PAINTING PROCEDURE
for VALVES and ACTUATORS

Rev	Date	Description	Issued	Checked	Approved
1	02/10/2024	Revised after customer comments	A. Luise	L. Fornaro	L. Fornaro
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INDEX

1. SCOPE

This procedure describes the painting method, preparation of surfaces before application painting systems, and inspection related the protection of valves and actuators in carbon steel / aluminium.

2. REFERENCES DOCUMENTS

2.1 Applicable documents:

- Approved DWG
- Approved data sheet
- Approved QCP
- Norsok M501 rev.6 (only for preparation of the document)
- Painting procedure Rev.00

2.1.1 International codes and standards:

ASTM D 4285	Standards Test Method for indicating Oil or Water in compressed Air
ISO 8501-1 (2007)	Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Part. 1: Rust grades and preparation grades of uncoated steel substrate and of steel substrate after overall removal of previous coating.
ISO 8502-3 (2017)	Preparation of steel substrates before application of paints and related products. Test for the assessment of surface cleanliness. Part. 3: Assessment of dust on steel surface prepared for painting (pressure sensitive tape method)
ISO 8502-4 (2017)	Preparation of steel substrates before application of paints and related products. Test for the assessment of surface cleanliness. Part. 4: Guidance on the estimation of the probability of condensation prior to coating application.
ISO 8502-6 (2006)	Preparation of steel substrates before application of paints and related products. Test for the assessment of surface cleanliness. Part. 6: Extraction of soluble contaminants for analysis. The Bresle method
ISO 8503-3 (2012)	Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates
ISO 8502-9	Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness —
SSPC-PA 2 (2022)	Procedure for determining Conformance to Dry Coating Thickness Requirements

SSPC-SP1	Solvent Cleaning.
SSPC-SP3	Power Tool Cleaning.
SSPC-SP10	Near-White Metal Blast Cleaning

3. APPLICATION OF PAINTING MATERIALS

3.1 Coating Application

3.1.1 Surface cleaning

Solvents such as water, mineral spirits, xylol, toluol etc., are used to remove solvent-soluble foreign matter from the surface of ferrous metals. Rags and solvents must be replenished frequently to avoid spreading the contaminant rather than removing it. Low-pressure (1500 - 4000 psi) high volume (3 - 5 gal/min.) water washing with appropriate cleaning chemicals is a recognized "solvent cleaning" method. All surfaces shall be cleaned as per this specification prior to use hand tools or blast equipment.

Any surface to be coated will be dry and rendered dust-free prior to the application of the primer coat by using an industrial vacuum cleaner together with a stiff brush. Dust contamination level will be checked and will be maximum Class 2 as per the ISO 8502-3 standard.

Any surface to be coated will be visually checked to ensure the absence of rust or grease, dirt, water-soluble salts, corrosion products, oxides, and any other foreign matter.

The maximum acceptable soluble salts contamination on blast cleaned surfaces before application of the first layer will be 3 µg/ cm^2 as per ISO 8502-6 and ISO 8502-9 standard or by using the SCM 400 salt contamination meter.

In case of the presence of surface contamination, solvent and blast cleaning will be done again until surface will be clean.

3.1.2 Restriction

No coatings will be applied when:

the steel surface temperature is less than 3°C above dew point

the relative humidity of the ambient air is greater than 80'%

the ambient air temperature is below +5°C

the temperature of the steel surface to be painted is above +45°C

there is a likelihood of a detrimental weather change within two hours after application which would result in deposition of rain, condensation, etc. upon the surface.

Each coat in the painting system will be left to dry for minimum 24 hours before the following coat is applied.

4. COATING METHOD

4.1 General

All coating materials will be thoroughly mixed and stirred with a high shear-low rotating power mixer for a sufficient time to thoroughly remix the pigments and vehicles. Sufficient continuous agitation to maintain good mixing will be applied until the product is used.

4.1.1 Spray application

Paint application will be done using the spraying equipment.

Subcontractor to provide description of their spraying equipment that shall use for painting of the item and shall insert all of the working parameters (set-up) of this equipment.

Flexible hoses, spray pumps, guns and pots will be thoroughly cleaned before addition of new material.

