# DARTON SLEEVES™

**Patented Technology for the Serious Competitor**


*The most comprehensive catalogue from the most creative sleeve company in the business.*

# The Definitive "How-to Book"

from the most creative sleeve company in the business.

**1.800.71DARTON**

The axiom "unless you are in the lead, the view never changes" is routinely used in many team endeavors to describe what the followers see while in trail positions. At Darton Sleeves, the view is always changing.

Darton has taken a rather mundane product and transformed it into high technology solutions for performance engines. Darton is proud of our recently issued sleeve patent which, to our knowledge, is the only sleeve patent issued to a U.S. sleeve manufacturer.

Darton stays in the lead technologically because we concentrate on solutions to the problem associated with the expanding envelope of more performance and horsepower demands made by enthusiasts and racers alike. At Darton we are constantly evaluating current engine designs from the OEM market and anticipating the needs of the racer to stay ahead of the new product curve. From simple and cost effective sleeve replacements to high tech modified engine sleeve solutions, count on Darton Sleeves, the sleeve technology leader.

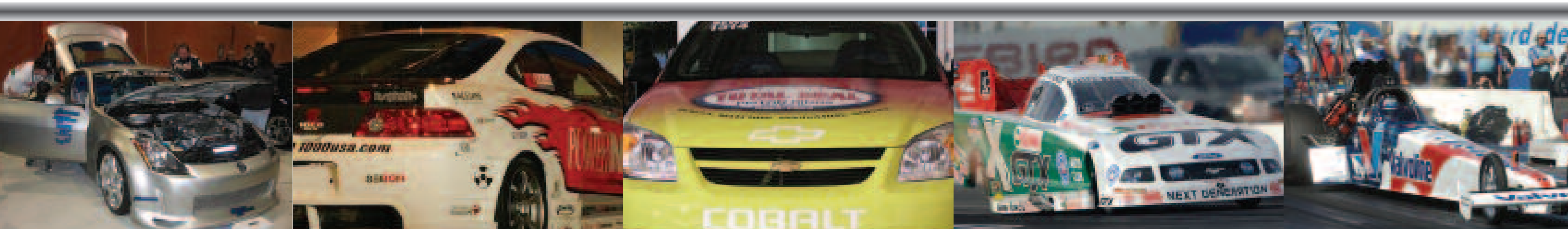
## MISSION STATEMENT:

"Darton is focused on servicing the needs of our customers, small and large alike–leading the way in new technologies for an innovative product–guided by ethical and noble business practices."



## DARTON FIRSTS:

- First with custom chemistry to increase Ductile Iron beyond ASTM
- First to exceed 5% elongation while maintaining Ductile Iron hardness
- First to offer small lot custom manufacturing at an affordable cost
- First to offer professional sleeve design assistance
- First to offer engineering blueprint templates for customer designs
- First to provide Ductile Iron sleeves for a FAA Certified Aircraft Engine
- First new revolutionary sleeve design with the Patented M.I.D. concept
- First to offer R&D on M.I.D. applications to customers with in house block machining services
- First to offer unique Dry Sleeve "Seal Tight Technology" manufacturing
- First to offer customers choices in Ductile Iron specifications for small lot runs
- First 300 mph pass by a Top Fuel Dragster
- First 300 mph pass by a Top Fuel Funny Car
- First 6 second pass by a PRO RWD with a 4cyl. Engine
- First 9 second pass by a N/A Honda SOHC on gas
- First 6 second pass by a Nissan 350Z
- First 8 second pass by Pro 4cyl. (hotrod) on gas



# Contents

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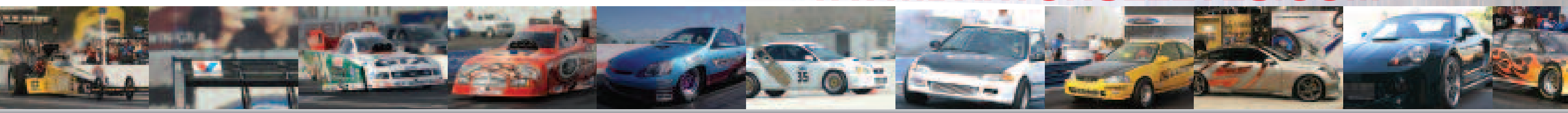
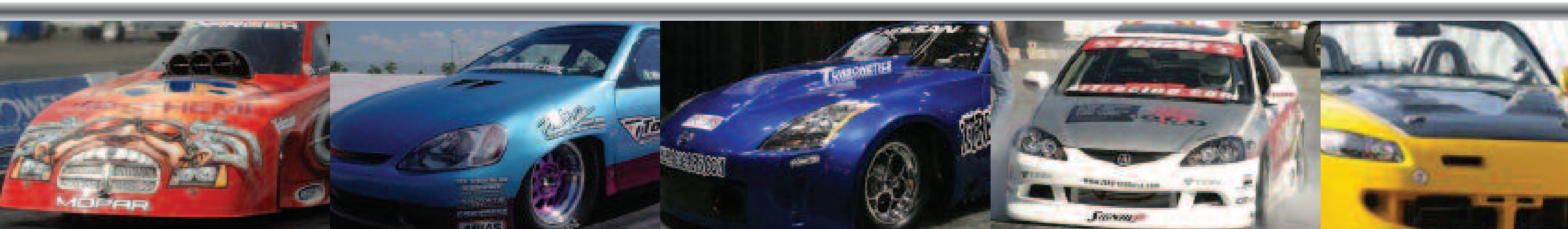






# Darton Story



Darton International was incorporated in 1978 with a goal of becoming a premier manufacturer of automotive speed equipment parts. Pursuit of this objective lead the founders to establish manufacturing relationships with unique European factories specializing in products and techniques which would harmonize with Darton's potential customers

Darton initially selected two groups of products to concentrate on: steelstampings (such as valve covers) and precision CYLINDER SLEEVES. One of the company's first customers for both groups of products was Milodon Engineering. Together, they pioneered new and innovative ways to manufacture their product, performance cylinder sleeves. Darton became the first supplier of high quality centrifugally cast ductile iron cylinder sleeves to meet SAE and ASTM rigid quality control standards.

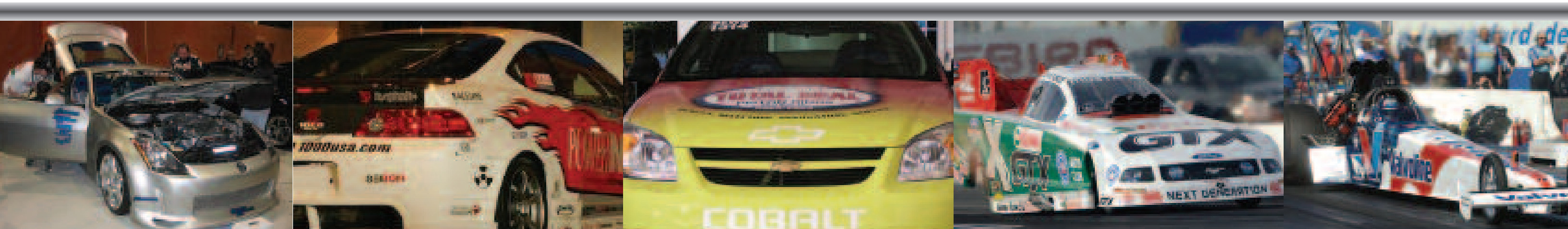
In 1990, Darton aligned with  an international company based in Portugal. Pachancho, a 100 year-old manufacturing firm, located in picturesque northern Portugal, leads a group of manufacturing firms specializing in automotive products such as piston rings, CYLINDER SLEEVES, iron castings and specialty aluminum castings. The Darton affiliate company is world renowned and is a major supplier to the automotive industry in Europe.

In addition Darton has expanded its sources of centrifugally cast ductile iron. Due to the unique chemical and mechanical properties of Darton's ductile iron extensive testing was done in order to find the right foundry that could adhere to the strict process required to make Darton's specific ductile iron. After careful evaluation Darton has strategically formed a partnership with a very large and reputable foundry located in India. With this new addition Darton is able to increase it's production to become the largest supplier of ductile iron cylinder liners worldwide.

Still today the focus of Darton International's business is the manufacture and delivery of cylinder sleeves, sometimes referred to as cylinder liners. Darton continues to advance in the performance racing industry market and the aviation market. A recent marriage of the two marketplaces occurred when Darton was selected by the Orenda Aerospace Corporation to manufacture cylinder sleeves for Orenda's new liquid cooled V-8 airplane engine program. The new Orenda engine, OE-600, is certified by The Canadian Department Of Transport and the Federal Aviation Administration.

Darton is also the prime sleeve supplier for the Ford SVO aluminum engine program. Darton employs a market strategy aimed at becoming the primary sleeve supplier of choice for small engine shops and OEM's alike. To accomplish this task, Darton continues its research and development and utilizes state-of-the-art manufacturing technology to continually market with new products such as our latest invention: "modular integrated deck" wet sleeve kits and our “seal tight” dry sleeve kits.

DARTON



# How To Use This Catalogue



## APPLICATIONS LISTED BY

### Sleeve Type

example: M.I.D., repair, blank

### Block Manufacturer or Type of Block

Listed in alphabetical order

### Cylinder Sleeve Sizes:

A. Listed by Bore Size, Outside Diameter, Over All Length

B. If the sleeve has a Flange the size of the Flange Thickness and Flange Outside Diameter is listed

**Important Note:**

1. Not all dimensions are listed for some sleeves, ie. extra body diameters and/or flats, contact sales for details

2. If you cannot find the correct size or application listed we can custom make the sleeve. See the Custom Sleeve Section of the catalog



## SLEEVE TYPES

These are descriptions on the different types of sleeves available

Del Sohn Racing, courtesy of DSport Magazine

### Repair Sleeve

Single body diameter sleeve

### Flanged Sleeve

Single body diameter with flange at the top

### Flanged Sleeve With Multi Diameters

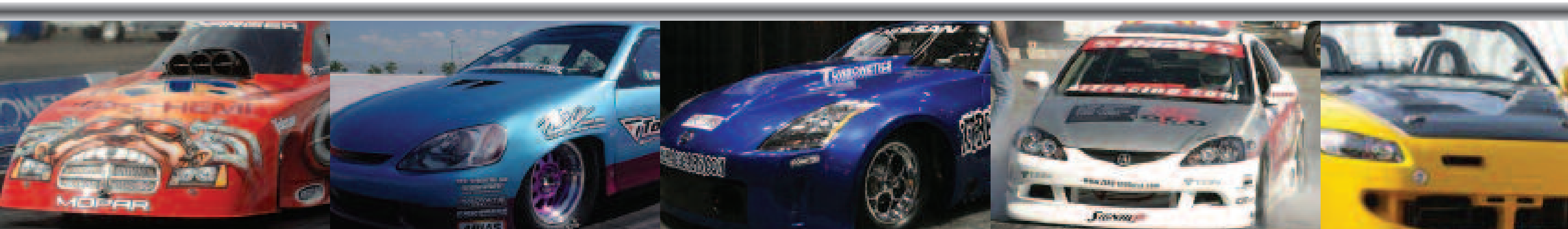
Two or more body diameters with a flange on the top

### Wet Sleeve

Sleeve with or without a flange, also with multi-body diameters and one or more bodies exposed to coolant

### M.I.D. Sleeve (Modular Integrated Deck™)

Wet sleeve with special features, see M.I.D. section of catalog for description



# What is M.I.D.™?

MID™
MODULAR INTEGRATED DECK

**1.800.71DARTON**

Darton pioneered modular sleeve designs and specialty ductile iron material beginning with our manufacture of top fuel sleeves for Keith Black Racing Engines and Milodon Engineering in 1978. This experience, our racing heritage, and our highly experienced staff of machinists and racing engine builders offered a unique set of blended talent to solve inherent block weakness design in the currently available engines where bore sizes were intended to be increased.

Many production cast iron and aluminum blocks suffer from a design weakness of cylinder stability by nature of poor support at the upper deck area. The manufacturing process of "cast in sleeves" provides for economy of scale in low horsepower engines, but does not accommodate high horsepower, high boost, or larger bore sizes.

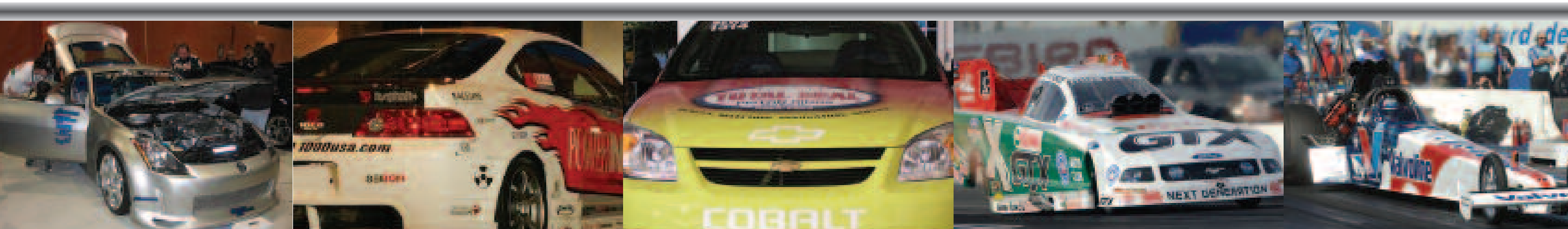
Darton has engineered a superior patented (patent #6,799,541) solution by using a unique designed cylinder sleeve which when siamesed and nested, creates a solid deck of sleeve flanges held in tension, reinforcing the upper deck area and provides for individual replacement with what we call Modular Integrated Deck (MID). In addition, Darton designs' manage and enhance water flow from block to head to promote stability of cooling and all sleeves are of the "Wet" design.

The enhanced water flow in and around the flange area is possible because of ported water flow control engineering we call "Swirl Coolant Technology™". This process begins with specific engineering models of respective cylinder head and combustion chamber designs and then we promote increased flow of water in those areas of the upper sleeve area subjected to the most heat. Heat is also dissipated through the use of " Register Fins"™. There is a different engineering model for each engine and cylinder design. While heat is generally considered to translate into energy, high resident heat in the combustion chamber can lead to detonation, the single highest cause of engine failure in the high horsepower regimes. High RPM normally translates into efficient scavenging of airflow but during misfires or incomplete flame propagation, high cylinder pressures and temperatures are created. Our MID design compensates for this high resident heat soak condition.

