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20MP MULTI-DIRECTIONAL 360 DEGREE CAMERA

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

Notes to Specifier:

1. Where several alternative parameters or specifications exist, or where, the specifier has the option of inserting text, such choices are presented in **<bold text>**.
2. Explanatory notes and comments are presented in **colored** text.

Important: See further notes on the following page.

Important Note to Security Systems Specifiers

CSI MasterFormat 2016 incorporates numerous significant changes affecting electronic safety and security. This document is written to provide flexibility in using either format, although adoption of MasterFormat 2016 is encouraged. The following is a guide to the MasterFormat numbers relevant to the product referenced in this specification.

Primary Specification Area:**MasterFormat 2014:**

28 20 00	Electronic Surveillance
28 23 00	Video Surveillance
28 23 29	Video Surveillance Remote Devices and Sensors

MasterFormat 2016:

28 20 00	Video Surveillance
28 2x xx	Surveillance Cameras
28 2x xx	IP Cameras

Related Requirements:**MasterFormat 2014:**

27 20 00	Data Communications
28 23 13	Video Surveillance Control and Management Systems
28 23 16	Video Surveillance Monitoring and Supervisory Interfaces
28 23 19	Digital Video Recorders and Analog Recording Devices
28 23 23	Video Surveillance Systems Infrastructure

MasterFormat 2016

27 15 01.xx	Video Surveillance Communications Conductors and Cables
27 20 00	Data Communications
28 05 xx.xx	PoE Power Sources for Electronic Safety and Security
28 05 xx	Storage Appliances for Electronic Safety and Security
28 05 xx.xx	Network Video Recorders
28 05 xx	Cyber Requirements for Electronic Safety and Security
28 05 xx	Safety and Security Network Communications Equipment
28 2x 00	Video Management System

20MP MULTI-DIRECTIONAL 360 DEGREE CAMERA**PART 1 GENERAL****1.01 SUMMARY**

- A. Section includes a 20MP multi-directional (omnidirectional) camera with a 360 degree field of view in vandal proof dome housing.
- B. Product - A 20MP IP video camera with multi-streaming (H.265, H.264 and MJPEG) capability and variable view modes including panorama and quad view.
- C. Related Requirements

Refer to MasterFormat notes at the beginning of this document to select requirements specific to the MasterFormat version being used in the specification.

1.02 REFERENCES

- A. Abbreviations
 - 1. AGC - Automatic Gain Control
 - 2. ARP – Address Resolution Protocol
 - 3. AWB - Automatic White Balance
 - 4. BLC – Back light compression
 - 5. CBR – Constant Bit Rate
 - 6. CVBS – Color, Video, Blanking, Sync
 - 7. DHCP - Dynamic Host Configuration Protocol
 - 8. DNR – Digital Noise Reduction
 - 9. DNS - Domain Name Server
 - 10. DDNS – Dynamic Domain Name Server
 - 11. DSCP – Differentiated Services Code Point
 - 12. fps - frames per second
 - 13. FTP - File Transfer Protocol
 - 14. GOV – Group of Video
 - 15. GUI – Graphical User Interface
 - 16. HD – High Definition
 - 17. HTTP - Hypertext Transfer Protocol
 - 18. ICMP – Internet Control Message Protocol
 - 19. IGMP - Internet Group Management Protocol
 - 20. IP - Internet Protocol
 - 21. JPEG - Joint Photographic Experts Group
 - 22. MJPEG - Motion JPEG
 - 23. MP - Megapixel
 - 24. MPEG - Moving Pictures Experts Group
 - 25. NAS – Network Attached Storage

26. NTP - Network Time Protocol
27. PIM-SM - Protocol Independent Multicast-Sparse Mode
28. PoE - Power over Ethernet
29. PPPoE – Point to Point Protocol over Ethernet
30. RTP - Real-Time Transport Protocol
31. RTCP – Real-Time Control Protocol
32. RTSP - Real-Time Streaming Protocol
33. SDK – Software Development Kit
34. SMTP - Simple Mail Transfer Protocol
35. SNMP – Simple Network Management Protocol
36. SSL – Secure Sockets Layer
37. TCP - Transmission Control Protocol
38. UDP - User Datagram Protocol
39. UPnP – Universal Plug and Play
40. VBR – Variable Bit Rate
41. VMS - Video Management System
42. WDR – Wide Dynamic Range
43. LDC – Lens Distortion Correction

