



**WaveLynx Technology Corporation**

100 Technology Drive, Suite B130

Broomfield, CO 80021

+1 720-572-4693

[WaveLynxTech.com](http://WaveLynxTech.com)

## **Architectural and Engineering Specification**

CSI Master Format

***NOTE: This is a transmittal page only and should be deleted from the specification document prior to publication or incorporation into a larger specification document.***

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WaveLynx Technologies  
100 Technology Drive  
Suite B130  
Broomfield, CO 80021  
720-572-4963  
[www.wavelynxtech.com](http://www.wavelynxtech.com)  
[info@wavelynxtech.com](mailto:info@wavelynxtech.com)

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### Product Guide Specification

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, based on *MasterFormat 2018*. *The Manufacturer is responsible for technical accuracy. By removing the references to specific Salient product names or part numbers, the text may also be used also in performance-based specifications.*

The section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the project and local building code. *Italicized Words and sentences within brackets [ ] are choices to include or exclude a particular item or statement.* Coordinate this section with other specification sections and the Drawings.

## SECTION 28 15 00 ELECTRONIC SAFETY AND SECURITY

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## **PART 1 GENERAL**

### 1.1 SUMMARY

- A. Related Sections
  - 1. Section 26 05 00 - Common Work Results for Electrical.

### 1.2 REFERENCES

- A. Electronic Industries Alliance (EIA):
  - 1. RS485 - Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multi-Point Systems.
- B. SIA/ANSI:
  - 1. Open Supervised Device Protocol (OSDP) **IEC CDV 60839-11-5 IEC 2019 VERIFIED**
  - 2. **Support for SIA OSDP V.2.2 DRAFT (09/24/2020)**
- C. LEAF Specification V3.0
- D. Federal Communications Commission (FCC):
  - 1. FCC Part 15 - Radio Frequency Device.
- E. Federal Information Processing Standards (FIPS):
  - 1. Advanced Encryption Standard (AES) (FIPS 197).
  - 2. FIPS 201: Personal Identity Verification (PIV) of Federal Employees and Contractors.
- F. National Fire Protection Association (NFPA):
  - 1. NFPA70 - National Electrical Code.
- G. Homeland Security Presidential Directive 12 (HSPD-12).
- H. Underwriters Laboratories (UL):
  - 1. UL294 - Access Control System Units.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Key Features.
  - 2. RF Technologies.
  - 3. Voltage and environmental.
  - 4. Dimensions.
  - 5. Warranty.
- B. Shop Drawings
  - 1. Submit complete shop drawings indicating system components, wiring diagrams and load calculations.
- C. Record Drawings:
  - 1. During construction maintain record drawings indicating location of equipment and wiring. Submit an electronic version of record drawings for the Security Management System not later than Substantial Completion of the project.

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- D. Operation and Maintenance Data:
  - 1. Submit manufacturer's operation and maintenance data, customized to the Security Management System installed. Include system and operator manuals.

### 1.4 QUALITY ASSURANCE

- A. Manufacturer: Minimum ten years' experience in manufacturing and maintaining Security Management Systems.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with original identification labels.
- B. Protect stored materials from environmental and temperature conditions following the manufacturer's instructions.
- C. Handle and operate products and systems according to the manufacturer's instructions.
- D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

### 1.6 WARRANTY

- A. Manufacturer's Warranty:
  - 1. WaveLynx Ethos Reader Warranty:
    - a. ET10 & ET20: Lifetime warranty
    - b. ET25: 3 Year warranty
  - 2. WaveLynx Credentials:
    - a. All Cards: Lifetime warranty
    - b. All Keyfobs: 3 Year warranty

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Acceptable Manufacturer:

WaveLynx Technologies  
100 Technology Drive  
Suite B130  
Broomfield CO 80021  
Tel: 720-572-4963  
wavelynxtech.com  
info@wavelynxtech.com

B. Substitutions: Not permitted.

### 2.2 ACCESS CONTROL READERS ETHOS

A. Contactless Smart Card Readers:

The Ethos line of multi-technology contactless access control readers offer standard technologies include Proximity (125 kHz), Smart (13.56 MHz), NFC, and Bluetooth. All Ethos readers are fully OSDP compliant and are currently enabled for Secure Channel and remote firmware upgrades.