In the normal dry sleeve installation the cooling medium, water, must transfer heat absorption through block material and sleeves, which may be dissimilar metals. When dry sleeves are pressed in with interference fit, the materials interface is not perfect which further exacerbates heat transfer. This thermal conductivity is inefficient and as more heat is generated, the combustion process is compromised. Even in wet sleeve designs of the past, water is never efficiently processed or flowed between the block and head to provide for maximum heat dissipation in the combustion chamber. Inherent in open or closed deck engine blocks of cast iron or aluminum is a certain amount of water stagnation. This is like pouring water through a funnel, there is really no flow or velocity until the water exits the spigot. In the case of blocks and heads, the casting ports are designed for ease of casting not efficient flow. Now with Darton's "MID", Swirl Coolant Technology the cooling medium is ported and directed to significantly improve heat transfer where it is needed most, in the upper cylinder wall/flange area.

The Darton M.I.D.™ Sleeve Kit is available for many series of 4, 6, and 8 cylinder import and domestic engines and provides for maximum bore sizes and boost potential. The benefits of our M.I.D.-series kits are:

- Improved block integral strength
- Improved cooling
- Kits can be installed by your local machine shop
- "Wet sleeve" replace-ability
- Full installation manual available on website
- Increased horsepower output potentia
- High boost and horsepower potential
- Superior oil and compression control
- Superior cylinder sealing and ring wear
- Street or strip application
- Bulletproof Darton ductile iron,
  130,000-psi tensile strength



DARTON SLEEVES

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# MID™

MODULAR INTEGRATED DECK

U.S. Patent #6,799,541

# Ford™ MID

1.800.71DARTON

MID™ MODULAR INTEGRATED DECK

## Darton M.I.D. Kits for FORD™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Bore Size |
|---|---|---|---|---|---|---|---|
| **DURATEC** | | | | | | | |
| 700-100 | 3.435 | 3.950 | 0.203 | 5.500 | 0.500 | 4.825 | 87mm to 90mm MAX |
| **4.6L MODULAR** | | | | | | | |
| 700-110 | 3.605 | 4.250 | 0.323 | 5.225 | 0.400 | 4.702 | 92mm to 95mm MAX |
| **5.4 MODULAR IRON/ALUMINUM BLOCK** | | | | | | | |
| 700-120 | 3.605 | 4.250 | 0.323 | 6.125 | 0.400 | 4.702 | 92mm to 95mm MAX |

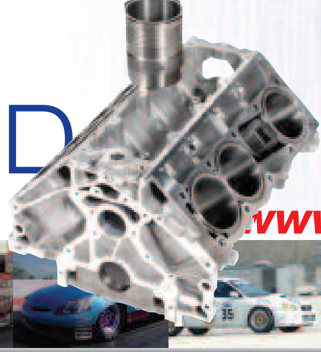


### TECH TIP:

When using the MID kits with the modular blocks you must use DOHC heads & special Cometic MID MLS gasket.


PER Racing Engines

# GM™ MID





MID™ MODULAR INTEGRATED DECK

## Darton M.I.D. Kits for GM™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Bore Size |
|---|---|---|---|---|---|---|---|
| **ECOTEC** | | | | | | | |
| 500-100 | 3.370 | 3.900 | 0.265 | 5.600 | 0.500 | 4.826 | 86mm to 90mm MAX |
| **NORTHSTAR** | | | | | | | |
| 600-500 | 3.645 | 4.285 | 0.320 | 5.100 | 0.400 | 5.030 | 93mm to 96mm MAX |
| **LS-1/ LS-6** | | | | | | | |
| 600-120 | 4.110 | 4.700 | 0.287 | 5.675 | 0.400 | 5.140 | 4.125 to 4.160 MAX |
| 600-140 | 4.165 | 4.700 | 0.267 | 5.675 | 0.400 | 5.140 | 4.170 to **4.200 MAX** |
| **LS-2** | | | | | | | |
| 600-160 | 4.100 | 4.700 | 0.300 | 5.675 | 0.400 | 5.140 | 4.125 to 4.165 MAX |
| 600-170 | 4.165 | 4.700 | 0.267 | 5.675 | 0.400 | 5.140 | 4.170 to **4.200 MAX** |
| **LS-2/7** (NEW!!) | | | | | | | |
| 600-180 | 4.100 | 4.700 | 0.300 | 5.800 | 0.400 | 5.140 | 4.125 to **4.200 MAX** |

### TECH TIP:

You must use Cometic's Darton MID gasket when using the MID kit on the LS-Series motors.


Tiffany Cline–Sport FWD

# Honda™ MID

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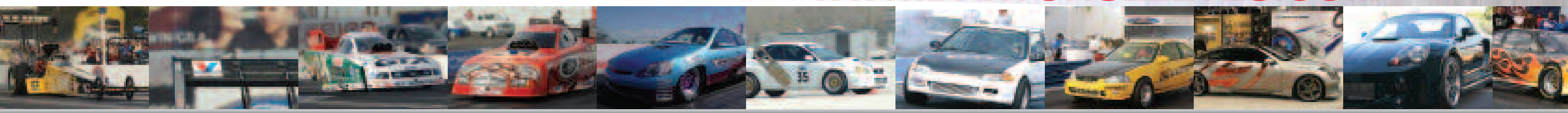
## Darton M.I.D. Kits for HONDA™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Bore Size |
|---|---|---|---|---|---|---|---|
| **D16** | | | | | | | |
| 400-100 | 2.940 | 3.400 | 0.230 | 5.450 | 0.500 | 4.326 | 75mm to 78mm MAX |
| **B16 81mm** | | | | | | | |
| 400-110 | 3.180 | 3.750 | 0.285 | 5.250 | 0.500 | 4.626 | 81mm to 85mm MAX |
| **B16 84mm** | | | | | | | |
| 400-120 | 3.298 | 3.750 | 0.226 | 5.250 | 0.500 | 4.626 | 84mm to 85mm MAX |
| **B18 81mm** | | | | | | | |
| 400-130 | 3.180 | 3.750 | 0.285 | 5.500 | 0.500 | 4.626 | 81mm to 85mm MAX |
| **B18 84mm** | | | | | | | |
| 400-140 | 3.298 | 3.750 | 0.226 | 5.500 | 0.500 | 4.626 | 84mm to 85mm MAX |
| **F22** | | | | | | | |
| 400-150 | 3.338 | 3.850 | 0.256 | 5.800 | 0.500 | 4.826 | 85mm to 90mm MAX |
| **H22 / H23** | | | | | | | |
| 400-160 | 3.415 | 3.850 | 0.217 | 5.800 | 0.500 | 4.826 | 87mm to 90mm MAX |




Bisi Ezerigha–All Motor



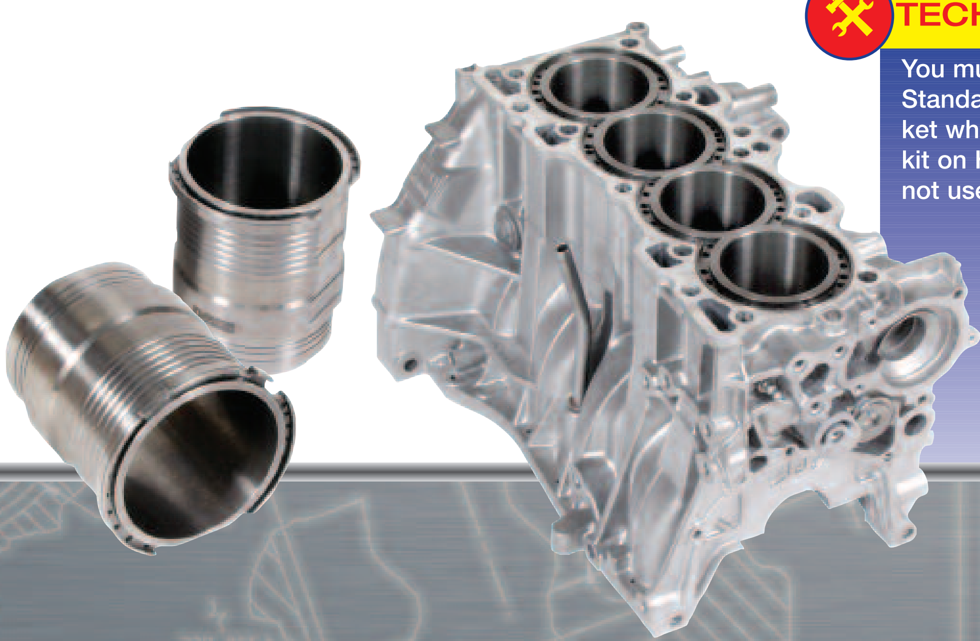
# Darton M.I.D. Kits for HONDA™

MID™ MODULAR INTEGRATED DECK

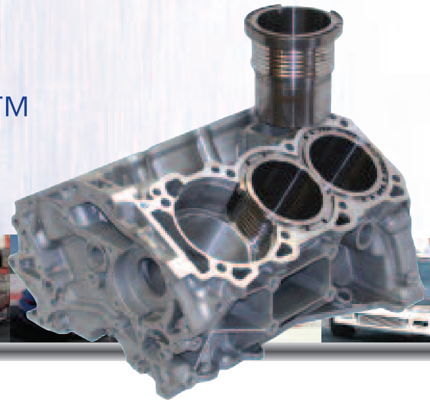
| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Bore Size |
|---|---|---|---|---|---|---|---|
| **B16 DRAG ONLY** | | | | | | | |
| 400-170 | 3.375 | 3.750 | 0.188 | 5.250 | 0.500 | 4.626 | 86mm to 87mm MAX |
| **B18 DRAG ONLY** | | | | | | | |
| 400-180 | 3.375 | 3.750 | 0.188 | 5.500 | 0.500 | 4.626 | 86mm to 87mm MAX |
| NEW!! **K20** | | | | | | | |
| 400-190 | 3.375 | 3.800 | 0.213 | 5.200 | 0.500 | 4.826 | 87mm to 90mm MAX |
| NEW!! **K24** | | | | | | | |
| 400-200 | 3.415 | 3.850 | 0.217 | 5.800 | 0.500 | 4.826 | 87mm to 90mm MAX |
| **C30 / C32 NSX** | | | | | | | |
| 400-210 | 3.645 | 4.160 | 2.570 | 4.900 | 0.500 | 4.850 | 93mm to 94mm MAX |
| *Custom made to order. | | | | | | | |
| NEW!! **F20** | | | | | | | |
| 400-220 | 3.415 | 3.850 | 0.217 | 5.800 | 0.500 | 4.826 | 87mm to 90mm MAX |
| NEW!! **J35** | | | | | | | |
| 400-230 | 3.490 | 3.970 | 0.230 | 5.475 | 0.400 | 4.950 | 89mm to 90mm Max |

## TECH TIP:

You must use Cometic's Standard MLS .030 gasket when using the MID kit on Honda motors. Do not use HP gaskets.



# Nissan™



**1.800.71DARTON**

MID™ MODULAR INTEGRATED DECK

## Darton M.I.D. Kits for NISSAN™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Bore Size |
|---|---|---|---|---|---|---|---|
| NEW!! **VQ35DE** | | | | | | | |
| 800-200 | 3.720 | 4.450 | 0.365 | 5.050 | 0.400 | 5.060 | 95mm to 100mm MAX |
| NEW!! **VQ40DE** | | | | | | | |
| 800-220 | 3.720 | 4.450 | 0.365 | 5.700 | 0.400 | 5.060 | 95mm to 100mm MAX |
| NEW!! **QR25DE** | | | | | | | |
| 800-240 | 3.490 | 3.950 | 0.230 | 5.925 | 0.400 | 4.950 | 89mm to 90mm Max |



Performance Motorsports–Pro RWD

# Porsche™ MID

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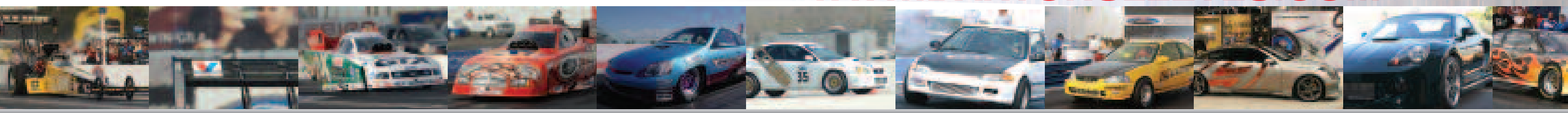


## Darton M.I.D. Kits for PORSCHE™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Bore Size |
|---|---|---|---|---|---|---|---|
| **968 3.0L** (NEW!!) | | | | | | | |
| 800-400 | 3.985 | 4.740 | 0.377 | 5.650 | 0.400 | 5.401 | 101.6mm to 106mm MAX |
| **944 2.5L & 3.0L** (NEW!!) | | | | | | | |
| 800-420 | 3.985 | 4.740 | 0.377 | 5.650 | 0.400 | 5.401 | 101.6mm to 104mm MAX |
| **928 V8** | | | | | | | |
| 800-440 | | | | | | | IN R&D |

# JE Pistons™

**1.800.71DARTON**



## LS-1™ / LS-6™

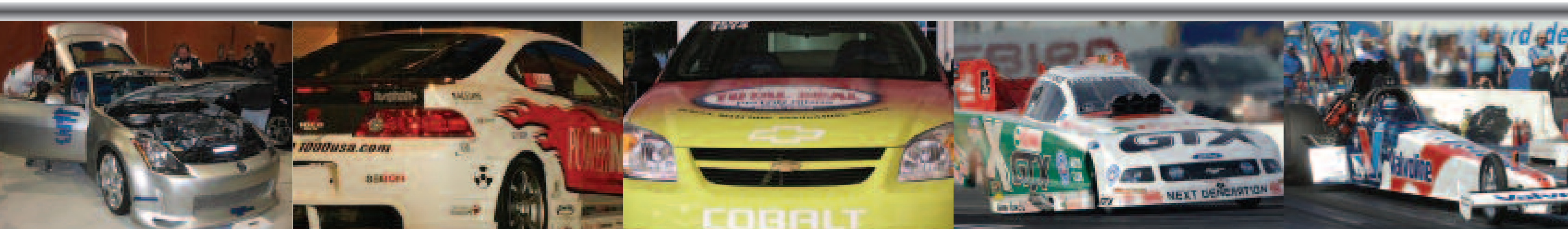
| Cubic Inches | Bore | Stroke | Rod Length | Deck Clearance 9.340 Block | Compression Distance | HEAD CC 64CC | 66CC | 72CC | Dome Volume | Weight | Footnote | Oversize | Part Number | Req'd Part Nr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STD BORE 3.900 5.7L 4.000 6.0L | | | | | LS-1 FSR SERIES | | | 1 | .5, 1.5, 3MM RINGS | | | | | J60008- |
| | 4.125 | 4.000 | 6.125. | .000 | 1.115 | 9.5 | 9.3 | 8.9 | -29 | NEW | C | | 207502 | 4125-5 |

