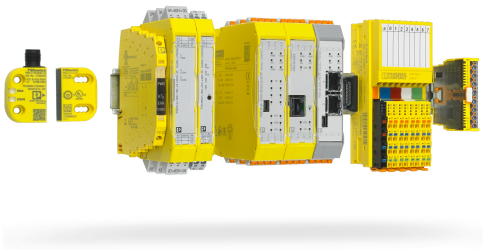
FUNCTIONAL SAFETY CHARACTERISTICS

Safety characteristics of Phoenix Contact safety products



Application note
105016_en_08

1 Aim of this document

This application note is a central data source for all safety characteristics of Phoenix Contact safety products.

It provides characteristics for:

- Machine building in accordance with EN ISO 13849 and EN 62061
- Process automation in accordance with IEC 61508

Phoenix Contact supports you here with the SISTEMA tool by providing you with a SISTEMA library containing all components that have already been certified in accordance with the latest standards.

You can find the current SISTEMA library on our website under the keyword SISTEMA.

This document also contains the characteristics required to calculate safety loops in the process industry.

In this document, discontinued products appear in gray.

Make sure you always use the latest documentation.
It can be downloaded at phoenixcontact.net/products.

This document provides additional data to the respective documentation for the products enclosed. The product documentation for the individual products takes priority and must always be observed.

Should you have any further questions, please contact the Safety service team.

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2 Safety relay modules for machine building

2.1 Safety relays – PSRmini

[1] In conjunction with a suitable evaluating device

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2904950	PSR-MS20	c	1	1	1.5E-09	20	≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15 Up to PL e/SIL 3 possible depending on the application
2904951	PSR-MS25						≥ 00/--	
2702192	PSR-MS21[1]	e	4	3	1.0E-09		≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2904952	PSR-MS30	e	4	3	1.5E-09		≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2904953	PSR-MS35						≥ 00/--	
2904954	PSR-MS40						≥ 00/--	
2904955	PSR-MS45						≥ 00/--	
2904956	PSR-MS50						≥ 00/--	
2904957	PSR-MS55						≥ 00/--	
2904958	PSR-MS60						≥ 00/--	

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2700466	PSR-MC20	c	1	1	1.5E-09	20	≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15 Up to PL e/SIL 3 possible depending on the application
2700467							≥ 00/--	
2700498	PSR-MC30	e	4	3			≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2700499							≥ 00/--	
1015520	PSR-MC31				1.0E-09		≥ 00/--	
1015503							≥ 00/--	
2700524	PSR-MC32						≥ 00/--	8760 switching cycles per year at 5 A DC13 or 5 A AC15
2700525							≥ 00/--	
2700540	PSR-MC34				1.5E-09		≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2700548							≥ 00/--	
1218392	PSR-MC34-C						≥ 00/--	2CH 8760 switching cycles per year at 4 A DC13 or 5 A AC15
1218389							≥ 00/--	
2702411	PSR-MC37				1.0E-09		≥ 00/--	8760 switching cycles per year at 5 A DC13 or 5 A AC15
2702412							≥ 00/--	
1009831	PSR-MC38						≥ 00/--	2CH 8760 switching cycles per year at 5 A DC13 or 5 A AC15
1009832							≥ 00/--	
2700569	PSR-MC40				1.5E-09		≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2700570							≥ 00/--	
2702901	PSR-MC42				1.0E-09		≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2702902							≥ 00/--	
1087561	PSR-MC43				1.0E-09		≥ 00/--	-
1087569							≥ 00/--	
1082024	PSR-MC45						≥ 00/--	2CH 8760 switching cycles per year at 5 A DC13
							≥ 00/--	2CH 2190 switching cycles per year at 5 A AC15
1082029							≥ 00/--	2CH 8760 switching cycles per year at 5 A DC13
							≥ 00/--	2CH 2190 switching cycles per year at 5 A AC15
2700553	PSR-MC50				1.5E-09		≥ 00/--	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2700564							≥ 00/--	
2700571	PSR-MC60	c	1	1	5.5E-07		≥ 00/100	
2700572							≥ 00/100	
2700574	PSR-MC62	e	4	3	1.0E-09		≥ 00/100	
2700575							≥ 00/100	
2702094	PSR-MC70	c	1	1	2.5E-08		≥ 00/100	8760 switching cycles per year at 4 A DC13 or 5 A AC15 Up to PL e/SIL 3 possible depending on the application
2702095							≥ 00/100	
2702096	PSR-MC72	e	4	3	1.5E-09		≥ 00/100	8760 switching cycles per year at 4 A DC13 or 5 A AC15
2702097							≥ 00/100	
1015526	PSR-MC73				1.0E-09		≥ 00/100	2CH 8760 switching cycles per year at 4 A DC13 or 5 A AC15
1015533							≥ 00/100	
2702382	PSR-MC82 [1)]				1.0E-09		≥ 00/--	8760 switching cycles per year at 3 A DC13 or 3 A AC15
2702383							≥ 00/--	

[1)] In conjunction with a suitable evaluating device

2.2 Safety relays – PSRclassic

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2963802	PSR-ESA2-B	c	1	1	4.05E-10	20	≥ 00/--	8766 switching cycles per year B10D = 230,000 at 3 A AC15 Up to PL e/SIL 3 possible depending on the application
2963954							≥ 00/--	
2963750	PSR-ESA4	e	4	3	5.05E-10		≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2963938							≥ 00/--	
2963763	PSR-ESA4-B						≥ 00/--	
2963941							≥ 00/--	
2901430	PSR-ESAM2/3x1-B	c	1	1	2.42E-10		≥ 00/--	8760 switching cycles per year B10D = 300,000 at 5 A DC13 Up to PL e/SIL 3 possible depending on the application
2901431							≥ 00/--	
2900525	PSR-ESAM4/2x1	e	4	3	5.05E-10		≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2900526							≥ 00/--	
2900509	PSR-ESAM4/3x1-B				5.05E-10		≥ 00/--	
2900510							≥ 00/--	
2981114	PSR-ESAM4/3x1				1.26E-10		≥ 00/-- < 08/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
					8.87E-10		≥ 08/--	8766 switching cycles per year B10D = 160,000 at 5 A DC13
2981127					1.26E-10		≥ 00/-- < 08/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
					8.87E-10		≥ 08/--	8766 switching cycles per year B10D = 160,000 at 5 A DC13
2963912	PSR-ESAM4/8x1				5.06E-10		≥ 00/--	8766 switching cycles per year B10D = 230,000 at 3 A AC15
2963996							≥ 00/--	
2901416	PSR-ESAM4-B AC				3.60E-10		≥ 00/--	8760 switching cycles per year B10D = 300,000 at 5 A DC13
2901417							≥ 00/--	
2901426							≥ 00/--	
2901427							≥ 00/--	
2901422							≥ 00/--	
2901425							≥ 00/--	
2901428							≥ 00/--	
2901429							≥ 00/--	

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2981800	PSR-ESD-30	e	4	3	1.80E-09	20	≥ 00/--	8766 switching cycles per year B10D = 400,000 at 3 A AC15 DC13
2981813							≥ 00/--	
1217839							≥ 00/--	
2981428	PSR-ESD-300 [2]				1.89E-09		≥ 00/--	8766 switching cycles per year B10D = 230,000 at 3 A AC15
2981431							≥ 00/--	
2981125	PSR-ESD-T [2]				1.67E-09		≥ 00/--	
2981198							≥ 00/--	
2981509							≥ 00/--	
2981059	PSR-ESL4-B				5.56E-10		≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2981062							≥ 00/--	
2963718	PSR-ESM4				5.05E-10		≥ 00/--	
2963705							≥ 00/--	
2963776	PSR-ESM4-B						≥ 00/--	
2963925							≥ 00/--	
2981020	PSR-ESP4	c	1	1	9.93E-11		≥ 00/--	8766 switching cycles per year B10D = 160,000 at 5 A AC15 Up to PL e/SIL 3 possible depending on the application
2981017							≥ 00/--	
2981978	PSR-FSP/1x1 [1]	e	4	3	2.02E-11		≥ 00/--	8766 switching cycles per year B10D = 1,000,000 at 5 A DC13
2981981							≥ 00/--	
2986960	PSR-FSP/2x1 [1]				2.02E-11		≥ 00/--	
2986957							≥ 00/--	
1301402	PSR-ME20	d	3	2	1.00E-08		≥ 00/--	8760 switching cycles/year 5 A DC13; 2 A AC15
1301404							≥ 00/--	
2963721	PSR-THC4	e	4	3	1.21E-09		≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2963983							≥ 00/--	
2963734	PSR-URM4/5x1 [1]				1.47E-09		≥ 00/--	8766 switching cycles per year B10D = 230,000 at 3 A AC15
2964005							≥ 00/--	
2981033	PSR-URM4/5x1-B [1]				1.02E-10		≥ 00/--	
2981046							≥ 00/--	
2903583	PSR-URML4				5.56E-10		≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2903584							≥ 00/--	
2702924	PSR-URM4 42-230UC [1]				1.00E-09		≥ 00/--	8766 switching cycles per year B10D = 200,000 at 5 A AC15
2702925							≥ 00/--	

