

SC16 for imc CANSASflex (CANFX/SC16)

16 channel CAN measurement module for voltage, current (20 mA) and temperature

The imc CANSASflex-SC16 measurement module is a 16 channel CAN bus measurement amplifier that comprises analog conditioning of physical sensor signals, digitization and output via CAN bus. The multiplexed differential inputs allow (depending on the variant) acquisition of:

- Voltage (100 mV to 10 V)
- Current (20 mA sensors)
- Temperature (thermocouple, RTD/PT100)



*imc CANSASflex-SC16
(Fig. similar)*

Module versions with DSUB-15 connectors support all measurement modes. Versions with alternative connectors, such as thermocouple inputs, support only these selected modes.

The module is available in both short and long housing.

Specific techniques aimed at noise and interference suppression (esp. block averaging) allow for very sensitive voltage and temperature measurements even in demanding environments, despite its multiplexed architecture. At a sampling rate of 1 Hz, this guarantees very stable measurements and an effective suppression of noise and aliasing caused by power line interference (50/60 Hz) and higher frequency disturbances.

Even the use of faster sampling rates is supported. However, since this operating mode does not provide full suppression of aliasing by line interference it should be limited to applications with signals of reasonable level and without significant spectral content (with respect to both noise and physical signal) beyond the selected sampling rate.

Highlights

- Measurement range and sampling rates can be set per channel in steps of 1, 2, 5
- Optimized for precise and robust measurement at 1 Hz sampling rate:
with very good suppression of noise, interference and aliasing
- Isolation between channels: ± 15 V
- 24 Bit digitization and internal processing, CAN-output format: 16 Bit
- Optional: adjustable sensor supply (e.g. for active voltage fed sensors)
- Support of imc Plug & Measure:
TEDS (Transducer Electronic Data Sheets, IEEE 1451.4)

Typical applications

- High-precision measurements of voltage and temperature at low sampling rates.

General imc CANSASflex functions and specifications

As a CAN-bus-based measurement engineering tool, the imc CANSASflex 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 CANSASflex 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 BUSDAQflex (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 BUSDAQflex

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 CANSASflex modules connected (Click-mechanism) in a block with imc BUSDAQflex 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

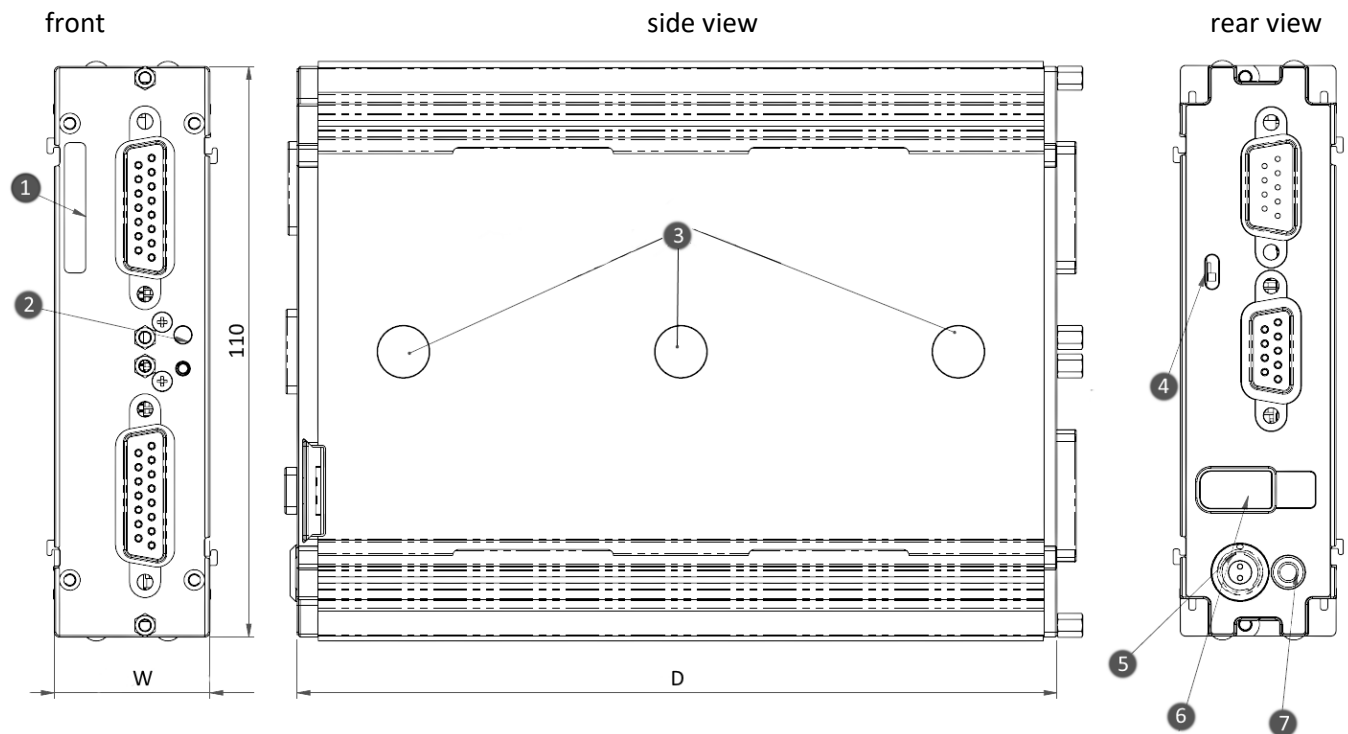
Overview of the available variants for imc CANSASflex-SC16

