TOOLOX®
ENGINEERING & TOOL STEEL

TOOLOX® 33, 40 AND 44
ENGINEERING & TOOL STEEL

TYPICAL VALUES

Toolox® 33 – Mechanical Properties	-20°C	+20°C	+200°C	+300°C	+400°C	+500°C
Hardness (HBW)		300	305	290	270	
Hardness (HRC)		~29	~30	~29	~26	
Yield strength $R_{p0.2}$ (MPa)		850	690	680	590	560
Tensile strength R_m (MPa)		980	900			
Elongation, A5, (%)		16	12			
Reduction of Area Z (%)		55				
Impact toughness, Charpy-V (J)	41	100	170	180	180	

Toolox® 40 – Mechanical Properties	-20°C	+20°C	+200°C	+300°C	+400°C	+500°C
Hardness (HBW)		400				
Hardness (HRC)		~40				
Yield strength $R_{p0.2}$ (MPa)		1150	1010	990	900	780
Tensile strength R_m (MPa)		1260	1170	1160	1060	900
Elongation, A5, (%)		14	14	14	15	16
Impact toughness, Charpy-V (J)	18	38				

Toolox® 44 – Mechanical Properties	-20°C	+20°C	+200°C	+300°C	+400°C	+500°C
Hardness (HBW)		450	440	415	380	345
Hardness (HRC)		~45	~44	~42	~38	~35
Yield strength $R_{p0.2}$ (MPa)		1300	1150	1040	980	825
Tensile strength R_m (MPa)		1450	1340	1270	1190	1010
Elongation, A5, (%)		13	10	12	14	19
Reduction of Area Z (%)		35				
Impact toughness, Charpy-V (J)	13	30	60	80	80	

Physical Properties	+20°C		+200°C		+400°C	
	Toolox® 33	Toolox® 44	Toolox® 33	Toolox® 44	Toolox® 33	Toolox® 44
Heat conductivity (W/m*K)	35	34	35	32	30	31
Thermal expansion coefficient (10^{-6}/K)	13.1	13.5	13.1	13.5	13.1	13.5

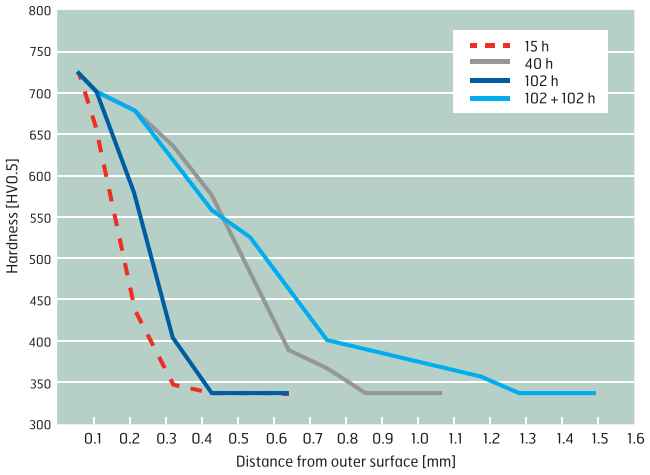
Inclusions			
	Toolox® 33	Toolox® 40	Toolox® 44
Inclusion size (equiv. diam.)	6 micron	6 micron	6 micron
Area fraction	0.015%	0.015%	0.015%
Aspect Ratio	1.2	1.2	1.2

Typical chemical composition	Toolox® 33	Toolox® 40	Toolox® 44
C	0.23%	0.28%	0.32%
Si	1.1%	1.1%	0.9%
Mn	0.8%	0.6%	0.8%
P	Max 0.011%	Max 0.011%	Max 0.011%
S	Max 0.003%	Max 0.002%	Max 0.003%
Cr	Max 1.60%	Max 1.30%	Max 1.70%
Mo	Max 0.80%	Max 1.10%	Max 1.40%
V	Max 0.12%	Max 0.12%	Max 0.17%
Ni	Max 1.0%	Max 1.4%	Max 1.4%
CEIIW	0.65 (Max 0.69)	0.80 (Max 0.84)	0.96 (Max 1.00)
CET	0.39 (Max 0.42)	0.47 (Max 0.50)	0.57 (Max 0.60)

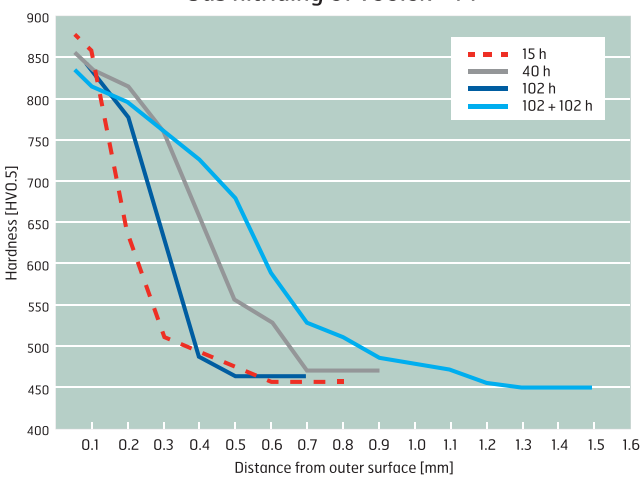
607-en-Toolox: Typical values V1-2020-Solodesign

SURFACE TECHNOLOGY

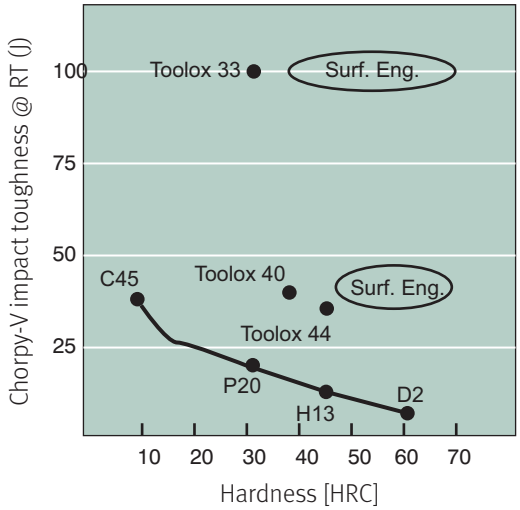
Gas nitriding of Toolox® 33



Gas nitriding of Toolox® 44



HARD & TOUGH



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