



PIGGABLE PIPE SYSTEMS



BUTTING

Approved in many industrial applications

For more than 230 years BUTTING has been a partner of the industry. Since the development of corrosion resistant steels the production of high-quality longitudinally welded steel pipes made of stainless – both in standard and special dimensions – has been our core business. Hardly any company in Europe can refer to such

a long period of experience and great variety in the production of stainless steel pipes in dimensions from NB 15 up to NB 1,800 as BUTTING does. Besides the production of longitudinally welded pipes BUTTING manufactures and delivers a wide range of pipe fittings. Thus, our customers can cover their demands for pipes

and pipe fittings from one source. Our facilities provide an extensive range of pre-fabrication capacities and the combination of pipes and pipe fittings in approved BUTTING quality, leading to shaped parts ready for installation, guarantees you a maximum of economy and reliability. Since the foundation of BUTTING the construction and assembly of vessels have also become a regular feature of our wide range of services.

Standard pipes (acc. to DIN 10217-7 and ASTM)



Products for pigging technology



Products for aseptic techniques and pharmaceuticals



Piggable pipe technology

Meanwhile, the piggable pipe technology is used in nearly all industrial sectors. BUTTING has not only initiated considerably the standardization of piggable pipes made of stainless steel, but also contributed to establish the piggable pipe technology in many fields of application by supplying more than 550 tons of corresponding high-quality products.

Well-known customers such as BASF and Bayer rely on our exclusive know-how of piggable pipe technology.

We attach importance to guaranteeing you individual solutions and specific advice by our experienced sales team.

Your contact for piggable pipe technology:



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Products in 1.4539/904L



Solutions for pneumatic conveyor techniques



Products made from special alloys



Products for the food industry



Worldwide customer proximity

For seven generations the name BUTTING has been standing for quality and flexibility. In 1777 BUTTING was founded as a coppersmithery by the ancestors of the today's owner Hermann Butting. In 1945 the family business moved its headquarters to Knesebeck and started the production of soldered and later on of welded copper pipes and linepipes. At the end of the fifties stainless steel gradually replaced copper as raw material for BUTTING products. Today, the family business is run in the seventh generation and 1,300 employees process more than 40,000 tons of stainless steel per year.

BUTTING's history is characterized by a healthy and continuous growth based on enterprise and foresight. This principle

Proudly looking on our company history of 230 years



brought Dr Hannshermann Butting to establish an associated company in Schwedt on the Oder in 1991, after the German reunification. Today, BUTTING in Schwedt is our expert's unit for vessel and linepipe construction as well as for international assemblies.

Your partner for longitudinally welded pipes and linepipes



A team with visions (from left to right): Markus Bartsch, Hermann Butting, Dr Iris Rommerskirchen, Thomas Schüller, Dr Jens Peter Lux

Since 2004 BUTTING has been represented in China. In Jiading, on the outskirts of Shanghai, we dispose of a production line for pipework and individual items for the Chinese market. It is our aim to enthuse our customers worldwide. This requires an areal proximity for particular services and products. For the very same reason we decided to establish a branch in Canada in 2005. With BUTTING Canada in Calgary we are able to provide Canadian customers more quickly and more directly with our long-standing experience in the manufacturing of stainless steels.

Our core competences

During the past years, BUTTING has invested in the latest manufacturing technology, environmental protection and

quality assurance facilities at numerous locations to extend our core competences in the fields of material, forming and welding technology. During the entire value added process we extensively take into consideration the material characteristics of stainless steels. Our know-how and our expertise in surface techniques guarantee BUTTING products with optimal corrosion resistance.

Worldwide quality standard

Since the foundation of our company the reliable quality assurance is a distinctive part of our company philosophy. Various fields of application in different industrial sectors, such as the chemical plant construction, the aircraft and aerospace industry as well as the power engineering and environmental and shipbuilding technology prove the high quality and reliability of our products.

The constant development of new products and processes as well as their continuous improvement have a long tradition at BUTTING. For more than 230 years, we have been facing tomorrow's challenges in collaboration with our customers, combining craftsmanship and engineering know-how under the motto "nothing is impossible".

From concept to criterion

Back in 1995 BUTTING first received an enquiry for welded pipes with very tight tolerances on the inside diameter, welds flat to face and a surface as smooth as possible from the Bayer group, a leading company in the chemical industry. BUTTING faced this challenge and innovative concepts and solutions were developed. It so happened that at that time the chemical company BASF was in the process of establishing a manual dealing with "pigging technology" and prescribing stringent requirements. The number of enquiries for piggable stainless steel pipes and elbows increased, with varied specifications for diameter and wall thickness.

