TECHNICAL SPECIFICATIONS FOR OUTSOURCED PARTS

REVISIONS

Issue	Date	Description	Compiled	Checked	Approved
00	14.12.2015	Document creation	T. Fiala	I. Beranová	M. Salač
01	01.06.2016	Change of the company name	T. Fiala	I. Beranová	M. Forys
02	1.6.2017	Definition of intolerable dimensions 3.3, definition of protection of surfaces against plating 3.4	T. Fiala	J. Sušanka	J. Němeček
03	18.8.2017	Specification of requirements for hot-dip and electrogalvanising	P. Batovec	M. Sabo	J. Němeček
04	21.11.2017	Amended points 6.3 (silver plating) and 6.4 (tin plating) Amendment to text b. 7 (hot-dip galvanising); paragraph 5 added	P. Batovec	T. Fiala	T. Lorenc
05	19.4.2018	Addition of nickel-plating point 6.5 and unification of plating point 7 on GEOMET 500B	P. Batovec	T. Fiala	T. Lorenc
06	11.9.2019	Addition to points 4.1 and 4.2	T. Fiala	V. Duchková S. Mastek	J. Němeček
07	8.10.21	Amendment to Chapter 6 Related documentation	T. Fiala	V. Duchková S. Mastek	J. Němeček
08	1.12.2022	Additions to chapters 4.11	T. Fiala	V. Duchková S. Mastek	M. Frantes
09	09.03.26	Modifications to the entire document	V. Svoboda	S. Mastek	J. Černý

SUMMARY

1 Purpose 5
2 Scope 5
3 Terms and definitions 5
4 Procedure 5
4.1 Technical specification 5
4.2 Material 5
4.3 Dimensions 6
4.4 Surface treatment 6
4.5 Requirements for the supplier's output control 6
4.6 Packaging and protection 6
4.7 Special processes 7
4.8 Cut and bent parts 7
4.9 Electrolytically deposited zinc coatings with additional treatment on iron or steel 7
4.9.1 Marking of electrolytically deposited zinc coatings 8
4.9.2 Corrosion resistance of electrolytically deposited coatings 8
4.9.3 Electrolytically deposited silver coatings 9
4.9.4 Electrolytically deposited tin coatings 9
4.9.5 Electrolytically deposited nickel coatings 10
4.9.6 Chemical nickel plating 10
4.9.7 Appearance of parts after electrolytically deposited zinc coatings 10
4.9.8 Coating thickness measurement 10
4.9.9 Adhesion test by abrasion 11
4.9.10 Tests – Sampling 11
4.10 Non-electrolytically applied coatings 11
4.10.1 Chemical nickel plating 11
4.10.2 Lamellar surface protection 12
4.10.3 Appearance 13
4.10.4 Corrosion resistance 13
4.10.5 Temperature resistance 13
4.10.6 Adhesion 13
4.10.7 Tests – Sampling 13
4.11 Specifications for hot-dip zinc coatings 14
4.11.1 Input material 14
4.11.2 Information that must be provided to FTCZ 17
4.12 Coatings 18
4.13 Komaxit powder paint 18
4.14 Blasting 18
4.14.1 Requirements for blasted surfaces 19
4.14.2 Blasting of stainless steel 19
4.14.3 Aluminum and non-ferrous metal alloys 19
4.15 Metallisation (sputtering) 19
4.16 Aluminium anodising 19
4.16.1 Appearance 20
4.17 Cataphoresis 20
4.18 Surtec 20

4.19 Nitriding 20
4.19.1 Nitriding notation in the drawings 20
4.19.2 Standards 20
4.20 Cementing 20
4.21 Cementation notation in the drawings 21
4.22 Pickling of copper parts 21
4.23 Surface of copper contacts 21
4.24 Pickling of stainless steel parts 23
4.25 Welding work or weldments for FTCZ 24
4.25.1 Approval by welding supervision – general audit 24
4.25.2 Requirements for specific weldments 24
4.25.3 Base material 24
4.25.4 Additional material 24
4.25.5 Welder qualification 24
4.25.6 Dimensional report 24
4.25.7 Non-destructive testing report 24
4.26 Soldering 25
4.27 Contact soldering 25
4.28 Assembly – screw connections, tightening torques 25
4.29 Assembly - wiring 25
4.30 Riveting 25
4.31 Bonding 25
4.32 Forging and casting 26
4.33 Additive manufacturing 26
4.34 Rubber products 26
4.35 Prohibited substances 26
5 Annexes 26
6 Related documentation 26
7 Distribution list 28

1 Purpose

This directive sets out general technical specifications required for parts manufactured or outsourced from external suppliers for FAIVELEY TRANSPORT CZECH a.s. (hereinafter FTCZ).

2 Scope

The directive applies to all processes of purchasing, manufacturing, delivery and inspection of parts manufactured by external suppliers. External suppliers, the quality department and the purchasing department are responsible for compliance.

3 Terms and definitions

FTCZ: FAIVELEY TRANSPORT CZECH a.s.
CF, FC: critical characteristic, product criticality

4 Procedure

4.1 Technical specification

The supplied part must comply with the technical specifications set out in the following documents in the order listed:

- In the order, where the current revision of the drawing is always specified for parts manufactured according to FTCZ drawings
- In the drawing (the valid revision of the drawing is always available on FTCZ extranet: **extranet-cz.wabtec.com**)
- In the technical conditions for purchased parts which specify the drawing documentation (the valid revision of the document is always available on FTCZ extranet: **extranet-cz.wabtec.com**). Related documentation (e.g. guidelines listed at the end of this document) will be provided to the supplier upon request.

The technological procedure is auxiliary information for outsourcing parts, a description of the technological procedure in FTCZ.

The supplier is informed of any changes to the drawing published to the supplier by automatic email. The change may not always lead to a revision of the drawing (e.g. updating the names of technical standards) and may also apply to components that FTCZ does not currently purchase.

After being notified of the change, the supplier is obliged to check the new drawing and inform the SUPPLY REFERENT of any impact the change may have on the delivery time of the part and the PURCHASER of any impact the change may have on the price of the part.

4.2 Material

In case the requirement for a material certificate 3.1 is specified in the order, the supplier shall deliver a material certificate 3.1 in accordance with ČSN EN 10204 for the material used with the designation of the delivered melt with each delivery of the component by sending it to the email address **atest.fcz@wabtec.com** in the following format:

Email subject: Supplier name_delivery note number (e.g. Faiveley_DL12345)

Body of the e-mail: All orders in the delivery note, separated by an underscore
(e.g.: 12345/17_67890/17_113579/17_etc.)

Email attachments: 1) Delivery note – for the delivery in question

2) Certificates – item name and name of the required certificate (2.1; 2.2; 3.1; 3.2).

Send the certificate for each item in a separate file, do not combine them into one (e.g. carbon rail/25_cert.2.2)

Replacement of materials is permitted only after mutual written agreement between the supplier and FTCZ.

4.3 Dimensions

Geometric dimensions of the component shall be governed by the drawing and references in the drawing, if specified (e.g. QP-Te-01/06, ČSN ISO 2768-1). If the drawing does not include a reference to tolerances for non-tolerated dimensions, directive QP-Te-01/06 applies.

Furthermore, some dimensions can be specified by a technological procedure with regard to superior assemblies; the specification must be included in the order. For unmarked edges of components and holes, a rounding of R 0.3 or a chamfer of 0.3x45° is performed.

