CI8 for imc CANSASflex

Isolated 8-channel CAN measurement module for voltage, current (20 mA) and temperature

The CAN-Bus measurement module imc CANSAS*flex*-CI8 is an analog input module with 8 channels which are individually filtered, amplified and digitized; the module is ideal for the measurement of:

- Voltage (20 mV to 60 V)
- Current (20 mA sensors)
- Temperature (Thermocouples, PT100 or PT1000)
- Resistance

imc CANSASflex-CI8

Highlights

- Channel-wise isolated, galvanically-separated inputs:
  - environments with unclear electrical potential conditions
  - high common mode isolation and ground loop suppression
  - in challenging, electrically polluted environments
- 440 Hz bandwidth with max. 1 kSps/channel sampling rate
- Measurement range and sampling rates can be set per channel in steps of 1, 2, 5
- 24 Bit digitization and internal processing
  CAN-output format: 16 Bit
- Optional: adjustable sensor supply (e.g. for active voltage fed sensors)
- Supports either PT100 or PT1000 (special variant)
- Support of imc Plug & Measure:
  TEDS (Transducer Electronic Data Sheets, IEEE 1451.4)

Typical applications

Electrically robust measurement equipment with optimal suppression of ground loops, independent of common mode voltage levels.

- General voltage signals, including vehicle battery voltages (up to 60 V) and current measurements at external shunts (down to 20 mV)
- Temperature measurement in test station applications as well as in drive testing
- Industrial sensors (standard 20 mA interface) for arbitrary physical variables

imc CANSAS*flex* - General 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*flex*, 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 CANSAS*flex*-CI8

Order Code	signal connection	option/extra	housing	article no.
CANFX/L-CI8	DSUB-15		L1	12500002
CANFX/L-CI8-SUPPLY	DSUB-15	Sensor supply	L1	12500044
CANFX/L-CI8-PT1000	DSUB-15	PT1000	L1	12500060
CANFX/L-CI8-PT1000-SUPPLY	DSUB-15	PT1000, Sensor supply	L1	125000xx
CANFX/L-CI8-BNC	BNC		L1	12500047
CANFX/L-CI8-V-SUPPLY	ITT Veam	Sensor supply	L1	125000xx
CANFX/L-CI8-L	LEMO		L1	12500066
CANFX/L-CI8-L-SUPPLY	LEMO	Sensor supply	L1	12500059
CANFX/L-CI8-2T	thermocouple terminal conn.	type K	L1	12500067

Additional-Option (Order option ex-factory)
- Variants with integrated Sensor supply, configurable voltage settings

Mechanical drawings
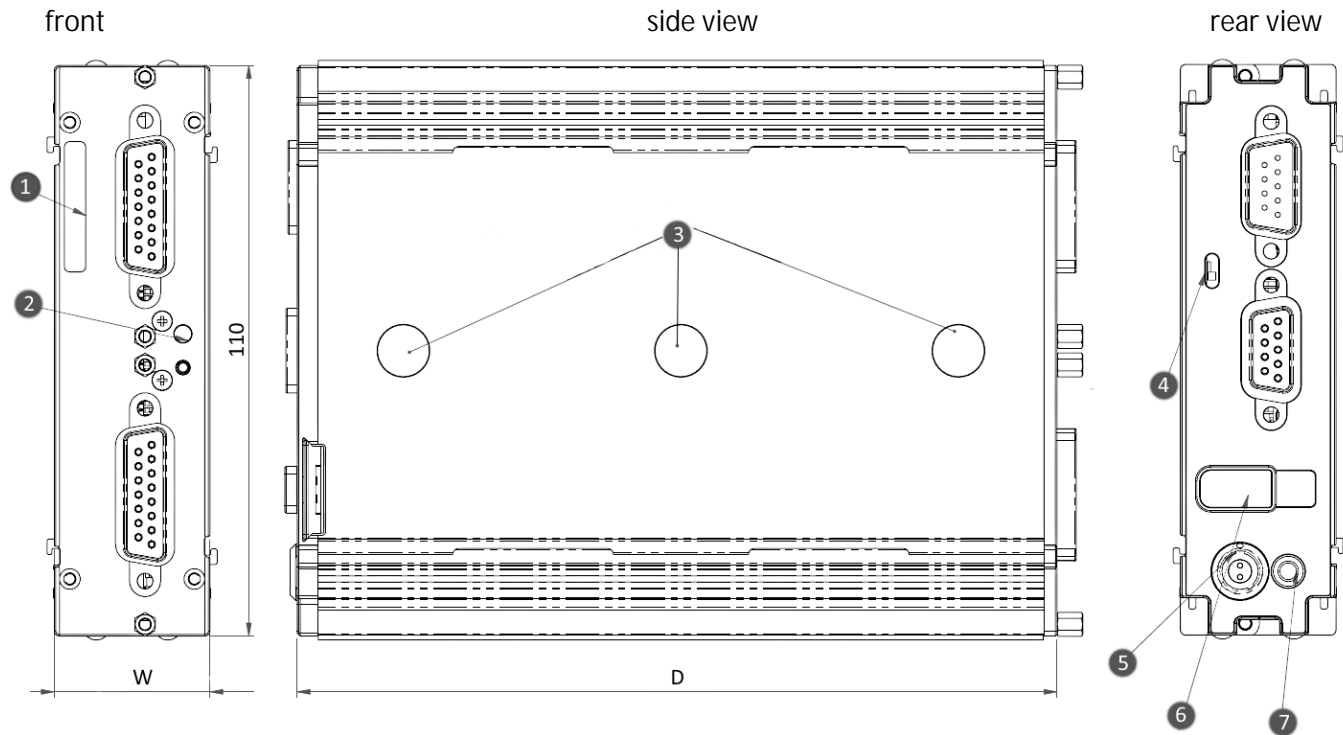
Shown in standard operating orientation: housing type L0; width (W) = 30 mm.