BUTTING provides an extensive pipe storage for you



Table 1: Stock of piggable pipes acc. to DIN 2430-1, edition Febr. 2009

DN/NB	ID (mm)	t (mm)	1.4307/ AISI 304L	1.4404/ AISI 316L	Weight kg/m*
25	29.7	2.0		•	1.59
50	54.5	2.9	•	•	4.17
80	82.5	3.2	•	•	6.87
100	107.1	3.6	•	•	9.98
125	131.7	4.0	•	•	13.59
150	159.3	4.5	•	•	18.46
200	206.5	4.5	•	•	23.71

* Weights are indications only ** Pipes in grades 1.4541 or 1.4571 on request

No guarantee for correctness

Stock of material acc. to DIN 2430-1

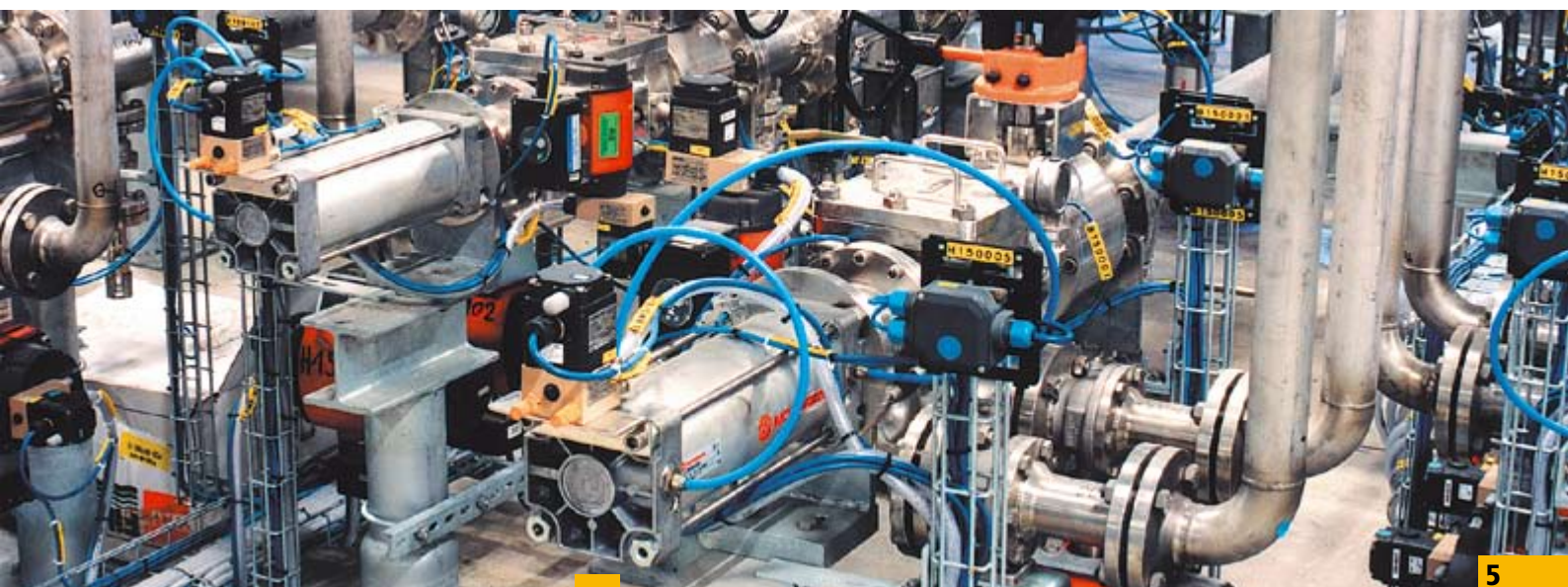
In 1998 BUTTING suggested that users and producers meet in Knesebeck in order to standardize the materials used in piggable piping installations for both users and producers. Basis of the joint discussions was the works standard established by BUTTING. The results of the discussions were minuted and documented and an application for the standardization of such piping systems was put forward to the German Institute of Standardization (DIN).

In the excellent book "Molchtechnik" (Pigging technology), the authors G. Hiltcher, W. Mühltaler and J. Smits (all from BASF AG) gave an account of the state of the art at the time. By 1999, BUTTING had already decided to put stainless steel piggable pipes on stock. In September and December 2002



Piggable pipes made by BUTTING meet highest quality requirements

resp. the standardization board for the first time passed the German standard for "Piggable Piping Systems". Since then we have been stocking piggable pipes in dimensions from NB 25 up to NB 200 acc. to the latest DIN 2430-1, edition February 2009.



Piggable piping installation

Pigging technology – many fields of application

Owing to economic and environmental considerations, there is a growing demand for piggable pipes. Nearly all industries rely on this process nowadays and new plants and production lines are furnished with piggable pipe systems. Minimal production losses, decreased amounts of waste water due to redundant flushing processes, lower energy costs giving reduced long-term overhead, these are only some of the reasons why this process should be used. As it is used in many different industrial sectors with varying requirements for the pigging result, the DIN standard 2430 mainly covers the requirements of process lines in the chemical industry.

