AO420FMC

4 Channel Simultaneous Analog Output Module

Product Description

- Standard LPC FMC Module or D-TACQ ELF Module
- 4 Channels of Simultaneous Analog output
- Up to 1 MSPS/channel update rate
- Standard configuration: 16 bit resolution, 20 bit option
- -LLC with higher frequency reconstruction filter to optimise step response in control applications

Module Key Features

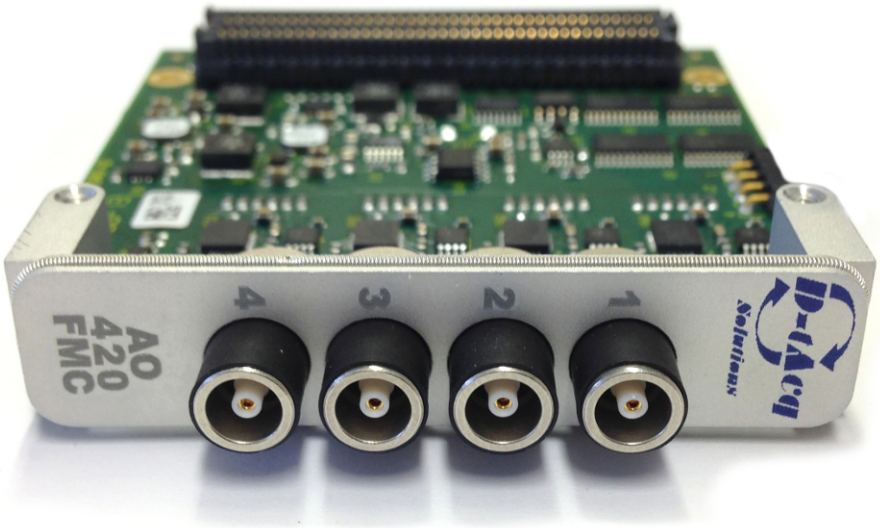
- Ideal for control applications
- Compatible with all D-TACQ Carriers
- Fully compliant with VITA-57, FMC-LPC
- Range of output modes. DC, AWG

Platform Key Features

D-TACQ supplies a complete working Intelligent DAQ Appliance providing:

- FPGA based system with a range of flexible and customisable features
- Microprocessor system running open source Linux
- Comprehensive API provided in Python
- Onboard EPICS IOC for rapid integration

Please contact info@d-tacq.com for details on the above system integration options.



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1 Product Description

1. AO420FMC is a 4 channel simultaneous analog output module.
2. Standard configuration: 4 channels, 16-bit resolution, 1 MSPS/channel.
3. Analog voltage outputs on single pin LEMO Connectors with 20 mA/channel drive.
4. Per channel programmable output range, see Section 3.1.
   - ±10V
   - ±5V
   - ±2.5V is available when used with D-TACQ Carriers.
5. Standard reconstruction filter at 50kHz. Also available in a Low-Latency Control configuration at 250kHz. Please contact info@d-tacq.com for custom options.
6. DC and AWG modes.

1.1 Product Variants

- AO420FMC : 4 channels, 16 bit resolution, 1000kSPS/channel, 50 kHz Butterworth Reconstruction Filter.
- AO420FMC-LLC* : 4 channels, 16 bit resolution, 1000kSPS/channel, 250kHz Bessel Reconstruction Filter.
- AO420FMC-20* : 4 channels, 20 bit resolution, 1000kSPS/channel, 50 kHz Butterworth Reconstruction Filter.

  * Special Build : MOQ and/or longer lead time may apply.

Note: FMC versions of the module include an additional connector to be used as an External Clock for the module see Section 2.3 for details.

1.2 Applications

- Instrumentation applications, control and monitoring.

1.3 Carrier Compatibility

The FMC module standard, adds user IO to carrier modules fitted with FPGA resource. D-TACQ recommends carriers based on the Xilinx ZYNQ system on chip, combining FPGA resource with a dual-core ARM Cortex A9 and gigabit Ethernet see Module Carriers on the D-TACQ website.

Compatible carriers include:

- D-TACQ ACQ1001 : D-TACQ single site FMC/ELF carrier, ZYNQ Z7020
- D-TACQ ACQ1002 : D-TACQ dual site FMC/ELF carrier, ZYNQ Z7020
- D-TACQ ACQ2106 : D-TACQ 6 site ELF carrier, ZYNQ Z7030
- D-TACQ ACQ2206 : D-TACQ 6 site ELF carrier, ZYNQ Z7030
- D-TACQ ACQ1102 : D-TACQ 2 site FMC/ELF carrier, Z7030
- DAMC-FMC1Z7IO + D-TACQ ACQ400-MTCA-RTM-2 : 2 site ELF + 1 site FMC carrier, ZYNQ Z7030/7035

D-TACQ supplies a complete working Intelligent DAQ Appliance including programmable logic and microprocessor system running Linux.

