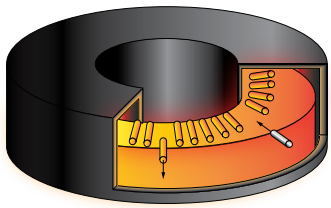
TIMKEN STEEL

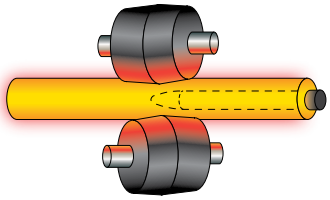
Seamless Mechanical Tubing

Tailored Products for the World's Harshest Conditions

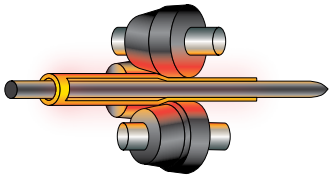
Typical Steel Piercing Path



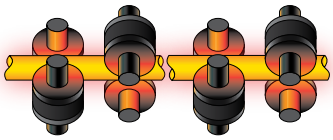
Reheat



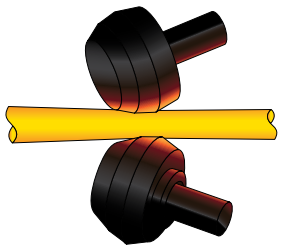
Pierce



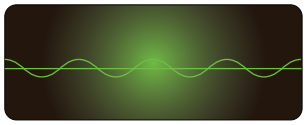
Elongator



Reducing Mill

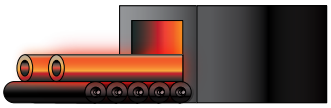


Rotary Sizer

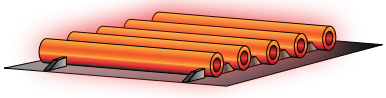


In-Line
Size Gaging

Controlled Furnace Cool

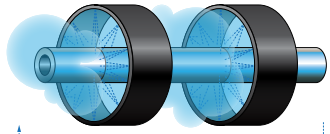


Hot Bed Cool

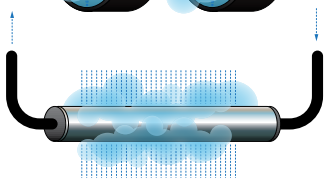


Typical Tube Finishing Path

Austenitize

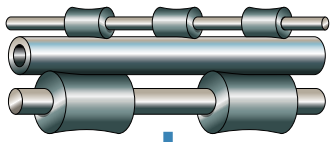


Quench
OD Only

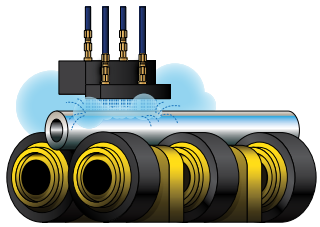


OD & ID

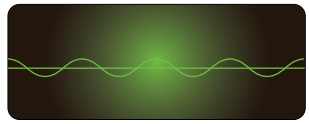
Temper



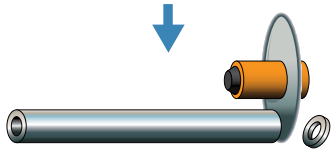
Straighten



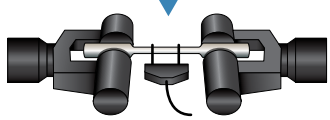
Water Blast



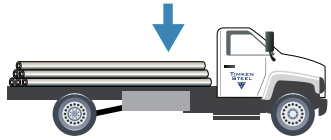
Final Inspect



Cut-off



Testing



Ship

Seamless Mechanical Tubing

We apply our materials and applications expertise to manufacture high-performance seamless mechanical tube products to meet your needs. This includes:

- Carbon, alloy and custom grades
- Annealed, normalized and tempered
- Stress relieved and stress free
- Quench and tempered

We provide tube products that thrive in demanding, high-stress applications. You find these products in automotive components where performance depends on reliability and quality. In addition, you find our tubing for industrial applications – ranging from bearings to cylinders and gears – where toughness is essential for functionality. Oil and gas exploration is another common use for our tubing, where durability and component life is paramount.

We produce tubing close to your finished part size, which makes it very competitive compared to other forging or machining processes. You may also purchase tubes in sizes recommended to clean-up at finished part dimensions, which allows for optimum material utilization. No matter what your application is, we leverage our global capabilities and deep technical expertise to help generate value for you. We use our combination of metallurgy, application engineering and process capabilities to improve your performance. From manufacturing and warehousing to inventory management services, distribution and green and finished components, we offer you the options you need for a competitive edge.

Improved Performance

We also provide a complete line of precision steel components such as cut rings, gear components, finished assembly components and precision-cut tubes.

