

# BI-COMPATIBILITY OF F-GPM SYSTEMS FOR VEGA LAUNCH COMPLEX

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**Abstract:** Vega launch complex was born with the aim to support needs just for Vega launch vehicle. With Vega-C program, an adaptation of existing Vega launch complex is necessary to respond to Vega and Vega-C launch vehicles requirements; i.e. a single launch complex for two rocket configurations: Vega and Vega-C (Vega launch complex bi-compatibility requirement). Bi-compatibility need provides adaptations of Vega launch complex in order to reuse the existing VEGA operational systems and networks, to monitor the in-site operations via two different control benches (CCV and CCV2) in accordance with rocket configuration, to optimize the global signals to manage by control benches, minimizing the in-site works and launch campaign activities. A part of launch complex to adapt are the Fluid-Ground Proximity Means (F-GPM) systems. F-GPM systems include the ground fluid networks, in-support to launch vehicle operations, and bench interface for the collecting and the management of signals from fluid systems to field units connected to CCV and CCV2. F-GPM concept is based on the reusing of common systems and networks for both Vega configurations and specific parts of processes and networks dedicated to Vega or Vega-C only. The architectures permit to set the F-GPM networks according to operational configuration of the launcher, isolating the parts of circuits dedicated to the non-operational configuration. Specific units placed at the end of common parts permit to switch the F-GPM networks from one configuration to the other in the safe way.

For ground fluid networks, the switching units are generally additional manual valves equipped with interlock devices and mechanical keys, used also for remote monitoring of valves status at Safety Authority bureau. According to launcher configuration, the setting of ground fluid networks is realized by opening or closing operations of these specific valves without any signal to control benches. Switching units for ground fluid networks, permit to manage two different configurations: Vega configuration and Vega-C configuration.

For bench interface, the switching units are supplementary Remote I/O (RIO) stations collecting all the signals from Vega and Vega-C ground fluid systems and reporting to CCV and CCV2 only the information associated to operational configuration. According to launcher configuration, the setting of signals to report is realized by selectors placed on each RIO station and a double validation token exchange with the relevant control bench. Switching units for bench interface permit to manage three different configurations: Vega configuration to CCV, Vega configuration to CCV2 and Vega-C configuration to CCV2. Moreover, multiple signal redundancy, safety interceptions (execution of emergency maneuvers) and ATEX constraints conditioning are all managed independently by this new interface system.

Major adaptations of launch complex are confined to F-GPM systems inside Vega Mobile Gantry.

Vega-C F-GPM program follows all design phases including the development of concept, architectures, P&IDs, the selection of suppliers according to in-site safety requirements and guidelines up to physical realization and commissioning of fluid and bench interface systems.

New Vega launch complex is qualified and operational with Vega-C F-GPM systems setting in Vega configuration (VV18, VV19 and VV20 flights).

For Vega launch complex with Vega-C F-GPM systems setting in Vega-C configuration, the qualification test campaign is successfully closed. The launch campaign for Vega-C maiden flight is in-progress.