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DUALSHIELD C5H

Installation Guideline

Installation Guideline DUALSHIELD C5H Coating

Revision 1.0

September 2025

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09/2025

1. Preliminary Notes

This installation guideline DUALSHIELD Coating C5H describes the additional requirements for the correct storage, handling and installation of coated Sikla products. Regardless of this, the general installation instructions must be kept in mind.

These are available as a PDF document via the following link:

Installation Technique

For a quick visual overview, we recommend our DUALSHIELD “How To” video:

How-To-Video

2. Corrosion Protection DUALSHIELD C5H

There are various options for protecting steel against corrosion, which are described in DIN EN ISO 12944-1[1]. Corrosion category C5 according to DIN EN ISO 12944-2[2] describes a heavy corrosion protection.
The protection period of corrosion categories C1 to C5 is divided into four different time periods.
The DUALSHIELD Duplex Coating offered by Sikla offers an expected corrosion protection of 15 to 25 years in corrosion category C5 and is therefore categorised as C5H.

In this document, a distinction is made between four periods of protection:

-- low (L)	up to 7 years;
-- medium (M)	7 years to 15 years;
-- high (H)	15 years to 25 years;
-- very high (VH)	over 25 years.

The protection period is not a "warranty period". Protection period is a technical term/planning parameter that can help the owner to define a maintenance programme. The warranty period is a legal term that is subject to contractual terms and conditions. The warranty period is generally shorter than the protection period. There are no rules that combine the two periods.

Extract from DIN EN ISO 12944-1

Extract from DIN EN ISO 12944-1:
Coating systems that meet the requirements of the cyclic ageing test with 1,680 hours fulfil the C5H category.

1 DIN EN ISO 12944-1:2019-01: Paints and varnishes - Corrosion protection of steel structures by coating systems - Part 1: General introduction
2 DIN EN ISO 12944-2:2018-04: Paints and varnishes - Corrosion protection of steel structures by coating systems - Part 2: Classification of environmental conditions

2.1. Test Methods

		Programme 1		Programme 2
Corrosion Category according to ISO 12944-2	Protection Duration according to ISO 12944-1	ISO 6270-1 (condensation of water)	ISO 9227 (neutral salt spray)	Annex B (cyclic ageing test)
C2	Low	48	–	–
	Medium	48	–	–
	High	120	–	–
	Very High	240	480	–
C3	Low	48	120	–
	Medium	120	240	–
	High	240	480	–
	Very High	480	720	–
C4	Low	120	240	–
	Medium	240	480	–
	High	480	720	–
	Very High	720	1440	1680
C5	Low	240	480	–
	Medium	480	720	–
	High	720	1440	1680
	Very High	–	–	2688

Table from DIN EN ISO 12944-6[3] – Test methods for coating systems for unalloyed steel, hot-dip galvanised steel or steel with a thermally sprayed metal coating for atmospheric corrosion categories

2.2. Corrosion Categories for Environmental Conditions

DIN EN ISO 12944-2 can be used to determine the optimum corrosion protection for components made of steel and hot-dip galvanised steel. Part 2 of the series enables a more precise assessment of the atmospheric load at the place of use and shows which surface treatments can influence corrosion protection.

In addition to the atmosphere, the microclimatic conditions directly at the place of use of the components must also be considered.