We offer more than 450 different grades of steel. Our manufacturing flexibility allows us to produce many of these grades in smaller quantities (which we determine at the time you place an order). We can meet American Society for Testing and Materials (ASTM), German Institute for Standardization (DIN), and European Standards (EN) requirements or your specifications.

We provide customers with the highest-quality products and services, as we are an ISO 9001 registered company.

Mining is a common use for our tubing, as our steel thrives in demanding, high-stress environments.

You find our tubing in automotive components where performance depends on reliability and quality.

Our tubing performs well in industrial applications like bearings, cylinders and gears.

Tube Processing

We continually improve the quality of our processes.

Our approach to manufacturing integrates our melting, rolling, piercing and finishing operations, helping to ensure quality control from start to finish. Here is a look at our tubing processes:

Piercing (rotary forging):
Piercing a seamless steel tube is a forging operation in which the metal is worked from the inside as well as the outside. We convert a solid bar into a hollow shell by displacing material over a mandrel during rotary rolling. This process results in a refined grain structure and uniform grain flow.

Subsequent tube-making processes include elongating to reach the desired wall thickness, rolling to achieve the outside diameter, and rotary sizing to round the tube diameter to your final required dimensions. We monitor these operations to produce a tube with uniform properties from the surface through wall and from one end to the other.

Thermal Treatment:
We house multiple thermal treatment facilities that tailor solutions to meet a wide range of customer needs. We also operate two Induction Thermal Treatment Facilities (ITTF), a Continuous Thermal Treatment Facility (CTTF), a Quench Temper Facility (QTF), a Gambrinus Thermal Treat Facility (GTTF) and our newest Advanced Quench-and-Temper Facility (AQTF) in Canton, Ohio. At these facilities, we provide a diverse range of processing options to meet demanding strength and hardness requirements – regardless of the order size. We continue to develop these facilities, advance our capabilities and broaden our sophistication in thermal treatment offerings so you can rely on innovative product designs and proven quality.

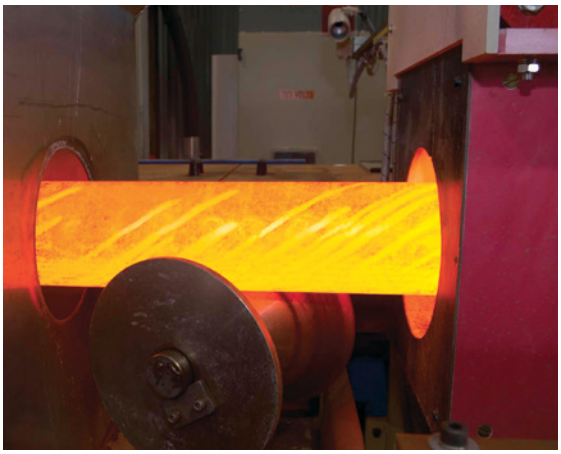
CTTF: Advanced Processes Produce Uniform Results
The CTTF is one of the world's most advanced quench-and-temper operations. From the austenitizing furnace and the quench station to the tempering furnace and five-roll straightener, our automation process allows us to customize properties for customers.

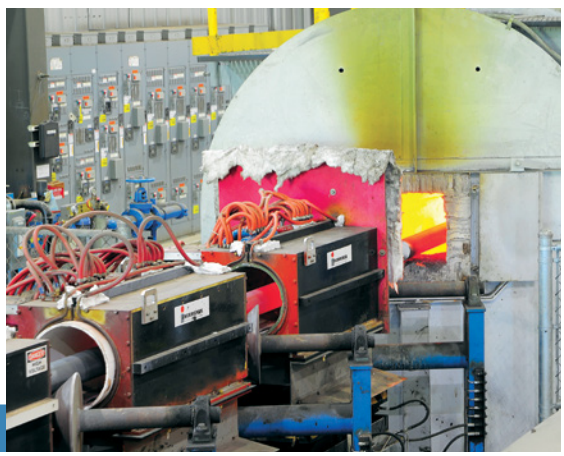
ITTF: Maximum Control Equals Customization
Our ITTF supports customization with highly precise, consistent temperature controls. Such control and efficiency helps ensure that all products - even those for smaller quantities - meet exacting specifications. We built a second ITTF as an all-induction line capable of processing a wider range of O.D. tubes. The facility employs a unique V-shaped roll design that allows product to remain exceptionally straight. The piece-tracking system gathers key parameters at all points of processing.