4.4 Surface treatment

The surface treatment is governed by the regulations specified in the drawing (e.g. ISO 2081). If the surface treatment according to the standard is not specified in the drawing, it is specified in this directive. Please note that the tolerances specified in the drawing include plating! The plating layer must not exceed +50% of the thickness specified in the drawing (e.g. for a specified plating thickness of 8 µm, the thickness must be between 8-12 µm).

If protection of functional surfaces is specified (surface without surface treatment, incomplete surface treatment), this surface is marked on the drawing and its protection is carried out by suitable means (preparations) in order to achieve the required quality.

4.5 Requirements for the supplier's output control

The inspection takes place on two levels:

The supplier performs dimensional inspection according to the drawing and directive QP-TK-02/03. Parts that have been inspected must be marked for subsequent identification. The delivery must also include a dimensional report or visual inspection report in the form approved by FTCZ, if required by the order. In case of a delivery without required reports, the supplier is obliged to keep these records and provide them to FTCZ upon request. The requirement for surface treatment reports will be specified in the order.

The drawings may contain critical characteristics (dimensions, plating, etc.) marked CF1 or CF2 according to TR-I-ENG-013.



These characteristics must be measured and recorded in the reports. The characteristics are measured and recorded for 100% of the parts in the delivery.

4.6 Packaging and protection

The supplier shall ensure that the components are packaged in such a way that they are not damaged (e.g. scratched or oxidised) under standard Central European transport conditions.

The packaging method is defined by regulation QP-Te-01/19 General Rules and Specifications for Packaging and TR-I-MAT-003 Generic Supplier Logistic Protocol.

The machined surfaces of castings, weldments and other parts must be covered with suitable protective agents (e.g. OMNI 200) that provide protection against corrosion during transport. The protective agent used must be approved by FTCZ prior to use.

4.7 Special processes

The supplier of the product (part) must comply with the rules for special processes according to SQP-Te-09/01 or TR-S-IND-002, including process qualification and personnel qualification. Specifically, these are the following processes:

- Welding
- Soldering
- Painting
- Blasting
- Metallisation
- Heat treatment
- Degreasing
- Wiring
- Riveting
- Bonding
- Tightening of screw connections
- Forging
- Casting
- Additive manufacturing

In the case of its own regulations, the supplier must demonstrate compliance with FTCZ regulations.

If the supplier's own regulations are not in accordance with TR-I-IND, TR-QUA and TR-S-IND guidelines for the processes used in the manufacture of the part, the customer is informed of the non-compliance and a procedure is initiated for delivery with a deviation, either one-off or permanent.

4.8 Cut and bent parts

Parts supplied to FTCZ manufactured by cutting (laser, plasma, water jet, etc.), punching, with or without subsequent bending, are subject to a first part approval process. During the inspection, the following quality parameters are assessed: dimensions, condition of cut edges, surface cleanliness, marks from clamping or bending tools.

Detailed rules and procedures for cut parts are governed by TR-I-QUA-112.

Under no circumstances are cracks or the initial formation of cracks permissible after bending. Verification can be performed using a capillary test.

4.9 Electrolytically deposited zinc coatings with additional treatment on iron or steel

Galvanic zinc coating is specified by the drawing documentation and technological procedure supplied by FTCZ. The process is defined in the ČSN EN ISO 19598 standard. Chrome plating must be performed in a bath containing trivalent chromium salts.

The use of hexavalent chromium is only permitted for parts with prescribed olive (green) chromate.

FTCZ must provide the supplier with at least the following information:

1. Reference to the standard according to which plating is required – usually ČSN EN ISO 19598.
2. Information about the base material – designation, properties, etc.
3. Required type of plating

4.9.1 Marking of electrolytically deposited zinc coatings

The prescribed marking is according to the following pattern (see standard ČSN EN ISO 19598). The layer thickness is indicated in µm.

ISO 19598 ***-Fe//X//Y//Z***
where:
ISO 19598 = the plating supplier complies with this standard
Fe = base material
X = coating designation and thickness:
Zn = zinc coating
ZnFe = zinc coating (alloy) with iron content of 0.3 to 1%
ZnNi= zinc coating (alloy) with 12 to 16% nickel content

Y =Type of passivation
An= colourless or slightly iridescent (thin-film passivation)
Cn= coloured, iridescent (thick-film passivation)
Fn= black passivation

Z =Sealing method
T0= without sealing
T2 = sealing

Examples of markings:

ISO 19598 – Fe//Zn12//Cn/T0
= zinc coating on steel base material with a minimum thickness of 12 µm with rainbow (thick-film) passivation, without sealing.

ISO 19598 – Fe//ZnNi8//Cn/T2
=zinc-nickel coating on steel base material with a minimum thickness of 8 µm with rainbow (thick film) passivation, with sealing.

The specified layer thickness refers to the minimum coating layer on the product measured at any external point on the product.

Furthermore, the drawing or technological procedure may also prescribe a coating thickness tolerance for functional areas, e.g.: marked area 12-16 µm. This tolerance must be complied with for the given area!

Please note that the tolerances specified in the drawing include plating!

The maximum plating thickness must not exceed twice the specified value (measured at any point on the product).

If the drawings specify galvanising according to old practices (only Fe/Zn8c, Fe/Zn12c, etc.) or ISO 2081 or DIN 50979 standards), the supplier is obliged to carry out galvanising in accordance with the valid ČSN EN ISO 19598 standard with a layer thickness according to the drawing and with Cn or Fn passivation if the requirement for black colour is specified in the drawing. The surface must be sealed – T2.

4.9.2 Corrosion resistance of electrolytically deposited coatings

The supplier must guarantee the corrosion resistance in salt spray (NSS according to ČSN EN ISO 9227) of the galvanic coating as specified in the following table (see ČSN EN ISO 19598).

Type of plating	Plating designation	Type of plating	Minimum salt spray resistance time NSS according to ISO 9227 (h)			
			No surface corrosion	No corrosion of base material		
				5µm	8µm	12µm
Zn coating, colourless, unsealed	Zn//An//T0	suspension	16	72	96	120
Zn coating, rainbow, unsealed	Zn//Cn/T0	suspension	120	192	264	336
Zn coating, rainbow, sealed	Zn//Cn/T2	suspension	168	264	360	480
ZnFe coating, rainbow, unsealed	ZnFe//Cn//T0	suspension	168	240	312	384
ZnFe coating, rainbow, sealed	ZnFe//Cn//T2	suspension	216	312	408	528
ZnNi rainbow coating, unsealed	ZnNi//Cn//T0	suspension	192	600	720	720
ZnNi rainbow coating, sealed	ZnNi//Cn//T2	suspension	360	720	720	720
ZnFe coating black, sealed	ZnFe//Fn//T2	suspension	168	264	360	480
ZnNi coating black, sealed	ZnNi//Fn//T2	suspension	240	600	720	720
ZnNi coating, black, unsealed	ZnNi//Fn/T0	suspension	72	600	720	720

Note: Bulk plating may only be used with the written consent of the responsible FTCZ employee and must be specified in the order.

4.9.3 Electrolytically deposited silver coatings

Prescribed by drawing and technological procedure:

ISO 4521-X/YZ where:

ISO 4521 - the plating supplier complies with this standard
X =base material (e.g. Cu)
Y =plated material (e.g. Ag)
Z =prescribed plating thickness, taken as the minimum thickness measured at any point on the product surface

Example: **Electrolytically deposited coating ISO 4521-Cu/Ag(98.8)20**
=Silver (Ag) coating with a minimum thickness of 20 µm deposited on brass (Cu).

