

QI-4 for imc CRONOSflex (CRFX/QI-4)

4-channel charge- and audio measurement module

The imc CRONOSflex measurement module (CRFX/QI-4) is specially suited for quasi-static as well as dynamic charge measurements. By means of piezoelectric sensors, it is possible to measure forces, pressure, acceleration, as well as to perform analysis of solid-borne noise such as that occurring in engine indication on vehicle test stands.

As an alternative to standard BNC terminals, triaxial terminals are available which allow the use of charge sensors with built-in TEDS (Transducer Electronic Data Sheet).

The module is additionally designed for acoustics measurements and vibration analysis. For this purpose, current-fed IEPE sensors such as ICP™-, DeltaTron®-, and PiezoTron® sensors are supported.

Further, the module can be used for high-precision measurement across a wide voltage range.

The module features a very high signal-to-noise ratio and high fidelity. In combination with its large bandwidth of around 50 kHz and its 24-bit resolution, a wide scope of applications in the field of measurement engineering can be accomplished. The separate galvanic isolation for each channel provides for robust, interference-free signal capture.



*imc CRONOSflex Module
(CRFX/QI-4)*

Highlights

- Charge measurement with low drift over time, for quasi-static measurements
- Per-channel galvanic isolation
- High Signal-to-Noise ratio (-110 dB SNR)
- Low signal distortion (-115 dB THD)

imc CRONOSflex - Frameless expansion, flexible modularity

An imc CRONOSflex system is composed of a base unit (CRFX-400 / CRFX-2000G) and one or more modules. These modules are designed to be directly connected to one another. The imc Click Mechanism and extruded aluminum case provide a firm mechanical and electrical connection. As a result, no mainframe or rack is needed.

In addition when a module is added it is automatically recognized by the software displaying its dynamically assigned ID on the front of the module.

Alternatively, connection can be made by means of standard Ethernet cables (RJ45, CAT5) thus creating a spatially distributed system.

imc CRONOSflex Modules can be operated without the base unit when used as components within an EtherCAT-based automation system operating as EtherCAT slaves with full CANopen over EtherCAT (CoE) support.



*imc CRONOSflex
distributed system*

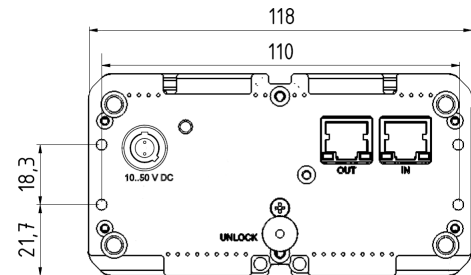
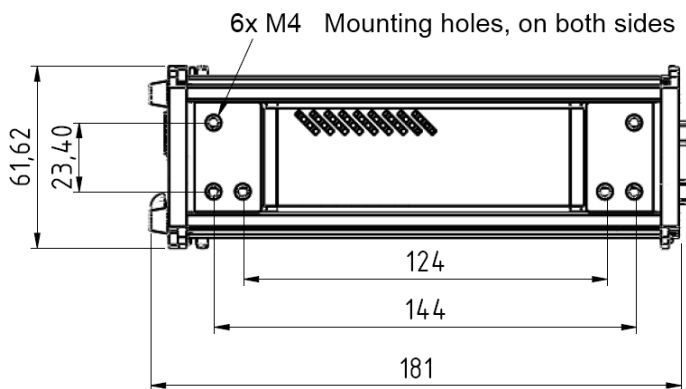
Models and Options

Overview of the available variants

Order Code		article no.	ET version*
CRFX/QI-4	charge and audio module	11900049	--
CRFX/QI-4-1UC	module variant with 1.000.000 pC	11900240	--

* ET: Version in extended temperature range

Mechanical drawings with dimensions



rear view of the imc CRONOSflex module

Module power supply options

- Direct connection (LEMO.EGE.1B.302 power socket)
- Adjacent module (module connector / imc Click Mechanism)
- EtherCAT network cable: Power over EtherCAT (PoEC)

For further details refer to the power options documentation.

Optional accessories

AC/DC power adaptor 110-230 VAC 50-60 Hz (with appropriate LEMO.1B.302 plug)		article no.
48 V DC / 150 W	ACC/AC-ADAP-48-150-1B	13500148
24 V DC / 60 W	CRPL/AC-ADAPTER-60W-1B	10800066
Power plugs		
ACC/POWER-PLUG-5	Power plug for DC supply LEMO.FGE.1B.302 plug (male, E-coded: 2 coding keys)	13500150
CRFX/MODUL-PP-90	Power plug for DC supply 90° angular LEMO.FHE.1B.302 plug (male, E-coded: 2 coding keys)	11900074

