Airbus A318, A319, A320 & A321

EATON

Powering Business Worldwide

Airbus A318, A319, A320 & A321 Overview
Eaton's Aerospace Product Capabilities

Recognized as some of the world's most advanced commercial aircraft the A318/ A319/A320/A321 are the first to use carbon-fiber composite construction. These aircraft are also unique in the way the pilot commands are processed to control flight. A small side-stick controller replaces the traditional control column and converts pilot input into electrical signals. A computer interprets these signals and orders control surface movements to achieve the desired results.

A centralized fault display system (CFDS) helps reduce operational delays by permitting easy and rapid identification of faulty line replaceable units within normal turnaround time.

Airbus has designed the A320 series with turbofan engines commanded by digital fuel controls and provides commercial operators a large cabin with flexible seating arrangements.

The A320 family is powered by two CFM 56-5 IAE V2500 or PW 6000 engines, rated at 20,000-33,000 pounds of thrust per engine. With a maximum take-off weight of 158,000 pounds (72,000 kg), the single-aisle A318/A319/ A320/ A321 are capable of accommodating 107 to 185 passengers. And with a range of 3,000 nautical miles, these aircraft can offer true transcontinental non-stop capability, whether business or leisure travel.

Eaton is a recognized leader in the aerospace industry and is a key supplier of hydraulics, fuel, conveyance and actuation products on the Airbus A320 family.

The Airbus A320 family employs three fully independent hydraulic systems - Blue, Green, and Yellow - to furnish the hydraulic power required to operate flight controls, landing gear, wing tip brakes, flaps and slats, cargo doors, nose wheel steering and thrust reversers utilizing Eaton's hydraulic motor-driven generator, engine-driven pumps, electro-mechanical, fluid conveyance, and power and load management products.

The hydraulic systems operate simultaneously under normal conditions at a nominal pressure of 3000 psi (20,700 kPa) and are capable of operating at all altitudes and temperatures covered by the aircraft flight envelope. In addition, each system has two different power sources for redundancy.

Eaton Vickers® product line variable-displacement inline pump (PV3-240-10C) is mounted on the accessory gearbox of each engine. These engine-driven pumps are equipped with an inlet boost impeller and EDV (electrical depressurization valve). Two Eaton air-cooled, variable displacement, continuously rated motor pumps (MPEV3-032-15) are AC electric motor-driven inline pumps. (Older aircraft may be fitted with the MPEV3-32-10B).

These engine-driven pumps supply hydraulic power for the Green and Yellow systems under normal conditions. The Blue AC motor pump runs continuously, and the Yellow AC motor pump can be switched on by the crew. Two engine-driven pumps and the Blue AC motorpump will handle all normal hydraulic power requirements.

Under abnormal conditions, if engine #1 becomes inoperative or the Green system engine-driven pump fails, then the system can be pressurized via the reversible power transfer unit (PTU), model MPHV3-115-1, by the Yellow system. If engine #2 becomes inoperative or the Yellow engine-driven pump fails, then the Yellow system is pressurized similarly by the Green system via the PTU.

An electric motorpump will pressurize the Yellow system if the engine-driven pump becomes inoperative and the PTU fails. For ground operations, the Green system may be pressurized via the PTU. Blue and Yellow systems may be pressurized by the AC motorpumps. A hand pump (operated from the ground on the Yellow system) facilitates opening the cargo doors.

Under emergency conditions, hydraulic power is generated by a ram air turbine (RAT) pump, which is deployed automatically and drives an Eaton variable displacement pump (model PV3-115-EA1D).

The RAT pump provides flow to an Eaton variable displacement hydraulic (12,000 rpm) motor-driven generator (HMDG), model CMV3-022-EA3C, and generator control unit (GCU), model MGC-050-EA2E, for the emergency electrical power system. The oil-cooled HMDG produces 5KVA (Power Factor 1.0 - 0.75 lagging) of electrical power from the Blue system RAT pump.

