# 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 55024

#### EN 55032 Class A

#### EN 61000-3-2

#### EN 61000-3-3

#### EN 61000-6-1

#### EN 61000-6-2

#### FCC Part 15 Subpart B Class A

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

#### KC KN32 Class A, KC KN35

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

#### VCCI Class A

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

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

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

#### IS 13252

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

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

### 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)

##### NIST SP500-267

#### Mechanical environment:

##### IEC 60068-2-1

##### IEC 60068-2-2

##### IEC 60068-2-6

##### IEC 60068-2-14

##### IEC 60068-2-27

##### EC 60068-2-78

##### IEC/EN 60529 IP66

##### IEC/EN 62262 IK10

##### NEMA 250 Type 4X

#### Railway environment:

##### EN 50121-4

##### IEC 62236-4

#### Network:

##### NIST SP500-267

##### IPv6 USGv6

## 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. Power injectors (midspans) shall be provided by the
contractor when required for proper operation.

### 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:

#### Interior and exterior PTZ dome 720p network camera shall
be AXIS P5654-E

## VIDEO SURVEILLANCE CAMERAS

### Wide angle PTZ with HDTV 720p and 21x zoom

#### 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 be equipped with a varifocal lens with auto-iris.

##### The camera shall be equipped with a 4.0-84.6 mm lens with
auto-iris and autofocus.

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

##### The camera shall provide local video storage utilizing a
SD/SDHC/SDXC memory card expansion.

##### The camera shall be manufactured with an UV-resistant IP66,
NEMA 4X-rated and IK10 aluminum casing with a polycarbonate dome.

##### The camera shall provide options for a smoked lower dome

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

##### Illumination

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

Color: 0.11 lux at 50 IRE F1.6

Color: 0.1 lux at 30 IRE F1.6

B/W: 0.03 lux at 50 IRE F1.6

B/W: 0.01 lux at 30 IRE F1.6

##### Resolution

###### The camera shall be designed to provide video streams in
HDTV 720p (1280x720) at up to 60 frames per second (60Hz mode) or
50 frames per second (50Hz mode) using H.264, H265 or Motion JPEG.

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

1280x720 (HDTV 720p)

800x450

480x270

##### Video streaming

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

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

###### 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 50/60
frames per second.

Baseline Profile H.264 encoding with motion estimation in
up to 50/60 frames per second.

Main Profile H.264 and H.265 encoding with motion estimation
and context-adaptive binary arithmetic coding (CABAC) in up to 50/60
frames per second.

High Profile H.264 encoding with motion estimation up to
50/60 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 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

###### The camera shall support optimized image processing time
for live streams by reducing the latency in live streams to the minimum.

##### 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 (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 1/66500s to 2s.

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

HDTV 720p (1280x720) with WDR: Up to 25/30 fps (50/60Hz)

HDTV 720p (1280x720) without WDR: Up to 50/60 fps (50/60
Hz)

###### 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 incorporate a function for optimization
of low light behavior at different light levels.

###### The camera shall incorporate a function for optimization
of low light behavior.

###### The camera shall allow for rotation of the image.

###### The camera shall incorporate a function for Electronic Image
Stabilization (EIS) for real-time image stabilization.

###### The camera shall incorporate automatic defog functionality.

##### 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 more than 255 manually set preset positions.

Provide On-screen directional indicator (OSDI) functionality.

Be equipped with accurate pan and tilt functionality with
a range of:

Pan: 360 endless

Tilt 180

Provide pan and tilt speed in a range of:

Pan: 0.1 - 350/sec

Tilt: 0.1 - 350/sec

Provide e-flip functionality, which will automatically rotate
the image 180 electronically when following a moving object passing
under the camera.

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 functionality

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

Device status

Above operating temperature

Above or below operating temperature

Below operating temperature

Fan

IP address

Network lost

Shock detection

Storage failure

System ready

Edge storage

Recording ongoing

Storage disruption

I/O

Manual trigger

Virtual input

PTZ

Malfunctioning

Movement

Preset position reached

Ready

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

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 SD-card slot

Network attached storage, located on the local network

###### The camera shall incorporate encryption functionality for
the SD card (AES-XTS-Plain64 256bit).

###### 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, HTTP/2, HTTPSa , 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,
IGMPv1/v2/v3, RTCP, ICMP, DHCPv4/v6, ARP, SSH, NTCIP, 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 SSL/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.

Authentication

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

Restrict access to pre-defined IP addresses, commonly known
as IP address filtering.

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.

##### 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 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.

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

##### Analytics

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

######  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.

The camera shall provide a function to measure how long an
object (human or vehicle) stayed in a monitored area.

###### The camera shall support advanced video analytics capabilities
with a built-in hardware-accelerated object detect engine, capable
of automatically detecting several simultaneously visible objects
from a set of pre-trained object categories (such as vehicles, license
plates, people, and faces).

##### 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 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.

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

##### 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 interface

###### 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).

##### Enclosure

###### The camera shall:

Be manufactured with an IP66-, NEMA 4X- and IK10 Aluminum
casing, polycarbonate (PC) dome.

##### Power

###### The camera shall provide power over Ethernet IEEE 802.3at,
Type 2 Class 4.

Max: 16 W

Typical: 8 W

###### The camera shall be connected to a separate midspan and obtain
power through a network cable. The midspan shall use 100-240 V AC/50-60
Hz, max 37 W, and provide the camera with a maximum of:

Max: 37W

##### Environmental

###### The camera shall:

Operate in a temperature range of -30 °C to +50 °C
(-22 F to 122 F).

Operate in a maximum temperature (intermittent) of +55 °C
(131 °F).

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