



AEROSYSTEMS

AIRCRAFT FUEL SYSTEMS CAPABILITIES



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FUEL MEASUREMENT AND MANAGEMENT

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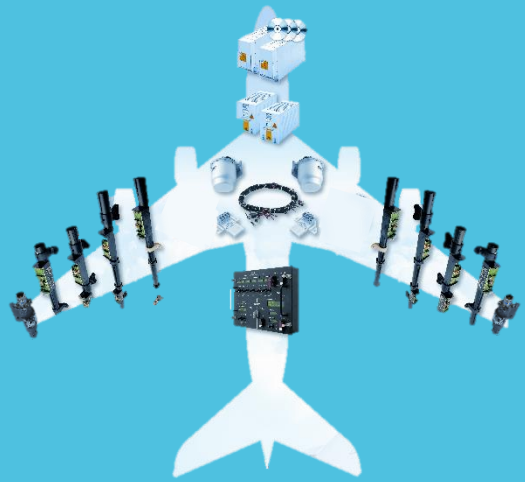


STANDARD FUEL QUANTITY INDICATING SYSTEM

PROVEN AND MATURE TECHNOLOGY OPTIMISING WEIGHT AND COST REDUCTION

Based on our large experience of fuel quantity management systems for business jets and commercial aircraft, Safran Aerosystems can propose a competitive fuel quantity indicating (FQIS) system for all types of aircraft.

Safran Aerosystems proposal is based on a centralized architecture where a unique computer (Fuel Quantity Gauging Computer) monitors directly all the LRUs of the fuel system and performs all the operations dedicated to the management of the whole fuel system.



BENEFITS

Safran Aerosystems FQIS performs the following functions:

- **Fuel measurement:**
 - Wing sub sections and collector (individual tanks)
 - Total fuel per side
 - Aircraft total fuel
- **Fuel permittivity and temperature measurement**
- **Indication and alerts**
- **Fuel level sensing** through thermistor type sensors
- **Refueling valves management** through manual and automatic modes
- **BITE**
- **ARINC-429 bus communications** to and from avionics
- **CAN communication** to and from the Refuel Defuel Panel

Safran Aerosystems FQIS architecture is designed to address:

- **Full compliance with AC25-981-1C requirements**
- **Single failure tolerance** enabling high dispatchability performance and data availability
- **Fuel gauging and low level sensing segregation**
- **Ability to cope with the hazardous failure condition classification** as per ARP4754 standard

FEATURES

Based on aircraft specific structural and functional architecture, the FQIS consists of the following units:

- **A Fuel Quantity Gauging Computer (FQGC)** which includes the gauging electronic circuits, a set of discrete inputs and outputs, several ARINC-429 and CAN buses
- **A Refuel Defuel Panel (RDP)** which includes displays and controls for the refuel the high level detection circuit
- **Fuel Probes** including the fuel permittivity sensors
- **A Fuel Level Sensor Control unit (FLCU)** providing segregation with the fuel gauging and interfacing with the level sensors, the avionic system and the RDP
- **Low and high Level Sensors**

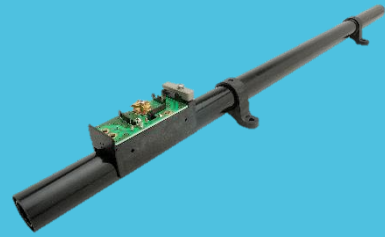


SINGLE FUEL PROBE

HIGH PRECISION MEASUREMENT PROBE AVAILABLE IN ALL SIZE

More than 170,000 composite probes have been delivered by Safran Aerosystems since 1960 on more than 20 aircraft programs.

Single fuel probes are capacitive sensors used for fuel quantity measurement in the fuel tanks. They provide a capacitance which is image of the immersed fuel height at their location.



BENEFITS

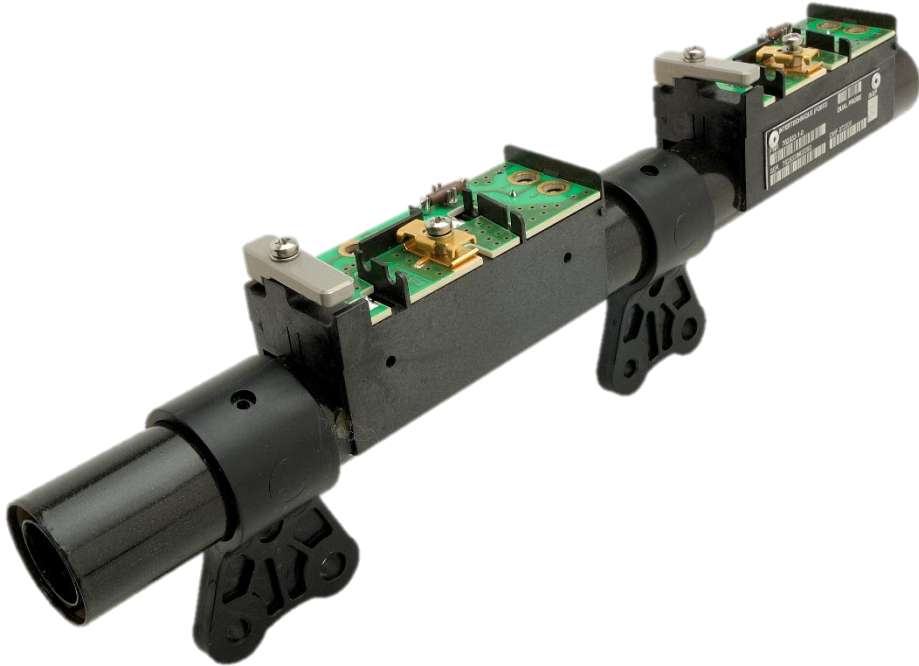
Safran Aerosystems **composite fuel probes** are made up with two concentric tubes (one inner tube and one outer tube) rigidly maintained in a co-axial configuration by spacers included in the probe assembly

The electrodes of the capacitor are made with **passive metallic paint** onto the inner surface of the outer tube and the outer surface of the inner tube. The overall surfaces of the tubes and their electrodes are protected by varnish layers.

- **Single fuel probes:** the metallization of the outer tube and the inner tube run without interruption on 360° from tip to tip of the fuel probe. They are **used for fuel quantity measurement only**
- **Single fuel probes with capacitance index compensator (CIC):** the metallization of the tubes is interrupted on 360° near the bottom of the fuel probe in order to **divide the fuel probe in two independent parts:**
 - The **lower part** of the probe constitutes the CIC and is used for **fuel permittivity measurement when fully covered by fuel** and used for **fuel quantity measurement** otherwise.
 - The **upper part** of the fuel probe constitutes an **independent single probe** and is used for **fuel quantity measurement only**

FEATURES

- **Average weight on probe shipset:** 0.2 kg (0.44 lb)
- **Length:** from 14.5 cm (5.71 in) to 100 cm (39,37 in)
- **Gauging accuracy:** ± 1.5 mm on the whole temperature range
- **Capacitance value:** 1.58 pF per cm in air (4 pF per inch)
- **Temperature range:** - 55°C to +90°C (-67°F to 194°F)
- **High reliability** >1,000,000 flight hours
- **Error-proof terminal block for aircraft gauging wiring**
- **Full compliance with AC25-981-1C**
- **MTBF:**
 - **Single fuel probe:** 1,000,000 flight hours
 - **Single fuel probe with compensator:** 750,000 flight hours

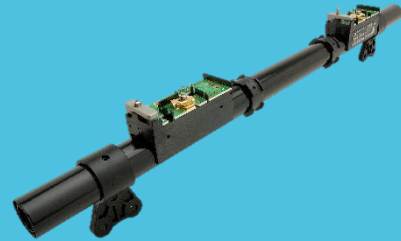


DUAL FUEL PROBE

A PATENTED DESIGN ENSURING HIGHER INTEGRITY OF FUEL GAUGING

More than 170,000 composite probes have been delivered by Safran Aerosystems since 1960 on more than 20 aircraft programs.

Safran Aerosystems dual fuel probes are used to increase the redundancy level of the gauging function at a given measurement point, since they offer the possibility to monitor the same point by different channels.



BENEFITS

Safran Aerosystems **composite fuel probes** are made up with two concentric tubes (one inner tube and one outer tube) rigidly maintained in a co-axial configuration by spacers included in the probe assembly

The electrodes of the capacitor are made with **passive metallic paint** onto the inner surface of the outer tube and the outer surface of the inner tube. The overall surfaces of the tubes and their electrodes are protected by varnish layers.

In order to divide the dual fuel probe into two half cylindrical capacitors, the metallization of the tubes still runs from tip to tip of the tubes but is interrupted at 180°

Each **half cylindrical capacitor** can then be considered as an independent single probe

Safran Aerosystems dual fuel probes are used for **fuel quantity measurement only**

One Safran Aerosystems dual composite probe is **50% lighter than 2 equivalent metallic probes**

FEATURES

- **Average weight on probe shipset:** 0.3 kg (0.66 lb)
- **Gauging accuracy:** ± 1.5 mm on the whole temperature range
- **Error-proof terminal block for aircraft gauging wiring**
- **Full compliance with AC25-981-1C**
- **MTBF:** 750,000 flight hours

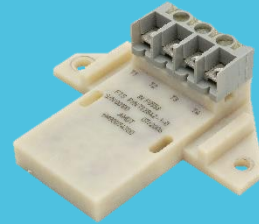


FUEL TEMPERATURE SENSOR

ENSURING HIGHLY RELIABLE AND ACCURATE FUEL MEASUREMENT

Safran Aerosystems has acquired experience in temperature measurement over a wide range of products both for commercial and military application.

The temperature sensor is part of the Fuel Quantity Gauging System and designed to detect the fuel temperature variations in the aircraft tanks.



BENEFITS

The fuel temperature sensor is located at the **bottom of the fuel tank** in order to remain surrounded by fuel even when the fuel tank is quite empty

Safran Aerosystems fuel temperature sensors are made of **composite material** which makes them **lighter than competition products**

Safran Aerosystems temperature sensors are based on **platinum resistance technology**

Their **resistance varies linearly with the temperature** according to CEI 751 class B and hence delivers an analogical signal which is the image of the temperature in the tanks

Safran Aerosystems temperature sensors are **fully compliant with AC25-981-1C certification standard**

Safran Aerosystems can propose a **single or a dual fuel temperature sensor** (for redundancy) in the same package

FEATURES

- **Light weight:** 60g (0.13 lb)
- **Dimensions:**
 - Width: 90 mm (3.5 in)
 - Height: 75 mm (2.9 in)
 - Depth: 28 mm (1.1 in)
- **Probe sensibility:** 0.2 Ω / $^{\circ}$ C
(0.36 Ω / $^{\circ}$ F)
- **Accuracy:** \pm 0.35 $^{\circ}$ C (\pm 0.63 $^{\circ}$ F) on the whole temperature range
- **Temperature range:** -55 $^{\circ}$ C to +80 $^{\circ}$ C
(-70 $^{\circ}$ F to +180 $^{\circ}$ F)
- **Altitude range:** -305 m to +16,154 m
(-1,000 ft to 53,000 ft)
- **High reliability** >150,000 flight hours



BULKHEAD FUEL TEMPERATURE SENSOR

ENSURING HIGHLY RELIABLE AND ACCURATE FUEL MEASUREMENT

Safran Aerosystems has acquired experience in temperature measurement over a wide range of products both for commercial and military application.

The temperature sensor is part of the Fuel Quantity Gauging System and designed to detect the fuel temperature variations in the aircraft tanks.



BENEFITS

In service for almost 20 years, Safran Aerosystems bulkhead fuel temperature sensor are **fully compliant with AC25-981-1C certification standard**

Connected electrically outside the tank, Safran Aerosystems Bulkhead Fuel Temperature Sensor are designed to be screwed:

- directly on the tank structure
- on a support which is fixed on a fuel measurement probe

Safran Aerosystems temperature sensors are **based on platinum resistance technology** and **vary linearly with the temperature** according to CEI 751

FEATURES

- **Light weight:** 75 g (0.165 lb)
- **Probe sensibility:** $0.2 \Omega/^{\circ}\text{C}$ ($0.36 \Omega/^{\circ}\text{F}$)
- **Accuracy:** $\pm 0.35^{\circ}\text{C}$ ($\pm 32.6^{\circ}\text{F}$) on the whole temperature range
- **Nominal resistance value:** $500 \Omega @ 0^{\circ}\text{C}$ ($+32^{\circ}\text{F}$)
- **Temperature range:** -55°C to $+80^{\circ}\text{C}$
(-70°F to $+180^{\circ}\text{F}$)
- **Altitude range:** -305 m to $+16,154 \text{ m}$
($-1,000 \text{ ft}$ to $53,000 \text{ ft}$)

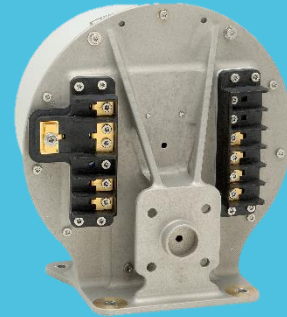


FUEL CHARACTERISTIC SENSOR

ENSURING HIGHLY RELIABLE AND ACCURATE FUEL CHARACTERISTICS MEASUREMENT

The Fuel Characteristic Sensor is a part of the Fuel Quantity Indication System and is used for fuel characteristics measurement in fuel tank.

Thanks to their very accurate and robust technology, more than 11,000 Safran Aerosystems fuel characteristic sensors are in service on civil and military aircraft since 1970.



