

LISK
G.W. Lisk Company, Inc.



**PRECISION CONTROL
SAFETY COMPLIANT**

**Components for Hazardous
Locations and Environments**



LISK SOLENOID VALVES FOR HAZARDOUS LOCATIONS AND ENVIRONMENTS



SOLENOID VALVES CUSTOMIZED TO MEET YOUR EXACT LEVELS OF SAFETY AND COMPLIANCE.

Hazardous location applications dictate the use of “intrinsically safe,” “increased safety,” “flameproof,” or “explosionproof” solenoid operators, we can provide our standard designs, or provide a complete redesign to accommodate your exact requirements.

A CHOICE OF PROVEN VALVE DESIGNS.

ON - OFF valve types are available in various mounting configurations and designs to meet your requirements.

Proportional operators add the capability of flow and pressure control. Our modular design permits interchange of solenoid operators for use on two-way, three-way, four-way cartridge, inline, and manifold mount valves.

Most of our **high-pressure designs** are of the poppet variety, but slide versions are also offered. Flow ratings are typically considered in the “pilot valve” range, meaning that the C_v is usually below 6.

Lisk can also design a **custom valve configuration** for your special application. See **enclosures** for a graphical explanation of typical operator/valve combinations.

PERFORMANCE AND SAFETY FOR A WIDE RANGE OF HAZARDOUS APPLICATIONS.

Examples:

- Surface and sub-sea hydraulic system for control
 - Tree assemblies
 - Choke Valves
 - Blow out preventors (BOP)
- Drilling rigs - multiple applications
 - Hydraulic
 - Pneumatic
 - Natural Gas
- Power generation
 - Main shut off pilot valves
 - Anti-surge protection
- Refinery applications
 - Hydraulic
 - Pneumatic
 - Natural gas
- Transportation
 - Pipeline
 - Boosting stations
 - Tankers
- Hydraulic applications to 1000 Bar
- Pneumatic/gas to 500 Bar

PREMIUM MATERIALS AND COMPONENTS ENSURE MAINTENANCE FREE PERFORMANCE.

We custom design and manufacture our components to meet the demanding safety requirements for operation in hazardous locations and harsh environments. We pay special attention to material selection, coatings, and plating. Only premium components designed to withstand extreme operating conditions are used.

TECHNICAL OVERVIEW

DEFINITIONS:

HAZARDOUS LOCATIONS

A hazardous location is defined as one in which ignitable gas may be present continually, intermittently, or under abnormal circumstances. Items intended for use in a hazardous location are subject to specific design criteria relating to the level of risk.

Method of Protection

Flameproof/Explosionproof (d)

Any part(s) which may ignite an explosive atmosphere are enclosed in a tight-fitting housing with a long flame propagation path such that any explosion that may occur would be contained (and/or prevented from igniting the external atmosphere).

Intrinsically Safe (ia)

An intrinsically safe device working at low power can never generate enough energy to ignite a hazardous atmosphere. An intrinsically safe device is used in conjunction with barrier circuitry to ensure that power will never increase above safe working conditions.

Increased Safety (e)

A type of protection by which the parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound and are fitted with a thermofuse in such a way that an explosive atmosphere cannot be ignited.

Increased Safety — with encapsulated coil (me)

A type of protection in which the parts could ignite an explosive atmosphere by either sparking or heating are thus enclosed in a compound in such a way that the explosive atmosphere cannot be ignited.

Group I Mining (methane)

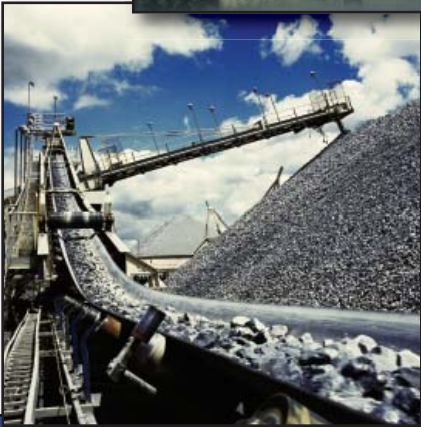
Group II non-mining see Hazardous Location: Zone Description for Gas groups and Zone methods



