

Technical specifications

Continuous galvanic copper coating line

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Parameters of the Offer.....	Chyba! Záložka není definována.

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Purpose of the document

The purpose of this document is to provide information necessary for technically sound operation, easy maintenance and operation safety of the device purchased for purposes of Cooper Standard Automotive.

Unless stated otherwise, compliance with this specification is mandatory. The technical requirements apply to the device itself to full extent; general requirements apply to the device and have to be approved prior to realization.

Fulfilling these specification does not relieve the contractor of the responsibility of creating a safe, high-quality and functional device. The contractor is ultimately exclusively responsible for the integrity of the device.

CSA encourages open and substantive communication with partners. They encourage the contractors to generate ideas and fail-safe measures.

Bid Scope

This specification supports the design and production of a single-purpose machine for the customer – Cooper Standard Žďár. The project must contain proposal, design, production, assembly, transport, installation of machinery, training of operators and maintenance personnel, and participation in the commissioning at the customer's facility, as required.

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General Requirements for the machinery

- These requirements serve as a general regulation for machinery design.
- The system shall be designed and produced in order to meet the CE requirements and general ergonomic regulations valid in the Czech Republic. The evaluation of ergonomics of the individual worksites shall be included in the handover documentation, and it must fulfil CSA specification of ergonomic factors for operation of machinery.
- The current power distribution system features 240 V or 3x400 V. If the supplier requires other media or media parameters, these requirements must be included in the proposal, including any supplemental devices.
- The pneumatic circuits must be designed for the pressure of 6 bar (the hall features a maximum distribution system pressure of 7 bar).
- The machine controls must be comfortably accessible by the operator in line with the worksite ergonomics (start buttons, controls, hangers, conveyer level, etc.).
- The electric panels should feature a surface finish (powdery coating) shade agreed with the customer. The machine must feature a touch display (at least 4 rows) and five extra inputs and outputs. All the sensors installed in the machine must be connected through connectors due to their simpler and quicker replacements during operation.
- Every machine must be lit in line with the legal hygienic requirements. It shall be possible to control the light separately - independent of the machine controls. The machines must feature manual closing valves at the hall central distribution system connection location. The machine must always feature one set of 230 V sockets behind the operator's work area and one 230 V socket in the machine distribution box.
- Machine process parameters: the process parameters setting must be password-protected.
- If the machine features measuring and evaluating components (technological parameters, leaks, etc.), their calibration sheets and defined calibration periods must be supplied.
In the case of electric value testers, it is possible to replace the calibration protocol with a measuring protocol based on comparable equipment that is ten times more accurate. The machine producer's declaration must be supplied as well.
- If the machine features a PC for data control and storage – consider a monitor-integrated PC with wireless mouse and keyboard. All the measured process

(temperature, speed, etc.) or test values (leaks, pressures, etc.) must be stored in the machine PC.

- The surface finishing of all the tools must meet the requirements for accurate position setting during key operations.
Hardened tools shall be machined and surface treated in order to extend their lifetime.
Replaceable tools shall be marked according to adequate mounting assemblies and sub-assemblies – marking agreed with the customer.
- The machine must feature a lighted beacon that indicates production conditions. (GYR).
- Protective elements on the frames and clamps shall be a combination of the following elements:
 - photo cells enabling easy access to the machine from the front - the supplied photo cells must include a test roller to check the photo cell operation. The roller must be directly supplied by the photo cell manufacturer. This check element must be placed on the machine. It must be easily available to the operator, and it must not interfere with the machine operation.
 - Sliding or otherwise closing panels shall be made of section aluminium with windows of clear and transparent polycarbonate in order to prevent any potential injuries of the operator or others. The panels shall be secured against sliding and opening via electronic lock.
 - Protective elements shall feature connections that will allow their service and maintenance.
 - The surface temperature of the machinery must not exceed 35+3°C.
- All machines must be filled with their first operating fluids. The machines whose chemical substances may leak (hydraulic oil, etc.) must feature drip trays for leaking fluids.
- The completion documentation must include a list of used chemical substances, including their MSDS.
- All the air reducing valves must feature lockable covers, or reducing valves with key-based position blocking must be installed.
- The machinery has to be equipped with a counter of hours (pieces made) with options to report service intervals in relation to operation hours (pieces made).
- The tool exchange for different references has to comply with SMED guidelines and must not take longer than 10 minutes.
- The machinery must be equipped with elements of the LOTO system that ensures the safe locking of the main controls in case of downtime, or maintenance.

Description of the Machine Functions and Technical Requirements

The enquired "Continuous galvanic copper coating line" machinery is used for two-sided strip copper coating.

The strip is wound into a roll and guided into the continuous line in which a copper layer is applied in a KCN electro-alkaline bath. The copper-coated strip is at the end of the line wound into a roll again. An integral part of the delivery of the machinery must be a complete system for cleaning the wastewater from production, and also a complete system for cleaning the vapours from the production line.

Input material

The input material is a metal strip in the form of a roll. The mechanical and dimensional properties are listed below.