Order Code	signal connection	option/extra	housing	article number
CANFX/SC16	DSUB-15		S1	12500039
CANFX/L-SC16	DSUB-15		L1	12500040
CANFX/L-SC16-SUPPLY	DSUB-15	Sensor supply	L1	12500054
CANFX/L-SC16-2T	thermocouple terminal connector	type K	L2	12500048
CANFX/L-SC16-2T	thermocouple terminal connector	type T	L2	12500076

Additional-Option (Order option ex-factory)

- Variants with integrated Sensor supply, configurable voltage settings

Dimensions



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 | 3: magnet
(depending on model) | 5: supply socket (LEMO) |
| 2: Status LED (blue / red) | 4: adjustable CAN terminator | 6: locking slider CAN/supply |
| | | 7: ground connection M3 |

Included accessories

Documents	
Getting started with imc CANSAS (one copy per delivery)	
Device certificate	
Miscellaneous	
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).	

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-U4	DSUB-15 plug with screw terminals for 4-channel voltage measurement.	13500166
ACC/DSUBM-TEDS-U4	U4 plug variant with TEDS support, according IEEE 1451.4 for use with imc Plug & Measure	13500189
ACC/DSUBM-I4	DSUB-15 plug with screw terminals for 4-channel current measurement of up to 50 mA (shunt 50 Ω, scaling factor 0.02 A/V)	13500168
ACC/DSUBM-TEDS-I4	I4 plug variant with TEDS support, according IEEE 1451.4 for use with imc Plug & Measure	13500192
ACC/DSUBM-T4	DSUB-15 plug with screw terminals for 4-channel measurement of voltages as well as temperatures with PT100 and thermocouples with integrated cold junction compensation (CJC).	13500167
ACC/DSUBM-TEDS-T4	T4 plug variant with TEDS support, according IEEE 1451.4 for use with imc Plug & Measure	13500190
Handle		
CANFX/HANDLE-S	CANFX handle kit (left and right) - short (S)	12500027
CANFX/HANDLE-L	CANFX handle kit (left and right) - long (L)	12500028
Mounting brackets for fixed installations		
CANFX/BRACKET-CON-S	CANFX connection bracket short	12500019
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-S1	CANFX DIN Rail mounting bracket - Type S1	12500022
CANFX/BRACKET-DIN-L1	CANFX DIN Rail mounting bracket - Type L1	12500025
CANFX/BRACKET-DIN-L2	CANFX DIN Rail mounting bracket - Type L2	12500026

