA Squared) and also far lower electrodynamic stress (Now proportional to 10kA Squared).

This is what used to make fuses an ideal device for Short Circuit protection.

When it comes to fuses for Motor protection, following criteria was followed:

1. Rating of the Fuse shall be more than the Motor Full load current.
2. Motor in-rush current in case of DOL starter and peak change-over current in case of star-delta starters shall not cause blowing of the fuses (Pre-arcing I2t of fuses shall be more than Motor in-rush / peak change-over I2t).
3. Starting current shall not cause blowing of the fuses (Pre-arcing I2t of fuses shall be more than Motor starting I2t).

There was introduction of Molded case circuit breakers in market in early 90's and same was explored for various applications including motor protections.

Over a period, with progression of technology, MCCBs have come almost at par with Fuses when it comes to Quality of Short Circuit protection for any load is required. This is due to Current limiting Repulsion contact designs used now a days in most of the contemporary MCCBs.

However, when it comes to selection of MCCBs for Motor Protections, certain care must be taken.

As we know, MCCB can either be with both Overload and Short Circuit Protection or only with Short Circuit Protection.

Overload Protection in MCCB is based on thermal effect of electric current and uses Bimetallic strips for generating tripping command. This leads to inverse time current characteristics like fuses and as the current increases, trip time reduces. This protection is proportional to RMS value of current.

Short circuit protection in MCCB is based on magnetic effect of electric current and leads to instantaneous tripping. This protection is proportional to Peak current flowing through MCCB.

This is what necessitates special precautions when it comes to selection of MCCBs for Motor Protections.

MCCB Selection Criteria for Motor application:

1. Rated current of the MCCB shall be more than the Motor Full load current.
2. Worst case Motor in-rush current in case of DOL starter and worst-case peak change-over current in case of star-delta starters shall not cause instantaneous tripping of MCCB.
3. Starting current shall not cause thermal tripping of MCCB (Application starting time shall be studied accordingly).
4. Iq – Conditional Short Circuit current of Motor Feeder components (Starter + SCPD) shall be equal or more than fault level at the point of Installation.

If point no. 1, 2 and 3 are taken care, any MCCB including MCCBs with Overload and Short circuit can be selected for Motor applications.

When it comes to Point no.4, any MCCB which can fulfill the requirement of Iq – Conditional Short Circuit Current in conjunction with Starter components can be used as SCPD.

Can we use MCCB with Icu/Ics lower than Iq?

Icu / Ics (i.e., Ultimate breaking capacity and Service breaking capacity) comes into picture when MCCB is used for Distribution feeder protection.

Iq - Conditional Short Circuit current comes into picture when any SCPD (MCCB) is used for Motor feeder protection.

When MCCB is used in conjunction with Contactor and Overload Relays, Iq level of MCCB is usually higher than Icu / Ics.

This is because additional impedance of Overload relay, Contactors and connecting leads between all devices works as fault limiting impedance.

Is this even recognized by IEC?

IEC 60947-4-1, clause 9.3.4.2.3, Sub-clause (c) states as follows:

c) in the case of a combination starter or a protected starter, with the switching device of the SCPD having a short-circuit breaking capacity or rated conditional short-circuit current less than the rated conditional short-circuits current of the combination starter or protected starter the following additional test shall be made. One breaking operation of the SCPD shall be performed by closing ("CO" operation) the switching device (switch or circuit breaker) on to the short-circuit, the contactor or starter already being closed.

This operation may be performed either on a new sample (starter and SCPD) or on the first sample with the agreement of the manufacturer. After this operation only conditions a) to g) of 9.3.4.2.4 shall be verified.

This clearly infers that short circuit breaking capacity of SCPD can be lower than rated conditional short circuit current of protected starter or Switching devices.

How this benefits customers:

IEC has recognized the fact that, in normal circumstances when MCCB is selected based on Icu and Ics would lead to higher cost. However, since Motor feeders require selection based on Iq, i.e., Conditional Short Circuit current, MCCB with lower Icu and Ics can also deliver higher Iq due to fault limiting impedances of contactors, overload relays and connecting leads.

There are 2 possibilities when it comes to MCCB to be used for Motor feeders:

1. MCCB with Short Circuit Protection only – i.e., Magnetic only version MCCB – Selection criteria 1, 2 & 4 shall be taken care
2. MCCB with overload and Short Circuit Protection- i.e., Thermal and Magnetic version MCCBs – Selection criteria 1 to 4 shall be taken care.

Selection charts in this catalogue make use of MCCB with overload and Short Circuit Protections selected by consider all 4 points for Motor Protections.

This recommended selection comes with Havells Performance guarantee to improve Safety, Reliability, and availability of Motor feeders.

Possible Direct On-line and Star-Delta Starter Configurations basis Charts in this catalogue

Function	Product	Product	Product	Product
Switching	MPCB - (TM Version - Push button or Rotary Type)	Contactor	Contactor	Contactor
Overload Protection	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (TM Version - Push button or Rotary Type)	Overload Relay	Overload Relay
Phase-Loss Protection	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (TM Version - Push button or Rotary Type)	Overload Relay	Overload Relay
Short Circuit Protection	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (Magnetic Version - Push button or Rotary Type)	MCCB
Isolation	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (Magnetic Version - Push button or Rotary Type)	MCCB
Disconnection	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (TM Version - Push button or Rotary Type)	MPCB - (Magnetic Version - Push button or Rotary Type)	MCCB
	 Havells Make Motor	 Havells Make Motor	 Havells Make Motor	 Havells Make Motor

General Terms and condition of Recommended Charts

Motor

- Selection is valid for Switching & Protection of motors complying to IS 12615
- Full load current used for selection is for 4Pole Motors
- For motors with 2Pole, 6Pole and 8 Poles, same charts can be used provided Motor Full load current does not exceed current mentioned in selection charts
- Since market trend is to use mix of IE3 and IE2 Motors for given installations, it is advisable to make motor feeders which can cater to both efficiency class of Motors.
- Starting time of application depends on load inertia on Motor Shaft. Selection indicated here is for Normal starting time, i.e. Applications whose starting time is up to 6 Second.

Motor Feeders components

- SCPD stands for Short Circuit Protection Device.
- Trip Class of the devices used for Overload protection is 10 / 10A
- Higher ratings of Contactors can be used in place of recommended combinations.
- For high Inertia loads like Blowers, Pumps & ID/FD fans etc. taking longer starting time (> 6 Second), kindly consult to nearest branch office.
- For Star-Delta Motor feeders, In-side delta wiring is considered.
- For Star Delta Motor feeders, proper Change-over time and Pause time must be ensured. Use of electronics timer with Pause time of 150 ms is recommended (Specially where contactor either in Star or Delta is/are rated 115 A and higher.
- Selection is valid only when all devices are of Havells make only and as per given tables.
- Change in any of the recommended combination will void the performance guarantee and may lead to Human safety, Installation safety and product safety concerns.
- Max. Operating rate of each device shall not be exceeded specially for Circuit breakers. Refer respective product catalogues.