Material class:

DC01/DC03 according to EN 10139 – class LC

Chemical composition:

C	0.02 – 0.07%
Mn	0.1 – 0.3%
P	max. 0.020%
S	max. 0.020%
Al	0.02 – 0.085%
N	max. 0.006%

Mechanical properties (Tensile test according to EN 10002 Part 1, Annex B):

Rm	280-390 N/mm ²
Rp 0.2	180-290 N/mm ²
Ductility	min 28% (Lo=80mm, Clamping length 200mm)

Stripe thickness:

0.34 – 0.35 mm Tolerance: +0.008 / -0.013

Inner roll diameter:

508 mm

Outer roll diameter:

1100 – 1550 mm

Roll width:

336.44 – 350 mm Tolerance: 0 / +0.1mm

Permissible flatness deviation 1.5 mm / 1000 mm

Roll weight:

2.7 - 3 tons

Roll length:

3100 m

Technological requirements of the machinery

Continuous galvanic copper coating line

The minimum annual production capacity of the line (300 days in the year / 3 shifts per day / 7.5 hours per shift OEE 85%:

7000 tons of metal coated strip

Line speed:

According to the composition of the individual baths and line technologies upon achievement of the requirement for minimum annual production capacity

Maximum number of operators (including the wastewater cleaning plant)

2

The metal-coated strip runs vertically through the line

The line input must have a metal strip accumulator that ensures smooth and continuous operation during feed of a new roll to the continuous line. The accumulator must have equipment for mechanical jointing (riveting, welding, etc.) of the initial and new roll. The construction of the manipulator must be solved in such a way as to allow feed of the rolls without using a crane. The preferred solution is a roller conveyor that smoothly links to the conveyor of the upstream technology.

The galvanising line itself must be designed for galvanic copper coating in pure KCN baths. Combination of KCN, acid baths is non-permissible. Only demineralised water must be used on the line. The equipment for making demineralised water must be included in the offer. The first part of the line consists of separate cathodic and separate anodic cleaning. A rinsing system must exist in-between the baths.

A further part is activation of the surface of the metallic strip followed by the individual copper coating baths with an anodic basket for the copper granules on both sides of the metal strip. All the baths must be based only on KCN with rinsing in-between the baths.

The copper coating baths must have a shielding system to reduce the accumulation of a the metallic layer on the edges of the metallic strip. From the viewpoint of stable thickness of the copper layer, the edges of the strip with this layer must not be more than 1.6 mm from the edge of the strip. The copper must be applied directly to the metal strip without using any organic, or inorganic intermediate layers.

An integral part of the last galvanic section must be a measuring device capable of continuously measuring the thickness of the applied copper layer at a minimum number of 5 measuring points with a minimum frequency of every 450 mm.

The last section of the line is a bath for application of the passivation layer and final drying of the strip.

All dosed chemical substances, control of the concentrations and continuous dosing must be controlled automatically.

The only manual operation is top-up of the copper granules in the anodic baskets.

The full galvanic line must be located in a sump tray made of PP material to capture any eventual drips.

Each individual section of the line must be completely closed with a lid to prevent the evaporation of chemical substances into the working environment. Each section must have

a separate extraction and filtration system. The filtration system must ensure the removal of all chemical substances created during the galvanising processes. This filtration system must further be connected to the wastewater treatment plant for neutralization and liquidation of chemical deposits.

The line output must have a metal strip accumulator that ensures smooth and continuous operation during removal of the metal coated roll from the continuous line.

The construction of the manipulator must be solved in such a way as to allow removal of the rolls without using a crane. The preferred solution is a roller conveyor that smoothly links to the conveyor of the downstream technology.

The entire line must be made of chemical resistant PP material. All the metal components must be made of chemical resistant stainless steel.

Wastewater treatment plant

An integral part of the offer must be a wastewater cleaning and treatment plant. The treatment plant must be designed for fully automatic control of chemical processes, control of the concentrations of the individual sections and top-up of the necessary chemical substances. The condition of the individual sections, actually running processes must be located on one control panel.

The wastewater treatment plant is connected to the continuous galvanic copper coating line in a closed circuit. The output from the line should only be the "dry matter" of the settled chemical substances, for subsequent liquidation.

A galvanic line filtration system is also connected to the wastewater treatment plant.

The wastewater treatment plant must be designed to meet all the legislative and other requirements of the European Union and the Czech Republic as well as the requirements of the permitted ecological burden of the Czech Republic and the given region.

Output qualitative requirements

Copper coating structure corresponding to the KCN galvanic bath

Copper layers applied uniformly on both sides

Thickness of layer on one side 2.2 – 3.7 μm with Cpk 1.67

Thickness of layer on other side 2.2 – 3.7 μm with Cpk 1.67

Surface quality

RZ max. 5.0 μm

Rmax. < 10 μm

Any mechanical damage, scratches, cracks and wavy edges of the metal coated strip are non-permissible.

