

The stainless steel experts
Service and product overview



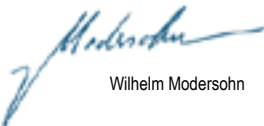
Wilhelm Modersohn
(Board member
Stainless Steel Information Centre)

Stainless steel? Modersohn!

Dear customers, dear business friends,
welcome to the Wilhelm Modersohn GmbH & Co. KG!
We would like to introduce ourselves to you as
a reliable and competent partner in all matters
relating to stainless steel.
And you can take that literally, because high
quality is a matter of course for us.

The company was founded in March 1970 and
currently employs around 140 people.

In addition to the product groups presented,
we are happy to be your contact for all special
solutions in stainless steel.



Wilhelm Modersohn

Reliability is no witchcraft

Service is a top priority for us, that's why we
established this sales division more than 30 years
ago.
The organisation was optimised to meet the
needs of customers with special wishes and
requirements.

Our specialities are troughs, linings and and
containers. We have the certificate for this in
accordance with §19 of the Water Resources Act.

We have special skills in the area of welding
technology. As a member of the DVS (German
Association for Welding Technology) and the
Informationsstelle Edelstahl Rostfrei Düsseldorf,
we are the competent contact for questions
concerning connection and material questions.



History / Timeline



Start of production in the former chicken coop

1972



Takeover of the management by Wilhelm Modersohn jr.

2000



New office building

2006



Dipl.-Ing. J. Matzelle becomes technical managing director

2014



Acquisition of a property for use as a small parts warehouse - Expansion of the outdoor warehouse

2017



Construction of a new hall for surface processing

2019



Modersohn celebrates its 50th anniversary

2020

1970



Founded by W. Modersohn sen.

1998



Member of the Stainless Steel Information Centre

2005



New approval for duplex steel in the construction sector

2010



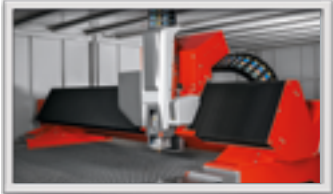
New water jet cutting system

2016



Completion of the extended central and administration building

2017



Investment in new waterjet cutting and fibre laser cutting system

2020



Commissioning of the welding robot

Competence and quality

Best services for individual wishes



EDELSTAHL
Rost
frei

STAINLESS STEEL



We will be happy to help you:

Modersohn offers expert advice, quotations at short notice and good-value solutions to problems. Our employees will help you quickly and reliably.

As a processor and wholesaler you will find stainless steel products for all areas of industry.

With a processing capacity of over 1,500 tonnes of sheet metal per year, we are one of the larger service companies in the stainless steel sector.

In addition, we maintain for our customers delivery service with our own vehicles; for small and medium component sizes.

LEAN DUPLEX STEEL
The better alternative



Stainless steel is our world

Stainless steel - that is our passion and our competence.

We are constantly working to further develop our core competencies and focus on our strengths.

Our aim is to offer you a high-quality delivery service with very good product advice and product quality.

Our extremely flexible production allows very short delivery times for your special customised products.

In addition, all processing steps in our production are located at **one site**, which ensures an optimal throughput.





Processing services	Processing, everything at <u>one</u> location	Cutting service (laser cuts, water jet cuts)	10
		Profile production (folded profiles, pressed and rolled profiles, tubular profiles, welded profiles, curved / rounded profiles)	12
		Special services stainless steel (milling / cutting / sawing)	14
		Assembly production	16
		Joining technology	18
		Cutting edge and surface finishing (grinding, staining, blasting)	20
		Electropolishing	22
		The K-Line - our 48-hour express service	24
Warehouse and shipping	Sheet metal bearing	Primary materials, finished goods	26
	Material stockpiling	Dowel and fastening systems, screws and nuts, threaded rods	26
	Shipping	On-call warehousing, packaging solutions	27
	Delivery	Shipment tracking, transport handling, 24-hour pick-up warehouse	27
Testing equipment	Technical possibilities	Material identification	28
		Roughness measurement	28
		Leak test	29
		Hardness and strength test	29
		Shape and dimensional accuracy	29
Materials & microstructure types	Microstructure types and use Materials		30
			31 - 33

Our processing services

▶ CUTTING SERVICE

▶ PROFILE PRODUCTION

▶ SPECIAL SERVICES STAINLESS STEEL

▶ ASSEMBLY PRODUCTION

▶ JOINING TECHNOLOGY

▶ SURFACE TREATMENT



Cutting service

Stainless steel blanks quickly and inexpensively; in a wide range of materials

The cutting service is probably one of the most differentiated areas at Modersohn. With the help of water jet and laser cutting systems as well as mechanical machining and processing methods, even the most filigree cuts are realised quickly and effortlessly. Even larger sheet metal formats and thicknesses pose no obstacles, especially for our customer-specific service.

We offer you **precise cutting quality through powerful high-speed fibre laser systems** with up to 10 kW power for **cutting areas up to 2,000 x 4,000 mm and sheet thicknesses up to 35 mm.**

Our **waterjet cutting system** has a maximum operating pressure of 3,800 bar and thus easily processes **material thicknesses of more than 100 mm.** The **maximum sheet size is 3,000 x 4,000 mm.**

Profile production

Stainless steel profiles made of duplex steel, such as standard duplex 1.4462 or super duplex 1.4410

As an alternative to 1.4404 or 1.4571, we supply the building authority approved stainless Lean Duplex steels, e.g. Wst. No. 1.4062, 1.4162, 1.4362, 1.4662.

These steels have at least twice the basic strength with at least the same **corrosion resistance**, a significantly higher fatigue strength and, due to lower alloy components, also lower alloy surcharges.

We can quickly and reliably produce stainless steel profiles for you from bent or folded sheet metal.

We are able to process **sheet thicknesses from 0.5 to 20 mm.**

Depending on the **profile design, lengths of up to 4,000 mm are possible.**

Our presses enable **very precise forming** of thin sheets, up to $\pm 0.3^\circ$ angular accuracy of the stainless steel profiles.

This makes it possible to produce polygonal profiles up to hollow bodies very precisely within the sheet thickness tolerances.

We also supply **bar steel** and **special profiles**, whether rolled, drawn or laser-welded.

We are an approved welding company according to EN1090-2 EXC3 with various additional certificates.

In the case of bar steels, we can also produce special lengths from shorter stock lengths at favourable prices.

We can supply special formats for flat steels and thick sectional bars quickly and cheaply as laser or waterjet cuts.

Special services stainless steel

Special production methods for individual customer requirements

- ▲ Machining on high-performance automatic machines and special machines
- ▲ Flow forming; fast and inexpensive for thin sheet, for stable thread forming
- ▲ Slit strip processing for the production of special system components made of sheet metal
- ▲ Component assembly up to a unit weight of 4 tonnes; welded together, screw-assembled and surface-machined

Assembly production

We are your extended workbench!

- ▲ Fast and precise processing with the highest level of quality
- ▲ Before processing, all parts are straightened and relaxed in our straightening machine
- ▲ Optimally coordinated product solutions, up to the complete welded construction with hinges and seals

Joining technology

One of our special services

- ▲ Manufacturer's qualification for welding steel structures according to DIN EN 1090 EXC3
- ▲ Procedure tests for solid austenitic and duplex steels available
- ▲ Six-axis welding robot with modern control technology for thin sheet processing

Surface treatment

Grinding

- ▲ Dry sanding with grit size 36 - 320
- ▲ Body grinding or component grinding with grinding of the welding edges
- ▲ Grinding with the flexible shaft for internal contours and cavities

Pickling

- ▲ Components are made metallically bright using the latest spray pickling technology
- ▲ Automatic pickling for small parts, manual spray pickling for large parts, washing and degreasing in automatic system
- ▲ Even ground parts can be stained and thus retain their silky sheen

Blasting

We have 3 blasting rooms

- ▲ 1 blasting room 4,800 mm x 4,000 mm x 8,000 mm (W x H x L)
- ▲ 2 blasting rooms that can be connected to a total length of 12,000 mm, height 3,000 mm and width 4,000 mm
- ▲ Impeller blast machine with maximum hanger dimensions of 1,600 mm height and 1,000 mm diameter

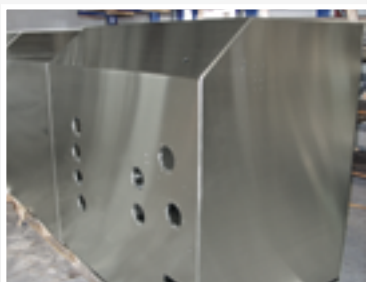
For example, housings, containers, cladding or decorative elements are blasted.

Very fine, filigree glass beads are used as blasting media, with which an optimal surface can be achieved.

