Data Sheet

SOREL FORGE

DENSIFIED PREHARDENED DIE BLOCKS STEEL *CRU-DIE*

■ GENERAL

Delivery Condition:

CRU-DIE blocks are furnished hardened and tempered to four hardness levels.

Hardness Designation	BHN Range	Rc Range
1	388/429	42/46
2	341/375	37/40
3	302/331	32/36
4	269/293	28/31

Generally the higher hardness range is used for shallow-impression dies of small section. The lower hardness range is for large dies with deep impressions. The No. 2 hardness range is the most popular and meets the greatest range of applications.

Typical Analysis (%)

C	Mn	Si	Cr	Ni	Mo
.55	.90	.30	1.05	.85	.40

CRU-DIE is a tough alloy steel of a balanced chromium, nickel and molybdenum composition. It offers good through hardening characteristics in a general purpose die block.

CRU-DIE is melted by electric arc furnace, ladle refined and vacuum degassed to ensure superior quality.

CRU-DIE is made by the "densified method " specially designed to forge tool steel with more uniform isotropic physical properties, higher strength and freedom from internal discontinuities.

CRU-DIE is available in standard incremental sizes.

CRU-DIE is 100% ultrasonic tested to very stringent acceptance levels.

DENSIFIED PREHARDENED DIE BLOCKS STEEL
CRU-DIE

TYPICAL APPLICATIONS

- Hot forging dies
- Die holders
- Forming tools
- Hot shear blades
- Mold frames
- Hammer ram and guides
- Piston rods
- Sow blocks
- Tie plates
- Insert dies

HEAT TREATMENT

Normalizing

Heat to 1600°F (870°C) and cool in air. Temper immediately.

Hardening

- **Preheat temperature :** 600°F (320°C) then 1250°F (680°C)
- **Austenitizing temperature :** 1600°F (870°C)
- **Quench :** oil or air
  After soaking at 1550/1600°F (850/870°C), drop the temperature of the part to 1450°F (790°C) before oil quench. This drop in temperature will reduce quenching hazards such as breakage and warpage. Temper immediately when the tool reaches 400°F (200°C)
- **Tempering :** for typical hardness levels, temperatures range between 900°F and 1250°F (480°C and 680°C) then hold for 1 hour per inch (25.4 mm) of total thickness. Temper twice with intermediate cooling to room temperature.
- **Attainable Surface Hardness :** 30 to 46 Rc (285/429 BHN)
- **Nitriding :** **CRU-DIE** steel can be nitrided to produce high surface hardness and for increased fatigue life. However, the steel must be pre-treated and nitriding must be done on finished parts

Note : Protect the part against decarburization and oxidation during hardening.
Tempering at low temperature gives a high stress level in the part and should be avoided.

PROPERTIES

- **Hardness :**
  (Specimens quenched in oil and tempered 4 hours)

Tempering Temperature (°F)	Hardness BHN	Hardness Rc	Tempering Temperature (°C)
600	555/575	55/57	320
700	514/534	52/54	370
800	477/514	50/52	430
900	444/477	47/50	480
1000	401/429	43/46	540
1100	363/375	39/40	590
1200	277/302	29/32	650
1300	217/229	18/21	700

- **Mechanical Properties :**
  (measured on 5 X 6 X 7 (127 X 152 X 178 mm) inch test bars as normalized, hardened and tempered)

Tempering Temperature	Yield Strength	Tensile Strength	Elongation	Reduction of Area	Hardness BHN
As normalized	66 KSI	130 KSI	13%	19%	269
1150°F (620°C)	135 KSI	162 KSI	14%	45%	321
1100°F (590°C)	144 KSI	169 KSI	12%	32%	352

Note : Properties shown throughout this data sheet are typical values. Normal variations in chemistry, size and conditions of heat treatment may cause deviations from these values.

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