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**Product Guide Specification**

**SECTION 28 23 29  
VIDEO SURVEILLANCE REMOTE DEVICES AND SENSORS  
BOSCH AUTODOME 7100i**

**PART 1 – GENERAL**

1.1 SUMMARY

1.A. Section Includes

1.A.1. Security Lighting

1.B. Related Sections

1.B.1. Section [28 23 13 – Video Surveillance Control and Management Systems].

1.B.2. Section [28 23 16 – Video Surveillance Monitoring and Supervisory Interfaces].

1.B.3. Section [28 23 19 – Digital Video Recorders and Analog Recording Devices].

1.B.4. Section [28 23 23 – Video Surveillance Systems Infrastructure].

\*\*\*\*\*Specifier's note: Include those standards referenced elsewhere in this SECTION.

## 1.2 REFERENCES

### 2.A. Canadian Standards Association (CSA)

- 2.A.1. Complies with CAN/CSA product safety standards.

### 2.B. European Norm

- 2.B.1. Complies with CE Product Safety regulations
- 2.B.2. Complies with EN Product Safety standards
- 2.B.3. EN 55032:2015+A11:2020 Class A - Electromagnetic compatibility of multimedia equipment - Emission Requirements.
- 2.B.4. CISPR 32:2015 Class A - Electromagnetic compatibility of multimedia equipment - Emission Requirements.
- 2.B.5. EN 50130-4:2011+A1:2014 - Alarm standard. Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and alarm systems.
- 2.B.6. EN-62368-1 Ed. 2 Audio/video, information and communication technology equipment –Part 1: Safety requirements
- 2.B.7. UL 62368-1
- 2.B.8. CAN/CSA-C22.2 No. 62368-1-14
- 2.B.9. IEC 62368-1 Ed. 2
- 2.B.10. IEC/EN/UL 60950-22 Ed. 2 Information technology equipment – Safety – Part 22: Equipment to be installed outdoors
- 2.B.11. EN 50121-4:2017 Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signaling and telecommunications apparatus
- 2.B.12. Power service: NEMA TS2 Section 2.2.7.2
- 2.B.13. Power interruption: NEMA TS2 Section 2.2.10

### 2.C. Federal Communications Commission (FCC) ([www.fcc.gov](http://www.fcc.gov))

- 2.C.1. Complies with FCC 47 CFR PART 15 SUBPART B:2022 Class A.

### 2.D. HD standards

- 2.D.1. Complies with the SMPTE 274M-2008 Standard in:
  - 2.D.1.a. Resolution: 1920x1080
  - 2.D.1.b. Scan: Progressive
  - 2.D.1.c. Color representation: complies with ITU-R BT.1120
  - 2.D.1.d. Aspect ratio: 16:9
  - 2.D.1.e. Frame rate: 25, 30, 50 and 60 frames/s
- 2.D.2. Complies with the 296M-2001 Standard in:
  - 2.D.2.a. Resolution: 1280x720
  - 2.D.2.b. Scan: Progressive
  - 2.D.2.c. Color representation: complies with ITU-R BT.1120
  - 2.D.2.d. Aspect ratio: 16:9
  - 2.D.2.e. Frame rate: 25, 30, 50 and 60 frames/s

### 2.E. Complies with ICES-003, ICES-003 Issue 7:2020, ICES-Gen Issue 1:2021-02 and VCCI-CISPR 32:2016 (Class A) regulations.

- 2.F. International Electrotechnical Commission (IEC)
  - 2.F.1. Complies with IEC Product Safety standards
- 2.G. Underwriters Laboratories, Inc. (UL) (www.ul.com)
  - 2.G.1. Complies with UL standards.

### 1.3 SYSTEM DESCRIPTION

#### 3.A. Section Includes

- 3.A.1. Video Surveillance Remote Devices

#### 3.B. Performance Requirements

- 3.B.1. The PTZ camera shall be a full-featured HD PTZ unit designed for discrete video surveillance applications in outdoor environments.
- 3.B.2. The PTZ camera shall be a high performance 1/2.8-in-type CMOS sensor with up to 1920 x 1080 (2 MP) resolution.
- 3.B.3. The PTZ camera shall offer enhanced system flexibility with dual recording (iSCSI and SD card) options.
- 3.B.4. The PTZ camera shall support the following dual, redundant power options:
  - 3.B.4.a. 24 VAC / 36 VDC
  - 3.B.4.b. IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan
- 3.B.5. The PTZ camera shall default to use power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan power supply, if connected.
- 3.B.6. The PTZ camera shall switch to the 24 VAC/36 VDC power supply if power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan is lost.
- 3.B.7. The PTZ camera shall offer a theoretical dynamic range of 120 dB for clear images in extreme high-contrast environments.
- 3.B.8. The PTZ camera shall offer a measured HDR value of 92 dB per IEC 62676 part 5.
- 3.B.9. The PTZ camera shall provide direct network connection using H.265, H.264, and M-JPEG compression and bandwidth throttling to manage bandwidth and storage requirements efficiently while delivering outstanding image quality.
- 3.B.10. The PTZ camera shall offer embedded Intelligent Video Analysis (IVA) that eliminates dedicated PCs and associated software maintenance.
- 3.B.11. The PTZ camera shall conform to the ONVIF standard to provide interoperability with other conformant systems.
- 3.B.12. The PTZ camera shall offer 3 fully configurable streams with stream prioritization.
- 3.B.13. The PTZ camera shall have an autofocus lens with 40x optical/32x digital zoom.