BENEFITS

Made of light composite material, Safran Aerosystems Fuel Characteristic Sensor is a unit embedding 3 sensors:

- one densitometer
- one dielectric measurement cell
- one temperature sensor

It sends to the fuel measurement controller **real-time indications** about characteristics of the used fuel:

- the density
- the permittivity (dielectric constant)
- the temperature

Safran Aerosystems Fuel Characteristic Sensors are **fully compliant with AC25-981-1C** certification standard

Safran Aerosystems Fuel Characteristic Sensors **operate regardless flight conditions** (able to compensate aircraft roll and pitch in fuel measurement)

Depending on customer requirement, Safran Aerosystems Fuel Characteristic Sensor can be fitted with an **option measuring**:

- the characteristics of the incoming fuel during refueling
- the characteristics of the mixed fuel once refueling is completed

FEATURES

- **Light weight:** 1.45 kg (3.2 lb)
- **Power supply voltage:** 5 Vrms - 400 Hz
- **Density**
 - Range: 660 to 950 kg/m³ (5.51 to 7.93 lb/USG)
 - Accuracy: < 0.2%
- **Temperature**
 - Range: -55°C to +70°C (-70°F to +160°F)
 - Accuracy: ± 0.35°C (± 0.63°F) on the whole temperature range
- **Dielectric constant measurement accuracy:** 0.1%
- **Vibration level proofness:** 11 Grms
- **High reliability:**
 - 70,000 flight hours if the option to measure while and after refueling is included
 - 90,000 flight hours if the option is not included

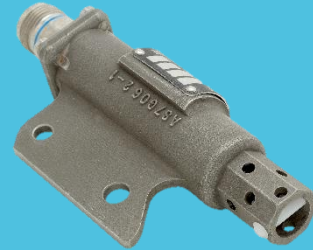


FUEL LEVEL SENSOR

A SOLID COMPONENT WITH LOW POWER AND VERY ACCURATE DETECTION

Fuel level sensors are components of the fuel quantity aircraft system and are designed to deliver a signal when the fuel quantity, contained in the tanks, reaches a predetermined level.

Thanks to their robust technology, more than 20,000 Safran Aerosystems fuel level sensors are in service on commercial and military aircraft since 1970.



BENEFITS

Safran Aerosystems thermistor level sensor main benefits are the following:

- No common mode failure with gauging sensor (fully dissimilar technology)
- No software for signal acquisition and processing
- **Fully compliant with AC 25.981-1C** (temperature, energy, current)
- Nominal current is below 25mA
- Testable (**Built-In-Test capability**)
- Reliable (**no moving part**, circuitry very simple and fully encapsulated)
- Ambient temperature compensated

Fuel level sensors are installed in tanks and send to the fuel measurement controller **high level and low level signals** depending on the fuel quantity in the tanks.

Since the level sensors are sensitive to fuel level they can be placed precisely in the tanks in order to detect a given fuel quantity expressed in volume

FEATURES

- **Dimensions and weight:**
 - Length: 105.8 mm (4.165 in)
 - Width: 30 mm max (1.18 in max)
 - Height: 47 mm (1.85 in)
 - Weight: 85 g (0.187 lb)
- **Altitude range:** -305 m to +16,154 m (-1,000 ft to 53,000 ft)
- **Temperature range:** -55°C to +70°C (-70°F to +160°F)
- **Commutation time:**
 - Fuel → Air: between 3 and 7 seconds (depending on the temperature)
 - Air → Fuel: below 0,4 seconds
- **High accuracy:** ± 1.5 mm (± 0.059 in)
- **Connection:** Plug type MIL C83723 series III
- **High reliability** >350,000 flight hours



GENERIC FUEL CONTROL UNIT

GENERIC FUEL CONTROL UNIT DESIGNED TO BE RE-USED WITHOUT MODIFICATION

Dedicated to small business jets or helicopters, Safran Aerosystems Generic Fuel Control Unit monitors the fuel quantity onboard aircraft.

Safran Aerosystems Generic Fuel Control Unit does not require new hardware development for new aircraft.

Its software functions are also designed to be easily adapted to customer needs



BENEFITS

Safran Aerosystems Generic Fuel Control Unit comprises **two channels** each one being dedicated to one fuel circuit

Independence of the fuel control unit channels is guaranteed **by the mean of two electronic boards** which monitor the fuel level sensors, fuel gauging sensors, fuel temperature sensors, fuel flowmeters and compute the relevant information

Each fuel control unit channel performs the following functions:

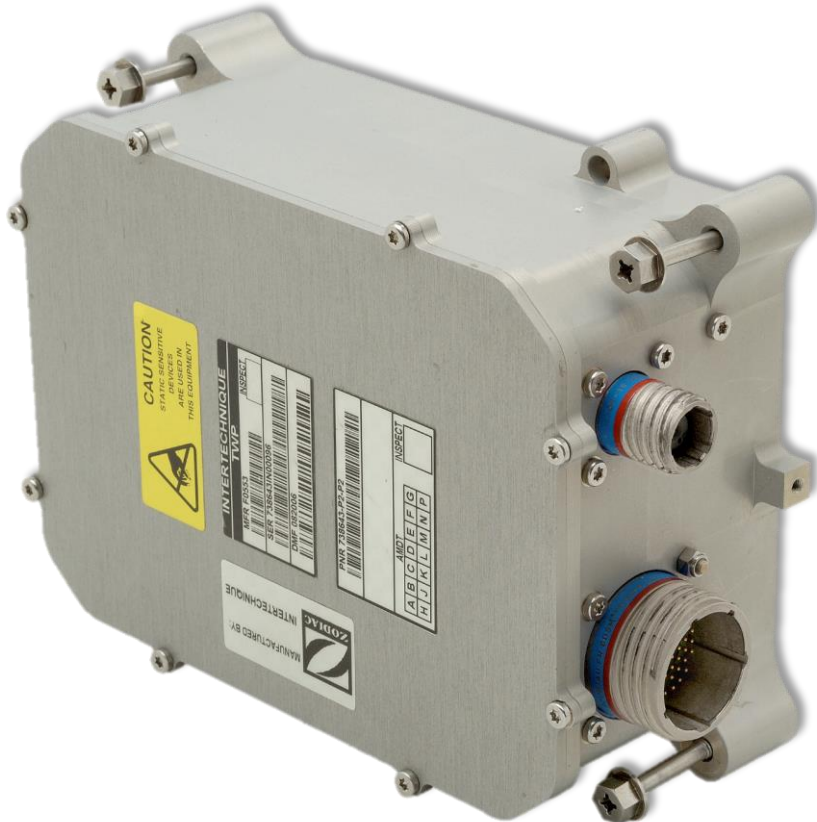
- **Fuel quantity measurement**
- **Centre of gravity monitoring**
- **Fuel level detection**
- **Fuel temperature computation**
- **Engine fuel flow in fuel used computation**
- **Manual and automatic refueling management**
- **BITE (Built-In Test)**
- **Communication with the avionics** via low speed ARINC bus, CAN Bus or RS422 link
- **Communication with an external computer for maintenance facilities** via a CAN bus

Safran Aerosystems Generic Fuel Control Unit hardware and software DAL is B

FEATURES

Each fuel control unit channel interfaces with the following sensors:

- 6 fuel probes
- 2 fuel level sensors
- 2 fuel temperature sensors
- 1 volumetric flowmeter
- **MTBF: >70,000 flight hours**
- **Certification:**
 - SW developed according to DO178-B
 - Environmental qualification according to DO160-E



REMOTE DATA CONCENTRATOR

A SAFE AND RELIABLE PROVEN DESIGN FOR BOTH MILITARY AND CIVIL PLATFORMS

The Fuel Remote Data Concentrator is a part of the Fuel Quantity Gauging & Control System. It monitors all the fuel sensors which are located inside the fuel tanks.

These acquisition modules are located as close as possible to the fuel tanks in order to ease compliance with intrinsic safety requirements.



BENEFITS

Safran Aerosystems Fuel Remote Data Concentrator interfaces with:

- up to 11 fuel probes
- up to 2 fuel temperature sensors
- 1 densitometer
- up to 5 high/low level fuel level sensors

Fuel gauging data are transmitted through an ARINC 825 CAN data link to the fuel gauging controller

The Fuel Remote Data Concentrator provides also through discrete level sensing states to fuel measurement and management computer and to flight warning computer

Safran Aerosystems Fuel Remote Data Concentrator has been designed with following key design drivers :

- Acquisition of in-tanks data for **composite wing aircraft**
- **Full compliance** with latest intrinsic safety standards and **AC25-981-1C**
- Highest accuracy requirements to withstand with new aircraft standards
- Environmental harsh conditions for **both military and civil applications**

FEATURES

Safran Aerosystems Fuel Remote Data Concentrator **hardware and software DAL is A**

- **Dimensions:** 236 x 170 x 77 mm
(9.29 x 6.69 x 3.03 in)
- **Weight:** 1.5 Kg (3.306 lb) with harness to tank wall
- **Temperature range:** - 55 °C to + 70 °C
(- 70 °F to + 160 °F)
- **Power supply:** 28 V DC
- **Power consumption:** 5,5W
- **High reliability** >100,000 flight hours



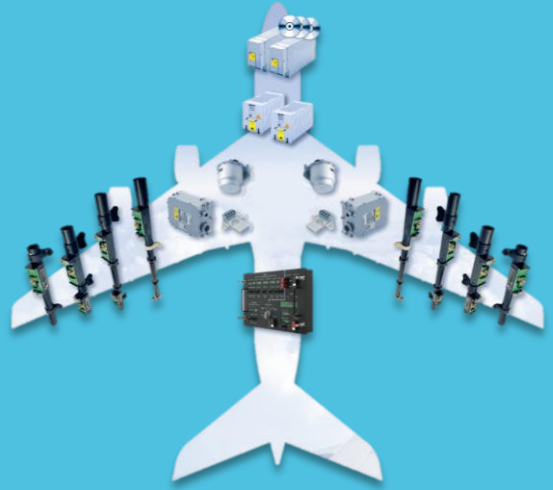
**FUEL QUANTITY INDICATING SYSTEM
with LiSafe® technology**

THE FUEL TANK ULTIMATE SAFE CONNECTIVITY

Composite wings present new challenges regarding resistance to electromagnetic threats. Complex and redundant installation designs were developed to ensure no hazards occurs inside the fuel tanks.

LiSafe® technology completely solves this problem by removing electrical wires from inside the wings.

A Fuel Quantity Measurement System using LiSafe® offers considerable advantages for composite wing aircraft and is a step ahead of any competing solution on the market.



BENEFITS

- **Ignition hazard eliminated**
 - Elimination of hazardous electrical wires
 - Straight evidence of safety for certification (no CDCCL)
- **System low weight**
 - Composite fuel probe
- **Unparalleled installation savings**
 - In final assembly line
 - During maintenance checks
- **Unmatched gauging accuracy**
 - Removal of stray capacitance from copper wire
 - Removal of probe error manufacturing
- **Application ready**
 - Passed stringent maturity tests

Safran Aerosystems Fuel Quantity Management System with LiSafe® technology was **selected for the largest commercial aircraft** and passed CDR.

FEATURES

The LiSafe® technology is an **innovative digital connectivity technology** dedicated to sensors installed in aircraft severe electromagnetic environments.

The Fuel Quantity Management System with LiSafe® technology can include:

- **In-tank fuel sensors**
 - Fuel measurement probes
 - Temperature sensor
 - Fuel Characterization sensor
 - Compensator
 - Water detector
- Remote data concentrator
- Fuel quantity processor unit
- Refuel/Defuel Control Indication Panel

All Sensor are connected to the Remote data concentrator with LiSafe® technology



**FUEL CAPACITIVE PROBE
with LiSafe® technology**

EXTREME LOW WEIGHT FUEL PROBE WITH UNMATCHED ACCURACY

Safran Aerosystems capacitive probes with LiSafe® technology are constituted of two concentric tubes forming a capacitor and a smart terminal block.

The tubes are of the same technology as a standard Safran Aerosystems capacitance fuel probe: they provide a capacitance which is the image of the immersed fuel height at their location.



BENEFITS

Thanks to their fool proof connector and digital capacitance data transmission (no more harness errors), LiSafe® capacitive fuel probes (LCP) guarantee a gauging accuracy level never achieved before in aviation

Developed at DAL A, they include a Built-In-Test reference capacitance which allows a continuous and reliable detection and isolation of any failure of LCP electronics

LiSafe® capacitive probes may optionally comprise a fuel characteristic compensator capacitance and/or a temperature sensor. This combined sensor design optimizes weight and MTBF

LiSafe® capacitive probe with compensator:

- The bottom side of the probe, when partially immersed, acts as fuel height sensor
- The bottom side of the probe, when fully immersed, acts as compensator sensor

LiSafe® capacitive probe with temperature sensor:

- The platinum temperature sensor is attached to the LCP tubes

FEATURES

- Length: from 15 to 200 cm (0.5 ft to 6.5 ft)
- Temperature range:
 - LCP: -55°C to +85°C (-67°F to 185°F)
 - Temperature sensor: -60°C to 85°C (-76°F to 185°F)
- High accuracy over the temperature range:
 - LCP Gauging accuracy: +/1mm (+/-0.04 inch)
 - Temperature sensor accuracy: ±0.65°C (1.17°F)
- Measurement refresh rate < 500 ms
- Vibration level: 14 Grms
- Electronics consumption: < 1mW compliant with FAA AC25981-1C



**FUEL CHARACTERISTIC SENSOR
with LiSafe® technology**

A ROBUST FUEL SENSING TECHNOLOGY WITH UNMATCHED ACCURACY

Designed by Safran Aerosystems, the LiSafe® Fuel Characteristic Sensor enables real-time and simultaneous density, dielectric constant and temperature measurements in various aircraft operating conditions.

Safran Aerosystems LiSafe® Fuel Characteristic Sensor ensures fine adjustments of the whole quantity computation algorithm of the fuel quantity indication system.



