



PTC Alliance

Producer of specialty carbon and alloy welded and DOM mechanical tubing

PTC Alliance — a new company, a new name, and a new market focused organization — combines the exceptional strengths of Pittsburgh Tube and Alliance Midwest Tubular Products, bringing new value to every customer. With a new team of commercial specialists, increased manufacturing flexibility, an extended product line, consistent quality, strong applications-engineering support and value-added services, PTC Alliance provides a one-stop shopping option to meet the most stringent requirements of the automotive and truck, steel service center, and OEM markets.



One-Stop Shopping for... Mechanical Steel Tubing and Tubular Shapes, Fabricated Parts and Precision Components

► **Increased Manufacturing Flexibility**

A North American manufacturing network of ten strategically located tube producing plants

► **Extended Product Line**

An extensive tubular size range available throughout North America, with outside diameters (ODs) from .625 to 10.75 inches and walls from .035 to .700 inches

Value added services ranging from cutting and machining to fabricated parts and components

► **Consistent Quality**

ISO 9002 and QS9000 Certified

► **Applications Engineering**

Strong applications-engineering support, providing engineered solutions for improved product design and reduced cost

► **Three Market Focused Commercial Groups**

Dedicated team of commercial specialists for each group—Automotive and Truck, Service Centers, and OEM

► **Employee Ownership**

Significant employee ownership, assuring total dedication to the customer — An ESOP Company

PTC Alliance is a leading manufacturer and marketer of welded and cold drawn mechanical steel tubing and tubular shapes, fabricated parts and precision components. Major markets include steel service centers, automotive and truck, construction and agricultural equipment, machinery and appliances. To optimize service levels for each of these sectors, the company has created three distinct, market-focused commercial groups — Automotive and Truck, Service Centers, and OEM — each with a dedicated team of experienced specialists.

With ten strategically located tube facilities in North America, manufacturing locations are close to the customer, minimizing shipping time and expense. Multiple locations also ensure maximum flexibility in production planning, a major advantage when lead times are particularly short, or customer emergencies arise. Technology sharing among all producing plants, adoption of “best practices” throughout the manufacturing network, and dedicated employee-owners are enabling each operation to become the highest-quality, lowest-cost producer within its tube-manufacturing range.

Because consistent product quality, shipment after shipment, is a major priority for every customer, PTC Alliance has invested heavily in the

development and implementation of a Quality System designed to provide that consistency, while ensuring full compliance with ISO 9002 and QS 9000 requirements.

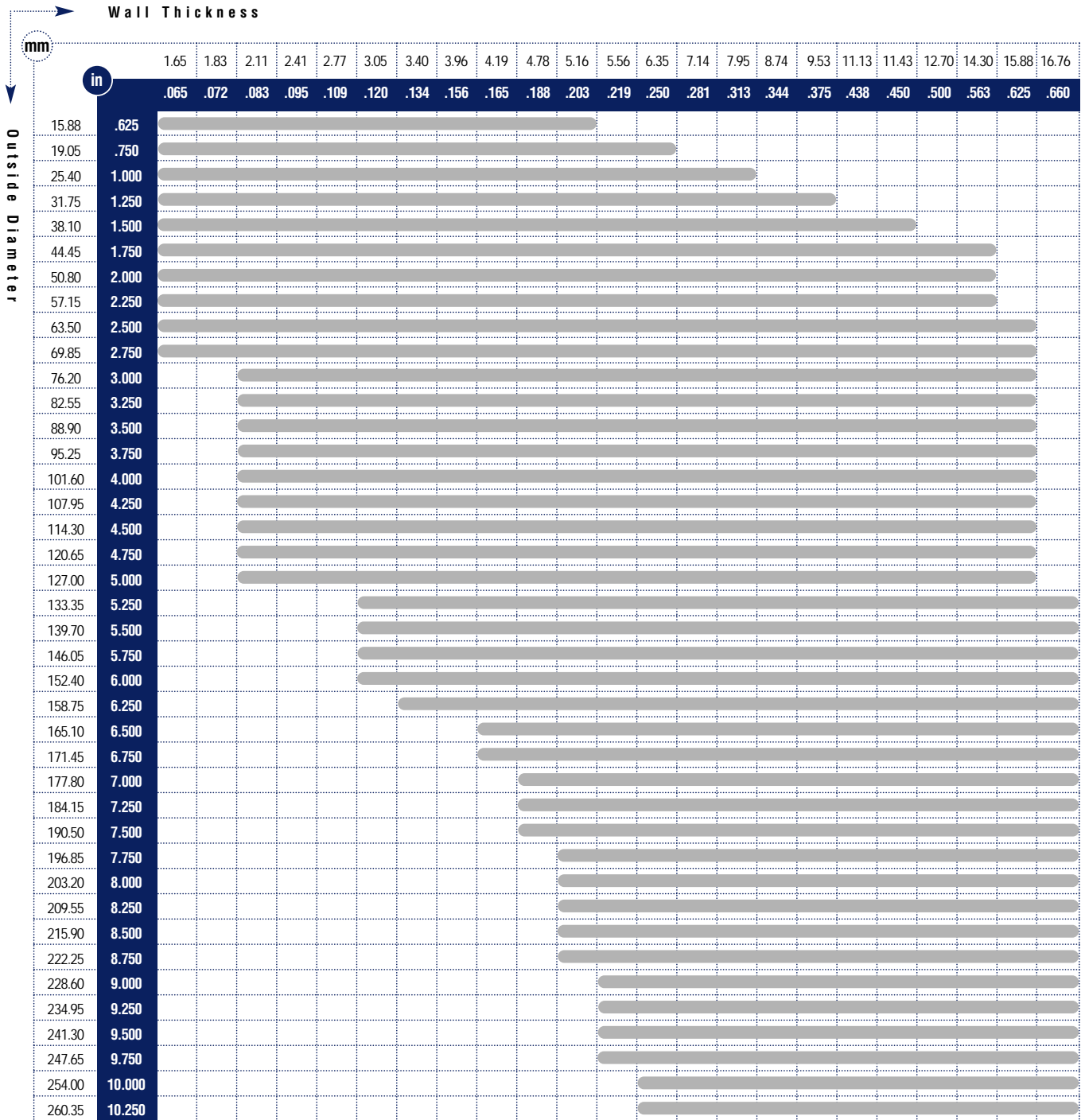
Tubing products produced in North America include: high-quality ERW tubing, ERW hot stretched reduced (HSR) tubing, drawn-over-mandrel (DOM) tubing, 512 PLUS mechanical tubing, and fabricated tubular parts. Through the integration of all North American manufacturing facilities, mechanical steel tubing is now available in sizes ranging from outside diameters of .625 inches to 10.75 inches, and walls from .035 inches to .700 inches.

