imc ARGUSfit-ENC-6

6 channel measurement amplifier for pulse signals and incremental encoder sensors

The ENC-6 from the imc ARGUS*fit* series is a 6-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.

The module is used as a pulse counter for measuring speed signals supplied by incremental encoders and other sensors with pulse signals. These signals can be used to record the following variables:

- Angle and displacement
- Rotational speed (RPM) and speed
- Frequency
- Time and phase shift
- PWM (duty cycle)
- Event counting
- Digital input status

Highlights

- High sampling rate or data output rate up to 100 kHz
- Measured values based on high-resolution time evaluation with 100 MHz counter clock
- Comprehensive analog signal conditioning: differential input amplifiers, configurable analog filter, adjustable threshold and hysteresis, digital glitch filter, galvanic isolation for ground loop suppression
- 2 galvanically isolated groups, each with 3 channels and an additional index track
- Dual-track evaluation (4 edges) of quadrature encoders with and without missing teeth index function
- Methods for zero position detection: Index signal and missing teeth
- Dual functionality: Digital Input recording function for all available 10 signal tracks, Port or Bit-wise, (with full signal conditioning and configurable level thresholds)
- Multiple trigger options based on all input and output variables
- Extrapolation function for accumulated variables and events
- Isolated sensor supply 5 V / 12 V, for powering transducers
- Robust, small, and compact: clickable into imc ARGUS*fit* systems

Typical applications

Robust measurement technology for mobile or stationary use and for test benches.

- Not only for well-defined TTL signals, but also for reliable use of transducers and sensors with unclean and noisy signals, thanks to sophisticated analog conditioning.
- Incremental encoder sensor (single or dual track, quadrature and/or direction of rotation, w/wo index)

Typical applications

- Sensors with complementary digital output signals (e.g. RS485)
- Passive inductive transducers and sensors with analog output signal
- Speed detection by magnetic pickups and gear wheels with "missing teeth"
- Light barriers
- Torque transducer systems with frequency output signal

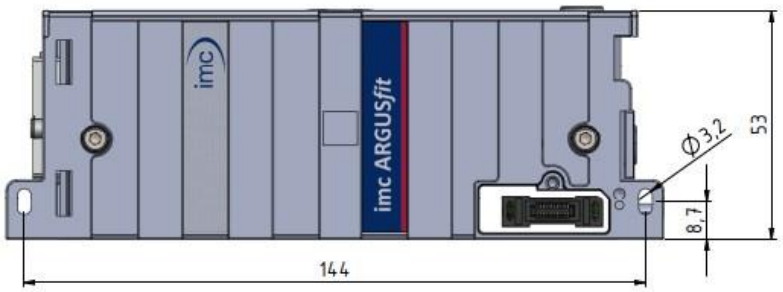
imc ARGUS*fit*: Flexible modular platform for fast measurement systems

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



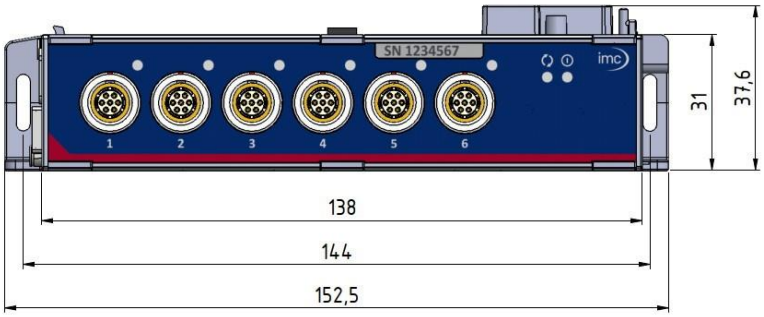
imc ARGUSfit ENC-6

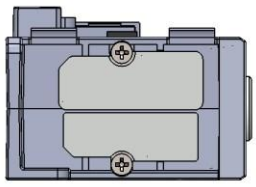
Module shown in standard operating position (terminal connections upwards)

ENC-6 for imc ARGUSfit

Technical Data Sheet

Dimensions





left module panel with parking position for the covers of the module connectors

Overview of available variables

Order Code	properties	article no.
ARGFT/ENC-6	pulse counter (incremental encoder signals) with sensor supply (-40°C... +85°C)	11400208
ARGFT/ENC-6-EC	variant for extended condensation	11410210

