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Painting System “ABB C2”

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X AMC	Stefan Palmgren	2006-11-08
X AMD	Davide Tacconi	2006-11-08
X AMG	Toni Tiihonen	2006-11-08
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Note! This document covers product families that are marked with "X". Restrictions to the scope of the document have been described in the body text.

¹⁾ HV machine

The "Technical Specification 3AAM700305" of which header is above, works as a master documents for this P-instruction. Technical content of this P-instruction has to be in uniform with its Master –document. The green texts in this instruction are factory wise interpolations which are not inconsistent with the Master document.

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1 Purpose

These work instructions apply to ABB Machines factories and their suppliers, who supply anti-corrosive painted parts (frames, terminal boxes, cooler covers...) to ABB's electric machines.

2 References

ISO 8501	Preparation of steel substrates before application of paints and related products -- Visual assessment of surface cleanliness.
ISO 8503	Preparation of steel substrates before application of paints and related products -- Surface roughness characteristics of blast-cleaned steel substrates.
ISO 12944	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems.

3 Surface treatment

The main factor determining the selection of paint system is the surface preparation performed before painting. For painting surfaces prepared with blast-cleaning, select a paint system described in section 3.1. Steel structures 3 mm or thicker and parts made of cast iron always belong to this group. As an alternative for this system, the powder coating paint system with zinc phosphatizing pretreatment can be used for the steel structures with a thickness of 3 mm or less and aluminum and zinc surfaces. This system is described in section 3.2.

The below general work instructions and notes are applicable for both paint systems (3.1 and 3.2), if nothing else is required on the order:

- a) The following surfaces shall not be painted: titanium, copper, brass, plastic, stainless steel, chrome- and nickel plated surfaces. **Also steel and cast iron surfaces that have above 40 µm zinc coating shall not be painted.**
- b) Surfaces on the parts that must remain free of paint shall be protected with a plastic film, masking tape or screw; such surfaces include threaded holes, machined surfaces, and contact surfaces on earthing components.
- c) After painting work, the unpainted steel and cast iron surfaces shall be protected with anti-corrosion oil.
- d) If spot welds or joints with narrow gaps remain on the parts to be painted, the gaps shall be filled with sealant (Würth, Glue + Joint Paste 08901002 or Sikaflex 221 Glue & Joint Paste). Extrude the paste onto the gaps after priming. Finally, level out the mass with wet finger to ensure that the top layer of paint forms a uniform and even layer on the seam. This item is applicable for the areas leaving in touch with the machine's external air if not deviated in the order.
- e) Paintwork on pipes made of stainless steel connected to carbon steel should overlap the stainless steel by 50 mm.
- f) Flameproof joints in enclosures of Exd machines shall not be painted.
- g) All the surfaces of the parts that can not be painted after the machine assembly and that will be in touch with the ambient air after the machine's assembly shall be painted according to the whole paint system including the top coat. In case there is doubt about such surfaces that shall be confirmed from ABB.
- h) Welds shall be carefully cleaned from spatters by blast cleaning (Sa2½, ISO 8501) or by wire brushing (St3, ISO 8501) before surface preparation and painting.
- i) **The parts coated with topcoat shall not be packed before 16 hours drying time.**

3.1 Painting of Surfaces Prepared with Blast-cleaning

The paint system described in this section is applied to all steel and cast iron surfaces which are cleaned by blast-cleaning. Steel structures over 3 mm thick and parts made of cast iron always belong to this group.

3.1.1 Surface preparation

Preliminary cleaning (for all surfaces to be painted): Remove all solid impurities that make cleaning difficult. Water-soluble salts, greases and oils should be removed by using an alkaline or emulsion wash (ISO 12944-4 / 6.1.3, 6.1.4). Carefully rinse the surfaces with water.

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Steel and cast-iron surfaces: Blast-cleaning to grade Sa 2½ according to standard ISO 8501-1. Surface roughness: Grade Fine to Medium (ISO 8503).