The pigs and pigging fittings, as well as the piping and control systems are the most important components in a piggable pipe installation. In the past, the importance of the requirements for the pipes was very often neglected. However, as they are the “direct” partners of the pigs and the “vein” of products, they require very special attention.

Piggable piping components from BUTTING have proved their quality in diverse sectors

Figure 1: Special requirements for welded pipes used in pigging technology

Materials	Standard 1.4307/TP 304L, 1.4404/TP 316L, 1.4541, 1.4571
Tolerances	Very tight tolerances of form relating to the ID
Wall thicknesses	Sufficient “minimum wall thickness”
Weld geometry	Smooth inside surface free from sharp edges and undercuts
Inside surface	As smooth as possible, low roughness values
Lengths/ pipe ends	Less circular welds
Tests and inspection	Acc. to AD 2000-Merkblatt W2/DIN 17457, class 2

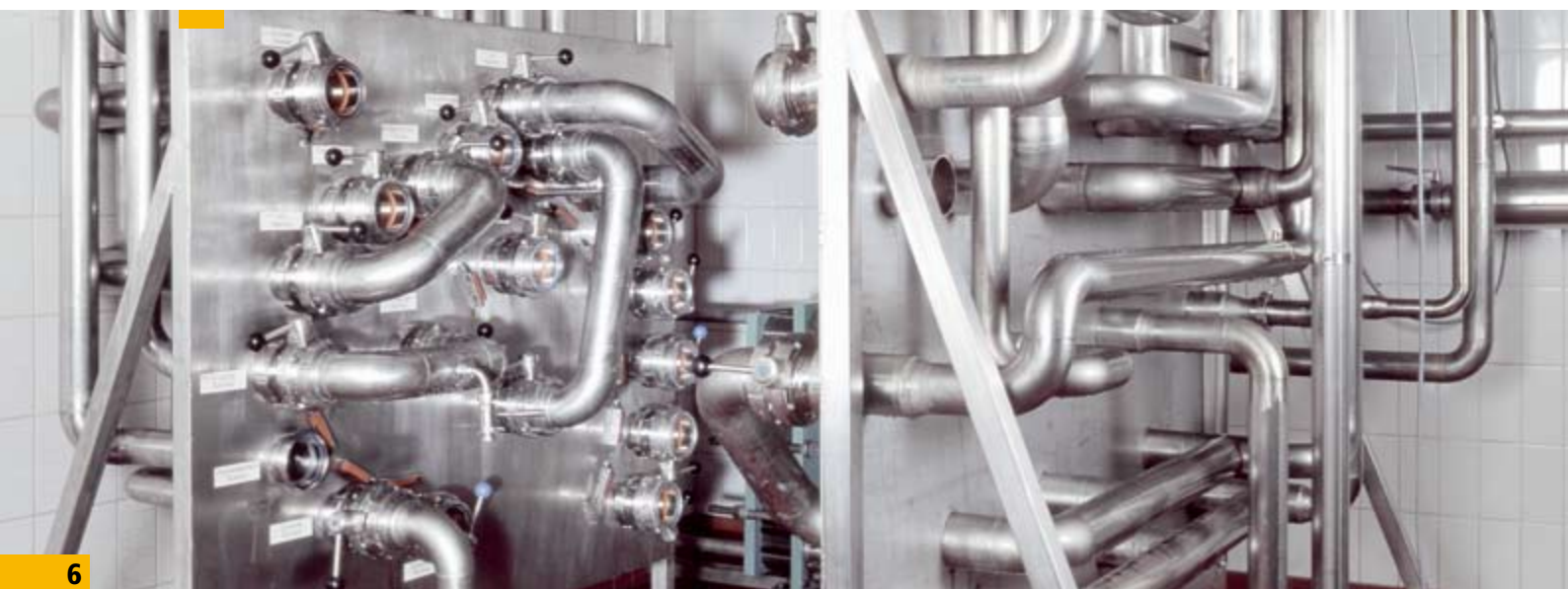
No guarantee for correctness

Requirements for piggable pipes

Piggable stainless steel pipes are produced with very tight tolerances for the inside diameter, minimal tolerances of wall thickness, smooth surfaces and without any root reinforcement. During bending, a thinning of the wall of up to approx. 20 % can occur which may result in changes in the cross section (necking) if mounting brackets are fixed too tightly during the assembly, hence sufficient minimum wall thicknesses must be prescribed to allow for this (see fig. 1). In all events, the DIN standard 2430-1 should be used

when designing new plants. BUTTING has not only contributed considerably to the standardization of the piggable stainless steel pipes, but also proved a reliable supplier of quality pigging technology products.