Miscellaneous		
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, 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)	12500043

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.



protective cover left (labeled with "L")



Set consisting of left and right protective cover

Technical Specs - SC16

Parameter	Value	Remarks
Channels	16	4x DSUB-15 with each 4 channels
Measurement mode (DSUB)	voltage measurement current measurement temperature measurement: thermocouple, RTD (PT100)	standard plug (ACC/DSUBM-U4) shunt plug (ACC/DSUBM-I4) thermo plug (ACC/DSUBM-T4)
Measurement mode Thermocouple terminal socket (-2T)	thermocouple type-K	miniature thermocouple terminal
Thermocouple terminal socket (-2T-T)	thermocouple type-T	miniature thermocouple terminal

Sampling rate, Bandwidth, CANopen®, TEDS		
Parameter	Value	Remarks
Sampling rate	max. 500 Hz (2 ms) / channel	maximum allowable input signal frequency: 100 Hz The data rates 500 Hz and 200 Hz are based on a slower working sampling rate and will be interpolated.
Sampling rate, temperature	max. 1 Hz (1 s) / channel	recommended maximum for optimized noise reduction; filter: 12 Hz (-3 dB); -60 dB @ 50 Hz no restrictions for input signal frequency (except for narrow band 0.5 Hz to 12 Hz)
Bandwidth with compensation filter	28 Hz sampling rate / 7	at sampling rate 500 Hz (2 ms), 200 Hz (5 ms) 100 Hz (10 ms) to 2 Hz (500 ms)
Resolution	16 bit	
CANopen® mode	"CiA® DS 301 V4.0.2" and "CiA® DS 404V1.2" supports 4 PDOs in INT16, INT32, and FLOAT	in CANopen® mode: max. 100 Hz (10 ms) / channel
TEDS - Transducer Electronic DataSheets	conformant to IEEE 1451.4 Class II MMI	ACC/DSUBM-TEDS-xxx

General			
Parameter	typ.	min. / max.	Remarks
Block isolation CAN-bus DC supply input	± 60 V	± 60 V	each function block to case (CHASSIS) nominal; testing: 300 V (10 s) nominal; testing: 300 V (10 s)
Max. common-mode input voltage	± 40 V		analog input to case (CHASSIS) nominal rating
Channel isolation	± 40 V ± 15 V		max. voltage between any two arbitrary input pins of different channels; max. fault protection for specified accuracy
Overvoltage protection	± 40 V		differential channel input voltage (long-term)
Input configuration	DC, differential		isolated to: case, supply and CAN-bus
Input impedance (static)	10 M Ω 50 Ω		voltage mode current mode (Shunt plug)
Input current static dynamic on overvoltage condition	2 nA (typ.) 0.2 mA (typ.) 20 nA (typ.) 0.1 μ A	25 nA (max.) 20 mA (max.) 2 μ A (max.) 1 μ A	dynamic input currents: (scanner/multiplexer) settled current at time of sampling peak dynamic input current (typ. @100 mV, max. @10 V) average dynamic input current (typ. @100 mV, max. @10 V) $ V_{in} > 15$ V; or device powered-down
Noise	25 mV _{pk-pk} 0.5 K _{pk-pk} 6 mV _{pk-pk}	5 μ V _{rms} 0.08 K _{rms}	sampling rate: 2 ms, $R_s = 50 \Omega$ range ± 100 mV thermocouple type K sampling rate: 1 s, $R_s = 50 \Omega$
Max. source impedance	5 k Ω		of sensor or signal source
Max. cable length (signal-input)	200 m		100 pF / m
Crosstalk (channel to channel)	< -105 dB		60 Hz, source impedance $R_s = 100 \Omega$, range ± 100 mV
CMRR / IMR	100 dB (50 Hz)		Common-Mode reference: case (CHASSIS) all other channels: CHASSIS

