

# Manual motor starter MS325



Manual motor starters (also known as motor protection circuit breakers or manual motor protectors) are electromechanical protection devices for the main circuit mainly used to switch motors manually ON/OFF and protect them fuseless against short-circuits, overloads and phase failures. Fuseless protection with a manual motor starter saves costs, space and ensures a quick reaction under short-circuit condition, by switching off the motor within milliseconds. Fuseless starter combinations are setup together with contactors.

### Description

- Overload protection – trip class 10A
- Phase loss sensitivity
- Disconnect function
- Temperature compensation from -25 ... +50 °C
- Adjustable current setting for overload protection
- Suitable for three- and single-phase application
- Trip-free mechanism
- Clear switch position indication ON/OFF

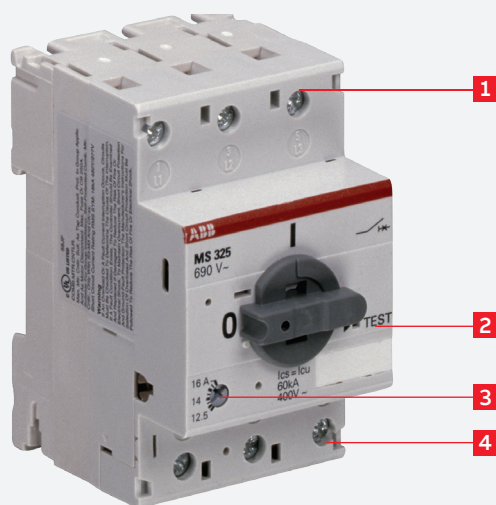


### Order data

MS325 screw terminals

| Setting range | Type       | Order code      | Weight<br>Pkg<br>(1 pce)<br>kg |
|---------------|------------|-----------------|--------------------------------|
| A             |            |                 | kg                             |
| 0.10...0.16   | MS325-0.16 | 1SAM150000R1001 | 0.310                          |
| 0.16...0.25   | MS325-0.25 | 1SAM150000R1002 | 0.310                          |
| 0.25...0.40   | MS325-0.4  | 1SAM150000R1003 | 0.310                          |
| 0.40...0.63   | MS325-0.63 | 1SAM150000R1004 | 0.310                          |
| 0.63...1.00   | MS325-1    | 1SAM150000R1005 | 0.340                          |
| 1.00...1.60   | MS325-1.6  | 1SAM150000R1006 | 0.370                          |
| 1.60...2.50   | MS325-2.5  | 1SAM150000R1007 | 0.370                          |
| 2.50...4.00   | MS325-4    | 1SAM150000R1008 | 0.370                          |
| 4.00...6.30   | MS325-6.3  | 1SAM150000R1009 | 0.370                          |
| 6.30...9.0    | MS325-9    | 1SAM150000R1010 | 0.370                          |
| 9.00...12.5   | MS325-12.5 | 1SAM150000R1011 | 0.370                          |
| 12.5...16.0   | MS325-16   | 1SAM150000R1012 | 0.370                          |
| 16.0...20.0   | MS325-20   | 1SAM150000R1013 | 0.370                          |
| 20.0...25.0   | MS325-25   | 1SAM150000R1014 | 0.370                          |

Note: Manual motor starters should always be selected so that the actual motor current is within the setting range.



### Functional description

1. Terminals 1L1, 3L2, 5L3
2. Test function
3. Current setting range  
Adjustable current setting for overload protection
4. Terminals 2T1, 4T2, 6T3

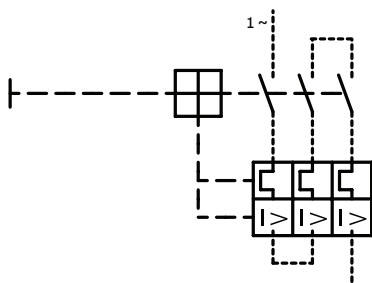
### Application

Manual motor starters (also known as motor protection circuit breakers or manual motor protectors) protect the load and the installation against short-circuits and overloads. They are three pole protection devices with thermal tripping elements for overload protection and electromagnetic tripping elements for short-circuit protection. Furthermore, they provide a disconnect function for

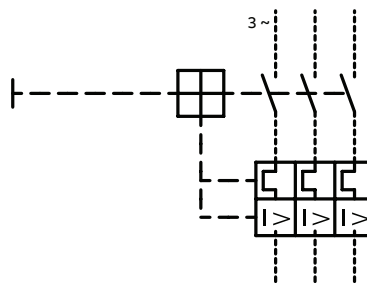
safe isolation of the installation and the supply, and they can be used for manual switching of loads. Manual motor starters have a setting scale in amperes, which allows direct adjusting of the device without any additional calculation.