Comprehensive capabilities in finishing and fabricating are also a company hallmark, and the PTC Alliance Value added Parts and Components Group can provide additional metalworking services — from single parts to partial or complete assemblies — that can shorten lead time, improve product quality, reduce inventory and provide measurable cost savings.

Engineering solutions for some of today’s most demanding manufacturing challenges is business as usual at PTC Alliance, where an ongoing commitment to customer satisfaction is shared by every engineer, every operator, and every sales and customer service representative.

DOM

DOM Size Range



Additional sizes available upon request.

DOM: Common Grades

Chemistry											
		1008	1010	1020	1026	ST52.3	ATP90	Impact 620	1035	1526	4130
Chemical Analysis %	Carbon	0.10 max.	0.08-0.13	0.17-0.23	0.22-0.28	0.12-0.17	0.12-0.17	0.10-0.16	0.31-0.38	0.22-0.29	0.28-0.33
	Manganese	0.25-0.50	0.30-0.60	0.30-0.60	0.60-0.90	1.20-1.60	1.20-1.60	1.20-1.60	0.60-0.90	1.10-1.40	0.40-0.60
	Phosphorus, max	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
	Sulphur, max	0.015	0.015	0.015	0.015	.010	.010	.010	0.015	0.015	0.015
	Silicon					0.15-0.30	0.15-0.30	0.15-0.30	0.15-0.30	0.15-0.30	0.15-0.35
	Chromium										0.80-1.10
	Molybdenum										0.15-0.25
	Vanadium							0.06-0.10			
Standard Mechanical Properties* (Min.)	As Drawn										
	Yield Strength, Ksi (Mpa)	50 (345)	50 (345)	60 (414)	70 (483)						
	Tensile Strength, Ksi (Mpa)	60 (414)	60 (414)	70 (483)	80 (552)						
	Elongation (% in 2" or 50mm)	5	5	5	5						
	Hardness Rb	73	73	80	85						
	Drawn and Stress Relieved										
	Yield Strength, Ksi (Mpa)	45 (310)	45 (310)	55 (379)	65 (448)	75 (517)	90 (621)	90 (621)	75 (517)	85 (586)	80 (552)
	Tensile Strength, Ksi (Mpa)	55 (379)	55 (379)	65 (448)	75 (517)	85 (586)	100 (690)	100 (690)	85 (586)	95 (655)	90 (621)
	Elongation (% in 2" or 50mm)	12	12	10	10	18	15	15	10	15	10
	Hardness Rb	68	68	75	80	85	92	92	85	90	87

* Inquire about other guaranteed minimum properties.

** PTC Alliance purchases the finest quality steel from approved vendors that make every effort to control both internal soundness and surface quality. Steel is purchased specifically for suitability to the ERW tube making process. Strand cast quality with additional control on inclusion morphology and/or frequency are required for tubular products. This does not preclude the presence of inclusions that are normal to the steel making process.

DOM: Tolerances

DOM OD and ID Tolerances										
Outside Diameter Range		Wall, % of OD	OD				ID			
			Over		Under		Over		Under	
in	mm		in	mm	in	mm	in	mm	in	mm
Up to 1.699	up to 43.15	All	.005	.127	.000	.000	.000	.000	.005	.127
1.700-2.099	43.18-53.31	All	.006	.152	.000	.000	.000	.000	.006	.152
2.100-2.499	53.34-63.47	All	.007	.178	.000	.000	.000	.000	.007	.178
2.500-2.899	63.50-73.63	All	.008	.203	.000	.000	.000	.000	.008	.203
2.900-3.299	73.66-83.79	All	.009	.229	.000	.000	.000	.000	.009	.229
3.300-3.699	83.82-93.95	All	.010	.254	.000	.000	.000	.000	.010	.254
3.700-4.099	93.98-104.11	All	.011	.279	.000	.000	.000	.000	.011	.279
4.100-4.499	104.14-114.27	All	.012	.305	.000	.000	.000	.000	.012	.305
4.500-4.899	114.30-124.43	All	.013	.330	.000	.000	.000	.000	.013	.330
4.900-5.299	124.46-134.59	All	.014	.356	.000	.000	.000	.000	.014	.356
5.300-5.549	134.62-140.94	All	.015	.381	.000	.000	.000	.000	.015	.381
5.550-5.999	140.97-152.37	All	.009	.229	.009	.229	.009	.229	.009	.229
6.000-6.499	152.40-165.07	All	.010	.254	.010	.254	.010	.254	.010	.254
6.500-6.999	165.10-177.77	All	.012	.305	.012	.305	.012	.305	.012	.305
7.000-7.499	177.80-190.47	All	.013	.330	.013	.330	.013	.330	.013	.330
7.500-7.999	190.50-203.18	All	.015	.381	.015	.381	.015	.381	.015	.381
8.000-8.499	203.20-215.88	All	.016	.406	.016	.406	.016	.406	.016	.406
8.500-8.999	215.90-228.58	All	.017	.432	.017	.432	.017	.432	.017	.432
9.000-9.499	228.60-241.28	All	.019	.483	.019	.483	.019	.483	.019	.483
9.500-9.999	241.30-253.98	All	.020	.508	.020	.508	.020	.508	.020	.508
10.000-10.250	254.00-260.35	All	.022	.559	.022	.559	.022	.559	.022	.559

Additional Ovality Table	
OD Range	Add'l Ovality Tolerances
OD up to 2"	.010"
OD over 2" to 3"	.015"
OD over 3" to 4"	.020"
OD over 4" to 5"	.025"
OD over 5" to 6"	.030"
OD over 6" to 7"	.035"
OD over 7" to 8"	.040"
OD over 8" to 9"	.045"
OD over 9" to 10"	.050"
OD over 10"	.055"

* Ovality shall be within the tolerances, except when the wall thickness is less than 3% of the OD.

