INTERNATIONAL STANDARD

ISO 9327-5

First edition 1999-06-15

Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions —

Part 5: Stainless steels

Pièces forgées et barres laminées ou forgées en acier pour appareils à pression — Conditions techniques de livraison —

Partie 5: Aciers inoxydables



Reference number ISO 9327-5:1999(E)

ISO 9327-5:1999(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9327-5 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 10, *Steel for pressure purposes*.

This first edition, together with parts 1 to 4 of ISO 9327, cancels and replaces ISO 2604-1:1975.

ISO 9327 consists of the following parts, under the general title *Steel forgings and rolled or forged bars for pressure purposes* — *Technical delivery conditions*:

- Part 1: General requirements
- Part 2: Non-alloy and alloy (Mo, Cr and CrMo) steels with specified elevated temperature properties
- Part 3: Nickel steels with specified low temperature properties
- Part 4: Weldable fine grain steels with high proof strength
- Part 5: Stainless steels

Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions —

Part 5:

Stainless steels

1 Scope

- **1.1** This part of ISO 9327 applies to forgings and rolled or forged bars manufactured from the austenitic and austenitic-ferritics steels given in Table 1 and delivered according to the specifications given in ISO 9327-1.
- **1.2** This part of ISO 9327 covers the following data:
- a) In Table 1 the limits for
 - the chemical composition according to the cast analysis;
 - the tensile properties at room temperature;
 - the indications on the usual heat treatment condition at the time of delivery;
- b) in Table 2 the permissible deviations of the results of the product analysis from the specified limits for the cast analysis,
- c) in Table 3 the minimum elevated temperature proof strength values;
- d) in Table 4 the estimated average stress rupture properties.

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2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9327. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 9327 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 148:1983, Steel — Charpy impact test (V-notch).

ISO/TR 4949:1989, Steel names based on letter symbols.

ISO 9327-1, Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions — Part 1: General requirements.

ISO/TR 15461:1997, Steel forgings — Testing frequency, sampling conditions and test methods for mechanical tests.

3 Terms and definitions

For the purposes of this part of ISO 9327, the terms and definitions given in ISO 9327-1 apply.

4 Ordering

See ISO 9327-1.

5 Requirements

See ISO 9327-1 and Tables 1 to 4.

6 Inspection, testing and conformity of products

See ISO 9327-1.

7 Marking

See ISO 9327-1.

Table 1 — Chemical composition, room temperature mechanical properties and heat treatment conditions of austenitic able 1

