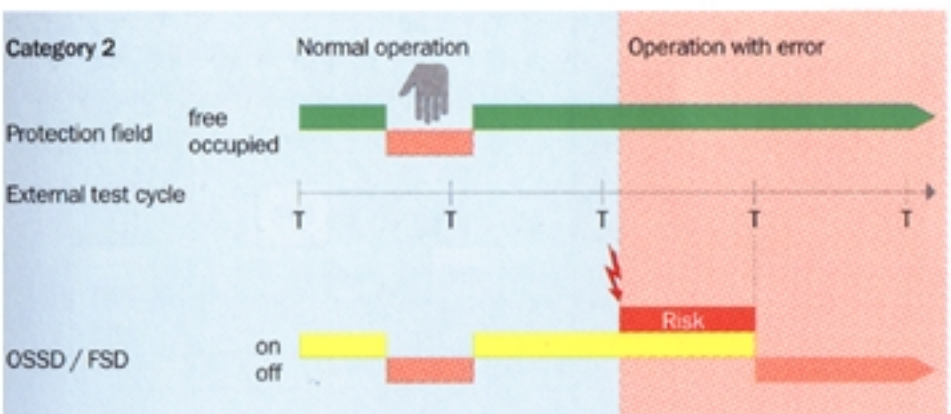
II.5 Connection to control circuit

II.5.1 Interface to the machine

Every safety device must be incorporated into the machine control system, so as to form an integral part of it. Therefore, the relevant part of the machine control circuit, the connection of the safety device to that part of the control system and the safety device itself must take into account the category, as defined at the time of estimating the risk in accordance with EN 954 and pr EN 61496.

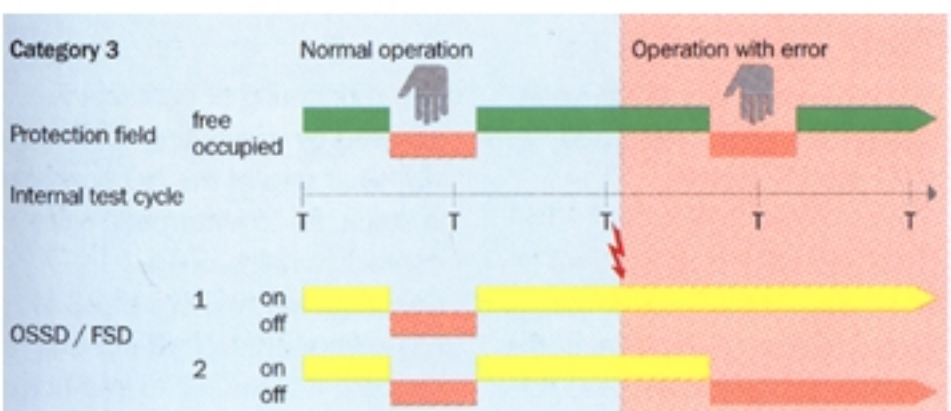
The following figures give an explanation of the safety categories in line with EN 954 suitable for an AOPD and control unit, taking into consideration the whole system including the stop valve.
How do safety devices of a particular category behave in case of a fault occurring?

If a safety device is activated under normal operating conditions, e.g. a hand enters the protected field, this always leads to a machine stop (regardless of the safety category).
Fault detection in the respective safety categories is different.

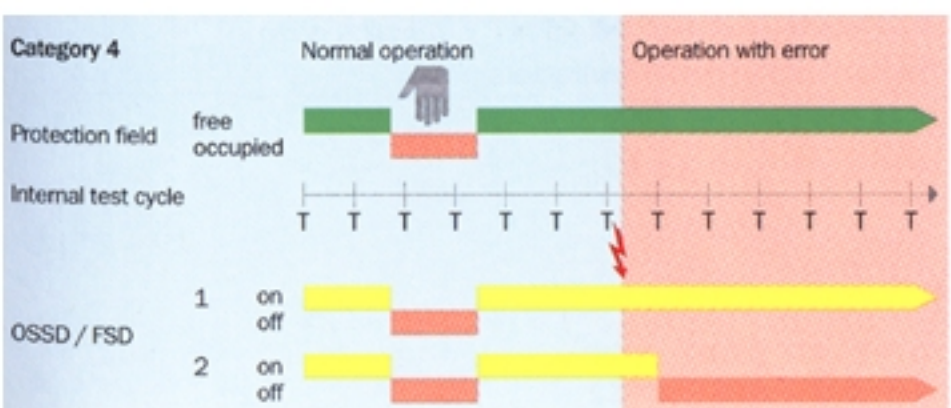


Loss of safety function between checking intervals possible.

Fault detection at time of checking through the external test.
In the period between the fault occurrence and the next test there is a risk of an accident.



A single fault assures the safety function as an output signal for stopping can still be generated (e.g. if a hand enters the protection field). The fault is detected either when the hand enters the protection field or by internal checking.
Accumulation of faults may lead to loss of the safety function.
The system shall be designed so that a single fault in any of its parts does not lead to the loss of safety functions.



A single fault still assures the safety function. In addition to category 3 the safety function must be assured in case of an accumulation of faults. Therefore internal tests must be within the response time of the safety device. The single fault is detected at or before the next demand on the safety function. If the detection is not possible then an accumulation of faults shall not lead to a loss of the safety function.