PROCUREMENT SPECIFICATION

Bulletin 284D ArmorStart® Safety Distributed Motor Control with Variable Frequency Drive

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SAFETY VERSION DISTRIBUTED MOTOR CONTROL WITH VARIABLE FREQUENCY DRIVE

PART 1 GENERAL

1.01 QUALIFICATIONS

A. Manufacturer

1. The manufacturer shall have a minimum of 25 years of experience in the manufacture of distributed motor control.
2. The approved manufacturers are:

    a) Rockwell Automation Allen-Bradley
    b) Substitutions: None permitted

B. Support

1. The manufacturer shall maintain factory trained and authorized service facilities within 100 miles of the project and shall have a demonstrated record of service for at least the previous ten years.
2. Support personnel are to be direct employees of the manufacturer and be available 24 hours per day through a toll-free number.
3. The manufacturer shall provide all required start-up and training services.
4. The approved manufacturers are:

    a) Rockwell Automation Customer Support & Maintenance
    b) Substitutions: None permitted

C. Certification

1. To ensure all quality and corrective action procedures are documented and implemented, all manufacturing locations shall be certified to the ISO-9001 Series of Quality Standards.
2. Third-party manufacturers and brand labeling shall not be allowed.

1.02 REFERENCES

A. The distributed motor control (DMC) shall be suitable for safety applications up to Safety Category 4 PLe (TÜV assessment per ISO 13849-1:2008).
B. The distributed motor control shall be designed to meet or exceed the applicable requirements to comply with the standards:

1. UL/CSA

    a) UL 508C
    b) CSA C22.2, No. 14

2. EN/IEC

    a) EN 50178
    b) EN 61800-3
    c) EN/IEC 60947-4-2
    d) CE Marked per Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC

3. CCC
4. ODVA for DeviceNet

C. The distributed motor control shall be certified cULus (File No. E207834, Guides NMMS, NMMS7).

1.03 ENVIRONMENTAL REQUIREMENTS

A. The supplier shall confirm specified service conditions during and after installation of products.
B. The supplier shall maintain the area free of dirt and dust during and after installation of products.

1.04 PRE-MANUFACTURE SUBMITTALS

A. Refer to Section _____ for submittal procedures.
B. Product Data

1. Publications on distributed motor control.
2. Data sheets on all furnished options.

C. Specification Response

1. Detailed response to this specification showing where in the literature each requirement is satisfied.
2. Clearly identified clarifications and exceptions.

D. Installation Instructions

1. A copy of the manufacturer’s installation instructions, including receiving, handling and storage instructions.

E. Testing and Test Reports

1. Testing per manufacturer’s standard.
2. A copy of the test reports, if available, shall be provided as part of the final documentation.

1.05 FINAL SUBMITTALS

A. Refer to Section _____ for procedure on submittal of final documentation.

B. Supplier Certification

1. The supplier shall provide certification that the distributed motor control has been installed in accordance with the manufacturer's instructions.
2. The supplier shall provide certification that the distributed motor control settings have been properly adjusted.

C. Final Drawings

1. The manufacturer shall provide final drawings reflecting the "As-Shipped" state of the installed equipment.
2. Manufacturer drawings shall be provided in DWG format.
3. Manufacturer drawings do not need to be stamped if a drawing schedule is provided that lists the drawing numbers, revision levels, and status of drawings (Preliminary, Approval, Final, etc.).
4. The supplier shall be responsible for making any changes to the "As-Shipped" drawings from the manufacturer to reflect any field modifications.

D. Maintenance Data

1. Distributed motor control installation instructions and User Manual.
2. Parameter listing with final settings.
3. Field service report from start-up service.
4. Name and phone number for a local distributor for the spare parts.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. Allen-Bradley – Bulletin 284D ArmorStart Safety Distributed Motor Control with Variable Frequency Drive (No substitutions)

2.02 RATINGS

A. The distributed motor control (DMC) shall support a three-phase induction motor. DMC power circuit ratings:

1. Horsepower of 0.5 to 5 HP (0.4 to 3.3 kW).
2. Operating voltage of 380Y/220 VAC to 480Y/277 VAC.
3. Operating frequency of 50/60 Hz.