2 Physical

2.1 Module Outline

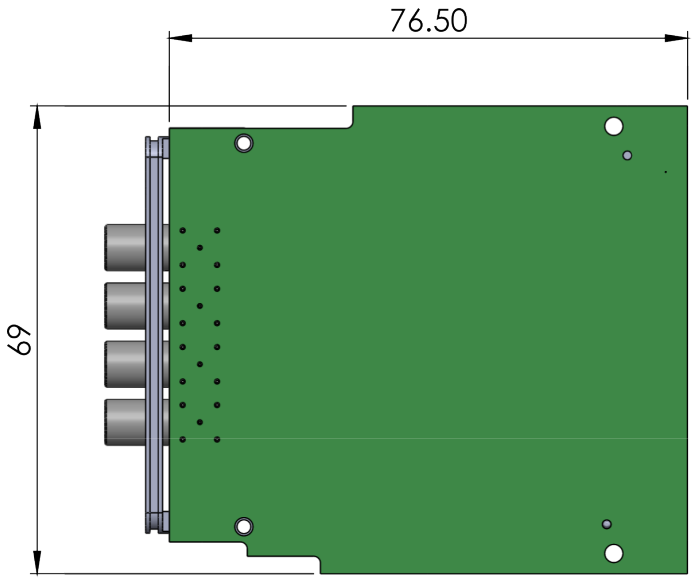

Figure 1: Module Outline

2.2 Appearance

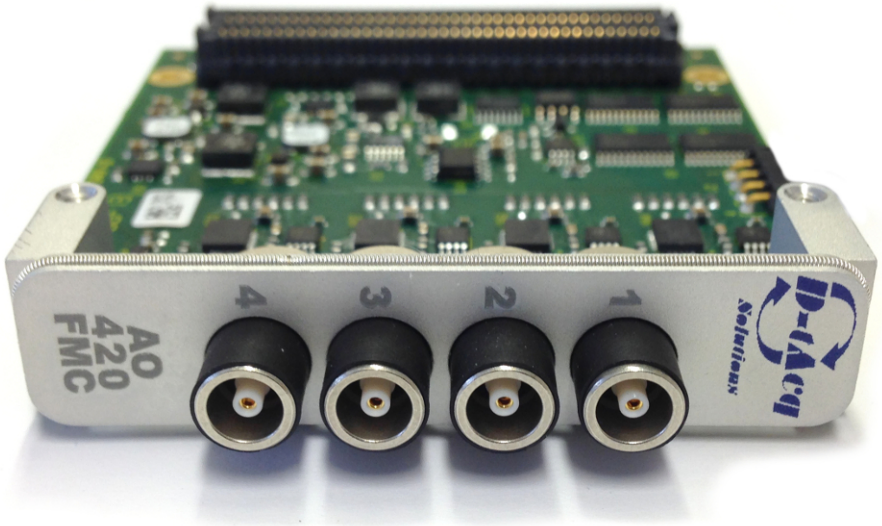

Figure 2: Module Photo

2.3 Front Panel LEMO Connectors

- Single Pin LEMO per channel output, 4 connectors fitted.
- On FMC Modules Single Pin LEMO Front panel CLK input (Use dedicated External Clock on D-TACQ Carriers).

LEMO Analog Output connectors are centre-output/shield 0V.
LEMO Digital Input connector is centre-input/shield 0V.
All connectors are single-pin LEMO 00 Series Mini Coax connector part EPL.00.250.NTN. Mating plugs should be compatible with this part.

Contact info@d-tacq.com for alternative front panel connectors.

3 Electrical Specification

3.1 Gain Ranges

3.1.1 FMC Version

The FMC variant has an onboard 5V master reference voltage.

Each channel has soft-selectable x1 or x2 multipliers, therefore each channel may be either:

- ±5V range
- ±10V range

3.1.2 ELF Version

The D-TACQ ELF variant takes its master references from the carrier and is able to switch between 2.5V or 5V providing an additional output range.

Each channel has soft-selectable x1 or x2 multipliers, therefore each channel may be either:

- Master reference 2.5V:
  - ±2.5V range.
  - ±5V range.
- Master reference 5V:
  - ±5V range.
  - ±10V range.

3.2 Analog Output Specification

#	Parameter	Value
1	Number of Channels	4
2	Update Rate	Up to 1 MSPS, per channel simultaneous
3	Resolution	-16 : 16 bit -20: 20 bit
4	Coupling	DC, Single-ended Output
5	Maximum Output current	20 mA Per-Channel
6	Output Voltage Range[1]	±10V ±5V ±2.5V
7	Output Impedance	33 Ω
8	Offset Error	0.01% FS with numerical calibration
9	Gain Error	0.01% FS with numerical calibration
10	INL	16 bit ±2 LSB
11	DNL	16 bit ±1 LSB
12	CMRR	>80dB FS @ 1 kHz
13	THD	-92 dB
14	SINAD	92 dB
15	SFDR	95 dBc
16	SNR	90 dB
17	Reconstruction Filter BW (-3dB)	50kHz Standard [250kHz -LLC Option]
18	Small Signal BW	1 MHz
19	Crosstalk	<95 dB @ 1 kHz FS Output
20	Temperature Stability	<25ppm/°C

[1] Available with D-TACQ Carriers. Please contact info@d-tacq.com for details.

Table 1: AO420FMC Electrical Performance

3.3 LEMO Clock Input

The Clock Input has the following properties

Parameter	Value
TTL Input Low Voltage[1]	< 1.5V
TTL Input High Voltage[1]	> 3.5V
Minimum Input Voltage[2]	-0.5V
Maximum Input Voltage[2]	5.5V
TTL Output Low Voltage[3]	< 0.55V
TTL Output High Voltage[3]	> 3.8V
TTL Max Output Current	24 mA

[1] Input hysteresis at least 700mV
[2] Inputs have under/over voltage protection up to 100mA
[3] Output Voltages at specified Max Current

Table 2: LEMO TTL Input/Output Characteristics

4 Mechanical & Environmental Specification

#	Parameter	Value
1	Form Factor	Standard FMC
2	Power Consumption	12V, 220mA 3.3V, 100mA
3	Supported VADJ	Min 1.8V, Max 3.3V
4	Environmental	0 °C - 50 °C Operational −10 °C - 85 °C Non-Operational
5	Mezzanine Socket	Standard FMC, Low Pin Count LPC
6	Digital Signal I/O	CLK input 5V TTL

Table 3: Mechanical & Environmental Specification

Revision History

Revision	Date	Author(s)	Description
5	February 2016	JMcL	Last Release of Previous Format
6	February 2025	JMcL	Updated Format