imc CANSASflex-INC4

4 channel CAN-based measurement module for pulse signals and incremental counter sensors

The CAN-Bus measurement module
imc CANSAS*flex*-INC4 is a 4 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, time
- events.

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Those calculated and scaled measurement values will be output via CAN-Bus. The sensor signals 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
- Two-track processing of quadrature encoders with and without index
- Processed values based on resolution time measurements with 32 MHz

Typical applications

- Incremental counter sensor (single or dual-track encoder)
- 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

General imc CANSAS*flex* functions and specifications

As a CAN-bus-based measurement engineering tool, the imc CANSAS*flex* series offers a wide selection of measurement modules which process and digitize sensor signals and output these as CAN-messages.

The modules of the imc CANSAS*flex* series (CANFX) can be joined together mechanically and electrically by means of a latching ("click") mechanism, without the use of any tools nor the need for any extra cables, and also allows the CAN-logger imc BUSDAQ*flex* (BUSFX) to dock on directly. Depending on the module type, they are available in either long (L-), short, or both housing versions.

Besides fixed installations or operation on a laboratory bench, the modules are also designed to fit in a special 19" subrack to provide a convenient solution in test station settings.

Fields of application

- For test rigs, vehicle testing, road trials and all-purpose measurement applications
- Deployable both in decentralized, distributed and in centralized measurement setups
- Operable with CAN-interfaces and CAN-data loggers from either imc or 3rd-party manufacturers

Properties and capabilities

Operating conditions:

- Operating temperature: -40°C to +85°C, condensation allowed
- Shock resistance: 50 g (pk over 5 ms)
- Ingress Protection: IP40 (only with optional protective cover on top of the locking slider, otherwise IP20)

CAN-Bus:

- Configurable Baud rate (max. 1 Mbit/s)
- Default configuration ex-factory: Baud rate=125 kbit/s and IDs: Master=2, Slave=3
- Galvanically isolated
- Built-in terminator resistance, manually switchable

Sampling rates and synchronization:

- Configurable CAN data rate
- Simultaneous sampling of all module's channels, as well as across multiple modules
- Synchronization of multiple modules as well as to a global CAN-logger: based on CAN messages (no Sync-signal required)

Power supply:

- Galvanically isolated power supply input
- DC 10 V to 50 V
- LEMO.0B connector (2-pin); alternative power supply via CAN connector (DSUB-9)

On-board signal processing:

- "Virtual channels": integrated signal processor (DSP) for online processing. Data reduction, filtering, scaling, calculations, threshold monitoring, etc.
- Programmable multi-functional status-LED, supporting linkage to virtual channels

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)

FindMe:

- Identification of a module by means of selective LED flashing (via configuration software; does not occupy any additional CAN messages)

flex-Series: flexible granulation, topology and block assemblies

Click-mechanism:

- Modules joinable to module-blocks: mechanically and electrically connected (CAN and power supply)
- No tools or additional cabling required
- With guide grooves, magnetic catches and locking slider
- Both short and long housing versions joinable: with electrical connection: align on rear side; mechanically only: align on front side
- Direct connection of compatible CAN-logger: imc BUSDAQ*flex*

19" rack solution (subrack):

- Modules designed for insertion into special 19" frames ("boom-box") for installation in test stations
- Rack backplane accommodates the power supply, CAN and slot information (automatically read out configuration information for use in automation software)

Mounting:

- Mountable by means of recessed threaded holes (M3), either individually or jointly as a block
- Rubber bumper rails providing secure placement in laboratory settings
- Various brackets and handles, and DIN top-hat rail mounting kit available as accessories

imc CANSAS*flex* modules connected (Click-mechanism) in a block with imc BUSDAQ*flex* Logger (left)

rear view of this block: CAN, Power supply, Terminator, Locking slider

Software

Configuration:

- Using imc CANSAS software (free of charge), including dbc-export
- Autostart with saved configuration; also pre-configurable at factory
- The module's current configuration can be read out and exported by the software; For transfer of configuration via physical transport of the module; for back tracing and recovery.
- Supports the CANopen® protocol according "CiA® DS 301 V4.0.2" and "CiA® DS 404V1.2"; 4 TPDOs (Transmit Process Data Objects) in INT16, INT32 and FLOAT. See "CANSAS CANopen®" for a detailed description of the supported features and settings.