*FOOTNOTES: B= OIL RAIL SUPPORT IS INCLUDED, C= .927 PIN DIAMETER, K= .945 PIN DIAMETER*

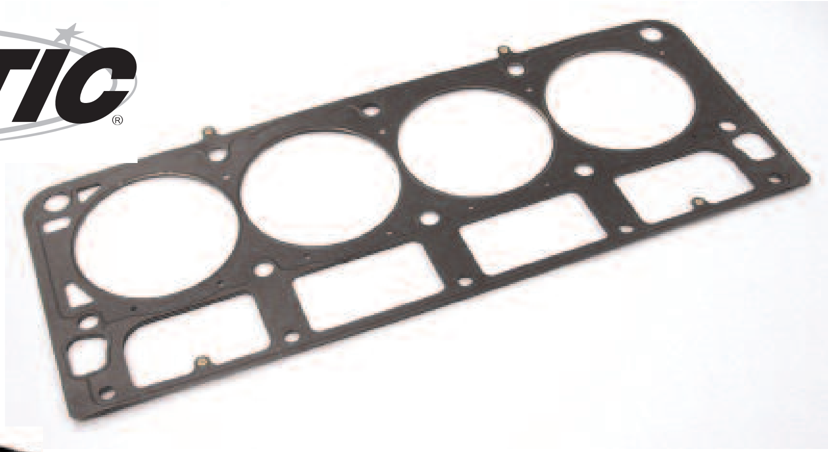
## Honda™ / Acura™

| Bore | mm/Inch | Oversize | Stroke | Rod Length | Comp Height | Head CC | Compression Ratio | Dome Volume | Weight | Footnote | Part Number | Req'd Ring Set |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ACURA-B18C1, 1.8L DOHC, VTEC 94-01, ACURA INTEGRA GSR** | | | | | | | | | | | | |
| 81.50 | 3.209 | +.020 | 3.433 | 5.429 | 1.181 | 41.5 | 9.0:1 | -9.3 | 284 | T | 189682 | JXCOF4-3209-2 |
| 81.50 | 3.209 | +.020 | 3.433 | 5.429 | 1.195 | 41.5 | 12.5:1 | 6.7 | 287 | U | 179501 | JXCOF4-3209-2 |
| **HONDA-H22A1 2.2L DOHC VTEC 92-96 PRELUDE Si/97-01 PRELUDE** | | | | | | | | | | | | |
| 87.00 | 3.425 | STD | 3.571 | 5.630 | 1.220 | 53.8 | 9.0:1 | -7.1 | 329 | M,T | 165052 | JC0004-3425 |
| 87.00 | 3.425 | STD | .571 | 5.630 | 1.220 | 53.8 | 11.5:1 | 9.8 | 343 | M,U | 166035 | JC0004-3425 |

*M Nikasil Block must be resleeved with Ductile Iron Sleeves, T Accepts Turbo and Nitrous,*
*U Not designed for use with Turbo or Nitrous, V Accepts Nitrous*



COMETIC GASKET
www.cometic.com



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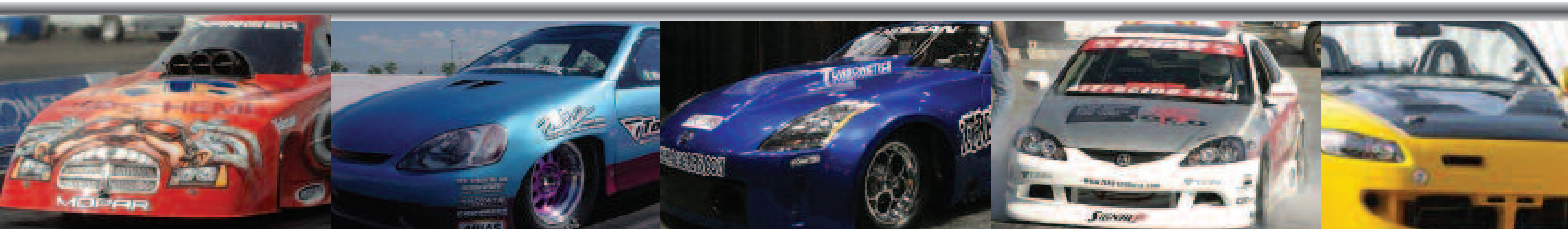

# Brodix™/Rodeck™

1.800.71DARTON

## Darton Manufactured Sleeves to Fit BRODIX/RODECK™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 100-1010-A | 3.995 | 4.272 | 0.139 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1010-A+.010 | 3.995 | 4.282 | 0.144 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1010-A+.020 | 3.995 | 4.292 | 0.149 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1010 | 3.995 | 4.300 | 0.153 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1010+.010 | 3.995 | 4.310 | 0.158 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1010+.020 | 3.995 | 4.320 | 0.163 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011-A | 4.115 | 4.272 | 0.079 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011-A+.010 | 4.115 | 4.282 | 0.083 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011-A+.020 | 4.115 | 4.292 | 0.088 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011 | 4.115 | 4.300 | 0.092 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011+.005 | 4.115 | 4.305 | 0.095 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011+.010 | 4.115 | 4.310 | 0.097 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011+.020 | 4.115 | 4.320 | 0.103 | 5.535 | 0.188 | 4.481 | SBC STYLE |
| 100-1011-TD | 4.115 | 4.300 | 0.092 | 6.035 | 0.188 | 4.481 | SBC STYLE |
| 100-1011TD+010 | 4.115 | 4.310 | 0.097 | 6.035 | 0.188 | 4.481 | SBC STYLE |
| 100-1011TD+020 | 4.115 | 4.320 | 0.103 | 6.035 | 0.188 | 4.481 | SBC STYLE |
| 430-075-TD-1 | 4.118 | 4.272 | 0.077 | 6.035 | 0.188 | 4.481 | SBC STYLE |
| 430-075-TD | 4.118 | 4.272 | 0.081 | 5.735 | 0.188 | 4.481 | SBC STYLE |
| NEW!! 44-317 | 4.480 | 4.725 | 0.122 | 6.600 | 0.250 | 4.950 | BIG BLOCK |
| 44-321 | 4.480 | 4.695 | 0.107 | 6.300 | 0.250 | 4.950 | BIG BLOCK |



# Chevrolet™

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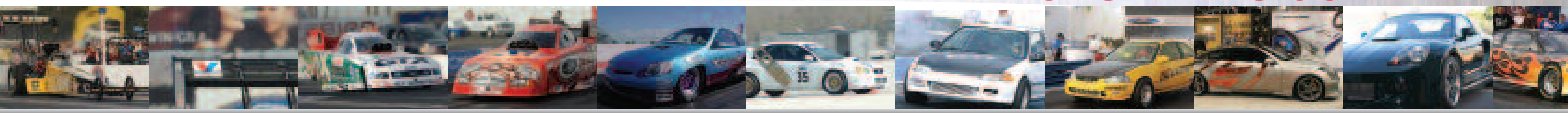

## Darton Manufactured Sleeves to Fit CHEVROLET™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 100-2003 | 4.120 | 4.272 | 0.076 | 5.545 | 0.230 | 4.380 | BOW TIE SBC |
| 100-2003+.005 | 4.120 | 4.278 | 0.079 | 5.545 | 0.230 | 4.380 | BOW TIE SBC +.005 |
| 100-2003+.010 | 4.120 | 4.283 | 0.082 | 5.545 | 0.230 | 4.380 | BOW TIE SBC +.010 |
| 100-2200-SF | 3.375 | 3.570 | 0.097 | 5.625 | 0.200 | 3.825 | ECOTEC |
| 100-2200-DF | 3.375 | 3.570 | 0.097 | 5.625 | 0.200 | 3.825 | ECOTEC |
| 100-3135 | 3.970 | 4.254 | 0.142 | 6.000 | 0.200 | 4.500 | SBC |
| 100-3137 | 4.090 | 4.315 | 0.113 | 6.750 | 0.125 | 4.440 | CHEVY SPECIAL |
| 100-3138 | 4.090 | 4.375 | 0.143 | 6.750 | 0.125 | 4.500 | CHEVY SPECIAL |
| 100-3139 | 4.210 | 4.500 | 0.145 | 6.750 | 0.200 | 4.625 | CHEVY SPECIAL |
| 300-023-SF | 3.875 | 4.300 | 0.212 | 5.675 | 0.205 | 4.550 | LS-2 3.897 UNDERSIZED BORE |
| 300-023-DF | 3.875 | 4.300 | 0.212 | 5.675 | 0.205 | 4.550 | LS-2 3.897 UNDERSIZED BORE |
| 300-024 | 3.890 | 4.180 | 0.145 | 5.600 | 0.285 | 4.320 | LS-1 / LS-6 BORE SIZE 3.897 |
| 300-025-SF | 4.110 | 4.325 | 0.108 | 5.800 | 0.205 | 4.550 | LS-2 4.125 BORE DRY |
| 300-025-DF | 4.110 | 4.325 | 0.108 | 5.800 | 0.205 | 4.550 | LS-2 4.125 BORE DRY |
| 300-026-SF | 3.985 | 4.325 | 0.200 | 5.800 | 0.215 | 4.575 | LS-2/7 4.000 BORE DRY |
| 300-026-DF | 3.985 | 4.325 | 0.200 | 5.800 | 0.215 | 4.575 | LS-2/7 4.000 BORE DRY |
| 300-027-SF | 4.110 | 4.325 | 0.108 | 5.800 | 0.215 | 4.575 | LS- 7 4.125 BORE DRY |
| 300-027-DF | 4.110 | 4.325 | 0.108 | 5.800 | 0.215 | 4.575 | LS-7 4.125 BORE DRY |


Race Engine Development

# Donovan™

1.800.71DARTON

## Darton Manufactured Sleeves to Fit DONOVAN™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 100-9001 | 3.990 | 4.273 | 0.141 | 5.575 | 0.190 | 4.371 | SBC STYLE BLOCK |
| 100-9003 | 4.110 | 4.273 | 0.081 | 5.575 | 0.190 | 4.371 | SBC STYLE BLOCK |
| 100-9003+.010 | 4.110 | 4.283 | 0.086 | 5.575 | 0.190 | 4.371 | SBC STYLE BLOCK |
| 100-9003-TD | 4.110 | 4.273 | 0.081 | 6.075 | 0.190 | 4.371 | SBC STYLE BLOCK |
| 100-9004-A | 4.000 | 4.630 | 0.315 | 6.775 | 0.380 | 5.000 | 417 BLOCK |
| 100-9004-D | 4.030 | 4.630 | 0.300 | 6.775 | 0.380 | 5.000 | 417 BLOCK |
| 100-9004-B | 4.125 | 4.630 | 0.253 | 6.775 | 0.380 | 5.000 | 417 BLOCK |
| 100-9004-C | 4.250 | 4.630 | 0.190 | 6.775 | 0.380 | 5.000 | 417 BLOCK |
| 100-8001 | 4.390 | 4.612 | 0.111 | 6.625 | 0.225 | 4.995 | SPECIAL |
| 100-8005-1 | 4.492 | 4.702 | 0.105 | 7.250 | 0.188 | 4.897 | 500 BLOCK |
| 100-8005-2 | 4.245 | 4.702 | 0.229 | 7.250 | 0.188 | 4.897 | 500 BLOCK |
| 100-8007 | 4.490 | 4.731 | 0.121 | 8.000 | 0.188 | 4.897 | 700 BLOCK |
| 100-8007-05 | 4.490 | 4.750 | 0.130 | 8.000 | 0.188 | 4.897 | 700 BLOCK |




John Blanchard Racing

# Ford™

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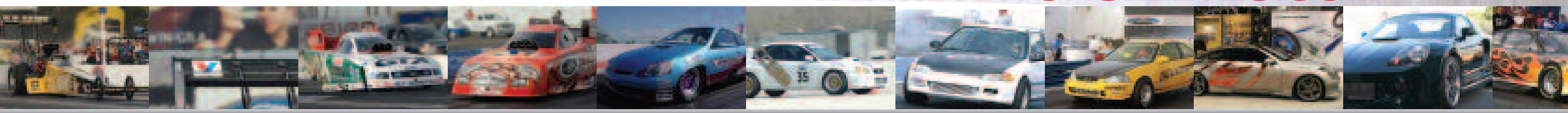

## Darton Manufactured Sleeves to Fit FORD™/AR/SVO

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 300-060 | 3.985 | 4.251 | 0.133 | 5.820 | 0.250 | 4.500 | FORD 351 |
| 300-060+.010 | 3.985 | 4.261 | 0.138 | 5.820 | 0.250 | 4.500 | FORD 351 |
| 100-3141 | 4.245 | 4.701 | 0.228 | 6.250 | 0.324 | 5.200 | SPECIAL |
| 100-3143 | 4.370 | 4.801 | 0.216 | 7.150 | 0.324 | 5.200 | SPECIAL |
| 100-3146 | 4.245 | 4.625 | 0.190 | 6.350 | 0.324 | 5.873 | SPECIAL |
| 100-3147 | 4.245 | 4.625 | 0.190 | 6.875 | 0.324 | 5.873 | SPECIAL |
| 100-3148 | 4.432 | 4.625 | 0.096 | 6.875 | 0.324 | 5.873 | SPECIAL |
| 100-3149 | 4.432 | 4.687 | 0.128 | 6.875 | 0.324 | 5.873 | SPECIAL |
| 100-3150 | 4.432 | 4.700 | 0.134 | 6.875 | 0.324 | 5.873 | SPECIAL |
| 100-8006 | 4.490 | 4.801 | 0.156 | 8.000 | 0.325 | 5.200 | AR FORD |
| 100-8006-O/S | 4.490 | 4.820 | 0.165 | 8.000 | 0.325 | 5.200 | AR FORD |



# Import

# Keith Black™

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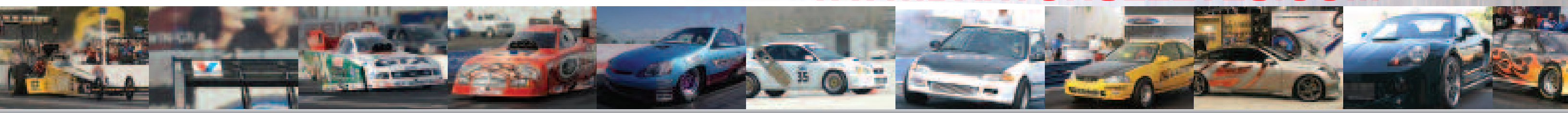
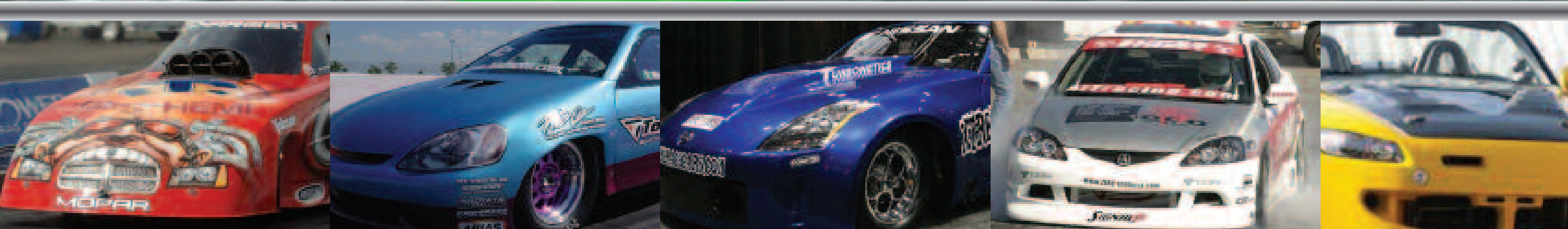