Transportation



Refining



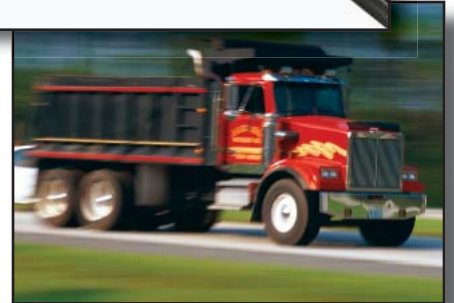
Mining



Dispensing



Subsea



Engine Controls
and Emissions

TECHNICAL OVERVIEW CONTINUED:

Hazardous Locations: Zone Descriptions

Hazardous locations may contain gases, vapors or liquids (Class I), combustible dust (Class II) or ignitable fibers or flyings (Class III). Class I refers to flammable gases, vapors, or liquids, and can be defined according to the following categories:

Area	Description	Example Protection Method (code)
Zone 0	Hazardous environment always present	Intrinsically Safe (ia)
Zone 1	Hazardous environment sometimes present	Increased Safety (e) Encapsulated (m) Flameproof (d)
Zone 2	Hazardous environment present only under abnormal circumstances	Non-incendive (nC) Non-Sparking device (nA) Restricted breathing (nR)

Although the zone system defines likelihood of exposure to hazardous environment, this is not the only consideration. These gas groups are defined to categorize level of risk:

- IIC Acetylene and Hydrogen
- IIB Ethylene
- IIA Propane
- II IIA, IIB, IIC combined

Temperature limitations are also required for all components such that the hazardous atmosphere will not ignite.

T1	≤ 450° C	T4	≤ 135° C
T2	≤ 300° C	T5	≤ 100° C
T3	≤ 200° C	T6	≤ 85° C

Certification

We have many standard Solenoid Operators that are certified to a multitude of governing bodies.

Hazardous Duty Solenoid Design

The most stringent specifications require intrinsically safe solenoid construction:

- Low operating power (ia)
- Minimal heating (ia)
- Power limiting barrier circuitry (ia)

When greater solenoid force or stroke is required, a flameproof/explosionproof design or Increased Safety with encapsulated coil may be considered.

- Thick wall, tight-fitting housing (d)
- Long flame propagation path (d)
- Encapsulated w/thermal fuse (me)

If our customer's design requires a custom Solenoid Operator that needs to be certified, then we encourage our customer to certify the Solenoid at a system level. If required, we can facilitate the certification process.

Flame Arrestor - non electrical protection device

A Flame Arrestor is a device designed to stop the propagation of a flame or explosion to areas where it could potentially damage equipment or injure personnel. In a detonation situation, the resulting pressure wave can in some cases be more destructive than the flame itself. The Flame Arrestor will not only stop the flame; it will help disperse the pressure wave as well.

OVER 90 YEARS OF EXPERIENCE AND INNOVATION

In 1910, George Washington Lisk opened a small sheet metal shop on a portion of land that our current U.S. plant now occupies. The Main Campus is over 400,000 square feet (37,000 square meters) with supporting facilities in both the US and international locations.

The initial move into what is now our primary manufacturing facility came in 1949 with the introduction of SOLENOIDS. The design, development, and manufacturing of these coil-based products has been our focus ever since.

Building on the expertise and experience gained in both solenoids and valves, the company progressed into the design and manufacture of solenoid operated valves for specialized markets. Lisk's solenoid valve design and manufacturing expertise has continued to grow as applications have emerged and developed. The continued progression of product lines led to a hazardous-duty range of solenoid valves.

As our company has expanded, so have our engineering and manufacturing capabilities, which include a complete machine shop, welding, assembly and plating, complemented by a wide range of environmental, mechanical, and non-destructive testing facilities. These assets enable us to produce all parts from prototype to production.

No application is too small or too large for our consideration. We produce low volume, highly specialized designs as well as high volume, mass-produced products.

TOTAL IN-HOUSE CAPABILITY FOR DESIGN DEVELOPMENT AND MANUFACTURE.

