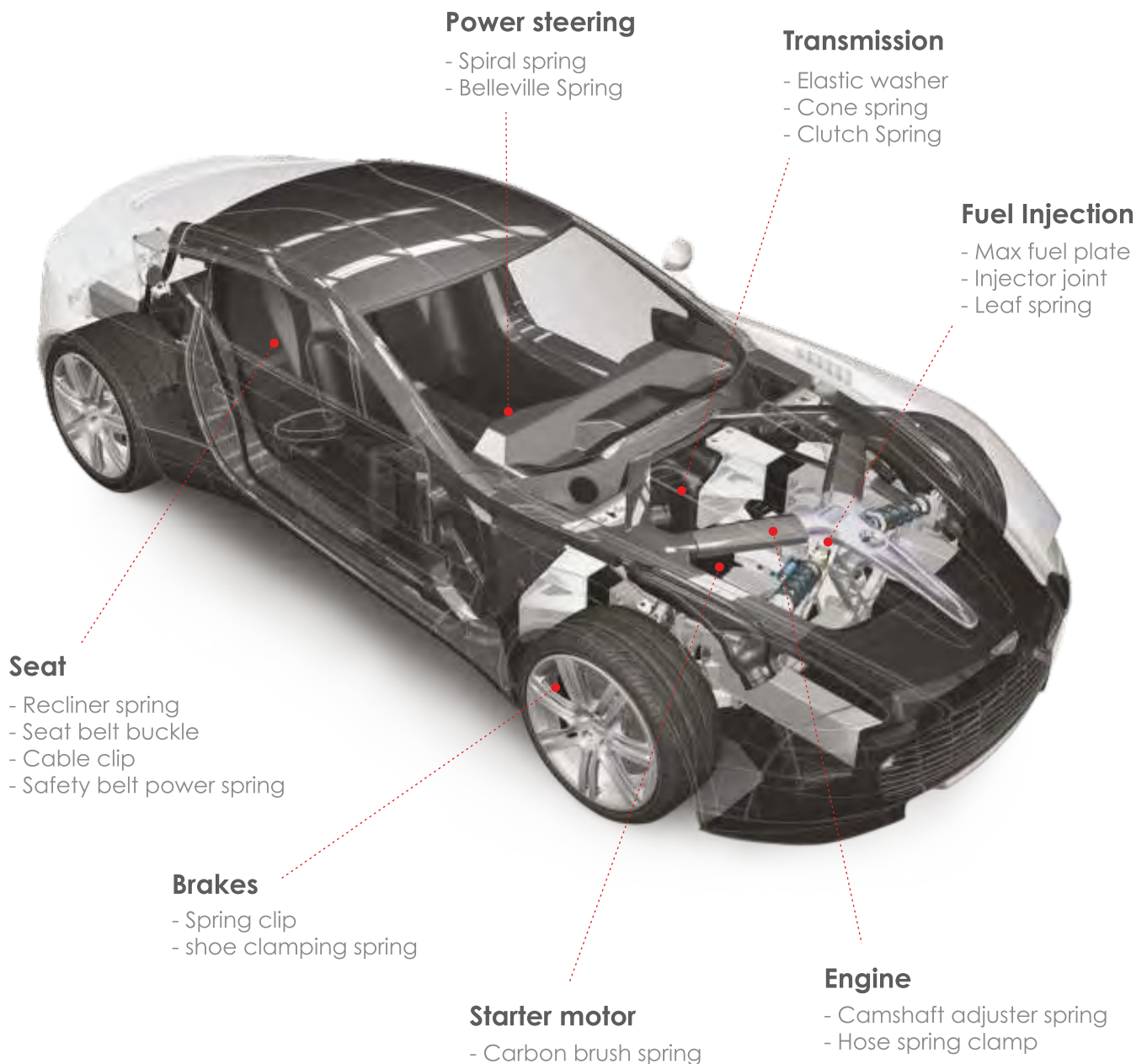


# Springs Technology for High Fatigue Automotive Applications



## About Gala

Gala provides an extensive range of springs for Indian as well as Global OEMs in Automotive, Off Highway Vehicles, Power Equipments & Wind Turbines from its TS16949 certified plants. Exports to 25 countries including Germany, Switzerland, Finland, Italy, USA, Singapore, China, etc. contributes 60%+ of company's sales.

