## Rockwell Automation

Functional Safety Data Sheet


IMPORTANT: The data given cannot be regarded as valid unless
proper account is taken of the relevant * notes.

| Type | Family | Part Number | See Notes | SIL CL | PL | Category per EN ISO 13849-1 | PFH <br> Probability of dangerous failure per hour according to EN/IEC 61508 or EN/IEC 62061 (Continuous and High demand mode) | PFD <br> Probability of dangerous failure on demand according to EN/IEC 61508 (Low demand mode) | B10d <br> (ElectroMechanical products) | B10d Test Criteria | T1 <br> Proof Test IntervalMission Time Lifetime Years |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Interlock <br> Switches | Elf | 440K-E33 | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | 2.00E+06 | Mechanical only or minimal load | 20 years |
|  | Cadet 3 | 440K-C21 | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{* 16}$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | Trojan 5, 6, \& T15 | 440K-T11 | ${ }^{*} 1,{ }^{*} 7,{ }^{* 8},{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | 2.00E+06 | Mechanical only or minimal load | 20 years |
|  | MT-GD2 | 440K-MT | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | SensaGuard | $440 \mathrm{~N}-2$ | - | 3 | e | 4 | 1.12E-09 |  |  |  | 20 years |
|  | Ferrogard | 440N-G | *1, *7, *8, *12 |  |  | 1 (Up to 4 with monitoring unit) |  |  | 2.00E+06 | Mechanical only or minimal load | 20 years |
|  | Sipha Sensors S1, S2, S3, S4 | 440N-S | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 12,{ }^{* 14}$ |  |  | N/A (Must only be used with designated monitoring unit- Up to Cat. 4) |  |  | $2.00 E+06$ | Control unit load | 20 years |
| Guard Locking Switches | 440G-MT | 440G-MT | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{* 16}$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | TLS-GD2 | 440G-T | ${ }^{*} 1,{ }^{*} 7,{ }^{*}{ }^{*}{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | Atlas 5 | 440G-L | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | Spartan | 440G-S | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
| Hinge Interlocking Switches | Sprite | 440H-S | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | Ensign 3 | 440H-E | ${ }^{*} 1,{ }^{*} 7,{ }^{* 8},{ }^{*} 12,{ }^{* 16}$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | 2.00E+06 | $\begin{aligned} & \text { Mechanical only or } \\ & \text { minimal load } \\ & \hline \end{aligned}$ | 20 years |
|  | Rotacam | 440H-R | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
| Prosafe Trapped Key Interlocking | Prosafe Key Code Barrel Assembly | 440 T | *9 |  | d | 3 (see note *9) | 1.01E-7 (see note *9) |  | 2.00E+05 | Mechanical | 20 years |
| Presence <br> Sensing | GuardShield | 440L | - | 3 | e | Type 4 (IEC 61496) | 3.17E-9 (IEC 61508, single) 9.51E-9 (IEC 61508, 3 cascaded) |  |  |  | 20 years |
