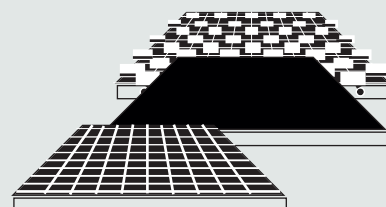




## Plates



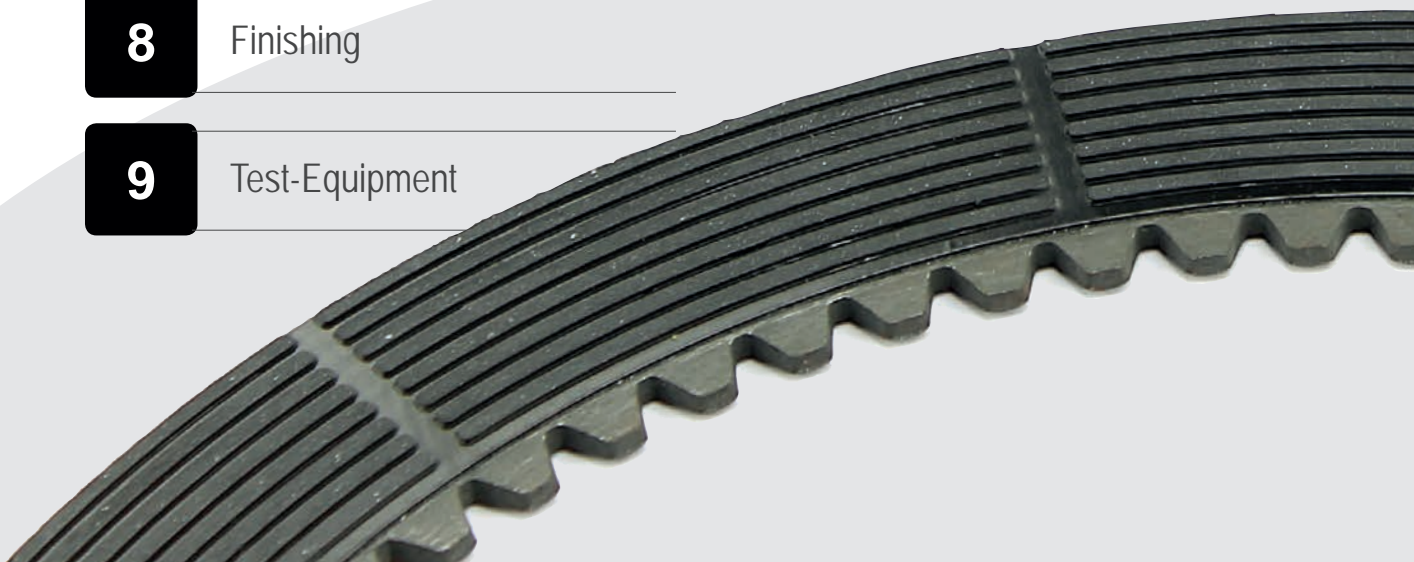
## Solutions for brakes and clutches in commercial industry

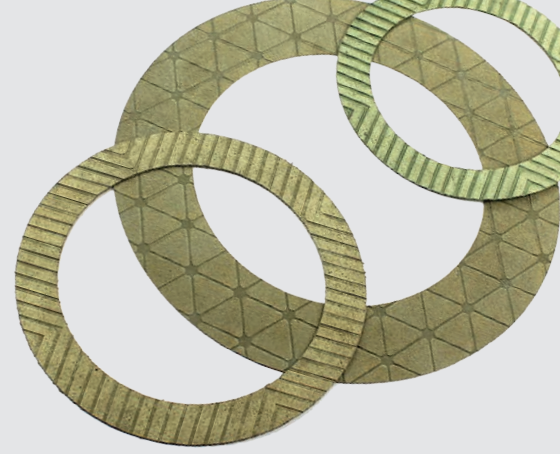
Friction lining plates and steel plates for wet or dry running  
according to customer requirements



