

DATA SHEET

MXFS DI QuantumX BraggMETER Interrogator Module

SPECIAL FEATURES

- Parallel measurements of up to 128 FBG sensor channels
- NTP and PTP synchronization
- 100 nm measurement range
- 2000 S/s and 100 S/s acquisition rates
- Smart Peak Detection (SPD)
- Delivered with catman® software
- EN45545 and ATEX certified



DESCRIPTION

The MXFS DI BraggMETER module is an optical interrogator based on the QuantumX platform. The compatibility with the QuantumX family adds to fiber Bragg grating (FBG) measurements the possibility of including any other type of sensors in the same sensing network, as well as the generation of analog/digital control signals and the use of most common industrial protocols.

BraggMETER interrogators employ proven continuous swept laser scanning technology that includes a NIST

traceable wavelength reference, providing continuous calibration to ensure system accuracy over long term operation. The high dynamic range and output power combined with Smart Peak Detection allow high resolution to be attained even for long fiber leads and lossy connections. Delivered together with the powerful catman®Easy software for data acquisition, analysis, visualization and storage.

BENEFITS AND APPLICATION

Interrogator

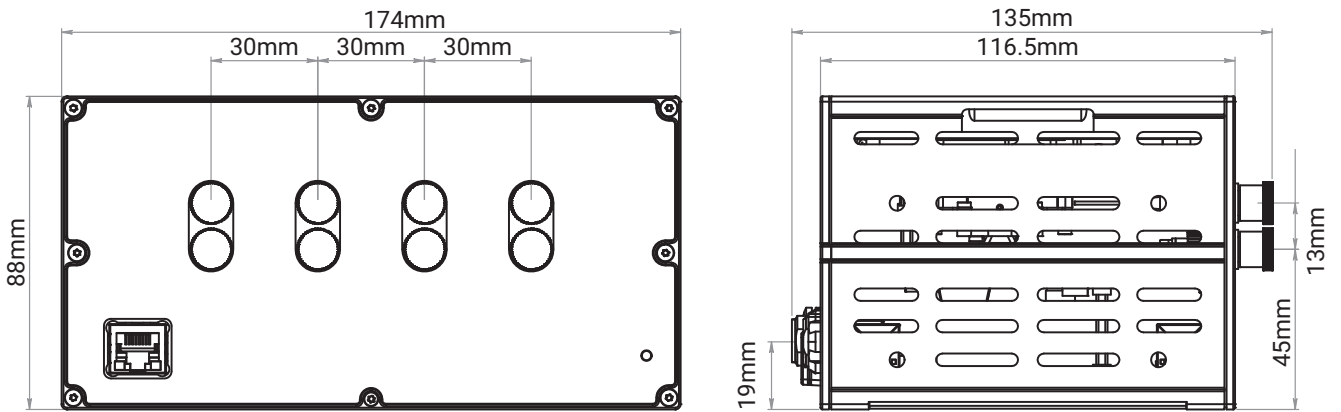
- Modular design of the QuantumX platform, combinable with all modules
- Compatible with catman® software
- Drivers for connecting to third party software
- Small size and weight for mobile applications
- EN45545 certified for fire safety and ATEX certified for explosive atmospheres
- Two different laser sweeping rates ensuring best fitting to different applications
- Monitoring of Civil structures, wind turbines, ship hulls or railways

