WÜRTH

Wurth Industry of Canada Ltd.

DE | **EN**

W.TEC®
SURFACE PROTECTION

Optimum corrosion protection for your C-Parts

CHROMIUM(VI)-FREE
REACH COMPLIANT

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Dear Wurth Industry of Canada Customer,

The wide range of C-Parts adapted to the target groups and a unique logistic supply concept make Wurth Industry of Canada be your competent industrial partner for C-Parts.

The product range of Wurth Industry of Canada is focused on the industrial requirements for production needs, small parts and assembly material for the production of machines and plants as well as maintenance equipment.
Our ambition: the right article, at the right time, in the right quantity, in the right quality, at the right place, at the right price.

To offer you the right article in the right quality, Wurth Industry of Canada consequently analyses the current needs and the future technical requirements of all customers.

Due to technical innovations and modifications in environmental legislation, industry guidelines and customer standards, the requirements for corrosion protection of fasteners have significantly changed. This is the reason for further expanding our standard product range of surface coatings.

This brochure informs you about new environmental specifications for surface coatings and presents our high quality Würth Surface Systems.

We are looking forward to a cooperative partnership and thank you for your trust.

Dennis Birresborn
Head of the Technical Department
Würth Industrie Service GmbH & Co. KG

Extension of the REACH Regulation

The REACH Regulation convers the Registration, Evaluation, Authorisation and Restriction of Chemicals within the EU. In 2013 the European Chemicals Agency decided to include chromium(VI) in the REACH Regulation (REACH Regulation Annex XIV) as carcinogenic and mutagenic. As a result of this decision, it is expected that compounds containing chromium(VI) will be completely forbidden within the EU after entering into force on September 21st, 2017.

Effects of the ban of chromium(VI)

- Greatly reduced availability of surface coatings containing chromium(VI)
  → Security of supply no longer ensured
- Rising prices for surface systems containing chromium(VI) due to worse bundlings
  → Economic inefficiency of surfaces containing chromium(VI)
- Changeover to alternative surfaces
  → Changeover efforts for users, distributors and coating companies

Chances arising by the ban of chromium(VI)

- Exploitation of the standardisation potential in the field of surface coatings used
- Technical optimisation of bolted joints
  → Duration of corrosion resistance
  → Improvement of the installation properties resulting from an additional or integrated lubrication

Chromium(VI)-free corrosion protection coatings are state-of-the-art in coating technology

Würth Surface Systems have been developed for a wide field of applications after careful market analysis and several standardisation processes.

Your benefits:

- **High corrosion resistances**
- **Conformity to the latest environmental legislation**
  - ✓ REACH Regulation EG 1907/2006 (Chromium(VI)-free)
  - ✓ EU Directive 2011/65/EU (RoHS Directive)
  - ✓ EU Directive 2000/53/EU on end-of-life vehicles
  - ✓ EU Directive 2012/19/EU (WEEE Directive)
  - ✓ bbVDA-List (GADSL)
- **Reproducible preloads due to a defined coefficients of friction for all coating systems**
- **Highest quality standard due to strict supplier audits and regular inspection by our quality assurance laboratory**
- **Cost savings due to a reduced number of parts**

On the following pages you get an overview of the properties of **Würth Surface Systems in comparison to standard surfaces containing chromium(VI)**.

Technical properties

Designation	Breakdown of Würth Surface Systems		Nominal size	Reference coating thickness (µm) [1]
ZSML 	**Z**	Zinc (Zinc plated)	from M2	min. 3
	S	Silver (Glossy silver colour) [5]	from M4	min. 5
	M	Medium (Medium corrosion protection)	from M10	min. 8
	L	Lubricated		
ZNSHL 	**ZN**	Zinc nickel (Galvanic zinc nickel coating)	from M2	min. 3
	S	Silver (Glossy silver colour)	from M4	min. 5
	H	High (High corrosion protection)	from M10	min. 8
	L	Lubricated		
ZNBHL 	**ZN**	Zinc nickel (Galvanic zinc nickel coating)	from M2	min. 3
	B	Black (Glossy black colour)	from M4	min. 5
	H	High (High corrosion protection)	from M10	min. 8
	L	Lubricated		
ZFSHL 	**ZF**	Zinc flake	from M6	min. 5
	S	Silver (Matte silver colour)		
	H	High (High corrosion protection)	from M10	min. 8
	L	Lubricated		
ZFBHL 	**ZF**	Zinc flake	from M6	min. 5
	B	Black (Matte black colour)		
	H	High (High corrosion protection)	from M10	min. 8
	L	Lubricated		

[1] Reference coating thicknesses: The result of the corrosion test is decisive for the assumed value.
[2] WR=Coating corrosion (white rust), RR=Base metal corrosion (red rust).
[3] The range of the coefficient of friction is adjusted by additionally applied lubricants or lubricants integrated in the sealing systems.
The friction coefficient window was determined under laboratory conditions according to DIN EN ISO 16047 and can slightly vary for individual applications.