All Ethos readers shall be equipped with a unique feature called OSDP Auto-Detect; this feature allows existing Wiegand communications to be transitioned to OSDP leveraging the same wires by automatically detecting and converting to the OSDP Secure Channel protocol when a PACS panel is upgraded.

1. Contactless Smart Card Readers: "Ethos", combining electronics and antenna in one package in the following configurations:
  - a. Surface Mounting Style:
    - 1) 13.56 MHz
    - 2) 125 kHz and 13.56 MHz
    - 3) 13.56 MHz and Mobile Bluetooth BLE and (NFC *Android Only*)
    - 4) 125 kHz and 13.56MHz and Mobile (NFC and Bluetooth BLE)
2. Comply with ISO 15693, ISO 14443A (CSN) ISO 14443B:
  - a. Read credentials complying with these standards.
3. Output credential data complying with SIA AC-01 Wiegand standard:
  - a. Reads standard proximity format data from MIFARE Classic cards and outputs data as encoded.
  - b. Reads card serial number (CSN) of a MIFARE or DESFire card with configurable outputs as 26-bit, 32-bit, 37-bit, 56-bit.
4. Data Security with MIFARE EV1 and EV2 Cards: Use up to 128-bit authentication keys to reduce risk of compromised data or duplicate cards.
  - a. The reader shall support MIFARE EV2 cards requiring matching keys in order to function together.

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- b. All RF data transmission between the card and reader will be encrypted, using a secure algorithm.
  - c. Reader shall support the LEAF 2.1+ data structure
  - d. Readers are configured with default keys but can optionally configured with WaveLynx Cc Custom Keysets (LEAF enabled) during manufacturing or after installation.
  - e. LEAF shall be enabled only on EV2 card formatting.
  - f. Shall read advanced access control data structure (ACD), with security features that include:
    - 1) Digital signatures
    - 2) Unique badge ID / site code sets
5. Reader shall support FSK and ASK legacy proximity credential support
- a. Readers shall support legacy unencrypted FSK and ASK formats
  - b. Shall report ASK in CASI 4002 format by default but can be configured to report CASI 4001 format
6. When transitioning legacy prox sites to secure LEAF enabled credentials, the WaveLynx Prox Filter simplifies the transition process. Unless the low frequency side of a dual technology card is filtered out, the panel will receive two identical credentials when the card is presented to WaveLynx multitech reader. The low frequency side of a dual technology card could also be duplicated, no longer providing a secure solution. Prox filter works as follows:
- a. Apply a custom WaveLynx Prox Filter to the multitech Ethos reader to specifically filter out all low-frequency credential reads for dual technology cards presented to the multitech reader
  - b. Low-frequency side of dual technology cards will work on existing prox readers
  - c. Existing low-frequency cards will still work with multitech readers
  - d. Secure side of dual technology card will work on multi-tech readers
7. Accelerometer based tamper detection
- a. Reader shall report a tamper if tilted 20° of the vertical or horizontal plane
  - b. Sensitivity shall be configurable to support more, less or disabled
8. Material:
- a. The reader electronics are conformally coated in a silicone water resistant coating.
  - b. UL294 compliant.
9. Provide ability to change operational features post installation using a factory-programmed command card or by reader mobile administration application i.e. mobile app. Additionally, firmware may be updated by programming the reader remotely.
- a. Command card operational programming options shall include:
    - 1) Output configurations.
    - 2) LED and Audio configurations.
    - 3) Keypad configurations.
    - 4) Reader key rolling
  - b. Reader mobile administration application & OSDP remote programming options through OSDP file transfer shall include:
    - 1) Output configurations.
    - 2) LED and Audio configurations.
    - 3) Keypad configurations.
    - 4) Reader key rolling