Source: ASTM Standards - A513.

When the wall thickness is less than 3% of the OD, an additional ovality tolerance is required. The additional ovality shall be as indicated in the additional ovality table; however, mean OD or ID must be within the minimum and maximum permitted by the tolerance table.

Standard Mill Cut-to-Length Tolerances		
OD Size Inches	At least 48 inches but under 10 feet	10 feet to 24 feet
5/8 to 3	+/- 3/64 in.	+/- 1/8 in.
Over 3 to 6	+/- 1/16 in.	+/- 1/8 in.
Over 6 to 9	+/- 1/8 in.	+/- 1/8 in.
Over 9 in.	+/- 1/8 in.	+/- 1/8 in.

For each additional 10' or fraction thereof over 24', an additional allowance of +/- 1/16" should be made.

Closer tolerances for lengths under 4' must be developed for quotation.

Wall Thickness Tolerances (inches)				
Wall Thickness (inches)	OD Size			
	3/8 to 7/8	Over 7/8 to 1-7/8	Over 1-7/8 to 3-3/4	Over 3-3/4
.065	+0.02 -0.02	+0.02 -0.03	+0.03 -0.03	+0.04 -0.05
.083	+0.02 -0.02	+0.02 -0.03	+0.03 -0.03	+0.04 -0.05
.095	+0.02 -0.02	+0.02 -0.03	+0.03 -0.03	+0.04 -0.05
.109	+0.02 -0.03	+0.02 -0.04	+0.03 -0.03	+0.05 -0.05
.120	+0.03 -0.03	+0.02 -0.04	+0.03 -0.03	+0.05 -0.05
.134		+0.02 -0.04	+0.03 -0.03	+0.05 -0.05
.148		+0.02 -0.04	+0.03 -0.03	+0.05 -0.05
.165		+0.03 -0.04	+0.03 -0.04	+0.05 -0.06
.180		+0.04 -0.04	+0.03 -0.05	+0.06 -0.06
.203		+0.04 -0.05	+0.04 -0.05	+0.06 -0.07
.220		+0.04 -0.06	+0.04 -0.06	+0.07 -0.07
.238		+0.05 -0.06	+0.05 -0.06	+0.07 -0.07
.259		+0.05 -0.06	+0.05 -0.06	+0.07 -0.07
.284		+0.05 -0.06	+0.05 -0.06	+0.07 -0.07
.300		+0.06 -0.06	+0.06 -0.06	+0.08 -0.08
.320		+0.07 -0.07	+0.07 -0.07	+0.08 -0.08
.344		+0.08 -0.08	+0.08 -0.08	+0.09 -0.09
.375		+0.12 -0.12	+0.09 -0.09	+0.09 -0.09
.400		+0.12 -0.12	+0.10 -0.10	+0.10 -0.10
.438		+0.14 -0.14	+0.10 -0.10	+0.11 -0.11
.460		+0.16 -0.16	+0.12 -0.12	+0.12 -0.12
.480		+0.18 -0.18	+0.12 -0.12	+0.12 -0.12
.531			+0.13 -0.13	+0.13 -0.13
.563			+0.13 -0.13	+0.13 -0.13
.580			+0.14 -0.14	+0.14 -0.14
.625			+0.16 -0.16	+0.16 -0.16
.650			+0.17 -0.17	+0.17 -0.17

Wall Thickness Tolerances (mm)				
Wall Thickness (mm)	OD Size			
	9.525 to 22.225	Over 22.225 to 47.625	Over 47.625 to 92.250	Over 92.250
1.651	+0.51 -0.51	+0.51 -0.76	+0.76 -0.76	+1.02 -1.27
2.108	+0.51 -0.51	+0.51 -0.76	+0.76 -0.76	+1.02 -1.27
2.413	+0.51 -0.51	+0.51 -0.76	+0.76 -0.76	+1.02 -1.27
2.769	+0.51 -0.76	+0.51 -1.02	+0.76 -0.76	+1.27 -1.27
3.048	+0.76 -0.76	+0.51 -1.02	+0.76 -0.76	+1.27 -1.27
3.404		+0.51 -1.02	+0.76 -0.76	+1.27 -1.27
3.759		+0.51 -1.02	+0.76 -0.76	+1.27 -1.27
4.191		+0.76 -1.02	+0.76 -1.02	+1.27 -1.52
4.572		+1.02 -1.02	+0.76 -1.27	+1.52 -1.52
5.156		+1.02 -1.27	+1.02 -1.27	+1.52 -1.78
5.588		+1.02 -1.52	+1.02 -1.52	+1.78 -1.78
6.045		+1.27 -1.52	+1.27 -1.52	+1.78 -1.78
6.579		+1.27 -1.52	+1.27 -1.52	+1.78 -1.78
7.214		+1.27 -1.52	+1.27 -1.52	+1.78 -1.78
7.620		+1.52 -1.52	+1.52 -1.52	+2.03 -2.03
8.128		+1.78 -1.78	+1.78 -1.78	+2.03 -2.03
8.738		+2.03 -2.03	+2.03 -2.03	+2.29 -2.29
9.525		+3.05 -3.05	+2.29 -2.29	+2.29 -2.29
10.160		+3.05 -3.05	+2.54 -2.54	+2.54 -2.54
11.125		+3.56 -3.56	+2.54 -2.54	+2.79 -2.79
11.684		+4.06 -4.06	+3.05 -3.05	+3.05 -3.05
12.192		+4.57 -4.57	+3.05 -3.05	+3.05 -3.05
13.487			+3.30 -3.30	+3.30 -3.30
14.300			+3.30 -3.30	+3.30 -3.30
14.732			+3.56 -3.56	+3.56 -3.56
15.875			+3.81 -3.81	+3.81 -3.81
16.510			+4.32 -4.32	+4.32 -4.32