|  | GuardShield Safe 2 | 445L | - | 2 | d | Type 2 (IEC 61496) | 7.93E-9 (worst case figure: 32 modules $\times 30 \mathrm{~mm}, \mathrm{~L}=3840 \mathrm{~mm}$ ) | 6.95E-4 (worst case figure: 32 modules x $30 \mathrm{~mm}, \mathrm{~L}=3840 \mathrm{~mm}$ ) |  |  | 20 years |
|  | GuardShield Safe 4 | 445L | - | 3 | e | Type 4 (IEC 61496) | 7.93E-9 (worst case figure: 32 modules $\times 30 \mathrm{~mm}$, $\mathrm{L}=3840 \mathrm{~mm}$ ) | 2.58E-4 (worst case figure: 7 modules $x$ mixed, $\mathrm{L}=840 \mathrm{~mm}$ ) |  |  | 20 years |
|  | GuardShield Mirco 400 | 445L | - | 3 | e | Type 4 (IEC 61496) | 4E-9 (Micro 400 alone, 255 beams) 6E-9 (worst case: Micro 400, MSR42, \& MSR45E with 255 beams cascaded) | 4E-4 (Micro 400 a lone, 255 beams) 5E-4 (worst case: Micro 400, MSR42, \& MSR45E with 255 beams cascaded) |  |  | 20 years |
|  | SafeZone | 442L-S | - | 2 | d | 3 | 4.46E-07 | $3.91 \mathrm{E}-03$ |  |  | - |


| Type | Family | Part Number | See Notes | SIL CL | PL | Category per EN ISO 13849-1 | PFH <br> Probability of dangerous failure per hour according to EN/IEC 61508 or EN/IEC 62061 (Continuous and High demand mode) | PFD <br> Probability of dangerous failure on demand according to EN/IEC 61508 (Low demand mode) | B10d <br> (ElectroMechanical products) | B10d Test Criteria | T1 <br> Proof Test Interval Mission Time Lifetime Years |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| E-Stop and <br> Operator <br> Interface | 800F E-Stop | 800FD-MT | $\begin{gathered} * 1,{ }^{*} 7,{ }^{*}{ }^{*},{ }^{*} 12,{ }^{*} 17, \\ * 19,{ }^{*} 20 \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | $1.11 \mathrm{E}+05$ | Mechanical and Control unit load | 20 years |
|  | 800F E-Stop | $\begin{aligned} & \text { 800FP-MT_ } \\ & \text { 800FM-MT_ } \end{aligned}$ | $\begin{gathered} * 1,{ }^{*} 7,{ }^{*}{ }^{*},{ }^{*} 12,{ }^{*} 17, \\ * 18,{ }^{*} 20 \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | 7.36E+05 | Mechanical and Control unit load | 20 years |
|  | 800F E-Stop | $\begin{aligned} & \text { 800FP-LMT_ } \\ & \text { 800FM-LMT_ } \end{aligned}$ | $\begin{gathered} { }^{* 1},{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 17, \\ { }^{*} 18,{ }^{*} 19,{ }^{*} 20 \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | $2.06 \mathrm{E}+05$ | Mechanical and Control unit load | 20 years |
|  | 800F E-Stop | $\begin{aligned} & \text { 800FP-MK__ } \\ & \text { 800FM-MK_ } \end{aligned}$ | $\begin{gathered} * 1,{ }^{*} 7,{ }^{*}{ }^{*},{ }^{*} 12,{ }^{*} 17, \\ * 18,{ }^{*} 20 \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | 7.36E+05 | Mechanical and Control unit load | 20 years |
|  | 800F E-Stop | $\begin{aligned} & \text { 800FP-MP_- } \\ & \text { 800FM-MP_- } \\ & \text { 800FP-LMP_- } \\ & \text { 800FM-LMP_- } \end{aligned}$ | $\begin{gathered} { }^{* 1, * 7, * 8,{ }^{*} 12,{ }^{*} 17,} \\ { }^{*} 18,{ }^{*} 19,{ }^{*} 20 \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | $2.43 \mathrm{E}+05$ | Mechanical and Control unit load | 20 years |
