

ENGINEERING SPECIFICATION

Hyster-Yale Group, Inc.

Title: LOW CARBON ALLOY STEEL FOR CARBURIZING AND THROUGH HARDENING**Document Control Number:****HC-2****Page 1 of 2****Document Author:** Caitlin Toohey**Effective Date:** 01-Mar-2017 **Revision No.** 2017-03

ANY ACCESS TO THIS DOCUMENT OUTSIDE THE PRIMARY ELECTRONIC SOURCE IS UNCONTROLLED, UNLESS STAMPED, INITIALED AND DATED. THIS DOCUMENT IS CONFIDENTIAL. BY ACCEPTING THIS INFORMATION THE BORROWER AGREES THAT IT WILL NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS LOANED.

I. OBJECTIVE

To provide a general purpose carburizing grade of steel with moderate hardenability which may also be through hardened to a yield strength of 100,000 psi (690 MPa) and remain readily weldable.

II. CITED

See [Master Index](#) or attached Appendix for a complete list of Citing & Cited Documents.

III. REQUIREMENTSStandard Grade

SAE/A1S1 8620H

UNS H86200

Chemical Composition (% Ladle Analysis)

Carbon	0.18 – 0.23
Manganese	0.70 – 0.90
Phosphorous	0.035 maximum
Sulfur	0.040 maximum
Silicon	0.15 – 0.35
Nickel	0.40 – 0.70
Chromium	0.40 – 0.60
Molybdenum	0.15 – 0.25

Alternate Specifications

Chinese: Grade 20CrNiMo per GB/T 3077-1999

Japanese: Grade SNCM220H per JIS G4052

European: Grade 20NiCrMo2 per EN 10084-2008

Hardenability (Jominy)

	<u>Inch</u>	<u>Metric</u>
Rc 41-48	J1	J1.5
Rc 28 Minimum		J6
Rc 27 Minimum	J4	
Rc 21 Minimum	J6	
Rc 20 Minimum		J10.5

Quality

Forgings: Fully killed, fine grain practice as determined by ASTM E112

Bar stock: Regular quality, fine grain practice as determined by ASTM E112.

Heat Treatment

Forgings: Normalized; Brinell hardness 149-207

Bar stock: As rolled; typical Brinell hardness 229 maximum

Dimensional Tolerances

ENGINEERING SPECIFICATION

Hyster-Yale Group, Inc. Title: LOW CARBON ALLOY STEEL FOR CARBURIZING AND THROUGH HARDENING	Document Control Number: HC-2
Page 2 of 2 Document Author: Caitlin Toohey	Effective Date: 01-Mar-2017 Revision No. 2017-03

ANY ACCESS TO THIS DOCUMENT OUTSIDE THE PRIMARY ELECTRONIC SOURCE IS UNCONTROLLED, UNLESS STAMPED, INITIALED AND DATED. THIS DOCUMENT IS CONFIDENTIAL. BY ACCEPTING THIS INFORMATION THE BORROWER AGREES THAT IT WILL NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS LOANED.

Forgings: Commercial forging tolerances, unless otherwise specified

Bar stock: As stated within ASTM A29/A29M

Certification

The supplier shall include with each material or subcontracted part lot shipped to Hyster-Yale Group a statement certifying compliance with HC-2 requirements signed by an authorized representative of the supplier.

IV. GENERAL INFORMATION (Not Part of Requirements)EngineeringApplication

This material is primarily intended to be used for parts such as gears, shafts, and pins which require high surface hardness and a strong, tough supporting core. These properties can be obtained with a carburizing type heat treatment. Parts which require higher core hardness or have heavy sections may require HC-6 to obtain the required core strength level.