Fiber Bragg grating technology

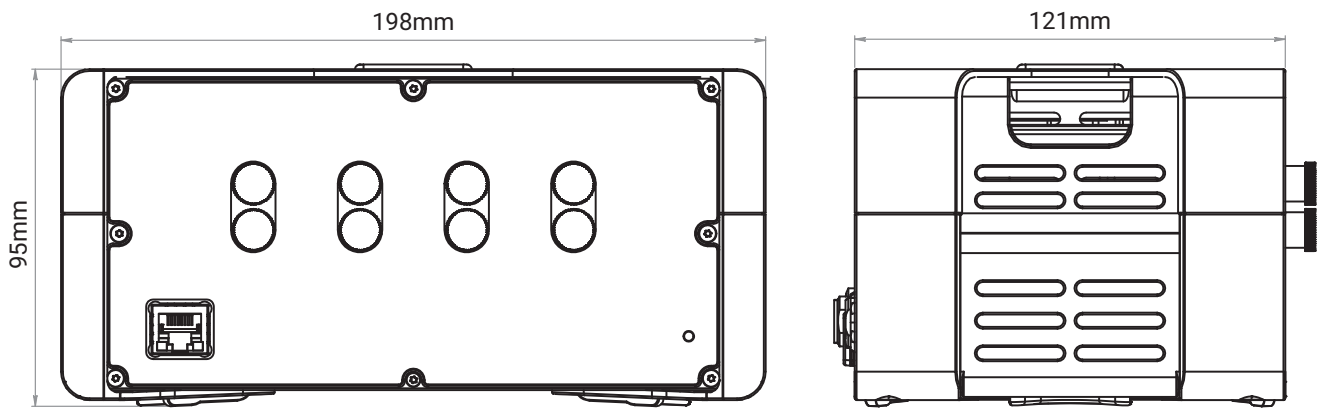
- Absolute reference measurement
- Insensitive to EM/RF interferences
- Passive (can be used in risk explosion areas)
- Intrinsic multiplexing capability reducing cabling requirements
- Long distances between sensors and interrogators
- Different sensor measurands per optical connector (e.g. strain, temperature, acceleration, tilt, displacement, load...)