## Overview

- 1 Plates
- 2 Moulded pieces
- 3 Friction material
- 4 Surface design
- 5 Steel discs / flat parts
- 6 Production of friction material
- 7 Friction lining discs
- 8 Finishing
- 9 Test-Equipment





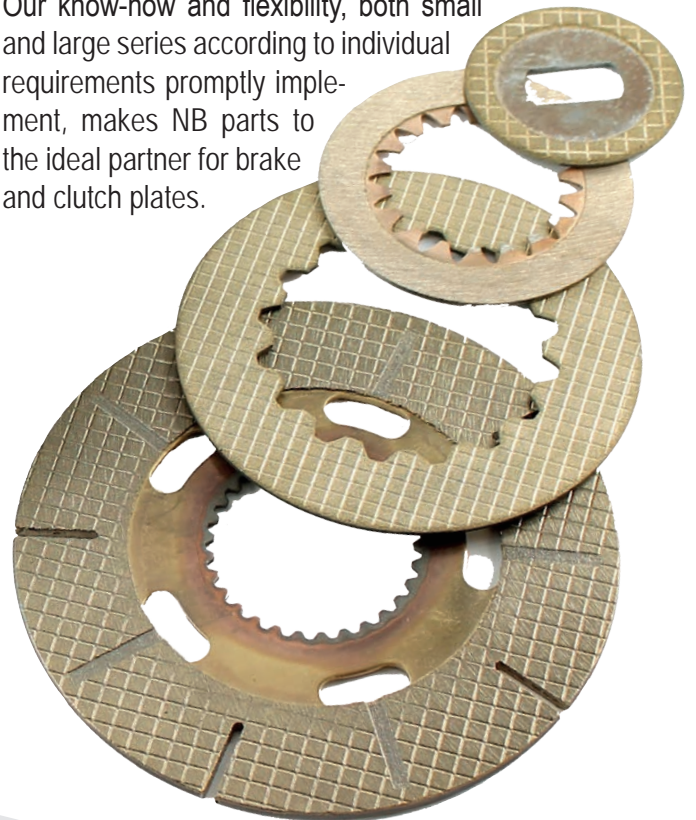
## Company portfolio

### „Friction linings are our business“

Focusing on the optimal integration of brake and clutch plates in your industry environment, friction materials, counter materials and oils are tailored to the specific requirements of the application - and, if appropriate, modified or redesigned.

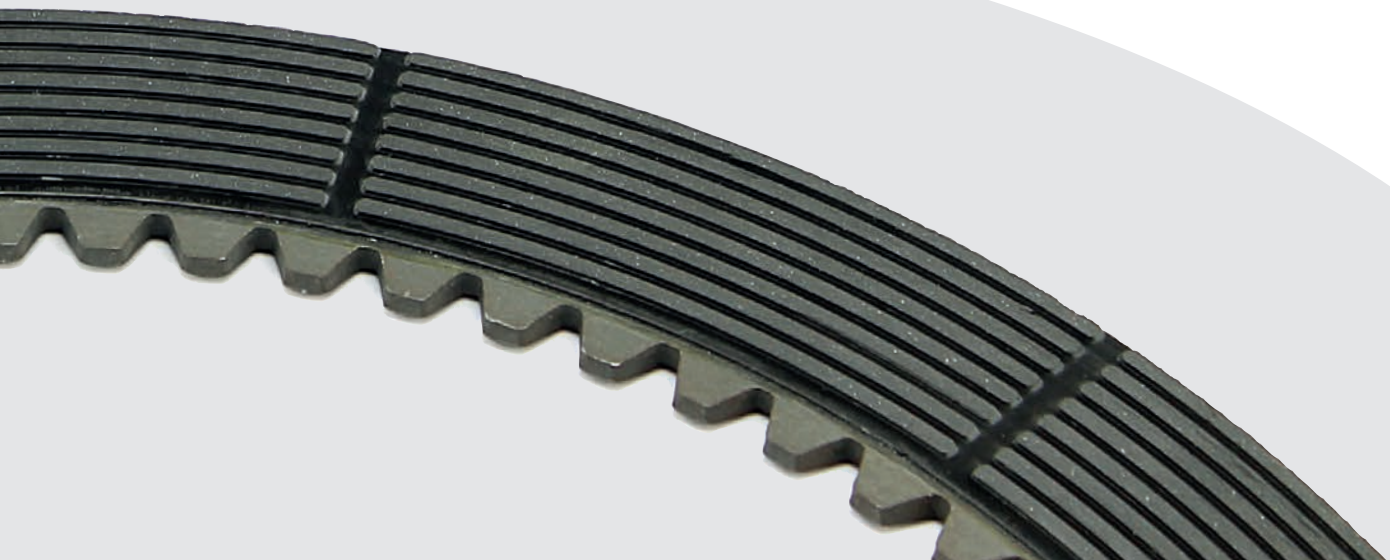
The available friction materials, such as sintering, sintering spray, carbon, elastomer, graphite and paper cover a wide range of different requirements. Furthermore, a variety of steels in various degrees of hardness provide for the necessary balance.