General Condition

- Product evolution and improvement is a Continuous process at Havells. Hence, recommendations and guidelines are subject to change. Contact nearest branch office for latest guidelines.

How to use this charts

1. Calculate the fault lavel (I_{fault}) at the point of Motor Installation.

2. Iq - Conditional short Circuit Current Should be equal or more than I_{fault}

3. Select the Icu of MCCB to deliver appropriate Iq level.

For Example :

If calculated I_{fault} = 30 kA

Iq > = I_{fault}, i.e 30 kA

In this case, one can select any Iq above 36 kA from this charts. However. for economical reason one shall select nearest higher Iq level.

One shall select Iq = 36 kA for this case.

Refer appropriate charts basis DOL or Star-Delta starter and MCCB frame required.

It can be seen from page no 17 that for 11 kW DOL Starters, one can use either MPCB or MCCB of required frame.

Fuseless Motor Starters

MPCB based DOL and Star Delta Motor Starters for IE2 / IE3 Motors

Model	HGSTMR	
Type of Starter	DOL	
MPCB Range	0.16-6.3	6.3-63
Iq kA	100	50

Model	HGSMR			
Type of Starter	DOL		Star Delta	
MPCB Range	0.25-6.3	6.3-63	1.6-6.3	6.3-63
Iq kA	100	50	100	50

MCCB based DOL and Star Delta Motor Starters for IE2 / IE3 Motors

Model	ML1 Frame
MCCB Range	63-125
Icu kA	10
Ics of Icu	50%
Iq kA	20

Model	G Frame	HID1 Frame
MCCB Range	16-160	40-160
Icu kA	10	10
Ics of Icu	100%	100%
Iq kA	25	25

Model	G Frame	A Frame	HID1 Frame	A Frame
MCCB Range	16-160	25-63	40-160	80-250
Icu kA	25	25	27	25
Ics of Icu	50%	75%	100%	75%
Iq kA	36	36	36	36

Model	A Frame	A Frame	HID1	L TM	L ETU	L ETU
MCCB Range	25-63	80-125	40-160	200-630	250-630	250-630
Icu kA	35	35	36	36	36	50
Ics of Icu	75%	75%	100%	100%	100%	75%
Iq kA	50	50	50	50	50	50

Model	L TM
MCCB Range	250-630
Icu kA	50
Ics of Icu	100%
Iq kA	65

Fuse based DOL and Star Delta Motor Starters for IE2 and IE3 / IE4 Motors

Fuse Model	Hi-break (2 A to 800 A)
SDF Model	Kompact (32 A to 800 A)
Iq kA	50

Direct Online Starter - SCPD wise summary
Motor efficiency class IE2 & IE3

Product	Model	Operation method	Version	Iq kA	Motor kW at 415 V																																								
					0.06	0.09	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.3	1.5	2.2	3	3.7	4	5.5	7.5	9.3	11	13	15	18.5	22	30	37	45	55	75	80	90	110	125	132	150	160	180	200	225	250
MPCB	HGSM	PB	TM	100	0.06 ---- 4																																								
				15																5.5 ---- 13																										
				10																					15																				
	HGSTMR	Rotary	TM	100	0.06 ---- 3																																								
				50														3.7 ---- 30																												
	HGSMR	Rotary	M	100	0.06 ---- 3																																									
				50														3.7 ---- 30																												
MCCB	G Frame	Direct and Rotary	TM	25						0.37 ---- 37																																			
				36						0.37 ---- 37																																				
	HID1 Frame			25						0.37 ---- 45																																				
				36						0.37 ---- 45																																				
				50						0.37 ---- 45																																				
	A Frame			36						0.37 ---- 55																																				
				50						0.37 ---- 30																																				
	ML1 Frame			20																			11 ---- 30																						
	L Frame			50																									37 ---- 250																
				65																											75 ---- 250														
			ETU	50																									37 ---- 250																
				65																									37 ---- 250																

TM - Thermal Magnetic
M - Magnetic only
ETU - Electronic Trip Unit

Direct Online Starter - Iq wise summary
Motor efficiency class IE2 & IE3

Product	Model	Operation method	Version	Iq kA	Motor kW at 415 V																																						
					0.06	0.09	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.3	1.5	2.2	3	3.7	4	5.5	7.5	9.3	11	13	15	18.5	22	30	37	45	55	75	80	90	110	125	132	150	160	180	200	225	250
MPCB	HGSM	PB		10																					15																		
MPCB	HGSM	PB		15																5.5				13																			
MCCB	ML1 Frame		TM	20																			11					30															
MCCB	G Frame		TM	25						0.37																			37														
MCCB	HID1 Frame		TM	25						0.37																				45													
MCCB	G Frame		TM	36						0.37																			37														
MCCB	HID1 Frame		TM	36						0.37																				45													
MCCB	A Frame		TM	36						0.37																					55												
MCCB	A Frame		TM	50						0.37																		30															
MCCB	HID1 Frame		TM	50						0.37																				45													
MPCB	HGSTMR	Rotary	TM	50														3.7										30															
MPCB	HGSMR	Rotary	M	50														3.7										30															
MCCB	L Frame		TM	50																									37														250
MCCB	L Frame		ETU	50																									37														250
MCCB	L Frame		ETU	65																									37														250
MCCB	L Frame		TM	65																												75											250
MPCB	HGSTMR	Rotary	TM	100	0.06												3																										
MPCB	HGSMR	Rotary	M	100	0.06												3																										

TM - Thermal Magnetic
M - Magnetic only
ETU - Electronic Trip Unit

Star Delta Starter - SCPD wise summary
Motor efficiency class IE2 & IE3

Product	Model	Operation method	Version	Iq kA	Motor kW at 415 V																																		
					0.06	0.09	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.3	1.5	2.2	3	3.7	4	5.5	7.5	9.3	11	13	15	18.5	22	30	37	45	55	75	80	90	110	125	132	150
MPCB	HGSMR	Rotary	M	100					0.25	----------	----------	----------	----------	----------	1.5																								
MCCB		Rotary	M	50												2.2	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	22											
	G Frame	Direct and Rotary	TM	25								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	30											
			TM	36								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	30											
	HID1 Frame		TM	25								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	45								
			TM	36								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	45								
			TM	50								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	45								
	A Frame		TM	36								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	45								
			TM	50								0.75	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	22											
	ML1 Frame		TM	20																			11	----------	----------	----------	22											
	L Frame		TM	50																									45	----------	----------	----------	----------	----------	----------	150	
			TM	65																											75	----------	----------	----------	----------	----------	150	
			ETU	50																									45	----------	----------	----------	----------	----------	----------	150	
			ETU	65																									45	----------	----------	----------	----------	----------	----------	150	