DOM: Allowances

Honing Allowances Minimum ID stock allowances for the removal of inside surface imperfections*							
Outside Diameter, Inches	Wall Thickness, Inches						
	Up to .125	Over .125 to .188	Over .188 to .250	Over .250 to .375	Over .375 to .500	Over .500 to .625	Over .625
Up to 3	.006	.007	.008	.009	.010		
Over 3 to 4	.007	.008	.009	.010	.011	.012	.014
Over 4 to 6	.008	.009	.010	.011	.012	.013	.015
Over 6 to 8	.008	.009	.010	.011	.013	.014	.016
Over 8 to 10.750			.011	.012	.013	.015	.017

*For steel grades with over 0.29% carbon, a minimum of 0.015" stock is required for removal of decarburization.
* Allowances are not intended to cover sub-surface steel imperfections such as non-metallic inclusions.*

HONING EXAMPLE #1		HONING EXAMPLE #2	
3.000" OD tube that will clean-up by honing to 2.500/2.497"		6.750" OD tube that will clean-up by honing to 6.000/5.996"	
Step 1: 3.000" OD - 2.497" ID = .503"/2 = .252" nominal wall thickness. Minimum clean-up allowance for removal of ID surface imperfections is .009".		Step 1: 6.750" OD - 5.996" ID = .754"/2 = .377" nominal wall thickness. Minimum clean-up allowance for removal of ID surface imperfections is .013".	
Step 2: Minimum honed size	2.497"	Step 2: Minimum honed size	5.996"
Minus clean-up allowance	<u>.009"</u>	Minus clean-up allowance	<u>.013"</u>
	2.488"		5.983"
Minus possible ID Over tolerance	<u>.000"</u>	Minus possible ID Over tolerance	<u>.012"</u>
Ordered ID size	2.488"	Ordered ID size	5.971"
Step 3: Ordered Tube Size: 3.000" OD (+ .009"/-.000") x 2.488" ID (+ .000"/-.009")		Step 3: Ordered Tube Size: 6.750" OD (+ .012"/-.012") x 5.971" ID (+ .012"/-.012")	

Skiving Allowances Minimum ID stock allowances for the removal of inside surface imperfections*							
Outside Diameter, Inches	Wall Thickness, Inches						
	Up to .125	Over .125 to .188	Over .188 to .250	Over .250 to .375	Over .375 to .500	Over .500 to .625	Over .625
Up to 3	.012	.014	.016	.018	.020		
Over 3 to 4	.013	.015	.017	.019	.021	.024	.026
Over 4 to 6	.014	.016	.018	.020	.022	.025	.027
Over 6 to 8	.016	.018	.020	.022	.024	.026	.028
Over 8 to 10.750			.021	.023	.025	.027	.029

*For steel grades with over 0.29% carbon, a minimum of 0.015" stock is required for removal of decarburization.
* Allowances are not intended to cover sub-surface steel imperfections such as non-metallic inclusions.*

SKIVING EXAMPLE #1		SKIVING EXAMPLE #2	
3.000" OD tube that will clean-up by skiving to 2.500/2.497"		6.750" OD tube that will clean-up by skiving to 6.000/5.996"	
Step 1: 3.000" OD - 2.497" ID = .503"/2 = .252" nominal wall thickness. Minimum clean-up allowance for removal of ID surface imperfections is .018".		Step 1: 6.750" OD - 5.996" ID = .754"/2 = .377" nominal wall thickness. Minimum clean-up allowance for removal of ID surface imperfections is .024".	
Step 2: Minimum skived size	2.497"	Step 2: Minimum skived size	5.996"
Minus clean-up allowance	<u>.018"</u>	Minus clean-up allowance	<u>.024"</u>
	2.479"		5.972"
Minus possible ID Over tolerance	<u>.000"</u>	Minus possible ID Over tolerance	<u>.012"</u>
Ordered ID size	2.479"	Ordered ID size	5.960"
Step 3: Ordered Tube Size: 3.000" OD (+ .009"/-.000") x 2.479" ID (+ .000"/-.009")		Step 3: Ordered Tube Size: 6.750" OD (+ .012"/-.012") x 5.960" ID (+ .012"/-.012")	

Machining Allowances Minimum OD and ID stock allowances for the removal of surface imperfections*

Outside Diameter, Inches	Wall Thickness, Inches				
	Up to .125	Over .125 to .188	Over .188 to .250	Over .250 to .375	Over .375 to .500
Up to 3	.012	.014	.017	.020	.021
Over 3 to 4	.014	.017	.020	.021	.025
Over 4 to 6	.020	.021	.025	.028	.030
Over 6 to 8		.025	.028	.030	.032
Over 8 to 10.750				.034	.035

For steel grades with over 0.29% carbon, a minimum of 0.015" stock is required for removal of decarburization.
 * Allowances are not intended to cover sub-surface steel imperfections such as non-metallic inclusions.

MACHINING EXAMPLE #1 (Based on machining OD and ID in 4" lengths.)

Finished machined size: 4" OD (+0/-0.002") x 3.5" ID (+.002"/-0)

Step 1: 4.000" OD - 3.500" ID = .500"/2 = .250" nominal wall thickness. Minimum clean-up allowance for removal of surface imperfections is .020".

Step 2: Minimum finished OD size	4.000"
Plus clean-up allowance	<u>.020"</u>
	4.020"
Plus possible OD Under tolerance	<u>.000"</u>
Ordered OD size	4.020"

Step 3: Minimum finished ID size	3.500"
Minus clean-up allowance	<u>.020"</u>
	3.480"
Minus possible ID Over tolerance	<u>.000"</u>
Ordered ID size	3.480"

Step 4: Ordered Tube Size:
 4.020" OD (+ .011"/-.000") x 3.480" ID (+ .000"/-.011")

Allowances are based on conventional chucking procedures.

Centerless Grinding Allowances Minimum OD stock allowances for the removal of outside surface imperfections*

Outside Diameter, Inches	Wall Thickness, Inches					
	Up to .125	Over .125 to .180	Over .180 to .230	Over .230 to .360	Over .360 to .460	Over .460
Up to 3 Incl	.012	.014	.016	.020	.024	.026
Over 3 to 4-3/4 Incl	.016	.018	.020	.022	.024	.026
Over 4-3/4 to 6 Incl	.018	.020	.022	.024	.026	.028
Over 6 to 7 Incl	.020	.022	.024	.026	.028	.030
Over 7 to 8 Incl			.026	.027	.029	.031
Over 8			.027	.028	.030	.032

For steel grades with over 0.29% carbon, a minimum of 0.015" stock is required for removal of decarburization.
 * Allowances are not intended to cover sub-surface steel imperfections such as non-metallic inclusions.

