

This section specifies instrumentation and control for HaliO® smart-tinting glass in CSI format.

SECTION 26 09 46 – NETWORK INSTRUMENTATION AND CONTROL OF ELECTROCHROMIC GLAZING

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes power, data, control and automation systems for electrochromic glazing, including integration with building automation systems.
- B. Related Sections:
 - 1. Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
 - 2. Division 23 Sections regarding Building Management System for HVAC.
 - 3. Division 25 Sections for integrated automation of multiple systems.
 - 4. Division 26 Sections for daylighting automation systems.

1.2 REFERENCES

- A. Reference Standards: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units" and as follows:
 - 1. Division 23 Sections regarding Building Management System for HVAC.
 - 2. Division 25 Sections for integrated automation of multiple systems.
 - 3. Division 26 Sections for daylighting automation systems.
- B. Preinstallation Meetings: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- C. Sequencing: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- D. Commissioning: [See Section 08 08 00 "Commissioning of Glazing Systems".]

1.4 ACTION SUBMITTALS

- A. Product Data: For power, signal, automation and remote management, and control components of system.
- B. Sustainable Design Requirements: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- C. Shop Drawings: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units", and as follows:
 - 1. Include cabinet configurations, including unique identifier for each driver associated with its glazing unit.
 - 2. Include cable lengths from each glazing unit to its driver.
 - 3. Include locations and mounting requirements for each of the following:
 - a. Power supply cabinet.
 - b. Wall mounted controls.
 - c. Sensors.
 - d. Gateway.
 - e. Tint selectors.
- D. Samples: To be provided upon request.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Instructions: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- B. Field Quality Control Submittals: Field reports from startup and testing.
- C. Qualification Statements: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Contracts See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- B. Operation and Maintenance Data: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- C. Warranty Documentation: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

1.7 MAINTENANCE MATERIALS

1.8 Spare Parts: Provided in accordance with Customer Purchase Agreement

- A. Qualifications for Installers: Installer shall have completed manufacturers training program and received certification.
- B. Qualifications for Testing Agencies: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

- C. Mock-ups: As required in Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: As required in Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

1.10 FIELD CONDITIONS

- A. Field Conditions: As required in Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

1.11 WARRANTY

- A. Warranty: As required in Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Manufacturer: Kinestral Technologies, Inc., distributed by:

Halio North America, LLC. 3955 Trust Way
Hayward, CA 94545
Email: salesna@halioglass.com

- B. Substitution Limitations:
 - 1. Substitutions are not permitted.

Select substitution limitation requirement above or below. Because Halio is uniquely consistent in color and rigorously factory-tested, it has no known equal. If project requires substitutions to be considered, retain and edit requirement below, but carefully review any proposed substitutions.

- 2. Substitutions will be considered according to [Instructions to Bidders] [Division 01 Section "Substitution Procedures"] [Division 01 Section "Product Requirements"].

Halio and Halio Black glazing units are available from 1'-11 15/16" (608 mm) to 10'-0 3/8" (3058 mm) tall by 1'-11 15/16" (608 mm) to 4'-11 3/8" (1508 mm) wide. They can be glazed into four-side captive glazing systems, including doors, sloped glazing, and skylights. Contact Halio North America for customization options.

- A. Electrochromic Glazing System
 - 1. Halio Insulating Glass Unit (IGU) or Halio Black IGU to be used for fenestration applications, or Halio Laminated Glass Unit (LGU) or Halio Black LGU for interior applications.
 - 2. Halio Component Cabinet: houses Halio electronics.

3. Halio System Gateway: coordinates communication between Halio or Halio Black IGUs/LGUs and Halio Cloud.
 4. Halio Tint Driver: sends power profile required to each Halio Glass unit to adjust tint levels.
 5. Halio Tint Selector: wireless wall-mounted controller for adjusting tint levels
 6. Halio System Power Supply: supplies 48VDC power for Halio system components
 7. Halio Energy Manager: provides peak power for fast tinting & backup power
 8. Halio Rooftop Sensor: senses changing sunlight and sky conditions for system automation
 9. Halio Wireless Range Extender: extends wireless network for device communication
 10. Halio Driver Cables: transmits power from Halio Tint Driver to Halio IGU/LGU or Halio Black IGU/LGU.
 11. Halio Mobile App: for remote control.
 12. Halio Dashboard: for desktop control, analytics, and support.
- B. Section 25 56 13 "Integrated Automation of Electrochromic Glazing System" for integrating system with building management or automation system.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrochromic Glazing System Performance: See Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Network Security Performance: Data shall be secured using TLS encryption, private keys, and oAuth2 for authentication.

2.3 ELECTROCHROMIC GLAZING CONTROLS

- A. Electrochromic Glazing Units: In-glass electronic components specified in Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".
- B. Electrochromic Component Cabinet.
 1. Wall-mounted (surface or recessed) cabinet for housing Tint Drivers, System Gateway, and Energy Manager.
 2. Material: 20-gauge powder-coated, electrogalvanized steel.
 3. Select from standard sizes (SM, M, L, XL) as required for driver count.
- C. Tint Drivers: transmit power to tint or clear each glazing unit.
 1. Electrical characteristics: Input 48VDC 8A; output 42VDC 8A.
 2. Power consumption:
 - a. Peak current draw: Less than 8A
 - b. Low standby power mode: Less than 0.25W.
- D. Cables:

1. Driver Cable: Molex cable assembly with phoenix connectors at pigtail of electrochromic glazing unit and at driver.
 - a. Shall withstand voltage of 300V DC
 - b. Cable Lengths: up to 300 ft.
 2. Power Cable: connects System Power Supply cabinet to the Components Cabinet
 - a. Maximum distance from power supply to drivers: 250 ft
- E. System Power Supply: Transforms high voltage AC to low voltage DC to power Halio electronics such as the Tint Driver, Gateway, and Energy Manager.
1. Power Supply Input Voltage: 100 – 240 VAC
 2. Output Voltage: 48 VDC.
 3. Output: 20 A at 48VDC total (10A per charging supply)
 4. Output Wiring: 4 x 14 AWG per charging supply (8 x 14 AWG total)
 5. Power Supply Efficiency: 90 percent.
- F. Energy Manager: stores power for Halio system, providing high peak power for fast tinting and failover power when building power is lost:
1. Power Input Voltage: 48VDC
 2. Power Output Voltage: 48VDC
 3. Peak Output Power: 3360W @ 48VDC
 4. Input Wiring: 2pr x 16 AWG from cabinet terminal block to 4-position connector
 5. Output Wiring: 16 position connector to 8pr x 16 AWG to cabinet terminal block
- G. Tint Selector: wall-mounted controller for manual control of pre-selected single or multiple electrochromic IGUs.
1. Tint Levels: Nine levels from clear state to fully-tinted state
 2. Connectivity: Wireless control network specified herein.
 3. LED shall provide visual confirmation of selected tint level
 4. Dimensions: 1.3 by 4.8 by 0.54 inch.
 5. RF connectivity: IEEE 802.15.4 wireless mesh, IPV6 TCP/IP
 6. Replaceable Battery type: CR2032
- H. System Gateway: Component Cabinet-mounted device serves as the secure connection between the local smart-tinting system and the cloud services; monitors and report on the status of system components.
1. Power source: 48VDC
 2. Network Interface: Ethernet 10/100 Mbps, DHCP-compatible
 3. Wireless antenna: Screw-on dipole. Optional external antennas.
 4. Operating system: Embedded Linux
 5. Mounting: DIN-rail within Component Cabinet
 6. RF connectivity: IEEE 802.15.4 wireless mesh, IPV6 TCP/IP
- I. Wireless Range Extender: repeats Halio wireless mesh network communication to extend range and ensure reliable communication between Halio electronics.
1. Input Power: 12VDC – 48VDC
 2. Power Consumption: <.25W
 3. Mounting: Ceiling mount using drywall screws and anchors
 4. Protocols: IEEE 802.15.4 wireless mesh, IPV6 TCP/IP

- J. Rooftop Sensor: monitors and reports sun position and changes in light levels and glare to Haliao Cloud.
 - 1. Power Input: 48VDC
 - 2. Sensing Range:
 - a. Range: 0 to 2000 W/ m²
 - b. Resolution: 0.6 W/ m²
- K. Junction Boxes and Conduit: As specified in Division 26 for low-voltage power and data conductors.

2.4 SOFTWARE AND USER INTERFACES

- A. Cloud Controller: Internet-based virtual computer
- B. User Interfaces: Complete system of software included in Owner-Manufacturer service contract, including, but not limited to the following interfaces:
 - 1. Web dashboard.
 - 2. Mobile device apps.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verification of Conditions: As specified in Section 08 88 34 "Electrochromic Glazing at Perimeter Fenestration"

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions:
 - 1. Use the Haliao Installation App to install the Tint Drivers, Gateway(s), Tint Selectors
 - 2. Connect the Haliao IGU/LGU Pigtail or Haliao Black IGU/LGU Pigtail to a Tint Driver.
 - a. The maximum cable length between Haliao driver and IGU cannot exceed 300 feet.
 - b. Cable recommended to be installed using a cable tray or J-hooks as per local code for low-voltage wiring
 - 3. Connect the System Power Supply to the building's input power within 250 feet (76 m) of the Haliao Component Cabinet.
 - a. Route line-voltage electrical wiring for AC input power through conduit connected to cabinet knock-outs.
 - b. Route DC power output cables from both power supplies to the desired Haliao Component Cabinets.
 - c. Connect all wiring using the power cabinet screw terminals.
- B. Electrochromic Glazing Installation, see Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units.

3.3 SYSTEM STARTUP

- A. System Startup:

1. System Commission: Complete functional system tests with documentation. Verification of all normal functionalities.
 2. System Optimization
 - a. Configuration of the system
 - b. Configuration of glare control settings.
 - c. Connection to Home Automation/Building Automation system and verification of functionalities.
- B. Manufacturer's Technical Representative shall provide guidance to first-time installers during the installation. A Halio representative will assist in the programming of daylight management automation system. On-site support for installation shall be provided when real-time support via mobile application does not resolve an issue.

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Connectivity testing.
 2. Power testing.
 3. Tinting and glazing performance inspection per Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units" commissioning requirements.
- B. Manufacturer's Field Services: Provided upon request when remote assistance is insufficient.
- C. Manufacturer's Remote Support Services: Provide factory real-time support for installers via mobile startup application.
- D. Coordination of Other Tests and Inspections: Cooperate with electrical commissioning and with commissioning specified in Section 08 08 00 "Commissioning of Glazing Systems".

3.5 CLOSEOUT ACTIVITIES

- A. Demonstration and Training: As specified in Section 08 88 34 "Electrochromic Glazing at Perimeter Fenestration".

3.6 MAINTENANCE

- A. Maintenance Service: Fully-managed service contract between Owner and electrochromic glazing manufacturer, as specified in Section 08 88 36.11 "Electronically Controlled Switchable Insulating Glass Units".

END OF SECTION

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