Product examples



▲ Profile production



▲ Housing, surface grinded



▲ Welded construction

Overview of services



Order registration - Planning, Construction

Quick offer by a competent team

Processing of all file formats:
dxf, dwg, step, etc.

Production planning



Cutting

Cutting reworking

Laser cutting

Roller straightening and relaxation

Waterjet cutting

Straightening beam

Cropping

Belt straightening

Sawing

Brush and
grinding deburring

Flexing

Grinding chamfers, automatic

All workstations are located

Overview of services

Everything from a single source from the specialist for stainless steel



Cold-forming	Joining	Surface treatment	Quality inspection/ Warehousing/ Shipping
Bending with press brakes	MAG welding	Blasting with glass beads	Internal: X-ray fluorescence testing, Laser spectroscopy, Roughness test, Hardness test, Dimensional accuracy check, Leak test
Bending with mandrel	WIG welding	Pickling	External*: Spark spectrometer, Ultrasound-/ X-ray inspection, Tension/ compression test, notched bar impact test, Corrosion tests
Forming with slit strip processing	MAG + WIG robot welding	Electropolishing	On-call storage up to 1 year
Profile bending with rollers*	Laser welding with the robot*	Degreasing/ Hot washing	Own forwarding agency with shipping specialists, also for export / import declarations and customs clearance
Profile rollers*	Gluing, riveting, soldering	Belt grinding	Online shipment tracking during transport with reputable carriers

located at our site with modern machines and equipment. Stations marked with * are located at our partners.

Cutting service



Cutting service

Stainless steel blanks quickly and inexpensively in a wide range of materials

We offer you **large-format sheet and plate blanks quickly and inexpensively with excellent cutting quality for quality-conscious customer requirements.**

Stainless steel cuts are possible for the following materials:

1.4301, 1.4307, 1.4541, 1.4401, 1.4404, 1.4571, 1.4529, 1.4547, 1.4539

And if you like it even more stable and cheaper, we also store and process the duplex stainless steel grades

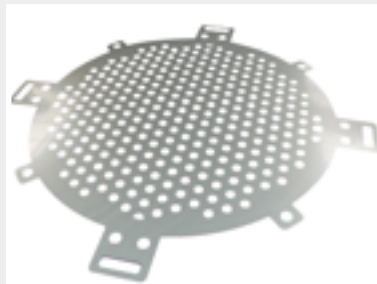
- | | | |
|----------|--|-----------------------|
| ▲ 1.4062 | Lean Duplex Stainless steel (D4) (at least equivalent V4A) | Resistance class III* |
| ▲ 1.4162 | Lean Duplex Stainless steel (D4) (at least equivalent V4A) | Resistance class III* |
| ▲ 1.4462 | Standard Duplex Stainless steel | Resistance class IV* |
| ▲ 1.4410 | Superduplex Stainless steel | Resistance class V* |

* According to Eurocode 3

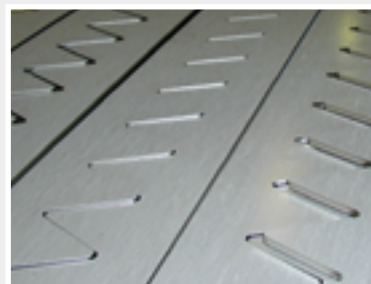
Product examples



▲ Laser cuttings



▲ Laser cutting for plant engineering



▲ Laser cuts with serrated edge

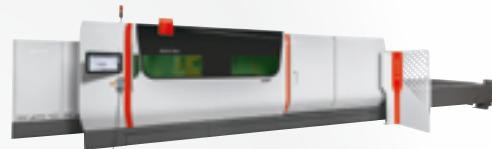
Laser systems

Performance data

- ▲ Fibre laser 8 kW & 10 kW,
Accuracy with thin sheet: ± 0.1 mm
- ▲ CO₂-Laser 6 kW,
Accuracy with thin sheet: ± 0.2 mm
- ▲ Cutting thickness: von 0.3 - 30 mm
- ▲ Material: Stainless steel, mild steel, aluminium
- ▲ Sheet metal format sizes: max. 2,000 x 4,000 mm
- ▲ Advantages of the fibre laser compared to conventional CO₂ lasers:
 - Faster throughput times
 - More economic
 - Cuts all hard and soft metals (e.g. aluminium) and steels;
in contrast to a CO₂ laser, which only cuts hard metals



▲ Laser cutting



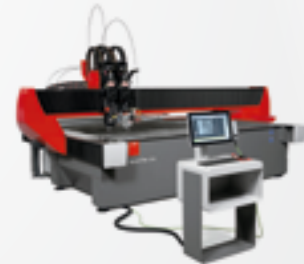
Water jet cuttings

Performance data

- ▲ Cut qualities: fine cut, quality cut, simple separation cut
(please specify with enquiry, request sample if necessary!)
- ▲ Sheet thicknesses up to 150 mm and more (depending on cutting speed)
- ▲ Accuracy depending on cutting speed:
max. ± 0.1 mm for thin sheet metal
- ▲ Material: stainless steel, mild steel, aluminium, copper, brass, plastic,
stones, ceramics
- ▲ Profile shapes: sheets / panels, square tubes
other profiles such as angles, U-profiles etc. by arrangement
- ▲ Sheet / panel format sizes: max. 2,000 mm x 4,000 mm



▲ Water jet cutting



Product examples



▲ Waterjet cutting with simple separation cut for cost-effective and fast machining...



▲ ...big and small...



▲ ...with high cutting edge accuracy

Profile production



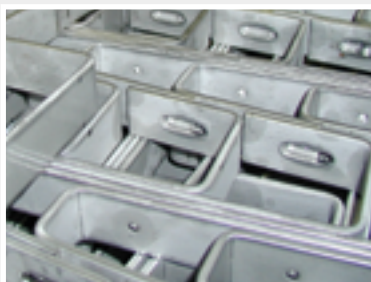
Profiles

Stainless steel profiles alternatively made of duplex steel, such as standard duplex 1.4462 or super duplex 1.4410

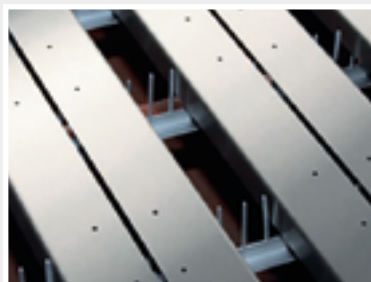
- ▲ Material thicknesses: from 0.3 to 20 mm
- ▲ High folding blades for tub and container edges with side wall heights of 300 mm all round
- ▲ Stainless steel profiles with rolled-in or lasered lettering or labelling
- ▲ Deburring, grinding and milling of the cut edges on the stainless steel profiles
- ▲ Static calculation of profiles in our own engineering office for structural analysis (Conversion from hot rolled to folded or cold rolled profiles)
- ▲ Foiling of the delivery with special packaging to protect sensitive surfaces



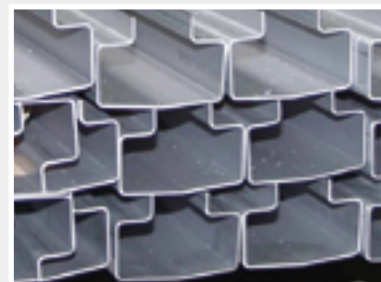
Product examples



▲ Roof hook profiles in larger series



▲ Precise and optically perfect plant construction profiles, laser cut or water jet cut



▲ Precise guide and retaining profiles

Folded profiles

Performance data

- ▲ Material thicknesses from 0.3 - 20 mm
- ▲ Profile lengths: standard up to 4,000 mm, special profiles up to 12,000 mm
- ▲ Surfaces corresponding to sheet metal or rolled section surface, ground, blasted, pickled, milled (also with serration), pattern rolled
- ▲ Material: stainless steel, aluminium, copper
- ▲ High folding blades for tub and container edges with side wall heights of 300 mm all round

Pressed and rolled profiles

Performance data

- ▲ From slit strip with continuous rolling mills or with follow-on tools
- ▲ Slit strip width up to 320 mm (depending on material thickness), slit strip thickness up to 6 mm (depending on slit strip width)
- ▲ Working speed: up to 120 strokes / minute



▲ C-rail

Pipe profiles

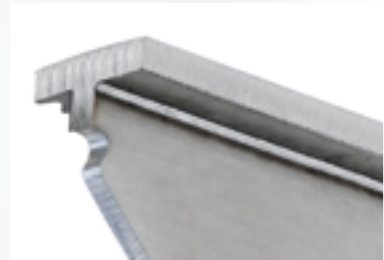
Performance data

- ▲ Saw off fixed lengths up to a profile cross-section or profile bundles of 340 x 700 mm
- ▲ Mitre cuts up to 45° individually: right-angled cut, also as a collar with automatic feed
- ▲ Tube lasering: \varnothing up to 300 mm
- ▲ Pipe lengths up to 12,000 mm, if primary material available

