imc CANSASfit-ENC-6

6 channel CAN-based measurement module for pulse signals and incremental encoder sensors

The ENC-6 module from the CANSAS*fit* series is a 6 channel pulse counter unit, suited to measure RPM, based on incremental encoder signals. It is generally capable to interface with any type of sensors that deliver pulse signals and can derive output values such as:

- RPM, speed, angle, displacement
- frequency, events, time, PWM

CANFT/ENC-6

Those calculated and scaled measurement values will be output via CAN-Bus. The sensor signal are subjected to analog signal conditioning with differential amplifiers, filters and configurable detection thresholds, in order to derive reliable and robust digital signals.

Highlights

- Per-channel differential amplifier and filter, adjustable thresholds and hysteresis
- 2 galvanically isolated groups, each with 3 channels and additional index track
- Two-track processing of quadrature encoders with and without index
- Isolated sensor supply 5 V / 12 V to power active transducers
- Processed values based on high-resolution time measurements with 100 MHz
- 1 MHz analog bandwidth, output rate: max. 1 kSps/channel

- High temperature durability, operating temperature: -40°C to +125°C
- Sealed against dust and moisture as per IP65
- Robust, compact and miniaturized
- Click mechanism providing simultaneous mechanical and electrical coupling

Typical applications

Robust test measurement for mobile applications at high temperatures and in rugged environments. Particularly on-board vehicles such as in drive tests, under the engine hood.

- Incremental encoder sensor (single or dual-track encoder, quadrature processing and sense of rotation detection, with and without index)
- Sensors with complementary digital outputs (e.g. RS485)
- Passive inductive transducers with analog output signal
- RPM measurement with magnetic pickup coupling, toothed wheel and missing teeth
- Light barrier

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imc CANSAS*fit* general functionalities and specifications

As a CAN-Bus-based test and measurement tool, the imc CANSAS*fit* series offers a selection of measurement modules which precondition and digitize sensor signals and output these as CAN-messages. Their design, the resistance to extreme environmental conditions and the supported sensors and signals make them particularly suited for applications in the fields of automotive engineering, vehicle testing, road trials and measurements on mobile machines.

imc CANSAS*fit* modules can be mechanically and electrically attached to each other by means of a click mechanism. When the module connectors are open, this is accomplished without the need for tools and without additional connecting cables.

Application fields

- Ideal for vehicle testing and road trials
- Deployable in both distributed installations and centralized measurement setups
- Operable with CAN interfaces and CAN data loggers from either imc or third-party suppliers

Properties and capabilities

Operating conditions:

- Operating temperature: -40°C to +125°C, condensation allowed
- Ingress protection rating: IP65
- Pollution degree (internally): 2; according to IEC 61010-1:2010
- Shock resistance in accordance with MIL STD810F

CAN-Bus:

- Configurable Baud-rate (max. 1 Mbit/s)
- Default configuration ex-factory: Baud rate=500 kbit/s and IDs: Master=2, Slave=3
- Galvanically isolated

Sampling rates:

- Configurable CAN data rate

Power supply:

- Wide range supply voltage, see technical specs
- LEMO.0B.305 sockets (IN / OUT) in conjunction with CAN-Bus signals

Onboard signal processing (depending on module type):

- Low pass filter
- Anti-Aliasing Filter (AAF) automatically adapted to the output rate
- Averaging filter
- Multi functional status LED, global or channel-wise (depending on module type)

Heartbeat-message:

- Configurable with cyclical "life-sign", e.g. for integrity check purposes in test rigs
- Contains checksum for configuration and serial number, e.g. for consistency monitoring (checking of whether the correct module is still being used, for instance in installations undergoing maintenance)

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fit-series: versatile, click-together module block assemblies

Click mechanism:

- Multiple modules connected in a central block: mechanically and electrically (CAN and power supply)
- No need for tools or additional connection cables
- To maintain the degree of protection, the assembly of a complete system consisting of several modules must be carried out in a controlled environment (e.g. also sealing cap for click connectors).

