Thermal Temperature Monitoring Solution
Complete Solution to Detect and Monitor Temperatures

Required Components (sold separately)
- Thermal Hybrid Network Camera (DH-TPC-BF5421-T or DH-TPC-BF3221-T)
- JQ-D70Z Blackbody
- DHI-NVR5216-16P-I 16-channel NVR

Recommended Accessories (sold separately)
- VCT-999 Tripod (x2)
- RQW026-00 Bracket (x2)
- DHI-LM43-F200 Full HD Monitor

Solution Features
- Safe, Efficient, and Accurate Temperature Monitoring
- ±0.3° C (±0.54° F) Temperature Measurement Accuracy (with blackbody)
- Long-distance Screening at up to 4.50 m (15.0 ft)
- Enhanced Power and Data Transmission Distances (ePoE)
- Recommended Use in Commercial Buildings, Healthcare Facilities, Airports, Metro Stations, and Public Gathering Locations

Solution Overview

The Dahua Thermal Temperature Monitoring Solution offers the latest hybrid thermal network camera that combines a Vanadium Oxide (VOx) sensor with a 2 MP visible-light sensor. The solution also provides a blackbody calibration device that maintains a customizable constant temperature as a reference point for the thermal camera. The thermal camera coupled with the blackbody calibration device and a feature-rich 4 TB Network Video Recorder delivers a contactless solution for continuous and non-invasive comparison of human skin temperature compared to the blackbody device. Thermal imaging equipment can easily be installed and implemented to detect elevated skin temperature in environments such as airports, hospitals, and clinics.

The Dahua Thermal Temperature Monitoring Solution is not FDA-cleared or approved. The Solution should not be solely or primarily used to diagnose or exclude a diagnosis of COVID-19 or any other disease. Elevated skin temperature in the context of use should be confirmed with secondary evaluation methods (e.g., an NCIT or clinical grade contact thermometer). Public health officials, through their experience with the Solution in the particular environment of use, should determine the significance of any fever or elevated temperature based on the skin telethermographic temperature measurement. The Solution should be used to measure only one subject's temperature at a time. Visible thermal patterns are only intended for locating the points from which to extract the thermal measurement.

Thermal Camera Functions

High Thermal Sensitivity
The VOx detector offers high thermal sensitivity (≤ 50 mK) that allows Dahua thermal cameras to distinguish objects in a scene with minimal temperature differences. The camera captures detailed images where thermal contrast between object and background is minimal.

NVR Functions

The Dahua DHI-NVR5216-16P-I combines Analytics+ algorithms with Dahua's ePoE technology into an all-in-one network video recorder. This NVR uses a powerful multi-core processor to provide 4K resolution processing for applications where impeccable image details are required. The Dahua Analytics+ algorithms significantly improve accuracy and reliability, as compared to standard intelligent features.

Face Detection
The NVR performs real-time face detection to identify and capture human faces in digital images.

Smart H.265+
Smart H.265+ is the optimized implementation of the H.265 codec that uses a scene-adaptive encoding strategy, dynamic GOP, dynamic ROI, flexible multi-frame reference structure and intelligent noise reduction to deliver high-quality video without straining the network. Smart H.265+ technology reduces bit rate and storage requirements by up to 70% when compared to standard H.265 video compression.

4K Resolution
4K resolution is a revolutionary breakthrough in image processing technology. 4K delivers four times the resolution of standard HDTV 1080p devices and offers superior picture quality and image details. 4K resolution improves the clarity of a magnified scene to view or record crisp forensic video from large areas.

Enhanced Power over Ethernet Technology

Dahua's innovative ePoE technology offers a plug-and-play solution to transmit power and data over long distances via Ethernet or coaxial cables, reducing installation time and saving money. ePoE technology encompasses pure IP systems where a single CAT5E cable can carry signals up to 800 m (2624 ft), and IP/Analog hybrid systems where the technology leverages existing analog infrastructure to transmit signals up to 1000 m (3281 ft) over RG59 coaxial cable.