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

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 mm²	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/TERMI	2 CAN bus terminator: 1x DSUB-9 (male), 1x DSUB-9 (female)	10500028
ACC/CABLE-DSUB-DSUB-2M5	cable for CAN and power supply, DSUB-9 (female) to DSUB-9 (male); 2,5 m Länge; wire cross section: 0.25 mm² signals; 1.0 mm² supply	13500414

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 , 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

LEMO and ITT Veam plug (variants)		
ACC/TH-LEM-150	LEMO.1B plug for 1-channel thermocouple measurement with built-in cold-junction compensation (CJC) via PT100	13500086
CAN/UNIST-PT100	ITT Veam plug for 1-channel thermocouple measurement with built-in cold-junction compensation (CJC) via PT100	10500120
CAN/UNIST-7-3	ITT Veam plug for 1-channel, all measurement modes; cable diameter 3 mm	10500059
CAN/UNIST-7-6	ITT Veam plug for 1-channel, all measurement modes; cable diameter 6 mm	10500060

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-L1	CANFX DIN Rail mounting bracket - Type L1	12500025

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,	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)		

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 - CANFX/CI8

Channels, Measurement modes		
Parameter	Value	Remarks
Channels	8	
Measurement modes DSUB	voltage measurement	voltage plug (ACC/DSUBM-U4)
	current measurement	shunt plug (ACC/DSUBM-I4)
	temperature measurement thermocouples	thermo plug (ACC/DSUBM-T4)
	temperature measurement PT100	only with standard variant
	temperature measurement PT1000	only with PT1000 variant
	resistance measurement	not supported with PT1000 variant
	current fed sensors	IEPE/ICP expansion plug (ACC/DSUB-ICP4)
	temperature measurement PT100	CANFX/L-CI8-PT CI8-PT variant does not support thermocouple or current measurement
Measurement modes LEMO and ITT Veam (-L, -V)	voltage measurement	
	current measurement	
	temperature measurement PT100 / PT1000	PT1000 variant upon request
	resistance measurement	not supported with PT1000 variant
Measurement mode Thermocouple terminal socket (-2T)	thermocouple type-K	miniature thermocouple terminal
Measurement mode BNC (-BNC)	voltage measurement	

Sampling rate, bandwidth, filter, TEDS		
Parameter	Value	Remarks
Sampling rate	≤1 kHz	per channel
Bandwidth	440 Hz	-3 dB without lowpass filter
Filter cutoff frequency filter characteristic	1/6 of sampling rate	digital lowpass, Butterworth, Bessel 2.order
TEDS - Transducer Electronic DataSheets	conformant to IEEE 1451.4 Class II MMI	esp. with ACC/DSUBM-TEDS-xx (DS2433)
CANopen® mode	"CiA® DS 301 V4.0.2" and "CiA® DS 404V1.2" supports 4 TPDOs in INT16, INT32, and FLOAT	

General

Parameter	Value typ.	min. / max.	Remarks
Isolation:	galvanically isolated		channel to case (housing, CHASSIS, case) and channel-to-channel
CAN-Bus	± 60 V		nominal; testing voltage: 300 V (10 s)
power supply input	± 60 V		nominal; testing voltage: 300 V (10 s)
analog input	± 60 V		nominal; testing voltage: 300 V (10 s)
Overvoltage protection	± 60 V		differential input voltage (continuous)
	ESD 2 kV		human body model
	transient protection: automotive load dump ISO 7637		R_i=30 Ω, t_d=300 μs, t_r<60 μs
Input coupling	DC		
Input configuration	differential, isolated		galvanically isolated to System-GND (case, CHASSIS)
Input impedance	6.7 M		ranges $\leq \pm 2$ V)
	1 M		ranges $\geq \pm 5$ V an device powered-down
	50		with shunt-plug (ACC/DSUBM-I4) respectively current input (-L, -V)
Input current			
operating conditions		1 nA	at operating conditions
on overvoltage condition		1 mA	$|V_{in}|$ >5 V on ranges <± 5 V or device powered-down
Auxiliary supply			for IEPE/ICP plug
voltage	5 V	± 5%	independent of optional
available current	>0.26 A	>0.2 A	sensor supply, short circuit proof
internal resistance	1.0	<1.2	power per DSUB-plug

