

## Assab Steels DIEVAR Hot Work Steel

Category : Metal , Ferrous Metal , Chrome-moly Steel , Tool Steel , Hot Work Steel

### Material Notes:

DIEVAR is a high performance chromium-molybdenum-vanadium alloyed hot work tool steel which offers a very good resistance to heat checking, gross checking, hot wear and plastic deformation. DIEVAR is characterized by: Excellent toughness and ductility in all directions Good temper resistance Good high-temperature strength Excellent hardenability Good dimensional stability throughout heat treatment and coating operations Applications: Die casting, forging, and extrusion

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Physical Properties	Metric	English	Comments
Density	7.78 g/cc	0.281 lb/in <sup>3</sup>	
	7.58 g/cc	0.274 lb/in <sup>3</sup>	
	@Temperature 800 °C	@Temperature 1470 °F	
	7.67 g/cc	0.277 lb/in <sup>3</sup>	
	@Temperature 399 °C	@Temperature 750 °F	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell C	26	26	Hardness during tempering. At tempering temperature (2+ 2h) 700°C. Austenitizing temperature 1025°C (1875°F)
	31	31	Temper resistance. 10 hour holding time at 650°C (1200°F).
	32	32	Temper resistance. 100 hour holding time at 600°C (1110°F).
	33	33	Hardness during tempering. At tempering temperature (2+ 2h) 650°C. Austenitizing temperature 1000°C (1830°F)
	40	40	Temper resistance. 1 hour holding time at 650°C (1200°F).
	42	42	Temper resistance. 100 hour holding time at 550°C (1020°F).
	42	42	Temper resistance. 10 hour holding time at 600°C (1110°F).
	45	45	Temper resistance. 10 hour holding time at 550°C (1020°F).
	45	45	Temper resistance. 1 hour holding time at 550°C (1020°F).

Mechanical Properties	<sup>45</sup> Metric	<sup>45</sup> English	Temper resistance. 1 hour holding time at 500 °C (930 °F).
	45	45	Temper resistance. 1-100 hour holding time at 500°C (930°F)
	51	51	Hardness during tempering. At tempering temperature (2+ 2h) 400°C. Austenitizing temperature 1000°C (1830°F)
	52	52	Hardness during tempering. At tempering temperature (2+ 2h) 400°C. Austenitizing temperature 1025°C (1875°F)
	52	52	Hardness during tempering. At tempering temperature (2+ 2h) 550°C. Austenitizing temperature 1000°C (1830°F)
	50 - 54	50 - 54	Hardness before tempering. Austenitizing temperature: 1000°C (1830°F). Soaking time 30 minutes.
	53	53	tempering temperature (2+ 2h) 550°C. Austenitizing temperature 1025°C (1875°F)
	53	53	Hardness during tempering. At tempering temperature (2+ 2h) 150°C. Austenitizing temperature 1000°C (1830°F)
	54	54	1000°C (1830°F) austenitizing temperature.
	53 - 57	53 - 57	Hardness before tempering. Austenitizing temperature: 1025°C (1875°F). Soaking time 30 minutes.
	55	55	Hardness during tempering. At tempering temperature (2+ 2h) 150°C. Austenitizing temperature 1025°C (1875°F)
	56	56	1025°C (1877°F) austenitizing temperature.
	57	57	1052°C (1920°F) austenitizing temperature
Tensile Strength at Break	1100 MPa @Temperature 500 °C	160000 psi @Temperature 932 °F	R <sub>m</sub> . Short transverse direction.
	1450 MPa @Temperature 100 °C	210000 psi @Temperature 212 °F	R <sub>m</sub> . Short transverse direction.
Tensile Strength, Ultimate	1480 MPa	215000 psi	R <sub>m</sub> . short transverse direction. 44 HRC.
	1640 MPa	238000 psi	R <sub>m</sub> . short transverse direction. 48 HRC.

