ELECTRIC MOTORS

August 2023

C5mid and **CX** Paint Systems

The introduction of these new paint systems is an extension of our already available paint systems. The new high performance paint systems are suitable for the following corrosivity categories:
C5-very high and
CX-extreme
Both according to **ISO 12944-2:2018**.

We wish to offer our customers a complete and reliable solution for electric motor coating for the most demanding industrial, marine and offshore environments. The main objective is to significantly enhance the surface protection of cast iron motors (not suitable for aluminum motors) to increase the resistance against corrosion and to reduce the service and maintenance costs.

Corrosivity categories acc. to ISO 12944-2		
Corrosivity category	**Examples of typical environments**	
	Outdoor	**Indoor**
C5 (very high)	Industrial areas with high humidity and aggressive atmosphere and coastal areas with high salinity.	Buildings or areas with almost permanent condensation and with high pollution.
CX (extreme)	Offshore areas with high salinity and industrial areas with extreme humidity and aggressive atmosphere and subtropical and tropical atmospheres.	Industrial areas with extreme humidity and aggressive atmosphere.

Durability of the paint system:

The **ISO 12944-1** standard defines a number of durability ranges.

The paint system **C5mid** was developed to achieve **durability "Medium"** with expectancy of the first major coating failure between **7 and 15 years** from the date of installation.

The paint system **CX** is intended for extreme environment and meets **durability "High"** with expectancy of the first major coating failure between **15 and 25 years** from the date of installation.

The existing option code **S04** (**C5-offshore** special paint system) fulfills **durability "Low"**, with expectancy of the first major coating failure **< 7 years**.

The defined **durability** is the expected life of the protective paint system until first major maintenance painting is necessary. It is to help the user to set up an appropriate maintenance plan.

Durability of the protective paint system according to ISO 12944-1	
Low	up to 7 years
Medium	from 7 up to 15 years
High	from 15 up to 25 years
Very High	more than 25 years

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Option code
S04 = Special paint finish **C5-offshore** with **"Low"** durability.
S08 = Special paint finish **C5mid** with "**Medium"** durability. (New!)
S09 = Special paint finish **CX-offshore** with **"High"** durability. (New!)

All suitable for cast iron motors only because the process includes sandblasting and zinc galvanizing, which cannot be done on aluminum motors.

Migration Strategy

The latest revision of **ISO 12944:2018** is superseding the old **ISO 12944:1998** standard. The corrosion categories **C1, C2 and C3** remain the same. These paint systems (option codes S00, S01, S02, S03) remain unchanged.

The formerly known corrosion categories **C5-I "Industrial"** and **C5-M "Marine"** have been replaced with the category **C5**.

The marine paint system **C4** (option code S03) remains unchanged.

The **C5-offshore** paint system with **durability "Low"** (Option Code S04) remains unchanged.

For **C5mid** paint system with **durability "Medium"** please select Option Code S08.

The corrosion category **CX** is new and beyond all categories listed in the old standard. For this paint system please select Option Code S09.

Here is the summary:

Old Standard ISO 12944-2: 1998		**New Standard ISO 12944-2: 2018**		**Option Code**
Corrosion Category	**Durability**	**Corrosion Category**	**Durability**	
C2 (low)	Low	**C2** (Low)	Low	without
C3 (medium)	Low	**C3** (Medium)	Low	**S02**
C4 (high)	Low	**C4** (High)	Low	**S03**
C5-I (very high – Industrial) **C5-M** (very high – Marine)	Low	**C5** (Very High)	Low	**S04**
C5-I, **C5-M**	**Medium**	**C5** (Very High)	**Medium**	**S08**
-----		**CX** (Extreme)	**High**	**S09**

The new paint systems are equivalent to 'Norway Petroleum Industry' paint systems referred to as "Norsok" paint systems.

Option S08 – The **C5mid** paint system is an equivalent of **'Norsok 1B'**.
Option S09 – The **CX** paint system is an equivalent of **'Norsok 2B'**.

Test Reports of surface treatment and painting operations
Option S08 – The Paint Test Report will be provided upon request.
Option S09 – The Paint Test Report will be provided automatically with the motor.

