

Bar stock

The following tables shows the typical bar stock range available in Europe. Other grades and sizes are available on request. All products are available in imperial sizes, subject to enquiry. From our Bar Finishing operation we can also cut bars to length and pack according to customer requirements. Please contact your local Outokumpu sales representative for further information.

Cold Drawn Round Bar

Available in metric and imperial. Some sizes also available as centreless ground bar.

Typical Length	Diameter (mm)	1.4305 Grade 303	1.4301/1.4307 Grade 304/304L	1.4401/1.4404 Grade 316/316L	1.4162 LDX 2101®
Tolerances					
		ISO h9	ISO h9	ISO h9	ISO h9
3m	5.00	✓	✓	✓	-
3m	6.00	✓	✓	✓	✓
3m	8.00	✓	✓	✓	✓
3m	10.00	✓	✓	✓	✓
3m	12.00	✓	✓	✓	✓
3m	14.00	✓	✓	✓	-
3m	15.00	✓	✓	✓	✓
3m	16.00	✓	✓	✓	✓
3m	18.00	✓	✓	✓	-
3m	20.00	✓	✓	✓	✓
3m	22.00	✓	✓	✓	-
3m	24.00	✓	✓	✓	-
3m	25.00	✓	✓	✓	-
3m	28.00	-	✓	-	-
3m	30.00	✓	✓	✓	-

Typical Length	Diameter (mm)	1.4305 Grade 303	1.4301/1.4307 Grade 304/304L	1.4401/1.4404 Grade 316/316L	1.4162 LDX 2101®
Tolerances					
		ISO h9	ISO h9	ISO h9	ISO h9
3m	6.35	✓	✓	✓	-
3m	7.94	✓	✓	-	✓
3m	9.53	✓	✓	✓	✓
3m	12.70	✓	✓	✓	✓
3m	15.88	✓	✓	✓	✓
3m	19.05	✓	✓	✓	-
3m	22.23	✓	✓	✓	✓
3m	25.40	✓	✓	✓	✓

Peeled Bar

Available in 1 tonne bundles. Some sizes also available as centreless ground bar.

Typical Length	Diameter (mm)	1.4305 Grade 303		1.4301/1.4307 Grade 304/304L		1.4401/1.4404 Grade 316/316L		1.4162 LDX 2101®
Tolerances								
		ISO h8	ISO k11	ISO h8	ISO k11	ISO h8	ISO k11	ISO k11
5m	25.00	✓	-	✓	✓	✓	✓	✓
5m	28.00	✓	-	✓	-	-	-	-
5m	30.00	✓	✓	✓	✓	✓	✓	-
5m	32.00	-	✓	-	✓	-	✓	✓
5m	35.00	✓	✓	✓	✓	✓	✓	✓
5m	40.00	✓	✓	-	✓	✓	✓	✓
5m	45.00	-	✓	-	✓	-	✓	✓
5m	50.00	✓	✓	✓	✓	✓	✓	✓
5m	55.00	-	✓	-	✓	-	✓	-
5m	60.00	-	✓	-	✓	-	✓	✓
5m	65.00	-	✓	-	✓	-	✓	-
5m	70.00	-	✓	-	✓	-	✓	✓
5m	75.00	-	✓	-	✓	-	✓	✓
5m	80.00	-	✓	-	✓	-	✓	-

Please note h8 bars are a typical length of 3m.

Peeled Bar

Available in 1-2 tonne bundles.

Typical Length	Diameter (mm)	1.4305 Grade 303	1.4301/1.4307 Grade 304/304L	1.4401/1.4404 Grade 316/316L	1.4162 LDX 2101®
Tolerances					
		ISO k13	ISO k13	ISO k13	ISO k13
5m	85.00	✓	✓	✓	-
5m	90.00	-	✓	✓	-
5m	95.00	-	✓	✓	-
5m	100.00	-	✓	✓	✓
5m	105.00	-	✓	✓	-
5m	110.00	-	✓	✓	-
5m	115.00	-	✓	✓	-
5m	120.00	-	✓	✓	✓
5m	130.00	-	✓	✓	-
5m	150.00	-	✓	✓	✓
5m	160.00	-	✓	✓	-
5m	165.00	-	✓	✓	-
5m	170.00	-	✓	✓	-

Tolerances refer to ISO 286-2:1988. All bar products are PRODEC® treated (PRODUCTION ECONOMY).

