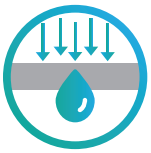
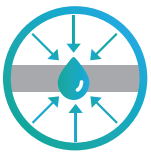
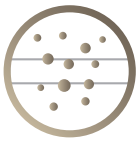
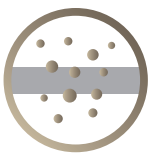
# 10

# TECHNICAL DATA

## Contents

# Ingress Protection

| Degrees of protection against solid foreign objects (1st characteristic numeral) | | | Degrees of protection against ingress of water (2nd characteristic numeral) | | |
|---|---|---|---|---|---|
| **Digit** | **Protection** | | **Digit** | **Protection** | |
| 0 |  | No Protection | 0 |  | No Protection |
| 1 |  | Protected against foreign objects of 50mm Ø and greater. Protected against access to hazardous parts with the back of a hand. | 1 |  | Protected against vertically falling water drops. Vertically falling drops shall have no harmful effects. |
| 2 |  | Protected against solid foreign objects of 12.5mm Ø and greater. Protected against access to hazardous parts with a finger. | 2 |  | Protected against vertically falling water drops when enclosure tilted up to 15°. Vertically falling drops shall have no harmful effects when the enclosure is tilted at an angle up to 15° on either side of the vertical. |
| 3 |  | Protected against solid foreign objects of 2.5mm Ø and greater. Protected against access to hazardous parts with a tool. | 3 |  | Protected against spraying water. Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects. |
| 4 |  | Protected against solid foreign objects of 1mm Ø and greater. Protected against access to hazardous parts with a wire. | 4 |  | Protected against splashing water. Water projected in splashes against the enclosure from any direction shall have no harmful effects. |
| 5 |  | Dust-protected. Ingress of dust is not totally prevented, but dust shall not penetrate in a quality to interfere with satisfactory operation of the apparatus or to impair safety. | 5 |  | Protected against water jets. Water projected in jets against the enclosure from any direction shall have no harmful effects. |
| 6 |  | Dust-tight. No ingress of dust. | 6 |  | Protected against powerful water jets. Water projected in powerful jets against the enclosure from any direction shall have no harmful effects. |
| | | | 7 |  | Protected against the effects of temporary immersion in water. Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardised conditions of pressure and time. |
| | | | 8 |  | Protected against the effects of continuous immersion in water. Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7. |

# Utilisation Chart / Motor Rating Chart

## Utilisation Categories

A contactor duty is characterised by the utilisation category

| | |
|---|---|
| **Utilisation categories for contactor relays according to IEC 337-1** | |
| **Alternating current** | |
| AC 11 | Making and breaking for normal and occasional utilisation conditions |
| **Direct current** | |
| DC 11 | Making and breaking for normal and occasional utilisation conditions |
| **Utilisation categories for contactor relays according to IEC 947-5-1** | |
| **Alternating current** | |
| AC-12 | Control of resistive loads and solid state loads with isolation by opto couplers |
| AC-13 | Control of solid state loads with transformer isolation |
| AC-14 | Control of small electromagnetic loads (< 72VA) |
| AC-15 | Control of small electromagnetic loads (> 72VA) |
| **Direct current** | |
| DC-12 | Control of resistive loads and solid state loads with isolation by opto couplers. |
| DC-13 | Control of electromagnets. |
| DC-14 | Control of electromagnetic loads having economy resistors in circuit |
| **Utilisation categories for contactors according to IEC 158-1** | |
| **Alternating current** | |
| AC 1 | Non-inductive or slightly inductive loads, resistance furnaces |
| AC 3 | Slip-ring motors: starting, plugging |
| AC 3 | Squirrel-cage motors: starting, switching-off motors during running |
| AC 4 | Squirrel-cage motors: starting, plugging, inching |
| **Direct current** | |
| DC 1 | Non-inductive or slightly inductive loads, resistance furnaces |
| DC 2 | Shunt motors: starting, switching-off motors during running |
| DC 3 | Shunt motors: starting, plugging, inching |
| DC 4 | Series motors: starting, switching-off motors during running. |
| DC 5 | Series motors: starting, plugging, inching |
| **Utilisation categories for contactors according to IEC 947-4-1** | |
| **Alternating current** | |
| AC 1 | Non-inductive or slightly inductive loads, resistance furnaces |
| AC 3 | Slip-ring motors: starting, switching off |
| AC 3 | Squirrel-cage motors: starting, switching-off motors during running |
| AC 4 | Squirrel-cage motors: starting, plugging, inching |
| AC 5a | Switching of discharge lamp controls |
| AC 5b | Switching of incandescent lamps |
| AC 6a | Switching of transformers |
| AC 6b | Switching of capacitor banks |
| AC 8a | Hermetic refrigerant compressor motor control with manual resetting of overload releases |
| AC 8b | Hermetic refrigerant compressor motor control with automatic resetting of overload releases |
| **Direct current** | |
| DC 1 | Non-inductive or slightly inductive loads, resistance furnaces |
| DC 3 | Shunt motors: starting, plugging, inching. Dynamic breaking of DC motors |
| DC 5 | Series motors: starting, plugging, inching. Dynamic breaking of DC motors |
| DC 6 | Switching of incandescent lamps. |