Our know-how and flexibility, both small and large series according to individual requirements promptly implement, makes NB parts to the ideal partner for brake and clutch plates.



Individual and custom-made:

**For wet and dry -  
to high-performance applications  
for vehicles and machines**





## Plates

Plates and mating plates  
individualized  
as guarantor for your success  
... for any application!

1



**Steel plates**



**Lining plates**



**Lining plates**

### Features

Application

Version 1

Version 2

dry / wet  
outside / inside  
cam / gear

wet  
outside / inside  
cam / gear

dry  
outside / inside  
cam / gear

### Production

Manufacturing

Volume

Refinement

lasering/punching  
1 – 1.000.000  
hardening / grooving

sinter / gluing  
1 – 1.000.000  
groove / waffle / sunburst

gluing  
1 – 1.000.000  
groove / waffle / sunburst

### Dimension

Thickness

Diameter

1,0 mm - 20,0 mm  
50,0 mm - 1000,0 mm

0,1 mm - 2,0 mm  
50,0 mm - 1000,0 mm

0,3 mm - 1,5 mm  
50,0 mm - 1000,0 mm

### Friction partners

sinter, sinter-spray  
carbon, elastomer,  
graphite, paper

steel, cast steel  
grey cast iron

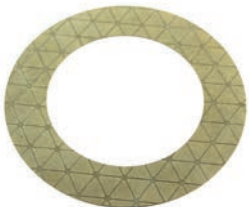
steel, cast steel  
grey cast iron





## Moulded pieces

**Moulded pieces of high-grade friction material  
for wet- and  
dry-running applications**  
... for client-oriented application!