In compliance with international and national standards, the setting current is the rated current of the motor and not the tripping current.

### Operation mode

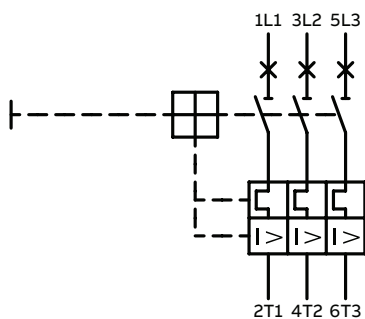


Single-phase operation



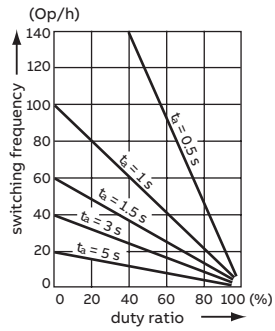
Three-phase operation

### Wiring diagram



**Resistance and power loss per pole**

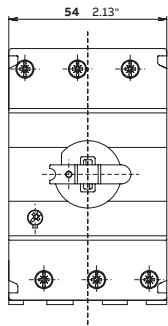
| Type       | Setting range |             | Resistance per pole<br>Ω | Power loss per pole |                |
|------------|---------------|-------------|--------------------------|---------------------|----------------|
|            | lower value   | upper value |                          | at lower value      | at upper value |
|            | A             | A           |                          | W                   | W              |
| MS325-0.16 | 0.10          | 0.16        | 71.10                    | 0.7                 | 1.8            |
| MS325-0.25 | 0.16          | 0.25        | 27.10                    | 0.7                 | 1.7            |
| MS325-0.4  | 0.25          | 0.40        | 12.30                    | 0.8                 | 2.0            |
| MS325-0.63 | 0.40          | 0.63        | 5.17                     | 0.8                 | 2.1            |
| MS325-1    | 0.63          | 1.00        | 2.090                    | 0.8                 | 2.1            |
| MS325-1.6  | 1.00          | 1.60        | 0.805                    | 0.8                 | 2.1            |
| MS325-2.5  | 1.60          | 2.50        | 0.340                    | 0.9                 | 2.1            |
| MS325-4    | 2.50          | 4.00        | 0.141                    | 0.9                 | 2.3            |
| MS325-6.3  | 4.00          | 6.30        | 0.051                    | 0.8                 | 2.0            |
| MS325-9    | 6.30          | 9.0         | 0.022                    | 0.9                 | 1.8            |
| MS325-12.5 | 9.00          | 12.5        | 0.012                    | 1.0                 | 1.8            |
| MS325-16   | 12.5          | 16.0        | 0.007                    | 1.0                 | 1.7            |
| MS325-20   | 16.0          | 20.0        | 0.004                    | 1.0                 | 1.6            |
| MS325-25   | 20.0          | 25.0        | 0.003                    | 1.1                 | 1.7            |



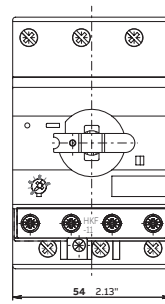
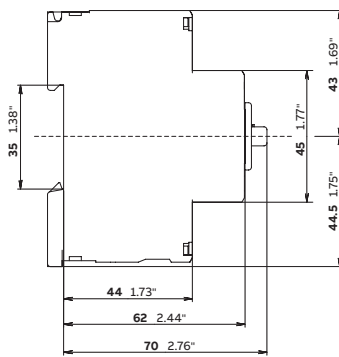
Intermittent periodic duty, ta: Motor starting time