- 5) Reader and Bluetooth firmware updates
  
10. Provide the Following Programmable Audio/Visual Indication:
  - a. An audio transducer shall provide various tone sequences to signify access granted, access denied, power up, and diagnostics.
  - b. Three LEDs on keypad; green, red, and amber, shall provide clear visual status.
  - c. A high-intensity RGB light bar (HW 3.0 and later, pre 3.0 only RG LED) shall provide clear free programmable visual status that is visible even in bright sunlight.
11. Meet the Following Certifications:
  - a. Canada/UL 294.
  - b. EN302291
  - c. EN301489
  - d. EN300330
  - e. FCC.
  - f. IP55
  - g. UL 294
12. Meet the Following Environmental Specifications:
  - a. Operating Temperature Range:
    - 1) Minus 40° to 158°F
    - 2) Minus 40° to 70°C
  - b. Storage (Unpowered) Temperature Range:
    - 1) Minus 40° to 158°F
    - 2) Minus 40° to 70° C
  - c. Operating Humidity:
    - 1) 5 to 95 percent relative humidity non-condensing.
    - 2) Weatherized design suitable to withstand harsh environments.
      - a) The reader electronics are coated in a silicone water resistant coating. UL294 outdoor rated.
  - d. Cabling Requirements Wiegand:
  - e. Cable Distance: 500 feet (61 m).
  - f. Cable Type: 6-conductor No. 26 AWG minimum with overall foil shield and drain wire.
13. Cabling Requirements OSDP:
  - a. Cable Distance: 2 wire RS485 @ 1000 ft (305 m).
  - b. Cable Type: 4-conductor No. 26 AWG minimum with overall foil shield and drain wire.
14. Voltage Requirements:
  - a. 5-16 VDC
  - b. HS Code:
    - 1) 8471.60.9030
15. Manufacturing Country of Origin:
  - a. All products are manufactured, assembled and shipped from the USA.

**B. ET10-2 Mullion Reader 13.56 MHz**

1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 1.2 inches (0 to 3 cm) using EV1.

- b. Range: 0 to 2.2 inches (0 to 5.5 cm) using EV2.
  - 2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 64 / 111 mA at 5 VDC.
      - 2) Average/Peak: 62 / 109 mA at 12 VDC.
      - 3) Average/Peak: 61 / 108 mA at 16 VDC.
  - 3. Physical Specifications:
    - a. Dimensions: 5.1 x 1.7 x 0.71 inches (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.
- C. ET10-3 Mullion Reader 125KHz & 13.56Mhz**
- 1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
    - b. Range: 0 to 1.2 inches (0 to 3 cm) using EV1.
    - c. Range: 0 to 2.2 inches (0 to 5.5 cm) using EV2.
  - 2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 64 / 113 mA at 5 VDC.
      - 2) Average/Peak: 60 / 110 mA at 12 VDC.
      - 3) Average/Peak: 59 / 110 mA at 16 VDC.
  - 3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.
- D. ET10-6 Mullion Reader 13.56 MHz & Mobile**
- 1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 1.2 inches (0 to 3 cm) using EV1.
    - b. Range: 0 to 2.2 inches (0 to 5.5 cm) using EV2.
    - c. Range: 0 to 16 feet (0 to 5 m) use BLE
  - 2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 78 / 139 mA at 5 VDC.
      - 2) Average/Peak: 77 / 134 mA at 12 VDC.
      - 3) Average/Peak: 76 / 134 mA at 16 VDC.

3. Physical Specifications:
  - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
  - b. Weight: 7 oz (198 grams).
  - c. Material: Polycarbonate
    - 1) UL94 V2 Flame retardant
    - 2) UL746CFL Outdoor rated
  - d. Two-part design with separate mounting plate and reader body.
  - e. Color: Black.
- E. **ET10-7 Mullion Reader 125KHz & 13.56 MHz & Mobile**
  1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
    - b. Range: 0 to 1.2 inches (0 to 3 cm) using EV1.
    - c. Range: 0 to 2.2 inches (0 to 5.5 cm) using EV2.
    - d. Range: 0 to 16 feet (0 to 5 m) use BLE
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 77 / 112 mA at 5 VDC.
      - 2) Average/Peak: 73 / 134 mA at 12 VDC.
      - 3) Average/Peak: 72 / 134 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.
- F. **ET20-2 Single Gang Reader 13.56 MHz**
  1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
    - b. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 71 / 130 mA at 5 VDC.
      - 2) Average/Peak: 69 / 130 mA at 12 VDC.
      - 3) Average/Peak: 69 / 129 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1 x 1.7 x 0.71 inches (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant

- 2) UL746CFL Outdoor rated
- d. Two-part design with separate mounting plate and reader body.
- e. Color: Black.