TM - Thermal Magnetic
M - Magnetic only
ETU - Electronic Trip Unit

Star Delta Starter - Iq wise summary
Motor efficiency class IE2 & IE3

Product	Model	Operation method	Version	Iq kA	Motor kW at 415 V																																		
					0.06	0.09	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.3	1.5	2.2	3	3.7	4	5.5	7.5	9.3	11	13	15	18.5	22	30	37	45	55	75	80	90	110	125	132	150
MCCB	ML1 Frame	Direct and Rotary	TM	20																			11 ---------- 22																
MCCB	G Frame	Direct and Rotary	TM	25								0.75 ---------- 30																												
MCCB	HID1 Frame	Direct and Rotary	TM	25								0.75 ---------- 45																												
MCCB	G Frame	Direct and Rotary	TM	36								0.75 ---------- 30																												
MCCB	HID1 Frame	Direct and Rotary	TM	36								0.75 ---------- 45																												
MCCB	A Frame	Direct and Rotary	TM	36								0.75 ---------- 45																												
MPCB	HGSMR	Rotary	M	50												2.2 ---------- 22																									
MCCB	HID1 Frame	Direct and Rotary	TM	50								0.75 ---------- 45																												
MCCB	A Frame	Direct and Rotary	TM	50								0.75 ---------- 22																												
MCCB	L Frame	Direct and Rotary	TM	50																									45 ---------- 150										
MCCB	L Frame	Direct and Rotary	ETU	50																									45 ---------- 150										
MCCB	L Frame	Direct and Rotary	TM	65																											75 ----------150								
MCCB	L Frame	Direct and Rotary	ETU	65																									45 ---------- 150										
MPCB	HGSMR	Rotary	M	100					0.25 ---------- 1.5																														

TM - Thermal Magnetic
M - Magnetic only
ETU - Electronic Trip Unit

HiBreak Fuse (DIN Type and BS Type)
Kompact Plus SDF

Product	Model	Operation method	Iq kA	Starter Type	Eff. Class	Motor kW at 415 V																																				
						0.37	0.55	0.75	1.1	1.3	1.5	2.2	3	3.7	4	5.5	7.5	9.3	11	13	15	18.5	22	30	37	45	55	75	80	90	110	125	132	150	160	180	200	225	250
Fuse + SDF	Hi-break + Kom-pact	Rotary	50	DOL	IE2	0.37 ---------- 250																																				
			50	SD	IE2									3.7 ---------- 250																												
			50	DOL	IE3/IE4	0.37 ---------- 250																																				
			50	SD	IE3/IE4												7.5 ---------- 250																										

Please scan the QR Code for the Catalogues

- Contactor and Overload Relay
- IP Pricelist
- Low Voltage Switchgear & Power Quality Solutions
- Motor Protection Circuit Breaker

Fuseless Charts : With Thermal Magnetic Type Push-button MPCB type HGSM

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Iq in kA	Contactor	Overload Relay		MPCB type HGSM
kW	HP	Full Load Current Amps			Type	Range	Current Rating
0.06	--	0.19	100 kA	HGS9	Overload Protection is In-built in MPCB Trip Class 10A		0.16 A - 0.25 A
0.09	--	0.28	100 kA	HGS9			0.25 A - 0.4 A
0.12	0.16	0.51	100 kA	HGS9			0.4 A - 0.63 A
0.18	0.25	0.6	100 kA	HGS9			0.4 A - 0.63 A
0.25	0.33	0.8	100 kA	HGS9			0.63 A - 1 A
0.37	0.5	1.4	100 kA	HGS9			1 A - 1.6 A
0.55	0.75	1.7	100 kA	HGS9			1.6 A - 2.5 A
0.75	1	2.2	100 kA	HGS9			1.6 A - 2.5 A
1.1	1.5	2.9	100 kA	HGS9			2.5 A - 4 A
1.3	1.75	3	100 kA	HGS9			2.5 A - 4 A
1.5	2	3.8	100 kA	HGS9			2.5 A - 4 A
2.2	3	5.1	100 kA	HGS12			4 A - 6.3 A
3	4	6	100 kA	HGS12			4 A - 6.3 A
3.7	5	8.1	100 kA	HGS18			6.0 A - 10 A
4	5.5	8.5	100 kA	HGS18			6.0 A - 10 A
5.5	7.5	11.4	15 kA	HGS22			9 A - 14 A
7.5	10	15.4	15 kA	HGS25			13 A - 18 A
9.3	12.5	17.3	15 kA	HGS25			13 A - 18 A
11	15	22	15 kA	HGS32			20 A - 25 A
13	17.5	24	15 kA	HGS40			20 A - 25 A
15	20	30	10 kA	HGS40			24 A - 32 A

Fuseless Charts : With Thermal Magnetic type Rotary MPCB Type HGSTMR

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Iq in kA	Contactor	Overload Relay		MPCB Type HGSTMR	
kW	HP	Full Load Current A			Type	Range	Frame	Current Rating
0.06	--	0.19	100 kA	HGS9	Overload Protection is In-built in MPCB Trip Class 10		A1	0.16 A - 0.25 A
0.09	--	0.28	100 kA	HGS9			A1	0.25 A - 0.4 A
0.12	0.16	0.51	100 kA	HGS9			A1	0.4 A - 0.63 A
0.18	0.25	0.6	100 kA	HGS9			A1	0.4 A - 0.63 A
0.25	0.33	0.8	100 kA	HGS9			A1	0.63 A - 1 A
0.37	0.5	1.4	100 kA	HGS9			A1	1 A - 1.6 A
0.55	0.75	1.7	100 kA	HGS9			A1	1.6 A - 2.5 A
0.75	1	2.2	100 kA	HGS9			A1	1.6 A - 2.5 A
1.1	1.5	2.9	100 kA	HGS9			A1	2.5 A - 4 A
1.3	1.75	3	100 kA	HGS9			A1	2.5 A - 4 A
1.5	2	3.8	100 kA	HGS9			A1	2.5 A - 4 A
2.2	3	5.1	100 kA	HGS12			A1	4 A - 6.3 A
3	4	6	100 kA	HGS12			A1	4 A - 6.3 A
3.7	5	8.1	50 kA	HGS18			A1	6.3 A - 10 A
4	5.5	8.5	50 kA	HGS18			A1	6.3 A - 10 A
5.5	7.5	11.4	50 kA	HGS25			A1	10 A - 16 A
7.5	10	15.4	50 kA	HGS32			A1	10 A - 16 A
9.3	12.5	17.3	50 kA	HGS32			A1	16 A - 20 A
11	15	22	50 kA	HGS40			A1	20 A - 25 A
13	17.5	24	50 kA	HGS50			A1	20 A - 25 A
15	20	30	50 kA	HGS50			A1	25 A - 32 A
18.5	25	36	50 kA	HGS50			A2	28 A - 40 A
22	30	43	50 kA	HGS65			A2	40 A - 50 A
30	40	56	50 kA	HGS75			A2	45 A - 63 A