- 3.B.14. The PTZ camera shall have variable pan and tilt speeds, and auto pivot capability for optimal camera control and viewing at all zoom levels.
- 3.B.15. The PTZ camera shall offer bi-directional audio.
- 3.B.16. The PTZ camera shall support 256 user-defined pre-positions.
- 3.B.17. The PTZ camera shall:
  - 3.B.17.a. Offer IP66 environmental protection
  - 3.B.17.b. Conform to the UL Type 4X standard for the following:
    - 3.B.17.b.1) Access to Hazardous parts
    - 3.B.17.b.2) Ingress of solid foreign objects (falling dirt, circulating dust, settling dust)
    - 3.B.17.b.3) Ingress of water (dripping and light splashing, hose down and splashing)
    - 3.B.17.b.4) Corrosive agents
  - 3.B.17.c. Meet the requirements for UL Type 4X certification with use of a polycarbonate bubble.

## 1.4 SUBMITTALS

4.A. Submit under provisions of Section [01 33 00.]

4.B. Product Data:

4.B.1. Manufacturer's data, user and installation manuals for all equipment and software programs including computer equipment and other equipment required for complete video management system.

4.C. Shop Drawings; include

4.C.1. System device locations on architectural floor plans.

4.C.2. Full Schematic of system, including wiring information for all devices.

4.D. Closeout Submittals

4.D.1. User manual.

4.D.2. Parts list.

4.D.3. System device locations on architectural floor plans.

4.D.4. Wiring and connection diagram.

4.D.5. Maintenance requirements.

## 1.5 QUALITY ASSURANCE

5.A. Manufacturer:

5.A.1. Minimum of [10] years' experience in manufacture and design Video Surveillance Devices.

5.B. Video Surveillance System:

5.B.1. CAN/CSA compliant

5.B.2. Certified compliant to FCC and CE for the required loads. Test methods are in accordance with Industry Canada and the IEC. Provide evidence of compliance upon request.

5.C. Installer:

5.C.1. Minimum of [5] years' experience installing Video Surveillance System.

## 1.6 DELIVERY, STORAGE AND HANDLING

- 6.A. Comply with requirements of Section 01 60 00.
- 6.B. Deliver materials in manufacturer's original, unopened, undamaged containers; and unharmed original identification labels.
- 6.C. Protect store materials from environmental and temperature conditions following manufacturer's instructions.
- 6.D. Handle and operate products and systems according to manufacturer's instructions.
- 6.E. Bosch provides off-the-shelf availability for our top selling products and same-day or 24-hour shipping.

## 1.7 WARRANTY

- 7.A. The Bosch AUTODOME family of products is covered by a limited hardware warranty period of 3 years for moving parts and 5 years for non-moving parts, from the date of shipment, against any proved defect in materials or workmanship. This warranty will be limited to a period of one year from the date of original purchase for moving parts such as, but not limited to:
  - 7.A.1. Pan/Tilt drive and belts
  - 7.A.2. Electrical slip-ring contacts

## 1.8 MAINTENANCE

- 8.A. Make ordering of new equipment for expansions, replacements, and spare parts available to dealers and end users.
- 8.B. Provide factory direct technical support from 8:00 a.m. to 8:00 p.m. via phone and e-mail.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

#### 1.A. Acceptable Manufacturer:

Bosch Security Systems, LLC  
130 Perinton Parkway  
Fairport, New York, 14450, USA  
Phone: + 1 800 289 0096  
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#### 1.B. Substitutions: [Not permitted.] [Under provisions of Division 1.]

- 1.B.1. [All proposed substitutions must be approved by the Architect or Engineer professional.]
- 1.B.2. [Proposed substitutions must provide a line-by-line compliance documentation.]

## 2.2 BOSCH AUTODOME 7100i CAMERA [NDP-7602-Z40]

### 2.A. General Characteristics:

- 2.A.1. The PTZ camera shall provide a 1/2.8-inch type CMOS day/night camera with the following minimum capabilities:
  - 2.A.1.a. 1920x1080 effective picture elements.
  - 2.A.1.b. Sensitivity down to 0.0010 lux.
- 2.A.2. The PTZ camera shall have direct network connection using H.265, H.264, and M-JPEG compression and bitrate selection per encoder profile to manage bandwidth and storage requirements efficiently while delivering outstanding image quality.
- 2.A.3. The PTZ camera shall support the following dual, redundant power options:
  - 2.A.3.a. 24 VAC
  - 2.A.3.b. 36 VDC
  - 2.A.3.c. PoE (IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan)
- 2.A.4. The PTZ camera shall default to use power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan power supply, if connected.
- 2.A.5. The PTZ camera shall switch to the 24 VAC/36 VDC power supply if power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan is lost.
- 2.A.6. The PTZ camera shall offer a theoretical dynamic range of 120 dB for clear images in extreme high-contrast environments.
- 2.A.7. The PTZ camera shall offer a measured HDR of 92dB per IEC 62676 part 5
- 2.A.8. The PTZ camera shall offer 256 user-defined pre-positions with 40-character titles.
- 2.A.9. The PTZ camera shall offer configurable, pre-programmed user modes.
- 2.A.10. The PTZ camera shall offer bi-directional audio.
- 2.A.11. The PTZ camera shall offer an optional direct fiber optic SFP connection to the camera, through an SFP slot designed to accept 1Gbps SFP modules for use with Multimode or Single mode optical fiber with LC or SC connectors.
- 2.A.12. The PTZ camera shall be able to be mounted to a wall or mounted to a pipe.
- 2.A.13. The PTZ camera shall:
  - 2.A.13.a. Offer IP66 environmental protection
  - 2.A.13.b. Conform to the UL Type 4X standard for the following:
    - 2.A.13.b.1) Access to Hazardous parts
    - 2.A.13.b.2) Ingress of solid foreign objects (falling dirt, circulating dust, settling dust)
    - 2.A.13.b.3) Ingress of water (dripping and light splashing, hose down and splashing)
    - 2.A.13.b.4) Corrosive agents

