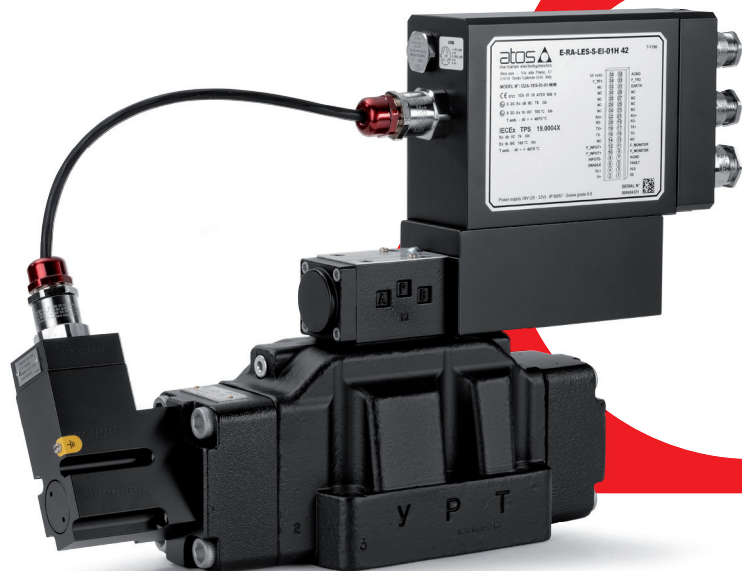




# Ex-proof electrohydraulics

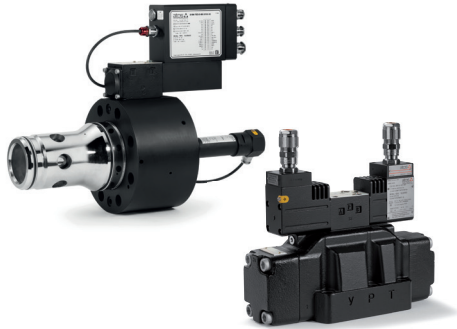
The widest range for safe operations in surface and mining environments in presence of potentially explosive mixtures



**atos**   
the **smart** electrohydraulics

## Explosion proof range

The most complete range of multi-certified electrohydraulics components for applications in potentially explosive environments, from on-off valves to the complete systems, including digital servoproportionals with on-board driver



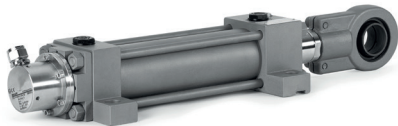
**Proportional valves**



**Axis & P/Q controls**



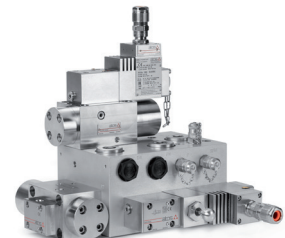
**On-off valves**



**Cylinders**



**Pumps**



**Systems**

# Explosion proof electrohydraulics

- **Multi-certified components** according to the main international directives and regulations for safe operations in mining or surface environments with potentially explosive mixtures of liquids, gases and dusts



EUROPE



INTERNATIONAL



EURASIAN



NORTH AMERICA



CHINA



CHINA



INDIA



JAPAN

- **Rugged design** developed through laboratory research, CFD/FEM analysis and simulations of extreme environments



- **Multi-fluid compatibility** ensured by specific options which allow to select the most appropriate seals according to hydraulic system fluid. Stainless steel components allow water-based fluids with very high percentage of water or even pure water



## Protection methods & certifications

Potentially explosive environments can be defined as areas where interaction between an oxidant and a combustible, could be activated by an external ignition source, as like sparks or high temperatures

- **Ex-d flameproof** enclosure prevents that eventual internal ignition events will be transmitted outside
- **Ex-t dustproof** enclosure avoids dust ingress and prevents the internal heat from igniting the flammable dust outside
- **Ex-i intrinsically safe** limits solenoid electrical and thermal energy to values not able to ignite flammable atmosphere
- **Ex-h** as a combination of **constructional safety** and **ignition sources control** to prevent eventual risks caused by hot surfaces or mechanical moving parts







Explosion proof products category	Classifications			Certifications							
	Gas surface	Dust surface	Gas mining	ATEX	IECEX	EAC	CCC	PESO	cULus	MA	TIIS
Proportional valves	Ex-d II 2G	Ex-t II 2D	Ex-d I M2	●	●	●	●	●	●		●
Axis & P/Q controls	Ex-d II 2G	Ex-t II 2D	Ex-d I M2	●	●	●	●	●	●		●
On-off valves	Ex-d II 2G	Ex-t II 2D	Ex-d I M2	●	●	●	●	●	●	●	
Intrinsically safe on-off valves	Ex-i II 1G		Ex-i I M1	●	●	●	●				
Stainless steel on-off valves	Ex-d II 2G	Ex-t II 2D		●	●	●	●	●	●		
Cylinders	Ex-h II 2G	Ex-h II 2D		●							
Pumps	Ex-h II 2/2G	Ex-h II 2/2D		●							
Systems	According to application requirements			●	●	●	●	●	●		

