# GENERAL

## SYSTEM DESCRIPTION

### General Requirements

#### The specified unit shall be of manufacturer’s official product line, designed for commercial and/or industrial 24/7/365 use.

#### The specified unit shall be based upon standard components and proven technology using open and published protocols.

#### Related Requirements

##### 28 05 07.21 PoE Power Sources for Electronic Safety and Security

##### 28 05 11 Cyber Security Requirements for Electronic Safety and Security

##### 28 05 19 Storage Appliances for Electronic Safety and Security

##### 28 05 21 Network Attached Storage for Electronic Safety and Security

##### 28 05 23 Storage Area Network for Electronic Safety and Security

##### 28 23 11 Video Management System Analytics

##### 28 23 13 Video Management System Interfaces

### Sustainability

#### The specified unit shall be manufactured in accordance with ISO 14001.

#### The specified unit shall be compliant with the EU directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE).

#### The specified unit shall be compliant with the EU regulation 1907/2006 (REACH).

#### The specified unit, including all its components, shall not contain any added PVC.

#### The manufacturer shall have signed and support the UN Global Compact initiative as defined by United Nations.

## CERTIFICATIONS AND STANDARDS

### General abbreviations and acronyms

#### AGC: Automatic gain control

#### ABR: Average Bit Rate

#### AES: Advanced Encryption Standard

#### API: Application Programming Interface

#### Aspect ratio: A ratio of width to height in images

#### Bit Rate: The number of bits/time unit sent over a network

#### Bonjour: Enables automatic discovery of computers, devices, and services on IP networks.

#### DHCP: Dynamic Host Configuration Protocol

#### DNS: Domain Name System

#### EIS: Electronic Image Stabilization

#### FPS: Frames per Second

#### FTP: File Transfer Protocol

#### SFTP: Secure File Transfer Protocol

#### H.264 (Video Compression Format)

#### H.265 (Video Compression Format)

#### HSMS: Hosted Security Management System (SaaS PACS Application)

#### IEEE 802.1x: Authentication framework for network devices

#### IP: Internet Protocol

#### IR light: Infrared light

#### ISO: International Standards Organization

#### JPEG: Joint Photographic Experts Group (image format)

#### LAN: Local Area Network

#### LED: Light Emitting Diode

#### LPR: License Plate Recognition

#### Lux: A standard unit of illumination measurement

#### MBR: Maximum Bit Rate

#### MPEG: Moving Picture Experts Group

#### Multicast: Communication between a single sender and multiple receivers on a network

#### NTP: Network Time Protocol

#### NTSC: National Television System Committee – a color encoding system based on 60Hz

#### ONVIF: Global standard for the interface of IP-based physical security products

#### PACS: Physical Access Control System

#### PAL: Phase Alternating Line – a color encoding system based on 50Hz

#### PoE: Power over Ethernet (IEEE 802.3af/at) standard for providing power over network cable

#### Progressive scan: An image scanning technology which scans the entire picture

#### PTZ: Pan/Tilt/Zoom

#### QoS: Quality of Service

#### RAID: Redundant Array of Independent Disks

#### RMD: Radar Motion Detection

#### RPC: Remote Procedure Call

#### SaaS: Software as a Service

#### SIP: Session Initiation Protocol

#### SMTP: Simple Mail Transfer Protocol

#### SMPTE: Society of Motion Picture and Television Engineers

#### SNMP: Simple Network Management Protocol

#### SSL: Secure Sockets Layer

#### TCP: Transmission Control Protocol

#### TLS: Transport Layer Security

#### Unicast: Communication between a single sender and single receiver on a network

#### UPnP: Universal Plug and Play

#### UPS: Uninterruptible Power Supply

#### VBR: Variable Bit Rate

#### VMS: Video Management System

#### WDR: Wide dynamic range

### The specified unit shall carry the following EMC approvals:

#### EN 55032 Class A

#### EN 55035

#### EN 61000-6-1

#### EN 61000-6-2

#### FCC Part 15 Subpart B Class A

#### ICES-3(A)/NMB-3(A)

#### VCCI Class A

#### RCM AS/NZS CISPR 32 Class A

#### KS C9832 Class A

#### KS C9835

### The specified unit shall meet the following product safety standards:

#### IEC/EN/UL 60950-22

#### IEC/EN/UL 62368-1

#### IEC/EN 62471

#### IS 13252

### The specified unit shall meet relevant parts of the following video standards:

#### SMPTE 296M (HDTV 720p)

