

Gears and Shafts

Through Hardened



Gears and shafts can be produced from steel that is suitable for through hardening by quenching and tempering.

The objective is to provide a material with a hardness of between 30HRC and up to 62 HRC. The main problem is that when we seek to achieve higher and higher hardness figures, to be able to increase the load of the component and to resist surface wear, we introduce a greater and greater possibility of quench cracking. Another problem is uncontrolled distortion due to fast quenching. The trade off between steel selection is dependent on hardenability and quenching speed.

The oldest and most well known UK specification is En 19A now called 709M40 and other alternatives include En24 called 817M40.

Where 'clean steel' is a pre-requisite then the most commonly used material is S132. Other grades are available where companies have developed specifications to overcome specific problems associated with either mechanical properties or processing. OvaX 600 is our advanced material to meet this need.

OvaX 600

Today at Ovako we have designed a modern alloy steel alternative specifically developed for through hardening. OvaX 600 is a perfect steel for conventional furnace hardening and air quenching followed by a tempering process and hard shot peening with a 200% coverage.

The material is capable of achieving the high hardness levels of 60HRC and since the material is air quenched the quench cracking, normally associated with high hardness through hardened steels, is virtually eliminated.

The material has been designed to give:

- High Cleanliness
- Slow Air Cooling
- Very Low Distortion
- Reduced Grinding and Finishing
- Dimensional Stability
- High Operating Temperature

Chemical composition

Element	C	Si	Mn	P	S	Cr	Ni	Mo	O	Ti
Min.	0.65	1.45	1.35			1.00		0.23		
Max.	0.70	1.60	1.50	0.025	0.002	1.20	0.25	0.27	9 ppm	30 ppm

OvaX 600

We normally recommend that the material be delivered after tough tempering to give a hardness of between 240-270 HB. In this condition the other properties are show below.

Mechanical properties OvaX 600

Tensile strength, R_m	750 MPa
Yield strength, $R_{p0.2}$	450 MPa
Elongation, A_5	30 %
Area reduction, Z	45 %
Impact strength, KV	20 J
Hardness, HB	240-270 HB

After machining with standard or coated carbide cutting tools the components can be hardened and quenched in still air to give excellent properties.

Mechanical properties for OvaX 600 after hardening at low temperature (160° C)

Tensile strength, R_m	1550 MPa
Yield strength, $R_{p0.2}$	1450 MPa
Impact strength, KV	6 J
Hardness, HRC	61-63 HRC
Retained austenite, %	10-15 %

OvaX 600 has been independently evaluated as a gear steel against conventional carburising steel and will offer superb performance as might be expected from advanced materials.

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Smiths High Performance
Unit O, Stratton Business Park
London Road
Bigglesworth, Beds. SG18 8QB
Tel.: 01767 60 4708
Fax: 01767 31 2885
E-mail: info@smithshp.com
www.smithshp.com



Ovako Ltd.
Unit 2, Britannia Park
Tident Drive, Wednesbury
West Midlands WS10 7XA
Tel.: 0121-502 1010
Fax: 0121-505 0019