

Statement regarding Mean Time Between Failure (MTBF)

LOW FLOW FLUIDICS HANDLING TECHNOLOGY

The MTBF calculation performed by Bronkhorst® concerns the hardware of the EL-FLOW / IN-FLOW series equipment. The failure rate and Failure In Time (FIT) for the equipment, in combination with their internal component application and component load, has been determined. The EXIDA component database (Electrical & Mechanical Component Reliability Handbook, edition 3) is used as source for all technical failure rates which is also a trusted source for failure rate calculations for industrial applications and FMEA's within scope of IEC 61508.

The FIT of the equipment is then converted to failure rate (λ , failures per hour) from which the MTBF is calculated. The conversion and calculation relations are as follows:

$$1 \text{ FIT} = 1 \times 10^{-9} \text{ failures per hour} = \lambda; \quad \lambda = 1 / \text{MTBF};$$

Environmental profile: EXIDA profile 1 – cabinet mounted/climate controlled, 60°C average component temperature, 0-95% RH non-condensing.

Results	FIT per 10 ⁹ hours	For use upto 100bar(g) MTBF [years]	For use upto 3.5bar(g) MTBF [years]
MFM analogue	1187.633	96	113
MFM digital (RS232/485)	972.333	117	144
MFC analogue	1458.233	78	89
MFC digital (RS232/485)	1242.933	92	107

*The FIT for 'For use up to 3.5 bar(g)' is reduced with 176 per 10⁹ hours.

It is to be noted that the MTBF derived from this analysis serves as the reference calculation and this MTBF figure will be applicable to all the Bronkhorst® equipment with comparable build and specifications as mentioned in the table below:

Series	Version	Mass Flow Meter (MFM)	Mass Flow Controller (MFC)
EL-FLOW Select	Elastomeric sealed	All	Direct acting valve
EL-FLOW Low-ΔP			
IN-FLOW			
IN-FLOW Low-ΔP			
IN-FLOW High-Flow			n.a.

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Ruurlo, 15 sept 2021

This is a digital version of the EU Declaration of Conformity which bears no signature. If a copy of a declaration with an actual signature should be needed, please contact your local Bronkhorst High-Tech sales office.