BENEFITS

LiSafe® Fuel Characteristic Sensor (L-FCS) eliminates the risk of electrical arcing becoming an ignition source in the tank by replacing all copper wires by power-by-light technology

Easy to install, the L-FCS is located near the lower level of fuel tanks to always be submerged

LiSafe® Fuel Characteristic Sensor can **measure both uploaded fuel and tank bottom fuel characteristics:**

- **Measurement in Refuel mode:** the incoming fuel is derived from the refuel gallery pipe and fill the L-FCS through an inlet located at the top of the L-FCS body to be characterized before being mixed with the fuel on board before refuel
- **Continuous fuel tank measurement:** once the refuel is completed, the L-FCS is smoothly flushed by the surrounding fuel, owing to multiple holes at the top and bottom of the L-FCS what allows continuous measurement in various aircraft operating conditions

LiSafe® Fuel Characteristic Sensor is **able to compensate aircraft roll in fuel measurement** and is also **fully compliant with AC25-981-1C**

FEATURES

- **L-FCS dimensions and weight:**
 - Overall diameter: 190 mm (7.48 in)
 - Body diameter: 140 mm (5.51 in)
 - Height: 175 mm (6.89 in)
 - Weight: 1.8 kg (2.2 lb)
- **Optical level:** < 5 optical mW
- **Density**
 - Range: 720 to 900 kg/m³ (6 to 7.5 lb /USG)
 - Accuracy: < 0.8 g.L⁻¹ on ground and normal flight over full temperature range
- **Temperature**
 - Range: -55°C to +70°C (-70°F to +160°F)
 - Accuracy: ±1°C (±1.8°F)
- **Vibration level proofness:** 14 Grms
- **High reliability** >90,000 flight hours
- **L-FCS refuel inlet port:**
 - Inlet pressure: 0.14 to 0.5 bar (2 to 7.25 Psi)
 - Port interface tailored to client's specification



FUEL QUANTITY DATA CONCENTRATOR with LiSafe® technology

ENSURING DATA TRANSMISSION RELIABILITY WHILE MAXIMISING SERVICE LIFE

DESIGNED BY SAFRAN AEROSYSTEMS, THE LISAFE® FUEL QUANTITY DATA CONCENTRATOR ENABLES TRANSMISSION OF IN-TANK SENSORS DATA FROM THE OPTICAL CAPACITIVE PROBES TO THE FUEL QUANTITY PROCESSOR UNIT.

LISAFE® TECHNOLOGY DRASTICALLY SIMPLIFIES THE DESIGN OF FUEL QUANTITY DATA CONCENTRATOR BY REDUCING THE SIZE OF CLEARANCE BETWEEN GAUGING CIRCUITRY AND AIRCRAFT STRUCTURE AND BY REDUCING THE SIZE OF CONNECTORS.



BENEFITS

LiSafe® Fuel Quantity Data Concentrator (OFQDC) is in charge of providing optical power to all in-tank sensors, **acquisition of all in-tank sensors of the fuel quantity indicating system and transmission of the fuel tank data to the fuel quantity processor unit** through digital CAN busses

The optical in-tank sensors include:

- optical capacitive probes
- permittivity sensors
- temperature sensors
- density sensors

The electronic design of the OFQDC is composed of three boards:

- one Mother board containing two CPU
- two optical boards

LiSafe® Fuel Quantity Data Concentrator integrates **BITE & health monitoring functions** which allow:

- detection and accurate localization of all failures inside equipment
- assessment of optical components performances and remaining life time

LiSafe® Fuel Quantity Data Concentrator design is **compatible with flammable fuel leakage area** and its housing is explosion proof

FEATURES

- **Dimensions:** 460 x 86 x 189 mm (18,1 x 3,4 x 7,4 in)
- **Weight:** 4.5 kg (9.9 lb)
- **Temperature range:** -55°C to +85°C (-70°F to +185°F)
- **Aircraft interfaces:**
 - Two 38999 connectors for optical interfaces of in tank components
 - Two 38999 connectors for electrical interfaces (distributing power supply, discrete signals and CAN bus signal to the dedicated Mother/ CPU board)
- **Dual redundant power input** (no loss of optical capacitive probe in case of single failure)
- **Intrinsic safety design compliance:**
 - AC25-981-1C
 - IEC60079-28-1/2
 - IEC60079-11
- **High reliability** > 45,000 flight hours



SMART FUEL TANK UNIT

ALL-IN-ONE FUEL GAUGING SYSTEM ADAPTABLE TO ALL TYPES OF AIRCRAFT

Designed for all types of aircraft, Safran Aerosystems Smart Fuel Tank Unit is a flange mounted probe with an electronic circuitry housed in the probe head.

Smart Fuel Tank Unit provides fuel mass measurement, fuel low level caution and fuel temperature indication.

Safran Aerosystems Smart Fuel Tank Units are currently used onboard helicopter tanks and aircraft auxiliary fuel tanks.



BENEFITS

Safran Aerosystems Smart Fuel Tank Unit is a metallic fuel probe fitted with 3 segregated sensors: up to two level sensors and a temperature sensor

The level function provides a discrete signal indicating the presence or absence of fuel at the fuel sensor location

The gauging function measures the quantity of fuel in the tank taking into account fuel temperature and provides the following data on digital buses:

- Capacitance (in pF)
- Resistance (in Ohm) for fuel temperature
- Temperature (in °C)
- Permittivity (dielectric constant)
- Density (in kg/m³)
- Fuel height (in mm)
- Volume (in L)
- Mass (in kg, lb)
- BITE information

The usable fuel quantity is available on:

- 3 digital outputs (ARINC 429 bus, CAN bus RS422 bus)
- 1 analog output

Our Smart Fuel Tank Unit provides full independence of the gauging function and of the level sensing function

FEATURES

- **Weight:** 900g with L=1m (2.16 lb with L= 39.4 in)
- **Length:** from 0.2 m to 1.5 m (7.87 to 59.05 in)
- **Accuracy:**
 - Mass gauging: ± 1% at empty, ± 2 % at full
 - Level sensing: ± 1.5 mm (± 0,059 in)
 - Temperature: ± 1 °C (± 1.8 °F)
- **High reliability:**
 - Helicopter: >80,000 FH with one level sensor
 - Commercial aircraft: >170,000 FH without level sensor
- **Crashworthy option** for helicopter available
- **Installation**
 - Flange fitment with head fitted at the top or at the bottom of the tank
 - Suitable for airplane additional fuselage tanks
- **Certification:**
 - Intrinsic safety compliant per AC25-981-1C
 - Qualified per DO-160 qualification standards



REMOTE OIL LEVEL SENSOR SYSTEM

A PROVEN HIGHLY ACCURATE LEVEL SENSING TECHNOLOGY

Remote Oil Level Sensor System is part of the fuel quantity measurement system and includes two similar oil sensors monitored by the oil level signal conditioner.

Safran Aerosystems Remote Oil Level Sensor Systems are already in service on several midsize business jets.



BENEFITS

Safran Aerosystems Remote Oil Level Sensor System comprises up to two **Engine Oil Sensor (EOS)** connected to one **Oil Level Signal Conditioner (OLSC)**

The engine oil sensor is capacitive and mainly consists of two concentric metallic tubes forming the electrodes of a capacitor whose value varies according to the length immersed in the oil

Developed without software, the OLCS conditions the analog signal from the EOS and transmits the total capacitance of the EOS on one ARINC 429 low speed bus

The Oil Level Signal Conditioner comprises fault detection features and provides data for fault isolation on the ARINC 429 bus

FEATURES

- **System accuracy:** ± 5 mm
- **Weight:**
 - EOS : 0.349 kg (0.770 lb)
 - OLSC: 0.49 kg (1.1 lb)
- **Temperature range:**
 - EOS: -55°C to +100°C (-70 °F to +210°F)
 - OLSC: - 55°C to +70°C (-70 °F to +160°F)
- **High reliability**
 - EOS: >100,000 flight hours
 - OLSC: >150,000 flight hours
- Environmental qualification according to DO160-E



WATER DETECTOR

MAKE IN TANK FREE WATER DETECTION SAFER

Water in fuel may freeze during long flights at high altitudes. This risk may increase when using polar routes.

Excessive water may flaw fuel quantity indication if in contact with capacitive probes.

It may also compromise intrinsic safety (clearances violation). In addition, excessive water facilitates microbiological contamination.



BENEFITS

Safran Aerosystems water proximity detection sensor allows **detection of free water accumulation** in the sump area of fuel tanks

The measurement system relies on an accurate, reliable and safe detection for various water conditions **without compromising electrical insulation**

It has been developed in accordance with **safety clearance requirements**

Safran Aerosystems water detector is **suitable for "on request" draining policy** (instead of periodic)

FEATURES

- Robust sensing technology, **hermetically sealed**
- **Fully compliant with FAA AC25-981-1C** (no loss of protection barrier even when immersed with water)
- **Dimensions:** 170 x 88 x 61 mm
(6,70 x 3,46 x 2,40 inch)
- **Weight:** 0.3 kg (0.66 lb)
- **Temperature range:** -55°C to +70°C
(-70°F to +160°F)
- **High accuracy** ±78 mil (±2mm)
- **High reliability** >500,000 flight hours

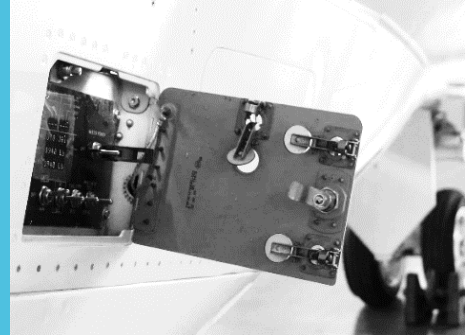


REFUEL/ DEFUEL PANEL

A MODULAR DESIGN OFFERING TAILORED SOLUTION TO AIRCRAFT MANUFACTURERS

Refuel/Defuel panels are a functional component of the aircraft fuel quantity gauging system.

Located externally on the aircraft fuselage, they provide interface to the operator for refuel/defuel operations on aircraft.



BENEFITS

Using **alpha-numeric display**, Safran Aerosystems Refuel/Defuel panels offer **high flexibility** for the display to meet aircraft manufacturer requirements

Interfacing with the fuel computer unit and the shut off valves, the Refuel/Defuel panel provides:

- Control of the refuel/defuel shut off valves
- Display of the fuel quantities, fuel high level, engine oil level, refuel valves end of strokes state and subsystems faults
- Display of the overfilling warnings

The main features of Safran Aerosystems Refuel/Defuel panel are the following:

- **High reliable panel**
- **Low weight**
- **Small size panel**
- **Customizable front panel**

Refuel/ defuel panel size (weight and dimensions) vary according to the number of buttons and displays

FEATURES

- **Weight:** 0.7 kg to 1.6 kg (1.5 lb to 2.2 lb)
 - 0.85 kg (0.19 lb) for a 4 displays Refuel/defuel panel
- **Dimensions for a 4 displays Refuel/defuel panel:**
 - Width: 225.5 mm (8.88 in)
 - Height: 77.9 mm (3.25 in)
 - Length: 77.5 mm (3.16 in)
- **Power supply:** 28 VDC
- **Consumption:** 0.5 to 0.9 A
- **Temperature range:** -40°C to +70°C (-40°F to +158°F)
- **MTBF:** 120,000 flight hours



FLAME ARRESTOR

A TAILORED SOLUTION FOR OPTIMAL PROTECTION

The flame arrestor or fuel vent protection assembly is a passive part of the tank venting system.

It prevents a flame from outside of the aircraft from going through the vent system up to inside the fuel tank.

The unit thereby postpones tank explosion should flammable vapor be continuously burning at the outlet of the vent insuring passengers safety.



BENEFITS

Safran Aerosystems flame arrestors offer a protection of fuel/ fuel vapors from ignition by:

- **Preventing a flame from entering into the tank**
 - Protection against lightning strikes' direct effect or ground fire
- **Delaying the propagation of a permanent flame into the tank**
 - Protection against ground fire
- **Delaying surface temperature from rising upon contact with fuel / fuel vapor above 200°C**
 - Intrinsic safety

An **ice catcher** can be added to prevent ice from logging during icing conditions

Safran Aerosystems flame arrestors do not require predictive maintenance. The **1,000,000 FH MTBF** is the sign of our flame arrestors' remarkable reliability

With a strong experience in complete fuel system design, Safran Aerosystems is able to assist with **Fuel Vent analysis** and can also **provide Pass Relief Valves or Burst discs**

APPLICATION

Safran Aerosystems flame arrestors are already flying on numerous types of aircraft:

- Long range
- Single aisle
- Military
- Business jets
- Regional jets

More than **10 000 units** are currently in service and many models are available off-the shelf

Our design is a compromise between flame holding capability, pressure loss and equipment diameter

Flame holding and flame propagation were tested according to the latest **FAA advisory circular AC25.975-1**



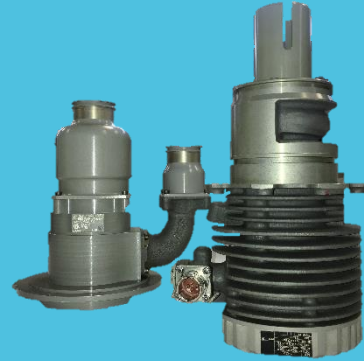


**CENTRIFUGAL AC PUMP WITH FIXED FREQUENCY
(P99A38-613)**

LOW MAINTENANCE ENGINE FUEL FEED PUMP FOR REGIONAL JET APPLICATION

Engine fuel feed pumps provide positive fuel pressure at the inlet of aircraft engines to prevent engine flame out and vapour lock phenomenon which occur in altitude and/or with hot fuels.

Available for all types of aircraft, Safran Aerosystems engine fuel feed pumps may also be used as inter-tank transfer pumps.



