

Discrete Automation and Motion Global Product Group PLC AC500 / S500 – MTTFd values

19.01.2010

MTTFd values of AC500 and S500 according to EN ISO 13849-1



For non-safety products of the AC500 PLC family and associated S500 I/O-modules a calculation of the mean time to failure dangerous (MTTFd) has been realized according to EN ISO 13849-1 (in case of use in an application according to ISO 13849-1).

The MTTFd values will be reduced according to EN ISO 13849-1 to 100 years, when the calculated value is bigger than 100 years.

The MTTFd values based on MTBF values according to EN ISO 13849-1 („50% as dangerous failures“, see appendix C.5) would be calculated as follow:

$MTTFd = 2 * MTTF = 2 * (MTBF + MTTR) = 2 * MTBF$
as MTTR can be neglected (= 0)

MTTFd = Mean Time To Failures dangerous
(Mean time in years till a dangerous failure of a component)

MTTF = Mean Time To Failures
(Mean time in years till a failure of a component)

MTTR = Mean Time To Repair
(Mean time to repair after a failure of a system)

MTBF = Mean Time Between Failures
(Mean time between two successional failures of a component)

The MTBF and the MTTFd are statistic characteristics and will be specified in years or hours. The MTBF-value is based on the summarization of the individual failure-rate of the component under consideration of particular environmental conditions. The values are typically based on an environmental temperature of 40°C.

The results of the calculations are summarized in the following table. The software CARE® BQR, Version 8.700 has been used as calculation tool. All results are normalized with 24h operation at 40°C (according to EN/IEC 61709 norm respectively Siemens Norm SN 29700 with 50% part load).

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Part number	Type	Description	System	MTBF (Years)	MTTFd (Years)
1SAP111100R0160	TB511-ARCNET	TB511-ARCNET: AC500, Terminal Base	AC500	297,61	100
1SAP111100R0170	TB511-ETH	TB511-ETH: AC500, Terminal Base	AC500	295,46	100
1SAP112100R0160	TB521-ARCNET	TB521-ARCNET: AC500, Terminal Base	AC500	275,22	100
1SAP112100R0170	TB521-ETH	TB521-ETH: AC500, Terminal Base	AC500	271,53	100
1SAP114100R0170	TB541-ETH	TB541-ETH: AC500, Terminal Base	AC500	272,35	100
1SAP130100R0100	PM571	PM571: AC500, CPU, 64kB, 24VDC	AC500	204,02	100
1SAP130100R0170	PM571-ETH	PM571-ETH: AC500, CPU, 64kB, 24VDC, ETHERNET	AC500	127,26	100
1SAP140100R0100	PM581	PM581: AC500, CPU, 256kB, 24VDC	AC500	197,01	100
1SAP140100R0160	PM581-ARCNET	PM581-ARCNET: AC500, CPU, 256kB, 24VDC, ARCNET	AC500	122,23	100
1SAP140100R0170	PM581-ETH	PM581-ETH: AC500, CPU, 256kB, 24VDC, ETHERNET	AC500	124,50	100
1SAP140200R0100	PM582	PM582: AC500, CPU, 512kB, 24VDC	AC500	197,01	100
1SAP140200R0160	PM582-ARCNET	PM582-ARCNET: AC500, CPU, 512kB, 24VDC, ARCNE	AC500	122,23	100
1SAP140200R0170	PM582-ETH	PM582-ETH: AC500, CPU, 512kB, 24VDC, ETHERNET	AC500	124,50	100
1SAP150000R0100	PM590	PM590: AC500, CPU, 2MB, 24VDC	AC500	163,32	100
1SAP150000R0160	PM590-ARCNET	PM590-ARCNET: AC500, CPU, 2MB, 24VDC, ARCNET	AC500	108,36	100
1SAP150000R0170	PM590-ETH	PM590-ETH: AC500, CPU, 2MB, 24VDC, ETHERNET	AC500	110,14	100
1SAP150100R0100	PM591	PM591: AC500, CPU, 4MB, 24VDC	AC500	163,32	100
1SAP150100R0160	PM591-ARCNET	PM591-ARCNET: AC500, CPU, 4MB, 24VDC, ARCNET	AC500	108,36	100
1SAP150100R0170	PM591-ETH	PM591-ETH: AC500, CPU, 4MB, 24VDC, ETHERNET	AC500	110,14	100
1SAP250300R0001	AI523	AI523: S500, Analog Input module 16AI, U/I/RTD	S500	73,98	100
1SAP250600R0001	AI531	AI531: S500, Analog Input module 8AI, U/I/RTD 16 bit	S500	65,34	100
1SAP250200R0001	AO523	AO523: S500, Analog Input module 16AO, U/I	S500	58,63	100
1SAP250100R0001	AX521	AX521: S500, Analog I/O-Module 4AI/4AO, U/I/RTD	S500	65,34	100
1SAP250000R0001	AX522	AX522: S500, Analog I/O-Module, U/I/RTD	S500	65,34	100