**Main dimensions**

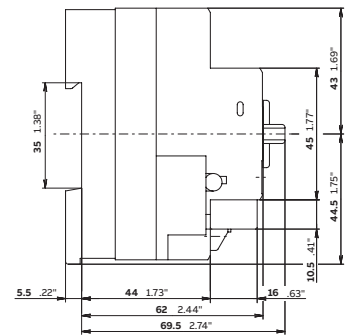
in mm / inches



MS325



MS325 with HK-F11







**Technical data IEC/EN**Data at  $t_a = 40\text{ °C}$  and at rated values, if nothing else indicated**Main circuit**

|                                                                                                       |                                                                         |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Terminal marking                                                                                      | 1L1-3L2-5L3<br>2T1-4T2-6T3                                              |
| Rated operational voltage $U_e$                                                                       | 690 V AC                                                                |
|                                                                                                       | 440 V DC                                                                |
| Setting range - thermal overload protection                                                           | see table "Order data" on page 1                                        |
| Rated operational current $I_e$                                                                       | see table below                                                         |
| Rated operational current DC-5 $I_e$<br>3 conducting paths in series up to 250 V                      | see "Rated operational current $I_e$ "                                  |
| Rated instantaneous short-circuit current setting $I_i$                                               | see table below                                                         |
| Rated service short-circuit breaking capacity $I_{cs}$                                                | see table "Short-circuit breaking capacity and back-up fuses" on page 6 |
| Rated ultimate short-circuit breaking capacity $I_{cu}$                                               | on request                                                              |
| Rated service short-circuit breaking capacity DC $I_{cs}$<br>3 conducting paths in series up to 250 V | on request                                                              |
| Trip class                                                                                            | see table "Order data" on page 1                                        |
| Rated frequency                                                                                       | DC, 50/60 Hz                                                            |
| Number of poles                                                                                       | 3                                                                       |
| Resistance per pole                                                                                   | see table "Resistance and power loss per pole" on page 3                |
| Power loss per pole                                                                                   | see table "Resistance and power loss per pole" on page 3                |

**Isolation data**

|                                           |       |
|-------------------------------------------|-------|
| Rated impulse withstand voltage $U_{imp}$ | 6 kV  |
| Rated insulation voltage $U_i$            | 690 V |
| Pollution degree                          | 3     |

**Electrical connection**

|                                                                                                                     |  |                                                                  |
|---------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------|
| Type                                                                                                                |  | <b>MS325</b>                                                     |
|  solid                           |  | $1/2 \times 1 \dots 6 \text{ mm}^2 / 1 \times 10 \text{ mm}^2$   |
|  flexible with ferrule           |  | $1/2 \times 0.75 \dots 4 \text{ mm}^2 / 1 \times 6 \text{ mm}^2$ |
|  flexible with ferrule insulated |  | $1/2 \times 0.75 \dots 4 \text{ mm}^2 / 1 \times 6 \text{ mm}^2$ |
|  flexible without ferrule        |  | $1/2 \times 1 \dots 6 \text{ mm}^2$                              |
| Stripping length                                                                                                    |  | 10 mm                                                            |
| Tightening torque                                                                                                   |  | 1.4 Nm                                                           |
| Recommended screw driver                                                                                            |  | Pozidriv 2                                                       |

| Type       | Rated instantaneous short-circuit current setting $I_i$<br>A | Rated operational current $I_e$<br>A |
|------------|--------------------------------------------------------------|--------------------------------------|
| MS325-0.16 | 1.56                                                         | 0.16                                 |
| MS325-0.25 | 2.44                                                         | 0.25                                 |
| MS325-0.4  | 3.90                                                         | 0.40                                 |
| MS325-0.63 | 6.14                                                         | 0.63                                 |
| MS325-1    | 11.50                                                        | 1.00                                 |
| MS325-1.6  | 18.40                                                        | 1.60                                 |
| MS325-2.5  | 28.75                                                        | 2.50                                 |
| MS325-4    | 50.00                                                        | 4.00                                 |
| MS325-6.3  | 78.75                                                        | 6.30                                 |
| MS325-9    | 135.5                                                        | 9.00                                 |
| MS325-12.5 | 180                                                          | 12.5                                 |
| MS325-16   | 240                                                          | 16.0                                 |
| MS325-20   | 300                                                          | 20.0                                 |
| MS325-25   | 375                                                          | 25.0                                 |

