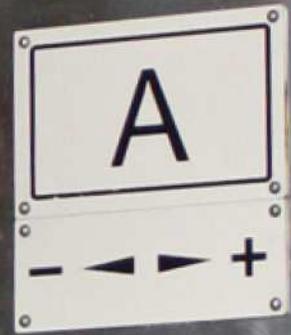
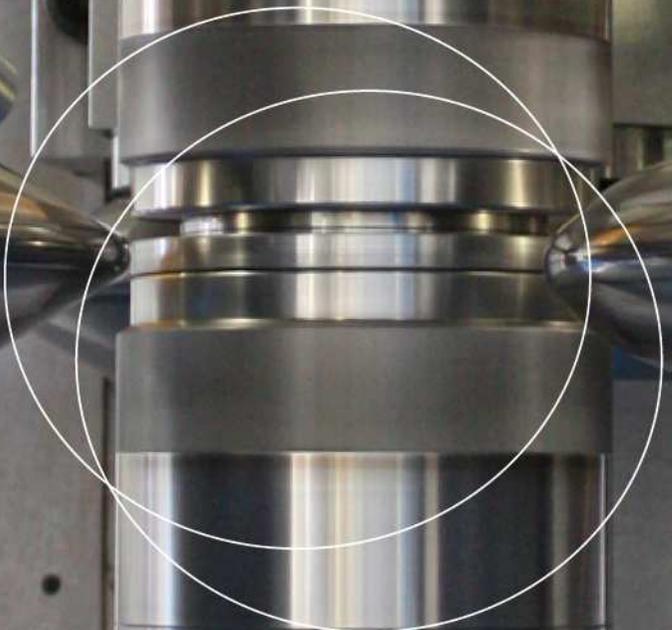




LEIFELD



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**HIGHLY EFFICIENT  
MANUFACTURING OF  
DRIVE UNITS**



eckotech®

## LEIFELD METAL SPINNING AG

Long Term and Trustful Cooperation

- ▶ The confidentiality of our clients plans and data is most critical. Leifeld rigorously applies organizational separation of teams working for competitors as well as several other rules **to protect the confidentiality of all client information.**
- ▶ Similarly, our industry is very competitive and we regard our approaches and insights as proprietary. Therefore, we look to our clients **to protect Leifelds interests in our presentations, methodologies and techniques. Under no circumstances** should this material be shared with any third party, including competitors, **without the written consent of Leifeld Metal Spinning.**



## FFC SERIES

Highly Efficient Manufacturing of Drive Units

### PERFORMANCE FEATURES

- ▶ Manufacturing of high-precision drive units
- ▶ Flexible part processing in one clamping
- ▶ Individual combining of manufacturing steps
- ▶ High equipment availability, energy-efficient manufacturing
- ▶ Flexible integration in existing production processes
- ▶ Substitution of devices



## FFC SERIES

Highly Efficient Manufacturing of Drive Units

### PERFORMANCE FEATURES

- ▶ Reduced required production spare due to vertical design
- ▶ Optimized strength distribution due to slides mounted to each other at  $3 \times 120^\circ$  of the flow forming roller
- ▶ Best usability of flow-forming technology caused by 6 + 2 independent CNC controlled axes
- ▶ Forward flow forming in two directions during one clamp is possible
- ▶ Reverse flow forming for alternative applications possible (e.g. shafts for automatic gear box)



## FFC SERIES

Highly Efficient Manufacturing of Drive Units

### BENEFITS

- ▶ Low production costs, short payback period
- ▶ Highest precision of inner and outer measurements
- ▶ High degree of material utilization
- ▶ Increase in solidity and hardness
- ▶ Low reconditioning effort
- ▶ Long service life, low maintenance requirements
- ▶ High production process reliability
- ▶ High equipment availability



## FFC SERIES

Highly Efficient Manufacturing of Drive Units

### PRODUCTS

- ▶ Clutch housings
- ▶ Hollow shafts
- ▶ Piston parts
- ▶ Housing parts

### APPLICATIONS

- ▶ Trucks
- ▶ Passenger cars
- ▶ Construction machinery
- ▶ Agricultural machinery
- ▶ Utility vehicles