Welded profiles

Performance data

- ▲ Sheet thicknesses up to over 50 mm
- ▲ Welded pipe sections up to wall thickness 20 mm
- ▲ Profile lengths up to 12,000 mm
- ▲ Profile piece weights up to 4 tons
- ▲ Profile pickling up to approx. 8,000 mm length, in a spray pickling line



▲ Laser-welded T-profile

Curved / rounded profiles

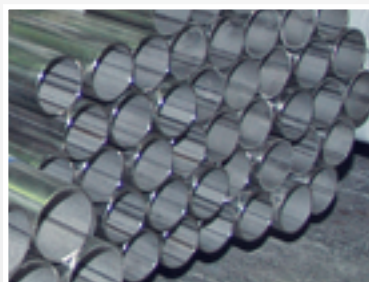
Performance data

- ▲ Mandrel bending for e.g. round steels or reinforcing bars
- ▲ with segmental edging, e.g. for flat steel
- ▲ Rounding of tubes or sections
- ▲ **Dimensions on request!**

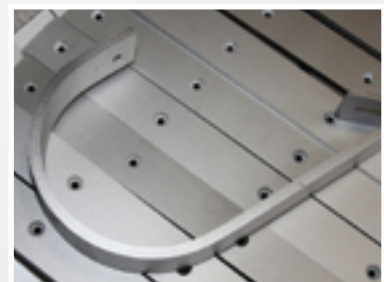
Product examples



▲ Small twist locks or clamping profiles
(also from slit strip with follow-on tool)



▲ Pipe profiles



▲ Curved profile

Special services stainless steel



Special services

Special manufacturing options for the individual wishes of our customers

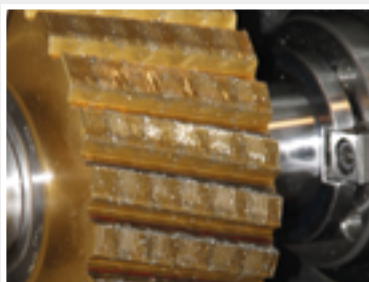
- ▲ **Machining**
Sawing, turning, milling, drilling, countersinking, thread cutting
- ▲ **Flow forms**
Specially suitable for tapped holes and hole stiffeners in thin sheet metal
- ▲ **Slit strip processing**
Can be realised with high repeat accuracy by means of our slit strip processing systems and corresponding follow-on tools



Product examples



▲ Countersinking



▲ Groove milling



▲ Drilling

Machining (milling, turning, drilling, thread cutting)

Performance data

- ▲ All material types, also high-strength stainless steels
- ▲ On high-performance automatic machines and special machines with high-performance tools, for cost-effective and very precise series production.
- ▲ Face milling, tooth milling, edge milling
- ▲ Countersinking holes, cutting internal and external threads (through holes, blind holes)
- ▲ Groove milling



▲ Milling

Shear cutting, notching, punching, forming

Performance data

- ▲ Sheet thicknesses: 1 - 8 mm
- ▲ Material: stainless steel, mild steel, aluminium
- ▲ Profile shapes: sheets, flat steel
- ▲ Sheet size: max. 2,000 x 4,000 mm
- ▲ Notches up to sheet thickness 8 mm
- ▲ Hole and slot punching
- ▲ Hole punching with hole curvature
- ▲ Crimping
- ▲ Beading



▲ Stamped parts

Sawing, flex cutting and chipping of bar steels and tubes

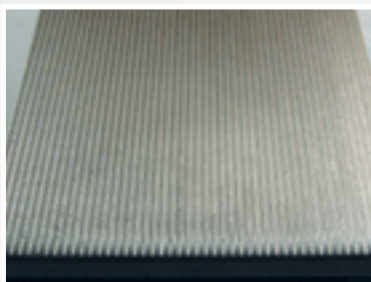
Performance data

- ▲ Profile and collar sizes: up to 340 x 720 mm
- ▲ Pipe and bar lengths: up to 12,000 mm
- ▲ Material: stainless steel, mild steel, aluminium, brass
- ▲ Mitre cuts up to 45° possible
- ▲ Flextrimming for bar steel cross-sections up to $\varnothing = 16$ mm
- ▲ Chopping off rolled or edged profiles, as an inexpensive and cost-effective process with form shear tools



▲ Automatic band saw

Product examples



▲ Milled serrations



▲ Hole punching with hole edge curvature



▲ Saw cuttings

Assembly production



Assembly production

Optimally coordinated product solutions from a single source

- ▲ **Fast and precise production with the highest level of quality**
- ▲ Before processing, the components are straightened and relaxed on a straightening machine.
- ▲ Component assembly with part sizes up to 3,000 x 2,500 x 14,000 mm and a weight of up to 4 tonnes

We offer comprehensive and well-founded advice on the subject of stainless steel and on the use of stainless steel grades, among other things from Managing Director Wilhelm Modersohn, who is an honorary member of the board of the Stainless Steel Information Center in Düsseldorf.

We supply enclosures, constructions and components for medical technology, the food industry, vehicle construction, mechanical engineering, environmental technology and architecture; up to complete welded constructions with hinges and seals.

Product examples



▲ Collecting tray for hazardous substances



▲ Frames for vehicle construction



▲ Straightening machine for the straightening of sheet metal

Tubs, containers, gutters, linings

Performance data

- ▲ Tank sizes up to 2,000 x 1,600 x 6,000 mm are possible
- ▲ Gutters up to a length of 12,000 mm
- ▲ Unit weights of maximum 4 tonnes
- ▲ Sheet thicknesses of up to 10 mm and more

Covers, enclosures, stainless steel housings

Performance data

- ▲ Enclosure sizes up to approx. 2,000 x 2,600 x 6,000 mm
- ▲ Unit weights of maximum 4 tonnes
- ▲ Sheet thicknesses from 0.5 - 10 mm and more
- ▲ As with the trays, our high folding swords allow all-round edging up to a height of 300 mm

Frames, racks, struts

Performance data

- ▲ Profile joints **mitre-sawn** or **assembled** at right angles to each other
- ▲ Unit weights of maximum 4 tonnes
- ▲ Sheet thicknesses from 0.5 - 10 mm and more
- ▲ Frame and rack sizes up to 2,350 (H) x 2,400 (W) x 12,000 (L) mm are possible with normal truck transport, with a special trailer and transport permit, dimensions up to 2,800 x 3,000 x 12,000 (W x H x L) mm can also be transported

Connecting elements & hinges

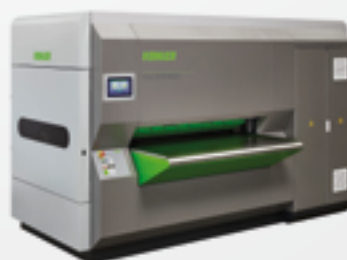
Performance data

- ▲ Threaded parts with metric standard thread up to M 56
- ▲ **Precise water jet cutting** up to a thickness of 150 mm; **often cheaper** than machining
- ▲ Setting of threaded bolts with the tip ignition and lift ignition method
- ▲ **Riveting of rivet studs and rivet nuts**
- ▲ Flow forming of holes with collars in thin sheet metal and subsequent thread cutting up to M 12

Straightening machine

Performance data

- ▲ Straightening machine for straightening sheets up to a thickness of approx. 15 mm
- ▲ Sheet or cut-to-size widths up to 1,500 mm



Joining technology



Joining technology

Load-bearing structures made of stainless steel, welded by experts

- ▲ In the sensitive area of joining technology, we enable **perfect execution with all the necessary welding test certificates, procedure qualification tests and product approvals.**
- ▲ Manufacturer's qualification for welding steel structures according to DIN 1090 EXC3
- ▲ Manufacturer's qualification for welding of reinforcing steels according to DIN EN ISO 17660:2006
- ▲ Proof of welding quality requirements according to DIN EN 3834-2
- ▲ Procedure tests for solid austenitic and duplex steels available
- ▲ Materials: 1.4003, 1.4301, 1.4307, 1.4541, 1.4401, 1.4404, 1.4571, 1.4435, 1.4439, 1.4539, 1.4547, 1.4529, 1.4062, 1.4162, 1.4482, 1.4362, 1.4662, 1.4637, 1.4462, 1.4501, 1.4507, 1.4410, 1.4658, 1.4828, 1.4841, Normal steel grades, concrete reinforcing bars BST500B etc.
- ▲ Various welding processes, depending on customer requirements
- ▲ Welding also of different materials; e.g. black-white joints

Please talk to our welding expert.