- 2.A.13.c. Conform to the IK10 rating for external mechanical impact.
- 2.A.13.d. Meet the requirements for UL Type 4X certification with use of a polycarbonate bubble.
- 2.A.14. The PTZ camera shall support the following languages:
  - 2.A.14.a. English
  - 2.A.14.b. Czech
  - 2.A.14.c. Dutch
  - 2.A.14.d. French
  - 2.A.14.e. German
  - 2.A.14.f. Italian
  - 2.A.14.g. Polish
  - 2.A.14.h. Portuguese (Brazilian)
  - 2.A.14.i. Russian
  - 2.A.14.j. Spanish
  - 2.A.14.k. Japanese
  - 2.A.14.l. Chinese (simplified)

2.B. Imaging

- 2.B.1. The PTZ camera shall offer a 1/2.8-inch type CMOS imager.
- 2.B.2. The PTZ camera shall offer a minimum effective number of pixels of 1920x1080.
- 2.B.3. The PTZ camera shall offer a 40x optical zoom lens (4.25 to 170mm focal lengths).
- 2.B.4. The PTZ camera shall offer a 32x digital zoom.
- 2.B.5. The PTZ camera shall have a horizontal field of view of 1.9° to 66.35°.
- 2.B.6. The PTZ camera shall produce a color image with a minimum scene illumination of 0.0067 lux and a monochrome image, when in the night mode, with a minimum illumination of 0.0010 lux at 30 IRE, 3100K, 1/30, F1.6 and reflectivity of 89%.
- 2.B.7. The PTZ camera shall produce a clear image with DORI (Detect, Observe, Recognize, Identify) performance (per EN 62676-4\_2016-07 standard):

DORI	Distance (WIDE 1x)	Distance (TELE 40x)	Scene Width
Detection 25 pixel/m (8 pixel/ft)	59 m (194 ft)	2316 m (7598 ft)	77 m (252 ft)
Observation 63 pixel/m (19 pixel/ft)	23 m (75 ft)	926 m (3038 ft)	31 m (101 ft)
Recognition 125 pixel/m (38 pixel/ft)	12 m (39 ft)	463 m (1519 ft)	15 m (50 ft)
Identification 250 pixel/m (76 pixel/ft)	6 m (20 ft)	232 m (761 ft)	8 m (25 ft)

- 2.B.8. The PTZ camera shall offer automatic focus and iris control with manual override.
- 2.B.9. The HD PTZ shall offer Intelligent Dynamic Noise Reduction.
- 2.B.10. The PTZ camera shall offer a theoretical dynamic range of 120 dB.
- 2.B.11. The PTZ camera shall offer a measured HDR of 92dB per IEC 62676 part 5.
- 2.B.12. The PTZ camera shall offer a defog image feature that assists the camera in registering a usable image when viewing foggy or other low-contrast scenes.
- 2.B.13. The PTZ camera shall have an auto exposure (AE) function, user-customized, in which the camera determines the optimum level of iris, gain, and shutter speed for a specific scene and then produces an image of the scene.
- 2.B.14. The PTZ camera shall have a focus region, user-customized, that allows users to focus on a specific area of a scene.

### 2.C. Image Processing

- 2.C.1. The PTZ camera shall provide an AutoPivot feature to rotate and flip the camera automatically as it tilts through the vertical position to maintain the correct orientation of the image.
- 2.C.2. The PTZ camera shall provide an AutoScaling feature that reduces the pan/tilt speed as the camera zooms in on an object, so that the relative speed on the screen remains constant.

### 2.D. System Features

- 2.D.1. The PTZ camera shall offer an optional direct fiber optic SFP connection to the camera, through an SFP slot designed to accept 1Gbps SFP modules for use with Multimode or Single mode optical fiber with LC or SC connectors.
- 2.D.2. The PTZ camera shall be compatible with the Bosch Configuration Manager and the Bosch Video Management System.
- 2.D.3. The PTZ camera shall provide one (1) audio mono line in and one (1) audio mono line out.