| Motor Ratings | | Motor Rated Current at | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| kW | HP | 220-230V | 240V | 380V | 415V | 440V | 500V | 600V | 660-690V |
| 0.06 | 1/12 | 0.38 | 0.35 | 0.22 | 0.20 | 0.19 | 0.16 | 0.12 | |
| 0.09 | 1/8 | 0.55 | 0.50 | 0.33 | 0.30 | 0.28 | 0.24 | 0.21 | |
| 0.12 | 1/6 | 0.76 | 0.68 | 0.42 | 0.40 | 0.37 | 0.33 | 0.27 | |
| 0.18 | 1/4 | 1.1 | 1 | 0.64 | 0.60 | 0.55 | 0.46 | 0.40 | |
| 0.25 | 1/3 | 1.4 | 1.38 | 0.88 | 0.85 | 0.76 | 0.59 | 0.56 | - |
| 0.37 | 1/2 | 2.1 | 1.93 | 1.22 | 1.15 | 1.06 | 0.85 | 0.77 | 0.7 |
| 0.55 | 3/4 | 2.7 | 2.3 | 1.5 | 1.4 | 1.25 | 1.20 | 1.02 | 0.9 |
| 0.75 | 1 | 3.3 | 3.1 | 2 | 2 | 1.67 | 1.48 | 1.22 | 1.1 |
| 1.1 | 1.5 | 4.9 | 4.1 | 2.6 | 2.5 | 2.26 | 2.1 | 1.66 | 1.5 |
| 1.5 | 2 | 6.2 | 5.6 | 3.5 | 3.5 | 3.03 | 2.6 | 2.22 | 2 |
| 2.2 | 3 | 8.7 | 7.9 | 5 | 5 | 4.31 | 3.8 | 3.16 | 2.9 |
| 2.5 | 3.4 | 9.8 | 8.9 | 5.7 | 5.5 | 4.9 | 4.3 | 3.59 | 3.3 |
| 3 | 4 | 11.6 | 10.6 | 6.6 | 6.5 | 5.8 | 5.1 | 4.25 | 3.5 |
| 3.7 | 5 | 14.2 | 13 | 82 | 7.5 | 7.1 | 6.2 | 5.2 | 4.4 |
| 4 | 5.5 | 15.3 | 14 | 8.5 | 8.4 | 7.6 | 6.5 | 5.6 | 4.9 |
| 5 | 6.8 | 18.9 | 17.2 | 10.5 | 10 | 9.4 | 8.1 | 6.9 | 6 |
| 5.5 | 7.5 | 20.6 | 18.9 | 11.5 | 11 | 10.3 | 8.9 | 7.5 | 6.7 |
| 6.5 | 8.8 | 23.7 | 21.8 | 13.8 | 12.5 | 12 | 10.4 | 8.7 | 8.1 |
| 7.5 | 10 | 27.4 | 24.8 | 15.5 | 14 | 13.5 | 11.9 | 9.9 | 9 |
| 8 | 11 | 28.8 | 26.4 | 16.7 | 15.4 | 14.4 | 12.7 | 10.6 | 9.7 |
| 9 | 12.5 | 32 | 29.3 | 18.3 | 17 | 15.8 | 13.9 | 11.6 | 10.6 |
| 11 | 15 | 39.2 | 35.3 | 22 | 21 | 19.3 | 16.7 | 14.1 | 13 |
| 12.5 | 17 | 43.8 | 40.2 | 25 | 23 | 21.9 | 19 | 16.1 | 15 |
| 15 | 20 | 52.6 | 48.2 | 30 | 28 | 26.3 | 22.5 | 19.3 | 17.5 |
| 18.5 | 25 | 64.9 | 58.7 | 37 | 35 | 32 | 28.5 | 23.5 | 21 |
| 20 | 27 | 69.3 | 63.4 | 40 | 37 | 34.6 | 30.6 | 25.4 | 23 |
| 22 | 30 | 75.2 | 68 | 44 | 40 | 37.1 | 33 | 27.2 | 25 |
| 25 | 34 | 84.4 | 77.2 | 50 | 47 | 42.1 | 38 | 30.9 | 28 |
| 30 | 40 | 101 | 92.7 | 60 | 55 | 50.1 | 44 | 37.1 | 33 |