CENTERLESS GRINDING EXAMPLE #1

OD to be centerless ground to 4.000/3.996" x 3.500" ID.

Step 1: 4.000" OD - 3.500" ID = .500"/2 = .250" nominal wall thickness. Minimum clean-up allowance for removal of OD surface imperfections is .022".

Step 2: Minimum finished OD size	4.000"
Plus clean-up allowance	<u>.022"</u>
	4.022"
Plus possible OD Under tolerance	<u>.000"</u>
	4.022"

Step 3: Ordered Tube Size:
 4.022" OD (+ .011"/-.000") x 3.500" ID (+ .000"/-.011")
 with a referenced wall thickness of .257".

CENTERLESS GRINDING EXAMPLE #2

OD to be centerless ground to 6.750/6.745" x 6.000" ID.

Step 1: 6.750" OD - 6.000" ID = .750"/2 = .375" nominal wall thickness. Minimum clean-up allowance for removal of OD surface imperfections is .028".

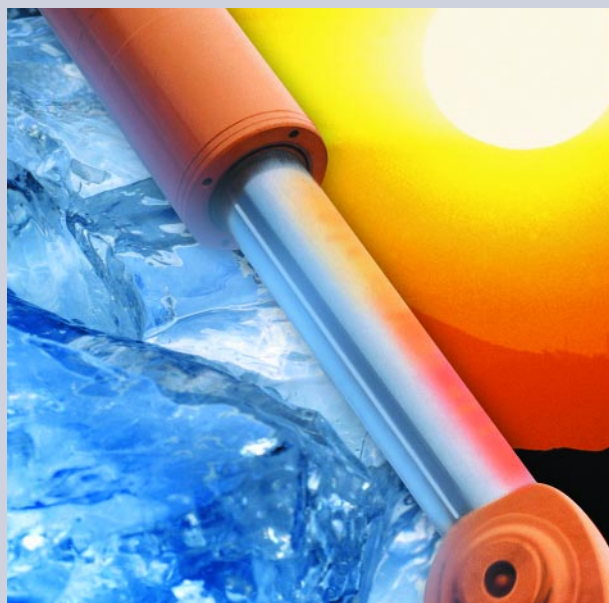
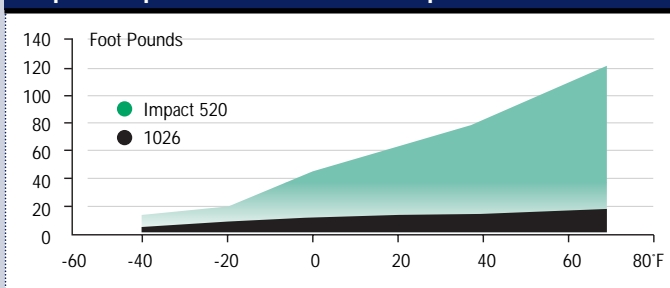
Step 2: Minimum finished OD size	6.750"
Plus clean-up allowance	<u>.028"</u>
	6.778"
Plus possible OD Under tolerance	<u>.012"</u>
Ordered OD size	6.790"

Step 3: Ordered Tube Size:
 6.790" OD (+ .012"/-.012") x 6.000" ID (+ .012"/-.012")
 with a referenced wall thickness of .390".

Impact DOM

- Impact DOM mechanical tubing is manufactured from ERW hollows and cold drawn through a die and over a mandrel, improving surface finish, mechanical properties and dimensional accuracy of both outside and inside diameters.
- Impact 520 exhibits impact values almost 12 times better than 1026 at room temperature, and at -4° F provides approximately a nine-fold improvement. This advantage is especially beneficial in low-temperature and other extreme conditions.
- Impact 620, a micro-alloy grade, meets challenges of the most severe operating environments, where both increased strength and toughness are critical.
- ATP 90, another PTC Alliance exclusive, applies a different process to the 520 chemistry to achieve higher mechanical properties for applications in which reduced weight and increased strength are important.

Impact Properties Grade 1026 vs. Impact 520



Typical Mechanical Properties (Minimum Values)						
	Yield Strength		Tensile Strength		% Elongation	RB
	KSI	N/mm	KSI	N/Mpa		
IMPACT 520	75	517	85	585	18	85
ATP90	90	621	100	690	15	92
IMPACT 620	90	621	100	690	15	92
1026*	65	448	75	517	10	80

* Shown for reference only

Guaranteed Impact Values (upon request) Impacts at -20°C (-4°F)					
	Size (mm x mm)	Avg. of 3		Min. Value	
		Ft.#'s	Joules	Ft.#'s	Joules
IMPACT 520	10 x 10	20	27	10	14
	10 x 7.5	16	22	10	14
	10 x 6.6	14.8	20	5	7
	10 x 5.0	12	16	5	7

