



**BUTTING HeRo<sup>®</sup>**  
**HEAT-RESISTING FURNACE ROLLER**



**BUTTING**



**Longitudinally welded pipes**

Produced continuously from coil in sizes of 15 mm – 762 mm OD and wall thicknesses up to 16 mm

From plate: in sizes of 33.7 mm – 3,000 mm OD and wall thicknesses up to 60 mm

Pipes in special shapes

In random length up to 24 m with circumferential welds



**Clad pipes**

Mechanically bonded BuBi®-pipes in sizes of 114.3 mm – 660 mm OD

Metallurgically clad pipes

In random length up to 24 m with circumferential welds



**Vessel construction**

Up to 6,000 mm OD: complete prefabrication at the mill

Above 6,000 mm OD: prefabrication at the mill and assembly on site



**Pre-fabrication**

Piping components ready for assembly

Pipe bends acc. to drawings, piping segments, isometric drawings



**Fittings**

Tees, reducers, special fittings

Pipe bends acc. to DIN 2605

Collars acc. to DIN 2642

Elbows with long radii



**Piping technology**

Pipes with special tolerances, e.g. furnace rollers, jackets for pumps

Pipes with special surface requirements e.g. for the pharmaceutical industry, architecture

Further processing of pipes using forming, grinding, Laser cutting, e.g. jackets for pumps, valves and lamps

Special products, e.g. BUTTING HeRo® (an uncooled furnace roller)

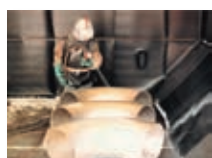


**Assemblies**

Vessels

Linepipes

Special constructions, equipment



**Surface treatment**

Pickling (also on subcontract basis)

Blasting, peening (also on subcontract basis)

Grinding (also on subcontract basis)



**Services**

Expert technical and metallurgical guidance

CAD-facilities, isometric drawings

Metallurgical testing and non-destructive testing

## Material selection

- Steels containing 10.5 % Cr min, e. g.
  - Stainless steels
  - Heat resisting steels
  - Creep resisting steels
- Nickel alloys
- Titanium
- Aluminium and aluminium alloys
- Special alloys
- Clad materials

## Approvals

- By TÜV acc. to AD-WO/HPO and TRD 100/201 and DIN EN 729-2
- DGRL (pressure vessel code)
- Acc. to the rules of the water board § 19 I
- Quality Management System acc. to DIN EN ISO 9001 : 2000
- Accreditation of the laboratory acc. to DIN EN ISO 17025 : 2000
- Acc. to BDLI QSF-B
- AECMA EASE DIN EN 9100

Photographs  
 • Cover: Stan Schneider  
 • Aerial View: Stuttgarter Luftbild Elsaßer GmbH  
 • Inside:  
 Heike Butting  
 Company archives  
 Stan Schneider  
 Rutzen und Scherer  
 Sigfrid Wilke  
 Schmidt + Clemens

Edition 2006

Approx. 3,000 t of standard pipes from DN 20 up to DN 800 in 140 dimensions are stored in the pipe open storage ground



## Progress by tradition

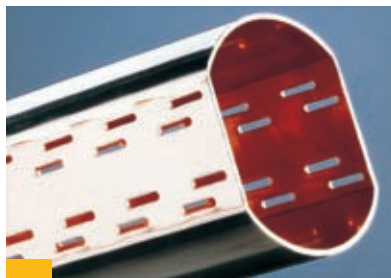
Founded as a coppersmith's in Crossen at the river Oder in 1777, BUTTING has been located in Knesebeck in West-Germany, since 1946. Since then, we have become renowned worldwide for the production



**Fully machined pneumatic casing with laser-welded cover**

of high-quality stainless steel pipes and for fabricating high-tech stainless steel products. Thanks to state-of-the-art welding techniques and calibration systems, BUTTING is well-established in the field of customised special production. More than 35,000 t of stainless steel are processed each year at the company, which is managed by Hermann Butting, a member of the 7<sup>th</sup> generation of the family.

Our products' wide range of applications in all sorts of industrial fields, such as chemical plants, the oil and gas industry, aircraft and aerospace and the pharmaceuticals and food industry, demonstrate



**Beam-Screen**

the high quality and reliability of our products all over the world.