Cold Drawn Hexagonal Bar

Typical Length	Diameter (mm)	1.4305 Grade 303	1.4301/1.4307 Grade 304/304L	1.4401/1.4404 Grade 316/316L
Tolerances				
		ISO h11	ISO h11	ISO h11
3m	6.00	✓	✓	✓
3m	7.00	✓	✓	✓
3m	8.00	✓	✓	-
3m	10.00	✓	-	✓
3m	11.00	✓	✓	✓
3m	12.00	✓	✓	✓
3m	13.00	✓	✓	✓
3m	14.00	✓	✓	✓
3m	17.00	✓	✓	✓
3m	19.00	✓	✓	✓
3m	22.00	✓	✓	✓
3m	24.00	✓	✓	✓
3m	25.40	✓	✓	✓

Cold Drawn Square Bar

Typical Length	Diameter (mm)	1.4305 Grade 303	1.4301/1.4307 Grade 304/304L	1.4401/1.4404 Grade 316/316L
Tolerances				
		ISO h11	ISO h11	ISO h11
3m	8.00	✓	✓	-
3m	10.00	✓	-	✓
3m	11.00	✓	✓	✓
3m	12.00	✓	✓	✓
3m	13.00	✓	✓	✓
3m	14.00	✓	✓	✓
3m	17.00	✓	✓	✓
3m	19.00	✓	✓	✓
3m	22.00	✓	✓	✓

Bar stock grades

Currently the bar stock is made up of the following grades. Other grades are available on request.

Outokumpu steel grade	International steel designation EN	ASTM/UNS	Typical chemical composition % C N Cr Ni Mo Others	Main characteristics & applications
303 PRODEC®	1.4305	303	0.05 0.05 17.2 8.7 - S (0.34)	Outokumpu branded grades, offering significantly improved machinability due to special steel making practice and chemistry.
304 PRODEC®	1.4301/1.4307	304/304L	0.02 0.06 18.3 9.2 - -	
316 PRODEC®	1.4401/1.4404	316/316L	0.02 0.04 17.5 11.7 2.5 -	
LDX 2101®	1.4162	S32101	0.03 0.22 21.5 1.5 0.3 5Mn	Developed by Outokumpu, this is a low-alloyed, general-purpose duplex stainless steel offering high mechanical strength with good corrosion resistance on par with most stainless steel grades. Its high mechanical strength makes it particularly suitable for building and construction and other high tensile applications. The steel also has good machinability comparable to 304 PRODEC®.

Tolerances

Diameter (mm)		Tolerance (mm) for given tolerance number				
		h8	h9	h11	k11	k13
>3	6	0.018	0.030 ^h	0.075 ^h	0.075	0.180
>6	10	0.022	0.036 ^h	0.090 ^h	0.090	0.220
>10	18	0.027	0.043 ^h	0.110 ^h	0.110	0.270
>18	30	0.033 ^h	0.052 ^h	0.130 ^h	0.130 ^k	0.330
>30	50	0.039 ^h	0.062		0.160 ^k	0.390
>50	80	0.046	0.074		0.190 ^k	0.460 ^k
>80	120	0.054	0.087		0.220	0.540 ^k
>120	180	0.063	0.100		0.250	0.630 ^k
>180	250	0.072	0.115		0.290	0.720



Tolerance limits for bars and shafts are defined in ISO286-2:2010

^h Cold drawn round bars available to h9 tolerances.

^h Cold drawn hexagonal and square bars available to h11 tolerances.

Centreless ground bars are available between 25mm and 50mm to h8 tolerances.

^h Tolerances are =zero / minus an amount depending on tolerance number and diameter, e.g.

h9 for 20mm bar = 20mm +0/-0.052 = 20 to 19.948mm.

^k Peeled bars are available from 25mm to 8mm to k11 tolerances and between 85mm and 170mm to k13 tolerances.

^k Tolerances are + an amount depending on the tolerance number and diameter and minus zero, e.g.

k13 for 100mm bar = 100mm + 0.540/-0 = 100.540 to 100mm.