Supply module (Power Handle)		article no.
CRFX/HANDLE-POWER-L	Handle with system power supply 50 V 100 W, without UPS	11900058
CRFX/HANDLE-UPS-L	Handle with system power supply 50 V 100 W, UPS with lead-gel battery	11900043
CRFX/HANDLE-LI-IO-L	Handle with system power supply 50 V 100 W, UPS with Li-Ion battery	11900010
Passive-Handle		
CRFX/HANDLE-L	standard unpowered left handle	11900008
CRFX/HANDLE-R	standard unpowered right handle	11900007
Mounting bracket for increased stability (recommended for lifetime and robustness)		
CRFX/BRACKET-CON	assembly element for 2 modules	11900071
Mounting brackets for fixed installations		
CRFX/BRACKET-90	mounting bracket 90°	11900068
CRFX/BRACKET-180	mounting bracket 180°	11900069
CRFX/BRACKET-BACK	rear panel mounting element	11900070
CRFX/RACK	19" RACK for imc CRONOSflex Modules	11900066
CRFX/BRACKET-RACK	mounting element in the RACK	11900072
Miscellaneous		
CRFX/CAL-P Calibration report set for each device	Report set with manufacturer's calibration certificate and individual readings, as well as list of test equipment used (PDF). Meets requirements of ISO 17025	11900051

Technical Specs - CRFX/QI-4

Inputs, measurement modes, terminal connections		
Parameter	Value	Remarks
Inputs	4+4	2 per channel
Measurement modes	voltage measurement charge measurement current fed sensors	(ICP™-, DELTATRON®-, PIEZOTRON®-Sensors)
Terminal connection	8x BNC	4 for charge measurement (Q) and 4 for voltage measurement or IEPE (U), optionally charge or voltage

Sampling rate, Bandwidth, Filter, TEDS		
Parameter	Value	Remarks
Sampling rate	≤100 kHz	per channel
Bandwidth	0 Hz to 49 kHz 0 Hz to 46 kHz	-3 dB -0.1 dB
Filter (digital) cut-off frequency characteristic order	50 Hz to 20 kHz	low pass or high pass filter: 8th order band pass: LP 4th and HP 4th order Bessel, Butterworth
Resolution	16 Bit 24 Bit	output format is selectable for each channel individually: a) 16 Bit Integer b) 32 Bit Float (24 Bit Mantissa)
TEDS - Transducer Electronic Data Sheet	conforming to IEEE 1451.4 Class 1 MMI	

General			
Parameter	Value typ.	min. / max.	Remarks
Isolation	≤100 V		channel to case (chassis) and channel-to-channel ² test voltage 500 V _{RMS} , 1 min.
Overvoltage protection	<±1 V ±150 V ±50 V		charge measurement voltage measurement range >±2.5 V and device switched off range ≤±2.5 V
Input coupling	AC, DC, AC with current feed		
Input configuration	differential, isolated		to system ground (protection ground) and channel-to-channel
Input impedance	1 MΩ >10 MΩ		range >±2.5 V and device switched off range ≤±2.5 V
Lower cut-off frequency	0.2 Hz	±20 %	-3 dB; AC-coupling voltage measurement

Voltage measurement			
Parameter	Value typ.	min. / max.	Remarks
Ranges	$\pm 100\text{ V}$, $\pm 50\text{ V}$, $\pm 25\text{ V}$, $\pm 10\text{ V}$, $\pm 5\text{ V}$, $\pm 2.5\text{ V}$, $\pm 1\text{ V}$ to $\pm 5\text{ mV}$		
Gain error	0.002 %	$\leq 0.05\%$	of reading
Gain drift	$2\text{ ppm/K}\cdot\Delta T_a$	$13\text{ ppm/K}\cdot\Delta T_a$	$\Delta T_a = T_a - 25\text{ }^\circ\text{C} $ ambient temperature T_a
Offset error	0.002 %	$\leq 0.05\%$ $\leq 0.1\%$	of the range, DC-coupling range $> \pm 10\text{ mV}$ range $\leq \pm 10\text{ mV}$
Offset drift	$\pm 85\text{ }\mu\text{V/K}\cdot\Delta T_a$ $\pm 2\text{ }\mu\text{V/K}\cdot\Delta T_a$ $\pm 0.35\text{ }\mu\text{V/K}\cdot\Delta T_a$	$\pm 200\text{ }\mu\text{V/K}\cdot\Delta T_a$ $\pm 7\text{ }\mu\text{V/K}\cdot\Delta T_a$ $\pm 0.9\text{ }\mu\text{V/K}\cdot\Delta T_a$	ranges $> \pm 2.5\text{ V}$ ranges $\pm 2.5\text{ V}$ to $\pm 500\text{ mV}$ range $\leq \pm 250\text{ mV}$ $\Delta T_a = T_a - 25\text{ }^\circ\text{C} $ ambient temperature T_a
Non-linearity	10 ppm	$\leq 20\text{ ppm}$	
THD (Total Harmonic Distortion)	-100 dB		signal frequency $\leq 1\text{ kHz}$
Isolation voltage rejection range: $\pm 50\text{ V}$ to $\pm 2.5\text{ V}$ range: $\pm 2.5\text{ V}$ to $\pm 5\text{ mV}$	-100 dB -74 dB -146 dB -120 dB		Isolation test voltage, 70 V_{RMS} 50 Hz 1 kHz 50 Hz 1 kHz
Signal-to noise ratio	-105 dB -106 dB -97 dB -72 dB		(A-weighted), $\leq 100\text{ kps}$ bandwidth 20 Hz to 20 kHz range $\pm 100\text{ V}$ range $\pm 1\text{ V}$ range $\pm 100\text{ mV}$ range $\pm 5\text{ mV}$
Noise	$1.8\text{ }\mu\text{V}_{\text{RMS}}$ $0.3\text{ }\mu\text{V}_{\text{RMS}}$ $0.1\text{ }\mu\text{V}_{\text{RMS}}$		DC-coupling; bandwidth: 0.1 Hz to 50 kHz 0.1 Hz to 1 kHz 0.1 Hz to 10 Hz

