

## DESCRIPTION OF THE SUBJECT OF THE AGREEMENT

measuring current transformers

for a linear accelerator

in the PolFEL Free Electron Laser system

(Part 1)

1.	Integrated Current Transformer A – 1 piece .....	2
2.	Integrated Current Transformer B – 1 piece.....	2
3.	Electronic module for Integrated Current Transformer - 2 pieces.....	2
4.	Shielded powered chassis for electronic module for Integrated Current Transformer - 2 pieces .....	3
5.	Cables for Integrated Current Transformer - 2 pieces .....	3

The subject of the order is the delivery of integrated current transformers for measuring the electron bunch charge or average electron beam current. The transformers are intended to be mounted along the beamline of the linear electron accelerator.

## **1. General requirements**

- 1.1 All of the offered devices should be covered by a minimum 24-months manufacturer's warranty.
- 1.2 All offered devices should be delivered to the recipient within 12 months from the date of the contract.

## **2. Integrated Current Transformer A – 1 piece**

- 2.1 Connecting flange DN 160 CF
- 2.2 Inner diameter not lower than 96.0 mm
- 2.3 Compatible with Ultra High Vacuum (UHV) standard
- 2.4 Average noise (rms) for single bunch measurement does not exceed the greater of: 10 fC or 1% of the bunch charge
- 2.5 Measurement range for bunch charge up to 300 pC, for average beam current up to 3 mA
- 2.6 Material for UHV part: stainless steel EN 1.4301 (AISI 304)
- 2.7 Bakeout temperature up to 80°C
- 2.8 Leak rate lower than  $5 \cdot 10^{-10}$  mbar·l/s
- 2.9 Base pressure without cleaning lower than  $1 \cdot 10^{-8}$  mbar
- 2.10 Base pressure with cleaning lower than  $5 \cdot 10^{-10}$  mbar
- 2.11 Sensor axial length not higher than 40 mm
- 2.12 Equipped with calibration pulse generator
- 2.13 Equipped with preamplifier
- 2.14 Equipped with GUI to communicate with the device, setting up the working conditions and signal readout

## **3. Integrated Current Transformer B – 1 piece**

- 3.1 Connecting flange DN 63 CF
- 3.2 Inner diameter not lower than 38 mm
- 3.3 Compatible with Ultra High Vacuum (UHV) standard
- 3.4 Average noise (rms) for single bunch measurement does not exceed the greater of: 10 fC or 1% of the bunch charge
- 3.5 Measurement range for bunch charge up to 300 pC, for average beam current up to 3 mA
- 3.6 Material for UHV part: stainless steel EN 1.4301 (AISI 304)
- 3.7 Bakeout temperature up to 80°C
- 3.8 Leak rate lower than  $5 \cdot 10^{-10}$  mbar·l/s
- 3.9 Base pressure without cleaning in rage lower than  $1 \cdot 10^{-8}$  mbar
- 3.10 Base pressure with cleaning in rage lower than  $5 \cdot 10^{-10}$  mbar
- 3.11 Sensor axial length not higher than 40mm
- 3.12 Equipped with calibration pulse generator
- 3.13 Equipped with preamplifier
- 3.14 Equipped with optical signal generator and plastic fiber optic cable (length  $\geq 2$ m) to trigger calibrated pulse generator via dedicated connector, e.g. SMA
- 3.15 Equipped with GUI to communicate with the device, setting up the working conditions and signal readout

#### **4. Electronic module for Integrated Current Transformer - 2 pieces**

- 4.1 Electronic module as plug-in card compatible with IEC 60297 standard, calibrated to work with integrated current transformer, respectively of type A or type B
- 4.2 Coaxial output for signal envelope from current transformer ( $50\ \Omega$  or  $1\ M\Omega$ ), voltage range up to 2 V
- 4.3 Coaxial output for voltage signal logarithmically proportional to the input charge, voltage range up to 2 V and average input current (measured on the resistivity  $1\ M\Omega$ ), voltage range up to 5 V
- 4.4 Coaxial connector for trigger input of charge measurement
- 4.5 LED indication of selected operation mode: bunch charge or average current measurement
- 4.6 USB connection for remote control, compatible with USB 2.0 or 3.0
- 4.7 Adjustment of trigger signal remotely by microcontroller
- 4.8 Beam current monitor input for coaxial cable from integrated current transformer
- 4.9 Beam current monitor output voltage logarithmically proportional to the input charge or to the average input current
- 4.10 External trigger input
- 4.11 External trigger output

#### **5. Shielded powered chassis for electronic module for Integrated Current Transformer - 2 pieces**

- 5.1 Shielded powered chassis compatible with plug-in card for integrated current transformer A and B
- 5.2 Size: width 19" (482.6 mm), height between 2U and 4U (1U = 44.45 mm)
- 5.3 Chassis should be RF-shielded, according to third level shielding of IEC 61857-3 standard
- 5.4 Chassis should contain at least twelve spaces (slots) for mounting electronic cards compatible with IEC 60297 standard
- 5.5 Integrated with compatible power supply meeting the EN 61204-3, EN 61000-3-2, EN 61000-3-3, EN 61000-4-5, EN 61000-4-6 standards, rated with 230V/50Hz-60Hz, with plug standard BN-90/3064, equipped with EMI/RFI filter and fuse

#### **6. Cables for Integrated Current Transformer - 2 pieces**

- 6.1 Interconnect cable to connect Integrated Current Transformer type A and B with compatible electronic module mounted in a chassis. The cable should meet the Dca-s2,d1,a2 flammability rating (according to EN 50575 standard), or better, and should be characterized by radiation index (according to IEC 60544-4 standard) equal to 7 or more
- 6.2 Cable length at least 30 m