Multi-certification
  Available
  Available only with off-board driver
  On request

# Proportional valves

The widest ex-proof range, from simple valves without transducer to servoproportionals with on-board digital driver

## Directional valves

Precision motion controls or high dynamic speed controls. With or without LVDT transducer



Subplate valves • ISO sizes 06 ÷ 32  
**Q**max 1.500 l/min • **P**max 350 bar

Cartridges • ISO sizes 25 ÷ 100  
**Q**max 16.000 l/min • **P**max 420 bar

## Pressure valves

Relief & reducing controls grant high pressure accuracy and repeatability. With or without pressure transducer



Subplate valves • ISO sizes 06 ÷ 32  
**Q**max 600 l/min • **P**max 250 bar

Cartridges • ISO sizes 16 ÷ 80  
**Q**max 4.500 l/min • **P**max 250 bar

## Flow valves

Pressure compensated speed controls. With or without LVDT transducer



Subplate valves • ISO sizes 06 ÷ 10  
**Q**max 90 l/min • **P**max 210 bar

## Digital electronics

- **Fieldbus connectivity** provide real-time access to functional parameters, diagnostics, transducers

CANopen

PROFI  
BUS

ETHERNET  
POWERLINK

EtherCAT

PROFI  
NET

EtherNet/IP

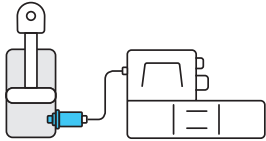
- **Built-in oscilloscope** for accurate diagnostic without additional instrumentation
- **Off-board electronic drivers** for proportional directional, flow and pressure valves, with or without transducer. DIN-rail drivers with solenoid current limitation, suitable for installation in ex-proof electrical cabinets



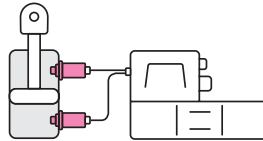
# Explosion proof smart technology

On-board ex-proof electronics allow solutions developed for industrial sector to be extended also to hazardous locations

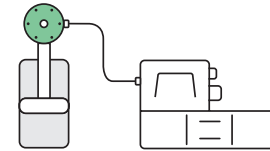
**P/Q control** add force limitation to proportional valves flow regulation



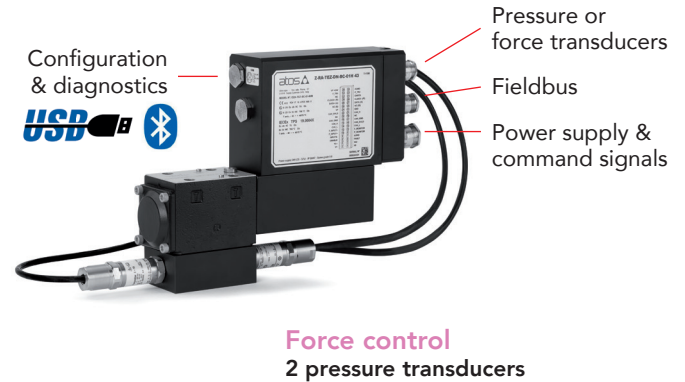
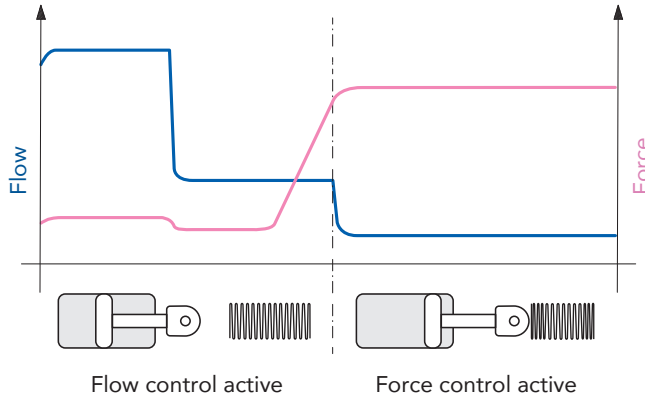
**Pressure control**  
1 pressure transducer