Electrolytically deposited coating ISO 4521-Fe/Ni5/Ag(99.8)10
=Silver alloy coating containing 99.8% silver (Ag99.8) with a minimum thickness of 10 µm with a nickel (Ni) interlayer with a thickness of 5 µm.

4.9.4 Electrolytically deposited tin coatings

Prescribed by the drawing and technological procedure:

ISO 2093-A/BCD where:

ISO 2093 – the plating supplier complies with this standard
A = base material of the component (e.g. Fe)
B = indicates the chemical symbol of the interlayer metal and the subsequent number of the minimum thickness of this layer in µm (if no interlayer is required, this information is omitted)
C = indicates the chemical symbol for tin (Sn) and the subsequent number indicating its required minimum thickness in µm
D = indicates the surface finish with the symbol: m = matt coating; r = glossy coating; f = fused coating

Example: **ISO 2093- Fe/Ni2.5 Sn5 f**
= Iron or steel substrate with a nickel intermediate layer 2.5 µm thick, electroplated with a 5 µm thick fused tin coating.

4.9.5 Electrolytically deposited nickel coatings

Requirements for electrolytically deposited nickel coatings are governed by ČSN EN ISO 1456 standard.

Specified by drawing and technological procedure:
ELECTROPLATED COATING ČSN EN ISO 1456 – Cu/Ni12x where:

Cu – is the type of base material (copper)
Ni – galvanic nickel plating
12 – minimum local layer thickness measured at any point on the functional surface
x – type of nickel coating:

b = decorative glossy, semi-glossy or satin nickel coating with sulphur content and lamellar structure
i = glossy, semi-glossy or matt nickel coating with high sulphur content and lamellar structure, without mechanical polishing
p = matt or semi-gloss nickel coating, with mechanical polishing
s = matt or semi-gloss nickel coating without sulphur, with a columnar structure, without mechanical polishing
d = two-layer or three-layer nickel coating (requirements according to Table 5 of ČSN EN ISO 1456)

4.9.6 Chemical nickel plating

prescribed by drawing and technological procedure:

ISO 4527 – Fe/NiP(10)X where:

ISO 4527 = plating supplier complies with this standard
(10) = phosphorus content (the value is fixed for FTCZ purposes)
X = required minimum layer thickness (e.g. 15)

Example: **Fe/NiP(10)12** = chemical nickel plating with a minimum thickness of 12 µm

4.9.7 Appearance of parts after electrolytically deposited zinc coatings

The surface of an electrolytically plated product must not show any clearly visible plating defects such as blisters, pits, rough spots, cracks or unplated areas.
The plating supplier is obliged to inspect the part before plating and to notify the customer of any material defects or other defects that could affect the plating process and the subsequent quality of the plating. After mutual agreement, the defect will be removed or the part will be plated.

4.9.8 Coating thickness measurement

Layer thickness measurement is performed in accordance with ČSN EN ISO 19598, Article 8.1.

Upon written request from FTCZ, the supplier is obliged to provide measurement reports proving compliance with the prescribed layer thickness. The supplier shall mark the parts on which the layer thickness was measured and the place where the measurement was performed in a suitable and pre-agreed manner.

The report must state the type of measuring device used, the manufacturer and the date until which the device calibration is valid. The calibration period of the device must not exceed 2 years.

4.9.9 Adhesion test by abrasion

The adhesion test of coatings shall be carried out by lightly rubbing the surface approximately ten times with clean, white paper, a cloth or a soft, unfilled rubber eraser.

The adhesion of the coating is satisfactory if no stains or contamination from the coating appear on the paper and there are no signs of metal exposure on the tested surface as a result of surface removal (see ČSN EN ISO 3613, point 5.9).

The abrasion adhesion test shall be performed on at least one piece from the delivered batch.

The abrasion adhesion test is performed by FTCZ, unless otherwise specified in the order.

4.9.10 Tests – Sampling

Tests to verify corrosion resistance are performed in accordance with ČSN EN ISO 9227. The supplier of the part shall demonstrate corrosion resistance in accordance with the above-mentioned requirements by means of validation tests on samples tested in accordance with ČSN EN ISO 9227 in an accredited testing laboratory. Based on a flawless result, the supplier of the parts is validated to supply the part, including plating.

FTCZ reserves the right to participate in the tests performed.

The performance of tests and their invoicing shall be agreed in writing between the customer and the supplier.

FTCZ reserves the right to conduct a customer audit of the plating supplier and to validate the supplier. FTCZ will perform regular revalidation once a year in the form of an internal audit, or in the event of non-conformities in deliveries an extraordinary audit.

A validated supplier may not be changed without written consent of the responsible FTCZ employee. Any complaints against the supplier will be handled in accordance with the standard procedure applicable to FTCZ, as specified in TR-S-QUA-004.

In the event a plating supplier is changed, the parts supplier undertakes to repeat the corrosion resistance tests. FTCZ reserves the right to carry out tests to verify the corrosion resistance of selected parts from serial deliveries a maximum of 4 times a year in the same accredited laboratory where the validation tests were performed.

The costs of the tests in the event of a positive test result shall be borne in full by FTCZ.

The costs of testing in the event of a negative test result shall be borne in full by the parts supplier.

4.10 Non-electrolytically applied coatings

4.10.1 Chemical nickel plating

There are two types (low and high phosphorus). It is specified by the drawing and technological procedure:

Autocatalytic nickel coating ISO 4527 - Fe/NiP(10)X where:

ISO 4527 = the plating supplier complies with this standard
(10) = the coating contains 10% phosphorus by weight (the value is fixed).
10% phosphorus is considered "low-phosphorus nickel plating"
X = required minimum thickness of the layer in µm (e.g. 15)

Example: **Autocatalytic nickel coating ISO 4527 - Fe/NiP(10)12** = low-phosphorus chemical nickel plating with a minimum thickness of 12 µm

Autocatalytic nickel coating ISO 4527 - Fe/NiP(12)X where:

ISO 4527 = the plating supplier complies with this standard
(12) = content of 12% by weight of phosphorus in the coating (the value is constant)
12% phosphorus is considered "high-phosphorus nickel plating"
X = required minimum thickness of the layer in µm (e.g. 25)

Example: **Autocatalytic nickel coating ISO 4527 - Fe/NiP(12)25** = high-phosphorus chemical nickel plating with a minimum thickness of 25 µm

If chemical nickel plating is performed on alloys other than iron, Fe is replaced with the appropriate other material in the report. E.g. on copper or brass parts.

Example: **Autocatalytic nickel coating ISO 4527 - Cu/NiP(10)12**

4.10.2 Lamellar surface protection

These are zinc lamellar-based coatings known as GEOMET and DACROMET.
The method of designation in drawings and technological procedures is defined in QP-KO-05/15.
The technical requirements for surface treatment are defined in ČSN EN ISO 10683.