Each coat will be applied uniformly and completely the entire surface. All runs and sags will be brushed out immediately, or the coating removed and the surface re-sprayed.

All surfaces contaminated by over-spray or dry-spray will be rubbed down and the surface re-sprayed.

Before spraying each coat of the paint system, all areas as corners, edges, welds, small brackets, bolts, nuts, etc., will be stripe-coated by brush to ensure that these areas have at least the minimum specified film thickness.

Large surfaces will be 'cross-coated' by receiving passes in two directions at right angles to each other. The gun will be not operated continuously but will be triggered before and after each pass to obtain the correct spray pattern and to avoid runs and sags.

Spray width adjustments on the gun and re-adjustment at atomizing pressure at the regulators will be made until the desired spray pattern is obtained within manufacturers recommendations.

5. INSPECTION AND TESTING

During the execution of coating works the following inspections and tests will be performed:

- Inspection during the material receipt

- Verification of calibration of the instruments
- Visual inspection of steel surface before cleaning
- Environmental conditions test
- Cleanliness test
- Roughness test
- Visual examination test
- Thickness test
- Adhesion test

5.1 INSPECTION DURING THE MATERIAL RECEIPT

On delivery of the coating materials, all documents that Painting Manufacturer will deliver together with the materials will be reviewed and their compliance will be verified with the requirements specified in relevant Purchase order.

Then the material packages and the material storage conditions will be Inspected for overall acceptability for use In the Project (expiry date, package damages. etc.).

Non-conforming material will be not used, it shall be marked as "REJECTED" and removed from the work site.

5.2 VERIFICATION OF CALIBRATION OF THE INSTRUMENTS

Verification of the calibration of the following instruments shall be carried out at the beginning of each working shift:

- digital "stylus" surface roughness measurement instrument.
- dry film thickness gauge.

The verification of calibration of the digital "stylus" surface roughness measurement instrument shall be performed by measuring the surface roughness on the calibration plate which is supplied together with the instrument. The instrument shall be considered acceptable for use when the displayed value is within the nominal R_a or R_{max} surface roughness value of the calibration plate ± 10%.

The verification of calibration of the coating thickness gauges shall be performed as follows:

- the clean plate made of steel shall be placed in horizontal position;

- the coating thickness measurement shall be performed on this steel plate and the displayed value must be 0.00 mm;
- in case any other value is displayed the instrument shall be calibrated manually until 0.00 mm value is obtain when the measurement is performed on the steel plate;
- then the calibration plate of the certified thickness shall be placed over the steel plate;
- the calibration plates a shall have the thickness of less than 250 µm for calibration of the thickness gauge;
- at least three measurements shall be taken on this calibration plate and if each displayed value is within the range specified by the instrument's Manufacturer or if this range is not specified the following acceptance criteria shall apply:
- displayed value = nominal value of the calibration plate ± 5%
- if the acceptance criteria are not met, the instrument shall be calibrated manually until the three consecutive measurements enter within the acceptable range.

Instruments not meeting the acceptance criteria will be not used for the works in the project until is verified that their accuracy has been brought back within the acceptable limits.

5.3 VISUAL INSPECTION OF THE STEEL SURFACE BEFORE CLEANING

Before the start of cleaning, the steel surface will be checked to identify steel imperfections or presence of oil, grease or fatty materials.

The following steel imperfections shall be considered, and If found, shall be rectified in accordance with Contractor: welding shots, drops and spatters, pores in welding seams, undercuts, blowholes, lamination defects, flame cuts, edges from flame, fragments and dents.

In case of steel imperfections, they will be removed before surface preparation with suitable power tools and edges from flame will be rounded to a minimum radius of 2 mm using grinding machine.

Cleaned surface will be checked for remaining pollutants by using a "Black Light" lamp. If that surface will be still dirty, cleaning with cloths soaked in the solvent will be repeated.

5.4 ENVIRONMENTAL CONDITIONS TEST

Environmental conditions such as ambient temperature, ambient relative humidity and consequently, the ambient dew point will be checked using digital instrument equipped with the relevant probe and capable to present the result of measurement on a display or using the appropriate equipment which will be able to provide data required for calculation of the ambient dew point (ISO 8502-4 standards) depending on their availability on the work site.

In case the digital instrument is use for this propose, it will be accompanied with a calibration certificate valid for the duration of relevant coating works in the project.

Relevant report shall be prepared which shall contain the following:

- Date
- Time
- Ambient temperature
- Ambient relative humidity
- Ambient dew point
- Steel temperature

5.5 CLEANLINESS TEST

5.5.1 Check of the cleanliness of the compressed air

To verify that the compressed air used for cleaning is free from oil and water, relevant testing will be performed in accordance with the ASTM D 4285 standard as follows.

The compressed air system will be switched on until it will reach the standard operating condition.

An absorbent paper or white cloth will be located within 600 mm of the air-discharge point, centered in the air stream. Air will discharge onto this absorbent paper or white cloth for a minimum of 1 min.

If the paper or cloth will show presence of oil and/or water, compressed air supply will not be used and shall be changed with one free of oil and water.

5.5.2 Check of the cleanliness of the blast cleaning abrasive

In order to verify that the blast cleaning abrasives are free of any contaminant that will prevent satisfactory surface preparation, the blast cleaning abrasives will be checked as follows.

Small quantity of the blast cleaning abrasives will be poured in a transparent glass or plastic container filled with clean water. Then, the container will be closed and shaken. Afterwards, it will be verified that the water within the container did not change color and that it does not contain foreign particles once the blast cleaning abrasives deposited at the bottom of the container.

Then, another small quantity of the blast cleaning abrasives will be put on the clean white paper. Another piece of clean white paper will be put on the top of the blast cleaning abrasives sample and rubbed against them. Afterwards, both pieces of the white paper will be examined that they do not contain any trace of any foreign material.

In case any contamination is found after performance of the above-mentioned tests, the package containing the contaminated blast cleaning abrasives wilt not be used in the Project.

5.6 SALT TEST

The salt contamination level will be checked after blast cleaning according to ISO 8502-6 and ISO 8502-9 standard.

The maximum salt contamination level will be 3 µg/cm2.

Test frequency and test locations shall be agreed between Subcontractor, Contractor and Company

In case the acceptance criterion has not been achieved, the entire surface of the item to be coated will be washed with fresh water and re-blasted.

The salt contamination measurement will be repeated after cleaning with compressed air. This process shall be repeated until the salt contamination level is within acceptable limits.

The salt contamination level measurement instrument will be accompanied with a calibration certificate valid for the duration of relevant coating works.

Test report will be prepared for this inspection activity and will contain the following:

- date
- blast cleaned surface;
- salt contamination level obtained for each measurement.
- acceptance criteria.

5.7 ROUGHNESS TEST

Surface roughness measurements after blast cleaning will be taken either by Testex-Tape (only when the steel surface temperature is less than + 50° C by the digital "stylus" surface roughness meter,

Two measurements will be taken per each 1 m2 of blast cleaned surface in accordance with the ISO 8503-5 standard.

In case any single measurement is not within the range between 50 µm and 80 µm the item will be locally re-blasted and the measurement repeated.

For this inspection activity a test report will be prepared containing the following:

- date;
- blast cleaned surface
- result of each measurement.

5.8 VISUAL EXAMINATION TEST

After the cleaning has been carried out, the surface quality will be determined, by visual inspection, in accordance with the ISO 8501-1 standard.

In case the acceptance criteria for surface cleanliness grade have not been met, the steel surface will be re-cleaning

5.9 THICKNESS TEST

Wet film thickness check will be carried out using the wet film thickness gauge and will be carried out for information only in order to know if there can be risk that the dry film thickness cannot meet the acceptance criteria.

The dry film thickness will be measured using a digital coating thickness gauge in according to SSPC-PA2.

SYSTEM 1: Carbon Steel – valves with operating temperature up to 120°C:

Minimum dry film thickness for the first coat shall be 75 µm, second coat shall be 75 µm and for the last coat 75 µm. Total minimum dry film thickness shall be 225 µm

SYSTEM 2: Carbon Steel – actuators with operating temperature up to 120°C:

Minimum dry film thickness for the first coat shall be 75 µm, second coat shall be 75 µm and for the last coat 75 µm. Total minimum dry film thickness shall be 225 µm

In case these criteria have not been met, the applied coating will be removed, surface re-cleaned and recoated according to the requirements described in this procedure.

6. REPAIR OF APPLIED COATING

All damages to previous coats will be repaired before application of any subsequent coats and before acceptance of delivery by the Contractor.

Before starting any repair activities, a visual inspection will be done to assure the absence of oil, grease and all contaminants according to his procedure necessary to not compromise adhesion between new coats and previous one. If all, grease or any other contaminant is present on the surface to repair, it shall be removed using a MEK or other suitable solvent available on work site in according to SSPC SP1.

In case of damages of primer, far small areas to repair (< 15 cm^2), the power tool cleaning will be carried out according to the SSPC SP 3 specification to obtain the steel surface cleanliness grade St 3 as per the ISO 8501-1 standard.

To ensure the integrity of the coating system, area close to damaged surface will be ground to minimum 30 mm width and repainted with new coat/s which will overlap the existing coat.

Before application of paint, surface will be visually inspected to assure it is dry and dust-free. If these requirements will be not met, the surface will be re-cleaned.

Before application of each coat, brush touch-up will be performed on all areas as corners, edges, welds, small brackets, bolts, nuts, etc.

For areas larger than 50 cm x 50 cm, airless spray application will be performed; for surfaces smaller than 50 cm x 50 cm, brush or roller will be used.

All steps of the repair and touch-up process will be inspected and tasted according to requirements of Section 7 of this procedure.

7. UNPAINTED SURFACES

The following surfaces shall not be blast-cleaned and painted:

- Raised and mating faces of flanges and all machined contact areas;
- Valve stems, S.S. drain and vent plugs;
- Nameplates, instrument panels.

All these surfaces shall be properly protected with tape, rubber, plastic caps etc. before blast-cleaning and painting.

8. CERTIFICATION

All tests result for each item will be reported in the relevant “COATING CERTIFICATE”

Uboldi s.r.l.	COMPANY WITH QUALITY SYSTEM CERTIFIED BY LLOYD'S R.Q.A. ISO 9001:2015 -14001:2015	**DAILY INSPECTION REPORT**	N.23-1135

CLIENTE *Customer*	**VSI CONTROLS s.r.l.**
JOB: 800033	
RIFERIMENTO *References*	PROCEDURE PROQA_009_06 SYS A

ITEM	Q.TÀ *Q.ty*	DESCRIZIONE *Description*	Matricola
001	8	VALVOLA GLS LINEAR DN 2" 600 RF STD	800033-001-01 ÷ 800033-001-08

PREPARAZIONE DELLA SUPERFICIE – *Surface preparation*

CONTROLLO VISIVO / Visual Examination: ISO 8501-3 satisfactory
BLOTTER TEST ASTM D 4285: no oil or water in compressed air: Satisfac.
PULIZIA / Cleaning - agent bio-degradable SSPC SP1
SURFACE PREPARATION: Blasting – SSPC SP10
De-Dusting rate 1-2 ISO 8502-3: 1 Satisfactory
Grit Type : Garnet

CONDIZIONI AMBIENTALI – *Environmental conditions*

Start date 17.07.2023				Finish date 17.07.2023			
Amb. Temp °C	Rel Humidity %	Dew Point °C	Steel Temp °C	Amb. Temp °C	Rel Humidity %	Dew Point °C	Steel Temp °C
30,6	56,5	20,8		31,9	54,9	21,6	32,3

DIGITAL HYGROMETER AND THERMOMETER: TQC mod DEWCHECK 4 SN 72059356 exp July 2023

CONTROLLO DELLA PREPARAZIONE – *Inspections of surface preparation*

TIPO DELL'ESAME *Test Type*	METODO *Method*	ACCETTABILITÀ *Acceptance criteria*	DATA ESAME *Date of Test*	RISULTATO DEL CONTROLLO *Test Results Obtained*	GIUDIZIO *Test Results*
PROVA SALINA *Salt Test*	ISO 8502-6 ISO 8502-9	Max conductivity corresponding to 30mg/m² NaCl	17.07	mg/m² NaCl	Accepted
RUGOSITÀ *Roughness*	ISO 8503-5	50÷75µm Rz		60-62 µm Rz	Accepted