**Force control**  
2 pressure transducers



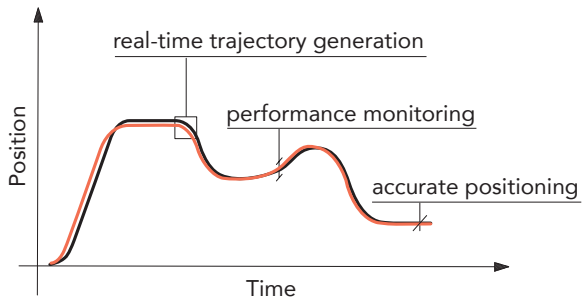
**Force control**  
load cell



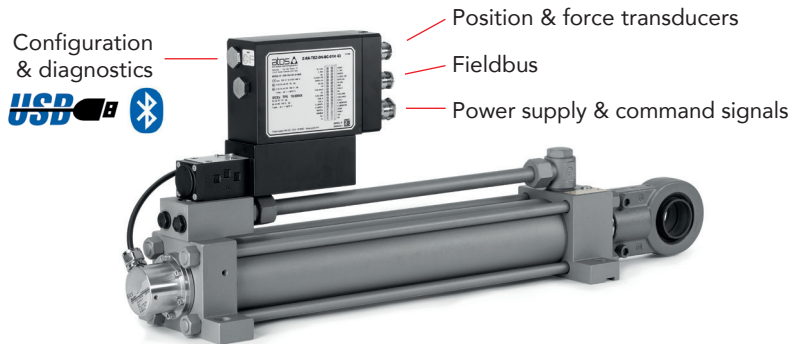




## Axis control to boost hydraulic actuators performances



Axis control is available also in P/Q executions for max force limiting during the motion cycle



## On-off valves

A full range of explosion proof valves to satisfy the most demanding applications in hazardous environments

### Directional valves

Solenoid valves, spool type with standard leakage or leak free poppet type



Subplate valves • ISO sizes 06 ÷ 32  
Q<sub>max</sub> 1.000 l/min • P<sub>max</sub> 350 bar

### Pressure valves

Relief solenoid valves with pilot for venting or multiple pressure selection



Subplate valves • ISO sizes 10 ÷ 32  
Q<sub>max</sub> 600 l/min • P<sub>max</sub> 350 bar

In line valves • sizes G ¾" ÷ G 1 ¼"  
Q<sub>max</sub> 500 l/min • P<sub>max</sub> 350 bar

### ISO cartridges

High flow ISO cartridges with functional covers equipped by solenoid pilot valve



Cartridges • ISO sizes 16 ÷ 63  
Q<sub>max</sub> 4.000 l/min • P<sub>max</sub> 350 bar

# Intrinsically safe on-off valves

They provide the highest protection level in environments with very high risk of explosion, **up to Zone 0**

## Directional valves

Solenoid valves, spool type with standard/low leakage or leak free poppet type



Subplate valves • ISO sizes 06 ÷ 25  
**Q<sub>max</sub> 700 l/min • P<sub>max</sub> 350 bar**

Cartridges • ISO sizes 16 ÷ 63  
**Q<sub>max</sub> 4.000 l/min • P<sub>max</sub> 350 bar**

## Pressure valves

Relief solenoid valves with pilot for venting or multiple pressure selection



Subplate valves • ISO sizes 10 ÷ 32  
**Q<sub>max</sub> 600 l/min • P<sub>max</sub> 350 bar**

In line valves • sizes G 3/4" ÷ G 1 1/4"  
**Q<sub>max</sub> 500 l/min • P<sub>max</sub> 350 bar**

## Barriers

Electronic power supply barrier for intrinsically safe valves, single or double channel



Located outside the hazardous environment, they limit the electric power to the solenoid within the classified range, also in case of short circuit

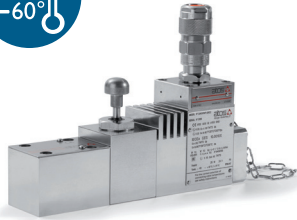
## Stainless steel on-off valves

Directional valves, spool or leak free poppet type, which provide the highest resistance to low temperatures, corrosive environments and fluids



Subplate valves • sizes 06 ÷ 16

Q<sub>max</sub> 220 l/min • P<sub>max</sub> 350 bar



**X FULL**  
STAINLESS STEEL

All parts are stainless steel made for a complete protection of valve external and internal surfaces. Suitable for applications in hazardous locations with corrosive atmospheres which require water-based fluids or pure water

+1000h  
SALT SPRAY



**XS EXTERNAL**  
STAINLESS STEEL

Only external parts are stainless steel made, while internal parts are carbon steel made. Suitable for applications in hazardous locations with corrosive atmospheres which require standard mineral oils or synthetic fluids



**XW INTERNAL**  
STAINLESS STEEL

Only internal parts are stainless steel made, while external parts are mainly carbon steel made. Suitable for applications in hazardous locations with non-corrosive atmospheres which require water-based fluids or pure water



