RELIABILITY DATA

1. PRODUCT DESCRIPTION.

The models C2472A Omniterm FCT and C2473A Omniterm FCR are a high-reliability Fibre-Optic Transmitter/Receiver pair that satisfy **SIL2** requirements of IEC61508.

The FCT accepts a relay contact input and provides an output through an optic fibre cable. This output is sent to the companion Model C2473A Omniterm FCR Fibre-Optic Receiver Module. The Omniterm FCR module outputs a relay contact that represents the state of the input to this Omniterm FCT module. The standard version of the Omniterm FCT transmits at 850nm wavelength into a multi-mode glass fibre-optic cable (typically 50/125um) using ST connector termination.

For detailed specifications consult the product datasheet.

2. CONDITIONS OF USE IN SAFETY-RELATED APPLICATIONS.

- The FCT must be used within its electrical and mechanical specifications.
- EMC environment must be “typical industrial environment” as specified in IEC61000-4-4.
- The input contact must be set to close in the NORMAL condition, opening in the ALARM condition.

3. RELIABILITY INFORMATION.

3.1. FCT

Hardware reliability analysis yields the results as summarised in the Table below. The FCT has no software.

Subsystem	Type A
DC	0%
SFF	99.7%
PFD_{avg}, (TI = 1 year)	8.76×10^{-6}
PFD_{avg}, (TI = 2 years)	1.75×10^{-5}
MTBF (in years)	151.8
λ (total)	752 FIT
λ_{SD}	650 FIT
λ_{SU}	100 FIT
λ_{DD}	0 FIT
λ_{DU}	2 FIT

An MTTR of 8hrs was used in the above PFD calculations.

KEY:

DC = Diagnostic Coverage	λ = failure rate per billion hours (1 FIT = 1 failure in 10^9 hours)
SFF = Safe Failure Fraction	Failure Rate Categories:
PFD = Probability of Failure on Demand	SU = Safe Undetected
TI = Test Proof Interval	SD = Safe Detected
MTBF = Mean Time Between Failures	DU = Dangerous Undetected
MTTR = Mean Time To Repair	DD = Dangerous Detected

3.2. FCR

Hardware reliability analysis yields the results as summarised in the Table below. The FCR has no software.

Subsystem	Type A
DC	52%
SFF	87%
PFD_{avg}, (TI = 1 year)	6.52×10^{-4}
PFD_{avg}, (TI = 2 years)	1.30×10^{-3}
MTBF (in years)	103.4
λ (total)	1104 FIT
λ_{SD}	662 FIT
λ_{SU}	132 FIT
λ_{DD}	161 FIT
λ_{DU}	149 FIT

An MTTR of 8hrs was used in the above PFD calculations.

4. EXPLANATION OF RESULTS.

Any hardware failure which causes the fibre-optic output to change to the ALARM state (equivalent to open input contacts) is considered a safe failure. Any hardware failure, which results in a NORMAL state on the output, is deemed a dangerous failure. The Omniterm FCT module does not generate independent diagnostic signals. Almost all failures lead to a safe state – the output signal transmission is stopped, placing the output in the ALARM condition.

SIL2 requirements – PFD figures for the system consisting of both modules and with Proof Test Interval of 1 year are better than the SIL2 requirements of EN61508-1 par. 7.6.2.9, Table 2 and fulfil the requirement not to claim more than 10% of allowed range. They also exceed the requirements of IEC61508-2 par. 7.4.5.4 Table 2 for SIL2 Type A subsystems without hardware fault tolerance.

SIL1 requirements – PFD figures for the system consisting of both modules and Proof Test Interval of 2 years are better than the SIL1 requirements of EN61508-1 and fulfil the requirement not to claim more than 10% of allowed range.

The listed failure rates are valid for operating stress conditions of a “typical industrial environment” similar to that specified in IEC61000-4-4 with an average temperature over a long period of time not greater than 40˚C.

A user of the model C2472A Omniterm FCT and C2473A FCR modules can utilise the failure rates presented in this report in to determine Safety Integrity Level (SIL) of the entire safety function.

5. DISCLAIMER

This datasheet provides reliability figures only. Omniflex does not assume responsibility for the correct and safe application of the FCT and FCR or their reliability data. In safety-related applications, it is the user’s responsibility to comply with all other requirements of EN61508, which may be applicable to the safety system in question.

Omniflex reserves the right to change specifications without notice.