B. Reference Standards

1. Network - IEEE
 - a. 802.3 Ethernet Standards
 - b. 802.1x Port-based Network Access Control
2. Video
 - a. ISO / IEC 23008-2:2013, MPEG-H Part2 (ITU H.265, HEVC)
 - b. ISO / IEC 14496–10, MPEG-4 Part 10 (ITU H.264)
 - c. ISO / IEC 10918 – JPEG
 - d. ONVIF – Profiles S
3. Emissions
 - a. FCC-47 CFR Part 15 Subpart B Class B
 - b. CE EN 55022:2010
4. Immunity - CE
 - a. EN 50130-4:2011
 - b. EN 61000-3-3:2014
 - c. EN 61000-4-2:2009
 - d. EN 61000-4-3:2006+A2:2010
 - e. EN 61000-4-4:2012
 - f. EN 61000-4-5:2014
 - g. EN 61000-4-6:2009
5. Safety
 - a. UL listed
 - b. CE EN 50581:2012 (hazardous substances)

6. Ingress Protection and Vandal Resistance
 - a. ANSI / IEC60529 – Degrees of protection Provided by Enclosures : IP67
 - b. IEC EN 62262 - Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts : IK10
 - c. IEC 60068-2-75 : IK10

C. Definitions

1. GOV (Group of Video object planes) - A set of video frames for H.264 and H.265 compression, indicating a collection of frames from the initial I-Frame (key frame) to the next I-Frame. GOV consists of 2 kinds of frames: I-Frame and P-Frame.
2. WiseStream – Smart Codec that controls quantization parameter in H.265 and H.264 to efficiently manage bitrate of the video stream and reduce the storage required.
3. Dynamic GOV – Dynamic assignment of GOV length based on the complexity of the scene to efficiently manage bitrate of the video stream and reduce the storage required.
4. Multi-exposure wide dynamic range - Operation which automatically adjusts shutter speed to provide a wide range between dark and light areas visible at the same time, preventing backlighting issues. Long exposure is used for bright areas and a short exposure is used in dark areas.
5. Dynamic fps – Dynamic assignment of fps (frames per seconds) based on the movement of object(s) in the scene to efficiently manage bitrate of the video stream and reduce the storage required.

1.03 SUBMITTALS

A. Product Data

1. Manufacturer's printed or electronic data sheets
2. Manufacturer's installation and operation manuals
3. Warranty documentation

1.04 QUALIFICATIONS

- A. Manufacturer shall have a minimum of five years' experience in producing IP video equipment.
- B. Installers shall be trained and authorized by the Manufacturer to install, integrate, test, and commission the system.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver the camera in the manufacturer's original, unopened, undamaged container with identification labels intact.
- B. Store the camera in a temperature environment indicated in 2.04 Detailed Specification, protected from mechanical and environmental conditions as designated by the manufacturer.

1.06 WARRANTY, LICENSING AND SUPPORT

- A. Manufacturer shall provide a limited 3 year warranty for the product to be free of defects in material and workmanship.
- B. Manufacturer shall provide embedded camera video analytics free of license charges.

END OF SECTION

PART 2 PRODUCTS**2.01 EQUIPMENT**

- A. Manufacturer: Hanwha Techwin
<http://www.hanwha-security.com/>
- B. Model PNM-9081VQ
- C. Alternates: None

2.02 GENERAL DESCRIPTION

- A. The camera shall provide 360-degree field of view and produce video in quad view mode. It shall also provide digital PTZ along with automated video analytics to allow users to efficiently monitor large visual fields with capability to focus on certain areas when suspicious activity is observed.
- B. Video Compression and Transmission – The multi-directional camera shall have the following properties relating to the video signals it produces.
 - 1. H.265, H.264 and MJPEG compression, each derived from a dedicated encoder and capable of being streamed independently and simultaneously
 - a. H.265 and H.264 – Maximum of 30 fps at all resolutions
 - b. MJPEG – Maximum of 30 fps
 - 2. The multi-directional camera shall be able to configure up to 10 independent video stream profiles with differing encoding, quality, frame rate, resolution, bit rate, and other video settings.
 - 3. The multi-directional camera shall have four lenses and each lens shall provide the following resolutions.
 - a. 2560 x 1920 (5M), 2560 x 1440, 1920 x 1080, 1600 x 1200, 1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 720 x 576, 720 x 480, 640 x 480, 320 x 240
 - 4. Simultaneous unicast access by up to 20 users
 - 5. Multicast or unicast capable
 - 6. Dynamic DNS (DDNS) support.
 - 7. The multi-directional camera shall provide smart codec (WiseStream, Dynamic GOV, and Dynamic fps) to efficiently manage bit rate of the video stream and reduce storage while producing video quality that is visually equal to the one without smart codec.
 - a. Viewing composition: Quad view
- C. Camera – The multi-directional camera device shall have the following physical and performance properties:
 - 1. IK10 rated for protection against impacts.
 - 2. IP66 for protection against dust and water.
 - 3. Auto day/night operation with removable IR cut filter
 - a. Low light level operation to 0.07 lux (color) and 0.007 lux (black and white)
 - 4. 2D and 3D digital noise reduction
 - 5. 32 privacy masking regions utilizing polygons
 - 6. The multi-directional camera shall be able to capture high contrast scenes with 120 dB multi-exposure wide dynamic range.
 - 7. One touch (Simple) or manual focus controllable remotely via network. The camera shall have motorized varifocal lens.