ISO 9001:2015 Certified

Thermal Solution

Technical Specification

Thermal Hybrid Camera

Thermal Camera

	DH-TPC-BF5421-T	DH-TPC-BF3221-T
Image Sensor	Uncooled VOx Focal Plane Detector	
Effective Pixels	400 (H) x 300 (V)	256 (H) x 192 (V)
Pixel Size	17 µm	12 µm
Thermal Sensitivity (NETD)	≤40 mK	≤50 mK
Spectral Range	8 µm to 14 µm	
Image Settings	Electronic Thermal Image Stabilization Digital Detail Enhancement	
Color Palettes	18, including: Whitehot, Blackhot, Icefire, Fusion, Rainbow, Globow, Ironbow1, and Sepia	

Thermal Lens

Lens Type	Fixed-focal	
Focus Control	Athermalized, Focus-free	
Aperture	F1.0	F1.1
Focal Length	13 mm	7 mm
Field of View	Horizontal: 30.0° Vertical: 22.60°	Horizontal: 24.0° Vertical: 18.0°

Visible-light Camera

Image Sensor	1/2.8-in. CMOS
Effective Pixels	1920 (H) x 1080 (V)
Electronic Shutter Speed	1/1 s to 1/30,000 s
Minimum Illumination	Color: 0.005 lux at F1.9 B/W: 0.0005 lux at F1.9 0 lux with IR On
IR Distance	35.0 m (114.83 ft)
IR On/Off Control	Auto, Manual
IR LEDs	One (1)

Visible-light Lens

Focal Length	8 mm
Maximum Aperture	F1.9
Field of View	Horizontal: 40° Vertical: 22°

Temperature Measurement

Range	30° C to 45° C (86° F to 113° F)
Accuracy	±0.3° C (±0.54° F), with blackbody
Mode	Spot, Line, Area
Rule	Supports 12 Rules Simultaneously: Spot: 12 Line: 12 Area: 12

Video

		DH-TPC-BF5421-T	DH-TPC-BF3221-T
Compression		H.265, H.264, H.264H, H.264B, MJPEG	H.265, H.264, MJPEG
Frame Rate	Main Stream		
	Thermal	1280 x 1024, 1024 x 768, 640 x 480, 256 x 192 at 30 fps	
	Visible	1920 x 1080, 1280 x 720, 704 x 480 at 30 fps	
	Sub Stream		
	Thermal	640 x 480, 256 x 192 at 30 fps	
	Visible	704 x 480, 352 x 240 at 30 fps	
Bit Rate Control		CBR, VBR	
Bit Rate		H.264: 640 Kbps to 8192 Kbps	
Day/Night		Auto (ICR), Color, B/W	
BLC Mode		BLC, HLC, True WDR (120 dB)	
White Balance		Auto, Indoor, Outdoor, ATW, Manual, Natural, Street Lamp	
Motion Detection		Off, On (4 zones, Rectangle)	
Noise Reduction		2D, 3D	
Advanced Features		Electronic Thermal Image Stabilization Digital Detail Enhancement	
Region of Interest		Off, On (4 zones)	
Defog		Off, Manual, Auto	
Flip		90°, 180°	180°
Mirror		Off, On	
Privacy Masking		Off, On (4 areas, Rectangle)	

Network

Ethernet	RJ-45 (10/100 Base-T)
Protocol	IPv4/IPv6, HTTP, HTTPS, 802.1x, Qos, FTP, SMTP, UPnP, SNMP, DNS, DDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, ICMP, DHCP, PPPoE, ONVIF
Interoperability	ONVIF, CGI, Dahua SDK
Streaming Method	Unicast, Multicast
Edge Storage	MicroSD Card slot (up to 256 GB)
Maximum User Access	20 Users (64 Mbps total bandwidth)
User Management	Supports 20 users at one time and users are classified as one of two groups: Administrator or User
Security	Authorized username and password; Attached MAC address; Encrypted HTTPS; IEEE 802.1x; Controlled network access
Web Viewer	IE 8 or later, Explorer with IE Core Chrome version 42 and later Firefox version 42 and later

Certifications

Safety	UL 60950-1 CAN/CSA C22.2 No. 60950-1-07 EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013 IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013
Electromagnetic Compatibility (EMC)	CFR 47 FCC Part 15 Subpart B ANSI C63.4 2014 EN 55032:2015 EN 61000 3 2:2014

Technical Specification - Thermal Hybrid Camera, cont.