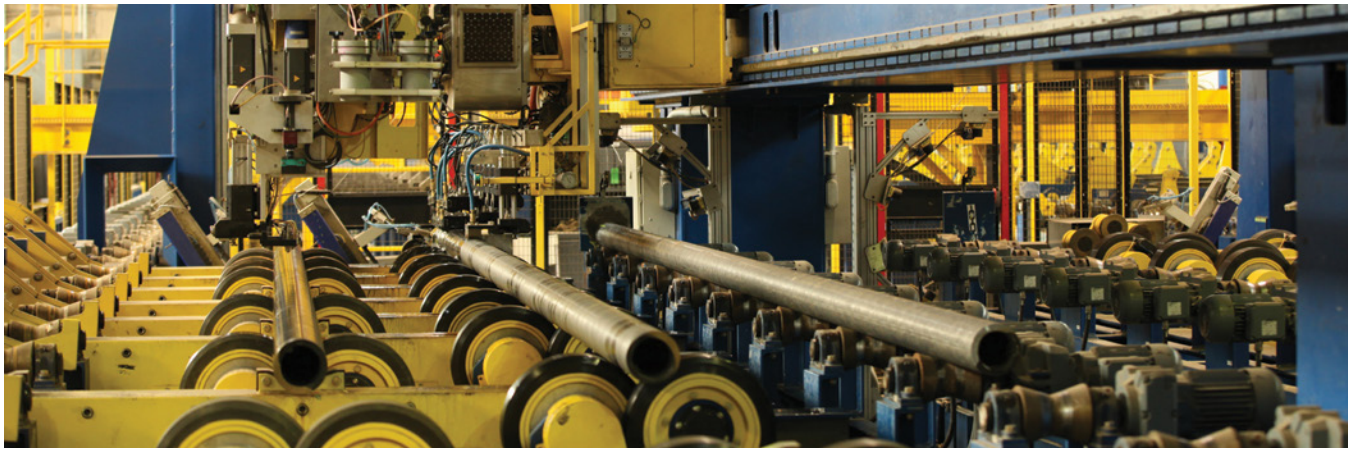
QTF: Combining Strength With Efficiency
In this facility, we efficiently process tubular orders. Our streamlined quench-and-temper operation produces customized product quickly and reliably.

GTTF: Offering Flexibility, Customization
Gas-fired and roller-hearth type furnaces provide flexibility to normalize, stress-relief, anneal and temper on both bar and tube products. Multiple furnaces allow for customization of thermal treat recipes.

AQTF: Increased Capacity for Demanding Needs
The AQTF, the largest of our thermal treatment facilities, can handle 50,000 process tons annually of up to 13-inch (330.2 mm) bars and tubes. With its proprietary, uniform "shell" quench and tight temperature tolerances, this added quench-and-temper capacity especially benefits intensive horizontal and offshore drilling and completion activities.





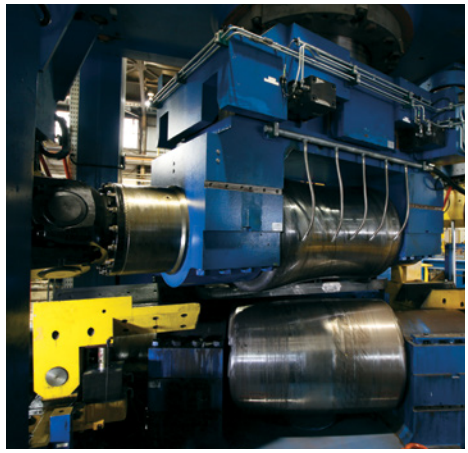


Testing and Finishing

The intermediate finishing line (IFL) in Canton, Ohio, incorporates the latest technologies and employs lean processes. This significantly eliminates product touches and material movements, helping improve lead times.

Our state-of-the-art finishing processes through the IFL include straightening, water blast scale removal, cutting, ultrasonic testing, eddy current testing, and dimensional gauging. Our IFL testing capabilities include hardness, strength, and toughness and cleanness testing to meet your specifications.

The IFL is part of the hundreds of millions of dollars we have invested to provide customers a suite of assets second to none. We are the only company in North America to operate a facility like this for seamless mechanical tubing.



Four Key IFL Benefits

Environmental stewardship: An environmentally friendly water jet de-scaling system replaces the former pickling process. This process uses high-pressure water to remove scale from the tube, resulting in clean tube surfaces. This new technology advances our waste minimization philosophy and approach to quality.

Processing times: In-line testing and finishing operations reduce processing time from days to hours, getting you product quicker. The IFL can finish 13.5 million feet (4,114,800 m) of material each year.

Quality: Automated testing and piece tracking improve our testing efficiency and provide information to help achieve up-stream process improvements. Our water-blast process enhances surface quality by removing surface dirt and mill scale. To help traceability, we also verify piece identity before every operation with 2D bar-coding.