The Airbus A320 family of aircraft engines are also equipped with Eaton's Tedeco® chip collectors, located in the secondary power system oil flow. The collectors capture ferrous wear particles from gears and bearings that could indicate impending failure. Eaton's chip collectors are equipped with self-closing valves permitting withdrawal of the magnetic probe for visual inspection of the collected debris, with minimal loss of oil.

The aircraft engines are also equipped with liquid level indicators that provide a viewing port that allows the operator to check oil level in the auxiliary power unit. A high contrast feature provides excellent readability in subdued light. Another level indicator is the sight gauge, which is mounted on the oil reservoir of the engine to provide visual indication of fluid levels over a wide range. The gauge is designed to withstand direct flame impingement without fluid loss.

Eaton's filler plug has an easy opening quick-disconnect filler cap with strainer to allow operators to add oil into the APU and starter housings.

Eaton also provides pressure switches for the A320 family. A differential pressure switch is mounted on the V2500 engine to detect filter clogging in the fuel, LOP and scavenge oil systems. When the pressure differential between the high and low ports exceeds a pre-set value, the pressure sensor actuates a snap-action electrical switch to signal the filter condition.

The lightweight altitude pressure switch utilizes an aneroid capsule to operate a snap-action electrical switch. As part of the sanitation system, the 214C40-1 is used for remote sensing of altitude. The switch is set to actuate at 16,000 feet and de-actuate at 12,000 feet.

Eaton also provides fuel boost pumps and canisters. They were specifically designed and manufactured to provide excellent pumping performance at high climb rates and altitudes with many different types of fuel. This pump has the ability to provide vapor free fuel, even at near boiling conditions, with hot volatile fuels.

Airbus A320 Series Eaton Components

Engine Solutions

1. Debris Monitoring
2. Lube Oil Accessories
3. Chip Collectors
4. Liquid Level Gauges
5. Filler Plug
6. Gear Box Seals

Hydraulic Systems

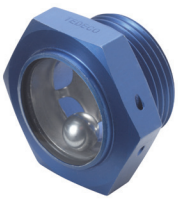
7. Power Transfer Unit
8. Quick Disconnect Couplings
9. Inline AC Motorpump
10. Inline Motor
11. Fuel Manifold Assembly
12. Pressure Switches & Transducers
13. Reinforced Hose Assemblies
14. Engine-Driven Inline Pump
15. Relief Valves
16. RAT Driven Inline Pump
17. Generator Control Unit
18. Hydraulic Motor-Driven Generator
19. Start Valve

Fuel & Inerting Systems

20. Main Engine Fuel Pumps
21. VBV Gear Motor
22. Manual Ball Valve
23. Fuel Boost Pumps & Canisters
24. Jet Pumps - Scavenge
25. Refuel Couplings
26. Flush Cover & Cable
27. Vent Valves
28. Drain Valves
29. Check Valves
30. Float Vent Valves
31. Non-Return Valves
32. Gas Charging Valves
33. Shut-Off Valves
34. Air Release Valves
35. Pressure Reducing & Relief Valves
36. Pressure Holding Valves
37. HP Ground Connect NRV
38. Magnetic Fuel Level Indicators
39. Level & Temperature Sensors
40. Single and Twin Motor Actuators

A75J/1A6794/A75RD
Chip Collectors

Eaton's chip collector, A75J, is located in the secondary power system oil flow to capture ferrous wear particles from gears and bearings that could indicate impending failure. Its self-closing valve permits withdrawal of the magnetic probe for visual inspection of the collected debris, with the loss of only a few drops of oil.



2D1341
Liquid Level Indicator

Eaton's liquid level indicator provides a viewing port that allows the operator to check oil level in the Auxiliary Power Unit. A high contrast feature provides excellent readability in subdued light.

2D6546
Sight Gauge

Eaton's sight gauges are mounted on the oil reservoir of the engine to provide visual indication of fluid level over a wide range. The unit is made to withstand direct flame impingement without fluid loss. An easy-opening quick dsconnect filler cap with strainer to allow operators to add oil into the APU and Starter housing.