Our philosophy of maintaining complete control of the design, manufacture, and quality of Lisk products has led to a substantial investment in equipment, facilities, and training. This enables delivery of every order to specification, on time and on budget.

CNC WINDING MACHINES. COMPUTER AUTOMATED TEST STANDS. Reduces the time and costs associated with manual testing as well as eliminating any possibility of operator error.

COMPUTER AIDED DESIGN. Featuring 3D capability.

FINITE ELEMENT ANALYSIS. Vibration, shock, temperature, magnetic, flow, heat transfer and stress.

GENERAL SCREW MACHINES. Six spindle, eight spindle chucking, and bar machines.

CNC MACHINES. Multi-axis, vertical and horizontal turning and milling as well as automatic manufacturing cells.

MISC. With blanking and forming presses up to 55 ton. 2, 4 and 20 ton machines. Surface, centerless cylindrical and on-center grinding. Annealing and heat treating. Thermal deburring.

PLATING. Cadmium, zinc, electroless nickel, zinc phosphate, chemical film on aluminum, anodize, passivate, Zinc Nickel and others.

PRESSURE MOLDING. Transfer and injection coil overmolding.



WELDING/BRAZING. Electron beam, gas tungsten arc welding, laser, induction, heliarc, spot welding, and brazing.

NDT TESTING & MATERIAL ANALYSIS. Non-Destructive Testing services that includes x-ray, visual, and Dye Penetrant inspection.

ENVIRONMENTAL TESTING. Including, but not limited to shock, vibration, salt spray, humidity, high (1000F) and low (-150F) temperatures, altitude to 100,000 feet, and other testing as required.

HYDRAULIC TESTING. Up to 75HP, 60,000 PSI, with a multitude of fluids.

PACKAGING. Commercial, military, environmental storage, custom, VPCI, and returnable packaging and cleaning.

R & D LABORATORY. Electrical characteristics, operational performance including pneumatic and hydraulic pressure/flow stands, response time, life cycling, evaluation of new processes, features, and new product development are just a few of the many "in-house capabilities".

INTERNATIONAL STANDARDS. Lisk meets and/or exceeds many international certification standards. Please inquire for our latest certifications.

MANUFACTURING ENGINEERING. In house Tool/Machine design and build capabilities. Fully trained technical staff for troubleshooting/repair of machinery and automated equipment to minimize downtime.

A WORKFORCE DEDICATED TO CONTINUOUS IMPROVEMENT, PROBLEM PREVENTION AND TOTAL CUSTOMER SATISFACTION.

Our investment in equipment and facilities is just part of our commitment to customer satisfaction. We demonstrate this commitment through the utilization of statistical process controls, Lean Manufacturing programs, training of suppliers and in-house personnel.

It is this level of commitment and investment that makes Lisk respected in the design and manufacture of Valves, Solenoids, LVDT's and Flame Arrestors. Whatever your application -- Sub-Sea petroleum extraction, transportation and refining, power generation, fuel dispensing and emission control -- our teams are eager to satisfy your requirements every step of the way.

“The result: dedication of every Lisk employee to defect-free products.”



Linear

Rotary

Proportional

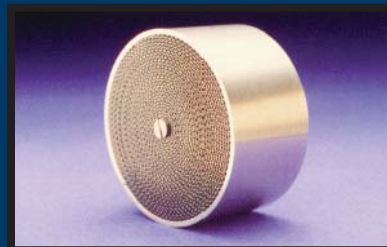
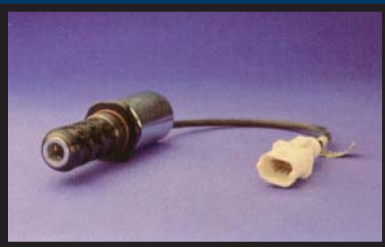
Wet-pin

Solenoid Valves

Flame Arrestors

LVDT

Hazardous Location Valves



**A World Leader
in Aerospace,
Military and
Commercial
Products**

**International Sales Office
and Manufacturing Facility**

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LISK
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Compliance with and certification to these and other governing bodies