## Darton Manufactured Sleeves to Fit KEITH BLACK™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 445A-310 | 4.310 | 4.635 | 0.163 | 6.360 | 0.252 | 4.995 | DRY LINER |
| 51425-187-FH | 4.187 | 4.635 | 0.224 | 6.860 | 0.252 | 4.995 | WET LINER 4.187 BORE |
| 51425-310-FH | 4.310 | 4.635 | 0.163 | 6.860 | 0.252 | 4.995 | WET LINER 4.310 BORE |
| 439-375 | 4.375 | 4.700 | 0.163 | 6.860 | 0.252 | 4.995 | WET LINER 4.375 BORE |

Drag Boat Review





## Darton Manufactured Sleeves to Fit MERLIN™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 440-066-5-SF | 4.490 | 4.731 | 0.121 | 6.175 | 0.188 | 4.897 | 9.800 DECK |
| 440-066-5-DF | 4.490 | 4.731 | 0.121 | 6.175 | 0.188 | 4.897 | 9.800 DECK |
| 440-066-4-SF | 4.490 | 4.731 | 0.121 | 6.575 | 0.188 | 4.897 | 10.200 DECK |
| 440-066-4-DF | 4.490 | 4.731 | 0.121 | 6.575 | 0.188 | 4.897 | 10.200 DECK |
| 440-066-3-SF | 4.490 | 4.731 | 0.121 | 6.975 | 0.188 | 4.897 | 10.600 DECK |
| 440-066-3-DF | 4.490 | 4.731 | 0.121 | 6.975 | 0.188 | 4.897 | 10.600 DECK |
| 440-066-1-SF2 | 4.490 | 4.731 | 0.121 | 7.475 | 0.188 | 4.897 | 11.100 DECK |
| 440-066-1-DF2 | 4.490 | 4.731 | 0.121 | 7.475 | 0.188 | 4.897 | 11.100 DECK |



# Mopar™

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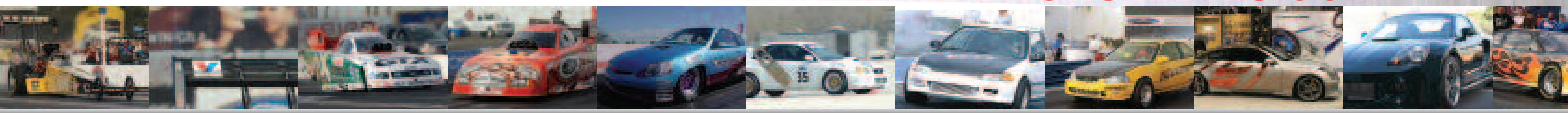
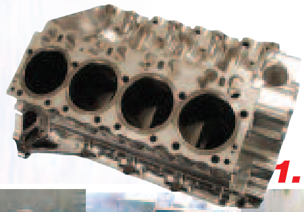


## Darton Manufactured Sleeves to Fit MOPAR™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| MP4000 | 4.000 | 4.210 | 0.105 | 5.545 | 0.188 | 4.540 | MOPAR SMALL BLOCK |
| MP4000+.010 | 4.000 | 4.220 | 0.110 | 5.545 | 0.188 | 4.540 | MOPAR SMALL BLOCK |
| MP4000+.020 | 4.000 | 4.230 | 0.115 | 5.545 | 0.188 | 4.540 | MOPAR SMALL BLOCK |
| MP4125 | 4.095 | 4.301 | 0.103 | 5.545 | 0.188 | 4.540 | MOPAR SMALL BLOCK |
| MP4125+.010 | 4.095 | 4.311 | 0.108 | 5.545 | 0.188 | 4.540 | MOPAR SMALL BLOCK |
| MP4125+.020 | 4.095 | 4.321 | 0.113 | 5.545 | 0.188 | 4.540 | MOPAR SMALL BLOCK |
| P5007708 | 4.118 | 4.355 | 0.119 | 5.570 | 0.186 | 4.595 | MOPAR SPRINT BLOCK |
| P4510316 | 4.118 | 4.400 | 0.141 | 5.600 | 0.186 | 4.537 | MOPAR SPRINT BLOCK |
| P4510317 | 4.118 | 4.400 | 0.141 | 6.000 | 0.186 | 4.537 | MOPAR SPRINT BLOCK |



# TFX™/BAE™



1.800.71DARTON

## Darton Manufactured Sleeves to Fit TFX™

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 100-1016-1D | 4.187 | 4.450 | 0.132 | 6.800 | 0.253 | 4.995 | TFX/BAE |
| 100-1017-1D | 4.187 | 4.550 | 0.182 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1018-X | 4.187 | 4.610 | 0.211 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1018-1D | 4.250 | 4.610 | 0.180 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1019-FH | 4.280 | 4.610 | 0.165 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1020 | 4.305 | 4.610 | 0.153 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1020-FH | 4.310 | 4.610 | 0.153 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1020-SD | 4.305 | 4.610 | 0.153 | 6.300 | 0.254 | 4.995 | TFX/BAE |
| 100-1020-SD-FH | 4.310 | 4.610 | 0.150 | 6.300 | 0.254 | 4.995 | TFX/BAE |
| 100-1021 | 4.370 | 4.610 | 0.120 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1021-FH | 4.375 | 4.610 | 0.118 | 6.800 | 0.254 | 4.995 | TFX/BAE |
| 100-1021-SD | 4.370 | 4.610 | 0.120 | 6.300 | 0.254 | 4.995 | TFX/BAE |
| 100-1021-SD-FH | 4.375 | 4.610 | 0.118 | 6.300 | 0.254 | 4.995 | TFX/BAE |



**Only Available Through:** BAE

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| 100-1022-SDSPL | 4.459 | 4.666 | 0.104 | 6.300 | 0.400 | 4.995 | TFX/BAE |
| 100-1023-SPL | 4.459 | 4.666 | 0.104 | 6.800 | 0.400 | 4.995 | TFX/BAE |

# Repair Sleeves

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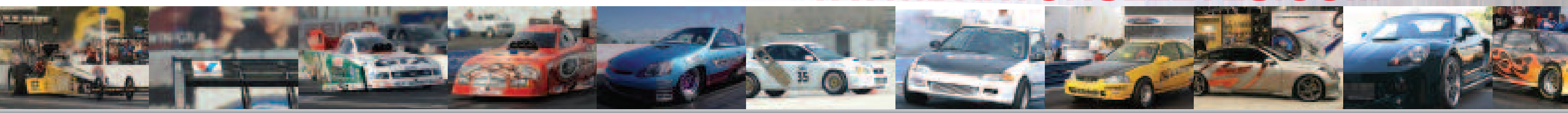

## Darton Repair Sleeves

| Part Number | Bore | O.D. | Wall | Length | Application |
|---|---|---|---|---|---|
| RS3.800 3-32 | 3.794 | 3.987 | 0.097 | 6.875 | REPAIR SLEEVE |
| RS3.800 1-8 | 3.794 | 4.050 | 0.128 | 6.875 | REPAIR SLEEVE |
| RS3.8125 3-32 | 3.806 | 4.000 | 0.097 | 7.625 | REPAIR SLEEVE |
| RS3.8125 1-8 | 3.806 | 4.062 | 0.128 | 7.625 | REPAIR SLEEVE |
| RS3.900 3-32 | 3.894 | 4.087 | 0.096 | 7.000 | REPAIR SLEEVE |
| RS3.900 1-8 | 3.894 | 4.150 | 0.128 | 7.000 | REPAIR SLEEVE |
| RS3.937 3-32 | 3.931 | 4.125 | 0.097 | 7.875 | REPAIR SLEEVE |
| RS3.9371-8 | 3.931 | 4.187 | 0.128 | 7.875 | REPAIR SLEEVE |
| RS4.000 3-32 | 3.994 | 4.187 | 0.097 | 7.875 | REPAIR SLEEVE |
| RS4.000 1-8 | 3.994 | 4.250 | 0.128 | 7.875 | REPAIR SLEEVE |
| RS-4.040 3-32 | 4.034 | 4.234 | 0.100 | 6.375 | REPAIR SLEEVE |
| RS-4.040 1-8 | 4.034 | 4.296 | 0.131 | 6.375 | REPAIR SLEEVE |
| RS4.0625 3-32 | 4.056 | 4.250 | 0.097 | 6.750 | REPAIR SLEEVE |
| RS4.0625 1-8 | 4.056 | 4.312 | 0.128 | 6.750 | REPAIR SLEEVE |
| RS4.125 3-32 | 4.119 | 4.312 | 0.097 | 7.750 | REPAIR SLEEVE |
| RS4.125 1-8 | 4.119 | 4.375 | 0.128 | 7.750 | REPAIR SLEEVE |
| RS4.1875 3-32 | 4.182 | 4.375 | 0.096 | 7.000 | REPAIR SLEEVE |
| RS4.1875 1-8 | 4.182 | 4.437 | 0.128 | 7.000 | REPAIR SLEEVE |
| RS4.250 3-32 | 4.244 | 4.437 | 0.097 | 7.760 | REPAIR SLEEVE |
| RS4.250 1-8 | 4.244 | 4.500 | 0.128 | 7.760 | REPAIR SLEEVE |
| RS4.375 3-32 | 4.369 | 4.562 | 0.097 | 7.563 | REPAIR SLEEVE |
| RS4.375 1-8 | 4.369 | 4.625 | 0.128 | 7.563 | REPAIR SLEEVE |
| RS4.500 3-32 | 4.494 | 4.687 | 0.097 | 8.000 | REPAIR SLEEVE |
| RS4.500 1-8 | 4.494 | 4.750 | 0.128 | 8.000 | REPAIR SLEEVE |



## Darton Sleeve Blanks

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| T-2750-L | 2.675 | 3.375 | 0.350 | 6.500 | | | BLANK |
| T-2812-L | 2.750 | 3.400 | 0.325 | 6.500 | 2.000 | 3.600 | BLANK |
| T-3000-L | 2.900 | 3.400 | 0.250 | 6.000 | 2.000 | 3.700 | BLANK |
| I-3600 | 2.900 | 3.410 | 0.255 | 6.000 | 0.600 | 4.350 | BLANK |
| T-7 | 2.950 | 3.800 | 0.425 | 7.250 | | | BLANK |
| I-3187-L | 3.050 | 3.600 | 0.275 | 6.000 | 2.000 | 3.800 | BLANK |
| I-3187 | 3.100 | 3.600 | 0.250 | 5.500 | 2.000 | 3.800 | BLANK |
| I-3703 | 3.160 | 3.800 | 0.320 | 6.000 | 0.600 | 4.750 | BLANK |
| I-3250-L | 3.180 | 3.900 | 0.360 | 6.500 | 2.000 | 4.100 | BLANK |
| I-N1 | 3.180 | 3.950 | 0.385 | 6.500 | 2.000 | 4.100 | BLANK |
| T-3312 | 3.250 | 3.950 | 0.350 | 5.500 | 2.000 | 4.100 | BLANK |
| T-3375 | 3.300 | 3.700 | 0.200 | 6.500 | 0.400 | 4.100 | BLANK |
| I-3800 | 3.300 | 3.950 | 0.325 | 6.500 | 0.650 | 4.850 | BLANK |
| I-3801 | 3.300 | 3.975 | 0.338 | 6.000 | 0.600 | 4.850 | BLANK |
| I-3452 | 3.400 | 3.950 | 0.275 | 6.000 | 0.400 | 4.150 | BLANK |
| T-3500-L | 3.400 | 3.950 | 0.275 | 6.500 | 2.000 | 4.100 | BLANK |
| T-8-1 | 3.400 | 4.150 | 0.375 | 7.250 | | | BLANK |
| I-3450 | 3.450 | 3.950 | 0.250 | 8.000 | 0.400 | 4.150 | BLANK |
| I-3451 | 3.450 | 3.950 | 0.250 | 6.000 | 1.200 | 4.150 | BLANK |
| I-11 | 3.450 | 3.950 | 0.250 | 6.000 | | | BLANK |
| T-3550-L | 3.550 | 4.300 | 0.375 | 6.000 | 0.750 | 4.500 | BLANK |
| I-3900 | 3.580 | 4.300 | 0.360 | 5.750 | 0.525 | 5.050 | BLANK |
| H-3901-A | 3.580 | 4.300 | 0.360 | 6.200 | 0.525 | 5.050 | BLANK |
| T-3625 | 3.600 | 3.950 | 0.175 | 6.500 | 0.650 | 4.200 | BLANK |
| T-9-L2 | 3.600 | 4.200 | 0.300 | 8.000 | | | BLANK |
| I-N3 | 3.600 | 4.310 | 0.355 | 7.100 | 0.650 | 4.600 | BLANK |
| I-3902 | 3.600 | 4.500 | 0.450 | 5.800 | 0.550 | 5.100 | BLANK |
| T-3750 | 3.700 | 3.975 | 0.138 | 6.100 | 0.650 | 4.250 | BLANK |
| T-3875 | 3.900 | 4.310 | 0.330 | 7.100 | 0.650 | 4.500 | BLANK |
| I-N4 | 3.800 | 4.375 | 0.287 | 7.100 | 0.650 | 4.875 | BLANK |
| I-944 | 3.875 | 4.300 | 0.213 | 6.500 | 0.400 | 4.800 | BLANK |
| I-943 | 3.875 | 4.310 | 0.218 | 6.300 | 0.400 | 4.610 | BLANK |
| T-D1 | 3.900 | 4.375 | 0.238 | 7.100 | 0.400 | 4.740 | BLANK |
| T-4000-L | 3.900 | 4.500 | 0.300 | 8.250 | 1.000 | 4.750 | BLANK |
| I-N6 | 3.900 | 4.550 | 0.325 | 8.500 | 0.650 | 4.825 | BLANK |
| T-D7 | 3.950 | 4.550 | 0.300 | 9.000 | 1.000 | 4.825 | BLANK |
| I-D6 | 3.970 | 4.365 | 0.198 | 6.275 | 0.300 | 4.600 | BLANK |
| I-D2 | 3.970 | 4.365 | 0.198 | 6.275 | 0.400 | 4.825 | BLANK |
| T-4030-1 | 3.970 | 4.500 | 0.265 | 8.500 | 0.650 | 4.700 | BLANK |
| I-N8 | 3.975 | 4.500 | 0.263 | 6.500 | 0.500 | 4.875 | BLANK |
| T-D3 | 3.975 | 4.550 | 0.288 | 7.150 | 0.400 | 4.825 | BLANK |



