Analog and digital outputs for imc CRONOSflex

Modules providing control and actuating outputs for control applications

Data Sheet Version 1.4

This family of modules provides output of analog control and actuator signals on 8 channels. The outputs can be defined as the results of live calculations performed by imc Online FAMOS on combinations of measurement channels.

imc CRONOS*flex* Module

Highlights DAC

- ±10 V output voltage levels with max. ±10 mA drive current
- ensured startup level 0 V without undefined transient states
- short-circuit proof against ground
- up to 50 kHz output rate

Besides this DAC module there is a combined "Double-Module" with additional 16 digital outputs (DO-16-HC) available. The digital outputs provide isolated control signals with high output current capabilities. The signals' states can be generated by imc Online FAMOS as the result of live calculations or be assigned to states of the trigger machine.

Highlights DO-16-HC

- Galvanically isolated 8 Bit groups
- compatible with 5 V and 24 V Volt output level
- Configurable driver modes (Open Drain / Open Source / Totem Pole)
- 0.7 A / Bit drive current (sink and source)

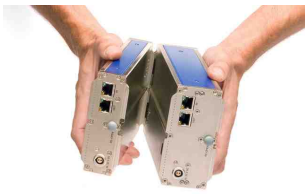
This "Double-Module" acts as two logical modules with their respective IDs displayed on two 7-segment displays.

imc CRONOSflex - Frameless expansion, flexible modularity

An imc CRONOS*flex* system is composed of a base unit (CRFX-400 / CRFX-2000G) and one or more modules. These modules are designed to be directly connected to one another.

The imc Click Mechanism and extruded aluminum case provide a firm mechanical and electrical connection. As a result, no mainframe or rack is needed.

In addition, when a module is added it is automatically recognized by the software displaying its dynamically assigned ID on the front of the module.



imc Click Mechanism

imc CRONOS*flex* distributed system

Alternatively, connection can be made by means of standard Ethernet cables (RJ45, CAT5), thus creating a spatially distributed system. imc CRONOS*flex* Modules can be operated without the base unit when used as components within an EtherCAT-based automation system operating as EtherCAT slaves with full CANopen over EtherCAT (CoE) support.

Overview of the available variants

Order Code	DAC	DO	properties	article no.
CRFX/DAC-8	8	-	Single-module	1190092
CRFX/DAC-8-ET	8	-	extended environmental range	1191050
CRFX/DO-16-HC-DAC-8	8	16	Double-module	1190102

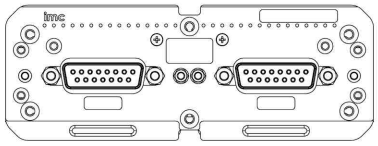
Order Code	DAC	DO	properties	article no.
CRFX/DO-16-HC-DAC-8-ET	8	16	extended environmental range	1191064

Terminal connection

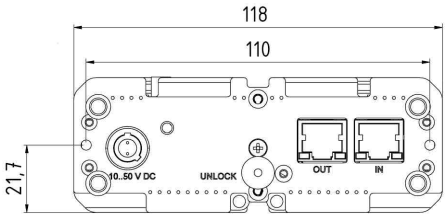
- Outputs: DSUB-15
- System bus (EtherCAT): 2x network plugs RJ45
- Power supply: LEMO.EGE.1B.302 (female) multicoded
- Module connector: 2x 20 pin (System bus and power supply)

Mechanical drawings with dimensions

- Single-module

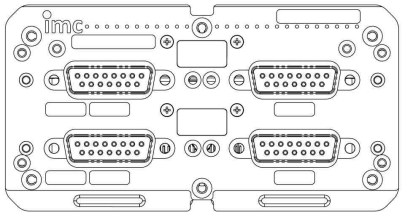


front view

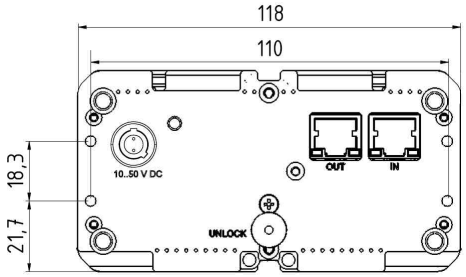


rear view

- Double-module



front view



rear view

Module power supply options

- Direct connection (LEMO.EGE.1B.302 power socket)
- Adjacent module (module connector / imc Click Mechanism)
- EtherCAT network cable: Power over EtherCAT (PoE)

For further details refer to the power options documentation.