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Test according to DIN EN ISO 9227-NSS (h) [2]	Friction coefficient window (μ) according to DIN EN ISO 16047 [3]	Maximum operating temperature [4]	Property class
72 WR 120 RR	**0.09 – 0.14**	120°C	up to 10.9
120 WR 192 RR			
120 WR 264 RR			
120 WR 360 RR		120°C	up to 10.9
168 WR 600 RR			
168 WR 720 RR [6]			
120 WR 360 RR		120°C	up to 10.9
168 WR 480 RR			
168 WR 720 RR [6]			
480 RR		200°C	up to 12.9
720 RR			
480 RR		200°C	up to 12.9
720 RR			

[4] Up to this temperature the systems have proven successful in practical applications.
[5] Irisidescent colouring possible.
[6] To limit the testing efforts the requirements are restricted to 720 h.

Application areas of Würth Surface Systems

Designation	Application area	Coating composition	Coating properties
ZSML 	• For components with a low or moderate risk of corrosion • Defined friction coefficient window needed • Superior substitute for conventional galvanic coatings such as A3C	• Zinc • Passivation (chromium III) • Sealing (Top coat with lubrication)	• Functional and decorative • High ductility • Good cathodic corrosion protection • Thermal resistance up to 120°C • Uniform distribution of layers • General coating is a "thick layer passivation"
ZNSHL  **ZNBHL** 	• For components with an extreme risk of corrosion • Superior substitute for conventional zinc nickel and zinc iron coatings	• Zink nickel alloy layer • Sealing (Top coat with lubrication)	• Maximum cathodic corrosion protection • Corrosion resistances up to 720h [1] against base metal corrosion according to DIN EN ISO 9227 • Thermal resistance up to 120°C • Uniform distribution of layers • Functional and decorative
ZFSHL  **ZFBHL** 	• For components with an extreme risk of corrosion • For high-strength components (property class 10.9 and higher)	• Base coat: Base coat of zinc and aluminium flakes • Top coat: Organic or anorganic top coat with lubrication	• Corrosion resistances up to 720 h against base metal corrosion according to DIN EN ISO 9227 • No hydrogen during the coating process • Thermal resistance up to 200°C • Increased protection against contact corrosion • Sufficient electrical conductivity for most applications • Sufficient ductility for most applications • Mostly resistant against vehicle operating materials

[1] To limit the testing efforts the requirements are restricted to 720 h.

High quality alternatives for standard surfaces containing chromium(VI)

Due to the imminent ban of chromium(VI), it is recommended to change the surfaces mentioned below to future-proof and sustainable surface systems. This can largely improve the corrosion protection and the installation properties.

	Stan-dard	Standard designation	White rust [1] (WR)	Red rust [1] (RR)	Friction coefficient window (µ)	Recommended alternative surface: Name	Comparison Corrosion resistance	Comparison Installation properties
Zinc Yellow	ISO 4042	A1C /A1G/A1L	24	24	not defined	ZSML	↑	↑
		A2C/A2G/A2L	48	72				
		A3C/A3G/A3L	72	120				
Zinc Black	ISO 4042	A1R/A1S/A1T	12	36	not defined			
		A2R/A2S/A2T	12	72				
		A3R / A3S /A3T	24	96				
Zinc Olive green	ISO 4042	A1D / A1H / A1M	24	24	not defined			
		A2D / A2H / A2M	72	96				
		A3D / A3H / A3M	96	144				
Zinc nickel Black	ISO 4042	P1R	not defined	not defined	not defined	ZNSHL ZNBHL	↑	↑
		P2R						
		P3R						
Zinc iron Black	ISO 4042	R1R	not defined	not defined	not defined			
		R2R						
		R3R						

[1] Reference values for corrosion resistances in salt spray test according to DIN EN ISO 9227

	Stan-dard	Standard designation	White rust [1] (WR)	Red rust [1] (RR)	Friction coefficient window (µ)	Recommended alternative surface: Name	Comparison Corrosion resistance	Comparison Installation properties
Zinc flake	ISO 10683	flZn/yc/Tn/600h (e.g. DACROMET® 320 Grade A)	-	600	not defined	ZFSHL	↑	↑
		flZn/yc/Tn/1,000h (e.g. DACROMET® 320 Grade B)	-	1,000			↓	↑
		flZn/yc/TL/600h/C (e.g. DACROMET® 500 Grade A)	-	600	0.12 - 0.18		↑	Changed friction coefficient window! NEW: 0.09–0.14
		flZn/yc/ TL/1,000h/C (e.g. DACROMET® 500 Grade B)	-	1,000	0.12 - 0.18		↓	

↑ Optimisation in case an alternative surface is used ➲ Alternative surface is equivalent ↓ Reduced property of the alternative surface

Product expertise

Due to a continuous product line extension in the field of chromium(VI)-free surfaces, we acquired extensive expertise and are able to support the changeover to alternative surfaces as your industrial partner. We are constantly working on further expanding our range of chromium(VI)-free coatings in order to make a neutral changeover from the technical and economic point of view possible for you.

We will be happy to advise you to find the optimum coating for your individual application.