Product examples



▲ Container with lid for water treatment



▲ Door mounting frame for cooling vans



▲ Facade substructure for the architectural sector



Welding techniques

Performance data

- ▲ More than 20 modern welding workstations
- ▲ Welding techniques:
 - MIG / MAG
 - WIG
 - Electrode welding
 - Stud welding with drawn arc and tip ignition processes
 - Resistance spot welding
 - Robot welding
- ▲ Extensive range of sizes:
From small and filigree constructions to large components with a weight of up to 4 tonnes can be welded



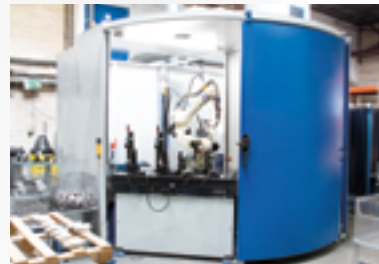
▲ Weld seam according to design class EXC3

Welding robot

Six-axis welding robot with special control for precise sheet metal welding

Performance data

- ▲ P500L welding machine with 6 axes
- ▲ Online and offline programming
- ▲ Possible welding types: MIG / MAG
- ▲ Part size up to 1,400 x 900 x 800 mm
- ▲ Part weight up to 1,000 kg



▲ Welding robot cabin

Product examples



▲ Special constructions



▲ Container welding



▲ Welding certificate EXC3 according to DIN EN 1090-2

Cutting edge and surface finishing



Surface treatment

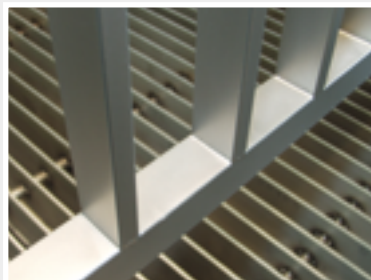
We are experts in surface treatment on stainless steel

- ▲ We are your one-stop shop for all important surface finishing processes:
Glass bead blasting, pickling, sheet metal grinding, body grinding and sheet metal deburring.
- ▲ The contract blasting, contract pickling and contract grinding takes place on state-of-the-art equipment, which guarantee high quality standards
- ▲ **Electropolishing** is not only used to produce **visually smooth and shiny surfaces**, but also **improves the corrosion resistance**.
Duplex steels, for example, are **up to a whole corrosion resistance class better** after this refinement!
Processing in a large basin or in a small parts basin.

Product examples



- ▲ Supporting structure of the Frauenkirche Dresden before the pickling process (length = over 11 m)



- ▲ Railing, glass bead blasted



- ▲ Blasted welded construction

Grinding

Performance data

- ▲ Grinding with grit size:
36 grit, 80 grit, 120 grit, 180 grit, 240 grit oder 320 grit
- ▲ Smoothing the grinding tips with
fleece MF (medium) and FF (fine)
- ▲ Body grinding sizes up to
1,700 (H) x 2,800 (W) mm, lenght approx. 4,000 mm
- ▲ Grinding deburring up to 1,500 mm width
and 200 mm height



▲ Subsequently sanded housing for
medical technology

Pickling

Performance data

- ▲ Part sizes up to 1,200 x 1,600 x 5,500 mm
- ▲ Unit weights:
Small pickle: up to max. 200 k
Spray pickling: up to max. 1,300 kg per trolley (4 pieces in total)
- ▲ Only high-alloy, stainless steels with at least 16 % chromium can be pickled.
For simple, ferritic steels, we recommend glass bead blasting or grinding.



▲ Staining of large constructions,
e.g. for the food industry

Blasting

Performance data

- ▲ Compressed air and wheel blasting
- ▲ Part sizes max. height 2,500 mm, width 3,000 mm and length up to 8,000 mm
- ▲ Unit weights up to approx. 2 tonnes
- ▲ We can blast small parts from a few centimetres up to large components of
several metres.
- ▲ By masking with foil, also as lettering or logo, we can apply characters to
the surface with glass bead blasting.
The foil is then removed and the shiny or smoother lettering is clearly
visible on the inscribed areas.



▲ Large channel, blasted,
assembled from several parts,
dimensions:
9,675 mm x 2,615 mm x 2,542 mm
(L x W x H)

Other services

- ▲ Chamfering of edges, for improved joining of workpieces during welding
- ▲ Deburring of edges that have arisen during the machining or
manufacturing process.

Product examples



▲ Pickled nuts



▲ Chamfer edges



▲ Deburring edges

Surface treatment

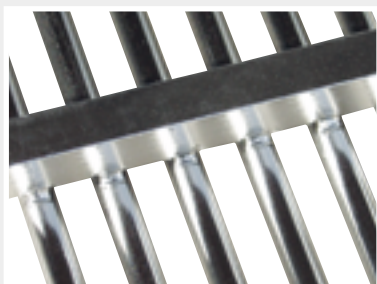


Electropolishing

Brilliant performances

- ▲ Electrochemical ablation process, with the aid of a current source based on direct current
- ▲ Metal is anodically removed in an electrolyte specially adapted to the metal
- ▲ This reduces the surface roughness, and the micro-roughness is lowered
- ▲ The result is a metallurgically pure, shiny surface without imperfections.
- ▲ Applicable for small parts as well as for larger individual workpieces made of electropolishable material
- ▲ Particularly suitable for small and delicate parts, as electropolishing is a distortion-free process and is not subject to mechanical, thermal or chemical stresses
- ▲ The prerequisite for optimum electropolishing is a surface that is as far as possible free of oil, grease and dirt.
- ▲ Useful size of basin 1: 3,000 x 700 x 750 mm (length x width x filling height)
- ▲ Useful size of basin 2: 800 x 450 x 500 mm (length x width x filling height)

Product examples



▲ Welded construction, electropolished



▲ Stainless steel sign, blasted, sanded and electropolished



▲ Presentation stand, detail foot

Processing method

Performance data

- ▲ The workpieces to be polished must be freed from oils, greases, oxides and other contaminants that would hinder even electropolishing
- ▲ They are then mounted on frames made of titanium, copper or bronze. Polishing is carried out by immersing them in the polishing bath containing electrolytes and applying current. This removes material from the surface. The process is a reversal of electroplating, in which metal ions from a solution are attached to the material.
- ▲ The metal removal is proportional to the applied current, the effectiveness of the electrolytes and the treatment time.
- ▲ An increased current is applied to burrs or other protruding irregularities, so that these are preferentially removed.
- ▲ The dwell time in the bath depends on the material, type and surface of the workpieces used.
- ▲ Afterwards, the fabric removed from the polishing bath is rinsed to remove any polishing electrolytes still adhering to it.



▲ Anchor channel, electropolished



▲ Electropolishing plant with a container size for part lengths up to max. 3,000 mm

New process combination for surface optimisation, in terms of durability, fingerprints and appearance

Performance data

- ▲ In order to reduce the risk of crevice corrosion in particular, as well as fingerprints on very smooth surfaces, Modersohn combined the electropolishing process with surface blasting. The result is a very insensitive surface on which the machining marks, which would otherwise be very clearly visible during electropolishing, are removed by the even and less time-consuming abrasive blasting (compared to grinding).
- ▲ After the surface treatment, the Lean Duplex components are not only classified one corrosion class higher, but they also gain visually. The graining during blasting creates a rough and thus also slightly non-slip feel. The result is a velvety-looking, noble shimmering surface on which any subsequent scratches are less noticeable.

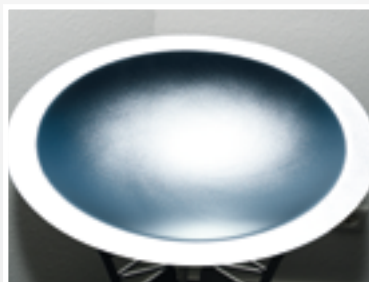


▲ Stainless steel surface, pickled, blasted and finally electropolished

Product examples



▲ Handrail, pickled, blasted and electropolished



▲ Stainless steel bowl, pickled, blasted and electropolished



▲ Stainless steel grate, electropolished



The MODERSOHN K-Line

A short hand to the desired product

- ▲ In our *NiroFix* sales division, we have special production facilities to satisfy even individual wishes of our customers at short notice. The aim is to provide our customers with the widest possible range of processing options with our special production facilities. This is the only way to produce complex projects and assemblies promptly and cost-effectively.
- ▲ The K-line is our 48-hour service for customers who need their stainless steel components, including lean duplex steel, particularly quickly.
- ▲ Whether industry, trade or construction:
Depending on the quantity required (please consult your sales representative in advance!), orders can be made available for collection or dispatch within two working days under the following conditions.
 - ▲ The order corresponds to the matrix of the K-line
 - ▲ The order is received from monday to thursday (on working days) by 3.00 p.m. at the latest
 - ▲ The required primary material is in stock in sufficient quantity and quality
 Please note that this short delivery date is also quantity-dependent.
Larger quantities may have to be divided into several partial deliveries. Please talk to our sales advisors about this.