# Functional safety

The ex-proof range includes specific executions aimed to further increase the safety level in hazardous environments

Subplate valves • ISO size 06  
Q<sub>max</sub> 70 l/min • P<sub>max</sub> 350 bar

## SIL certification

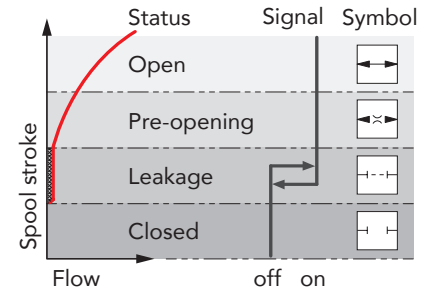
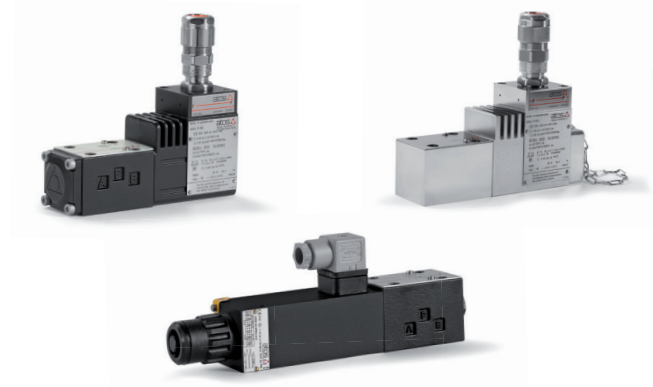
Safety Integrity Level directive states the max acceptable level of risk in process control systems, in order to reduce hazardous events

The ex-proof range, which includes also intrinsically safe and stainless steel valves, offer on-off executions dedicated to functional safety certified SC3 up to SIL2 / SIL3 according to IEC 61508

## Inductive safety sensors


Ex-proof on-off directional valves with inductive proximity sensors that monitor the spool position to safely operate even in potentially explosive environments

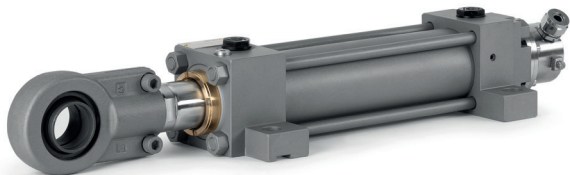
The spool position monitor signal switches its status from safe condition to unsafe condition according to the spool position



## Cylinders

ISO 6020-2 executions with rugged design, engineered for high speeds, low friction and extended operative life. Optional ATEX certified position transducers and proximity sensors


 **Bore**  $\varnothing$  25 ÷ 200 mm  
**Pmax** 250 bar




## Pumps

Fixed or variable displacement pumps, for high pressure applications with low noise and long service life



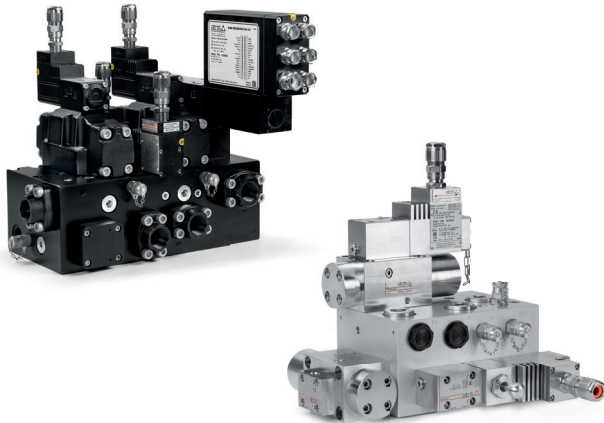
 **Fixed disp.** 10 ÷ 150 cm<sup>3</sup>/rev  
**Pmax** 160 ÷ 300 bar



 **Variable disp.** 29 ÷ 88 cm<sup>3</sup>/rev  
**Pmax** 250 ÷ 350 bar

## Explosion proof & stainless steel systems

Power units and hydraulic blocks designed for potentially explosive environments and extreme working conditions. Certified by TÜV, DEKRA, UL, CSA, ABS, BV, DNV GL, RINA



### Blocks

Cast iron, carbon steel or stainless steel executions, equipped with ex-proof or intrinsically safe components for applications in hazardous locations.

Full stainless steel blocks satisfy application requirements for the most aggressive environments, extreme temperatures and water-based fluids



### Power units

Designed for oil & gas, energy, chemical and marine sectors in compliance with explosion proof international directives, for safe operations in environments with presence of flammable gas, vapours or combustible dusts

## Worldwide Sales Organization

A sales network with 25 branches, 120 sales professionals and distributors in more than 80 countries, together with great responsiveness and focus on customers



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