

Quality	16NiCrMo12
According to standards	UNI 7846: 1978
Number	

Chemical composition								Deviations allowed for analysis product
C%	Si%	Mn%	P% max	S% max	Ni%	Cr%	Mo%	
0,13-0,19 ± 0.02	0,15-0,40 ± 0.03	0,40-0,70 ± 0.04	0,035 + 0.005	0,035 + 0.005	2,70-3,20 ± 0.07	0,80-1,10 ± 0.05	0,30-0,40 ± 0.04	

Temperature °C						
Hot-forming	Normalizing	Core hardening	Carbonitriding	Carburizing	Hardening carburizing surf.	Tempering
1100-900	840 air	820-850 oil-polymer salt bath		870-900	780-810 oil-polymer salt bath	150 200
Soft annealing	Isothermal annealing	Spheroidizing	End quench hardenability test	Pre-heating welding	Stress-relieving after welding	
680 furnace (HB max 250)	810 furnace cooling to 620, then air (HB 190-236)		850 water	150-350 Ac1 710	Ac3 780	600 furnace cooling Ms * core ** carburizing surface 330* 150**
welding must be carried out on the annealed state and before carburizing						

Mechanical and physical properties						
Hot-rolled values obtained on test blanks after core hardening + stress-relieving UNI 7846: 1978. Use only as reference						
size mm test blanks	Testing at room temperature (longitudinal)					
	R	Rp 0.2	A%	C%	Kcu	HB
11	1230-1520	980	9	min.	32.5	363-432
30	1080-1370	785	10	min.	35	327-394 for information only
63	980-1270	735	10	min.	42.5	295-373 for information only

Table of tempering values obtained at room temperature on rounds of Ø 10 mm after quenching oil at 840 °C														
HB	426	421	421	415	409	404	385	381	357	327	301	271	250	
HRC	45.5	45	45	44.5	44	43.5	42.5	41	38.5	35	32	28	24.5	
R N/mm ²	1490	1480	1470	1460	1440	1420	1360	1300	1200	1090	1000	910	840	
Rp 0.2 N/mm ²		1300	1320	1330	1320	1300	1260	1200	1140	1050	960	830	720	
A %	12.0	12.0	11.8	11.2	10.4	10.0	10.6	11.5	12.8	14.6	16.8	20.0	21.8	
C %	50	52	55	55	56	56	56	56	57	59	63	67	69	
Kv J	42	43	46	66	66	46	42	42	46	76	100	128	126	
HRC carburized layer	65	64.5	64	62	59	57								
Tempering at °C	50	100	150	200	250	300	350	400	450	500	550	600	650	700

16NiCrMo12

Cold-drawn					Hot-rolled peeled-reeled				
size		Testing at room temperature			Testing at room temperature				
mm		R	Rp 0.2	A%	HB	R	Rp 0.2	A%	HB
from	to	N/mm ²	N/mm ² min	min		N/mm ²	N/mm ² min	min	
No indications from reference standards									

Forged UNI 8550: 1984. Use only as reference

size		Testing at room temperature								
mm		R	Rp 0.2	A% L	A% T	A% Q	Kcu L	Kcu T	HRC	HB
from	to	N/mm ²	N/mm ² min	min	min	min	J min	J min	<i>for information</i>	
	11	1225-1520	980	8			32.5		39-46	361-432
11	25	1130-1500	835	9			35		36.5-45.5	339-426
25	40	1030-1325	735	10			37		33-41.5	311-384
40	100	930-1275	685	10			40		29-40	278-373
100	150	835-1130	635	11			40		24.5-36.5	250-339

Mechanical properties obtained on test blanks after core hardening + stressrelieving
L = longitudinal T = tangential Q = radial

UNI 7846: 1978 Jominy test HRC grain size 5 min.

mm distance from quenched extremity															
	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50
min	42	41.5	41	40.5	40	39	38.5	38	36.5	35.5	34	33	32	31	30
max	48	48	48	47.5	47.5	47	47	46.5	45.5	44.5	44	43	42	41.5	41

Temperature	Mod. of elasticity GPa		Thermal expansion		
Testing at °C	E long.	G tang.	10 ⁻⁶ • K ⁻¹		
20	210	80			

EUROPE EN	ITALY UNI	CHINA GB	GERMANY DIN	FRANCE AFNOR	U.K. B.S.	RUSSIA GOST	USA AISI/SAE
14NiCrMo13-4	16NiCrMo12			16NCD13		16HN3M	9314