

**Cerakote™**  
CERAMIC COATINGS

**FINISH STRONG™**

**High Temperature  
Ceramic Coatings  
(C-Series Air Cure)  
Training Manual**

**TURN UP THE HEAT**  
WITH CERAKOTE™ HIGH TEMP.



TRAINING VIDEOS AVAILABLE AT  
[YOUTUBE.COM/NICTRAINING](https://www.youtube.com/nictraining)



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# **PLEASE READ**

Cerakote™ High Temperature Air Cure Coatings are designed for professionals and should be applied by NIC-trained applicators and coating professionals with proper training and equipment. This training manual is intended to be used as a supplemental guide for certified and professional applicators **ONLY**. It is critical to follow all instructions in this manual. If for any reason you are not willing to, or cannot follow the steps in this manual, do not attempt to coat any product using Cerakote™, or any other NIC product. If you have any questions, please contact NIC Industries.

Thank you

**Cerakote High Temperature Coatings**  
**A Division of NIC Industries, INC.**  
**866-774-7628**  
**[www.CerakoteHighTemp.com](http://www.CerakoteHighTemp.com)**

# PHASE 1: SURFACE PREP

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## Surface Prep:

The parts must be free from any oils prior to sandblasting. Degreasing can be achieved by baking the parts off in an oven, or by soaking the parts in an effective degreaser for 15 to 30 minutes.

A blasted profile must be applied to the substrate to remove any rust, scale or other coatings. Grit blasting is required to ensure maximum adhesion. Blast the parts with 80 to 100 grit aluminum oxide or garnet sand at 80 to 100 psi. Strive for an even blast pattern over the surfaces of the parts. **Do not use glass beads,** as they dimple the surface rather than etching it, which is required.



### TIP:

- If the part's surface is still shiny after blasting, you haven't blasted enough.
- If you use too coarse of grit, the microscopic valleys on the part's surface will be too deep for the .001 - .002" (1 - 2 mils) coating to completely fill while covering the corresponding "peaks" sufficiently to assure a satisfactory coating.



- Don't use sand that has been previously used to clean dirty, greasy or oily parts. Doing so will contaminate your parts.

### CAUTION:

- If you use #100 grit, be sure the grit does not wear out as you are using it. #100 is pretty fine at the start, and will wear to an ineffective dust.
- Do not use glass beads. Glass beads dimple the surface rather than etching it, and will not yield a sufficient blast profile for optimum coating adhesion.

## Racking:

Hang or otherwise fixture parts so that you can access all the surfaces of each part with your HVLP spray gun. Metal hooks of different length are ideal for racking exhaust parts. Make sure to rack parts far enough apart so that they will not bump into each other.

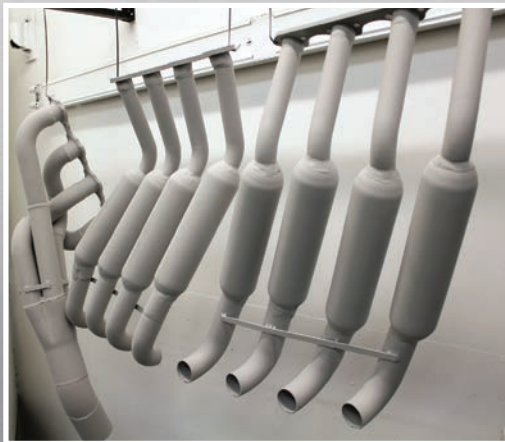
Racking Headers



Racking Exhaust Pipes



Evenly Spaced Parts



# PHASE 3: GAS OUT

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## Gas Out:

It is recommended, but not required, to heat the parts in an oven at 350-500+ degrees Fahrenheit for approximately 30-45 minutes. This will evaporate and burn off any remaining moisture and oils. Gassing out is typically done when parts are oily. If you are unsure whether or not you should perform the gas out process, please contact NIC for further assistance at **866-774-7628**.

