

AUDIO2-4 for imc CRONOSflex (CRFX/AUDIO2-4)

4-channel Audio Measurement Module

The CRFX/AUDIO2-4(-MIC) module has four individual, galvanically-isolated channels for the acquisition of:

- IEPE/ICP sensors (current-fed 4 mA)
- Voltage (AC and DC coupling)

Direct connection of ICP-compatible sensors (ICP®, Deltatron®, Piezotron® sensors) takes place via BNC connectors.

LED's BNC: In case of an error, such as cable breakage and short circuit a LED beside each BNC socket will shine and signalize the error case. In case of a missing connection to the sensor the LED will shine permanently.

LED's LEMO: (as of Rev. 2) Beside each LEMO socket (microphone supply) there is a LED in order to monitor the polarization voltage. During normal operation the LED will not shine.



Highlights

- Per-channel galvanic isolation
 - Robust and feedback-free signal acquisition
 - Large signal-to-noise ratio (-110 dB SNR)
 - Low signal distortion (-115 dB THD)
 - High-precision measurements over broad voltage ranges
 - Supports imc Plug & Measure conforming to IEEE 1451.4 (Class I mixed mode interface)
- Optional supply unit for a condenser microphone available: **CRFX/AUDIO2-4-MIC**.

Typical applications

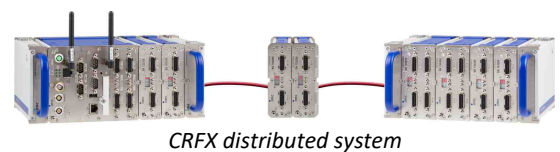
- Ideal for noise measurements, noise and vibration analysis and measuring acceleration.

imc CRONOSflex - Frameless expansion, flexible modularity

The imc Click Mechanism and extruded aluminum case provide a firm mechanical and electrical connection. As a result, no mainframe or rack is needed.

An imc CRONOSflex system uses EtherCAT as an "internal" system bus for connecting various modules to the main base unit (CRFX-400 / CRFX-2000G). With the system bus, all imc CRONOSflex modules are guaranteed to be synchronized with each other. This allows various modules to be either connected in one central block or connected via standard network cable in a spatially distributed system.

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



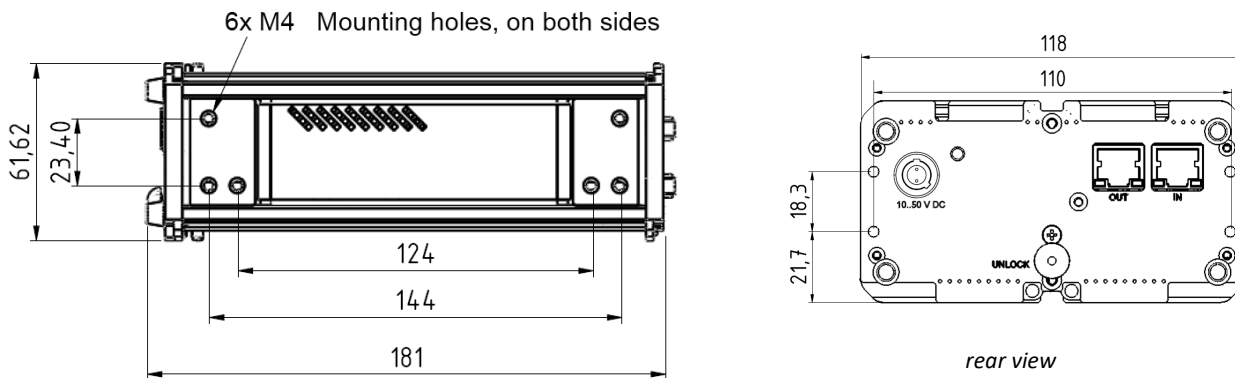
Overview of available variants

Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/AUDIO2-4	11900046	11910056	with BNC, see Fig. CRFX/AUDIO2-4

Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/AUDIO2-4-MIC	11900121	11910112	variant with supply module for microphones

* ET: Version for an extended temperature range

Mechanical drawings with dimensions



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.