The following is prescribed by the drawing and technological procedure:

DACROMET 320 A or **B**
Type A corrosion resistance 600 hours in salt spray (2 layers, 5-8 µm)
Type B corrosion resistance 900 hours in salt spray (3 layers, 8-11 µm)

Dacromet 320 does not contain lubricant

DACROMET 500 A or **B**
Type A corrosion resistance 600 hours in salt spray (2 layers, 5-8 µm)
Type B corrosion resistance 900 hours in salt spray (3 layers, 8-11 µm)

Dacromet 500 contains a lubricant, friction coefficient is 0.15
DACROMET contains hexavalent chromium, its use is prohibited. Unlike DACROMET, GEOMET does not contain hexavalent chromium, it is its substitute.

GEOMET 321 A or **B**
Type A corrosion resistance 600 hours in salt spray (2 layers, 5-8 µm)
Type B corrosion resistance 900 hours in salt spray (3 layers, 8-11 µm)

Geomet 321 does not contain lubricant

GEOMET 500 A or **B**
Type A corrosion resistance 600 hours in salt spray (2 layers, 5-8 µm)
Type B corrosion resistance 900 hours in salt spray (3 layers, 8-11 µm)

Geomet 500 contains lubricant, friction coefficient is 0.15

4.10.3 Appearance

The colour of the coating should be silver-grey, the coated part must be free of blisters, local excess coating and uncoated areas that may adversely affect corrosion protection and proper use.

4.10.4 Corrosion resistance

Tests to verify corrosion resistance are performed in accordance with ČSN EN ISO 9227. The supplier of the part shall demonstrate corrosion resistance in accordance with the above requirements (number of hours) by means of validation tests on samples tested in accordance with ČSN EN ISO 9227 in an accredited testing laboratory.

4.10.5 Temperature resistance

After heating the coated component to 150 °C for 3 hours, the corrosion protection requirements must still be complied with. After this heating and cooling, no flaking, blistering or other serious damage to the coating may appear on the component.

4.10.6 Adhesion

The adhesion test is performed using adhesive tape with an adhesive strength of 7±1 N over a width of 25 mm. The tape is pressed firmly onto the test surface and then torn off intermittently and perpendicular to the surface. The coating must not peel off the base metal after the tape is removed. A small amount of coating material adhering to the tape is permissible.

4.10.7 Tests – Sampling

Tests shall be carried out on samples for supplier approval. The number and size of samples shall be agreed between FTCZ and the supplier. FTCZ reserves the right to participate in the tests carried out.

The test report shall be provided free of charge to the responsible FTCZ representative.

FTCZ reserves the right to conduct a customer audit of the plating supplier and to validate the supplier.

FTCZ will perform regular re-validation once a year in the form of an internal audit, or in the event of non-conformities in deliveries, an extraordinary audit.

A validated supplier may not change the technology unless he obtains written consent of the responsible FTCZ employee.

Any complaints against the supplier will be handled in accordance with the standard procedure applicable to FTCZ under TR-S-QUA-004.

In the event of a change of plating supplier, the part supplier undertakes to repeat the corrosion resistance tests.

FTCZ reserves the right to perform corrosion resistance tests on selected parts from serial deliveries a maximum of four times a year in the same accredited laboratory where the validation tests were performed.

The costs of the tests in the event of a positive test result shall be borne in full by FTCZ.

The costs of the tests in the event of a negative test result shall be borne in full by the supplier.

4.11 Specifications for hot-dip zinc coatings

4.11.1 Input material

The material to be hot-dip galvanised must be suitable for this type of coating (chemical composition). The surface quality must ensure high-quality plating; there must be no scale present after either material production or cutting operations (laser cutting, etc.). Edge treatment must ensure that the plating does not flake off at the edges.

REQUIREMENTS FOR THE CHEMICAL COMPOSITION OF STEEL FOR HOT-DIP GALVANISING:

1. Si content + 2.5 x P content is within the range of 0–0.03% or 0.12–0.25%.
2. Si content + Al content is within the range of 0–0.03% or 0.12–0.25%
3. P content is less than 0.02%

THE COMPOSITION MUST BE PROVED BY A 3.1 CERTIFICATE.

Surface treatment report on drawings: **ISO 1461 – HOT-DIP GALVANISED MIN. 50 µm**
Or for high-temperature hot-dip galvanising: ISO 1461 – HIGH-TEMPERATURE HOT-DIP GALVANISING MIN. 85 µm. High-temperature hot-dip galvanising (HTV) refers to a process with a zinc bath temperature of 560 to 620 °C.

For cut-outs from sheets with a thickness of 10 mm and above, pre-treatment by blasting is recommended – surface preparation grade Sa2.5 according to ISO 8501-1

The supplier is obliged to comply with the following rules:

- **The protective surface must be hot-dip galvanised in accordance with ČSN EN ISO 1461 with increased requirements for appearance. The parts are intended for subsequent painting.**
- **The minimum prescribed zinc coating thickness (usually 40 µm) must be observed.**

The specified thickness is taken as the minimum value at any point on the product; if the thickness is not specified, it is set out in Table 3 of ČSN EN ISO 1461 standard.

- **The maximum thickness of hot-dip zinc coating must not exceed 200 µm.**

Measured at any point on the product. For parts that are blasted before hot-dip galvanising, the thickness may exceed 200 µm; this deviation must be approved by the customer.

- **Adhesion**

Galvanised parts must have sufficient adhesion so that the zinc layer does not flake off during normal handling of the part.

- **Appearance of the part after hot-dip galvanising**

The surface of the galvanised product, just through visual inspection or with vision correction from a distance of 1 m, must not show any visible growths, blisters (convex areas), rough areas, sharp protrusions that could cause injury, or uncoated areas.

Residues of flux and zinc ash are not permitted, as they reduce service life of the zinc coating.

- **Repairs**

Repairs are governed by ČSN EN ISO 1461, paragraph 6.3. The material used for local repairs (repair paint) must be approved by FTCZ.

The following images define the acceptable and unacceptable appearance of parts:

- Sharp protrusions – there must be no sharp protrusions on the coated surface



INCORRECT

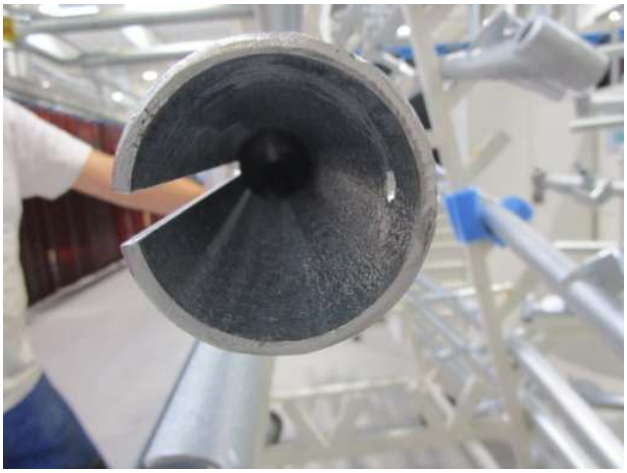


CORRECT

- Accumulated zinc – failure to comply with the technological procedure for suspension (the zinc plant is able to repair – additional work)