Interface

	DH-TPC-BF5421-T	DH-TPC-BF3221-T
Audio	Input: One (1) Channel, 3.5 mm Jack Output: One (1) Channel, 3.5 mm Jack	
Audio Compression	G.711a, G.711Mu, AAC, PCM	G.711a/G.711Mu/AAC
RS485	One (1) Port	
Alarm	Input: Two (2) Channels Output: Two (2) Channels	
Alarm Linkage	SD Card Recording, On/Off Output, Siren and Light, Email, PTZ, snapshot	
Alarm Actions	Motion Detection, Privacy Mask, Audio Detection, SD Card Abnormality, Network Abnormality, Anti-burn Warning	

Electrical

Power Supply	12 VDC ±20% , PoE (IEEE802.3af Class 0), or ePoE (Refer to the ePoE/EoC chart on the last page)	
Power Consumption	Basic: <8 W Maximum: <18 W	Basic: 5 W Maximum: 12 W

Environmental

Operating Temperature	10° C to +30° C (50° F to 86° F), Less than 95% RH
Storage Conditions	10° C to +35° C (50° F to 95° F), Less than 95% RH
Ingress Protection	IP67
Static Discharge Protection	Physical Contact: 8 KV Via Air: 15 KV
Self-Adaptive	Toggles heater on or off, depending on ambient temperature

Construction

Casing	Metal
Dimensions, camera	280.90 mm x 103.80 mm x 96.70 mm (11.06 in. x 4.09 in. x 3.81 in.)
Net Weight	1.40 kg (3.09 lb)
Gross Weight	≤ 1.90 kg (4.19 lb)

Ordering Information

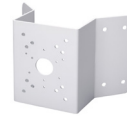| Type	Part Number	Description
Thermal Hybrid Network Camera	DH-TPC-BF5421-T	400 x 300, 13 mm lens
	DH-TPC-BF3221-T	256 x 192, 8 mm lens
Mounting Accessories, optional	DH-PFB120C	Ceiling Mount Bracket
	PFA121	Junction Box
	DH-PFB129W	Wall/Ceiling Mount Bracket
	PFA151	Corner Mount
	PFA152-E	Pole Mount
	DH-PFM320D-US	12 VDC, 2 A Power Adapter
	DH-PFM321D-US	12 VDC, 1 A Power Adapter

Accessories

Optional :

DH-PFB120C
Ceiling Mount Bracket

PFA121
Junction Box

DH-PFB129W
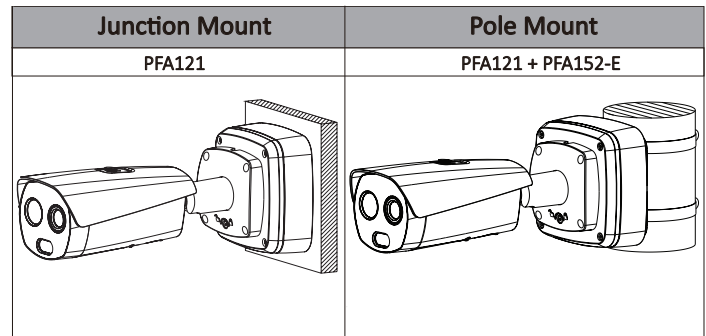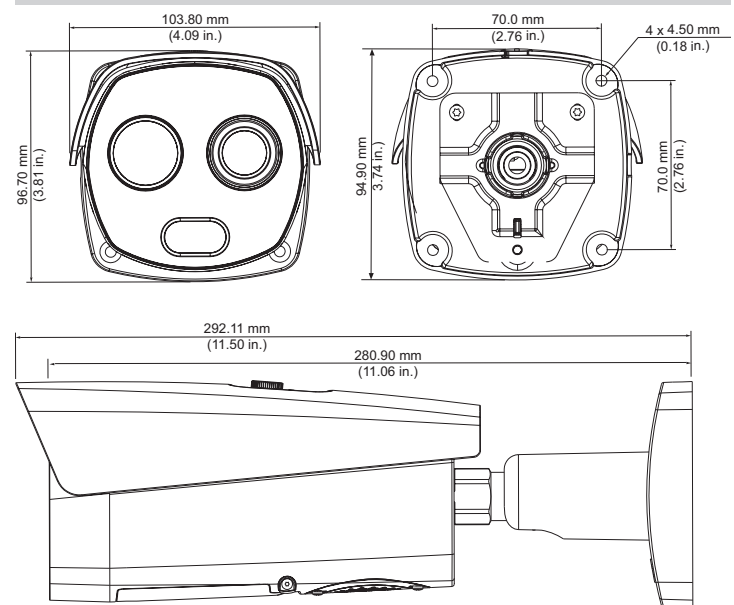Wall/Ceiling Mount Bracket

