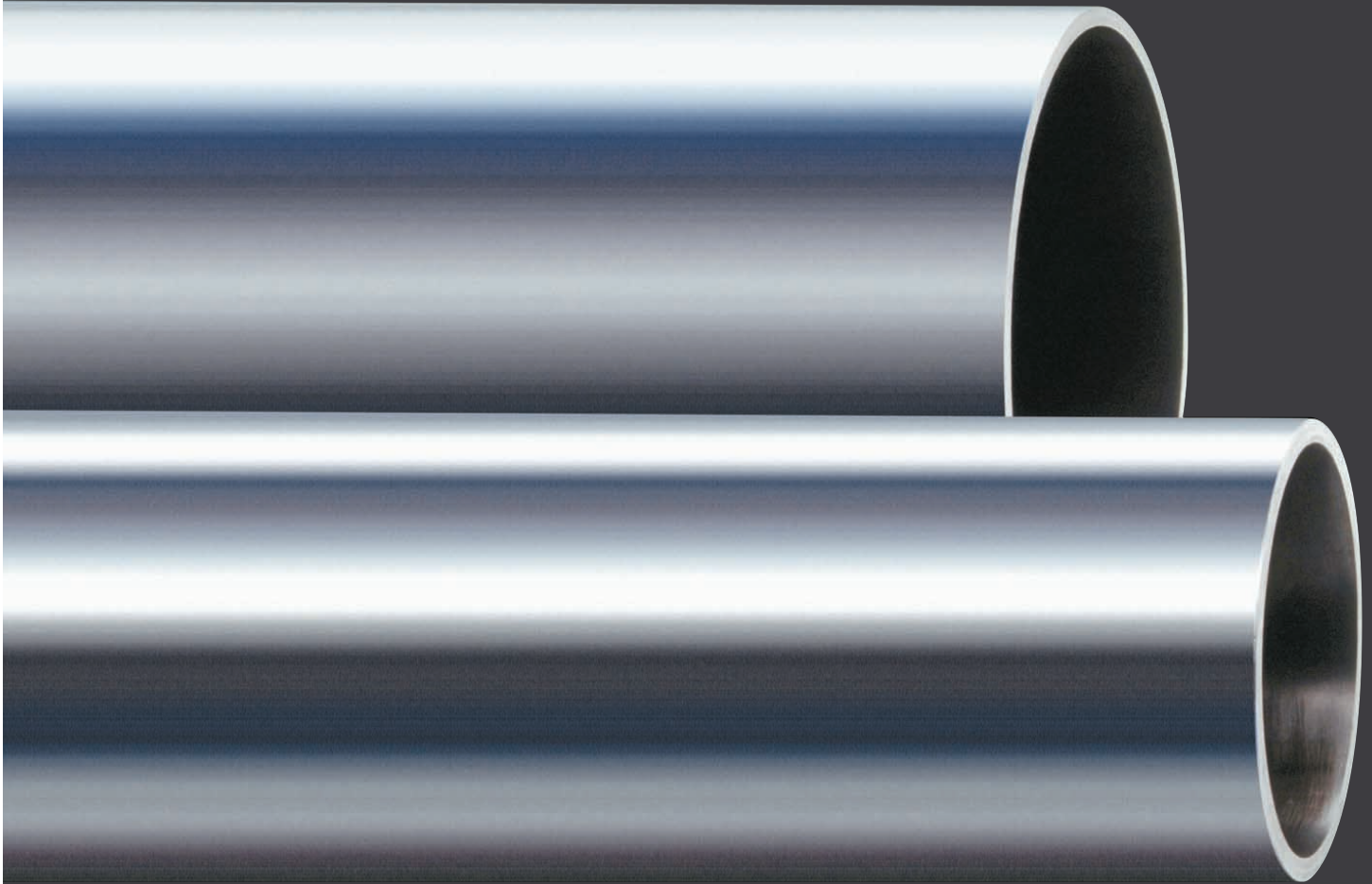


As-Welded Mechanical Steel Tubing

Specifications & Size Ranges

ArcelorMittal Marion



transformingtomorrow



ArcelorMittal

As-Welded Mechanical Steel Tubing Specifications & Size Ranges

Materials and Finishes

The Marion Division of ArcelorMittal manufactures as-welded mechanical tubing in a variety of steel grades to meet and exceed customer requirements. As-welded tubing is offered hot-rolled pickled-and-oiled and cold-rolled. It can be normalized for improved formability.