3 DIN EN ISO 12944-6:2018-06: Paints and varnishes - Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods

Corrosion Category	Area-Related Mass Loss / Thickness Reduction (after the first year of ageing)				Examples of Typical Environments (Informative Only)	
	Unalloyed Steel		Zinc		Outdoor	Indoor
	Mass Loss g/m²	Thickness Reduction µm	Mass Loss g/m²	Thickness Reduction µm		
C1 Very Low	≤ 10	≤ 1.3	≤ 0.7	≤ 0.1	–	Heated buildings with a neutral atmosphere, e.g. offices, salesrooms, schools, hotels
C2 Low	> 10 to 200	> 1.3 to 25	> 0.7 to 5	> 0.1 to 0.7	Atmosphere with a low level of contamination: mostly rural areas	Unheated buildings where condensation can occur, e.g. warehouses, sports halls
C3 Medium	> 200 to 400	> 25 to 50	> 5 to 15	> 0.7 to 2.1	Unheated buildings where condensation can occur, e.g. warehouses, sports halls	Production rooms with high humidity and a certain level of air pollution, e.g. food processing plants, laundries, breweries, dairies
C4 High	> 400 to 650	> 50 to 80	> 15 to 30	> 2.1 to 4.2	Industrial atmosphere and coastal atmosphere with moderate salt pollution	Chemical plants, swimming pools, shipyards near the coast and boat harbours
C5 Very High	> 650 to 1500	> 80 to 200	> 30 to 60	> 4.2 to 8.4	Industrial areas with high humidity and aggressive atmosphere and coastal atmosphere with high salt load	Industrial areas with high humidity and aggressive atmosphere and coastal atmosphere with high salt load
CX Extreme	> 1500 to 5500	> 200 to 700	> 60 to 180	> 8.4 to 25	Offshore areas with a high salt load and industrial areas with extreme humidity and aggressive atmospheres as well as subtropical and tropical atmospheres	Industrial areas with extreme humidity and aggressive atmospheres
NOTE The loss values for the corrosion categories are identical to the values in ISO 9223.						

Table from DIN EN ISO 12944-2 – Corrosion categories for atmospheric conditions and examples of typical environments

3. Areas of Application

The corrosion-resistant DUPLEX coating is used in various demanding environments to protect steel components from corrosion.

Typical areas of application are:

- **Chemical industry:**
  In plants that are exposed to aggressive chemicals.
- **Seawater environments:**
  Applications close to seas, e.g. industry near the coast, offshore platforms and ship.
- **Infrastructure projects:**
  Bridges, tunnels and structures exposed to road salt and other corrosive influences.
- **Industrial areas:**
  In areas with high levels of air pollution or chemical exposure, such as industrial parks.

The DUALSHIELD coating combines the advantages of zinc and organic coatings to provide a particularly durable protection.

4. DUALSHIELD Coating Structure

The Sikla DUALSHIELD coating is a duplex coating. It is a special corrosion protection process that consists of a total of three layers:

1. Hot-dip galvanising in accordance with DIN EN ISO 1461, 55 µm
2. Epoxy resin primer and intermediate powder, baked at approx. 180°C, 160 µm 180°C, 160 µm
3. Polyester top coat, baked at approx. 180°C, 80 µm

Depending on the material thickness, the total NDFT[4] layer thickness is between 295 µm and 325 µm.

The hot-dip galvanising already achieves corrosion category C4 in accordance with DIN EN ISO 12944-2. With the two additional layers, the components achieve corrosion category C5H in accordance with DIN EN ISO 12944-6.

The powder coatings are made of an organic material.
The continuous operating temperature of pipe-enclosing is 75 and, for short periods (max. 2 hours), 120°C. This may cause colour changes.

4 NDFT = Nominal Dry Film Thickness | Intended, theoretical layer thickness of a coating that must be achieved in order to ensure the required protection period.

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5. Delivery Time and Return of Goods

Sikla DUALSHIELD products are produced and delivered on a project basis. The delivery time is approximately 45 working days from receipt of order at Sikla. In exceptional cases, small quantities of various coated products may be available from stock.

As DUALSHIELD coated goods are customised products manufactured to order, they cannot be returned. Sikla reserves the right to charge a minimum quantity surcharge for orders of very small quantities.

6. Single-Type Delivery

DUALSHIELD coated goods are only ever delivered "complete" and "unmixed". These are packed separately on a Euro pallet or other transport unit.

Smaller quantities of a single product will be delivered with other products on the same pallet. It must always be ensured that the different products can be clearly distinguished from each other on the construction site, e.g. by using additional cardboard/packaging.

7. Coated and Uncoated Parts and Components

Generally, all steel parts are coated following the structure outlined in chapter 4.

However, not all components and products can be coated and may need to be treated with correction paint or spray after assembly in order to achieve the corrosion protection of category C5H.

7.1. Non-Coated Components

7.1.1. End Cap ADK

The cover caps are made of plastic and do not require coating or post-treatment.