Fuseless Charts : With Magnetic type Rotary MPCB Type HGSMR

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Iq in kA	Contactor	Overload Relay		MPCB Type HGSMR	
kW	HP	Full Load Current A			Type	Range	Frame	Current Rating
0.06	--	0.19	100 kA	HGS9	HGST18	0.18 A - 0.26 A	A1	0.25
0.09	--	0.28	100 kA	HGS9	HGST18	0.25 A - 0.35 A	A1	0.4
0.12	0.16	0.51	100 kA	HGS9	HGST18	0.5 A - 0.7 A	A1	0.63
0.18	0.25	0.6	100 kA	HGS9	HGST18	0.5 A - 0.7 A	A1	0.63
0.25	0.33	0.8	100 kA	HGS9	HGST18	0.6 A - 0.9 A	A1	1
0.37	0.5	1.4	100 kA	HGS9	HGST18	1.1 A - 1.6 A	A1	1.6
0.55	0.75	1.7	100 kA	HGS9	HGST18	1.5 A - 2.1 A	A1	2.5
0.75	1	2.2	100 kA	HGS9	HGST18	2 A - 3 A	A1	2.5
1.1	1.5	2.9	100 kA	HGS9	HGST18	2.8 A - 4.2 A	A1	4
1.3	1.75	3	100 kA	HGS9	HGST18	2.8 A - 4.2 A	A1	4
1.5	2	3.8	100 kA	HGS9	HGST18	2.8 A - 4.2 A	A1	4
2.2	3	5.1	100 kA	HGS12	HGST18	4 A - 6 A	A1	6.3
3	4	6	100 kA	HGS12	HGST18	5.6 A - 8 A	A1	6.3
3.7	5	8.1	50 kA	HGS18	HGST18	6 A - 9 A	A1	10
4	5.5	8.5	50 kA	HGS18	HGST18	6 A - 9 A	A1	10
5.5	7.5	11.4	50 kA	HGS25	HGST40	8 A - 12 A	A1	16
7.5	10	15.4	50 kA	HGS32	HGST40	12 A - 18 A	A1	16
9.3	12.5	17.3	50 kA	HGS32	HGST40	12 A - 18 A	A1	20
11	15	22	50 kA	HGS40	HGST40	17 A - 25 A	A1	25
13	17.5	24	50 kA	HGS50	HGST40	17 A - 25 A	A1	25
15	20	30	50 kA	HGS50	HGST40	22 A - 32 A	A1	32
18.5	25	36	50 kA	HGS50	HGST40	28 A - 40 A	A2	40
22	30	43	50 kA	HGS65	HGST65	34 A - 50 A	A2	50
30	40	56	50 kA	HGS75	HGST65	45 A - 65 A	A2	63

Fuseless Charts : With Magnetic type Rotary MPCB Type HGSMR

IE2 IE3 READY

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Iq in kA	Contactor			Overload Relay		MPCB Type HGSMR	
kW	HP	FLC - In Amps			Main	Delta	Star	Type	Range	Frame	Current Rating
		Line	Phase								
0.25	0.33	0.8	0.5	100 kA	HGS9	HGS9	HGS9	HGST18	0.5 A - 0.7 A	A1	1.6
0.37	0.5	1.2	0.7	100 kA	HGS9	HGS9	HGS9	HGST18	0.6 A - 0.9 A	A1	2.5
0.55	0.75	1.5	0.9	100 kA	HGS9	HGS9	HGS9	HGST18	0.8 A - 1.2 A	A1	2.5
0.75	1	2.2	1.3	100 kA	HGS9	HGS9	HGS9	HGST18	1.1 A - 1.6 A	A1	4
1.1	1.5	2.9	1.7	100 kA	HGS9	HGS9	HGS9	HGST18	1.5 A - 2.1 A	A1	6.3
1.3	1.75	3	1.7	100 kA	HGS9	HGS9	HGS9	HGST18	1.5 A - 2.1 A	A1	6.3
1.5	2	3.8	2.2	100 kA	HGS9	HGS9	HGS9	HGST18	2 A - 3 A	A1	6.3
2.2	3	5.1	2.9	50 kA	HGS9	HGS9	HGS9	HGST18	2.8 A - 4.2 A	A1	10
3	4	6	3.5	50 kA	HGS9	HGS9	HGS9	HGST18	2.8 A - 4.2 A	A1	10
3.7	5	8.1	4.7	50 kA	HGS9	HGS9	HGS9	HGST18	4 A - 6 A	A1	16
4	5.5	8.5	4.9	50 kA	HGS9	HGS9	HGS9	HGST18	4 A - 6 A	A1	16
5.5	7.5	11.4	6.6	50 kA	HGS12	HGS12	HGS9	HGST18	5.6 A - 8 A	A1	20
7.5	10	15.4	8.9	50 kA	HGS18	HGS18	HGS9	HGST18	8 A - 12 A	A1	25
9.3	12.5	17.3	10.0	50 kA	HGS25	HGS25	HGS12	HGST40	8 A - 12 A	A1	32
11	15	22	12.7	50 kA	HGS25	HGS25	HGS12	HGST40	12 A - 18 A	A1	32
13	17.5	24	13.9	50 kA	HGS32	HGS32	HGS12	HGST40	12 A - 18 A	A2	40
15	20	30	17.3	50 kA	HGS32	HGS32	HGS18	HGST40	15 A - 22 A	A2	50
18.5	25	36	20.8	50 kA	HGS40	HGS40	HGS25	HGST40	15 A - 22 A	A2	63

Fuseless Charts : With Thermal Magnetic Type MCCB, A Frame

Model	A Frame			
Range	25-63	80-250	25-63	80-125
Icu kA	25	25	35	35
Ics of Icu	75%	75%	75%	75%
Iq kA	36	36	50	50

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		MCCB
kW	HP	FLC - In A		Type	Range	Current Rating
0.37	0.5	1.4	HGS9	HGST18	1.1 A - 1.6 A	25
0.55	0.75	1.7	HGS9	HGST18	1.5 A - 2.1 A	25
0.75	1	2.2	HGS9	HGST18	2 A - 3 A	25
1.1	1.5	2.9	HGS9	HGST18	2.8 A - 4.2 A	25
1.3	1.75	3	HGS9	HGST18	2.8 A - 4.2 A	25
1.5	2	3.8	HGS9	HGST18	3 A - 5 A	25
2.2	3	5.1	HGS12	HGST18	4 A - 6 A	25
3	4	6.0	HGS12	HGST18	5.6 A - 8 A	25
3.7	5	8.1	HGS18	HGST18	6 A - 9 A	25
4	5.5	8.5	HGS18	HGST18	6 A - 9 A	25
5.5	7.5	11.4	HGS25	HGST40	8 A - 12 A	25
7.5	10	15.4	HGS25	HGST40	12 A - 18 A	32
9.3	12.5	17.3	HGS25	HGST40	15 A - 22 A	40
11	15	22	HGS32	HGST40	17 A - 25 A	50
13	17.5	24	HGS40	HGST40	22 A - 32 A	63
15	20	30	HGS40	HGST40	28 A - 40 A	80
18.5	25	36	HGS50	HGST65	28 A - 40 A	80
22	30	43	HGS50	HGST65	34 A - 50 A	100
30	40	56	HGS75	HGST100	45 A - 65 A	125
37	50	69	HGS85	HGST100	52 A - 75 A	160
45	60	84	HGS100	HGST100	70 A - 100 A	160
55	75	99	HGS115	HGST150	69 A - 115 A	160