# PHASE 4: COATING PREPARATION

## Coating Preparation:

Begin by shaking the bottle until the coating is completely mixed and no solids remain in the bottom of the container. Failure to completely disperse the product will result in poor chemical ratios and product failure. Pour the coating through a disposable automotive type paint filter or a reusable filter (shown: NIC Part # SE-139). This is done to ensure that no contaminants will be sprayed on the finished product. Clean all containers and equipment with acetone.

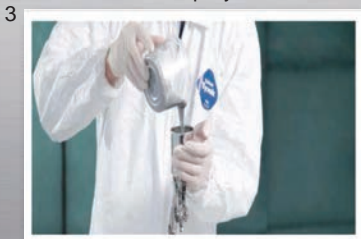
Shake



Pour/Filter



Fill HVLP Spray Gun



Clean with Acetone





## Checklist Before Spraying:

- Ensure all parts to be coated are hung securely, ensuring parts do not touch anything during the application process.
- Spray in a well-ventilated area, wear a respirator, protective gloves and safety glasses.
- MSDS's and additional safety & handling information are available at [www.CerakoteHighTemp.com](http://www.CerakoteHighTemp.com)

## Suggested Equipment:

### **IWATA LPH-80:** NIC Part # SE-138



- Miniature, center post gravity feed spray gun is a full-featured HVLP gun with a .8mm tip.
- Using only 1.8 cfm at 13 psi, this low-air-consumption gun provides high atomization with precise control of the spray pattern and a minimum of overspray.
- Features adjustable spray pattern from round to full-fan shape.
- A stainless-steel nozzle, paint passage and heat-tempered needle ensure long-lasting, peak-performance spraying.
- Uses the reliable and easy-to-service cartridge-style "air-valve" set, which can be serviced outside the gun and easily placed back into the gun body.
- Its 4 oz. (110 ml) stainless-steel gravity cup is center-mounted and rotates, allowing for spraying horizontally, vertically or underneath surfaces.
- Unlike siphon-feed guns, this gravity-fed cup will work with small amounts of paint without spitting
- Spray pattern is from 1/8" to 6" (0.3 cm to 15.24 cm)

# PHASE 5: SPRAYING

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## **Spraying:**

Pour the Cerakote into an HVLP gun with a .8mm tip (NIC Part # SE-138). 20 to 25 psi is the recommended air pressure for spraying Cerakote.

## **Practice:**

Start spraying on a piece of white paper to adjust the spray pattern and practice your spraying technique. Spray with the gun 3 to 5 inches away from the paper and adjust the spray pattern to between 2 and 3 inches wide.



Blow off parts with dry compressed air to make sure there is no trapped blasting media in holes or pockets. Sand or other media left behind will cause surface defects.



## Spraying Continued:

Start spraying in the most difficult area of each part, then progress and finish the easier areas. This should help avoid runs and thin spots. When spraying, strive for even coverage. You are seeking a .001 - .002" (1 - 2 mils) coating thickness. Spray with sufficient volume so that the Cerakote doesn't dry spray, which is when the coating dries in the air before reaching the part.



### TIP:

- When spraying, the part should appear wet, but not so wet that it wants to run.



# PHASE 6: AIR CURING

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## Curing:

Allow parts to air cure. Parts will be tack free after approximately 35-45 minutes and can be packaged or installed the same day.



Cerakote will reach full cure in five days. Prior to full cure, parts should be handled with care, however, you do not need to wait the full five days for packaging, installation or use.



## Cerakote™ High Temp Coating Training Program

NIC Industries offers the only one-on-one training program for Cerakote™ High Temperature Ceramic Coatings. With individual training, our instructors speak with the customers prior to the training course to custom design each class to meet the specific needs of each customer. Customers can apply any of NIC's industry leading ceramic coatings on their own parts, or parts supplied by NIC. Courses are taught at NIC's training facility in White City, Oregon, or onsite\*. While every class is custom tailored to meet each customer's needs, below are topics typically covered in most courses.

### Training Topics

- Metal Prep
- Out-gassing
- Racking Techniques
- Coating Selection
- Proper curing techniques and schedules
- Problem solving and troubleshooting defects
- Proper equipment and operation
- Re-works
- Cost analysis
- Marketing

\*Contact NIC for further information about on-site training at 866-774-7628.

