



SENTEZ
Sistem ve Mühendislik Ticaret
Limited Şirketi

Longwave Infrared Thermal Imaging Camera

Security application cameras

384x288 resolution: CG300

640x480 resolution: CG600

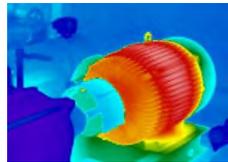
1024x768 resolution: CX1000



Radiometric (Thermography) application cameras

384x288 resolution: CG320

640x480 resolution: CG640



Thermal network cameras transmitting video data and temperature data

384x288 resolution: CG320-IP

640x480 resolution: CG640-IP

1024x768 resolution: CX1000-IP (transmits video data only)

Thermal cameras for automotive night vision

384x288 resolution thermal camera for automotive night vision



Others

Lenses (variety of lenses from 4.8-250mm), zoom lenses, 2FOV, Athermalized, Macro

Housing with Ge window

PT Drive



Radiometric application thermal cameras

All CG series radiometric models are with latest version of thermal detectors from ULIS, which are, QVGA Gen2 detector and VGA Gen2 detector, respectively. Those detectors have better NETD than detectors for former CX series models, and just several times of NUC in a day is good enough because they are shutter-less compatible. Even though we do not execute NUC every 5 minutes or 1 minute, image quality is much better than former CX series models.

By increasing processing capacity, CG series cameras has more detailed features in alarm setting and ROI settings which were only available in thermal imaging analyzer.

CG series radiometric thermal cameras are fully controlled by thermal imaging analyzer on PC.

SDK for thermal imaging analyzer, working in Windows and developed in C++ language, is provided for customers who develop own version of thermal imaging analyzer.

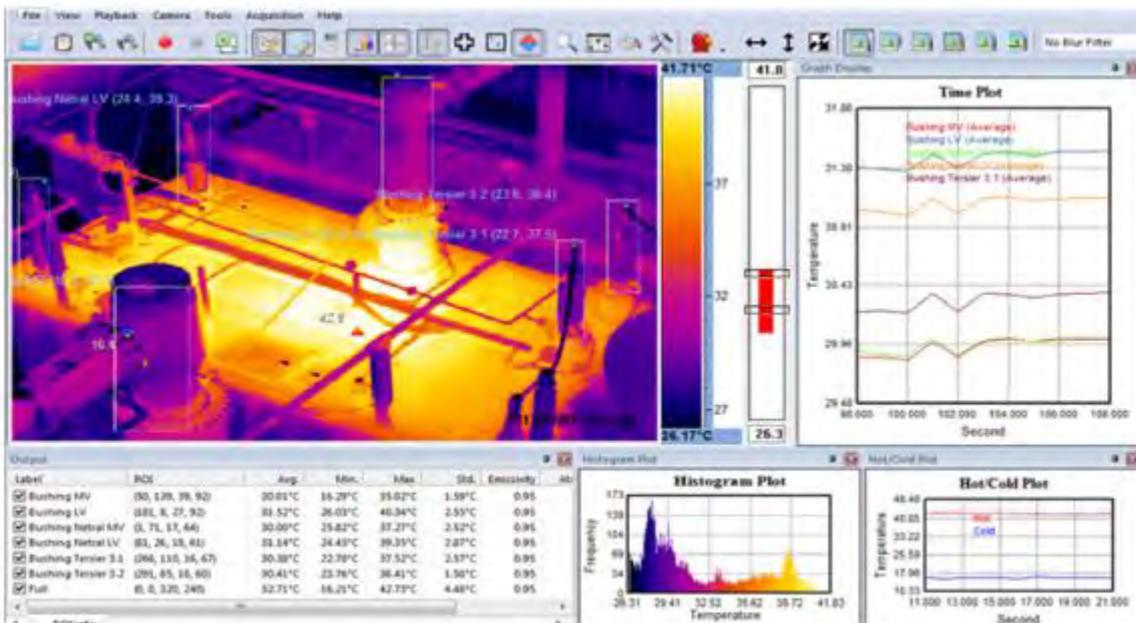
Radiometric models	CG320	CG640
Resolution(sensor pixels)	384x288	640x480
Thermal sensitivity of sensor (NETD)	40mK @ f1.0 30Hz 300K	50mK @ f1.0 30Hz 300K
Spectral response	8-14μm	8-14μm
Measurement accuracy in lab condition	±2°C or ±2% of reading (Accuracy is not guaranteed in measurement in the open air far apart from the object)	
Output	CVBS analogue video(BNC port) Temperature raw data from all pixels(Giga Ethernet)	
Temperature detection mode		
Normal temperature detection	-20~120°C	-20~120°C
High temperature detection(Dual)	0~650°C	0~650°C
PC software included	Thermal imaging analyzer: Radiometric analysis PC software Camera controller: Access to camera via Ethernet for set-up Thermal report: help preparing report	
Lenses	From 4.8 to 250mm/Manual focus or motorized focus Zoom, 2 FOV, Athermalized, Macro-lens for PCB inspection	
Application	Medical/Fire Prevention/Preventive maintenance/PCB inspection/R & D/Process control/others	



PC software for CG series radiometric cameras

CG320(384x288 resolution) and CG640(640x480 resolution) models have two different outputs, that is, CVBS analogue video data from BNC port and temperature raw data of each pixel from Ethernet port. All CG series thermography models are supplied with PC software for easy analysis with temperature raw data from thermal camera via Ethernet.