Our as-welded mechanical product is

produced from carbon steel manufactured to ASTM Specification A513, as well as ASTM/ASME, A/SA 178 and A/SA 214. Carbon steel is cost-effective and provides low to moderate strength and moderate to excellent formability. It also offers generally excellent fabricating qualities such as welding or bending. Typical AISI grades employed include 1006 to 1035.

Also available are high-strength low-alloy (HSLA) grades, which offer a distinct advantage in strength/weight ratio that

can result in reduced section weight and possible lower overall unit costs. Strength levels from 40,000 through 90,000 psi minimum yield strength are available. Micro alloyed products include: 10B21, 15B21 and ST52.3 or E355

Marion as-welded mechanical tubing has excellent surface quality. All tube is continuously stencilled and has a water soluble synthetic rust preventive applied.

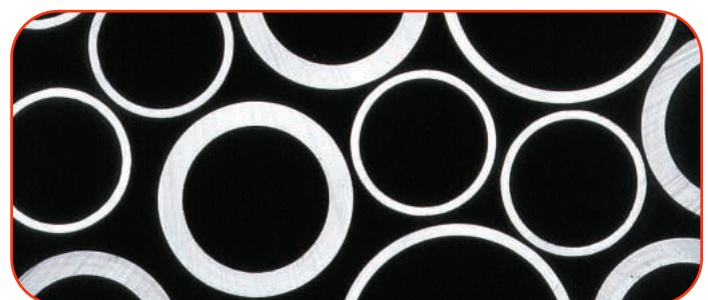
Dimensional Tolerances

DIAMETER TOLERANCES FOR HOT-ROLLED STEEL – ROUND TUBING*			
Outside Diameter	Wall Thickness		Outside Dia. Tolerances Flash-in Tubing and Flash Controlled to .010" or .005" max. (Inches +/-)
	B.W.G.**	Inches	
1 to 1 1/8, incl	16 to 10	.065 to 0.134	.0035
Over 1 1/8 to 2, incl.	16 to 14	.065 to 0.083	.005
Over 1 1/8 to 2, incl.	13 to 7	.095 to 0.180	.005
Over 1 1/8 to 2, incl.	6 to 5	.203 to 0.220	.005
Over 1 1/8 to 2, incl.	4 to 3	.238 to 0.259	.005
Over 2 to 2 1/2, incl.	16 to 14	.065 to 0.083	.006
Over 2 to 2 1/2, incl.	13 to 5	.095 to 0.220	.006
Over 2 1/2 to 3, incl.	16 to 14	.065 to 0.083	.008
Over 2 1/2 to 3, incl.	13 to 5	.095 to 0.220	.008
Over 2 1/2 to 3, incl.	4 to 3	.238 to 0.259	.008
Over 2 1/2 to 3, incl.	2 to 0.320	.284 to .320	.010
Over 3 to 3 1/2, incl.	16 to 14	.065 to .083	.009
Over 3 to 3 1/2, incl.	13 to 5	.095 to .220	.009
Over 3 to 3 1/2, incl.	4 to 3	.238 to .259	.009
Over 3 to 3 1/2, incl.	2 to 0.360	.284 to .360	.012
Over 3 1/2 to 4, incl.	16 to 14	.065 to .083	.010
Over 3 1/2 to 4, incl.	13 to 5	.095 to .220	.010
Over 3 1/2 to 4, incl.	4 to 3	.238 to .259	.010
Over 3 1/2 to 4, incl.	2 to 0.500	.284 to .500	.015
Over 4 to 5, incl.	16 to 14	.065 to .083	.020
Over 4 to 5, incl.	13 to 5	.095 to .220	.020
Over 4 to 5, incl.	4 to 3	.238 to .259	.020
Over 4 to 5, incl.	2 to 0.500	.284 to .500	.020
Over 5 to 6, incl.	16 to 10	.065 to .134	.020
Over 5 to 6, incl.	9 to 5	.148 to .220	.020
Over 5 to 6, incl.	4 to 3	.238 to .259	.020
Over 5 to 6, incl.	2 to 0.500	.284 to .500	.020