[1] In conjunction with a suitable evaluating device

[2] Delayed contacts up to PL d, category 3

2.3 Modular safety relay system – PSRmodular

[1] In conjunction with a suitable evaluating device

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2981486	PSR-SDC4	e	4	3	2.53E-10	20	≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2981499							≥ 00/--	
2981703	PSR-URD3/T2 [1]	d	3	2	1.35E-09		≥ 00/--	8766 switching cycles per year B10D = 300,000 at 5 A DC13
2981729							≥ 00/--	
2981732	PSR-URD3/3 [1]	e	3	3			≥ 00/--	
2981745							≥ 00/--	
2981512	PSR-URD3/30 [1]				1.39E-09		≥ 00/--	
2981525							≥ 00/--	
2981677	PSR-URM4/B [1]	e	4		9.70E-11		≥ 00/--	
2981680							≥ 00/--	
2981936	PSR-SIM4	-	-	-	-	-	≥ 00/--	Due to the series connection of safety door switches, the possible diagnostic coverage is reduced as are the maximum achievable safety classifications.
2981949							≥ 00/--	
2981871	PSR-SACB-4/4-L-5,0PUR-SD	-	-	-	-	-	≥ 00/--	
2981884							≥ 00/--	
1104981	PSR-M-B1	e	4	3	6.86E-09	20	≥ 00/--	
1104972							≥ 00/--	
1104974	PSR-M-B2	e	4	3	1.35E-08		≥ 00/--	
1104975							≥ 00/--	
1104890	PSR-M-EF1	e	4	3	1.32E-08		≥ 00/--	
1104889							≥ 00/--	
1104888	PSR-M-EF2	e	4	3	4.93E-09		≥ 00/--	
1104887							≥ 00/--	
1104885	PSR-M-EF3	e	4	3	5.60E-09		≥ 00/--	
1104884							≥ 00/--	
1104856	PSR-M-EF4	e	4	3	5.84E-09		≥ 00/--	
1104868							≥ 00/--	
1104976	PSR-M-EF5	e	4	3	5.64E-09		≥ 00/--	
1104977							≥ 00/--	
1104982	PSR-M-EF6	c	1	1	3.36E-07		≥ 00/--	1CH 8760 switching cycles per year at 3 A AC15
		e	4	3	1.61E-08		≥ 00/--	2CH 8760 switching cycles per year at 3 A AC15
1104983		c	1	1	3.36E-07		≥ 00/--	1CH 8760 switching cycles per year at 3 A AC15
		e	4	3	1.61E-08		≥ 00/--	2CH 8760 switching cycles per year at 3 A AC15

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
1104985	PSR-M-EF7	d	2	2	1.53E-08	20	≥ 00/--	
		e	4	3			≥ 00/--	
1104986		d	2	2			≥ 00/--	
		e	4	3			≥ 00/--	
1105522	PSR-M-EF8	e	4	3	5.67E-09		≥ 00/--	
1105523							≥ 00/--	
1104987	PSR-M-EM1	e	4	3	5.98E-09		≥ 00/--	
1104988							≥ 00/--	
1104989	PSR-M-EM2	e	4	3	7.08E-09		≥ 00/--	
1104990							≥ 00/--	
1105009	PSR-M-EM3	e	4	3	6.70E-09		≥ 00/--	
1105010							≥ 00/--	
1105011	PSR-M-EM4	e	4	3	7.94E-09		≥ 00/--	
1105012							≥ 00/--	
1105014	PSR-M-EM5	e	4	3	8.18E-09		≥ 00/--	
1105015							≥ 00/--	
1300906	PSR-M-EM5.1	e	4	3	9.66E-09		≥ 00/--	
1300905							≥ 00/--	
1105016	PSR-M-EM6	e	4	3	7.42E-09		≥ 00/--	
1105017							≥ 00/--	
1105018	PSR-M-EM7	e	4	3	9.89E-09		≥ 00/--	
1105093							≥ 00/--	

[1] In conjunction with a suitable evaluating device

2.4 Multifunctional safety relays – PSRmultifunction

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2902725	PSR-MXF1	e	4	3	1.93E-10	20	≥ 00/--	8766 switching cycles per year B10D = 780,000 at 5 A DC13 or 3 A AC15
2902726							≥ 00/--	
2903253							≥ 00/--	
2903254	PSR-MXF2						≥ 00/--	
2903255							≥ 00/--	
2903256							≥ 00/--	
2903257	PSR-MXF3						≥ 00/--	
2903258							≥ 00/--	
2903259							≥ 00/--	
2903260	PSR-MXF4						≥ 00/--	
2903261							≥ 00/--	
2903262							≥ 00/--	

3 Over-speed and zero-speed safety relays – PSRmotion

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2702355	PSR-MM25	e	3	3	5.79E-08	20	≥ 00/--	17520 switching cycles per year at 4 A DC13 or 5 A AC15
2702356							≥ 00/--	
2702357	PSR-MM30	e	4	3	7.76E-09		≥ 00/--	2CH 17520 switching cycles per year at 6 A DC1
2702358							≥ 00/--	
1249516	PSR-MM35	e	4	3	5.72E-09		≥ 00/--	2CH 8760 switching cycles per year at 4 A DC13
1249515							≥ 00/--	
2981538	PSR-RSM4	e	4	3	7.90E-09		≥ 00/--	In conjunction with suitable sensor systems.
2981541							≥ 00/--	

4 Safe coupling relays – PSRclassic

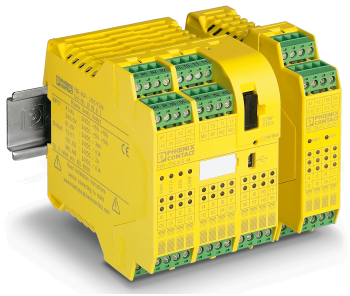
4.1 High demand – safety characteristic data

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2963747	PSR-24UC/URM/5X1/2X2	c	1	1	1.00E-07 [1] 1.35E-07 [2] 1.56E-07 [3]	20	≥ 11/--	1) 3 A AC15; 8760 switching cycles/year; 5% of the total SIL 2) 3 A DC13; 8760 switching cycles/year; 5% of the total SIL 3) 6 A AC1; 8760 switching cycles/year; 5% of the total SIL 4) 3 A AC15; 8760 switching cycles/year; 10% of the total SIL 5) 3 A DC13; 8760 switching cycles/year; 10% of the total SIL 6) 6 A AC1; 8760 switching cycles/year; 10% of the total SIL
2963970							≥ 09/--	
2981444	PSR-24UC/URM/4X1/2X2	c	1	1	6.00E-07 [4] 6.00E-07 [5] 2.40E-07 [6]		≥ 04/--	
2981457							≥ 04/--	
2981839	PSR-24UC/URM/3X1/3X2	c	1	1	4.00E-07 [1] 4.00E-07 [2] 2.40E-07 [3]		≥ 06/--	
2981842							≥ 06/--	
2981952	PSR-24UC/URM/5X1/1X2	c	1	1	1.00E-07 [1] 1.35E-07 [2] 1.56E-07 [3]		≥ 04/--	
2981965							≥ 04/--	
2981402	PSR-120UC/URM/5X1/2X2	c	1	1	1.00E-07 [1] 1.35E-07 [2] 1.56E-07 [3]		≥ 08/--	
2981415							≥ 08/--	
2981363	PSR-24UC/URM/2X21	c	1	1	6.67E-07 [4] 3.33E-07 [5] 2.00E-07 [6]		≥ 03/--	
2981376	PSR-120UC/URM/2X21	c	1	1	6.67E-07 [4] 3.33E-07 [5] 2.00E-07 [6]		≥ 03/--	

4.2 Low demand – safety characteristic data

Item no.	Short designation	Device type	HFT	IEC 61508 SIL	PFD_{avg}	T_{1max} (years)	t_M (years)	Data valid for HW/FW version	Note
2963747	PSR-24UC/URM/5X1/2X2	A	0	1	4.05E-03	4.6	20	≥ 11/--	-
2963970								≥ 09/--	-
2981444	PSR-24UC/URM/4X1/2X2	A	0	1	4.05E-03	4.6		≥ 04/--	-
2981457								≥ 04/--	-
2981839	PSR-24UC/URM/3X1/3X2	A	0	1	4.05E-03	4.6		≥ 06/--	-
2981842								≥ 06/--	-
2981952	PSR-24UC/URM/5X1/1X2	A	0	1	4.05E-03	4.6		≥ 04/--	-
2981965								≥ 04/--	-
2981402	PSR-120UC/URM/5X1/2X2	A	0	1	4.05E-03	4.6		≥ 08/--	-
2981415								≥ 08/--	-
2981363	PSR-24UC/URM/2X21	A	0	1	4.05E-03	4.6		≥ 03/--	-
2981376	PSR-120UC/URM/2X21	A	0	1	4.05E-03	4.6		≥ 03/--	-