8. Advanced digital image stabilization with built in gyro sensor. The camera shall be able to measure movements in three axes and accurately enhance images from distortions caused by instability.
- D. Intelligence and Analytics – The multi-directional camera shall have a suite of integral intelligent operations and analytic functions to include:
 1. Motion detection with eight definable detection areas, minimum/maximum object size definition and a learning algorithm that ignores false alarms such as trees and waves on water. The camera shall also be able to send meta-data to NVR or VMS to allow users to search for motion events and generate video summary.
 2. Detection of logical events of specified conditions from the camera's video input
 - a. camera tamper (scene change)
 - b. loitering
 - c. directional detection
 - d. defocus detection
 - e. fog detection
 - f. virtual line
 - g. enter/exit
 - h. appear/disappear
- E. Interoperability – The multi-directional camera shall be ONVIF Profile S compliant.
- F. The multi-directional camera shall possess the following further characteristics:
 1. Built-in web server, accessed via standard browsers including Internet Explorer, Firefox, Chrome & Safari
 2. Micro SD/SDHC/SDXC memory card options, with configurable pre-alarm and post-alarm recording intervals
 3. Alarms and notifications
 - a. alarm notification triggers:
 - 1.) alarm input
 - 2.) motion detection
 - 3.) video analytics
 - 4.) network disconnect
 - b. available notification means upon trigger:
 - 1.) file upload via FTP and e-mail
 - 2.) notification via e-mail
 - 3.) record to local storage (SD/SDHC/SDXC card)
 - 4.) external output
 4. Pixel Counter available in the plug-in web viewer.

2.03 CAMERA SOFTWARE

- A. The multi-directional camera shall have a built in web server which supports browser-based configuration using Internet Explorer, Google Chrome, Mozilla Firefox, and Apple Safari, for which web viewer plug-ins are available, from a PC or Mac.
- B. The web viewer shall provide a monitoring screen which displays live camera video and simultaneously provides same-screen access to the following functions:
 1. Live view window size

2. Resolution setting
 3. Image (snapshot) capture
 4. Manual recording to SD
 5. Audio/microphone control
 6. Access Playback and Setup menus
- C. The web viewer shall provide a playback screen which provides access to the following functions:
1. Search date and time range
 2. Search event type
 3. Play an event video
 4. Set resolution
 5. Play audio if present
 6. Generate a backup copy of saved video data
- D. The web viewer shall provide a setup screen which provides access to the following configuration settings and functions in the camera:
1. Digital video profile to include compression type, maximum or target bit rate, frame rate, multicast parameters, crop encoding area
 2. User profile to include password, access level, authentication
 3. Date and time
 4. Network settings and IP version
 - a. DDNS
 - b. SSL, including certificate management
 - c. 802.1x authentication
 - d. Quality of Service settings
 - e. SNMP to include version selection and settings
 - f. Auto configuration
 5. Video setup to include flip and mirror mode, video type, privacy zone
 6. Audio setup to include source, audio codec type, gain, and bit rate
 7. Camera settings to include image preset, sensor frame capture, dynamic range, white balance, back light, exposure, day/night operation, on-screen display, IR illumination, sharpness, contrast, and color level.
 8. Event detection setup to include notification parameters, recording rules, time schedule, tamper protection, motion detection, event triggers
 9. System function to include reboot, upgrade, check system and event logs, application (SDK) management
 10. View profile information
- E. Client requirements
1. Acceptable Operating Systems: Windows 7 / 8.1 / 10, MAC OS X 10.9~10.12
 2. Acceptable browsers
 - a. Plug-in free web viewer: Google Chrome 54, MS Edge 38, Mozilla Firefox 49
(Windows 64bit only), Apple Safari 9 (Mac OS X only)
 - b. Plug-in web viewer: MS Explore 11, Apple Safari 9 (Mac OS X only)