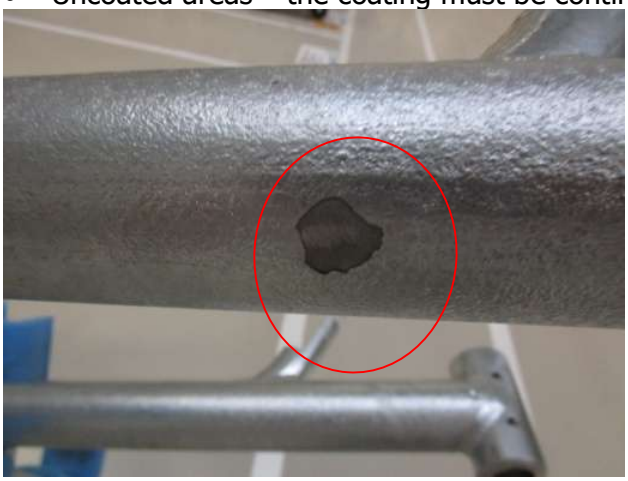


INCORRECT



CORRECT

- Uncoated areas – the coating must be continuous in all areas

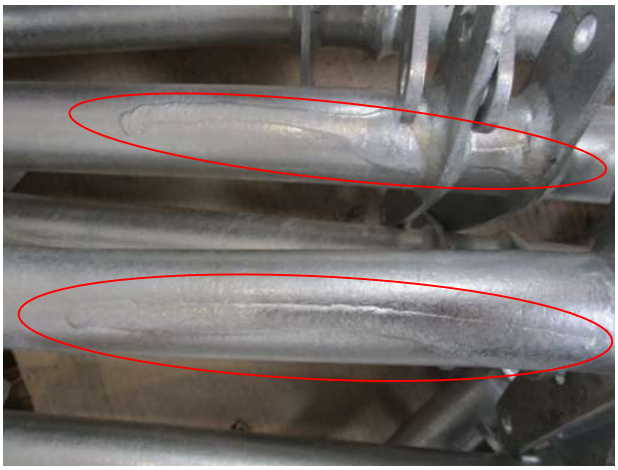


INCORRECT



CORRECT

- Unevenness, overflowing zinc

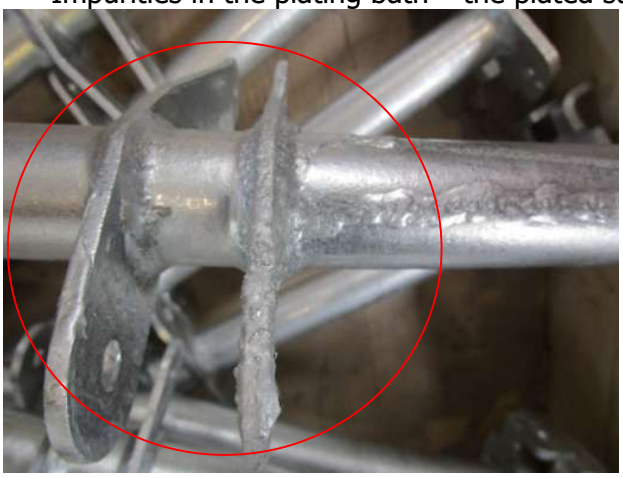


INCORRECT



CORRECT

- Impurities in the plating bath – the plated surface must be free of sharp protrusions and impurities



INCORRECT



CORRECT

- Leaked zinc – failure to follow the technological procedure for suspension

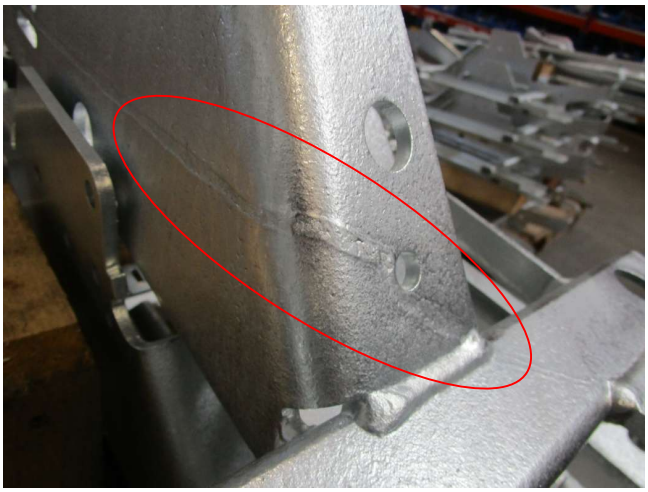


INCORRECT

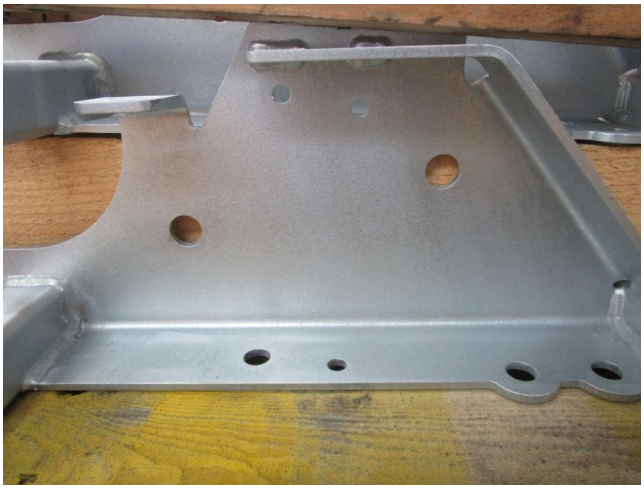


CORRECT

- Unevenness on the metal-coated surface – must not occur on parts to which further coatings are to be applied, e.g. paint



INCORRECT



CORRECT

- Poor storage and handling of parts – parts must not touch each other, they must be sufficiently separated and tied together to prevent damage to the zinc layer during transport.



INCORRECT



CORRECT

In some of the cases shown, the defects are due to the base material (inappropriate Si content); in such cases, the galvanising plant is unable to influence the appearance of the galvanising to 100%. It is always necessary to agree on further steps between the customer and the galvanising plant, or to submit a measurement report on the content of the base material.

4.11.2 Information that must be provided to FTCZ

- FTCZ must provide the coating manufacturer with the designation of this international standard, i.e. ČSN ISO 14617
- Additional information provided by FTCZ

The following information may be required for specific purposes and, if so, the customer must provide or specify it as necessary upon request:

a) designation of functional surfaces, e.g. by means of a drawing or appropriately marked samples
b) a drawing or other designation of places where surface irregularities would prevent the intended use of the plated product, e.g. if additional coatings are to be applied to the plated product
c) a sample or other demonstration of the required surface finish
d) any special coating thickness

e) any special requirements for preliminary surface treatment
f) inspection programme

4.12 Coatings

Coatings may only be applied by pre-approved suppliers. Approval is granted prior to the first delivery of parts and is carried out in accordance with TR-I-IND-003 and, where applicable, in accordance with special FTCZ customer regulations (e.g. NF F standards or DTRF documents). After approval of the supplier, coatings are applied and governed in accordance with directive QP-Te-02/03 and the information specified in the drawing – coating system number, shade, gloss. All documentation in accordance with the above directive, including samples representing the batch and completed coating delivery notes, must be supplied with the delivered part.

The supplier shall submit an inspection plan for the delivered part; the inspection plan must be approved by FTCZ before delivery of the first batch.

The supplier agrees to an audit and regular evaluation by FTCZ. In the event of a repeated C rating, there is a risk of termination of cooperation with immediate effect.
The coating is specified by the drawing and technological procedure, which includes coating instructions (the instructions specify the required application and control parameters), shade and gloss of the top coat. If no gloss is specified, a minimum gloss of 80%/60° is required.