Mechanical properties at room temperature

Condition	Diameter (mm)	Grade	HB ^a	Rp0.2 ^a MPa	Rp1.0 ^a MPa	RM MPa	A ^a %
1X & 1G	≤160	1.4305	230	190	225	500 to 750	35
		1.4307	215	175	210	500 to 700	45
		1.4404	215	200	235	500 to 700	40
		1.4162	200 ^b	480 ^b	-	700 ^b	38 ^b
1X & 1G	>160 ≤ 250	1.4305	230	190	225	500 to 750	35
		1.4307	215	175	210	500 to 700	35
		1.4404	215	200	235	500 to 700	30
		1.4162	200 ^b	480 ^b	-	700 ^b	38 ^b
2H	≤10	1.4305	-	400	-	600 to 950	15
		1.4307	-	400	-	600 to 930	25
		1.4404	-	400	-	600 to 930	25
		1.4162	-	820 ^b	-	960 ^b	7 ^b
2H	> 10 ≤ 16	1.4305	-	400	-	600 to 950	15
		1.4307	-	380	-	600 to 930	25
		1.4404	-	380	-	580 to 930	25
		1.4162	-	800 ^b	-	940 ^b	10 ^b
2H	> 16 ≤ 25	1.4305	-	190	-	500 to 850	20
		1.4307	-	175	-	500 to 830	30
		1.4404	-	200	-	500 to 830	30
		1.4162	-	790 ^b	-	910 ^b	10 ^b

^a EN 10088-3:2005 minimum values

^b Typical values only

General standards

- All products are supplied in compliance with the requirements of the customer order
- Product testing is in accordance with standard procedures
- Quality systems are assessed to ISO 9001
- Environmental management systems are assessed to ISO 14001
- Our products are free from any known mercury or radiation contamination
- Products are corrosion tested in accordance with EN ISO 3651-2
- PRODEC® enhanced machinability grade

Grade specific standards: Cold Drawn Bar 5mm - 25.5mm

304/304L

- 1.4301, 1.4307, AISI 304, AISI 304L

Chemistry according to:

- EN10088-3:2005
- 1.4301
- 1.4307 ASME SA182 (2007)
- S30400
- S30403 ASME SA193 (2007)
- ASME SA320 (2008)
- AISI 304 grade EN10272 (2007)
- 1.4307 & 1.4301 ASTM A276 (2008a)
- ASTM A479 (2008a)
- S30400
- S30403 AMS-QQ-S-763 B

303

- 1.4305, AISI 303

Chemistry according to:

- EN10088-3:2005
- 1.4305 ASME SA320 (2008)
- AISI 303 (30300) grade B8
- ASTM A582 (2005)
- S30300

316/316L

- 1.4404, 1.4401, AISI 316, AISI 316L

Chemistry according to:

- EN10088-3:2005
- 1.4404
- 1.4401 ASME SA182 (2007)
- S31600
- S31603 ASME SA193 (2007)
- ASME SA320 (2008)
- AISI 316 grade B8M EN10272 (2007)
- 1.4404 & 1.4401 ASTM A276 (2008a),
- ASTM A479 (2008a)
- S31600
- S31603 AMS-QQ-S-763 B

LDX 2101®

- 1.4162
- S32101 ASTM A276 (2008a)
- ASTM A479 (2008a)
- S32101

Grade specific standards: Hot Rolled Bar 25mm – 180mm

304/304L

- 1.4301 1.4307, AISI 304, AISI 304L

Chemistry according to

- EN10088-3:2005
- 1.4301
- 1.4307 ASME SA182 (2007)
- S30400
- S30403 ASTM A193 (2007)
- ASME SA320 (2008)
- AISI 304 grade B8M EN10272 (2007)
- 1.4307 & 1.4301 ASTM A276 (2008a)
- ASTM A479 (2008a)
- S30400
- S30403 condition A AMS QQS 763 304 A
- 304L A NACE MR0175 / ISO15156-1:2001: S30400A

303

- 1.4305, AISI 303

Chemistry according to:

- EN10088-3:2005 ASME SA320(2008)
- AISI 303 (S30300) grade B8 ASTM A582 (2005)
- S30300

316/316L

- 1.4401, 1.4404, AISI 316, AISI 316L

Chemistry according to:

- EN10088-3:2005
- 1.4404
- 1.4401ASME SA182 (2007)
- S31600
- S31603 ASME SA193 (2007)
- ASME SA320 (2008)
- AISI 316 grade B8M EN10272 (2007)
- 1.4404 & 1.4401 ASTM A276 (2008a)
- ASTM A479 (2008a)
- S31600
- S31603 condition A AMS QQS 763 316 A
- 316L A NACE MR0175 / ISO15156-1:2001: S31600A