|  | 800H E-Stop | $\begin{aligned} & \text { 800H-FRX_ } \\ & \text { 800HC-FRX_ } \end{aligned}$ | $\begin{gathered} * 1,{ }^{*}{ }^{*},{ }^{* 8},{ }^{*} 12,{ }^{*} 17, \\ { }^{*} 18,{ }^{*}{ }^{20} \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | $1.82 \mathrm{E}+06$ | Mechanical and Control unit load | 20 years |
|  | 800T E-Stop | $\begin{aligned} & \text { 800T-FX_ } \\ & \text { 800TC-FX_ } \end{aligned}$ | $\begin{gathered} * 1,{ }^{*},{ }^{*}{ }^{*},{ }^{*}{ }^{*} 2,{ }^{*} 17, \\ { }^{*} 8, *{ }^{2} 20 \end{gathered}$ |  |  | 1 (Higher with monitoring unit) |  |  | 1.95E+06 | Mechanical and Control unit load | 20 years |
|  | Lifeline 3, 4 | 440E-L/D | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
| Limit Switches | 440P-C, 440P-M | $\begin{aligned} & \text { 440P-C } \\ & \text { 440P-MD/MM/ } \\ & \text { MR/MS } \end{aligned}$ | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | 802T | 802T | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
|  | Imp 1,2 | 440P-M1 | ${ }^{*} 1,{ }^{*} 7,{ }^{*} 8,{ }^{*} 12,{ }^{*} 16$ |  |  | 1 (Up to 3 with monitoring unit) |  |  | $2.00 E+06$ | Mechanical only or minimal load | 20 years |
| Safety Logic | MSR117 | 440R | *5 | 3 | e | 4 | $2.31 \mathrm{E}-10$ | 4.05E-05 |  |  | 20 years |
|  | MSR5 | 440R | *5 | 3 | e | 4 | $2.31 \mathrm{E}-10$ | 4.05E-05 |  |  | 20 years |
|  | MSR121 | 440R | *5 | 3 | e | 4 | 1.45E-09 | $2.53 \mathrm{E}-04$ |  |  | 20 years |
|  | MSR122 | 440R | *5 | 3 | e | 4 | 2.82E-10 | 4.94E-05 |  |  | 20 years |
|  | MSR124 | 440R | *5 | 3 | e | 4 | $2.00 \mathrm{E}-09$ | $3.51 \mathrm{E}-04$ |  |  | 20 years |
|  | MSR125 | 440R | *5 | 3 | e | 4 | 1.44E-09 | 2.52E-04 |  |  | 20 years |
|  | MSR126 | 440R | *5 | 3 | e | 4 | 1.45E-09 | 2.54E-04 |  |  | 20 years |
|  | MSR127 | 440R | *7 | 3 | e | 4 | 1.45E-09 | 2.54E-04 |  |  | 20 years |
|  | MSR131 | 440R | *5 | 3 | e | 4 | 1.67E-09 | 2.93E-04 |  |  | 20 years |
|  | MSR132E | 440R | *5 | 3 | e | 4 | $2.34 \mathrm{E}-10$ | 4.10E-05 |  |  | 20 years |
|  | MSR132ED | 440R | *5 | 2 | d | 3 | $2.34 \mathrm{E}-10$ | 4.10E-05 |  |  | 20 years |
|  | MSR138 | 440R | *5, *10 | 3/4 | d/e | 2/3 | $2.38 \mathrm{E}-09$ | 4.17E-04 |  |  | 20 years |


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| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Safety Logic | MSR142 | 440R | *5 | 3 | e | 4 | 1.92E-09 | 3.36E-04 |  |  | 20 years |
|  | MSR144 | 440R | *5 | 3 | e | 4 | 1.67E-09 | 2.93E-04 |  |  | 20 years |
|  | MSR178 | 440R | *5 | 3 | e | 4 | $2.74 \mathrm{E}-09$ | 4.80E-04 |  |  | 20 years |
|  | MSR210 | 440R | *5 | 3 | e | 4 | $3.44 \mathrm{E}-09$ | $6.03 \mathrm{E}-04$ |  |  | 20 years |
|  | MSR211 | 440R | *5 | 3 | e | 4 | 3.49E-09 | $6.11 \mathrm{E}-04$ |  |  | 20 years |
|  | MSR220 | 440R | *5 | 3 | e | 4 | 3.70E-10 | $6.48 \mathrm{E}-05$ |  |  | 20 years |