Fuseless Charts : With Thermal Magnetic Type MCCB, A Frame

Model	A Frame			
Range	25-63	80-250	25-63	80-125
Icu kA	25	25	35	35
Ics of Icu	75%	75%	75%	75%
Iq kA	36	36	50	50

IE2 IE3 READY

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		MCCB
kW	HP	FLC - In Amps							
		Line	Phase	Main	Delta	Star	Type	Range	Current Rating
0.75	1	2.2	1.3	HGS9	HGS9	HGS9	HGST18	1.1 A - 1.6 A	25
1.1	1.5	2.9	1.7	HGS9	HGS9	HGS9	HGST18	1.5 A - 2.1 A	25
1.3	1.75	3	1.7	HGS9	HGS9	HGS9	HGST18	1.5 A - 2.1 A	25
1.5	2	3.8	2.2	HGS9	HGS9	HGS9	HGST18	2 A - 3 A	25
2.2	3	5.1	2.9	HGS9	HGS9	HGS9	HGST18	2.8 A - 4.2 A	25
3	4	6	3.5	HGS9	HGS9	HGS9	HGST18	2.8 A - 4.2 A	25
3.7	5	8.1	4.7	HGS9	HGS9	HGS9	HGST18	4 A - 6 A	25
4	5.5	8.5	4.9	HGS9	HGS9	HGS9	HGST18	4 A - 6 A	25
5.5	7.5	11.4	6.6	HGS12	HGS12	HGS9	HGST18	5.6 A - 8 A	25
7.5	10	15.4	8.9	HGS18	HGS18	HGS9	HGST18	8 A - 12 A	32
9.3	12.5	17.3	10.0	HGS25	HGS25	HGS12	HGST40	8 A - 12 A	40
11	15	22	12.7	HGS25	HGS25	HGS12	HGST40	12 A - 18 A	50
13	17.5	24	13.9	HGS32	HGS32	HGS12	HGST40	12 A - 18 A	80
15	20	30	17.3	HGS32	HGS32	HGS18	HGST40	15 A - 22 A	80
18.5	25	36	20.8	HGS40	HGS40	HGS25	HGST40	15 A - 22 A	80
22	30	43	24.8	HGS40	HGS40	HGS32	HGST40	22 A - 32 A	125
30	40	56	32.3	HGS50	HGS50	HGS40	HGST65	28 A - 40 A	160
37	50	69	39.8	HGS65	HGS65	HGS40	HGST65	34 A - 50 A	200
45	60	84	48.5	HGS75	HGS75	HGS50	HGST100	45 A - 65 A	250

Fuseless Charts : With Thermal Magnetic Type MCCB, G Frame

	G Frame	
Range	16-160	16-160
Icu kA	10	25
Ics of Icu	100%	50%
Iq kA	25	36

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		MCCB
kW	HP	FLC - In A		Type	Range	Current Rating
0.37	0.5	1.4	HGS9	HGST18	1.1 A - 1.6 A	16
0.55	0.75	1.7	HGS9	HGST18	1.5 A - 2.1 A	16
0.75	1	2.2	HGS9	HGST18	2 A - 3 A	16
1.1	1.5	2.9	HGS9	HGST18	2.8 A - 4.2 A	16
1.3	1.75	3	HGS9	HGST18	2.8 A - 4.2 A	16
1.5	2	3.8	HGS9	HGST18	3 A - 5 A	16
2.2	3	5.1	HGS12	HGST18	4 A - 6 A	16
3	4	6.0	HGS12	HGST18	5.6 A - 8 A	16
3.7	5	8.1	HGS18	HGST18	6 A - 9 A	16
4	5.5	8.5	HGS18	HGST18	6 A - 9 A	16
5.5	7.5	11.4	HGS25	HGST40	8 A - 12 A	20
7.5	10	15.4	HGS25	HGST40	12 A - 18 A	25
9.3	12.5	17.3	HGS25	HGST40	15 A - 22 A	32
11	15	22	HGS32	HGST40	17 A - 25 A	40
13	17.5	24	HGS32	HGST40	22 A - 32 A	50
15	20	30	HGS40	HGST40	28 A - 40 A	50
18.5	25	36	HGS50	HGST65	28 A - 40 A	63
22	30	43	HGS50	HGST65	34 A - 50 A	80
30	40	56	HGS75	HGST100	45 A - 65 A	100
37	50	69	HGS85	HGST100	52 A - 75 A	125

Fuseless Charts : With Thermal Magnetic Type MCCB, G Frame

	G Frame	
Range	16-160	16-160
Icu kA	10	25
Ics of Icu	100%	50%
Iq kA	25	36

IE2 IE3 READY

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		MCCB
kW	HP	FLC - In Amps							
		Line	Phase	Main	Delta	Star	Type	Range	Current Rating
0.75	1	2.2	1.3	HGS9	HGS9	HGS9	HGST18	1.1 A - 1.6 A	16
1.1	1.5	2.9	1.7	HGS9	HGS9	HGS9	HGST18	1.5 A - 2.1 A	16
1.3	1.75	3	1.7	HGS9	HGS9	HGS9	HGST18	1.5 A - 2.1 A	16
1.5	2	3.8	2.2	HGS9	HGS9	HGS9	HGST18	2 A - 3 A	16
2.2	3	5.1	2.9	HGS9	HGS9	HGS9	HGST18	2.8 A - 4.2 A	16
3	4	6	3.5	HGS9	HGS9	HGS9	HGST18	2.8 A - 4.2 A	16
3.7	5	8.1	4.7	HGS9	HGS9	HGS9	HGST18	4 A - 6 A	16
4	5.5	8.5	4.9	HGS9	HGS9	HGS9	HGST18	4 A - 6 A	16
5.5	7.5	11.4	6.6	HGS12	HGS12	HGS9	HGST18	5.6 A - 8 A	20
7.5	10	15.4	8.9	HGS18	HGS18	HGS9	HGST18	8 A - 12 A	25
9.3	12.5	17.3	10.0	HGS25	HGS25	HGS12	HGST40	8 A - 12 A	32
11	15	22	12.7	HGS25	HGS25	HGS12	HGST40	12 A - 18 A	40
13	17.5	24	13.9	HGS32	HGS32	HGS12	HGST40	12 A - 18 A	50
15	20	30	17.3	HGS32	HGS32	HGS18	HGST40	15 A - 22 A	50
18.5	25	36	20.8	HGS40	HGS40	HGS25	HGST40	15 A - 22 A	63
22	30	43	24.8	HGS40	HGS40	HGS32	HGST40	22 A - 32 A	80
30	40	56	32.3	HGS50	HGS50	HGS40	HGST65	28 A - 40 A	100

Fuseless Charts : With Thermal Magnetic Type MCCB, HID1 Frame

Model	HID1 Frame		
Range	40-160	40-160	40-160
Icu kA	10	27	36
Ics of Icu	100%	100%	100%
Iq kA	25	36	50