B. The DMC shall accept control power of 24 VDC (+10%, -15%) A2.
C. The DMC shall be equipped with a Short Circuit Protection Device (SCPD), Performance Type 1. The DMC shall have an I_{rms} of:

1. 30, 45 or 65 kA @ 480Y/277 VAC.
2. 30 or 65 kA @ 480 VAC.

D. The DMC shall be UL Listed for Group Motor Applications, sized per NFPA 70 (NEC) or NFPA 79.

E. The DMC's environmental ratings include:

1. Enclosure rating of Type 4/12/13 and IP67.
2. Operating temperature range of -20 to +40°C (-4 to +104°F).
3. Relative humidity range of 5 to 95%, non-condensing.
4. Operating shock resistance to 15 G.
5. Operating vibration resistance to 1 G, 0.15 mm (0.006 in.) displacement.
6. Ability to operate without de-rating to an elevation of 1000 m.
7. Application in Pollution Degree 3 environments.

2.03 CONSTRUCTION

A. The distributed motor control (DMC) shall be a modular plug-n-play design in a DeviceNet safety installation and shall offer variable speed control of a three-phase AC squirrel cage induction motor.

1. The DMC shall be combined with a TÜV certified safety I/O module to form a subsystem that is part of the overall machine stop function.
2. The DMC shall be connected to the safety I/O module through specified cable assemblies.
3. The DMC shall achieve Category 4 functionality by using redundant contactors.
4. The safety I/O module's inputs shall monitor the status of the safety-related contactors inside the DMC.
5. The safety I/O module's outputs shall provide control power to the DMC.

B. The DMC's drive performance shall be Sensorless Vector Control (SVC) — The DMC shall provide:

1. Exceptional speed regulation
2. Very high levels of torque across the entire speed range of the drive
3. Adaptation to individual motor characteristics

C. The DMC shall provide a local at-motor disconnect means by incorporating a motor circuit protector.
D. The DMC shall use quick disconnects for I/O and communications.
E. 3-phase power, control power and motor connections shall be made via a gland plate:

1. Conduit/cord-ready power options with 3/4 and 1 in. conduit holes:

a) Trunk and drop
b) Daisy chain

2. ArmorConnect® media option. The media shall be:

a) produced by the DMC manufacturer, or
b) UL 2237 and approved for use by the DMC manufacturer.

F. The DMC shall provide an internal EMI filter (option) and shall be CE compliant.
G. The DMC shall include a source brake contactor (option), an internal contactor used to switch the electromechanical motor brake on/off (motor brake is powered from the main power circuit).
H. A dynamic brake resistor (option) with plug-n-play design shall be available.

I. The DMC shall be supplied with a 3-meter unshielded 4-conductor cordset. If the DMC includes the EMI filter option, it shall be supplied with a shielded cordset.

J. The DMC shall include a local fault reset button and 4 status LEDs:

1. Power
2. Run
3. Network
4. Fault

K. The DMC shall also include externally accessible:

1. 2 relay output connections (Micro/M12) sourced from control power (A1 and A2) with status indication.
2. 4 inputs (Micro/M12) sourced from DeviceNet power (24 VDC) with status indication.
3. DeviceNet connection (Mini/M18).
4. Ground terminal.
5. A1/A2 - 24 VDC control power from the safety I/O module output.
6. Safety monitor input from the safety I/O module input.

L. The DMC shall have local control (option) with field-disable capability (except OFF): HAND – OFF – AUTO – JOG – FORWARD/REVERSE keypad.

M. I/O points shall be used with sensors and actuators.

1. Two 24 VDC nominal outputs – 0.5 A per point (max 1 A total outputs).
2. Four 24 VDC nominal inputs – 50 mA per point (200 mA total inputs).

2.04 COMMUNICATIONS

A. The distributed motor control (DMC) shall allow efficient data handling on the device-level DeviceNet network.

B. DeviceNet addressing shall be by hard set node address switches or by software node addressing.

C. The DMC shall support DeviceLogix™, which allows local control using simple embedded logic.

D. The DMC shall provide peer-to-peer zone interlocking parameters (ZIP) to allow direct communication with up to 4 other DeviceNet nodes.