A4139 & F9104
Filler Plug

Eaton's filler plug has an easy opening quick-disconnect filler cap with strainer to allow operators to add oil into the APU and starter housings.

AE95336P
Ground Service Couplings

Eaton's ground service couplings speed inspection and servicing or replacement of the power plant and other aircraft fluid system components. Fluid lines may be disconnected and connected rapidly with virtually no loss of fluid or introduction of air into the system.

HF0B9-180-EA2
Flow Bypass Valve

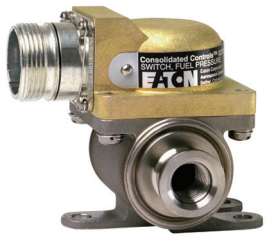
This Eaton bypass valve is used to assist the ram air turbine pump start-up. The valve is designed to close when RAT pump flow reaches a predetermined rate after which hydraulic power becomes available to the active system. Valve weight is 0.2 lbs (0.1 kg).

1800 Series
Quick Disconnect Couplings

The 1800 Series low profile self-sealing ratchet lock thread together couplings, offer unsurpassed dependable service in aircraft and missile hydraulic systems. The coupling is designed for high pressure applications ranging from 3000 psi to 5000 psi (20,684 kPa to 34,475 kPa) and is offered in both CRES and Titanium. The 1801 series coupling is designed for low pressure applications of 1000 psi (6,895 kPa) or less and is offered in light weight aluminum. Both the 1800 and the 1801 series couplings have been qualified to MIL-C-25427.

AE96787N
Self-Sealing B-nut Fitting

Eaton combined a small envelope size with minimal weight to develop the low profile, self-sealing hydraulic "B" nut fittings. The "B" nut design is for both high and low pressure hydraulic systems.



21SN04
Differential Pressure Switch

Eaton's 21SN04 pressure switch is mounted on the V2500 engine to detect filter clogging in fuel, LOP and scavenge oil systems. When the pressure differential between the high and low ports exceeds a pre-set value, the pressure sensor actuates a snap-action electrical switch to signal the filter condition.

214C40-1
Altitude Switch

Eaton's lightweight altitude pressure switch utilizes an aneroid capsule to operate a snap-action electrical switch. As part of the sanitation system, the 214C40-1 is used for remote sensing of altitude. The switch is set to actuate at 16,000 feet and de-actuate at 12,000 feet.

666/AE641
Stainless Steel Reinforced Hose Assemblies

Reinforced hose assemblies for the A320 include the 666 smooth bore, medium pressure hose assemblies and the AE641 convoluted hose assemblies, which are used in the low pressure return side of the hydraulic system and in the fuel system.

Eaton's Aeroquip wire reinforced medium pressure hose assemblies are rated for pressures up to 1500 psi (10,342 kPa) and feature a wire reinforced, Teflon® hose with lightweight, low profile crimp fittings.

Convoluted hose assemblies provide increased flexibility and are excellent for use in areas that require a tight bend.

HR6B9-002-EA5A
Park Brake Relief Valve

Eaton's Park Brake Relief Valve is installed in the aircraft's hydraulic braking circuit. It performs the function of protecting the hydraulic circuit in the event of over-pressurization as a result of hydraulic fluid thermal expansion effects, or as a consequence of an over-pressurization failure mode within the hydraulic system. The valve also has a manual override function that allows for the manual depressurizing of the braking circuit, thus enabling the system maintenance tasks to be undertaken. The valve weighs 0.35 lbs (0.16 kg).

MGC-050-EA2E
Generator Control Unit

Eaton's Generator Control Unit (GCU) incorporates the latest solid-state technology to provide high performance and reliability in a compact package. The GCU houses the electronic circuitry to control and test numerous functions within the aircraft, including: voltage and power regulations, protection for current overload, voltage/frequency limits and permanent magnet generator (PMG) short circuit, servo-valve speed control and built-in system test (BITE). The GCU weighs 3.21 lbs (1.44 kg).

