

| S/ No | Description                                                 | Qty      |
|-------|-------------------------------------------------------------|----------|
| 01    | Circulation Pump (Detail specification attached at page 02) | 01       |
| 02    | VFD Controller                                              | 01       |
| 03    | Spares (Included)                                           | 05 years |

# Detailed Technical Specifications

| Sr. No.                                                                                                                     | Description                                   |                                                                                                                                                                                                                 | Qty.     |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 01.                                                                                                                         | Main Circulation Pump for TMO test loop       |                                                                                                                                                                                                                 | 01       |
|                                                                                                                             | Stages                                        | 01                                                                                                                                                                                                              |          |
|                                                                                                                             | Type                                          | Canned motor pump (Centrifugal)                                                                                                                                                                                 |          |
|                                                                                                                             | Location/Orientation                          | Indoor/ Horizontal                                                                                                                                                                                              |          |
|                                                                                                                             | Working Fluid                                 | R-134a                                                                                                                                                                                                          |          |
|                                                                                                                             | Flow Rate                                     | 0 - 1 m <sup>3</sup> /hr. ( 0 - 0.3 kg/s)                                                                                                                                                                       |          |
|                                                                                                                             | Design Pressure                               | 5 MPa (50 bar)                                                                                                                                                                                                  |          |
|                                                                                                                             | Design Temperature                            | 150 °C                                                                                                                                                                                                          |          |
|                                                                                                                             | Operating Pressure Range                      | 1.5 to 4 MPa (15 to 40 bar)                                                                                                                                                                                     |          |
|                                                                                                                             | Operating Temperature Range                   | 20 - 90 °C                                                                                                                                                                                                      |          |
|                                                                                                                             | Discharge Pressure (Max.)                     | Upto 4 MPa (40 bar)                                                                                                                                                                                             |          |
|                                                                                                                             | Differential Pressure                         | 0.4 MPa                                                                                                                                                                                                         |          |
|                                                                                                                             | Motor Data                                    |                                                                                                                                                                                                                 |          |
|                                                                                                                             | Motor Type:                                   | VFD Controlled (Compatible with Pump Model)                                                                                                                                                                     |          |
|                                                                                                                             | Phase / Voltage / Frequency                   | 3 Ph / 400V / 50 Hz                                                                                                                                                                                             |          |
|                                                                                                                             | Motor type/Connection                         | 3 phase/DOL                                                                                                                                                                                                     |          |
|                                                                                                                             | Type of Starting                              | Direct Online                                                                                                                                                                                                   |          |
|                                                                                                                             | Permissible Phase Unbalance in Supply Voltage | < 5%                                                                                                                                                                                                            |          |
|                                                                                                                             | Degree of Protection                          | IP-65                                                                                                                                                                                                           |          |
|                                                                                                                             | Material of Construction                      |                                                                                                                                                                                                                 |          |
|                                                                                                                             | Casing                                        | SS-316                                                                                                                                                                                                          |          |
|                                                                                                                             | Impeller                                      | SS-316                                                                                                                                                                                                          |          |
| Pump Shaft                                                                                                                  | SS-316 (May be of Duplex Steel)               |                                                                                                                                                                                                                 |          |
| Sleeves                                                                                                                     | SS-316                                        |                                                                                                                                                                                                                 |          |
| Motor Body                                                                                                                  | SS-304                                        |                                                                                                                                                                                                                 |          |
| All wetted parts                                                                                                            | SS-304/higher grades                          |                                                                                                                                                                                                                 |          |
| 02.                                                                                                                         | VFD Controller                                |                                                                                                                                                                                                                 | 01       |
| 03.                                                                                                                         | Counter Flanges & Base Plate                  |                                                                                                                                                                                                                 | Required |
| 04.                                                                                                                         | Terms and conditions – documentation required |                                                                                                                                                                                                                 |          |
| i. To be designed and manufactured according to API-685                                                                     |                                               | vi. Standard QA certificate should be provided & QCP Pump and motor data sheet.                                                                                                                                 |          |
| ii. Certificate of Origin.                                                                                                  |                                               | vii. Instrumentation details.                                                                                                                                                                                   |          |
| iii. 3.1 Certificate of hydrostatic pressure test and pump material tests for pressure retaining parts and main components. |                                               | viii. Electrical test (type and routine procedure)                                                                                                                                                              |          |
| iv. Pump characteristic curves.                                                                                             |                                               | ix. Dynamic balance test procedure and report                                                                                                                                                                   |          |
| v. General arrangement drawings.                                                                                            |                                               | x. Hydraulic performance test 3.1 B according to ISO 9906 class 2B                                                                                                                                              |          |
| 05.                                                                                                                         | Inspection                                    | Certificates of inspection & performance testing, noise level monitoring along-with inspection of QCP documents as per above quoted standards by third party, <i>Pre-shipment inspection at vendor premises</i> |          |
| 06.                                                                                                                         | Spares                                        | 05 Years (included)                                                                                                                                                                                             |          |
| 07.                                                                                                                         | Make                                          | Hermetic-Pumper GmbH, Teikoku Elec. Mfg Co. Ltd., Nikkiso Nor-Seal Pumps, Optimex, Hayward Tyler, Hermag Pumps, Gruppe Rutschi etc. <i>European/ American/Japanese/ Chinese</i>                                 |          |