**G. ET20-3 Single Gang Reader 125KHz & 13.56Mhz**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
  - b. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
  - c. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
- 2. Electrical Specifications:
  - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
  - b. Current requirements:
    - 1) Average/Peak: 79 / 139 mA at 5 VDC.
    - 2) Average/Peak: 75 / 136 mA at 12 VDC.
    - 3) Average/Peak: 74 / 135 mA at 16 VDC.
- 3. Physical Specifications:
  - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
  - b. Weight: 7 oz (198 grams).
  - c. Material: Polycarbonate
    - 1) UL94 V2 Flame retardant
    - 2) UL746CFL Outdoor rated
  - d. Two-part design with separate mounting plate and reader body.
  - e. Color: Black.

**H. ET20-6 Single Gang Reader 13.56 MHz & Mobile**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
  - b. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
  - c. Range: 0 to 16 feet (0 to 5 m) use BLE
- 2. Electrical Specifications:
  - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
  - b. Current requirements:
    - 1) Average/Peak: 83 / 156 mA at 5 VDC.
    - 2) Average/Peak: 82 / 153 mA at 12 VDC.
    - 3) Average/Peak: 81 / 153 mA at 16 VDC.
- 3. Physical Specifications:
  - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
  - b. Weight: 7 oz (198 grams).
  - c. Material: Polycarbonate
    - 1) UL94 V2 Flame retardant
    - 2) UL746CFL Outdoor rated
  - d. Two-part design with separate mounting plate and reader body.
  - e. Color: Black.

**I. ET20-7 Single Gang Reader 125KHz & 13.56 MHz & Mobile**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
  - b. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
  - c. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.

- d. Range: 0 to 16 feet (0 to 5 m) use BLE.
- 
- 2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 90 / 165 mA at 5 VDC.
      - 2) Average/Peak: 87 / 159 mA at 12 VDC.
      - 3) Average/Peak: 86 / 158 mA at 16 VDC.
  - 3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.

**J. ET25-2 Single Gang Keypad Reader 13.56 MHz**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
  - b. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
- 2. Electrical Specifications:
  - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
  - b. Current requirements:
    - 1) Average/Peak: 87 / 146 mA at 5 VDC.
    - 2) Average/Peak: 86 / 150 mA at 12 VDC.
    - 3) Average/Peak: 85 / 149 mA at 16 VDC.
- 3. Physical Specifications:
  - a. Dimensions: 5.1 x 1.7 x 0.71 inches (129 x 43 x 18 mm).
  - b. Weight: 7 oz (198 grams).
  - c. Material: Polycarbonate
    - 1) UL94 V2 Flame retardant
    - 2) UL746CFL Outdoor rated
  - d. Two-part design with separate mounting plate and reader body.
  - e. Color: Black.

**K. ET25-3 Single Gang Keypad Reader 125KHz & 13.56Mhz**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
  - b. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
  - c. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
- 2. Electrical Specifications:
  - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
  - b. Current requirements:
    - 1) Average/Peak: 105 / 169 mA at 5 VDC.
    - 2) Average/Peak: 98 / 162 mA at 12 VDC.