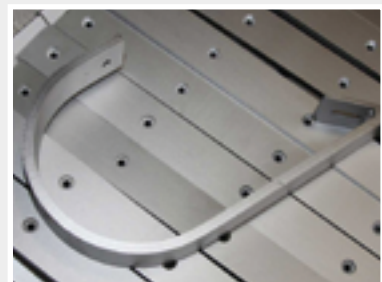
Product examples



▲ Laser cuts



▲ Laser cuts








▲ Folded and curved profiles



Product information

Requirements matrix for the express-production-parts of the MODERSOHN® K-Line

- ▲ Our K-line matrix immediately tells you whether your product is suitable for our express production.

Description		Sketch Hand Sketch / Outline	Drawing File format: .dxf / .dwg / .pdf	2D-file File format: .dxf / .dwg	3D-file File format: .step / .sat / .iges / .ipt	
Simple laser cutting Without customer data	This variant only allows the cutting without further operations	✓				
Complex laser cutting With customer data	This variant only allows the cutting without further operations			✓		
					✓	
Laser cutting plus prefabrication According to customer drawing	This variant enables subsequent operations, such as thread cutting, counterboring, chamfer grinding		✓	✓		
			✓		✓	
Edge profiles incl. pre-cut material According to customer drawing, tolerance field acc. DIN ISO 2768 m	This variant enables subsequent operations, such as thread cutting, counterboring, chamfer grinding		✓		✓	
Edge profiles incl. pre-cut material According to customer drawing, tolerance field acc. DIN ISO 2768 c/v	This variant enables subsequent operations, such as thread cutting, counterboring, chamfer grinding		✓	✓		
			✓		✓	

K-Line-matrix

The fields marked with a tick determine the minimum requirement for a K-line product.

Important: The short delivery date is also quantity-dependent.

Latest release october 2021 | © Wilhelm Modersohn GmbH & Co. KG

Available operations

- ▲ Laser cutting up to = 35 mm
- ▲ Shearing Sheets | Round Steels | Reinforcing bars
- ▲ Flexing
- ▲ Grinding Deburring | Hand Deburring
- ▲ Flat straightening
- ▲ Thread cutting | Counterboring
- ▲ Folding | Hemming
- ▲ Weld seam preparation
- ▲ Chamfer grinding by machine
- ▲ Glass bead blasting
- ▲ Pickling | Washing | Passivation
- ▲ Elektropolishing



- ▲ Top IT equipment for more efficient work

Storage

Primary material

Sheets, strips, rods, tubes - we always have over 400 tonnes of high-quality semi-finished products in stainless steel, in all standard grades and thicknesses up to 100 mm. This enables us to manufacture your requirements quickly and reliably and deliver them on time.

Upon request, we will also provide you with a works certificate for the of the primary material (3.1 according to DIN EN 10204:2005-01).



▲ Sheet metal stocks also for large demand quantities

Dowel and fastening systems

We are a partner of leading German dowel system manufacturers. Enquire about your dowel requirements with us and get professional advice from our engineers. We have a large stock of standard and special dowels in stainless steel; from heavy-duty dowels for the cracked tension zone to simple universal plastic dowels.

We can also provide you with special variants with general approval or approval in individual cases. Take advantage of our competence and experience!

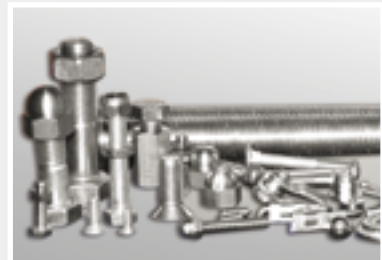


▲ Heavy duty dowels

Screws, nuts and washers

We offer you high-quality bolts and nuts according to standard and special designs in stainless steel, and that (thanks to procurement of our requirement quantities in large volumes) at good prices and in exactly the quantity you need.

- ▲ From M 6 - M 42 in various standardised designs from stock in A4 and also in duplex steel D4 and D6



▲ Screws and nuts

Threaded rods

Thanks to our own stainless steel processing with **extensive machinery**, we can also supply fixed lengths of threaded rods, **bent threaded ends or round steels** with threads cut on both sides (so-called double ends) at short notice in a wide range of stainless steel grades.

We can also weld the precisely fitting threaded ends with retaining plates, sleeves or other supporting or connecting elements.

- ▲ **Favourable prices**, thanks to extensive purchases through imports from abroad.
- ▲ **MOSO® threaded rods and MOSO® part threaded ends** with metric standard thread M 6 - M 42 in A2 (1.4301), in A4/A4L (1.4401/1.4404) or in duplex steel D2, D4 and D6.
- ▲ **Lengths up to 5,900 mm and larger.** On request, we cut the threaded rods to a fixed length and make the threaded ends common.

We have the right solution for every need.



▲ Threaded rods

Call orders and transport handling

On-call warehousing, packaging solutions, shipment tracking, transport handling, 24-hour pick-up warehouse

Call orders and transport handling

On-call warehousing

We have extensive customer storage areas that are created for up to one year, depending on the customer retrieval rate, and can be extended by one year if required. You can always call off „just in time“.

This allows us to significantly reduce costs for our customers, as we can operate with interesting series sizes. **For smaller parts**, such as standard, turned and milled parts, **optimal packaging units are then determined, which favour quick processing and save follow-up costs.**

Your advantages:

- ▲ **Cheaper production** due to lower set-up and administration costs per unit
- ▲ **Better packaging options** with defined packaging quantities and labelling
- ▲ **Reduction of in-house storage space requirements** and thus **lower storage costs**
- ▲ **More liquidity** for other projects due to lower capital commitment
- ▲ **Faster delivery and greater certainty** of delivery date, as there is sufficient lead time

Packaging solutions

Special shipping storage areas allow us to clearly manage and organise packing and shipping. Sensitive parts are protected with additional PE sleeves and paper or cardboard interlayers; fragile parts are provided with separate labels. Shrink-wrapping and sturdy cardboard packaging with labelling are a matter of course for us in shipping.

Shipment tracking

Regardless of whether it is a shipment by parcel service or by freight forwarder: Our customers receive a shipment code by e-mail, which they can use at any time to find out the status and the expected delivery date of their order.

Transport handling

In order to avoid having to drive „from Steel-Meyer to Screw-Müller“ for 3 blanks and 50 screws, we have built up an inexpensive and reliable delivery organisation in the local area with our own vehicles.

Our vehicle fleet includes delivery vans, vans and a truck.

The tours are completed inexpensively and punctually by our experienced shipping specialists.

24-hour pick-up warehouse

We have set up a 24-hour service for urgent consignments of goods.

This makes it possible for our customers **to pick up urgent orders on site day and night or even on weekends.**

These consignments can be collected from our premises in Spenge, Industrie-strasse 30, using an access code.

Simply speak to your contact person about the collection process and the necessary access code.



Testing equipment

Technical possibilities

Your advantages

Our own outgoing goods inspection and cooperation with testing laboratories of renowned institutes, such as the **Federal Institute for Materials Research and Testing (BAM, Berlin)**, the **IEA Stuttgart** and many others, make us one of the leading specialists for special applications and new developments in the field of stainless steel. We can provide you with **the necessary test certificates** for all **stainless steel constructions quickly and reliably**.

Material identification

We permanently check the incoming goods and can take random samples for material control at any time, even during production.

Testing with fluorescence devices is non-destructive and very accurate.

In addition, we have a modern laser spectroscope with which the carbon content can also be measured.

Thanks to the mobility of the devices, tests can also be carried out at the construction site or at the customer's factory after a thorough examination of the effort involved.

Mobile material identification as a fast service for customers and suppliers.

In industry and trade, there is growing interest in reliable statements about the quality of materials.

Human lives can depend on the right quality of material:

It's hard to imagine what the use of the wrong material can do to a facade fastening, for example.

Reliable information on this is provided by a technology from the USA that was developed for NASA (for use in the Mars robot!) and works with X-rays.

The „Niton“ device quickly and precisely detects chemical elements in metal alloys (in the element range aluminium-uranium) and provides information at the push of a button.

Sheets, wires, pipes and also welded constructions including the weld seams are tested.

The standard elements for testing are MG (12) to U (92) according to the periodic table of the elements. In addition, we can also determine C (6) very precisely.

In addition, we have the authorisation to restamp primary materials.



▲ X-ray fluorescence measuring device for material identification



Roughness measurement

Surface roughness measurement for sensitive surfaces

Precise and fast determination of surface roughness in micrometres.

Not only in medical technology or the food industry does the fast and targeted determination of surface roughness play an important role, especially for hygiene regulations.

A coarse and poorly ground surface, e.g. with a stainless steel 1.4404, results in poorer corrosion resistance properties than a very well and smoothly ground or electropolished surface with stainless steel 1.4301!

Therefore, besides the choice of material, the choice of surface is one of the most important selection criteria for ensuring the correct corrosion resistance properties. You should have the desired surface quality checked and confirmed in the form of the surface roughness, among other things!