### 2.E. PTZ Features

- 2.E.1. The PTZ camera shall provide the following pan/tilt speeds:
  - 2.E.1.a. Pan: 0.01°/s to 400°/s
  - 2.E.1.b. Tilt: 0.01°/s to 300°/s
- 2.E.2. The PTZ camera shall provide a pre-position pan speed of 120°/s with a maximum pre-position speed up to 400°/s.
- 2.E.3. The PTZ camera shall provide a pan range of 0° to 360° continuous.
- 2.E.4. The PTZ camera shall have a tilt range of -90° to 20°.
- 2.E.5. The PTZ camera shall provide pan and tilt pre-position repeatability (average) accurate to  $\pm 0.10^\circ$  (typical).
- 2.E.6. The PTZ camera shall provide a feature that automatically rotates, or pivots, the camera to simplify tracking of a person walking directly under the camera.
- 2.E.7. The PTZ camera shall divide the camera's 360° rotation into 4, 6, 8, 9, 12, or 16 independent sectors with 40-character titles per sector. Any or all of the 16 sectors can be blanked from the operator's view.

- 2.E.8. The PTZ camera shall offer the ability to define 32 masks, with a maximum of 8 masks per pre-position, that prohibit areas of the field of view from being seen even if the camera is panned, tilted, or zoomed.
- 2.E.9. The PTZ camera shall store up to 256 pre-positions with each pre-position programmable for 40-character titles.
- 2.E.10. The PTZ camera shall support the following tour modes:
  - 2.E.10.a. One (1) pre-position (preset) tour capable of 256 sequential pre-positions and a configurable dwell time between positions.
  - 2.E.10.b. Two (2) separate tours of an operator's keyboard movements consisting of pan, tilt and zoom activities. The recorded tours can be played back continuously.
  - 2.E.10.c. One (1) 360° AutoPan mode.
  - 2.E.10.d. One (1) AutoPan mode between limits.
- 2.E.11. The PTZ camera shall execute one of the following programmable options when an operator stops manual control of the camera, and a programmed period of time is allowed to expire: return to a stored pre-position number, return to the automated tour previously executed, and do nothing.
- 2.E.12. The PTZ camera shall support scene tours that automatically reposition the camera to each scene for a specified duration.

## 2.F. Pre-programmed Modes

- 2.F.1. The PTZ camera shall offer pre-programmed but configurable user modes.
- 2.F.2. The pre-programmed modes shall be optimized with the best settings for the following environments:
  - 2.F.2.a. Standard
  - 2.F.2.b. Sensitivity Boost
  - 2.F.2.c. Fast Movement
  - 2.F.2.d. Vibrant
  - 2.F.2.e. Color Only (Traffic)
  - 2.F.2.f. Illuminator
  - 2.F.2.g. 2 custom modes
- 2.F.3. The PTZ camera shall allow users to customize these modes for the specific requirements of the camera site.

## 2.G. Recording and Storage Management

- 2.G.1. The PTZ camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array.
- 2.G.2. The PTZ camera shall support iSCSI storage targets.
- 2.G.3. The PTZ camera shall have an SD card slot that uses a standard, off-the-shelf full-sized SD (Secure Digital) card (SDHC, or SDXC) for local storage.
- 2.G.4. The local storage feature shall be capable of storage for Automatic Network Replenishment (ANR).
- 2.G.5. The PTZ camera shall be compatible with the Bosch Video Recording Manager (VRM) to control and manage video recording.

## 2.H. HD Characteristics

- 2.H.1. The PTZ camera shall generate full HD 1080p resolution and 720p resolution using H.265 and H.264 compression (ISO/IEC 14496-10).

- 2.H.2. The PTZ camera shall offer 3 fully configurable streams with stream prioritization.
- 2.H.3. The PTZ camera shall allow a choice of HD resolution in combination with SD resolutions.

## 2.I. IP Connectivity

- 2.I.1. The PTZ camera shall allow full camera control and configuration capabilities via a TCP/IP network.
- 2.I.2. The PTZ camera shall support the following dual, redundant power options:
  - 2.I.2.a. 24 VAC/36 VDC
  - 2.I.2.b. PoE (IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD)
- 2.I.3. The PTZ camera shall default to use power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan power supply, if connected.
- 2.I.4. The PTZ camera shall switch to the 24 VAC/36 VDC power supply if power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan is lost.
- 2.I.5. The PTZ camera shall be capable of capturing and storing images using H.265 and H.264 compression at HD 1080p and HD 720p resolutions.
- 2.I.6. The PTZ camera shall deliver 1080p video, at rates up to 60 images per second via TCP/IP over Cat5e/Cat6 F/UTP (overall screened cable with unscreened twisted pairs often referred to as FTP), or S/UTP (overall braided shield with unscreened twisted pairs often referred to as STP) cable.
- 2.I.7. The PTZ camera shall support iSCSI devices to allow the network-enabled camera to stream video directly to an iSCSI RAID array.
- 2.I.8. The PTZ camera shall conform to the ONVIF Profile S, G, M, and T standards.
- 2.I.9. The PTZ camera shall offer Quality of Service (QoS) configuration options.
- 2.I.10. The PTZ camera shall support the IPv6 internet-layer protocol for packet switched internetworking across multiple IP networks.
- 2.I.11. The PTZ camera shall offer embedded Intelligent Video Analysis (IVA) that eliminates dedicated PCs and associated software maintenance.