4.13 Komaxit powder paint

Powder paint is specified in the drawing and technological procedure as follows:

POWDER PAINT W,X,Y,Z where:

W =paint type and directive QP-Te-….
X =required shade
Y = required layer thickness (specified in the range of, for example, 60-100 µm; this value represents the average of 5 or 10 measurements, but no measurement may fall below the specified minimum limit)
Z = required colour gloss, must be within the specified range (measured at 60°, unless the paint thickness specifies otherwise)

A common example of a specification used in FTCZ:

POLYESTER POWDER COATING ACCORDING TO QP-Te-02/03–KOM; RAL 1014; GLOSS 85 ± 10 / 60°; LAYER THICKNESS 60-100 µm

or:

POLYESTER POWDER COATING ACCORDING TO QP-Te-02/03–KOM; RAL 9017; GLOSS 20 ± 5 / 60°; LAYER THICKNESS 60-100 µm

or:

POWDER COATING ACCORDING TO OP-TE-02_03-KOM, IGP-DURA face 5803A; SHADE RAL9005; LAYER THICKNESS: 60-100 µm; GLOSS 25-35/60°

4.14 Blasting

If blasting is required before painting, this process is governed by directive QP-Te-02/06.
For carbon steel (except stainless steel), the entire surface must be blasted (except for threads and areas specified in the drawing) in accordance with ČSN EN ISO 8504 and ČSN EN ISO 8501 before coating.

4.14.1 Requirements for blasted surfaces

Unless specified otherwise (e.g. when sweeping or light blasting of welds is required), the requirements are as follows:

- the degree of blasting must be at least Sa2 ½ on all surfaces
- the roughness of the blasted surface must be between Ra 3.2 and 12.6.
- dustiness on the blasted surface must be in the range of 1–3 according to ČSN EN ISO 8502-3 or instruction QP-Te-17/01.

The supplier records the data measured in the coating guide, which is part of each batch. The supplier also blasts one control plate with the batch; which represents the given batch.

If the operation following blasting is coating, the primer must be applied within a maximum of 4 hours after blasting. The supplier is obliged to adjust the blasting or coating time so that this condition is complied with.

4.14.2 Blasting of stainless steel

Oxides formed during the stainless-steel welding process must be removed:
a) if painting is required on the welded part, the oxides must be blasted with glass microspheres (or a similar non-metallic abrasive).
b) if no surface treatment is subsequently applied to the weldment, the oxides must be removed after welding by "pickling".

4.14.3 Aluminum and non-ferrous metal alloys

If a weldment requires coating, it is necessary to sweep all coated surfaces with glass microspheres (or a similar non-metallic abrasive) before applying the coating to ensure proper adhesion of the primer.

4.15 Metallisation (sputtering)

If metallisation of the surface is required, proceed in accordance with NF A 91-010 and ČSN EN ISO 12683.

The metallised surface is marked on the drawing or specified in the technological procedure which indicates the size of the metallised area, the thickness of the layer and the metallised material (mainly tin or zinc). The metallised surface must be intact, must not flake off and must be of the required thickness.

For PAINTING and BLASTING operations, or METALLISATION with a batch, the supplier is also obliged to supply a control sheet metal sample representing the batch and a completed coating delivery note, where the necessary operational data is recorded. The sheet metal will be blasted and coated with the given batch according to the specifications for the given batch. The sample will be supplied by FTCZ. The delivery note is supplied in paper form together with the technological procedure or order and is filled in for each batch.

4.16 Aluminium anodising

Anodising is prescribed by the drawing or technological procedure as follows:

ISO 7599-EW/AAX/Y/Z where:

ISO 7599 = the supplier complies with this standard
W = type of pre-treatment, see Table B.1 in ČSN EN ISO 7599
(e.g. E0=only degreasing and deoxidation)
X = coating thickness classes, see Table 1 of ČSN EN ISO 7599 (e.g. AA15=minimum average thickness 15 µm, minimum local thickness 12 µm)

Y = required colour appearance (e.g. NATURAL ANODISED)
Z= hydrothermal sealing or non-sealing (e.g. NO SEALING)
An unsealed surface is required wherever a coating is subsequently applied to the component.

A common example of a specification used in FTCZ:

ISO 7599-E0/AA15/NATURAL ANODISED / UNSEALED = natural anodised with an average minimum thickness of 15 µm, unsealed.

In some cases, the original (older) marking may appear in the ANODISE GREY technological process, which corresponds to: **ISO 7599-E0/AA15/NATURAL ANODISED/UNSEALED**

The sealing / non-sealing of the coating is checked in accordance with ČSN EN ISO 2143 and ČSN EN ISO 2931.

4.16.1 Appearance

After anodising, no defects such as blisters must be visible on the surface of the component from a distance of 1 m. The anodised surface must have the same colour appearance over the entire surface.

4.17 Cataphoresis

Cataphoresis is specified by the drawing and technological procedure which sets out the required layer thickness.
The surface must be free of obvious defects – spots, blisters or impurities in the surface.

4.18 Surtec

When a conductive surface treatment of aluminium parts is required, Surtec 650 aluminium passivation can be used in a layer of 150–300 mg/m^2.

4.19 Nitriding

This is a chemical hardening of the steel surface by saturating it with nitrogen at temperatures of approx. 500–600°C. Nitrided steel must contain alloys that support the nitriding process, i.e. mainly aluminium, chromium, but also molybdenum, nickel, vanadium and titanium.
Very hard nitrides are formed in the surface layer of the steel, which increase its hardness (up to 1200 HV). The resulting hardness depends on the chemical composition of the steel. This nitrided layer is not very tough, but it is abrasion-resistant and resistant to fatigue under cyclic stress.

4.19.1 Nitriding notation in the drawings

It is specified in the technical requirements above the drawing stamp or in the stamp in the "SURFACE FINISH" field. The entry must specify the depth and hardness of the nitrided layer.

4.19.2 Standards

ČSN EN ISO 683-5 Heat Treatable Steels, Alloy Steels and Free-Cutting Steels – Part 5: Steels for Nitriding

4.20 Cementing

This is a chemical-thermal treatment in which the surface of the steel is saturated with carbon. Soft steels with a carbon content of 0.1–0.3% are used for cementing. The carbonised layer has a thickness of 0.5 to 0.15 mm. Cementing is followed by hardening to ensure that the surface of the components is very hard.

4.21 Cementation notation in the drawings

This is specified in the technical requirements above the drawing stamp. The drawing parameters must be:

1. Depth of the cemented layer in mm
2. Hardness value in the required layer (in HV or HRC) – designation Eht or CHD
3. Core hardness

4.22 Pickling of copper parts

If pickling is specified in the drawing of a copper part, the final result must be smooth, without visible stains, fingerprints, etc.