BENEFITS

Safran Aerosystems engine fuel feed pumps provide the required fuel flow/pressure to the inlet of regional jet engines in normal and abnormal conditions

Thanks to its safe foolproof internal design, Safran Aerosystems P99A38-613 engine fuel feed pump meets FAR25.981(a)(3) requirements

The P99A38-613 engine fuel feed pump does not require scheduled maintenance. The **20,000 flight hours MTBF** is the sign of its remarkable reliability

Safran Aerosystems **P99A38-613 pump** benefits from all the many flight cycle intensive operation on regional jet applications

With a strong know-how in complete fuel system design, Safran Aerosystems is able to assist with engine feed and transfer analysis and can also provide APU feed pumps

FEATURES

- **Altitude:** up to 13,106 m (43,000 ft) depending on fuel type and temperature
- **Jet fuel temperature range:** -54°C to +65°C (-65°F to +150°F)
- **Tank hole diameter:** 10.16 cm (4 in)
- **Flow:** 20,000PPH+
- **Power supply:** 115 VAC 400 Hz - 4.7 Amps
- **Maximum weight with canister:** 5.7 kg (12.5 lb)
- **Canister with separate mounting flange** allowing damage-free maintenance
- **Thermal protection**
- **Horizontal installation in canister**



**CENTRIFUGAL AC PUMP WITH FIXED FREQUENCY
(P99A31-603)**

A PROVEN AND RELIABLE ENGINE FUEL FEED PUMP DESIGN

Engine fuel feed pumps provide positive fuel pressure at the inlet of aircraft engines to prevent engine flame out and vapour lock phenomenon which occur in altitude and/or with hot fuels.

Available for all types of aircraft, Safran Aerosystems engine fuel feed pumps may also be used as inter-tank transfer pumps.



BENEFITS

Safran Aerosystems engine fuel feed pumps provide the required fuel flow/pressure to the inlet of business jet engines in normal and abnormal conditions

Thanks to its safe foolproof internal design, Safran Aerosystems P99A31-603 engine fuel feed pump meets FAR25.981(a)(3) requirements

Safran Aerosystems P99A31-603 engine fuel feed pump does not require scheduled maintenance. The **80,000 flight hours MTBF** is the sign of its remarkable reliability

The **P99A31-603 pump** benefits from Safran Aerosystems wide experience with **high-end very long range business jet applications**

With a strong know-how in complete fuel system design, Safran Aerosystems is able to assist with **engine feed and transfer analysis** and can also provide **APU feed pumps**

FEATURES

- **Altitude:** up to 15,545 m (51,000 ft) depending on fuel type and temperature
- **Jet fuel temperature range :** -54°C to +65°C (-65°F to +150°F)
- **Tank hole diameter:** 14 cm (5.5 inch approx.)
- **Flow:** 11,000PPH+
- **Power supply:** 115VAC 360Hz to 650 Hz - 7.5 Amps
- **Maximum weight with canister:** 6.12 kg (13.5 lb)
- **Thermal protection**
- **Vertical installation in canister**



**CENTRIFUGAL AC PUMP
WITH VARIABLE FREQUENCY
(P99A38-612)**

LOW WEIGHT AND LOW MAINTENANCE ENGINE FUEL FEED PUMP

ENGINE FUEL FEED PUMPS PROVIDE POSITIVE FUEL PRESSURE AT THE INLET OF AIRCRAFT ENGINES TO PREVENT ENGINE FLAME OUT AND VAPOUR LOCK PHENOMENON WHICH OCCUR IN ALTITUDE AND/OR WITH HOT FUELS.

AVAILABLE FOR ALL TYPES OF AIRCRAFT, SAFRAN AEROSYSTEMS ENGINE FUEL FEED PUMPS MAY ALSO BE USED AS INTER-TANK TRANSFER PUMPS.



BENEFITS

Safran Aerosystems engine fuel feed pumps provide the required fuel flow/pressure to the inlet of business jet engines in normal and abnormal conditions

Thanks to its safe foolproof internal design, Safran Aerosystems P99A38-612 engine fuel feed pump **meets FAR25.981(a)(3) requirements**

Safran Aerosystems P99A38-612 engine fuel feed pumps does not require scheduled maintenance. The **80,000 flight hours MTBF** is the sign of its remarkable reliability

The P99A38-612 pump benefits from Safran Aerosystems wide experience with high-end very long range business jet applications

With a strong know-how in complete fuel system design, Safran Aerosystems is able to assist with **engine feed and transfer analysis** and can also **provide APU feed pumps**

FEATURES

- **Altitude:** up to 15,545 m (51,000 ft) depending on fuel type and temperature
- **Jet fuel temperature range :** -54°C to +65°C (-65°F to +150°F)
- **Flow:** 11,000PPH+
- **Power supply:** 115VAC 360Hz to 800 Hz – 2.2 Amps per phase
- **Thermal protection**
- **Vertical installation**
- **No canister**
 - Minimization of tank opening (10.16 cm/ 4 inch)
 - Minimization of weight (2.4kg/ 5.3 lb)
- **Output signals for health monitoring** providing predictive and cost effective maintenance



CENTRIFUGAL DC PUMP (P92C31-602)

LOW MAINTENANCE ENGINE FUEL FEED PUMP FOR VERY LONG RANGE BUSINESS JET

ENGINE FUEL FEED PUMPS PROVIDE POSITIVE FUEL PRESSURE AT THE INLET OF AIRCRAFT ENGINES TO PREVENT ENGINE FLAME OUT AND VAPOUR LOCK PHENOMENON WHICH OCCUR IN ALTITUDE AND/OR WITH HOT FUELS.

AVAILABLE FOR ALL TYPES OF AIRCRAFT, SAFRAN AEROSYSTEMS ENGINE FUEL FEED PUMPS MAY ALSO BE USED AS INTER-TANK TRANSFER PUMPS.



BENEFITS

Safran Aerosystems engine fuel feed pumps provide the required fuel flow/pressure to the inlet of business jet engines in normal and abnormal conditions

Thanks to its safe foolproof internal design, Safran Aerosystems P92C31-602 engine fuel feed pump **meets FAR25.981(a)(3) requirements**

Safran Aerosystems P92C31-602 engine fuel feed pumps does not require scheduled maintenance. The **20,000 flight hours MTBF** is the sign of its remarkable reliability

The **P92C31-602 pump** benefits from Safran Aerosystems wide experience with **high-end very long range business jet** applications

With a strong know-how in complete fuel system design, Safran Aerosystems is able to assist with **engine feed and transfer analysis** and can also **provide APU feed pumps**

FEATURES

- **Altitude:** up to 15,545 m (51,000 ft) depending on fuel type and temperature
- **Jet fuel temperature range :** -54°C to +65°C (-65°F to +150°F)
- **Tank hole diameter:** 11.7 cm (4.6 in approx.)
- **Flow:** 4,500PPH+
- **Power supply:** 28 V - 19 Amps
- **Maximum weight with canister:** 3.4 kg (7.5 lb)
- **Thermal protection**
- **Horizontal installation in canister**
- **Output signals for health monitoring** providing predictive and cost effective maintenance



APU FUEL FEED PUMP (P99C15-606)

STATE-OF-THE-ART DESIGN FOR BUSINESS JET APPLICATION

SAFRAN AEROSYSTEMS AUXILIARY POWER UNIT (APU) FUEL FEED PUMPS PROVIDE POSITIVE FUEL FLOW/PRESSURE AT THE INLET OF BUSINESS JET ENGINES.

THEY PREVENT APU ENGINE FLAME OUT AND VAPOUR LOCK PHENOMENON WHICH OCCUR IN ALTITUDE AND/OR WITH HOT FUELS.



BENEFITS

Thanks to its safe foolproof internal design, Safran Aerosystems P99C15-606 APU fuel feed pump meets FAR25.981(a)(3) requirements

The P99C15-606 APU feed fuel pump does not require scheduled maintenance. The 130,000 flight hours MTBF is the sign of its remarkable reliability

The P99C15-606 pump benefits from Safran Aerosystems wide experience with high-end very long range business jet applications

FEATURES

- **Weight:** 0.960 kg (2.1 lb)
- **Operating temperature**
 - Fuel : -54°C to +65°C (-65°F to +150°F)
 - Environment: -55 °C to +85 °C (-67 °F to +185 °F)
- **Altitude:** up to 15,545 m (51,000 ft) depending on fuel type and temperature
- **Tank hole diameter:** 8.8 cm (3.46 inch)
- **Flow:** up to 250 l/h (440 PPH)
- **Performances:** 0.7 bar @ 250 l/h (10.15 Psi @ 440 PPH)
- **Power supply:** 3.5 Amps @ 28VDC
- **Thermal protection**
- **Vertical installation on tank bottom skin** (no canister)
- **Output signals for health monitoring** providing predictive and cost effective maintenance



**APU FUEL FEED PUMP
(P99C25-613)**

STATE-OF-THE-ART DESIGN FOR BUSINESS JET APPLICATION

SAFRAN AEROSYSTEMS AUXILIARY POWER UNIT (APU) FUEL FEED PUMPS PROVIDE POSITIVE FUEL FLOW/PRESSURE AT THE INLET OF BUSINESS JET ENGINES.

THEY PREVENT APU ENGINE FLAME OUT AND VAPOUR LOCK PHENOMENON WHICH OCCUR IN ALTITUDE AND/OR WITH HOT FUELS.



BENEFITS

Thanks to its safe foolproof internal design, Safran Aerosystems P99C25-613 APU feed pump meets FAR25.981(a)(3) requirements

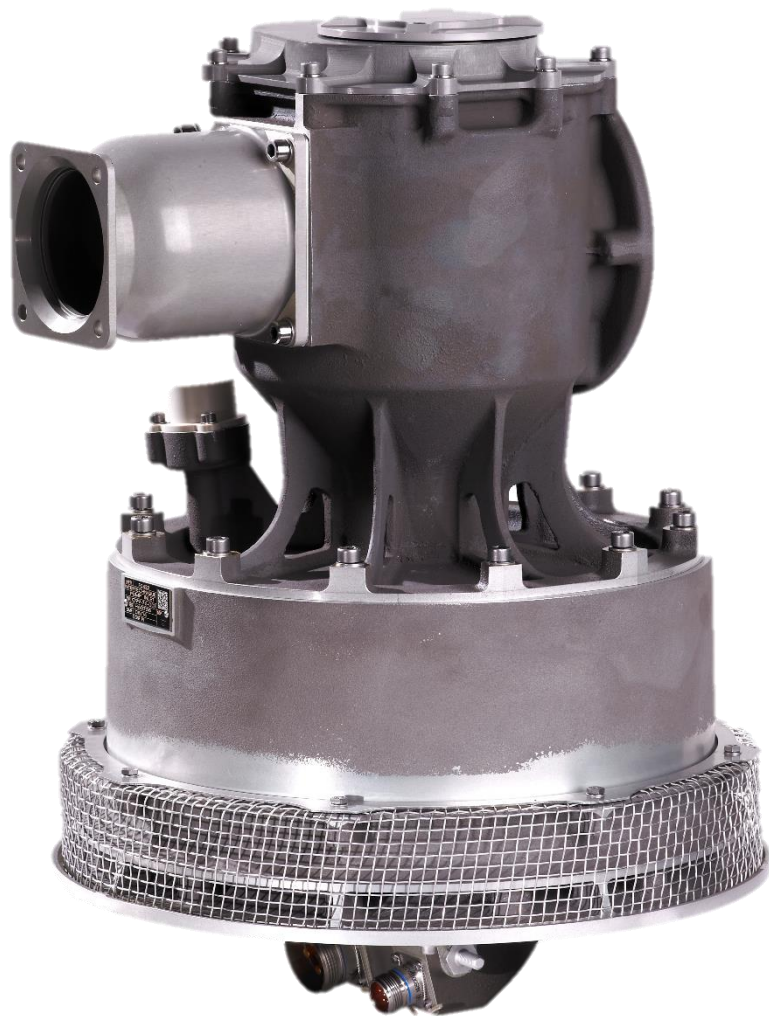
Safran Aerosystems P99C25-613 APU feed fuel pump does not require scheduled maintenance. The 80,000 flight hours MTBF is the sign of its remarkable reliability

The P99C25-613 pump benefits from Safran Aerosystems wide experience with high-end very long range business jet applications

FEATURES

- **Operating temperature:**
 - Fuel: -54°C to +65°C (-65°F to +150°F)
 - Environment: -55 °C to +85 °C (-67 °F to +185 °F)
- **Altitude:** up to 12,500 m (41,000 ft) depending on fuel type and temperature
- **Tank hole diameter:** 14 cm (5.5 in approx.)
- **Flow:** up to 400 l/h (705 PPH)
- **Performances:** 0.67 bar @ 300 l/h (9.7 psig @ 530 PPH)
- **Maximum power consumption:** 2.8 Amps @ 28VDC
- **Maximum weight with canister:** 3.9 kg (6.61 lb)
- **Thermal protection**
- **Vertical installation in canister**
- **Output signals for health monitoring** providing predictive and cost effective maintenance

AEROSYSTEMS



FUEL DISPENSE PUMP

SMART HIGH POWER WILD FREQUENCY FUEL PUMP WITH ELECTRONIC CONVERTER

THANKS TO OUR VERY LARGE EXPERIENCE IN DEVELOPING, QUALIFYING AND USING ELECTRONIC CONVERTOR IN FUEL PUMP MOTORS, SAFRAN AEROSYSTEMS FUEL DISPENSE PUMP IS VERY EFFICIENT AND RELIABLE.

SAFRAN AEROSYSTEMS FUEL DISPENSE PUMP IS AN IN-TANK MOUNTED SELF PRIMING PUMP WHICH CAN BE USED FOR TRANSFER, JETTISON AND IN FLIGHT REFUELING APPLICATIONS.