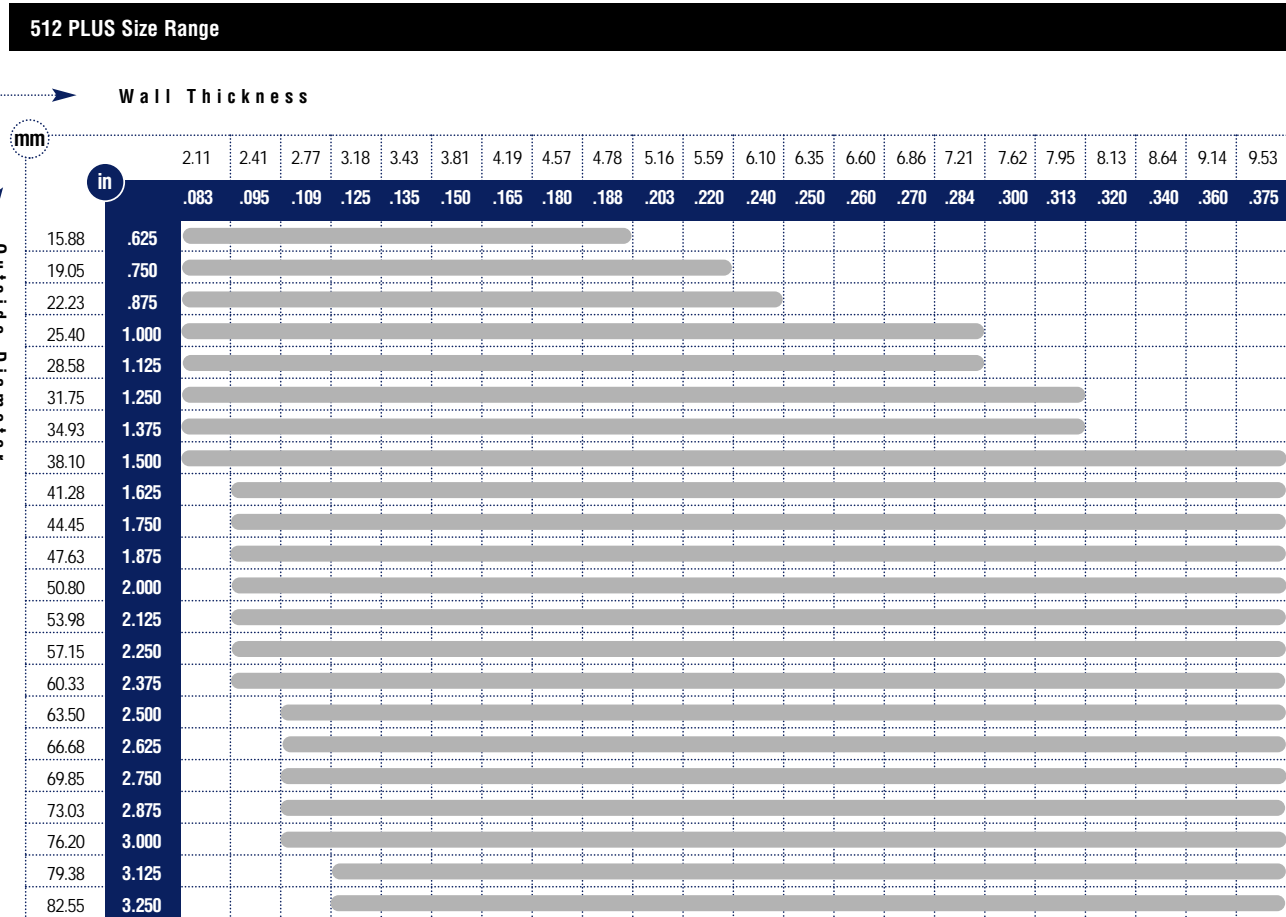
ATP 90 and 1026 are not available with guaranteed impact values

Typical Impact Values					
	Size (mm x mm)	Avg. of 3		Min. Value	
		Ft.#'s	Joules	Ft.#'s	Joules
IMPACT 620	10 x 10	10	13.5	8	11
	10 x 7.5	8	10.8	6	8
	10 x 6.6	7.4	10	5.5	7
	10 x 5.0	6	8.1	4.5	6

Guaranteed values to be developed at time of inquiry.

512 PLUS Mechanical Tubing

The most economical ERW cold drawn tubing currently available, 512 PLUS, is an excellent choice for applications including rocker shafts, water pump bearings, bushings, spacers, tie rods, torque rods, suspension parts, tine tubes and axle tubes. Manufactured from an ERW tube or hot stretch reduced tube hollow and produced to the mechanical, physical and chemical requirements of ASTM A-512, this product combines all of the economies of buttweld tubing with the qualities of ERW tubing. It is usually mandrel-drawn to improve surface finish, mechanical properties and dimensional accuracy of inside and outside diameters.



Additional intermediate sizes on request

512 PLUS Rounds Tolerances

(Includes ovality)

Outside Diameter	in			
	OD	ID	Wall	
.500-1.499	.005	.005	± 7%	
over 1.499	.010	.010	± 7%	

Outside Diameter	mm			
	OD	ID	Wall	
12.70-38.08	.127	.127	± 7%	
over 38.08	.254	.254	± 7%	

512 PLUS Machining Tolerances

Outside Diameter	Wall Thickness		
	in	mm	
.500-1.499	.083-.199	.020	.025
	over .199	.025	.030
12.70-38.07	2.11-5.05	.508	.635
	over 5.05	.635	.762

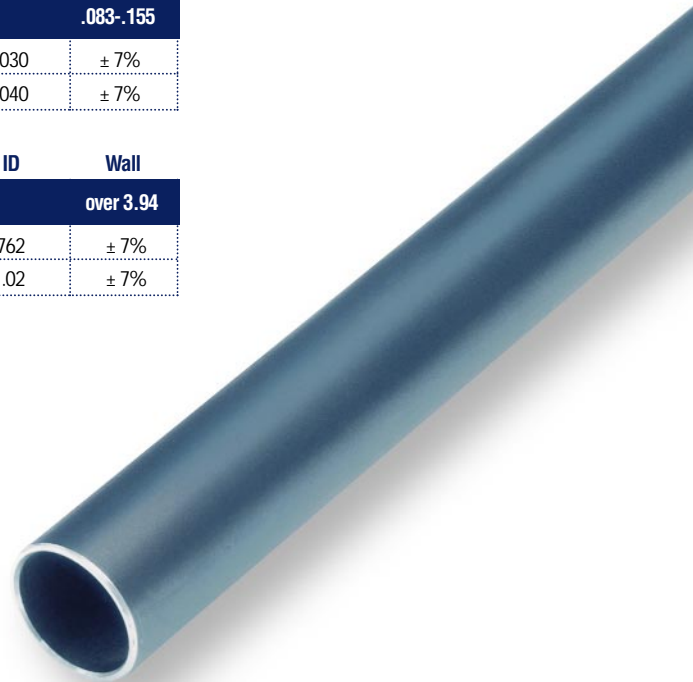
512 PLUS Square and Rectangular Tolerances

Outside Diameter	Wall Thickness			Wall Thickness		
	in	mm		in	mm	
.750-1.250	.083-.155	.030	± 10%	.083-.155	.030	± 7%
	1.251-2.500	.040	± 10%	over .155	.040	± 7%
19.05-31.75	2.11-3.94	.762	± 10%	over 3.94	.762	± 7%
	31.76-63.50	1.02	± 10%	over 3.94	1.02	± 7%

