

Quality	32CrMoV12-28	Supply conditions:	<i>Technical card</i>
According to standards	UNI EN ISO 4957: 2002	Annealed HB max 229	Lucefin Group
Number	1.2365		rev. 2018

Chemical composition

C%	Si%	Mn%	P% max	S% max	Cr%	Mo%	V%
0,28-0,35	0,10-0,40	0,15-0,45	0,030	0,020	2,70-3,20	2,50-3,00	0,40-0,70
± 0.02	± 0.03	± 0.04	+ 0.005	+ 0.005	± 0.10	± 0.10	± 0.04

Product deviations are allowed

Temperature °C

Hot-forming	Quenching +Q	Tempering see table +T	Stress-relieving +SR	Stress-relieving must be done after machining and before quenching			
1050-900	I° heating up to 400, pause, then II° heating up to 800, pause, then 1030-1050 oil, polymer (HRC ~ 52)	immediately after quenching minimum 2 cycles	600-650 furnace cooling to 350, then air				
Soft annealing +A	+TH annealing	Stress relieving +SR ¹⁾	Pre-heating welding	Stress-relieving after welding ¹⁾			
780-800 furnace cooling max 25 °C/h to 600, then air (HB max 229)	850-900 controlled cooling 22 °C/h (HB 192-229)	50° under the temperature of tempering	350-380	Ac1	Ac3	Ms	Mf
				800	900	320	100

Mechanical and physical properties

Tempering table after quenching at 1040 °C in oil.

HB	518	525	496	489	489	496	504	504	496	482	432	432	371
HRC	52.5	52	51	50.5	50.5	51	51.5	51.5	51	50	49	46	40
R N/mm²		1880	1820	1790	1790	1820	1850	1850	1820	1760	1700	1520	1250
Tempering at °C	50	100	150	200	250	300	350	400	450	500	550	600	650
Thermal expansion	10 ⁻⁶ · K ⁻¹	▶		12.0	12.5	12.7	13.0	13.2	13.4	13.7			
Modulus of elasticity	long.	GPa	215		176								165
Modulus of elasticity	tang.	GPa	82		68								63
R +QT	N/mm ²		1600		1350				1150	900	700		
Rp 0.2	N/mm ²				1100				950	700	580		
R +QT	N/mm ²		1200		1050				900	650	520		
Rp 0.2	N/mm ²				850				730	480	360		
R +QT	N/mm ²		900		830	790	720	700	600	420	300		
Rp 0.2	N/mm ²				630	630	610	580	550	400	280		
Specific heat capacity	J/(Kg·K)		460		550				590				
Thermal conductivity	W/(m·K)		30.0		30.1				29.7				
Density	Kg/dm ³		7.88		7.69				7.65				
Specific electric resist.	Ohm·mm ² /m		0.37		0.78				0.89				
Electrical conductivity	Siemens·m/mm ²		2.70		1.28				1.12				
°C			20	100	200	300	400	500	600	650	700		

The symbol ▶ indicates temperature between 20 °C and 100 °C, 20 °C and 200 °C ...

Europe	Germany	China	Japan	India	R. of Korea	Russia	USA
EN	DIN	GB	JIS	IS	KS	GOST	AISI/SAE
32CrMoV12-28	X 32 CrMoV 3 3		SKD 7		STD 7	3Ch3MF	H10

H10 ASM High-temperature property data - **Typical properties at elevated-temperature**, quenched steel at 1010 °C air cooled and double tempered at 606 °C

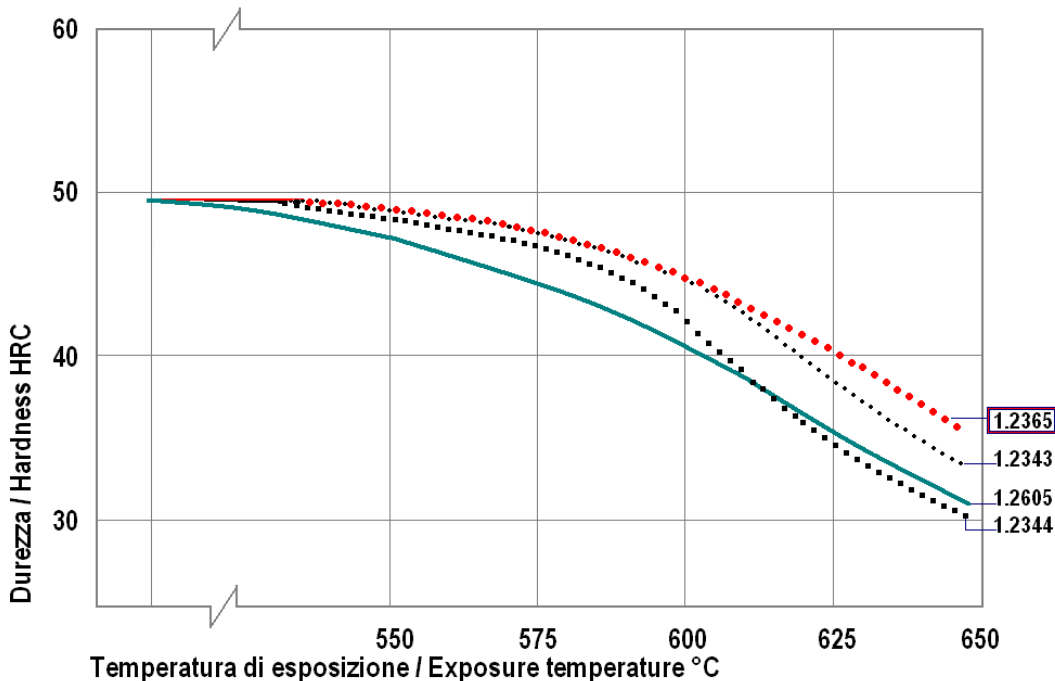
Test temperature °C	Tensile strength N/mm ²	Yield strength N/mm ²	Elongation %	Reduction %
21	1679	1451	11,4	35
427	1348	1214	14,0	58
482	1258	1145	16,6	63
538	1134	1048	17,4	63
593	941	810	21,3	69
649	596	527	22,1	79