5 Configurable safety modules – PSRtrisafe



5.1 High demand – safety characteristic data

Item no.	Short designation	Parameterization	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2986229 2986232	PSR-TRISAFE-S	1CH	d	2	2	16.1E-09	20	≥ 10/1636	-
		2CH	e	4	3				-
2986012 2986025	PSR-TRISAFE-M	1CH	d	2	2	17.1E-09		≥ 10/2033	-
		2CH	e	4	3				-
2986038 2986041	PSR-TS-SDI8-SDIO4	1CH	d	2	2	3.94E-09		≥ 10/1021	-
		2CH	e	4	3				-
2986096 2986106	PSR-TS-SDOR4	1CH	c	1	1	3.67E-07		≥ 03/1002	4 A DC13; 8760 switching cycles/year
						5.5E-07			5 A AC15; 8760 switching cycles/year
						1.41E-07		≤ 02/1002	5 A DC13; 8760 switching cycles/year
						1.0E-07			3 A AC15; 8760 switching cycles/year
		2CH	e	4	3	7.3E-10		≥ 03/1002	4 A DC13; 5 A AC15; 8760 switching cycles/year
						7.3E-10		≤ 02/1002	5 A DC13; 3 A AC15; 8760 switching cycles/year

5.1.1 High demand – alternative illustration as 1oo1 structure

Item no.	Short designation	Parameterization	Device type	HFT	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	λ_{Total} (FIT)	MTBF (years) [1]	PFH_D (1/h)	T_{1max} (years)	t_M (years)	Data valid for HW/FW version	Note
2986229 2986232	PSR-TRISAFE-S	1CH	B	0	2	99.81	0	1282	459	3.39	1745	64.78	3.39E-09	20	20	≥ 10/1636	-
		2CH			3												-
2986012 2986025	PSR-TRISAFE-M	1CH			2											≥ 10/2033	-
		2CH			3												-
2986038 2986041	PSR-TS-SDI8-SDIO4	1CH	B	0	2	99.88	0	1253	317	1.91	1572	71.91	1.91E-09			≥ 10/1021	[2]
		2CH			3												
2986096 2986106	PSR-TS-SDOR4	1CH	-	0	1	83.79	873	990	33	367	2263	49.94	3.67E-07			≥ 03/1002	4 A DC13
						93.88	873	1259	33	141	2305	49.02	1.41E-07			≤ 02/1002	5 A DC13
		2CH			3	99.99	910	2681	23.75	0.17	3615	31.26	1.72E-10			≥ 03/1002	4 A DC13
						99.99	910	1781	21.51	0.13	2712	41.67	1.27E-10			≤ 02/1002	5 A DC13

[1] Includes faults that are not part of the safety function. MTTR was set to 8 hours.

[2] Values calculated for configuring up to 8 inputs and up to 4 outputs.

5.2 Low demand – safety characteristic data

Item no.	Short designation	Parameterization	Device type	HFT	IEC 61508 SIL	PFD_{avg}	T_{1max} (years)	t_M (years)	Data valid for HW/FW version	Note
2986229 2986232	PSR-TRISAFE-S	1CH	B	0	2	2.99E-04	20	20	≥ 10/1636	-
		2CH		1	3					-
2986012 2986025	PSR-TRISAFE-M	1CH		0	2				≥ 10/2033	-
		2CH		1	3					-
2986038 2986041	PSR-TS-SDI8-SDIO4	1CH	B	0	2	2.1E-04	20		≥ 10/1021	-
		2CH		1	3					-
2986096 2986106	PSR-TS-SDOR4	1CH	-	0	1	4.35E-03	5		≥ 03/1002	-
									≤ 02/1002	-
		2CH		1	3	1.18E-04	5		≥ 03/1002	-
									≤ 02/1002	-

5.2.1 Low demand – alternative illustration as 1oo1 structure

Item no.	Short designation	Parameterization	Device type	HFT	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	λ_{Total} (FIT)	MTBF (years) [1]	PFD_{avg} [2]	T_{1max} (years)	t_M (years)	Data valid for HW/FW version	Note
2986229 2986232	PSR-TRISAFE-S	1CH	B	0	2	99.84	0	1638	505	3.39	2146	64.36	1.49E-05	20	20	≥ 10/1636	-
		2CH			3												-
2986012 2986025	PSR-TRISAFE-M	1CH			2											≥ 10/2033	-
		2CH			3												-
2986038 2986041	PSR-TS-SDI8-SDIO4	1CH	B	0	2	99.91	0	1729	349	1.91	2080	66.41	8.38E-06	20		≥ 10/1021	[3]
		2CH			3												
2986096 2986106	PSR-TS-SDOR4	1CH	-	0	1	94.26	873	2379	32	200	3484	32.44	9.69E-04	5		≥ 03/1002	-
																≤ 02/1002	-
		2CH			3	99.88	910	3700	21.18	5.45	4637	24.37	1.23E-04	5		≥ 03/1002	-
																≤ 02/1002	-

[1] Includes faults that are not part of the safety function. MTTR was set to 8 hours.

[2] For T_1 = 1 year

[3] Values calculated for configuring up to 8 inputs and up to 4 outputs.

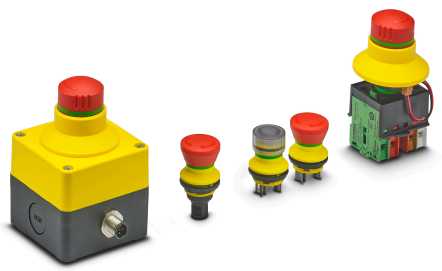
6 Safe sensors

6.1 PSRswitch

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW version	Note
2702972	PSR-CT-C-SEN-1-8[1]	e	4	3	6.00E-10	20		
2702973	PSR-CT-C-ACT	e	4	3	-	20		
2702975	PSR-CT-M-SEN-1-8[1]	e	4	3	6.00E-10	20		
2702976	PSR-CT-F-SEN-1-8[1]	e	4	3	6.00E-10	20		

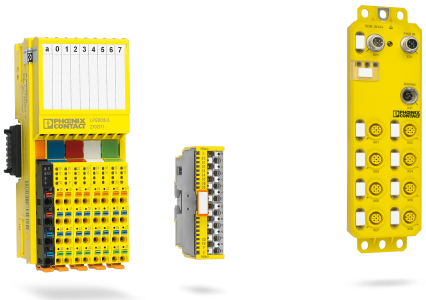
[1] In conjunction with PSR-CT-C-ACT

6.2 Emergency stop switches



Item no.	Item designation	B_{10D}	Note
1221735	PSR-ESS-M2-H110-2000-A	250000 cycles	
1221737	PSR-ESS-M0-H210-2000-A	250000 cycles	
1221739	PSR-ESS-M0-H220-2001-C	250000 cycles	
1221740	PSR-ESS-M0-H200-2000-C	250000 cycles	
1221749	PSR-ESS-ACC-CB1-SM-SC	104000 cycles	
1221752	PSR-ESS-ACC-CB1-NC-SC	250000 cycles	Assembly with just 1 ... 3 contact modules
1396559	PSR-ESS-ACC-CB1-NC-EF-SC	250000 cycles	Assembly with just 4 contact modules. The B_{10D} value is valid per contact module.

7 Network safety solutions



1 In conjunction with clock signals. See user documentation for the module.

2 Version as per Figure 6-3 in the user manual. See Table 7-3, Figure 6-3, and Figure 6-4 in the user manual.

Item no.	Short designation	Parameteriza-tion	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW/FW version	Note
2916024	IB IL LPSDO 8	1CH	d	3	2	1.00E-08	20	≥ 00/100/100	-
		2CH	e	4	3	1.00E-09			
2700606	IB IL LPSDO 8 V2	1CH	d	3	2	1.00E-08		≥ 00/100/100	
		2CH	e	4	3	1.00E-09			
2701625	IB IL LPSDO 8 V3	1CH	d	3	2	1.00E-08		≥ 00/100/100	
		2CH	e	4	3	1.00E-09			
2916493 2700804	IB IL PSDO 4/4	1CH	d	3	2	1.00E-08		≥ 01/200/100	
		2CH	e	4	3	1.00E-09			
2985631	IB IL PSDO 8	1CH	d	3	2	1.00E-08		≥ 01/200/100	
		2CH	e	4	3	1.00E-09			
2985864 2700563	IB IL PSDOR 4 IB IL PSDOR 4-F	1CH-AC15	c	1	1	1.00E-08		≥ 00/200/100	The PFH_D value is an example value here. It depends on the parameterization and wiring. You can determine the exact value with the aid of the product documentation.
		1CH-DC13	c	1	1	1.00E-08			
		2CH-AC15 version A [2]	e	4	3	1.00E-09			
		2CH-AC15 version B [2]	e	4	3	1.00E-09			
		2CH-DC13 version A [2]	e	4	3	1.00E-09			
		2CH-DC13 version B [2]	e	4	3	1.00E-09			
2985688	IB IL PSDI 8	1CH	d	3 [1]	2	1.00E-08		≥ 00/200/-	-
		2CH	e	4	3	1.00E-09			
2700994	IB IL PSDI 16	1CH	d	3 [1]	2	1.00E-08		≥ 00/200/-	
		2CH	e	4	3	1.00E-09			
2702446	IB IL SAFE 2-ECO	1CH	c	1	1	1.00E-09		≥ 00/--	
		2CH	e	4	3				
2701559	AXL F PSDI8/4 1F	1CH	d	3 [1]	2	1.00E-08	20	≥ 00/100/-	
		2 CH	e	4	3	1.00E-09			
2701560	AXL F PSDO8/3 1F	1CH	d	3	2	1.00E-08		≥ 00/100/-	
		2CH	e	4	3	1.00E-09			
2702263	AXL F SSDI8/4 1F	1CH	d	3 [1]	2	1.00E-08		≥ 01/200/-	
		2CH	e	4	3	1.00E-09			
2702264	AXL F SSDO8/3 1F	1CH	d	3	2	1.00E-08		≥ 01/200/-	
		2CH	e	4	3	1.00E-09			
2702171	AXL F LPSDO8/3 1F	1CH	d	3	2	1.00E-08		≥ 00/100/-	
		2 CH	e	4	3	1.00E-09			