|  | MSR221 | 440R | *5 | 3 | e | 4 | $3.70 \mathrm{E}-10$ | $6.48 \mathrm{E}-05$ |  |  | 20 years |
|  | MSR230 | 440R | *5 | 3 | e | 4 | $2.30 \mathrm{E}-10$ | 4.03E-05 |  |  | 20 years |
|  | MSR238 | 440R | *5 | 2 | d | 3 | 7.70E-10 | 1.35E-04 |  |  | 20 years |
|  | MSR30 | 440R | *5 | 3 | e | 4 | 9.20E-10 | 1.61E-04 |  |  | 20 years |
|  | MSR310 | 440R | *5 | 3 | e | 4 | 3.15E-09 | 5.52E-04 |  |  | 20 years |
|  | MSR312 | 440R | *5 | 3 | e | 4 | $3.15 \mathrm{E}-09$ | 5.52E-04 |  |  | 20 years |
|  | MSR320 | 440R | *5 | 3 | e | 4 | $3.10 \mathrm{E}-10$ | 5.43E-05 |  |  | 20 years |
|  | MSR329 | 440R | *5 | 3 | e | 4 | $3.80 \mathrm{E}-10$ | 6.66E-05 |  |  | 20 years |
|  | MSR33 | 440R | *5 | 3 | e | 4 | 9.20E-10 | 1.61E-04 |  |  | 20 years |
|  | MSR330 | 440R | *5 | 3 | e | 4 | 2.30E-10 | 4.03E-05 |  |  | 20 years |
|  | MSR338 | 440R | *5 | 2 | d | 3 | 7.70E-10 | 1.35E-04 |  |  | 20 years |
|  | MSR35 | 440R | *5 | 3 | e | 4 | 9.20E-10 | 1.61E-04 |  |  | 20 years |
|  | MSR38 | 440R | *5 | 3 | e | 4 | 9.20E-10 | 1.61E-04 |  |  | 20 years |
|  | MSR42 | 440R-P | - | 3 | e | 4 | $9.00 \mathrm{E}-10$ | 8.00E-05 |  |  | 20 years |
|  | MSR45E | 440R-P | - | 3 | e | 4 | 3.00E-10 | 2.00E-05 |  |  | 20 years |
|  | MSR57 Safe Speed Monitor single encoder mode - Pulse test OFF | 440R-S | *5, *24, *26 | 3 | e | 3 | 1.48E-08 | 2.59E-3 |  |  | 20 years |
|  | MSR57 Safe Speed Monitor single encoder mode - Pulse test ON | 440R-S | *5, *24 | 3 | e | 4 | 7.04E-09 | 1.23E-04 |  |  | 20 years |
|  | MSR57 Safe Speed Monitordual encoder mode - Pulse test OFF | 440R-S | *5, ${ }^{*} 25, * 26$ | 3 | e | 3 | 1.11E-08 | 1.95E-03 |  |  | 20 years |
|  | MSR57 Safe Speed Monitordual encoder mode - Pulse test ON | 440R-S | *5, *25 | 3 | e | 4 | 3.38E-09 | 5.93E-04 |  |  | 20 years |
|  | CU2 | 440R | *5 | 1 | b | 1 | 1.58E-07 | $2.80 \mathrm{E}-02$ |  |  | 20 years |
|  | CU3 | 440R | - | 1 | b | 1 |  |  |  |  | 20 years |
|  | CU4 | 440R | *5 | 2 | d | 3 | 2.31E-10 | 4.05E-05 |  |  | 20 years |
|  | MatManager | 440F-C | *5 | 2 | d | 3 | $2.59 \mathrm{E}-09$ | 4.54E-04 |  |  | 20 years |


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| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Safety Logic | MatGuard controller | 440F-C | *5 | 2 | d | 3 | 2.90E-08 | 5.08E-03 |  |  | 20 years |
|  | Safe Edge Controller | 440F-C | *5 | 2 | d | 3 | 3.99E-09 | 6.99E-04 |  |  | 20 years |
|  | Sipha 2 Controller | 440N | *5 | 2 | d | 3 | 7.27E-09 | 1.27E-03 |  |  | 20 years |
|  | GuardPLC 1200 | 1754-L28 | - | 3 | N/A | 3/4 | 3.09E-09 | 1.45E-04 |  |  | 10 years |
|  | GuardPLC 1600 | 1753-L28 | - | 3 | N/A | 3/4 | 3.93E-09 | 4.16E-05 |  |  | 10 years |
|  | GuardPLC 1800 | 1753-L32 | - | 3 | N/A | 3/4 | 5.67E-09 | 5.46E-05 |  |  | 10 years |
|  | GuardPLC 2000 | 1755-L1 | - | 3 | N/A | 3/4 | 4.37E-09 | 4.88E-05 |  |  | 10 years |
|  | GuardPLC I/0 | 1753-1816 | - | 3 | e | 4 | 2.77E-09 | 3.68E-05 |  |  | 10 years |