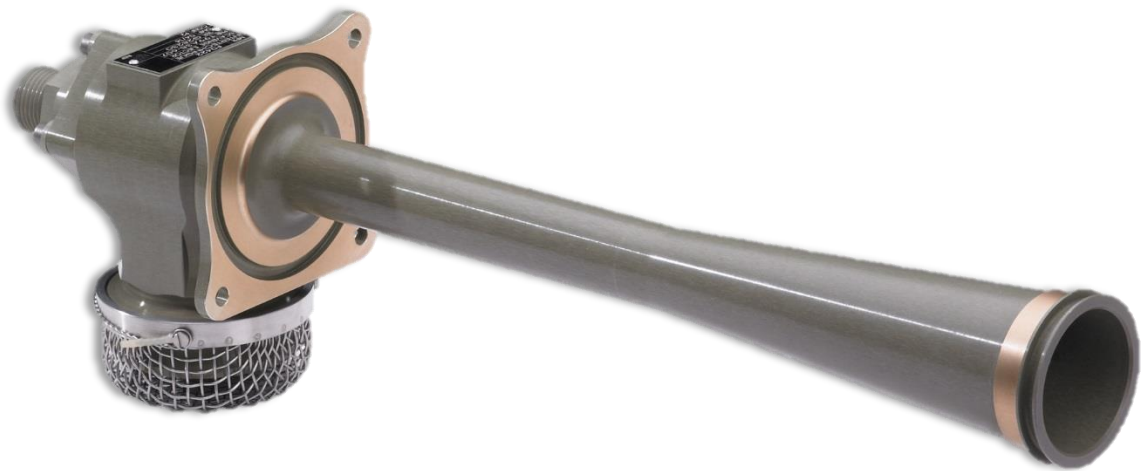


BENEFITS

- **System performance can be adjusted to system configuration** using internal pressure regulation by integrated pressure sensor and target provided from aircraft signal
- High power pump which **can be installed on composite wing**
- **Electrical consumption much lower than induction motor thanks to HV Brushless motor**
- **Compliant with FAR 25.981 requirements**
- **Dry run protected**

FEATURES

- **24.5 Psi @ 93600 PPH 42,500 kg/h**
- **Weight (with canister): 17.2 kg (38 lb)**
- **Power: 7.6 kVA**
- **Frequency: 360 – 650 Hz**
- **Voltage: 100 to 122VAC**
- **Power factor > 0.9**
- **Integrated functions:**
 - › **Pressure regulated by integrated pressure sensor**
 - › **Input signals integrity detection**
 - › **Fault signal output generation**
 - › **Input phase disconnection**
 - › **Overpressure detection**
 - › **Fault current monitoring**
 - › **Dry run detection**
 - › **Current limitation**



JET PUMP

A COST-EFFECTIVE SOLUTION FOR VARIOUS OPERATIONS

SAFRAN AEROSYSTEMS FUEL JET PUMPS ARE EJECTOR PUMPS USING THE ASSOCIATION OF VENTURI OR NOZZLE DEVICES.

SAFRAN AEROSYSTEMS JET PUMPS ARE THE RESULT OF SEVERAL YEARS OF RESEARCH TO IMPROVE EFFICIENCY WHATEVER THE APPLICATION IN THE FUEL SYSTEM.



BENEFITS

Thanks to their **very low weight** and **maintenance-free** operation, Safran Aerosystems fuel jet pumps offer simple, more cost-effective ways to:

- **Supply fuel continuously to engines**
- **Provide a tank to tank fuel transfer function**
- **Transfer fuel from center tank to wing tanks**
- **Manage water in the bottom of the tank to prevent icing**

Safran Aerosystems ejector pump design has proven robustness and reliability on main business jet, regional and commercial aircraft programs

They can be supplied by low motive pressure coming from the fuel system or high motive pressure provided by engines

Depending on customer requirements, Safran Aerosystems fuel jet pumps can be equipped with:

- Non return valve
- Filter
- Screens icing resistance
- Cavitation resistance devices

FEATURES

- **Flow**
 - Suction flow: 0 l/h to 10,000 l/h (0 g/h to 2642 g/h)
 - Motive flow: 100 l/h to 3,000 l/h (0 g/h to 792.5 g/h)
- **Pressure**
 - Outlet pressure: 0 bar to 1.5 bar (0 Psi to 14.5 Psi)
 - Motive pressure: 0.6 bar to 42 bar (8.7 Psi to 609 Psi)
- **Temperature range:** -55°C and +85°C (-70°F to +185°F)
- **Altitude range:** -609.6 m to +15,545 m (-2,000 ft to +51,000 ft)
- **Fuel:** all types of jet fuel
- **MTBF:** > 1,000,000 flight hours



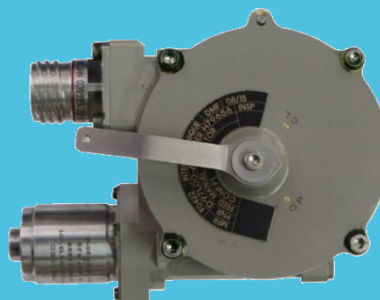
SINGLE MOTOR ACTUATOR

HIGHLY RELIABLE EQUIPMENT THROUGHOUT THE OPERATIONAL LIFE OF THE AIRCRAFT

SAFRAN AEROSYSTEMS ACTUATORS CAN BE EMPLOYED ON ALL TYPES OF VALVES NEEDING A STABLE-ROTATIONAL MOVEMENT.

SAFRAN AEROSYSTEMS ACTUATORS ARE MOSTLY USED TO PROVIDE A ROTATION OF 90° OF AIRCRAFT FUEL AND INERTING SYSTEMS BALL VALVES TO REACH AN OPEN OR A CLOSED POSITION.

THANKS TO THEIR COMPACT AND ROBUST DESIGN, SAFRAN AEROSYSTEMS ACTUATORS OFFER A VERY LOW WEIGHT AND DOES NOT REQUIRE ANY KIND OF MAINTENANCE.



BENEFITS

Safran Aerosystems single motor actuators operate **refueling, defueling, engine feed or transfer and isolation and flow control functions**

Safran Aerosystems offer two types of single motor actuator. They differ by their attachment means and by their shaft drive configuration

Compliant with FAR25.981 requirements, Safran Aerosystems single motor actuator consists in a brushed DC motor, a wormscrew/gear drive and two electronic boards

The electronic board provides **filtering of Electromagnetic Interference and indirect lightning protection**

Two discrete **output signals** are available to indicate **actuator's position** (valve open or closed). These signals are provided by two mechanical microswitches

Safran Aerosystems **mechanical gear design allows the holding of position when the actuator is not any more powered**. A dispatch interface can indeed be used to lock the ball valve in open or closed position

A lever and its clutch system can be proposed **on option** to provide an **additional manual command**

FEATURES

| | P/N D97C00-682 | P/N D97C00-684 |
|-------------------------------|--|--|
| Dimensions | 69 x 128 x 60 mm (2.7 x 5 x 2.4 inch) | 46 x 100 x 57 mm (1.8 x 3.9 x 2.2 inch) |
| Weight | 350 g (0.77 lb) | |
| Valve fixation | 4 Screws | V-clamp |
| Valve transmission | Splined shaft | Flat shaft |
| Temperature range | -60°C to +70°C (-76°F to +158°F) | |
| Voltage range | 18VDC to 32VDC (nominal 28VDC) | |
| Electrical consumption | Rated < 0.5A Stall < 1A | |
| Torque | Rated: 4.5N.m Stall @ 28VDC: 12N.m | |
| Operating time | 2 to 9 seconds | |
| Angular stroke | 90° ±1.5° | |
| Insulation resistance | > 100MΩ at 45VDC | |
| Dielectric strength | 500VDC | |
| Endurance | 300,000 cycles | |
| Altitude | 16,764 m (55,000 ft) | |
| Motorization | Brushed DC motor | |
| Electrical connector | D38999 series III or as required | |



TWIN MOTOR ACTUATOR (D97D00-622)

A UNIQUE DESIGN ENHANCING FUEL SYSTEM SAFETY AND RELIABILITY

SAFRAN AEROSYSTEMS ACTUATORS CAN BE EMPLOYED ON ALL TYPES OF VALVES NEEDING A STABLE-ROTATIONAL MOVEMENT.

SAFRAN AEROSYSTEMS ACTUATORS ARE MOSTLY USED TO PROVIDE A ROTATION OF 90° OF AIRCRAFT FUEL AND INERTING SYSTEMS BALL VALVES TO REACH AN OPEN OR A CLOSED POSITION.

THANKS TO THEIR COMPACT AND ROBUST DESIGN, SAFRAN AEROSYSTEMS ACTUATORS OFFER A VERY LOW WEIGHT AND DOES NOT REQUIRE ANY KIND OF MAINTENANCE.



BENEFITS

Safran Aerosystems twin motor actuators operate **engine feed, cross feed, jettison or APU feed**

Safran Aerosystems offer two types of twin motor actuator which differ by their attachment means (V-clamp or 4 screws)

Compliant with FAR25.981 requirements, our twin motor actuator consists in two brushed DC motors, a wormscrew/gear drive and two electronic boards

The two electronics boards and motors ensure **actuation redundancy for enhanced safety**

The electronic board provides **filtering of Electromagnetic Interference** and **indirect lightning protection**

Two discrete **output signals** are available to indicate **actuator's position** (valve open or closed). These signals are provided by four mechanical microswitches

Safran Aerosystems **mechanical gear design** allows **the holding of position when the actuator is not any more powered**

A lever and its clutch system can be proposed on **option** to provide an **additional manual command**

FEATURES

| | |
|-------------------------------|---|
| Dimensions | 80 x 162 x 82 mm (3.15 x 6.38 x 3.23 inch) |
| Weight | 660g (1.45 lbs) |
| Valve attachment | 4 Screws |
| Valve drive | Splined shaft |
| Temperature range | -60°C to +70°C (-76°F to +158°F) |
| Voltage range | 18VDC to 32VDC (nominal 28VDC) |
| Electrical consumption | Rated < 0.5A Stall < 2A |
| Torque | Rated: 4.5N.m Stall @ 28VDC: 24N.m |
| Operating time | Both motors supplied: 2 to 6 seconds One motor supplied: 2 to 10 seconds |
| Angular stroke | 90° ±1.5° |
| Insulation resistance | > 100MΩ at 45VDC |
| Dielectric strength | 500VDC |
| Endurance | 60,000 cycles |
| Altitude | 16,764 m (55,000 ft) |
| Motorization | Brushed DC motor |
| Electrical connector | D38999 serie III or as required |



BALL VALVE

EXCLUSIVE DESIGN IMPROVING SAFETY AND MAINTENANCE

SAFRAN AEROSYSTEMS BALL VALVES ARE SHUT OFF VALVES OPERATED BY 90° ELECTRICAL ROTARY ACTUATORS (SINGLE OR TWIN MOTOR ACTUATORS).

THEY ARE USED ON REFUEL, DEFUEL, TRANSFER AND ENGINE FEED FUEL SUB SYSTEMS.



BENEFITS

Safran Aerosystems ball valves are qualified as per FAR 25.981 and EUROCAE ED-14D/ RTCA DO-160 requirements

Zodiac has developed an easy-to-remove attachment collar between the ball valve and the electrical actuator. This allows an easy and fast replacement of the actuator in case of failure, with no need to dismount the valve itself.

In order to prevent fuel vapour ignition hazard, Safran Aerosystems installs a plastic isolating device between the actuator output shaft and the ball valve shaft. This prevents any current or voltage to leak into the fuel area. This is an improvement regarding FAR25.981 compliance

A pressure relief function is included in the valve body. It opens for a pressure higher than 3.5 bar (50.76 Psi), avoiding any pressure rise in the pipes generated by a fuel heating.

FEATURES

- **Weight:** 0.75 kg (1.65 lb) for ball valve Ø 3.18 cm (1.25 inch)
- **Operating temperature:**
 - › Fuel: -55 °C to +70 °C (-67 °F to +158 °F)
 - › Environment: 55 °C to +85 °C (-67 °F to +185 °F)
- **Pressure**
 - › Maximum operating pressure: 3.79 bars (55 Psi)
 - › Surge pressure : 8.27 bars (120 Psi)
 - › Proof pressure : 16.55 bars (240 Psi)
 - › Burst pressure : 24.83 bars (360 Psi)
- **Leakage**
 - › External leakage : 0 cm³/ 0 cu inch per minute up to proof pressure
 - › Internal leakage : 1 cm³/ 0.06 cu inch per minute up to max operating pressure
- **MTBF** > 150 000 flight hours



ISOLATION FUEL SOLENOID VALVE

A TRULY VERSATILE SOLUTION FOR ANY COMPLEX OR DEMANDING SYSTEM

ISOLATION FUEL SOLENOID VALVES ARE A COMPONENT OF THE FUEL REFUELING/ DEFUELING SYSTEM. CONTROLLED BY AN ELECTRIC CURRENT THROUGH A SOLENOID, THESE VALVES ARE USED TO TRANSMIT OR STOP THE FUEL FLOW IN THE REFUEL LINE.

SAFRAN AEROSYSTEMS SOLENOIDS OFFER FAST AND SAFE SWITCHING, HIGH RELIABILITY, LONG SERVICE LIFE, LOW CONTROL POWER AND LIGHT COMPACT DESIGN.



BENEFITS

Safran Aerosystems isolation fuel solenoid valves are **capable to operate in both directions of flow**:

- Refueling direction
- Defuel direction

They can be installed in the tank with their **electrical connector located outside fulfilling FAA AC 25.981 requirements**

All the electrical parts are indeed protected with reinforced insulation sleeve and are located in a dry and hermetic zone

Safran Aerosystems solenoid fuel isolation valves have a **poppet electrically operated by an electromagnet**

When the supply voltage is applied to the electromagnet and upstream pipe is pressurized, the isolation valve opens

At rest, when the electromagnet is not supplied or pressure not available, the isolation valve is closed

Zodiac solenoid valves are qualified for use of all type of aviation jet fuel

FEATURES

- **Weight:** 2.270 kg (5.004 lb)
- **Temperature range:** -55°C to +70°C (-70°F to +160°F)
- **Operating time:** 3 to 8 seconds
- **Pressure:**
 - › Maximum working pressure: 8 bar (120 Psi)
 - › Proof pressure: 16 bar (240 Psi)
 - › Burst pressure: 20-bar (300 Psi)
- **Pressure drop:** < 480 mbar (7 Psi) at maximum flow
- **Maximum fuel flow:** 1800 kg per minute (600 GPM)
- **Maximum current consumption:** 0.6 Amps



VENT FLOAT VALVE

LONG LASTING SOLUTION PREVENTING THE FUEL TO GO INTO THE VENT TANK

VENT FLOAT VALVES ARE MOUNTED INSIDE THE TANK ON THE VENT LINE PIPE OR ON THE TANK WALL.