The surface is precisely scanned over a measuring distance of up to 12.5 mm.

Different average roughness values can be determined:

- ▲ Arithmetic centre line value Ra
- ▲ Square centre roughness value Rq
- ▲ average peak-to-valley height Rz and much more.



▲ Surface roughness measurement

Leak test with the dye penetrant test or the vacuum test method

Modersohn supplies the plant construction and tank construction industries with collection trays and channels. These are tested for leak tightness with WHG certification. Modersohn offers the dye penetration method (red-white testing) and the vacuum testing method (with different vacuum bells).

Furthermore, Modersohn is a certified specialist company according to §19 of the of the Water Resources Act.



Hardness and strength test

Trust is good, control is better, especially when it comes to mechanical properties. For a fastening specialist, **determining the strength values** is of course a basis of his work - **you should pay attention to this when purchasing your fastening products!**

We carry out the following tests with our own testing equipment and external laboratories:

Hardness test:

- ▲ Brinell HB
- ▲ Rockwell HRC, HRA, HRB
- ▲ Vickers HV

Radiation test:

- ▲ Dosimeter test (microsievert) (radioactivity)

Strength test:

- ▲ Yield strength $R_{p0.2}$ in N/mm^2 - Tensile strength R_m in N/mm^2
- ▲ Strain at failure A_5 , A_{50} / A_{80} in %
- ▲ Notched impact strength bending strength J (Joule)
(Cold toughness measurement)
Should be at least 40 joules at $-40^\circ C$ for outdoor use!



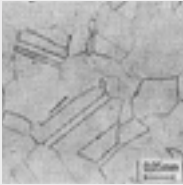
Shape and dimensional accuracy

In order to perfect our product quality, we have a „mobile quality control“, which enables us to check the manufactured components in detail; up to dimensions of 4,000 mm.

The 7-axis 3D measuring arm, certified to international ISO 10360-12 standards, inspects workpieces to within ± 0.03 mm and records all measurement results. Thanks to this technology, we can guarantee our customers the highest degree of shape and dimensional accuracy.

Microstructure types and use

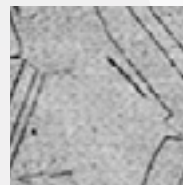
Properties of microstructure types



▲ Microstructure
Austenitic steel

Austenitic Stainless Steels

- Not magnetisable (exception: standard austenites, cold forming, forming martensite).
- **Very good corrosion resistance** with increasing alloy content
- Susceptible to stress corrosion cracking
- **High toughness even at low temperatures**
- **Very good hot and cold formability** (Ductility, Elongation)
- Not hardenable by heat treatment, strength increase through cold forming
- **Good weldability**
- High coefficient of thermal expansion
- Low thermal conductivity



▲ Microstructure
Manganese-Austenitic
Stainless steel

Manganese-Austenitic Stainless Steels

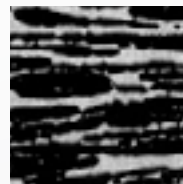
- **Less expensive than nickel-austenitic stainless steels**
- **High strength**
- **Moderate to comparatively poor corrosion resistance**
- Higher demands on cold formability among other things due to strong strain hardening
- **Very good thermoforming and hydroforming properties**
- Poor machinability
- Difficult to weld (hot cracks)
- High surface effort in the steel production
- Inhomogeneous material properties with large cross-sections



▲ Microstructure
Ferritic steel

Ferritic stainless steels

- Magnetisable
- Weldable to a limited extent, coarse grain formation during welding, loss of notched impact strength at higher temperatures (Chi phase, Sigma phase)
- Lower elongation at fracture (20 %) compared to austenites (> 40%)
- Machinable to a limited extent and cold workable
- Lower strength, not hardenable and heat treatable
- Not suitable for low temperatures
- Not crevice corrosion resistant
- High resistance to chloride-induced stress corrosion cracking
- **Coefficient of thermal expansion like Stainless steel**



▲ Microstructure
Stainless duplex steel

Austenitic-ferritic stainless steels (duplex stainless structures)

- **Magnetisable**
- 0.2% yield strength above the austenites, with good toughness values
- **Good corrosion resistance**
- **Favourable fatigue strength**
- **Good resistance to chloride and hydrogen-induced stress corrosion cracking**
- **Machinable to a limited extent**
- In the variants with little to no molybdenum, a **very low 475°C embrittlement**, i.e. the notched impact strength values remain sufficiently high
- **Good weldability**
- Moderate coefficient of thermal expansion
- Low thermal conductivity



▲ Microstructure
Martensitic steel

Martensitic stainless steels

- Magnetisable
- **High strength**
- **Hardenable** or heat treatable by heat treatment
- Moderate hot and cold formability
- Heat treatment effort, especially after welding
- Lower elongation at fracture compared to austenites
- High wear resistance and cutting edge retention
- Low coefficient of thermal expansion
- High thermal conductivity

Materials / Properties / Designations

Steel structure	Market description steel group	EN material no. 1 2	AISI no. 3	ASTM UNS no. 4	Steel type short name acc. to DIN EN 10027, 10088-1 or SEW 400 5	Standard parts steel type acc. to DIN EN ISO 3506	Approved for the building industry, acc. to Eurocode 3, DIN EN 1993 Part 1-4	Comparison corrosion resistance class acc. to DIN EN 1993-1-4 7	Currently common forms of delivery	
Ferritic/ Austenitic	Stainless Lean Duplex Steel	1.4062	-	S32202	X2CrNi22-2	D4	yes	III / medium	Metal sheet	Wire / Round
Ferritic/ Austenitic	Stainless Lean Duplex Steel	1.4162	-	S32101	X2CrMnNiN21-5-1	D4	yes	III / medium	Metal sheet	Wire / Round
Ferritic/ Austenitic	Stainless Lean Duplex Steel	1.4482	-	S32001	X2CrMnNiMoN21-5-3	D2	yes	II / moderate	Metal sheet	Wire / Round
Ferritic/ Austenitic	Stainless Lean Duplex Steel	1.4362	-	S32304	X2CrNiN23-4	D2	yes	III / medium	Metal sheet	Wire / Round
Ferritic/ Austenitic	Stainless Lean Duplex Steel	1.4637*6	-	S82031	New, currently no indication	-	no	(III / medium)	Thin metal sheet	
Ferritic/ Austenitic	Stainless Lean Duplex Steel	1.4662	-	S32404	X2CrNiMnMoCuN24-4-3-2	D4	yes	III / medium	Metal sheet	
Ferritic/ Austenitic	Stainless Standard Duplex Steel	1.4462	-	S31803/ S32205	X2CrNiMoN22-5-3	D6	yes	IV / strong	Metal sheet / Rohr	Wire / Round
Ferritic/ Austenitic	Stainless Super Duplex Steel	1.4410	-	S32750	X2CrNiMoN25-7-4	D8	yes	V / super strong	Metal sheet / Tube	Wire / Round
Ferritic/ Austenitic	Stainless Super Duplex Steel	1.4501	-	S32760	X2CrNiMoCuWN25-7-4	D8	yes	V / super strong	Metal sheet	Round
Ferritic/ Austenitic	Stainless Super Duplex Steel	1.4507	255	S32550	X2CrNiMoCuN25-6-3	D8	yes	V super strong	Metal sheet	Round
Ferritic/ Austenitic	Stainless Hyper Duplex Steel	1.4658	-	S32707	X2CrNiMoCoN28-8-5-1	-	no	> V / super strong	Seamless tubes	
Ferriticer Stahl	Ferritic chromium steel	1.4003	-	S40977	X2CrNi12	-	yes	I / low	Metal sheet	Wire / Round
Ferritic steel	Ferritic chromium steel	1.4512	409	S40910	X2CrTi12	-	yes	I / low	Metal sheet	Wire / Round
Ferritic steel	Ferritic chrome steel	1.4016	430	S43000	X6Cr17	-	yes	I / low	Metal sheet	Wire / Round
Austenitic steel	Spring steel	1.4310	301	S30100	X10CrNi18-8	A1	no	I / low	Metal sheet	Wire / Round
Austenitic steel	Standard steel	1.4301 (1.4307)	304	S30400	X5CrNi18-10	A2	yes	II / moderate	all	Wire / Round
Austenitic steel	Standard Low Carbon	1.4307	304L	S30403	X2CrNi18-9	A2L	yes	II / moderate	all	
Austenitic steel	Standard stabilized	1.4541	321	S32100	X6CrNiTi18-10	A3	yes	II / moderate	Metal sheet	Wire / Round
Austenitic steel	Standard steel	1.4401 (1.4404)	316	S31600	X5CrNiMo17-12-2	A4	yes	III / medium	all	
Austenitic steel	Standard Low Carbon	1.4404	316L	S31603	X2CrNiMo17-12-2	A4L	yes	III / medium	all	
Austenitic steel	With higher Ni + Mo content	1.4435	316L	S31603	X2CrNiMo18-14-3	-	no	III / medium	Metal sheet	
Austenitic steel	Standard stabilized	1.4571	316Ti	S31635	X6CrNiMoTi17-12-2	A5	yes	III / medium	all	
Austenitic steel	Higher Mo content + Nitrogen	1.4439	317 LNM	S31726	X2CrNiMoN17-13-5	-	yes	IV / strong	Metal sheet	
Austenitic steel	Fully austenitic steel	1.4539	904L	N08904	X1NiCrMoCu25-20-5	-	yes	IV / strong	Metal sheet	Wire / Round
Austenitic steel	Fully austenitic steel	1.4529	-	N08925/6	X1NiCrMoCuN25-20-7	A8	yes	V / very strong	Metal sheet	Wire / Round
Austenitic steel	Fully austenitic steel	1.4547	-	S31254	X1CrNiCuN20-18-7	A8	yes	V / very strong	Metal sheet	
Austenitic steel	Heat resistant	1.4828	309	S30900	X15CrNiSi20-12	-	no	(low)	Metal sheet	Wire / Round
Austenitic steel	Heat resistant	1.4841	314	S31400	X15CrNiSi25-21	-	no	(very good)	Metal sheet	Wire / Round

