Sr No	Description/Specifications/	Quantity Required
1	2	3
1	Dilatometer	01

Technical Specifications

1. **Instrument: Dilatometer** **(Qty: 01 No.)**
   - **Design:** Pushrod dilatometer
   - **Displacement system:** Opto-electronic displacement system with perfect linearity and resolution
   - **Furnace type:** Silicon Carbide furnace with motorized operation
   - **Cooling mechanism:** Liquid Nitrogen
   - **Temperature range** : RT to 1600°C
   - **Heating rates:** 0.001 ... 50 K/min
   - **Temperature (Accuracy / Precision / Resolution):** 1 K / 0.1 K / 0.001 K
   - **Thermal stability (isothermal):** ± 0.02 K
   - **Measuring range:** ± 25 mm
   - **ΔL Resolution:** 0.1 nm
   - **$\Delta L/L_0$ Repeatability:** 0.001 %, absolute value
   - **$\Delta L/L_0$ Accuracy:** 0.002 %, absolute value
   - **Force range (load at the sample):** 10 mN ... 3 N
   - **Force resolution:** 0.001 mN
   - **Gas atmosphere:** Inert, oxidizing, reducing, vacuum
   - **Gas control:** 3 MFC:1 x protective gas, 2 x purge gas
   - **Oxygen Trap System:** Included, for single and for dual sample holder systems
   - **Sample holder systems:** Single and Dual Interchangeable sample holder system (SiO_2 and Al_2O_3)
   - **Sample dimensions:** Diameter (single): standard 12 mm - 19 mm; Diameter (dual): 8 mm
   - **Automatic sample length determination:** Yes, in expansion mode
   - **Softening Point detection:** Included
   - **Density determination:** Included
   - **Calibration Kit:** Included
   - **Installation and Operational Manuals:** English
   - **Power requirement:** 220 volts/ 50-60 Hz
   - **Note:**
   - **Proposed Model:** NETZSCH DIL 402 *Expedis Supreme*, Germany or Equivalent

2. **Software:**

The instrument must be equipped with a Windows OS compatible software that can perform multi-tasking i.e., measurement and evaluation. It can also control experimental factors like force adjustment and determine the following characteristics of materials especially glasses;

▪ Coefficient of thermal expansion (CTE)	▪ temperature calibration or determination of caloric effects
▪ Volumetric expansion	▪ Peak Separation
▪ Shrinkage steps	▪ Simultaneous analysis of length changes and endothermic/exothermic effects
▪ Softening point determination	▪ Influence of additives and raw materials

▪ Glass transition temperature	▪ Decomposition temperature of e.g., organic binders
▪ Phase transitions	▪ Anisotropic behavior
▪ Sintering temperature and step	▪ Rate-Controlled Sintering (RCS)
▪ Density change with temperature	▪ Thermo kinetics

- **Proposed Software:** Proteus Software by **NETZSCH Germany** or equivalent.

3. Accessories (must be compatible with the instrument)

- **Spare Furnaces:**
  - Fused Silica (RT to 1100 °C) **Qty: 01**
  - SiC (RT to 1600 °C) **Qty: 01**
- Automatic Evacuation System **Qty: 01**
- Oxygen trap system (OTS) **Qty: 01**
- Accessories kit of Length and Force calibration **Qty: 01**
- **Tube sample holder kits**
  - Complete Tube sample holder kit for single measuring system along with sample supports, slide, push rod and thermocouple (S type)
    - Material: Alumina (sample length 52mm, sample dia:12 & 19mm) **Qty: 02 each**
    - Material: Fused Silica (sample length 52mm, sample dia: 12 & 19 mm) **Qty: 02 each**
  - Complete Tube sample holder kit for double measuring system along with sample supports, slide, push rod and thermocouple (S type)
    - Material: Alumina (sample length 52mm, sample dia:8 mm) **Qty: 02**
    - Material: Fused Silica (sample length 52mm, sample dia:8 mm) **Qty: 02**
- **Sample supports**
  - Sample supports for single measuring system
    - Alumina (sample diameter: 4mm,6mm,8mm,12.7 mm and 15 mm) **Qty: 04 each**
    - Fused silica (sample diameter: 4mm,6mm,8mm,12.7 mm and 15 mm) **Qty: 04 each**
  - Sample supports for double measuring system
    - Alumina (sample diameter: 4mm, 6mm, 8mm) **Qty: 04 each**
    - Fused silica (sample diameter: 4mm, 6mm, 8mm) **Qty: 04 each**
- **Slides for tube sample holder**
  - Alumina (Dia: 12 mm and 19 mm) **Qty: 04 each**
  - Fused silica (Dia: 12 mm and 19 mm) **Qty: 04 each**
- **Protective tubes for furnaces**
  - Material: Alumina and fused silica **Qty: 02 each**
- **Push Rods:** Alumina and Fused Silica (single & dual mode) **Qty: 02 each**
- **Thermocouples:** S type (RT to 1600 °C) **Qty: 04**
- Complete sample holder kit for tension measurement **Qty: 01**
- **Computer & Printer:** Core i7 (8th gen) computer system along with laser printer **(Qty: 01)**

Proposed Model: Dilatometer "DIL 402 *Expedis Supreme*" by NETZSCH, Germany or Equivalent.

Note: Supplier may please be asked for installation and operational training of two relevant officials. Chinese make is not acceptable.