Gala is specialized in Strip Springs for high fatigue applications in two wheelers, four wheelers & off-highway vehicles.

High quality, reliability and design partnership are the 3 factors that have helped us to become preferred partners of our global customers like ABB, Alstom, Bosch, Delphi, Brembo, Mando, Valeo, Dana, Emerson, John Deere, Siemens, Vestas, etc.



## Springs for Transmission

### 4 Wheeler

#### Slotted Belleville Springs

Slotted Disc springs are used in clutches of automatic, CVT, and dual clutch transmissions. They ensure highest spring return forces in the small space. These springs also minimize the overall size and weight of the transmission. The spring characteristics are designed to meet the specific load and space requirements for different applications.

#### Cushion Springs

In applications where shift comfort is critical, cushion springs are added in clutch assembly. Both Disc type and wave type springs are used for cushion spring applications. Wave type cushion springs are most commonly used as they typically are lighter than a Disc design cushion spring results in space saving. Wave springs also results in lower hysteresis compare to disc spring.



## Spiral Spring for Clutch Fan

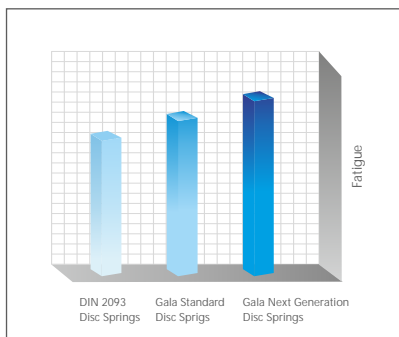
Thermal fan clutches have a built-in thermostat spring that detects the air temperature passing through the radiator and air conditioning condenser.

The fan clutch engages and provides air flow, only when cooling is needed. When disengaged, the fan clutch powers down reducing power drain and increasing fuel economy.



## 2 & 3 Wheelers

Gala offers Judder Plate, Judder Spring (Clutch spring), Plain washer & Belleville washers for 2 & 3 wheeler clutches. Gala is able to meet stringent requirements of flatness, ovality & round edges for free movement of parts inside clutch to achieve optimum performance.



## High Fatigue Life of Gala Springs

## Off-highway Vehicles

We supply belleville springs for transmission of off-highway vehicles like tractor, construction equipment & earth-moving equipment.



# Spiral Springs



Seat Height Adjustment



Two Wheeler Kick Start



## Engine Camshaft Adjuster Springs

The spiral springs have the task of moving the camshaft adjuster to its early position when switching off the engine



## Clock & Belleville Springs for Steering Wheel

The clock spring is located between the steering wheel and the steering column. We also offer belleville springs, wave springs & spring clamps.







## Carbon Brush Springs for Starter Motors

A carbon spring is a sliding electrical contact that carries current to a moving surface. It performs this electric duty while operating within the constraint of a mechanical system.

Carbon brush springs are constant force springs that are specially constructed to ensure consistent & dependable pressure to electric motor commutations. We provide both single coil constant force springs and twin coil constant force springs for carbon brush.

Gala is able to meet customer specific raw material need with options of manufacturing either from annealed & hardened and tempered material.

### Our Advantage

- Constant pressure for commutator in any brush length
- Increases brush life, reduces electrical wear
- Compact design for overall motor size  
Meets required load requirements critical for function of starter motors
- Allows longer brushes
- Allows larger commutators
- Reduces spark, lower influence of electromagnetic interference (EMI)



## Spiral Springs for Seat Recliner

Spiral springs serve as energy storage units or damping elements.