*Please contact your sales representative for sizes not listed in this table.
**Birmingham Wire Gauge

DIAMETER TOLERANCES FOR COLD-ROLLED STEEL – ROUND TUBING*			
Outside Diameter	Wall Thickness		Outside Dia. Tolerances Flash-in Tubing and Flash Controlled to .010" or .005" max. (Inches +/-)
	B.W.G.**	Inches	
Over 1 to 1 1/8, Incl.	18	.049	.0035
Over 1 to 1 1/8, Incl.	16 to 14	.065 to .083	.0035
Over 1 to 1 1/8, Incl.	13	.095	.0035
Over 1 to 1 1/8, Incl.	12 to 11	.109 to .120	.0035
Over 1 1/8 to 2, Incl.	22 to 18	.028 to .049	.005
Over 1 1/8 to 2, Incl.	16 to 13	.065 to .095	.005
Over 1 1/8 to 2, Incl.	12 to 10	.109 to .134	.005
Over 2 to 2 1/2, Incl.	16 to 13	.065 to .095	.006
Over 2 to 2 1/2, Incl.	12 to 10	.109 to .134	.006
Over 2 1/2 to 3, Incl.	16 to 13	.065 to .095	.008
Over 2 1/2 to 3, Incl.	12 to 10	.109 to .134	.008
Over 3 to 3 1/2, Incl.	16 to 13	.065 to .095	.009
Over 3 to 3 1/2, Incl.	12 to 10	.109 to .134	.009
Over 3 1/2 to 4, Incl.	16 to 13	.065 to .095	.010
Over 3 1/2 to 4, Incl.	12 to 10	.109 to .134	.010
Over 4 to 6, incl	16 to 13	.065 to .095	.020
Over 4 to 6, incl	12 to 10	.109 to .134	.020

*Please contact your sales representative for sizes not listed in this table.
**Birmingham Wire Gauge





Dimensional Tolerances *(Continued)*

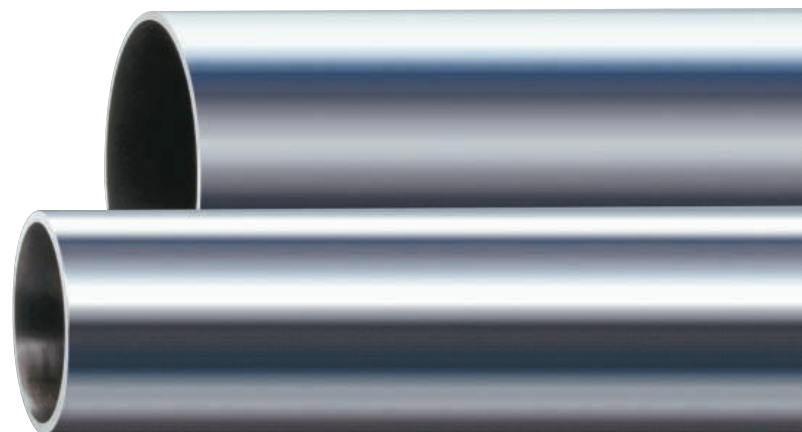
WALL THICKNESS TOLERANCES (INCHES) FOR COLD-ROLLED STEEL - ROUND TUBING									
O.D.		O.D. Over 1" to 1-7/8 Incl.		O.D. Over 1-7/8 to 3-3/4 Incl.		Over 3-3/4 to 5 Incl.		Over 5 to 6 Incl.	
Wall Thickness		Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
B.W.G.*	Inches								
16	.065	.004	.007	.004	.007	.004	.007	.004	.007
14	.083	.004	.007	.004	.007	.004	.007	.004	.008
13	.095	.004	.007	.004	.007	.004	.007	.004	.008
12	.109	.005	.008	.005	.008	.005	.008	.005	.009
11	.120	.006	.008	.005	.008	.005	.008	.005	.009
10	.134	.006	.008	.005	.008	.005	.008	.005	.009