#### SMPTE 274M (HDTV 1080p)

### The specified unit shall meet the following standards

#### MPEG-4:

##### ISO/IEC 14496-10 Advanced Video Coding (H.264)

##### ISO/IEC 23008-5 Advanced Video Coding (H.265)

#### Networking:

##### IEEE 802.3at (Power over Ethernet Plus)

##### IEEE 802.1x (EAP-TLS, PEAP-MSCHAPv2) (Authentication)

##### IPv4 (RFC 791)

##### IPv6 (RFC 2460)

##### QoS – DiffServ (RFC 2475)

##### IPv6 USGv6, NIST SP500-267

#### Cybersecurity

##### ETSI EN 303 645

#### Mechanical Environment:

##### IEC 60068-2-1

##### IEC 60068-2-2

##### IEC 60068-2-6

##### IEC 60068-2-14

##### IEC 60068-2-27

##### 60068-2-78

##### IEC/EN 60529 IP66

##### IEC/EN 62262 IK10 (IR window IK09)

##### NEMA 250 Type 4X

##### NEMA TS 2 (2.2.7-2.2.9)

## QUALITY ASSURANCE

### The contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years’ experience installing and servicing systems of similar scope and complexity and evidence that is completed at least three (3) projects of similar design and is currently engaged in the installation and maintenance of systems herein described.

### All installation, configuration, setup, program and related work shall be performed by electronic technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided.

### The contractor or designated sub-contractor shall submit credentials of completed manufacturer certification, verified by a third-party organization, as proof of the knowledge.

### The specified unit shall be manufactured in accordance with ISO9001.

## WARRANTY

### The manufacturer shall provide a five (5) year limited hardware warranty for product that is free from defects in design, workmanship and materials under substantiated normal use. Defective products under the warranty period will be either repaired or replaced by the manufacturer.

# PRODUCTS

## GENERAL

### The product shall be IP-based and comply with established network and video standards.

### The product shall be powered by the switch utilizing the network cable.

### The product shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third-party applications.

## VIDEO SURVEILLANCE SCHEDULE

### The product or product types listed below describing various resolutions, form-factor and features shall be supplied by a single manufacturer for video surveillance system.

### The product name and model numbers will be as follows:

#### Fixed 12 MP network dome camera shall be AXIS M4308–PLE

## VIDEO SURVEILLANCE CAMERAS

### Fixed 12 MP network dome camera

#### The specified product shall meet or exceed the following design specifications:

##### The camera shall operate on an open source and Linux-based platform, and include a built-in web server.

##### The camera shall provide a removable IR-cut filter, providing day/night functionality.

##### The camera shall be equipped with a 1.3 mm IR corrected lens with fixed iris and fixed focus, providing horizontal field of view: 183° and vertical field of view: 183°.

##### The camera shall be designed to provide an image up to 20° above the horizon without any loss of image quality.

##### The camera shall provide local video storage utilizing a microSD/microSDHC/microSDXC memory card expansion.

##### The camera shall be manufactured with a repaintable metal (aluminum) casing.

##### The camera shall be manufactured with an IP66-, NEMA 4X- and IK10-rated (IR window IK09) casing with polycarbonate hard coated dome.

#### The specified product shall meet or exceed the following performance specifications:

##### Illumination

###### The camera shall meet or exceed the following illumination specifications:

Color: 0.19 lux at 50 IRE, F2.4

B/W: 0.04 lux at 50 IRE, F2.4

0 lux with IR illumination on

##### Resolution

###### The camera shall be designed to provide video streams in 12 MP (2880x2880) at up to 30 frames per second (60Hz mode) or 25 frames per second (50Hz mode) using H.264, H265 or Motion JPEG.

###### The camera shall provide 4 individually cropped out view areas.

###### The camera shall support video resolutions including:

Overview: 2880x2880 to 160x160

Panorama: 3840x2160 to 192x72

Double panorama: 3584x2688 to 512x288

Quad view: 3584x2688 to 512x288

View area 1–4: 2048x1536 to 256x144

Corner right/left: 3200x1200 to 192x72

Double corner: 2560x1920 to 480x480

Corridor: : 2560x1920 to 256x144

###### The camera shall provide both landscape format (4:3 and 16:9 aspect ratio) as well as corridor format (3:4 and 9:16 aspect ratio).

