

High-pressure tubes

IN AUSTENITIC STAINLESS STEELS



Our seamless high-pressure tubes are used for various high-pressure applications, not only for extremely high pressures, but also in corrosive atmospheres. The main applications are chemical production processes, hydraulic installations, test benches as well as water-jet cutting facilities. The pressure medium can be a suitable liquid or gas.

During many years of co-operation with our customers we have developed special tubes with optimal properties for high-pressure applications. These are characterized by high yield and tensile strength in connection with a high elongation. The pressure resistance is guaranteed by the very smooth ID surface. *)

QUALITY ASSURANCE

Our quality inspections include, for instance, examination of dimensions, technological tests, tensile testing, metallographic examination, intergranular corrosion as well as eddy current testing.

The scope of inspection depends on the customer's specification.

Our quality management system is certified according to DIN EN ISO 9001, the environmental management system is certified according to DIN EN ISO 14001. Furthermore Sandvik P&P has the TÜV approval as manufacturer according to AD Merkblatt WO/TRD 100 and is certified according to PED 97/23 EC.

Grades and mechanical properties

Sandvik DIN	D ASTM	USA BS	GB AFNOR	F SS	S Yield strength	Mechanical properties		Elongation A
						R _{p0.2} min. MPa	R _m min. MPa	
5R10	1.4301	TP 304	304S31	Z 6 CN 18-09	2333	600	700	min. 18%
3R65	1.4404	TP 316L	316S31	Z 2 CND 17-12	2348	600	700	min. 18%
HP 160	–	–	–	–	–	1100	1200	min. 12%

Other grades and mechanical properties on request.

*) Individual advice can be provided.

Standard sizes

OD mm	inch	ID mm	inch	Wall thickness		Working pressure (stat.) ¹⁾		Theoretical weight kg/m
				mm	inch	4301/4404 bar	HP 160 bar	
6.00		2.20		1.90		3120	5710	0.195
6.35	1/4"	2.39	3/32"	1.98	.0781	3045	5580	0.217
6.35	1/4"	2.29	.0902	2.03	.0799	3180	–	0.220
6.35	1/4"	1.59	1/16"	2.38	.0938	4300	7890	0.237
9.52	3/8"	3.20	1/8"	3.16	.1245	3380	6190	0.503
9.52	3/8"	1.60	1/16"	3.96	.1560	5530	10140	0.551
14.00		8.00		3.00		2330	–	0.826
14.00		5.00		4.50		3200	–	1.070
14.30	9/16"	8.00	5/16"	3.15	.1240	2380	4360	0.879
14.30	9/16"	4.76	3/16"	4.77	.1878	3390	6210	1.138
19.05	3/4"	1.8		8.63		–	12000	2.251
30.00		10		10		–	6250	5.008

Larger dimensions on request.

¹⁾ Calculation basis:

K: Factor = OD/ID

K < 2: Calculation according to OD-regulation B10.

K ≥ 2: Calculation basis full plastic condition. Safety factor 0.45.

Standard tolerances

OD and ID $\pm 0,1$ mm
Wall ± 10 %
Other tolerances on request.

Certificates

The tests carried out are set down in an inspection certificate to DIN EN 10204 3.1.B. Reception tests to DIN EN 10204 3.1.C by third party inspectors can also be made on request.

Internal surface

Standard: Free from laps, flaws and fissures deeper than 0,1 mm, max. 5 defects > 0,05 mm per cross-section. On prior consultation depth of defects of max. 0,02 mm according to DIN ISO 8535-1 can be reached.

Lengths

Standard: random lengths of 4 – 7 m.
Other lengths on request.
Lengths up to 16 m – depending on the dimension – can be produced.

Marking and packing

According to customers' specification.

Special tests on request

- Fatigue strength up to 4,000 bar
- Maximum internal pressure up to 15,000 bar
- Bursting pressure trials

Examinations in order to determine the cycle fatigue behaviour under defined operating conditions can be carried out on request. We offer individual advice.

Sandvik HP 160

HP 160 is a high-strength nitrogen-alloyed austenitic stainless steel with high corrosion resistance.

Characteristic properties

- strength higher than TP 304 / TP 316
- improved corrosion resistance
- high degree of purity
- minor depth of defects
- good forming properties
- autofrettage with approx. 12,000 bar

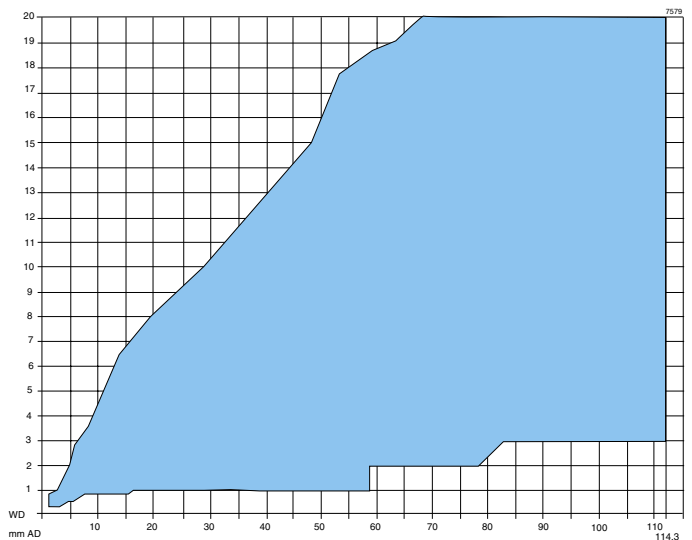
Chemical composition (nominal), %

C max.	Mn	Cr	Ni	Mo	N	Nb
0.08	3.6	20.5	10	2.5	0.4	0.3

Mechanical properties

For high static and dynamic requirements:
Tensile strength R_m : min. 1200 MPa
Yield strength $R_{p0,2}$: min. 1100 MPa
Elongation A: min. 12 %

Size range



Larger dimensions on request.