We have supplied welded piggable pipes made from stainless steel including to some high profile projects, e.g. 5 kilometres of pipes 168.3 × 4.5 mm for the “Friesenheimer Insel” project of BASF in Ludwigshafen or 6 kilometres of pipes having inside diameters of 82.5 × 4 mm and 107.1 × 4 mm for the NMP-Bayer-INEOS project in Antwerp for the transport of phenol and acetone.



Steel comparison

The BUTTING piggable pipes are produced and stocked in the material grades 1.4307 and 1.4404, which are covered by DIN EN 10088-1, 2 and 3 (stainless steels). These quality pipes are also produced by us in grades 1.4541 and 1.4571 on request.

Regarding piggable pipe systems without increased requirements for the mechanical and chemical properties, materials not containing molybdenum are used for cost considerations (see table 2).

By using the standard material types 1.4307 and 1.4404, the commonly used international grades 304L and 316L according to the AISI and ASTM standards are covered at the same time (see table 2).

BUTTING offers a wide range of material grades for piggable pipes



Macrograph of titanium stabilized material



Macrograph of non titanium stabilized material

Electropolished pipe with hard stamping



We would be pleased to give you advice

Production using other materials with a high corrosion resistance can be examined from case to case and is dependent on the type of raw material available. Our competent staff would be pleased to help you with the selection of the appropriate material.

Table 2: Material comparison

Material	Relevant specification	Reference analysis (%)							0.2% - Yield strength (MPa) - transverse	1% - Yield strength (MPa) - transverse	Tensile strength (MPa)	Resistance to intergranular corrosion	Density (g/cm ³)	Remarks
		C ≤	Si ≤	Mn ≤	Cr	Mo	Ni	Others						
V2A														
1.4307	DIN EN 10088-2 X2CrNi18-9	0.03	1.0	2.0	17.5 19.5	—	8.0 10.0		≥ 220	≥ 250	520 up to 670	yes	7.95	cold rolled material
304L	ASTM A 240	0.03	0.75	2.0	18.0 20.0	—	8.0 12.0		≥ 170		≥ 485	yes	7.95	*)
1.4541	DIN EN 10088-2 X6CrNiTi18-10	0.08	1.0	2.0	17.0 19.0	—	9.0 12.0	Ti ≥ 5 × % C	≥ 220	≥ 250	520 up to 720	yes	7.95	cold rolled material
V4A														
1.4404	DIN EN 10088-2 X2CrNiMo17-12-2	0.03	1.0	2.0	16.5 18.5	2.0 2.5	10.0 13.0		≥ 240	≥ 270	530 up to 680	yes	7.95	cold rolled material
316L	ASTM A 240	0.03	0.75	2.0	16.0 18.0	2.0 3.0	10.0 14.0		≥ 170		≥ 485	yes	7.95	*)
1.4571	DIN EN 10088-2 X6CrNiMoTi17-12-2	0.08	1.0	2.0	16.5 18.5	2.0 2.5	10.5 13.5	Ti ≥ 5 × % C	≥ 240	≥ 270	540 up to 690	yes	7.95	cold rolled material

No guarantee for correctness

*) As regards the mechanical properties, the ASTM specifications do not distinguish between hot and cold rolled materials

Sophisticated fabrication

For the production of longitudinally welded stainless steel pipes, BUTTING uses two different production processes. Pipes are produced either continuously from coil or from individual plates. Piggable pipes are produced from coil, using either Laser welding or TIG welding processes. The forming from coil is a prerequisite for the production of pipes for which very tight tolerances are required. Subsequent calibration of the pipes is indispensable to achieve the tolerances prescribed in the DIN 2430-1 standard.

The tolerances

In the past mainly seamless pipes were used owing to inadmissible root reinforcements of the longitudinal weld which could damage or even destroy the pigs. However, the disadvantage of seamless pipes is the fact that they are produced according to a defined outside diameter, disregarding the tolerances on wall thickness. As a result the inside diameter, which is of the essence, is adversely affected.

In case of pipes 114.3 × 3.6 mm for example, which are produced according to DIN EN ISO 1127 D3/T3 and taking into account the maximum tolerances prescribed on outside diameter and wall thickness, variations of the inside diameters in the range of 105.52 up to 108.68 = 3.16 mm (see fig. 2) may occur. Where pipes according to the ASTM standards are concerned, allowing even bigger tolerances, the variations of the inside diameters can be even worse.

Continuous pipe production line for pipes from coil



Part 1 of the DIN 2430 covers the welded stainless steel pipes and elbows for pigging installations. It contains the most stringent criteria for inside diameters, flatness of inside welds and smooth outside surfaces, as well as only one pipe size for each nominal bore. The BUTTING piggable pipes are produced according to DIN 2430 having inside diameters

with only the smallest variations. In the case of a pipe 114.3 × 3.6 mm, it is in the range of 106.75 up to 107.45, viz: only 0.7 mm (see fig. 2). This is an optimum prerequisite for a perfect fit of the pig, simultaneously ensuring a continuous flow process and providing excellent cleaning results.