## Stainless steel innovations

The constant development of new products and processes as well as the continuous improvement of the status quo have a long tradition at BUTTING. The technical and economic optimisation of products on the basis of each project's specific requirements takes centre stage at BUTTING and is undertaken by team-oriented, qualified staff. Workmanship and engineering



**Laser cut-outs created using modern technology and designed for filter pipes**

knowledge are combined throughout the production process each day.

BUTTING has developed many in-house products and services and is always interested in new challenges. One current innovation at our company is the BUTTING HeRo® (Heat-resisting Roller). We set a high value on guaranteeing customised solutions for your annealing requirement as well as tailored advice from our points of contact.

## Our points of contact



**Dr. Iris Rommerskirchen**  
Managing Director  
Material selection

Phone: +49 5834 50-321



**Petra Sander**  
Sales specialized piping  
Technology, Application,  
Costing

Phone: +49 5834 50-470



**Gernold Holler**  
Development and  
Construction  
Development

Phone: +49 5834 50-307

BUTTING HeRo®



## The heat-resisting furnace roller

In the manufacturing of long and flat products in the steel-producing and metal-processing industry, furnace rollers are required for roller hearth furnaces as an integral part of heat treatment plants. Until now, ceramic rollers sensitive to temperature fluctuations have been used, as well as water-cooled drive rollers, which cause extensive energy loss and incur heavy maintenance costs, also offering to have a relatively short service life. This is exactly where our newly developed, uncooled furnace roller is convincing: the BUTTING HeRo®.

## The innovative product

The BUTTING HeRo® is designed and produced to suit any specific annealing requirement. The specific materials and construction chosen for each solution minimise energy costs and downtimes.

The BUTTING HeRo® has a guaranteed long life due to its low tendency to oxidation through use of suitable high-temperature materials. With very small tolerances in production, the BUTTING HeRo® has very high running precision, reflected in a high mechanical resistance to wear. This substantially reduces the costs which are incurred with conventional rollers because of furnace standstills and maintenance

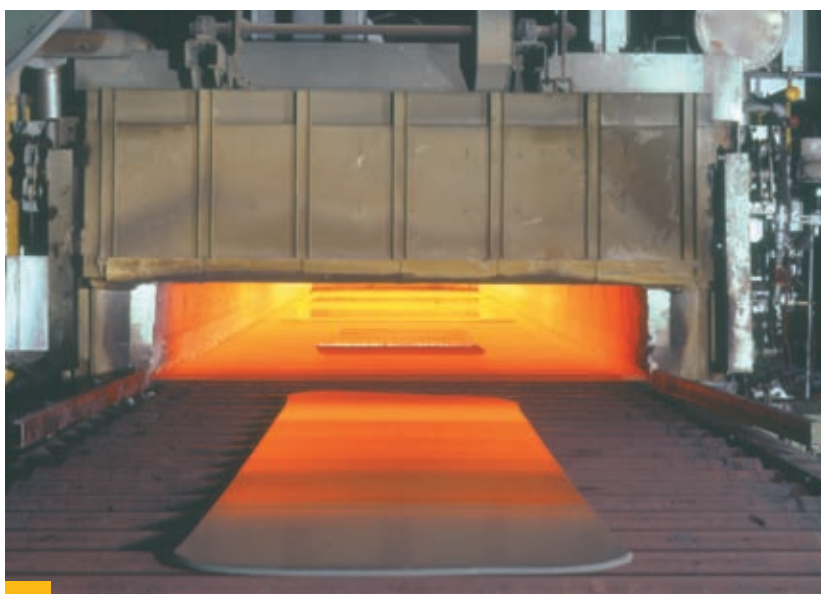


**The precise dimensional accuracy of the furnace roller is guaranteed using hydroforming equipment**

work. As there is no water cooling system, the energy costs are also much lower while the furnace is operating.

## Long life

The BUTTING HeRo® also saves on resources: if after many years of use the furnace roller gets out of shape, it can easily be restored by use of special calibrating machines, and be ready again for further prolonged use. This possibility is taken into account in the construction of the furnace roller, the relevant requirements being met for the product. When the BUTTING HeRo® reaches the end of its product lifecycle, the material can be melted down again, protecting resources and generating a yield. The BUTTING HeRo® has many advantages. Find out for yourself!



Roller hearth furnace at ThyssenKrupp VDM, Siegen site

## Superior knowledge through innovation

The key advantage of the BUTTING HeRo® is that the furnace roller does not have to be cooled. Conventional drive rollers, which are mostly water-cooled, have a high energy consumption and create a considerable amount of maintenance work.