SAFRAN AEROSYSTEMS VENT FLOAT VALVES GIVE CORRECT VENTING TO THE FUEL TANKS.



BENEFITS

Safran Aerosystems vent float valves' function is to shut venting port when the fuel reaches the maximum level

They can be located:

- at the tip of the wing tank under one of the vent stringer
- inboard and forward and installed on a pipe connected to the vent stinger

Safran Aerosystems vent float valves ensure:

- proper venting of the tanks during refueling
- proper fuel drain of the vent lines during flight

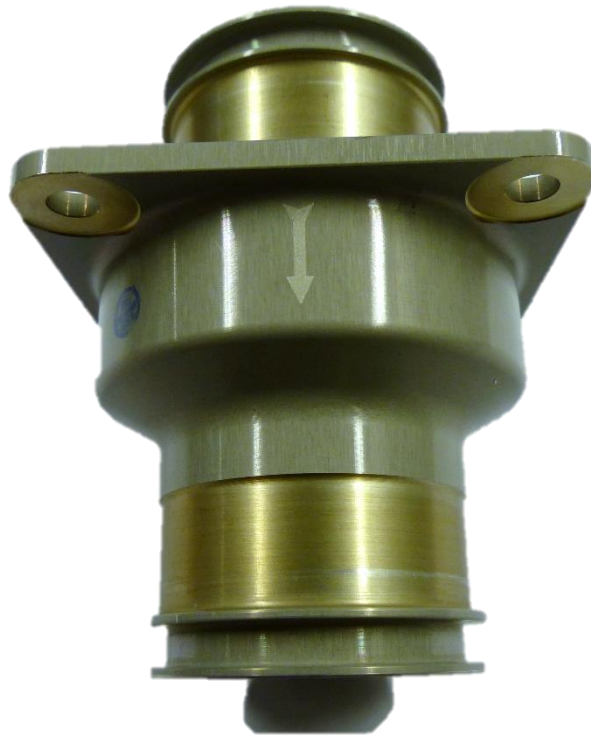
When the vent float valve is fitted on the tank wall, the interface with structure is made:

- by a flange with 4 fixation holes
- with standard AS1656 end fitting connections

Safran Aerosystems vent float valves are qualified as per FAR 25.981 and EUROCAE ED-14D/ RTCA DO-160 requirements

FEATURES

- **Weight:** 0.1 to 0.250 kg (0.22 to 0.55 lb)
- **Jet fuel temperature range:** -55 °C to +70 °C (-67 °F to +158 °F)
- **Ambient operating temperature:** -55 °C to +85 °C (-67 °F to +185 °F)
- **Maximum operating pressure:** 0.24 bar (3.5 Psi)
- **Proof pressure :** 1 bar (15 Psi)
- **Burst pressure :** 2 bars (30 Psi)
- **Internal leakage :** 5 cm³/ 0.31 cu inch per minute up to max operating pressure
- **Fluid:** Jet fuel
- **MTBF >** 300,000 flight hours



SPRING LOADED FUEL NON RETURN VALVE

PROVIDING QUALITY PRECISION AIRCRAFT FLUID CONTROL WHATEVER THE REQUIREMENT

SAFRAN AEROSYSTEMS DESIGNS AND MANUFACTURES TWO TYPES OF FUEL NON RETURN VALVE : SPRING-LOADED AND FLAPPER.

IDEAL FOR AIRCRAFT FUEL SYSTEM APPLICATIONS, SAFRAN AEROSYSTEMS FUEL NON RETURN VALVES ALLOW FLUID TO FLOW IN ONLY ONE DIRECTION.



BENEFITS

Safran Aerosystems spring loaded fuel non return valves are usually **mounted inline on fuel piping**

The spring maintains the poppet closed when there is no pressure. The internal sealing is ensured by an overmolded seal or direct metal contact

Compatible with all types of jet fuel, Safran Aerosystems spring loaded fuel non return valves can be used on:

- Low fuel pressure lines (refuel, defuel, transfer, engine or APU feed line)
- High pressure fuel lines (flow fuel lines)

Safran Aerosystems spring loaded fuel non return valves are **qualified as per FAR 25.981 and EUROCAE ED-14D/ RTCA DO-160 requirements**

FEATURES

- **Standard end fitting connection:**
 - High pressure non return valve: AS4395 Ø 12.7 mm (0.5")
 - Low pressure non return valve: AS1656 Ø 16.05 to 38.1 mm (0.75 to 1.5")
- **Weight:**
 - High pressure non return valve: 50 g (0.11 lb)
 - Low pressure non return valve: from 100 to 140 g (0.22 to 0.30 lb)
- **Maximum operating pressure:**
 - High pressure non return valve: up to 34.5 bar (500 Psi)
 - Low pressure non return valve: from 0 to 4.1 bar (0 to 60 Psi)
- **Cracking pressure:** 0.035 bar (0.5 Psi)
- **Temperature range:** -55 °C to +85 °C (-67 °F and +158 °F)
- **MTBF** > 500, 000 flight hours

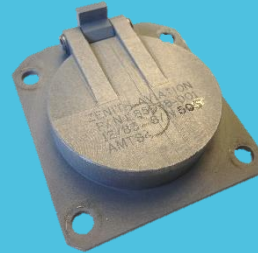


NON RETURN FLAP VALVE

PROVIDING QUALITY PRECISION AIRCRAFT FLUID CONTROL WHATEVER THE REQUIREMENT

SAFRAN AEROSYSTEMS DESIGNS AND MANUFACTURES TWO TYPES OF NON RETURN VALVE: SPRING-LOADED AND FLAPPER.

IDEAL FOR AIRCRAFT FUEL SYSTEM APPLICATIONS, SAFRAN AEROSYSTEMS NON RETURN VALVES ALLOW FLUID TO FLOW IN ONLY ONE DIRECTION.



BENEFITS

Safran Aerosystems non return flap valves are usually mounted on other fuel equipment (pump canister, jet pump) or on tank separation walls. They can also be mounted in line on piping with double flap (butterfly valve) principle

Safran Aerosystems non return flap valves are **available in all sizes** used on current aircraft platforms (business jet, regional or commercial):

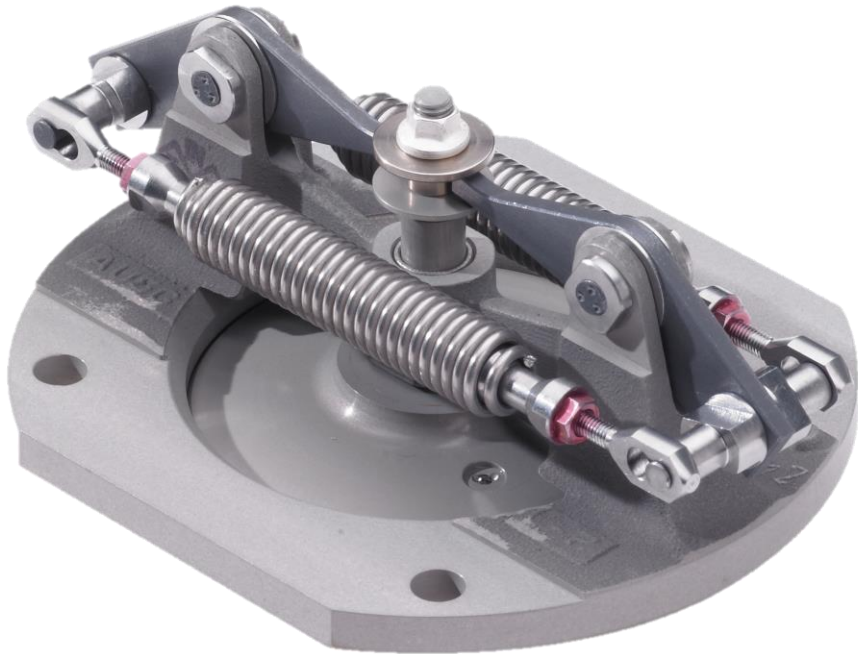
- **Metallic one flap valve mounted on fuel equipment**
- **Metallic double flap valve mounted on line**
- **Plastic flapper valve mounted on tank sealed ribs**

Safran Aerosystems non return flap valves are **jet fuel resistant with the common aerospace standards for additives and temperatures ranges**

Thanks to their **very simple and robust design**, Safran Aerosystems non return flap valves are **qualified as per FAR 25.981 and EUROCAE ED-14D/ RTCA DO-160 requirements**

FEATURES

| | Plastic flap valve | Metallic one flap valve | Metallic double flap valve |
|-----------------------------------|--|--|--|
| Weight | Between 5 and 32 g (0.01 to 0.07 lb) | Between 50 and 200 g (0.11 to 0.44 lb) | Between 50 and 200 g (0.11 to 0.44 lb) |
| Diameter | From 1.5 to 4.6 cm (0.6 to 1.8 inch) | From 1.5 to 7.6 cm (0.6 to 3 inch) | From 3.8 to 6.35 cm (1.5 to 2.5 inch) |
| Maximum operating pressure | From 0 to 0.35 bar (0 to 5 Psi) | From 0 to 4.14 bar (0 to 60 Psi) | |
| Cracking pressure | 0.035 bar (0.5 Psi) | | |
| Operating temperature | From -55 °C to +85 °C (-67 °F to +158 °F) | | |
| MTBF | > 1,000,000 flight hours | | > 800,000 flight hours |



PRESSURE RELIEF VALVE

PROVIDING OVERPRESSURE PROTECTION WHATEVER TANK STRUCTURE AND PRESSURE

AIRCRAFT FUEL SYSTEM ARCHITECTURE MUST AVOID FUEL TANKS OVERPRESSURE IN THE EVENT OF REFUEL CUT-OFF FAILURE OR ABNORMAL PRESSURE IN THE WINGS.

PROVIDED FOR EACH WING, SAFRAN AEROSYSTEMS PRESSURE RELIEF VALVES PROTECT THE WINGS FROM THIS KIND OF DAMAGE



BENEFITS

Used on the main business jet, regional or commercial aircraft, Safran Aerosystems pressure relief valves are **compatible with the latest icing and direct lightning requirements**

Safran Aerosystems designs and manufactures either **one-way or two-way pressure relief valves** depending on system requirements

Thanks to their robust design, Safran Aerosystems pressure relief valves are very reliable and **only** require **condition-based maintenance**

The pressure relief valve is a spring loaded piston type non return valve

When the pressure in the fuel tank exceeds the cracking pressure, the pressure load applied on the poppet exceeds the spring load, so the poppet moves and opens a flow path from the inside to the outside of the fuel tank

For safety and maintenance purpose, the poppet can also be activated by a handle on ground

FEATURES

- **Temperature range:** -55°C and +85°C (-70°F to +185°F)
- **Altitude range:** -609.6 m to +15,545 m (-2,000 ft to +51,000 ft)
- **Cracking Pressure:** 0.035 bar to 2.48 bar (0.5 Psi to 36 Psi)



WATER DRAIN VALVE

COMPLIANT TO THE LATEST STANDARD SAFETY STANDARDS WHATEVER THE STRUCTURE

SAFRAN AEROSYSTEMS WATER DRAIN VALVES ARE USED TO REMOVE WATER AND OTHER CONTAMINANTS FROM THE FUEL TANKS AND ENSURE TIGHTNESS.

SAFRAN AEROSYSTEMS DESIGNS AND MANUFACTURES METALLIC AND PLASTIC WATER DRAIN VALVES WHICH HAVE PROVEN THEIR EASE OF USE AND ROBUSTNESS.



BENEFITS

Safran Aerosystems water drain valves equip main **business jet, regional and commercial aircraft** programs

They are **lightning strike resistant** qualified as per FAR 25.981 and EUROCAE ED-14D/ RTCA DO-160 requirements

Their simple design is outstanding for **aluminium or composite structure** and **prevents fuel tank corrosion** caused by water or bacteria

Located on the lower wing skin at the low points of each fuel tank, the water drain valve is a manually operated spring-loaded poppet valve

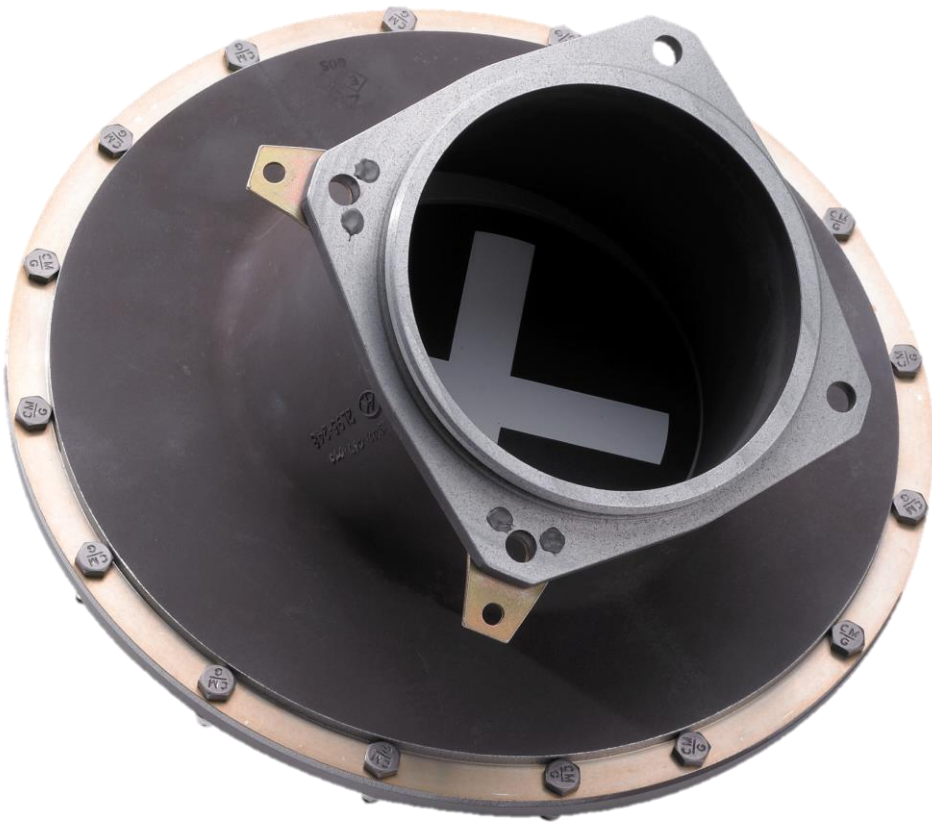
The water drain valve is directly mounted on the tank floor, attached by 4 screws or simple thread. It **can be flushed mounted** and can be opened from the outside by a simple screwdriver

The water drain valve **sealing can be replaced without defueling the tank**

Safran Aerosystems water **drain valve can be integrated in a fuel dump** valve which can be proposed if requested. This dump valve would allow to defuel by gravity and manually the fuel tanks

FEATURES

- **Weight:** from 0.03 to 0.05 kg (0.07 to 0.11 lb)
- **Temperature range:** -55°C to +85°C (-70°F to +160°F)
- **Fluid:** Water, Jet fuel
- **MTBF:** > 500,000 cycles



BURST DISC

A RELIABLE AND PRECISE TECHNOLOGY TO PREVENT PRESSURE FAILURES

SAFRAN AEROSYSTEMS BURST DISC ARE FRANGIBLE NON-RESETTING DEVICE PREVENTING THE OCCURRENCE OF OVERPRESSURE OR LOW PRESSURE IN THE TANK OUTSIDE THE SET TOLERANCES.