Included accessories

DAC-8

• ACC/DSUBM-DAC4	DSUB-15 plug with screw terminals for each 4 analog outputs	1350177

DO-16-HC-DAC-8

• ACC/DSUBM-DO-HC-8	DSUB-15 plug with screw terminals for each 8 Bit	1350198
• ACC/DSUBM-DAC4	DSUB-15 plug with screw terminals for each 4 analog outputs	1350177

Complete set of plugs for each module provided

Optional accessories / expansions

AC/DC power adapter 110-230 VAC 50-60 Hz (with appropriate LEMO.1B.302 plug)

• 24 V DC / 60 W	CRPL/AC-ADAPTER-60W-1B	1080066
• 24 V DC / 150 W	ACC/AC-ADAPTER-150W-1B	1350139
• 48 V DC / 150 W	ACC/AC-ADAP-48-150-1B	1350148

Power connectors

• ACC/POWER-PLUG-5	Power connector for DC supply LEMO FGE.1B.302 plug (male, E-coded: 2 coding keys)	1350150
• CRFX/MODUL-PP-90	Power connector for DC supply 90° angular LEMO.FHE.1B.302 plug (male, E-coded: 2 coding keys)	1190074

Supply module (Power Handle)

• CRFX/HANDLE-POWER-L	Handle with system power supply 50 V 100 W, without UPS	1190058
• CRFX/HANDLE-UPS-L	Handle with system power supply 50 V 100 W, UPS with lead-gel battery	1190043
• CRFX/HANDLE-LI-IO-L	Handle with system power supply 50 V 100 W, UPS with Li-Ion battery	1190010

Passive-Handle

• CRFX/HANDLE-L	standard unpowered left handle	1190008
• CRFX/HANDLE-R	standard unpowered right handle	1190007

Mounting brackets for fixed installations

• CRFX/BRACKET-90	mounting bracket 90°	1190068
• CRFX/BRACKET-180	mounting bracket 180°	1190069
• CRFX/BRACKET-BACK	rear panel mounting element	1190070
• CRFX/BRACKET-CON	assembly element for 2 modules	1190071
• CRFX/RACK	19" RACK for imc CRONOS*flex* Modules	1190066
• CRFX/BRACKET-RACK	mounting element in the RACK	1190072

DAC-8

Parameter	Value typ.	min. / max.	Remarks
Channels	8		
Output level	±10 V		
Load current		max. ±10 mA	short circuit protection
Resolution	16 bit		
Linearity		max. 4 LSB	14-bit no missing codes
Max. output rate	50 kHz		
Analog bandwidth	50 kHz		-3 dB, low-pass 2nd order
Additional system delay	typ. 400 µs ± 100 µs		delay from setting value (imc Online FAMOS) to analog output
Accuracy	±4 LSB (16 bit)		25°C
Offset error	<10 mV	<17 mV	25°C
Offset drift	0.06 mV / K		
Total offset error		<20 mV	over entire temperature range
Gain error	<0.29%		25°C
Gain drift	25 ppm / K		
Total gain error		<0.8%	over entire temperature range
Block isolation	60 V		DAC outputs and the driver units isolated from the housing (CHASSIS, PE)
Isolation impedance	500 kΩ || 1 nF		
Internal reference ground	AGND		all channels with one common, galvanically connected reference ground
External reference ground	CHASSIS, metal housing		DAC outputs as one unit (8 channels), galvanically isolated from housing
Terminal connection	DSUB-15 / 4 Bit		ACC/DSUB(M)-DAC-4

Note

Block isolation for improved suppression of ground loops and related interference. Does not constitute channel-wise individual isolation. Not rated nor intended for safety of equipment and personnel.