Assumed area of the machinery

Continuous galvanic copper coating line

ca. 6 x 90 m (height limit 4 m)

Wastewater treatment plant:

ca. 30 x 7 m

Description of the Control Elements

Operation, control and visualisation of the stations is preferentially solved using industrial automatons of the Siemens Simatic S7 brand. Other control elements are only acceptable throughout prior agreement of both parties.

Visualisation on the electro-panel must shall all the functional elements of the line, their states and graphically represent their function.

System for monitoring of technological parameters:

Must display and store the following data:

- Line speed in m/min

- Flow characteristics of the individual sections

- Temperatures of the individual sections – continuous frequency of the sample/1sec

- All the setting limits and tolerance fields – always at the moment of change

- All error messages + alarms – always with time stamp and elimination condition with time stamp

The curves of the individual temperatures, flow axes and strip speed must be entered continuously in a graph in relation to time. The machine must be ready for local download of stored data and also connection to the internal server.

The work delivery includes control SW as well as its source codes.

Control Equipment Documentation

The contractor is obliged to provide the operation manual in variant scope for "engineers" and "operators" with different privileges. The control SW has to be protected against access of unauthorized personnel (password, fingerprint,...).

The machinery delivery has to include a crisis plan (as long as it is possible to compose one for such equipment). It has to contain instructions on how to proceed in case of operation outage of various peripherals and what to use as a substitute until the situation has been rectified. The crisis plan has to be discussed with the ordering party representative during the concept approval phase.

Document Requirements

Together with the work, it is necessary to provide following documentation in specified language versions:

- Declaration of conformity (Czech and English)
- Maintenance schedule (Czech)
- Commissioning inspection (Czech)
- Parts list (Czech and English)
- Operation manual (Czech and English)

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- Assembly drawings / Welded unit drawings (Czech)
- Wiring / pneumatic / hydraulic diagrams (Czech)
- List of spare parts and fast wear parts (Czech)
- Plan of revisions and preventive inspections (Czech)

Preferred systems / providers

Machinery ram - use standard structural materials.

- The PLC and connected devices, including PLC display, must come from the same manufacturer (SIEMENS)
- Pneumatic elements: Festo
- Sensors: Keyence, Balluf, Festo, Sick
- Security bars: Sick, Keyence
- Electrical elements: Telemecanique

Floor area and anchoring

The machine shall be installed on a concrete floor. The anchoring requirements must not exceed the depth of 22 cm from the floor level.

Machine and Process Capability

The machinery must fulfil the requirement of C_p , C_{pk} , C_m , $C_{mk} \geq 1.67$ for the dimensions defined in point 5.

The control unit must be provided with software that can calculate C_p and C_{pk} from stored values and display these in real time.

Availability of the machinery

OEE machines > 85% 300 days in the year / 3 shifts per day / 7.5 hours per shift

Ensuring Operation

In case of malfunction, it is necessary that the contractor installs a remote access fault diagnostic device.

Work Safety and Health & Environmental Protection

The machinery must comply with loudness standards according to the relevant laws of the Czech Republic.

The device must include sufficient means of worker protection. All moving or rotating parts have to be covered and inaccessible during operation.

The machinery must not diminish the air quality or pollute its surroundings and/or environment.

Marking requirements according to GHS. Piping and marking of copper according to ČSN 130072.

The machine shall be installed in the following environment: 3. Particularly dangerous

1. Normal
2. Dangerous
3. Particularly dangerous

Generally

The machinery must not damage or degrade worked or tested component (as in cause a functional or visual defect). The maximum allowed scrap ratio caused by the machinery for the aforementioned faults is 2 per mile.

During the design and construction periods, the contractor is obliged to seek solutions to reduce costs without compromising the quality or the specification.

Handover of the Work

The work can be handed over only if:

- all the requirements of this specification are taken into consideration
- all the required records and documents are available,
- the R&R inspection procedure results in no objections,
- SMED guidelines are complied with
- presentation of a suitable protocol on "Inspection of the commissioning of safety elements".

The machinery may only be accepted as a whole, not its partial components:

- Draft design acceptance – relates to machinery completeness approval.
This shall be completed through e-mail or visit paid to the manufacturer - design acceptance requires a complete machine assembly with its main sub-assemblies. The

assembly must contain all the to-be-installed items (distribution box, PC, keyboard, scrap box, etc.). Approving individual partial machine nodes is unacceptable. Completed acceptance certificate – see the Acceptance certificate issued for machine and equipment at the manufacturer's facility – document number d1120_1.

- Before - acceptance at the supplier's facility shall be done – take place after installation at the manufacturer's facility, during which the functional test of the mechanical parts and line controls must be done. The customer shall supply the components at own cost in an adequate quantity for a continuous three-shift operation. Record of acceptance in the acceptance certificate issued for machine and equipment at the manufacturer's facility.
- Transport, assembly, and installation at the customer's facility – must be included in the bid price – trial operation during which the machine must reach the required time cycle during one-day production (three shifts). The customer shall supply the components at its own cost.
- If any other components are required, they shall be billed to the supplier.

Business terms and conditions according to Annex 3 - Draft business terms and conditions_copper coating