Product quality

Quality is not only a simple term for Wurth Industry of Canada, it is lived throughout all parts of the company. We supply you with articles on a reliable supplier basis. For this purpose, a consequent supplier development by product-specific process audits is ensured. Furthermore, a supplier partnership with competent manufacturers and coating companies is important for a high product quality.

Targeted incoming goods inspections in our laboratory increase the quality of your products by using, among others, the following test methods:

- **Torque/Preload tests** to determine the friction coefficients, e.g. according to DIN EN ISO 16047 carried out on the biggest friction coefficient test bench in the world
- Determination of the lifetime of the corrosion protection in **salt spray test** according to DIN EN ISO 9227
- **Coating thickness measurements**
- Tests relating to the **trueness of gauge**
- **Screw-in tests**

The selection of the optimum surface coating for your individual application does not only depend on the required corrosion resistance needed. The following criteria have to be observed for taking a decision:

Environment
Which corrosion resistance is needed?

↓

Material properties
Which property or hardness has the fastener used?

↓

Geometry of the fastener
Which drive and which thread pitch has the fastener used?

↓

Installation requirement
Is an adjusted friction coefficient window needed?

↓

Legal and normative requirements
Which (industrial) requirements have to be met?

↓

Optical requirements
Is the component in the visible area?

↓

Optimum corrosion protection

Environment

Which corrosion resistance is needed?

Basic task of a corrosion protection is to protect the component against corrosion throughout its entire lifetime. For this reason, the first step is to analyse to which environmental influences the component is exposed:

- Indoor/Outdoor area
- Surrounding media (air, salt air, acids, etc.)
- Temperature range

Material properties

Which property or hardness has the fastener used?

Apart from mechanical stress, the hardness or the property of the fastener as well as the amount of hydrogen inside are decisive factors which could cause hydrogen brittle fracture. From a core and/or surface hardness of 320 HV or a tensile strength of 1,000 MPa and more, atomic hydrogen generated during galvanizing can lead to such a failure of the bolted joint. Even post treatments (such as tempering) cannot completely exclude hydrogen embrittlement according to DIN EN ISO 4042.

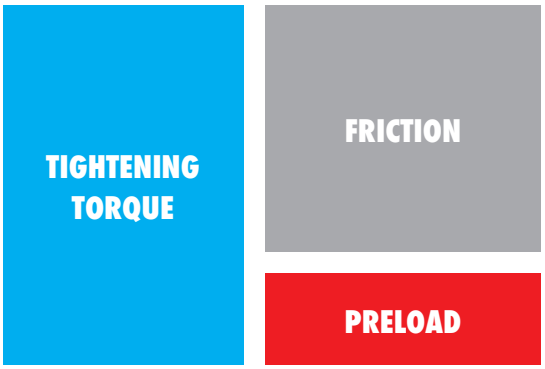
Geometry of the fastener

Which drive and which thread pitch has the fastener used?

Due to their geometry, Würth Surface Systems with zinc flake coating are available from a thread diameter ≥ M6. Reason for this is that the mobility of the nut cannot be completely ensured for a thread pitch smaller than 1 mm. Thus, according to the latest standards the zinc flake technology can only be used without restrictions for thread components ≥ M6. Furthermore, there is a higher risk of material accumulations for products with an inner drive smaller than M6 so that an optimum force transmission cannot be ensured.

Installation requirement

Is an adjusted friction coefficient window needed?



The operatability of a bolted joint is determined by the preload of the connection. However, during tightening only a part of the torque applied by the assembly tool is transformed into preload – the rest is friction. The amount of torque flowing into friction is deteremind by the coefficient of friction μ which can vary more or less depending on the coating. This results in a scattering of the preload for constant tightening torques (e.g. in case of automatic fastening processes) and leads to an inconsistent tightening quality. If the bolt/nut is lubricated, the area in which the coefficient of friction ranges can be limited and so the quality increases significantly. However, to make it possible to achieve for a bolted joint consisting of a bolt, washers and a nut the friction coefficient window of the laboratory tests in real friction conditions, the washers in our systems are not lubricated.

Legal and normative requirements

Which (industry) regulations have to be met?

To control the risks to humans and the environment emanating from certain substances (e.g. chromium(VI)), directives and regulations were adopted in recent years that limit the use of such substances for specific industries (e.g. RoHS) or across all industries (e.g. REACH). The conformity with the applicable regulations is a point that absolutely has to be observed when selecting a corrosion protection. All Würth Surface Systems comply with the applicable environmental regulations.

Optical requirements

Is the component in the visible area?

The final product design pays more and more attention to a uniform appearance. Fasteners that are visible should not disturb. For this reason, even the visual appearance of the surface coating plays a more and more important role when selecting the corrosion protection. Especially our visually appealing zinc nickel surfaces ZNSHL and ZNBHL are used for exposed installation positions in the visible area.

YOUR NOTES

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Wurth Industry of Canada Ltd.
10 Abbott Court, Building B, Unit 203
Brantford, ON, N3S 0E7
T: 519-756-9700
F: 519-756-9701
info@wurthindustry.ca
www.wurthindustry.ca

Responsible for the content:
Tino Schablow

Editor:
Pauline Ciolko