**General data**

|                                                 |                                  |                                                                                                                                                            |
|-------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mechanical durability                           |                                  | 100 000                                                                                                                                                    |
| Electrical durability                           |                                  | 50 000                                                                                                                                                     |
| Duty time                                       |                                  | 100%                                                                                                                                                       |
| Operating frequency without early tripping      |                                  | up to 15 operations/h or 60 operations/h with 40% duty ratio, if the motor breaking current $6 \times I_n$ and the motor starting time does not exceed 1 s |
| Dimensions (W x H x D)                          |                                  | see drawing "Dimensions" on page 3                                                                                                                         |
| Weight                                          |                                  | see table "Order data" on page 1                                                                                                                           |
| Mounting                                        |                                  | DIN-rail (EN 60715)                                                                                                                                        |
| Mounting position                               |                                  | position 1-6 (optional for single mounting)                                                                                                                |
| Group mounting                                  |                                  | on request                                                                                                                                                 |
| Minimum distance to other units same type       | horizontal                       | 0 mm                                                                                                                                                       |
|                                                 | vertical                         | 100 mm                                                                                                                                                     |
| Minimum distance to electrical conductive board | horizontal, up to 400 V          | > 1.5 mm                                                                                                                                                   |
|                                                 | horizontal, up to 690 V          | > 1.5 mm                                                                                                                                                   |
|                                                 | vertical                         | 75 mm                                                                                                                                                      |
|                                                 | housing / main circuit terminals | IP20                                                                                                                                                       |
| Degree of protection                            |                                  | IP20                                                                                                                                                       |
| Utilization category                            |                                  | A                                                                                                                                                          |
| Maximum operating altitude                      |                                  | 2000 m                                                                                                                                                     |
| Maximum operating frequency                     |                                  | 170 cycles/h                                                                                                                                               |

**Environmental data**

|                                                      |                    |                          |
|------------------------------------------------------|--------------------|--------------------------|
| Ambient air temperature                              |                    |                          |
| Operation                                            | open - compensated | -25 ... +50 °C           |
|                                                      | open               | -25 ... +50 °C           |
| Storage                                              |                    | -50 ... +80 °C           |
| Ambient air temperature compensation                 |                    | acc. to IEC/EN 60947-4-1 |
| Vibration (sinusoidal) acc. to IEC/EN 60068-2-6 (Fc) |                    | 5g / 10 ... 150 Hz       |
| Shock (half-sine) acc. to IEC/EN 60068-2-27 (Ea)     |                    | 15g / 11 ms              |

**Standards / directives**

|                       |                                                                                                                                        |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Standards             | IEC/EN 60947-1<br>IEC/EN 60947-2<br>IEC/EN 60947-4-1<br>UL 60947-1<br>UL 60947-4-1<br>CSA-C22.2 No. 60947-1<br>CSA-C22.2 No. 60947-4-1 |
| Low Voltage Directive | 2014/35/EU                                                                                                                             |
| RoHS Directive        | 2011/65/EU                                                                                                                             |

### Short-circuit breaking capacity and back-up fuses

$I_{cs}$  Rated service short-circuit breaking capacity

$I_{cu}$  Rated ultimate short-circuit breaking capacity

- No back-up fuse required, because short-circuit proof up to 100 kA



| Type       | 230 V AC       |                |         | 400 V AC       |                |         | 440 V AC       |                |         | 500 V AC       |                |         | 690 V AC       |                |         |
|------------|----------------|----------------|---------|----------------|----------------|---------|----------------|----------------|---------|----------------|----------------|---------|----------------|----------------|---------|
|            | $I_{cs}$<br>kA | $I_{cu}$<br>kA | gG<br>A | $I_{cs}$<br>kA | $I_{cu}$<br>kA | gG<br>A | $I_{cs}$<br>kA | $I_{cu}$<br>kA | gG<br>A | $I_{cs}$<br>kA | $I_{cu}$<br>kA | gG<br>A | $I_{cs}$<br>kA | $I_{cu}$<br>kA | gG<br>A |
| MS325-0.16 | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       |
| MS325-0.25 | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       |
| MS325-0.4  | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       |
| MS325-0.63 | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       |
| MS325-1    | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       |
| MS325-1.6  | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       |
| MS325-2.5  | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 40             | 40             | 25      |
| MS325-4    | 100            | 100            | -       | 100            | 100            | -       | 100            | 100            | -       | 60             | 60             | 40      | 10             | 10             | 40      |
| MS325-6.3  | 100            | 100            | -       | 100            | 100            | -       | 70             | 70             | 50      | 40             | 40             | 50      | 7              | 7              | 40      |
| MS325-9    | 100            | 100            | -       | 100            | 100            | -       | 50             | 50             | 80      | 30             | 30             | 80      | 5              | 5              | 50      |
| MS325-12.5 | 100            | 100            | -       | 75             | 75             | 80      | 45             | 45             | 80      | 27             | 27             | 80      | 4.5            | 4.5            | 50      |
| MS325-16   | 100            | 100            | -       | 60             | 60             | 100     | 40             | 40             | 100     | 25             | 25             | 100     | 4              | 4              | 50      |
| MS325-20   | 100            | 100            | -       | 55             | 55             | 100     | 35             | 35             | 100     | 22             | 22             | 100     | 3.5            | 3.5            | 50      |
| MS325-25   | 100            | 100            | -       | 50             | 50             | 125     | 30             | 30             | 125     | 20             | 20             | 125     | 3              | 3              | 50      |