# Sleeve Blanks

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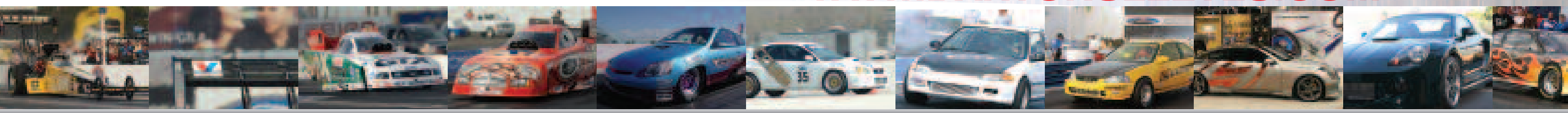


## Darton Sleeve Blanks

| Part Number | Bore | O.D. | Wall | Length | Flange Thickness | Flange Diameter | Application |
|---|---|---|---|---|---|---|---|
| I-944-1 | 3.980 | 4.750 | 0.385 | 5.800 | 0.500 | 5.420 | BLANK |
| I-4001 | 3.980 | 4.750 | 0.385 | 6.000 | 0.550 | 5.200 | BLANK |
| FH-4000 | 4.000 | 4.500 | 0.250 | 8.500 | 0.500 | 5.000 | "BLANK, FINISHED I.D." |
| T-4125/60-L | 4.070 | 4.550 | 0.240 | 9.000 | 0.650 | 4.700 | BLANK |
| T-316 | 4.090 | 4.445 | 0.178 | 5.800 | 0.250 | 4.580 | BLANK |
| I-4002 | 4.100 | 4.750 | 0.325 | 6.000 | 0.550 | 5.200 | BLANK |
| I-FH4125 | 4.125 | 4.625 | 0.250 | 8.500 | 0.650 | 5.200 | "BLANK, FINISHED I.D." |
| T-4187 | 4.125 | 4.650 | 0.263 | 8.100 | 0.650 | 5.100 | BLANK |
| T-4200 | 4.150 | 4.800 | 0.325 | 9.000 | 1.100 | 5.200 | BLANK |
| I-4185 | 4.200 | 4.650 | 0.225 | 6.200 | 0.400 | 5.000 | BLANK |
| I-4186 | 4.200 | 4.650 | 0.225 | 7.000 | 0.400 | 5.000 | BLANK |
| I-752 | 4.200 | 4.750 | 0.275 | 7.600 | 0.400 | 5.000 | BLANK |
| I-753 | 4.200 | 4.750 | 0.275 | 8.300 | 0.550 | 5.250 | BLANK |
| T-4753 | 4.200 | 4.750 | 0.275 | 8.300 | 0.550 | 5.250 | BLANK |
| T-4250-1 | 4.200 | 4.925 | 0.363 | 9.100 | 1.100 | 5.350 | BLANK |
| T-4187-2 | 4.210 | 4.660 | 0.225 | 7.510 | 0.660 | 4.850 | BLANK |
| 100-8008-751 | 4.230 | 4.750 | 0.260 | 8.500 | 0.500 | 5.250 | BLANK |
| FH-4250-A | 4.250 | 4.750 | 0.250 | 9.600 | 0.650 | 5.100 | "BLANK, FINISHED I.D." |
| I-4300 | 4.280 | 4.755 | 0.253 | 8.100 | 2.100 | 5.000 | BLANK |
| FH-4310 | 4.310 | 4.875 | 0.283 | 9.600 | 0.850 | 5.350 | "BLANK, FINISHED I.D." |
| FH-4375 | 4.375 | 4.875 | 0.250 | 9.600 | 0.650 | 5.350 | "BLANK, FINISHED I.D." |
| I-750 | 4.400 | 4.750 | 0.175 | 8.500 | 0.500 | 5.250 | BLANK |
| T-4500 | 4.410 | 5.125 | 0.358 | 9.600 | 0.650 | 5.350 | BLANK |
| I-820 | 4.450 | 4.820 | 0.185 | 8.500 | 0.500 | 5.250 | BLANK |
| I-910 | 4.490 | 4.910 | 0.210 | 8.300 | 0.400 | 5.220 | BLANK |
| FH-4500 | 4.500 | 5.000 | 0.250 | 9.600 | 0.650 | 5.350 | "BLANK, FINISHED I.D." |
| I-4625 | 4.500 | 5.200 | 0.350 | 10.300 | 0.650 | 5.600 | BLANK |
| I-950 | 4.500 | 4.950 | 0.225 | 9.100 | 1.200 | 5.250 | BLANK |
| I-FH4562 | 4.562 | 5.125 | 0.282 | 10.500 | 0.750 | 5.350 | "BLANK, FINISHED I.D." |
| I-4750 | 4.600 | 5.325 | 0.363 | 10.300 | 0.850 | 5.600 | BLANK |
| I-FH4625 | 4.625 | 5.125 | 0.250 | 10.500 | 0.850 | 5.350 | "BLANK, FINISHED I.D." |
| I-FH4750 | 4.750 | 5.250 | 0.250 | 10.500 | 0.850 | 5.600 | "BLANK, FINISHED I.D." |
| T-4875 | 4.800 | 5.400 | 0.300 | 10.300 | 0.850 | 5.600 | BLANK |
| I-FH4875 | 4.875 | 5.325 | 0.225 | 10.500 | 0.850 | 5.600 | "BLANK, FINISHED I.D." |
| I-FH4876 | 4.875 | 5.325 | 0.225 | 10.500 | 1.200 | 5.600 | "BLANK, FINISHED I.D." |
| I-FH4877 | 4.875 | 5.400 | 0.263 | 10.500 | 1.200 | 5.700 | "BLANK, FINISHED I.D." |
| T-5000 | 4.900 | 5.500 | 0.300 | 10.300 | 0.850 | 5.600 | BLANK |
| T-1000-A | 4.900 | 5.175 | 0.138 | 7.000 | 1.125 | 5.275 | BLANK |
| FH-5000 | 5.000 | 5.500 | 0.250 | 10.500 | 0.850 | 5.800 | "BLANK, FINISHED I.D." |
| T-5125 | 5.050 | 5.500 | 0.225 | 10.300 | 0.850 | 5.800 | BLANK |
| FH-5125 | 5.125 | 5.500 | 0.188 | 10.500 | 0.850 | 5.800 | "BLANK, FINISHED I.D." |



# Seal Tight Technology





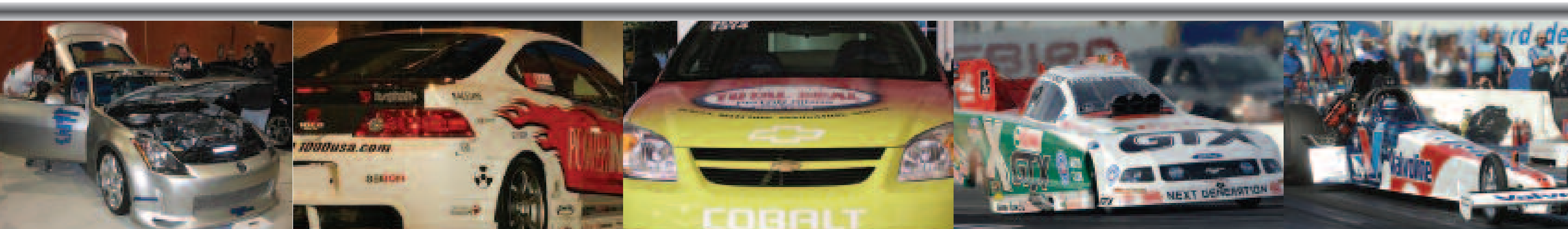
Darton sets the standard AGAIN!!! Darton proudly introduces the innovative "Purpose Built" Dry Sleeve Kit . These sleeves incorporate Darton's new " Seal Tight Technology".

You can now replace the weak dry casting supplied by the manufacturer easily and reliably. The new Dry Sleeve will increase bore integrity and block rigidity.

The new Darton Dry Sleeve Kit is made from Darton's famous high strength Ductile Iron and is designed specifically for a select few applications. Currently the Seal Tight Kit is available for GM LS-2/7, Nissan SR20 and the Subaru EJ25. The new sleeves are designed and will be supplied to cover multiple bore sizes depending on the application. The new multi-diameter sleeve, with flats assures max-wall thickness for strength at any bore size.

The Darton Sleeve Kit design incorporates dimensional features to maximize fitment and installation ease. This design also promotes an oil sealing feature to assure no contamination between the sleeve and the cylinder wall. . In addition Darton has simplified installation and created a technical brochure to guide proper block machining. The new Dry Sleeve kit will come with everything you need to have a qualified machine shop do the installation for you.

If you do not have a qualified machine shop that can install the new Dry Sleeve Kit for you Darton also offers installation of the kit with quick turn around times.



# Custom Sleeves

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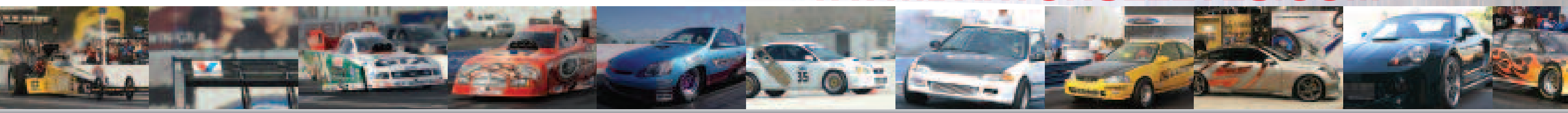


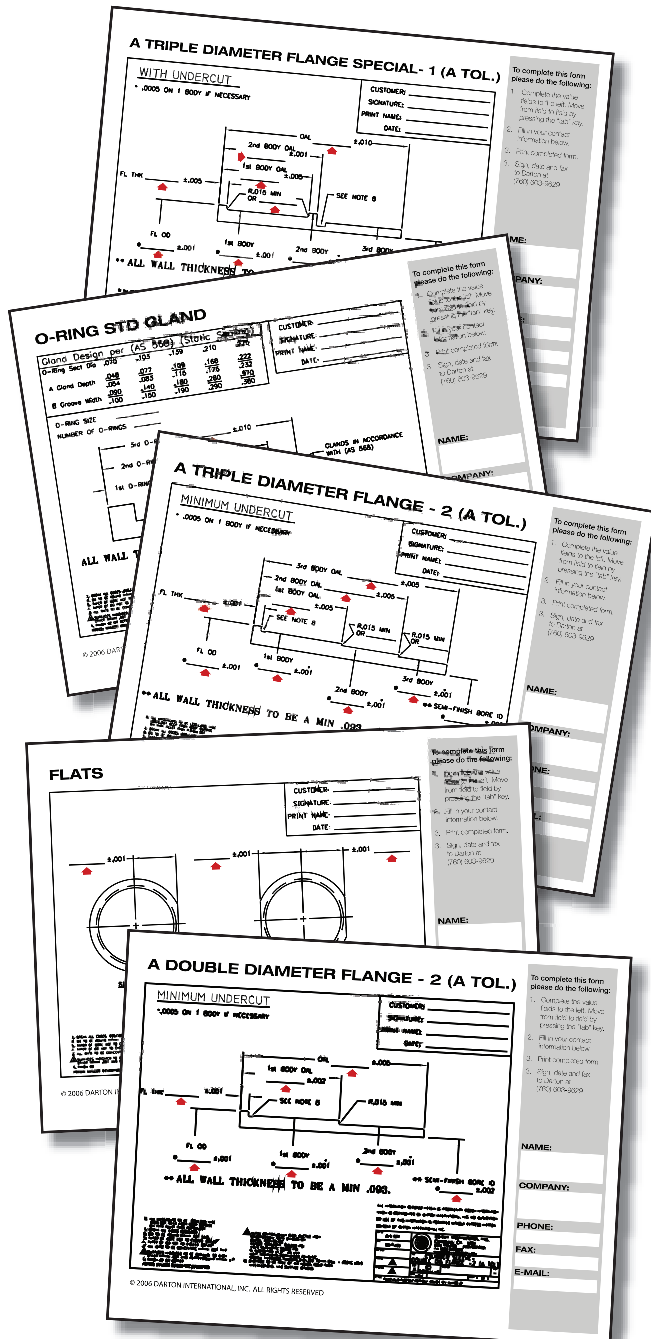
Darton is the leading producer of custom sleeves in the world. If you can come up with the specifications we can make the sleeve you need and if you can't we can help you. Darton covers a wide range of applications like tractors, motorcycles, marine engines, vintage race cars and many more race and street applications. We can even make the most complex sleeves like ones used in Ferrari™, Alfa Romeo™, Peugeot™ and Porsche™ to name a few. We can do short runs or larger quantities of your sleeve depending on your needs.

We can make sleeves ranging from bore sizes of 2.800" – 5.200" and lengths from 4.000" – 10.500". Darton can make sleeves like the basic re-sleeve to 2 and 3 body diameter sleeves and even water jacket sleeves. We can also add special features like fire dams, multiple o-rings, undercuts, flats, special chamfer or radius and crank notches.

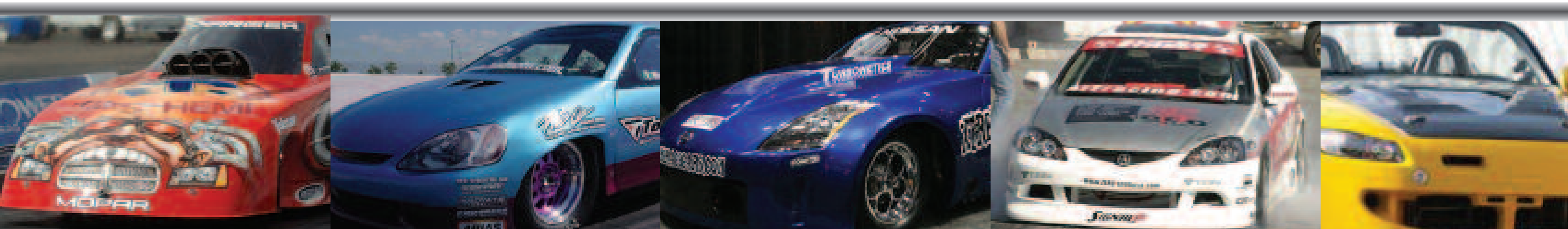
Reverse engineering is also available should you not be able to measure the sleeves you need. For an additional charge you can send us a sample sleeve and we will do the measuring for you. When we reverse engineer a sleeve we use state of the art measuring equipment and create a blueprint of the sleeve you need us to manufacture.