- 3) Average/Peak: 97 / 161 mA at 16 VDC.
3. Physical Specifications:
  - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
  - b. Weight: 7 oz (198 grams).
  - c. Material: Polycarbonate
    - 1) UL94 V2 Flame retardant
    - 2) UL746CFL Outdoor rated
  - d. Two-part design with separate mounting plate and reader body.
  - e. Color: Black.
- L. **ET25-6 Single Gang Keypad Reader 13.56 MHz & Mobile**
  1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
    - b. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
    - c. Range: 0 to 16 feet (0 to 5 m) use BLE
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 99 / 174 mA at 5 VDC.
      - 2) Average/Peak: 99 / 173 mA at 12 VDC.
      - 3) Average/Peak: 98 / 173 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.
- M. **ET25-7 Single Gang Keypad Reader 125KHz & 13.56 MHz & Mobile**
  1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
    - b. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
    - c. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
    - d. Range: 0 to 16 feet (0 to 5 m) use BLE
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 119 / 194 mA at 5 VDC.
      - 2) Average/Peak: 110/ 186 mA at 12 VDC.
      - 3) Average/Peak: 110/ 185 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.

- e. Color: Black.

## 2.3 ACCESS CONTROL READERS ETHOS PIV

### A. Contactless Smart Card Readers:

The Ethos PIV line of multi-technology contactless access control readers are designed for FIPS 201-2 identification validation in program such as GSA/FICAM.

This line of readers is fully compliant with the SIA ISDP protocol for validation of PKI based Smart Cards (PIV, PIV-1, CIV, TWIC, and CAC) using the INID protocol only. Standard technologies include Proximity (125 kHz), Smart (13.56 MHz), NFC, and Bluetooth. All Ethos readers are fully OSDP compliant and are currently enabled for Secure Channel and remote firmware upgrades.

All Ethos readers are equipped with a unique feature called OSDP Auto-Detect; this feature allows existing Wiegand communications to be transitioned to OSDP leveraging the same wires by automatically detecting and converting to the OSDP Secure Channel protocol when a PACS panel is upgraded.

1. Firmware Revision
  - a. Ethos 2.4.1.0 or later with PIV configuration
2. Compliance
  - a. NIST SP-800-116
  - b. SDP Compliant to IEC CDV 60839-5:2015
3. Contactless Smart Card Readers: "Ethos PIV", combining electronics and antenna in one package in the following configurations:
  - a. Surface Mounting Style:
    - 1) 13.56 MHz
    - 2) 125 kHz and 13.56 MHz
4. Configurable to comply with ISO 14443A (CSN) ISO 14443B:
  - a. Read credentials complying with these standards.
5. Optionally configurable to output credential data complying with SIA AC-01 Wiegand standard:
  - a. Reads standard proximity format data from MIFARE Classic cards and outputs data as encoded.
  - b. Reads card serial number (CSN) of a MIFARE or DESFire card with configurable outputs as 26-bit, 32-bit, 37-bit, 56-bit.
6. Optionally configurable for data security with MIFARE EV1 and EV2 Cards: Use up to 128-bit authentication keys to reduce risk of compromised data or duplicate cards.
  - a. The reader shall support PIV/CIV/PIV1
  - b. All RF data transmission between the card and reader will be encrypted, using a secure algorithm.
7. Material:
  - a. The reader electronics are conformally coated in a silicone water resistant coating.
  - b. UL294 compliant.
8. Provide ability to change operational features in the field using a factory-

## WaveLynx Secure Access Control Products Specification

programmed command card or by reader utility application i.e. mobile app. Additionally, firmware may be updated by programming the reader through OSDP. Command card operational programming options shall include:

- a. Output configurations.
  - b. LED and Audio configurations.
  - c. Keypad configurations.
9. Provide the Following Programmable Audio/Visual Indication:
- a. An audio transducer shall provide various tone sequences to signify access granted, access denied, power up, and diagnostics.
  - b. Three LEDs on keypad; green, red, and amber, shall provide clear visual status.
  - c. A high-intensity RGB light bar (HW 3.0 and later, pre 3.0 only RG LED) shall provide clear free programmable visual status that is visible even in bright sunlight.
10. Meet the Following Certifications:
- a. Canada/UL 294.
  - b. EN302291
  - c. EN301489
  - d. EN300330
  - e. FCC.
  - f. IP55
  - g. UL 294
11. Meet the Following Environmental Specifications:
- a. Operating Temperature Range:
    - 1) Minus 40° to 158°F
    - 2) Minus 40° to 70°C
  - b. Storage (Unpowered) Temperature Range:
    - 1) Minus 40° to 158°F
    - 2) Minus 40° to 70° C
  - c. Operating Humidity:
    - 1) 5 to 95 percent relative humidity non-condensing.
  - d. Weatherized design suitable to withstand harsh environments.
    - 1) The reader electronics are coated in a silicone water resistant coating. UL294 outdoor rated.
12. Cabling Requirements Wiegand:
- a. Cable Distance: 500 feet (61 m).
  - b. Cable Type: 6-conductor No. 26 AWG minimum with overall foil shield and drain wire.
13. Cabling Requirements OSDP:
- a. Cable Distance: 2 wire RS485 @ 4000 ft (1200 m).
  - b. Cable Type: 4-conductor No. 26 AWG minimum with overall foil shield and drain wire.
14. Voltage Requirements:
- a. 5-16 VDC
15. Manufacturing Country of Origin:
- a. All products are manufactured, assembled and shipped from the USA.

### B. ET10-2PS Mullion Reader 13.56 MHz

1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 1.2 inches (0 to 3 cm) using EV1.



- b. Range: 0 to 2.2 inches (0 to 5.5 cm) using EV2.
- 2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 53 / 113 mA at 5 VDC.
      - 2) Average/Peak: 51 / 109 mA at 12 VDC.
      - 3) Average/Peak: 50 / 109 mA at 16 VDC.
  - 3. Physical Specifications:
    - a. Dimensions: 5.1 x 1.7 x 0.71 inches (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.

**C. ET10-3PS Mullion Reader 125KHz & 13.56Mhz**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
  - b. Range: 0 to 1.2 inches (0 to 3 cm) using EV1.
  - c. Range: 0 to 2.2 inches (0 to 5.5 cm) using EV2.
- 2. Electrical Specifications:
  - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
  - b. Current requirements:
    - 1) Average/Peak: 47 / 112 mA at 5 VDC.
    - 2) Average/Peak: 46 / 111 mA at 12 VDC.
    - 3) Average/Peak: 45 / 110 mA at 16 VDC.
- 3. Physical Specifications:
  - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
  - b. Weight: 7 oz (198 grams).
  - c. Material: Polycarbonate
    - 1) UL94 V2 Flame retardant
    - 2) UL746CFL Outdoor rated
  - d. Two-part design with separate mounting plate and reader body.
  - e. Color: Black.

**D. ET20-2PS Single Gang Reader 13.56 MHz**

- 1. Typical Contactless Smart Card Read Ranges:
  - a. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
  - b. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
- 2. Electrical Specifications:
  - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
  - b. Current requirements:
    - 1) Average/Peak: 56 / 130 mA at 5 VDC.
    - 2) Average/Peak: 54 / 130 mA at 12 VDC.

- 3) Average/Peak: 53 / 130 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1 x 1.7 x 0.71 inches (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.
- E. **ET20-3PS Single Gang Reader 125KHz & 13.56Mhz**
  1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
    - b. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
    - c. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 77 / 112 mA at 5 VDC.
      - 2) Average/Peak: 73 / 134 mA at 12 VDC.
      - 3) Average/Peak: 72 / 134 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.
- F. **ET25-2PS Single Gang Keypad Reader 13.56 MHz**
  1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
    - b. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 73 / 147 mA at 5 VDC.
      - 2) Average/Peak: 71 / 150 mA at 12 VDC.
      - 3) Average/Peak: 70 / 149 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1 x 1.7 x 0.71 inches (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.