### Our Advantage

- High durability
- Optimum design for space saving
- Capability to offer variety of surface treatments & coating
- Meeting stringent tolerances

Gala offers Spiral Springs for

- [Seat Reclining System](#)
- [Seat Height Adjustment System](#)
- [Automotive Drive Control Mechanism](#)
- [Window Regulator Mechanism](#)

Spiral springs are used as equalizing springs for smaller angles of rotation. The stored energy is used as an equalizing force or righting moment. The spring curve here rises almost linearly.

### Features

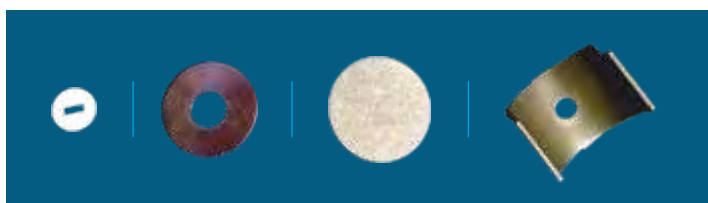
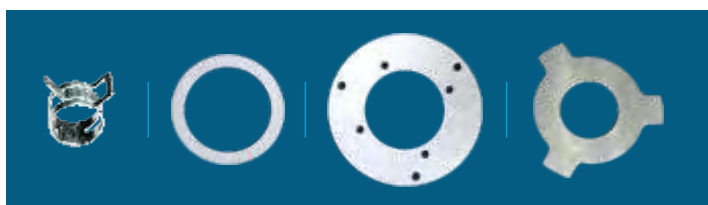
Gala offers thickness ranges from 1.5 to 5.0 mm with variety of options for Surface Coatings.

# Precision Springs & Components for Fuel Injection System

Gala offers high precision components for Fuel Injection systems for petrol as well as diesel vehicles.

## Components for Fuel Injection Systems

Max Fuel Plate | Back Plate | Injector Joint | Piston Stop  
TP Back Plate | Belleville washer | Leaf Spring