You can contact Darton and we will even supply you with blank prints to fill in the specifications of your sleeve or you can get the prints off our website, www.dartonsleeves.com, under the custom sleeve section. Once we receive your print or the part we are reverse engineering we can give you a quote and estimated production time.

Darton makes it easy to make those difficult and often hard to find sleeves for almost any application. All of our custom sleeves are made of our superior strength Ductile Iron used on all of our regular production sleeves and high performance sleeves like Top Fuel and Funny Car. For more information contact Darton Sales.

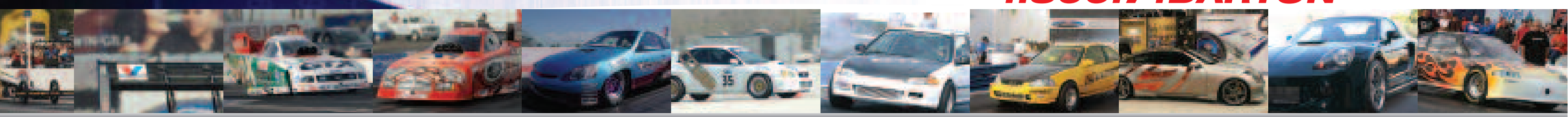




# All About Ductile Iron

**1.800.71DARTON**



Ductile iron is a cast ferrous alloy. It always contains carbon in excess of 1.5 percent and, customarily, in excess of 3.0 percent. It also contains silicon usually from 1.0 to 4.0 percent and manganese up to 1.0 percent. In order to obtain the needed properties both phosphorus and sulfur contents must be low. Phosphorus content is usually less than 0.1 percent, preferably less than 0.05 percent. Sulfur content must be less than 0.02 percent. One more element, magnesium, is always present in ductile irons. Its concentration normally ranges from 0.02 to 0.08 percent.

### Why Use Darton Sleeves?

DARTON has been manufacturing precision performance sleeves since 1978. Currently we are the major suppliers of performance sleeves throughout the United States and Canada. The reason for this market share is simple, a very high quality product at the most competitive prices available. The ASTM specifications for performance ductile iron sleeves indicates a minimum tensile strength of 100,000 pounds. DARTON SLEEVES are much stronger than this and will withstand the punishment these sleeves must endure in Top Fuel motors. In addition, DARTON sleeve material is much more abrasion resistant and harder on the surface than any other product available. This feature provides for good oil retention, ring seal, and the ultimate in leak down performance. DARTON performance sleeves in a "Race Ready" condition are in stock for most all popular applications.

### Darton Sleeves & the Aerospace Industry

Because of DARTON's superior chemistry and foundry consistency for it's Centrifugally Cast Ductile Iron, we have been chosen as the sole manufacturer of sleeves to an international aerospace engine firm. Their new program is for a liquid-cooled, eight-cylinder internal combustion engine, which uses DARTON sleeves exclusively and is FAA certified. DARTON was chosen as the manufacturer because all our sleeves passed a rigorous Military Standard testing program which included 100 percent X-ray and Magnetic Particle Inspection. DARTON's performance sleeves are made to the same high standards of quality required of our aviation sleeves so that you, the racer, can be assured of repeatable results every time you use a DARTON sleeve.

### The Difference Between Steel, Ductile Iron and Ordinary Cast Iron

Difference in properties stems from the difference in microscopic structures of these three alloys. Steel is basically a pure iron which is strengthened to different degrees by dispersing alloying elements in the crystalline structure of the iron. The most common of these elements is carbon. The effects of carbon are usually enhanced by a variety of chemical elements. Also, there are steels practically free of carbon, the desired properties obtained through alloying with other elements.

Cast iron differs from steel in that it always contains carbon in excess of its solubility in solid iron. This excess carbon precipitates during freezing in the form of pure, crystalline graphite. Ordinarily, the graphite assumes the shape of flakes ranging in length from 0.001 to 0.04-inch (0.025 to 1 millimeter). Through proper treatments the graphite will crystallize in the form of spheroids or nodules. Cast iron with its graphite in spheroidal form is ductile iron.

### Why is Graphite Necessary in Cast Iron?

Graphite is necessary in cast iron for a number of reasons. Basically, dissolving carbon and silicon in liquid iron decreases the freezing temperature of iron. Cast iron freezes at approximately 2,100 ° F (1,150 ° C) compared to the approximate 2,730 ° F (1,500 ° C) freezing temperature of steel. All founding characteristics are improved through this lowered freezing temperature. The presence of freezing graphite, also, profoundly influences mechanical, physical and chemical properties.

### Is Ductile Iron, then, Basically Steel with Graphite Spheroids Dispersed Throughout?

For all practical purposes, yes it is. The quantity of graphite is usually between 8 and 12 percent of the volume.

### How Does Microscopic Structure Influence the Properties of Ductile Iron?

Graphite – as long as it is in spheroidal form – does not significantly influence properties. On the other hand, the qualities of the metallic matrix (steel) into which graphite spheroids are embedded do alter properties within wide limits.

### What Kind of Matrices Are Encountered in Ductile Irons and What Kinds of Influences Do These Structures Exert?

FERRITE: Basically pure iron. Soft. Ductile. Relatively low in strength. Poor wear resistance. High impact resistance. Relatively good thermal conductivity. High magnetic permeability. Low hysteresis loss. In some exposures, good corrosion resistance. Good machinability with proper tooling.

PEARLITE: This component is a mechanical mixture of ferrite and iron carbide. Relatively hard. Moderate ductility. High strength. Good wear resistance. Moderate impact resistance. Somewhat reduced thermal conductivity. Low magnetic permeability. High hysteresis loss. Good machinability with proper tooling.

PEARLITE-FERRITE: A structure consisting of a mixture of pearlite and ferrite. This is the most common grade of ductile irons. Properties are between those with the above two structures. Good machinability with proper tooling.

BAINITE (Acicular Iron): Produced through alloying and/or heat treatment. Harder and stronger than pearlite. Low ductility and moderate impact resistance. Very good high temperature strength and fatigue resistance (to approximately 1,000 ° F – 600 ° C). Adequate machinability.

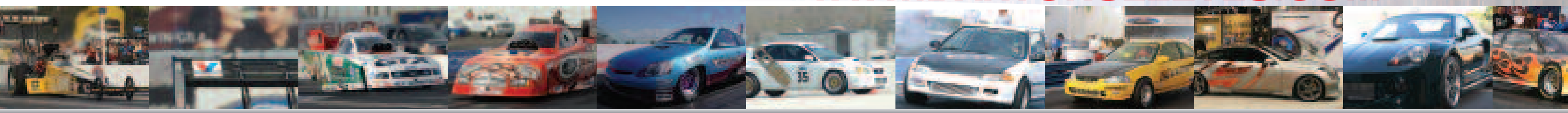
MARTENSITE: Produced through alloying and quenching. This is very hard and possibly brittle depending on heat treatment, which may be called for when maximum wear resistance is needed. Most often only the surfaces exposed to wear are martensitic. Martensite can be tempered by a low temperature heat treatment. Depending on tempering temperature, a wide variety of strength and wear resistance properties can be produced, all more ductile and easier to machine than untempered martensite. Relatively expensive, usually obtained in centrifugal casting.

AUSTENITE: Like ferrite, this is also a basically pure iron with a different crystal lattice. Relatively low strength and high ductility. High impact resistance, especially at low temperatures. Thermal expansivity can be controlled within wide limits with nickel content. Nickel is always needed in high concentrations (minimum 18 percent) to produce austenitic matrix. Good to excellent corrosion and heat resistance. Very good creep and stress rupture properties up to 1,300 ° F (700 ° C). Very good wear and combined wear-corrosion-erosion resistance. Nonmagnetic and fairly easy to machine. Expensive.

CARBIDE: A compound between iron and carbon. This component is seldom desired in ductile iron except when very high wear resistance is needed and low ductility, low strength and poor machinability can be tolerated. Most grades of austenitic ductile iron contain some carbides.

### How Does Alloying Affect Microscopic Structure and Properties?

SILICON: Promotes ferrite. High silicon ductile irons ($Si>4.0\%$) are resistant to oxidation but are increasingly more brittle with increased silicon content. Within 1 to 4 percent range silicon markedly increases the strength of ferrite. For this reason ferritic ductile irons – annealed or as-cast – should,



normally contain at least 2.75 percent of this element. Exceeding the 2.75 percent limit is not desired in cases where the need for a high impact resistance is clearly indicated.

MANGANESE: Promotes pearlite, harden-ability, and carbides. Because of the last, it is seldom desired for alloying.

NICKEL: Promotes pearlite, bainite and harden-ability without the disadvantages of manganese. Promotes austenite at high concentrations.

CHROMIUM: Promotes harden-ability and carbides. Use is limited to carbide containing grades (such as austenitic grades).

COPPER: Promotes pearlite and harden-ability. Its use is controlled for developing high strength pearlitic grades.

TIN: Acts similarly to copper and percentage of content depends on use.

MOLYBDENUM: Promotes harden-ability, bainite and high temperature mechanical properties.

### How Does Heat Treatment Affect Microscopic Structure and Properties?

AS-CAST: Ductile iron is the most economical type and the one most commonly used. With proper selection of the chemical composition, most grades of ductile iron can be produced as-cast.

ANNEALED: Ductile iron is ferritic with corresponding high impact resistance and relatively low strength. Annealing is necessary for austenitic ductile irons operating at elevated temperatures in order to avoid warpage.

NORMALIZING: Promotes a pearlitic structure. Strength and wear resistances are high; ductility is moderate.

Bainitic structure can be produced either as cast or through isothermal heat treatment (i.e., quenching in a bath held at a pre-determined temperature). Bainitic ductile iron is normally Ni-Mo alloyed.

QUENCHING: Results in a martensitic, hard, brittle and highly wear resistant structure.

TEMPERING: Relieves most of the brittleness caused by quenching resulting in a high strength and still highly wear-resistant structure.

STRESS RELIEVING: Is a low temperature heat treatment seldom applied to ductile irons except when a large portion of the original casting is removed by machining for dimensional accuracy.

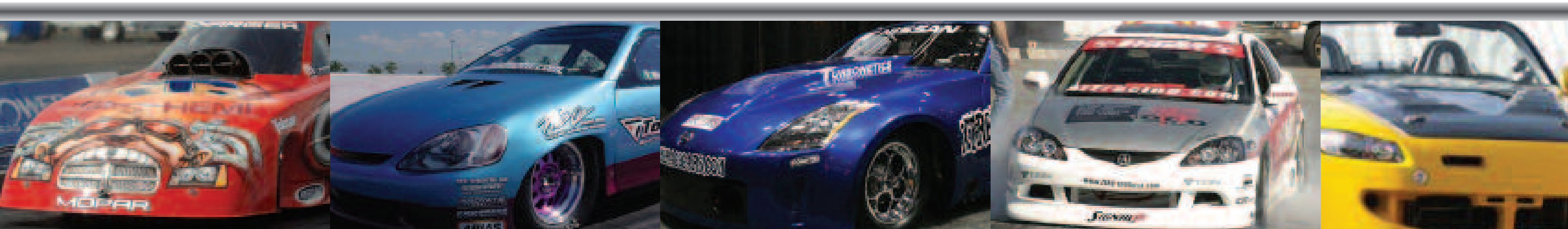
### Why is Centrifugal Casting Used in Sleeve Manufacture?

Centrifugal casting is superior to as-cast in many ways. First and foremost is the ability, by precise control of the rotational speed, to compact the more important strength molecules of the material in different places on the cross section. Also, mechanical impurities are slung to the outside of the casting thereby allowing scrap material to be removed in the machining process. By using specific temperature control in the pouring process, consistency and density of the material can be changed according to the hardness and surface wear requirements. In centrifugal casting, hard spots are almost non-existent because of uniform compacting of the molten material.



# Material Specifications

| | Centrifugally Cast Nodular Ductile Iron ASTM-A536 | A=436 Centrifugally Cast Chromoly Class 50 | Centrifugally Cast Gray Iron ASTM-A48 Class 30 |
|---|---|---|---|
| **Chemical Composition** | C: 1.70 - 4.50% | C: 3.2 - 3.3% | C: 3.10 - 3.50% |
| | Si: 1.00 - 3.00 | Si: 2.2 - 2.5 | Si: 1.80 - 2.00 |
| | Mn: .10 - 1.00 | Mn: .6 - .8 | Mn: .45 - .90 |
| | S: .10 max | S: .10 max | S: .12 max |
| | P: .10 max | P: .20 max | P: .12 max |
| | Ni: 1.0 | Cr: .3 - .5 | |
| | Mg: .03 | Mo: .5 - 1.0 | |
| **Tensile Strength** | 100,000 PSI Min. 689 Mpa | 50,000 PSI Min. 448 Mpa | 30,000 PSI Min. 207Mpa |
| **Hardness (Bhn)** | 240 - 290 | 200 - 240 | 196 - 269 |
| **Class** | 100 - 70 - 03 | 65 - 45 - 12 | 30 - - |
| **Heat Treatment** | Normalized Pearlitic | Normalized Pearlitic | |
| **Transverse Strength** | 140,000 PSI | 75,000 PSI | 2,200 Lb Min. |
| **Microstructure** | Tempered Pearlitic | Tempered Ferritic Predominately | Graphite |
| | | Type A, size 4 - 7 | |
| **Matrix** | Ferritic | Lamellar, Free Ferrite, Massive Carbides | |