### Technical data UL/CSA

#### Main circuit

|                                 |                         |                 |
|---------------------------------|-------------------------|-----------------|
| Maximum operational voltage     | 600 V                   |                 |
| Manual motor controller ratings | see table below         |                 |
| Motor ratings                   | Horse power             | see table below |
|                                 | Full load amps (FLA)    | see table below |
|                                 | Locked rotor amps (LRA) | see table below |

#### Electrical connection

|                                                                                                              |                    |
|--------------------------------------------------------------------------------------------------------------|--------------------|
| Type                                                                                                         | <b>MS325</b>       |
|  stranded                 | 1/2 x AWG 14 ... 8 |
|  flexible without ferrule | 1/2 x AWG 14 ... 8 |
| Stripping length                                                                                             | 10 mm              |
| Tightening torque                                                                                            | 14 lb-in           |
| Recommended screw driver                                                                                     | Pozidriv 2         |

**Motor ratings, single phase**

hp Horse power  
 FLA Full load amps  
 LRA Locked rotor amps

| Type       | 110 ... 120 V AC |     |     | 220 ... 240 V AC |      |      |
|------------|------------------|-----|-----|------------------|------|------|
|            | hp               | FLA | LRA | hp               | FLA  | LRA  |
| MS325-0.16 | -                |     |     | -                | 0.16 | 0.96 |
| MS325-0.25 | -                |     |     | -                | 0.25 | 1.5  |
| MS325-0.4  | -                |     |     | -                | 0.4  | 2.4  |
| MS325-0.63 | -                |     |     | -                | 0.63 | 3.78 |
| MS325-1    | -                |     |     | -                | 1    | 6    |
| MS325-1.6  | -                |     |     | 1/10             | 1.5  |      |
| MS325-2.5  | -                |     |     | 1/6              | 2.2  |      |
| MS325-4    | 1/8              | 3.8 |     | 1/3              | 3.6  |      |
| MS325-6.3  | 1/4              | 5.8 |     | 1/2              | 4.9  |      |
| MS325-9    | 1/3              | 7.2 |     | 1                | 8    |      |
| MS325-12.5 | 1/2              | 9.8 |     | 2                | 12   |      |
| MS325-16   | 1                | 16  |     | 2-1/2            |      |      |
| MS325-20   | 1-1/2            | 20  |     | 3                | 17.0 |      |
| MS325-25   | 2                | 24  |     | 3                | 17.0 |      |

