Quality	**10CrMo9-10**	**Creep-resisting Steel**	*Technical card*
According to standard	**EN 10273: 2016**		***Lucefin Group***
Number	**1.7380**		*rev. 2018*

Chemical composition

C%	**Si%** max	**Mn%**	**P%** max	**S%** max	**Cr%**	**Mo%**	**Cu%** max	**N%** max	
0,08-0,14	0,50	0,40-0,80	0,020	0,025	2,00-2,50	0,90-1,10	0,30	0,012	Product deviations are allowed
± 0.02	± 0.05	+0.10 –0.05	+ 0.005	+ 0.003	± 0.10	± 0.04	± 0.05	+ 0.002	

The aluminium content of the casting should be determined and indicated in the control document

Temperature °C

Hot-forming	**Normalizing +N**	**Quenching +Q**	**Tempering +T**	**Stress-relieving +SR**	**Step cooling**
1050-900	940-980 air	9890-950 water	630-730 air	50° under the temperature of tempering	593 furnace EN 10028-2:2009

Soft annealing +A	**Spheroidized annealed +AC**	**Pre-heating welding**	**Stress-relieving after welding** (PWHT)	**Ac1**	**Ac3**	**Ms**	**Mf**
650-700 air (HB max 210)	880-900 furnace cooling	300	600-690 furnace cooling	795	850	440	230

Mechanical properties

10CrMo9-10 1.7380 **Hot-rolled** mechanical properties in the delivery condition [b] UNI EN 10273: 2016

size mm		Heat treatment	Kv and traction test at room temperature in longitudinal				
			R	**Re_H** [a]	**A%**	**Kv_2**	***HBW***
from	to		N/mm²	N/mm² min.	min.	J min.	*for information*
	16	+NT	480-630	310	18	40	*146-192*
16	40	+NT	480-630	300	18	40	*146-192*
40	60	+NT	480-630	290	18	40	*146-192*
60	100	+NT / +QA / +QL	470-620	270	17	40	*141-190*
100	150	+NT / +QA / +QL	460-610	250	17	40	*139-183*

+NT = normalized and tempered; +QA = air quenched and tempered; QL = liquid quenched and tempered

If the yeld strength (Re_H) is not pronounced, this be replaced by determination of the 0,2% proof strength (Rp0,2). In this case, 10 N/mm² lower minimum values apply for Rp0,2

Min. proof strength 0.2 % at high temperatures UNI EN 10273: 2016

from	to	Heat treatment					**Rp** 0.2 N/mm²					
	16	+NT	288	266	254	248	243	236	225	212	197	185
16	40	+NT	279	257	246	240	235	228	218	205	191	179
40	60	+NT	270	249	238	232	227	221	211	198	185	173
60	100	+NT / +QT	260	240	230	224	220	213	204	191	178	167
100	150	+NT / +QT	250	237	228	222	219	213	204	191	178	167
		°C	**50**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**

Thermal Expansion	$10^{-6} \cdot K^{-1}$ ►	10.5	11.4	11.5	12.1	12.7	13.2	16.6	14.0	14.4
Mod. of Elasticity long.	GPa	217	213	212	207	199	192	184	175	164
Mod. of Elasticity tang.	GPa			81	79	76	73	70	67	62
Poisson ratio	*v*				0.29				0.30	0.31
Specific Heat Capacity	J/(Kg•K)	423	456	461	479	499	517	536	558	587
Thermal Conductivity	W/(m•K)			34.9	37.3	38.2	37.8	36.6	35.2	33.6
Density	Kg/dm³			7.84						
Specific Electric Resist.	Ohm•mm²/m			0.298	0.343	0.413	0.497	0.595	0.703	0.825
Electrical Conductivity	Siemens•m/mm²			3.35	2.91	2.42	2.01	1.68	1.42	1.21
°C		**-100**	**0**	**20**	**100**	**200**	**300**	**400**	**500**	**600**