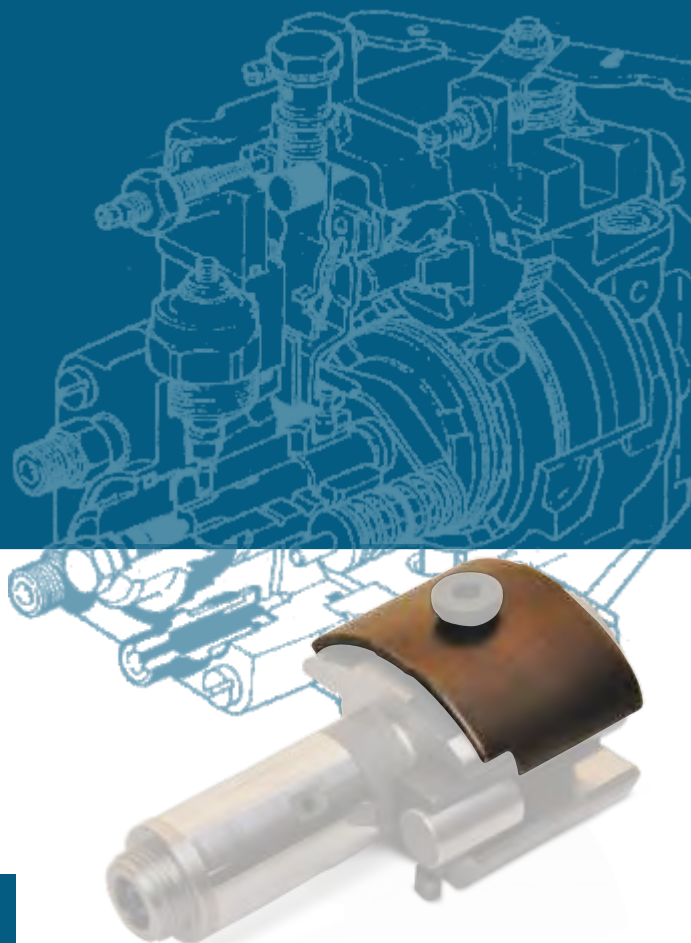
### Our Advantage

Flatness upto 0.03 mm

Parallelism upto 0.02 mm

Shot peening for high residual stress induction  
resulting in High Fatigue life

Edge radiusing for smooth movement of parts  
inside pump



Spring Clamps

## Precision Springs & Components for Brakes

Gala manufactures components for Caliper & Drum brakes of Passenger cars & two wheelers from Spring steel, Stainless steel & other special steels.

### Brake Components

Leaf Spring | Shoe clamping spring | Pawl Lever / Adjuster  
Pad Spring | Clip



### Our Advantage

Forming with stringent tolerances

Heat Treatment & stress relieving to meet required spring force and load characteristics

Proprietary finishing process for high residual stress induction resulting in High Fatigue life

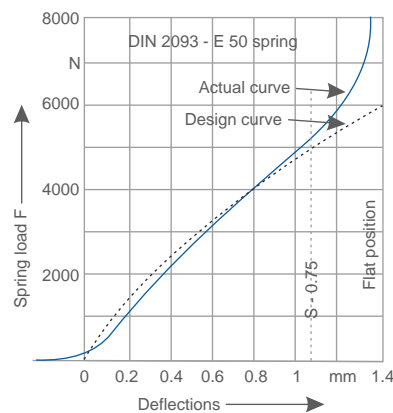
Edge radiusing



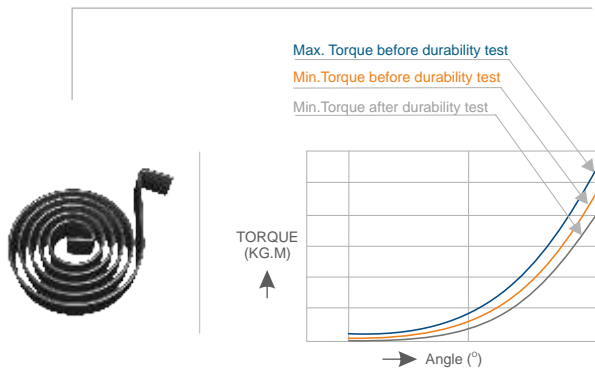
# Design & Engineering

At Gala we have 30 years of experience in understanding spring material behavior. We have tie ups with global research institutes & universities in Germany & India for new product testing & new process validations.

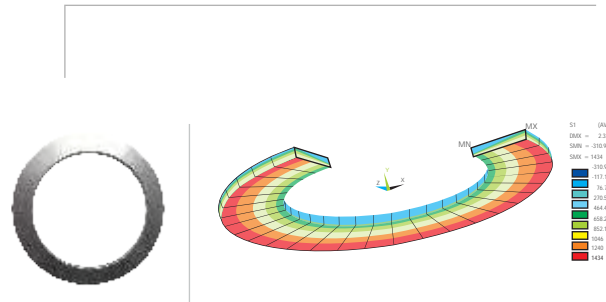
## Design and actual load / deflection curves for a conical disc spring



## Torque Durability Test



## Finite Element Analysis for Determining High Stress Zone of Disc Springs



# Materials

Gala has successfully forged alliances with its suppliers of Steel, which is absolutely vital for maintaining consistency in quality & delivery. Almost 50% of raw materials are imported from leading steel mills from Europe, Brazil, Korea, etc.