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		MCCB
kW	HP	FLC - In A		Type	Range	Current Rating
0.37	0.5	1.4	HGS18	HGST18	1.1 A - 1.6 A	40
0.55	0.75	1.7	HGS18	HGST18	1.5 A - 2.1 A	40
0.75	1	2.2	HGS18	HGST18	2 A - 3 A	40
1.1	1.5	2.9	HGS18	HGST18	2.8 A - 4.2 A	40
1.3	1.75	3	HGS18	HGST18	2.8 A - 4.2 A	40
1.5	2	3.8	HGS18	HGST18	3 A - 5 A	40
2.2	3	5.1	HGS18	HGST18	4 A - 6 A	40
3	4	6.0	HGS18	HGST18	5.6 A - 8 A	40
3.7	5	8.1	HGS22	HGST18	6 A - 9 A	40
4	5.5	8.5	HGS22	HGST18	6 A - 9 A	40
5.5	7.5	11.4	HGS25	HGST40	8 A - 12 A	40
7.5	10	15.4	HGS25	HGST40	12 A - 18 A	40
9.3	12.5	17.3	HGS32	HGST40	15 A - 22 A	50
11	15	22	HGS32	HGST40	17 A - 25 A	50
13	17.5	24	HGS40	HGST40	22 A - 32 A	50
15	20	30	HGS50	HGST65	28 A - 40 A	63
18.5	25	36	HGS65	HGST65	28 A - 40 A	80
22	30	43	HGS65	HGST65	34 A - 50 A	100
30	40	56	HGS75	HGST100	45 A - 65 A	125
37	50	69	HGS85	HGST100	52 A - 75 A	125
45	60	84	HGS100	HGST100	70 A - 100 A	160

Fuseless Charts : With Thermal Magnetic Type MCCB, HID1 Frame

Model	HID1 Frame		
Range	40-160	40-160	40-160
Icu kA	10	27	36
Ics of Icu	100%	100%	100%
Iq kA	25	36	50

IE2 IE3 READY

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		MCCB
kW	HP	FLC - In Amps							
		Line	Phase	Main	Delta	Star	Type	Range	Current Rating
0.75	1	2.2	1.3	HGS18	HGS18	HGS18	HGST18	1.1 A - 1.6 A	40
1.1	1.5	2.9	1.7	HGS18	HGS18	HGS18	HGST18	1.5 A - 2.1 A	40
1.3	1.75	3	1.7	HGS18	HGS18	HGS18	HGST18	1.5 A - 2.1 A	40
1.5	2	3.8	2.2	HGS18	HGS18	HGS18	HGST18	2 A - 3 A	40
2.2	3	5.1	2.9	HGS18	HGS18	HGS18	HGST18	2.8 A - 4.2 A	40
3	4	6	3.5	HGS18	HGS18	HGS18	HGST18	2.8 A - 4.2 A	40
3.7	5	8.1	4.7	HGS18	HGS18	HGS18	HGST18	4 A - 6 A	40
4	5.5	8.5	4.9	HGS22	HGS22	HGS22	HGST18	4 A - 6 A	40
	7.5	11.4	6.6	HGS22	HGS22	HGS18	HGST18	5.6 A - 8 A	40
7.5	10	15.4	8.9	HGS22	HGS22	HGS18	HGST18	8 A - 12 A	40
9.3	12.5	17.3	10.0	HGS25	HGS25	HGS18	HGST40	8 A - 12 A	50
11	15	22	12.7	HGS32	HGS32	HGS18	HGST40	12 A - 18 A	50
13	17.5	24	13.9	HGS40	HGS40	HGS22	HGST40	12 A - 18 A	50
15	20	30	17.3	HGS40	HGS40	HGS18	HGST40	15 A - 22 A	63
18.5	25	36	20.8	HGS50	HGS50	HGS25	HGST65	15 A - 22 A	80
22	30	43	24.8	HGS50	HGS50	HGS32	HGST65	22 A - 32 A	100
30	40	56	32.3	HGS50	HGS50	HGS40	HGST65	28 A - 40 A	125
37	50	69	39.8	HGS65	HGS65	HGS50	HGST65	34 A - 50 A	125
45	60	84	48.5	HGS75	HGS75	HGS50	HGST100	45 A - 65 A	160

Fuseless Charts : With Thermal Magnetic Type MCCB, ML1 Frame

Model	ML1 Frame
Range	63-125
Icu kA	10
Ics of Icu	50%
Iq kA	20

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		MCCB
kW	HP	FLC - In A		Type	Range	Current Rating
11	15	22	HGS32	HGST40	17 A - 25 A	63
13	17.5	24	HGS32	HGST40	22 A - 32 A	63
15	20	30	HGS40	HGST40	28 A - 40 A	63
18.5	25	36	HGS50	HGST65	28 A - 40 A	80
22	30	43	HGS65	HGST65	34 A - 50 A	100
30	40	56	HGS75	HGST100	45 A - 65 A	125

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay			MCCB
kW	HP	FLC - In Amps								
		Line	Phase	Main	Delta	Star	Type	Range	Frame	Current Rating
11	15	22	12.7	HGS25	HGS25	HGS12	HGST40	12 A - 18 A	ML1	63
13	17.5	24	13.9	HGS32	HGS32	HGS12	HGST40	12 A - 18 A	ML1	63
15	20	30	17.3	HGS32	HGS32	HGS18	HGST40	15 A - 22 A	ML1	63
18.5	25	36	20.8	HGS40	HGS40	HGS25	HGST40	15 A - 22 A	ML1	80
22	30	43	24.8	HGS40	HGS40	HGS32	HGST40	22 A - 32 A	ML1	100

Fuseless Charts : With Thermal Magnetic Type MCCB, L Frame

Model	L Frame	
Range	200-630	250-630
Icu kA	36	50
Ics of Icu	100%	100%
Iq kA	50	65

IE2 | IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		MCCB
kW	HP	FLC - In A		Type	Range	Current Rating
37	50	69	HGS85	HGST100	52 A - 75 A	200
45	60	84	HGS100	HGST100	70 A - 100 A	200
55	75	99	HGS115	HGST150	69 A - 115 A	200
75	100	134	HGS150	HGST150	90 A - 150 A	250
80	110	139	HGS150	HGST150	90 A - 150 A	250
90	120	164	HGS185	HGST265	111 A - 185 A	250
110	150	204	HGS225	HGST265	135 A - 225 A	250
125	170	234	HGS265	HGST265	159 A - 265 A	250
132	180	247	HGS265	HGST265	159 A - 265 A	320
160	215	288	HGS300	HGST500	240 A - 400 A	400
180	240	298	HGS400	HGST500	240 A - 400 A	400
200	270	348	HGS400	HGST500	240 A - 400 A	500
225	300	360	HGS400	HGST500	240 A - 400 A	500
250	335	435	HGS500	HGST500	300 A - 500 A	630