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Part number	Type	Description	System	MTBF (Years)	MTTFd (Years)
1SAP170200R0001	CM572-DP	CM572-DP: AC500, Communication module PROFIBUS DP	AC500	264,77	100
1SAP170400R0001	CM574-RS	CM574-RS: AC500, Communication module 2xRS232/485	AC500	187,48	100
1SAP170401R0001	CM574-RCOM	CM574-RCOM: AC500, Communication module RCOM protocol	AC500	187,48	100
1SAP170500R0001	CM575-DN	CM575-DN: AC500, Communication module DeviceNet	AC500	247,12	100
1SAP170700R0001	CM577-ETH	CM577-ETH: AC500, Communication module ETHERNET	AC500	211,14	100
1SAP170800R0001	CM578-CN	CM578-CN: AC500, Communication module CANopen	AC500	236,18	100
1SAP170901R0001	CM579-PNIO	CM579-PNIO: AC500, Communication module PROFINET IO	AC500	265,23	100
1SAP170902R0001	CM579-ETHCAT	CM579-ETH: AC500, Communication module ETHERCAT	AC500	265,23	100
1SAP220000R0001	DC505-FBP	DC505-FBP: S500, FBP-Bus module, 8DI/8DO	S500	114,46	100
1SAP220500R0001	DC551-CS31	DC551-CS31: S500, CS31-Bus module 8DI/16DC	S500	87,57	100
1SAP220600R0001	CI501-PNIO	CI501-PNIO: S500, Bus module 8DI/8DO/4AI/2AO	S500	50,61	100
1SAP220700R0001	CI502-PNIO	CI502-PNIO: S500, Bus module 8DC/8DI/8DO	S500	56,39	100
1SAP220900R0001	CI511-ETHCAT	CI511-ETHCAT: S500, Bus module 8DI/8DO/4AI/2AO	S500	50,61	100
1SAP221000R0001	CI512-ETHCAT	CI512-ETHCAT: S500, Bus module 8DC/8DI/8DO	S500	56,39	100
1SAP221100R0001	CI590-CS31-HA	CI590-CS31-HA: S500, Bus module 16DC 1-wire	S500	88,92	100
1SAP260300R0001	CD522	CD522: S500, 2xEncoder module, 2xPWM outputs	S500	69,29	100
1SAP240600R0001	DC522	DC522: S500, Digital I/O-Module 16DC	S500	112,02	100
1SAP240500R0001	DC523	DC523: S500, Digital I/O-module 24DC	S500	88,33	100
1SAP240100R0001	DC532	DC532: S500, Digital I/O-module 16DI/16DC	S500	99,99	100
1SAP270000R0001	DC541-CM	DC541-CM: AC500, Function module 8DC	AC500	124,65	100
1SAP240000R0001	DI524	DI524: S500, Digital input module, 32DI	S500	156,29	100
1SAP245200R0001	DX522	DX522: S500, Digital I/O-module, 8DI/8DO, Relays	S500	174,73	100
1SAP245000R0001	DX531	DX531: S500E/A, Digital I/O-module 8DI/4DO, Relays 230VA	S500	167,75	100

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Part number	Type	Description	System	MTBF (Years)	MTTFd (Years)
1SAP210200R0001	TU505-FBP	TU505-FBP: S500, FBP-Terminal block, Screw	S500	4.548,02	100
1SAP210000R0001	TU506-FBP	TU506-FBP: S500, FBP-Terminal block, Spring	S500	4.062,46	100
1SAP214200R0001	TU507-ETH	TU507-ETH: S500, Bus Terminal block, Screw	S500	2.278,55	100
1SAP214000R0001	TU508-ETH	TU508-ETH: S500, Bus Terminal block, Spring	S500	2.212,31	100
1SAP212200R0001	TU515	TU515: S500, Terminal block, 24VDC, Screw	S500	4.459,19	100
1SAP212000R0001	TU516	TU516: S500, Terminal block, 24VDC, Spring	S500	2.942,15	100
1SAP217200R0001	TU531	TU531: S500, Terminal block, 230VAC, Screw	S500	3.882,83	100
1SAP217000R0001	TU532	TU532: S500, Terminal block, 230VAC, Spring	S500	3.224,72	100
1SAP210600R0001	TU551-CS31	TU551-CS31: S500, CS31-Terminal block, Screw	S500	4.529,97	100
1SAP210400R0001	TU552-CS31	TU552-CS31: S500, CS31-Terminal block, Spring	S500	3.658,82	100

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