DO-16-HC

Parameter	Value		Remarks
Channels	16		groups of 8 Bit, isolated, common reference potential (“LCOM“) for each group
Isolation strength	±50 V		to system ground (housing, CHASSIS, PE) and between groups of 8 Bit
Output configuration	Totem Pole (push-pull) Open Drain (LowSide) Open Source (HighSide)		configurable at DSUB with “OPDRN” – pin: “OPDRN”: wire jumper to “LCOM” “OPDRN”: open “OPDRN”: 10 kΩ-resistor to “LCOM”
Output level	max. U_{ext} = 8 V to 28 V *or* TTL / CMOS 5 V *or* Open-Drain (max. 28 V)		connection of an external supply voltage U_{ext} to “HCOM”, (Totem Pole or Open-Source) by means of internal isolated supply voltage and external pull-up-resistors (with 5 V, only Open-Drain configuration supported, no Totem-Pole / push-pull) external supply not required for Open-Drain operation
Max. output current (typ.) Totem Pole (8 V to 28 V) Open Source (8 V to 28 V) Open Drain (max. 28 V) open-drain with internal 5 V supply	HIGH 0.7 A 0.7 A --- 	LOW 0.7 A --- 0.7 A 20 mA	no external clamping diode required for inductive load switching
Output impedance	0.5 Ω		sink and source
Output voltage	HIGH U_{ext} -0.5 Ω * I_{high}	LOW 0.5 Ω * I_{low}	with load current: I_{high} and I_{low} ≤0.7 A
Internal supply voltage, available at user pin "HCOM"	5 V, 160 mA isolated		per 8-bit group; VCC_int = 5 V, decoupled from U_{ext} by diodes on HCOM
Protection mechanisms	short circuit thermal overload capacitive load (surge) inductive load (load dump)		quick response current limiting: 1.4 A (typ.), 2 A (max.) unlimited duration current limiting voltage limiting
State upon system power-up Activation of the output stage Connection of internal 5 V supply to contacts	high impedance (High-Z) upon preparation of measurement upon preparation of measurement		Independent of output configuration with selectable initial states (High / Low) in the selected output configuration VCC_int = 5 V via diodes at HCOM
Switching time	<300 µs		
Additional system delay	typ. 400 µs ±100 µs		Delay, until the value (imc Online FAMOS) is available for output

Parameter	Value	Remarks
Terminal connection	DSUB-15 / 8 Bit	DSUB-15 connector (ACC/DSUBM-DO-HC-8) with high current capacity wiring recommended (HCOM / LCOM!)

General technical data

Power supply of the module			
Parameter	**Value (typ.)**	**min. / max.**	**Remarks**
Input supply voltage	10 V to 50 V DC		
Power consumption	7,3 W	11 W	CRFX/DO-16-HC-DAC-8
	6,5 W	9 W	CRFX/DAC-8
Isolation	60 V		nominal isolation specification of the supply input
Power-over EtherCAT (PoE)	minimal 42 V DC necessary		supply via EtherCAT network cable

Terminal connections		
EtherCAT connection	2x RJ45	system bus for distributed imc CRONOSflex components
Input supply plug	LEMO.EGE.1B.302	multicoded 2 notches, for optional individually power supply
Module connector	2x 20 pin	direct connection of modules (click) supply and system bus

Pass through power limits	
Directly connected (clicked) imc CRONOS*flex* Modules	3.1 A (maximum current) Equivalent power with chosen DC power input: • 148.8 W @ 48 V DC (e.g. AC/DC line adapter) • 74.4 W @ 24 V DC (e.g. AC/DC line adapter) • 37.2 W @ 12 V DC (typical vehicle supplied DC input)
Power over EtherCAT (PoE) for remote imc CRONOS*flex* Modules	350 mA (maximum current) Equivalent power with chosen DC power input: • 17.5 W @ 50 V DC (e.g. Power Handle) • 16.8 W @ 48 V DC (e.g. AC/DC line adapter) • 14.7 W @ 42 V DC (minimum voltage for PoE) Note: minimum system power of 42 V DC required for PoE

Operating conditions	
Operating environment (standard)	dry, non corrosive environment within specified temperature range
Ingress Protection Rating	IP20
Operating temperature range (standard)	-10°C to +55°C no condensation
Extended environmental range (optional)	-40°C to +85°C with condensation
Shock- and Vibration resistance	IEC 60068-2-27, IEC 61373 Category 1, Class A and B
Extended Shock- and Vibration resistance (special order)	MIL-STD-810F Rail Cargo Vibration Exposure U.S. Highway Truck Vibration Exposure