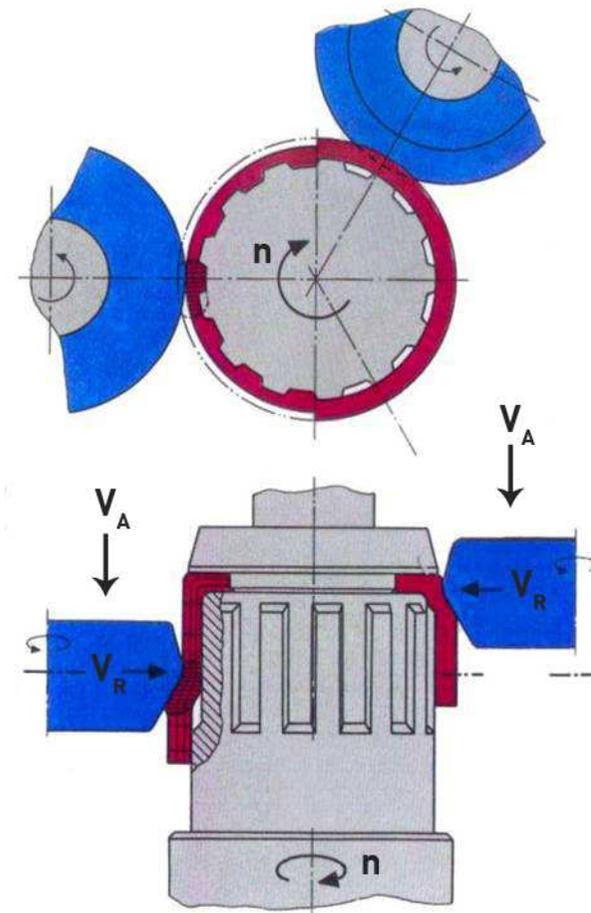
## FFC SERIES

Flow-Formed Machine Part

### BENEFITS

- ▶ Simple preform (blank) or forging blank
- ▶ Time saving compared to metal-cutting manufacturing

$V_A$  = Axial feed  
 $V_R$  = Radial feed  
 $n$  = Spindle speed



## FFC SERIES

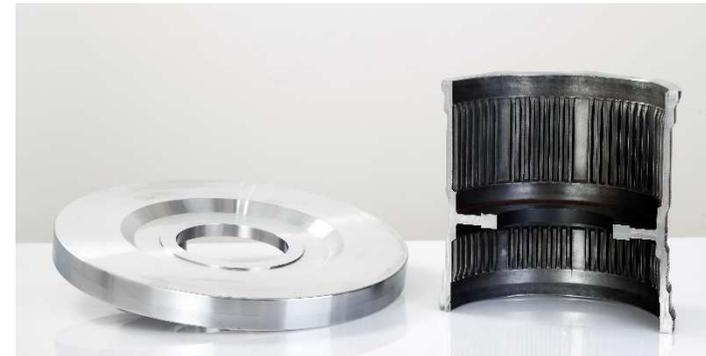
Clutch Housing

### BENEFITS

- ▶ High precision production - High accuracy in both directions
- ▶ Precise spline contour
- ▶ One-pieced drive units produced in one working process including splitting

### PRODUCTION PROCESS

- ▶ Technologies: Flow forming in both directions
- ▶ Preform: Flat disc blank
- ▶ Material: SAE 1022



## FFC SERIES

Clutch Housing with Castle Teeth

### BENEFITS

- ▶ Non symmetrical splitting- the best way to produce sophisticated parts
- ▶ One-pieced drive units produced in one working process
- ▶ Optimized component regarding weight and available space
- ▶ Uninterrupted fibers in processes parts

### PRODUCTION PROCESS

- ▶ Technologies: Flow forming, spinning
- ▶ Preform: Forged preform
- ▶ Material: SAE 1015



Picture: product after final machining

## FFC SERIES

### Clutch Housing with Castle Teeth

#### PRODUCTION PROCESS

- ▶ Forming sequence:
  - ▶ Firstly, a non symmetrical splitting into three portions is carried out. One branch is flow formed to produce the inside splines, the other is spun for the piston area. The last one is flattened and the outside splines are rolled in.
  - ▶ The castle teeth are produced by simply turning away residual material between the flow formed splines.



- ▶ Rollers:
  - ▶ 1 splitting roller
  - ▶ 2 flow forming rollers
  - ▶ 1 spinning roller
  - ▶ 1 flattening roller
  - ▶ 1 tothing roller

## FFC SERIES

Highly Efficient Manufacturing of Drive Units



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