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SURFACE VEHICLE STANDARD

SAE J435

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(R) Automotive Steel Castings

1. Scope—This SAE Standard defines the specifications for steel castings used in the automotive and allied industries.

2. References

2.1 Applicable Publications—The following publications form a part of the standard to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ASTM A 781/A 781M—Standard Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use
ASTM A 370—Methods and Definitions for Mechanical Testing of Steel Products
ASTM A 802/A 802M—Standard Practice for Steel Castings, Surface Acceptance Standards, Visual Examination
ASTM A 488—Standard Practice for Steel Castings, Welding, Qualifications of Procedures and Personnel
ASTM A 781—Standard Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use
ASTM E 1030—Standard Test Method for Radiographic Examination of Metallic Castings
ASTM E 446—Reference Radiographs for Steel Castings Up to 2 in. (51 mm) in Thickness

2.1.2 MSS PUBLICATIONS—Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., 127 Park Street, N.E., Vienna, Virginia 22180

MSS SP-55—Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components—Visual Method

3. General Conditions for Delivery

3.1 Material furnished to this specification shall conform to the requirements of specifications ASTM A781/A781M, including any supplementary requirements that are indicated in the order.

4. Chemical Composition

4.1 The composition shall comply with the requirements of Table 1.

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TABLE 1—CHEMICAL AND MECHANICAL TEST REQUIREMENTS FROM SEPARATELY CAST TEST BARS

Grade New	Grade Old	Composition, (wt%)[1] C	Composition, (wt%)[1] Mn	Composition, (wt%)[1] Si	Composition, (wt%)[1] P	Composition, (wt%)[1] S	Mechanical Properties[2] Tensile Strength MPa	Mechanical Properties[2] Tensile Strength (ksi)	Mechanical Properties[2] Yield Strength MPa	Mechanical Properties[2] Yield Strength (ksi)	Mechanical Properties[2] El %	Mechanical Properties[2] R in A %	Mechanical Properties[2] HBW
0000	0022	0.12	0.50–0.90	0.60	0.40	0.045	—	—	—	—	—	—	187 max
415	0025	0.25	0.75[3]	0.80	0.040	0.045	415	(60)	205	(30)	22	30	187 max
450	0030	0.30	0.70[3]	0.80	0.040	0.045	450	(65)	240	(35)	24	35	131–187
585	0050A	0.40–0.50	0.50–0.90	0.80	0.040	0.045	585	(85)	310	(45)	16	24	170–229
690	0050B	0.40–0.50	0.50–0.90	0.80	0.040	0.045	690	(100)	485	(70)	10	15	207–255
550	080	—	—	—	0.040	0.045	550	(80)	345	(50)	22	35	163–207
620	090	—	—	—	0.040	0.045	620	(90)	415	(60)	20	40	187–241
725	0105	—	—	—	0.040	0.045	725	(105)	585	(85)	17	35	217–248
830	0120	—	—	—	0.040	0.045	830	(120)	655	(95)	14	30	248–311
1035	0150	—	—	—	0.040	0.045	1035	(150)	860	(125)	9	22	311–363
1205	0175	—	—	—	0.040	0.045	1205	(175)	1000	(145)	6	21	363–415

1. Single values are maxima.
2. Unless otherwise indicated single values are minima.
3. For each reduction of 0.01% below the specified maximum carbon content an increase of 0.04% manganese above the specified maximum will be permitted to a maximum of 1%.

4.2 **When** not specified in Table 1 the content of carbon, manganese, silicon, and alloying elements may, by agreement, be prescribed by the purchaser. If not specified, the content may be selected by the manufacturer to obtain the required mechanical properties or hardenability.

5. ***Heat Treatment***—All castings shall be supplied in the heat treated condition. The heat treatment procedure may be specified by the purchaser in a written agreement with the supplier. Unless otherwise specified, the supplier may choose to heat treat the castings by one or more of the following processes; annealing, normalizing, normalizing and tempering or quenching and tempering.

In the event of a change in the heat treatment procedure the requirements of Section 6 must be met.

6. ***Mechanical Properties***

6.1 Mechanical testing from separately cast test bars shall be carried out in accordance with ASTM A370.

The mechanical properties shall comply with the requirements of Table 1. The test bars shall be heat treated in production furnaces. Test bars shall be heat treated to the same procedure as the castings they represent.

6.2 **Product Testing**—Subject to agreement between the purchaser and supplier, test bars may be taken from the castings. The location and the required mechanical properties are subject to agreement between the purchaser and supplier.

7. ***Frequency of Testing***

7.1 Following the satisfactory achievement of the required mechanical properties of ten consecutive heats from any one grade, succeeding heats from the same grades may be qualified by hardness testing providing they fall within the range of compositions of the original 10 heats. The castings in each heat will be accepted by hardness testing of one test bar from each heat.

If the purchaser wishes to substitute complete mechanical testing then supplementary requirement 10.1 should be specified.

7.2 **Retests**—If any specimen shows defective machining, or exhibits flaws, it may be discarded and another substituted from the same heat.

8. ***Inspection***

8.1 **Minor discontinuities**—The surface of the casting shall be free of adhering sand, scale, cracks and hot tears as determined by visual examination. Other surface discontinuities shall meet the visual acceptance standards specified in the order. Practice ASTM A 802/A 802M or other visual standards such as MSS SP-55 may be used to define acceptable surface discontinuities and finish. Unacceptable visual surface discontinuities shall be removed and their removal verified by visual examination of the resultant cavities.

8.2 **Peening**, plugging and impregnating of castings are not allowed.

8.3 **Marking**—The manufacturer's name or identification mark and the pattern number shall be cast or stamped on all castings. When further specified, the heat numbers or serial numbers shall be marked on the individual castings.

8.4 **Inspection by the Purchaser**—The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to satisfy him that the material is being produced and supplied in accordance with this specification. Foundry inspection by the purchaser shall not interfere with the manufacturer's operations`. All tests and inspections (except product analysis) shall be made at the place of manufacture unless otherwise agreed to.

8.5 Rejection and Rehearing—Requirements for rejections and rehearing shall be agreed between the purchaser and supplier.

9. Welding—Welding may be carried out by the producer. The welder and procedure must be qualified to the requirements of ASTM A 488. Welds shall be subject to the same inspection standards as the casting.

10. Supplementary Requirements—The following supplementary requirements may be specified at the time of the inquiry and order.

10.1 The castings in each heat will be accepted from one mechanical test specimen.

10.2 Limits for unspecified elements and the methods of analysis for them shall be as agreed upon by the supplier and purchaser.

10.3 Details of the following supplementary requirements may be found in ASTM A781/A781M.

10.3.1 PROOF TESTING

10.3.2 DESTRUCTIVE TESTS

10.3.3 RADIOGRAPHIC EXAMINATION

10.3.4 ULTRASONIC EXAMINATION

10.3.5 MAGNETIC PARTICLE EXAMINATION

The acceptance standards for radiography, ultrasonic, magnetic particle examination, and destructive testing shall be agreed upon by the purchaser and supplier at the time of the enquiry and order.

11. Notes

11.1 Marginal Indicia—The change bar (l) located in the left margin is for the convenience of the user in locating areas where revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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AUTOMOTIVE IRON AND STEEL CASTINGS