**Motor rating, three phase**

| Type       | 220 ... 240 V AC |      |      | 440 ... 480 V AC |      |      | 550 ... 600 V AC |      |      |
|------------|------------------|------|------|------------------|------|------|------------------|------|------|
|            | hp               | FLA  | LRA  | hp               | FLA  | LRA  | hp               | FLA  | LRA  |
| MS325-0.16 | -                | 0.16 | 0.96 | -                | 0.16 | 0.96 | -                | 0.16 | 0.96 |
| MS325-0.25 | -                | 0.25 | 1.5  | -                | 0.25 | 1.5  | -                | 0.25 | 1.5  |
| MS325-0.4  | -                | 0.4  | 2.4  | -                | 0.4  | 2.4  | -                | 0.4  | 2.4  |
| MS325-0.63 | -                | 0.63 | 3.78 | -                | 0.63 | 3.78 | -                | 0.63 | 3.78 |
| MS325-1    | -                | 1    | 6    | 1/2              | 1.1  | 10   | 1/2              | 0.9  | 8    |
| MS325-1.6  | -                | 1.6  | 9.6  | 3/4              | 1.6  | 12.5 | 3/4              | 1.3  | 10   |
| MS325-2.5  | 1/2              | 2.2  | 20   | 1                | 2.1  | 15   | 1-1/2            | 2.4  | 16   |
| MS325-4    | 1                | 4.2  | 30   | 2                | 3.4  | 25   | 3                | 3.9  | 25.6 |
| MS325-6.3  | 1-1/2            | 6    | 40   | 3                | 4.8  | 32   | 5                | 6.1  | 36.8 |
| MS325-9    | 2-1/2            |      |      | 5                | 7.6  | 46   | 7-1/2            | 9.0  | 50.8 |
| MS325-12.5 | 3                | 9.6  | 64   | 7-1/2            | 11.0 | 63.5 | 10               | 11.0 | 64.8 |
| MS325-16   | 5                | 15.2 | 92   | 10               | 14.0 | 81   | 10               | 11.0 | 64.8 |
| MS325-20   | 5                | 15.2 | 92   | 10               | 14.0 | 81   | 15               | 27.0 | 93   |
| MS325-25   | 7-1/2            | 22.0 | 127  | 15               | 21.0 | 116  | 20               | 35.0 | 116  |

**Manual motor controller for motor disconnect / group installation**

| Type       | Maximum circuit breaker per UL/NEC 480 V | Maximum fuse type (class ...) per UL/NEC 480 V<br>A | Maximum short-circuit current 480 V<br>kA | Maximum circuit breaker per UL/NEC 600 V | Maximum fuse type K5 or RK5 per UL/NEC 600 V<br>A | Maximum short-circuit current 600 V<br>kA |
|------------|------------------------------------------|-----------------------------------------------------|-------------------------------------------|------------------------------------------|---------------------------------------------------|-------------------------------------------|
| MS325-0.16 | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-0.25 | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-0.4  | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-0.63 | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-1    | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-1.6  | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-2.5  | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-4    | -                                        | 1600 (class L)                                      | 85                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-6.3  | S7H1200                                  | 600 (class K5)                                      | 50                                        | S7H1200                                  | 1200                                              | 50                                        |
| MS325-9    | S7H1200                                  | 600 (class K5)                                      | 50                                        | S4H250                                   | 250                                               | 50                                        |
| MS325-12.5 | S4H250                                   | 400 (class K5)                                      | 50                                        | S7H1200                                  | 1200                                              | 30                                        |
| MS325-16   | S4H250                                   | 400 (class K5)                                      | 50                                        | S7H1200                                  | 1200                                              | 30                                        |
| MS325-20   | S4H250                                   | 400 (class K5)                                      | 50                                        | S4H250                                   | 250                                               | 30                                        |
| MS325-25   | S4H250                                   | 400 (class K5)                                      | 50                                        | S4H250                                   | 250                                               | 30                                        |

**Self-Protected (Type E) Combination Motor Controller and Tap Conductor Protection**

| Type       | Self-Protected Combination Motor Controller (Type E)<br>Maximum short-circuit current 480 Y / 277 V<br>kA | for Tap Conductor Protection<br>Maximum short-circuit current 480 Y / 277 V<br>kA |
|------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| MS325-0.16 | 18                                                                                                        | 18                                                                                |
| MS325-0.25 | 18                                                                                                        | 18                                                                                |
| MS325-0.4  | 18                                                                                                        | 18                                                                                |
| MS325-0.63 | 18                                                                                                        | 18                                                                                |
| MS325-1    | 18                                                                                                        | 18                                                                                |
| MS325-1.6  | 18                                                                                                        | 18                                                                                |
| MS325-2.5  | 18                                                                                                        | 18                                                                                |
| MS325-4    | 18                                                                                                        | 18                                                                                |
| MS325-6.3  | 18                                                                                                        | 18                                                                                |
| MS325-9    | 18                                                                                                        | 18                                                                                |
| MS325-12.5 | 18                                                                                                        | 18                                                                                |
| MS325-16   | 18                                                                                                        | 18                                                                                |
| MS325-20   | 18                                                                                                        | 18                                                                                |
| MS325-25   | 18                                                                                                        | 18                                                                                |





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