Figure 2: Calculation example – pipe 114.3 × 3.6 mm

1. Dimensions acc. to DIN EN ISO 1127 D3/T3					
OD		114.30 mm	OD		114.30 mm
+ D3 = 0.75 %	+	0.86 mm	- D3 = 0.75 %	-	0.86 mm
- 2 × wall thickness 3.6 mm			- 2 × wall thickness 3.6 mm		
- 10 % (T3)	-	6.48 mm	+ 10 % (T3)	-	7.92 mm
biggest ID	=	108.68 mm	smallest ID	=	105.52 mm
			Difference		= 3.16 mm
2. Dimensions acc. to DIN 2430-1					
biggest ID	=	107.45 mm	smallest ID	=	106.75 mm
			Difference		= 0.70 mm

No guarantee for correctness

Table 3: Extract from DIN 2430-1 Pipes for pigging installations

NB	Wall thickness acc. to DIN EN 10259 (mm)	ID (mm)	Tolerance of ID (mm)		Root reinforcement (mm)
			Including ovality	Of circumference*	
25	2.0 ± 0.09	29.7	± 0.15	± 0.10	h < 0.04
50	2.9 ± 0.10	54.5	± 0.25	± 0.10	h < 0.04
80	3.2 ± 0.13	82.5	± 0.30	± 0.15	h < 0.05
100	3.6 ± 0.13	107.1	± 0.35	± 0.20	h < 0.09
125	4.0 ± 0.14	131.7	± 0.55	± 0.23	h < 0.17
150	4.5 ± 0.14	159.3	± 0.75	± 0.25	h < 0.25
200	4.5 ± 0.14	206.5	± 1.00	± 0.30	h < 0.25

* Calculation: ID = (outer circumference / π) - (2 × actual wall thickness)

No guarantee for correctness

Measurement of the circumference to determine the inside diameter



Testing during production using an outside gage and a ball for the inside



Measurement of the pipe inside diameter including the ovality



Proper realisation of the wall thicknesses

In addition to the deviation of the inside diameter it is extremely important to maintain a minimum wall thickness or a "safe" wall thickness during the production of welded piggable stainless steel pipes. In most cases a wall thickness of 2 mm is sufficient, based on the pressure ratings.

As regards commonly used pipes acc. to DIN EN ISO 1127 T3 and acc. to DIN 11850, a minus tolerance on the wall thickness of 10 % is permitted. For economic reasons, this tolerance is used up by the producers, hence in case of a nominal wall thickness of 2 mm, the actual wall thickness may go down to 1.8 mm.

If one took such a pipe and made it into an elbow with a general thinning of the wall of 20 % in the back of the elbow, then a remaining wall thickness of only 1.4 mm would be very critical in an area which is especially dangerous in pigging technology.

It so happened that due to maloperation of the system, a pig went right through the "thin" wall in the back of the elbow. With the introduction of the DIN 2430



Bent piggable pipes from BUTTING

standard prescribing relatively thick walls, this risk is reduced correspondingly (see table 3).

The weld geometry

During the production of welded BUTTING piggable pipes the inside weld bead is rolled. This means that the inside weld is nearly flat to face for pipes up to NB 100 and wall thicknesses of up to 3.6 mm. As regards pipes of NB 200 and a wall thick-

ness of 4.5 mm, the maximum root reinforcement is only 0.25 mm, thus fulfilling the requirements of the DIN 2430.

Comparison:

Where commonly used stainless steel pipes acc. to DIN EN 1127, referring to DIN EN 10217-7, table 11 are concerned, a root reinforcement of 0.3 mm + 0.06 times the wall thickness is allowed.

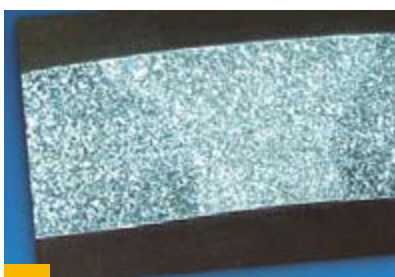
It is also very important that the transition zones from weld to parent metal are smooth and free from undercuts. A weld reinforcement, sharp edges or undercuts can damage or even destroy the pigs. The quality of the cleaning may also be impaired considerably.

The lengths and ends of the pipes

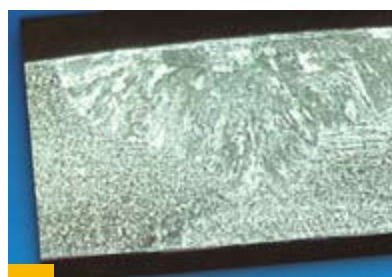
Generally, the BUTTING piggable pipes are produced in lengths of 12 m, thereby reducing the number of circumferential welds which is a big advantage from a quality point of view. However, from an economical point of view, the reduction of circumferential welds and likewise of flange connections is also crucial. In smaller process plants 6 m lengths are also used. Generally, pipe ends are cut square and deburred. A special end preparation, e. g. according to DIN 2559 at the pipe mill should be recommended if the pipes are to be welded together in their supply lengths.



