B-4 for imc ARGUSfit

4-channel measurement module for strain gauge, bridge mode and voltage

The B-4 module belonging to the imc ARGUS*fit* series is a 4-channel measurement amplifier that can be used in conjunction with an imc ARGUS system (or base unit) to which it is directly docked with its housing.

Individually isolated, configurable differential channels capturing:

- Strain gauges, bridge-mode sensors and potentiometers
- Voltages (25 mV to 10 V)
- Active transducers that require voltage supply

Highlights

- Per-channel isolated measurement inputs, individual filtering and ADCs
- Software selectable quarter-bridge completion with 120 Ω, 350 Ω und 1 kΩ
- Bridge and sensor supply, channel-wise individually configurable
- Bridge mode excitation from 5 V down to 0.5 V
- Sensor supply of voltage-fed transducers up to +15 V
- 40 kHz bandwidth at max. 100 kSps/channel sampling rate
- Graphical configuration wizard to setup strain gauge modes
- Measurement ranges and sampling rates individually selectable (in steps of 1, 2, 5)
- 24-bit digitization, internal processing and data output
- Robust, compact and miniaturized: click mechanism for imc ARGUS*fit* systems

Typical applications

- Robust data acquisition for mobile or stationary applications and for test benches
- Strain gauge, load cells, piezoresistive accelerometers, potentiometer transducers, pressure sensors
- Durability and fatigue analysis
- Active voltage-fed sensors

## imc ARGUS*fit*: Flexible modular platform for fast measurement systems
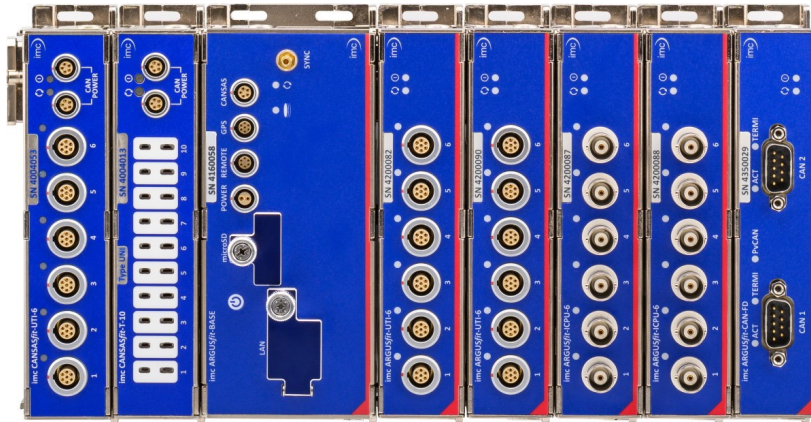
Based on an imc ARGUS*fit* base unit, imc ARGUS*fit* measurement amplifier and interface modules can be combined to form complete systems by means of a robust click mechanism, which can even integrate imc CANSAS*fit* modules. The click connectors provide the electrical connection to the power supply and system bus.

For expansion to decentralized distributed topologies, the fast internal ARGFT system bus can be converted to fiber optic cables by means of a clickable fiber converter module.

The entire system can be controlled via a common Ethernet connection (LAN/WLAN) with a PC (imc STUDIO software) and can be networked and operated synchronously and uniformly with all other imc data acquisition instrument series. Furthermore, it can also be operated autonomously and stand-alone without PC with data storage on microSD.