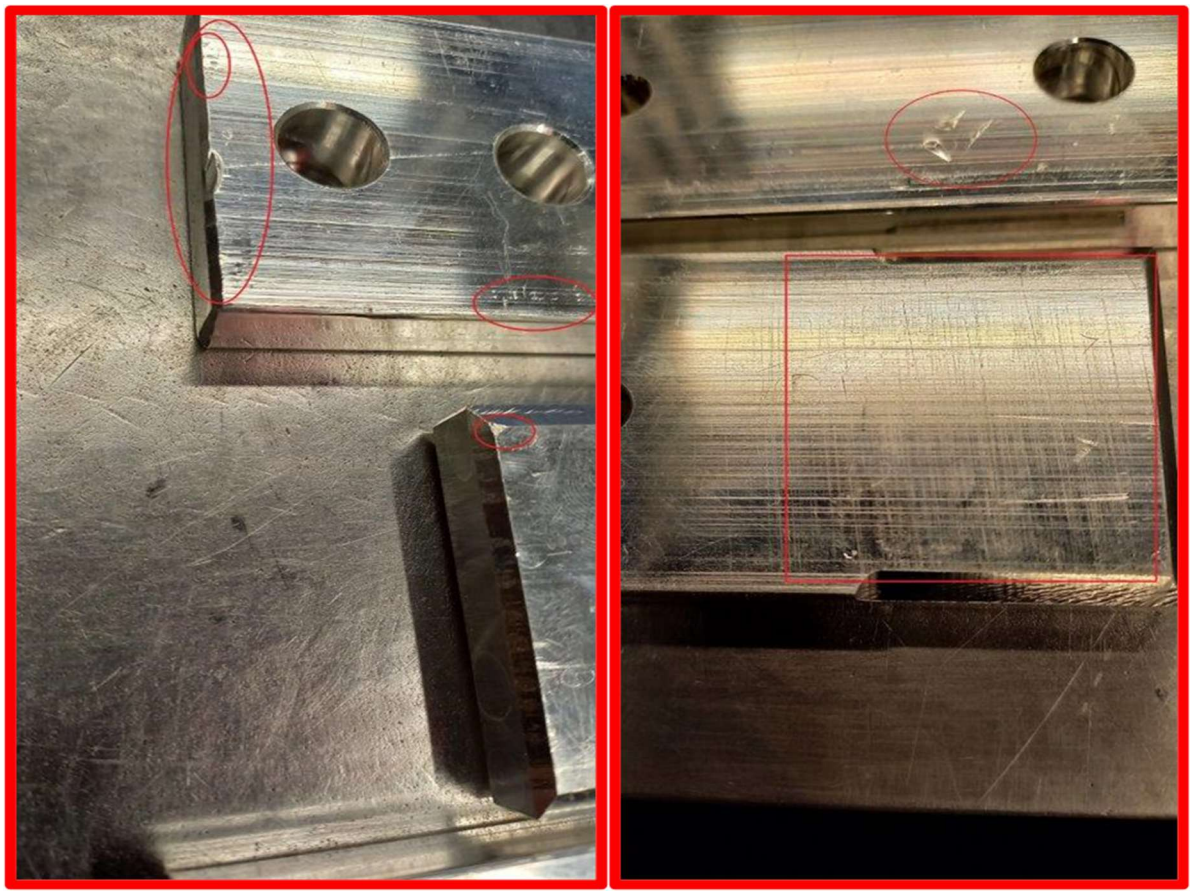
NOK OK

4.23 Surface of copper contacts

The contact surfaces of copper contacts must be free of visible damage, scratches, gouges, holes, etc. Any traces from rolling the semi-finished product are permissible.



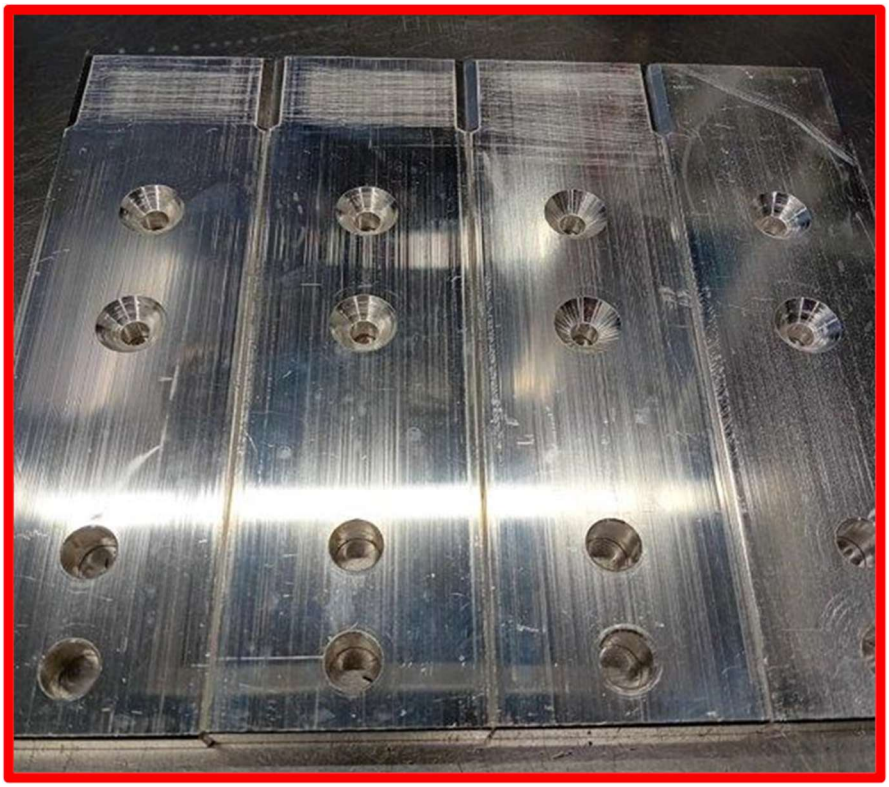
CORRECT



INCORRECT



INCORRECT



INCORRECT

4.24 Pickling of stainless-steel parts

If the drawing or procedure specifies that a stainless-steel part must be pickled, one of the following standards must be complied with:

- EN 2516:1977 – Passivation of stainless steels and decontamination of nickel alloys

- ASTM A380 – Procedures for cleaning, pickling and passivating stainless steel parts, equipment and systems
- ASTM A967 – Specification for the treatment of stainless-steel parts by chemical passivation

4.25 Welding work or weldments for FTCZ

The following conditions apply to all weldments supplied to FTCZ by external companies and to capacity welding work performed outside FTCZ.

Only companies that meet the following conditions may weld or supply welded parts to FTCZ:
a) they are approved by the FTCZ welding supervisor
b) they meet the requirements of regulation TR-I-SRC-001
c) they meet the technical requirements for welding that are required for the supplied weldment.

An order from FTCZ may only be issued on the basis of valid approval from the supplier.

4.25.1 Approval by welding supervision – general audit

The approval procedure is in the form of an audit. The audit examines the welding management system, the quality of welding work, welding certificates and their scope, weldment drawings, qualifications of welding personnel, qualifications of personnel performing weld inspections, and the prerequisites for meeting FTCZ customer requirements for welding work.

The supplier must have a valid EN 15085-2 welding certificate and, for projects in the Czech Republic and Slovakia, a V95/5 certificate.

4.25.2 Requirements for specific weldments

Welded joints must be made in accordance with EN 15085-1 to 5 and regulation V95/5.

4.25.3 Base material

The quality of all base materials used in weldments must be documented by a 3.1 material certificate in accordance with EN 10204.

4.25.4 Additional material

The quality of all base materials used in the weldment must be documented by a material certificate 3.1 according to EN 10204, and the material must also have a declared conformity with the CE mark according to ČSN EN 13479 and according to Merkblatt DVS 1622. The CE marking, indicating the certification body and certification number, must be stated on the packaging of the welding wires.

4.25.5 Welder qualification

Welders must be qualified in accordance with ČSN EN ISO 9606

4.25.6 Dimensional report

The weldment must be delivered with a dimensional report (the scope of the report is approved by SQA or FTCZ technical inspection).