Included accessories

Documents
Getting started with imc ARGUS*fit* (one copy per delivery)
Device certificate

Miscellaneous
6x 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

Technical Specs - ARGFT/ENC-6

General

Input, measurement mode		
Parameter	**Value**	**Remarks**
Channels	6	2 isolated channel groups: each with 3 channels, additional index track and sensor supply
Output channels	max. 12	up to 2 derived output quantities for each input channel
Measurement modes	rotational speed, frequency, speed	derived from pulse counting and time measurement
	distance, angle	0...360°, ±180°
	flow, flow rate	scaled to physical size
	PWM	Duty Cycle
	time, phase shift	between definable signal edges
	pulse timing	high-precision time measurement for e.g. NVH function
Signal monitoring	Digital Input Port	Logical state of all 10 input signals as a digital input port for measurement and display, in addition to the set measurement modes
Combination of derived variables	rotational speed & angle speed & distance frequency & event	possible combinations; each derived from the same input signal
Signal encoder types	single-track encoder	without direction detection; with / without zero-pulse; usable on inputs 1 to 6; all relevant modes
	dual-track encoder	with direction detection; with / without zero-pulse; 4-slope evaluation (quadrature) usable on inputs 1Y & 4Y squarewave signal recommended
Zero-pulse (reference position)	separate index signal or missing tooth	fully conditioned index track for each group of 3 channels
Reset	reset once, reset with each zero-impulse	depending on measurement mode
Signal conditioning	differential amplifier	individually for all 6 channels
	impulse filter (analog input signal filter)	
	AC/DC coupling	
	Switching threshold	
	Hysteresis	
	Glitch suppression (digital filter)	

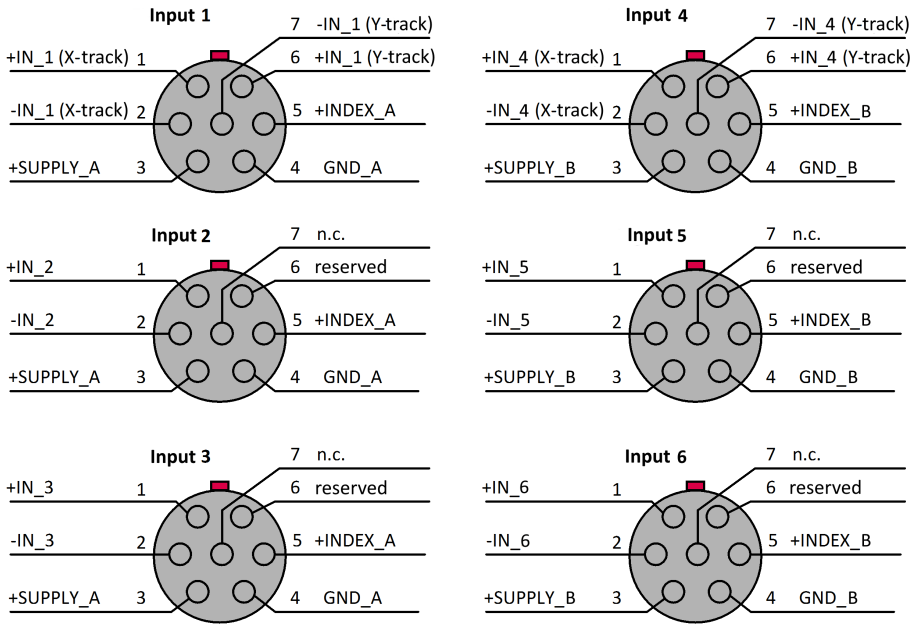
ENC-6 for imc ARGUSfit

Technical Data Sheet

Parameter	Value	Remarks
Scaling of output variables	individual scaling configurable for any physical primary variables: physical unit, scaling factor, offset, interactive taring function (zero)	example: Torque sensors, Nm converted into signal frequency (neutral mean frequency and modulation range)
Digital output filter	low pass	downstream digital filtering of the measured variables, e.g., to smooth out fluctuating speeds
Trigger	trigger events based on all measured variables, including digital port and zero detection	e.g., trigger on index signal or missing tooth, selected angle, speed range, etc.