*Birmingham Wire Gauge

WALL THICKNESS TOLERANCES (INCHES) FOR HOT-ROLLED STEEL - ROUND TUBING									
O.D.		O.D. Over 1 to 1-15/16 Incl.		O.D. Over 1-15/16 to 3-3/4 Incl.		O.D. Over 3-3/4 to 4-1/2 Incl.		O.D. Over 4-1/2 to 6 Incl.	
Wall Thickness		Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
B.W.G.*	Inches								
16	.065	.004	.010	.003	.011	.002	.012	.002	.012
15	.072	.004	.010	.003	.011	.002	.012	.002	.012
14	.083	.005	.011	.004	.012	.003	.013	.003	.013
13	.095	.005	.011	.004	.012	.003	.013	.003	.013
12	.109	.005	.011	.004	.012	.003	.013	.003	.013
11	.120	.005	.011	.004	.012	.003	.013	.003	.013
10	.134	.005	.011	.004	.012	.003	.013	.003	.013
9	.148	.006	.012	.005	.013	.004	.014	.004	.014
8	.165	.006	.012	.005	.013	.004	.014	.004	.014
7	.180	.006	.012	.005	.013	.004	.014	.004	.014
6	.203			.007	.015	.006	.016	.005	.017
5	.220			.007	.015	.006	.016	.005	.017
4	.238			.012	.020	.011	.021	.010	.022
3	.259			.013	.021	.012	.022	.011	.023
2	.284			.014	.022	.013	.023	.012	.024
1	.300			.015	.023	.014	.024	.013	.025

*Birmingham Wire Gauge

Marion is capable of closer than standard ASTM A513 tolerances.
Please contact your sales representative for sizes not listed in the table.



As-Welded Mechanical Steel Tubing Specifications & Size Ranges

Round Tubing Size Range

Marion produces round as-welded mechanical tubing with outside diameters ranging from 1" to 6" with wall thicknesses from 0.065" to .313". Tubular Products typically supplies tubing to OD, wall tolerances. Tubular Products can produce to OD/ID or ID/wall tolerances on selected sizes for special applications.

Our range of standard sizes of round as-welded mechanical tubing is shown in the table.

Please contact our inside sales representatives with the details of your inquiry.

Flash Control

Marion provides flash control as follows:

- **Flash-controlled .010" Max.**
Tubing is produced OD and wall in which the height of the cut welding flash is not to exceed .010".
- **Flash-controlled to ±.005" or +0/-.010"**
Please contact your sales representative for more details.
- **Flash-In**
OD sizes 1 1/4" and under are only produced as Flash in.

The height of the inside weld flash can be determined by obtaining the wall measurement at the point of the flash and subtracting the average wall thickness measured at a point other than the weld area. Such measurements should be made with a ball anvil micrometer.

