

TECHNICAL REFERENCE MANUAL

IOLITE® V26-1

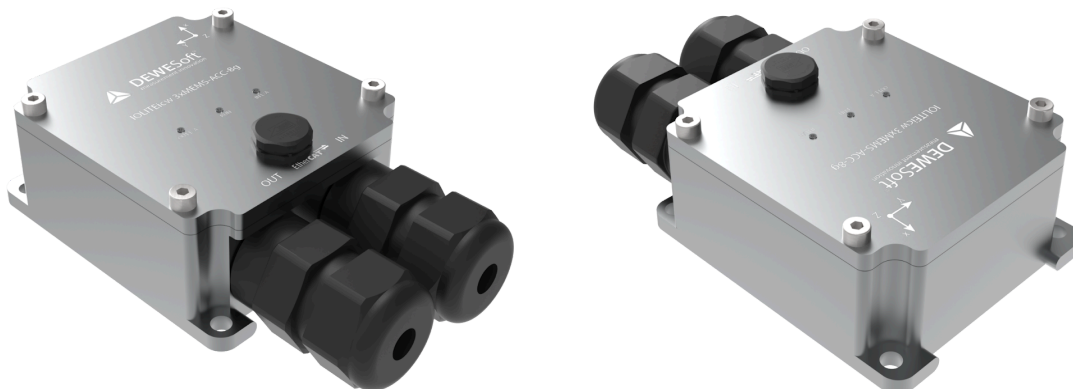


4.3.6. IOLITEc

IOLITEc compact housing is designed to be installed outdoors but still allow a cost-effective connection with network cables and RJ45 connectors. This is possible due to large cable glands with split-seals, through which the assembled RJ45 connector can pass. IOLITEc is the housing made for integrated all-in-one measurement devices (example: MEMS accelerometer + DAQ + EtherCAT interface) and for low-channel count I/O modules that can be placed near the measurement point. The housing allows a total distribution of the measurement devices and eliminates long analog cables.



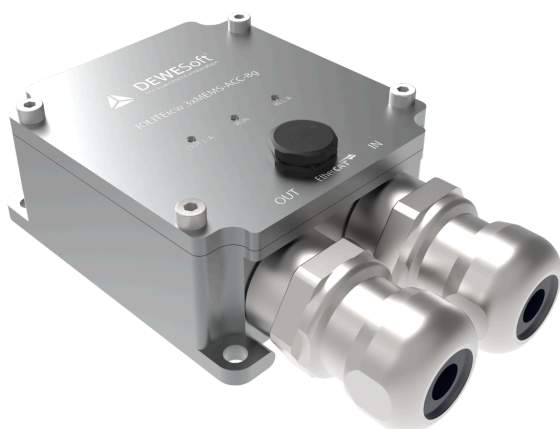
The cable glands can be plastic or stainless steel. The third option are push-pull connectors. The standard IOLITEc housing is aluminum and anodized. Full stainless steel (316 for marine environments) option is also possible to order.



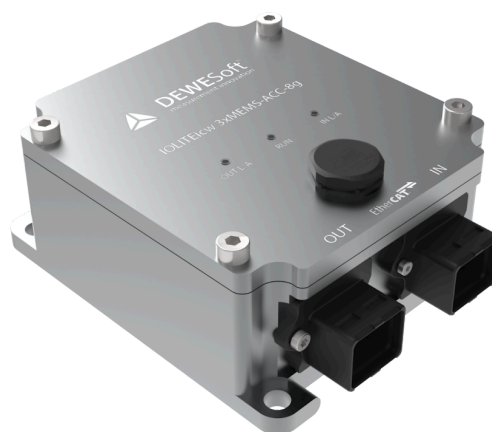
IOLITEicw 3xMEMS-ACC-8g



IOLITEicw 1xSTG

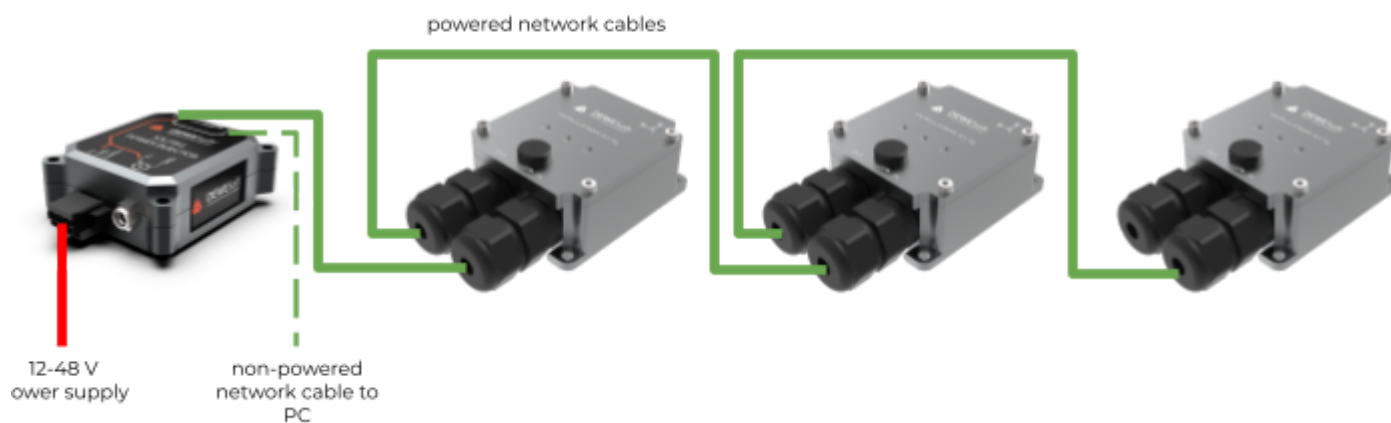


IOLITEicw 3xMEMS-ACC-8g-SSG



IOLITEicw 3xMEMS-ACC-8g-PP

Multiple IOLITEc modules can be daisy-chained together with a single cost-effective network cable with RJ45 connectors. A single network cable is used for power, data, and synchronization between devices. CAT6 cable with minimum wire thickness of AWG24 should be used. The recommended maximum device-to-device distance is 50 m, but distance up to 100 m can be achieved with good quality cables and properly crimped connectors.