Measurement of wall thickness



BUTTING piggable pipe 114.3 x 3.6 mm (magnification of 10:1)



BUTTING piggable pipe 168.3 x 4.5 mm (magnification 10:1)

Special requirements to the inside surface

The BUTTING piggable pipes are generally produced from cold rolled raw materials according to DIN EN 10088-2 (execution 2B). The average roughness of this material is approx. 0.4 micron. Taking into account irregularities of the surface caused by tool marks during the production (DIN 10217-7), the roughness of the finished pipes is < 0.8 micron. Due to the rolling operation of the weld already described, a roughness value of $R_a < 1.6$ microns can be obtained. Roughness measurements are carried out in the longitudinal direction of the pipe (axial measurement). A radial measurement, as especially required by the pharmaceutical industry, can be performed on request.

The aforementioned roughness values can be improved considerably by additional grinding, honing and/or electropolishing. The inside surfaces of the commonly used pipes according to DIN EN ISO 1127 are quite rough, as they are mainly produced from hot rolled raw materials (execution 1D/DIN EN 10088). As a rule, there are roughness values of approx. 5 microns. Also seamless pipes show roughness values up to 4 microns owing to the production process used. The smoother the pipe inside surface, and the

Roughness measurement of the inside surface



Piggable pipes and elbows are used in many industrial branches

smaller the residual product quantities after the pigging process, the better the cleanness of the entire pipeline.

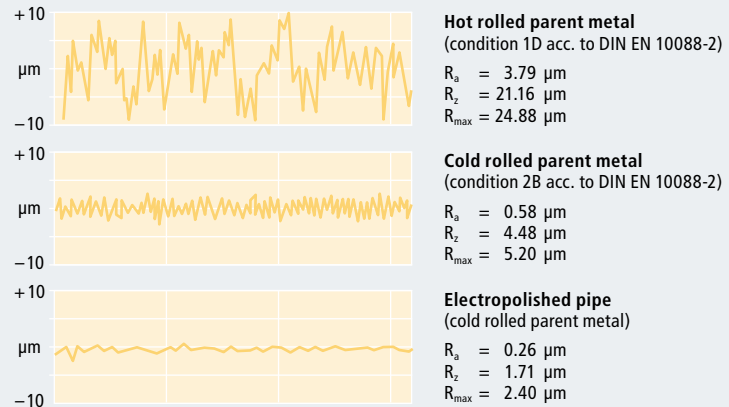
Merkblatt W2/DIN 10217-7, class 2. In our view the application of less stringent test requirements is not recommended.

The construction

As pigging plants are closed piping systems in most cases, which have to be treated in accordance with the new pressure vessel rules, BUTTING produces its piggable pipes according to AD 2000-

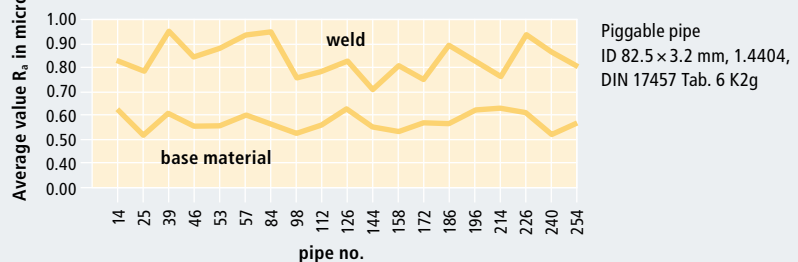
Remark: Part 3 of the DIN 2430 deals with the testing and inspection of an entire pigging system before start of operation. It contains useful recommendations for the pipe producers and end users with regard to the piggability and safety of the entire installation.

Figure 3: Comparison of roughness measurement



Comparison of roughness measurement	Cut off	: 0.8 mm	Piggable pipe	
	Direction	: base material – longitudinal		NB 80 / ID 82.5 x 3.2 mm
	Location	: pipe inside surface		Grade 1.4307

Figure 4: Roughness measurement with a production lot



Various piggable pipe elbows

A prerequisite for optimum pigging results in a pigging system is the use of integrated bends and individual elbows made from the same pipes as for the straight lines. The tolerances on wall thickness and the inside diameters of the pipes and elbows are nearly identical as they are all from the same heat and production lot. Orbital welding can be performed without any problems, as there are no internal misalignments.

During the production of piggable pipe bends it is important not to change the tolerances of the inside diameters of the mother pipes unduly. The variations of the tolerances are directly linked with the production process. Therefore, the



Single piggable elbow

integrated bends and elbows are generally made according to DIN 2605 type 5 ($2.5 \times D$) by means of the special bending machines BUTTING has at its disposal.