PFA151
Corner Mount

PFA152-E
Pole Mount

DH-PFM320D-US
12 VDC, 2 A
Power Adapter

DH-PFM321D-US
12 VDC, 1 A
Power Adapter

Junction Mount	Pole Mount
PFA121	PFA121 + PFA152-E

Dimensions (mm/in.)

103.80 mm (4.09 in.)
96.70 mm (3.81 in.)

70.0 mm (2.76 in.)
4 x 4.50 mm (0.18 in.)
94.90 mm (3.74 in.)
70.0 mm (2.76 in.)

292.11 mm (11.50 in.)
280.90 mm (11.06 in.)

Thermal Solution

Technical Specification

DHI-NVR5216-16P-I 16-channel NVR

System

Main Processor	Multi-core Embedded Processor
Operating System	Embedded LINUX

Analytics+ Perimeter Protection

Performance	• 16 channels • 9 Tripwire/Intrusion rules per channel
Object Classification	• Human or Vehicle • Secondary Recognition for Tripwire and Intrusion
Search	• Search by object classification (human or vehicle)

Audio and Video

IP Camera Input	16 Channels
Two-way Talk	Input: One (1) Microphone, RCA Output: (1) Channel, RCA

Display

Interface	One (1) HDMI Output One (1) VGA Output
Native Output Resolution (HDMI and VGA)	3840 x 2160, 1920 x 1080, 1280 x 1024, 1280 x 720 1024 x 768
Maximum Decoding	Four (4) Channels of 8 MP at 30 fps 16 Channels of 1080p at 30 fps
Multi-screen Display	1, 4, 8, 9, 16

Recording

Compression	Smart H.265+, H.265, Smart H.264+, H.264, MJPEG
Supported IP Camera Resolution	16 MP, 12 MP, 8 MP, 6 MP, 5 MP, 4 MP, 3 MP, 1080p, 1.3 MP, 720p, D1, CIF
Maximum Incoming Bandwidth	320 Mbps (160 Mbps when Analytics+ functions enabled)
Record Mode	Manual, Schedule (Continuous, Motion Detection, Alarm, IVS)
Record Interval	1 to 120 minutes (default: 60 minutes) Pre-record: 1 to 30 s Post-record: 10 to 300 s

Video Detection and Alarm

Trigger Events	Alarm Out, Video Push, Email, Recording, PTZ, Tour, Snapshot, Voice Prompt, Buzzer and Screen Tips
Video Detection	Motion Detection, MD Zones: 396 (22 × 18); Video Loss, Tampering, and Scene Change
Alarm Inputs	Four (4) Channels
Relay Outputs	Two (2) Channels

Playback and Backup

Sync Playback	1, 4, 9, 16
Search Mode	Time and Date, Alarm, Motion Detection, and Exact Search (accurate to one second)
Backup Mode	USB Device, Network

Third-party Support

Third-party Support	Arecont Vision, AXIS, Canon, Dynacolor, Panasonic, Pelco, Samsung, Sanyo, Sony, plus more

Network

Interface	One (1) RJ-45 Port (10/100/1000 Mbps)
PoE	16 PoE Ports (IEEE802.3af/at)
ePoE and EoC	Ports 1 through 8
Network Function	HTTP, HTTPS, TCP/IP, IPv4/IPv6, UPnP, SNMP, RTSP, UDP, SMTP, NTP, DHCP, DNS, IP Filter, PPPoE,DDNS, FTP, Alarm Center, IP Search (Support Dahua IP camera, DVR, NVS, etc.), P2P
Maximum User Access	128 Users
Mobile Operating Systems	IOS, Android
Interoperability	ONVIF 2.4, SDK, CGI

Storage

Internal HDD	Two (2) SATA III Ports, up to 8 TB capacity for each HDD Ships with a pre-installed 4 TB HDD

Auxiliary Interface

USB	One (1) USB 3.0 Port, rear One (1) USB 2.0 Port, front
RS232	One (1) Port for PC Communication and Keyboard
RS485	One (1) Port for PTZ Control

Technical Specification - 16-channel NVR, cont.