## 2.J. Intelligent Video Analysis

- 2.J.1. The PTZ camera shall be able to detect and start alarms when objects are in alarm fields, even when the camera is moving.
- 2.J.2. The PTZ camera shall use machine learning to define and classify objects of interest, both moving and non-moving, and then generate detectors for the objects. The machine learning program shall allow distribution of detectors to other cameras.
- 2.J.3. The PTZ camera shall incorporate an Alarm Rule Engine, enabling abnormal events that IVA detects to prompt the camera to take one or more actions such as:

- 2.J.3.a. Trigger a relay connected to an alarm siren and/or strobe
- 2.J.3.b. Trigger a visual alert to be displayed on the operator's screen
- 2.J.3.c. Go to a specified scene (pre-position)
- 2.J.4. The PTZ camera shall allow users to set up to 10 separate profiles and switch profiles based on a day/night or holiday schedules.

## 2.K. Intelligent Video Analytics Pro (IVA Pro)

- 2.K.1. The PTZ camera shall offer embedded IVA Pro Buildings and IVA Pro Perimeter for reliable deep learning-based detection and support IVA Pro Traffic with license option.
- 2.K.2. The PTZ camera shall offer embedded machine learning capabilities that eliminates dedicated PCs and associated software maintenance.
- 2.K.3. The PTZ camera shall use machine learning to allow users to define and classify objects of interest, both moving and non-moving, and then generate detectors for the objects. The machine learning program shall allow distribution of detectors to other cameras.
- 2.K.4. The PTZ camera shall detect unusual movements in all applications and under all conditions
- 2.K.5. The PTZ camera shall avoid false alarm triggers.
- 2.K.6. The PTZ camera shall offer object detection while the camera is moving and alert the operator in case of unusual behavior or events.
- 2.K.7. The PTZ camera shall include AI-based vehicle detection for traffic monitoring, with the following characteristics:
  - 2.K.7.a. AI vehicle detector shall not require calibration.
  - 2.K.7.b. Vehicle headlights and shadows shall not trigger alerts and counts.
  - 2.K.7.c. The detector shall be able to separate vehicles even in dense congestion or traffic queues.
  - 2.K.7.d. AI vehicle detector shall be configurable to analyze different scenes for one or more events including: traffic congestion, wrong-way vehicle, presence and volume of vehicles, automatic incident detection.
  - 2.K.7.e. AI detector shall collect traffic statistics.
  - 2.K.7.f. AI detector shall detect parking space vehicle occupancy status.
- 2.K.8. The PTZ camera shall offer advanced Intelligent Video Analytics Pro (IVA Pro) with automated calibration by use of an integrated sensor so only camera height needs to be set for a full calibration.
- 2.K.9. The PTZ camera shall detect up to 20 objects per frame in real time or up to 64 objects with reduced frame rate.
- 2.K.10. The PTZ camera shall offer IVA Pro Buildings and IVA Pro Perimeter with the following functionalities:
  - 2.K.10.a. Triggers: any object, object in field, line crossing, enter field, leave field, loitering, follow route, idle object, removed object, counting, occupancy, crowd density, condition change, similarity search, flow, counter flow, conditional change, objects stopping or starting to move
  - 2.K.10.b. Filters: duration, size, aspect ratio, speed, direction, color, object classes
  - 2.K.10.c. Object classes: Persons, Vehicles
  - 2.K.10.d. Tracking modes: Perimeter tracking (2D), Perimeter tracking (3D), People tracking (3D), Ship tracking (2D), Museum mode (2D), Base tracking (2D)
  - 2.K.10.e. Tamper detection: global change, scene too bright, scene too dark, reference check
  - 2.K.10.f. Support other analytics (license option): IVA Traffic
- 2.K.11. The PTZ camera shall be configurable to ignore specified image areas and small objects to enhance robustness.

- 2.K.12. The PTZ camera shall support people counting.
- 2.K.13. The PTZ camera shall allow users to set up to two (2) separate profiles and switch profiles based on a day/night or holiday schedules.
- 2.K.14. The PTZ camera shall include a calibration option to transform 2D pixels into 3D pixels, including size, speed, and geolocation of objects for tracking use cases.
- 2.K.15. The PTZ camera shall incorporate an IVA alarm rule engine that supports programming of alarm tasks which are individually reported to the video management software.

#### 2.L. Access Security

- 2.L.1. The PTZ camera shall offer three levels of password protection.
- 2.L.2. The PTZ camera shall incorporate Trusted Platform Module (TPM) functionality provided by "Secure Element" (dedicated AES/DES/PKI crypto co-processor) for storage of encryption keys.
- 2.L.3. The PTZ camera shall have cryptography with a maximum of 4096 bit RSA keys for TLS (maximum version 1.3) and device identity.
- 2.L.4. The PTZ camera shall support secured connections.
- 2.L.5. The PTZ camera shall require a service-level password at initial setup to access camera functions.
- 2.L.6. The PTZ camera shall disable all unsecure ports.
- 2.L.7. The PTZ camera shall disable all unsecure remote communication.
- 2.L.8. The PTZ camera shall prevent uploading of untrusted, unauthenticated third-party software.
- 2.L.9. The PTZ camera shall support only authenticated firmware.
- 2.L.10. The PTZ camera shall incorporate an embedded login firewall.
- 2.L.11. The PTZ camera shall have software protection that seals the camera configuration ("software sealing") and detects changes to camera configuration.

