Safety-relevant characteristic values for Eaton components in applications according to EN ISO 13849-1 and IEC 62061

	SRP/CS	Values for calculations according to EN ISO 13849-1				Values for calculations according to IEC 62061		
	Eaton-Type	$B10_D$ [switching cycles]	$MTTF_D$ [years]	Category	PL	B10 [switching cycles]	PFH_D [1/h]	SIL CL
Input	Emergency switching off/emergency stop, turn-release M22-PVT..							
	NC M22-K01[1]	2.000.000[2]				1.000.000		
	NO M22-K10[1]	2.000.000[2]				1.000.000		
	Emergency switching off/emergency stop, pull release M22-PV..							
	NC M22-K01[1]	2.400.000[2]				1.200.000		
	SMC--contact M22-K02SMC10[1]	2.400.000[2]				1.200.000		
	Emergency switching off/emergency stop, turn-release with MPI (switching position) M22-PVT..-MPI							
	NC M22-K01[1]	900.000[2]				450.000		
	NO M22-K10[1]	900.000[2]				450.000		
	Pushbutton, Mushroom actuators M22(S)-D..							
	NC M22-K01[1]	3.000.000[2]				1.500.000		
	NO M22-K10[1]	3.000.000[2]				1.500.000		
	RMQ-Titan AS-Interface							
	M22-ASI-S, M22-ASI-CS		1390	4	PL e		$1{,}7 \times 10^{-11}$	3
	Position switches							
	LS(M)-11 1 NO[1]	54.000.000				54.000.000		
	1 NC[1]	54.000.000				54.000.000		
	LS(M)-02 2 NC[1]	54.000.000				54.000.000		
	Electronic position switch							
	LSE-02; LSE-11			3	PL d		3×10^{-8}	2
	Non-contact safety switch							
	RS2-…, RS2R-..., RS4-…, RS4R-…	20.000.000[3]				10.000.000[3]		

1) Mechanical lifespan test according to EN 60947-5-1: 2017 Annex C.2
2) When applying EN60947-1: 2014 Annex K.3.7 $B10_D$ = B10/F is assumed with F = 50%
3) When applying EN ISO 13849-1:2015 Table C.1 for proximity switches with low load

SRP/CS	Safety-Related Parts of Control System
$MTTF_D$	Mean Time To Failure Dangerous
$B10_D$	Number of switching cycles 10% of the components fail dangerously.
B10	Number of switching cycles 10% of the tested components fail.
PFH_D	Probability of Dangerous failure per hour
SILCL	Safety Integrity Level Claim Limit
PL	Performance Level
HFT	Hardware fault tolerance
NC	normally closed contact, break contact
NO	normally-open contact

Imprint
Published:
Eaton Industries GmbH
Hein-Moeller-Straße 7-11
D-53115 Bonn

BL0200-8896en Doku 04/20

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Powering Business Worldwide

	SRP/CS Eaton-Type			Values for calculations according to EN ISO 13849-1 $B10_D$ [switching cycles]	$MTTF_D$ [years]	Cate-gorie	PL	Values for calculations according to IEC 62061 B10 [switching cycles]	PFH_D [1/h]	SIL CL
Logic	Saftety control relay easySafety			(additional information see MN05013001Z-EN)						
	ES4P-...									
		Transistor output	HFT 0		315	2	PL d		$2{,}52 \times 10^{-9}$	2
			HFT 1		315	4	PL e		$6{,}57 \times 10^{-10}$	3
		Redundant relay output	HFT 1 [4]						$K1 + (K2 \times c^2) + K3 \times c$ [5]	
		Relay output	HFT 0 [4]		1 / (K1 + K2 x c) [6]	2	PL d		K1 + K2 x c [7]	2
			HFT 1 [4]		1 / (K1 + K2 x c) [6]	4	PL e		$K1 + (K2 \times c^2) + K3 \times c$ [5]	3
	Safety relays ESR5 [8]									
	ESR5-NO-41-24VAC-DC					1	PL c		$4{,}05 \times 10^{-10}$	1
	ESR5-VE3-42					3	PL d		$1{,}35 \times 10^{-9}$	2
	ESR5-NO-21-24VAC-DC					4	bis zu PL e		$5{,}05 \times 10^{-10}$	3
	ESR5-NO-31-24VAC-DC								$5{,}05 \times 10^{-10}$	
	ESR5-NZ-21-24VAC-DC								$1{,}21 \times 10^{-9}$	
	ESR5-NO-31-AC-DC								$1{,}26 \times 10^{-10}$	
	ESR5-NO-31-UC								$1{,}0 \times 10^{-9}$	
	ESR5-NO-31-230VAC								$3{,}6 \times 10^{-10}$	
	ESR5-NOS-31-230VAC					1	PL c		$2{,}42 \times 10^{-10}$	1
	ESR5-NV3-30					4	PL e		$1{,}8 \times 10^{-9}$	3
	ESR5-NV3-300 [9]								$1{,}89 \times 10^{-9}$	
	ESR5-NE-51-24VAC-DC								$1{,}02 \times 10^{-10}$	
	ESR5-BWS-31-24VAC-DC								$5{,}56 \times 10^{-10}$	

4) Specified values for PL/SIL CL are maximum values (note number of switching cycles)
5) $K1 = 6.4 \times 10^{-10}$, $K2 = 2.6 \times 10^{-11}$, $K3 = 3.2 \times 10^{-10}$, c = switching cycles per hour
6) $K1 = 1.7 \times 10^{-3}$, $K2 = 1.2 \times 10^{-3}$, c = switching cycles per hour
7) $K1 = 1.3 \times 10^{-9}$, $K2 = 1.3 \times 10^{-8}$, c = switching cycles per hour
8) 8760 switching cycles per year
9) Specified values apply to the non-delayed contacts. For delayed contacts, PL d, Cat 3, SIL 2 apply.