# Sleeve Use & Installation

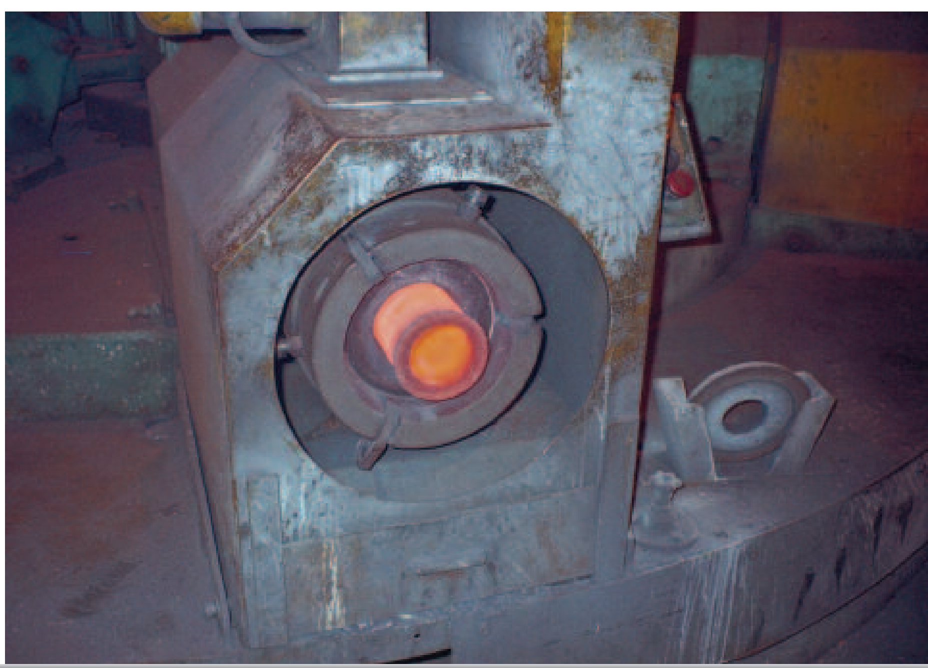


## Material Choices

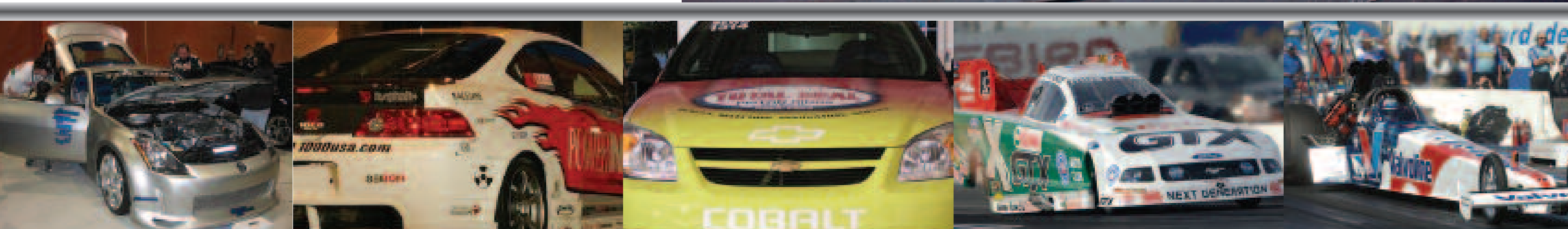
Sleeves may be manufactured from cast iron, alloyed iron, ductile iron, steel or aluminum. Within the iron category sleeves may be manufactured using an as-cast procedure or a more common "spin casting" process which in engineering terms is by a "centrifugal" die machine. Sleeve quality and consistency are more predictable using the centrifugal process. Darton produces all our sleeves except steel and aluminum using the centrifugal process and additionally Darton uses proprietary machinery to change rotational speed of the casting dies to manage the material compacting and density of certain chemicals within the material matrix. Please refer to material specifications under "All about Ductile Iron" for specific chemistry and mechanical properties.

Steel sleeves are not normally used except in hybrid installations or where the necessity exits for ultra thin walls in the dimensions of .040 - .060. Although steel tensile strength is generally higher in the ASTM 4-5000 series steels, the mechanical properties of steel are not as well suited to cylinder liner usage without additional processing of the material such as heat treating and/or surface coating. When steel sleeves are treated and coated with hard-chrome or nicasil the sleeve becomes very strong and useful,however, the costs are very high, sometimes as much as 4-5 times more expensive than ductile iron. Cast, alloyed, ductile or steel sleeves are all acceptable for use in iron or aluminum blocks although different installation procedures are required in each circumstance.

Aluminum sleeves are considered specialty items and can only be practically used in aluminum block, dry sleeve applications. The main advantage of aluminum sleeves is weight saving and generally equal rates of expansion. Although aluminum may reach tensile strengths over 50,000 psi, the elongation in aluminum is not suitable for a wet sleeve application. In addition, aluminum sleeves will require bore coatings such as nicasil to perform as a cylinder liner. There are some materials of aluminum structure referred to as "MMC" or metal matrix which incorporate amounts of silicon and carbide to improve or permit piston ring abrasion resistance however, machining of this type of material is difficult and expensive.







# Technical Info

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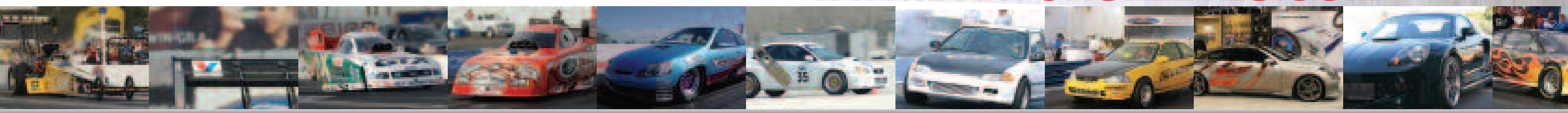


The coefficient of expansion vertically in a block differs, and in combination with piston ring drag, minor dimensional differences can occur top to bottom, which may affect cylinder sealing.

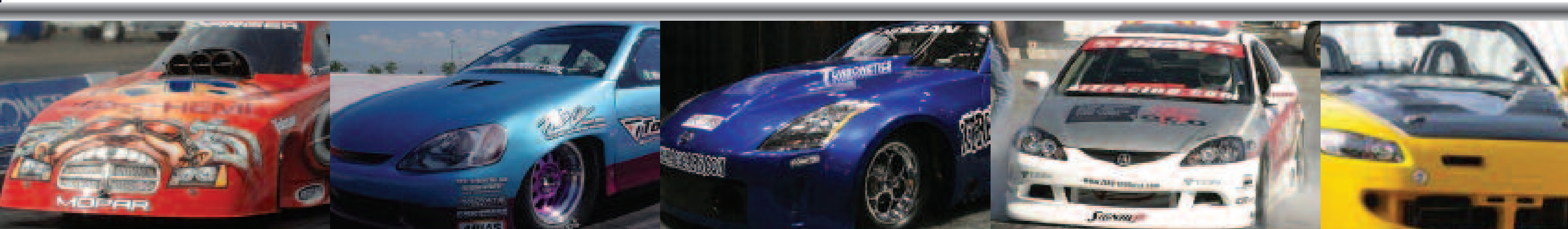
An aide to sleeve installation and heat transfer can be accomplished with adhesives. There are some products on the market, which promote sleeve installation with clearance, and proprietary adhesive that is swabbed on with an applicator. In our experience no chemical will form a continuing bond in clearance for security and heat transfer. Metal deformation with heat and cold is an elastic experience with varying degrees of predictability depending on material specifications. When an adhesive is called for Darton specifies "Loctite" and follows their guidelines for application and procedures.

Heat transfer is sometimes misunderstood. Certain marriages of material, chemicals and usage promote heat transfer and other circumstance reject heat.  For instance, pistons routinely are coated especially on the domes to reject heat to promote performance and prevent piston distortion. Heat is formed in more than one way in an engine. Forces of friction, compression and combustion all contribute to heat creation. Heat dissipation is through use of power, (exhaust and power stroke), conductivity of lubrication materials, and absorption throughout metal components. Most aluminums will not tolerate high temperatures for any length of time. The combustion and cylinder scavenging so rapidly process air mass that heat on pistons, heads and valves is resident for short periods of time. Whenthis cycle breaks down such as detonation or lean mixtures we have what is called meltdown.

Cylinder's walls by contrast must reside in a static state of high heat all the time. For this reason heat absorption and material resiliency are crucial to the heat transfer process without meltdown or distortion.

To promote heat transfer cylinder liners must be cast with the right chemistry, properly distributed throughout the sleeve wall with no occlusions, hard spots or grain structure concentrations. Darton's foundry uses special procedures to assure perfect chemical balance and unique furnace procedures to control how well the material homogenizes during pouring and centrifugal casting. When the material is properly compacted, heat transfer efficiency then becomes a function of sleeve/block fit, block structure, block cooling medium and water flow direction and speed. Dissimilar metallurgy, i.e. iron/aluminum exasperates cooling efficiency due to differences in thermal expansion rates. Typically aluminum engines made with iron sleeves are designed and cored differently than their cast iron cousins to compensate for thermal expansion variances.

Darton manufactures ductile iron sleeves for dry installation in aluminum blocks with special surface finishes and recommends that aluminum block cylinder walls be lightly honed with "Brush Research" bumble hones prior to sleeve installation. The combination of male and female surface preparation greatly enhances heat transfer when the sleeves are installed and fit properly.



# Dry & Wet Sleeves



## Dry Sleeves

Dry sleeves are named so because the sleeve body is not exposed to any cooling liquid within the block and is always installed in a block with an interference fit.

The usual interference value depends on the application and method of install. Darton recommends .001 - .002 interference on like material, i.e. iron sleeves in an iron block. When dissimilar materials are involved such as iron sleeves in aluminum blocks, and interference of as much as .003 can be used however, differential temperatures must be used for installation and the block must be perfectly prepared both dimensionally and surface finish. As a rule of thumb the following may be used as a guide for temperature differential for each instance and fit.

Interference values differ based on the types materials and the types of sleeves. Flanged sleeves are typically installed with less interference and normally provide better performance in high horsepower applications because the upper deck of the flange acts as a seal to combustion chamber pressure when held in compression against the gasket and head. On most high performance applications the deck is surfaced and the flange counter bore is .002 - .003 less than flange thickness providing for an extra margin of cylinder/gasket compression and seal.

Straight wall or tubular sleeves are typically installed with more interference with a slight protrusion above the deck and then the block is decked smooth. Straight wall sleeves when installed in press with the foundation "ledge" at the bottom of the bore are the least desirable sleeves in a performance application. The integrity of straight wall sleeves is totally dependent of press, step and coefficient of expansion. The coefficient of expansion vertically in a block differs, and in combination with piston ring drag, minor dimensional differences can occur top to bottom which may affect cylinder sealing.

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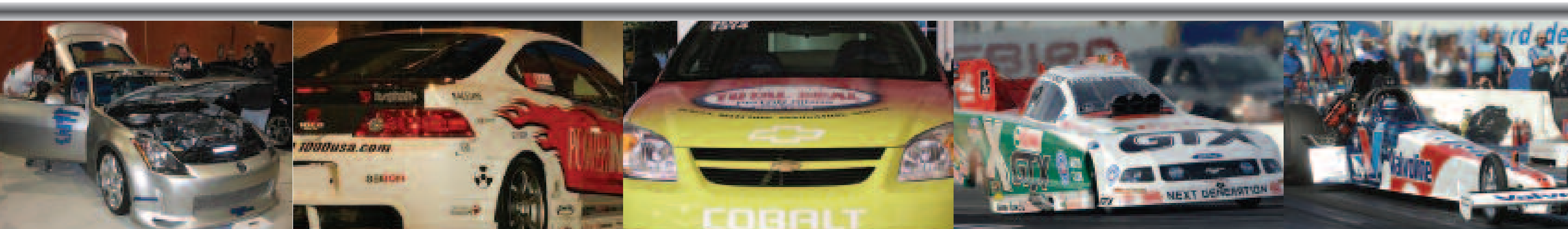
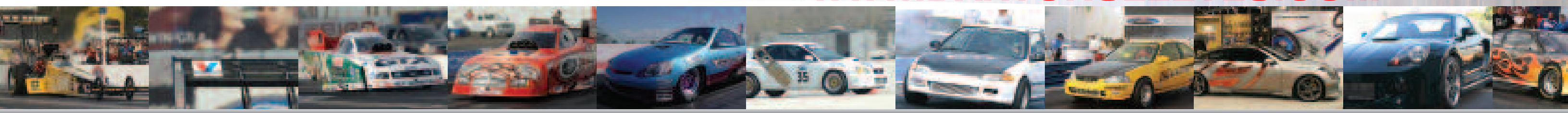




## DRY SLEEVE TOLERANCE CHART

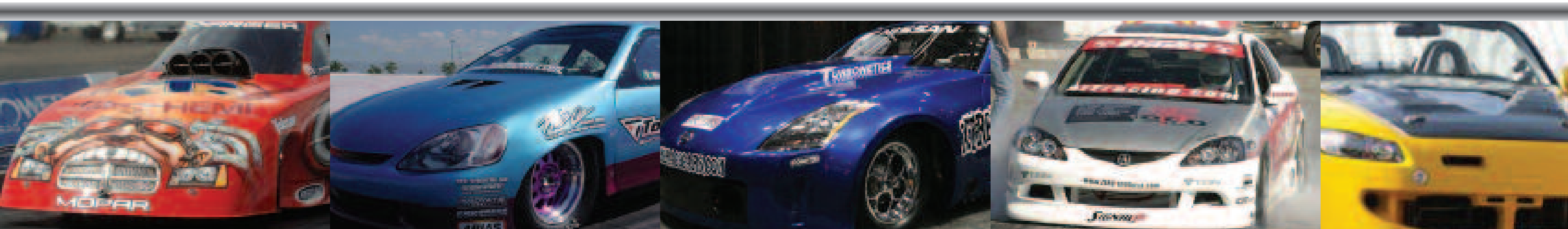
| BLOCK | SLEEVE | INTERFERENCE | TEMP DIFFERENTIAL |
|---|---|---|---|
| Iron | Iron | .0005 - .001<br>.001 - .002<br>.002 - .003 | 50° F<br>100° F<br>250° F |
| Iron | Steel | .0005 - .0015<br>.0015 - .0025<br>.003 - Above | 100° F<br>200° F<br>Not Recommended |
| Iron | Aluminum | - | Not Recommended |
| Aluminum | Aluminum | .0005 - .0015<br>.0015 - .003<br>.004 - Above | 100° F<br>200° F<br>Not Recommended |
| Aluminum | Cast Iron | .001 - .002<br>.003 - Above | 100° F<br>Not Recommended |
| Aluminum | Alloy Iron | .001 - .002<br>.002 - .003<br>.004 - Above | 100° F<br>200° F<br>Not Recommended |
| Aluminum | Ductile Iron | .0005 - .0015<br>.0015 - .0025<br>.0025 - .0035 | 100° F<br>150° F<br>200° F |



## Wet Sleeves

As the name implies, sleeves that are surrounded by water when installed are considered wet sleeves. The significant difference in sleeve design beyond the terms wet or dry are what structure within the cylinder carries the load. In a dry application they cylinder compressive force is carried by the sleeve and the block. In a wet sleeve application the compressive force is totally supported by the sleeve. Therefore, by nature of application and intended use, wet sleeves must be very strong and mechanically able to withstand compressive and frictional forces throughout their total unsupported length. Cast iron and alloy sleeves and aluminum generally do not have the required structural strength and mechanical properties required for wet sleeve installations. This application normally requires high strength ductile iron or steel or hybrids of either. The features of the material to be used in a wet sleeve design are tensile strength, hardness and elongation. Although Darton lists ASTM A536 as our base line ductile iron, our material exceeds all the mechanical specifications by a wide margin. Darton currently produces variations of ductile iron but our base line performance material equals 130,000 psi tensile, 280-290 Bhn hardness and 5-6% elongation.