	Steel type	9				ర్	Chemical composition ^b % by mass	cal compos % by mass	ition			Meci	anical	Mechanical properties at room temperature ^c	es at ro	om tem	peratu	و ا		Elevated to prop	Elevated temperature properties		Heat treatment	
No.	"New"	"old"	U	max.	Mn max.	max.	s max.	ō	W _o	Z	Others	Thickness of the ruling section	R _{p0.2} min.	R _{p1,0} min.	, R _m	` Ē 🗖	min. DIR:	$KV^{\rm d}$ min.	P 2 #	Rp	Creep properties	Usual cor	Usual conditions of reference heat treatment	nce heat
	designation ^a	, e										^f R max.				×	>	×.	×-×	See	See Table	Symbol ^e	Solution temperature ¹	Cooling in ^g
_	in accordance with ISO.	9 with ISO 2604-1										mm	N/mm²	N/mm² N/mm²	N/mm²	%	%	7	7	:			ပ်	
-	X2CrNi18-10	F46	< 0,030 1,00	1,00	2,00	0,045	0,045 0,030	17,00 to 19,00	1	9,00 to 12,00	-	250	180	215	480 to 680	30	30	82	55	ဧ	ı	σ	1000 to 1100	×, a
0	X2CrNiN18-10	1	≤ 0,030	1,00	2,00		0,045 0,030	17,00 to 19,00	1	8,50 to 11,50	0,12 to 0,22 N	250	270	305	550 to 750	30	30	82	55	ဇ	l	σ	1000 to 1100	š,
ო	X5CrNi18-9	F47	< 0,07	1,00	2,00	0,045	0,030	17,00 to 19,00	_	8,00 to 11,00	1	250	195	230	500 to 700	30	30	85	55	8	1	σ	1000 to 1100	s, s
4	X7CrNi18-9	F48	0,04 to 0,10	1,00	2,00		0,045 0,030	17,00 to 19,00	_	8,00 to 11,00	1	250	195	230	490 to 690	30	30	85	55	ဇ	4	o	1050 to 1120	, w
S.	X6CrNiNb18-10	F50	8 0'08	1,00	2,00		0,045 0,030 17,00 to 19,00	17,00 to 19,00	-	9,00 to 12,00	Nb ≽ 10 ×% C ≤1,00 ^j	450	205	240	510 to 710	30	30	82	55	8	1	σ	1020 to 1120	×, s
9	X6CrNiTi18-10	F53	≥ 0,08	1,00	2,00		0,045 0,030 17,00 to 19,00	17,00 to 19,00	_	9,00 to 12,00	Ti ≽ 5 × % C ≤ 0,80	450	200	235	510 to 710 ^k	30	30	82	55	9	ı	σ	1020 to 1120	s ×
7	X7CrNiTi18-10	F54	0,04 to 0,10	1,00	2,00	0,045	0,045 0,030	17,00 to 19,00	1	9,00 to 12,00	Ti ≽ 5 × % C ≤ 0,80	450	175	210	490 to 690	30	30	85	55	3	4	σ	1020 to 1120	×, a
œ	X7CrNiNb18-10	F51	0,04 to 0,10	1,00	2,00		0,045 0,030 17,00 to 19,00	17,00 to 19,00	_	9,00 to 12,00	Nb ≥ 10 × % C ≤ 1,20 [†]	450	205	240	510 to 710	30	30	85	55	3	4	o	1050 to 1120	w. s
6	X2CrNiMo17-12	F59	0,030	1,00	2,00	0,045	0,045 0,030	16,50 to 18,50	2,00 to 2,50	11,00 to 14,00	ı	250	190	225	490 to 690	30	93	85	55	3	1	ø	1020 to 1120 h	w, a

Table 1 (continued)