Measurement operation:

- Data logger operation:
  Software: imc STUDIO
  Hardware: imc measurement system with CAN-Interface, e.g. imc BUSDAQ, imc C-SERIES, imc SPARTAN and imc CRONOS device family (CRFX, CRXT, CRC, CRSL)
- With any desired CAN-interfaces and CAN-loggers from 3rd-party manufacturers

Overview of the available variants for imc CANSASflex-INC4

Order Code	signal connection	option/extra	housing	article number
CANFX/INC4	DSUB-15		S0	12500004
CANFX/L-INC4	DSUB-15		L0	12500015
CANFX/L-INC4-SUPPLY	DSUB-15	sensor supply	L1	12500065
CANFX/L-INC4-L-SUPPLY	LEMO (7-pin)	sensor supply	L1	12500124

Dimensions

front	side view	rear view
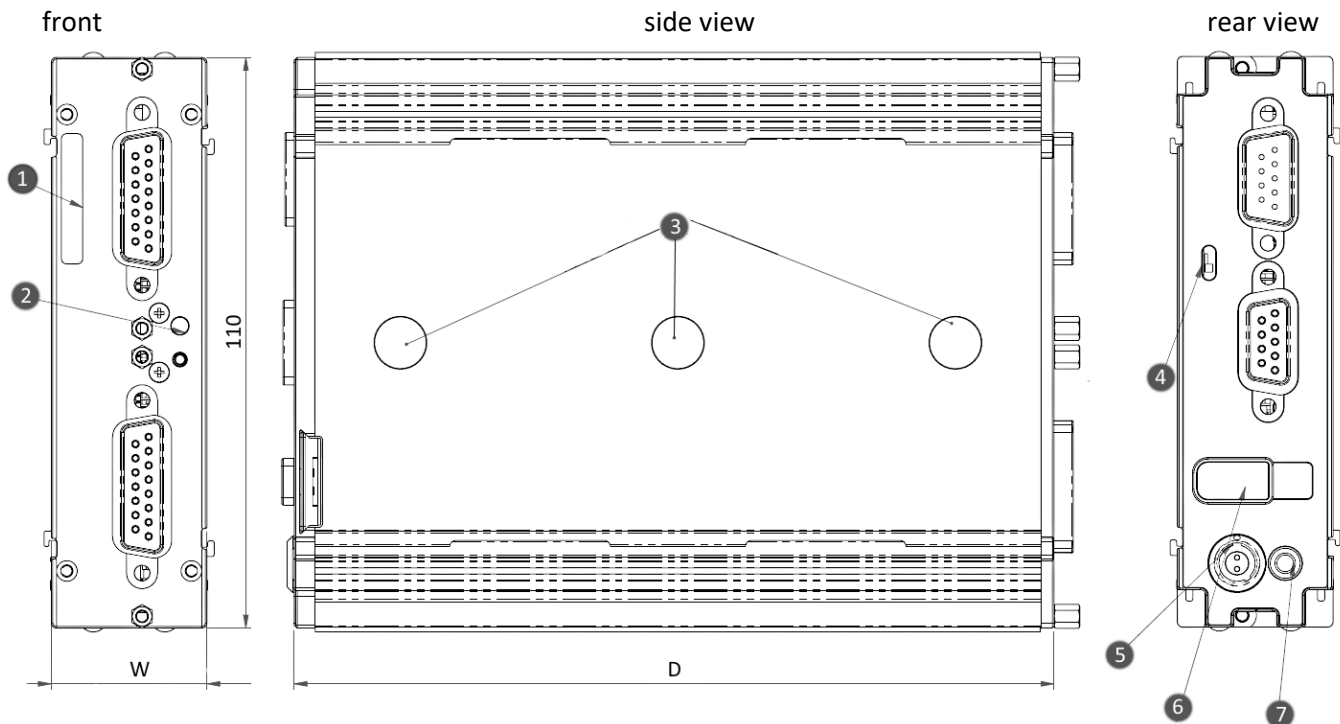
Shown in standard operating orientation: housing type L0; width (W) = 30 mm.