ATEX / IECEx Motors
The paint system of Hazardous Area motors must comply with IEC 60079-0 article 7.4 for explosion Group II and Group III. The paint systems **C5mid** and **CX** have been developed with conductive paints and accredited at certification laboratories for use in hazardous areas without restrictions. Therefore, the paint systems **C5mid** and **CX** with total paint thickness of more than 200µm can be used even in explosive atmospheres of gas group IIC.

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Technical Overview

Paint system	**C5mid**	**CX**
Option code	**S08**	**S09**
Corrosivity category	C5 Very High	CX Extreme
Durability	Medium 7 to 15 years	High 15 to 25 years
Primer - Thermal sprayed ZnAl15	50 µm	100µm
Intermediate coat (epoxy resin)	120 µm	240µm
Topcoat	Polysiloxan[1)] 60 µm	Polysiloxan[1)] 60 µm
Total number of coats	4	5
Min. thickness (final dry)	**230µm**	**400µm**
Surface Treatment Report	Upon request	□
UV-resistance (S06)	□[1)]	□[1)]
Stainless steel fasteners (H06)	□	□
Stainless steel rating plate (M11)	□	□
Metal fan cover (F74)	✓	□
Metal fan (F76)	✓	□
Paint finish in RAL colours (Y53, Y56, Y66)	✓	✓
Internal painting (S05)	✓	✓
Shaft made of stainless steel (L06)	✓	✓

Brakes and encoders are suitable for corrosive categories as defined by their manufacturers; however, they are generally not suitable for categories **C5mid** and **CX**.

[1)] Polysiloxan is free of isocyanates, as required by a number of offshore companies.
Not all color shades are available due to the requirement for paint conductivity.

✓ available as an option
□ included as standard

Attached is sample **Paint Test Report**

Paint report for Cx painting system

Control procedures before inhouse painting in accordance with …

Identification and visual inspection on 100% surface				
Control	**Yes**	**N/A**	**No**	**Comment**
Edges rounded				
No rust on surface				
No surface defect				
Welds are continual				
No porosity, pinholes				
No blistering				
No wrinkles, runs				
No wrinkles				
No brush hair				
No cracking				
All areas coated				
Right shade				
No flacking				
No contamination				
Date of inspection				

Control of surface cleanness – Arcotest 38mN/m				
Area	**Yes**	**N/A**	**No**	**Comment**
Frame				
Rib				
DE endshield				
Terminal box				
Terminal cover				
Sheet-metal cover				
Date of inspection				
Used instrument				
Expiration				

Dust presence – ISO 8502-3 Max. class 2				
Area	**Yes**	**N/A**	**No**	**Comment**
Frame				
Rib				
DE endshield				
Terminal box				
Terminal cover				
Sheet-metal cover				
Date of inspection				
Used instrument				

Paint inspection – thickness measuring Minimum 180μ; Maximum 460μ				
Area	**Min. [μ]**	**Avg. [μ]**	**Max. [μ]**	**Comment**
Frame 1				
Frame 2				
Frame 3				
DE endshield 1				
DE endshield 2				
DE endshield 3				
Terminal box 1				
Terminal box 2				
Terminal box 3				
Terminal cover 1				
Terminal cover 2				
Terminal cover 3				
Sheet-metal cover 1				
Sheet-metal cover 2				
Sheet-metal cover 3				
Date of inspection				
Used instrument				
Calibration valid				

Intermediate layer 1 - Preparation of painting in accordance with …

Intermediate coat name.:… Intermediate coat nr:…					
Batch number		Exp. Date		RAL	
Intermediate coat hardner name.:… Intermediate coat hardner nr:…					
Batch number		Exp. Date		RAL	

Control	Yes	N/A	No	Comment
The painting prepared in accordance with datasheet				
Date of preparation		Time of preparation		

Surface temperature – dT >3°C; Humidity max 85%								
Area	**Yes**		**N/A**		**No**		**Comment**	
Random spot								
Record values	Ts:		Ta:		Dew point:		Humidity:	
Date of inspection								
Used instrument								
Calibration valid								

Intermediate layer 1 - Aplication of painting in accordance with …

Start aplication Date		Start aplication Time		End aplication Date		End aplication Time	

