Analog and digital outputs for imc CRONOSflex

Modules providing control and actuating outputs for control applications

CRFX/DAC-8-BNC

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 in combinations with measurement channels.

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 5 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.

CRFX/DO-16-HC-DAC-8

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.

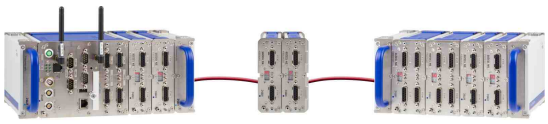
imc CRONOS*flex* - Frameless expansion, flexible modularity

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

imc Click Mechanism

An imc CRONOS*flex* system uses EtherCAT as an "internal" system bus for connecting various modules to the main base unit (CRFX-400 / CRFX-2000G). With the system bus, all imc CRONOS*flex* modules are guaranteed to be synchronized with each other. This allows various modules to be either connected in one central block or connected via standard network cable in a spatially distributed system.

Alternatively, connection can be made by means of standard Ethernet cables (RJ45, CAT5), thus creating a spatially distributed system.



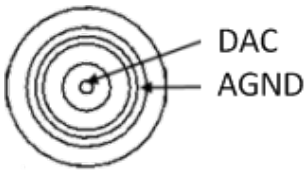
CRFX distributed system

Overview of the available variants

Order Code	DAC	DO	properties	article no.
CRFX/DAC-8	8	-	single-module	11900092
CRFX/DAC-8-ET	8	-	extended environmental range	11910050
CRFX/DAC-8-BNC	8	-	single-module with BNC connectors	11900175
CRFX/DAC-8-BNC-ET	8	-	extended environmental range	-
CRFX/DO-16-HC-DAC-8	8	16	double-module	11900102
CRFX/DO-16-HC-DAC-8-ET	8	16	extended environmental range	11910064

Terminal connection

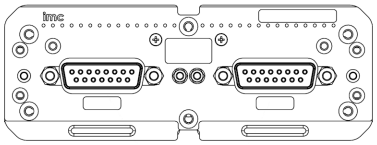
- Outputs: DSUB-15 or BNC only with CRFX/DAC-8-BNC
- System bus (EtherCAT): 2x network plugs RJ45
- Power supply: LEMO.EGE.1B.302 (female) multicoded
- Module connector: 2x 20 pin (System bus and power supply)

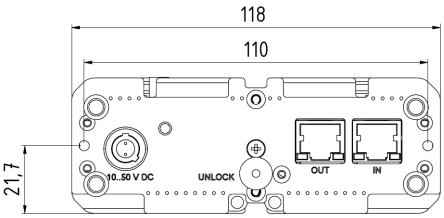


DAC-8-BNC configuration

Mechanical drawings with dimensions

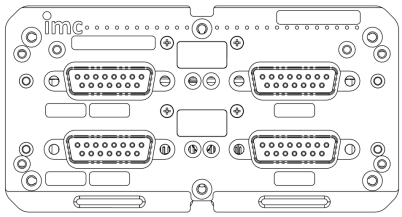
- Single-module


front view

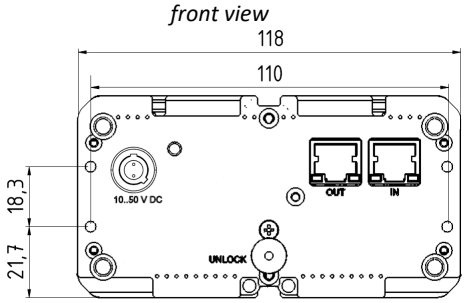


rear view

- 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 (PoEC)

For further details refer to the power options documentation.

