

The given failure rates refer to more than one article. For the valid articles please refer to the article list.

Device category 2 - electronical article with relay

Prediction done by: pykp03

	based on	Environmental condition	MTTF in h	MTTF in a	failure rate in FIT (λ basis)
at 40 °C with 100,00 % duty cycle	SN 29500	GB, GC - Ground Benign, Controlled	20576131,69	2348,87	48,6

MTTF values and failure rates - relay contact -, details according to SN 29500-7 type of load voltage in V ambient temperature in °C type of voltage current in A operating cycles per h failure criteria failure rate in FIT (λ contact) MTTF in h MTTF in a 360 2777777,78 317,1 40 resistive DC >0,5 <0,1 360 normal 40 360 AC >13 >0,1 36 27777777,78 3170,98 resistive normal 40 DC >13 360 180 5555555,56 resistive >0,1 normal 634,2 40 inductive AC >13 >0.1 360 normal 360 2777777,78 317.1 40 inductive DC >13 >0,1 360 normal 900 1111111,11 126,84



Notes for device category 2 (electronical article with relay)

- failure rates (λ) respectively MTTF values (rounded)
- One changeover contact counts as two contact
- One double contact counts as one contact
- Optional spark-extinguished contacts behave like contacts on ohm resistive load at the same current load
- Standardized load characteristic diagrams are shown in diagramm

The failure rate respectively the MTTF value of the relay can be calculated with the following formula Only used contacts have to be considered!

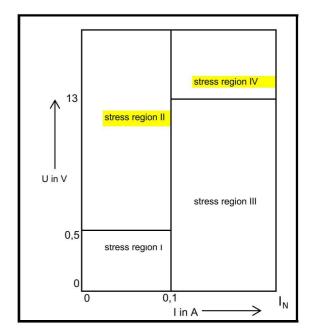
Calculation of total failure rate, λ device (FIT)

$$\lambda$$
 device = λ basis + $\Sigma \lambda$ contact

Calculation of total MTTF value, MTTF device (h)

$$MTTF$$
 device = $\frac{10^9 h}{\lambda \text{ device}}$

Diagram





Example of a MTTF calculation for an electronic article with relay (e.g. relay modul)

1. Product

Relay module with 2 changeover contacts: PLC-RSC-24DC/21-21 (Art.-No. 2967060)

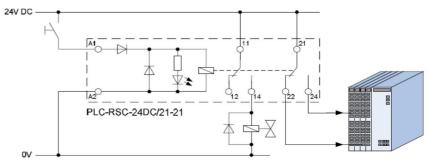
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3. Information about contact load

Load 1 at contact 1 (only NC of the changeover contact is used): Solenoid valve 24VDC / 1 A, wired up with freewheeling diode

Load 2 at contact 2 (change over contact is used): Electronical control input, 24VDC / 10mA (resistive load)

2. Application setup



4. Result lists of the failure rates λ

(relevant values for this example are highlighted in grey)

λ basic Failure rate for the electronic share (LED, freewheeling diode, polarity protection etc.) and e.g. the connections of the relay modul

λ contact Failure rate for one single contact of the relay module for different typical contact loads

Failure rate λ basic

	based on	Environmental condition	MTTF in h	MTTF in a	failure rate in FIT (λ basis)
at 40 °C with 100,00 % duty cycle	SN 29500	GB, GC - Ground Benign, Controlled	23310023,31	2660,96	42,9

Failure rate λ contact

ambient temperature in °C	type of load	type of voltage	voltage in V	current in A	operating cycles per h	failure criteria	failure rate in FIT (λ contact)	MTTF in h	MT
40	resistive	DC	>0,5	<0,1	360	normal	360	2777777,78	3
40	resistive	AC	>13	>0,1	360	normal	36	27777777,78	31
40	resistive	DC	>13	>0,1	360	normal	180 (1)	5555555,56	6
40	inductive	AC	>13	>0,1	360	normal	360	2777777,78	3
40	inductive	DC	>13	>0,1	360	normal	900	11111111,11	12

(1) A freewheeling diode	at load 1 represent a	an ideal contact protection	n circuit at an inductive	DC load an	d the
inductive share of the	load> Select value	e for resistive load!			

5. Calculation of the MTTF for the whole relay modul

 λ device = λ basic + $\sum \lambda$ contact -> in this example: -> λ device = λ basic + λ contact 1 + λ contact 2

Entry of the values from the result lists

$$\lambda$$
 device = 42,9 FIT + 180 FIT + (2 (2) x 360 FIT) = 942,9 FIT

(2) 2 x table value, because a changeover contact is considered as two contacts

$$MTTF \ device = \frac{10^{5} \text{ h}}{\lambda \ device} = \frac{10^{5} \text{ h}}{942.9} = 1060558 \text{ h} = 121 \text{ years}$$

RSP

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Article list

Article	from revision	Designation
2900304	03	PLC-RPT-120UC/21
		PLC-RP1-1200C/21
2900305	03	PLC-RPT-230UC/21
2912675	02	PLC-RSC-120UC/21-ECH
2912727	01	PLC-RSP-120UC/21-ECH
2966197	08	PLC-RSC-120UC/21
2966207	08	PLC-RSC-230UC/21
2966249	09	PLC-RSC-120UC/ 1/SEN
2900249		PLO-ROC-1200C/ 1/3EN
2966252	09	PLC-RSC-230UC/ 1/SEN
2966524	05	PLC-RSP-120UC/21
2966537	05	PLC-RSP-230UC/21
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