Using the example calculation below, we would like to clarify the energy-saving potential of uncooled furnace rollers to you:

### Initial object

Annealing facilities which are equipped with ceramic-coated, water-cooled furnace rollers.

### Example calculation

3 m<sup>3</sup>/h of water are required for cooling conventional furnace rollers.

The energy loss per roller is approx.

25 kW/h.

The price per kW/h for energy (gas in this case) is approx. 0.05 Euros (as at 2005).

The average running time is approx.

300 working days per year.

The plant produces goods in a 3-shift system.



View of the furnace rollers' cones

### Result

300 days × 24 h × 25 kW/h ×  
0.05 Euros/kW/h = 9,000 Euros.

**Energy saving per furnace roller per year: 9,000 Euros**

### Explanation

Based on a customer's conventional annealing plant which is equipped with cooled furnace rollers, approx. 3 m<sup>3</sup> of water is required per hour for cooling a furnace roller.

Due to the thermal conductivity of the water, this results in an energy loss of 25 kW/h per roller. With a cost rate of

0.05 Euros per kW/h of gas (as at 2005), which is conventional in the industry, this results in an energy saving potential of approx. 9,000 Euros per roller per year.

### Summary

The sum of the savings shown, with an average purchase price of 15,000 Euros per unit for an uncooled BUTTING HeRo®, would result in an amortisation period of less than 2 years for the case described. Further economic advantages of the furnace roller due to reduced maintenance work, the lower number of furnace standstills and the longevity of the furnace roller have not been taken into account.

**The BUTTING HeRo® attracted a lot of attention at Thermprozess 2003 (International Trade Fair and Symposium for Thermoprocessing Technology)**



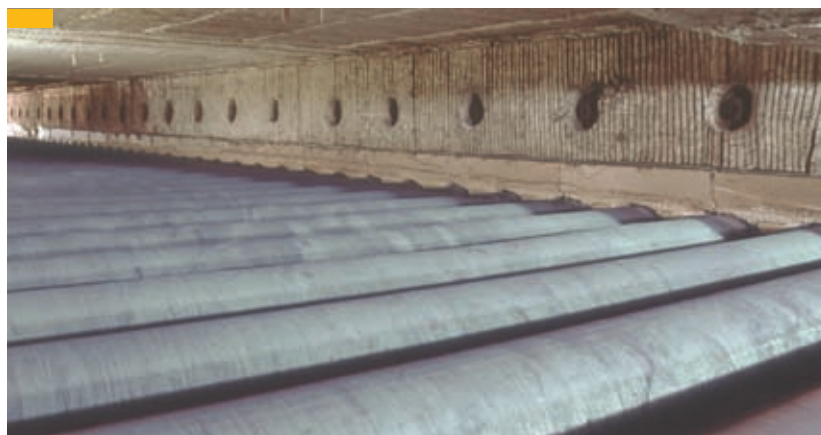
## Success in practice

Since 1994, BUTTING has fabricated roller bodies and furnace rollers from over 160 t of high temperature-resistant materials. In total, more than 140 BUTTING HeRo® have already been produced for heat treatment plants with very high technical requirements. Renowned customers from Germany and abroad are already using the BUTTING HeRo® with great success.

## Practical advantages

Since the start of 1994, the BUTTING HeRo® has been used very effectively with excellent results in various heat treatment plants of ThyssenKrupp VDM in Siegen and Altena. 101 roller bodies with dimensions of  $\varnothing 323.9 \times 25$  mm and made of Alloy 602 CA/Nicrofer 6025HT/2.4633 have been supplied. Since 2001, BUTTING has been producing complete furnace rollers for these customers – 74 units to date with these dimensions. Due to this success, other plants have been equipped with the BUTTING HeRo®. Four further trial rollers with the dimensions  $\varnothing 185 \times 15$  mm and made from Alloy 602 CA are currently in the test phase. In February 2000, Belgian company ALZ placed an order for 20 heat-resisting rollers with the dimensions  $\varnothing 273 \times 28$  mm for the heat treatment plant of its cold-rolling machine. We processed approx. 21 t of Alloy 602 CA plates for this order.

ThyssenKrupp VDM furnace - cold state



## Customers feel confident

The one-year test phase of some BUTTING HeRo®s was enough to convince our customer MKM in Hettstedt, too. In August 2003, we obtained an order for 31 more furnace rollers with the dimensions  $\varnothing 273 \times 20$  mm made from Alloy 602 CA, with a total volume of 15 t, from the special smelting plant.