**Friction material**

dry / wet  
all forms  
graphite / paper / org. materials

waterjet cutting / punching  
1 – 1.000.000  
groove

0,04 mm - 38,0 mm  
50,0 mm - 700,0 mm

steel, cast steel  
grey cast iron



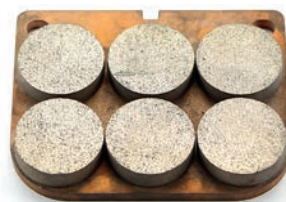
**Lining segments**

dry  
all forms  
sinter / sinter-spray

sinter  
1 – 1.000.000  
contour-designed / groove

0,25 mm - 2,0 mm  
50,0 mm - 1000,0 mm

steel, cast steel  
grey cast iron



**Brake blocks**

dry  
all forms  
sinter / sinter-spray

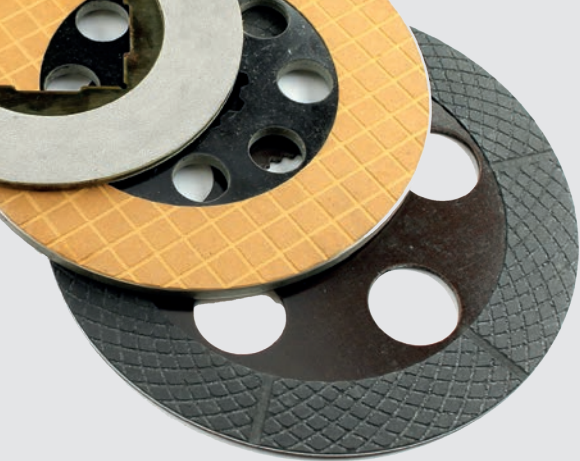
sinter  
1 – 1.000.000  
contour-designed

4,0 mm - 10,0 mm  
50,0 mm - 1000,0 mm

steel, cast steel  
grey cast iron

2





## Friction material

**Repeatedly proven friction materials  
for many dimensions  
and extreme loads**

*... for all high-running speeds!*

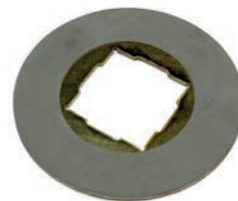
**3**



**Sinter**



**Sinter-Spray**



**Carbon**

### Friction Property

Using	wet	wet	dry / wet
Static	0,10 – 0,14	0,12 – 0,15	0,10 – 0,14
Dynamic	0,08 – 0,12	0,07 – 0,10	0,12 – 0,14

### Recomm. Values

Running speed	35 m/s	30 m/s	40 m/s
Surface pressure	7,0 N/mm <sup>2</sup>	2,5 N/mm <sup>2</sup>	3,2 N/mm <sup>2</sup>
Specific ratings	4,0 W/mm <sup>2</sup>	4,0 W/mm <sup>2</sup>	4,0 W/mm <sup>2</sup>

### Dimension

Thickness	0,30 mm – 2,0 mm	0,25 mm – 2,0 mm	0,35 mm – 0,75 mm
Diameter	50,0 mm – 600,0 mm	50,0 mm – 304,0 mm	50,0 mm – 1000,0 mm

### Friction partners

steel, cast steel grey cast iron	steel, cast steel grey cast iron	steel, cast steel grey cast iron
-------------------------------------	-------------------------------------	-------------------------------------