Steel type	9					Che	Chemical composition ^b % by mass	cal composi % by mass	ition ^b			Mech	Mechanical properties at room temperature $^{\mathrm{c}}$	ropertic	es at roc	om temp	peratur	٠,	Ш	Elevated temperature properties	perature les	T	Heat treatment	
Line "new" 'old" C Si Mn P S Cr M No.	C Si Mn P S Cr max. max. max. max.	Si Mn P S Cr max max max max	Mn P S Cr max. max. max.	P S Cr max. max.	wax.	ర		≥	οw	ž	Others	Thickness of the ruling	R _{p0,2}	R _{p1,0}	Rm	Y		ΚΛ¢		R _p Ord	Creep properties	Usual con	Usual conditions of reference heat treatment	ince heat
							····						nin.	Ë.		min. DIR:	ښن نے	min. DIR:						
												r _R max.				×	>	* Y-	×-×			Symbol	Solution temperature [†]	Cooling in ^g
designation ^a in accordance with	nna 9 with																			See Table	<u> </u>			
ISO/TR 4949 ISO 2604-1	ISO 2604-1											mm N	N/mm²	N/mm²	N/mm²	%	%	ſ	ſ				°C	
X2CrNiMoN17-12 — ≤ 0,030 1,00 2,00 0,045 0,030 16,50 2,00 to to to 18,50 2,50	 < 0.030 1,00 2.00 0,045 0,030 16,50 to to 18,50 	1,00 2,00 0,045 0,030 16,50 to to 18,50	1,00 2,00 0,045 0,030 16,50 to to 18,50	0,045 0,030 16,50 to 18,50	0,045 0,030 16,50 to 18,50	16,50 to 18,50				10,50 to 13,50	0,12 to 0,22 N	160	280	315	580 to 780	30	30	85	55	ε	1	o	1020 to 1120	w, a
X2CrNiMo17-13 F59 < 0,030 1,00 2,00 0,045 0,030 16,50 2,50 to	≤ 0,030 1,00 2,00 0,045 0,030 16,50 2,50 to to to to 16,50 3,00	1,00 2,00 0,045 0,030 16,50 2,50 to to to 18,50 3,00	1,00 2,00 0,045 0,030 16,50 2,50 to to to 18,50 3,00	0,045 0,030 16,50 2,50 to to 18,50 3,00	16,50 2,50 to to 18,50 3,00	16,50 2,50 to to 18,50 3,00	2,50 to 3,00	2,50 to 3,00		11,50 to 14,50	-	250	190	225	490 to 690	30	တ္တ	85	55	က	1	a	1020 to 1120	, a
X2CrNiMoN17-13 — < 0,030 1,00 2,00 0,045 0,030 16,50 2,50 to	 < 0.030 1,00 2,00 0,045 0,030 16,50 2,50 to to to 18,50 18,50 3,00 	1,00 2,00 0,045 0,030 16,50 2,50 to to 18,50 3,00	1,00 2,00 0,045 0,030 16,50 2,50 to to 18,50 3,00	0,045 0,030 16,50 2,50 to to 18,50 3,00	0,030 16,50 2,50 to to 18,50 3,00	0,030 16,50 2,50 to to 18,50 3,00	2,50 to 3,00	2,50 to 3,00		11,50 to 14,50	0,12 to 0,22 N	160	280	315	580 to 780	30	30	82	55	ဇ	ı	o	1020 to 1120	, g