Voltage measurement

Parameter	Value typ.	min. / max.	Remarks	
Input ranges	± 60 V, ± 20 V, ± 10 V, ± 5 V, ± 2 V, ± 1 V, ± 500 mV, ± 200 mV, ± 100 mV, ± 50 mV, ± 20 mV			
Gain error	<0.025%	<0.05%	of the measured value, at 25°C	
Gain drift		0.0006%/K$\cdot \Delta T_a$	ranges $\leq \pm 2$ V	over full temperature range
		0.005%/K$\cdot \Delta T_a$	ranges $\geq \pm 5$ V ΔT_a=$|T_a-25°C|$	
Offset error	0.02%	0.05%	of range	
Offset drift		0.00025%/K$\cdot \Delta T_a$	over full temperature range	
Non-linearity	<40 ppm	<60 ppm	range ± 10 V	
Input voltage noise	7.2 μV_{rms}		range ± 20 mV	sampling rate 1 kHz, R_{source} = 0
	36 μV_{pkpk}			
IMR (isolation mode rejection)	>145 dB (50 Hz)		range $\leq \pm 2$ V	R_{source} = 0
	>70 dB (50 Hz)		range $\geq \pm 5$ V	
Channel isolation	>1 G , <40 pF		channel-to-ground / protection ground	
	>1 G , <10 pF		channel-to-channel	

Voltage measurement			
Parameter	Value typ.	min. / max.	Remarks
Channel isolation (crosstalk) channel-to-channel	>165 dB (50 Hz) >92 dB (50 Hz)	range ≤±2 V range ≥±5 V	$R_{source} \leq 100$

Current measurement			
Parameter	Value typ.	min. / max.	Remarks
Current input ranges	±20 mA, ±10 mA		
Shunt impedance	50		DSUB variant: shunt-plug LEMO/ITT Veam variant: internal shunt
Gain error	<0.07% <0.025%	<0.15% <0.05%	DSUB variant LEMO/ITT Veam variant
Offset error		2.4 µA	
Offset drift		$0.00025\%/K \cdot \Delta T_a$	over full temperature range

Temperature measurement - thermocouples			
Parameter	Value typ.	min. / max.	Remarks
Measurement mode	R, S, B, J, T, E, K, L, N		
Measurement range	-50°C to 400°C -50°C to 150°C -270°C to 1370°C		type K
Resolution	0.063 K (1/16K)		
Measurement error		<±1.0 K	type K
Temperature drift	±0.02 K/K$\cdot \Delta T_a$		$\Delta T_a = |T_a - 25°C|$ ambient temperature T_a
Error of cold junction compensation temperature drift	±0.001 K/K$\cdot \Delta T_j$	<±0.15 K <±0.5 K	ACC/DSUBM-T4 variant CI8-2T $\Delta T_j = |T_j - 25°C|$ cold junction temperature T_j

Temperature measurement – RTD (PT100/ PT1000)		
Parameter	Value	Remarks
Measurement modes	PT100 PT1000	standard variant special variant only: PT1000 instead of PT100 mode
Measurement range	-50°C to +150°C -200°C to +850°C	
Resolution	0.063 K (1/16 K)	
Measurement error	<±0.2 K <±0.05%	−200°C to +850°C, 4-wire connection corresponding resistance
Temperature drift	±0.01 K/K$\cdot \Delta T_a$	$\Delta T_a = |T_a - 25°C|$; ambient temp. T_a
Sensor feed (PT100 and resistance measurement)	250 µA	
Sensor feed (PT1000 variant)	50 µA	special variant PT1000

Resistance measurement

Parameter	Value	Remarks
Measurement range	1 k , 500 , 250 , 150	for variant with DSUB-15 sockets: max. usable range 500 (limited voltage swing of reference current source) with PT1000 variant there is no resistance measurement available
Measurement error	0.06 <0.05%	4-wire measurement plus of reading
Temperature drift	±0.004 /K· ΔT_a	$\Delta T_a = |T_a - 25°C|$; 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				
standard	non isolated			output to case (CHASSIS)
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		<5.5 W	without supply
		<10 W	with optional supply
Module power supply options	power socket (LEMO) CAN socket (DSUB-9) adjacent module		direct connection imc CANSAS*flex* or imc BUSDAQ*flex*

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·ΔT_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 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 mA/K·ΔT_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 100 W at 24 V DC	at +85°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.

E-Mail: schulung@imc-tm.de
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International partners

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