Paint inspection – thickness measuring Minimum 260μ; Maximum 660μ				
Area	**Min. [μ]**	**Avg. [μ]**	**Max. [μ]**	**Comment**
Frame 1				
Frame 2				
Frame 3				
DE endshield 1				
DE endshield 2				
DE endshield 3				
Terminal box 1				
Terminal box 2				
Terminal box 3				
Terminal cover 1				
Terminal cover 2				
Terminal cover 3				
Sheet-metal cover 1				
Sheet-metal cover 2				
Sheet-metal cover 3				
Date of inspection				
Used instrument				
Calibration valid				

Visual inspection on 100% surface				
Control	**Yes**	**N/A**	**No**	**Comment**
No porosity, pinholes				
No blistering				
No wrinkles, runs				
No wrinkles				
No brush hair				
No cracking				
All areas coated				
Right shade				
No flacking				
No contamination				
Date of inspection				

Intermediate layer 2 - Preparation of painting in accordance with …

Intermediate coat name.:… Intermediate coat nr:…					
Batch number		Exp. Date		RAL	
Intermediate coat hardner name.:… Intermediate coat hardner nr:…					
Batch number		Exp. Date		RAL	

Control	Yes	N/A	No	Comment
The painting prepared in accordance with datasheet				
Date of preparation		Time of preparation		

Surface temperature – dT >3°C; Humidity max 85%								
Area	**Yes**		**N/A**		**No**		**Comment**	
Random spot								
Record values	Ts:		Ta:		Dew point:		Humidity:	
Date of inspection								
Used instrument								
Calibration valid								

Intermediate layer 2 - Aplication of painting in accordance with …

Start aplication Date		Start aplication Time		End aplication Date		End aplication Time	

Paint inspection – thickness measuring Minimum 340μ; Maximum 860μ				
Area	**Min. [μ]**	**Avg. [μ]**	**Max. [μ]**	**Comment**
Frame 1				
Frame 2				
Frame 3				
DE endshield 1				
DE endshield 2				
DE endshield 3				
Terminal box 1				
Terminal box 2				
Terminal box 3				
Terminal cover 1				
Terminal cover 2				
Terminal cover 3				
Sheet-metal cover 1				
Sheet-metal cover 2				

Sheet-metal cover 3				
Date of inspection				
Used instrument				
Calibration valid				

Visual inspection on 100% surface				
Control	**Yes**	**N/A**	**No**	**Comment**
No porosity, pinholes				
No blistering				
No wrinkles, runs				
No wrinkles				
No brush hair				
No cracking				
All areas coated				
Right shade				
No flacking				
No contamination				
Date of inspection				

Top coat - Preparation of painting in accordance with …

Top coat name : … Top coat number: …					
Batch number		Exp. Date		RAL	
Top coat hardner name : … Top coat hardner number: …					
Batch number		Exp. Date		RAL	

Control	Yes	N/A	No	Comment
The painting prepared in accordance with datasheet				
Date of preparation		Time of preparation		

Surface temperature – dT >3°C; Humidity max 85%								
Area	**Yes**		**N/A**		**No**		**Comment**	
Random spot								
Record values	Ts:		Ta:		Dew point:		Humidity:	
Date of inspection								
Used instrument								
Calibration valid								

Top coat - Aplication of painting in accordance with …

Start aplication Date		Start aplication Time		End aplication Date		End aplication Time	

Paint inspection – thickness measuring Minimum 400μ; Maximum 1010μ				
Area	**Min. [μ]**	**Avg. [μ]**	**Max. [μ]**	**Comment**
Frame 1				
Frame 2				
Frame 3				
DE endshield 1				
DE endshield 2				
DE endshield 3				
Terminal box 1				
Terminal box 2				
Terminal box 3				
Terminal cover 1				
Terminal cover 2				
Terminal cover 3				
Sheet-metal cover 1				
Sheet-metal cover 2				
Sheet-metal cover 3				
Date of inspection				
Used instrument				
Calibration valid				

Visual inspection on 100% surface				
Control	**Yes**	**N/A**	**No**	**Comment**
No porosity, pinholes				
No blistering				
No wrinkles, runs				
No wrinkles				
No brush hair				
No cracking				
All areas coated				
Right shade				
No flacking				
No contamination				
Date of inspection				