

19MnVS6

EN 10267:1998	19MnVS6
Hofors designation	Ovako 280T
Imatra designation	Ovako 280T
SmeBox designation	

General information

Micro alloyed steel with high tensile strength, good machinability and weldability. 19MnVS6 - Ovako 280T is mainly used for hydraulic cylinders and machine components.

- Suitable also for case hardening or nitriding
- Good dimensional stability
- Fine-grain treated
- Delivered in as-rolled, normalized or quenched and tempered condition
- Weldable if preheated
- Carbon equivalent; CEV = 0.46 - 0.60 (according to EN 1011-2:2001)

Comparable standard designations

EN	DIN	ASTM/SAE	AFNOR	SS
19MnV6	20MnV6		20 MV 6	2142

Chemical composition

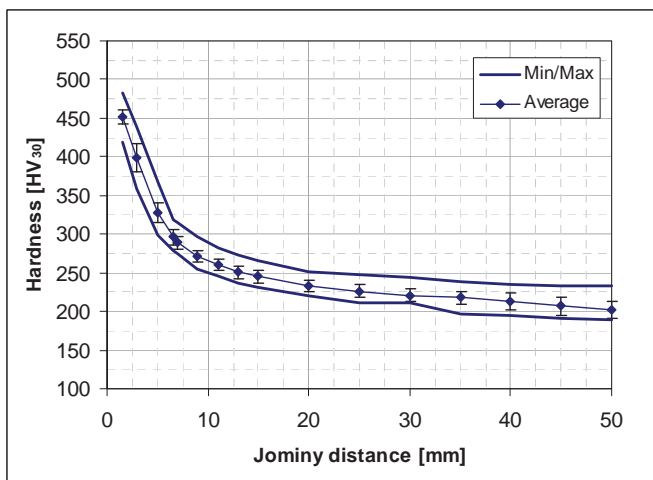
	C%	Si%	Mn%	P%	S%	Cr%	Ni%	V%
min.	0.17	0.30	1.45		0.020	0.20		0.08
max.	0.19	0.40	1.60	0.030	0.035	0.30	0.30	0.12

Steel cleanliness

Micro inclusions								
Applied standard	ASTM E45							
Sampling	ASTM A295							
Maximum average limits	A	B	C	D				
	Th	He	Th	He	Th	He	Th	He
	2.0	1.5	0.5	0.1	0	0	0.2	0.1

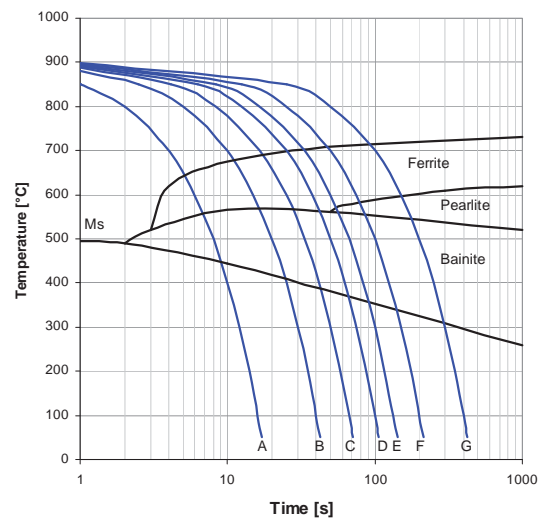
Macro inclusions	
Applied standard	ISO 3763 (Blue fracture)
Sampling	Statistical testing on billets.
Limits	<2.5mm/dm ²

Hardenability



Jominy hardenability according to ASTM A255. The graph shows the average values, standard deviation (error bars) and minimum/maximum values for Ovako 280T.