#### Class Location

NIC Industries, Inc. is located at 7050 Sixth Street, White City, OR, 97503. White City is located in Southern Oregon approximately 5 miles from Medford, Oregon, and approximately 280 miles from Portland, Oregon.

#### Transportation

Rogue Valley International Airport (MFR) is located 6 miles from NIC and provides daily flights from several major west coast airports. All major rental car companies are located at the Rogue Valley International Airport.

#### Lodging

NIC has negotiated discounted rates with several hotels in close proximity to our facility. Information can be found at <http://www.cerakotehightemp.com/resource/downloads/>





## MC-Series Microclear Ceramic Coatings

*Preparation of substrate is crucial for maximum adhesion and performance of this material*

- 1.) Completely disassemble the item to be coated. If pins or parts are left in, they can produce runs and ruin the finish.
- 2.) Prepare surface to remove oil, contaminants or any unwanted coatings from the substrate.
- 3.) For surfaces that must retain a specific appearance (such as wheels) denatured alcohol may be used.
- 4.) Hang parts to allow for best view and application access. This can be done by using support wires or hooks. Make sure to place parts in such a way that they will not bump into each other. **Do not touch parts with bare skin.**
- 5.) Blow off substrate with a high-pressure air nozzle to remove any blasting dust left on the surface. Wear safety goggles or face shield for your protection. Work in a well-ventilated area. If ventilation is not available, wear a respirator - see MSDS for additional information.
- 6.) Recommended spray equipment is a high quality HVLP gun (such as IWATA) or a siphon-fed detail gun with a fine to medium tip. The use of a small spray tip pattern will aid in coating hard to reach areas without excessive build up in surrounding areas. Electrostatic application may also be an option. **Material does not need to be thinned. Use as received.**
- 7.) A single application of product is recommended for a 0.5 to 1.0 mil film thickness. Work from the most difficult surface out to the easiest. This will aid in reducing runs or excessive build up.
- 8.) Allow to air-dry. Parts will be tack free after approximately 35 minutes. Until this point the coating is still wet, so take care to not bump or touch the parts. Parts will be partially cured after 24 hours and full cured 5 days after application.
- 9.) Finished goods may be shipped after 24 hours when the coating is partially cured.
- 10.) Clean tools and equipment with acetone or Cerakote™ cleaning solvent.

*Please contact a Cerakote™ technician with questions on proper use and/or application. Onsite or offsite training courses are available for further instruction. **Consult your MSDS for proper handling, disposal, and precautions while using this product.***

**\*Visit [www.CerakoteHighTemp.com](http://www.CerakoteHighTemp.com) to Download Application Guides.**

## V-Series, Piston Coat & W-Series High Temperature Ceramic Coatings

*Preparation of substrate is crucial for maximum adhesion and performance of this material*

- 1.) Remove all coatings, oils, and contaminants from substrate with either a de-greasing chemical and/or by heating the substrate to temperatures high enough to remove coatings or contaminates.
- 2.) A blasted profile must be applied to the substrate to remove any rust, scale, or other coatings. This is also required to ensure maximum adhesion. Remove any sharp edges that may create thin areas or protrude through the coating. For best results, use a dry grit material such as aluminum oxide or garnet equivalent to a 100 - 120 mesh size. Glass beads are not recommended as they are not aggressive enough to produce a significant blast profile. Profile plastic and wood parts lightly (~40 psi).
- 3.) Place parts in an oven at 500° F for approximately 30 minutes (**300° F for approximately 30 minutes for Piston Coat**) to evaporate any last minute moisture, oils, or contaminates. **Only Cerakote™ approved solvents may be applied to the substrate after completing the blast profile.**
- 4.) Hang parts to allow for best view and application access. This can be done by using support wires or hooks. Make sure to place parts in such a way that they will not bump into each other. **Do not touch parts with bare skin.** Alligator clips or 30-gauge wire are recommended for small parts such as screws and springs.
- 5.) Make sure each Cerakote™ product is completely mixed and no solids remain in the bottom of the container. Failure to completely disperse the product will result in poor chemical ratios and product failure.
- 6.) Blow off substrate with a high-pressure air nozzle to remove any blasting dust left on the surface. Wear safety goggles or face shield for your protection. Work in a well-ventilated area. If ventilation is not available, wear a respirator - see MSDS for additional information.
- 7.) Recommended spray equipment is a siphon-fed detail gun with a fine to medium tip. The use of a small spray tip pattern will aid in coating hard to reach areas without excessive build up in surrounding areas. Electrostatic application may also be an option. **Material does not need to be thinned. Use as received.**
- 8.) Two applications of product are recommended for a 0.5 to 1.0 mil film thickness (**2 mil thickness for W-Series**). In some cases a single coat will suffice for particular applications. Work from the most difficult surface out to the easiest. This will aid in reducing runs or excessive build up.