PV3-115-EA1D
Ram Air Turbine Pump
(only used on the A320)

Eaton's RAT pump is a two-stage device, comprised of an axial piston pump and a centrifugal impeller for low inlet pressure operations. Capable of being motored for ground checkout, the pump also features a constant horsepower control to match air turbine power characteristics. This pump provides hydraulic power for the hydraulic motor-driven generator and for priority flight control surfaces in the event power is lost in both engines or when a total electric power failure occurs. Displacement is 1.15 cu. in/rev. (18.84 ml/rev). Pump weight is 9.2 lbs (4.2 kg).

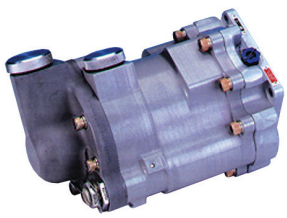
Fuel Boost Pump Type 8410 and Canister Type 8411

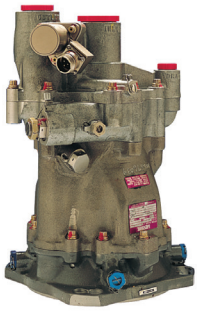
Eaton's Type 8410 canister mounted fuel boost pump provides exceptional performance for high climb rates and at high cruising altitudes with all conventional aviation fuels, including JP4.

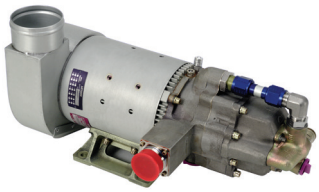
While running, the motor is cooled and bearing lubricated by fuel taken from the pump impeller by the action of the reprime pump. This pump also removes air released from the fuel during operation and gives reprime capability after temporary interruption of the inlet supply.

PV3-240-10C
Engine-Driven Pump

Main hydraulic power is supplied by two Eaton 37.5 gpm (141.95 L/min), 3750 rpm, variable displacement, 3000 psi (20,700 kPa), pressure compensated inline piston pumps. These highly reliable engine-driven pumps are equipped with an inlet boost impeller and electrical depressurization valve (EDV). Displacement is 2.40 cu. in/rev. (39.3 ml/rev).







CMV3-022-EA3C
Hydraulic Motor-Driven Generator

Eaton's Hydraulic Motor-Driven Generator (HMDG) consists of a servo controlled variable displacement hydraulic motor integrated with an AC electric generator. The HMDG drives the emergency generator at a constant speed of 12,000 rpm over a range of output from 0 to 5 KVA. A ram air turbine-driven pump provides the hydraulic power source to the CSM.

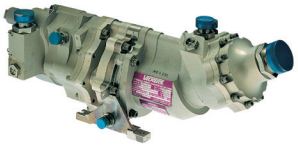
The AC generator is a liquid cooled, 400Hz unit. Liquid cooling is provided by circulating hydraulic motor fluid flow around the generator. The HMDG weighs 21.49 lbs (9.75 kg)

MPEV-032-15
AC Motorpump

Two motor pumps are used. One runs continuously in the Blue System as a main power source. The second motorpump, in the Yellow System, is generally used for ground maintenance, but may be switched on during flight as an auxiliary. Each motorpump uses a 115/200 VAC, 400 Hz explosion-proof electric motor to convert aircraft electrical energy into rotary motion to power the 8.5 gpm (32 L/min), variable displacement, 3000 psi (20,700 kPa), pressure-compensated inline piston pump. Displacement is 0.263 cu. in./rev. (4.3 ml/rev). (Older aircraft may be fitted with the MPEV-032-10B).

MPHV3-115-1C
Power Transfer Unit

Eaton's bi-directional Power Transfer Unit (PTU) is designed to transfer hydraulic power between two separate systems at constant pressure. The PTU has an adjustable hydro-mechanical pressure differential control, which senses the differential pressure between the two systems. This control is integrated with the inline unit and controls the variable displacement of the inline unit and controls the variable displacement of the inline unit in the Yellow System.



