DVRK Controller

The da Vinci Research Kit (dVRK) control system should consist of total of 4 embedded controllers, 2 for the Patient Side Manipulator (PSM) and 2 for the Master Tool Manipulator (MTM) of the DaVinci Surgical Robotics System (Classic). Each of the PSM/MTM controller should provide following functionalities and be able to communicate with a computer using the opensource DaVinci Research Kit platform for providing real-time control of the PSM/MTM at an update rate of 1 Khz or more. Following are the specifications for each of the controller box.

1. Two Field Programmable Gate Array (FPGA)-1394. The FPGA1394 board should use a Xilinx FPGA and provide a firewire interface and a 10BASE-T/100BASE-TX Ethernet port. This FPGA board should interface with the QLA board (item 2) and dMIB board (item 3).
2. Two Quad Linear Amplifier (QLA) boards where each of the QLA board should provides all hardware required for current (torque) control of four DC brush motors, using a bridge linear amplifier design. Each of the amplifier channel should have
    a. One 16-bit digital-to-analog converter (DAC) to enable the FPGA to set the desired motor current.
    b. Two 16-bit analog-to-digital converters (ADCs) to digitize the measured motor current and an external analog sensor (e.g., potentiometer).
    c. Differential receivers for one quadrature encoder with A, B, and Z (index) channels; these signals are routed to the FPGA board for quadrature decoding.
    d. Two OPA-549 power operational amplifiers (op amps) to provide bi-directional control of a motor from a single power supply (up to 6.25 Amps at up to 48 Volts).
    e. Digital inputs for one home and two limit switches; these can also be used as general-purpose inputs.
    f. One open-collector digital output with high current drive (up to 1 Amp).
3. One dMIB (da Vinci Manipulator Interface Board) for connection to PSM or MTM
4. A 12V (50W) logic power supply that provides power to the FPGA boards and the safety chain.
5. Each box should contains one or more motor power supplies that are connected to the QLAs.
    a. MTM: one 24V (75W) power supply connected to QLA #1 and one 12V (50W) power supply connected to supply QLA #2
    b. PSM: one 24V (225W) power connected to both QLAs.
6. LED interface boards showing controller status.
7. One AC power connector, with on/off switch
8. One 156-pin connector (for the MTM or the PSM)
9. Two FireWire connectors
10. Two Ethernet connectors
11. One or two 4 or 5-pin safety chain connectors (depending on version)
12. One DB15 foot pedal connector
13. Seven HD15 expansion connectors and one HD26 expansion connector
14. Scope of Warranty - Surgical robot
15. Catalogue:
16. Vendor eligibility criteria – Same as mentioned for Item II
17. Installation/commissioning – No
18. Warranty – 3 Years
19. AMC - No