LOCATED IN THE AIR VENTING ENCLOSURE OF THE WINGS, THEY OPERATE TO PROVIDE AN ALTERNATIVE ROUTE BETWEEN FUEL TANKS AND ATMOSPHERE IN THE EVENT OF A BLOCKED, OR PARTIALLY BLOCKED, TANK VENTING LINE.



BENEFITS

Safran Aerosystems burst disc's technology is based on carbon disc

Under all normal operating conditions, and abnormal events such as fuel overflow and emergency descent, over the full environmental spectrum, the burst disc stays intact, provided the vent tank pressure remains within specified limits

Only if the vent tank exceeds specified pressure limitations, the burst disc shall break

A filter in stainless steel to avoid carbon disc parts entering into the tank in case of inward bursting is installed on the equipment

A white cross on the disc allows the maintenance operator to check if the carbon disc is broken or not before flight

Safran Aerosystems burst discs are qualified as per FAR 25.981 and EUROCAE ED-14D/ RTCA DO-160 requirements

FEATURES

- **Dimensions:**
 - Diameter: 225 mm (8.858 in)
 - Length: 205 mm (8.071 in)
- **Weight:** 1.470 kg (3.241 lb)
- **Temperature range:** -55 °C to +70 °C (-70 °F to +160 °F)
- **Altitude range:** -300 m to +12,000 m (-1,000 ft to + 43,000 ft)
- **Maximum operating pressure:**
 - **Wing surge to outside:** 482 to 551 mbar (7 to 8 Psi)
 - **Outside to wing surge:** 206 to 344 mbar (3 to 5 Psi)
 - **Trim surge to outside:** 448 to 500 mbar (6.5 to 7.25 Psi)
 - **Outside to trim surge:** 200 to 300 mbar (2.9 to 4.35 Psi)
- **High reliability** >1,000,000 flight hours



PRESSURE REFUEL ADAPTOR

A GUARANTEE FOR TROUBLE FREE REFUELING OPERATIONS

SAFRAN AEROSYSTEMS REFUEL AND DEFUEL ADAPTOR IS AN EQUIPMENT USED TO CONNECT THE AIRCRAFT FUEL SYSTEM TO THE AVIATION REFUELING VEHICLE TO PRESSURE FILL THE FUEL TANK.

SAFRAN AEROSYSTEMS PRESSURE REFUEL ADAPTOR ARE USED ON ALL TYPES OF AIRCRAFT (COMMERCIAL AND MILITARY AVIATION, BUSINESS JET AND HELICOPTER).



BENEFITS

Safran Aerosystems refuel adaptor is a manually operated spring loaded poppet valve, with a double sealing function, which allows the operator to connect the refueling nozzle to the aircraft

When the operator connects the refueling nozzle onto the adaptor, the refueling nozzle pushes the poppet which opens the passage in the valve body

When the refueling nozzle is removed, the spring pushes the poppet and the plunger back into position and closes the adaptor

The adaptor inlet is protected by an aluminum or plastic cap attached to the adaptor by a flange

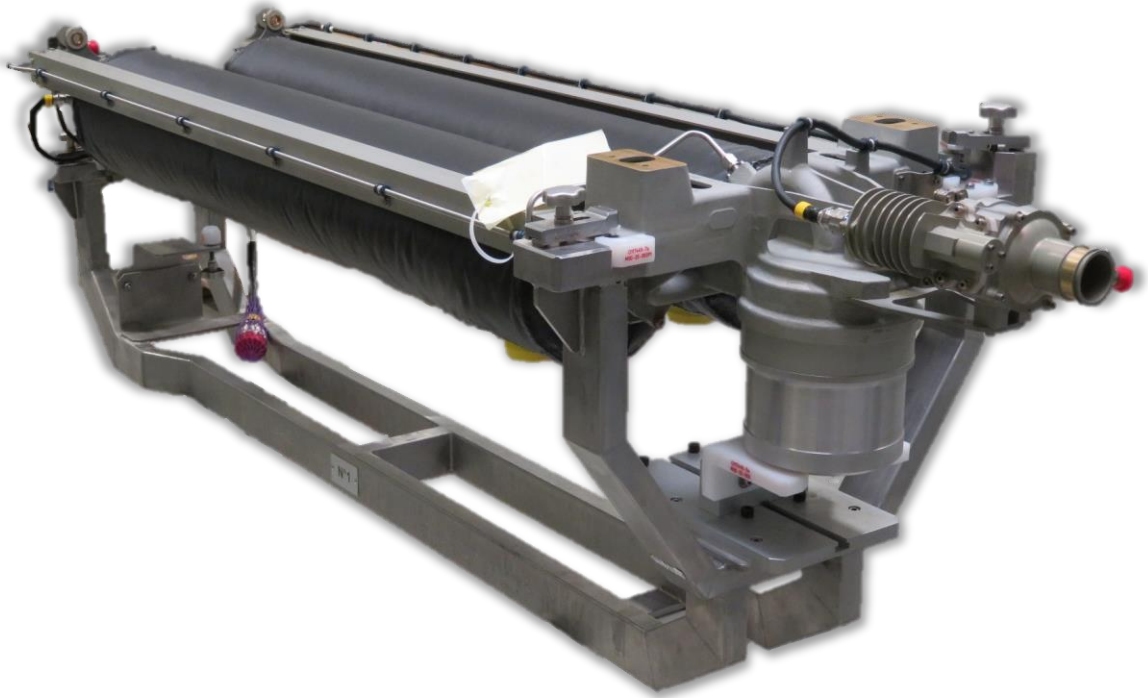
Safran Aerosystems refuel pressure adaptor can include a replaceable frangible part in the event of misuse of the refueling nozzle.

If the refueling operator forgets to disconnect or improperly disconnects the refueling nozzle from the aircraft, the frangible part will break to prevent any wing damage

This frangible part can easily be replaced without unsealing the valve

FEATURES

- **Weight:**
 - › Adaptor: from 0.9 to 3 kg (1.98 to 6.61 lb)
 - › Cap: from 0.165 kg to 0.22 kg (0.36 to 0.49 lb)
- **Maximum operating pressure:** 3.79 bar (55 psig)
- **Operating temperature:** -55 °C to +85 °C (-70°F to +160 °F)
- **Fluid:** Jet fuel
- **High reliability** > 500,000 flight hours
- **Qualification in accordance with:**
 - › FAR 25.981
 - › EUROCAE ED-14D/ RTCA DO-160 requirements
 - › ISO 45 Aircraft Pressure Refueling Connections



ON BOARD INERT GAS GENERATING SYSTEM

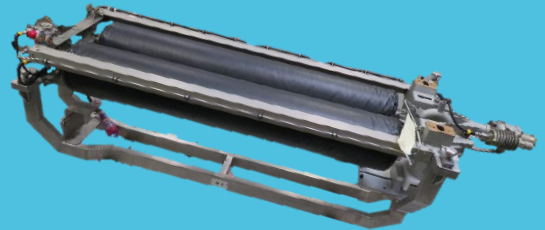
SUPPORTING CUSTOMERS FROM INERTING SYSTEM SPECIFICATION TO CERTIFICATION

THANKS TO ITS EXPERIENCED TEAMS, SAFRAN AEROSYSTEMS IS ABLE TO DESIGN, DEVELOP AND MANUFACTURE COMPLETE FUEL TANK INERTING SYSTEMS.

WE OFFER HIGH PERFORMANCE EQUIPMENT TAILORED TO CUSTOMERS REQUIREMENTS AS ON BOARD INERT GAS GENERATING SYSTEM (OBIGGS).

SAFRAN AEROSYSTEMS ALSO PROVIDES FULL FLAMMABILITY ANALYSIS AS WELL AS COMPLETE TEST VERIFICATION CAMPAIGNS.

WE ARE COMMITTED TO SUPPORT OUR CUSTOMERS FOR CERTIFICATION ACTIVITIES.



BENEFITS

The OBIGGS generates inert gas which is injected into the fuel tanks to drastically reduce the risks of explosion due to an unexpected/undesired ignition source.

OBIGGS main components are:

- Shut-off valve
- Flow control valve
- Ozone converter
- Particles and aerosols filter
- Air separation module
- Generic oxygen sensor
- Fuel tank inerting controller

Safran Aerosystems OBIGGS offers outstanding performances regarding flow and inert gas quality relying on:

- its recognized know-how on sensing and control system
- Its robust development and verification processes
- strong cooperation with world class suppliers to take advantage of reliable and field-proven components

Safran Aerosystems is able to offer cost-effective inerting systems for any size of commercial aircraft thanks to:

- A large existing component portfolio
- modular system architectures to tailor optimized solution to aircraft manufacturers

FEATURES

- **Power supply:** 28 VDC
- **Avionics interface**
 - 2 TX ARINC 429 digital buses high speed
 - 2 RX ARINC 429 digital buses high speed
 - 1 CAN digital bus
- **Operating temperature:** -55°C to +71°C
(-67°F to +160°F)
- **Certification:**
 - Fully compliant with AC25-981-1C
 - Qualified per DO-160 qualification standards



AIR SEPARATION MODULE

BEST-IN-CLASS SOLUTION TO ENHANCE AIRCRAFT SAFETY

THE AIR SEPARATION MODULE (ASM) ALLOWS THE PERMEATION OF PRESSURIZED AIR THROUGH A HOLLOW FIBER MEMBRANE BUNDLE TO SEPARATE THE AIR INTO NITROGEN ENRICHED AIR AND OXYGEN ENRICHED AIR. HENCE, IT CREATES INERT GAS THAT FULLY PROTECTS THE FUEL TANK AGAINST RISKS OF EXPLOSION.

BUILDING ON ITS 45 YEARS OF FUEL SYSTEMS AND INERTING EXPERIENCE, SAFRAN AEROSYSTEMS AIR SEPARATION MODULES ARE DESIGNED TO MEET CUSTOMER'S NEEDS AND INCORPORATES THE LATEST TECHNOLOGY STANDARDS.



BENEFITS

Based on a strong cooperation with world-recognized gas specialists, Safran Aerosystems has developed **robust and reliable** ASMs at very competitive prices.

Safran Aerosystems Air Separation Modules offer outstanding performances:

- an **optimized structural load distribution** over the tube sheet
- an **improved fiber bundle support system** reducing the thermal effect
- an improved inlet allowing a **more consistent airflow injection** over the tube sheet

Its specific design prevents early failure caused by cracking of the tube sheet that degraded the ASM performances on some existing aircraft.

Certified under part manufacturer approval, minor change test and computations, Safran Aerosystems B737NG ASM is fully compatible with existing inerting systems and can be installed line fit

FEATURES

Depending on inerting system specifications, Safran Aerosystems selects the best-fitted equipment:

| | ASM #1 (PMA & OBIGGS) | ASM #2 (OBIGGS) | ASM #3 (OBIGGS) |
|-------------------------------|-----------------------------|------------------------|------------------------|
| Length | 0.97 m (38 in) | 0.98 m (38.5 in) | 1.27 m (50 in) |
| Diameter | 0.22 m (8.5 in) | 0.16 m (6.3 in) | 0.16 m (6.3 in) |
| Weight | 12.0 kg (26.4 lb) | 7.3 kg (16.1 in) | 8.8 kg (19.4 lb) |
| Maximum operating Pressure | 3.4 bar rel (50 psig) | 5 bar rel (72 psig) | 5 bar rel (72 psig) |
| Nominal Operating temperature | 71 °C (160°F) | 77 °C (170°F) | 77 °C (170°F) |

Safran Aerosystems can also develop a tailored ASM to fully satisfy customer requirements.



FUEL TANK INERTING CONTROLLER

THE FIRST TWO-IN-ONE FUNCTION FUEL TANK CONTROLLER

SAFRAN AEROSYSTEMS IS THE FIRST COMPANY TO OFFER AN OXYGEN ANALYZER AND THE INERTING CONTROLLER IN AN ALL INTEGRATED HOUSING PACKAGE CALLED FUEL TANK INERTING CONTROLLER.