## 2.M. Installation Requirements

- 2.M.1. The PTZ camera shall be able to operate in an outdoor environment within the following temperature range: -40 °C to +60 °C (-40 °F to +140 °F) (continuous operation) and with a cold start temperature of -35 °C (-31° F).
- 2.M.2. The PTZ camera shall accept power, transmit video, and accept control via TCP/IP connection.
- 2.M.3. The PTZ camera shall support the following dual, redundant power options:
  - 2.M.3.a. 24 VAC/36 VDC
  - 2.M.3.b. IEEE 802.3bt Type 3, Class 6, 60W midspan
- 2.M.4. The PTZ camera shall default to use power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan power supply, if connected.
- 2.M.5. The PTZ camera shall switch to the 24 VAC/36 VDC power supply if power from the PoE IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at AUTODOME 7100i AKA PD side at PTZ camera AKA PD side) using a single-signature PD power supply is lost.
- 2.M.6. The PTZ camera shall provide a multi-language on-screen display with custom-sized fonts (1-1000).

## 2.N. Housing Options

- 2.N.1. The PTZ camera shall be offered in an outdoor pendant housing.
- 2.N.2. The PTZ camera housings shall come standard with recessed set screws and a recessed bubble latch for increased tamper resistance.
- 2.N.3. The PTZ camera shall provide built-in surge protection for power, data, and video and alarm inputs.
- 2.N.4. The PTZ camera shall have a hard coated, polycarbonate bubble.
- 2.N.5. The housing shall:
  - 2.N.5.a. Use a hinge, in place of a tether, to make installation easier and safer.
  - 2.N.5.b. Come with an attached sunshield.
  - 2.N.5.c. Allow the camera to view 20° above the horizon.
  - 2.N.5.d. Conform to the IP66 standard for a weather-resistant package.
  - 2.N.5.e. Conform to the UL Type 4X standard for the following:
    - 2.N.5.e.1) Access to Hazardous parts
    - 2.N.5.e.2) Ingress of solid foreign objects (falling dirt, circulating dust, settling dust)
    - 2.N.5.e.3) Ingress of water (dripping and light splashing, hose down and splashing)
    - 2.N.5.e.4) Corrosive agents
  - 2.N.5.f. Be made of anodized cast aluminum for corrosion resistance and supplied with a built-in heater/blower to provide an operating temperature range of -40 °C to +60 °C (-40 °F to +140 °F), and with a cold start temperature of -35 °C (-31° F).
  - 2.N.5.g. Be powder coated with a finish in white (RAL 9003).

## 2.O. Camera:

- 2.O.1. Imager: 1/2.8-inch type CMOS image sensor
- 2.O.2. Effective Picture Elements (pixels): 1920x1080 (2 MP)
- 2.O.3. Lens:
  - 2.O.3.a. 40x optical zoom, 4.25 to 170 mm
  - 2.O.3.b. 32x digital zoom
  - 2.O.3.c. Horizontal Field of View: 1.9° to 66.35°
- 2.O.4. Focus: Automatic with manual override
- 2.O.5. Iris: Automatic with manual override
- 2.O.6. Gain Control: AGC; Fixed; Region per pre-position
- 2.O.7. Electronic Shutter Speed (AES): 1/30,000 max
- 2.O.8. Wide Dynamic Range (WDR) / High Dynamic Range (HDR): theoretical 120 dB
- 2.O.9. The PTZ camera shall offer a measured HDR value of 92 dB per IEC 62676 part 5
- 2.O.10. Backlight Compensation: On/Off; Intelligent Auto Exposure (IAE)
- 2.O.11. White Balance: 2000 K to 10,000 K; ATW, Manual, indoor, outdoor, AWB Hold, Extended ATW
- 2.O.12. Day/Night: Monochrome, Color, Auto
- 2.O.13. Defog image feature: Allows the camera to “see” and register a usable image through the heaviest fog

## 2.P. Mechanical

- 2.P.1. Pan range: 0 to 360° continuous
- 2.P.2. Tilt range: -90° – 20°
- 2.P.3. Pre-position speeds:
  - 2.P.3.a. Pan: Up to 400°/s (max); 120°/s (typ)
  - 2.P.3.b. Tilt: 300°/s (max); 120°/s (typ)
- 2.P.4. Pan/Tilt speeds:
  - 2.P.4.a. Pan: 0.01°/s to 400°/s
  - 2.P.4.b. Tilt: 0.01°/s to 300°/s
- 2.P.5. Pre-position accuracy (average): ± 0.10° typical

## 2.Q.Electrical

### 2.Q.1. Input Voltage:

- 2.Q.1.a. 24 VAC  $\pm$  10%, 50/60 Hz (IEC 62368-1 Limited Power Source)
- 2.Q.1.b. 36 VDC  $\pm$  10% (IEC 62368-1 Limited Power Source)
- 2.Q.1.c. IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD

### 2.Q.2. Power Consumption (typical):

- 2.Q.2.a. 43.2 W at 24 VAC, 50/60Hz and 3A at 24 VAC, 50/60Hz
- 2.Q.2.b. 48.6W at PoE 54 VDC
- 2.Q.2.c. 46.8W at 36 VDC

### 2.Q.3. Built-in Surge Suppression:

- 2.Q.3.a. Compliant with EN 50130-4 and EN 50121-4 levels. **Note:** The camera must be installed per our Installation manual to achieve the standard levels.