512 PLUS Twist Tolerances

Outside Diameter	in	
	Allowable Twist/3ft.	
.500-1.500	.075	
1.501-2.500	.095	

Outside Diameter	mm	
	Allowable Twist/.914m	
12.70-38.10	1.91	
38.13-63.50	2.41	



ERW-Direct Weld

ERW Size Range for Round Tubes

		Steel Gage (BWG) and Nominal Wall Thickness																									
		GAGE: 20 19 18 16 14 13 12 11 10 9 8 7																									
mm	in	.89	1.07	1.24	1.65	2.11	2.41	2.77	3.03	3.40	3.76	4.19	4.57	5.33	5.84	6.35	7.11	7.62	8.89	10.4	12.3	14.3	15.8	16.8	17.3	17.8	
		.035	.042	.049	.065	.083	.095	.109	.120	.134	.148	.165	.180	.210	.230	.250	.280	.300	.350	.410	.485	.565	.625	.660	.680	.700	
19.05	.750																										
20.62	.812																										
22.23	.875																										
23.80	.937																										
25.40	1.000																										
28.58	1.125																										
31.75	1.250																										
33.32	1.312																										
34.93	1.375																										
38.10	1.500																										
39.67	1.562																										
41.28	1.630																										
44.45	1.750																										
47.63	1.875																										
48.26	1.900																										
50.80	2.000																										
53.98	2.125																										
57.15	2.250																										
60.33	2.375																										
63.50	2.500																										
69.85	2.750																										
73.03	2.875																										
76.20	3.000																										
82.55	3.250																										
85.73	3.375																										
88.90	3.500																										
101.60	4.000																										
114.30	4.500																										
120.65	4.750																										
127.00	5.000																										
139.70	5.500																										
168.27	6.625																										
190.49	7.500																										
219.07	8.625																										
244.47	9.625																										
273.04	10.750																										

Steel available for use:

SAE 1008 through 1035
 High Strength Low Alloy (HSLA)
 Boron Treated

Mechanical Properties:

Reference ASTM-A-513 Type 1 Table S5.1

Diameter Tolerances:

Reference ASTM-A-513 Type 1 Table 4

Wall Tolerances:

Reference ASTM-A-513 Type 1 Table 6

ERW Size Range for Square Tubes

		Wall Thickness							
		GAUGE: 20 19 18 16 14 13 12 11							
mm	in	889	1.07	1.24	1.65	2.11	2.41	2.77	3.05
		.035	.042	.049	.065	.083	.095	.109	.120
15.87	5/8" Square	[Shaded]							
19.05	3/4" Square	[Shaded]							
20.64	13/16" Square	[Shaded]							
22.23	7/8" Square	[Shaded]							
25.40	1" Square	[Shaded]							
31.75	1-1/4" Square	[Shaded]							
38.10	1-1/2" Square	[Shaded]							
50.80	2" Square	[Shaded]							

Additional dimensions on request

ERW Size Range for Rectangle Tubes

		Wall Thickness							
		GAUGE: 20 19 18 16 14 13 12 11							
mm	in	889	1.07	1.24	1.65	2.11	2.41	2.77	3.05
		.035	.042	.049	.065	.083	.095	.109	.120
12.7 x 25.4	1/2" x 1"	[Shaded]							
19.1 x 25.4	3/4" x 1"	[Shaded]							
12.7 x 38.1	1/2" x 1-1/2"	[Shaded]							
25.4 x 38.1	1" x 1-1/2"	[Shaded]							
25.4 x 50.8	1" x 2"	[Shaded]							

Additional dimensions on request

ERW-Hot Stretch Reduced

Hardness Limits and Tensile Properties by Grade for Hot Stretch Reduced Tubing

Grade	Yield Strength, ksi (Mpa), min.	Tensile Strength, ksi (Mpa), min.	Elongation in 2 in. or 50 mm, %, min.	Hardness max.
1008	23 (159)	38 (262)	30	65 RB
1010	25 (172)	40 (276)	30	65 RB
1015	30 (207)	45 (310)	30	70 RB
1020	35 (241)	50 (345)	25	75 RB
1026	40 (276)	60 (414)	25	85 RB
1030	40 (276)	60 (414)	25	85 RB
1035	45 (310)	65 (448)	20	88 RB
1040	45 (310)	65 (448)	20	90 RB
1524	45 (310)	65 (448)	20	88 RB
4130	50 (345)	70 (483)	20	100 RB

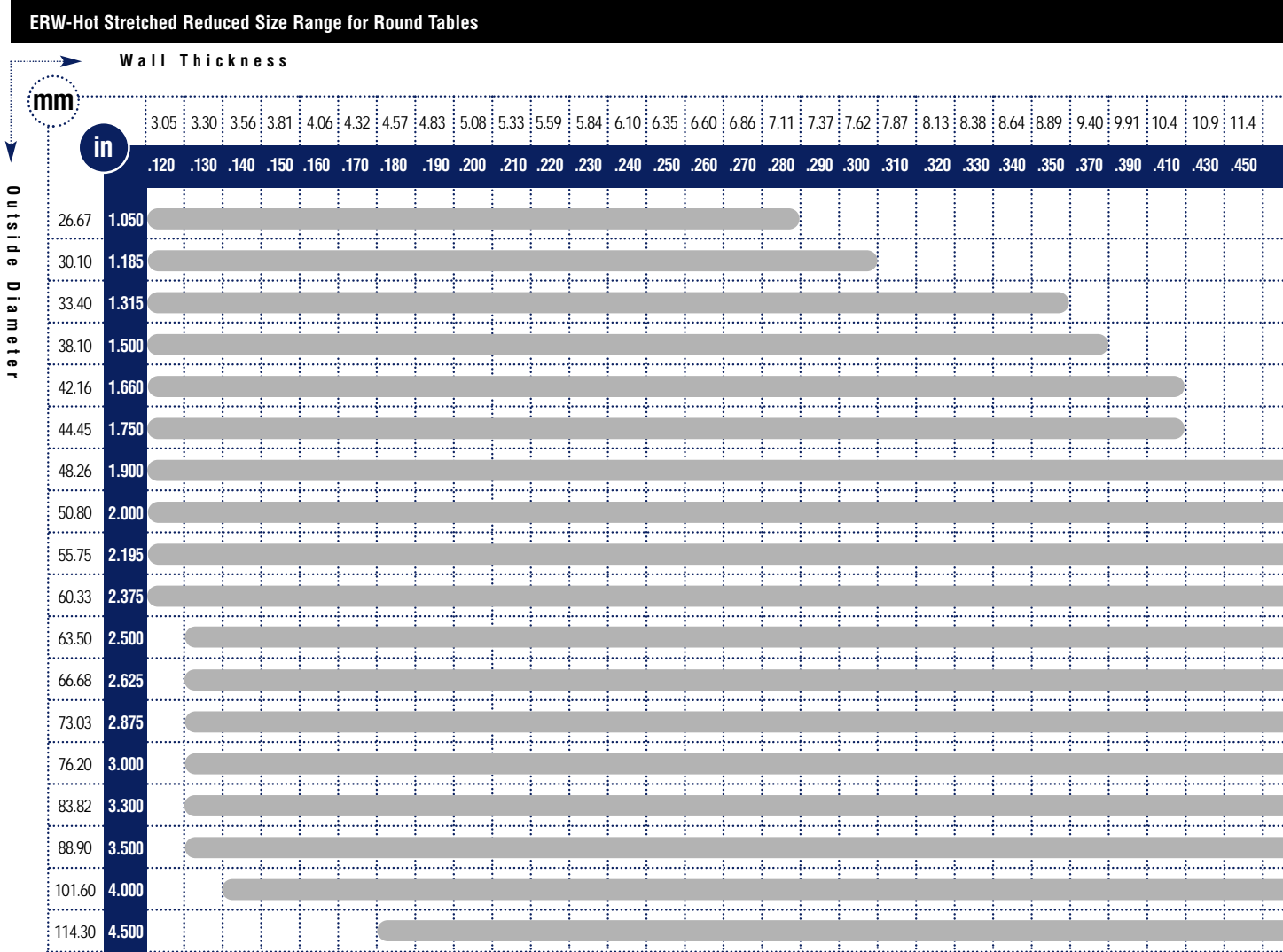
OD Tolerance Hot Stretch Reduced

Outside Diameter Range - Inches	Tolerance	
	in	mm
up to 1.500	+/- .006	+/- .152
1.501-2.000	+/- .008	+/- .203
2.001-2.500	+/- .010	+/- .254
2.501-3.000	+/- .012	+/- .305
3.001-3.500	+/- .015	+/- .381
3.501-4.000	+/- .015	+/- .381
Over 4.000	+/- .020	+/- .508

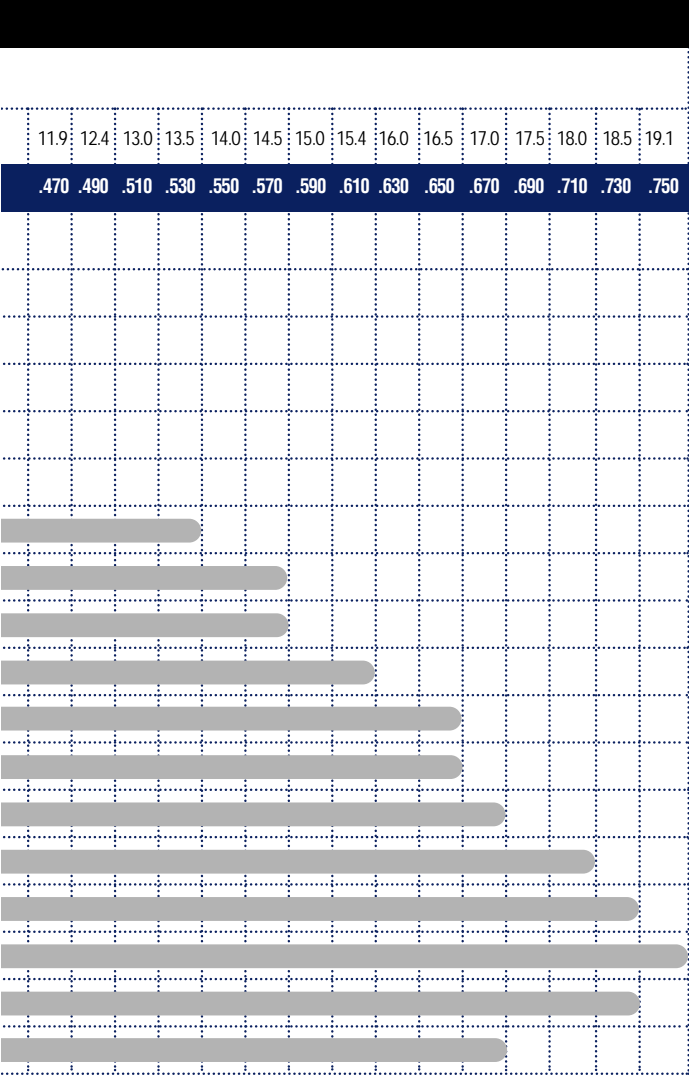
Size Range and Wall Tolerances for Hot Stretch Tubing

Outside Diameter		Tolerances (% + and -) Wall Thickness (inches)								
		.200 to .250	.251 to .300	.301 to .350	.351 to .400	.401 to .450	.451 to .500	.501 to .550	.551 to .600	.601 to .700
in	mm									
1.000 to 1.500	25.40 to 38.10	9%	—	—	—	—	—	—	—	—
1.501 to 2.000	38.13 to 50.80	8%	7%	—	—	—	—	—	—	—
2.001 to 2.500	50.83 to 63.50	8%	7%	7%	7%	6%	6%	—	—	—
2.501 to 3.000	63.53 to 76.20	8%	7%	7%	7%	6%	6%	—	—	—
3.001 to 3.500	76.23 to 88.90	8%	7%	7%	7%	6%	6%	5%	5%	5%
3.501 to 4.000	88.93 to 101.60	8%	7%	7%	7%	6%	6%	5%	5%	5%
4.001 to 4.500	101.63 to 114.30	8%	7%	7%	7%	6%	6%	5%	5%	5%

Hot Stretched Reduced



Inquire for intermediate sizes not shown.





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