

## Priloga 1: Tehnične specifikacije naprave za visokotemperaturno plazemsko nitiranje z aktivnim zaslonom

### 1. Tehnične specifikacije naprave:

- Izvajanje sledečih kemo-termičnih procesov:
  - plazemsko nitiranje
  - plazemska nitrocementacija
  - post-oksidacija
  - visokotemperaturno plazemsko nitiranje titanovih zlitin
  - plazemsko nitiranje z aktivnim zaslonom
- Uporabna velikost komore: min. 650x650 mm (premerxvišina)
- Tip komore: vakuumška vročestenska retorta, vertikalno nalaganje (zvonast tip)
- Maksimalna temperatura obdelave: 900°C
- Tri consko ogrevanje/hlajenje po višini komore in nadzor temperature s termočleni K-tipa
- Komora opremljena z opazovalnimi linami v območju vsake od treh con ter eno integrirano nadzorno kamero
- Nivo vakuum: 1x10<sup>-1</sup> mbar
- Nastavitve pulznega generatorja: nepulzno, mono-pulz in bipolarni pulz
- Nastavljivi parametri pulza: trajanje pulza, zakasnitev in frekvenca
- Možnost nadzora, kontrole in vizualizacije procesa z oddaljenim dostopom
- Baza osnovnih receptov obdelave
- Programiranje ciklov in izdelava procesnih predlog
- Shranjevanje in prikaz podatkov o opravljenih obdelavah

### 2. Naprava mora zajemati:

- Peč za plazemsko nitiranje s pulznim generatorjem plazme in vključenim aktivnim zaslonom,
- Večnivojski nosilec obdelovanih kosov z možnostjo individualne prilagoditve,
- Suh vakuumski črpalni sistem (dry-running),
- Plinsko razdelilno omarico s krmilniki pretoka (H<sub>2</sub>, N<sub>2</sub>, Ar, CH<sub>4</sub>),
- Napajalni in nadzorno-regulacijski sistem z računalnikom,
- CE certifikat,
- Navodila za delo z napravo.

### 3. Obseg dobave naprave mora zajemati:

- vso potrebno električno napeljavo in priključke,
- vso potrebno računalniško opremo,
- pred dobavo naprave mora biti omogočen pregled in predprevzem s preizkusom pri proizvajalcu naprave,
- zagon in demonstracija delovanja po inštalaciji,
- izvedba izobraževanja po opravljenem zagonu v obsegu vsaj 10 ur,
- pooblaščen zastopnik in serviser naprave ne sme biti od sedeža naročnika oddaljen več kot 500 km,
- zagotovljen mora biti odzivni čas ene (1) ure (24/7) od sporočene napake po telefonu ali e-mailu ter rezervni deli posredovani v roku treh (3) delovnih dni od ugotovljene napake,
- zagotavljanje originalnih rezervnih delov še najmanj devet (9) let po izteku garancijskega roka,
- dobava mora vključevati vse stroške transporta in postavitve naprave ter ustreznega zavarovanja,
- zagotavljanje garancije 12 mesecev od datuma primopredajnega zapisnika in uspešnega zagona naprave,
- zagotavljanje dostavo in zagon naprave v 10 mesecih od datuma podpisa pogodbe.

## **Annex 1: Technical specifications for High-temperature Plasma Nitriding Unit with Active Screen/Grid**

### **1. Technical specifications:**

- Included the following chemo-thermal processes:
  - plasma (ion) nitriding
  - plasma nitrocarburizing
  - post-oxidation
  - high temperature nitriding of titanium alloys
  - plasma nitriding with active screen/active grid
- Usable chamber size: minimum 650x650 mm (diameterxheight)
- Chamber type: vacuum hot-wall retort, top loading (bell type)
- Maximum process temperature: 900°C
- Three individual cooling/heating zones and temperature control with K-type thermocouples
- Chamber equipped with at least one sight glass in each zone and one on top of the bell with integrated camera
- Ultimate vacuum level: 1x10<sup>-1</sup> mbar
- Pulse generator operation modes: direct current, mono-pulse and bipolar pulse
- Adjustable pulse parameters: pulse duration, pulse pause and pulse frequency
- Monitoring, controlling and visualizing the process with remote access
- Database of basic processing recipes
- Cycle programming and process template creation
- Storage and display of data on performed processes

### **2. Plasma nitriding unit must include:**

- Plasma nitriding furnace with pulse plasma generator and active screen/grid,
- Multi-level loading rack with possible individual loading concept
- Dry-running vacuum pump system,
- Gas cabinet with flow controllers for H<sub>2</sub>, N<sub>2</sub>, Ar, CH<sub>4</sub>,
- Power supply and control-regulation system with computer,
- CE certificate,
- Working instructions.

### **3. Delivery must include:**

- all necessary electrical wiring and connections,
- all required computer equipment and software,
- before delivery, inspection and pre-acceptance with testing at the provider site must be assured,
- start-up and demonstration of operation after installation,
- implementation of training after commissioning in the amount of at least 10 hours,
- the authorized representative and service center must not be more than 500 km away from the customer's location,
- a response time of one (1) hour (24/7) from the reported error by phone or e-mail must be ensured and spare parts must be provided within three (3) working days after error is identified,
- provision of original spare parts for at least nine (9) years after the warranty period expires,
- the delivery must include all costs of transport and installation of the device, as well as appropriate insurance,
- providing a 12-month warranty from the date of successful commissioning of the device,
- ensure delivery and commissioning of the device within 10 months from the date of signing the contract.