THE FUEL TANK INERTING CONTROLLER (FTIC) CONTROLS THE ON-BOARD INTER GAS GENERATION SYSTEM (OBIGGS) PACK.



BENEFITS

By monitoring and controlling the sensors and valves of the OBIGGS system, the FTIC achieves the following functions:

- **Inert Gas Generation** (overheat and overpressure protection, inhibition function)
- **Flow Control** (inlet and outlet pneumatic isolation)

Safran Aerosystems FTIC also integrates a BITE function and a digital bus for data exchange with the aircraft

Physically integrated on the OBIGGS pack, the FTIC has a very light and compact design which allows:

- **Controller weight saving:** one single casing instead of two (one for OBIGGS, one for O₂ analyzer)
- **Harness weight saving:** as the controller is close to the pack, reduction of the electrical cables quantity
- **Better reliability by limiting the quantity of components**

The CPU board of the FTIC embeds libraries of configurable software functions designed to be re-used in the scope of each specific aircraft configuration

FEATURES

- **Dimensions:** 300 x 130 x 170 mm (11.8 x 5.1 x 6.7 in)
- **Maximum weight:** less than 2.5 kg (5.5 lb)
- **Temperature range:** -55°C to +85°C (-67°F to +185°F)
- **Power supply:** 28VDC
- **Hardware capabilities:**
 - 2 TX ARINC 429 digital buses High Speed
 - 2 RX ARINC 429 digital buses High Speed
 - 1 CAN digital bus
- **DAL B equipment**
- **MTBF:** 20,000 flight hours



GENERIC OXYGEN ANALYZER

THE ONLY CONTROLLER FOR BOTH INERTING & OXYGEN SYSTEMS

GENERIC OXYGEN ANALYSER (GO2A) IS DESIGNED TO WORK IN ON-BOARD INERT GAS GENERATION SYSTEM (OBIGGS) AS WELL AS IN ON-BOARD OXYGEN GENERATING SYSTEM (OBOGS).

SAFRAN AEROSYSTEMS IS THE FIRST COMPANY TO PROPOSE AN OXYGEN ANALYZER WITH A HEALTH MONITORING FUNCTION.



BENEFITS

Safran Aerosystems Generic Oxygen Analyzer analyzer is developed as a **generic sub-equipment that can be integrated in another application or used as a single equipment** in a standalone configuration

Safran Aerosystems Generic Oxygen Analyzer is implemented with the main following functions:

- **O₂ partial pressure measure (PpO₂)**
- **Pneumatic chamber pressure**
- **O₂ rate computation**
- **Health monitoring of O₂ sensor** by using a reference gas and other monitoring
 - Self diagnostic feature allowing O₂ sensor drift detection and PpO₂ recalibration under specific conditions
- **BITE function** through CAN bus and/or ARINC

The GO2A is composed of three subparts:

- a pneumatic chamber
- a hardware electronic part
- a software part

FEATURES

- **Dimensions:** 200 * 162 * 82 mm
(7,87 * 6,37 * 3,22 in)
- **Weight:** 1 kg (2,20 lb)
- **Power consumption:** 1,5A at 28 VDC
- **Temperature range:** -55°C to +85°C
(-70°F to +185°F)
- **O₂ measurement:**
 - Range: from 0% to 100% of O₂
 - Accuracy: 0.5% of O₂
- **Minimum MTBF:** 40,000 flight hours (depending on in-flight operating conditions)
- **Certification:**
 - Fully compliant with AC25-981-1C
 - Qualified per DO-160 qualification standards



LOW TEMPERATURE OZONE CONVERTER

IMPROVING EFFICIENTLY INERTING SYSTEM PERFORMANCES

SAFRAN AEROSYSTEMS HAS DEVELOPED A HIGH-QUALITY FILTRATION CHAIN TO IMPROVE THE LIFE DURATION OF ITS OBIGGS PACK.

OZONE IS PRESENT IN THE ATMOSPHERE AT HIGH ALTITUDE. THIS MOLECULE IS WELL KNOWN TO DEGRADE THE AIR SEPARATION MODULE BY BREAKING THE POLYMERIC FIBERS.

BASED ON A STRONG COOPERATION WITH A WORLD-CLASS FILTRATION SPECIALIST, ZODIAC HAS DEVELOP AN OZONE CONVERTER THAT ENSURES THE PROTECTION OF THE AIR SEPARATION MODULE AND KEEPS ITS FULL LIFE DURATION.00



BENEFITS

In cooperation with a recognized filtration specialist, Safran Aerosystems has developed an ozone converter which is directly installed in the OBIGGS pack. The catalyst breaks the ozone molecules into oxygen molecules harmless for the system.

The existing technology already used on aircraft functions with a minimum temperature of 300 to 350°F to activate the catalyst. If the gas temperature is below this threshold, the catalyst is inefficient.

Zodiac has developed a low temperature catalyst, which keeps its full efficiency with air temperature as low as 100°F

Directly installed in front of the separators, this converter operates even with very low ambient temperature and offers them a full protection.

Extensive test campaigns have proven its great efficiency.

FEATURES

- **Air temperature range:** 37.8°C to 93.3°C (100°F to 200°F)
- **Efficiency :** > 99 %
- **Weight:** 2.4 kg (5.3 lb)
- **Pressure drop:** 0.2 Psi max
- **Certification:**
 - Qualified per DO-160 qualification standards



AIR HEPA FILTER (F94-38-601)

IMPROVING EFFICIENTLY INERTING SYSTEM PERFORMANCES

SAFRAN AEROSYSTEMS HAS DEVELOPED A HIGH-QUALITY FILTRATION CHAIN TO IMPROVE THE LIFE DURATION OF ITS OBIGGS PACK.

PARTICLES, DUST, OIL AND AEROSOLS CONTAINED IN THE AIR CAN AFFECT THE PERFORMANCES OF THE SEPARATOR BY CLOGGING ITS FIBERS. THIS AIR HEPA (HIGH EFFICIENCY PARTICLE ARRESTOR) WILL TRAP THE PARTICLES, OIL AND AEROSOLS, IMPROVING GREATLY THE LIFE OF THE SEPARATORS.

BASED ON A STRONG COOPERATION WITH A WORLD-CLASS FILTRATION SPECIALIST, THIS COMPONENT OFFERS A GUARANTEE OF LONG TIME PERFORMANCES OF THE SYSTEM.



BENEFITS

In cooperation with recognized filtration specialists, Safran Aerosystems has developed a HEPA filter which is directly installed in the OBIGGS pack

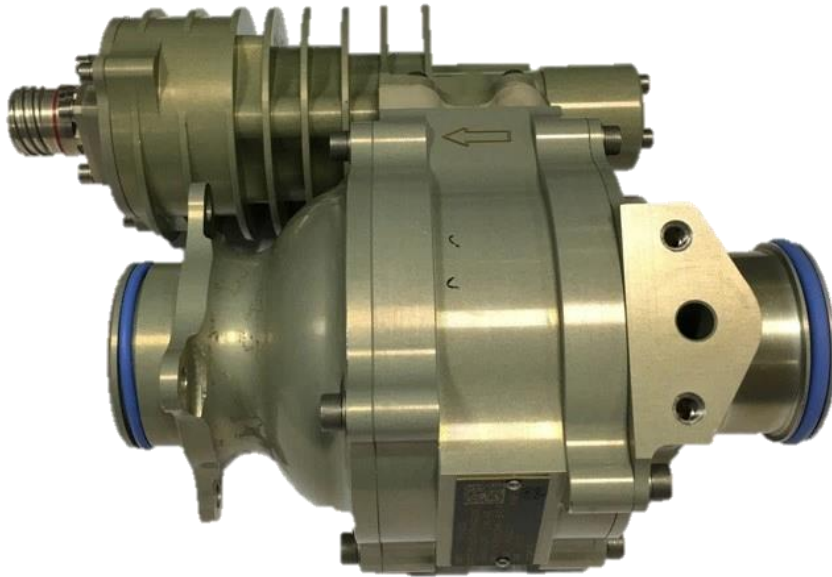
Based on a two-layer media pack, it will first stop the particles by trapping them in a special pleated media. This media pack drastically limits the pressure drop, thus allowing the air separation modules to perform optimally

The second layer stops the liquids and aerosols by coalescence. Small droplets merge into bigger ones which are recovered at the bottom of the filter. A permanent drain allows the evacuation of the resultant liquid

Extensive test campaigns have proven its great efficiency

FEATURES

- **Particles removal efficiency:**
 - ▶ 99.97% of particles with a size of 0,3 μm
 - ▶ > 99,97% for other particles size
- **Aerosol removal efficiency:** > 99,5%
- **Weight:** 1.7 kg (3.7 lb)
- **Pressure drop:** < 1 psid in the end of life conditions
- **Certification:**
 - ▶ Qualified per DO-160 qualification standards



**AIR SHUT-OFF VALVE
(L94N31-601 / L94N31-603)**

A HIGHLY RELIABLE CLOSED-SAFE AIR SHUT-OFF VALVE

SAFRAN AEROSYSTEMS CLOSED-SAFE AIR SHUT-OFF VALVE IS AVAILABLE FOR ALL TYPES OF AIRCRAFT.

THIS AIR SHUT-OFF VALVE MAY BE USED TO STOP BLEED AIR INJECTION IN THE OBIGGS PACK.

IT ALSO AVOIDS ANY FUEL FLOWING BACK IN THE OBBIGS PACK.



BENEFITS

Safran Aerosystems air shut-off valve is a compressed-air pilot valve activated by a solenoid.

When energized, the valve opens and it automatically closes in case of loss of power. Hence, the OBIGGS remains in safe conditions.

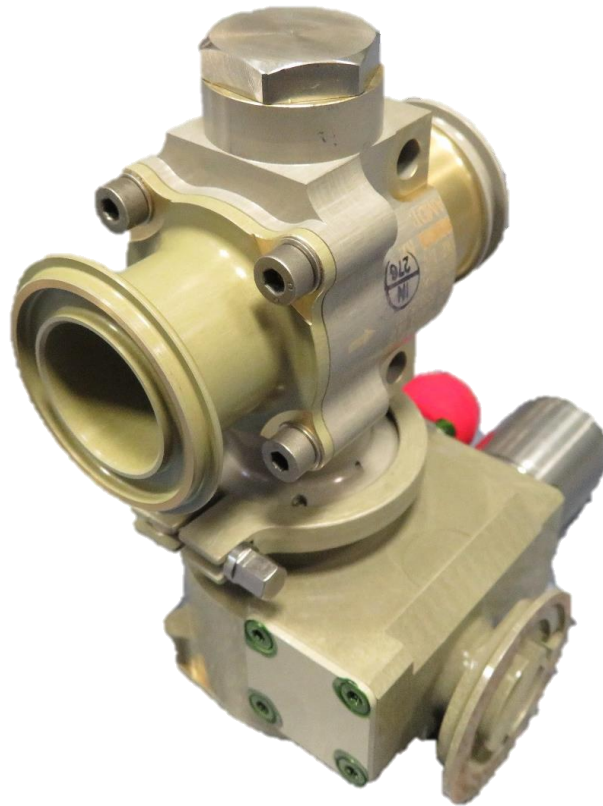
The pneumatic part is controlled by a piston. It generates very low pressure drop. Moreover, it reacts in less than 2 seconds.

It can be activated more than a quarter of million times, which largely exceeds its life operation and proves its high reliability.

The valve also includes a position detection with integrated hall effect sensors.

FEATURES

- **Altitude:** up to 51,000 ft
- **Gas temperature range :** from -54°C to +90 °C (-65.2°F to +195°F)
- **Max pressure drop:** 0.22 psid @ 7 lb/min
- **Power supply:** 28 VDC – 0.8 Amp
- **Weight:** 1.58 kg / 3.5 lb
- **Pneumatic interfaces:** per AS1656
- **Certification:**
 - Fully compliant with AC25-981-1C
 - Qualified per DO-160 qualification standards



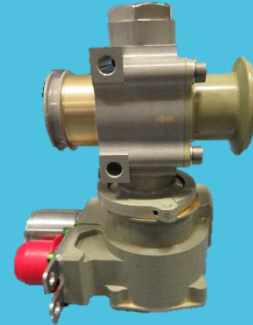
FLOW CONTROL VALVE (R98-B25-602)

BEST-IN CLASS SOLUTION FOR INERTING SYSTEM

SAFRAN AEROSYSTEMS FLOW CONTROL VALVE IS AVAILABLE FOR ALL TYPES OF AIRCRAFT.

MOUNTED IN AN OBIGGS PACK, SAFRAN AEROSYSTEMS FLOW CONTROL VALVE IS USED TO TAILOR THE INERT GAS FLOW IN FUNCTION OF THE AIRCRAFT FLIGHT PHASE.

WITH A DESIGN BASED ON EQUIPMENT DEVELOPED FOR FUEL SYSTEMS, THIS VALVE TAKES ADVANTAGE OF MORE THAN 45 YEARS OF EXPERIENCE AND OFFERS TO THE CUSTOMER A HIGH-QUALITY PRODUCT.



BENEFITS

Safran Aerosystems flow control valve is composed of an aluminum ball valve piloted by an electrical actuator

The position change, which directly affects the flow change, takes less than 5 seconds

This bi-stable electrical actuator offers to the customer a very low power consumption

It can be operated more than 100,000 cycles

Based on a technology developed and manufactured for decades in fuel system, this valve is one of the most mature and robust products available on the market

FEATURES

- **Altitude:** up to 15,545 m (51,000 ft)
- **Gas temperature range :** from -54°C to +77°C (-65.2°F to +170°F)
- **Power supply:** 28 VDC – 1,5 Amp (only during activation)
- **Weight:** 0.7 kg (1.54 lb)
- **Pneumatic interfaces:** per AS1656
- **Certification:**
 - › Fully compliant with AC25-981-1C
 - › Qualified per DO-160 qualification standards



For more information, please contact:

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