##### Encoding

###### The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.

###### The camera shall provide configurable compression levels.

###### The camera shall provide a video streaming indicator.

###### The camera shall support standard baseline profile with motion estimation.

###### The camera shall support motion estimation in H.264/MPEG-4 Part 10/AVC.

###### The camera shall support motion estimation in H.265 (MPEG-H Part 2/HEVC

###### The camera shall support the following video encoding algorithms:

Motion JPEG encoding in a selectable range from 1 up to 25/30
frames per second.

Baseline Profile H.264 encoding with motion estimation in
up to 25/30 frames per second.

Main Profile H.264 and H.265 encoding with motion estimation
and context-adaptive binary arithmetic coding (CABAC) in up to 25/30
frames per second.

High Profile H.264 encoding with motion estimation up to
25/30 frames per second.

###### The camera shall in H.264 and H.265 support Variable Bit Rate (VBR), Average Bit Rate (ABR) and Maximum Bit Rate (MBR).

###### The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and selected retention time.

The camera shall be able to deliver predictable storage using
Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate
budget and the selected retention time.

The ABR bitrate algorithm, depending on the bitrate budget
and the selected retention time, shall adjust the bitrate to meet
the bitrate budget over the whole retention time.

The ABR algorithm shall have a method to keep the video quality
even during busy periods by allowing the current bitrate to be significantly
above the configured average bitrate during significant parts of the
retention time.

The camera shall in H.264 and H.265 support flexible retention
period for Average Bit Rate (ABR) algorithm up to 1 year.

When using Average Bit Rate (ABR) the camera shall keep bitrate
history up to at least 30 days.

The camera shall in H.264 and H.265 support reuse of past
Average Bit Rate (ABR) history if a stream is disconnected and the
camera reconnects with the same basic stream parameters.

When using Average Bit Rate (ABR), the camera shall in H.264
and H.265 support multiple parallel stream with independent ABR-history.

The camera shall issue bitrate degradation events when using
Average Bit Rate (ABR) if the configuration is predicted to be

unrealistic

not fulfilling basic quality requirements

not fulfilling the bitrate budget.

###### The camera shall support scene adaptive bitrate control with one of the following capabilities to lower bandwidth and storage:

Automatic dynamic Region of Interest to reduce bitrate in
unprioritized regions in order to lowering bandwidth and storage requirements.

Automatic dynamic Group of Pictures to lower bandwidth and
storage requirements

Automatic dynamic Frames per Second to lower bandwidth and
storage requirements

##### Transmission

###### The camera shall allow for video to be transported over:

HTTP (Unicast)

HTTPS (Unicast)

RTP (Unicast & Multicast)

RTP over RTSP (Unicast)

RTP over RTSP over HTTP (Unicast)

SRTP/RTSPS (Unicast & Multicast)

###### The camera shall support Quality of Service (QoS) to be able to prioritize traffic.

##### Image

###### The camera shall incorporate automatic and manual white balance.

###### The camera shall incorporate an electronic shutter operating in the range of 1/22000s to 1s.

###### The camera shall incorporate capture mode with the following settings:

Without WDR: up to 25/30 fps (50/60 Hz) with up to 2880x2880
resolution

With WDR: dewarped views with maximum resolution (up to 12.5/15
fps (50/60 Hz))

###### The camera shall incorporate wide dynamic range – forensic WDR functionality.

###### The camera shall incorporate forensic wide dynamic range functionality providing up to 120 dB dynamic range.

###### The camera shall support manually defined values for:

Saturation

Brightness

Sharpness

Contrast

###### The camera shall support multiple scene profiles for:

forensic

vivid

traffic overview

backlit entrance

###### The camera shall incorporate a function for optimization of low-light behavior at different light levels.

###### The camera shall incorporate a function for motion-adaptive exposure to reduce motion blur from approaching or nearby object.

###### The camera shall allow for rotation of the image in steps of 90º.

##### Audio

###### The camera shall support one-way simplex audio:

Input sources

4x internal microphones

Output sources

Network speaker pairing

###### Encoding

The camera shall support:

LPCM 48 kHz

AAC-LC 8/16/32/44.1/48 kHz

G.711 PCM 8 kHz

G.726 ADPCM 8 kHz

Opus 8/16/48 kHz

Configurable bit rate

##### IR Illumination

###### The camera shall be equipped with built-in IR LEDs, with a range of up to 15 m (50 ft) with a wavelength of 850 nm.

###### The camera shall be equipped with built-in IR LEDs with automatic seamless adapting angle of illumination and intensity.

##### User Interface

###### Web server

The camera shall contain a built-in web server making video
and configuration available to multiple clients in a standard operating
system and browser environment using HTTP, without the need for additional
software.