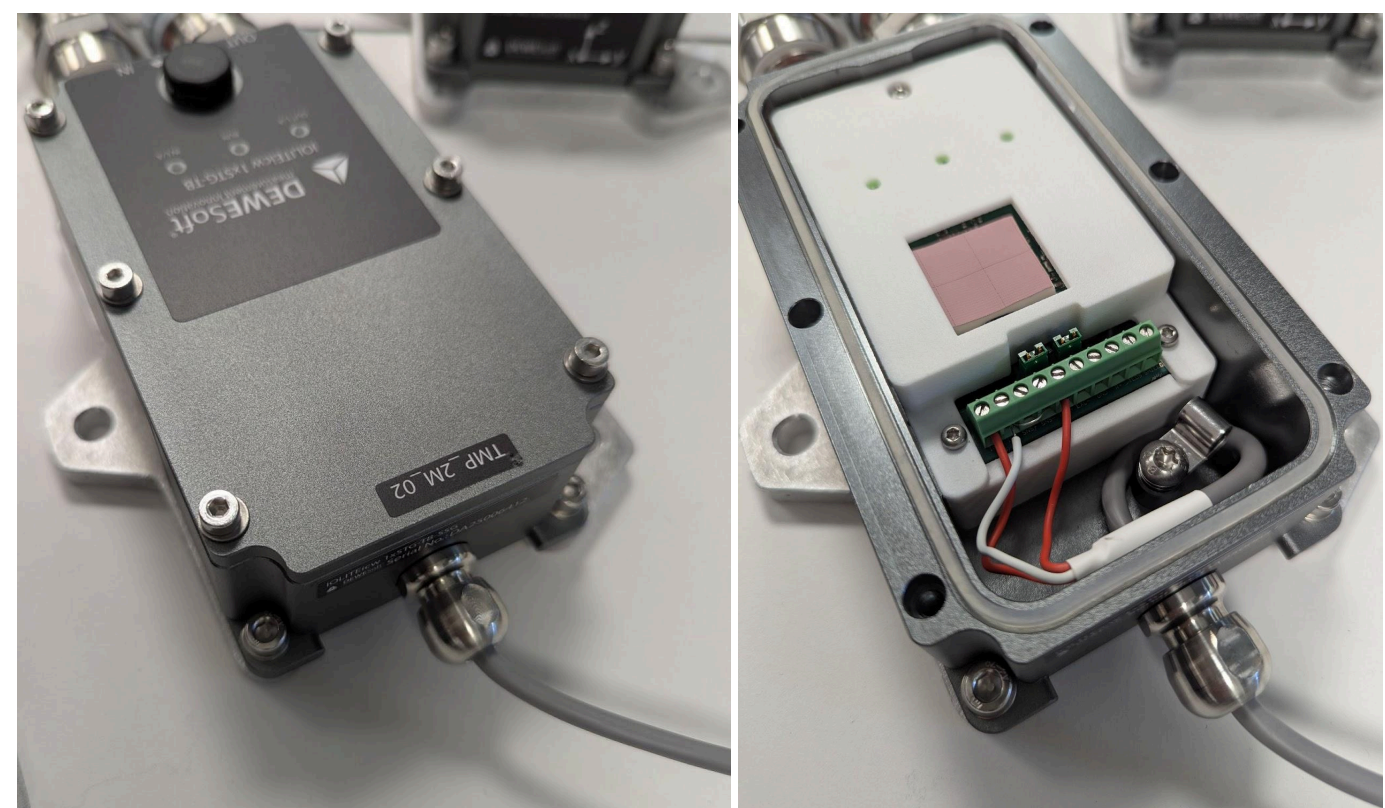


The table below shows the maximum number of IOLITEc devices running from the same power injector. The example is given for IOLITEicw 3xMEMS-ACC (device power: 1.5 W) and can vary for other modules with different power consumption. A specific configuration can be checked in Dewesoft Configurator.

Power supply voltage	Cable length device to device	Cable size	Max. number of devices from a single power injector
24 V	1 m	AWG 24	8
24 V	50 m	AWG 24	4
48 V	1 m	AWG 24	12
48 V	50 m	AWG 24	10

Example shown for IOLITEicw 3xMEMS-ACC-8g (1.5 W) - distances can vary for different types of modules

Devices with front connector (1xACC, 1xSTG, 4xDI, 4xDO, 1xAO ...) are available with the front connector exposed or in a terminal block variant that has an M12 cable gland exposed and a terminal block connector inside the housing. Those housings are therefore longer and still need to have the cover opened for wiring. The terminal block variant has a “-TB” added to the product name.



IOLITEicw 1xSTG-TB-SSG

IOLITEc devices can be directly attached using the four screws in the housing, or they can be attached to various brackets (flat, 90 degree, with or without magnets).

4.3.6.1. IOLITEc: Naming rules

The following meaning of suffixes applies:

- IOLITE**c** - "c" housing, not isolated, not waterproof
- IOLITE**cw** - the "c" housing, not isolated, waterproof
- IOLITE**icw** - "c" housing, isolated, waterproof

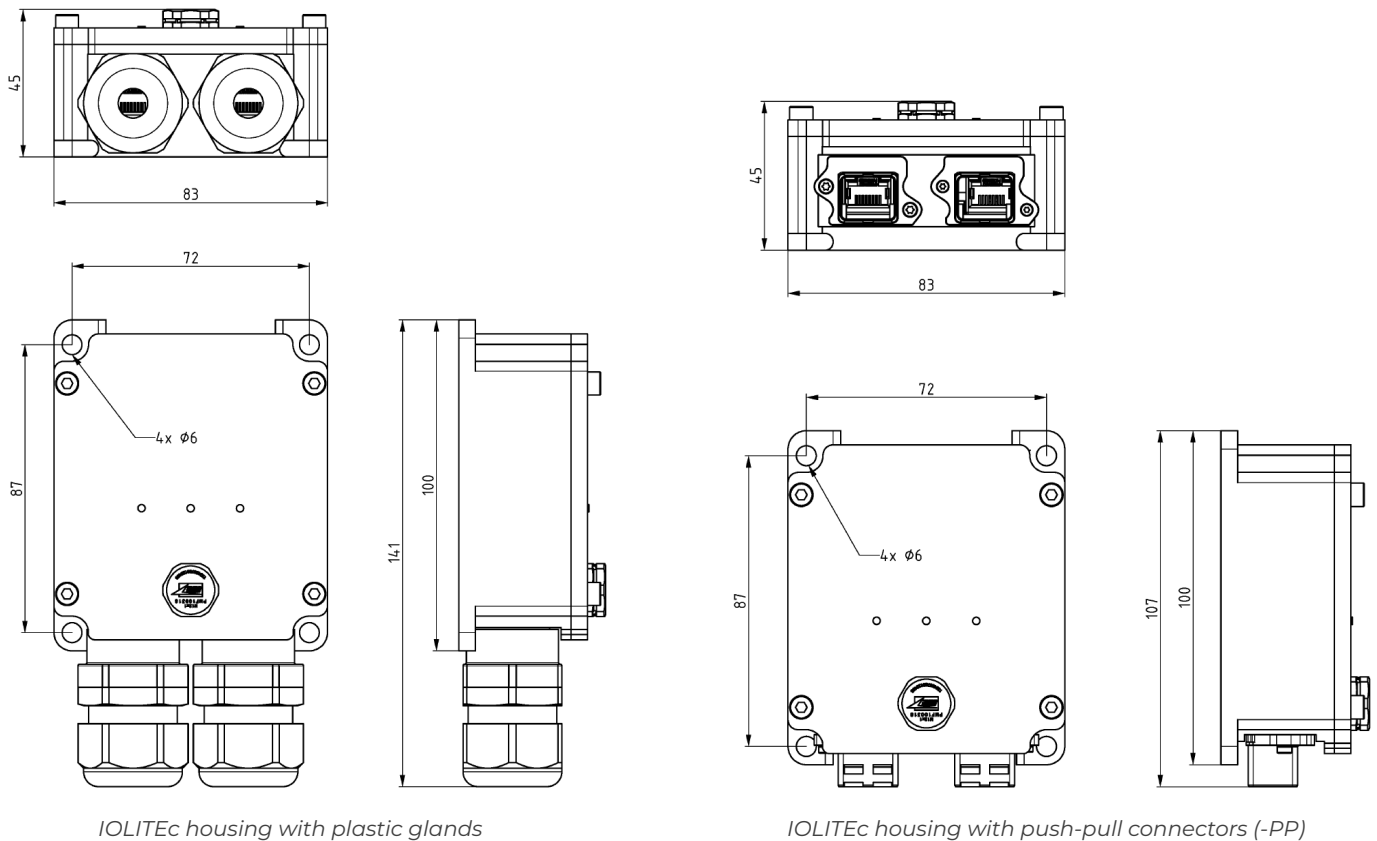
Additional designations are added at the end of the product name:

- SSG** - stainless steel glands
- PP** - Harting Push-Pull RJ45 connectors
- 316** - full stainless steel 316 housing
- TB** - terminal block housing

Some examples:

- IOLITEicw 3xMEMS-ACC-8g* - "c"housing, isolated, waterproof, plastic cable glands
- IOLITEicw 3xMEMS-ACC-8g-SSG* - "c"housing, isolated, waterproof, stainless steel glands
- IOLITEicw 3xMEMS-ACC-8g-PP* - "c"housing, isolated, waterproof, Harting Push-Pull
- IOLITEicw 1xSTG-SSG* - "c"housing, isolated, waterproof, stainless steel glands, DB9 front connector
- IOLITEicw 1xSTG-TB-SSG* - "c"housing, isolated, waterproof, stainless steel glands, terminal block front connector

4.3.6.2. IOLITEc - Dimensions



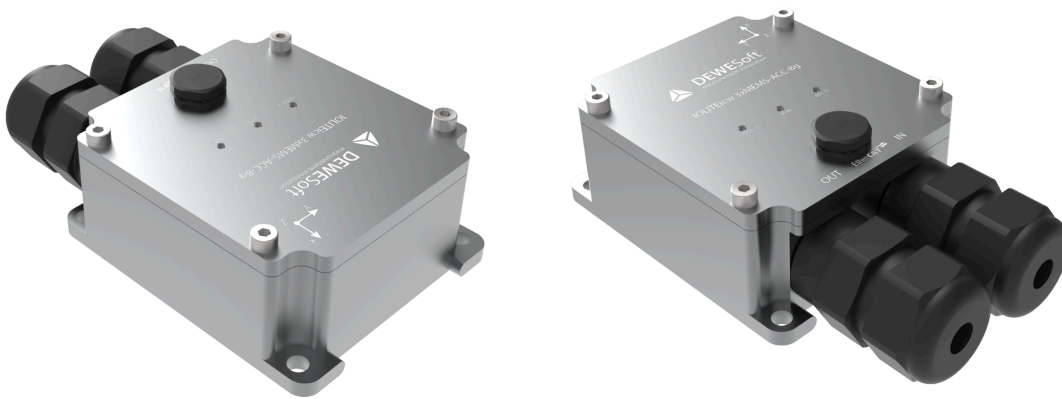
Resolution	24-bit	24-bit	Digital	Digital	18-bit
Bandwidth	0.49 fs	0.49 fs	✗	✗	✗
Voltage ranges	±10 V, ±5 V, ±1 V, ±200 mV	±50 V, ±10 V, ±1 V, ±100 mV	Digital (Low: < 1 V, High: > 2 V)	✗	±10 V
Input coupling	DC, AC 0.1 Hz, 1 Hz	DC, AC 1 Hz			
Sensor excitation	IEPE 4 mA, 8 mA	Unipolar 0 - 24 V Bipolar 0 - 12 V	✗	✗	✗
Bridge connection	✗	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	✗	✗	✗
Programmable shunt	✗	100 kΩ	✗	✗	✗
IEPE input	✓	DSI-ACC	✗	✗	✗
Resistance	✗	✓	✗	✗	✗
Temperature (PTx)	✗	DSI-RTD	✗	✗	✗
Thermocouple	✗	DSI-TH	✗	✗	✗
Current	✗	2 mA, 20 mA (internal shunt)	✗	✗	✗
Potentiometer	✗	✓	✗	✗	✗
LVDT	✗	DSI-LVDT	✗	✗	✗
Charge	✗	DSI-CHG	✗	✗	✗
TEDS	✓ (IEPE only)	✓	✗	✗	✗
Isolation	125 Vrms Isolation CH, GND	125 Vrms Isolation CH, GND	CH-CH, GND-GND	CH-GND	✗
Power consumption	2W	2.5W	2.5W	2.5W	2W

	IOLITEicw 3xMEMS-ACC-8g	IOLITEicw 3xMEMS-ACC-40g	IOLITEicw 3xMEMS-ACC-S	IOLITEicw 2xMEMS-INC	IOLITEicw 1xMEMS-ACC-Z
MEMS accelerometer					
Nr. of axes	3	3	3	✗	1
Measurement ranges	±2 to ±8g	±10 to ±40g	±15g	✗	±2 to ±8g
Max. sampling rate	4 kS/s	4 kS/s	1 kS/s	✗	4 kS/s
Bandwidth at max. sample rate	0 .. 1000 Hz	0 .. 1000 Hz	0 .. 460 Hz	✗	0 .. 1000 Hz
Dynamic range at max. bandwidth	96 dB	96 dB	137 dB	✗	96 dB
Noise spectral density	25 µg/√Hz	25 µg/√Hz	0.7 µg/√Hz	✗	25 µg/√Hz
Inclinometer option	✓	✗	✗	✓	✓
External Temperature sensor option	✓	✗	✗	✗	✓

6.10. Integrated accelerometers and inclinometers

6.10.1. IOLITEicw 3xMEMS-ACC

IOLITE-3xMEMS-ACC is an integrated sensing device. Acceleration is measured by a triaxial MEMS accelerometer inside the device that is tightly attached to the mechanical chassis. Analog to digital conversion is done inside the device, eliminating any noise pick up in analog cabling. A microcontroller inside the device transmits the acceleration samples over EtherCAT protocol into DEWESoft software running on a Windows PC, or alternatively to any controller running EtherCAT master on any platform. Scaling is automatic in DEWESoft software, therefore the data in g or m/s² is readily available to the user. MEMS sensor internal temperature is also available as a data channel in DEWESoft X software under System monitor channels.



IOLITEicw 3xMEMS-ACC

IOLITEicw 3xMEMS-ACC is supplied in a waterproof aluminum enclosure with cable glands. The enclosure is designed to be mounted outdoors. Cable glands with split-seals allow the fully assembled cables (network cable + RJ45 connector) to be fit through the mounted cable gland. The outdoor enclosure automatically vents air to equalize pressure inside the enclosure to the outside air pressure while it does not allow water to pass into the enclosure. This prolongs the life span of the seals and increases durability of the enclosure.

Velocity measurement: DewesoftX software includes functions for integrating the acceleration measurements from the 3xMEMS-ACC sensor into velocity and displacement. The integration high-pass frequency is freely adjustable in software.

Internal temperature sensor: there is an internal temperature sensor mounted inside the device that measures the temperature of the MEMS accelerometer. The readings from the temperature sensor are displayed in Dewesoft software as a System Monitor channel. The values are updated once per second.

Synchronization: EtherCAT communication between devices ensures 1 us synchronization between the samples taken from different devices in the chain. The distance between devices does not influence the precision of the synchronization.

Option: IOLITEicw 3xMEMS-ACC-INC (static inclinometer / tiltmeter)

IOLITEicw 3xMEMS-ACC can be used as a two-axial static inclinometer. The requirement needs to be specified at the time of order (-INC option) since additional calibration procedure is required to guarantee the calibrated accuracy of the device. 3xMEMS-ACC can be used to measure the roll and pitch angles (about its X and Y axes) with the Z axis positioned vertically. 90 degree mounting brackets are available for mounting on vertical walls. The inclination (tilt) angles appear as two additional channels (roll and pitch) in DewesoftX software.