Mechanical Properties	Metric MPa	English psi	Comments
	@Temperature 23.0 °C	@Temperature 73.4 °F	
Tensile Strength, Yield	1210 MPa	175000 psi	R<sub>p</sub></sub>02. short transverse direction. 44 HRC.
	1380 MPa	200000 psi	R<sub>p</sub></sub>02. short transverse direction. 48 HRC.
	900 MPa	131000 psi	R<sub>p</sub></sub>02. Short transverse direction.
	@Temperature 500 °C	@Temperature 932 °F	
	1200 MPa	174000 psi	R<sub>p</sub></sub>02. Short transverse direction.
	@Temperature 100 °C	@Temperature 212 °F	
	1560 MPa	226000 psi	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
Elongation at Break	12.5 %	12.5 %	short transverse direction. 52 HRC
	13 %	13 %	short transverse direction. 44 HRC
	13 %	13 %	short transverse direction. 48 HRC
	11 %	11 %	short transverse direction
	@Temperature 200 °C	@Temperature 392 °F	
	15 %	15 %	short transverse direction.
	@Temperature 400 °C	@Temperature 752 °F	
	18 %	18 %	short transverse direction.
	@Temperature 600 °C	@Temperature 1110 °F	
Reduction of Area	52 %	52 %	short transverse direction. 52 HRC
	55 %	55 %	short transverse direction. 44 HRC
	55 %	55 %	short transverse direction. 48 HRC
	50 %	50 %	short transverse direction
	@Temperature 200 °C	@Temperature 392 °F	
	60 %	60 %	short transverse direction.
	@Temperature 400 °C	@Temperature 752 °F	
	82 %	82 %	short transverse direction
	@Temperature 600 °C	@Temperature 1110 °F	
Modulus of Elasticity	210 GPa	30500 ksi	

Mechanical Properties	Metric	English	Comments
	@Temperature 800 °C	@Temperature 1470 °F	
	<b>180 GPa</b>	<b>26100 ksi</b>	
	@Temperature 400 °C	@Temperature 752 °F	
Charpy Impact	<b>28.0 J</b>	<b>20.7 ft-lb</b>	V notch. Short transverse direction. 700°C tempering temperature (2 + 2h).
	<b>47.0 J</b>	<b>34.7 ft-lb</b>	V notch. Short transverse direction. 600°C tempering temperature (2 + 2h).
	<b>51.0 J</b>	<b>37.6 ft-lb</b>	V notch. Short transverse direction. 400°C tempering temperature (2 + 2h).
	<b>55.0 J</b>	<b>40.6 ft-lb</b>	V notch. Short transverse direction. 200°C tempering temperature (2 + 2h).
	<b>39.0 J</b>	<b>28.8 ft-lb</b>	V-notch. Short transverse direction. 50 HRC
	@Temperature 100 °C	@Temperature 212 °F	
	<b>45.0 J</b>	<b>33.2 ft-lb</b>	V-notch. Short transverse direction. 47 HRC
	@Temperature 100 °C	@Temperature 212 °F	
	<b>55.0 J</b>	<b>40.6 ft-lb</b>	V-notch. Short transverse direction. 45 HRC
	@Temperature 100 °C	@Temperature 212 °F	
	<b>70.0 J</b>	<b>51.6 ft-lb</b>	V-notch. Short transverse direction. 47 HRC
	@Temperature 250 °C	@Temperature 482 °F	
	<b>70.0 J</b>	<b>51.6 ft-lb</b>	V-notch. Short transverse direction. 50 HRC
	@Temperature 250 °C	@Temperature 482 °F	
	<b>91.0 J</b>	<b>67.1 ft-lb</b>	V-notch. Short transverse direction. 45 HRC
@Temperature 250 °C	@Temperature 482 °F		
<b>97.0 J</b>	<b>71.5 ft-lb</b>	V-notch. Short transverse direction. 47 HRC	
@Temperature 400 °C	@Temperature 752 °F		
<b>105 J</b>	<b>77.4 ft-lb</b>	V-notch. Short transverse direction. 45 HRC	
@Temperature 400 °C	@Temperature 752 °F		
<b>110 J</b>	<b>81.1 ft-lb</b>	V-notch. Short transverse direction. 50 HRC	
@Temperature 400 °C	@Temperature 752 °F		
Impact Test	>= 300 J	>= 221 ft-lb	

Mechanical Properties	Metric	English	Comments
	@Temperature 23.0 °C	@Temperature 73.4 °F	
Thermal Properties	Metric	English	Comments
CTE, linear	12.7 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.06 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 20.0 - 400 °C	@Temperature 68.0 - 752 °F	
	13.3 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.39 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 20.0 - 600 °C	@Temperature 68.0 - 1110 °F	
Thermal Conductivity	31.0 W/m-K	215 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 400 °C	@Temperature 752 °F	
	32.0 W/m-K	222 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 600 °C	@Temperature 1110 °F	

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