Electrical

Power Supply	Single, 100 VAC to 240 VAC, 50/60 Hz
Power Consumption, NVR	< 16.5 W, without HDD
PoE Budget	• 130 W Total Rated Power (80% control for protection) • Maximum 25.5 W for a single port

Environmental

Operating Conditions	−10° C to +55° C (14° F to 131° F), 86 kpa to 106 kpa
Storage Conditions	−20° C to +70° C (−4° F to 158° F), 0% to 90% RH

Construction

|	
Dimensions	
NVR	1U, 375.0 mm x 327.18 mm x 53.80 mm (14.76 in. x 12.88 in. x 2.12 in.)
NVR with PFH101 Rack Mount Tray	482.60 mm x 327.18 mm x 53.80 mm (19.0 in. x 12.88 in. x 2.12 in.)
Net Weight	2.70 kg (5.95 lb), without HDD
Gross Weight	4.00 kg (8.82 lb), without HDD
Installation	Standard 19-in. Rack-mount

Certifications

Safety	UL 60950-1 EN60950-1
Electromagnetic Compatibility (EMC)	FCC CFR 47 Part 15 Subpart B EN 55032:2015 EN 61000 3 2:2014

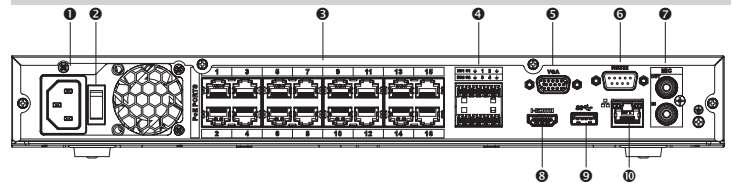## Ordering Information

Type	Part Number	Description
4K NVR with Analytics+	DHI-NVR5216-16P-I 4TB	16-channel 1U ePoE 4K, H.265 Network Video Recorder with Analytics+, 4 TB
Accessories, optional	PFH101	Rack Mount Tray 482.60 mm x 281.20 mm x 43.7 mm (19.0 in. x 11.07 in. x 1.72 in.)
ePoE Accessories	LR1002	EoC Passive Converter

Dimensions
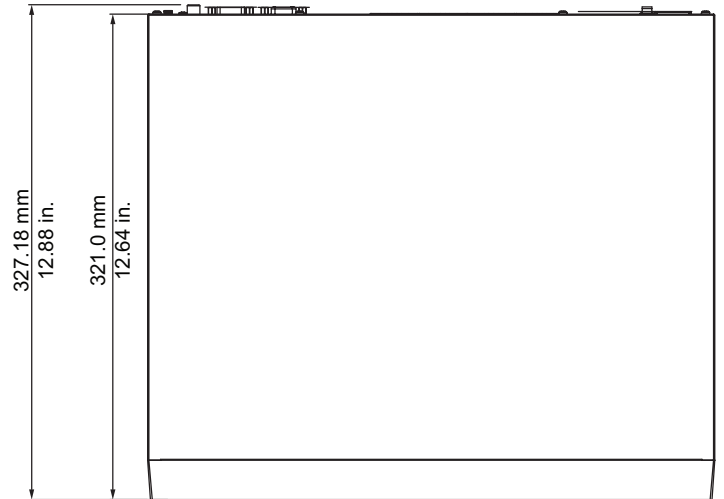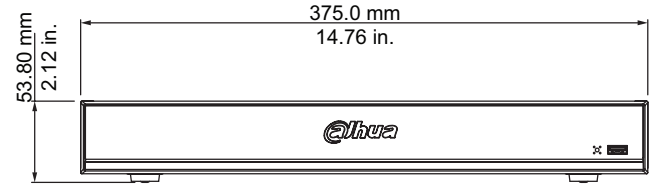
Rear Panel