LDX 2101®

- 1.4162
- S32101 ASTM A276 (2008a)
- ASTM A479 (2008a)
- S32101 condition A

5 European Stainless Bar

Physical Properties

WET CORROSION AND GENERAL SERVICE	Outokumpu Steel Name	Density, ρ kg/dm ³ RT	Modulus of elasticity, E GPa		Coefficient of thermal expansion T, 10 ⁻⁶ /°C between 20°C and 100°C	Thermal conductivity λ W/m°C		Thermal capacity, C		Electrical resistivity, ρ J/kg°C RT	Magnetizable $\mu\Omega\text{m}$	
			RT	400°C		400°C	RT	400°C	RT		RT	
Duplex	LDX2101®	7.8	200	172	13.0	14.5	15	20	500	0.80	Y	
	Austenitic	4301	7.9	200	172	16.0	17.5	15	20	500	0.73	N
		4307	7.9	200	172	16.0	18.0	15	20	500	0.73	N
		4305	7.9	200	172	16.0	17.5	15	20	500	0.73	N
		4401	8.0	200	172	16.0	17.5	15	20	500	0.75	N
		4404	8.0	200	172	16.0	17.5	15	20	500	0.75	N

Magnetizable: Y = Magnetizable ferritic, martensitic, duplex grades, N = Non-magnetizable austenitic grades with a typical magnetic permeability $\mu = 1.05 - 1.2$.

Small amounts of ferrite or martensite from composition or cold deformation will increase the magnetizability. Data from EN 10088, EN 10095 or typical values.

Conversion from EN to ASTM, ASME:

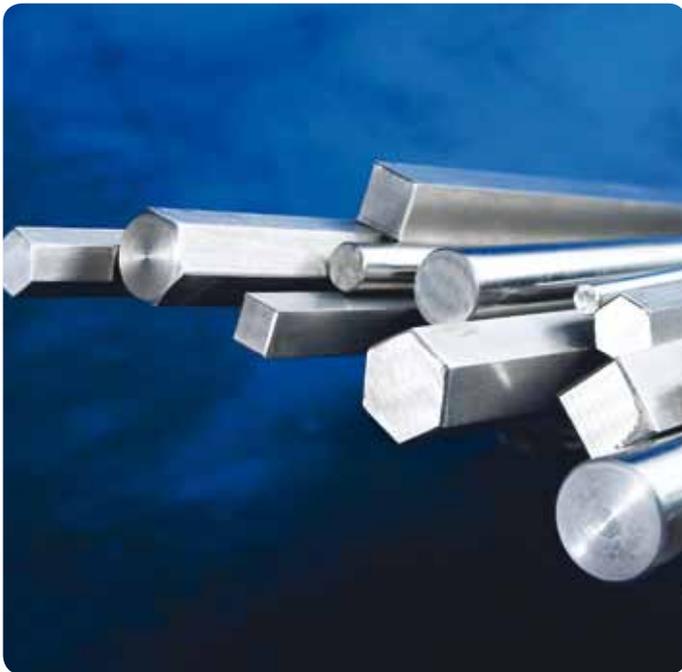
1 kg/dm³ = 0.361 lb/in³

1 GPa = 0.145 x 10⁶ psi

1x10⁻⁶/°C = 0.556 in/in °F

1 W/m °C = 0.578 Btu/h ft °F

1 J/kg °C = 0.000239 Btu/lb °F



Enhancing Performance

Outokumpu has invested in establishing a bar finishing operation in Sheffield, UK. Schumag Bright Bar drawing machines allow production of 5mm to 30mm cold drawn bar. Equipment incorporating some of the best available technology has been installed to ensure that products of the highest quality can be offered to suit the widest variety of demanding applications.

The manufacturing programme consists of round, hexagon and square drawn bar across the full size and grade range.

Bar can also be centreless ground for special applications where a high quality surface finish and tight tolerance is required.

For further information please contact your local Outokumpu sales representative.

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Outokumpu is a global leader in stainless steel. Our vision is to be the undisputed number one in stainless, with success based on operational excellence. Customers in a wide range of industries use our stainless steel and services worldwide. Being fully recyclable, maintenance-free, as well as very strong and durable material, stainless steel is one of the key building blocks for a sustainable future.

What makes Outokumpu special is total customer focus – all the way, from R&D to delivery. You have the idea. We offer world-class stainless steel, technical know-how and support. We activate your ideas.

**OUTO
KUMPU**

Outokumpu Long Products

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