2.04 DETAILED SPECIFICATIONS**A. Video****1. Imager**

- a. Sensor: 1/1.8" 6M CMOS (The camera includes four sensors.)
 - 1.) pixels per sensor: 3096 (H) x 2094 (V) 6M x 4 total
2616 (H) x 1976 (V) 5M x 4 effective
 - 2.) scanning : progressive
- b. Minimum illumination
 - 1.) Color mode: 0.07Lux (F1.2, 1/30 sec)
 - 2.) Black & white mode: 0.007Lux (F1.2, 1/30 sec)
- c. The following features with control settings shall be available:
 - 1.) Camera Title Off / On (Up to 85 characters per line)
 - W/W: English / Numeric / Special characters
 - China: English / Numeric / Special / Chinese characters
 - Common: Multi-line (Max. 5), Color (Grey / Green / Red / Blue / Black / White), Transparency, Auto scale by resolution
 - 2.) Day/night setting: Auto (ICR) / Color / B/W / External / Schedule
 - 3.) Backlight compensation (BLC): Off / BLC / WDR
 - 4.) WDR 120dB
 - 5.) Contrast Enhancement Off / On (Samsung Super Dynamic Range)
 - 6.) 2D + 3D Digital Noise Reduction: Off / On
 - 7.) Defog Off / Auto / Manual
 - 8.) Motion Detection Off / On (8ea polygonal zones)
 - 9.) Privacy Masking Off / On (32ea polygonal zones)
 - a.) Color: Gray / Green / Red / Blue / Black / White
 - Mosaic
 - 10.) Gain Control Off / Low / Middle / High / Manual
 - 11.) White Balance ATW / AWC / Manual / Indoor / Outdoor
(including Mercury and Sodium)
 - 12.) Electronic shutter speed:
 - a.) settings: Minimum / Maximum / Anti flicker
(2 ~ 1/12,000 sec)
 - 13.) Digital zoom 24x
 - 14.) Image flip: Off / On
 - 15.) Image mirror: Off / On
 - 16.) Intelligent video analytics Tampering, Loitering, Directional Detection, Defocus Detection, Fog Detection, Virtual Line, Enter/Exit, (Dis) Appear, Motion Detection

- | | |
|---------------------|--|
| 17.) Alarm I/O | Input 1 / Output 1 |
| 18.) Alarm Triggers | Alarm input, Motion detection, Video analytics, Network disconnect |
| 19.) Alarm Events | File upload via FTP and E-mail, Notification via E-mail, Local storage (SD/SDHC/SDXC) recording at event triggers, External output |
| 20.) Pixel Counter | Available in the plug-in web viewer. |
- d. Lens: 3.6mm ~ 9.4mm (2.6x) motorized varifocal
- | | |
|--------------------------|--|
| 1.) Max. Aperture Ratio | F1.2 |
| 2.) Angle of view: | H : 102.5°(Wide) ~ 38.7°(Tele), V : 74.2°(Wide) ~ 29.0°(Tele),
D : 135.5°(Wide) ~ 48.6°(Tele) |
| 3.) Min. Object Distance | 0.5 m (1.64ft) |
| 4.) Focus Control | Simple focus (Motorized V/F)
Manual - Remote control via network (Manual, Simple focus) |
| 5.) Lens Type | DC Auto Iris, P-Iris |
| 6.) Mount Type | Board Type |
- e. Pan/Tilt/Rotate
- | | |
|----------|-----------------------------------|
| 1.) Pan | ±15° |
| 2.) Tilt | 10° ~ 41°, 10° ~ 90° (CH2/Center) |
| 3.) Zoom | ±90° |
2. Video Streams
- a. The multi-directional camera shall be able to produce 10 independent video profiles, each of which may have the following properties:
- | | |
|------------------------------|--|
| 1.) Encoding type: | a.) H.265
b.) H.264
c.) MJPEG |
| 2.) Resolution: | a.) From each sensors 2560 x 1920, 2560 x 1440, 1920 x 1080, 1600 x 1200,
1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600,
720 x 576, 720 x 480, 640 x 480, 320 x 240 |
| 3.) Maximum frame rate: | a.) H.265 and H.264: 30fps@all resolutions
b.) MJPEG: Max. 30fps |
| 4.) Smart Codec | Manual mode (Area-based : 5ea), WiseStream, Dynamic GOV
Dynamic fps |
| 5.) Bit rate control method: | a.) H.265 and H.264
i. target bitrate level control |