In order to ensure subsequent orbital welding, the elbows must be provided with straight ends of a minimum of 150 mm each.

Control of the elbow tolerances

As any deviations of the tolerances, especially in the bending area of the elbow, can only be determined by measuring the outside diameter, relevant control was laid down in the DIN 2430 part 1, whereby the dimension of the mother pipe is always used as a reference. The issuing of a dimension report is required according to this standard. Figure 5 shows how the inside diameter changes during the bending process.

Production possibilities and tolerances can be found in the table 4 on page 12.

Bending process



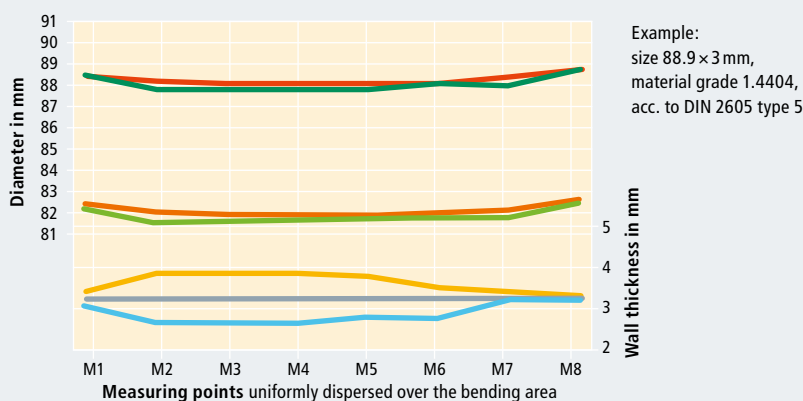
Bending process using rollers



Bending process using a mandril



Figure 5: Progression of a diameter and wall thickness of a 90° elbow



- OD A-A (vertical measurement)
- theoretic ID A-A (*)
- OD B-B (horizontal measurement)
- theoretic ID B-B (*)
- Wall thickness in the back of the elbow
- Wall thickness, inner radius of elbow
- Average wall thickness in the neutral bending zone

*) The theoretic inside diameters are calculated by subtracting the measured wall thicknesses from the measured outside diameters



Multiple bends are produced at BUTTING using a mandril

Prefabrication according to customer specifications

The installation of piggable pipelines on site is generally carried out by joining the materials by orbital welding or by using special welding-neck flanges. Both are covered by the DIN 2430-2. As regards the circumferential welds, the maximum tolerances on inside diameter, weld reinforcement and penetration cavity are prescribed. As to the flanges, a joint with projection and recess is prescribed, ensuring optimum alignment.

In order to guarantee an excellent quality, prefabrication at the pipe producer's mill is highly recommended. In order to improve the quality even further, we do not only supply the piggable pipes and elbows, but offer the following additional services:

a) Pipeline planning and isometric drawings

The basis of optimum prefabrication is the provision of isometric drawings according to given diagrams, layouts, construction drawings and dimensions of the components. It is therefore possible to improve the later course of the piggable pipelines right from the planning stage. Circumferential welds and flange connections are reduced as much as possible, and integrated bends are used rather than individual elbows, which need to be fitted by welding.

Welding-neck flanges with projection and recess



b) Piggable pipes with integrated bends

At BUTTING integrated bends are produced on modern bending machines

according to isometric drawings. Multiple bends having different angles and positions are also possible. The bending radii are in accordance with DIN 2605, type 5 (see table 4).

c) Full-body pickling

Full-body pickling of the entire piping components is one of the big advantages of prefabrication at the producer's workshops. The removal of residual matter from the bending process, and tinting and contamination of the circumferential welds guarantee the necessary corrosion resistance of the material.

Table 4: Production possibilities and tolerances for piggable elbows and integrated bends

NB	OD/ID (mm)	Wall thickness (mm) ¹	Average radius (mm)	Tangent (mm) ²	Tolerance of outside diameter of elbow ³	Also as multiple bends
25	33.7 / 29.7	2.0	72.5 (DIN 2605/5)	150/150	+ 0.5 up to -1.0 %	X
25	33.7 / 29.7	2.0	300 (and above)	150/150	0.0 up to -1.5 %	
50	60.3 / 54.5	2.9	135 (DIN 2605/5)	150/150	+ 0.5 up to -1.0 %	X
50	60.3 / 54.5	2.9	500 (and above)	150/150	0.0 up to -1.5 %	
80	88.9 / 82.5	3.2	205 (DIN 2605/5)	150/150	+ 0.5 up to -1.0 %	X
80	88.9 / 82.5	3.2	500 (and above)	150/150	0.0 up to -1.5 %	
100	114.3 / 107.1	3.6	270 (DIN 2605/5)	150/150	+ 0.5 up to -1.5 %	X
100	114.3 / 107.1	3.6	500 (and above)	150/150	0.0 up to +1.5 %	
125	139.7 / 131.7	4.0	330 (DIN 2605/5)	150/150	+ 0.5 up to -2.0 %	X
125	139.7 / 131.7	4.0	500 (and above)	150/150	0.0 up to +1.5 %	
150	168.3 / 159.3	4.5	390 (DIN 2605/5)	150/150	+ 0.5 up to -2.0 %	X
150	168.3 / 159.3	4.5	750 (and above)	150/150	0.0 up to +1.5 %	
200	215.5 / 206.5	4.5	510 (DIN 2605/5)	150/150	+ 0.5 up to -2.5 %	
200	215.5 / 206.5	4.5	900 (and above)	150/150	0.0 up to +2.0 %	