Optional components downloaded from the camera for specific
tasks shall be signed by an organization providing digital trust services.

###### Language Specification

The camera shall provide a function for altering the language
of the user interface, and shall include support for at least 10 different
languages.

###### IP addresses

The camera shall support both fixed IP addresses and dynamically
assigned IP addresses provided by a Dynamic Host Control Protocol
(DHCP) server.

The camera shall allow for automatic detection of the camera
based on UPnP and Bonjour when using a computer with an operating
system supporting this feature.

The camera shall provide support for both IPv4 and IPv6.

The camera shall provide support for IPv6 USGv6.

##### PTZ functionality

###### The camera shall:

Provide digital PTZ functionality.

Provide preset positions functionality.

Provide digital pan (except panorama at wall mount) and tilt
of panorama, corner, corridor and quad views.

Provide a guard tour functionality which allows the dome
to automatically move between selected presets using an individual
speed and viewing time for each preset.

##### Event conditions

###### The camera shall be equipped with an integrated event functionality:

Audio

Audio detection

Device status

Operating temperature failure

IP address

Network lost

Shock detection

Storage failure

System ready

Open casing

Edge storage

Recording ongoing

Storage disruption

I/O

Virtual inputs

Supervised external inputs

Scheduled and recurring

Video

Live stream open

###### Response to triggers shall include event actions:

Record video: SD card and network share

Upload of images and video clips: FTP, SFTP, HTTP, HTTPS,
email or network share

Send notification: email, HTTP, HTTPS, TCP and SNMP trap

Pre- and post-alarm video or image buffering for recording
or upload

PTZ: PTZ preset, start/stop guard tour

Overlay text

External output activation

Play audio clip

Zoom preset

Day and night mode

###### The camera shall provide memory for pre- and post-alarm recordings.

##### Storage

###### The camera shall support continuous and event controlled recording to:

Local memory added to the cameras microSD-card slot

Network attached storage, located on the local network

###### The camera shall incorporate encryption functionality for the SD card.

###### The camera shall be able to detect and notify edge storage disruptions.

##### Protocol

###### The camera shall incorporate support for at least IPv4, IPv6 USGv6, ICMPv4/ICMPv6, HTTP, HTTPSa , HTTP/2, TLSa , QoS Layer 3 DiffServ, FTP, SFTP, CIFS/SMB, SMTP, mDNS (Bonjour), UPnP® , SNMP v1/v2c/v3 (MIB-II), DNS/DNSv6, DDNS, NTP, NTS, RTSP, RTP, SRTP/RTSPS, TCP, UDP, IGMP, RTCP, ICMP, DHCPv4/v6, ARP, SSH, SIP, LLDP, CDP, MQTT v3.1.1, Secure syslog (RFC 3164/5424, UDP/TCP/TLS), Link-Local address (ZeroConf).

###### The SMTP implementation shall include support for SMTP authentication.

##### Text overlay

###### The camera shall:

Provide embedded on-screen text with support for date &
time, and a customer-specific text, camera name, of at least 45 ASCII
characters.

Provide the possibility to choose different font sizes for
embedded on-screen text, and to use white or black text on at least
four different backgrounds.

Provide the ability to manually set up and configure privacy
masks to the image.

Allow for the overlay of a graphical image, such as a logotype,
into the image.

##### Security

###### The camera shall support the following:

Secure web browsing

The use of HTTPS and TLS, providing the ability to upload
signed certificates to encrypt and secure authentication and communication
of both administration data and video streams.

Restrict access to the built-in web server by usernames and
passwords at three different levels.

Certificate management

Provide centralized certificate management, with both pre-installed
CA certificates and the ability to upload additional CA certificates.
The certificates shall be signed by an organization providing digital
trust services.

Enhanced security features

The use of signed firmware validates the firmware’s integrity
before accepting to install it.

The use of a secure boot process, based on the use of signed
firmware, ensures that the camera can boot only with authorized firmware.

The use of signed video (adding cryptographic checksum to
H.264 videos signed by the manufacturer’s secured device ID) provides
support for validating the video’s authenticity and origin.

The use of a cryptographically verifiable hardware module
where a collection of certificates, required to verify device identification,
is installed.

The collection of certificates (using IEEE 802.1AR) proves
that the device and its firmware are authentic and produced by
the manufacturer.

The product shall include a tamper-resistant hardware module,
certified to at least Common Criteria EAL4.