TECHNICAL DRAWINGS

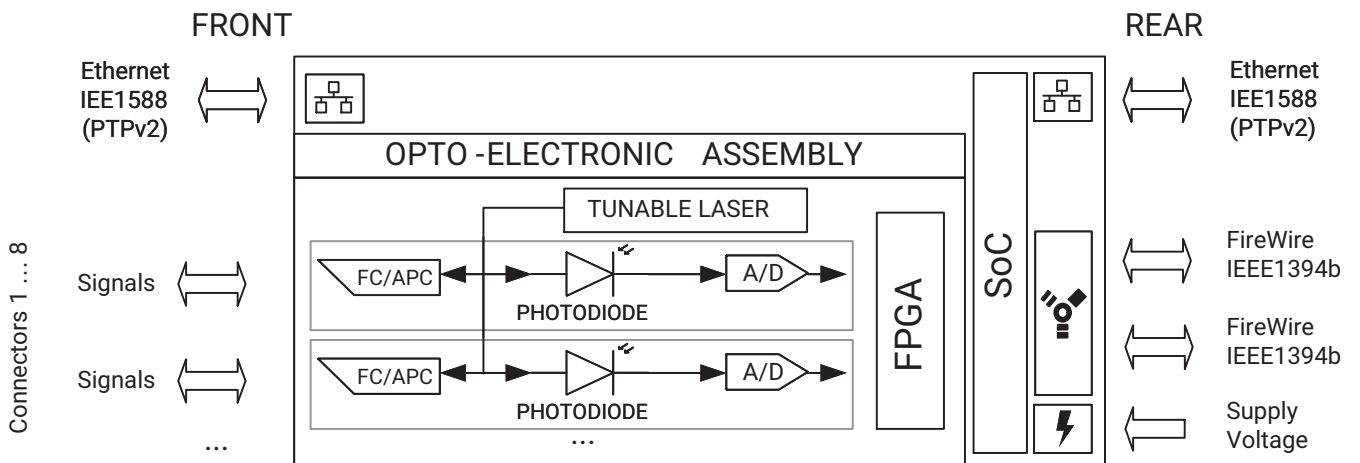
Without case protection



With case protection



BLOCK DIAGRAM



SPECIFICATIONS FOR MXFS DI

		High speed mode	Low speed mode
General specifications			
Inputs	-	8	
Connector types	-	FC/APC	
Transducer types	-	Any, based on Fiber Bragg Grating (FBG)	
Output options	-	Relative Wavelength, Absolute Wavelength, Strain, Temperature ¹⁾ , Acceleration, General polynomial ¹⁾	
Optical wavelength measurement range	nm	1,500 to 1,600 [100]	
Number of channels per optical connector	-	16	
Sample rate²⁾	S/s	2,000	100
Output rate	S/s	0.1 ... 2,000	0.1 ... 100
Signal bandwidth (-3 dB)	Hz	800	17.5
Resolution/Repeatability³⁾	pm	<0.5	<1
Stability/Reproducibility³⁾	pm	2	3
Peak detection method	-	SPD ⁴⁾	
Dynamic range⁵⁾	dB	>20	>22
OSA⁶⁾	-	Yes	
Optical Output Power per connector	dBm	-5 (typical) -3 (maximum)	
Active filters	Hz	Bessel, Butterworth, linear phase 0.01 ... 20 (-3 dB), filter OFF	
Supply voltage	V	12 ... 30 (24 V nominal (rated) voltage)	
Power supply interruption	-	Max. 5 ms at 24 V	
Power consumption	W	< 18	
Ethernet (data link) Protocol/addressing Connection Max. cable length to module	- - -	10Base-T/100Base-TX TCP/IP (direct IP address or DHCP) 8P8C plug (RJ-45) with twisted pair cable, Streaming (CAT-5) 100	
Synchronization⁷⁾ FireWire Ethernet	- -	IEEE1394b (2 ports per device) IEEE1588 (PTPv2) or NTP (2 ports per device)	
IEEE1394b FireWire (module synchronization, data link, optional supply voltage) Baud rate Max. current from module to module Max. cable length between nodes Max, number of modules connected in series (daisy chain) Max. number of modules in a IEEE1394b Firewire system (including hubs ⁸⁾ backplane) Max. number of hops ⁹⁾	MBaud A M - - -	IEEE1394b (HBK modules only) 400 (approx. 50 Mbyte/s) 1.5 5 12 (=11 Hops) 24 14	

1) Third order polynomial of the type ax^3+bx^2+cx+d
 2) User selectable. Changing the speed mode will restart the device.
 3) Measurements carried out using calibrated instrument against NIST traceable gas cell. Accuracy as per NIST Technical note 1297. Resolution/repeatability measured as σ value at room temperature over the full wavelength range for 1 min. Stability/Reproducibility measured as $|\mu|+\sigma$ value over full temperature range and over full wavelength range for more than 50 h. Measurements taken without any filtering and with relative wavelength values. Further details on HBK FiberSensing technical notes.
 4) Smart Peak Detection. Allows optimum management of multiple FBG with different losses/reflectivities in a single connector. For further details please refer to HBK FiberSensing technical notes.
 5) Measured as the admissible loss of a FBG peak that still ensures a measurement repeatability <5 pm.
 6) Optical Spectral Analysis available at both speed modes (0.5 S/s refresh rate; 10000 points per trace).
 7) EtherCAT® available via CX27 gateway module and IRIG-B available via MX440B or MX840B.
 8) Hub: IEEE1394b FireWire node or distributor.
 9) Hop: Transition from module to module/signal conditioning.

		High speed mode	Low speed mode
Environmental and mechanical			
Operating temperature range	°C [°F]	-20 ... +50 [-4 ... +122]	
Storage temperature range (EN60068-2-1; EN60068-2-2, EN60068-2-14)	°C [°F]	-40 ... +75 [-4 ... +167]	
Relative humidity	%	5 ... 95 (non-condensing)	
Mechanical tests¹⁰⁾			
Sinusoidal Vibration (EN60068-2-6)			
Acceleration	g _{0-PK}	2	
Duration per axis	min	30	
Frequency	Hz	5 ... 65	
Random Vibration (EN60068-2-64)			
Acceleration	g _{RMS}	1.87	
Duration per axis	min	30	
Frequency	Hz	10 ... 500	
Shock resistance (EN60068-2-27)			
Acceleration	g _{0-PK}	15	
Pulse Duration	ms	6	
Number of impacts		600	
EMC requirements	-	Per EN 61326	
Fire Safety (EN 45545-2)	-	Hazard levels HL1, HL2 and HL3, according to EN 45545-2:2016 and DIN EN 45545-2:2020 (without case protection)	
ATEX (EN 60079-28)	-	The device must be erected outside of the explosive atmosphere. The interrogator has been approved according to the EN 60079-28:2015 for: II (1)G [Ex op is IIC T6 Ga] Zone 0 for gas group IIC II (1)D [Ex op is IIIC Da] Zone 20 for dust group IIIC I (M1) [Ex op is I Ma] Zone M1 for mining	
Dimensions, horizontal (w x h x d)	mm	198 x 95 x 135 (with case protection) 174 x 88 x 135 (without case protection)	
Weight	kg	1.7(with case protection) 1.5 (without case protection)	
Degree of protection (EN60529; IEC529)	-	IP20	

¹⁰⁾ During tests the device is powered off. The correct functioning of the equipment is confirmed after test (transport simulation).