|  | GuardPLC I/0 | 1753-0816 | - | 3 | e | 4 | 3.90E-09 | 3.63E-05 |  |  | 10 years |
|  | GuardPLC I/0 | 1753-1B20XOB8 | - | 3 | e | 4 | 4.25E-09 | 5.11E-05 |  |  | 10 years |
|  | GuardPLC I/0 | 1753-1B8X0B8 | - | 3 | e | 4 | 6.58E-09 | 4.60E-05 |  |  | 10 years |
|  | GuardPLCI/0 | 1753-1B16XOB8 | - | 3 | e | 4 | 6.19E-09 | 6.66E-05 |  |  | 10 years |
|  | GuardPLCI/0 | 1753-1F8XOF4 | - | 3 | e | 4 | 5.16E-09 | 8.58E-05 |  |  | 10 years |
|  | GuardPLCI/0 | 1753-0W8 | - | 3 | e | 4 | 1.73E-09 | 2.24E-05 |  |  | 10 years |
|  | DeviceNet Safety Scanner | 1753-DNSI | - | 3 | N/A | 4 | $5.61 \mathrm{E}-10$ | $9.30 \mathrm{E}-06$ |  |  | 10 years |
|  | SmartGuard 600 DeviceNet | 1752-L24BBB | - | 3 | e | 4 | 3.89E-10 | 3.42E-05 |  |  | 20 years |
|  | SmartGuard 600 EtherNet/IP | 1752-L24BBBE | - | 3 | e | 4 | 3.89E-10 | 3.42E-05 |  |  | 20 years |
|  | GuardLogix | 1756 | - | 3 | e | 4 | 2.00E-10 | 1.20E-05 |  |  | 20 years |
|  | Compact GuardLogix | 1768 | - | 3 | e | 4 | $2.10 \mathrm{E}-10$ | 1.20E-05 |  |  | 20 years |
|  | CompactBlock Guard I/0 (DeviceNet Safety) | 1791DS-1B12 | - | 3 | e | 4 | 6.84E-11 | 6.01E-06 |  |  | 20 years |
|  | CompactBlock Guard I/0 (DeviceNet Safety) | 1791DS-IB8XOB8 | - | 3 | e | 4 | 6.84E-11 | 6.01E-06 |  |  | 20 years |
|  | CompactBlock Guard I/0 (DeviceNet Safety) | 1791DS-IB4XOW4 | *5 | 3 | e | 4 | 4.07E-09 | 7.68E-04 |  |  | 20 years |
|  | CompactBlock Guard I/0 (DeviceNet Safety) | 1791DS-IB8XOBV4 | - | 3 | e | 4 | 2.00E-10 | 1.75E-05 |  |  | 20 years |
|  | CompactBlock Guard I/0 (DeviceNet Safety) | 1791DS-IB16 | - | 3 | e | 4 | 1.94E-10 | 1.70E-05 |  |  | 20 years |
|  | ArmorBlock Guard I/O (DeviceNet Safety) | 1732DS-IB8 | - | 3 | e | 4 | 1.94E-10 | 1.70E-05 |  |  | 20 years |
|  | ArmorBlock Guard I/0 (DeviceNet Safety) | 1732DS-IB8XOBV4 | - | 3 | e | 4 | 2.00E-10 | 1.75E-05 |  |  | 20 years |
|  | CompactBlock Guard I/O (EtherNet/IP Safety) | 1791ES-1B8XOBV4 | - | 3 | e | 4 | 2.00E-10 | 1.75E-05 |  |  | 20 years |
|  | CompactBlock Guard I/0 (EtherNet/IP Safety) | 1791ES-1B16 | - | 3 | e | 4 | 1.89E-10 | 1.65E-05 |  |  | 20 years |
|  | POINT Guard I/0 | 1734-\|B85 | - | 3 | e | 4 | 1.34E-10 | 5.90E-06 |  |  | 20 years |
|  | POINT Guard I/0 | 1734-088S | - | 3 | e | 4 | 1.38E-10 | $6.10 \mathrm{E}-06$ |  |  | 20 years |


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| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Output <br> Actuation | Contactors 100S-C09 to C97at AC3 | $\begin{gathered} 100 \mathrm{~S}-\mathrm{CO9}, \mathrm{C} 12, \text {, } 16, \text { C } 23, \\ \text { C30, C37, C40, C43, C60, } \\ \text { C72, C85, C90, C97 } \end{gathered}$ | *3, *13 |  |  | 1 |  |  | $1.33 \mathrm{E}+06$ | AC-3 | 20 years |
|  | Contactors 100S-C09 to C43-Mechanical | 100S-C09... 43 | *3, *13, ${ }^{2} 23$ |  |  | 1 |  |  | $2.00 E+07$ | Mechanical only (current carrying not breaking) | 20 years |