SRP/CS	Safety-Related Parts of Control System
$MTTF_D$	Mean Time To Failure dangerous
$B10_D$	Number of switching cycles 10% of the components fail dangerously.
B10	Number of switching cycles 10% of the tested components fail.
PFH_D	Probability of dangerous failure per hour
SILCL	Safety Integrity Level Claim Limit
PL	Performance Level
HFT	Hardware fault tolerance

Safety-relevant characteristic values for Eaton components in applications according to EN ISO 13849-1 and IEC 62061

	SRP/CS	Values for calculations according to EN ISO 13849-1				Values for calculations according to IEC 62061		
	Eaton-Type	$B10_D$ [switching cycles]	$MTTF_D$ [years]	Cate-gorie	PL	B10 [switching cycles]	PFH_D [1/h]	SIL CL
Output	Contactor monitoring devices							
	CMD[10]		125					
	Safety Contactors (DILMS...), Contactors							
	DILEEM/XTMC6A, DILEM/XTMC9A	869.480				652.110		
	DILMS7/ XTSE007B, DILMS9/ XTSE009B, DILMS12/ XTSE012B, DILM7/XTCE007B, DILM9/XTCE009B, DILM12/XTCE012B,	1.782.229				1.336.672		
	DILMS17/ XTSE018C, DILMS25/ XTSE025C, DILMS32/ XTSE032C, DILM17/XTCE018C, DILM25/XTEC025C, DILM32/XTEC032C,	966.617				724.963		
	DILMS40/ XTSE040D, DILMS50/ XTSE050D, DILMS65/ XTSE065D, DILM40/XTCE040D, DILM50/XTEC050D, DILM65/XTEC065D,	1.341.161				1.005.871		
	DILMS80/ XTSE080F, DILMS95/ XTSE095F DILM80/ XTCE080F, DILM95/ XTCE095F	1.058.707				772.856		
	DILMS115/ XTSE115G, DILMS150/ XTSE150G DILM115/XTCE115G, DILM150/XTCE150G	1.705.268				1.278.951		
	DILM185A/XTCE185H , DILM225A/XTCE225H	1.774.629				1.330.972		
	Circuit-breakers with undervoltage releases							
	NZM1	20.000				10.000		
	NZM2	10.000				5.000		
	NZM3	2.500				2.500		
	Electronic motor starters [11]							
	EMS-DOS-…			3	PL e		$2,4 \times 10^{-9}$	3
	EMS-ROS-…						$2,7 \times 10^{-9}$	
	EMS-DOS-…-SWD						$0,1 \times 10^{-9}$	
	EMS-ROS-…-SWD						$0,1 \times 10^{-9}$	
	EMS2-DOS-…			3	PL e		$4,2 \times 10^{-9}$	3
	EMS2-ROS-…						$4,2 \times 10^{-9}$	
	EMS2-DOS-…-SWD						$0,1 \times 10^{-9}$	
	EMS2-ROS-…-SWD						$0,1 \times 10^{-9}$	
	EMS2-ROSF-...						$4,2 \times 10^{-9}$	
	Variable Frequency Drives							
	DA1 (STO-Function)		4525	3	PL d		$1,23 \times 10^{-9}$	2
	DG1 (STO-Function, Size FS0)		1972	1	PL c		$5,79 \times 10^{-8}$	1
	DG1 (STO-Function, Size FS1 to FS6)		1162				$9,82 \times 10^{-8}$	
	DG1 (STO-Function, Size FS7)		2534	2			$1,39 \times 10^{-9}$	
	DG1 (STO-Function, Size FS8)		1088				$1,45 \times 10^{-9}$	
	Variable frequency drive Rapid-Link 5.0 (RASP 5.0) (STO-Function)		10000	3	PL e		$0,15 \times 10^{-9}$	3

10) 350.400 switching cycles per year, DC = 90%

11) Values apply for safe stop or safe switch-off, ambient temperature up to 40°C (values for motor protection are not specified, for further values see manual MN). Values for 60°C ambient temperature on request.

SRP/CS	Safety-Related Parts of Control System
$MTTF_D$	Mean Time To Failure dangerous
$B10_D$	Number of switching cycles 10% of the components fail dangerously.
B10	Number of switching cycles 10% of the tested components fail.
PFH_D	Probability of dangerous failure per hour
SIL CL	Safety Integrity Level Claim Limit
PL	Performance Level
HFT	Hardware fault tolerance
DC	Diagnostic Coverage