# List of Goods Requirements and Technical Requirements

**Attention: The technical specifications marked with "\*" are important technical terms or parameters, and technical support materials must be provided. Any negative deviation or lack of technical materials from these important technical terms or parameters will result in the rejection of the bid.**

**1. Hardware technical parameters:**

**\***1.1 High speed infrared motion capture camera with a resolution of ≥ 5 million pixels (2560 x 1920). The high-speed infrared motion capture camera has two full field of view acquisition modes: supporting a shooting speed of ≥ 700 fps at a full field resolution of 5 million pixels (2560 x 1920); Supports a shooting speed of ≥ 1400 fps with a full field resolution of 10 million pixels (1280 x 960). When reducing the captured field of view, the maximum shooting speed is ≥ 10000 fps. (After winning the bid, it is necessary to demonstrate at the user's site to prove that this function is available.)

1.2 The same high-speed infrared motion capture camera can capture the motion trajectory of moving object markers through infrared light, as well as capture images of moving objects during their motion process through video functionality. (Video demonstration required)

1.3 The high-speed infrared motion capture camera is equipped with a built-in display and a high contrast OLED, which can independently display information such as the high-speed infrared motion capture camera label. The body is equipped with an LED aperture, with orange and green colors that are constantly on and flashing, displaying the status of the high-speed infrared motion capture camera startup, waiting for network address allocation, communication, software selection of high-speed infrared motion capture camera, spatial calibration and testing process, etc.

**\*The** 1.4 high-speed infrared motion capture camera supports both active and passive reflective marker balls to capture motion trajectories. The active marker ball is 16x11mm, 3g, equipped with an IR synchronous receiving line, with a frequency range of 1-500fps adjustable, a maximum testing distance of ≥ 35 meters, and a usage time of ≥ 4.5h after full charging. There is no lead between the passive reflective marking ball and the acquisition system, no heating, and no radiation.

**\***1.5 Collect the motion trajectory of moving object markers through infrared light, and also capture images of moving objects during their movement through video function. There are 10 high-speed infrared motion capture cameras equipped with this function.

1.6 The video image must be overlaid and presented in real-time with the trajectory of the marked points captured by infrared light.

The 1.7 high-speed infrared motion capture camera supports both parallel and series connection methods. When using series connection, there is no need for an adapter, making it easy for the system to be quickly arranged.

**\*The** 1.8 high-speed infrared motion capture camera model is unlimited. After upgrading, the original high-speed infrared motion capture camera can continue to be used without obstacles and can be extended to be used in conjunction with underwater motion capture high-speed infrared motion capture cameras for swimming, underwater gait rehabilitation and other underwater motion project tests.

1.9 High speed infrared motion capture cameras must be able to be used outdoors, have active filtering function, and have anti-interference ability

**\***1 color video high-speed infrared motion capture camera, 9mm standard high-speed infrared motion capture camera, FOV 61 ° x 37 °, supporting 2 million pixels (1920 x 1080), with a full field and full resolution shooting speed of ≥ 85 fps. Supporting a shooting speed of ≥ 330 fps for full field and full resolution with a resolution of 500000 pixels (960 x 540).

**\***1.11 Color video high-speed infrared motion capture cameras and infrared high-speed infrared motion capture cameras must be produced by the same manufacturer and brand, and can be calibrated, calibrated, collected, and analyzed in the same space. The video image must be overlaid and presented in real-time with the trajectory of the marked points captured by infrared light.

**\***1.12 Synchronous connector: The connector can be used in series with high-speed infrared motion capture cameras, with input interfaces Trig NO, Trig NC, Event, Sync, SMPTE, Genlock, and output interfaces Measurement time, Out1, and Out2.

1.13 Camera cooling: ultra quiet, fanless design.

**\***1.14摄像机内置阳光滤镜，能够屏蔽太阳光等复杂环境光的干扰。

1.15 Camera size: ≤ 135 \* 130 \* 145mm.

1.16 Camera weight: ＜ 2.0kg.

1.17 Body materials: Die cast aluminum, polycarbonate and thermoplastic polyurethane, with built-in quick pan tilt mounting plate.

1.18 Built in infrared strobe: 24 high-power near-infrared light-emitting diodes with an infrared wavelength of 850nm.

1.19 Spatial resolution: 0.04mm (minimum motion can be measured at a distance of 10m).

1.20 Working temperature: -15-45 ℃.

1.21 Calibrator: 1 T-type two passive reflective ball corrector (600mm), and 1 L-type four passive reflective ball corrector.

The 1.22 camera is equipped with a Kensington lock anti-theft lock, and the body can be upgraded to IP67 protection level,.

1.23 Marker Ball Combination Set:

100 12.5mm marker balls and bases, 1 set of upper limb marker frame, 1 set of lower limb marker frame, double-sided adhesive tape, etc.

1.24 System synchronization: It can achieve internal synchronization with 3D force measurement platforms and wireless surface electromyography instruments.