|  | Contactors 100S-C60 to C97-Mechanical | 100S-660... 97 | *3, *13, *23 |  |  | 1 |  |  | 1.20E+07 | Mechanical only (current carrying not breaking) | 20 years |
|  | Contactors 100S-D115 to D300 at AC3 | 100S-D115... 300 | ${ }^{*} 13, * 23$ |  |  | 1 |  |  | 1.07E+06 | AC-3 | 20 years |
|  | Contactors 100S-D420 at AC3 | 100S-D420 | ${ }^{*} 13,{ }^{2} 23$ |  |  | 1 |  |  | $8.00 \mathrm{E}+05$ | AC-3 | 20 years |
|  | Contactor Relays: 700S-CFB at AC15 | 700S-CFB | ${ }^{*} 3,{ }^{*} 13,{ }^{*} 23$ |  |  | 1 |  |  | $2.00 E+06$ | AC-15 | 20 years |
|  | Contactor Relays: 700S-CFB - Mechanical | 700S-CFB | $\begin{gathered} { }^{* 3,}{ }^{*} 4,{ }^{*} 13, \\ { }^{2} 23 \\ \hline \end{gathered}$ |  |  | 1 |  |  | $2.00 \mathrm{E}+07$ | Low energy or mechanical only | 20 years |
|  | Control Relays | 7005-CF | ${ }^{*} 3,{ }^{*} 13, * 23$ |  |  | 1 |  |  | $2.00 E+06$ | AC-15 | 20 years |
|  | Reversing Contactor 104S-C | 104S-C09 to C97 | ${ }^{*} 3,{ }^{*} 13,{ }^{*} 23$ |  |  | 1 |  |  | $1.33 \mathrm{E}+06$ | AC-3 | 20 years |
|  | PowerFlex 40P with Safe Torque Off | 22 D | *21, *27 | 2 | d | 3 | 4.43E-10 | 1.74E-05 |  |  | 20 years |
|  | PowerFlex 70 with Safe Torque Off | 20A | *21, *27 | 2 | d | 3 | 1.02E-09 | 3.40E-05 |  |  | 20 years |
|  | PowerFlex 700S with Safe Torque Off | 200 | *21, *27 | 2 | d | 3 | $9.68 \mathrm{E}-10$ | 5.28E-05 |  |  | 20 years |
|  | PowerFlex 700L with Safe Torque Off | 20 L | *21, *27 | 2 | d | 3 | $9.68 \mathrm{E}-10$ | 5.28E-05 |  |  | 20 years |
|  | PowerFlex 700H with Safe Torque Off | 20 C | *5, - | 2 | d | 3 | 1.37E-08 | 1.52E-03 |  |  | 20 years |
|  | PowerFlex 753 with Safe Torque Off | 20F | *5, - | 3 | e | 3 | 1.36E-09 | 3.29E-05 |  |  | 20 years |
|  | PF753 Safe Speed Monitor, Single Encoder, Pulse Test On | 20 F | *24 | 3 | e | 4 | 2.68E-09 | 4.74E-04 |  |  | 20 years |
|  | PF753 Safe Speed Monitor, Single Encoder, Pulse Test Off | 20F | *24, *26 | 3 | e | 4 | 3.13E-08 | $5.44 \mathrm{E}-03$ |  |  | 20 years |
|  | PF753 Safe Speed Monitor, Dual Encoder, Pulse Test On | 20 F | *25 | 3 | e | 4 | 2.39E-09 | 4.19E-04 |  |  | 20 years |
|  | PF753 Safe Speed Monitor, Dual Encoder, Pulse Test Off | 20F | *25, 26 | 3 | e | 4 | 2.77E-08 | 4.85E-03 |  |  | 20 years |
|  | PowerFlex 755 with Safe Torque Off | 20 G | *5 | 3 | e | 3 | 1.36E-09 | 3.29E-05 |  |  | 20 years |
|  | PF755 Safe Speed Monitor, Single Encoder, Pulse Test On | 20 G | *24 | 3 | e | 4 | 2.68E-09 | 4.74E-04 |  |  | 20 years |
|  | PF755 Safe Speed Monitor, Single Encoder, Pulse Test Off | 20 G | *24, *26 | 3 | e | 4 | 3.13E-08 | 5.44E-03 |  |  | 20 years |
|  | PF755 Safe Speed Monitor, Dual Encoder, Pulse Test On | 20 G | *25 | 3 | e | 4 | 2.39E-09 | 4.19E-04 |  |  | 20 years |
|  | PF755 Safe Speed Monitor, Dual Encoder, Pulse Test Off | 206 | *25, *26 | 3 | e | 4 | 2.77E-08 | 4.85E-03 |  |  | 20 years |