SOFTWARE, INCLUDED

Article	Description	Order no.
catman® Easy	Test and measurement software for system configuration, data acquisition, analysis, visualization and storage. Includes maintenance for 12 months.	1-CATMAN-EASY

SOFTWARE, TO BE ORDERED SEPARATELY

Article	Description	Order no.
catman® Easy to AP upgrade¹¹⁾	Software upgrade: catman Easy to catman AP full version. Only possible with a registered catman Easy version and valid maintenance contract. License key for activation is delivered by e-mail.	1-CATEASY-TO-AP
catman® AP¹¹⁾	All-inclusive package, comprising catman® Easy Functionality plus add-on modules such as video camera integration (EasyVideoCam), full post-process analysis (EasyMath), recurrent activity automation (EasyScript), measurement project preparation offline (EasyPlan), and additional functions such as electrical power calculation, special filters, frequency spectrum, etc. Details at https://www.hbkworld.com/pt/products/software/daq	1-CATMAN-AP
catman® PostProcess	PostProcess edition for visualization, analysis and processing of measurement data with many mathematical functions, data export and reporting.	1-CATEASY-PROCESS
LabVIEW™ driver	Universal driver from HBK for LabVIEW™	1-LabVIEW-DRIVER

¹¹⁾ MXFS DI is compatible with catman version 5.4.1 or higher

ACCESSORIES, TO BE ORDERED SEPARATELY

Article	Description	Order No.
Power		
AC-DC power supply / 30 W	Input : 100 ... 240 V AC (± 10%), 1.5 m cable Output: 24 V DC, max. 1.25 A, 2 m cable with ODU connector	1-NTX001
3m cable - QuantumX supply	3 m cable for voltage supply of QuantumX modules; Suitable plug (ODU Medi-Snap S11M08-P04MJGO-5280) on one side and open strands on the other end.	1-KAB271-3
Communication		
Ethernet cable	Ethernet patch cable for direct operation between a PC or Notebook and a module / device, length 2 m, type CAT6A	1-KAB239-2
IEEE1394b FireWire cable (module-to-module)	FireWire connection cable for QuantumX or SomatXR-modules; with matching plugs on both sides. Length 0.2 m (angled) / 2 m / 5 m Note: The cable enables QuantumX modules to be supplied with power (max. 1.5 A, from the source to the last drain).	1-KAB272-W-0.2 1-KAB272-2 1-KAB272-5
Mechanic		
Connecting elements for QuantumX modules	Connecting elements (clips) for QuantumX modules; Set comprising 2 case clips including mounting material for fast connection of 2 modules.	1-CASECLIP
Connecting elements for QuantumX modules	Fitting panel for mounting of QuantumX modules using case clips (1-CASECLIP), lashing strap or cable tie. Basic fastening by 4 screws.	1-CASEFIT
QuantumX Backplane (big)	QuantumX Backplane for a maximum of 9 modules - Mounting on wall or control cabinet (19") - Connection of external modules by FireWire possible - Power supply: 18 ... 30 V DC / max. 5 A (150 W)	1-BPX001

Article	Description	Order No.
QuantumX Backplane (Rack)	QuantumX Backplane - Rack for maximum 9 modules - 19" rack mounting with handles left and right - Connection of external modules via FireWire possible - Power supply: 18 ... 30 V DC / max. 5 A (150 W).	1-BPX002
QuantumX Backplane (small)	QuantumX Backplane for a maximum of 5 modules - Connection of external modules by FireWire possible - Power supply: 11 ... 30 V DC / max. 3.75 A (90 W)	1-BPX003

SPECIFICATIONS POWER PACK NTX001

NTX001		
Nominal input voltage (AC)	V	100 ... 240 ($\pm 10\%$)
Stand-by power consumption at 230 V	W	0.5
Nominal load		
U _A	V	24
I _A	A	1.25
Static output characteristics		
U _A	V	24 \pm 4%
I _A	A	0 ... 1.25
U _{Br} (Output voltage ripple; peak to peak)	mV	≤ 120
Current limiting, typically from	A	1.6
Primary - secondary separation		galvanically, by optocoupler and converter
Creep distance and clearance	mm	≥ 8
High-voltage test	kV	≥ 4
Plugs and cables	-	international plugs
Ambient temperature range	°C [°F]	0... +40 [+32 ... +104]
Storage temperature	°C [°F]	-40 ... +70 [-40 ... +158]

ORDERING INFORMATION

Description	Order no.
QuantumX BraggMETER Interrogator Module with Dynamic sampling rates and 8 FC/APC Optical Connectors	1-MXFS8DI1/FC

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