		Wall Th						
OD Roll Sets		Gauge	16	15	14	13	12	11
Inches	mm	Inches	0.065	0.072	0.083	0.095	0.109	0.125
1.000	25.40	*						
1.043	26.49	*						
1.050	26.67	*						
1.181	30.00	*						
1.250	31.75	*						
1.500	38.10							
1.625	41.28							
1.750	44.45							
1.772	45.01							
2.000	50.80							
2.193	55.70							
2.250	57.15							
2.375	60.33							
2.500	63.50							
2.625	66.68							
2.750	69.85							
2.953	75.01							
3.000	76.20							
3.028	76.91							
3.100	78.74							
3.189	81.00							
3.250	82.55							
3.500	88.90							
3.641	92.48							
3.927	99.75							
4.000	101.60							
4.095	104.01							
4.500	114.30							
4.590	116.59							
4.690	119.13							
4.750	120.65							
5.000	127.00							
5.250	133.35							
5.500	139.70							
6.000	152.40							

As-Welded tubing sizes
 Please inquire about these sizes
 All tolerances per ASTM-A513
 Availability with HR P&O or CR steel Please inquire about tighter tolerance availability
 Grades 1006 to 1035, alloy, 10B21, 15B21, St52.3, and HSLA 40XF to 90XF
 FC: + .010/ -0; +0/-.010; +/--.005"; FI=Flash-In
 *FI only

As-Welded Mechanical Steel Tubing Specifications & Size Ranges

Additional Capabilities

Tube Cutting/End Finishing

Marion has some of the most extensive tube cutting capabilities in the industry. Marion's full size range can be cut to length in one of our six cutting centers. Tolerances as close as ± 0.030 " are available. Chamfering and wire brush deburring of OD and ID surfaces are available.

Marion tube mills are equipped with state-of-the-art, cost-effective cut-offs that produce a chamfered tube cut-to-length to a tolerance of ± 0.250 ", for lengths between 15 to 30'.

Thermal Treatment

Normalizing furnaces utilizing an exothermic gas atmosphere, protect the tubing from oxidation and scaling, is used to heat-treat product specified for severe fabrication applications. Normalizing homogenizes the metallurgical structure of the weld zone and base metal.

Stress relieve annealing is available. This is thermally processing the tube below the critical transformation temperature to reduce or remove the residual stress imparted during the tube manufacturing process.

Steel Slitting

Marion has state-of-the-art equipment in-house to slit steel strip to the proper widths and profile to assure maximum weld integrity. This increases production flexibility and helps to maintain reliable manufacturing and shipping schedules.

Cellular

Additional capabilities incorporated as manufacturing cells include:

- Swaging
- NHV damper insertion
- Dry film tube application
- Off line full body NDT
- RP booth
- Rotary straightening

Quality Systems and Testing

Statistical process and quality control techniques are used to maintain superior quality through every step of the manufacturing process. All tubing is subjected to visual, dimensional inspection, destructive testing and non-destructive testing during production. All tubing is NDE tested on the tube mill by UT or Eddy Current. Combined with our ThermaSure weld monitor provides a direct continuous feedback loop.

Marion is certified to ISO 9001 and TS 16949.

Metallurgical Services

The modern testing facilities at Marion can analyze samples of as-welded tubing to assure strict compliance with specifications or to generate information needed to quote new applications. Test and information capabilities include:

• **Mechanical Property Evaluation**

Equipment includes a 120,000 ksi tensile machine equipped with tooling and instrumentation for both tension and compression testing. Historical information is compiled and evaluated to establish the prediction of properties in future applications. A tester is used to determine hardness of strip and tube samples.

• **Metallography/Low-Power Microscopy**

A full range of equipment is available to perform metallography on strip and tube sample. Equipment includes a metallograph to obtain photomicrographs and a stereo micrograph for low-power examination of surface details.

• **Dimensional Testing**

The dimensional analysis of tubing includes surface condition, OD, ID and wall thickness tolerances manually by NDE and CMM.

MECHANICAL TUBING BUSINESS

Contact us at one of the following locations:

132 West Main Street, Shelby, OH 44875-1471
Telephone 800-345-8823 • Fax 800-552-9943

686 West Fairground Street, Marion, OH 43302-1706
Telephone 800-345-8823 • Fax 800-552-9943

tubularproducts@arcelormittal.com
www.arcelormittal.com/tubular



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