1	Power Input	6	RS232 Port
2	Power Switch	7	Audio Input, RCA Audio Output, RCA
3	PoE/PoE+ Ports, RJ-45 (x16) ePoE/EoC Ports: 1 through 8	8	HDMI Output
4	Alarm Input (x2) Alarm Output (x2) RS485	9	USB 3.0 Port
5	VGA Output	10	RJ-45 Ethernet Port (1000 Mbps)

ePoE/EOC Transmission Distances

Via CAT5E/CAT6 Ethernet Cable
ePoE supply voltage 48 V
Maximum DC resistance < 10 Ω/100 m

Cable Length, m (ft)	Bandwidth, Mbps	PoE Load Capacity, W	Hi-PoE Load Capacity, W	Working Mode
100 (328)	100	25.5	53	IEEE/E100
200 (656)	100	25.5	33	E100
300 (984)	100	19	19	E100
400 (1312)	10	17	17	E10
500 (1640)	10	13	13	E10
800 (2625)	10	7	7	E10

Via CAT5E/CAT6 Ethernet Cable
ePoE supply voltage 53 V
Maximum DC resistance < 10 Ω/100 m

Cable Length, m (ft)	Bandwidth, Mbps	PoE Load Capacity, W	Hi-PoE Load Capacity, W	Working Mode
100 (328)	100	25.5	53	IEEE/E100
200 (656)	100	25.5	47	E100
300 (984)	100	25.5	32	E100
400 (1312)	10	23	26	E10
500 (1640)	10	20	20	E10
800 (2625)	10	13	13	E10

Via RG-59 Coaxial Cable
ePoE supply voltage 48 V
Maximum DC resistance < 5 Ω/100 m

Cable Length, m (ft)	Bandwidth, Mbps	PoE Load Capacity, W	Hi-PoE Load Capacity, W	Working Mode
100 (328)	100	25.5	50	IEEE/E100
200 (656)	100	25.5	30	E100
300 (984)	100	18	18	E100
400 (1312)	100	15	15	E100
500 (1640)	10	12	12	E10
800 (2625)	10	6	6	E10
1000 (3281)	10	5	5	E10

Via RG-59 Coaxial Cable
ePoE supply voltage 53 V
Maximum DC resistance < 5 Ω/100 m

Cable Length, m (ft)	Bandwidth, Mbps	PoE Load Capacity, W	Hi-PoE Load Capacity, W	Working Mode
100 (328)	100	25.5	52	IEEE/E100
200 (656)	100	25.5	48	E100
300 (984)	100	25.5	30	E100
400 (1312)	100	20	23	E100
500 (1640)	10	16	16	E10
800 (2625)	10	10	10	E10
1000 (3281)	10	8	8	E10

Technical Specification

JQ-D70Z Blackbody

Working Temperature	Factory Settings: 35.0° C (95.0° F), 37° C (98.6° F), 40.0° C (104.0° F) Environmental Temperature: +5° C to 50° C (41° F to 122° F)
Effective Radiant Surface	70 mm x 70 mm (2.76 in. 2.76 in.)
Temperature Resolution	0.1° C
Temperature Accuracy	±0.2° C (single point)
Temperature Stability	±0.1° C to 0.2° C / 30 minutes
Effective Emissivity	0.97
Temperature Sensor	Pt100
Power Supply	110 VAC to 220 VAC
Power Consumption	35 W
Net Weight	1.80 kg (3.97 lb)
Dimensions (W x H x D)	110.0 mm x 120.0 mm x 180.0 mm (4.33 in. x 4.72 in. x 7.09 in.)
Ambient Operating Conditions	0° C to 40° C (32° F to 104° F), ≤ 80% RH

Certifications

Safety	EN 62368-1:2014 + A11:2017 IEC 62368-1:2014 (Second Edition)
Electromagnetic Compatibility (EMC)	CFR 47 FCC Part 15 Subpart B EN 55032:2015, EN 61000 3 2:2014, EN 61000 3 3:2013, EN 55024:2010/A1:2015, EN 55035:2017, EN 50130 4:2011/A1:2014