## Friction material

**Wear proof and high temperature resistant  
brake and clutch plates  
for different oils**

*... especially used for customized applications!*



### Elastomer

wet  
0,10 – 0,15  
0,09 – 0,12

### Graphite

dry / wet  
0,13 – 0,15  
0,11 – 0,12

### Paper

dry / wet  
0,12 – 0,16  
0,11 – 0,14

35 m/s  
2,0 N/mm<sup>2</sup>  
4,0 W/mm<sup>2</sup>

40 m/s  
3,5 N/mm<sup>2</sup>  
4,0 W/mm<sup>2</sup>

40 m/s  
3,5 N/mm<sup>2</sup>  
4,0 W/mm<sup>2</sup>

0,60 mm – 1,2 mm  
50,0 mm – 750,0 mm

0,04 mm – 1,50 mm  
50,0 mm – 660,0 mm

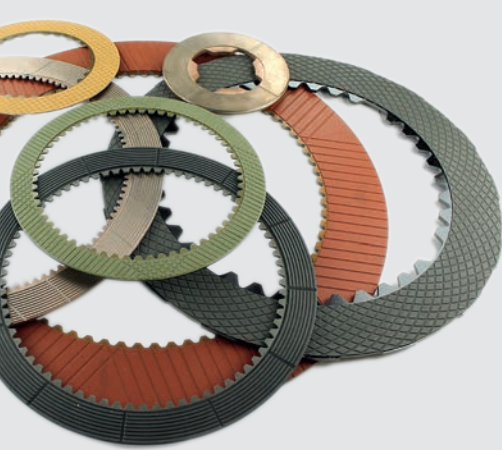
0,35 mm – 1,50 mm  
50,0 mm – 1000,0 mm

steel, cast steel  
grey cast iron

steel, cast steel  
grey cast iron

steel, cast steel  
grey cast iron

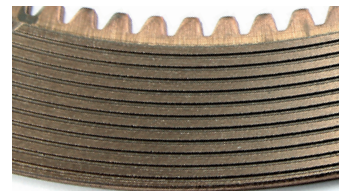




## Surface design

**Efficiency and sustainability:**  
**From the selection of raw materials**  
**to the finished plate**  
*... transparent designed for you*  
*and retraceable at any time!*

4



### Seeping slots

### Radial grooves

### Spiral grooves

#### Friction materials

Sinter	yes	yes	yes
Sinter-Spray	yes	yes	yes
Carbon	yes	yes	yes

#### Friction materials

Elastomer	yes	yes	yes
Graphite	yes	yes	yes
Paper	yes	yes	yes

#### Dimension

Height	on request	on request	on request
Width	on request	on request	on request

#### Lubricants

different oils and lubricants	different oils and lubricants	different oils and lubricants
-------------------------------	-------------------------------	-------------------------------

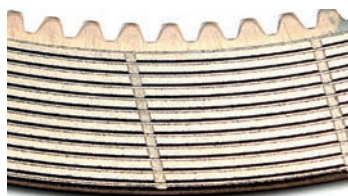






## Surface design

Different grooving-varieties  
 for the ideal distribution  
 of lubricants  
 ... in differing depths and widths!



### Spiral- / Radial grooves

yes  
yes  
yes

### Sunburst

yes  
yes  
yes

### Waffle

yes  
yes  
yes

yes  
yes  
yes

yes  
yes  
yes

yes  
yes  
yes

on request  
on request

on request  
on request

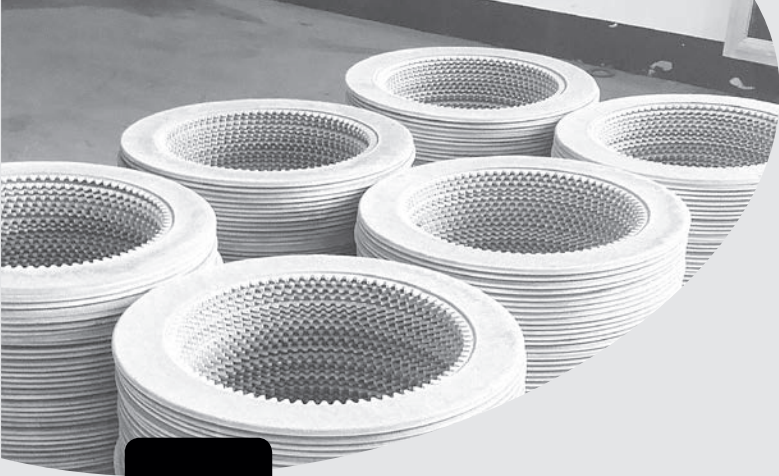
on request  
on request

different oils and  
lubricants

different oils and  
lubricants

different oils and  
lubricants





5

## Steel plates / flat parts



Different steels in different degrees of hardness form the basis for both the friction and the steel plates.

The production is charged per unit caused by laser cutting or punching. Then starts the plane parallel processing which includes grinding the fins.

Any heat treatments are personalized according to customer specifications and taking account of its intended purpose.



The subsequent step is cleaning the fins as well as preparation for further friction plate processing or in the form of preservation of steel plates ...