Table designation (table right page)

*1 Values in brackets = the materials commonly used today. The EN material no. „...01“ may still be used for the newer alloy with less carbon [$< 0.03\%$].

*2 According to EN10088, ISO 1872, management by Steel Centre Düsseldorf

*3 AISI = numbering system for steels, administered by the American Iron and Steel Institute, materials under the AISI number similar to the German versions!

*4 Unified Numbering System for all materials, administered by the American Society for Testing and Materials (ASTM).

*5 Steel-iron materials sheet „SEW“ from the publishing house *Stahleisen* (Steel Centre Düsseldorf) for non-standardised materials

*6 New Lean Duplex steel with high elongation at break A80 > 35% - deep-drawable

*7 Information of the values in brackets, materials not be included in Eurocode 3, assessment according to general tests and experience



Mechanical and physical properties

The following are the stainless steel material grades frequently processed by Modersohn:

Mechanical and physical properties												
Material no.	at room temperature (20°C)					at different temperatures						
	Tensile strength MPa min.	Yield strength $R_{p0.2}$ Delivery condition with- out strain hardening, MPa min. ^{*1}	Breaking elongation A in % min. (lengthwise / crosswise) $k = 5,65 \frac{L_0}{S_0}$ $L_0 = k \cdot S_0$	Modulus of elasticity GPa acc. to DIN EN 1993-1-4 ^{*4}	Hardness ^{*3} HB max (typical values)	Electrical resistance value $\frac{W \cdot mm^2}{m}$	Magnetisability	Thermal conductivity $\lambda = W/(m \cdot K)$	Thermal expansion coefficient [10 ⁻⁶ /K]	Cold toughness properties recommendation for load-bearing constructions min. °C ^{*4} for thicknesses > 3 mm	Recommended max. operating temperature in air until °C, ^{*5} permanent load	
1.4062	650	450	30	200	290 (225-235)	0,68	yes	15	13 (9,5) ^{*6}	-40	on request	
1.4162	650	450	30	200	290 (225-235)	0,75	yes	15	13	-40	on request	
1.4482	650	450	25	200	290 (220-255)	0,80	yes	13	13	-40	on request	
1.4362	600	400	25	200	260 (210-235)	0,80	yes	15	13	-40	on request	
1.4637	700	500	35	(205)	k. A.	0,80	yes	14,5	13	k. A.	on request	
1.4662	680	480	25	200	290 (230-250)	0,80	yes	15	13	-40	on request	
1.4462	650	450	25	200	270 (230-250)	0,80	yes	15	13	-40	250 (300)	
1.4410	730	530	25	200	290 (250-270)	0,80	yes	14	13	-40	250 (300)	
1.4501	730	530	25	200	270	0,80	yes	15	13	-40	250 (300)	
1.4507	730	530	25	200	270	0,80	yes	15	13	-40	250 (300)	
1.4658	920	700	25	(197)	320	0,80	yes	12	12,5	k. A.	k. A.	
1.4003	450	240	20	220	200	0,60	yes	25	10,4	-40	300	
1.4512	380	200	25	220	200	0,60	yes	25	10,5	+10	350	
1.4016	400	240	20	220	200	0,60	yes	25	10	+10	400	
1.4310	500	250	40	(195)	230	0,73	no ^{*7}	15	17	k. A.	300	
1.4301	500	190	45 / 35	200	215	0,73	no ^{*7}	15	16	-200	450	
1.4307	500	175	45 / 35	200	215	0,73	no ^{*7}	15	16	-200	450	
1.4541	500	190	40 / 30	200	215	0,73	no ^{*7}	15	16	-273	500	
1.4401	500	200	40 / 30	200	215	0,75	no ^{*7}	15	16	-200	450	
1.4404	500	200	40 / 30	200	215	0,75	no ^{*7}	15	16	-200	450	
1.4435	500	200	40 / 30	200	215	0,75	no ^{*7}	15	16	-200	450	
1.4571	500	200	40 / 30	200	215	0,75	no ^{*7}	15	16,5	-273	500	
1.4439	580	280	35 / 30	200	250	0,85	no ^{*7}	14	16	-200	450	
1.4539	530	230	35 / 30	195	230	1,00	no	12	16	k. A.	500	
1.4529	650	300	40 / 35	195	250	1,00	no	12	16	k. A.	500	
1.4547	650	300	40 / 35	195	260	0,85	no	14	16,5	k. A.	500	
1.4828	500	230	30	(196)	223	0,85	no ^{*7}	15	16,5	k. A.	1.000	
1.4841	550	230	30	(196)	223	0,90	no ^{*7}	15	15,5	k. A.	1.120	

Mechanical and physical properties

* Values in brackets = factory data or from DIN EN 10088-1 (guide values without strain hardening!)

*1 The yield strength $R_{p0.2}$ is one of the most important mechanical values for structural design. Work hardening can significantly increase the values while changing other mechanical and physical properties. If you want to take strain hardening into account in the calculation, you must ensure that the stiffness (i.e. the modulus of elasticity) decreases and that the strain hardening is reduced again (depending on the temperature level) in the case of subsequent high-temperature influences! Frequently, work hardening is completely eliminated by e.g. welding and thermal cutting in the heat-affected zones and may no longer be applied to the complete component! Then only the minimum yield strength $R_{p0.2}$ given here is to be expected.

*2 S_0 = Output cross-section

L_0 = Initial dimension length

k = International factor (5,65)

During cold forming, a minimum radius must always be maintained for ferritic chromium steels and duplex steels due to the lower elongation at fracture. Up to 3 mm material thickness for flat products r (inner radius) = t (thickness).

This is calculated on the basis of the tool yields with the adjacent table:

See the current „General technical approval Z-30.3-6“ of March 5th 2018 under point 4.4 (page 14).

*3 This value is for orientation only. Depending on heat treatment and rolling, the value may vary.

*4 The temperature value for cold toughness behaviour is one of the most important bases for deciding whether or not a material is suitable for load-bearing constructions in normal ambient atmospheres (with winter phase, Europe to max. -40°C), especially for fastening technology. For the building authority approval, the materials are tested with the notched impact bending method at -40°C, and an energy value of at least 40 joules to be achieved. The ferritic chromium steels generally perform poorly, especially in the temperature influence range of welds. In addition, the thickness of the material used has a great influence on failure due to cold embrittlement. Basically, the thicker the material, the faster you get glass-fracture-like failures, especially with components that are subject to high mechanical loads and stress. Therefore, most ferritic chromium steels should only be used as thin sheets with a material thickness of max. 2.99 mm if the application takes place in temperature ranges below 10°C. The austenitic steels, on the other hand, have no problems due to their high nickel content and can even be used for cryotechnical applications. The cold toughness values of duplex steels are still in a good range for normal atmospheric applications. Duplex steels with a higher nickel content, such as 1.4462 or 1.4362, have an advantage here. These can still bear loads at -50° or -60°C without any problems.

*5 Values for continuous high-temperature loading. The strength values, especially those of the austenitic steel grades, decrease sharply with increasing temperature. The advantage of austenitic steel grades is their continued high toughness even at high temperatures. Duplex stainless steel containing molybdenum becomes even stronger as the temperature rises (high-temperature strength), but tends to become brittle above 300°C, this is due to the so-called „475°C brittleness“. There are examples where heat exchangers have functioned perfectly for many years even at temperatures of 350°C, but there are also individual cases where considerable embrittlement has occurred in welded joints after about 30,000 - 40,000 hours and temperatures above 250°C. (Source: *Brücken 1997*).