4.25.7 Non-destructive testing report

The report must include the type and scope of non-destructive testing of welds, the name of the employee who performed the inspection, and the result of the inspection. Together with the report, it is necessary to document the employee's qualification according to EN 15085-4 (the scope of the report and the qualification of employees performing weld inspections are approved by the FTCZ welding supervisor).

Additional requirements (or clarification of the above requirements) resulting from a review of the contract with the FTCZ customer.
The supplier agrees to audits and regular evaluations by FTCZ. In the event of a repeated C rating, the supplier is at risk of the termination of cooperation with immediate effect; for more information, see regulation TR-S-QUA-004.

4.26 Soldering

The following conditions apply to all deliveries of products (parts) to FTCZ where soldering is used, with the exception of soldering electrical conductors.

These are deliveries of soldered pipes and assemblies, where the main function is to ensure the flow of media in the form of both gas and liquids.

Detailed rules and processes for soldering are governed by TR-I-IND-005.

4.27 Contact soldering

The following conditions apply to all deliveries of products (parts) to FTCZ where the process of soldering of contact elements is used, with the exception of soldering of electrical conductors.

This concerns deliveries of products (parts) where the main function is to ensure an electrically conductive connection between the contact element and its carrier.

Detailed rules and processes for soldering are governed by QP-Te-03/03.

4.28 Assembly – screw connections, tightening torques

The conditions below apply to all deliveries of products (parts) to FTCZ where assembly (connection using screw connections) is used, with the exception of the assembly of electrical conductors.

Detailed rules and procedures for screw connections are governed by TR-I-IND-004 and QP-Te-06/03.

4.29 Assembly - wiring

The following conditions apply to all deliveries of products (parts) to FTCZ where both HV and LV electrical wiring is used.

The wiring process also includes the process of connecting using screw connections and soldering.

Detailed rules and procedures for wiring are governed by TR-I-QUA-102 and QP-Te-07/05, QP-Te-06/05, QP-Te-10/01, QP-Te-04/03.

In the case of a request for wiring of ESD parts, the rules and process are governed by QP-Te-01/12.

4.30 Riveting

The conditions below apply to all deliveries of products (parts) to FTCZ where the riveting process is used.

These are deliveries of products (parts) where the main function is to secure the connection of parts using rivets.

Detailed rules and processes for riveting are governed by TR-I-IND-002, TR-I-IND-009, QP-Te-06/14.

4.31 Bonding

The conditions below apply to all deliveries of products (parts) to FTCZ where the bonding process is used.

These are deliveries of products (parts) where the main function is to secure the connection of parts using an adhesive (sealant).

Detailed rules and processes for bonding are governed by TR-I-IND-007.

4.32 Forging and casting

The following conditions apply to all deliveries of products (parts) to FTCZ where forging and casting processes are used.

This applies to deliveries of products (parts) where the semi-finished or finished product was created by forging or casting. The parts may be delivered either raw or machined.

Detailed rules and processes for forging and casting are governed by TR-I-QUA-105, TR-I-QUA-106, and TR-I-QUA-108.

4.33 Additive manufacturing

The following conditions apply to all deliveries of products (parts) to FTCZ where additive manufacturing processes are used.

These are deliveries of products (parts) where the semi-finished or complete product was created by an additive process. The parts may be delivered both unmachined and machined.

Detailed rules and processes for additive manufacturing are governed by TR-I-QUA-101.

4.34 Rubber products

The following conditions apply to all deliveries of products (parts) to FTCZ where the base material is rubber.

These are deliveries of products (parts) where the semi-finished or finished product is made of rubber. Parts may be delivered either raw or machined.

Detailed rules and procedures for rubber products are governed by TR-I-QUA-111.

4.35 Prohibited substances

Supplied substances, materials, components and chemicals must comply with the applicable legislative requirements of the EU and associated countries, including the entire supply chain (subcontractors).
In particular, the supplier must comply with the following regulations:

- Regulation (EC) No. 1907/2006 – REACH.
- Directive 2012/19/EU – WEEE.
- Directive 2011/65/EU – RoHS 2

Detailed rules for chemical substances are governed by TR-S-QUA-004

5 Annexes

[1] F-Oj-02/09-05 – Training record

6 Related documentation

[1] TR-S-QUA-004 Supplier Quality Requirements
[2] SQP-Te-09/01 Process Validation
[3] TR-I-SRC-001 General technical instruction for procurement and subcontracting of welded parts

[4] QP-Te-07/03 Welding
[5] QP-Te-02/08 Visual inspection of welds
[6] QP-Te-03/08 Capillary inspection of welds
[7] QP-Te-10/03 Repair of welds
[8] QP-Te-10/04 Sputtering
[9] QP-Te-03/03 Hard soldering
[10] QP-Te-04/03 Soft soldering
[11] TR-I-ENG-013 Functional Classes & Classified Characteristics Management Instruction
[12] TR-I-IND-003 Painting
[13] QP-Te-02/03 Coatings
[14] QP-Te-02/05 Degreasing
[15] QP-Te-02/06 Blasting
[16] QP-Te-17/01 Dust on blasted surface
[17] QP-Te-04/13 Coating adhesion test
[18] QP-Te-04/05 Transport of painted parts
[19] QP-Te-07/05 Pressed joints – methodological guidelines
[20] QP-Te-01/05 Conductor radii
[21] QP-Te-06/05 Pressing pliers tests
[22] QP-Te-10/01 Printing of wire markers for wire identification
[23] QP-Te-08/05 Marking cams
[24] QP-Te-05/03 Heat treatment
[25] QP-Te-06/03 Tightening torques
[26] QP-Te-14/01 Bonding
[27] QP-Te-06/14 Riveting
[28] QP-Te-05/05 Switch adjustment
[29] QP-Te-01/06 Tolerances for non-tolerated dimensions
[30] QP-Te-01/12 Electrostatic discharge ESD
[31] QP-Te-13/01 Pinning
[32] TR-I-IND-004 Torque tightening
[33] TR-I-IND-002 Cold Riveting
[34] TR-I-IND-007 Bonding
[35] TR-I-IND-009 Blind Riveting
[36] TR-I-QUA-110 Manufacturing Quality Requirements Fasteners
[37] TR-I-QUA-110 Manufacturing Quality Requirements Fasteners
[38] TR-I-QUA-102 Manufacturing Quality Requirement Wiring
[39] TR-I-QUA-105 Manufacturing Quality Requirement Forging
[40] TR-I-QUA-106 Manufacturing Quality Requirement Steel Cast
[41] TR-I-QUA-108 Manufacturing Quality Requirement Iron Casting
[42] TR-I-QUA-111 Manufacturing Quality Requirement Rubber
[43] TR-I-QUA-112 Manufacturing Quality Requirements Bending
[44] TR-I-MAT-003 Generic Supplier Logistics Protocol
[45] QP-Te-01/19 General rules and specifications for packaging
[46] OMNI 200 | OMNI 200 | Lubricants | Protection / Lubrication | Products | Bio-Circle
[47] Decree No. 352/2022 Sb. Decree on diseases and illnesses transmissible from animals to humans, against which animals must not be vaccinated

7 Distribution list

By storing this directive in the e-Synergy IS, it becomes valid and accessible to all FTCZ employees. Verification and approval of the document is ensured electronically. This directive is an integral part of the documentation provided to external suppliers for the purpose of manufacturing parts for FAIVELEY TRANSPORT CZECH a.s.