CCT - Ovako 280T



	A	B	C	D	E	F	G
t ₈₋₅ [s]	6	15	25	38	50	75	150
Hv ₃₀	370	335	285	260	250	230	205

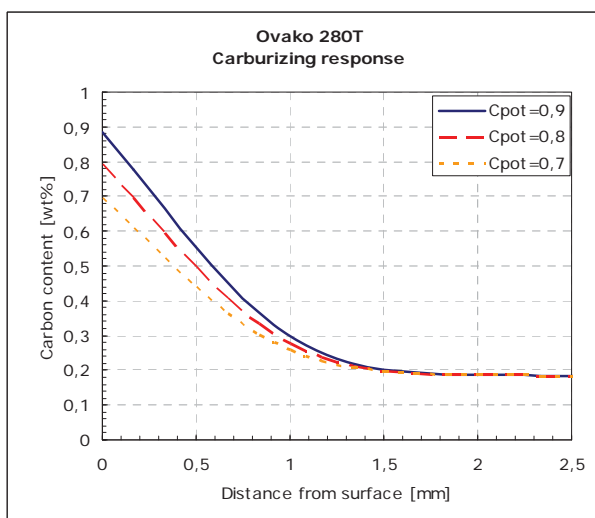
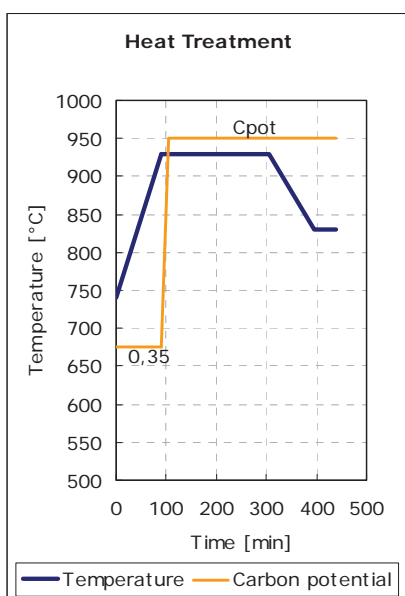
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Heat treatment

		Temperature [°C]	Cooling/quenching
Normalizing		900 - 920	Cool in still air
Case hardening	Austenitizing, carbon potential see below	850 – 950	Still air or direct quench
	Stress relieving	150 - 200	In air
Quenching and tempering	Austenitizing	850 - 910	Quench in oil
	Tempering	500 - 650	In air
Stress relieving		550 – 600	Furnace or in still air

Case carburising response



Carburization response for Ovako 280T for the cycles shown

Typical mechanical properties

Tube	Wall thickness	R _e min	R _m	Z min	A ₅ min	Hardness	KV +20°C
	mm	MPa	MPa	%	%	HB	J
Hot rolled	<25	500	670	65	22	220	27
	>25	480	650	65	22	215	27
Normalized	-15	430	620	68	25	190	27
	>15	400	600	70	27	180	27
Cold rolled	15-18	830	870	64	14	270	-
Cold rolled, stress relieve annealed	6-10	600	700	67	25	220	-
Cold drawn	-10	790	930	-	13	270	-
Cold drawn, stress relieve annealed	-10	580	700	71	23	220	-
Q&T	<30	600	700	65	20	240	27

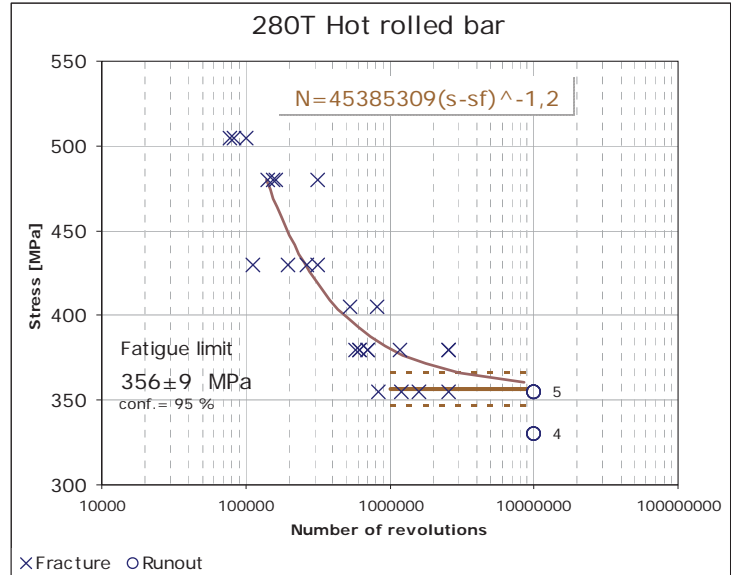
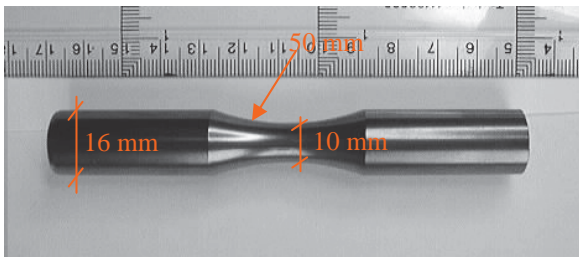
Bar	Diameter	R _e min	R _m	Z min	A ₅ min	Hardness	KV +20°C
	mm	MPa	MPa	%	%	HB	J
Hot rolled	≤80	450	620	60	20	200	27
	>80	410	600	60	20	200	27

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Fatigue properties

Test method:	Rotating beam
Test procedure:	Stair-case 20 MPa steps
Specimen:	Hourglass shape Ø 10 mm
Heat treatment:	Hot rolled bar Ø 80 mm
Hardness:	200 HB



Welding

Ovako 280T has good welding properties and can be welded with all conventional welding methods. The low carbon equivalent means that 280T can be welded without preheating up to fairly large dimensions.