9.) You may re-coat parts prior to pre-bake or cure cycle if needed. **Touch-up cannot be performed after the cure cycle.** If the parts need to be touched up after the cure cycle, the coating will need to be removed down to the bare metal with the entire coating process repeated.

10.) Allow to air-dry for 20 minutes, and then place in an oven at 175° F for 20 minutes to allow excess solvents from the coating to out-gas.

11.) Ramp the oven up to 500° F (minimum) to 700° F (**300° F for Piston Coat**). After desired temperature is reached, cure parts for 60 minutes. For W and V-Series (**NOT including Piston Coat**), higher cure temperatures are recommended for extreme application requirements. If parts are processed below 500° F, they have **NOT** fully cured. The final cure needs to take place at higher temperatures, which can occur with exhaust heat or the higher temperature cure cycles as mentioned above.

12.) After cure cycle is complete, finished goods may be shipped once they have cooled to the touch. **FOR W-SERIES ONLY:** The parts will need to be lightly buffed with a super fine steel wool (0000 or 4/0) then polish in a vibratory polisher.

11.) Clean tools and equipment with acetone or Cerakote™ cleaning solvent.

*Please contact a Cerakote™ technician with questions on proper use and/or application. Onsite or offsite training courses are available for further instruction. **Consult your MSDS for proper handling, disposal, and precautions while using this product.***

***\*Visit [www.CerakoteHighTemp.com](http://www.CerakoteHighTemp.com) to Download Application Guides***

NIC Industries, Inc. does not warranty the use or application of the materials it manufactures or supplies. Our only obligation shall be to replace any defective materials supplied by us or refund the original purchase price of that product after we have determined the product to be defective. We assume no liability for damages of any kind and the user accepts the product "as is" and without any warranties, expressed or implied. The suitability of the product and/or intended use shall be solely the responsibility of the user.

The information contained here is believed to be correct to the best of our knowledge and testing. The recommendations and suggestions herein are made without guarantee or representation as to results. We recommend that you make adequate tests in your laboratory or plant to determine if this product meets all your requirements.



## Cerakote™ High Temperature Ceramic Coatings

The unique, ceramic-based formulation used in the entire line of Cerakote™ High Temperature coatings enhances a number of physical characteristics. Cerakote™ High Temperature coatings are durable, heat-resistant coatings with excellent long-term performance. Additionally, Cerakote™ High Temperature ceramic coatings function as thermal barriers for thermally-sensitive applications. This report outlines the different high-temperature coatings available from Cerakote™ and discusses the properties inherent to each. The thermal barrier capability and chemical resistance of each coating was also studied, and the results of this study are published below.

### Background

Unlike other "ceramic" coatings, Cerakote™ is formulated from the molecular level. All Cerakote™ products begin with a liquid resin, and during the cure process, the resin forms a 3-D ceramic matrix. Additional property-enhancing materials are combined with the raw resin and trapped within the matrix. This technology creates a durable, heat resistant coating and makes Cerakote™ the premier coating available on the market today.