The symbol ► indicates temperature between -100 °C and 0 °C, -100 °C and 20 °C …

Service Temperatures from **-30** °C to **600** °C

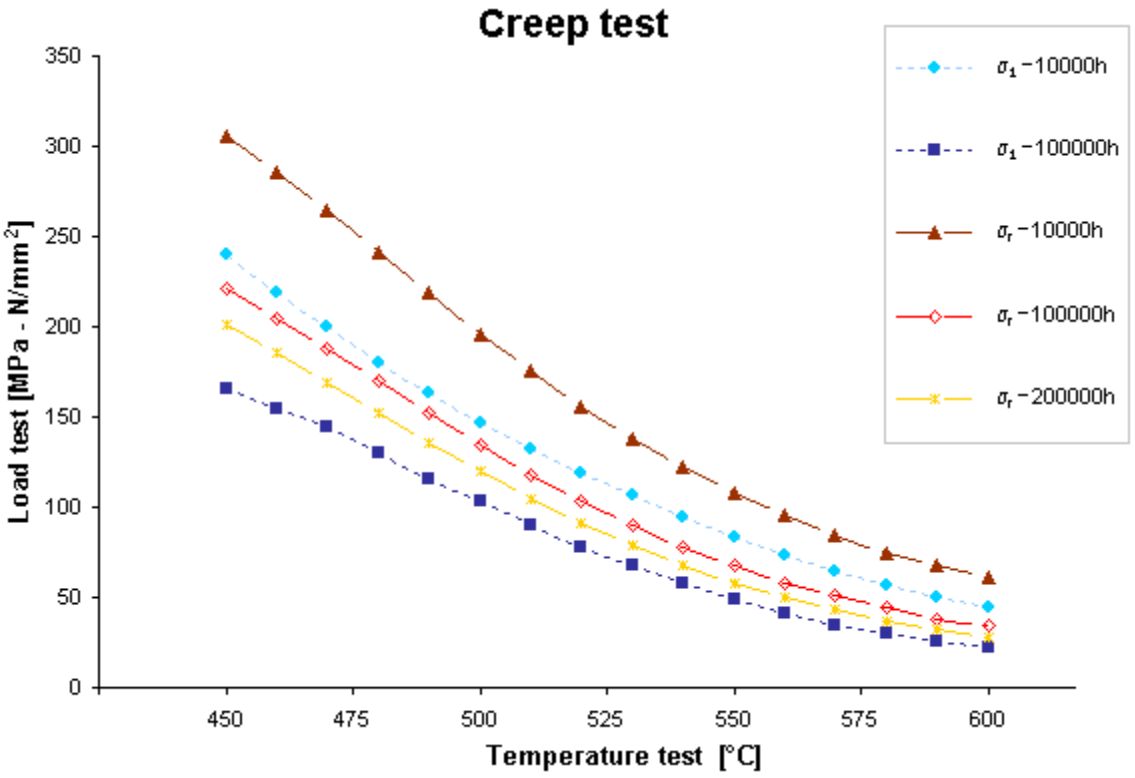
Approximate values of hardenability.

mm	**2**	**6**	**10**	**14**	**16**	**20**	**24**	**28**	**32**	**40**	**50**	**60**	Distance from quenched end
HRC	39	38	38	37	36	35	34	33	32	31	30	30	Hardness

Plastic deformations and creep rupture resistance EN 10273: 2016

	σ_1 (1%) N/mm²		σ_R N/mm²		
°C	10.000 h	100.000 h	10.000 h	100.000 h	200.000 h
450	240	166	306	221	201
460	219	155	286	205	186
470	200	145	264	188	169
480	180	130	241	170	152
490	163	116	219	152	136
500	147	103	196	135	120
510	132	90	176	118	105
520	119	78	156	103	91
530	107	68	138	90	79
540	94	58	122	78	68
550	83	49	108	68	58
560	73	41	96	58	50
570	65	35	85	51	43
580	57	30	75	44	37
590	50	26	68	38	32
600	44	22	61	34	28

σ_1 = permanent creep strain 1% — σ_R = creep rupture strength



Lucefin experience. Heat treatment on 15 mm hot-rolled thickness **FATT** (Fracture Appearance Transition Temperature)

Impact test	Kv J	12	18	42	110	130	150	180	200	200
Fibrosity		2	4	10	50	62	74	100	100	100
°C		**-60**	**-50**	**-40**	**-20**	**0**	**+20**	**+50**	**+80**	**+100**
Impact test	Kv J	6	10	90	190	230	250	260	260	260
Fibrosity		9	10	25	85	95	100	100	100	100
°C		**-110**	**-100**	**-80**	**-60**	**-40**	**-20**	**0**	**+20**	**+50**

+NT N 980 °C air T 720 °C air

+QT Q 950 °C water T 720 °C air
+PWHT * = 690 °C x 10 h furn.cooling
(* Post Weld Heat Treatment)

EUROPE	**ITALY**	**CHINA**	**GERMANY**	**FRANCE**	**U.K.**	**RUSSIA**	**USA**
EN	UNI	GB	DIN	AFNOR	B.S.	GOST	AISI/SAE
10CrMo9-10	10CrMo9-10	12Cr2MoG	10CrMo9-10	12CD9-10	622/B3	12Ch8	A182 F22