Tensile properties after exposure to elevated temperature

Quenching air °C	double tempered °C	Exposure temperature °C	Exposure time, h			
			4	10	50	100
			<i>hardness HRC</i>			
1010	606	538	49	48	48	47
		565	49	48	45	43
		593	48.5	46	40	38
		621	45.5	41.5	34.5	33.5
		649	37	35	30	28.5

Effect of hardness on impact values. Quenched steel at 1038 °C air cooled and tempered to indicated hardness ¹⁾

HRC ¹⁾	Kv +27 °C J	Kv +149 °C J	Kv +260 °C J	Kv +427 °C J
40	11	18	22	27
45	9	12	15	23
50	8	11	14	20
55	8	11	14	20

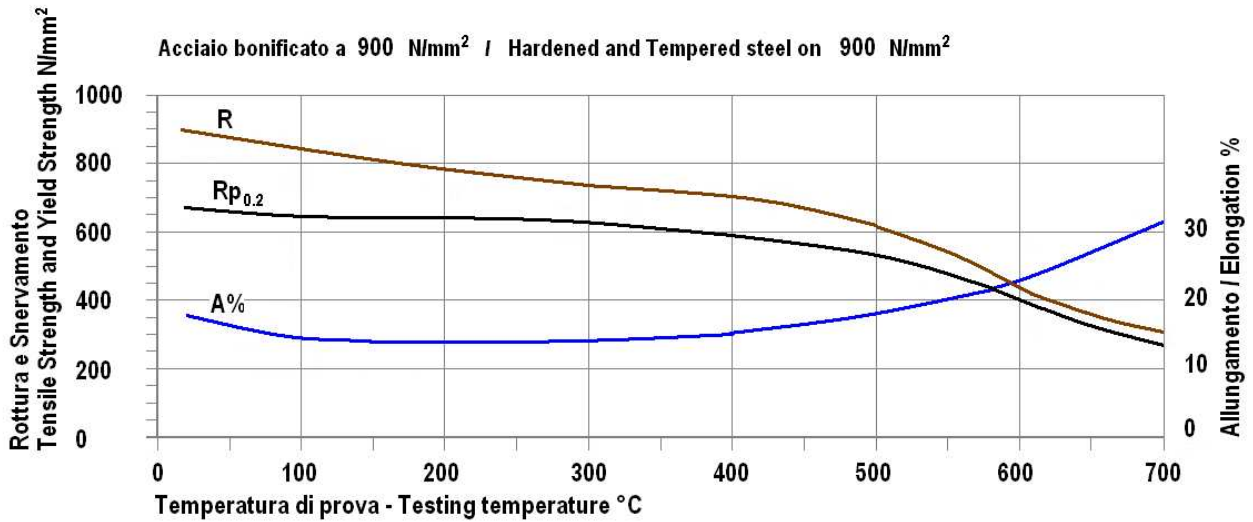


Softening during 10 h elevated-temperature exposure. Initial hardness of all specimens was 49 HRC

Tool steel for high-working temperatures

- chrome-molybdenum-vanadium alloyed steel
- high resistance to thermal shock and hot cracking
- good mechanical characteristics and toughness in hot condition
- good resistance to tempering
- excellent machinability
- if required, it is possible to carry out welding operation with TIG or MMA methods
- it can be nitrided in its final state; we recommend heat treating the component in the finish machined condition
- applications: *dies for aluminium die-casting, dies subject to low pressure, chill moulds for gravity casting, containers for die-casting presses, matrix for aluminium extrusion, extrusion press blocks, sleeves for extrusion presses, injection moulds*

H10 Proprietà meccaniche a temperature elevate R 900 N/mm²



H10 Proprietà meccaniche a temperature elevate R 1650 N/mm²

