Mean Time To Failure

***Type de Produits:* Compact NSX**
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Modèles :
Models:

Le MTTF d'un produit (Mean Time to Failure) représente le temps moyen avant la première défaillance. La pertinence du MTTF dépend essentiellement du nombre de défaillances prises en compte dans le calcul. La valeur communiquée a été calculée avec les données les plus pertinentes reçues de nos clients. Elle correspond à un intervalle de confiance de 95%.
The MTTF of a device is the average time until the first failure occurs. The significance of the MTTF depends essentially on the number of failures which has been taken into account for its computation. The value here-after has been calculated with the most relevant data we got from our customers. Its related confidence interval is 95%

Reference	lower limit at 90%	MTTF (years)	upper limit at 90%	Failure rate (hours)
NSX 100 -250 AC & DC / Fixed (breaker block only)	3349	3436		3,32E-08
NSX 400 -630 AC & DC / Fixed (breaker block only)	902	931		1,23E-07
NSX Coils MN & MX	870	897		1,27E-07
NSX Trip Unit / Thermal Magnetic (TM-D)	10845	11758		9,71E-09
NSX Trip Unit / Magnetic (MA)	5443	6489		1,76E-08
NSX Trip Unit / Micrologic (all versions)	3381	3580		3,19E-08
NSX Motor Mechanism / 100-250A	271	286		3,99E-07
NSX Motor Mechanism / 400-630A	153	160		7,13E-07
NSX Vigi Module & Insulation monitoring module	519	546		2,09E-07
NSX Accessories / Withdrawable function	18545	20745		5,50E-09
NSX Accessories / Rotary handle function	19725	23077		4,95E-09
NSX Communication (BSCM, FDM121, IFM...)	3925	4276		2,67E-08

Le MTTF peut être exprimé en heures, en années ou en opérations. Il ne doit cependant pas être compris comme une information sur la durée de vie. En revanche le MTTF permettra d'estimer le nombre de défaillances pouvant affecter une application. Cette information aidera notamment à gérer un budget, un stock de pièces de rechanges, à évaluer les disponibilités d'un process.
The MTTF could be expressed in hours, years or operations. It should not be understood as a kind of lifetime. In contrast, the MTTF will contribute to estimate the order of magnitude of the number of failures that may affect an application. This information will help also to manage a budget, a stock of spare parts, to assess availability of a process.

Partner Project Customer Satisfaction & Quality
Power Breakers - Expert support

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Annex

The **failure rate** $\lambda(t)$ is the probability that the device fails between the t^{th} and the $(t+1)^{th}$ demand, given the condition that it is still operating after the t^{th}.
A failure rate is usually measured using units such as $hour^{-1}$, $month^{-1}$, $demand^{-1}$ etc…
The order of magnitude of an electrical device failure rate is 10^{-8} to 10^{-6} /h, for an electronic device 10^{-8}/h, for an electronic board 10^{-6}/h.

A failure rate is generally not a constant function of time. Its variations may be represented by a curve which shape is characteristic and looks like the following (bathtub curve).

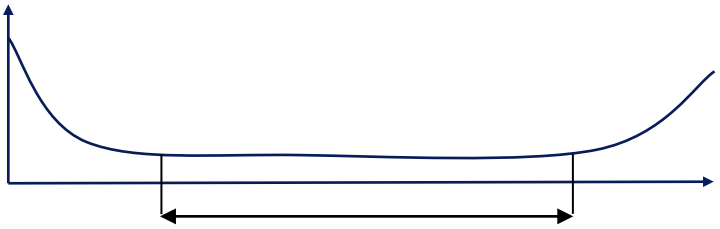

Fig 1

The horizontal part of the curve is related to the ”lifetime”, which is the period of time during which the failure rate may be considered constant.

Failure rate (λ) and MTTF can be easily understood only when the failure rate is constant with time. With this assumption, the reliability at time t, i.e. the probability that the device will not fail between time 0 (at which the device is supposed operating) and time t, is given by the formula:

$$R(t) = \exp(-\lambda t)$$

The MTTF is then equal to $1/\lambda$, and we have:

$$R(t) = \exp(-t/MTTF)$$

As an example, for 1000 devices operating since t=0 and a constant failure rate $\lambda = 10^{-6}$/hour.
The following table shows the relationship between the elapsed time in years and the average number of devices still operating (out of order devices are supposed not being replaced).

Time (years)	*1*	*2*	*5*	*10*	*20*
R(t)	*0,99*	*0,98*	*0,96*	*0,92*	*0,84*
Proportion of failures	*0,01*	*0,02*	*0,04*	*0,08*	*0,16*
Average number of failures	*9*	*17*	*43*	*84*	*161*

As well, the annual number of failures in a set of n identical installed devices has an average of:

$$N = n /MTTF \text{ (if unit is year)} = n \times 8760/MTTF \text{ (if unit is hour)}.$$

For a MTTF = 100 years, a set of 1000 operating devices. On average, 1000/100 = 10 failures per year. An average of 10 failures may eventually lead to 3 or 4, or 20, but probably not 100 failures.