Item no.	Short designation	Parameterization	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Data valid for HW/FW/FW version	Note
1185380	AXL E IOL SDI8 SDO4 2A M12 L	1CH	d	3	2	1.00E-8	20	≥ 00/110/110	
		2 CH	e	4	3	1.00E-9			
2702859	AXL F SSDOR4/2 1F	1CH	c	1	1	6.00E-7		≥ 00/100/-	
		2 CH	e	4	3	1.00E-9			
2702858	AXL F PSDOR4/2 1F	1CH	c	1	1	6.00E-7		≥ 00/100/-	
		2 CH	e	4	3	1.00E-9			
1079241	AXL SE PSDI8/3	1CH	d	3[1)]	2	1.00E-8	25	≥ 00/100/-	
		2 CH	e	4	3	1.00E-9			
1079231	AXL SE PSDO4/2	1CH	d	3	2	1.00E-8		≥ 00/100/-	
		2 CH	e	4	3	1.00E-9			
1190012	AXL SE SSDI8/3	1CH	d	3[1)]	2	1.00E-8		≥ 00/100/-	
		2 CH	e	4	3	1.00E-9			
1190017	AXL SE SSDO4/2 2A	1CH	d	3	2	1.00E-8		≥ 00/100/-	
		2 CH	e	4	3	1.00E-9			
1061424	AXL F PSAI8 I 1F	1CH	c	1	2	1.00E-7		≥ 00/100/-	
		2 CH	e	4	3	5.00E-9			

1 In conjunction with clock signals. See user documentation for the module.

2 Version as per Figure 6-3 in the user manual. See Table 7-3, Figure 6-3, and Figure 6-4 in the user manual.

8 Safe control technology

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 / IEC 61508 SIL	PFH_D (1/h)	t_M (years)	Data valid for version				Note
							HW	FW	FW COP	SIS FW HW/FW	
2916794	RFC 470S PN 3TX	e	4	3	1E-09	20	> 01	> 46F	> 360Q	> 10/236	-
2700651	FL PN/PN SDIO-2TX/2TX						> 01	> 100	> 010	-	
2404577	RFC 480S PN 4TX	e	4	3	1E-09	25	≥ 02	-	≥ 6.1.0	≥ 02/ 01.07.0009	-
1051328	RFC 4072S	e	4	3	1E-09	25	≥ 00	≥ 2019.0 LTS	-	≥ 02/ 01.08.0000	-
1246285	BPC 9102S	e	4	3	1E-09	25	≥ 02	≥ 2021.6		≥ 03/ 02.00.0000	-
1159811	AXC F XT SPLC 1000	e	4	3	1E-09	25	≥ 01	-	-	≥ 01/ 01.00.0000	-

8.1 Safe analog value processing

Function block library for safety-related analog value acquisition with standard I/O modules.

The following characteristics are only valid if the total MTBF of the network infrastructure components used between the controller and SAFE AI station is ≥ 30 years.
If the total MTBF is < 30 years, please contact Phoenix Contact.

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	EN 62061 SIL	PFH_D (1/h)	t_M (years)	Note
2400057	SAFE AI	e	4	3	2E-09 [1] 5E-09 [2]	20	When only using safety-related input signals in the station
		d	3	2			When using safety-related and non-safety-related input signals in the station

1) When used with the AXL F AI8 1F module (item no. 2688064)

2) When used with the AXL F AI8 W 1F module (item no. 2702525)

9 CONTACTRON hybrid motor starters

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	IEC 62061, IEC 61508 SIL	PFH_D (1/h)	t_M (years)	Note
2297031	ELR-W3-24DC/500AC-2I	e	3	3	2.67E-09	20	-
2297044	ELR-W3-230AC/500AC-2I				6.82E-09		
2297057	ELR-W3-24DC/500AC-9I				2.67E-09		
2297060	ELR-W3-230AC/500AC-9I				6.82E-09		
2900582 2900414 2900421	ELR-H5-IES-SC-24DC/500AC...				2.67E-09		
2903902 2903904 2903906	ELR-H5-IES-PT-24DC/500AC...						
2900692 2900420 2900422	ELR-H5-IES-SC-230AC/500AC...				6.82E-09		
2900559 2900561	ELR-H5-ES-SC-24DC/500AC...				2.67E-09		
2900566 2900567 2900569	ELR-H3-IES-SC-24DC/500AC...				2.40E-09		
2903914 2903916 2903918	ELR-H3-IES-PT-24DC/500AC...						
2900689 2900568 2900570	ELR-H3-IES-SC-230AC/500AC...				6.27E-09		

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	IEC 62061, IEC 61508 SIL	PFH_D (1/h)	t_M (years)	Note
2905151 2905138 2905152 2905139 2905153 2905140	ELR H5-IES…-IFS	e	3	3	0.1E-09	20	-
2905154 2905141 2905155 2905142 2905156 2905143	ELR H3-IES…-IFS						
2903933 2903934 2903935	ELR H5-IES…SWD…				0.1E-09		
2903936 2903937 2903938	ELR H3-IES…SWD…						
2908669 2908670	ELR H5-IES...-IOL						
2908671 2908672	ELR H3-IES...-IOL						
2909570 2909568	ELR H3-IS-PT- 24DC/500AC-...-P		4		4.3E-09		
2908700 2908698	ELR H3-IS-SC- 24DC/500AC-...-P						
2909569 2909567	ELR H5-IS-PT- 24DC/500AC-...-P						
2908699 2908697	ELR H5-IS-SC- 24DC/500AC-...-P						
2909557 2909555	ELR H3-IES-PT- 24DC/500AC-...-P		3				
2909556 2909554	ELR H5-IES-PT- 24DC/500AC-...-P						

10 CONTACTRON Speed Starters

Item no.	Short designation	EN ISO 13849-1 PL	EN ISO 13849-1 Category	IEC 62061, IEC 61508, IEC/EN 61800-5-2 SIL	PFH_D (1/h)	t_M (years)	Note
1201132	CSS 0.25-1/3	e	4	3	10.9E-12	20	-
1201135	CSS 0.37-1/3						
1201494	CSS 0.55-1/3						
1201509	CSS 0.75-1/3						
1201511	CSS 1.5-1/3						
1201520	CSS 0.25-1/3-EMC						
1201600	CSS 0.37-1/3-EMC						
1201602	CSS 0.55-1/3-EMC						
1201613	CSS 0.75-1/3-EMC						
1201642	CSS 1.5-1/3-EMC						
1201679	CSS 0.25-3/3						
1201683	CSS 0.37-3/3						
1201694	CSS 0.55-3/3						
1201695	CSS 0.75-3/3						
1201650	CSS 1.5-3/3						
1201713	CSS 0.25-3/3-EMC						
1201825	CSS 0.37-3/3-EMC						
1201828	CSS 0.55-3/3-EMC						
1201829	CSS 0.75-3/3-EMC						
1201696	CSS 1.5-3/3-EMC						