- G. **ET25-3PS Single Gang Keypad Reader 125KHz & 13.56Mhz**
1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 4 inches (0 to 10 cm) using Prox
    - b. Range: 0 to 1.5 inches (0 to 3.8 cm) using EV1.
    - c. Range: 0 to 2.5 inches (0 to 6.3 cm) using EV2.
  2. Electrical Specifications:
    - a. Operating voltage: 7 to 18 VDC, reverse voltage protected. Linear power supply recommended.
    - b. Current requirements:
      - 1) Average/Peak: 86 / 169 mA at 5 VDC.
      - 2) Average/Peak: 81 / 164 mA at 12 VDC.
      - 3) Average/Peak: 80 / 163 mA at 16 VDC.
  3. Physical Specifications:
    - a. Dimensions: 5.1" x 1.7" x 0.71" (129 x 43 x 18 mm).
    - b. Weight: 7 oz (198 grams).
    - c. Material: Polycarbonate
      - 1) UL94 V2 Flame retardant
      - 2) UL746CFL Outdoor rated
    - d. Two-part design with separate mounting plate and reader body.
    - e. Color: Black.

#### 2.4 USB Readers:

USB readers can be configured to read CSN and 125KHz or with a Secure access Module (SAM) to read secure applications.

For secure applications, The SP Plus Reader with Secure access Module (SAM) may be used. The reader comes loaded with a SAM administered by WaveLynx Key Management Services. This reader is compatible with LEAF enabled credentials for applications such as enrollment and secure printing.

- A. **~~WL-RDR-80MH1AKU-LF~~ WL-RDR-80MH1AKU-LF USB Reader 125KHz & 13.56Mhz**
1. Typical Contactless Smart Card Read Ranges:
    - a. Range: 0 to 3.0 inches (0 to 7.5 cm) using Prox
    - b. Range: 0 to 3.0 inches (0 to 7.5 cm) using EV1.
    - c. Range: 0 to 3.0 inches (0 to 7.5 cm) using EV2.
  2. Cable length
    - a. P06M: 6 ft (standard for desktop applications)
    - b. P02M 2.5 inch (63.5 mm) Mini USB Male
    - c. P05M 5 inch (127 mm) Mini USB Male
    - d. P07M 7 inch (177.8 mm) Mini USB Male
  3. Electrical Specifications:
    - a. USB 2.0
    - b. Current requirements:
      - 1) Average/Peak: 70 / 100 mA at 5 VDC.
  4. Physical Specifications:
    - a. Dimensions: 0.6 x 2 x 3 inches (15 x 50 x 76 mm).

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- b. Weight: 2.7 oz (76.5 grams).
- c. Material: Silicone water resistant coating.
  - 1) UL294 compliant.
- d. Color: Black

### 2.5 ACCESS CONTROL CREDENTIALS

Access cards shall be used with access readers to gain entry to access controlled portals (e.g., doors, gates, turnstiles) and to hold information specific to the user and shall be Contactless Smart Card or Contactless Card technology credentials.

- 1. Contactless Smart Card Read Range:
  - a. Range: 0 to 2.5" inches (0 to 6 cm) using EV2
- 2. LEAF Compatibility
  - a. Smart Card shall support a full AES 128-bit encryption mode.
  - b. Every LEAF card is issued in a secure facility to guarantee that the (NXP) transport keys are securely updated and to ensure that every card is authentic and secure
  - c. Smart Card shall come with an advanced access control data structure (ACD), with security features that include digital signatures, unique badge ID / site code sets, and tiered security access privileges
  - d. Advanced Key Management support: The card design allows for the secure applications to be protected by custom keys at issuance or at any time during the lifetime of the product. Additional applications can be added anytime, and without affecting the security of the access control application.
  - e. Standard WaveLynx Manufacturing key support: DESFire EV2 or EV3 based credentials issued by WaveLynx.
  - f. LEAF Cc (Custom Crypto) support: The design of the LEAF card also allows for the card to be protected by end-user or OEM owned custom keys. The LEAF cards can be ordered with custom keys.
- 3. The card shall meet the ISO 14443A specification for contactless smart cards.
- 4. The card shall meet ISO 7810 specifications for length, width, thickness, flatness, card construction and durability, and shall be in a form suitable for direct two-sided dye-sublimation or thermal transfer printing on the specified badge printer.
- 5. The card shall not carry any identification showing the location of the property unless otherwise specified herein.