Housing type	S0	S1	S2	L0	L1	L2
W: Width	30 mm	50.3 mm	70.6 mm	30 mm	50.3 mm	70.6 mm
D: Depth	93 mm, with two magnets			146.5 mm, with three magnets		

Legend:

1: Serial number label
2: Status LED (blue / red)

3: magnet
   (depending on model)
4: adjustable CAN terminator

5: supply socket (LEMO)
6: locking slider CAN/supply
7: ground connection M3

Included accessories

- Calibration certificate (PDF) with test equipment verification as per ISO 9001 (manufacturer's calibration certificate)
- Grounding set consisting of: a spring washer S3 (stainless steel), a flat washer (A3.2 DIN 433 A2) and a pan-head screw M3x8 (mounted on the rear panel).
- Getting started with imc CANSAS (one copy per delivery)

Optional accessories

AC/DC power adaptor 110-230V AC (with appropriate LEMO plug)		
ACC/AC-ADAP-24-60-0B	24 V DC, 60 W, LEMO.0B.302	13500246

Power plug		
ACC/POWER-PLUG3	Power connector for DC supply LEMO FGG.0B.302, solder contact, max. 0.34 mm^2	13500033
ACC/CABLE-LEMO-0B-BAN-2 M5	Power supply cable LEMO/banana 2.5 m	13500276

DSUB-9 plug (CAN)		
CAN/RESET	Reset-plug (DSUB-9 female)	10500025
CAN/KABEL-TYP2	CAN-Bus connection cable 2x DSUB-9 1:1, 2 m length	10500027

DSUB-15 plug		
ACC/DSUBM-ENC4	DSUB-15 plug for incremental inputs	13500171
ACC/DSUBM-ENC4-IP65	IP65 sealed version of the plug	13500219

Handle		
CANFX/HANDLE-L	CANFX handle kit (left and right) - long (L)	12500028

Mounting brackets for fixed installations		
CANFX/BRACKET-CON-L	CANFX connection bracket long	12500020
CANFX/RACK	19" Rack	12500094
CANFX/RACK-BLOCK	19" Rack frame for entire block CANFX/BUSFX	12500103

Mounting brackets for DIN Rail		
CANFX/BRACKET-DIN-L0	CANFX DIN Rail mounting bracket - Type L0	12500024
CANFX/BRACKET-DIN-L1	CANFX DIN Rail mounting bracket - Type L1	12500025

Miscellaneous		
CAN/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	10500048
CANFX/RUBBER-1M	silicone strip blue 1 m	12500029
CANFX/COVER-IP40	protective cover on top of the locking slider in compliance with IP40 ingress protection class	12500069
CANFX/USB-P	USB-CAN interface (CAN: DSUB-9, USB 2.0); AC/DC power adaptor,	12500043
24 V DC, 60 W, with LEMO.0B plug; CAN cable, DSUB-9 (F, terminated) - DSUB-9 (M, terminated); CAN reset plug; imc CANSAS configuration software (download)		

Technical Specs - INC4

Input, measurement mode		
Parameter	**Value**	**Remarks**
Inputs	4 + 1 (9 tracks)	4 channels with 2 tracks (X, Y) each 1 index channel, all fully conditioned inputs isolated from CAN-Bus and supply, but not mutually
Measurement modes	RPM (rotational speed) angle velocity displacement time frequency PWM event-counter	differential, integrated, absolute (0°..360°) differential, integrated between selectable edges duty cycle differential, integrated
Signal encoder types	single-track encoder	without direction detection; with / without zero-pulse; usable on inputs 1 to 4; all relevant modes
	dual-track encoder	with direction detection; with / without zero-pulse; 4-slope evaluation (quadrature) usable on inputs 1Y & 4Y
Zero-pulse (reference position)	separate index signal	fully conditioned index track commonly used for 4 channels The connection for the zero-pulse is only led out at CON1.
Signal conditioning	differential amplifier filter detection threshold hysteresis	individually for all channels

Sampling rate, bandwidth, CAN-Bus		
Parameter	**Value**	**Remarks**
Sampling rate (CAN output)	1 kHz / channel (max.)	
Time resolution	33 ns 32 MHz clock	clock frequency of the counter for primary time measurement
Stability of primary oscillator	<100 ppm aging <5 ppm / year	
Resolution of data	16 bit	
CAN-Bus	defined by ISO 11898	
CANopen® mode	"CiA® DS 301 V4.0.2" and "CiA® DS 404V1.2" supports 4 PDOs in INT16, INT32, and FLOAT	

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Technical Data Sheet

General		
Parameter	**Value**	**Remarks**
Isolation		to CHASSIS
CAN-Bus	60 V	nominal; testing: 300 V (10 s)
power supply input	60 V	nominal; testing: 300 V (10 s)
analog input	no isolation	analog reference ground: CHASSIS
Sensor supply	+5 V (±200 mV), 20 mA (max.)	Reference: GND

Analog signal conditioning		
Parameter	**Value**	**Remarks**
Input configuration	differential	all x- and y-tracks
	single-end	index-track
Input voltage range (differential)	±10 V	linear range
	±30 V	maximum, outside of linear range: max. non-linearity error: 300 ns
Overvoltage protection	±60 V	permanently
Input impedance	100 kΩ	
Common mode input voltage	max. ±30 V	
CMRR	70 dB (typ.), 50 dB (min.)	DC, 50 Hz
	60 dB (typ.), 50 dB (min.)	10 kHz
Analog bandwidth	500 kHz	-3 dB (full power)
Analog filter	bypass (without filter), 20 kHz, 2 kHz, 200 Hz	configurable (globally for all channels) Butterworth, 2nd order
Switching threshold	-8 V to +10 V	globally configurable in 0.1 V steps
Hysteresis	0.3 V to 4 V	globally configurable in 0.1 V steps
Gain error	<1%	
Offset	<1%	

Optional sensor supply (CANFX/xx-SUPPLY)				
Parameter	**Value (typ. / max.)**			**Remarks**
Configuration options	7 selectable settings			
Output voltage	voltage	current	net power	set globally for all channels of a module
	+2.5 V	580 mA	1.5 W	
	+5.0 V	580 mA	2.9 W	
	+7.5 V	400 mA	3.0 W	
	+10 V	300 mA	3.0 W	
	+12 V	250 mA	3.0 W	
	+15 V	200 mA	3.0 W	
	+24 V	120 mA	2.9 W	
Short-circuit protection	unlimited duration			to output voltage reference ground
Output voltage accuracy	<0.25% (typ) / <0.5% (max.) <0.9% (max.)			at terminal plugs, no load 25°C; 2.5 V to 24 V over entire temperature range
Capacitive load (max.)	>4000 µF >1000 µF >400 µF			2.5 V to 10 V 12 V, 15 V 24 V

Terminal connections

Parameter	Value	Remarks
Supply input	type: LEMO.0B (2-pin)	compatible with LEMO.EGE.0B.302 multicoded 2 notches for optional individually power supply compatible with connectors FGG.0B.302 (Standard) or FGE.0B.302 (E-coded, 48 V) pin configuration: (1)+SUPPLY, (2)-SUPPLY
Module connector	via locking slider	for power supply and networking (CAN) of directly connected modules (Click-mechanism) without further cables
CAN bus	2x DSUB-9	CAN and power supply CAN_IN (male) bzw. CAN_OUT (female) all signals on both DSUB-9 directly 1:1 connected

Operating conditions

Parameter	Value	Remarks
Ingress protection class	IP40	only with optional protective cover (CANFX/COVER-IP40) on top of the locking slider, otherwise IP20
Operating temperature range	-40°C to 85°C	internal condensation temporarily allowed

Power supply

Parameter	Value typ.	min. / max.	Remarks
Input supply voltage	10 V to 50 V DC		
Power consumption	4 W		INC4
	8 W		INC4-SUPPLY
Module power supply options	power socket (LEMO) CAN socket (DSUB-9) adjacent module		direct connection imc CANSASflex or imc BUSDAQflex

Pass through power limits for directly connected modules (Click-mechanism)		
Parameter	**Value**	**Remarks**
Max. current	8 A	at 25°C current rating of the click connector
	-50 mA/K$\cdot\Delta T_a$	Derating with higher operating temperatures T_a, $\Delta T_a = T_a - 25°C$
Max. power		Equivalent pass through power at 25°C
	96 W at 12 V DC	typ. DC vehicle voltage
	192 W at 24V DC	AC/DC power adaptor or cabinets
	60 W at 12 V DC	at +85°C
	120 W at 24V DC	

Available power for supply of additional modules via CAN-cable (DSUB-9, "down stream")		
Parameter	**Value**	**Remarks**
Max. current	6 A	at 25°C current rating of DSUB-9 connection (CAN-IN, CAN-OUT); assuming adequate wire cross section!
	-30 mA/K$\cdot\Delta T_a$	Derating with higher operating temperatures T_a, $\Delta T_a = T_a - 25°C$
Max. power		Equivalent pass through power at 25°C
	72 W at 12 V DC	typ. DC vehicle voltage
	144 W at 24 V DC	AC/DC power adaptor or cabinets
	50 W at 12 V DC	at +85°C
	100 W at 24 V DC	