Option: IOLITEicw 3xMEMS-ACC-T (external temperature sensor)

A version of the device with an input channel for an external temperature sensor. M8 connector is added to the front panel of the device to which a digital external temperature sensor is connected. The temperature sensor DS-TEMP-1WIRE-M8 must be ordered separately, cable lengths up to 10 m are available. [Temperature sensor specifications are available under IOLITEcw 1xT section.](#)



IOLITEicw 3xMEMS-ACC-8g-T

Option: IOLITEicw 3xMEMS-ACC-S (lower noise version)

IOLITEicw is also available with a lower noise sensor inside, which considerably reduces the noise (noise density between 0.07 and 0.7 $\mu\text{g}/\sqrt{\text{Hz}}$ in 0.1 Hz to 450 Hz band). The range of this variant is fixed at 15 g, therefore also providing a much larger dynamic range compared to the regular version. Sample rate is limited to 1000 S/s. The -S version housing is higher than the regular version as it includes a larger sensor element. For the full specification see the detailed table in the next section.



IOLITEicw 3xMEMS-ACC-S

6.10.3.1. IOLITEicw 3xMEMS-ACC: Specifications

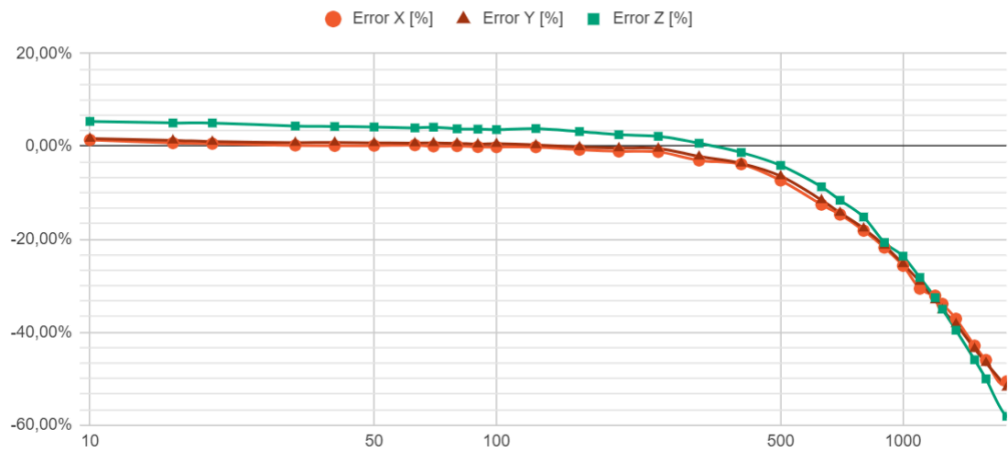
General device specification

Data interface	
Digital interface	EtherCAT
Interface connectors	RJ45
Power specifications	
Power consumption	1.5 W typ
Supply voltage	12-48 V
Environmental specifications	
Operating temperature	-40°C .. 65°C
IP rating	IP67
Physical specifications	
Weight	550 g (plastic glands), 720 g (SSG glands)
Dimensions	IOLITEc housing: 100 x 83 x 45 mm See drawings for all variants
Housing material	Anodized aluminium (stainless steel possible)
Other	
Tariff number (HTS)	9031.80.80
Tested according to	IEC-61010, IEC-61326

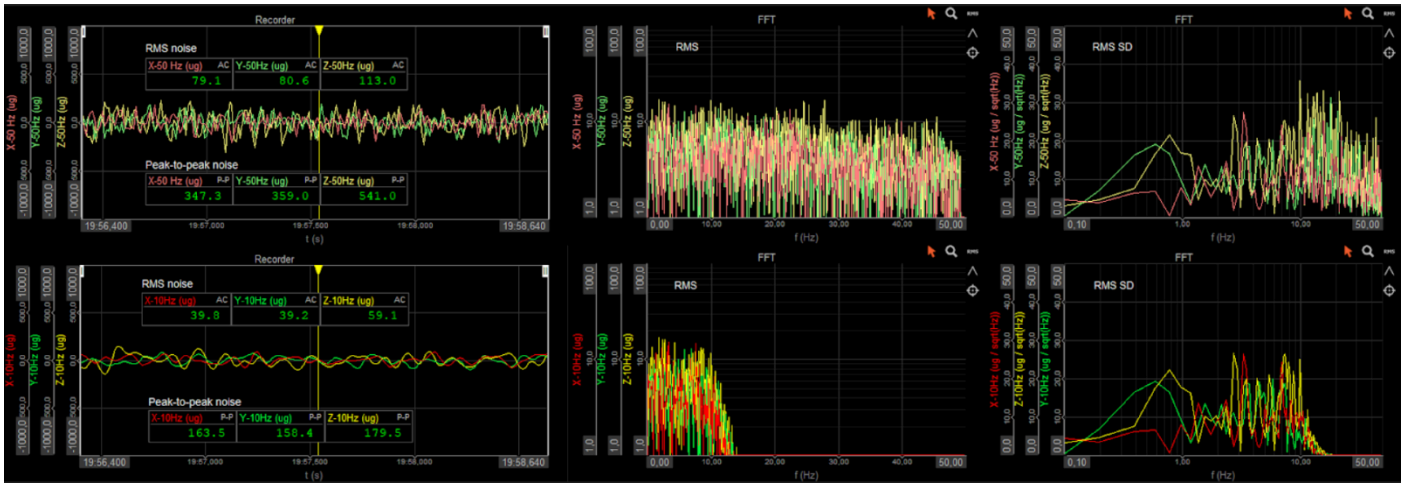
Measurement specification

MEMS Accelerometer						
	3xMEMS-ACC-8g			3xMEMS-ACC-40g		
	Min.	Typ.	Max.	Min.	Typ.	Max.
Measurement ranges	+2 g	✗	+8 g	+10 g	✗	+40 g
-3 dB bandwidth	✗	1000 Hz	✗	✗	1000 Hz	✗
Sample rate	✗	✗	4 kHz	✗	✗	4 kHz
Dynamic range	✗	96 dB	✗	✗	96 dB	✗
Calibrated offset error	✗	+4 mg	✗	-100 mg	30 mg	100 mg
Calibrated gain error	✗	+0.2 %	✗	✗	+0.5 %	✗
Offset temperature drift (-20 .. 60 degC)	-0.15 mg / degC	+0.02 mg / degC	0.15 mg / degC	-0.75 mg / degC	+0.2 mg / degC	0.75 mg / degC
Sensitivity temperature drift (-20 .. 60 degC)	✗	+0.01 % / degC	✗	✗	+0.01 % / degC	✗
Linearity error (smallest range)	✗	0.1 % FS	✗	✗	0.1 % FS	✗
Crossaxis sensitivity	-1 %	✗	1 %	✗	1 %	✗
	X, Y axis	Z axis		X, Y axis	Z axis	
Noise density (lowest range)	22 µg/√Hz	25 µg/√Hz		75 µg/√Hz	75 µg/√Hz	
Acceleration noise 0.05-10 Hz (RMS, +-2 g range)	37 µg	54 µg		✗	✗	
Acceleration noise 0.05-50 Hz (RMS, +-2 g range)	83 µg	120 µg		✗	✗	
Acceleration noise 0.05-100 Hz (RMS, +-2 g range)	116 µg	170 µg		✗	✗	
Acceleration noise 0.05-460 Hz (RMS, +-2 g range)	232 µg	340 µg		✗	✗	
Velocity noise 0.05 - 460 Hz (RMS)	95 µm/s	143 µm/s		✗	✗	
Velocity noise 0.1 - 460 Hz (RMS)	70 µm/s	110 µm/s		✗	✗	
Velocity noise 0.5 - 460 Hz (RMS)	29 µm/s	43 µm/s		✗	✗	
Velocity noise 1 - 460 Hz (RMS)	20 µm/s	30 µm/s		✗	✗	
Velocity noise 2 - 460 Hz (RMS)	14 µm/s	20 µm/s		✗	✗	
Velocity noise 5 - 460 Hz (RMS)	9 µm/s	13 µm/s		✗	✗	
Velocity noise 10 - 460 Hz (RMS)	6.5 µm/s	9.5 µm/s		✗	✗	
MEMS Inclinometer						
Accuracy and resolution valid in range	±15 deg			±15 deg		
Relative accuracy (23 degC)	0.01 deg			0.05 deg		
Resolution	0.001 deg			0.005 deg		