Connections

Parameter	Value	Remarks
Inputs	compatible socket type	
Measurement input	LEMO.1B 7-pin	recommended plug: FEG.1B.307



Pin	input 1, 4	input 2,3 5,6
1	+IN (X)	+IN
2	-IN (X)	-IN
3	+SUPPLY	+SUPPLY
4	GND	GND
5	+INDEX	+INDEX
6	+IN (Y)	reserved
7	-IN (Y)	n.c.

inputs 1...3: isolated channel group A with INDEX_A, SUPPLY_A, GND_A

inputs 4...6: isolated channel group B with INDEX_B, SUPPLY_B, GND_B

for inputs 1, 4 apply:
also for dual-track encoder (X, Y)

INDEX: single-ended connection (reference: GND_A/B)

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

Note: Since the Index-signal can only be applied at one terminal per channel group, the pins allocated to the index track on the other two terminals must remain unconnected. In order to prevent picking up interference or additional damping of the signal due to cable capacitance, no unconnected lines should be connected to the open pins either.

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Isolation		
Parameter	**Value**	**Remarks**
Isolated channel groups	2	each group has 3 channels, including index and sensor supply (groups are galvanically isolated from each other)
Isolation		channel group (no individual isolation of the channels within the channel group)
analog input and sensor supply	±60 V	
channel groups	±60 V	

Power supply of the module			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input supply voltage		7 V to 50 V DC 9.5 V to 50 V DC	after power up upon power up power supply via base unit, fiber converter or UPS module
Power consumption	1.8 W	2 W 3.5 W	without sensor supply with sensor supply
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 actively configured	
red	over-range error	(in preparation)

Sensor supply				
Parameter	**Value**			**Remarks**
Configuration options	2 selectable settings 5 V / 12 V			selectable for each 3-channel group (A/B): SUPPLY_A/B; groups galvanically isolated
Output voltage	voltage +5 V +12 V	current 100 mA 42 mA	power 0.5 W 0.5 W	total consumption for each 3-channel group (A/B)
Short-circuit protection	unlimited duration			to output voltage reference ground (GND_A/B)
Accuracy of output voltage	2%			at terminals, no load over the entire temperature range

Measurement mode

Analog Signal conditioning			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Number of fully conditioned input tracks	10		2 isolated groups with 3 channels each, 1 out of 3 is equipped with XY-tracks (dual-track), additional index track
Input configuration	differential single-ended		all x- and y-tracks index-track (reference: GND_A/B)
Input-voltage range	±12 V ±50 V		linear range max range
Overvoltage protection	±60 V		permanently
Input coupling	DC, AC		
Input impedance	170 kΩ 8..10 kΩ		diff., linear range (±12V) with ±50 V input voltage
Common mode input voltage	max. ±20 V		referenced to GND_A/B
CMRR	70 dB 60 dB	50 dB 50 dB	DC, 50 Hz 10 kHz
Analog bandwidth	1 MHz		-3 dB
Analog filter (impulse filter)	bypass (without filter) 2 kHz, 20 kHz, 200 kHz		configurable individually per channel Butterworth, 2. order
Detection threshold	-12 V to + 12 V		individually configurable for each channel identical for XY tracks
Switching threshold deviation	100 mV 1%		typ.: 25 °C, max.: across the entire temperature range plus: from the set value
Hysteresis	min. 100 mV		configurable individually per channel
Switching delay	500 ns		signal: 100 mV square wave
Glitch suppression (digital filter)	10 ns ... 10 µs selectable		suppression of false pulses shorter than the selected time constant

Timing resolution		
Parameter	**Value**	**Remarks**
Time resolution	10 ns 100 MHz clock	clock frequency of the counters for primary time measurement
Frequency stability	50 ppm	over full temperature range; 100 MHz system clock, determined by ARGFT base unit. Can be synchronized to external reference (e.g., IRIG-B, GPS)

Sampling rate and Filter of the output channels		
Parameter	**Value**	**Remarks**
Sampling rate	≤100 kHz	individual per channel configurable
Filter		
Type	low pass	
Characteristic	Mean, Butterworth, Bessel, AAF	individual selectable; mean and AAF: adapted automatically, according to selected output rate
Order	8^{th}	
Anti-aliasing filter	Cauer 8^{th} order	with $f_{cut-off} = 0.4 \cdot f_s$; f_s: output rate
Output format		individual per channel configurable
	32 Bit Integer	
	32 Bit Float	with Float: Resolution increase through extrapolation for accumulated values

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 60068-2-27, IEC 61373 IEC 60068-2-64 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