- For the best results welding should be continuous, and the weld should be slowly cooled in ambient air conditions.
- If the welding is performed in a damp environment or if the temperature is below 5°C, the preheating temperature should be increased by 25°C.
- To minimize the effects of a mixed zone, the chemical composition of the filler metal should be similar to that of the base material.
- Post-heating directly after welding also assists the removal of hydrogen. It should be performed at 200°C, directly after welding, holding for 5 min/mm material thickness, for at least one hour.

Recommended working temperatures for welding with ferritic consumables:

Combined wall thickness, mm	10	20	30	40	50	60	70	80
RT		75°C	100°C	125°C	150°C			

The recommended preheating temperatures are based upon a heat input around 1.7 KJ/mm and that the hydrogen content does not exceed 5ml/100g weld metal.

Typical filler metals:

	ESAB	AWS	EN
MMA	OK 48.08	SFA/AWS A5.5 E8018-G	EN 499 E 46 5 1Ni B 32 HS
MIG/MAG	OK Autrod 12.64	SFA/AWS A5.18 ER70S-6	EN 440 G4Si1
SMAW	OK Tubrod 14.05	SFA/AWS A5.28 E70C-G	EN 758 T 42 4 Z M M 2 H10

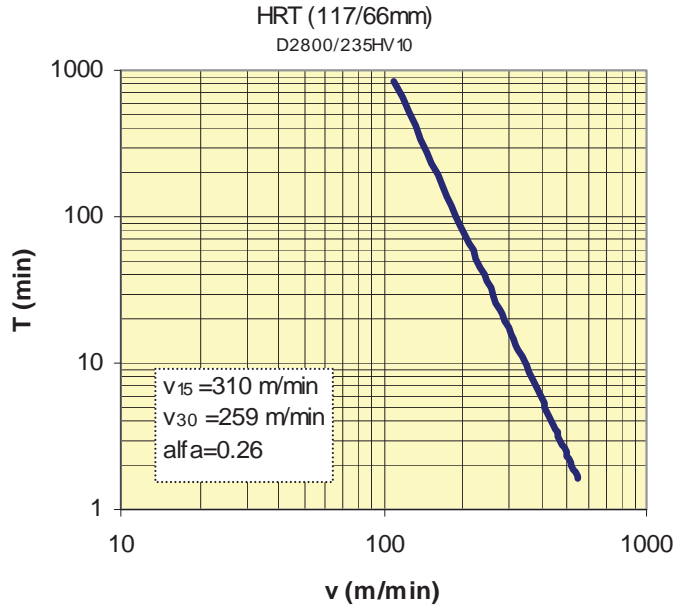
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Machinability

Test condition:	Hot rolled tube 235 HV
Test procedure:	ISO 3685
Insert:	SNMA 120408 P15
Tool holder:	CSRNL
Feed rate:	0.4 mm/r
Cutting depth:	2.5 mm
Wear criteria:	$vB_{\text{mean}} = 0.3\text{mm}$

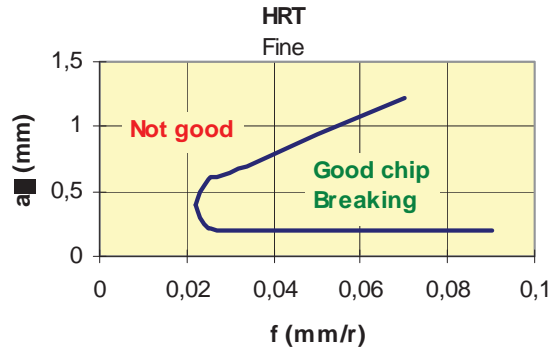
vT-diagram - 280T



Fine machining

Test condition:	Hot rolled tube 235 HV
Insert:	VBMT 110204-UF (CT 525/P10)
Cutting speed:	200 mm/min

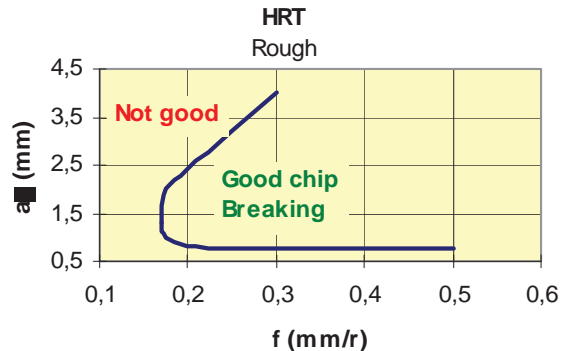
Chip formation diagram - 280T



Rough machining

Test condition:	Hot rolled tube 235 HV
Insert:	SNMG 120408-QM (GC415)
Cutting speed:	200 mm/min

Chip formation diagram - 280T



Disclaimer

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