- ii. constant bit rate (CBR) or variable bit rate (VBR)
 - b.) MJPEG
 - i. quality level control
 - ii. variable bit rate (VBR)
 - 3. Number of multi-streaming profiles: 40 maximum
 - 4. Simultaneous users (total): 20 maximum (unicast)
 - 5. Storage and Recording
 - a. The multi-directional camera shall have onboard SD card storage for each sensor.
 - 1.) Card type: Micro SD/SDHC/SDXC
 - 2.) Capacity: Up to 128 GB per card
 - 3.) Image content on the card shall have the ability to be downloaded to a selected destination.
 - 6. Interoperability - Video streams shall be capable of supporting ONVIF protocol, profiles S.
 - 7. Single Images - The multi-directional camera shall support screenshot and export in jpg format.
- B. Network
- 1. Connectivity: 10/100 Base-T Ethernet via RJ-45 connector
 - 2. Protocols supported:
 - a. Transmission Control Protocol (TCP), Internet Protocol (IP) v4 and v6, User Datagram Protocol (UDP)
 - b. Configuration: Dynamic Host Configuration Protocol (DHCP)
 - c. Web services: Hypertext Transfer Protocol (HTTP), Secure HTTP (HTTPS)
 - d. Network services: Address Resolution Protocol (ARP), Bonjour, Domain Name System (DNS), Internet Control Message Protocol (ICMP), Network Time Protocol (NTP), Protocol Independent Multicast-Sparse Mode (PIM-SM), Simple Network Management Protocol (SNMP v1/2c/3 – MIB-2), Universal Plug and Play (UPnP)
 - e. Media: Real-Time Transport Protocol (RTP), Real-Time Control Protocol, Real-Time Streaming Protocol (RTSP)
 - f. Multicast: Internet Group Management Protocol (IGMP)
 - g. Notifications: File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP)
 - h. Remote Access: Point-to-Point Protocol over Ethernet (PPPoE)
 - 3. DDNS – The multi-directional camera shall support DDNS services offered by the Manufacturer and other publicly available service offerings.
 - 4. Quality of Service (QoS) – Layer 3 DSCP
 - 5. Security features:
 - a. user password protection
 - b. IP address filtering - list of allowed or blocked IP addresses
 - c. HTTPS(SSL) login authentication
 - d. HTTPS(SSL) secured communications
 - e. Digest login authentication
 - f. User access log
 - g. 802.1x authentication

6. Discovery - Manufacturer shall offer a discovery program to identify all devices of his manufacture on the network and enable device configuration remotely and simultaneously for multiple devices to reduce time required for installation and setup.

C. Electrical

1. Power

- a. Input Voltage / Current HPoE, 12 DC
- b. Power Consumption:
 - 1.) 12V DC Max. 28.8W
 - 2.) HPoE Max. 33.6W

D. Mechanical And Environmental

1. Material:

- a. Housing: Aluminum

2. Dimensions (W x H): 315.0 x 152 mm (12.40 in. x 5.98 in.)

3. Weight 4.89kg (10.78 lb.)

4. Temperature:

- a. Operating: -40° C to 55° C (40° F to 131° F)
- b. Storage: -50° C to 60° C (-58° F to 140° F)

5. Humidity: 0 - 90%, non-condensing

6. Environmental Rating:

- a. Mechanical (Vandal) Protection IK10
- b. Ingress Protection IP66

END OF SECTION

PART 3 EXECUTION

3.01 INSTALLERS

- A. Contractor personnel shall comply with all applicable state and local licensing requirements.

3.02 PREPARATION

- A. The network design and configuration shall be verified for compatibility and performance with the camera(s).
- B. Network configuration shall be tested and qualified by the Contractor prior to camera installation.
- C. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.
- D. All firmware found in products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by the provider of the Video Management Application (VMA).
- E. 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.

3.03 INSTALLATION

- A. The contractor shall carefully follow instructions in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operate system.
- B. Before permanent installation of the system, the contractor shall test the system in conditions simulating the final installed environment.

3.04 STORAGE

- A. The hardware shall be stored in an environment where temperature and humidity are in the range specified by the Manufacturer.

END OF SECTION