The wide range of dimensions in production was also reflected in further orders: two drive rollers measuring  $\varnothing 76 \times 9.5$  mm and  $\varnothing 102 \times 8.0$  mm for Faba Autoglas Technik, Berlin, as the first test rollers for various annealing requirements.

Needless to say, our in-house heat treatment facilities are equipped with the BUTTING HeRo®. 16 furnace rollers meas-

uring  $\varnothing 194 \times 16.0$  mm and made of material grade Alloy 602 CA were fabricated for them. In addition, a further 10 trial rollers were produced, in order to test various materials and constructions under real working conditions.

We are confident that the uncooled furnace roller will live up to its name in the next few years. The course is set for this to happen. Both for ecological and economic reasons, the BUTTING HeRo® has the stuff real heroes are made of.

Table 1: 1% time yield limit

Table 2: long period creep resistance

Werkstoff-Nr.	Abbreviation		1% time yield limit $R_p$ in MPa								long period creep resistance $R_m$ in MPa						
			$t_1 = 1,000$ h $t_2 = 10,000$ h								$t_1 = 1,000$ h $t_2 = 10,000$ h						
			600 °C	700 °C	800 °C	900 °C	1,000 °C	1,100 °C	1,150 °C		600 °C	700 °C	800 °C	900 °C	1,000 °C	1,100 °C	1,150 °C
1.4828	X15CrNiSi20-12	$t_1$	120	50	20	8				$t_1$	190	75	35	15			
		$t_2$	80	25	10	4				$t_2$	120	36	18	8.5			
1.4841	X15CrNiSi25-21	$t_1$	105	50	23	10	3			$t_1$	170	90	40	20	5		
		$t_2$	95	35	10	4				$t_2$	130	40	20	10			
1.4835	X9CrNiSiNce21-11-2	$t_1$	170	66	31	15.5	(8)*			$t_1$	238	105	50	24	(12)*		
		$t_2$	126	45	19	10	(5)*			$t_2$	157	63	27	13	(7)*		
1.4862	X8NiCrSi38-18	$t_1$								$t_1$							
		$t_2$	80	35	15	5				$t_2$	125	45	20	8			
1.4876	X10NiCrAlTi32-21	$t_1$	130	70	30	13				$t_1$	200	90	45	20			
		$t_2$	90	40	15	5				$t_2$	152	68	30	10			
1.4959	X8NiCrAlTi32-21	$t_1$								$t_1$							
		$t_2$		59	28,2	12.1	3.5			$t_2$		74	32.6	15.6	6.4		
2.4851	NiCr23Fe	$t_1$								$t_1$	264	153	60	20			
		$t_2$								$t_2$	205	101	31	10	5		
2.4633	NiCr25FeAlY	$t_1$								$t_1$							
		$t_2$		132	32	13	5.8	2.2	0.4	$t_2$		155	42	18	9	4.4	3.0

\* Values in brackets are extrapolated over the time and/or over the voltage. All statements without guarantee.

## Expert in special materials

BUTTING has extensive processing experience in forming, welding and heat-treating special materials, such as corrosion- and heat-resistant steels and fully-alloyed nickel-based alloys.

### Optimum use of materials

The perfect material for the roller body and the cones is selected and used on a case-by-case basis in accordance with the furnace atmosphere and temperatures as well as the load from the annealing material. Various combinations of materials are possible for cones and roller bodies, including the use of dead heads.