*Steel plates in all forms  
and quality grades  
**flexible & fast**  
according to your specifications*

*... performed with greatest precision!*





6

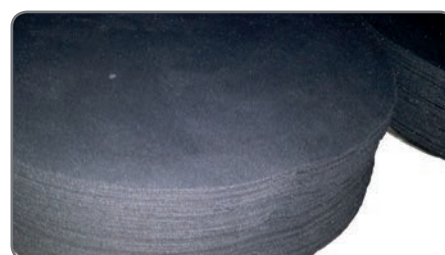
## Friction materials

The production of friction materials begins with the assessment of the recipe ingredients at incoming inspection of raw materials.

Even here, the foundation stone was laid for the quality to be achieved by chemical composition, particle size distribution and hardness are coming under scrutiny.

This prevents that off-spec materials are transported in the manufacturing process. If it is found that the required frictional properties are not covered by an existing portfolio of our material, a new material based on it can be developed.

The preparation of the mixture takes place in so-called mixing equipment. Subsequently, the friction material is prepared in rolling and extrusion process for further processing.



**Our friction materials  
of any kind and quality  
guarantee  
client oriented solutions**

*... also for high power densities!*





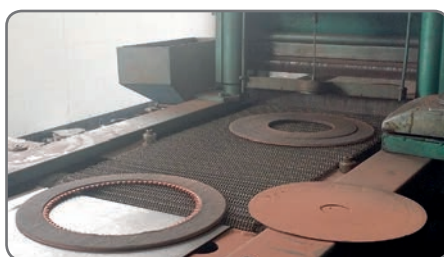
7

## Sinter spray process

Preparation of steel plate



Application of the friction material



In the furnace



## Sinter process

Preparation of steel plate



Pressing the sintered blank

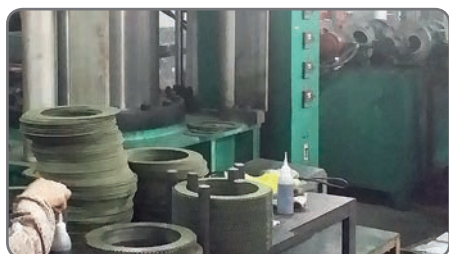


Preparation of sinter blank



## Pressing action of friction lining

Bonding of steel and base



Preparation of the press process



Pressing the plate under heat





## Sinter spray process

Temperature: ca. 800°C

Plate after furnace treatment

Plate without surface treatment



## Sinter process

Loading of the sinter system

Sintering under pressure and heat

Plate without surface treatment

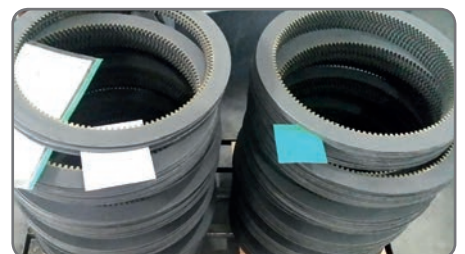


## Pressing action of friction lining

Pressing the plate under heat

Multiple pressing process

Plate without surface treatment





## Finishing

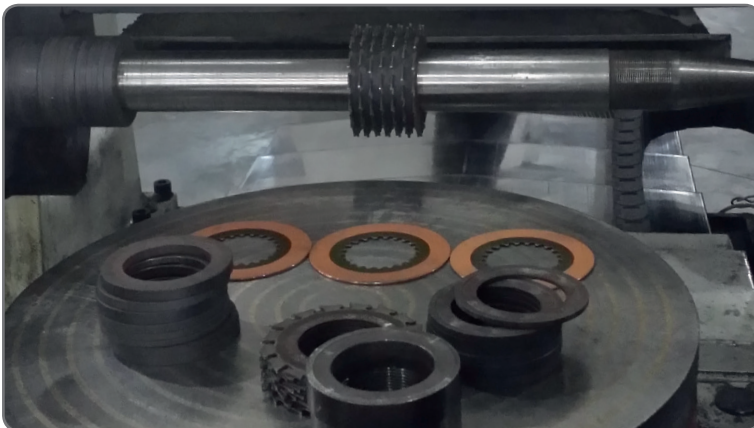


On the basis of applications, aging resistance, friction components, cooling parameters and friction materials required plate splines be made using milled grooves.