Cerakote™ offers four different types of high-temperature products. An outline of each of these coatings is shown below in table 1. As shown, Cerakote™ exhaust coatings are available in both ambient-cure and oven cure systems. Each of the coatings may be used over a number of different substrates, including steel and aluminum. The MC-Series line of ceramic clear coatings is the world's strongest clear coat and is typically used as a protective clear coat over aluminum, steel, brass, PVD, and numerous other paint and powder coatings to improve their appearance and durability. The average coating thickness ranges from 0.5-1.0 mil and can be used in areas of low tolerance. These coatings are also VOC exempt in all 50 states and in the South Coast region of California.

**Table 1.** Characteristics of different high-temperature Cerakote™ exhaust coatings

Type of Cerakote™	Cure Schedule	Appearance	General Use
C-Series	Ambient Cure; Dry to touch; 45 min.	Various Colors	High Temperature Applications up to 1800° F
MC-Series	Ambient Cure; Dry to touch; 45 min.	Clear	Clear Protective Coating up to 1000° F
W-Series	500° F, 1 hr.	Chrome/ Polished Aluminum	Exhaust Components up to 1300° F
V-Series	500° F, 1 hr.	Various Colors	High Temperature Applications up to 1800° F

## Chemical Resistance

The ability of Cerakote™ High Temperature coatings to resist chemical breakdown was tested by dipping coated panels into a series of solvents and allowed to sit for 24 hours. Afterward, the samples were removed, analyzed and assigned a rank depending on the resistance to each specific chemical. The results of this test are shown in table 2. The performance of Cerakote™ C-186, C-7300, and V-171 was classified as excellent for the solvent tests. This indicates that the coating was not affected following a 24-hour immersion in the solvents. Cerakote™ W-207 performed excellent in 9 of the solvents and performed fair to good in the remaining solvents.

**Table 2.** Chemical resistance of Cerakote™ C-186, C-7300, W-207, and V-171 to 13 different solvents.

Solvent	Cerakote™ C-186	Cerakote™ C-7300	Chromex W-207	Cerakote™ V-171
WD-40	★★★★★	★★★★★	★★★★★	★★★★★
Motor Oil	★★★★★	★★★★★	★★★★★	★★★★★
Lacquer Thinner	★★★★★	★★★★★	★★★	★★★★★
Mineral Spirits	★★★★★	★★★★★	★★★★★	★★★★★
Methyl Ethyl Ketone	★★★★★	★★★★★	★★★	★★★★★
Gasoline	★★★★★	★★★★★	★★★★★	★★★★★
Diesel	★★★★★	★★★★★	★★★★★	★★★★★
Graffiti Remover	★★★★★	★★★★★	★★	★★★★★
Brake Cleaner	★★★★★	★★★★★	★★★★★	★★★★★
Denatured Alcohol	★★★★★	★★★★★	★★★★★	★★★★★
Paint Stripper	★★★★★	★★★★★	★★★★★	★★★★★
Acetone	★★★★★	★★★★★	★★★★★	★★★★★
Ammonia	★★★★★	★★★★★	★★★	★★★★★