X5CrNiMo17-12 F62 < 0,07 1,00 2,00 0,045 0,030 16,50 2,00 10 10 10 10 10 10 10 10 10 10 10 10 1	 < 0,07 1,00 2,00 0,045 0,030 16,50 2,00 10 10 10 10 10 2,50 	1,00 2,00 0,045 0,030 16,50 2,00 to to to 18,50 2,50	2,00 0,045 0,030 16,50 2,00 to to 18,50 2,50	0,045 0,030 16,50 2,00 to to 18,50 2,50	0,030 16,50 2,00 to to 18,50 2,50	0,030 16,50 2,00 to to 18,50 2,50	16,50 2,00 to to 18,50 2,50	2,00 to 2,50		10,50 to 13,50	I	250	205	240	510 to 710	30	30	85	55	ε	1	o	1020 to 1120	, , ,
X5CrNiMo17-13 F62 ≤ 0,07 1,00 2,00 0,045 0,030 16,50 2,50 to 10 10 10 10 10 10 10 10 10 10 10 10 10	≤ 0,07 1,00 2,00 0,045 0,030 16,50 2,50 to to 10,50 18,50 3,00	1,000 2,000 0,045 0,030 16,50 2,50 to to 10 18,50 3,00	2,00 0,045 0,030 16,50 2,50 to to 18,50 3,00	0,045 0,030 16,50 2,50 to to 18,50 3,00	0,030 16,50 2,50 to to 18,50 3,00	0,030 16,50 2,50 to to 18,50 3,00	16,50 2,50 to to 18,50 3,00			11,00 to 14,00	1	250	205	240	510 to 710	30	30	85	55	8		o	1020 to 1120 h	w, a
X7CrNiMo17-12 F64 0,04 1,00 2,00 0,045 0,030 16,50 2,00 to to 0.10 to to 18,50 2,50	0,04 1,00 2,00 0,045 0,030 16,50 to to to 0.10	1,00 2,00 0,045 0,030 16,50 to 10 18,50	2,00 0,045 0,030 16,50 to 18,50	0,045 0,030 16,50 to 18,50	0,030 16,50 to 18,50	0,030 16,50 to 18,50		2,00 to 2,50		10,50 to 13,50	ı	250	205	240	510 to 710	30	30	85	55	ε	4	o	1020 to 1120	w, a
X6CrNiMoTi17-12 F66 < 0,08 1,00 2,00 0,045 0,030 16,50 2,00 10 10 10 10 10 10 10 10 10 10 10 10 1	≤ 0,08 1,00 2,00 0,045 0,030 16,50 to to 18,50	1,00 2,00 0,045 0,030 16,50 to to 18,50	2,00 0,045 0,030 16,50 to 18,50	0,045 0,030 16,50 to 18,50	16,50 to 18,50	16,50 to 18,50		2,00 to 2,50		11,00 to 14,00	Ti ≽ 5 × % C ≤ 0,80	450	210	245	510 to 710 ^k	30	30	85	55	8	1	Ø	1020 to 1120 h	w, a
X6CnNi25-21 F88 ≤ 0,08 1,50 2,00 0,045 0,030 24,00 — t0 10 10 10 10 10 10 10 10 10 10 10 10 10	 < 0.08 1,50 2,00 0,045 0,030 24,00 10 10 26,00 	1,50 2,00 0,045 0,030 24,00 to to 26,00	2,00 0,045 0,030 24,00 to 26,00	0,045 0,030 24,00 to 26,00	24,00 to 26,00	24,00 to 26,00		1		19,00 to 23,00	I	160	210	250	500 to 700	30	30	85	25	ဇ	- 1	o	1000 to 1100 h	w, a

Table 1 (concluded)

	Steel type	8				ర్	Chemical composition ^b % by mass	cal compos % by mass	osition s	۵			Mechan	Mechanical properties at room temperature $^{\circ}$	erties	at room	tempe	rature	0	E E	Elevated temperature properties	perature ies	<u> </u>	Heat treatment	
Line No	ne "new"	"old"	υ	is X	W X	a X	s ×e	ច	₩	ž	Others	Thickness of the ruling		Rpo.2 Rp1.0	<u> </u>	Rm	Ą	<u> </u>	ΚVď		R _p Dr	Creep	Usual con	Usual conditions of reference heat treatment	nce heat
:				Š								section		min.			m E E E		min. OIR.		i				
												'R max.					×	× >	x-y y-x	×			Symbol	Solution temperature ^f	Cooling in ⁹
	designation ^a in accordance with	on ^a e with																			See Table	ele ele			
	ISO/TR 4949	ISO 2604-1										m m	ž	N/mm² N/mm² N/mm²	m² N/r		<u> </u>	%						ပ့	
18	3 X2NiCrMoCu25-20-5	1	≤ 0,025	1,00	2,00	0;030	0,020	19,00 to 22,00	00 4,00 to 5,00	0 24,00 to 0 27,00	0 1,00 to 2,00 Cu, (≤ 0,15 N) ^m	Cu, 160	22	220 ^m 225 ^m		520 3 to 720 ^m	8	9 08	85 54	55	e e	1	o	1050 to 1150	, S
19	X2CrNiN23-4	1	0:030	1,00	2,50		0,035 0,020 22,00 ≤0, to 24,00	22,00 to 24,00	00,60	3,50 to 5,00	0,05 to 0,20 N	160 N		400	œ - 88	ļ	52	20	85	55	e		σ	970 to 1070	×,
20	X2CrNIMoN22-5-3	1	∞0,030	1,00	2,00	0,035	5 0,020	0,020 21,00 to 23,00	10 2,50 to 10 3,50	0 4,50 to 0 6,50	0,08 to 0,20 N	0 N 250	4	450	യ ്ത്	600 to 860	55	8	85 55	ம	e e	1	σ	1020 to 1100	»,
e o	All data on designations in this part of ISO 9327 are to be regarded as preliminary (see N See 5.9.1.1 of ISO 9397.1.1009	s in this part of	ISO 9327	are to	be reg	arded a	as prelir	minary	(see N(ЭТЕ 2 о	OTE 2 of 4.1 in ISO 9327-1:1999)	:7-1:1999).													
c																									
,	$R_{\rm p0,2}$ or $R_{\rm p1,0}$ is the proof strength; $R_{\rm m}$ is the tensile strength;	of strength; th;																							
	A is the percentage elongation after fracture on gauge length;	ngation after fre	acture on	gauge	length;																				
	L_0 is the gauge length = 5,65 $\sqrt{S_0}$;	: 5,65 \So.;																							
	KV is the Charpy V-notch impact energy.	th impact energ	λ.																						
	DIR:x, DIR:x-y, DIR:y and DIR: y-x are the directions of the test piece in relation to the main direction of grain flow. For detailed explanations see Table 5 and Figures 9 and 10 of ISO/TR 15461:1997.	nd DIR: y-x are	the direc	tions of	f the te	st piece	e in rela	ition to	the ma	in direct	ion of grain flow	. For detailed e:	xplanatio	ns see Ta	ble 5 ai	nd Figur	es 9 an	d 10 of	ISO/TR	15461:1	.266				
0	Average of three tests. One of the individual values may be below the specified minimum average, provided it is not less than 70 % of this value. The values apply to standard 10 mm × 10 mm Charpy V-notch impact test pieces (see ISO 148). Austenitic stainless steels do not exhibit any transition range of impact values so that there is no important decrease in the impact values down to low temperatures.	One of the in-	dividual v xit any trat	alues r	may be range (below of impa	the spi ct value	ecified	minimu. Iat there	ım aver is no ir	age, provided i nportant decre≀	t is not less thatse is the impaction of	an 70 % o t values o	of this val	ue. The	s values eratures	apply .	to stan	dard 10	mm ×	0 mm Che	arpy V-notol	h impact te	st pieces (see l	
ω,	Q = quenched.																								
-	For guidance only, except in cases where testing of reference test pieces is required.	opt in cases wh	ere testin	g of ref	ference	test pi	eces is	require	jg jg																
5	a = air - cooling sufficiently rapid; w = water.	ntly rapid; w =	water.																						
e .	In the case of heat treatment in the course of processing after delivery, the lower part of the given solution temperature range shall be aimed for. If, in the course of hot working, the temperature is not below the specified lower limit of the solution temperature, the following temperatures are sufficient for repeat heat treatments: 980 °C in the case of Mo-free steels, 1 000 °C in the case of steels with \(\in \) 3 % Mo.	tment in the c	ourse of ses are	process ficient f	sing aff	ter deliv at heat	very, thi	e lowel ents: 9	r part o 80 °C ir	of the gi≀ nthe ca	ven solution ten se of Mo-free st	nperature range :eels, 1 000 °C i	shall be in the cas	aimed for e of steel	۲. ااf, in swith ≼	the cou	rse of t o.	oot worl	king, the	temper	ature is no	ot below the	specified k	ower limit of the	e solution
_	For the steels for which stress rupture values are given in table 4, the treatment temperature shall not be less than the minimum of the reference temperature range.	stress rupture	values ar	e given	in tab	le 4, the	e treatm	nent ter	nperatu	ıre shall	not be less tha	n the minimum	of the refe	arence te	nperatu	ıre rangı	ள்								
_	Niobium content including tantalum determined as niobium.	ng tantalum de	termined	as niob	jium.																				
ϫ .	For diameters above 100 mm, lower values are to be agreed.	10 mm, lower va	alues are	to be a	greed.																				
_	Since this steel is at the stage of development, small deviations in chemical composition is	stage of devel	lopment, s	small de	eviation	ns in ch	emical	сошро	sition a	re perm	itted, provided t	are permitted, provided the other requirements are fulfilled.	ements ar	e fulfilled											
ε	By agreement, nitrogen may be added up to a limit of 0,15 %. In this case higher proof strength and tensile strength values may also be agreed upon	may be added	up to a li	mit of C),15 %.	In this	case hi	igher pi	roof stre	angth ar	nd tensile streng	ath values may a	also be a	greed upc	č.										
																	l								

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Table 2 — Permissible product analysis tolerances on the limiting values given in Table 1 for the cast analysis

Element	Specified limits, cast analysis	Permissible tolerance ^a
	% by mass	% by mass
С	≤ 0,30	+ 0,005
	> 0,030 ≤ 0,10	± 0,01
Si	≤ 1,50	+ 0,05
Mn	≤ 2,50	+ 0,05
Р	≤ 0,045	+ 0,005
S	≤ 0,030	+ 0,003
Cr	≤ 26,00	± 0,20
Cu	≤ 0,60	+ 0,05
	≥ 0,60 ≤ 2,00	± 0,07
Мо	≤ 3,00	± 0,08
	> 3,00 ≤ 5,00	± 0,10
N	≤ 0,22	± 0,01
Nb	≤ 1,20	± 0,05
Ni	≤ 20,00	± 0,15
141	> 20,00 ≤ 27,00	± 0,20
Ti	≤ 0,80	± 0,05

^a The deviations, other than when maxima only are specified, apply either above or below the specified limits of the range but not both above and below for the same element from different sample products from the same cast. When maxima only are specified, the deviations are positive only. The values are valid only if the samples were selected according to C.5 of ISO 9327-1:1999.

Table 3 — Minimum 0,2 % $(R_{
m p0,2})$ and 1,0 % $(R_{
m p1,0})$ proof strength values at elevated temperatures for the quenched condition (see Table 1)

Line No.	Steel type					R _{p0,2} ^a N/mm²	,2 a Im²								· -	R _{p1,0} a N/mm²					
	_					min.	ċ									min.					
						Temperature,	iture, °C								Temp	emperature,	ပ္စ				
		150	200	250	300	350	400	450	500	550	009	150	200 2	250 30	300 350	00 400	_	450 5	500 5	550 6	900
-	X2CrNi18-10	116	104	96	88	84	81	78	92	74	72	150	137	128 1	122 116	6 110		108	106	102	100
7	X2CrNiN18-10	169	155	143	135	129	123	119	115	113	110	201	182 1	172 1	163 156	149		144	140 13	36 1	131
က	X5CrNi18-9	126	114	106	86	63	89	98	84	26	62	160	147	139 1	132 125	120		117 1	115 1	112 1	109
4	X7CrNi18-9	126	114	106	86	63	89	98	84	84	79	160	147 1	139 1	125	120	ļ	117 1	115 1	112 1	109
വ	X6CrNiNb18-10	162	153	147	139	133	129	126	124	122	121	192	182 1	172 10	166 162	159	9 157	_	155 1	153 1	151
9	X6CrNiTi18-10	149	144	139	135	129	124	119	116	11	108	179	172 1	164	158 152	148	<u> </u>	143	140 1	138	135
7	X7CrNiTi18-10	123	117	114	110	105	100	92	93	06	88	155	147 1	141	133 129	126	6 121	-	118	116 1	115
8	X7CrNiNb18-10	162	153	147	139	133	129	126	124	122	121	192	182	172 16	166 162	159	9 157		155 1	153 1	151
6	X2CrNiMo17-12	130	120	109	101	96	96	87	84	81	79	161	149 1	139 1	133 127	7 123	3 119	\vdash	115 1	112 1	110
10	X2CrNiMoN17-12	178	164	154	146	140	136	132	129	126	124	208	192	180 17	172 166	161	1 157		152 14	149	44
Ξ	X2CrNiMo17-13	130	120	109	101	96	06	87	84	81	79	161	149 1	139 10	133 127	7 123	3 119		115 1	112 1	110
12	X2CrNiMoN17-13	178	164	154	146	140	136	132	129	126	124	208	192 1	180 17	172 166	161	_	57 1	152 14	149 1	44
13	X5CrNiMo17-12	144	132	121	113	107	101	98	92	95	90	172	159 1	50 1	143 137	133	3 129		125 12	121	119
4	X5CrNiMo17-13	144	132	121	113	107	101	98	95	95	06	172	159 1	150 14	143 137	133	3 129		125 12	121	119
15	X7CrNiMo17-12	144	132	121	113	107	101	98	95	95	90	172	159 1	150 14	143 137	133	3 129		125 12	121	119
16	X6CrNiMoTi17-12	(148)	(137)	(126)	(117)	(111)	(105)	(102)	(66)	(36)	(63)	(183)	(169)	(159) (18	(152) (147)	7) (142)	2) (138)	-	(133) (129)	_	(127)
11	X6CrNi25-21	(128)	(116)	(108)	(100)	(94)	(91)	(88)	(82)	(84)	(82)	(167)	(154) (1-	(146) (13	(139) (132)	(126)	6) (123)		(121) (11	(118)	(114)
18	X2NiCrMoCu25-20-5b	(165)	(155)	(145)	(135)	(130)	(125)	1	1	1	-) (361)	(185) (1.	(175) (16	(165) (160)	0) (155)	- (<u>s</u>		-		1
19	X2CrNiN23-4 c	300	280	265		ı	ı	ı	ı	ı	ı	ı	'	'						<u> </u>	1
50	X2CrNiMoN22-5-3 c	335	310	567	1	I	ı	ı	ı	ı	1	ı	1					<u>'</u>			
Ē																		$\ $			Τ

The values were derived, as far as possible, from the regression lines given in various TC 17/SC 18 documents. Values given in parentheses were derived from the regression lines for the nearest appropriate steels.

^b The values shown for steel type X2NiCrMoCu25-20-5 come from a German specification.

