SPACE CAPABILITIES

CIRCOR AEROSPACE

AERODYNE CONTROLS, INC.

CIRCLE SEAL CONTROLS, INC.

INDUSTRIA, S.A.

LOUD ENGINEERING & MANUFACTURING, INC.

U.S. PARA PLATE

NASA Johnson Space Center (NASA-JSC); Top: NASA Johnson Space Center (NASA-JSC); Middle: ESA; Bottom: NASA/Dryden

Space Shuttle NASA

CIRCLE SEAL CONTROLS, INC.

Circle Seal Controls manufacturers valves, regulators, and controls for aerospace applications. Products include check, relief, solenoid, sampling, bleed, and electromechanical valves; float, vacuum, and pilot-operated valves; pressure regulators; tire fill valve gauges; gauge savers; temperature compensating pressure regulator systems; and positive hydraulic control systems, with design capability to meet your instrumentation and fluid regulation specification requirements. Circle Seal Controls also features an on-site Class 10000 clean room that is tailored to all space requirements.

CHECK VALVES

APPLICATIONS

Spacecraft, ground support, launch vehicles, launch support equipment, simulators

FEATURES

- Small size
- Lightweight
- High inlet pressure
- High reliability

SPECIFICATIONS

Operating fluid
Hydrogen, oxygen, helium, nitrogen

Material
Stainless steel

Operating pressure
0 to 5500 psi (0 to 380 bar)

Flow
1.5 lb/sec (0.68 kg/sec)

Temperature range
–320° F to +530° F (–196° C to +277° C)

PRECISION SOLENOID VALVES

APPLICATIONS

Spacecraft, ground support, launch vehicles, launch support equipment, simulators, missile launch vehicles

FEATURES

Many types of solenoid valves, including general purpose, coaxial, gate, four-way and manifold, cartridge, pilot-assisted, latching, cryogenic, and ultra high pressure. Circle Seal solenoid valves can be designed in a wide variety of voltages, line sizes, duty cycles, pressures, performance characteristics, and connections

RELIEF VALVES

APPLICATIONS

Spacecraft, ground support, launch vehicles, launch support equipment, simulators

FEATURES

- Small size
- Lightweight
- High inlet pressure
- High reliability

SPECIFICATIONS

Material
Body: Aluminum, brass, stainless steel
Seat: Buna N, EPR, neoprene, silicone, Viton®, Teflon®

Pressure range
Operating: 0 to 10,500 psi (0 to 725 bar)
Cracking: 2˝ H_2O to 10,500 psi (4.98 mbar to 725 bar)

X-38 NASA/Dryden

U.S. Para Plate manufactures valves and pressure regulators for aerospace ground support, aircraft and launch vehicles. Valve types include ball, globe, angle, check, and solenoid valves. Regulators include manual adjustment, servo-dome, miniature and back pressure regulators. U.S. Para Plate has standard products and also provides custom engineering to meet every customer need. U.S. Para Plate also features an on-site Class 10000 clean room that is tailored to all space requirements.

PRESSURE REGULATORS

APPLICATIONS

Miniaturized pressure systems, research & development labs

FEATURES

- Exceptionally compact design envelope
- Unique design minimizes friction and wear
- Repeatable set pressure
- Filtered inlet prevents contaminants from affecting set pressure and lockup
- Threaded seat provides blow-out safety
- Corrosion resistant

SPECIFICATIONS

Weight
3.5 oz to 16 lbs (99.2 g to 7.26 kg)

Material
316 stainless steel

Pressure ranges
Inlet: 0 to 10,000 psig (0 to 690 bar)
Outlet: 0 to 6000 psig (0 to 414 bar)

Cv
0.0005 to 12

Temperature range
–65° F to +400 F (–54° C to +204° C)

CHECK VALVES

APPLICATIONS

Aerospace ground support, wide range of gases and liquids, service and test equipment

FEATURES

- Positive shutoff in the check direction
- Corrosion resistant 316 stainless steel
- Pressures up to 6000 psi (414 bar)
- Cv's ranging from 2.5 to 55.0
- Line sizes from ¼″ to 2″ standard
- Cryogenic models available
- MS tube or NPT end connections
- NASA tested and approved models