For wet sleeves, tensile strength determines the matrix strength of the part, hardness determines surface abrasion resistance and elongation equals flexibility with out memory to absorb shocks of combustion and resists permanent deformation. As compressive and combustive pressures rise, wet sleeves face enormous stresses caused by pressure, heat and ring friction. Without superior metallurgy these kinds of sleeves would not endure. Typical diesel sleeve applications may reach 20-1 compression and turbo boosts of 60 pounds. In addition to mechanical strength, wet sleeves must be constructed of enough wall thickness to replace block integrity. No matter how strong the material is, mass and structure will determine performance and longevity. As a guideline, Darton does not recommend wet sleeve wall thickness under .150.



## Piston Rings

Piston rings have one of the toughest jobs inside an engine. They're slammed up and down between the ring lands thousands of times a minute; they're subjected to searing temperatures and extreme pressures; and they are constantly scraping back and forth against the cylinder walls. In spite of all this, the rings are expected to seal combustion and vacuum, prevent blowby, control oil consumption, keep the cylinder walls lubricated, cool the pistons and last but certainly not least, last almost forever (150,000 mile plus in a passenger car/light truck engine or up to a million miles in a heavy-duty over the road diesel).

## Plateau Finish

Regardless of what kind of rings or liners are used in a performance motor, rings usually seat best and last the longest when the cylinder bores are given a plateau finish. A plateau finish essentially duplicates a "broke-in" bore finish, so there is less scrubbing and wear on rings when the engines is assembled. What's more, if the surface is finished correctly it will provide plenty of flat, smooth bearing surfaces to support the rings while also retaining oil in the crosshatch valleys to lubricate the rings.

Most ring manufacturers recommend using a two- or three-step honing procedure to achieve a plateau finish. First, rough hone to within .003″ of final bore size to leave enough undisturbed metal for finish honing. For plain cast iron or chrome rings in a stock, street performance or dirt track motor, hone with #220 grit silicone carbide stones (or #280 - #400 diamond stones) to within .0005″ of final size. Then finish the bore with a few strokes using an abrasive nylon bristle plateau honing tool, cork stones or a flexible abrasive brush.

For moly faced rings in a street performance, drag or circle track motor, hone with a conventional #280 grit silicone carbide vitrified abrasive, then finish by briefly honing to final size with a #400 grit vitrified stone or #600 grit diamond stone (or higher), plateau honing tool, cork stones or a brush.

For stock and street performance engines with moly rings, an average surface finish of 15 - 20 Ra is typically recommended. For higher classes of racing, you can go a little smoother, provided you don't glaze the cylinders.

For moly or nitrited rings in a performance motor, hone with #320 or #400 vitrified stones, and finish with #600 stones, cork stones, a plateau honing tool or brush.

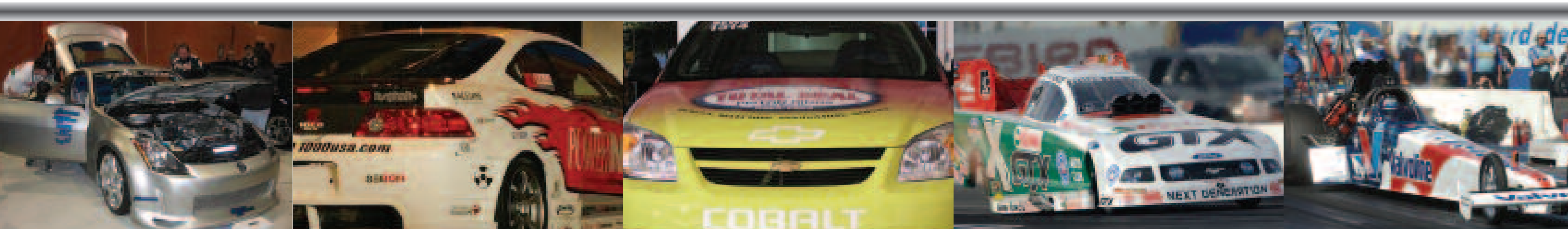
If the cylinders are rough honed with a diamond, they can be finished honed with a finer grit diamond, a fine-grit vitrified abrasive or a plateau honing tool or brush. Because diamond is a harder material and wears more slowly than conventional abrasives, it cuts differently and many require more honing pressure. But many newer diamond stones now use a more friable bond that stays sharp and doesn't load up, allowing the stones to cut smoother and leave a rounder, smoother bore finish.

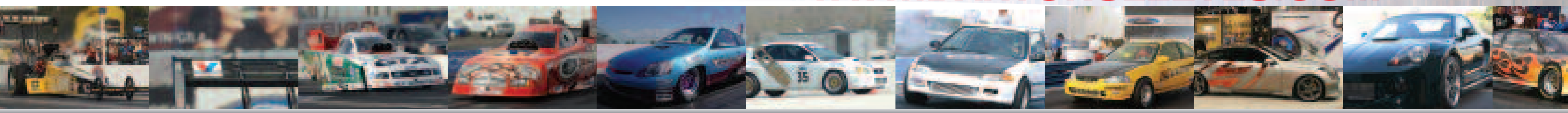
When using diamond-honing stones instead of vitrified abrasives you generally have to use a higher number grit to achieve the same Ra (roughness average) surface finish. For example, if you have been using #220 grit conventional stones to finish cylinders for a plain cast iron or chrome rings, the equivalent diamond stones might be #400 - #500 grit stones. The actual numbers will vary somewhat depending on the brand and grade of the stones.

Bristle style soft hones (plateau honing tools) have mono-filament strands that are extrude molded with a fine abrasive material embedded in the strands. The filaments are mounted in different types of holders for use with portable or automatic honing equipment. Another type of brush uses molded abrasive balls that are mounted on flexible metal shafts so the balls can easily conform to the surface. Brushing helps sweep away torn and folded metal on the surface while removing many of the sharp peaks to make the surface smoother.

When finishing the cylinders with a brush, only light pressure is required. The rpm of the brush should be similar to that which the cylinder was originally honed, and no more than 16 - 18 strokes should be applied (some say 8 - 10 strokes is about right). Too many strokes with a brush may produce too smooth a finish in a cast iron cylinder that won't retain oil. Reversing the direction of rotation while brushing helps to remove the unwanted material on the surface. The end result should be a cylinder that provides immediate ring seal with little if any wear on the cylinder wall or rings when the engine is first started.







With the right plateau honing techniques, you should be able to get the surface down to an average roughness of 8 - 12 Ra or less, with RPK (relative peak height) numbers in the 5 - 15 range, and RVK (relative valley depth) numbers in the 15 - 30 range. These numbers are meaningless unless you have a surface profilometer that can measure them (which a growing number of performance shops now have).

### Bore Geometry

Bore geometry is especially important in performance engines because of the higher cylinder pressures they generate and higher rpms at which they operate. Torque plate honing is a must with all high performance engines to compensate for the bore distortion that occurs when the heads are installed.

Typically, cylinder bores tend to squash in and deform the most areas that are next to the head bolts. Depending on how many head bolts are around the cylinder the bore will experience fourth, fifth, or sixth orders of distortion. Oblong distortion may also occur from side loading during the honing process.

The cylinders should be round and straight to a tolerance of .0005″ or less (ideally, .0002″ - .0003″).

Bore distortions are bad at high rpm because it can prevent the rings from conforming to the surface, allowing more blowby and oil consumption. If the cylinders are not straight, the rings can bounce away from the surface and lose their seal with the same results.

The amount of bore distortion that occurs depends on the block, the location of the cylinders, and the design of the heads and how much loading is on the head bolts. The higher the head bolt loads and the less rigid the block, the more distortion that occurs in the bores.

No matter how perfectly straight and round it may be when it is machined, a cylinder bore will change shape when cylinder heads are installed and when the engine reaches normal operating temperatures. Tests have shown that some bores can distort as much as .0035″ at 220° F compared to room temperature. Less bore distortion when the engine is hot means better sealing and less blowby.

The subject of hot honing has, therefore, caused a stir of excitement among performance engine builders who were looking for it to provide straighter cylinder bores, reducing oil consumption, blowby, wear and engine friction.

In terms of friction reduction, hot honing is claimed to offer a 1% - 2% improvement, which is good for maybe 5- or 6-hp in a 600hp engine. The numbers are not huge, but in a tightly regulated racing classes every advantage helps.

Hot honing hold the most promise for endurance engines that run at high rpm for long races. But it provides less of a benefit for drag racing and street engines. Even so, some Pro Stock drag racers are not hot honing their blocks whether they gain any benefit or not.

Because hot honing's benefits may not be as evident to drag racers as in some other types of racing, much of the improvement seen by drag racers may, in fact, come from torque plates developed for use with the system. In fact, even the developer of the currently available system says many engine builders would se bigger benefits simply by using a well-designed set of torque plates.



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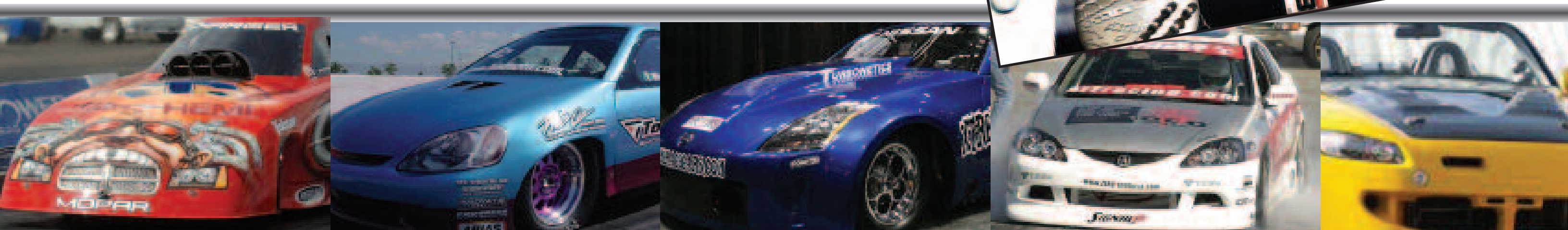

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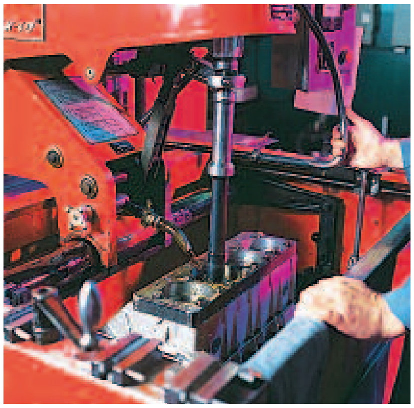

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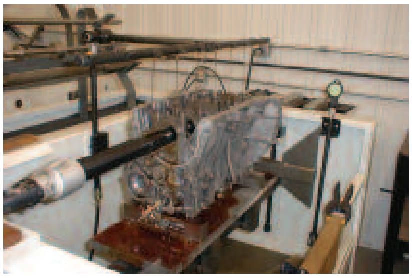
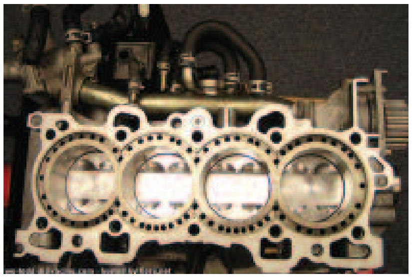


ALIGN BORE AND HONE



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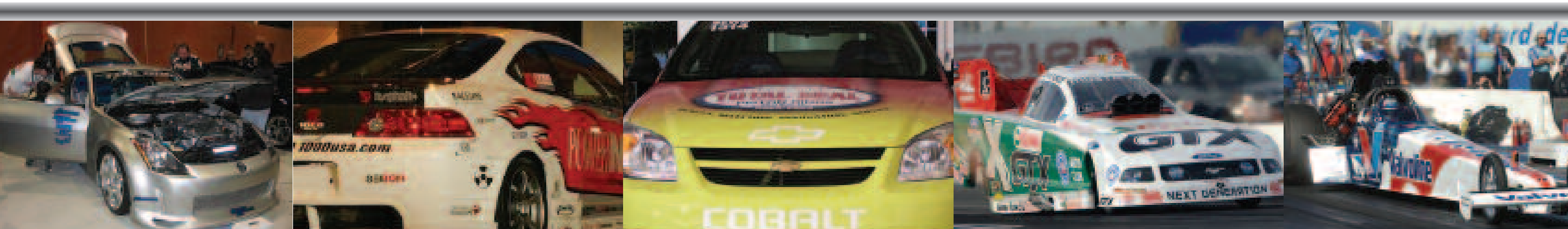

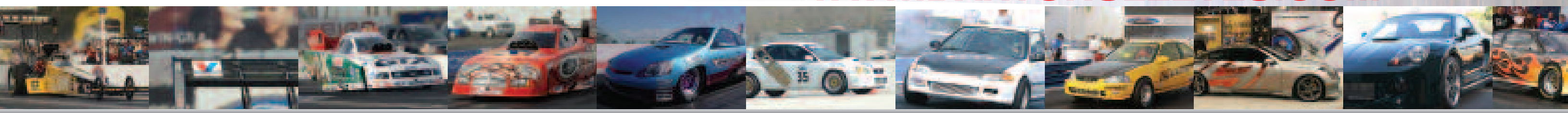



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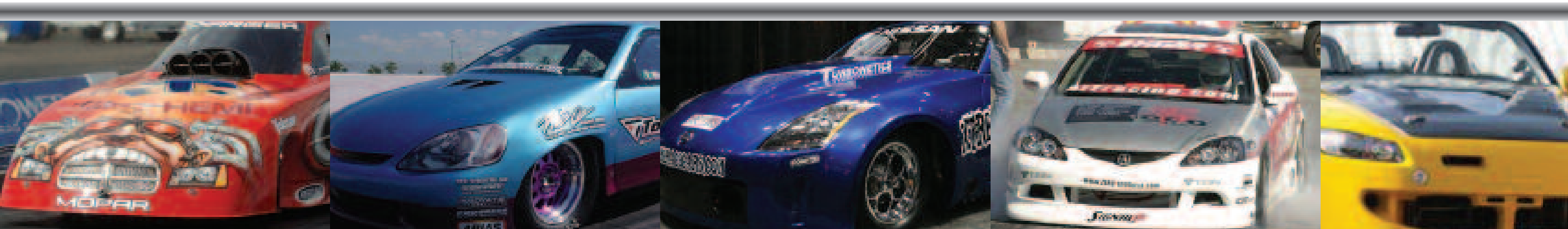

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