Dimensions
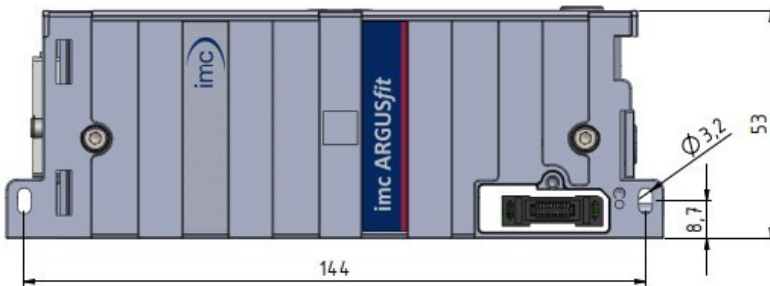
imc ARGUSfit B-4

Module shown in standard operating position (terminal connections upwards)
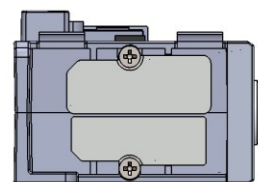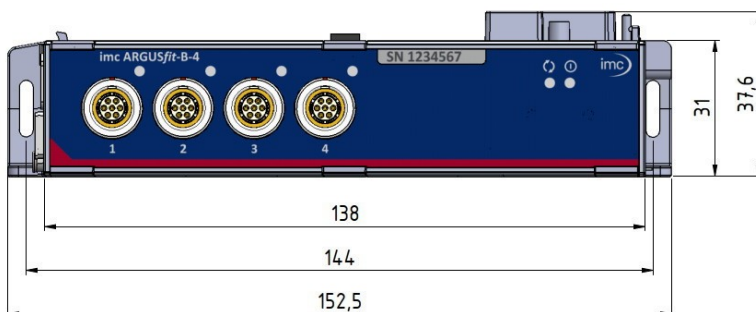
left module panel with parking position for the covers of the module connectors

Overview of the available variants

Order Code	Properties	article no.
ARGFT/B-4	strain gauge (bridge) amplifier with sensor supply (-40°C... +85°C)	11400214
ARGFT/B-4-EC	variant for extended condensation	11410204

Included accessories

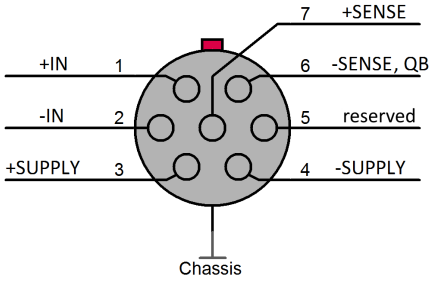| Documents |
|---|
| Getting started with imc ARGUS*fit* (one copy per delivery) |
| Device certificate |
| **Miscellaneous** |
| 4x ACC/CAP-LEMO.1B, 13500233 (protective cover for LEMO.1B sockets) |

Optional accessories

Connector: signals		
ACC/FGG.1B.307-5.3-6.2	plug for the signal connection (FGG series, IP50)	13500096
ACC/FEG.1B.307-3.1-4.2	plug for the signal connection (FEG series, IP54)	13500262
ACC/FGG.1B.307-TERMINAL	screw terminal plug LEMO.1B, 7 pin (FGG series) LEMO plug with integrated screw terminal adaptor (7 pin + shield)	13500418

Fiber-Converter Set		
ARGFT/FIBER-CONVERTER-SET	Media converter for the ARGUS system bus Includes: 2 converter modules, 2x SFP+ transceiver, 5 m fiber optic cable, AC/DC power adaptor and a power plug	11400225

Mounting accessories		
CANFT/BRACKET-DIN	Mounting on DIN-Rail (top hat rail) for imc ARGUS*fit* and imc CANSAS*fit*	12100029
CANFT/BRACKET-MAG	Mounting with magnet system for imc ARGUS*fit* and imc CANSAS*fit*	12100030

Documents		
SERV/CAL-PROT	Calibration protocol per amplifier imc manufacturer calibration certificate with measurement values and list of calibration equipment used (pdf).	150000566
SERV/CAL-PROT-PAPER	Calibration protocol per amplifier (paper print) imc manufacturer calibration certificate with measurement values and list of calibration equipment used with signature and seal.	150000578
Device certificates and calibration protocols: Detailed information on certificates supplied, the specific contents, underlying standards (e.g. ISO 9001 / ISO 17025) and available media (pdf etc.) can be found on our website, or you can contact us directly.		