Aluminum surfaces: Roughen the surfaces by grinding, or washing with an alkaline detergent, and rinse them carefully with water. Dry the surfaces and remove all dust before painting.

Zinc surfaces: Clean the surfaces lightly with blast-cleaning; use clean and dry quartz sand as the cleaning material. Wash and dry the surfaces and remove dust before painting.

Old painted surfaces (final painting of the machines): Wash the surfaces by solvent, alkaline or emulsion detergent rag. Roughen the surfaces by grinding with sand paper. Remove the grinding particles and paint dust from the surface. (ISO 12944-4 / 6.1.5, 6.2.2)

3.1.2 Painting

Painting must be performed according to the instructions in the paint manufacturer's product data sheet.

Following surface preparation, priming is performed with an airless high-pressure spraying pistol. A brush can be used for priming hard-to-spray and small objects.

Below is a list about the paint types and their nominal film thicknesses. The chapter "Technical Spec." in the table refers to the Technical specification -document in which there are listed the paint suppliers and their product names that can be used for the painting. The same paint supplier's products shall be used for the whole paint system.

The supplier shall paint the coating marked with reference letter "A", if the chapter 3 in this specification or order does not require anything else. If the top coating, marked with letter "D", is required to be applied, the color of the paint shall be ABB standard, Munsell 8B 4.5/3.25 (NCS 4822-B 05 G) if nothing else is stated in the order.

Coating ref. letter	Paint type	Thickness	Number of coats	Technical Spec.
A	2-component epoxy primer Color: light grey	80 µm	1	3AAM700310 - EP primer
D	Acrylic topcoat ⁽¹⁾	40 µm	1	3AAM700313 - AY top coat
	TOTAL NDFT ⁽²⁾	120µm		

¹⁾ In case the specified colour is not available in Acrylic, polyurethane can be used for final painting of the assembled machines'. See the Technical Spec. "[3AAM700315 - PUR top coat](#)" for product information.

²⁾ NDFT = Nominal Dry Film Thickness

3.2 Powder Painting of Un-abraded Surfaces Prepared with Zn-phosphatizing

The paint system described in this section can be used for metal surfaces that are difficult to prepare with blast-cleaning and that can be processed on a powder coating line. Parts within this class include steel structures with a thickness of 3 mm or less and certain aluminum and zinc surfaces.

3.2.1 Surface preparation

Preliminary cleaning (for all surfaces to be painted): Remove all solid impurities that make cleaning more difficult. Water-soluble salts, greases and oils should be removed by using an alkaline or emulsion wash (ISO 12944-4 / 6.1.3, 6.1.4). Carefully rinse the surfaces with water.

Steel surfaces (sheet metal structures): Zinc phosphatizing, and passivating if possible (ISO 12944-4 / 6.1.6).

Aluminium surfaces: Chromating (ISO 12944-4 / 6.1.6).

Zinc surfaces: Removal of any white rust with e.g. alkaline wash (ISO 12944-4), and zinc phosphatizing or chromating (ISO 12944-4).

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Old painted surfaces (final painting of the machines): Wash the surfaces by solvent, alkaline or emulsion detergent rag. Roughen the surfaces by grinding with sand paper. Remove the grinding particles and paint dust from the surface. (ISO 12944-4 / 6.1.5, 6.2.2)

3.2.2 Painting

Painting must be performed according to the instructions in the paint manufacturer's product data sheet.

Following surface preparation, priming is performed with an electrostatic spraying pistol. The coating is placed in an oven to melt and cure the powder.

Below is a list about the paint types and their nominal film thicknesses. The chapter "Technical Spec." in the table refers to the "Technical specification" document in which there are listed the paint suppliers and their product names that can be used for the painting. The same paint supplier's products shall be used for the whole paint system.

