

SANDVIK 3R69

TUBE AND PIPE, SEAMLESS

DATASHEET

Sandvik 3R69 is an austenitic stainless steel with a low carbon content alloyed with molybdenum, boron and nitrogen and is used in superheaters, reheaters in power boilers and other high temperature applications. The grade is characterized by:

- High creep strength
- Good corrosion and steam oxidation resistance for moderate conditions

STANDARDS

- ASTM: 316N
- EN Number: 1.4910
- EN Name: X3CrNiMoBN17-13-3
- W.Nr.: 1.4910
- DIN: X 2 CrNiMoN 17 13 3

Product standards

- EN 10216-5
- DIN 17456, 17458

CHEMICAL COMPOSITION (NOMINAL)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo	B
≤0.030	0.4	1.7	≤0.030	≤0.015	17.5	12.5	2.2	0.002

Others
N=0.12

FORMS OF SUPPLY

Seamless tube and pipe - Finishes and dimensions

Seamless tube and pipe in 3R69 is supplied in dimensions up to 260 mm outside diameter in the solution-annealed and white-pickled condition or in the bright-annealed condition.

MECHANICAL PROPERTIES

At 20°C (68°F)

Proof strength		Tensile strength			Elong.	
Rp0.2 ¹⁾		Rp1.0 ¹⁾		Rm	A ²⁾	
MPa	ksi	MPa	ksi	MPa	ksi	%

Proof strength				Tensile strength		Elong.
R _{p0.2} ¹⁾		R _{p1.0} ¹⁾		R _m		A ²⁾
MPa	ksi	MPa	ksi	MPa	ksi	%
≥260	≥38	≥300	≥44	550-750	80-109	≥35

1 MPa = N/mm²

¹⁾ R_{p0.2} and R_{p1.0} correspond to 0.2% offset and 1.0% offset yield strength, respectively.

²⁾ Based on $L_0 = 5.65 \sqrt{S_0}$ where L_0 is the original gauge length and S_0 the original cross-section area.

Impact strength

Due to its austenitic microstructure, Sandvik 3R69 has very good impact strength both at room temperature and at cryogenic temperatures.

Tests have demonstrated that the steel fulfils the requirements (60 J (44 ft-lb) at -196°C (-320 °F)) according to the European standards EN 13445-2 (UFPV-2) and EN 10216-5.

At high temperatures

Metric units

Temperature	Proof strength	
	R _{p0.2}	R _{p1.0}
	MPa	MPa
°C	min.	min.
50	234	273
100	205	240
150	187	220
200	170	200
250	159	189
300	148	178
350	141	171
400	134	164
450	130	160
500	127	157
550	124	154

Imperial units

Temperature	Proof strength	
	R _{p0.2}	R _{p1.0}
	ksi	ksi
°F	min.	min.
100	36.1	41.2
200	30.3	35.4
300	27.2	32.0
400	24.5	28.9
500	22.7	27.1

Imperial units

Temperature	Proof strength	
	Rp0.2	Rp1.0
°F	ksi	ksi
	min.	min.
600	21.0	25.5
700	20.0	24.4
800	19.1	23.5
900	18.6	22.9
1000	18.1	22.4

Creep rupture strength

Temperature		10 000 h		100 000 h	
°C	°F	MPa	ksi	MPa	ksi
		approx.	approx.	approx.	approx.
550	1020	290	42.1	220	31.9
560	1040	272	39.4	202	29.3
570	1060	254	36.8	186	30.0
580	1075	237	34.4	170	24.7
590	1095	220	31.9	155	22.5
600	1110	205	29.7	141	20.4
610	1130	190	27.6	127	18.4
620	1150	174	25.2	114	16.5
630	1165	162	23.5	102	14.8
640	1185	148	21.5	92	13.3
650	1200	135	19.6	83	12.0
660	1220	122	17.7	75	10.9
670	1240	112	16.2	68	9.9
680	1255	102	14.8	61	8.8
690	1275	93	13.5	56	8.1
700	1290	84	12.2	52	7.5
710	1310	78	11.3	48	7.0
720	1330	71	10.3	45	6.5
730	1345	65	9.4	41	5.9
740	1365	58	8.4	37	5.4
750	1380	52	7.5	34	4.9
760	1400	48	7.0	31	4.5

PHYSICAL PROPERTIES

Density: 8.0 g/cm³, 0.29 lb/in³

Thermal conductivity

Temperature, °C	W/m °C	Temperature, °F	Btu/ft h °F
20	14	68	8
100	15	200	8.5
200	17	400	10
300	18	600	10.5
400	20	800	11.5
500	21	1000	12.5
600	23	1100	13

Specific heat capacity

Temperature, °C	J/kg °C	Temperature, °F	Btu/lb °F
20	485	68	0.11
100	500	200	0.12
200	515	400	0.12
300	525	600	0.13
400	540	800	0.13
500	555	1000	0.13
600	575	1100	0.14

Thermal expansion 1)

Temperature, °C	Per °C	Temperature, °F	Per °F
30-100	16.5	86-200	9.5
30-200	17	86-400	9.5
30-300	17.5	86-600	10
30-400	18	86-800	10
30-500	18	86-1000	10
30-600	18.5	86-1200	10.5
30-700	18.5	86-1400	10.5

1) Mean values in temperature ranges (x10⁻⁶)

Modulus of elasticity 1)

Temperature, °C	MPa	Temperature, °F	ksi
20	200	68	29.0
100	194	200	28.2
200	186	400	26.9
300	179	600	25.8
400	172	800	24.7
500	165	1000	23.5

1) (x10³)

Disclaimer: 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. This datasheet is only valid for Sandvik materials.