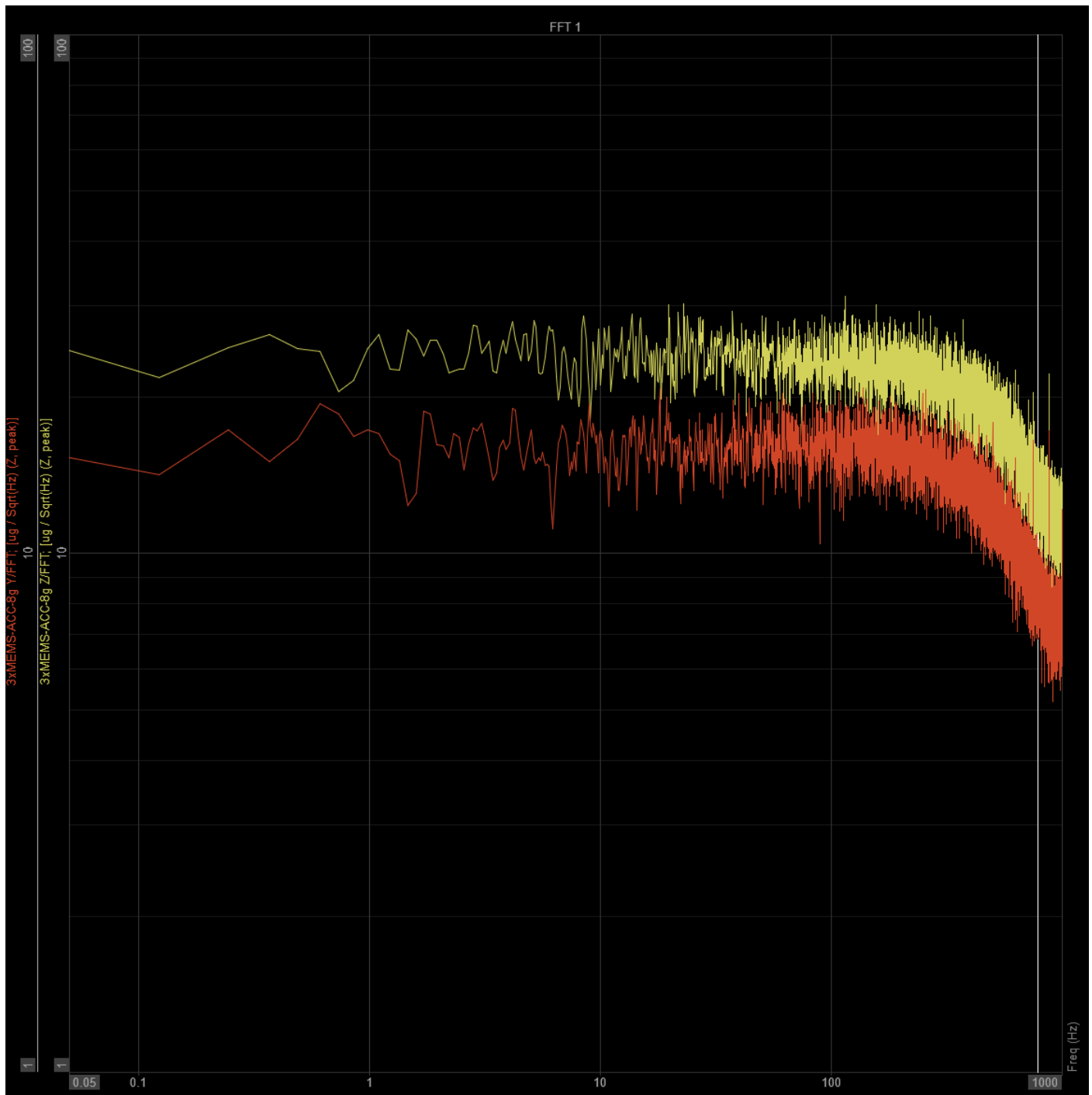
Temperature offset drift	0.0001 deg / degC (typ.)	X
Bandwidth	<0,1Hz	<0,1Hz
Update rate of inclination channels	1Hz	1Hz
IP67 version		
Option available	✓	✓



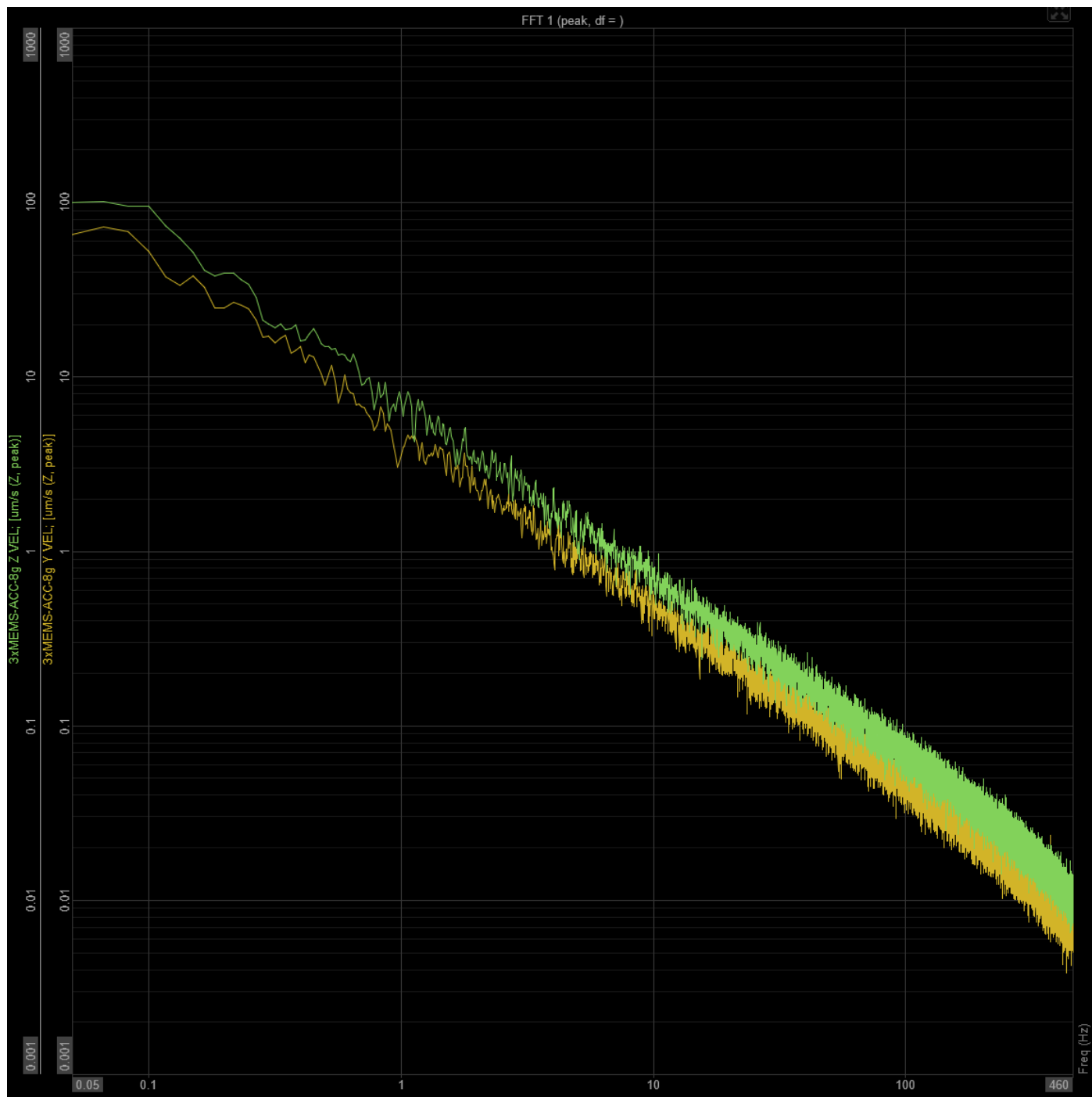
IOLITEicw 3xMEMS-ACC frequency response (Range: 2g, SR: 4 kS/s)



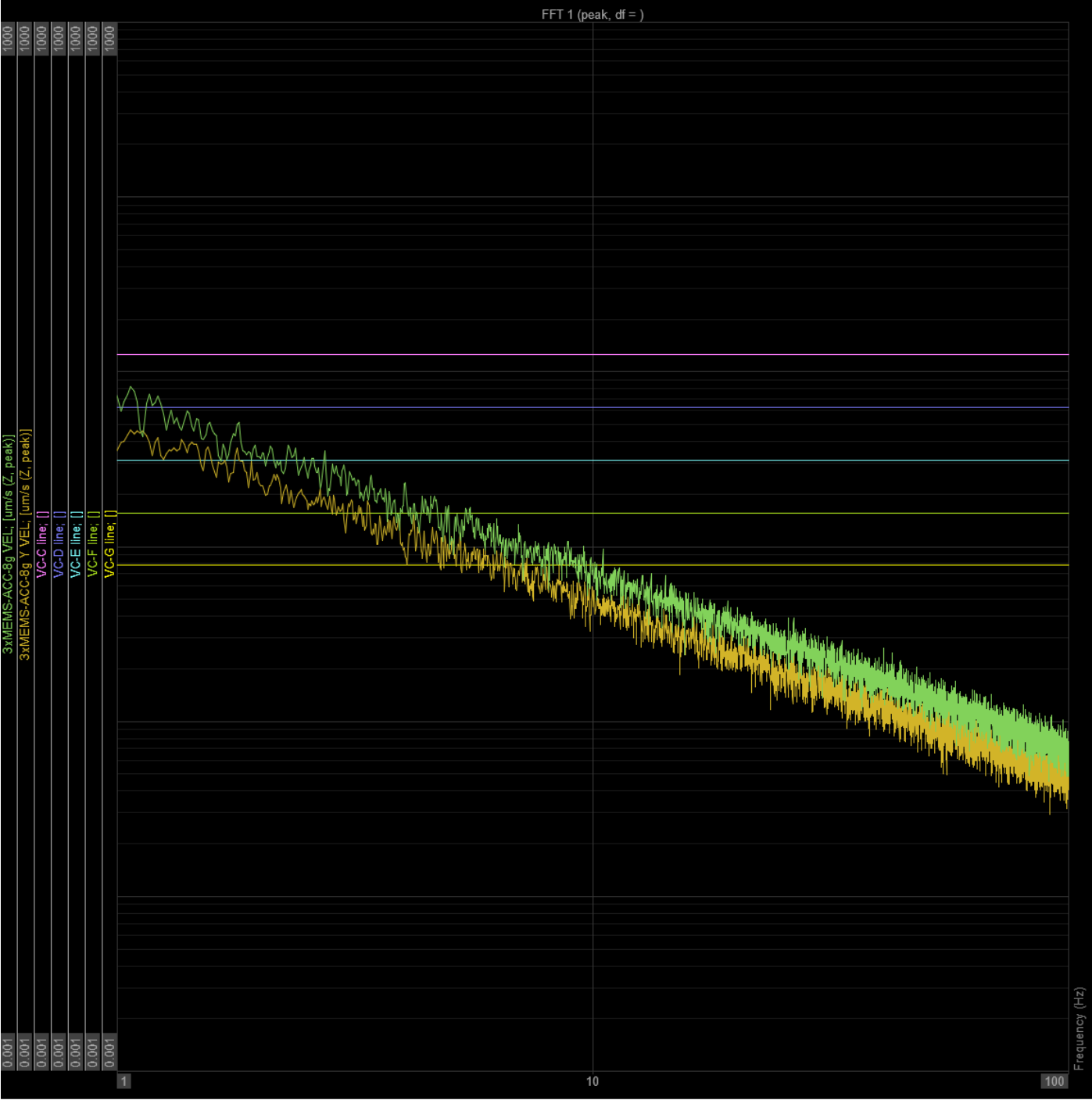
A typical noise spectrum of all three axes of the 3xMEMS-ACC. From left to right the plots show: time recorder, FFT (RMS value), FFT (RMS spectral density value). The top section shows noise floor at 50 Hz bandwidth and the bottom section shows the reduced noise when a 12 Hz low pass filter is applied.



Acceleration spectral noise density of IOLITEicw 3xMEMS-ACC-8g ($\mu\text{g}/\sqrt{\text{Hz}}$). X and Y axis noise is similar, Z axis noise is higher.



Velocity noise spectrum of IOLITEicw 3xMEMS-ACC-8g (um/s RMS). X and Y axis noise is similar, Z axis noise is higher.



Velocity noise spectrum of IOLITEicw 3xMEMS-ACC-8g (um/s RMS) including VC curves. X and Y axis noise is similar, Z axis noise is higher.

6.10.3.2. IOLITEicw 3xMEMS-ACC-S: Specifications

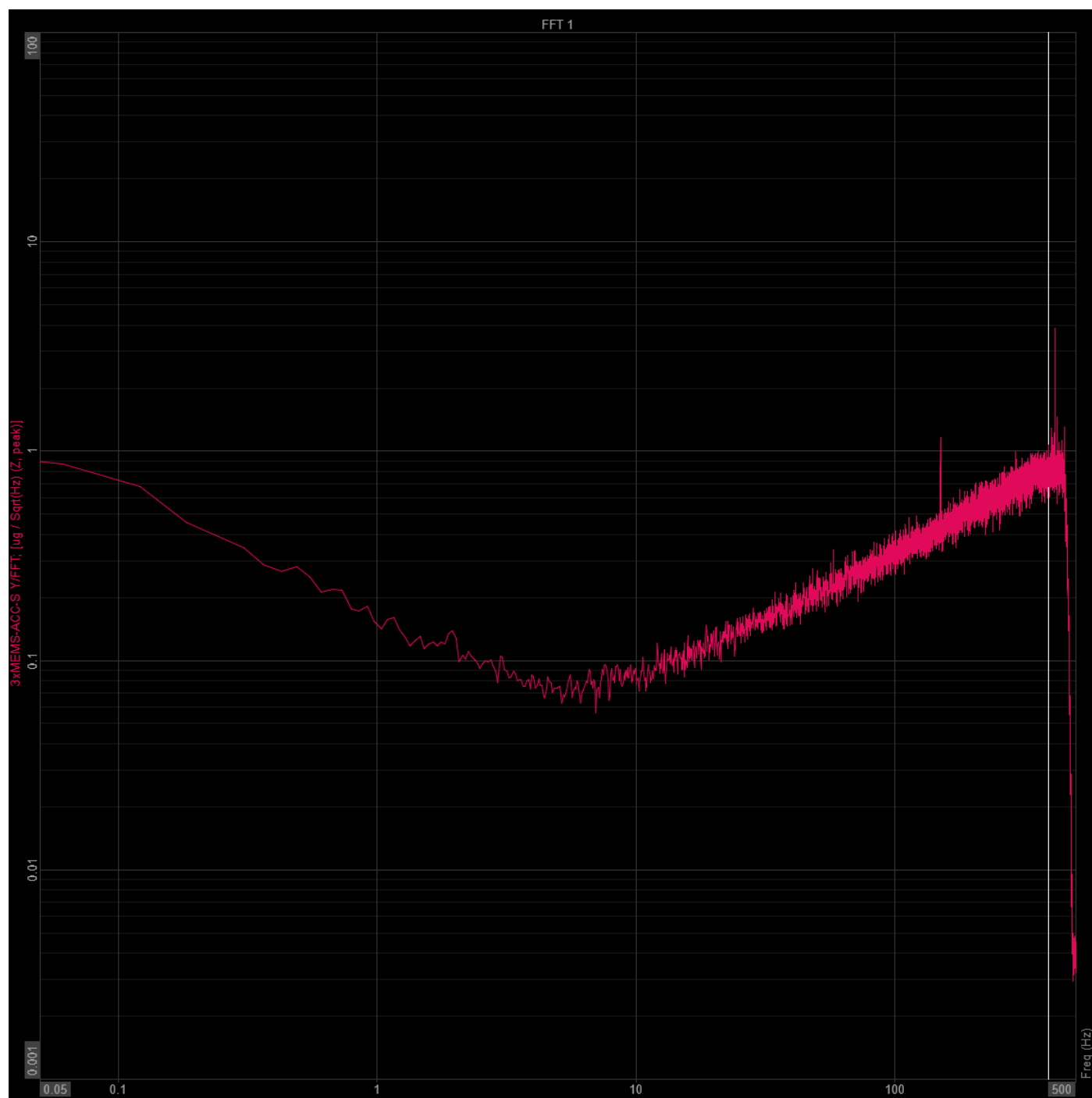
General device specification

Data interface	
Digital interface	EtherCAT
Interface connectors	RJ45
Power specifications	
Power consumption	1.5 W typ
Supply voltage	12-48 V
Environmental specifications	
Operating temperature	-40°C .. 65°C
IP rating	IP67
Physical specifications	
Weight	550 g (plastic glands), 720 g (SSG glands)
Dimensions	IOLITEc housing: 100 x 83 x 45 mm See drawings for all variants
Housing material	Anodized aluminium (stainless steel possible)
Other	
Tariff number (HTS)	9031.80.80
Tested according to	IEC-61010, IEC-61326

