



AUSTEMPERED DUCTILE IRON

Austempering Offers Manufacturers High-Strength, Low-Cost Components:

Austempered Ductile Iron (ADI) has found successful applications across many industries. This specialty heat treated material combines low-cost manufacturing and near net shape casting technologies with a combination of beneficial properties to provide you and your customer with cost-effective components that outperform the competition.

Applications

AUTOMOTIVE

- Timing Gears
- Output Shafts
- Control Arms
- CV Joints
- Engine Brackets
- Differential Housings
- Crankshafts
- Steering Knuckles
- Tow Hooks

HEAVY TRUCK

- Brake Spiders
- U-Bolt Brackets
- Sway Bar Bushings
- Suspension Brackets
- Wheel Hubs
- Differential Case and Clutch Collars
- Pintle Hooks

INDUSTRIAL

- Conveyor Links
- Trolley Bodies
- Pipe Bending Components
- Tool Holders

AGRICULTURE

- Plow Points
- Hitches
- Control Arms
- Digger Teeth
- J-Hooks
- Knotter Gears

CONSTRUCTION

- Bucket Teeth
- Engine Components
- Sprockets
- Shafts

Railroad

- Suspension Housings
- Suspension Covers
- Wear Plates

Mining

- Drive Shafts
- Wear Plates



ADI Components

The Leader In Austempering Technology...Applied Process

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Latest Revision/Update:
ASTM 897 (in-lb units)
ASTM 897M (SI units)

8-Feb-2002

125-80-10

150-100-07

175-125-04

200-155-01

230-185-00

850-550-10

1050-700-07

1200-850-04

1400-1100-01

1600-1300-00

GRADE 1

GRADE 2

GRADE 3

GRADE 4

GRADE 5

TYPICAL PROPERTIES*

MONOTONIC (STATIC) PROPERTIES					
TENSILE STRENGTH (ksi/MPa)	140/966	165/1139	190/1311	220/1518	240/1656
0.2% OFFSET YIELD STRENGTH (ksi/MPa)	110/759	130/897	160/1104	180/1242	210/1449
ELONGATION (% IN 2 INCH GAGE LENGTH)	11	10	7	5	3
HARDNESS BRINELL BHN (B.I.D. mm)	302 (3.50)	340 (3.30)	387 (3.10)	418 (3.00)	460 (2.85)
REDUCTION IN AREA (%)	10	9	6	4	2
**YOUNG'S MODULUS (Msi/GPa)	23.1/159.3	22.9/157.9	22.7/156.5	22.5/155.1	22.3/153.8
COMPRESSIVE STRENGTH (ksi/MPa)	200/1380	240/1650	280/1935	330/2275	365/2520
SHEAR STRENGTH (ksi/MPa)	125/870	150/1025	170/1180	200/1370	215/1490
MODULUS OF RIGIDITY (Msi/GPa)	9.44/65.1	9.28/64.0	9.16/63.2	9.04/62.4	9.00/62.1
POISSON'S RATIO	0.25	0.25	0.25	0.25	0.25
***STRENGTH COEFFICIENT K (ksi, MPa)	218/1503				
***STRAIN HARDENING EXPONENT n	0.143				
***TRUE FRACTURE STRENGTH sf	150/1032				
***TRUE FRACTURE DUCTILITY ef	0.082				
DYNAMIC PROPERTIES					
FATIGUE STRENGTH (@10 MILLION CYCLES):					
-ROTATING BENDING AS MACHINED (ksi/MPa)	65/450	70/485	60/415		
-REVERSE BENDING AS MACHINED (ksi/MPa)		60/415	55/380		
-AXIAL PUSH-PULL		55/385			
-G-50 MAX. ALLOWABLE CONTACT STRESS (ksi/MPa)	165/1155	180/1260	195/1365	220/1560	250/1750
-G-50 SINGLE TOOTH BENDING AS MACHINED (ksi/MPa)	50/350	52/365	50/350	48/335	46/320
-G-50 SINGLE TOOTH BENDING AS SHOT PEENED (ksi/MPa)	100/700	110/770	100/700	95/665	90/630
-UN-NOTCHED CHARPY IMPACT@70F/21C (ft-lb/JOULES)	90/120	90/120	70/93	60/80	40/53
-NOTCHED CHARPY IMPACT @70F/21C (ft-lb/JOULES)	9/12	8/10.6	7/9.3	6.5/8.6	6/8
DYNAMIC ELASTIC MODULUS (Msi/GPa)	24.7/170	24.4/168	24.2/167	23.9/165	23.7/164
EST. DUCTILE/BRITTLE TRANSITION TEMP. (F/C)	-2/-20	-2/-20	-2/-20	-2/-20	-2/-20
FRACTURE TOUGHNESS (ksi*SQRT(in)/MPa*SQRT(m))	100/109	78/85	55/60	48/52	40/44
**STRENGTH COEFFICIENT K' (ksi/MPa)	223/1538				
**STRAIN HARDENING EXPONENT n'	0.1330	0.1376	0.1465	0.1600	
**FATIGUE STRENGTH COEFFICIENT sf' (ksi/MPa)	211/1455	2720	3100	5020	
**FATIGUE STRENGTH EXPONENT b	-0.1110	-0.1460	-0.1600	-0.2050	
**FATIGUE DUCTILITY COEFFICIENT ef'	0.1990	0.1780	0.3960	0.4880	
**FATIGUE DUCTILITY EXPONENT C	-0.6770	-0.6280	-0.7520	-0.8480	
PHYSICAL (INTRINSIC) PROPERTIES					
DENSITY (lb/cu. in; g/cu. cm)	.2562/7.0965	.2558/7.0872	.2555/7.0779	.2552/7.0686	.2548/7.0593
COEFF. OF THERMAL EXPANSION (in/in/F; mm/mm/C) X 10 ⁻⁶	8.1/14.6	8.0/14.3	7.8/14.0	7.7/13.8	7.5/13.5
WEAR RESISTANCE (AMAX PIN TEST,VOLUME LOSS cu. mm)	10.9	10.8	10.6	10.3	9.8
LINEAR EXPANSION inches/inch (from Ferritic/from Pearlitic)	.0012/.0002	.0018/.0008	.0025/.0013	.0027/.0016	.0028/.0017
THERMAL CONDUCTIVITY (BTU-in/h-sq.ft-F; W/M-K)	153/22.1	151/21.8	149/21.5	147/21.2	145/20.9
INTERNAL DAMPING (log decr.) X .0001	5.26	5.41	5.69	12.7	19.2

These numbers are not guaranteed minimums. They represent typical properties that one may observe in commercial ADI components.

** Young's modulus data courtesy of Daimler-Chrysler

*** Grade 125-80-10 fatigue coeff. & exponents courtesy of Daimler-Chrysler. All other grades courtesy of John Deere

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