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		MCCB
kW	HP	FLC - In Amps							
		Line	Phase	Main	Delta	Star	Type	Range	Current Rating
45	60	84	48.5	HGS75	HGS75	HGS50	HGST100	45 A - 65 A	200
55	75	99	57.2	HGS100	HGS100	HGS65	HGST100	45 A - 65 A	200
75	100	134	77.4	HGS115	HGS115	HGS75	HGST150	48 A - 80 A	250
80	110	139	80.3	HGS115	HGS115	HGS75	HGST150	69 A - 115 A	250
90	120	164	94.7	HGS150	HGS150	HGS100	HGST150	69 A - 115 A	250
110	150	204	117.8	HGS185	HGS185	HGS115	HGST265	78 A - 130 A	320
125	170	234	135.1	HGS225	HGS225	HGS115	HGST265	90 A - 150 A	500
132	180	247	142.6	HGS225	HGS225	HGS115	HGST265	90 A - 150 A	500
150	200	248	143.2	HGS225	HGS225	HGS115	HGST265	90 A - 150 A	500

Fuseless Charts : With Microprocessor based MCCB, L Frame

Model	L Frame	
Range	200-630	250-630
Icu kA	36	50
Ics of Icu	100%	100%
Iq kA	50	65

IE2 IE3 READY

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		MCCB
kW	HP	FLC - In A		Type	Range	Current Rating
37	50	69	HGS85	HGST100	52 A - 75 A	250
45	60	84	HGS100	HGST100	70 A - 100 A	250
55	75	99	HGS115	HGST150	69 A - 115 A	250
75	100	134	HGS150	HGST150	90 A - 150 A	250
80	110	139	HGS150	HGST150	90 A - 150 A	250
90	120	164	HGS185	HGST265	111 A - 185 A	250
110	150	204	HGS225	HGST265	135 A - 225 A	320
125	170	234	HGS265	HGST265	159 A - 265 A	400
132	180	247	HGS265	HGST265	159 A - 265 A	400
160	215	288	HGS300	HGST500	240 A - 400 A	500
180	240	298	HGS300	HGST500	240 A - 400 A	500
200	270	348	HGS400	HGST500	240 A - 400 A	630
225	300	360	HGS400	HGST500	240 A - 400 A	630
250	335	435	HGS500	HGST500	300 A - 500 A	630

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		MCCB
kW	HP	FLC - In Amps							
		Line	Phase	Main	Delta	Star	Type	Range	Current Rating
45	60	84	48.5	HGS75	HGS75	HGS50	HGST100	45 A - 65 A	250
55	75	99	57.2	HGS100	HGS100	HGS65	HGST100	45 A - 65 A	250
75	100	134	77.4	HGS115	HGS115	HGS75	HGST150	48 A - 80 A	320
80	110	139	80.3	HGS115	HGS115	HGS75	HGST150	69 A - 115 A	320
90	120	164	94.7	HGS150	HGS150	HGS100	HGST150	69 A - 115 A	400
110	150	204	117.8	HGS185	HGS185	HGS115	HGST265	78 A - 130 A	500
125	170	234	135.1	HGS225	HGS225	HGS115	HGST265	90 A - 150 A	630
132	180	247	142.6	HGS225	HGS225	HGS115	HGST265	90 A - 150 A	630
150	200	248	143.2	HGS225	HGS225	HGS115	HGST265	90 A - 150 A	630

Fusel Based Charts for Direct Online Starters : With HRC Fueses

Conditional Short Circuit Current Iq - 50 kA

IE2

Direct online Starters

3Φ Motors rated at 415 V, 50 Hz			Contactor	Overload Relay		Nominal Backup Fuse		SDF
kW	HP	FLC - In A		Type	Range	Type	Rating (A)	
0.37	0.5	1.1	HGS 9	HGST18	0.8--1.2	BS	4	H-TIA 32
0.55	0.75	1.4	HGS 9	HGST18	1.1-1.6	DIN	6	H-CD-00-32
0.75	1	1.7	HGS 9	HGST18	1.5-2.1	DIN	6	H-CD-00-32
1.1	1.5	2.4	HGS 9	HGST18	2.0-3.0	DIN	6	H-CD-00-32
1.5	2	3.2	HGS 9	HGST18	2.8-4.2	DIN	10	H-CD-00-32
2.2	3	4.8	HGS 9	HGST18	4.0-6.0	DIN	16	H-CD-00-32
3.7	5	7.4	HGS 9	HGST18	6-9.0	DIN	20	H-CD-00-32
5.5	7.5	11.2	HGS 12	HGST18	8-12.0	DIN	25	H-CD-00-32
7.5	10	15	HGS 18	HGST18	12-18.0	DIN	32	H-CD-00-32
9.3	12.5	19	HGS 25	HGST40	15-22	DIN	40	H-CD-00-63
11	15	21	HGS 25	HGST40	17-25	DIN	50	H-CD-00-63
15	20	28	HGS 32	HGST40	22-32	DIN	63	H-CD-00-63
18.5	25	34	HGS 40	HGST40	28-40	DIN	80	H-CD-00-100
22	30	40	HGS 50	HGST65	34-50	DIN	100	H-CD-00-100
30	40	57	HGS 65	HGST65	45-65	DIN	125	H-CD-00-125
37	50	64	HGS 85	HGST100	52-75	DIN	125	H-CD-00-125
45	60	77	HGS 85	HGST100	59-85	DIN	160	Size 1-160
55	73	101	HGS 115	HGST150	69-115	DIN	160	Size 1-160
75	100	134	HGS 150	HGST150	90-150	DIN	200	Size 1-200
90	120	160	HGS 185	HGST265	111-185	DIN	250	Size 1-250
110	150	190	HGS 225	HGST265	135-225	DIN	300	Size 2-320
132	177	228	HGS 265	HGST265	159-265	DIN	400	Size 2-400
160	215	269	HGS 300	HGST500	180-300	DIN	400	Size 2-400
200	270	350	HGS 400	HGST500	240-400	DIN	500	Size 3-630
250	340	430	HGS 500	HGST500	300-500	DIN	630	Size 3-630