**\***1.25 provides one set of high-precision IMU sensors, which can obtain data such as pitch angle and tilt angle of the measured object. The sensor is designed for full wireless, with a weight of ≤ 12g; Size: ≤ 40 \* 30 \* 10mm; Battery endurance: ≥ 6 hours; Delay: ≤ 30ms; Internal sampling rate of the sensor: ≥ 800Hz; The sensor adopts waterproof design, achieving IP68 waterproof level; Sensor data output method: Bluetooth 5.0, equipped with iPad program, supports the establishment of rigid body models and calculation of rigid body angle data; The IMU sensor has a secondary development function and is equipped with an SDK for Android and iOS; Sensor direction measurement accuracy: static tilt accuracy ≤ 0.5 °, heading accuracy ≤ 1 °; Dynamic tilt accuracy ≤ 1 °, heading accuracy ≤ 2 °; Provide PC data acquisition software for this motion sensor; (Technical proof materials of the sensor must be provided in the bidding documents, including screenshots of the PC data acquisition software interface that is compatible with this sensor).

**2. Software technical parameters:**

**2.1 Data acquisition software**

**\***2.1.1 Provide professional motion capture and analysis software in both Chinese and English, which enables various functions such as camera control, calibration, image capture, and motion trajectory analysis. The installation and use of motion acquisition software do not require a software dog, and it is allowed to install no less than 100 computers, making it easy for teachers and students of the purchasing unit to operate with multiple users.

2.1.2 The software displays the acquisition area of each motion capture camera for easy camera position adjustment.

2.1.3 Provide a working environment that supports real-time installation, calibration, collection, and real-time processing. It supports dynamic and static calibration and can be displayed in real-time without specifying the order of dynamic and static calibration. Users can choose according to their situation and provide custom calibration function.

2.1.4 Before testing and collection, it is not necessary to measure the length values of the upper and lower limbs, wrists, elbows, ankles, knees, and other dimensions of the human body using calipers or other instruments, and the collection system automatically calculates them.

2.1.5 supports real-time dynamic display in both 2D and 3D, with the ability to rotate and adjust the angle 360 degrees. The screen can be translated at any angle, and can be freely scaled to display stick images, dot matrix images, simulated graphics, and customized display modes. It also supports 2D display, and the camera motherboard supports 2D real-time tracking function.

2.1.6 Support XYZ coordinate display, both global coordinates and local coordinates of custom rigid bodies can be displayed/hidden in real time. Customize the color and form of the capture area, display/hide virtual markers and their motion trajectories, real-time 2D and 3D data, and achieve real-time interpolation operation. Interpolation data is automatically displayed with dashed lines, and custom interpolation operation parameters are displayed in multiple windows. Custom window categories include 2D, 3D, images, data, videos, graphics, etc.

2.1.7 Non defined impurity data can be manually defined and filtered, or all raw data can be collected without filtering to ensure that the data does not lose its smoothing function. Multiple smoothing algorithms are available, and the position (spatial 3D coordinates of any point) can be calculated/output manually through a custom smoothing mode. The spatial position of the rigid body coordinate center in the global coordinates can also be defined.

2.1.8 It is possible to adjust the aperture and exposure of the camera in the data acquisition software.

2.1.9 The software can access real-time data from the 3D force measurement platform and wireless surface electromyography, achieving synchronous acquisition of kinematic, dynamic, and electromyographic signals.

**\***2.1.10 Provide a biomechanical cloud computing platform for the analysis of biomechanical data. By utilizing online processing engines, all calculations for analysis and reporting are provided in the cloud platform, allowing users to perform cloud computing on data online, reprocess data at any time, and view test reports.

**\***2.1.11 The software supports calling and executing user-defined program scripts, achieving richer data processing and UI presentation functions. Program scripts can customize UI controls and implement their functions, obtain raw data from software interfaces, process the raw data through custom processing programs, and then present and use the processing results in the software.

**2.2** **Labview, Matlab real-time data communication plugin (plug** **in)**

The system provides real-time data communication plugins for Labview and Matlab, without the need for additional data processing. The collected motion capture data can be directly obtained and used by Labview and Matlab through the plugins.

**2.3** **Virtual Reality Engine** **Plugin**

The system has interface plugins with mainstream virtual reality software such as Unity, Unreal, iClone, and Maya, which do not require additional data processing. The collected data can be directly obtained and used by mainstream virtual reality software such as Unity and Unreal through plugins.

**\*2.4** **Original factory technical support: If the equipment is imported, a** registration certificate **for the** permanent representative office of a foreign manufacturing enterprise in China must be provided. The laboratory is designed and installed by the original factory engineer, and the manufacturer is certified by ISO and EC. Relevant certification documents and official seals are required.

**\*2.5** Imported equipment must provide a special authorization document and after-sales service commitment letter provided by the manufacturer or agent for this project.

**3** **Configuration requirements:**

|  |  |
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| **name** | **quantity** |
| Infrared motion capture camera | 10 units |
| Color video camera | 1 unit |
| Data/power cable | 1 set |
| Calibrator | 1 set |
| Sports Mark Set | 1 set |
| Professional 3D motion capture and acquisition software in both Chinese and English | 1 set |
| High precision IMU sensor | 1 set |
| IMU sensor PC data acquisition software | 1 set |
| Real Time SDK Secondary Development Kit | 1 set |
| Unity software data plugin | 1 set |
| Unreal software data plugin | 1 set |
| Matlab Real time Data Communication Plugin | 1 set |
| Labview real-time data communication plugin | 1 set |