## Raw materials offered

- Spring Steel Ck55, Ck60, Ck67, Ck70, Ck75, 80C6, 85C6, SWRH62A, SWRS2
- Chrome Vanadium Steel 50CrV4 / 51CrV4
- Precipitation Hardenable Steel 17/7Ph
- Work Hardened Stainless Steel AISI 301, 304 & 316
- Inconel 718 & X750



# Technology & Manufacturing

Tool Design & Development Forming & Blanking  
Austenitizing Compressive Stress Induction Surface Finishing  
Raw Materials Heat Treatment Stress Relieving

## Tool Design & Development

- In-house tool design and development with latest CAD Software.
- Rapid Prototyping
- State-of-the-art CNC Wire Cut Machines for achieving surface finish upto 5 microns on cutting elements.
- Competency of manufacturing tools from variety of materials like HSS, Carbide, Venadis, Powder Metallurgy, etc.
- Different types of Coating & Treatments for tool elements to increase performance & achieve better edge quality.



16 Stage Progressive Tool

We have developed tooling technology for shaving of edges for reducing the shear zone upto 20% of material thickness, which is close to fine blanking.

## Blanking & Forming

Gala is equipped with presses having capacity up to 250 tons (2500 KN). The presses are attached with automatic De-coiling, Straightening and feeding arrangements. Photo Sensors are installed for elimination mis-blanking. The punching capacity is from thickness 0.1 (0.0039") to 10 mm (0.23").

State of the art Multi-slide machines ensure we meet stringent bending tolerances as per customers' specifications.

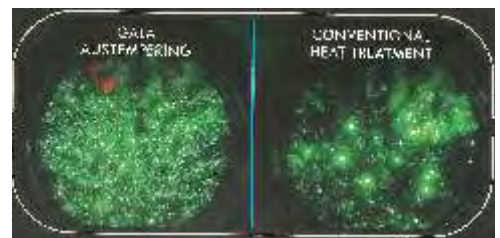
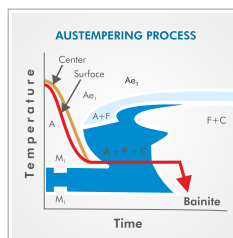


## Heat Treatment Technology

With years of experience in handling Spring steel & Stainless steel materials, Gala has optimized heat treatment process. Based on grade of steel & end application, Gala offers various options of heat treatment.

### Austempering

It is performed to achieve homogeneous Bainite structure by ensuring controlled atmosphere & process parameters. The resultant product is distortion free with uniform hardness & higher endurance life.



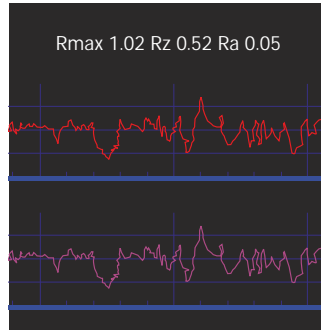
### Stress Relieving

For stainless steel parts stress relieving is done by heat treatment to remove internal stress induced during blanking, forming, etc.

### Vacuum Heat Treatment

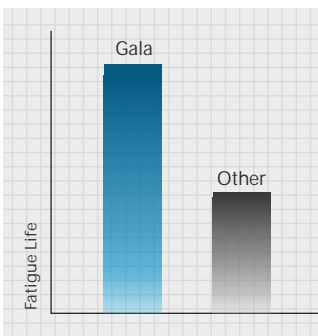
For thicker materials & application demanding high fatigue life, Gala offers vacuum heat treatment.

## Surface Finishing



Based on 30 years of experience in surface engineering, we offer components with fine surface finish - Ra value up to 0.5 microns. This finishing process also ensures uniform edge radius for smooth assembly & movement of parts inside assembly.

## Compressive Stress Induction



Proprietary process developed by Gala, induces high level of compressive stresses with larger depth of penetration in components resulting in higher fatigue life. This validated by the leading testing laboratories in the USA and Europe

## Inspection & Quality Control



Torque Testing



Load Testing

A variety of surface treatments & coatings offered by Gala

Phosphating

Mechanical Zinc Plating (Cr 6 free)

Blackodising

Dacromating

Epoxy Coating

Nickel Chrome Plating





ISO/TS 16949 Certified by Bureau Veritas

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