Product Overview for the Oil and Gas Industry
Company Overview

Rotor Clip Company, Inc. is a manufacturer of a full line of retaining rings, spiral rings, wave springs and hose clamps for the automotive, appliance, oil and gas and general OEM marketplace. It is headquartered in Somerset, New Jersey, and sells its products through a network of sales representatives and distributors worldwide. Today, the company is a worldwide leader in the market.

Robert Slass, a graduate mechanical engineer, founded the company in Farmingdale, New York in 1957. Robert's sons Jonathan Slass and Craig Slass currently run the company. Under their tenure, the company has realized significant growth and expanded to become a global entity with a manufacturing facility in the Czech Republic, a warehouse/distribution center in England, and field offices in Germany and China. They have also established the name of Rotor Clip as a quality entity throughout the world by securing certifications to ISO/TS 16949, ISO 9001 and AS9100.

The Somerset facility occupies 238,000 square feet on 64 acres, along with an additional warehouse off campus. Processes are conducted in house ensuring the quality and reliability of the products produced. These processes include engineering, which designs the tooling required to produce retaining rings, tool and die making, stamping and wire forming, laser cutting, heat treating, post-finishing, packaging, warehousing and shipping.
All Rings Have a Function

No one retaining ring style is “better” than another. Rather, the parameters of an application actually determine which retaining ring is best to use, and this can vary from assembly to assembly. Selecting the correct type of retaining ring based on variables such as installation/removal requirements, anticipated thrust load, and end play take-up can ensure the retaining ring you choose will perform reliably, while significantly reducing fastener costs.

There are three main types of retaining rings available to the designer: **Tapered, constant section and spiral**. These are typically made from carbon steel, stainless steel or beryllium copper and feature a variety of finishes for corrosion protection. The following are some points to take into consideration when choosing a ring.

For detailed specifications on all Rotor Clip products, visit [www.rotorclip.com](http://www.rotorclip.com).

**Tapered Section Retaining Rings**

Retaining rings are metal fasteners that are installed into a groove on a shaft or in a housing or bore creating a shoulder that retains an assembly. They eliminate threading, tapping, drilling and other machining operations associated with more traditional fasteners like screws, nuts, bolts, cotter pins, washers and more.

They can significantly reduce production costs since the grooves can be machined with other production processes. Overall they provide a more compact, functional design than their traditional counterparts.

Complete product listings can be found at [www.rotorclip.com](http://www.rotorclip.com).
Spiral Retaining Rings

SPIRAL RETAINING RINGS:
- Axially installed into machined grooves in housings/bores (internal) or on shafts (external)
- Make 360° contact with a groove in a housing/bore or shaft
- Offer more clearance than a tapered section ring

Spiral retaining rings can either be single or multi-turn, depending on the application requirements. Multi-turn, spiral-wound retaining rings consist of two or more turns of in-house rolled flat wire material with rounded edges. The material is coiled on edge to provide a gapless ring with 360° of retention. Spiral rings offer space savings in a radial direction since there are no assembly lugs as with tapered retaining rings. (Note: selection of a retaining ring - tapered, constant section or spiral - depends upon the parameters of an application.)

MATERIALS

CARBON SPRING STEEL
This steel is known for its high strength and reliability in spiral ring applications. Since carbon steel is subject to corrosion, Rotor Clip rings are oil dipped to ensure some corrosion resistance.

STAINLESS STEEL - AISI 302
This general purpose stainless steel offers corrosion resistance and can be cold worked to high tensile strengths.

STAINLESS STEEL - AISI 316
This type of stainless steel is heat resistant with superior corrosion resistance than other chromium nickel steels. It offers high creep strength at elevated temperatures and resistance to pitting.

STAINLESS STEEL - PH17-7
A high strength corrosion-resistant steel with good workability, easy hardening and excellent mechanical properties at elevated temperatures. Can be heat treated at relatively low temperatures for high strength properties.

BERYLLIUM COPPER
Applications that require conductivity are best served by this material. It is also characterized by excellent corrosion resistance and is particularly effective in sea air and seawater atmospheres.

FINISHES

OIL DIP
This standard finish for carbon steel spiral retaining rings offers an extended shelf-life protection against rusting.

BLACK OXIDE
This flat, black finish is used more for when aesthetics of the part are a factor with minimal corrosion protection.

CADMIUM PLATING
This protective coating offers excellent corrosion protection, ductility, natural lubricity and solderability in specialized applications.

PASSIVATION
The passivation process removes “free iron” contamination left behind on the surface of stainless steel due to the manufacturing process. Also, the passivation process facilitates the formation of a thin, transparent oxide film that protects the stainless steel from selective oxidation (corrosion).

ZINC PHOSPHATE
This coating provides basic corrosion protection for carbon steel.
TRUWAVE Wave Springs

TruWave flat wire wave springs help to save up to 50% of axial space in your application when compared to conventional coil springs. The result is more compact applications in which unnecessary space and therefore excess material of neighboring components can be reduced to a minimum. The flat wire effectively reduces the solid height of the wave spring so that with the same amount of turns one can visibly reduce the work height without compromising the load or spring deflection. Another advantage is that one can increase the number of turns of the spring design in order to decrease the deflection per turn when the wave spring is compressed. Thus, the spring rate is reduced proportionally to the number of turns and a flat linear characteristic can be generated.