★★★★★ = Excellent Chemical Resistance

★★★ = Good Chemical Resistance

★★ = Fair Chemical Resistance

★ = Poor Chemical Resistance

## Thermal Barrier Testing

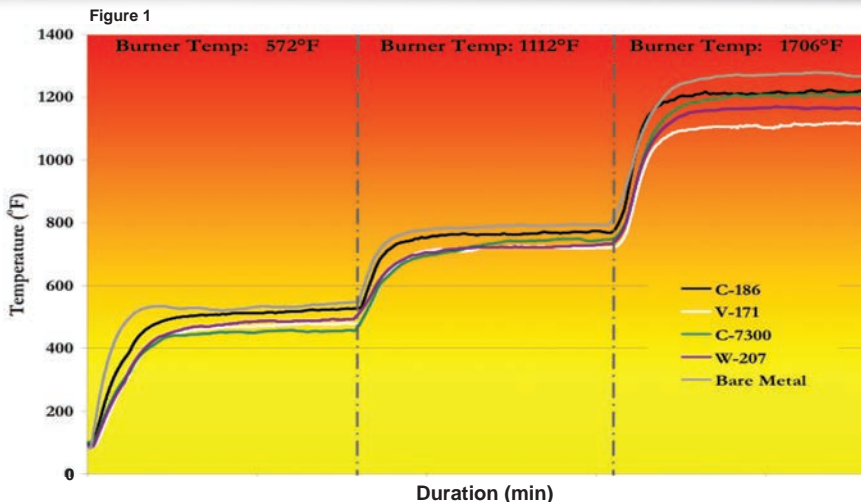
Four different Cerakote™ products were tested to determine the potential of each as a thermal barrier coating. These four coatings are shown in table 3 with their respective properties. Each of these coatings was used to coat a 3' long section of pipe. The pipes were manufactured of cold-rolled steel and had an inner diameter of 2". The pipes were cured according to the appropriate cure schedule and then horizontally mounted using 2 clamps spaced 6" from the center of each pipe. Three thermocouples, one in the center, one 3" from the inlet and one 3" from the outlet, were positioned on each pipe. Each thermocouple was held in place using a band clamp. A gas burner was attached to the inlet side of each pipe and the pipes were heated according to the following program:

Start condition: Ambient air at 100 SCFM  
 Ramp to 572°F in 1 minute, hold for 10 minutes  
 Ramp to 1112°F in 1 minute, hold for 10 minutes  
 Ramp to 1706°F in 1 minute, hold for 10 minutes

The air flow rate was maintained at 100 SCFM for the duration of the test. The inlet gas temperature and the temperatures recorded by the 3 skin thermocouples were also monitored and recorded at 1 second intervals. The results of this test are illustrated in figure 1 and further explained in table 4. At temperatures below 572°F, C-7300 Black Velvet performed the best. Above 572°F, V-171 Turbine Coat provided the most thermal protection. At 572°F, using C-7300 Black Velvet as a thermal barrier resulted in a 110°F drop in outer skin temperature. At 1112°F and 1706°F, V-171 Turbine Coat resulted in a 102°F and 185°F drop, respectively. Afterward, the pipes were examined in order to assess any deterioration in the physical or visual properties. C-186, C-7300, and V-171 maintained adhesion of 5B as well as color and gloss. W-207 showed a slight loss in adhesion and gloss. This can potentially be prevented by coating the inside of the pipe with V-171 turbine coat.

**Table 3.** Physical properties of four different Cerakote™ coatings tested for thermal barrier properties.

Type of Cerakote™	Adhesion ASTM D3359	Scratch Hardness/Hardness ASTM D3363	Impact ASTM 2794	Mandrel Bend ASTM D522	General Use
C-186 Piston Coat	5B	5h/9h	40/20 inch-lbs	4 mm at 180° rotation	Top of Piston/ Combustion Chamber
C-7300 Black Velvet	5B	6h/7h	40/20 inch-lbs	2 mm at 180° rotation	High Temp. Applications up to 1800°F
W-207 Chromex	5B	2h/9h	100/40 inch-lbs	0 mm at 180° rotation	Exhaust Components up to 1300°F
V-171 Turbine Coat	4B	4h/5h	60/20 inch-lbs	1 mm at 180° rotation	High Temp. Applications up to 1800°F



**Figure 1.** Outer skin temperature profile for 4 pipes coated with Cerakote™ and one uncoated, cold-rolled steel pipe over the temperature range ambient - 1706°F

**Table 4.** Temperature difference on outer skin of Cerakote™ coated pipe as compared to bare metal pipe.

Type of Cerakote™	Temperature Drop(°F) At 572°F	Temperature Drop(°F) At 1112°F	Temperature Drop(°F) At 1706°F
C-186 Piston Coat	-48	-55	-81
C-7300 Black Velvet	110	77	-91
W-207 Chromex	-77	-90	-135
V-171 Turbine Coat	-88	-102	-185





# CONTACT INFORMATION



## Need Help?

At any point during the Cerakote™ application you have a question, please contact Cerakote High Temperature Coatings at:

NIC Industries, Inc.  
7050 Sixth Street  
White City, OR 97503

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