Included accessories

for the DAC-8 with DSUB-15 sockets

• ACC/DSUBM-DAC4	DSUB-15 plug with screw terminals for each 4 analog outputs	13500177

for the DO-16-HC-DAC-8 variant

• ACC/DSUBM-DO-HC-8	DSUB-15 plug with screw terminals for each 8 Bit	13500198
• ACC/DSUBM-DAC4	DSUB-15 plug with screw terminals for each 4 analog outputs	13500177

Complete set of plugs for each module provided

Miscellaneous
Test certificate
Getting started witch imc CRONOS*flex* (one copy per delivery)

Optional accessories

AC/DC power adaptor 110-230 VAC 50-60 Hz (with appropriate LEMO.1B.302 plug)		article no.
48 V DC / 150 W	ACC/AC-ADAP-48-150-1B	13500148
24 V DC / 60 W	CRPL/AC-ADAPTER-60W-1B	10800066

Power plugs		
ACC/POWER-PLUG-5	Power plug for DC supply LEMO.FGE.1B.302 plug (male, E-coded: 2 coding keys)	13500150
CRFX/MODUL-PP-90	Power plug for DC supply 90° angular LEMO.FHE.1B.302 plug (male, E-coded: 2 coding keys)	11900074

Supply module (Power Handle)		article no.
CRFX/HANDLE-POWER-L	Handle with system power supply 50 V 100 W, without UPS	11900058
CRFX/HANDLE-UPS-L	Handle with system power supply 50 V 100 W, UPS with lead-gel battery	11900043
CRFX/HANDLE-LI-IO-L	Handle with system power supply 50 V 100 W, UPS with Li-Ion battery	11900010

Passive-Handle		
CRFX/HANDLE-L	standard unpowered left handle	11900008
CRFX/HANDLE-R	standard unpowered right handle	11900007

Mounting bracket for increased stability (recommended for lifetime and robustness)		
CRFX/BRACKET-CON	assembly element for 2 modules	11900071

Mounting brackets for fixed installations		
CRFX/BRACKET-90	mounting bracket 90°	11900068
CRFX/BRACKET-180	mounting bracket 180°	11900069
CRFX/BRACKET-BACK	rear panel mounting element	11900070
CRFX/RACK	19" RACK for imc CRONOS*flex* Modules	11900066
CRFX/BRACKET-RACK	mounting element in the RACK	11900072

Miscellaneous
Report set of function test for each device

DAC-8

Parameter	Value typ.	min. / max.	Remarks
Outputs	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	5 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 BNC		standard CRFX/DAC-8-BNC, CRSL/DAC-8-BNC

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
Terminal connection	DSUB-15		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(-BNC)
Isolation	60 V		nominal isolation specification of the supply input
Power-over EtherCAT (PoEC)	minimal 42 V DC necessary		supply via EtherCAT network cable

Terminal connections		
EtherCAT connection	2x RJ45	system bus for distributed imc CRONOS*flex* 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: • 149 W @ 48 V DC (e.g. AC/DC line adaptor) • 37 W @ 12 V DC (typical vehicle supplied DC input)
Power over EtherCAT (PoEC) 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 adaptor) • 14.7 W @ 42 V DC (minimum voltage for PoEC) Note: minimum system power of 42 V DC required for PoEC

Operating conditions		
Parameter	**Value**	**Remarks**
Operating environment	dry, non corrosive environment within specified operating temperature range	
Rel. humidity	80% up to 31°C, above 31°C: linear declining to50%	according IEC 61010-1
Ingress protection rating	IP20	
Pollution degree	2	
Operating temperature (standard)	-10°C to +55°C	without condensation
Operating temperature (extended: "-ET" version)	-40°C to +85°C	condensation temporarily allowed
Shock- and vibration resistance	IEC 61373, IEC 60068-2-27 IEC 60062-2-64 category 1, class A and B MIL-STD-810 Rail Cargo Vibration Exposure U.S. Highway Truck Vibration Exposure	
Extended shock- and vibration resistance	upon request	specific tests or certifications upon request
Dimensions (W x H x D)	single module: 43.3 x 118 x 186 mm double module: 61.6 x 118 x 186 mm	