**The BUTTING HeRo® – in process for 3 years**



**Table 3: Chemical analyses of selected materials**

Werkstoff-Nr.	Abbreviation	Alloy	AISI / UNS	Chemical analyses (%)						Other Elements
				C	Si	Mn	Cr	Ni		
1.4828	X15CrNiSi20-12	309	309/ S30900	max. 0.20	1.50 2.00	max. 2.00	19.00 21.00	11.00 13.00	N max. 0.11	
1.4841	X15CrNiSi25-21	310/314	310/ S31000 314/ S31400	max. 0.20	1.50 2.50	max. 2.00	24.00 26.00	19.00 22.00	N max. 0.11	
1.4835	X9CrNiSiNc21-11-2	253 MA	S30815	0.05 0.12	1.40 2.50	max. 1.00	20.00 22.00	10.00 12.00	N = 0.12 – 0.20 Ce = 0.03 – 0.08	
1.4862	X8NiCrSi38-18	DS	N08330	max. 0.10	1.90 2.60	0.80 1.50	17.00 19.00	34.50 41.00	Cu max. 0.50	
1.4876	X10NiCrAlTi32-21	800	N08800	max. 0.12	max. 1.00	max. 2.00	19.00 23.00	30.00 34.00	Al = 0.15 – 0.60 Ti = 0.15 – 0.60	
1.4876H 1.4959	X8NiCrAlTi32-21	800 H	N08811 N08810	0.05 0.10	max. 0.70	max. 1.50	19.00 22.00	30.00 34.00	Al = 0.25 – 0.65 Ti = 0.25 – 0.65	
2.4851	NiCr23Fe	601 H	N06601	0.03 0.10	max. 0.50	max. 1.00	21.00 25.00	58.00 63.00	Fe ≤ 18.00 Al = 1.00 – 1.70 Cu ≤ 0.50 B ≤ 0.006 Ti ≤ 0.50 Co max. 1.5 %	
2.4633	NiCr25FeAlY	602 CA	N06025	0.15 0.25	max. 0.50	max. 0.50	24.00 26.00	Rest	Al = 1.80 – 2.40 Cu ≤ 0.10 Fe = 8.00 – 11.00 Ti = 0.10 – 0.20 Y = 0.05 – 0.12 Zr = 0.01 – 0.10	

**Table 4: Changes of masses in mg/(m<sup>2</sup> + h)**

Werkstoff-Nr.	Alloy	750 °C	850 °C	1,000 °C	1,100 °C	1,200 °C
1.4876H 1.4959	800 H	+ 7	+ 8	- 24	- 162	
2.4851	601 H	+ 1	+ 10	+ 7	- 24	- 820
2.4633	602 CA	+ 0.4	+ 3	+ 12	+ 7	- 310

## Innovative materials

Our customers' individual requirement profiles demand innovative solutions time and again. In many cases they pose new challenges for our metallurgists, welding engineers and production staff. For example, the innovative Centralloy® 60 HT

from Schmidt + Clemens has recently been used with great success for the roller body, so another material is available allowing application temperatures of up to 1,250 °C.

## Extensive range of materials

The tables on this double page show the usage and combination possibilities of various high-temperature materials in applications and show the cyclical oxidation resistance of these alloys in air.

All materials that can be used for furnace rollers form the protective oxide layer on the basis of the chromium and/or silicon or aluminium alloy components.

### Innovative materials



## Rounding pipes from plates



## Flexibility and routine

The sophisticated longitudinally welded pipe produced in-house forms the core of the BUTTING HeRo® – the roller body – and is hence the basic product for further processing into the BUTTING HeRo®.

BUTTING manufactures longitudinally welded pipes in two different production processes: continuously from coil or discontinuously from plate. Due to the special materials used and the wall thicknesses required, the discontinuous process using plates with individual cuttings was chosen for the production of furnace rollers at BUTTING.

As a specialist in longitudinally welded stainless steel pipes, BUTTING has proved its success in the field of special produc-



Heat treatment of a thick-walled pipe

tion, thanks to state-of-the-art welding and calibration equipment. The WIG method, the MAG method, the UP welding method and increasingly the electron beam welding method are used to weld plates with thick walls - including plates made from high-alloy materials. On a cost-effective basis and attaining a high quality standard, BUTTING uses an enhanced welding technique for high-tem-

perature alloys which are susceptible to hot cracking, even for larger wall thicknesses.

## Vision for the future

Generally, the BUTTING HeRo® can be made from longitudinally welded pipe with outside diameters from DN 100 to DN 700, wall thicknesses of up to 60 mm and a diameter - wall thickness ratio of approx. 10 : 1.

Depending on the static requirement and in accordance with the relevant temperatures and the specific purposes, pipe dimensions are calculated on a case-by-case basis to make the roller body.

Using plates with precise specifications of the suitable material as the basis, the product is manufactured in a very tight tolerance range.

## Welding a thick-walled pipe from plate



After the forming and welding process of the future roller body, a finishing heat treatment guarantees the required material properties. Following this heat treatment, calibration in a three-dimensional expansion process ensures the precise dimensional accuracy of the roller body.

With BUTTING, you can find a tailor-made and intelligent technical solution for every challenge.