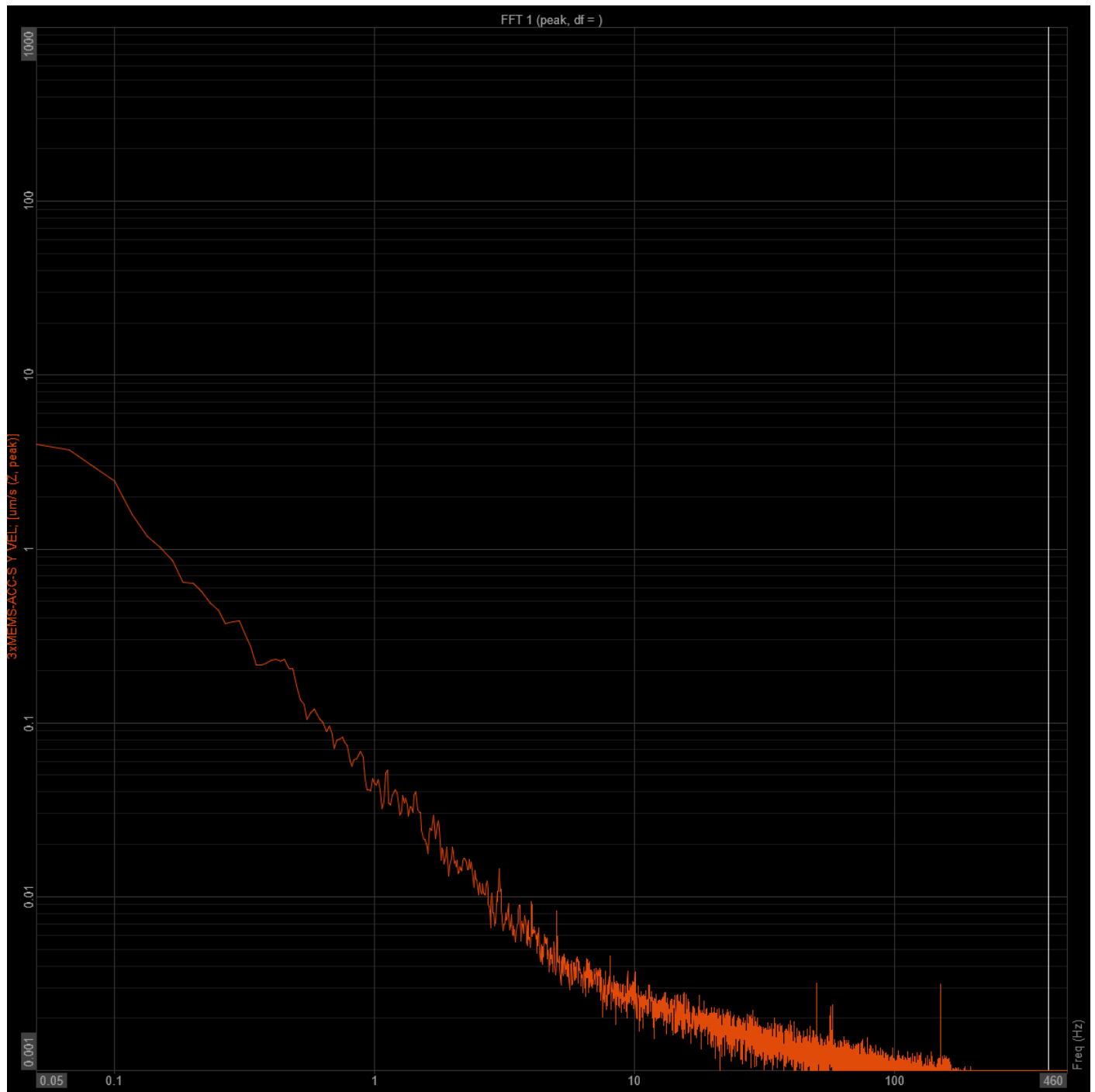
Measurement specification

MEMS Accelerometer			
Nr. of axes	3		
Range	±15g		
Max. sample rate	1 kS/s		
-6 dB bandwidth (at 1 kS/s sample rate) -6 dB bandwidth (at 1 kS/s sample rate) 0 Hz .. 460 Hz	0 Hz .. 460 Hz		
	Min.	Typ.	Max.
Dynamic range	✗	137 dB	✗
Offset error	✗	±4 mg	✗
Offset temperature drift (-20 .. 60 degC)	✗	+/-0.2 mg / degC	✗
Linearity error -1g ... +1g range	✗	0.05 % FS	✗
Crossaxis sensitivity	-1 %	✗	1 %
Noise density	✗	0.7 µg/√Hz	✗
Acceleration noise 0.05-10 Hz (RMS)		0.3 µg	
Acceleration noise 0.05-50 Hz (RMS)		0.8 µg	

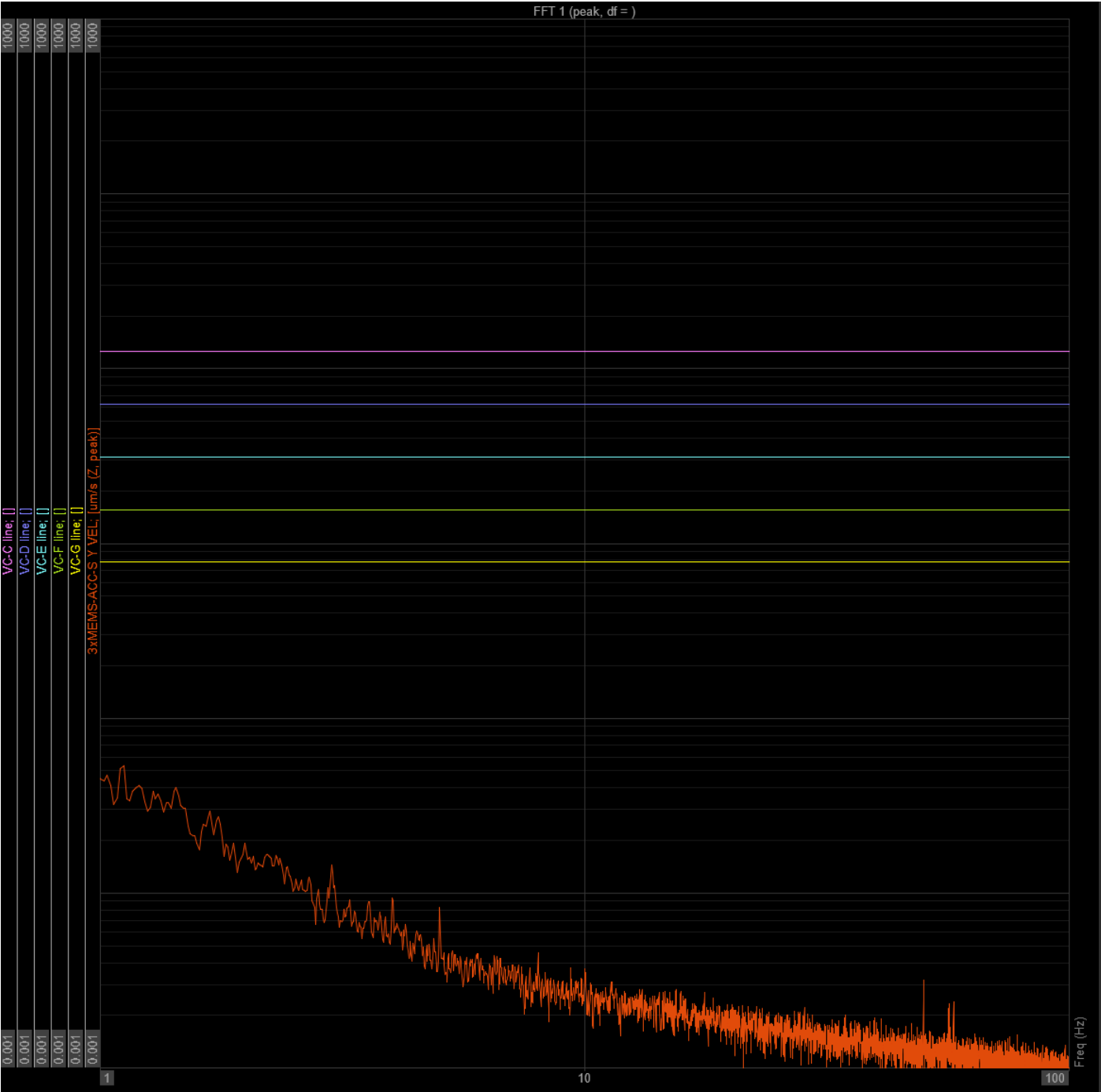
Acceleration noise 0.05-100 Hz (RMS)		1.6 μg	
Acceleration noise 0.05-460 Hz (RMS)		10 μg	
Velocity noise 0.05 - 460 Hz (RMS)		4 μm/s	
Velocity noise 0.1 - 460 Hz (RMS)		2 μm/s	
Velocity noise 0.5 - 460 Hz (RMS)		0.3 μm/s	
Velocity noise 1 - 460 Hz (RMS)		0.17 μm/s	
Velocity noise 2 - 460 Hz (RMS)		0.1 μm/s	
Velocity noise 5 - 460 Hz (RMS)		0.08 μm/s	
Velocity noise 10 - 460 Hz (RMS)		0.08 μm/s	
MEMS Inclinometer			
Option available	✗		
Digital Temperature input			
Option available	✗		
IP67 version			
Option available	✓		



Acceleration spectral noise density of IOLITEicw 3xMEMS-ACC-S (ug/sqrt(Hz)). All axes have similar noise.



Velocity noise spectrum of IOLITEicw 3xMEMS-ACC-S (um/s RMS). All axes have similar noise.



Velocity noise spectrum of IOLITEicw 3xMEMS-ACC-S (um/s RMS) including VC curves. All axes have similar noise.

6.10.3.3. IOLITEicw 2xMEMS-INC: Specifications

General device specification

Data interface	
Digital interface	EtherCAT
Interface connectors	RJ45
Power specifications	
Power consumption	1.5 W typ
Supply voltage	12-48 V
Environmental specifications	
Operating temperature	-40°C .. 65°C
IP rating	IP67
Physical specifications	
Weight	550 g (plastic glands), 720 g (SSG glands)
Dimensions	IOLITEc housing: 100 x 83 x 45 mm See drawings for all variants
Housing material	Anodized aluminium (stainless steel possible)
Other	
Tariff number (HTS)	9031.80.80
Tested according to	IEC-61010, IEC-61326

Measurement specification

MEMS Inclinometer	
Accuracy and resolution valid in range	±15 deg
Relative accuracy (23 degC)	0.01 deg
Resolution	0.001 deg
Temperature offset drift	0.0001 deg / degC (typ.)
Bandwidth	<0,1Hz
Update rate of inclination channels	1Hz
IP67 version	
Option available	✓