## 2.R. Software Control

2.R.1. Camera Setup/Control: Via Bosch Configuration Manager, Bosch Video Management System (BVMS), Video Security Client (VSC), Project Assistant, or support for third party software

2.R.2. Software Update: Network firmware upload

## 2.S. Network

2.S.1. Communications Protocols: Standard Bosch IP protocol, including ONVIF

2.S.2. Video Compression: H.265/HEVC, H.264 (ISO/IEC 14496-10), M-JPEG

2.S.3. Streaming: Three (3) fully configurable streams, with the option to activate or deactivate VCA overlays on each stream

2.S.4. Resolution (H x V):

- 2.S.4.a. 2 MP (1080p HD; 16:9): 1920 x 1080
- 2.S.4.b. 1.3 MP (16:9): 1536 x 864
- 2.S.4.c. 1 MP (720p HD; 16:9): 1280 x 720
- 2.S.4.d. 0.4 MP (4:3): 704 x 576
- 2.S.4.e. 0.3 MP (4:3): 704 x 480
- 2.S.4.f. 0.3 MP (432p SD): 768 x 432
- 2.S.4.g. VGA (4:3): 640 x 480
- 2.S.4.h. 0.1 MP (288p SD; 16:9): 512 x 288

2.S.5. Protocols: IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, ARP, DHCP, NTP (SNTP), SNMP (V3, MIBII), DNS, DNSv6, DDNS (DynDNS.org, selftHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), SOAP, CHAP, digest authentication, IGMP, HSTS, RTSPS, MQTT

2.S.6. Ethernet: 100 Base-TX/1000BASE-T, auto-sensing, full duplex

2.S.7. Encryption: TLS 1.2, TLS 1.3, AES 128, AES 256

2.S.8. GOP structure: IP

2.S.9. Overall IP Delay: 30 fps: 281 ms (typical); 60 fps: 159 ms (typical)

2.S.10. Audio: 1x mono line in, 1x mono line out

## 2.T. Local Storage

- 2.T.1. Memory Card Slot: SDHC/SDXC memory card
- 2.T.2. Recording: Continuous recording of video and audio, alarm/events/schedule recording

## 2.U. Miscellaneous

- 2.U.1. Sectors/Titling: 4, 6, 8, 9, 12, or 16 independent sectors with 40-character titles/sector
- 2.U.2. Privacy Masking: 32 individually configurable masks: 16 million colors, Mosaic option, Blurred option with 10 different levels, Auto (patented) option
- 2.U.3. Virtual Masking: 24 individually configurable masks to hide parts of the scene (background motion such as moving trees, pulsating lights, busy roads, etc.)
- 2.U.4. Pre-positions: 256, each with 40-character titles
- 2.U.5. Guard Tours: Two (2) types of tours, total duration of 30 minutes:
  - 2.U.5.a. Customized tours – one (1), consisting of up to 256 user-defined scenes
  - 2.U.5.b. Pre-position tour – one (1), consisting of up to 256 scenes consecutively
- 2.U.6. Supported Languages: English, Czech, Dutch, French, German, Italian, Polish, Portuguese, Russian, Spanish, Japanese, Chinese
- 2.U.7. Embedded logo with resolution of 1024x1024 and color depth of 16M colors.

## 2.V. User Connections:

- 2.V.1. Power
  - 2.V.1.a. IEEE 802.3bt Type 3, Class 6, 4 Pair Power (4PPOE) 60W at PSE (POE midspan or POE Ethernet switch) side, (51W at PTZ camera AKA PD side) using a single-signature PD midspan
  - 2.V.1.b. 24 VAC  $\pm$  10%, 50/60 Hz (IEC 62368-1 Limited Power Source)
  - 2.V.1.c. 36 VDC  $\pm$  10% (IEC 62368-1 Limited Power Source)
- 2.V.2. Video and Control: 100Base-TX/1000Base-T Ethernet or 1Gbps fiber using optional SFP
- 2.V.3. Alarm Inputs: 2 contact closure inputs
- 2.V.4. Alarm Outputs: 1 dry contact relay, 27 VAC, 1 A, AC, rms | 30 VDC, 2 ADC; Three output lines (selectable N.O./N.C./Common)
- 2.V.5. Audio: Line In; Line Out, full duplex

## 2.W. Environmental

### 2.W.1. Ingress Protection Rating/Standard:

2.W.1.a. IP66

2.W.1.b. UL Type 4X for:

2.W.1.b.1) Access to Hazardous parts

2.W.1.b.2) Ingress of solid foreign objects (falling dirt, circulating dust, settling dust)

2.W.1.b.3) Ingress of water (dripping and light splashing, hose down and splashing)

2.W.1.b.4) Corrosive agents

2.W.2. Operating Temperature: -40 °C to +60 °C (-40 °F to +140 °F)

2.W.3. Cold start Temperature: -35 °C (-31 °F)

2.W.4. Storage Temperature: -40 °C to +70 °C (-40 °F to +158 °F)

2.W.5. Operating Humidity: 0% to 95% non-condensing

2.W.6. Storage Humidity: 0% to 95% (relative)

2.W.7. Wind load (mph): Camera will hold its position in gusts up to 170 mph.