|  | Kinetix 300 with Safe Torque Off | 2097 | *5, *21 | 2 | d | 3 | 5.90E-09 | 1.00E-03 |  |  | 20 years |
|  | Kinetix 6000 with Safe Torque Off | 2094-S | *5, *21 | 3 | e | 3 | 4.31E-10 | $2.73 \mathrm{E}-05$ |  |  | 15 years |
|  | Kinetix 7000 with Safe Torque Off | 2099 | *5, *21 | 3 | e | 3 | 4.31E-10 | 2.73E-05 |  |  | 15 years |
|  | Kinetix 6200 with Safe Torque Off |  | *5 | 3 | e | 4 | 1.85E-09 | 1.62E-04 |  |  | 20 years |
|  | Kinetix 6200 Safe Speed Monitor |  | *24, *26, *28 | 3 | e | 4 | 5.90E-09 | 5.20E-04 |  |  | 20 years |
|  | Kinetix 6500 with Safe Torque Off |  | *5 | 3 | e | 4 | 1.85E-09 | 1.62E-04 |  |  | 20 years |
|  | Kinetix 6500 Safe Speed Monitor |  | *24, *26, *28 | 3 | e | 4 | 5.90E-09 | 5.20E-04 |  |  | 20 years |

IMPORTANT: The data given cannot be regarded as valid unless proper account is taken of the relevant * notes.

*2 - The maximum rating shown here assumes the monitoring of all dangerous single fault modes and a maximum diagnostic test interval of 6 months.
*3 - B10d value assuming a failure to open is considered a dangerous failure. If in the application a failure to close is considered a dangerous failure, in this case: 100S-C: B10d=4.00E +06 ,
$7005-$ CFB: B10d $=8.6 \mathrm{E}+05$
*4 - For low energy switching, the contact reliability is expressed as "Assessed constant failure rate". The assessment method is given in IEC60947-5-4.
*5 - Some aspects of the diagnostic testing of electromechanical inputs or outputs are initiated by usage. Therefore the Diagnostic Test Interval is equal to the time period between the operations of the device safety function. For devices with electromechanical inputs or outputs the Diagnostic Test Interval (operating interval) should not exceed 6 months. See IEC61508-4 3.8.7 Diagnostic Test interval and EN13849-1 3.1.29 Test rate.
*6 - Not used.
*7 - Where the product has two electrical safety switching function channels, the B10d data given is based on a failure of either channel. It can be used to determine the MTTFd of each single channel and will this produce conservative data.
*8 - The data given, including fault tolerance, is based on the use of fault exclusion at some single fault mechanical failure points, for example: actuator, cam, contact plunger, lock mechanism. Because of the inherent strength and simplicity of those parts they have an extremely low likelihood of failure and those faults are excluded in accordance with EN ISO 13849-2: 2008 Clause A.5.2 Table A4.
${ }^{*} 9$ - Separate subsystems should be entered for each Prosafe key code barrel assembly that are included in the safety function.

- This Prosafe data is based on the existing conservative assumptions given below. New test procedures for determination of PL for trapped key systems are being developed. This data will be updated accordingly as soon as possible.

 oriented failure mode techniques designed into the code operating key.