The values shown for steel types X2CrNiN23-4 and X2CrNiMoN22-5-3 where not derived in accordance with ISO 2605-1; the values are provisional. ပ

Table 4 — Stress rupture properties at elevated temperatures for the quenched condition (see Table 1)

l ine	Steel tyne	Buntura																			
Š		time								Estim	ated ave	erage stres: N/mm²	resses 1 n²	Estimated average stresses for rupture a N/mm ²	e a						
				_	•							Temperature °C	fure °C								
		£	540	550	260	220	580	290	009	610	620	630	640	9 09	9 099	670 68	069 089	0 700	0 710	720	730
		10 000		176	164	152	142	131	122	113	104	95	87	79	73 6	9 29	61 55	╀	╀	╀	
		30 000		147*	135*	126*	115*	105*	*96	*88	\$0¢	74	29	L	H	<u> </u>		"			
		20 000		134*	123*	113*	103*	94*	85*	78*	72*	.29	58*	52*	47* 4	41* (36	(36)* (32)*	\vdash	1		
4	X7CrNi18-9	100 000		115*	105*	* 86	*68	*18	74*	.89	61*	55*	₂₀ *	L	(40)* (3	(35)* (30	-	┝			
		150 000	1	108*	*66	*68	81*	74*	.29	.09	54*	49*	43*		-		H	┝			
		200 000		102*	93*	*44	.9/	* 69	.29	£9¢	20∗	45*	(40)*	-	├	(27)* (24	\vdash	-			
		250 000	1	*26	*88	¥6Z	73*	*99	£6\$	53*	47*	42*	(37)*	┝	┝	H	H				
	•••	10 000	1	230	220	210	190	170	160	140	130	120	110	100	8 06		74 66	9			
		30 000																			
		20 000																-			l
7	X7CrNiTi18-10	100 000	I	170	150	140	120	110	100 100	95	84	9/	89	62	56 5	50	44	35			
		150 000	-											-	H	H	H	+			
		200 000	-	150	130	120	110	<u>\$</u>	8	82	74	99	8	54	48	43	40	g			
		250 000												L	H	+	\dotplus	╀	H		
		10 000	243	228	215	200	186	173	159	146	134	124	114	104	95	86 77	69	6	12	46	
-		30 000	210*	197	184	172	159	146	133	123	112	102	92	┝	ŀ	-	╀	-	+	2 (2	
		20 000	198*	185*	172*	159*	146	133	123	Ξ	101	5	1 2	╁	╁	╀	+	+	+	+	
80	X7CrNiNb18-10	100 000	181*	168*	154*	142*	129	118	90	96	98	1	69	╁	+	+	H	+	╀	+	
		150 000	171*	158*	145*	132*	121	109	86	88	79	71*	63*	-	├	\vdash	-	F	H	╀	
		200 000	164*	151*	138*	127*	114*	103*	93*	83*	75*	.99	£8 _*	H	┝		⊢	╀	+		
		250 000	159*	146*	133*	122*	110*	*66	*88	7 8*	71*	63*	55*	48* 4	41* 36	36* (31)*	F	H	H		
		10 000	247	233	220	506	193	180	167	155	142	130	119	108	97 8	87 78	-	H	57	52	47
		30 000	222	208	195	181	168	155	143	131	119	107	97	. 28	9 8/			_	_	(42)	1
		ᆚ	210	197	183*	170	157	144	132	120	108	97	87	. 82	9 0/	62 56	51	46	(42)		ı
15	X7CrNiMo17-12		194*	181*	167*	154*	141	128	116	105	94	84	75	9 29	60 5	54 49*	*(44)*	*		1	ı
		150 000	189*	172*	158*	+	132	120	108	97	98	-22	* 69	61* 5	55* 5(50* (45)*	*(1	1		
		200 000	178*	164*	151*	\dashv	125	113	102	91	81	72*	e5*	58* 5	52* 47*	┞	*			1	ı
		250 000	173*	159*	146*	133*	120*	108*	*26	87*	77*	*69	61*	55* 5	H	(45)*					
a Val	Values with an asterisk have involved extended time extrapolation; values in parentheses have involved extended stress estrapolation.	erisk have ir	nvolved	extende	d time e	xtrapola	tion; val	ues in pa	renthes	es have	involve	d extend	ed stres	s estrapo	lation.						

Bibliography

- [1] ISO 2604-1:1975¹⁾, Steel products for pressure purposes Quality requirements Part 1: Forgings.
- [2] ISO 2605-2:1976, Steel products for pressure purposes Derivation and verification of elevated temperature properties Part 2: Proof stress of austenitic steel products.

¹⁾ To be replaced by ISO 9327 parts 1 to 5.

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