Optional Accessories

DH-PFB120C	Ceiling Mount Bracket
DH-PFB129W	Wall/Ceiling Mount Bracket

Positioning Accessories

Accessory	Description
VCT-999	Tripod Two (2) required: • One (1) for thermal camera • One (1) for blackbody
RQW026-00	Bracket Two (2) required: • One (1) to connect thermal camera to tripod • One (1) to connect Blackbody to tripod

Thermal Solution

Installation Recommendations

Thermal Camera and Blackbody Setup

Lens Focal Length	Distance Between Camera and Blackbody	Distance Between the Human Forehead and the Camera
13.0 mm (DH-TPC-BF5421-T)	3.0 m (118.11 in)	2.0 m to 7.0 m (78.74 in. to 275.60 in.)
8.0 mm (DH-TPC-BF3221-T)	3.0 m (118.11 in)	2.0 m to 5.0 m (78.74 in. to 196.85 in.)

Notes:
- The accuracy of temperature monitoring is best when the human forehead and blackbody are at the same distance from the camera.
- Place the camera 0.20 m to 0.50 m (7.87 in. to 19.69 in.) higher than the blackbody.
- Ensure the blackbody radiation surface is completely facing the thermal camera.
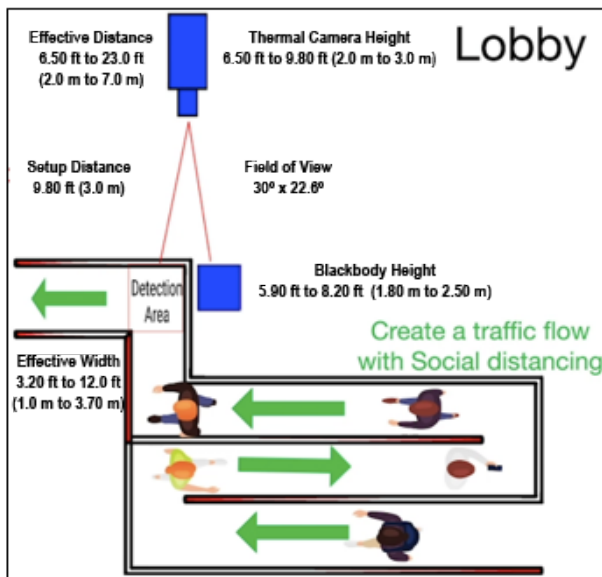
Installation Recommendations

Monitoring

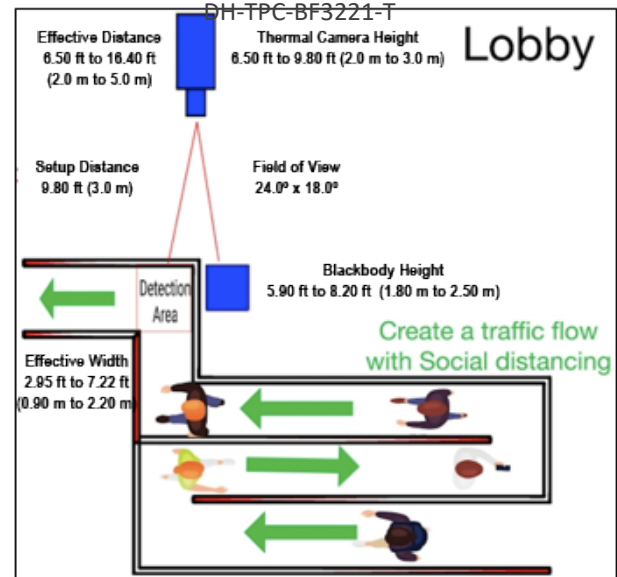|		
Height	Thermal Camera	2.0 m to 3.0 m (78.74 in. to 118.11 in.)
	Blackbody	1.80 m to 2.50 m (70.87 in. to 98.43 in.)
Blackbody Setting	Ambient Temperature	Blackbody Temperature
	10° C to 32° C (50° F to 89.6° F)	35° C (95° F)
	10° C to 35° C (50° F to 95° F)	38° C (100.4° F)

Installation Diagrams

The diagrams below depict a suggested layout and configuration for temperature monitoring in a building lobby.

These diagrams show the optimal camera and blackbody configuration and placement.

DH-TPC-BF5421-T

DH-TPC-BF3221-T