Mounting options:

- Fastening eyelets provided for installation with cable ties, srews or bolts

imc CANSAS*fit* modules connected in a block (click mechanism)

Latching mechanism and protective cover for click mechanism

Software

Configuration:

- Using imc CANSAS software (free of charge), including dbc-export
- Autostart with saved configuration; also pre-configurable at factory

Measurement operation:

- Data logger operation:

  Software: imc STUDIO

  Hardware: imc measurement system with CAN-Interface, e.g. imc ARGUS*fit*, imc BUSDAQ, imc C-SERIES, imc SPARTAN imc CRONOS device family (CRFX, CRC, CRXT, CRSL)

- With any desired CAN-interfaces and CAN-loggers from 3rd-party suppliers

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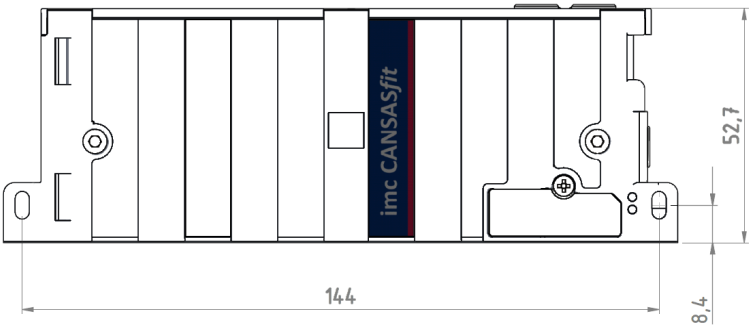
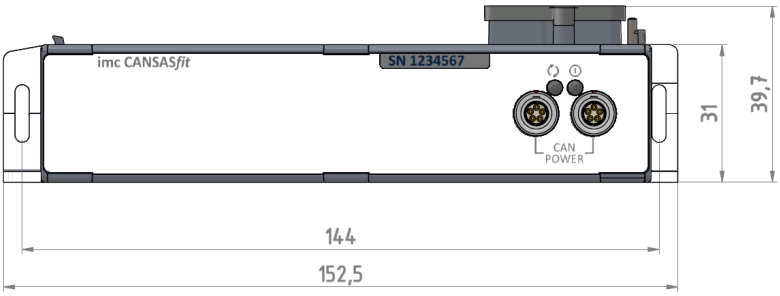
Overview of available variants for ENC-6

Order Code	Signal connection	CAN connection	article number
CANFT/ENC-6	LEMO.1B.307	LEMO.0B.305	12100005

Mechanical drawings with dimensions



Module shown in preferred position of use (terminal connections upwards)



Included accessories

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

Miscellaneous
6x ACC/CAP-LEMO.1B, 13500233 (protective cover for LEMO.1B sockets)
2x ACC/CAP-LEMO.0B, 13500232 (protective cover for LEMO.0B sockets)

Optional accessories

Power supply: AC/DC power adaptor (imc CANSAS*fit* power set)		
CANFT/POWER-P	AC/DC power adaptor, 24 V DC, 60 W, PHOENIX, cable for CAN and power supply, LEMO.0B to DSUB-9, power supply via PHOENIX	12100023

Connector: signals		
ACC/FGG.1B.307.CLAD62ZN	plug for the signal connection (FGG series[1])	13500096
ACC/FEG.1B.307.CLAD62ZN	plug for the signal connection (FEG series[1]), IP54	13500262
ACC/GMF.1B.062.072.EN	protective IP65 cover for the LEMO 1B plug (FGG series)	13500098