Technical Specs - ARGFT/B-4

General

Inputs, measurement modes		
Parameter	**Value**	**Remarks**
Inputs	4	
Measurement modes	voltage full-, half- and quarter bridge	with internal half- and quarter bridge completion
Connector / socket	compatible socket	recommended plug
Measuring input	LEMO.1B.307 (7-pin)	FEG.1B.307
LEMO pin configuration		

```
              7    +SENSE
 +IN    1          6    -SENSE, QB
 -IN    2          5    reserved
 +SUPPLY 3         4    -SUPPLY

        Chassis
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Module connector	Click-connection (covering caps)	For the supply and system bus of directly connected modules without further cables, see data sheet of ARGFT base unit.

Sampling rate, Bandwidth, Filter			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Sampling rate		≤100 kHz	configurable, individually per channel
Bandwidth	0 Hz to 40 kHz 0 Hz to 20 kHz		sampling rate 100 kHz, AAF filter -3 dB 0.1 dB
Filter			
Type	low pass		
Characteristic	Mean, Butterworth, Bessel, AAF		individual selectable; mean and AAF: adapted automatically, according to selected output rate
Cut-off frequency	1 Hz to 20 kHz		-3 dB, 1 - 2 - 5 steps digital filter in addition to hardware filter
Order	8^{th} order		
Anti-Aliasing Filter (AAF)	Cauer 8^{th} order		with $f_{cut-off} = 0.4\ f_s$; f_s: output rate
Resolution	24 Bit		data output: 32 Bit Float (24 Bit mantissa)

Isolation

Parameter	Value	Remarks
Isolation	galvanically isolated	
channel-to-case (CHASSIS)	±60 V	test voltage: ±300 V (10 s)
channel to power supply	±60 V	test voltage: ±300 V (10 s)
channel-to-channel	±60 V	test voltage: ±300 V (10 s)

Power supply of the module

Parameter	Value typ.	min. / max.	Remarks
Input supply voltage		7 V to 50 V DC	operating
		9.5 V to 50 V DC	upon power up
			power supply via base unit, fiber converter or UPS module
Power consumption	2 W @ 12 V		sensor supply not loaded
	3 W @ 12 V	<7 W	sensor supply loaded
Isolation	±60 V		to case (CHASSIS), isolation impedance ≥1 MΩ

Pass through power limits for directly connected modules (click-mechanism)

Parameter	Value	Remarks
Max. current	5 A	at 85 °C current rating of click connector to ARGFT modules
	60 W at 12 V DC 120 W at 24 V DC	typ. DC vehicle voltage AC/DC power adaptor and installations

LED

Parameter	Value	Remarks
Power-LED ⓘ		
green	power active	
Status-LED ↻	multicolor	global status of module
green	operating, run	
blue	init, etc.	
magenta	firmware update	
yellow	prepare configuration	
red	error	
Channel-Status-LED	bicolor	status for each channel
off	channel passive	
green	channel active	
red	over-range error	>5% over nominal range

Sensor supply			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Output voltage	15 V, 12 V, 10 V, 7,5 V, 5 V, 4 V, 3.5 V, 3.3 V, 3 V, 2.5 V		referenced to -SUPPLY, arbitrary for each channel
Short-Circuit-Proof	unlimited time		protection for module and each channel
Error of output voltage		±3%	
		0.01%/K·ΔT_a	$\Delta T_a = |T_a-25°C|$, with T_a = ambient temperature
Max. output current	150 mA		
Output power			depending on output current limit
per channel		0.5 W	
Capacitive load	0 to 1000 µF		
Output impedance	0.5 Ω		

Measurement modes

Voltage measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input ranges	±10 V, ±5 V, ±2.5 V, ±1 V to ±25 mV		
Max. over voltage	±60 V		
Input coupling	DC		
Input impedance	1 GΩ		
Gain error			of the measured value
		0.02% +	
		0.001%/K·ΔT_a	$\Delta T_a = |T_a-25°C|$, with T_a = ambient temperature
Offset error			of input range
		0.02% or 10 µV +	whichever is greater
		0.001%/K·ΔT_a	$\Delta T_a = |T_a-25°C|$, with T_a = ambient temperature
Nonlinearity	6 ppm		
Isolation mode rejection ratio (IMRR)	120 dB		50 Hz
Signal-to-Noise Ratio (SNR)			bandwidth = 1 kHz; input ranges:
	107 dB		10 V
	107 dB		5 V
	107 dB		2.5 V
	105 dB		1 V
	104 dB		500 mV
	103 dB		250 mV
	98 dB		100 mV
	93 dB		50 mV
	87 dB		25 mV

Bridge measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input ranges	±1000 mV/V, ±500 mV/V, ±250 mV/V,..,		full bridge
	±500 mV/V, ±250 mV/V, ±100 mV/V,..,		half bridge
	±25 mV/V,..,		quarter bridge
			for excitation voltage ($V_{excitation}$):
	±2.5 mV/V		5 V
	±5 mV/V		2.5 V
	±10 mV/V		1 V
	±25 mV/V		0.5 V
Max. over voltage	±60 V		
Input coupling	DC		

Input impedance
  ±IN
  ±SENSE
	1 GΩ
	10 MΩ		

Gain error			of the measured value
		0.03% +	full and half bridge input ranges ≥ 5 mV/V
		0.05% +	input range = 2.5 mV/V
		0.05% +	quarter bridge, all ranges
		0.001%/K·ΔT_a	$\Delta T_a = |T_a\text{-}25°C|$, with T_a = ambient temperature
Offset error [1]			full and half bridge, of input range
		0.03% + ± 7 µV/V/K·ΔT_a	1000 mV/V, ..., 100 mV/V
		0.03% + ± 0.4 µV/V/K·ΔT_a	50 mV/V, ..., 10 mV/V
		0.05% + ± 0.1 µV/V/K·ΔT_a	5 mV/V, ..., 2.5 mV/V
			$\Delta T_a = |T_a\text{-}25°C|$, with T_a = ambient temperature
Nonlinearity	6 ppm		

[1]   After a bridge balancing process, the offset is nearly zero.

Bridge measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Excitation voltage	5 V, 2.5 V, 1 V, 0.5 V	±0.05%	This tolerance must not be added when calculating total uncertainty. It is fully compensated due to the factory adjustment.
Load regulation range (Compensation of cable resistance by using ±SENSE)	90% to 100%		of excitation voltage $R_{bridge} / (R_{bridge} + R_{cable})$
Load regulation	-0.07 ppm/Ω·R_{cable}		additional gain error: compensation of cable resistance by using ±SENSE-inputs
Bridge resistance	100 Ω to 10 kΩ		
Half bridge completion		0.0005%/K·ΔT_a	ΔT_a=$|T_a$-25°C$|$, with T_a = ambient temperature
Quarter bridge completion	1 kΩ, 350 Ω, 120 Ω	±0.1% +	This tolerance must not be added when calculating total uncertainty. It is fully compensated due to the factory adjustment as well as the bridge balancing process.
Drift		0.0005%/K·ΔT_a	ΔT_a=$|T_a$-25°C$|$, with T_a = ambient temperature
Shunt calibration resistors (integrity check for entire signal chain)	499.5 kΩ, 174.83 kΩ, 59.94 kΩ	±0.12%	R_{bridge}: 1 kΩ 350 Ω 120 Ω
Isolation mode rejection ratio (IMRR)	150 dB		50 Hz, full bridge
Signal-to-Noise Ratio (SNR) [2]	107 dB 107 dB 106 dB 104 dB 103 dB 99 dB 92 dB 87 dB 81 dB		bandwidth = 1 kHz, $V_{excitation}$ = 5 V, full bridge, 120 Ω, input ranges: ±1000 mV/V ±500 mV/V ±250 mV/V ±100 mV/V ±50 mV/V ±25 mV/V ±10 mV/V ±5 mV/V ±2.5 mV/V

2   Add a value of 20 dB · log ($V_{excitation}$/5 V) for bridge excitation voltages different to 5 V.

Operating conditions

Operating conditions		
Parameter	**Value**	**Remarks**
Operating environment	dry, non corrosive environment within specified operating temperature range	
Ingress protection class	IP50	with correctly mounted covers over both module connectors
Pollution degree	2	
Operating temperature range	-40 °C to +85 °C	standard version: without condensation "-EC" version: temporary condensation allowed
Shock- and vibration resistance	IEC 60068-2, IEC 61373 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 certification upon request
Dimensions (L x W x H)	approx. 153 x 40 x 54 mm	including mounting flanges and click mechanism, see mechanical drawings 2
Weight	0.33 kg	

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imc ACADEMY - Training center

The safe handling of measurement devices requires a good knowledge of the system. At our training center, experienced specialists are here to share their knowledge.

E-Mail:	schulung@imc-tm.de
Internet:	https://www.imc-tm.com/service-training/imc-academy

International partners

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