Fusel Based Charts for Star Delta Starters : With HRC Fueses

Conditional Short Circuit Current Iq - 50 kA

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		Nominal Backup Fuse		SDF
kW	HP	FLC - In Amps		Main	Delta	Star	Type	Range	Type	Rating	
		Line	Phase								
4	5.5	7.8	4.5	HGS 9	HGS 9	HGS 9	HGST18	3-5.0	DIN	16	H-CD-00-32
5.5	7.5	11.2	6.5	HGS 9	HGS 9	HGS 9	HGST18	5.6-8	DIN	20	H-CD-00-32
7.5	10	15	9.2	HGS 12	HGS 12	HGS 9	HGST18	8-12.0	DIN	25	H-CD-00-32
11	15	21	12.0	HGS 12	HGS 12	HGS 9	HGST18	8-12.0	DIN	32	H-CD-00-32
15	20	28	16.2	HGS 25	HGS 25	HGS 18	HGST40	12-18.0	DIN	40	H-CD-00-63
18.5	25	34	19.7	HGS 32	HGS 32	HGS 25	HGST40	15-22	DIN	50	H-CD-00-63
22	30	40	23.2	HGS 40	HGS 40	HGS 25	HGST40	17-25	DIN	63	H-CD-00-63
30	40	57	30.6	HGS 40	HGS 40	HGS 25	HGST40	22-32	DIN	80	H-CD-00-100
37	50	64	37.5	HGS 40	HGS 40	HGS 32	HGST40	28-40	DIN	100	H-CD-00-100
45	60	77	45.0	HGS 50	HGS 50	HGS 40	HGST65	34-50	DIN	100	H-CD-00-100
55	75	101	55.4	HGS 65	HGS 65	HGS 40	HGST65	45-65	DIN	100	H-CD-00-100
75	100	134	75.6	HGS 85	HGS 85	HGS 65	HGST 100	59-85	DIN	160	Size 1-160
90	120	156	90.0	HGS 100	HGS 100	HGS 85	HGST 100	70-100	DIN	160	Size 1-160
110	150	190	113.0	HGS 115	HGS 115	HGS 115	HGST 150	78-130	DIN	200	Size 1-200
132	177	228	133.0	HGS 150	HGS 150	HGS 115	HGST 150	90-150	DIN	250	Size 1-250
160	215	269	162.0	HGS 185	HGS 185	HGS 115	HGST 265	111-185	DIN	300	Size 2-320
200	268	350	202.0	HGS 225	HGS 225	HGS 185	HGST 265	135-225	DIN	400	Size 2-400
250	335	430	248.0	HGS 265	HGS 265	HGS 265	HGST 265	159-265	DIN	500	Size 2-500

Fusel Based Charts for Direct Online Starters : With HRC Fueses

Conditional Short Circuit Current Iq - 50 kA

IE3 IE4 READY

Direct online Starters

	Motor : 3ϕ, 415 V, 50 Hz / 60 Hz, 4P, 1500 revolution per minute		Contactor (HGS)	Relay (HGST)		Nominal Backup Fuse		SDF
kW	HP	Ie (A) Max	Type	Type	Rating (A)	Type	Rating (A)	
0.37	0.5	0.99	HGS 9	HGST18	0.8-1.2	BS	4	H-TIA 32
0.55	0.75	1.2	HGS 9	HGST18	1.1-1.6	BS	4	H-TIA 32
0.75	1	1.7	HGS 9	HGST18	1.5-2.1	DIN	6	H-CD-00-32
1.1	1.5	2.2	HGS 9	HGST18	2-3.0	DIN	10	H-CD-00-32
1.5	2	3.1	HGS 12	HGST18	2.8-4.2	DIN	10	H-CD-00-32
2.2	3	4.3	HGS 12	HGST18	4.0-6.0	DIN	16	H-CD-00-32
4	3.7	8.2	HGS 12	HGST18	6-9	DIN	20	H-CD-00-32
3.7	5	7.3	HGS 12	HGST18	5.6-8	DIN	25	H-CD-00-32
5.5	7.5	11.0	HGS 12	HGST18	8-12	DIN	32	H-CD-00-32
7.5	10	14.0	HGS 32	HGST40	12-18	DIN	40	H-CD-00-63
11	15	20.0	HGS 32	HGST40	15-22	DIN	50	H-CD-00-63
15	20	27.0	HGS 32	HGST40	22-32	DIN	63	H-CD-00-63
18.5	25	34.0	HGS 40	HGST40	28-40	DIN	80	H-CD-00-100
22	30	40.0	HGS 50	HGST65	34-50	DIN	80	H-CD-00-100
30	40	55.0	HGS 65	HGST65	45-65	DIN	100	H-CD-00-100
37	50	64.0	HGS 85	HGST100	52-75	DIN	125	H-CD-00-125
45	60	77.0	HGS 100	HGST100	59-85	DIN	160	Size 1-160
55	73	95.0	HGS 115	HGST150	69-115	DIN	160	Size 1-160
75	100	129.0	HGS 150	HGST150	90-150	DIN	200	Size 1-200
90	125	151.0	HGS 185	HGST265	111-185	DIN	250	Size 1-250
110	150	186.0	HGS 225	HGST265	135-225	DIN	300	Size 2-320
132	180	221.0	HGS 265	HGST265	159-265	DIN	400	Size 2-400
160	220	267.0	HGS 300	HGST500	180-300	DIN	500	Size 2-630
200	270	332.0	HGS400	HGST500	240-400	DIN	630	Size 3-630
250	340	420	HGS500	HGST500	300-500	DIN	630	Size 3-630

Fusel Based Charts for Star Delta Starters : With HRC Fueses

Conditional Short Circuit Current Iq - 50 kA

IE3 IE4 READY

Star Delta Starters

3Φ Motors rated at 415 V, 50 Hz				Contactor			Overload Relay		Nominal Backup Fuse		SDF
kW	HP	FLC - In Amps		Main	Delta	Star	Type	Range	Type	Rating	
		Line	Phase								
7.5	10	15	8.7	HGS 25	HGS 25	HGS 9	HGST40	7-10	DIN	25	H-CD-00-32
11	15	21	12.2	HGS 32	HGS 32	HGS 12	HGST40	12-18	DIN	32	H-CD-00-32
15	20	29	16.8	HGS 32	HGS 32	HGS 12	HGST40	12-18.0	DIN	40	H-CD-00-63
18.5	25	34	19.7	HGS 40	HGS 40	HGS 32	HGST40	15-22	DIN	50	H-CD-00-63
22	30	40	23.2	HGS 50	HGS 50	HGS 32	HGST65	22-32	DIN	63	H-CD-00-63
30	40	57	33.1	HGS 65	HGS 65	HGS 40	HGST65	28-40	DIN	80	H-CD-00-100
37	50	64	37.1	HGS 85	HGS 85	HGS 40	HGST 100	34-50	DIN	100	H-CD-00-100
45	60	77	44.7	HGS 85	HGS 85	HGS 40	HGST 100	34-50	DIN	100	H-CD-00-100
55	75	101	58.6	HGS 115	HGS 115	HGS 65	HGST 150	48-80	DIN	125	H-CD-00-125
75	100	134	77.7	HGS 150	HGS 150	HGS 65	HGST 150	48-80	DIN	160	Size 1-160
90	120	156	90.5	HGS 185	HGS 185	HGS 65	HGST 265	69-115	DIN	160	Size 1-160
110	150	190	110.2	HGS 225	HGS 225	HGS 115	HGST 265	78-130	DIN	200	Size 1-200
132	177	228	132.2	HGS 265	HGS 265	HGS 115	HGST 265	90-150	DIN	250	Size 1-250
160	215	269	156.0	HGS 300	HGS 300	HGS 115	HGST 500	135-225	DIN	300	Size 2-320
200	268	350	203.0	HGS 400	HGS 400	HGS 225	HGST 500	135-225	DIN	400	Size 2-400
250	335	430	249.0	HGS 500	HGS 500	HGS 265	HGST 500	159-265	DIN	500	Size 2-500

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