The new Lean Duplex steels without molybdenum perform significantly better at the recommended maximum service temperature. Lean duplex steels with little or no molybdenum still remain sufficiently tough, even after 50 hours with temperature influence up to over 950°C. Currently, a research project is investigating details of the temperature or strip resistance.

*6 Value in brackets for factory specification ArcelorMittal Stainless Steel Europe Print 2009 (Aperam), compared to the value from EN 10088-1.

*7 Small amounts of ferrite and / or martensite lead to an increase in magnetisability when cold formed, slightly magnetic after cold forming.

$$r = (4,2 - A_0/10) \cdot t$$

r = Minimum inner radius


A_0 = Minimum elongation at break in % (unconsolidated)

t = Sheet thickness or diameter of round bars

Chemical properties

Chemical components stainless steel



Material no.	Analysis ^{*1}													Effective sum (WS) ^{*4} International „PRE“ Standard range ranking for pitting / crevice corrosion
	Short name DIN		C	Si	Mn	P	S	Cr	Mo	Ni	N	Cu	Sonstige	
		%	%	%	%	%	%	%	%	%	%	%	%	
		From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	From to / max.	
1.4062	X2CrNi22-2		0,03	1,00	2,00	0,04	0,01	21,5-24,0	≤ 0,45	1,00-2,90	0,16-0,28	-	-	25 - 30
1.4162	X2CrMnNiN21-5-1		0,04	1,00	4,0-6,0	0,04	0,015	21,0-22,0	0,10-0,80	1,35-1,90	0,20-0,25	0,10-0,80	-	25 - 29
1.4482	X2CrMnNiMoN21-5-3		0,03	1,00	4,0-6,0	0,035	0,03	19,5-21,5	0,10-0,60	1,50-3,50	0,05-0,20	1,00	-	21 - 27
1.4362	X2CrNiN23-4		0,03	1,00	2,00	0,035	0,015	22,0-24,0	0,10-0,60	3,50-5,50	0,05-0,20	0,10-0,60	-	23 - 29
1.4637	New, currently no indication		0,02	k. A.	≤ 2,5	k. A.	k. A.	19,0-22,0	0,6-1,4	2,0-4,0	0,14-0,24	0,40	-	23 - 30
1.4662	X2CrNiMnMoCuN24-4-3-2		0,03	0,70	2,5-4,0	0,035	0,005	23,0-25,0	1,0-2,0	3,0-4,5	0,20-0,30	0,10-0,80	-	30 - 36
1.4462	X2CrNiMoN22-5-3		0,03	1,00	2,00	0,035	0,015	21,0-23,0	2,50-3,50	4,50-6,50	0,10-0,22	-	-	31 - 38
1.4410	X2CrNiMoN25-7-4		0,03	1,00	2,00	0,035	0,015	24,0-26,0	3,0-4,5	6,0-8,0	0,24-0,35	-	-	38 - 46
1.4501	X2CrNiMoCuWN25-7-4		0,03	1,00	1,00	0,035	0,015	24,0-26,0	3,0-4,0	6,0-8,0	0,20-0,30	0,50-1,0	W: 0,50-1,00	38 - 46
1.4507	X2CrNiMoCuN25-6-3		0,03	0,70	2,00	0,035	0,015	24,0-26,0	3,0-4,0	6,0-8,0	0,20-0,30	1,00-2,50	-	37 - 44
1.4658	X2CrNiMoCoN28-8-5-1		0,03	0,50	1,50	0,035	0,01	26,0-29,0	4,0-5,0	5,5-9,5	0,3-0,5	1,0	Co: 0,50-2,00	44 - 54
1.4003	X2CrNi12		0,03	1,00	1,50	0,04	0,015	10,5-12,5	-	0,30-1,00	0,030	-	-	11 - 13
1.4512	X2CrTi12		0,03	1,00	1,00	0,04	0,015	10,5-12,5	-	-	-	-	Ti [6 x (C+N)] up to 0,65 ^{*2}	11 - 13
1.4016	X6Cr17		0,08	1,00	1,00	0,04	0,015 ^{*1}	16,0-18,0	-	-	-	-	-	16 - 18
1.4310	X10CrNi18-8		0,05-0,15	2,00	2,00	0,045	0,015	16,0-19,0	≤ 0,80	6,00-9,50	0,100	-	-	([16] - 22) ^{*5}
1.4301	X5CrNi18-10		0,07	1,00	2,00	0,045	0,015 ^{*1}	17,5-19,5	-	8,00-10,5	0,100	-	-	18 - 20
1.4307	X2CrNi18-9		0,03	1,00	2,00	0,045	0,015 ^{*1}	17,5-19,5	-	8,00-10,5	0,100	-	-	18 - 20
1.4541	X6CrNiTi18-10		0,08	1,00	2,00	0,045	0,015 ^{*1}	17,0-19,0	-	9,0-12,0	-	-	Ti:5xC up to 0,70	17 - 19
1.4401	X5CrNiMo17-12-2		0,07	1,00	2,00	0,045	0,015 ^{*1}	16,5-18,5	2,00-2,50	10,0-13,0	0,10	-	-	23 - 27
1.4404	X2CrNiMo17-12-2		0,03	1,00	2,00	0,045	0,015 ^{*1}	16,5-18,5	2,00-2,50	10,0-13,0	0,10	-	-	23 - 27
1.4435	X2CrNiMo18-14-3		0,03	1,00	2,00	0,045	0,015 ^{*1}	17,0-19,0	2,50-3,00	12,5-15,0	0,10	-	-	25 - 29
1.4571	X6CrNiMoTi17-12-2		0,08	1,00	2,00	0,045	0,015 ^{*1}	16,5-18,5	2,00-2,50	10,5-13,5	-	-	Ti:5xC up to 0,70	23 - 27
1.4439	X2CrNiMoN17-13-5		0,03	1,00	2,00	0,045	0,015	16,5-18,5	4,0-5,0	12,5-14,5	0,12-0,22	-	-	30 - 35
1.4539	X1NiCrMoCu25-20-5		0,02	0,70	2,00	0,03	0,01	19,0-21,0	4,0-5,0	24,0-26,0	0,15	1,20-2,00	-	32 - 38
1.4529	X1NiCrMoCuN25-20-7		0,02	0,50	1,00	0,03	0,01	19,0-21,0	6,0-7,0	24,0-26,0	0,15-0,25	0,50-1,50	-	39 - 44
1.4547	X1CrNiMoCuN20-18-7		0,02	0,70	1,00	0,03	0,01	19,5-20,5	6,0-7,0	17,5-18,5	0,18-0,25	0,50-1,00	-	39 - 44
1.4828	X15CrNiSi20-12		0,20	1,50-2,50	2,00	0,045	0,015	19,0-21,0	-	11,0-13,0	0,10	-	-	19 - 21
1.4841	X15CrNiSi25-21		0,20	1,50-2,50	2,00	0,045	0,015	24,0-26,0	-	19,0-22,0	0,10	-	-	24 - 26

^{*1} For products to be machined S 0.015-0.030%; long products S ≤ 0.030%; to ensure suitability for welding S 0.008-0.030%; to ensure polishability S ≤ 0.015%.

^{*2} Equivalent: Nb (mass fraction in %) = Zr (mass fraction in %) = 7/4 Ti (mass fraction in %)

^{*3} The decisive factor for corrosion resistance is essentially the chromium ratio! Molybdenum for austenites and nitrogen for duplex steels also increase corrosion resistance.

Higher carbon, phosphorus and sulphur contents, on the other hand, greatly reduce the corrosion resistance. Nickel increases the resistance in acidic environments from 8%, but at the same time leads to an increased risk of stress corrosion cracking with this mass proportion!

^{*4} Effective sum formula WS = %Cr + 3,3 · (%Mo + 0,5 · %W) + x · %N; (Mo ≥ 1,0 %; Austenite/Ferrite: x=0; Duplex: x=16)

The effective sum of a material is always determined as an arithmetic medium from the lowest and highest values of the alloy components resulting from the delivery standard DIN EN 10088 Part 1-3.

The effective sum results calculated in this way are not precise assessments of corrosion resistance, but only a rough guide!

Especially with the manganese-containing Lean Duplex steels, the values are very inaccurate!

The user must also always bear in mind that the exact corrosion resistance as a system property of numerous environmental, surface and material conditions can only ever be determined on an exact application.

This requires a detailed case-related practical investigation.

The Federal Institute for Materials Research and Testing (BAM) in Berlin already has many test results for Lean Duplex steels in certain atmospheric ranges.

Please enquire with us first.

^{*5} Comparable to stainless steel 1.4307/1.4301. The disadvantage in corrosion resistance with the higher carbon content is compensated by the addition of some molybdenum. [...]

Value depending on manufacturer's works.

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