Physical properties (20°C)

Density: 8 g / cm³
Modulus of elasticity: 200 000 MPa
Specific heat: 450 J / (kg°C)
Thermal conductivity: 15 W / (m°C)

Corrosion resistance

Sandvik HP 160 has a high corrosion resistance against corrosion in general as well as intergranular corrosion due to his high purity. The high molybdenum content causes good resistance against pitting and crevice corrosion.

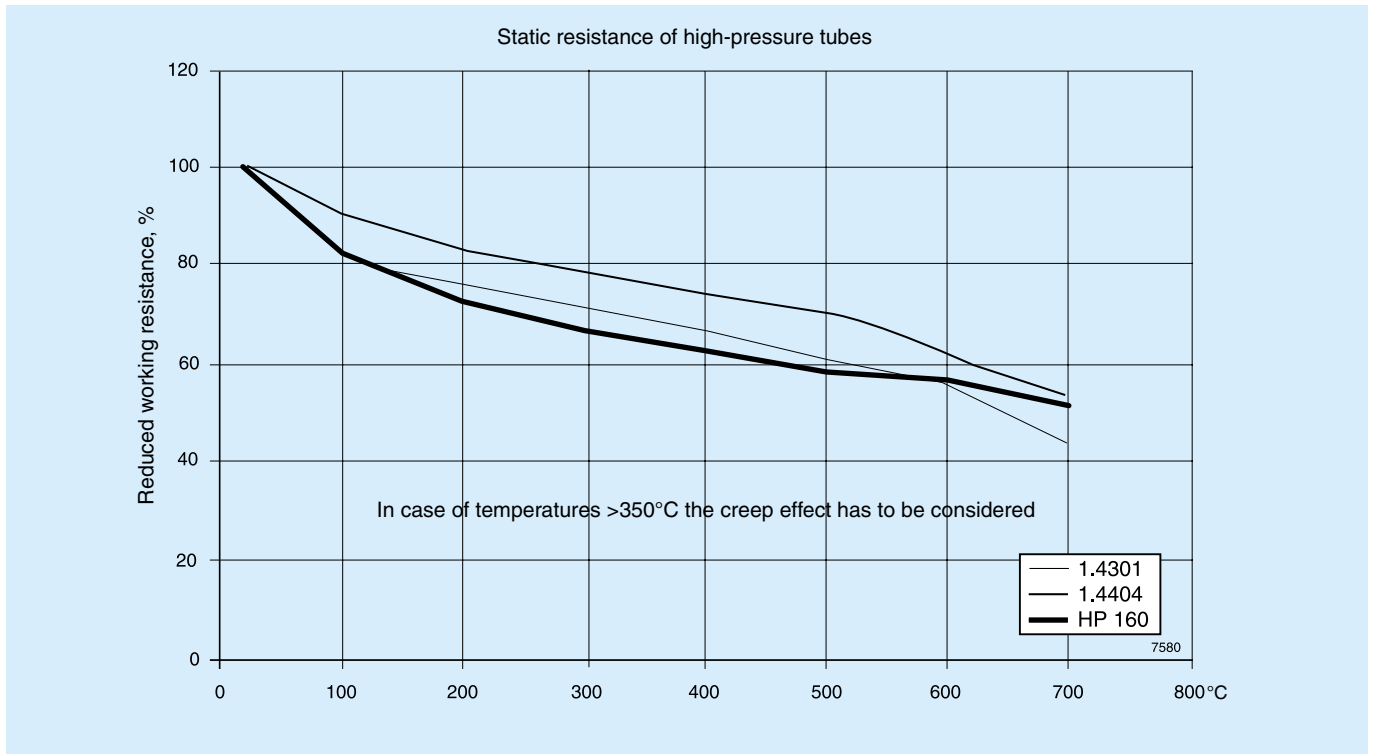
Forms of supply

- Seamless tubes
- Round bar in rolled or forged condition
- Square steel in rolled or forged condition
- Hexagon bars

If machining is required, please contact Sandvik Coromant.

Static resistance of high-pressure tubes

% of the factor at room temperature - HP 160 - 5R10 - 3R65



* All values are based on technical regulations and experience and do not give any guarantee for the pressure resistance. However, acceptance of special requirements needs written agreement.



Captions

Front page: Pulse test equipment (internal pressure tests) max. testing pressure 4,000 bar (58 ksi) (with max. 6 Hz) max. frequency 15 Hz.

Left: Autofrettage resp. bursting pressure equipment.

Autofrettage up to max. 14,000 bar (203 ksi).

Bursting pressure tests up to max. 12,000 bar (174 ksi).

Sandvik and HP 160 are trademarks owned by Sandvik AB.

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice.



Sandvik Materials Technology

Sandvik P&P Zweigniederlassung der Sandvik GmbH, Dammstraße 27-29, D-33824 Werther

Tel. +49 (0) 5203 9109-0, Fax +49 (0) 5203 910922

info.pp@sandvik.com

www.smt.sandvik.com/p&p