2.W.8. External mechanical impact (IK Code or Impact rating): IEC 62262, edition 1.0: IK10

## 2.X. Construction

2.X.1. Product dimensions (Ø x H): 210.65 mm x 324 mm (8.3 in. x 12.8 in.)

2.X.2. Product weight: 5.5 kg (12 lb)

2.X.3. Bubble size: 209.6 mm (8.25 in.)

2.X.4. Construction material:

2.X.4.a. Housing: Anodized cast aluminum

2.X.4.b. Bubble: Hard-coated polycarbonate

2.X.5. Standard Color: White (RAL 9003)

2.X.6. Standard Finish: Power coated, smooth finish

2.X.7. Sustainability: PVC free

## 2.3 ACCESSORIES

### 3.A. Bubbles

- 3.A.1. NDA-7100-BUBIR Spare bubble

### 3.B. Mounts

- 3.B.1. NDA-7100-PEN Pendant arm for AUTODOME 7100i
- 3.B.2. NDA-7100-PENF Pendant arm fiber for AUTODOME 7100i
- 3.B.3. NDA-7100-PIPE Pipe mount for AUTODOME 7100i
- 3.B.4. NDA-7100-PIPEF Pipe mount fiber for AUTODOME 7100i
- 3.B.5. NDA-PEND-WPLATE Mounting plate for NDA-7100-PEN/PENF
- 3.B.6. NDA-U-PMT Universal pendant pipe mount for NDA-7100-PIPE/PIPEF
- 3.B.7. NDA-U-WMP Universal pendant pipe mount for NDA-U-PMT
- 3.B.8. NDA-U-RMT Universal roof mount for AUTODOME cameras
- 3.B.9. LTC 9230/01 Parapet roof mount adapter
- 3.B.10. NDA-U-PMAL Pole mount adapter large
- 3.B.11. NDA-U-CMT Corner mount adapter

### 3.C. Power supplies

- 3.C.1. NPD-6001C midspan bt 60W indoor
- 3.C.2. NPD-6001C-E midspan bt 60W IP67
- 3.C.3. NPD-6001-I midspan bt 60W indoor industrial
- 3.C.4. NPD-6001C-BT midspan bt 60W indoor TAA
- 3.C.5. NPD-6001C-EBT midspan bt 60W IP67 TAA
- 3.C.6. NPD-6001-IBT midspan bt 60W indoor industrial TAA
- 3.C.7. NDA-U-PSU0 PSU, 24VAC, for NDA-7100PEN/PENF
- 3.C.8. NDA-U-PSU1 PSU, 120VAC, for NDA-7100-PEN/PENF
- 3.C.9. NDA-U-PSU2 PSU, 230VAC, for NDA-7100-PEN/PENF
- 3.C.10. NDA-7100-PA0 wall arm and PSU for AD7100i 24VAC
- 3.C.11. NDA-7100-PA1 wall arm and PSU for AD7100i 120VAC
- 3.C.12. NDA-7100-PA2 wall arm and PSU for AD7100i 230VAC
- 3.C.13. NDA-7100-PA0F wall arm and PSU for AD7100i fiber 24VAC
- 3.C.14. NDA-7100-PA1F wall arm and PSU for AD7100i fiber 120VAC
- 3.C.15. NDA-7100-PA2F wall arm and PSU for AD7100i fiber 230VAC

### 3.D. Power supply accessory

- 3.D.1. NDA-6090-PMA Pole mount for midspan bt outdoor

### 3.E. SD cards

- 3.E.1. SD-064G IP SECURITY SD CARD 64GB
- 3.E.2. SD-128G IP SECURITY SD CARD 128GB
- 3.E.3. SD-256G IP SECURITY SD CARD 256GB

### 3.F. Software options:

- 3.F.1. MVC-IVA-IT IVA Pro Intelligent Tracking
- 3.F.2. MVC-IVA-TRA IVA Pro Traffic

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- 1.A. Examine areas to receive devices and notify adverse conditions affecting installation or subsequent operation.
- 1.B. Do not begin installation until unacceptable conditions are corrected.

### **3.2 PREPARATION**

- 2.A. Protect devices from damage during construction.

### **3.3 INSTALLATION**

- 3.A. Install devices in accordance with manufacturer's instruction at locations indicated on the floor drawings plans.
- 3.B. Perform installation with qualified service personnel.
- 3.C. Install devices in accordance with the National Electrical Code or applicable local codes.
- 3.D. Ensure selected location is secure and offers protection from accidental damage.
- 3.E. Location must provide reasonable temperature and humidity conditions, free from sources of electrical and electromagnetic interference.

### **3.4 FIELD QUALITY CONTROL**

- 4.A. Test snugness of mounting screws of all installed equipment.
- 4.B. Test proper operation of all video system devices.
- 4.C. Determine and report all problems to the manufacturer's customer service department.

### **3.5 ADJUSTING**

- 5.A. Make proper adjustment to video system devices for correct operation in accordance with manufacturer's instructions.
- 5.B. Make any adjustment of camera settings to comply with specific customer's need.

### **3.6 DEMONSTRATION**

- 6.A. Demonstrate at final inspection that video management system and devices functions properly.

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END OF SECTION