



# OMNITERM TFX Function Module

Model C2404B Function Module/Transmitter

## RELIABILITY DATA

### 1. PRODUCT DESCRIPTION.

The model C2404B Omniterm TFX is a high-reliability programmable function module. The TFX accepts two 1-5V or 4-20mA inputs and provides Volts, pulses, bipolar current or 4-20mA current output. The unit can perform a variety of mathematical functions on the two inputs and the result is represented by the output. Input 2 can also be a logic input.

When TFX is used with a 4-20mA or 1-5V output range, an output current outside this range can be used for fault detection. The output value under fault condition is programmable.

For detailed specifications consult the product datasheet.

### 2. CONDITIONS OF USE IN SAFETY-RELATED APPLICATIONS.

- The TFX 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 and output ranges 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	81%
SFF	86%
PFD <sub>avg</sub> , (TI = 1 year)	1.58 x 10 <sup>-3</sup>
PFD <sub>avg</sub> , (TI = 2 years)	3.15 x 10 <sup>-3</sup>
MTBF (in years)	44.6
λ (total)	2562 FIT
λ <sub>SD</sub>	93 FIT
λ <sub>SU</sub>	621 FIT
λ <sub>DD</sub>	1490 FIT
λ <sub>DU</sub>	358 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 <sup>9</sup> 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





#### 4. EXPLANATION OF RESULTS.

Any hardware failure, where the output remains within the 4-20mA or 1-5V range with specified accuracy is considered a safe failure. Any hardware failure which results in output being more than 10% or reading outside of the specified range is considered a 'dangerous-detected' failure. This includes internal diagnostics, i.e. when the TFX detects a fault condition and sets the output to a pre-programmed value (e.g. 22mA).

Any hardware failure, which affects TFX output accuracy, with output remaining within the nominal 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 TFX 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 C2404B Omniterm TFX 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 TFX 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.