Authentication

IEEE 802.1x (EAP-TLS, PEAP-MSCHAPv2) authentication.

IEEE 802.1AE (MACsec PSK/EAP-TLS) authentication.

Restrict access to pre-defined IP addresses via a host-based
firewall.

Brute force delay protection

###### Firmware support

The manufacturer should provide a Software Bill of Material
(SBOM) for each product firmware in machine-readable format (CycloneDX,
SPDX) that contains information about the software composition of
the device’s operating system, publicly available for download.

The manufacturer must provide firmware with long-term support
that only contains corrections for critical bugs, security flaws and
performance issues.

The device should maintain high-level cybersecurity without
introducing any significant functional changes or affecting any existing
integrations.

##### Analytics

###### The camera shall provide a platform allowing the upload of third-party applications into the camera.

###### The camera shall be equipped with a built-in, deep-learning processing unit capable of executing neural network algorithms, such as object detection, classification and segmentation (including vehicle types, license plates, people and faces). The deep-learning processing unit shall contain multiple parallel hardware accelerated compute recourses capable of performing real-time video inference. The camera manufacturer shall support approved third-party developers to enable custom made deep-learning applications using the DLPU to accelerate custom trained deep-learning networks with commonly available network architectures.

###### The camera shall be supplied with preinstalled advanced video analytics capabilities, capable of detecting and classifying humans and vehicles in non-critical indoor and outdoor spaces.

##### System integration

###### The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third-party applications.

###### The camera shall be fully supported by the manufacturer’s own application platform, including Native SDK and Computer vision SDK.

###### The camera shall conform to ONVIF profile G as defined by the ONVIF Organization.

###### The camera shall conform to ONVIF profile S as defined by the ONVIF Organization.

###### The camera shall conform to ONVIF profile T as defined by the ONVIF Organization.

###### Support for Session Initiation Protocol (SIP) for integration with Voice over IP (VoIP) systems, peer to peer or integrated with SIP/PBX

##### Installation and maintenance

###### The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras’ configuration.

###### The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.

###### The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.

###### The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.

###### The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.

###### The camera shall accept external time synchronization from an NTP (Network Time Protocol) server.

##### Access log

###### The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit’s latest restart. The file shall include information about the connecting IP addresses and the time of connecting.

###### The camera shall provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.

##### Camera diagnostics

###### The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera’s operational status and provide information about power, communication with receiver, the network status and the camera status.

###### The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.

###### The camera shall send a notification when the unit has rebooted and all services are initialized.

##### Hardware interfaces

###### Network interface

The camera shall be equipped with one 10BASE-T/100BASE-TX
Ethernet-port using a RJ45 connector and shall support auto negotiation
of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full
and half duplex).

###### Inputs/Outputs

The camera shall be equipped with one digital (alarm) input
and one digital output, accessible via a removable terminal block.
This input shall be configurable to respond to normally open (NO)
or normally closed (NC) dry contacts. The output shall be able to
provide 12 V DC, 25 mA.

###### Power

The camera shall be equipped with a removable terminal block
providing connectivity for external power.

##### Enclosure

###### The camera shall:

Be manufactured with an IP66-, NEMA 4X- and IK10-rated (IR
window IK09) rated aluminum enclosure.

##### Power

###### The camera shall provide power over Ethernet IEEE 802.3af/802.3at Type 2 Class 4

Max: 15.5 W

Typical: 7.9 W

##### Environmental

###### The camera shall:

Operate in a temperature range of –40 ºC to 50 ºC (–40
ºF to 122 ºF)

Operate in a maximum temperature (intermittent) of 55 ºC
(131 ºF)

Operate at a start-up temperature of –30 ºC to 50 ºC
(–22 ºF to 122 ºF)

Operate in a humidity range of 10–100% RH (condensing).

# EXECUTION

## INSTALLATION

### The contractor’s or subcontractor’s main resources within the project shall carry proper professional certification issued by the manufacturer and verified by a third-party organization to confirm sufficient product and technology knowledge.

### The contractor shall carefully follow instructions in documentation provided by the manufacturer to ensure all steps have been taken to provide a reliable, easy-to-operate system.

### All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.

### All firmware found in products shall be the latest and most up-to-date version as specified by the manufacturer, or by the product component provider.

### All equipment requiring users to log on using a password shall be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.

### A proper installation shall meet NEC (National Electrical Code – US only) per the guidelines of that year’s revision. When properly installed equipment meets Low Voltage, Class 2 classification of the NEC.

END OF SECTION