SPECIFICATIONS

Material/Trim
316 stainless steel, Monel®

Cracking Pressure
1.0 to 8.0 psi (69 to 552 mbar)

Operating Pressure
0 to 3000 or 6000 psi (0 to 207 or 414 bar)

Cv
2.5 to 55

Temperature
–420° F to +165° F (–251° C to +74° C)

CRYOGENIC BALL VALVES

APPLICATIONS

Rocket engine test stands, aerospace ground support, fuel valves, drain valves

FEATURES

- Bubble-tight performance
- Floating ball design
- Standard operating pressures up to 6000 psi (414 bar)
- Optional pressures up to 15,000 psi (1035 bar)

SPECIFICATIONS

Operating Pressure
Up to 6000 psi (414 bar), standard

Proof Pressure
1½× design

Burst Pressure
4× design

Cv
9 to 31, higher available

Temperature
–420° F to +150° F (–251° C to +66° C)

Leakage
Bubble-tight

Satellite over Argentina NASA STI (Scientific and Technical Information) Program

Aerodyne Controls has provided custom engineered pneumatic components on every manned NASA program from Project Mercury through to the Space Shuttle. Our robust custom engineered pneumatic systems and components provide tighter specification tolerance than found on most off-the-shelf hardware. Aerodyne's product range includes regulators, check and relief valves, solenoid valves, stored energy systems, and mercury-free motion switches. Aerodyne Controls also has Class 10, Class 100, Class 1000 to 10000 assembly areas within the facility.

CRYOGENIC SOLENOID VALVES

APPLICATIONS

On-orbit, fuel isolation valves for Space Shuttle

FEATURES

- Small envelope
- Lightweight high pressure design, with tight tolerance on outlet pressure

SPECIFICATIONS

Operation
2-way, 2-position latching or non-latching, normally closed

Operating fluids
Liquid nitrogen (LN_2), liquid oxygen (LO_2), liquid hydorgen (LH_2), gaseous helium (GHe)

Weight
7.40 lbs (3.36 kg)

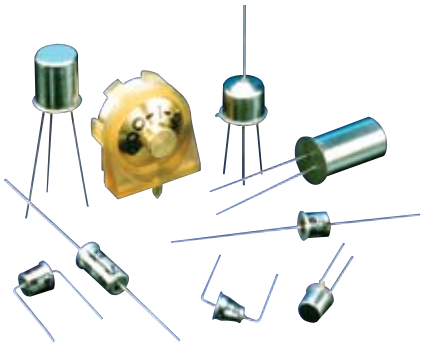
Material
Welded stainless steel

Pressures
Inlet to 1100 psig (76 bar)

Rated flow
215 lb/hr (49.5 scfm) (98 kg/hr) GN_2 @ 10 psid (690 mbar) @ 100 psia (5.9 bar) inlet and 70° F (21° C)

Temperature
Operating & fluid: –432° F to +120° F (–258° C to +49° C)

ACCELERATION SENSING G SWITCH



APPLICATIONS

Space dust collection and re-entry parachute deployment switch for Stardust Spacecraft, various missile impact applications, fuse initiation sensing switch

FEATURES

- Mercury-free
- Miniature size
- Extremely reliable
- Custom settings and sensitivities available

SPECIFICATIONS

- Part G accelerations to 20,000 G
- Hermetically sealed
- Individually tested
- Tilt, impact, linear, and multi-axis switch types available

MINIATURE PRESSURE REGULATOR

APPLICATIONS

Water system back pressure regulator for Space Shuttle

FEATURES

- Small envelope
- Lightweight design
- Tight tolerance on regulated and reseat pressures

SPECIFICATIONS

Service fluids
Water, isopropyl alcohol, gaseous helium (GHe), gaseous nitrogen (GN_2)

Pressures
Regulates @ 46 ± 1 psi (3 bar ± 69 mbar)

Rated Flow
12 lb/hr water @ 51 psia (5 kg/hr @ 2.5 bar) maximum

Temperature
+40° F to +220° F (+4 ° C to +104° C) with water

Materials
CRES stainless steel

Weight
0.60 lb (0.27 kg)