7.1.2. Self Forming Screws FLS

The Formlock screws are supplied in HCP quality. A coating could block the thread and affect the function of the screw. After assembly, the heads of the screws must be treated with the correction lacquer or correction spray to achieve corrosion category C5H for the entire construction.

Correctly coated FLS

7.1.3. U-Holder SB F

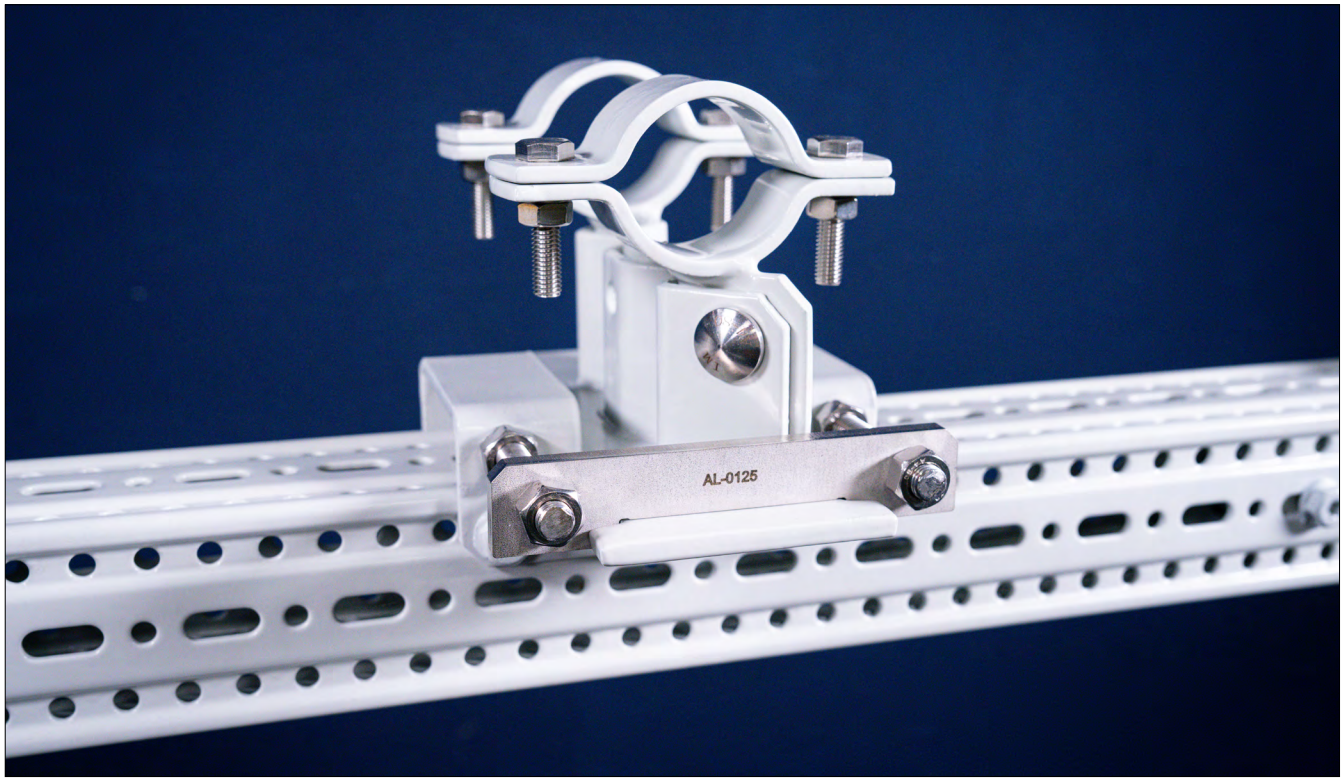
The U-Holder SB F are supplied in HCP quality. After assembly, the U-Holder must be treated with the correction lacquer or correction spray to achieve corrosion category C5H for the entire construction.

7.2. Stainless Steel Components and Parts

The following components and parts cannot be coated for installation reasons or due to the resulting loss of function and are therefore made of stainless steel A4 (1.4401):

- Screws
- Threaded Rods
- Washers
- Nuts
- Fixed Point Clamps of the Fixed Point Brackets and Fixed Point Sets
- Assembly Sets, completed

These components do not require post-treatment after installation.