11 Safety relay modules for the process industry

11.1 Safe coupling relays – PSRmini

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	HFT	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	λ_{Total} (FIT)	MTBF (years) [1]	PFD_{avg} [2]	PFH_D (1/h)	T_{1max} (years)	t_M (years)	Data valid for HW/FW version
2700356	PSR-PS20	High [3]	A	0	3	99.98	989.32	148.96	52.58	0.20	1191.06	80.63	-	1.95E-10	20	20	≥ 00/--
		Low				99.66	0	1579	0	5.392	1584	63	2.36E-05	-	6		
2700357	PSR-PS21	High [3]	A	0	2	99.18	494.66	79.10	494.66	8.80	1077.22	91.65	-	8.80E-09	20		≥ 00/--
		Low				81.20	0	794.1	0	183.8	977.9	99	8.06E-04	-	1.6		
2702524	PSR-PS22	High [3]	A	0	3	99.996	0	2857.88	5.45	0.11	2863.44	29.18	-	1.10E-10	20		≥ 00/--
		Low [4][5]				99.839	0	2639.18	0	4.26	2643.44	30.94	1.87E-05	-	6		
		High [6]				99.961	0	2855.45	6.86	1.12	2863.44	29.18	-	1.12E-09	20		
		Low [6]				99.907	0	2634.25	6.74	2.45	2643.44	30.94	7.08E-05	-	3.8		
2702663	PSR-PS23	High [3]	A	0	3	99.996	0	2765.12	5.45	0.11	2770.68	40.09	-	1.10E-10	20		≥ 02/--
		Low				99.833	0	2546.42	0	4.26	2550.68	43.48	1.87E-5	-	6		
2700398	PSR-PS40	High	A	0	3	99.99	989.32	460.91	51.90	0.10	1502.24	64.01	-	1.04E-10	20		≥ 00/--
		Low				99.72	0	1891	0	5.236	1896	52	2.29E-05	-	6		
2700577 2700578	PSR-PC20	High [3]	A	0	3	99.98	989.32	230.38	52.58	0.20	1272.48	76.43	-	1.95E-10	20		≥ 00/--
		Low				99.68	0	1660	0	5.392	1666	60	2.36E-05	-	6		≥ 00/--
1086945	PSR-PC21	High [7]	A	0	2	99	0	918.43	379.5	3.83	1301.77	85.72	-	3.83E-09	20		≥ 00/--
		Low [7]				84	0	1228.58	0	210.24	1438.82	79.14	9.91E-4	-	1.75		≥ 00/--
		High [3]			3	99	0	2497.76	3.63	0.07	2501.46	45.18	-	7.33E-11	20		≥ 00/--
		Low [8]				99	0	3010.53	0	4.26	3014.79	37.49	1.87E-5		6		≥ 00/--
2700581 2700582	PSR-PC32	High [3]	A	0	3	99.99	0	3135.22	62.35	1	3198.57	22.44	-	1.00E-09	20		≥ 00/--
		Low				99.85	0	3577.81	0	5.5	3583.32	22.51	2.41E-05	-	6		≥ 00/--
2700588 2700589	PSR-PC40	High	A	0	3	99.99	989.32	397.43	51.90	0.10	1438.75	64.98	-	1.04E-10	20		≥ 00/--
		Low				99.71	0	1798	0	5.236	1803	54	2.29E-05	-	6		≥ 00/--

Item no.	Short designation	Demand	Device type	HFT	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	λ_{Total} (FIT)	MTBF (years) [1]	PFD_{avg} [2]	PFH_D (1/h)	T_{1max} (years)	t_M (years)	Data valid for HW/FW version
2904664	PSR-PC50	Low	A	0	3	99.60	4.27	849	4.21	3.40	860.88	110.5	1.49E-05	-	10	20	≥ 00/--
2904665																	≥ 00/--
2702522	PSR-PC51	Low	A	0	3	99.68	0	1831.13	3.66	5.72	1840.51	66.98	2.5E-05	-	6		≥ 00/--
2702523																	≥ 00/--
1017062	PSR-PC52	Low	A	0	3	99.68	0	1831.13	3.66	5.72	1840.51	66.98	2.5E-05	-	6		≥ 02/--
1017064																	≥ 02/--

[1] Includes faults that are not part of the safety function. MTTR was set to 8 hours.

[2] For T_1 = 1 year

[3] Only in conjunction with a suitable evaluating device

[4] Diagnostics / proof test: Readback via N/C contact 22

[5] Diagnostics / proof test: Error message via diagnostic LEDs

[6] Diagnostics / proof test: Error feedback via A1 to DO

[7] 1-channel

[8] 2-channel

11.2 Safe coupling relays – PSRclassic

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	HFT	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	λ_{Total} (FIT)	MTBF (years) [1]	PFD_{avg} [2]	PFH_D (1/h)	T_{1max} (years)	t_M (years)	Data valid for HW/FW version
2981978 2981981	PSR-FSP	High [5]	A	0	3	99.99	198	62.7	3.66	0.02	264.38	319	-	2.02E-11	20	20	≥ 00/--
		Low [3]				99.77	0	909.7	0	2.09	911.79	113	9.15E-06	-	12		≥ 00/--
2981020 2981017	PSR-ESP4	High			1 [4]	99.99	949	58.3	44.5	0.093	1052	106.9	-	9.93E-11	20		≥ 00/--
		Low [3]				99.56	0	849	0	3.68	853	132.3	1.61E-05	-	9		≥ 00/--
2986960 2986957	PSR-FSP/2x1	High [5]			3	99.99	198	63.9	3.66	0.02	264.38	342	-	2.02E-11	20		≥ 00/--
		Low [3]				99.76	0	1026.9	0	2.42	1029.32	104	1.06E-05	-	5		≥ 00/--
2986575 2986588	PSR-FSP2/2x1	High [5]			2	99.61	99	55.7	99	1	254.7	361	-	1E-09	20		≥ 00/--
		Low [3]				81.97	0	455	0	100	555	185	4.38E-04	-	2.25		≥ 00/--
2901416 2901417 2901426 2901427 2901422 2901425 2901428 2901429	PSR-ESAM4-BAC	High			3	99.99	660	1298	26.7	0.359	1985	50.9	-	3.60E-10	20		≥ 00/--
		Low				99.66	0	1723	0	5.876	1729	57.46	2.57E-05	-	6.5		≥ 00/--
1119573 1272930	PSR-PE20	Low[5]		2	3	99.87	0	3140.37	0	4.07	3144.44	35.69	1.78E-05	-	3		≥ 00/--

1 Includes faults that are not part of the safety function. MTTR was set to 8 hours.

2 For T_1 = 1 year

3 Calculated assuming an average ambient temperature of 40°C. At higher ambient temperatures, a safety factor of 1.8 should be applied to the failure rates.

4 Up to SIL 3 possible depending on the application.

5 Only in conjunction with a suitable evaluating device

12 Signal conditioners

12.1 Analog IN / Analog OUT

For further operating modes, go to the corresponding data sheet for the relevant item at phoenixcontact.net/products.

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	Operating mode	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	MTBF (years)	PFD_{avg} [1]	PFH (1/h)	DC (%)
2811284	MACX MCR-UI-UI(-SP)(-NC)	Low/High	A	2	2	83.50	0	320	0	62.9	258	2.8E-04	6.28E-08	0.00
2811572														
2811446		Low/High	A	3	2	83.00	0	310	0	65	258	2.8E-04	6.48E-08	0.00
2811556														
2811459	MACX MCR-UI-UI-UP(-SP)(-NC)	Low/High	A	2	2	83.40	0	320	0	63	231	2.61E-04	6.0E-08	0.00
2811585														
2811297		Low/High	A	3	2	82.70	0	353.7	0	73	233	3.19E-04	7.30E-08	0.00
2811569														
2865955	MACX MCR-SL-RPSSI-I(-SP)	Low/High	A	4	2	91.2	0	245	332	55.4	161	2.46E-04	5.54E-08	85.7
2924207														
2865968	MACX MCR-SL-RPSSI-I-UP(-SP)	Low/High	A	5	2	80.17	0	251	0	62	205	2.73E-04	6.21E-08	0.00
2924210														
2924825	MACX MCR-RPSSI-2I(-SP)	Low/High	A	4	2	85.5	0	145.5	224.1	62.3	197	2.73E-04	6.23E-08	78.3
2924838														
2865971	MACX MCR-SL-IDSI-I(-SP)	Low/High	A	4	2	94.7	0	496.5	0	27.9	204	1.22E-04	2.79E-08	0.00
2924223														
2908063	MACX MCR-SL-IDS-I-I(-SP)	Low/High	A	3	2	83.44	1.03	156.1	34.45	38.01	55	1.67E-04	3.801E-08	47.54
2908064														
2908065	MACX MCR-IDS-2I-2I(-SP)	Low/High	A	3	2	83.44	1	156	34.5	38	55	1.67E-04	3.801E-08	47.54
2908066														
2904089	MACX MCR-SL-RPSS-2I-2I(-SP)	Low/High	A	4	2	87.6	0	195	198	55.3	254	2.48E-04	5.53E-08	78.1
2904090														

[1] For T_{proof} = 1 year

[2] Input isolator I ≙ I (4 … 20 mA)

[3] Output isolator I ≙ I (4 … 20 mA)

[4] Repeater power supply, output active, 1-channel

[5] Characteristic data in accordance with IEC 61508 Edition 2 1oo1

12.2 Temperature transducers

For further operating modes, go to the corresponding data sheet for the relevant item at phoenixcontact.net/products.

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	Operating mode	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	MTBF (years)	PFD_{avg} [1]	PFH (1/h)	DC (%)
2811394	MACX MCR-T-UI-UP(-SP)(-C)	Low/High	B	2	2	94.00	0	0	805	43	97	2.95E-04	4.30E-08	94.00
2811860														
2811873		Low/High		3	2	93.00	0	0	789	56	96	3.75E-04	5.60E-08	93.00
2811970														
2811378	MACX MCR-T-UIREL-UP(-SP)	Low/High	B	4	2	94.00	0	234	543	43	85	2.88E-04	4.30E-08	92.00
2811828														
2906169	MACX MCR-SL-UI-REL(-SP)	Low/High	A	5	2	87.60			54	77	132	0.34E-04	7.69E-08	41.20
2906170				6	2	87.00			54	83	129	0.36E-03	8.27E-08	39.40
1050192	MACX MCR-RTD-I(-SP)(-C)	Low/High	B	2	2	94.10	0.8	240	401.5	36.1	96	1.58E-04	3.61E-08	93.80
1050201														
1052464				7	2	94.00	0.8	240	401.3	37.8	96	1.65E-04	3.771E-08	93.30
1052472														
1050228	MACX MCR-TC-I(-C)	Low/High	B	8	2	94.20	0.8	240.1	403	34.6	96	1.51E-04	3.46E-08	92.50
1052459				9	2	93.80	0.8	240.1	394.4	39.8	96	1.74E-04	3.98E-08	93.70

[1] For T_{proof} = 1 year

[2] Pt 100 3-conductor, output 4 ... 20 mA

[3] Voltage input mV, output 4 ... 20 mA

[4] Pt 100 3-conductor, output relay

[5] Category AC1: 250 V AC, 2 A, cos ϕ = 1

[6] Category DC13: 24 V DC, 1 A, including switching capacity >50 mW

[7] Potentiometer, output 4 … 20 mA

[8] Thermocouple with external cold junction compensation, output 4 … 20 mA

[9] Millivolt signal, output 4 … 20 mA

12.3 Digital IN

For further operating modes, go to the corresponding data sheet for the relevant item at phoenixcontact.net/products.

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	Operating mode	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	MTBF (years)	PFD_{avg} [1]	PFH (1/h)	DC (%)
2865997	MACX MCR-SL-NAM-R(-SP)	Low/High	A	[2]	2	78.9	6	165	7	55	286	2.39E-04	54.6E-09	9.0
2924252				[3]	2	76.0	6	168	6	55	286	2.39E-04	54.6E-09	9.0
2865010	MACX MCR-SL-NAM-2RO(-SP)	Low/High	A	[2]	2	76.0	6	165	7	55	287	2.39E-04	-	9.0
2924265				[3]	2	76.0	7	168	6	55	286	2.39E-04	-	9.0
2865049	MACX MCR-SL-2NAM-RO(-SP)	Low/High	A	[2]	2	76.0	6	165	7	55	287	2.39E-04	-	9.0
2924294				[3]	2	76.0	7	168	6	55	286	2.39E-04	-	9.0
2865052	MACX MCR-SL-2NAM-R-UP(-SP)	Low/High	A	[2]	2	80.0	6	403	6	48	227	2.10E-04	-	9.0
2924304				[3]	2	79.4	0	413	6	106	227	2.54E-04	-	9.0
2865023	MACX MCR-SL-NAM-2T(-SP)	Low/High	A	[2]	2	80.0	5	112	8	31	352	2.12E-04	-	0.0
2924278				[3]	2	79.0	1	119	6	33	352	2.12E-04	-	0.0
2865036	MACX MCR-SL-2NAM-T(-SP)	Low/High	A	[2]	2	80.0	5	112	8	31	352	2.12E-04	-	0.0
2924281				[3]	2	79.0	1	119	6	33	352	2.12E-04	-	0.0
2905278	MACX MCR-SL-I-I-ILP(-SP)	Low/High	A	[4]	3	98.6	0	101.7	0	1.5	1106	6.60E-06	1.5E-09	0.0
2905279				[5]	3	91.3	0	94.2	0	9	1106	4.00E-05	9.0E-09	0.0
2905280	MACX MCR-SL-2I-2I-ILP(-SP)	Low/High	A	[4]	3	98.6	0	101.7	0	1.5	1106	6.60E-06	1.5E-09	0.0
2905281				[5]	3	91.3	0	94.2	0	9	1106	4.00E-05	9.0E-09	0.0
2907704	MACX MCR-SL-I-I-HV-ILP(-SP)	Low/High	A	[4]	3	98.6	0	101.7	0	1.5	1106	6.60E-06	1.5E-09	0.0
2907705				[5]	3	91.3	0	94.2	0	9	1106	4.00E-05	9.0E-09	0.0
2907706	MACX MCR-SL-2I-2I-HV-ILP(-SP)	Low/High	A	[4]	3	98.6	0	101.7	0	1.5	1106	6.60E-06	1.5E-09	0.0
2907707				[5]	3	91.3	0	94.2	0	9	1106	4.00E-05	9.0E-09	0.0

[1] For T_{proof} = 1 year

[2] Non-inverted output (N), load field IV, up to 250 V AC / 2 A or 30 V DC / 2 A ohmic or slightly inductive load (cos ϕ > 0.95)

[3] Inverted output (I), load field IV, up to 250 V AC / 2 A or 30 V DC / 2 A ohmic or slightly inductive load (cos ϕ > 0.95)

[4] 4 … 20 mA load ≤ 700 ohms

[5] 4 … 20 mA load ≥ 700 ohms

13 Ex i signal conditioners

13.1 Analog IN / Analog OUT

For further operating modes, go to the corresponding data sheet for the relevant item at phoenixcontact.net/products.

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	Operating mode	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	MTBF (years)	PFD_{avg} [1]	PFH (1/h)	DC (%)
2865340 2924016	MACX MCR-EX-SL-RPSSI-I(-SP)	Low/High	A	2	2	91.0	0	247	333.3	56.7	161	2.52E-04	5.67E-08	85.4
2865793 2924029	MACX MCR-EX-SL-RPSSI-I-UP(-SP)	Low/High	A	2	2	80.17	0	503	0	127	183	2.72E-04	6.21E-08	0.0
2865366 2924236	MACX MCR-EX-SL-RPSSI-2I(-SP)	Low/High	A	2	2	85.5	0	145.5	224.1	62.3	197	2.73E-04	6.23E-08	78.3
2865405 2924032	MACX MCR-EX-SL-IDSI-I(-SP)	Low/High	A	3	2	94.7	0	496.5	0	27.9	204	1.22E-04	2.79E-08	0.0
2908060 2908062	MACX MCR-EX-IDS-I-I(-SP)	Low/High	A	3	2	83.44	1.03	156.1	34.45	38.01	55	1.67E-04	3.801E-08	47.54
2865421 2904931	MACX MCR-EX-IDS-2I-2I(-SP)	Low/High	A	3	2	83.44	1	156	34.5	38	55	1.67E-04	3.801E-08	47.54
2865382 2924676	MACX MCR-EX-SL-RPSS-2I-2I(-SP)	Low/High	A	2	3	92.3	0	316.0	345	55.3	159	2.52E-04	5.53E-08	86.2
2865366	MACX MCR-EX-SL-RPSSI-2I(-SP)	Low/High	A	4	2	83.36	0	156	225	76	204	3.33E-04	7.15E-08	74.72
2924236				5	2	81.73	0	145	175	71.5	204	3.14E-04	7.15E-08	71
2908855	MACX MCR-EX-SL-RPSSI-2I-1S(-SP)	Low/High	A	4	2	83.36	0	156	225	76	204	3.33E-04	7.15E-08	74.72
2908856				5	2	81.73	0	145	175	71.5	204	3.14E-04	7.15E-08	71

[1] For T_{proof} = 1 year

[2] Repeater power supply, output active

[3] Output isolator I = I (4 … 20 mA)

[4] Repeater power supply (1-channel)

[5] Input signal conditioner (1-channel)

13.2 Temperature transducers

For further operating modes, go to the corresponding data sheet for the relevant item at phoenixcontact.net/products.

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	Operating mode	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	MTBF (years)	PFD_{avg} [1]	PFH (1/h)	DC (%)
2865654	MACX MCR-EX-T-UI-UP(-SP)(-C)	Low/High	B	[2]	2	94.0	0	0	805	43	97	2.95E-04	4.30E-08	94.0
2924689														
2811763		Low/High		[3]	2	93.0	0	0	789	56	96	3.75E-04	5.60E-08	93.0
2924692														
2865751	MACX MCR-EX-T-UIREL-UP(-SP)	Low/High	B	[4]	2	94.0	0	234	543	43	85	2.88E-04	4.30E-08	92.0
2924799														
2906164	MACX MCR-EX-SL-UI-REL(-SP)	Low/High	A	[5]	2	87.6	-		54	77	132	3.40E-04	7.69E-08	41.2
2906165				[6]	2	87	-		54	83	129	3.60E-04	8.27E-08	39.4
1050222	MACX MCR-EX-RTD-I(-SP)(-C)	Low/High	B	[2]	2	94.1	0.8	240	401.5	36.1	96	1.58E-04	3.61E-08	93.8
1052463														
1050252				[7]	2	94	0.8	240	401.3	37.8	96	1.65E-04	3.771E-08	94
1052652														
1050233	MACX MCR-EX-TC-I(-C)	Low/High	B	[8]	2	94.2	0.8	240.1	403	34.6	96	1.51E-04	3.46E-08	92.5
1052458				[9]	2	93.8	0.8	240.1	394.4	39.8	96	1.74E-04	3.98E-08	93.7
2908660	MACX MCR-EX-TS-I-OLP(-SP)	Low/High	B	[10]	2	90	3	123	258	41	156	1.79E-04	4.1E-08	
2908661														
2864587	MCR-FL-TS-LP-I-EX	Low/High	B		2	>75	136	183	17	111	255	4.85E-04	-	13.0
2864545	MCR-HT-TS-I-EX	Low/High	B		2	>73	136	183	17	111	255	4.69E-04	-	13.0

[1] For T_{proof} = 1 year

[2] Pt 100 3-conductor, output 4 ... 20 mA

[3] Voltage input mV, output 4 ... 20 mA

[4] Pt 100 3-conductor, output relay

[5] Category AC1: 250 V AC, 2 A, cos ϕ = 1

[6] Category DC13: 24 V DC, 1 A, including switching capacity >50 mW

[7] Potentiometer, output 4 … 20 mA

[8] Thermocouple with external cold junction compensation, output 4 … 20 mA

[9] Millivolt signal, output 4 … 20 mA

[10] Temperature, 4 … 20 mA output

13.3 Digital IN / Digital OUT

For further operating modes, go to the corresponding data sheet for the relevant item at phoenixcontact.net/products.

Alternative illustration as 1oo1 structure

Item no.	Short designation	Demand	Device type	Operating mode	SIL	SFF (%)	λ_{SD} (FIT)	λ_{SU} (FIT)	λ_{DD} (FIT)	λ_{DU} (FIT)	MTBF (years)	PFD_{avg} [1]	PFH (1/h)	DC (%)
2865434	MACX MCR-EX-SL-NAM-R(-SP)	Low/High	A	[2]	2	76.0	6	165	7	55	287	2.39E-04	-	9.0
2924045				[3]		76.0	7	168	6	55	286	2.39E-04	-	9.0
2865450	MACX MCR-EX-SL-NAM-2RO(-SP)	Low/High	A	[2]	2	76.0	6	165	7	55	287	2.39E-04	-	9.0
2924061				[3]		76.0	7	168	6	55	286	2.39E-04	-	9.0
2865476	MACX MCR-EX-SL-2NAM-RO(-SP)	Low/High	A	[2]	2	76.0	6	165	7	55	287	2.39E-04	-	9.0
2924087				[3]		76.0	7	168	6	55	286	2.39E-04	-	9.0
2865984	MACX MCR-EX-SL-2NAM-R-UP(-SP)	Low/High	A	[2]	2	80.0	6	187	6	48	227	2.10E-04	-	9.0
2924249				[3]		79.4	6	189	6	106	227	2.54E-04	-	9.0
2865463	MACX MCR-EX-SL-NAM-2T(-SP)	Low/High	A	[2]	2	80.0	5	112	8	31	352	1.34E-04	-	0.0
2924074				[3]		79.0	1	119	6	33	352	1.46E-04	-	0.0
2865489	MACX MCR-EX-SL-2NAM-T(-SP)	Low/High	A	[2]	2	80.0	5	112	8	31	352	1.34E-04	-	0.0
2924090				[3]		79.0	1	119	6	33	352	1.46E-04	-	0.0
2866006	MACX MCR-EX-SL-NAM-NAM(-SP)	Low/High	A	[2]	2	84.0	0	106	72	32	269	1.74E-04	-	69.0
2924883				[3]		83.0	0	108	72	36	269	1.74E-04	-	66.0
2905723	MACX MCR-EX-SL-NAM-YO(-SP)	Low	A	[2]	2	84.0	0	106	72	32	266	1.74E-04	-	69.0
2905724				[3]		83.0	0	108	72	36	266	1.74E-04	-	66.0
2907404	MACX MCR-EX-SL-NAM-HO(-SP)	Low	A	[2]	2	84.0	0	106	72	32	266	1.74E-04	-	69.0
2907405				[3]		83.0	0	108	72	36	266	1.74E-04	-	66.0
2865492	MACX MCR-EX-SL-SD-21-25-LP(-SP)	Low/High	A	-	3	100.0	0	50	0	0	236	0.00E+00	-	0.0
2924113														
2865764	MACX MCR-EX-SL-SD-21-40-LP(-SP)	Low/High	A	-	3	100.0	0	50	0	0	237	0.00E+00	-	0.0
2924139														
2865609	MACX MCR-EX-SL-SD-24-48-LP(-SP)	Low/High	A	-	3	100.0	0	50	0	0	237	0.00E+00	-	0.0
2924126														
2865515	MACX MCR-EX-SL-SD-21-60-LP(-SP)	Low/High	A	-	3	100.0	0	50	0	0	237	0.00E+00	-	0.0
2924100														
2924867	MACX MCR-EX-SL-SD-23-48-LFD (-SP)	Low/High	A	-	3	94.82	0	406	45.1	24.6	167	1.08E-04	2.46E-8	64.65
2924870														
2905669	MACX MCR-EX-SL-SD-21-25-LFD (-SP)	Low/High	A	-	3	94.82	0	406	45.1	24.6	167	1.08E-04	2.46E-8	64.65
2905674														
2906155	MACX MCR-EX-SL-SD-24-48-LFD (-SP)	Low/High	A	-	3	94.82	0	406	45.1	24.6	167	1.08E-04	2.46E-8	64.65
2906156														

[1] For T_{proof} = 1 year

[2] Non-inverted output (N), load field IV, up to 250 V AC / 2 A or 30 V DC / 2 A ohmic or slightly inductive load (cos ϕ > 0.95)

[3] Inverted output (I), load field IV, up to 250 V AC / 2 A or 30 V DC / 2 A ohmic or slightly inductive load (cos ϕ > 0.95)

14 Explanation of terms

Abbreviation	Term	Explanation
EN ISO 13849-1		
PL	Performance level	Classification of the ability of safety functions to meet a safety demand.
Category	Category	Classification of the resistance to faults in accordance with EN ISO 13849-1
PFH_D	Probability of dangerous failure per hour	Probability of dangerous failure per hour
t_M	Mission time	Duration of use
EN IEC 61508 / 61511 / 62061		
HFT	Hardware fault tolerance	Ability of a function unit to continue with the execution of a demanded function despite existing faults or deviations.
SIL	Safety integrity level	Safety integrity level
SFF	Safe Failure Fraction	Fraction of safe failures
λ_{SD}	Failure rate – safe detected	Failure rate of safe detected failures
λ_{SU}	Failure rate – safe undetected	Failure rate of safe undetected failures
λ_{DD}	Failure rate – dangerous detected	Failure rate of dangerous detected failures
λ_{DU}	Failure rate – dangerous undetected	Failure rate of dangerous undetected failures
λ_{Total}	Total failure rate	Failure rate of all failures
DC	Diagnostic coverage	Diagnostic coverage
MTBF	Mean time between failure	Mean time between failure
PFD_{avg}	Average probability of failure on demand	Average probability of failure on demand
FIT	Failure in time (in 10^9 hours)	Failures per unit time (1 failure every 10^9 hours)
T_{1max}	Proof test interval	Repeat testing

15 Revision history

Revision	Date	Contents
00	12/2011	First publication
01	01/2012	Layout adjustments PSR-SIM4 modular safety relay added PSR-SACB-4/4-L-5,0PUR-SD accessory added
02	04/2012	FL PN/PN SDIO-2TX/2TX safe PROFINET gateway added
03	01/2014	Layout adjustments Values for items ESA2-B and ESAM2/3x1 corrected in “Safety relays” on page 2 and items PSR-URML4, PSR-URM4 42-230UC, and PSR-MXF added “Force-guided coupling relays” moved to page 6 in Section 3 “Safety relay modules” (previously Section 6) Values for items 2986229, 2986232, 2986012, 2986025, 2986038, and 298604 updated in “PSR-TRISAFE configurable safety module” on page 7 and items 2986096 and 2986106 added Items 2700994 and 2701625 added to “Safe control technology” on page 10, PL and Cat. corrected for items IL-PSDOR-4-1CH-AC15 and IL-PSDOR-4-1CH-DC13, note text for item 2985864 reduced Designation for item 2916794 corrected in “Safe control technology” on page 10. “Safe coupling relays” on page 12 renamed (previously “Process technology”), item PSR-ETP/1x1 added, and footnote for items PSR-FSP and PSR-ETP/1x1 added. “Signal conditioners” added on page 13 “Ex i signal conditioners” added on page 16 “Explanation of terms” on page 19 extended
04	03/2015	Layout adjustments / structure revised / sections renamed in accordance with the designations of the product families Column for HW/FW version inserted in tables, where relevant “Safety relays – PSRmini” on page 3 added Second data record for items 2981114/2981127 “PSR-ESAM4/3x1” on page 5 added “Multifunctional safety relays – PSRmultifunction” on page 9 added (previously included in Section 3.1 “Safety relays”) Data revised in Section “Configurable safety modules – PSRtrisafe” on page 13 Items 2701559/270160 added in Section “Network safety solutions” on page 17 Items 2903902, 2903904, 2903906, 2903914, 2903916, and 2903918 added in Section “CONTACTRON hybrid motor starters” on page 20 Data for Section “CONTACTRON hybrid motor starters” on page 20 updated “Safe coupling relays – PSRmini” on page 23 added In Section “Safe coupling relays – PSRclassic” on page 25 HFT changed from 1 to 0 for PSR-FSP, PSR-ESP4, PSR-FSP2/2X1, PSR-ESAM4-B AC Data for signal conditioners “Analog IN / Analog OUT” on page 26 updated Data for Ex i signal conditioners “Analog IN / Analog OUT” on page 29 updated
04_c00	04/2015	Notes for TRISAFE-S, -M, and -SDI8-SDIO4 modified on Page 13