Safety: Our success in significantly eliminating product touches and miles in material movements reinforces our commitment to operate at world-class performance levels. The IFL decreases physical touches by 600,000 per year, crane operations by 300,000 annually, and mobile equipment usage by 60,000 miles (96,560 km) per year.

Hot-Rolled Tube Tolerances

Tube Diameter	Diameter Tolerances for Hot Rolled or Single Thermal Treat	Diameter Tolerances for Quenched and Tempered or Normalized and Tempered (OD and Wall or ID and Wall Dimensions Only)	Tube Wall Tolerances
Up to and including 10.75 inches (273 mm)	inches: T_{OD} = ±(0.0045 OD + 0.005) OR ± 0.015 min. mm: T_{OD} = ±(0.0045 OD + 0.130) OR ± 0.38 min.	inches: T_{OD} = ± 1.5 (0.0045 OD + 0.005) OR ± 0.023 min. mm: T_{OD} = ± 1.5 (0.0045 OD + 0.130) OR ± 0.58 min.	OD to Wall ratio over 10:1 = ± 10% or ± 0.020 inch min. (0.51 mm) OD to Wall ratio of 10:1 or less = ± 7.5% or ± 0.020 inch min. (0.51 mm)
Over 10.75 inches (273 mm) through 12.0 inches (305 mm)	inches: TOD = ± 0.095 mm: TOD = ± 2.41	inches: TOD = ± 0.113	± 10% or ± 0.020 min.
Greater than 12.0 inches (305 mm)	inches/mm: ± 1%	inches/mm: ± 1%	Walls less than 1.5 inch (38 mm) = ± 12.5% Walls 1.5 inch (38 mm) and greater = ± 10.0%

Guaranteed tube sizes are calculated using TimkenSteel tolerances. OD - Outside Diameter ID - Inside Diameter T - Tolerance

Tube Questions and Answers

What grade and quality do you need?
We produce more than 500 grades of steel in quality levels including aircraft, bearing and commercial, consumable electrode vacuum remelt (CV), electric furnace, and Parapremium™.

Does your order require thermal treatment?
We offer the following heat treatments or related combinations: annealed, normalized, quenched and tempered, stress relieved, and tempered.

What quantity do you need?
A minimum order is 10,000 pounds (4.5 t), except for CV, which has a minimum order quantity of 5,000 pounds (2,270 kg). For foot weight over 100 pounds (45 kg) per foot, the minimum order is 20,000 pounds (9.1 t).

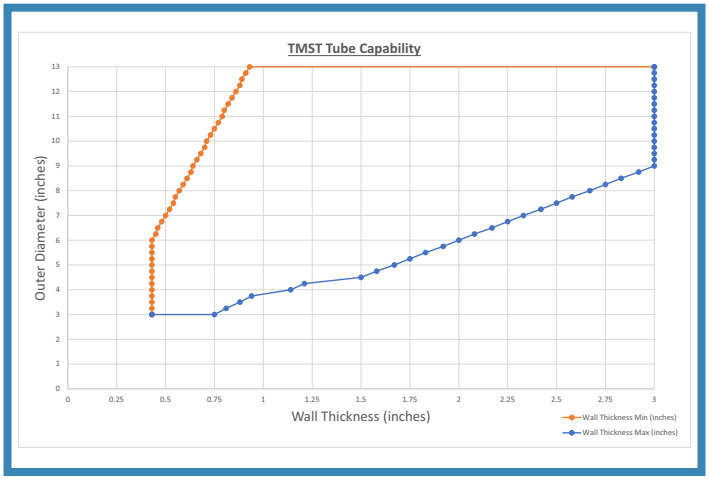
What lengths are most appropriate?
You can order random lengths, multiples or lengths cut to your specifications.

Do you have certain specifications that you require?
We make all our steel to order, so we can meet your specifications.

What tube size do you need?
We can calculate a size based on the size of your finished part and your machining parameters.

What is the machining sequence?
Is the part chucked on the OD or ID? Is it chucked at one or both ends? Your machining sequence affects your optimal tube size recommendation.

What type of clean-up of OD and ID do you need?
Full clean-up is the removal of all surface imperfections (seams, decarb, scale, etc.). See the warranty information on your order acknowledgment sheet. In addition, bright metal clean-up is the removal of the as-supplied surface, but not necessarily the removal of all surface imperfections.



Reliability. Efficiency. TimkenSteel.

Our high-performance steel integrates scientific discipline, supply chain expertise and operating acumen to strengthen customer applications. Contact us today to find out how we can improve your applications and exceed your expectations.

TIMKENSTEEL

Visit **www.timkensteel.com** or call us at 866-284-6536 (USA).