Pipe Shoe with VA components

8. Packaging & Transport

The coated parts are packaged for transport in a way that prevents damage under normal conditions.

8.1. Pipe shoes

The pipe shoes are supplied as follows:

- Upper clamp straps are turned down and placed in the lower half.
- Protective inserts are placed between the straps to prevent scratching.
- The clamp straps are connected to each other with cable ties.
- The clamp screws with washers and nuts as well as the screws for the height adjustment are located in a polybag, which is tied to the tube bearing with another cable tie.
- The upper part of the tube bearing is fixed in the lowest possible position with cable ties.

Pipe Shoe as delivered

Additional information: Tightening torques for screw connections

Clamping screw	Tightening torque [Nm]	Height adjustment	Tightening torque [Nm]
DN 15 - 40	40	Screws in the bar	80
DN 50 - 200	50	Screws in the bar	80
DN 250 - 600	60	Screws in the bar	80

8.2. Support Material

All support material is supplied as follows:

- Single-type, i.e. all identical components are supplied together. There may be several different items on one transport unit (Euro pallet, disposable pallet, special pallet). It is ensured that the different items are easy to separate.
- Brackets are not cut to length, they are always dispatched in their original length with a cover cap.

Euro pallet sorted with Cantilever Bracket AK F

8.3. Profiles

The profiles are supplied in 6 metre beam sections.

- Protective inserts are packed between the profiles and individual layers during transport.
- Transport straps stretched around the profiles and pallets, create bundles.

siFramo carrier profiles packed in bundles

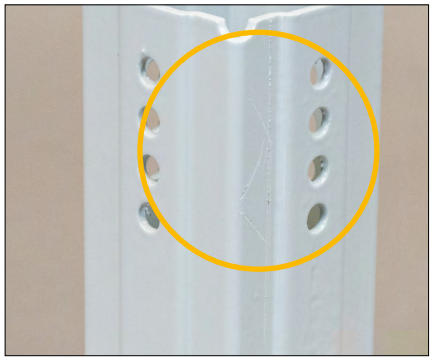
9. Incoming Goods Inspection, Checking for Transport Damage

Despite careful packaging, transport damage cannot be ruled out.

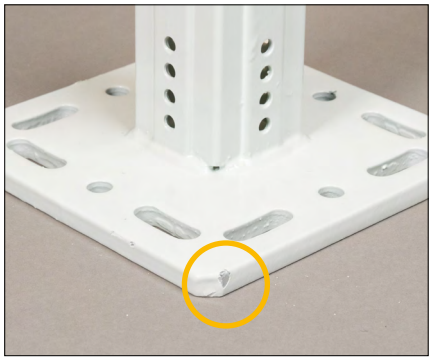
On delivery of the goods, they must be checked immediately for any defects or faults; if defects are found, these must be reported immediately.
The written claim of defects must include:

- Delivery note number
- Name and number of components affected
- Description of the damage with photos

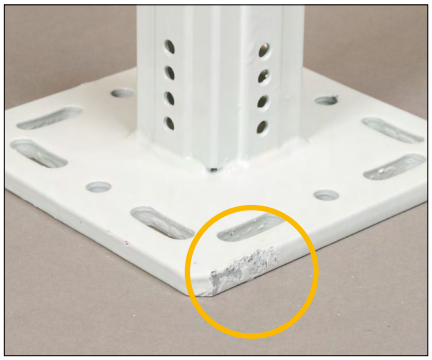
Transport damage does not necessarily lead to rejects. Depending on the type of damage, it is possible to use the goods and to touch up with a suitable correction paint or spray after assembly to regain full corrosion protection. The after-treatment should be agreed with Sikla.



Scratches = visual defect, reworking not necessary



Rework the damaged area (Less than 2cm in diameter)



Defect: Replace product (Larger than 2 cm in diameter)

The DUALSHIELD C5H products are attached to hooks during all three coating steps. The suspension points are recoated before delivery and do not impair the corrosion protection. They are not a production defect and are not grounds for complaint.

Powder coating with a spray gun

Suspension point after coating

Suspension point reworked before delivery

10. Storage

It is necessary to store coated goods in a dry location and shield them from environmental influences.

If not stored properly, transport cartons can soften or condensation can form in the polybags. This may make labels and installation notes unreadable.

The individual supports consist of profile cuts, cut-to-length brackets and connecting elements, which must be pre-assembled before being installed on site.
These works should be carried out in a controlled environment.

The top coat is highly resistant to weather, impact and scratching. Nevertheless, we recommend handling the goods with care.

On site warehouse

11. Cutting on Site

DUALSHIELD coated profiles and brackets can also be cut to length on site.

It is strongly recommended that the local conditions are checked before cutting, to minimise the need for reworking.

11.1. Cutting to Size

Suitable machines must be used for cutting the brackets and profiles to size. These are:

- Bandsaw
- Circular saw

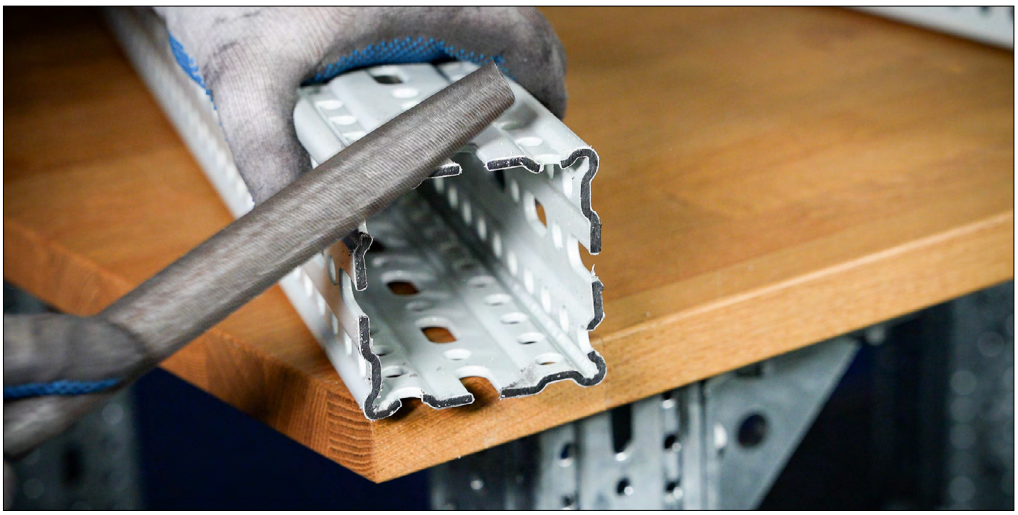
In both cases, no lubricants may be used. Cutting must be carried out using a dry-cutting process. This must be taken into account when selecting saw blades.

Bandsaw

TIP:
Unnecessary cutting of brackets should be avoided. The actual site conditions should be checked again before cutting. If there is no risk of collision, brackets should be used in the length supplied.

11.2. Treatment of Cut Edges

After cutting the profiles and brackets to size, the outer and inner edges must be deburred to minimise the risk of injury. A commercially available hand file can be used for this.
Caution: Do not degrease!



Treating cut edges with a hand file

12. Renewal of Corrosion Protection

To achieve complete corrosion protection with the DUALSHIELD coating, the application needs to be carried out in up to 2 steps.

12.1. Treatment of Cut Edges Before Assembly

Profiles and brackets must be cut to length according to the drawing using a suitable saw. As per chapter 11, the cut edges must be deburred to minimise the risk of injury. The corrosion protection must be reapplied on the cut surfaces before pre-assembly and installation on site. No additional application of zinc spray is required. Three coats of corrosion protection should be applied one after the other to ensure reliable protection.

12.2. Threads and Screw Heads of the FLS

To compensate for tolerances, brackets and other attached components must be adjusted on site to match actual conditions. Self Forming Screws FLS can be used to create multiple new threads and studs in profiles to achieve the required final position of the components. Any unused threads must be reworked.

The screw heads of the Self Forming Screws FLS must be post-treated in the final state of the installation to achieve corrosion protection of the overall construction.

12.3. Damaged Areas

Although the top layer of the Sikla DUALSHIELD coating consists of an abrasion-resistant polyester paint, minor damage cannot be ruled out during handling. However, generally these are purely visual defects that have no influence on the corrosion resistance. These can be retreated, as can any damage caused by transport and/or storage.

13. Methods for Renewing the Corrosion Protection

There are 2 methods available for renewing the corrosion protection:

13.1. Touch-Up Spray

The simplest and quickest method of restoring the corrosion protection is to use the 2K touch-up spray:

Apply three even spray bursts without waiting in between. Then allow at least 20 minutes for the surface to become dust-dry. Use the spray can within 20 hours after initial application.

When applying the spray, the instructions in the technical data sheet must be observed. This and the safety data sheet are linked at the end of this document.

The 2K touch-up spray can be ordered from Sikla with the following article number:

Item	Designation	Item Number
Touch-Up Lacquer ABL Spray 2K RAL 7035	ABL SPRAY 2K RAL 7035	807450

The 2K Touch-Up Spray is a dangerous good and is therefore not authorised for transport by sea in containers. If the corrosion protection needs to be touched up, this can be done using a suitable spray product available on the local market near the project site. The third-party product must fulfil the following technical requirements in order to achieve an equivalent result:

- Solvent-based 2K PUR Topcoat
- Colour: RAL 7035, satin gloss
- Good water resistance
- Good weather resistance
- High mechanical and chemical resistance

2K touch-up spray

13.2. Touch-Up Lacquer

The corrosion protection can also be renewed using the manufacturer Feycolor's 2K system. The system consists of a one-coat lacquer and hardener and can be ordered from Sikla:

Item	Designation	Item Number
Touch-Up Lacquer + Hardener ABL H (Set)	ABL H	111206
PU One-Coat Lacquer Feycopur RAL 7035 1kg (626 - 2K)	LAK PU One-Coat Feycopur RAL 7035 1kg	K114437
Hardener HAR FEYCOPUR 0,1 KG (114-11-9)	HAR FEYCOPUR 0,1 KG (114-11-9)	K114438

The manufacturer's processing instructions must be observed during application; the relevant documents are linked at the end of the document.

2K touch-up lacquer & hardener

14. Additional Training for Fitters

If DUALSHIELD is used for a project, additional measures must be taken into account before, during and after installation.

In addition to the general installation training, the fitters who pre-assemble and finalise DUALSHIELD-coated goods must receive additional instruction in the handling and treatment of coated goods. This ensures that the highly corrosion-resistant coated products are handled and installed in accordance with regulations. This is the only way to ensure that they fulfil the expected corrosion protection for the specified protection period.

This additional training takes place after the installation training and takes an additional 30 minutes.

15. Quality Control After Installation

Once the supports have been installed on site with all pipe supports and final adjustments, the correct installation and the renewal of the corrosion protection must be checked by a person to be appointed by the investor/builder.

Sikla recommends using a checklist for this purpose, which can also be used for quality control.The template can be downloaded from the following link and can be viewed on the next page:

C5H Installation Checklist

16. Appendices

Safety Data Sheet	Technical Data Sheet	Safety Data Sheet	Certificate
2K PUR Spray	SprayMax-2K-PUR Spray	2K Touch-up Lacquer	DUALSHIELD C5H

C5H Installation Checklist

This confirms the proper installation of the supports, as well as the pipe supports and connection kits associated with the following pipelines/isometrics. The special requirements of the 'DUALSHIELD Installation Guideline' have been taken into account. These must be observed in addition to the generally applicable installation guidelines.

Project/Project name: _____ Date:

Investor: _____

Installation company: _____

Pipeworks: [List of tested pipework / isometrics / areas]

Name of the fitters:

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

The installation was checked by:

Corrosion protection used: ☐ Touch-up spray ☐ 2K lacquer

☐	Cut edges were re-treated (deburred and coated)
☐	Formed threads that were not required have been reworked
☐	The heads of the FLS screws have been reworked
☐	Non-stainless steel components have been reworked after assembly
☐	Damaged corrosion protection (transport/storage/assembly) has been repaired

Comments, special occurrences:

Signature of Foreman/Installation Supervisor: _____

Art-Nr. 807490