¹ Thinning of the wall in the back of the elbow approx. 20 %

² Longer tangents are possible

³ Relating to the outside diameter of the mother pipe, including ovality

No guarantee for correctness



Special pickling plant for piggable elbows with long radii to guarantee the required surface quality



Approved worldwide

The Quality Management System of BUTTING is approved by Germanischer Lloyd according to DIN EN ISO 9001:2000. 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, IAEA 50-C-Q and AVS D 100/50
- Approval by Germanischer Lloyd for the welding of materials in defence engineering
- TÜV in accordance with the AD Merkblatt WO/HPO and TRD 100/201 EN 729-2
- Extensive verification of suitability acc. to DIN 18 800 part 7
- Approval acc. to HPO with DIN EN 729-2 and DGRL 97/23/EG

Burkhard Hirtz at tensile test with microstrain measurement



- Approval acc. to the water supply rules (WHG) § 19 I
- Statement of Assessment ASD-EASE acc. to EN 9100 (without design)
- Environmental Management System acc. to DIN EN ISO 14001
- Work Safety Management System acc. to OHSAS 18001

BUTTING complies with many testing and accreditation requirements:

- § 20 of the rules and regulations of radiation protection
- 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
- Radiology for pipes of up to 18 metres

Radioscopic examination (real time radiography)

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

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



Safe transport

In order to avoid damages or impairment of the quality of the pipes, elbows and fittings during transport, BUTTING has developed various packing methods. Besides standard cases and seaworthy crates, special wooden skids to ensure easy loading and off-loading of containers for export are produced by BUTTING.

Special project requirements

In the case of special requirements for inside surfaces, e. g. for piggable pipes, these are protected by plastic caps. Ground pipes are protected with plastic foil.

The pipes and piping components are put together in bundles and protected by wooden constructions to avoid any direct contact with the transport and handling equipment.

Our packing – your additional benefit

Logistic processes are rendered more efficient by the packing we use, e. g. the loading and off-loading times are reduced, less safety measures are needed, easier trans-shipments in the case of collect freight and storage without any additional equipment.

Piggable pipes ready for shipment with plastic end caps



Seaworthy packing for BUTTING HeRo® (furnace roller)



Special packing units for the transport of lamps



Pipes with special requirements in surface are protected prior to dispatch

Besides the transport by trucks, it is also possible to ship by rail via our own rail link in Knesebeck. Transport by barge is also possible via the harbour in Wittlingen, which has direct access to the Elbe-Lateral-Canal.

In Schwedt direct access to the European waterways is possible now via the new Oder harbour.

All-round-service

BUTTING offers its customers an all-round-service – from the selection of the right materials to the dispatch of piping components ready for use. For many projects all over the world BUTTING has proved a reliable partner owing to deliveries on time. Please let us assist you with your projects.

Special products require special packaging: spiral tubes





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 70 mm

Pipes in special shapes

In random lengths up to 24m with circumferential welds



Clad pipes

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

Metallurgically clad pipes

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

In random lengths up to 24m 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

Approvals

- By TÜV acc. to AD-WO/HPO and TRD 100/201 and DIN EN 729-2
- DGRL (pressure equipment directive)
- Acc. to the Water Resources Act (WHG) § 19 I
- Quality Management System acc. to DIN EN ISO 9001:2000
- Accreditation of the laboratory acc. to DIN EN ISO/IEC 17025:2000
- Statement of Assessment ASD-EASE acc. to EN 9100 (without design)
- Environmental Management System acc. to DIN EN ISO 14001
- Work Safety Management acc. to OHSAS 18001



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

Photographs
Cover: Stan Schneider/Henry N.
Aerial view: Thomas Keller
Inside: BUTTING company archives, Heike Butting, G.A. Kiesel GmbH (Heilbronn), Pfeiffer Chemie-Armaturen GmbH (Kempfen), I.S.T. Molchtechnik GmbH (Hamburg)
Thank you for your assistance!

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Aerial view BUTTING Knesebeck



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