| 37 | 50 | 124 | 114 | 72 | 66 | 61.9 | 54 | 45.4 | 42 |
| 40 | 54 | 134 | 123 | 79 | 72 | 67 | 60 | 49.1 | 44 |
| 45 | 60 | 150 | 136 | 85 | 80 | 73.9 | 64.5 | 54.2 | 49 |
| 51 | 70 | 168 | 154 | 97 | 90 | 83.8 | 73.7 | 61.4 | 56 |
| 55 | 75 | 181 | 166 | 105 | 96 | 90.3 | 79 | 66.2 | 60 |
| 59 | 80 | 194 | 178 | 112 | 105 | 96.9 | 85.3 | 71.1 | 66 |
| 75 | 100 | 245 | 226 | 140 | 135 | 123 | 106 | 90.3 | 82 |
| 80 | 110 | 260 | 241 | 147 | 138 | 131 | 112 | 96.3 | 86 |
| 90 | 125 | 292 | 268 | 170 | 165 | 146 | 128 | 107 | 98 |
| 100 | 136 | 325 | 297 | 188 | 182 | 162 | 143 | 119 | 107 |
| 110 | 150 | 358 | 327 | 205 | 200 | 178 | 156 | 131 | 118 |
| 129 | 175 | 420 | 384 | 242 | 230 | 209 | 184 | 153 | 135 |
| 132 | 180 | 425 | 393 | 245 | 242 | 214 | 186 | 157 | 140 |
| 140 | 190 | 449 | 416 | 260 | 250 | 227 | 200 | 167 | 145 |
| 147 | 200 | 472 | 432 | 273 | 260 | 236 | 207 | 173 | 152 |
| 160 | 220 | 502 | 471 | 295 | 280 | 256 | 220 | 188 | 170 |
| 180 | 245 | 578 | 530 | 333 | 320 | 289 | 254 | 212 | 192 |
| 184 | 250 | 590 | 541 | 340 | 325 | 295 | 259 | 217 | 200 |
| 200 | 270 | 626 | 589 | 370 | 340 | 321 | 278 | 235 | 215 |
| 220 | 300 | 700 | 647 | 408 | 385 | 353 | 310 | 260 | 235 |
| 250 | 340 | 803 | 736 | 460 | 425 | 401 | 353 | 295 | 268 |
| 257 | 350 | 826 | 756 | 475 | 450 | 412 | 363 | 302 | 280 |
| 295 | 400 | 948 | 868 | 546 | 500 | 473 | 416 | 348 | 320 |
| 315 | 430 | 990 | 927 | 580 | 535 | 505 | 445 | 370 | 337 |
| 355 | 480 | 1080 | 1010 | 636 | 580 | 549 | 483 | 405 | 366 |
| 400 | 545 | 1250 | 1130 | 710 | 650 | 611 | 538 | 450 | 410 |
| 450 | 610 | 1410 | 1270 | 800 | 740 | 688 | 608 | 508 | 460 |
| 475 | 645 | 1490 | 1340 | 850 | 780 | 730 | 645 | 540 | 485 |
| 500 | 680 | 1570 | 1420 | 890 | 830 | 770 | 680 | 565 | 510 |
| 560 | 760 | 1750 | 1580 | 1000 | 920 | 860 | 760 | 630 | 570 |
| 600 | 810 | - | - | 1080 | 990 | 920 | 810 | 680 | 610 |
| 670 | 910 | | | 1200 | 1100 | 1030 | 910 | 760 | 680 |