The basis of the plate spline can take place at different depths, widths and lengths individually.

Regardless of size and shape, both friction and steel plates if necessary be edited plane-parallel.

Also individual labels and labeling of the plates are possible.



After preservation, the transmitted packing instruction of the components according to customer requirements is done.



*An effective  
surface design  
for the ideal symbiosis  
of heat capacity  
and torque*

*... for a  
perfect result!*



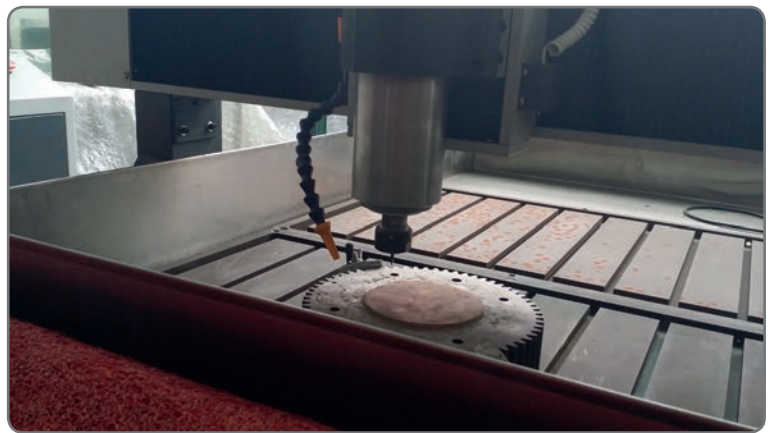
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## Test-Equipment

With our test equipment, we are able to implement temporary comparisons of friction coefficients and to determine a equivalent friction lining out of our range, as good as to simulate long-term studies taking into account certain parameters in order to offer you and your clients alternatives of friction lining sustainable.

By means of numerous instruments and computerized CAD programs your fins are measured and recognized.

Furthermore, we can assure you a timely quotation if you send us a technical drawing.

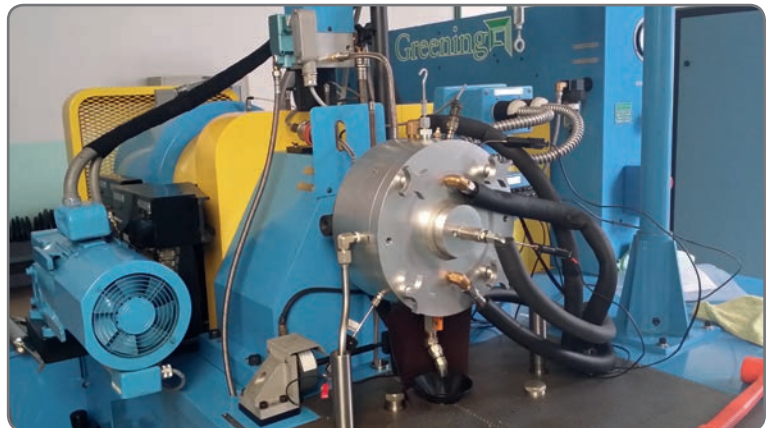


**We are there for you:**

*From the  
development  
of fins and plates*

*up to*

*inexpensive  
Alternatives*



*... and for all other matters:*

***We surely find  
a solution for you!***





## Plates

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Fax + 49 (0) 9195 92 19 520  
E-Mail [info@nb-parts.de](mailto:info@nb-parts.de)  
[www.nb-parts.de](http://www.nb-parts.de)

Register number: HRB 6248  
Register court: Bamberg District Court  
VAT reg. no.: DE 263 015 356

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