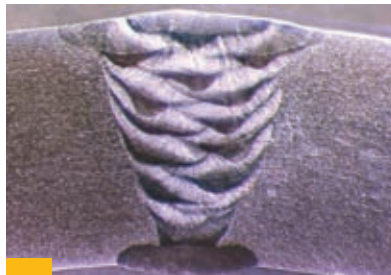
## Precisely-tailored processing

The starting point for mechanical processing is the longitudinally welded pipe from measured plates. Using state-of-the-art turning and milling machines and with qualified, experienced staff, the following technical features are realised:

- Precise machining of the inside pipe diameter at the pipe ends in order to prepare for the cones to be joined perfectly at a later point
- The precise position of the bearings, taking very tight tolerances into account
- The introduction of apertures in order to guarantee subsequent reconditioning by hydroforming
- Optimum requirements for introducing insulating material made of ceramic fibres for discontinuous heat treatment plants

The individual roller bodies are then provide with cones at each end. The application, the thermal loads and the static requirements form the basis for calculating the bearing necks, which are designed on a case-by-case basis. The welding method is chosen taking material, economic and application-specific factors into account. BUTTING has qualified and competent employees for all current welding methods and has many years of processing experience.

Welding on cones



Micrograph of a MAG weld (thick-walled)



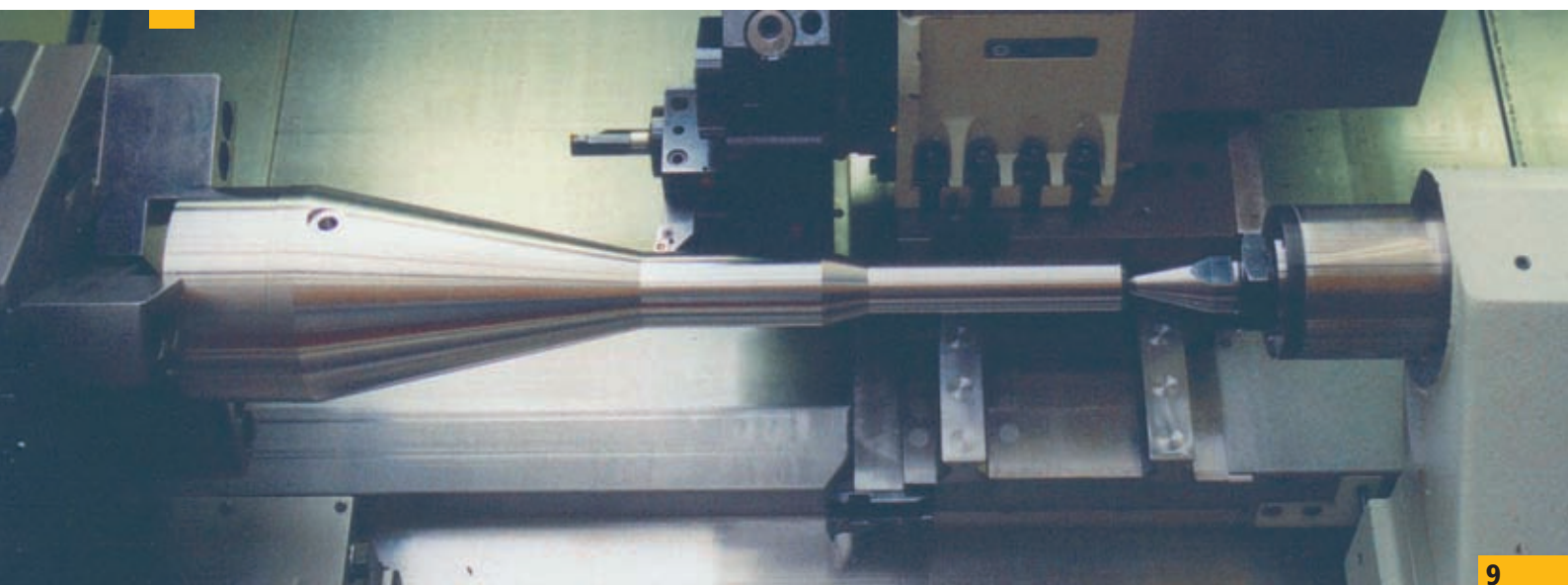
Longitudinal section through the cone

## A product ready for installation

Customer-specific requirements can be realised by mechanical methods. By means of special turning and grinding, BUTTING guarantees the defined surface roughness. In this way the best running

precision, exact diameters and ovality values in a very tight tolerance range are achieved, without any appreciable wall thickness weakening in the material.