Revision	Date	Contents
05	06/2016	Section **2.1 "Safety relays – PSRmini"**: New products added: PSR-MS21, PSR-MC60, PSR-MC62, PSR-MC70, PSR-MC72, PSR-MC82 Section **2.2 "Safety relays – PSRclassic"**: PL/Cat./SILCL/PFHD modified for PSR-ESP4 Section **3 "Over-speed and zero-speed safety relays – PSRmotion"**: New product added: PSR-MM25 Section **5 "Configurable safety modules – PSRtrisafe"**: HW/FW version column revised Note for TRISAFE-S 1CH and TRISAFE-M 1CH removed Section **7 "Network safety solutions"**: Cat./SILCL (for 1CH-AC15 and 1CH-DC13) for item 2985864 IB IL PSDO 4 adjusted Characteristics for 2CH-CAP-B for item 2985864 IB IL PSDOR 4 removed Footnote 1 added New products added: AXL F SSDI8/4 1F, AXL F SSDO8/3 1F, AXL F LPSDO8/3 1F Section **8.1 "Safe analog value processing"** added Section **9 "CONTACTRON hybrid motor starters"**: Heading modified (previously "CONTACTRON solid-state contactors") New products added: ELR H5-IES…-IFS , ELR H3-IES…-IFS , ELR H5-IES…SWD… , ELR H3-IES…SWD… Section **11.2 "Safe coupling relays – PSRclassic"**: T1max for PSR-FSP (low demand) modified SIL for PSR-ESP4 modified and corresponding footnote added Footnote for low demand values for PSR-FSP, PSR-ESP4, PSR-FSP2/2x1 added Section **12 "Signal conditioners"**: Item number for MACX MCR-T-UIREL-UP(-SP)(-C) corrected Items removed: 2811514, 2811831, 2865065, 2924317, 2865078, 2924320, 2924333, 2924346 Section **13 "Ex i signal conditioners"**: Items removed: 2865722, 2924809, 2865939, 2924142, 2865573, 2924168, 2865942, 2865586 New products added: MACX MCR-EX-SL-NAM-YO(-SP), MACX MCR-EX-SL-NAM-HO(-SP), MACX MCR-EX-SL-SD-21-25-LFD(-SP), MACX MCR-EX-SL-SD-24-48-LFD(-SP)

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06	03/2017	Page 1: Information about important product information added Section **2.1 “Safety relays – PSRmini”**: New products added: PSR-MC32, PSR-MC37 PFHD values for PSR-MC60 and PSR-MC62 modified Items 2902935 and 2902936 replaced by items 2702924 and 2702925 Section **4 “Safe coupling relays – PSRclassic”**: Section completely revised due to new SIL qualification of the products Section **5 “Configurable safety modules – PSRtrisafe”**: Section completely revised, new data added, for PSR-TS-SDI8-SDIO4: PFHD values modified, SILCL for 1CH assignment modified Section **7 “Network safety solutions”**: New product added: IB IL SAFE 2-ECO Footnote 2 added Section **8 “Safe control technology”**: Item 2985563 removed Section **9 “CONTACTRON hybrid motor starters”**: Items removed: 2900558, 2900688, 2900560, 2900562, 2900550, 2900552, 2900554, 2900686, 2900553, 2900555 PFHD value for ELR H3-IES…SWD… modified New products added: ELR H5-IES...-IOL and ELR H5-IES...-IOL Section **11.1 “Safe coupling relays – PSRmini”**: New products added: PSR-PS22, PSR-PC32, PSR-PC51 Section **11.2 “Safe coupling relays – PSRclassic”**: Footnote for low demand values for PSR-FSP/2x1 added Items removed: 2986711, 2986562 Section **13 “Ex i signal conditioners”**: Items removed: 2865502, 2924197 High demand changed for items 2865492 to 2906156 λ_{SU} and MTBF values changed for items 2865492 to 2924100

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07	03/2018	Section **4 “Safe coupling relays – PSRclassic”**: Safety parameters modified (PFH_D and PFD_{avg} values)
08	09/2022	Product photos updated Section **2.1 “Safety relays – PSRmini”**: New products added: PSR-MC31, PSR-MC34-C, PSR-MC38, PSR-MC42, PSR-MC43, PSR-MC45, PSR-MC73 Section **2.2 “Safety relays – PSRclassic”** New product added: PSR-ME20 Section **2.3 “Modular safety relay system – PSRmodular”**: New products added: PSR-M-B1, PSR-M-B2, PSR-M-EF1, PSR-M-EF2, PSR-M-EF3, PSR-M-EF4, PSR-M-EF5, PSR-M-EF6, PSR-M-EF7, PSR-M-EF8, PSR-M-EM1, PSR-M-EM2, PSR-M-EM3, PSR-M-EM4, PSR-M-EM5, PSR-M-EM5.1, PSR-M-EM6, PSR-M-EM7 Section **3 “Over-speed and zero-speed safety relays – PSRmotion”** New products added: PSR-MM30, PSR-MM35 New Section **6 “Safe sensors”** with Sections **6.1 “PSRswitch”** and **6.2 “Emergency stop switches”** added Section **7 “Network safety solutions”**: New products added: AXL E IOL SDI8 SDO4 2A M12 L, AXL F SSDOR4/2 1F, AXL F PSDOR4/2 1F, AXL SE PSDI8/3, AXL SE PSDO4/2, AXL SE SSDI8/3, AXL SE SSDO4/2 2A, AXL F PSAI8 I 1F, IB IL 24 PSDOR 4-F-PAC Section **9 “CONTACTRON hybrid motor starters”** New products added: ELR H3-IS-PT- 24DC/500AC-3-P, ELR H3-IS-SC- 24DC/500AC-3-P, ELR H5-IS-PT- 24DC/500AC-3-P, ELR H5-IS-SC- 24DC/500AC-3-P, ELR H3-IES-PT- 24DC/500AC-3-P, ELR H5-IES-PT- 24DC/500AC-3-P Column added for SIL values. New Section **10 “CONTACTRON Speed Starters”** added. Section **11.1 “Safe coupling relays – PSRmini”** New products added: PSR-PS23, PSR-PC21, PSR-PC52 Section **11.2 “Safe coupling relays – PSRclassic”** New products added: PSR-PE20 Section **12.1 “Analog IN / Analog OUT”** Section completely revised, new products added: MACX MCR-SL-IDS-I-I(-SP), MACX MCR-IDS-2I-2I(-SP), MACX MCR-SL-RPSS-2I-2I(-SP), footnotes revised and extended. Section **12.2 “Temperature transducers”** Section completely revised, new products added: MACX MCR-SL-UI-REL(-SP), MACX MCR-SL-UI-REL(-SP), MACX MCR-TC-I(-C), footnotes revised and extended. Section **12.3 “Digital IN”** Section completely revised, new products added: MACX MCR-SL-I-I-ILP(-SP), MACX MCR-SL-2I-2I-ILP(-SP), MACX MCR-SL-I-I-HV-ILP(-SP), MACX MCR-SL-2I-2I-HV-ILP(-SP) Footnotes revised and extended. Section **13 “Ex i signal conditioners”** Section **13.1 “Analog IN / Analog OUT”** Section completely revised, new products added: MACX MCR-EX-IDS-I-I(-SP), MACX MCR-EX-IDS-2I-2I(-SP), MACX MCR-EX-SL-RPSSI-2I(-SP), MACX MCR-EX-SL-RPSSI-2I-1S(-SP) Footnotes revised and extended.

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08	09/2022	Section **13.2 “Temperature transducers”** Section completely revised, new products added: MACX MCR-EX-SL-UI-REL(-SP), MACX MCR-EX-RTD-I(-SP)(-C), MACX MCR-EX-TC-I(-C), MACX MCR-EX-TS-I-OLP(-SP) Footnotes revised and extended. Section **13.3 “Digital IN / Digital OUT”** Section completely revised, footnotes revised