CAN: cable [1] and connector		
ACC/FGG.0B.305.CLAD56ZN	plug for the CAN connection (FGG series [2])	13500245
ACC/GMF.0B.035.060.EN	protective IP65 cover for LEMO 0B plug (FGG series [2])	13500272
ACC/CABLE-LEMO-LEMO-2M5	CAN + Power cable 2x LEMO.0B 2.5 m	13500229
ACC/CABLE-LEMO-DSUB-2M5	CAN + Power cable LEMO.0B/DSUB 2.5 m	13500230
ACC/CABLE-LEMO-DSUB-BAN-2M5	CAN + Power cable LEMO.0B/DSUB/PWR power supply via banana, 2.5 m	13500231
ACC/CABLE-LEMO-DSUB-LEMO-1B	CAN + Power cable LEMO.0B/DSUB power supply via LEMO.1B.302 for the 15V/24V power adaptor (e.g. CRPL/AC-ADAPTER-60W): G-coded	13500368
ACC/CABLE-LEMO-DSUB-LEMO-1BE	CAN + Power cable LEMO.0B/DSUB power supply via LEMO.1B.302 for 48 V power adaptor (ACC/AC-ADAP-48-150-1B): E-coded	13500296
ACC/CABLE-LEMO-LEMO-PWR-0M5	CAN + Power cable 2xLEMO.0B 0.5 m, with power supply for separate segments via banana jacks	13500324
ACC/CAP-LEMO.0B	protective IP65 cover for the LEMO 0B socket	13500232
ACC/CAP-LEMO.1B	protective IP65 cover for the LEMO 1B socket	13500233
ACC/CANFT-TERMI	CAN Terminator 120 Ω, LEMO.0B plug	13500242
ACC/CANFT-RESET	CAN Reset plug, manual reset via click connector	13500421

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

imc CANSAS*fit* configuration package (USB)	
CANFT/USB-P	12100018
USB-CAN interface (CAN: DSUB-9, USB 2.0); AC/DC power adaptor, 24 V DC, 60 W, connection via PHOENIX; CAN and power cable LEMO.0B/DSUB Power supply via PHOENIX, 2.5 m; CAN Terminator 120 Ω, LEMO.0B; gender changer (DSUB-9) with integrated CAN terminator; imc CANSAS configuration software (download), including COM library and LabVIEW (TM) VI	

To maintain the degree of protection, the assembly of a complete system consisting of several modules must be carried out in a controlled environment (e.g. also sealing cap for click connectors). Further detailed instructions for handling can be found in "Getting Started" and in the manual for imc CANSAS modules.

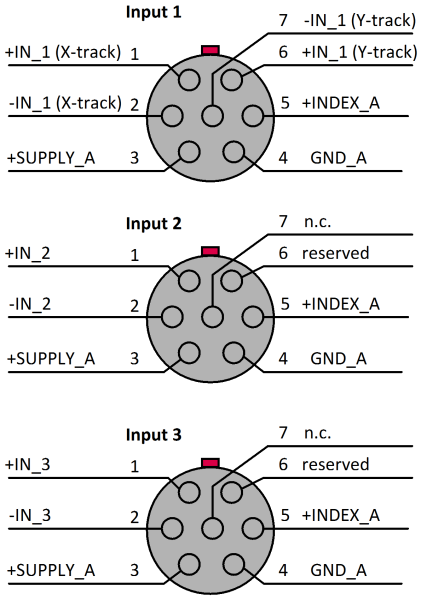
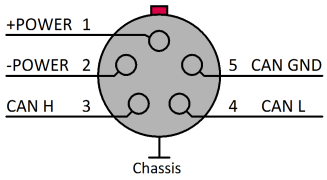
1 other cable lengths available

2 The LEMO plug series FGG and the FEG series are both compatible with the module's terminals.
The FEG plug model has an additional sealing lip which ensures an IP54 grade seal when connected. The protection rating provided by the FGG model when connected is IP50. The measurement module's protection rating remains at IP65. The FGG plug could additionally be equipped with a protection grommet (e.g. 13500098) to achieve the protection rating IP65 when connected.