#### **A. 4K (#50H4) and 8K (#50H8) MIFARE DESFire EV2 Contactless Smart Cards**

- 1. Shall support 13.56 MHz NXP contactless smart chip and antenna.
- 2. The card shall support capability, with a minimum of 4 Kbits (512 bytes) of EEPROM memory or 8 Kbits (2048 bytes) of EEPROM memory.
  - 1) Data retention shall be 10 years, nominal.
- 3. Physical Specifications:

- a. Dimensions: 3.37" x 2.13" x 0.03" (85.6 x 54 x 0.8 mm).
4. Environmental Specifications:
  - a. Storage & Operating Temperature Range:
    - 1) -50° to 160°F
    - 2) 10° to 70°C
5. The card shall be capable of accepting a slot punch on either vertical or horizontally, allowing it to be hung from a strap/clip in either orientation.
6. Colors available:
  - a. White
7. Warranty: Lifetime

**B. 4K (#50D4) and 8K (#50D8) Dual Frequency Proximity and MIFARE DESFire EV2 Contactless Smart Cards**

1. Shall support 125 kHz and 13.56 MHz NXP contactless smart chip and antenna.
2. The card shall support capability, with a minimum of 4 Kbits (512 bytes) of EEPROM memory or 8 Kbits (2048 bytes) of EEPROM memory.
  - 1) Data retention shall be 10 years, nominal.
3. Physical Specifications:
  - a. Dimensions: 3.37" x 2.13" x 0.03" (85.6 x 54 x 0.8 mm).
4. Environmental Specifications:
  - a. Storage & Operating Temperature Range:
    - 1) -50° to 160°F
    - 2) 10° to 70°C
5. The card shall be capable of accepting a slot punch on either vertical or horizontally, allowing it to be hung from a strap/clip in either orientation.
6. Colors available:
  - a. White
7. Warranty: Lifetime

**C. 8K (#60H8) MIFARE DESFire EV2 Keyfob**

1. Shall support 13.56 MHz NXP contactless smart chip and antenna.
2. The card shall support capability, with a minimum 8 Kbits (2048 bytes) of EEPROM memory.
  - 1) Data retention shall be 10 years, nominal.
3. Physical Specifications:
  - a. Dimensions: 1.57" x 1.22" x 0.19" (39.9 x 31 x 4.9 mm).
4. Environmental Specifications:
  - a. Storage & Operating Temperature Range:
    - 1) -13° to 176°F
    - 2) -25° to 80°C
5. Colors available:
  - a. Black with white center
6. Warranty:
  - a. The key fob shall be warranted against defects in materials and workmanship for three years.
7. The Key Fob shall be constructed of durable injection molded Polycarbonate UL94HB plastic center disc and an ABS UL94HB housing. The housing is molded with a slot in one end, and shall be suitable for placement on a key ring.

**D. Mobile Credential SDK**

1. WaveLynx Mobile SDK provides:
  - a. All base components needed to build a Mobile Credential Platform.
  - b. Reference Mobile Applications — for iOS® and Android®, which handle credential issuance and reader communication.
  - c. Customer ability to add features, functionality, and branding.

## **PART 2 EXECUTION**

### **2.1 EXAMINATION**

- A. Examine site conditions to determine site conditions are acceptable without qualifications. Notify Owner in writing if deficiencies are found. Starting work is evidence that site conditions are acceptable.

### **2.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **2.3 INSTALLATION**

- A. Supervise installation to appraise ongoing progress of other trades and contracts, make allowances for all ongoing work, and coordinate the requirements of the installation.

### **2.4 FIELD TESTING AND CERTIFICATION**

- A. Testing: User identification cards shall be tested in accordance with the following:
  - 1. Conduct a complete inspection and test of all installed readers. This includes testing and verifying connection to equipment of other divisions such as life safety and elevators.
  - 2. Provide staff to test all devices and all operational features of the System for witness by the Owner's representative and authorities having jurisdiction as applicable.
  - 3. Correct deficiencies until satisfactory results are obtained.
  - 4. Submit written copies of test results.

### **2.5 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION