

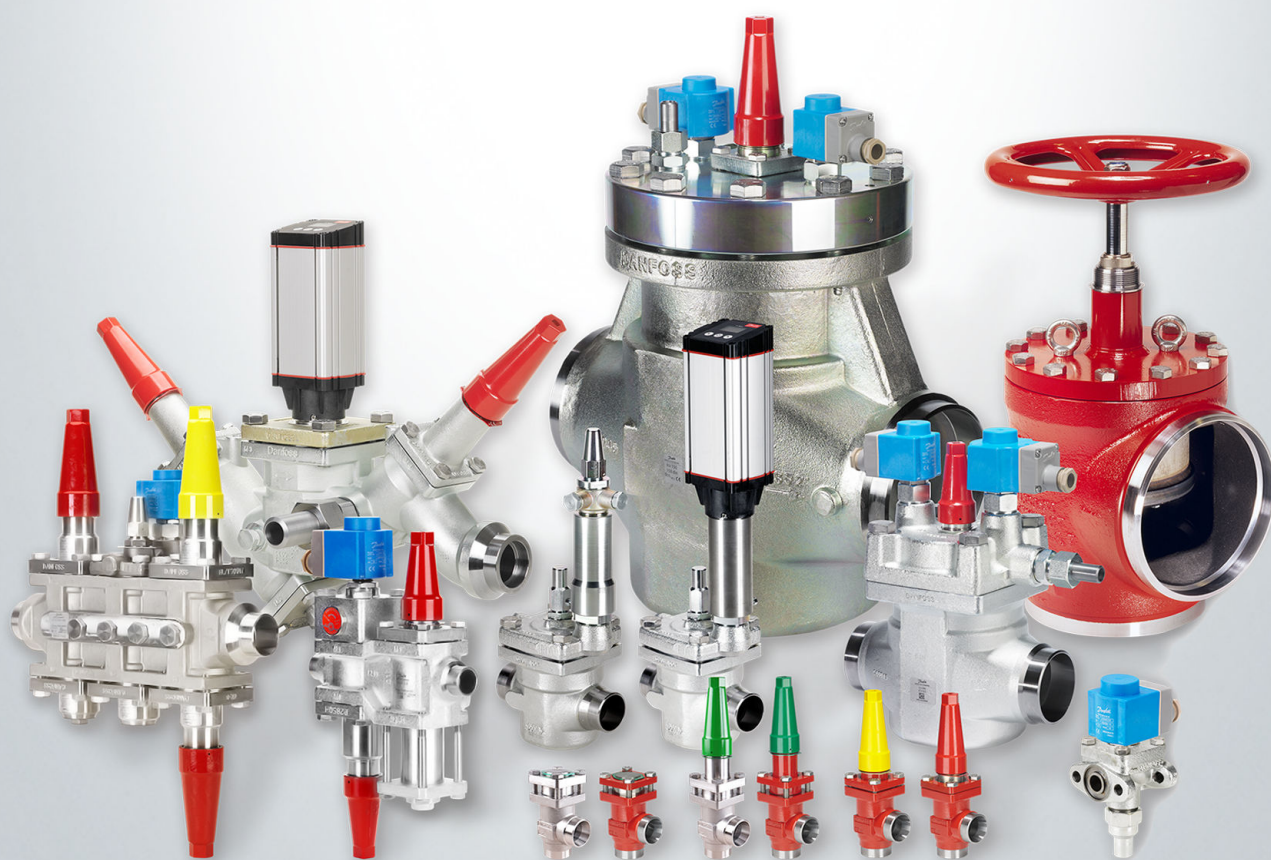
ENGINEERING  
TOMORROW

*Danfoss*

## User Guide

# Surface treatment Type **IRF Valves**

A general guideline about proper corrosion protection of Danfoss industrial refrigeration valves



## Introduction

Danfoss components are designed to give a high level of performance over an extended operating life. One of the key elements to assure long lasting performance is to have pipeline and installed components protected against different environmental conditions. If not treated properly, the corrosion and its damaging effect might lead to serious consequences for the system operation and safety. This document gives general guidelines how to protect Danfoss components made of carbon steel against corrosion.

## Product specification

### Corrosion

Corrosion is natural process which by chemical or electrochemical reaction changes the refined metal in more stable oxides. Rust is a common example of electrochemical corrosion which results in iron oxides. It is gradual process which leads to deterioration of material properties and structures. Corrosion increases the risk of damage and external leakage at pressure bearing parts. It might also impact performance of the components and shorten the expected lifetime.

Factors such as high humidity, temperature, air pollution in e.g. chemical production areas and coastal areas can accelerate rust formation and its damage to system components.

### Surface treatment of Danfoss components

The type of surface treatment is stated in the installation guides of most of Danfoss components. Mainly Danfoss Industrial Refrigeration valves (body and top/bonnet) are externally zinc chromated, coated with TLP<sup>(1)</sup> method or painted with a primer<sup>(2)</sup>. The zinc coating and primer secures that during shipment, storage time and installation the valves are well protected against rust. Parts which cannot have any surface treatment (e.g. welding connectors or inner parts) are protected for shipment and storage time with oil.

Special attention must be paid to the welding areas which needs surface protection after welding. Here no coating from factory is applied or it is damaged whilst welding.

There are also components which are delivered already painted such as some protective caps and handwheels, so they are protected for long standing operation.

**Figure 1: REG valve with body coated with primer and painted cap**



**Figure 2: ICS1 valve with zinc coated body and top cover**



To secure long standing protection against corrosion for zinc and primer coated elements, also welding areas, flanges and fittings, an appropriate surface treatment must be applied. The surface treatment should be sufficient to resist ambient impacts (especially in coastal and/or chemical production areas).

<sup>1</sup> Thick Layer Passivation (TLP) is electrochemical method. The coated parts are immersed in electrolyte (conductive fluid) and negative charge (cathode) is applied to the parts. Positively charged (anode) zinc rods are also immersed in the bath. The electrical current carries the zinc ions to the negatively charged steel parts. Since zinc is less noble than steel it works as an anode, and it provides electrons to the coated steel if corrosion starts to form.

Please note that ammonia at certain conditions can react with zinc coating, damaging TLP coating.

<sup>2</sup> Thixotropic water borne primers are used by Danfoss for parts which have a primer as surface protection

**⚠ WARNING:**

We strongly recommend aligning with local painter or surface treatment specialists on how to best protect the components considering used refrigerant, the ambient impacts and the surface treatment mentioned above. The guideline below is based on common practice, without covering all applications.

**Surface preparation/cleaning**

Valve housings, bonnets, covers, joints, etc. need to be properly cleaned from contaminants and water. Any traces of oil and grease must be removed from the surface of the components. If needed neutral solvents can be applied. Drying can be done with hot air to complete dryness.

Afterwards, the surface must be clean and dry, suitable for being painted.

**Surfaces coated with zinc (TLP):**

**To increase adhesion of paint, zinc coated surfaces should be prepared in one of the following methods:**

- Use of T-wash. This acid-mordant solution gives a blackening effect on zinc coated surfaces indicating the treatment has been effective. Once T-washed surface has dried, it should be painted with a proper primer within 1-2 days so that the contamination might not occur. The primer can either be etch primer or filler primer
- Use of etch primer. Etch primers are based on resins which improve adhesion to metal. A low concentration of phosphoric acid helps to etch the metal surface and increase adhesion. Please follow the manufacturer's recommendations for additional layer of filler primer to separate etch primer from the paint. The etch primer might not always be compatible with the paint

**Surfaces coated with primer**

Parts coated with a primer should be checked if there are no traces of corrosion and defects on the surface of the coating. If defects or rust are discovered, these elements should be cleaned and again painted with additional layer of primer.

Before painting, the elements should be thoroughly cleaned. Any traces of grease, oil or material residues must be removed to secure proper adherence of next layer of paint.

**Masking prior to painting**

If the preparation/cleaning and painting will take place before valve is mounted in the system and its pipelines, all threads, openings and welding ends/connections of the valve must be blocked by plastic plugs/plastic covers /tape.

This is to avoid damage or contamination caused by paint to inner elements of the components. All components which shouldn't be painted such as armature tubes, sight glasses, name plates, plastic elements, etc. should be masked with covers/tape.

**Painting**

All components before painting should be firstly coated with at least one layer of primer. If the part is going to work outdoors or in heavy environmental conditions, an additional layer of primer might be considered to delay metal oxidation.

**The following recommendations should be considered before painting:**

- The primer and top paint must be uniformly distributed on the painted surfaces
- The primer and the topcoat paint should be compatible with each other
- Follow the paint and primer manufacturer instructions for painting conditions and drying/cure times for each layer of coating
- All used paints and methods must be compatible with and cover the temperature range of the components. At least cover the temperature range of the application

**NOTICE:**

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