Beside the advantage to save space in axial direction, spiral wound flat wire wave springs are often used in the oil and gas industry to replace disc springs so that radial space could be saved as well. Compared to disc spring stacks only one wave spring (mainly nested designs) must be handled during the assembly process of the downhole tool. In addition, wave springs offer a wide supporting surface by offering the whole section width for the contact between spring and surfaces of the application. When a disc spring is used the area of contact is limited to the edge of the spring so that wear increases dramatically during operation of the downhole tool. Furthermore wave springs made from Inconel X-750 allows to operate the downhole tool in extreme environmental conditions. All of these advantages increase the service life of the downhole tool so that costs for the whole drilling operation will be saved.

MATERIALS

Each application offers different operating conditions for a flat wire wave spring. Choosing the right material depends on operating temperature, contact with corrosive environments and the required number of load cycles. Rotor Clip’s engineers will help you find the right material for your application. An overview of the materials used by Rotor Clip for flat wire wave springs can be found here:

**Standard Material Grades**
- SAE 1070-1090 Carbon Steel (1.1231 - 1.1273)
  - This prehardened material is the standard material for wave springs.
  - Less expensive option to Stainless Steel.
- 17-7 Stainless Steel (1.4568 – X7CrNiAl17-7)
  - Used for high stress and fatigue applications.
  - Can withstand much higher temperatures than SAE 1070-1090 and not lose its spring qualities.
  - Higher corrosion resistance than SAE 1070-1090.

**Special Material Grades**
- AISI 302 Stainless (DIN Material No.: 1.4319)
- AISI 316 Stainless (DIN Material No.: 1.4401)
- A286 (DIN Material No.: 1.4980)
- Inconel X-750 (DIN Material No.: 2.4669)
- Elgiloy (DIN Material No.: 2.4711)
- Hastelloy C276 (DIN Material No.: 2.4819)
- Beryllium-Copper (DIN Material No.: 2.1247)
- Phosphor-Bronze (DIN Material No.: 2.1030)
Spiral Ring and Wave Spring Types

**SST** - Single-Turn, Inch
Ideal for short deflection applications with low to medium forces. Offered in a number of waves and material thicknesses. Designed for a wide range of bore and rod diameter.

**MST** - Single-Turn, Metric
Ideal for short deflection applications with low to medium forces. Offered in a number of waves and material thicknesses. Designed for a wide range of bore and rod diameter.

**NST** - Single-Turn, Narrow, Inch
Ideal for short deflection applications where radial space is limited.

**WSL, WSM, WSR** - Multi-Turn, Inch
Used for low force applications with large deflections: More turns equals less force. Utilizes nearly half the space as helical compression springs while producing the same force.

**CL** - External, Light Duty, Inch
**DCL / CLM** - External, Light Duty, Metric
These single-turn retaining rings are ideal for light duty applications, or where axial positioning is the primary function.

**CM** - External, Medium Duty, Inch
**MCM** - External, Medium Duty, Metric
These rings offer the greatest economy in price and size. They are able to handle approximately twice the thrust capacity of the light duty series, and to be produced to military specifications if needed.

**CR** - External, Medium-Heavy Duty, Inch
**MCR** - External, Medium-Heavy Duty, Metric
With load bearing capacities closer to the heavy-duty series and almost universal groove dimensions, these rings offer greatest ease of assembly with greatest thrust capacity.

**CLR** - External, Heavy Duty Snap Ring, Metric
These single-turn snap rings are ideal for applications involving high thrust loads.

**DKR DIN 472** - Internal, Heavy Duty, DIN
An internal metric ring which meets DIN standards of performance and quality. Our metric rings come standard in 302 stainless steel.

**DKR DIN 471** - External, Heavy Duty, DIN
For applications where European DIN standards need to be met, these rings are designed to fit into the grooves established by DIN specifications.

**KL** - Internal, Light Duty, Inch
**DKL / KLM** - Internal, Light Duty, Metric
These single-turn retaining rings are ideal for light duty applications, or where axial positioning is the primary function.

**KM** - Internal, Medium Duty, Inch
**MKM** - Internal, Medium Duty, Metric
These rings offer the greatest economy in price and size. They are able to handle approximately twice the thrust capacity of the light duty series, and to be produced to military specifications if needed.

**KR** - Internal, Medium-Heavy Duty, Inch
**MKR** - Internal, Medium-Heavy Duty, Metric
The greatest size range and thrust capacity make these rings the only choice for applications that require minimum deflection or thrust loads that demand a deep groove capacity.

**KG** - Internal, Heavy Duty, Inch
**MKG** - Internal, Heavy Duty, Metric
These rings offer the greatest economy in price and size. They are able to handle approximately twice the thrust capacity of the light duty series, and to be produced to military specifications if needed.

**KLR** - Internal, Heavy Duty Snap Ring, Inch
These single-turn snap rings are ideal for applications involving high thrust loads.

**KL** - Internal, Light Duty, Inch
**DKL / KLM** - Internal, Light Duty, Metric
These single-turn retaining rings are ideal for light duty applications, or where axial positioning is the primary function.
Applications

- Centrifugal Pump
- Fuel Filter
- Ultrasonic Motor
- Steering Motor Preload
- Butterfly Valve
- Quick Connect
- Mechanical Seal
- Bearing Preload
- Magnetic Detection Slip Clutch
- Circular Plug-In Connector

Uses for Oil & Gas Industries

Fixing of Electrical Switch/Control Boxes
Drive Shafts of Downhole tools
Form-lock connecting of tubes
Pre-load baffle plates of downhole tools
Pre-load fixing systems installed on sea ground
Pre-load anchoring devices of downhole tools

www.rotorclip.com
Complete product listings and specifications