Turning machine with cone





## Approved worldwide

The Quality Management System of BUTTING is approved by Germanischer Lloyd according to DIN EN ISO 9001. BUTTING also holds approvals from classification companies and third party inspectorates, like Bureau Veritas and BDLI and renowned companies.

BUTTING also holds the following approvals:

- Weld procedure qualification acc. to AQUAP
- FRAMA TOM ANP - KTA 1401 and QSP 4a and TÜV-Nord Anlagentechnik AVS D 100/50, KTA 3211.1, KTA 3211.3
- Approval by Germanischer Lloyd for the welding of materials in defence engineering
- TÜV acc. to AD-Merkblatt W0/HPO and TRD 100/201
- Competence certificate acc. to DIN 18 800 part 7
- Approval acc. to HPO and DIN EN 729-2 and DGRL 97/23/EG
- Approval according to the water supply rules (WHG) § 19 I
- Approval acc. to AECMA EASE DIN EN 9100

### Tensile test by Burkhard Hirtz



BUTTING complies with many testing and accreditation requirements:

- § 20 of the rules and regulations of radiation protection, etc.
- Accreditation of the laboratory acc. to DIN EN ISO/IEC 17025 : 2000 etc.

## A great number of testing installations

As regards **non-destructive testing**, the following equipment is available at BUTTING:

- Radiography
- Radioscopy
- Eddy-current testing
- Ultrasonic testing
- Hydrostatic pressure testing
- Endoscope
- X-ray flash device
- Surface roughness measurements
- Dye-penetrant testing and Magnetic particle inspection

## Radioscopy (Real time X-ray) – Hans Gehring

The following destructive tests are performed in the internal laboratory:

- Corrosion tests
- Hardness tests
- Ferrite determination
- Tensile tests
- Hot tensile tests
- Bend tests
- Charpy-impact tests, also at low temperatures
- Technological testing
- Metallographic examinations
- Spectroscopic analyses



### Corrosion test by Reinhold Hoffmann

## Safely around the globe

In order to avoid damage or impairments to pipes, pipe elbows and innovative products during transport, BUTTING has developed its own packaging methods. In addition to standard packaging in the form of crates, seaworthy pipe bundles and supports, containers with storage aids developed in-house to suit the relevant dimensions are among the packaging options for exports.

## Special project requirements

If there are particular product requirements, they are protected by special measures. For example, the cones on the BUTTING HeRo® are protected by special seaworthy packaging.

The pipes, piping parts and components are combined together into packaging units using suitable wooden structures. In this way, the products cannot come into direct, unprotected contact with the means of transport.

### Seaworthy special packaging for the BUTTING HeRo®



### Special packaging for casings for the lighting industry



### Heavy goods transport via road



### Technical advice from the planning phase to after sales service

## Our packaging – your additional benefits

Our packaging additionally rationalises the logistical processes in various ways, e. g. through shorter loading/unloading times, less time spent on securing the load, simple unloading of individually packaged goods and through the option of short-term storage without any additional facilities.

Besides transport by truck, it is also possible to despatch by train via the factory rail link in Knesebeck.

## All rolled into one package

BUTTING offers its customers an all round service – from advice on the selection of suitable materials, to handling the shipment of piping parts which are ready to install. Our reliable, punctual project management has proved successful in numerous high profile projects around the world. Use our experience.

### Punctual shipment by air cargo via Hannover airport





Aerial view BUTTING Knesebeck



# BUTTING

BUTTING  
Gifhorner Straße 59  
**29379 Knesebeck**  
Germany  
Phone: +49 5834 50-0  
Fax: +49 5834 50-320  
E-Mail: [info@butting.de](mailto:info@butting.de)

BUTTING  
Kuhheide 13a  
**16303 Schwedt/Oder**  
Germany  
Phone: +49 3332 2097-0  
Fax: +49 3332 2097-19  
E-Mail: [info@butting-schwedt.de](mailto:info@butting-schwedt.de)

BUTTING (Shanghai) Co., Ltd.  
Jingxue Rd. 199 / 2, Malu Jiading  
**201801 Shanghai**  
China  
Phone: +86 21 69157598  
Fax: +86 21 69157599  
E-Mail: [info@butting.com.cn](mailto:info@butting.com.cn)

Internet: [www.butting.de](http://www.butting.de)