RELIABILITY DATA

1. PRODUCT DESCRIPTION.

The model C2406C Omniterm TWT is a high-reliability programmable two-wire transmitter module. The TWT accepts mV, V, mA, thermocouple (TC), RTD or slide-wire inputs and provides 4-20mA current output. The unit is powered from the output loop, which is isolated from the input.

Omniterm TWT is designed to operate with a 4-20mA output range, so that an output current outside this range can be used for fault detection. The value of output current under fault condition is programmable and can be set for example to comply with the NAMUR NE43 standard.

For detailed specifications consult the product datasheet.

2. CONDITIONS OF USE IN SAFETY-RELATED APPLICATIONS.

- The TWT must be used within its electrical and mechanical specifications.
- EMC environment must be "typical industrial environment" as specified in IEC61000-4-4.
- Reliability calculations assume the use of input range such as 4-20mA or 1-5V so that values outside the normal range can be identified as a fault.
- The unit receiving the output signal (logic solver) must be able to recognise signals falling outside the 4-20mA range as indication of a fault condition.

3. RELIABILITY INFORMATION.

Hardware reliability analysis yields the results as summarised in the Table below.

Subsystem	Type B
DC	71%
SFF	79%
PFD_{avg}, (TI = 1 year)	1.79×10^{-3}
PFD_{avg}, (TI = 2 years)	3.57×10^{-3}
MTBF (in years)	60.1
λ (total)	1900 FIT
λ_{SD}	106 FIT
λ_{SU}	414 FIT
λ_{DD}	974 FIT
λ_{DU}	406 FIT

An MTTR of 8hrs was used in the above PFD calculations.
For compliance with SIL requirements, see "Explanation of results".

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

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4. EXPLANATION OF RESULTS.

Any hardware failure, where the output remains within the 4-20mA range with specified accuracy is considered a safe failure. Any hardware failure which results in output current becoming smaller than 3.6mA or greater than 21mA is considered a 'dangerous-detected' failure. This includes internal diagnostics, i.e. when the TWT detects a fault condition and sets the output current to a pre-programmed value (e.g. 22mA).

Any hardware failure, which affects TWT output accuracy, with current remaining in the 4-20mA range, is deemed a 'dangerous-undetected' failure.

PFD figures for Proof Test Interval of 1 year and 2 years are both better than the SIL1 requirements of EN61508-1 par. 7.6.2.9, Table 2. Since TWT is only one part of the entire safety function it should not claim more than 10% of the required PFD range. The results fulfil this requirement as well. The results also fulfil the requirements of IEC61508-2 par. 7.4.5.4 Table 2 for SIL1 Type B subsystems without hardware fault tolerance.

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 C2406C Omniterm TWT and module can utilise the failure rates presented in this report in order 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 TWT and its 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.