Technical Specs - imc CANSASfit 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
Measurement modes	RPM (rotational speed) angle velocity displacement frequency event-counter	 differential differential, integrated with zero-impulse differential, integrated
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
Signal conditioning	differential amplifier filter switching threshold hysteresis	individually for all 6 channels

<table>
<tr><th>Parameter</th><th>Value</th><th>Remarks</th></tr>
<tr><td>Inputs
CAN / power supply
Measurement input
Pin configuration:</td><td>compatible socket type
LEMO.0B 5-pin
LEMO.1B 7-pin
 
</td><td>recommended plug:
FEG.0B.305
FEG.1B.307
CAN and power supply:
 
</td></tr>
<tr><td></td><td><table>
<tr><th>Pin</th><th>input
1, 4</th><th>input
2,3 5,6</th></tr>
<tr><td>1</td><td>+IN (X)</td><td>+IN</td></tr>
<tr><td>2</td><td>-IN (X)</td><td>-IN</td></tr>
<tr><td>3</td><td>+SUPPLY</td><td>+SUPPLY</td></tr>
<tr><td>4</td><td>GND</td><td>GND</td></tr>
<tr><td>5</td><td>+INDEX</td><td>+INDEX</td></tr>
<tr><td>6</td><td>+IN (Y)</td><td>reserved</td></tr>
<tr><td>7</td><td>-IN (Y)</td><td>n.c.</td></tr>
</table></td><td>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)</td></tr>
<tr><td>Module connector</td><td>Click connection
(covering caps)</td><td>for the supply and system bus (CAN) of directly connected modules without further cables</td></tr>
</table>

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.

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)
CAN-bus	±60 V	test voltage: ±300 V (10 s)
power supply input	±60 V	test voltage: ±300 V (10 s)
analog input and sensor supply	±60 V	
channel groups	±60 V	

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		
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) 200 Hz, 2 kHz, 20 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

Timing resolution			
Parameter	**Value**		**Remarks**
Time resolution	10 ns 100 MHz clock		clock frequency of the counters for primary time measurement
Frequency stability	<100 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	≤1 kHz	individual per channel configurable
Output format	16/32 Bit Integer	individual per channel configurable

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

Operating conditions

Operating conditions		
Parameter	**Value**	**Remarks**
Ingress protection class	IP65	dust- and splash water proof
Operating temperature range	-40 °C to +125 °C	internal condensation temporarily allowed
Pollution degree	2	
Dimensions (L x W x H)	approx. 153 x 40 x 54 mm	including mounting flanges and click mechanism
Weight	approx. 0.28 kg	

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 under conditions of IP65 (humidity): max. 35 V
Power consumption	1.8 W	3.8 W	without sensor supply
Power supply options	CAN/Power cable or via adjacent module		LEMO.0B, 5-pin module connector (click mechanism)

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Max. number of modules for direct coupling (block size with click mechanism)		
Parameter	**Value**	**Remarks**
Max. number of modules	8	limited by termination of internal CAN-Bus backbone (click junction)
Pass through power limits for directly connected modules (click-mechanism)		
Parameter	**Value**	**Remarks**
Max. current	4 A	at 25 °C current rating of click connector
	-20 mA/K·ΔT_a	derating with higher operating temperatures: T_a; $\Delta T_a = T_a$ -25 °C
Max. power	48 W at 12 V DC 96 W at 24 V DC	equivalent pass through power at 25 °C typ. DC vehicle voltage AC/DC power adaptor and installations
	24 W at 12 V DC 48 W at 24 V DC	at 125 °C

Available power for supply of additional modules via CAN-cable (LEMO.0B, "down stream")		
Parameter	**Value**	**Remarks**
Max. current	6.5 A	at 25 °C current rating of LEMO.0B connection (CAN-IN, CAN-OUT); assuming adequate wire cross section
	-15 mA/K·ΔT_a	derating with higher operating temperatures: T_a; $\Delta T_a = T_a$ -25 °C
Max. power	78 W at 12 V DC 156 W at 24 V DC	equivalent pass through power at 25 °C typ. DC vehicle voltage AC/DC power adaptor and installations
	60 W at 12 V DC 120 W at 24 V DC	at +125 °C

Contact imc

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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.

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