Included accessories


Miscellaneous
Calibration certificate with test equipment verification as per ISO 9001 (manufacturer's calibration certificate, PDF)
Getting started with imc CRONOSflex (one copy per delivery)

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/AUDIO2-4(-MIC)

Inputs, measurement modes, terminal connection		
Parameter	Value	Remarks
Inputs	4	
Measurement modes	voltage measurement current fed sensors	ICP™-, DELTATRON®-, PIEZOTRON®-Sensors
Terminal connection	4x BNC 4x LEMO	one channel per socket microphone supply AUDIO2-4-MIC 

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 Anti-aliasing filter: Cauer 8.order with $f_{\text{cutoff}} = 0.4 f_s$
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 ¹ , test voltage 500 V _{RMS} , 1 min.
Overvoltage protection		±150 V ±50 V	continuous, differential input (BNC) range >±2.5 V and device switched off range ≤±2.5 V
Input coupling	AC, DC, AC with current feed		
Input configuration	differential, isolated		
Input impedance	1 MΩ >10 MΩ	±1 %	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

¹ no isolation with optional microphone supply (AUDIO2-4-MIC)

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 the measured value, at 25 °C
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{ °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{ °C} $ ambient temperature T_a
Non-linearity	10 ppm	$\leq 20\text{ ppm}$	
CMRR (common mode rejection ratio)			Isolation test voltage, 70 V_{RMS}
range: $\pm 50\text{ V}$ to $\pm 2.5\text{ V}$	-100 dB -74 dB		50 Hz 1 kHz
range: $\pm 2.5\text{ V}$ to $\pm 5\text{ mV}$	-146 dB -120 dB		50 Hz 1 kHz
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
THD (Total Harmonic Distortion)	-100 dB		signal frequency $\leq 1\text{ kHz}$
Signal-to noise ratio	-105 dB -106 dB -97 dB -72 dB		(A-weighted), $\leq 100\text{ ksps}$ bandwidth 20 Hz to 20 kHz range $\pm 100\text{ V}$ range $\pm 1\text{ V}$ range $\pm 100\text{ mV}$ range $\pm 5\text{ mV}$

Sensor supply			
Parameter	typ.	min. / max.	Remarks
Constant current	4.2 mA	$\pm 10\%$	
Compliance voltage	25 V	$> 23\text{ V}$	
Source impedance	280 k Ω	$> 100\text{ k}\Omega$	is parallel to input resistor

Power supply of the module		
Parameter	Value	Remarks
Input supply voltage	10 V to 50 V DC	
Power consumption	9 W 11 W	10 to 50 V DC AUDIO2-4 AUDIO2-4-MIC
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		
Parameter	Value	Remarks
EtherCAT connection	2x RJ45	system bus for expanded 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	<p>3.1 A (maximum current)</p> <p>Equivalent power with chosen DC power input:</p> <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 flex modules	<p>350 mA (maximum current according to IEEE 802.3)</p> <p>Equivalent power with chosen DC power input:</p> <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) <p>Note: minimum system power of 42 V DC required for PoEC</p>

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 (standard)	-10°C to +55°C	without condensation
Operating temperature (extended: "-ET" version)	-40°C to +85°C	condensation temporarily allowed
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	ca. 0.9 kg (CRFX/AUDIO2-4), 1.2 kg (CRFX/AUDIO2-4-MIC)	

Microphone supply

CRFX/AUDIO2-4-MIC with a supply module for microphones			
Parameter	Value typ.	min. / max.	Remarks
Low supply voltage	±14 V	±3 %	
max. supply current/channel		≥3 mA	permanent short circuit proof
High supply voltage	±60 V	±3 %	
max. supply current/channel		≥3 mA	permanent short circuit proof
Polarization voltage	+200 V	±0.2 %	permanent short circuit proof
Max current		<300 µA	Attention! Risk of electric shock

Block isolation of the microphone supply		
Parameter	Value	Remarks
Block isolation	60 V	entire microphone supply isolated from the housing (CHASSIS, PE)
Isolation impedance	500 kΩ 1 nF	
Internal reference ground	-SUPPLY	
External reference ground	CHASSIS, metal housing	internal electronics as an entity, galvanically isolated from housing

Block isolation for improved suppression of ground loops and related interference. Does not constitute channel-wise individual isolation. Not rated nor intended for safety of equipment and personnel.