For salt test: SODIUM CHLORIDE BRESLE TEST : TQC Conductivity mod … 978650 expire date Jan 2024
Roughness Test Equipment: Elcometer 124 s.n. SP-001 exp Oct 2023

CONDIZIONI E DATI DI … *Painting and data conditions*

Painting: Method airless spray - Stripe Coat & touch-up by …

POS *Step*	APPLICATION DATE	PRODUCT USED	Amb. °C	…	Point °C	Steel Temp °C	W.F.T.* µm	D.F.T. µm Required	D.F.T. µm ** *Measured*	Test date
1ST	17.07.23	HEMPADUR MASTIC 45880	…	54,2	21,6	32,3	100	60	Avg 79	19.07.23
2ND	19.07.23	HEMPADUR MA… 880 RAL …	…	56,6	23,5	33,4	100	60	Avg 157	20.07.23

Not FABBRICANTE/*Manufacture* …

(*) WET FILM GAUGE - SPESSIMETRO A UMIDO
(**) DFT GAUGE – SPESSIMETRO

…O DELLA VERNICIATURA – *Inspections on Dry Film*

TIPO DELL'ESAME *Test Type*	METODO *Method*	…TTABILITÀ *…ceptance criteria*	DATA ESAME *Date of Test*	RISULTATO DEL CONTROLLO *Test Results Obtained*	GIUDIZIO *Test Results*
CONTROLLO VISIVO *Visual Examination*	DIRETTO *Direct*	No run, blister etc. Final color RAL 7040	20.07.2023	Satisfactory	Accepted
SPESSORE FINALE *Dry Film Thickness*	SSPC-PA2	120 µm	20.07.2023	Avg 157	Accepted

Thickness meter: Fischer mod Dualscope MP0R Serial N. 100164542 exp Nov. 2023

UBOLDI s.r.l. Q.C.	INSPECTOR	INSPECTOR
Jonathan Conti FROSIO Coating Inspector Level 1 – Cert. No.12131		
Data / Date: 20.07.2023		

Warranty 12 months from the date certificate. - Remarks :All mechanical damages due to transport and assembling and in particular for damages due to disassembling or tightening of nuts and bolts are excluded from the guarantee.
This document is the property of UBOLDI s.r.l. who will safeguard its rights according to the civil and penal provisions of the law.

9. PAINT LIST AND VALVE LIST:

PAINTING SYSTEMS FOR VALVES:

SYSTEM 1: Carbon Steel valves with operating temperature up to 120°C:

Surface preparation	CLEANLINESS SSPC-SP10 - ISO 8501-1 Sa 2.5 ROUGHNESS: ISO 8503 GRADE MEDIUM G (Rz 50-80 µm)	
COAT No.	**PRODUCT**	**MDFT µm**
First coat	HEMPADUR FAST DRY 15560	75
Second coat	HEMPADUR 15570	75
Final coat	HEMPATHANE HS 55610	75
	TOTAL MINIMUM DRY FILM THICKNESS (µ)	225
FINAL COLOR RAL 7038		

PAINTING SYSTEMS FOR ACTUATOR:

SYSTEM 2: Carbon Steel manual gearbox with operating temperature up to 120°C:

Surface preparation	CLEANLINESS SSPC-SP10 - ISO 8501-1 Sa 2.5 ROUGHNESS: ISO 8503 GRADE MEDIUM G (Rz 50-80 µm)	
COAT No.	**PRODUCT**	**MDFT µm**
First coat	HEMPADUR FAST DRY 15560	75
Second coat	HEMPADUR 15570	75
Final coat	HEMPATHANE HS 55610	75
	TOTAL MINIMUM DRY FILM THICKNESS (µ)	225
FINAL COLOR RAL 5015		

NOTES: N/A

VALVE LIST

ITEM	Q. TY	TAG	VALVE TYPE	SIZE	VALVE PAINT SYSTEM	ACTUATOR PAINT SYSTEM
001-01	1	LCV-RU0001A-01	G-STREAM	DN 1“CLASS 300 RF	1	2
001-02	1	LCV-RU0001B-01	G-STREAM	DN 1“CLASS 300 RF	1	2

PRODUCT DATA SHEETS