Charge measurement QI-4 (standard)			
Parameter	Value typ.	min. / max.	Remarks
Input ranges	±100,000 pC; ±50,000 pC; ±25,000 pC; ... ±10 pC		
Overload resistance max. signal slope		±5,000,000 pC <±0.01 C/s	permanently
Gain error	0.04 % 0.1 %	0.2 % 0.5 %	of reading ranges 100 nC to 100 pC ranges 50 pC to 10 pC
Gain drift	0.01 ppm/K·ΔT _a		ΔT _a = T _a -25°C ambient temperature T _a
Offset error DC-coupling	0.02 %	0.05 % 0.2 pC	the higher value applies of range
Drift with DC-coupling	±0.005 pC/s	±0.05 pC/s	after reset process, without incurring overload ¹ ΔT _a =25°C
Duration of the reset process	500 ms		
Bandwidth, higher cut-off frequency	48 kHz 30 kHz 10 kHz		Ck = Sensor- plus cable capacitance -3 dB ±0,1 dB; Ck <1 nF ±0,1 dB; Ck <10 nF
Bandwidth, lower cut-off frequency DC-coupling AC-coupling, ranges: ±100 nC to ±25 nC ±10 nC to ±2500 pC ±1000 pC to ±10 pC	quasi static 0.2 Hz 0.3 Hz 1.4 Hz		
Noise, ranges: ±100 nC to ±25 nC ±10 nC to ±2500 pC ±1000 pC bis ±10 pC	0.5 pC _{rms} 0.12 pC _{rms} 0.05 pC _{rms}		bandwidth: 0.1 Hz to 1 kHz

Charge measurement QI-4-1UC			
Parameter	Value typ.	min. / max.	Remarks
Input ranges	±1,000,000 pC; ±500,000 pC; ±250,000 pC; ... ±100 pC		

¹ An overload of the measurement inputs is applied the moment the charge passes the measurement ranges before the reset process is initiated. If that happens the reset process has to be executed two times in a period of ca. 30 s.

Sensor supply			
Parameter	Value typ.	min. / max.	Remarks
Constant current	4.2 mA	±10 %	
Compliance voltage	25 V	>24 V	
Source impedance	280 kΩ	>100 kΩ	is parallel to input resistor
Power supply of the module			
Input supply voltage	10 V to 50 V DC		
Power consumption	10 W		10 V to 50 V DC
Isolation	60 V		nominal isolation specification of the supply input
Power-over EtherCAT (PoEC)	42 V to 50 V DC		supply via EtherCAT network cable
Terminal connections of the module			
EtherCAT connection	2x RJ45		system bus for distributed imc CRONOSflex components
Input supply plug (female)	LEMO.EGE.1B.302		multicoded 2 notches, for optional individually power supply
Module connector	2x 20 pin		direct connection of modules (click) supply and system bus
Pass through power limits			
Directly connected (clicked) imc CRONOSflex Modules	3.1 A (maximum current) Equivalent power with chosen DC power input: <ul style="list-style-type: none"> • 149 W @ 48 V DC (e.g. AC/DC line adaptor) • 37 W @ 12 V DC (typical vehicle supplied DC input) 		
Power over EtherCAT (PoEC) for remote imc CRONOSflex Modules	350 mA (maximum current corresponding IEEE 802.3) Equivalent power with chosen DC power input: <ul style="list-style-type: none"> • 17.5 W @ 50 V DC (e.g. Power Handle) • 16.8 W @ 48 V DC (e.g. AC/DC line adaptor) • 14.7 W @ 42 V DC (minimum voltage for PoEC) Note: minimum system power of 42 V DC required for PoEC		

Operating conditions		
Parameter	Value	Remarks
Operating environment	dry, non corrosive environment within specified operating temperature range	
Rel. humidity	80% up to 31°C, above 31°C: linear declining to 50%	according IEC 61010-1
Ingress protection rating	IP20	
Pollution degree	2	
Operating temperature	-10°C to +55°C	without condensation
Shock- and vibration resistance	IEC 61373, IEC 60068-2-27 IEC 60062-2-64 category 1, class A and B MIL-STD-810 Rail Cargo Vibration Exposure U.S. Highway Truck Vibration Exposure	
Extended shock- and vibration resistance	upon request	specific tests or certifications upon request
Dimensions	62 x 118 x 186 mm	W x H x D
Weight	1.2 kg	