Voltage measurement			
Parameter	Value (typ.)	min. / max.	Remarks
Range	$\pm 10\text{ V}, \pm 5\text{ V} \pm 2\text{ V}, \pm 1\text{ V}$ $\pm 500\text{ mV}, \pm 200\text{ mV}, \pm 100\text{ mV}$		
Gain Error	<0.025 %	<0.05 %	at 25°C
Gain drift	30 ppm/K (typ.)	60 ppm/K (max.)	
Offset	<0.02 %		over entire temperature range
Linearity error	<50 ppm		range $\pm 10\text{ V}$

Current measurement with shunt connector			
Parameter	Value (typ.)	min. / max.	Remarks
Range	$\pm 40\text{ mA}, \pm 20\text{ mA}, \pm 10\text{ mA},$ $\pm 4\text{ mA}, \pm 2\text{ mA}$		
Shunt impedance	50 Ω		
Gain Error	<0.075 %	<0.15 %	at 25°C
Offset	<0.02 %		over entire temperature range

Temperature measurement - Thermocouples			
Parameter	Value (typ.)	min. / max.	Remarks
Measurement modes	R, S, B, J, T, E, K, L, N		
Measurement range	-200°C to +1200°C		type: R, S, B, J, T, E, K, L, N (max. one type per configuration)
Temperature error	$\pm 0.2\text{ K}$	$< \pm 0.5\text{ K}$	-150 °C to max range type: J, T, K, E, L (for other types: see uncertainties of voltage measurements) at sampling rate $\geq 1\text{ s}$ with imc plug ACC/DSUBM-T4 also apply for SC16-2T-x variant
Drift	$\pm 0.02\text{ K/K} \cdot \Delta T_a$		$\Delta T_a = T_a - 25^\circ\text{C} $; ambient temp: T_a
Error of cold junction Compensation		$< \pm 0.15\text{ K}$ $< \pm 0.5\text{ K}$	with imc plug ACC/DSUBM-T4 with thermo socket SC16-2T-x
Drift of cold junction	$\pm 0.001\text{ K/K} \cdot \Delta T_j$		$\Delta T_j = T_j - 25^\circ\text{C} $ cold junction T_j

Temperature measurement - RTD measurement (PT100)				
Parameter	Value (typ.)		min. / max.	Remarks
Measurement range	-200°C to +850°C			mixed configuration with thermocouples supported; Use of thermo-plug provides complete set of terminals for full 4-wire connection scheme; reference current: 410 µA, int. calibrated
Measurement error			<±0.2 K <±0.05 %	-200°C to 850°C, four-wire connection plus percentage of reading (corresponding to equivalent resistance value)
Drift			±0.01 K/K·ΔT _a	ΔT _a = T _a -25°C ; ambient temp: T _a
Optional sensor supply (CANFX/xx-SUPPLY)				
Parameter	Value			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	
Isolation	non isolated			output to case (CHASSIS)
standard				
optional, upon request	isolated			nominal rating: 50 V, test voltage (10 sec): 300 V
Short-circuit protection	unlimited duration			to output voltage reference ground
Accuracy of output voltage	<0.25% (typ.) / <0.5% (max.) <0.9% (max.)			at terminals, no load 25°C; 2.5 V to 24 V over entire temperature range
Max. capacitive load	>4000 µF >1000 µF >300 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	2.6 W	<3 W <7 W	12 V DC, over full temperature range without supply with optional 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
	$-50 \text{ mA/K} \cdot \Delta T_a$	Derating with higher operating temperatures T_a , $\Delta T_a = T_a - 25^\circ\text{C}$
Max. power	96 W at 12 V DC	Equivalent pass through power at 25°C typ. DC vehicle voltage
	192 W at 24V DC	AC/DC power adaptor or cabinets
	60 W at 12 V DC 120 W at 24V DC	at +85°C

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!
	$-30 \text{ mA/K} \cdot \Delta T_a$	Derating with higher operating temperatures T_a , $\Delta T_a = T_a - 25^\circ\text{C}$
Max. power	72 W at 12 V DC	Equivalent pass through power at 25°C typ. DC vehicle voltage
	144 W at 24 V DC	AC/DC power adaptor or cabinets
	50 W at 12 V DC 100 W at 24 V DC	at +85°C