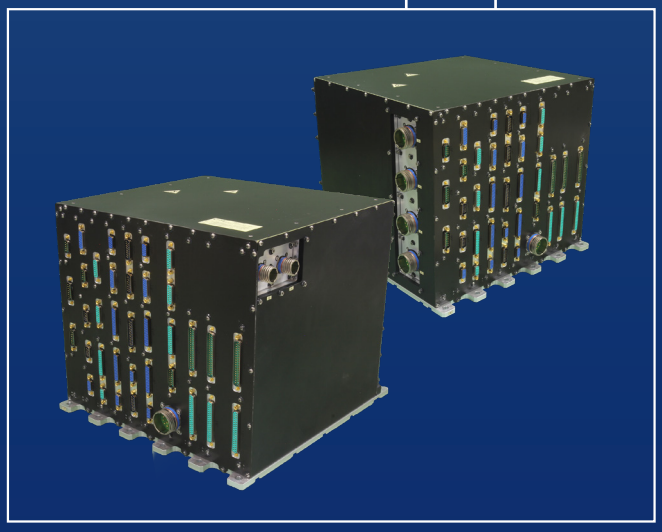
DEFENCE AND SPACE
Space Products

VEGA-C MFU

Multi-Functional Unit for versatile and cost effective launch vehicles

Launchers

Avionics



Based on Airbus Defence and Space heritage in the development of launch vehicles MFUs, this MFU has been specifically developed for VEGA-C, although its modular concept would allow the reuse of modules in other launchers.

The MFU is in charge of distributing the electrical power to most of the launcher's avionic equipment, it manages up to 10 MIL-STD-1553B buses through its bus repeater function, it generates the commands for different types of actuators (EEDs, NEAs, electro-valves…) and provides some services to the payloads (power supply lines, dry loop commands).

Thanks to the expertise and innovative approach of Airbus teams, optimization of costs, manufacturing and testing have been taken into account since the inception of the unit and make Airbus MFUs a reference on the market.

This new generation of MFUs has been engineered with a balanced use of commercial EEE parts, carefully chosen and tested, to grant competitive prices without lowering the reliability of the unit.

The MFU provides to the customer a compact solution that encompasses a good number of the functions carried out by the launcher's avionics, in the fields of power distribution, actuators' commanding and communications' management.

Airbus MFUs have a modular concept approach, which allows an easy upgrade or addition of new functions.

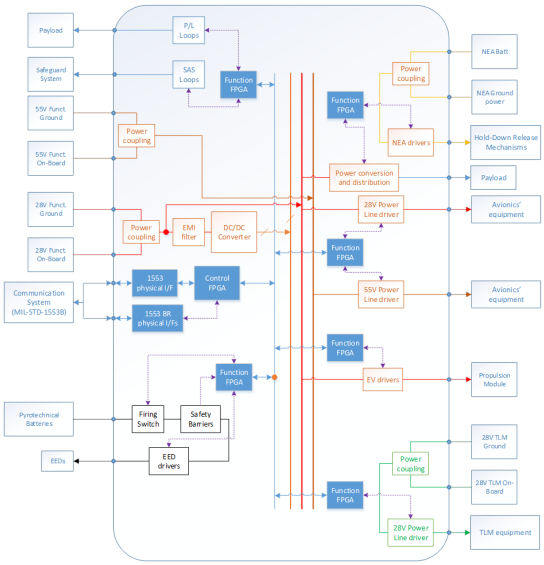
VEGA-C MFU is an improved evolution of VEGA MFU, based on flight-proven concepts; it cumulates already a track record of a dozen succeeded missions.

Airbus VEGA-C MFU encompasses in a single mechanical housing a significant part of the avionic functions of the launcher, allowing the simplification of the electrical wiring of the launcher and resulting in cost, mass and volume savings.

VEGA-C MFU
Architecture and key features

The MFU is a highly integrated modular box, which provides flexibility to the launcher to adapt to each type of mission. Its integrated concept allows reducing the AIT effort and the harness' complexity. The MIL-STD-1553B bus repeater is a robust system that allows having one bus dedicated to each stage of the launcher, not being needed to take care about the impedance of the lines after the stages' separations.

The MFU provides VEGA-C with the following main functions: MIL-STD-1553B bus repeater, power source (ground / onboard) commutation, power distribution, actuators' (electrovalves, EEDs, NEAs) commanding, generation of commands for setting the safeguard system in accordance with the different flight phases, services for the payloads (power supply lines, loop closure commands).



Interfaces

Type of interface	Number of interfaces	Characteristics
Functional power	2 (ground + on-board)	25.5 V to 32.0 V
Other power sources	--	28V for telemetry [GND + O/B] 55V for TVC 55V (functional) [GND + O/B] Ground control (28V + 10V) 28V for NEA [GND + O/B] 28V for EEDs [nom + red]
MIL-STD-1553B	2 x remote terminal 10 x bus repeater	
EED commands	42	Nominal + redundant output EED: ESI / NSI type 8 A / 20 ms (typical)
NEA commands	Up to 128	NEAs: several types, including TiNi, ISIPOD, lightband
Payload services	14 x dry loops 6 x power lines 5 x electrical orders	ON / OFF: ≤1.0 Ω / ≥1.0 MΩ 28 V / 75 W, 12 V / 35 W, 5 V / 35 W, 2 of each type 24 V to 32 V, 24 W each
Electro-valves commands	6 x reaction control thrusters 2 x venting valves 2 x solenoid valves 2 x spare commands	50 W. 24 V to 32 V. MIB control 36 W. 24 V to 32 V 36 W. 12 V to 16 V (maintenance) 36 W. 24 V to 32 V
Analog HW telemetry	1 x temperature 6 x voltage	PT-100 Main power rails. 0 V to 4 V
Power lines (Functional + telemetry avionics)	10 x 28V protected 8 x 28V unprotected 1 x 55V protected 4 x 55V unprotected	Protected power lines provided with LCL Output current capability varies from 2 A to more than 7 A
Safeguard commands	16 x dry loops	ON / OFF: ≤1.0 Ω / ≥1.0 MΩ

The MFU includes a 10-channel MIL-STD-1553B repeater, providing the launcher with up to ten physically independent communication buses with the same data traffic in all of them. The bus repeaters' logic is embedded in an FPGA and it has been fully developed by Airbus.

The functional and the telemetry electronics are segregated, thus preventing a failure propagation between the two sections. This is mandatory for the success of the launcher's mission, i.e. the release of the Payload(s) in the correct orbit.

Although it is not a unit with internal redundancy, the MFU includes all the barriers that prevent the occurrence of failures leading to catastrophic and severe consequences.

Budgets

Parameter	Characteristics
Number of modules	Up to 10, depending on the configuration
Dimensions (L x W x H)	333.5 x 360 x 295.0 mm^3 (including mounting feet)
Weight	18.0 kg to 20.6 kg, depending on the configuration
Power distribution capability	Up to 3.3 kW
Standby power consumption	<41 W on ground <31 W in flight
Power dissipation	≤100 W, delivering 3.3 kW, not considering transient sporadic commands (EEDs, NEAs)

Unit qualified to the following environment:

- Temperature range: -20ºC to +70ºC, hard vacuum
- Random vibration: 20 grms, 4 min
- Sine vibration: between 5 Hz and 2 kHz; 22.5 g between 60 Hz and 200 Hz
- High-level shock: 3,550 g at frequencies higher than 2 kHz
- EMC performances in accordance with MIL-STD-461G
- Reliability: 12,400 FIT in space flight environment

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