

Definition: Reliability

Reliability is probability that a component, device, equipment or a system will perform its intended function adequately for a specific period of time under a given set of conditions. According to definition the basic elements of reliability are Probability, adequate performance, duration of adequate performance and operating conditions.

Reliability can only be meaningful, if it is related to time. It can be explained with reliability of a motor car. If any car fails, even after following manufacturer's instructions specified, the car will be considered as unreliable. If it does not fail before its stated life, it would be considered as reliable.

It is difficult to predict at the start whether a particular car will be reliable because no two are ever absolutely identical, even though they are of the same make. There are always small manufacturing differences and a few many contain defects. The car designer tries to reduce variations and eliminate defects.

If both the designer and the quality engineer had been completely successful and every car had been used identically, that every car would have the same reliability. In practice, this is impossible.

Suppose that out of every 100 cars of a particular type, 99 prove to be trouble-free, if used and maintained correctly and one fails to work as intended, then it can be said that the reliability of each car is 99%.

Since reliability is a probability, it is expressed in decimals of 1.00 as given below:

- Reliability = 1.00 means certain to work as intended
- " - = 0.99 " 99% likely to work as intended
- " - = 0.50 " 50% " " " " "
- " - = 0.00 " absolutely certain not to work as intended

Reliability at time 't' can be defined as:

$$R(t) = \frac{\text{Number surviving at instant } t}{\text{Number at start (when } t=0)}$$