Ariane V ESA/CNES/ARIANESPACE-Service Optique CSG

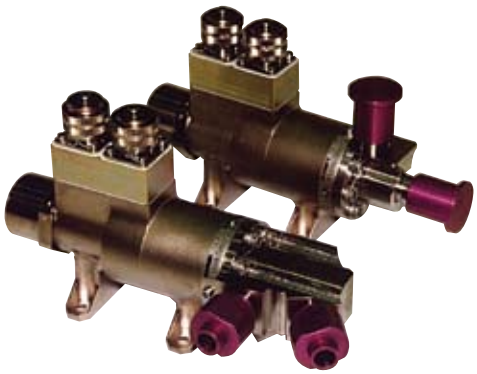
Industria has a comprehensive range of electromechanical, hydraulic and oleo-pneumatic components such as solenoids, solenoids valves, pressure switches, self-sealing couplings and connections to assembly, actuators, and manifold blocks. Our French facility contains a 56 sq ft (75 m^2) Class 10000 clean room FED STD209E equipped with two Class 100 workstations.

BLOCK MANIFOLDS

APPLICATIONS
Rockets, launch vehicles

FEATURES
- Small size
- Lightweight
- High inlet pressure
- High reliability

LATCHING SOLENOID VALVES



APPLICATIONS
Rockets, launch vehicles

FEATURES
- Small size
- Lightweight
- High inlet pressure
- High reliability

SPECIFICATIONS
Fluid
EPS Series: Helium gas
SCA Series: Hydrazine

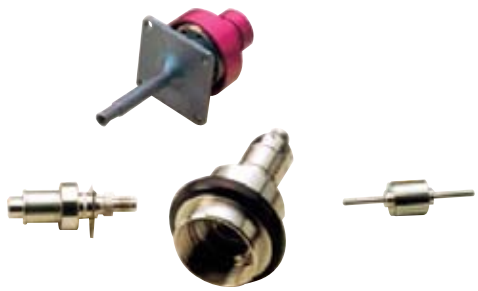
Temperature
–148° F to +104° F (–100° C to +40° C)

Weight
EPS Series: 3.28 to 3.37 lb (1.49 to 1.53 kg)
SCA Series: < 3.75 lb (1.7 kg)

Voltage
46 to 59 VDC

Flow
EPS Series: 0.4 oz/sec (12 g/sec) He for 5.8 psi (400 mbar) pressure drop
SCA Series: 0.88 lb/sec (400 g/sec) for 14.5 psi (1 bar) pressure drop

PILOT SOLENOID VALVES



APPLICATIONS
Rockets, launch vehicles, satellites

FEATURES
- Small size
- Lightweight
- High inlet pressure
- High reliability

SPECIFICATIONS
Nominal pressure
up to 7600 psi (525 bar)

Passage
up to 0.63″ (16 mm)

Temperature
–120° F to +840° F (–85° C to +450° C)

Tightness
better than 10^{-5} Ncc/s He

***Viking* Program** NASA Glenn Research Center (NASA-GRC)

For more than 50 years, the companies of CIRCOR Aerospace has been an integral player in many of the major space programs throughout the planet. And as we continue to explore new frontiers and push the bounds of human exploration, CIRCOR Aerospace will continue to develop the custom fluid control solutions that the rigors of space exploration continues to demand for now… and into the future

SPACE PROGRAMS

CIRCOR Aerospace has been involved with the following programs:

SPACE VEHICLES

Mercury
Gemini
Apollo
Space Shuttle
International Space Station
Hyper-X
X-33
X-38
Spacelab

SATELLITES & EXPLORATION

Navstar satellite
Spot satellite
Viking
Cassini Huyghens satellite
Lunar Landing Vehicle
Skylab
Nimbus satellite
Stardust spacecraft

ROCKETS / LAUNCH VEHICLES

Saturn
Delta II and IV (Boeing)
Ariane IV and V
JAXA H-I
Atlas (Lockheed-Martin)
Athena
Titan II

CIRCOR AEROSPACE

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