- The key code barrel is directly mechanically connected to a variety of parts that form the Prosafe system. Because of the inherent strength and simplicity of those parts they have an extremely low likelihood of failure and for the purposes of calculation those faults are excluded in accordance with EN IS0 13849-2: 2008 Clause A.5.2 Table A4 for the mechanical aspects and Clause D 5.3 Table D8 for the electrical aspects of the rotary key switch.
 B10d value of 250,000 for the solenoid unit. The engagement of the solenoid driven plunger is monitored via two monitoring switches. If these switches are connected in a dual channel configuration to a suitable monitoring device then a $90 \%$ © Can be used (according to EN ISO $13849-1$ Annex ETable E1) for the monitoring of the solenoid driven plunger engagement.
*10 - The delayed acting contacts are CAT 3, SIL CL 2, PLd.
*11 - Safety mats are only applied for CAT3 SIL 2.
*12 - The DC or SFF value given is for the device used on its own with no additional monitoring/diagnostic equipment.
An increased value for $D C$ and $S F F$ can be achieved by connection to specified external monitoring equipment. The maximum achievable value is based on individual monitoring of the devices in redundant or dual channel configuration.
In some cases this will require the use of two devices. It assumes a maximum diagnostic test interval of 6 months.
It assumes the monitoring all dangerous single fault modes. The maximum value given will not be achievable if it can be foreseen that some single faults will not be detected in, for example, multiple normally closed switches are connected in a series arrangement to the monitoring equipment.
*13 - Category 1 applies where the combination of the usage rate and the B10d value results in an MTTFd equal to or greater than 30 years.
*14 - This product must not be used in a safety related system unless it is connected to a suitable monitoring device.


IMPORTANT: The data given cannot be regarded as valid unless proper account is taken of the relevant * notes.
$\square$ Notes

*17 - B10d values using actual test results and calculations with a $90 \%$ confidence interval and at least 1 NC (normally closed) contact block.
*18 - Monitoring includes a Self-Monitoring contact block.
*19 - Safe failure $=$ actuating force less than $50 \%$ of original.
*20 - The Mission Time stated is based on possible time based degradation factors. For usage based degradation factors refer to the calculated T10d value. Always use the lowest value (Mission Time or T10d) for calculation of SIL or PL.
*21 - External monitoring equipment required - See product manual.
*22 - The data given based on a 20 year mission time (proof test interval) applies only to product with a manufacturing date code of 2009/01/01 (January 1, 2009) or later. See the product label for the date code.
*23 - The DC value given is for the device used on its own with no additional monitoring/diagnostic equipment.
An increased value for DC and SFF can be achieved by direct monitoring i.e. connection of the mechanically linked auxiliary contacts to external monitoring equipment. In most cases redundant devices or a second switch-off path this will be required.
It assumes a maximum diagnostic test interval of 6 months.
It assumes the monitoring all dangerous single fault modes. The maximum value given will not be achievable if it can be foreseen that some single faults will not be detected.
*24 - The encoder input(s) must be added as a separate subsystem.
Encoder Input 1 performs feedback signal monitoring to achieve a DC of $90 \%$ or $99 \%$ depending on encoder type (see product manual for details). Mechanical constraints can limit single encoder applications to PLd, SILL for the encoder input(s) subsystem.
By using a certified SIL3 encoder under specific conditions to ensure no loss of the feedback and with justifiable fault exclusions for shaft slippage and shaft breakage a SIL3 rating is feasible.
*25 - The encoder input(s) must be added as a separate subsystem.
Encoder Inputs perform feedback signal monitoring to achieve a DC of $90 \%$ or $99 \%$ depending on encoder type (see MSR57 product manual for details).
*26 - When pulse-testing of ALL used safety outputs is disabled, safety outputs and a power supply are only tested upon demand (at reset) or at a machine cycle (when motion starts). This has an effect on the PFHd. Enabled test pulses for at least one safety output can ensure main power supply testing. The diagnostic test interval is set to the demand rate of at least 0.5 years.
*27 - The data values given are based on a maximum usage rate of 500,000 switching operations per year of the Safe-Off board.
*28 - For the determination of the safety parameters a"worst case" configuration has been assumed (standalone, all inputs, all outputs, single encoder mode). Improved data can be achieved by use of dual encoders.

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