Summary
Eaton's Aerospace Products

MODEL or PART NUMBER	DESCRIPTION
A75J/1A6794/A758RD	Chip Collectors
2D1341	Liquid Level Indicator
2D6546	Sight Gauge
A4139 & F9104	Filler Plug
1D6549	Debris Monitoring
1800 Series	Quick Disconnect Couplings
AE96787N	Self-sealing B-nut Fitting
MPHV3-115-1C	Power Transfer Unit
MPEV3-032-15	AC Motorpump
214C40-1	Altitude Pressure Switch
21SN04	Differential Pressure Switch
PV3-240-10C	Engine-Driven Pump
666/AE641	Stainless Steel Refinforced Hose Assemblies
HR6B9-022-EA5A	Park Brake Relief Valve
9813385	Air Release Valve
CMV3-022-EA3C	Hydraulic Motor-Driven Generator
MGC-050-EA2E	Generator Control Unit
PV3-115-EA1D	Ram Air Turbine Pump
HF0B9-180-EA2	Flow Bypass Valve
7940061D	Shut-Off Valve
0725175/ 0725185	Refuel Couplings
8410/8411	Pumps & Canisters
9811820/9815715	Check Valves
4127360	Drain & Vent Valve Assemblies
0727540/0727540	Flush Cover & Cable Assemblies
HTE510016	Gas Charging Valves
3540000-1/3530000-1	Level & Temperature Sensors
AE95336P	Ground Service Couplings
3901395	Scavenge Jet Pump
HTE200002-1	Single Motor Actuators
HTE190001-1/HTE190001-2	Twin Motor Actuators
HTE420044	Pressure Holding Valves
HTE4918	Non-Return Valve
9508175	Float Vent Valves
HTE46009/HTE46009-1	Duct and Non-Return Valves
3508802/350883	Magnetic Fuel Level Indicators

The Eaton family of product line names reflects a proud heritage of quality and innovation that has grown over the years through acquisition of a number of highly respected aerospace companies. Eaton still uses many of those companies' names today, a reflection of their proud legacy of quality and customer satisfaction.

Product Line or Series/ Product Name	Product Descriptions	Cage Codes
AeroCheck®	Hydraulic Check Valves	8W928
Aeroquip®	Hose Fittings, V-Band Couplings	00624
	Ducting, Hoses	U2569
	Fuel Ducts, Flex Joints, Swivel Joints	FA9C4
Rynglok®	Tube Fitting Systems	C2178
ArcSeal™	Dynamic Beam Separable Fittings	00624
Argo-Tech™	Engine Fuel Pumps	59875
	Repair Station	OCMF7
	Fuel Systems, Pumps, Valves	86090
C-Seal™	Static Seals	15284
Carter®	Aircraft Ground Fueling Equipment	0DT23
Centurion™	Mechanical Seals and Sealing Components	77842
Eaton	Actuators, Bellows, Seals	F0562
	Fuel Systems, Pumps, Valves	K2523, U1918, U9084
	Pressure Switches, Transducers	02750
	Rotary/Linear Actuators	17472, 99145, 09790, 72121
	Pneumatic Ducting, Rigid and Flexible Pneumatic Joints	15284
Flex-Form™	Brush Seals	77842
Flex-Ring™	Brush Seals	77842
Microplex™ E-Seal™	Semi-Static Seals	15284
QDM®	Quanitative Debris Monitoring System	97484
Radial C-Seal™ U-Plex™	Semi-Static Seals	15284
Rynglok®	Tube Fitting Systems	00624
Sterer®	Hydraulic Motors, Actuators, Control Valves	99643, 76050, 09790, 52906
Sure-Mate®	Quick Disconnect Couplings	00624
Tedeco®	Chip Collectors	97484
Twist-Flex®	Semi-Static Radial Type Seals	15284
Ultra-Mate®	Self-Sealing, Self-Locking Fluid Couplings	00624
U-Plex ™	Semi-Static Seals	15284
Vickers®	Hydraulic Pumps, Electric Motorpumps, Hydraulic Motors, Power Transfer Units	62983, 90166, K4413
Zapper®	Debris Monitor	97484

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