The supplier shall paint the coating marked with reference letter "P", if the chapter 3 in this specification or order does not require anything else. If the top coating, marked with letter "D", is required to be applied, the color of the paint shall be ABB standard, Munsell 8B 4.5/3.25 (NCS 4822-B 05 G) if nothing else is stated in the order.

Coating ref. letter	Paint type	Thickness	Number of coats	Technical Spec.
P	Powder paint based on EP binder Color: light grey	80 µm	1	3AAM7003111 – EP powder primer
D	Acrylic topcoat ⁽¹⁾	40 µm	1	3AAM700313 - AY top coat
TOTAL NDFT ⁽²⁾		120µm		

¹⁾ In case the specified colour is not available in Acrylic, polyurethane can be used for final painting of the assembled machines'. See the Technical Spec. "[3AAM700315 - PUR top coat](#)" for product information.

²⁾ NDFT = Nominal Dry Film Thickness

3.3 Treatment of surfaces leaving inside Synchronous machines

3.3.1 Priming

Welding made during manufacturing of the machines shall be primed in the assembly department. The rotor shaft surfaces shall be painted with epoxy primer to the dry film thickness of 60 µm (fitting surfaces and surfaces leaving under bearing, gasket or poles shall not be painted). In case the painting is made before resin treatment, the solvent borne primer shall be used and the paint shall dry minimum 10 hours before resin treatment. Surfaces on the stator package shall not be painted.

3.3.2 Varnish treatment

Varnish treatment of the interior surfaces of the synchronous machines is made only if that is separately required in the order or work card.

The varnishing is made with the varnish "VA42 B8 Sterling Red" by airless spraying gun. If the varnish is needed to thin, the thinning shall be made with pure xylene or with thinner "VA42 Sterling" -thinner. The varnishing has to be carried out after resin treatment of the stator or rotor.

In case the varnish treatment is required to be made, it shall be made for the following surfaces:

- In rotor the varnish is applied after assembly of the exciter or slip ring. The varnishing is made for all rotor surfaces, except followings: slip and insulation surfaces on the slip ring, diode bridge, fitting surfaces and surfaces leaving under bearing or gasket.
- In stator the varnish is applied onto the surface leaving into the air gap side and onto the coil ends.

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3.4 Notes for painting of the machines after final assembly

After final assembly of the machine the plain surfaces (i.e. machined surfaces) leaving outside of the machine are primer painted with brush. Following to that the veil layer of intermediate coat is normally sprayed all over the exterior surfaces on the machine to create smooth and uniform adherence surface for top coating.

Drying time of the paint can be shortened by increasing the temperature of the incoming air into the painting chamber or by ovening the machine. However, following the painting, the pre-evaporation time before increasing of temperature shall be minimum 30 minutes.

The primer coated aluminum auxiliary terminal boxes (manufacturer: Fibox) are not painted in the final painting of the machines.

Lifting lugs of the machines are touch up painted with brush before packing of the machine.

4 Quality Control

The quality of paintwork shall be monitored continuously in accordance with these instructions and ISO 12944-7 standard. Summary of the results shall be included into the painting inspection record ([3AAM500127 - ABB, Record of Painting Inspection](#)).

4.1 Keeping an Inspection Record

Purpose of keeping an inspection record is to ensure that anti-corrosive paintwork conforms to the agreement, instructions and standards. The inspector must enter all of his observations, comments and repairs into the painting inspection record, which can be fulfilled either by computer or manually.

A single combined inspection record can be prepared, containing all parts included into the same order position. The inspection record must be delivered to ABB together with other quality control documents of the part(s). The inspection record shall be also stored in supplier's archives minimum for 24 months following the paint job.

4.2 Measuring the Thickness of the Paint

For structures with no defined measuring drawing, the coating thickness should be measured in such a way that as comprehensive a picture as possible is obtained of the entire coating. For structures with a defined measuring drawing, the coating thickness must be measured based on the areas defined in the measuring drawing. The permitted minimum coating thickness at any individual measuring point is 80% of the nominal coating thickness (upper limit 300%. ISO 12944-7).