## Direct-on-line starting

| Motor FLC Amp | | Recommended fuse link Type gG Amp | Recommended fuse link Type gG Amp |
|---|---|---|---|
| From | to | | |
| 0 | 0.7 | 2 | |
| 0.8 | 1.4 | 4 | |
| 1.5 | 2.0 | 6 | |
| 2.1 | 3.0 | 10 | |
| 3.1 | 6.1 | 16 | |
| 6.2 | 9.0 | 20 | |
| 9.1 | 11.0 | 25 | 20M25 |
| 11.1 | 14.4 | 32 | 20M32 |
| 14.5 | 15.4 | 35 | 32M35 |
| 15.5 | 18.0 | 40 | 32M40 |
| 18.1 | 22.0 | 50 | 32M50 |
| 22.1 | 28.0 | 63 | 32M63 |
| 28.1 | 45.0 | 80 | 63M80 |
| 45.1 | 58.0 | 100 | 63M100 |
| 58.1 | 80.0 | 125 | 100M125 |
| 80.1 | 99.0 | 160 | 100M160 |
| 99.1 | 128.0 | 200 | |
| 128.1 | 180.0 | 250 | 200M250 |
| 180.1 | 216.0 | 315 | 200M315 |
| 216.1 | 270.0 | 355 | 315M355 |
| 270.1 | 328.0 | 400 | |
| 328.1 | 385.0 | 450 | 400M450 |
| 385.1 | 430.0 | 500 | |
| 430.1 | 500.0 | 560 | |
| 500.1 | 560.0 | 630 | |
| 560.1 | 620.0 | 670 | 630M670 |

## Assisted starting - Star-delta, auto-transformer, etc.

| Motor FLC Amp | | Recommended fuse link Type gG Amp | |
|---|---|---|---|
| From | to | | |
| 0 | 1.4 | 2 | |
| 1.5 | 2.1 | 4 | |
| 2.2 | 3.1 | 6 | |
| 3.2 | 5.5 | 10 | |
| 5.6 | 1.0 | 16 | |
| 10.1 | 1.4 | 20 | |
| 14.1 | 1.8 | 25 | |
| 18.1 | 22.0 | 32 | |
| 22.1 | 28.0 | 35 | |
| 28.1 | 32.0 | 40 | |
| 32.1 | 40.0 | 50 | |
| 40.1 | 5.1 | 63 | |
| 51.1 | 80.0 | 80 | |
| 80.1 | 100.0 | 100 | |
| 100.1 | 125.0 | 125 | |
| 125.1 | 160.0 | 160 | |
| 160.1 | 200.0 | 200 | |
| 200.1 | 250.0 | 250 | |
| 250.1 | 315.0 | 315 | |
| 315.1 | 355.0 | 355 | |
| 355.1 | 400.0 | 400 | |
| 400.1 | 450.0 | 450 | |
| 450.1 | 500.0 | 500 | |
| 500.1 | 560.0 | 560 | |
| 560.1 | 630.0 | 630 | |
| | | | |

These recommendations apply for ambient temperatures up to 35ºC.

Suitable adjustments to the recommended ratings may be necessary if any of the following conditions occur singly or in combination:

a) Starting currents in excess of the assumed ones.

b) Long run up times due to high inertia loads.

c) Larger number of starts per operating cycle
(the recommendations allow for two starts in rapid succession and up to eight starts per hour).

d) High enclosure temperature.