2.05 CONFIGURATION

A. The distributed motor control (DMC) shall have the capability to be programmed by:

1. Add-On Profile (AOP) for CompactLogix and ControlLogix Controllers – The AOP is used for the Logix Designer programming tool in Studio 5000™ software, which is a single control platform. The AOP simplifies setup and commissioning via predefined tags and commissioning wizards and allows automatic tag generation and copy and paste functionality for quick setup and configuration of multiple DMCs. The Logix Designer programming tool is also used by the DMC's DeviceLogix program to perform configuration locally.
2. RSNetWorx™ – Using the DMC's embedded electronic data sheet (EDS), the device configuration tool RSNetWorx can configure the DMC.

2.06 FUNCTIONS

A. Motor control shall be of a 0.5 to 5 HP (0.4 to 3.3 kW) three-phase AC squirrel cage induction motor.
B. Electronic motor overload protection shall be accomplished with an I^2t algorithm.

1. Solid-state overload: 150% for 60 seconds or 200% for 3 seconds.
2. Class 10 protection with speed sensitive response and power-down overload retention function.
3. Overcurrent protection: 200% hardware limit, 300% instantaneous fault.

C. Fault diagnostics shall include:

1. Short Circuit
2. Over Temperature
3. Overload
4. Output Power Fuse Protection
5. Phase Short
6. DeviceNet Power Loss
7. Ground Fault
8. Internal Communication Fault
9. Stall
10. DC Bus Fault
11. Control Power Loss
12. EEprom Fault
13. Control Power Fuse Protection
14. Hardware Fault
15. I/O Fault
16. Over Current
17. Brake Fuse Protection

D. Device status parameters shall include:

1. Hdw Inputs
2. Network Inputs
3. Network Outputs
4. Trip Status
5. Starter Status
6. DNet Status
7. Starter Command
8. Breaker Type
9. Last Pr Fault
10. Warning Status
11. Output Frequency
12. Command Frequency
13. Output Current
14. Output Voltage
15. DC Bus Voltage

E. Basic configuration parameters shall include:

1. Motor NP Volts
2. Motor NP Hertz
3. Motor OL Current
4. Minimum Frequency
5. Maximum Frequency
6. Start Source
7. Stop Mode
8. Speed Reference
9. Accel Time 1
10. Decel Time 1

2.07 DETAILED SPECIFICATION

A. Power circuit:

1. Rated Impulsed Voltage (U_{imp}): 6 kV
2. Dielectric Withstand: UL – 2200 VAC, IEC – 2500 VAC
3. Reset Mode: Automatic or manual
4. Utilization Category: AC-3

B. DeviceNet:

1. DeviceNet Supply Voltage Rating Range: 11 to 25 VDC, 24 VDC nominal
2. DeviceNet Input Current:

   a) 167 mA @ 24 VDC – 4.0 W
   b) 364 mA @ 11 VDC – 4.0 W

3. DeviceNet Input Current Surge: 15 A for 250 μs
4. Baud Rates: 125, 250, 500 kbps
5. Distance Maximum:

   a) 500 m (1630 ft) @ 125 kbps
   b) 200 m (656 ft) @ 250 kbps
   c) 100 m (328 ft) @ 500 kbps

2.08 DIMENSIONS AND WEIGHT

A. The dimensions of the distributed motor control (DMC) shall not exceed 287.5 mm (11.32 in.) height x 444.38 mm (17.50 in.) width [or 420.38 mm (16.55 in.) width] x 266.9 mm (10.51 in.) depth with motor connection cable.
B. The approximate weight of the DMC shall be 13.6 kg (30 lb).

PART 3 EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

A. The supplier shall coordinate the shipping of equipment.
B. The supplier shall store the equipment in a clean and dry space.
C. The supplier shall protect the units from dirt, water, construction debris and traffic.

3.02 INSTALLATION

A. The supplier shall verify all distributed motor control components have been installed not exceeding the specifications or with proper derating prior to energizing.
B. The supplier shall follow local code and regulations with regard to electrical installation.
C. The supplier shall provide reasonable protection against accidental damage to component and associated cables.
D. The supplier shall ensure accessibility to diagnostic lights, communication ports and connection. These components shall be free from obstruction at all times.
E. The supplier shall verify all distributed motor control settings have been properly adjusted prior to energizing.

3.03 SPARE MATERIALS

A. The supplier shall provide one (1) spare distributed motor control of each size utilized, including options.

3.04 WARRANTY

A. The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of being energized, whichever occurs first.
B. The manufacturer shall confirm this warranty as part of the submittal.

END OF SECTION

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