- **Thermal Imaging Analyzer**



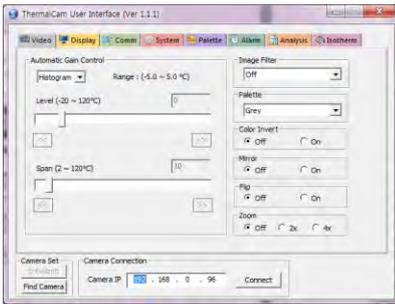
Thermal imaging analyzer on PC receives temperature raw data of all pixels via Ethernet from the camera connected to PC, and analyzes temperature data in various ways as user wants.

User can set ROI (Region of Interest) in different patterns to analyze just in ROI or to exclude specific area in the scene, and thermal imaging analyzer create alarm signal and play wave file or frame of image is glittering as set and two alarm relay-outs are available from the camera in addition to alarms on PC, when alarm conditions are met.

Multi-connection thermal imaging analyzer to which user can connect multi-cameras simultaneously shall be released early 2017.

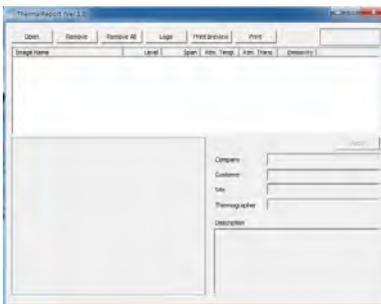
COX provides customers who develops own thermal imaging analyzer with SDK with sample program, working in Windows, prepared in C++ program language with technical support.

● **Camera controller**



With camera controller, user can access to the camera via Ethernet apart from the camera and change different settings.

● **Thermal report**



Using thermal report program, user can load radiometric jpeg file generated by thermal imaging analyzer, add description to each file, and make a thermal report easily.

COX provides users who want to develop own thermal imaging analyzer with SDK and sample program developed in C++ language.

FOV of COX thermal cameras

COX thermal cameras are supplied with different kinds of lenses to meet customers' requirements for the projects. Focal length from 4.8mm to 250mm is available, manual or motorized lens. Various continuous zoom lenses, 2FOV lenses, and athermalized lenses are also available. COX thermography cameras with macro-lenses to measure temperature of very small part, like pins of chip on PCB in SMT line are also available.

HFOV and VFOV for all COX cameras

Focal length (mm)	CX300/CX320/CM300-PAL		CX300/CX320/CM300-NTSC		CG300/CG320/CG320-IP PAL/NTSC		CX600/CX640/CX610/CM600-PAL/NTSC		CG600/CG640/CG640-IP PAL/NTSC		CG1000-PAL/NTSC	
	HFOV(°)	VFOV(°)	HFOV(°)	VFOV(°)	HFOV(°)	VFOV(°)	HFOV(°)	VFOV(°)	HFOV(°)	VFOV(°)	HFOV(°)	VFOV(°)
4.8	100.4	84.0	90.0	73.7	68.4	54.0	97.1	80.7	97.1	80.7		
5					66.3	52.2						
8	61.9	48.5	53.1	41.1	44.4	34.0	68.4	54.0	68.4	54.0		
8.16					43.6	33.4						
12	43.6	33.4	36.9	28.1	30.4	23.1	48.8	37.6	48.8	37.6		
13.6					27.0	20.4						
20					18.5	14.0						
20	27.0	20.4	22.6	17.1	18.5	14.0	30.4	23.1	30.4	23.1		
35	15.6	11.8	13.0	9.8	10.7	8.0	17.7	13.3	17.7	13.3	27.9	21.1
50	11.0	8.2	9.2	6.9	7.5	5.6	12.4	9.3	12.4	9.3	19.8	14.9
75	7.3	5.5	6.1	4.6	5.0	3.7	8.3	6.2	8.3	6.2	13.2	10.0
100	5.5	4.1	4.6	3.4	3.7	2.8	6.2	4.7	6.2	4.7	10.0	7.5
130	4.2	3.2	3.5	2.6	2.9	2.2	4.8	3.6	4.8	3.6	7.7	5.8
150	3.7	2.8	3.1	2.3	2.5	1.9	4.2	3.1	4.2	3.1	6.6	5.0
200	2.8	2.1	2.3	1.7	1.9	1.4	3.1	2.3	3.1	2.3	5.0	3.7
210	2.6	2.0	2.2	1.6	1.8	1.3	3.0	2.2	3.0	2.2	4.8	3.6
250	2.2	1.7	1.8	1.4	1.5	1.1	2.5	1.9	2.5	1.9	4.0	3.0

- 5mm, 8.16mm, 13.6mm, and 20mm indicated in different color are lenses designed just for CG300 and CG600, and they are used just for CG300 and CG600.
- Optics of lenses for CX1000 is a little bigger than for CG300/320/320-IP and CG600/640/640-IP.

Radiometric thermal network cameras

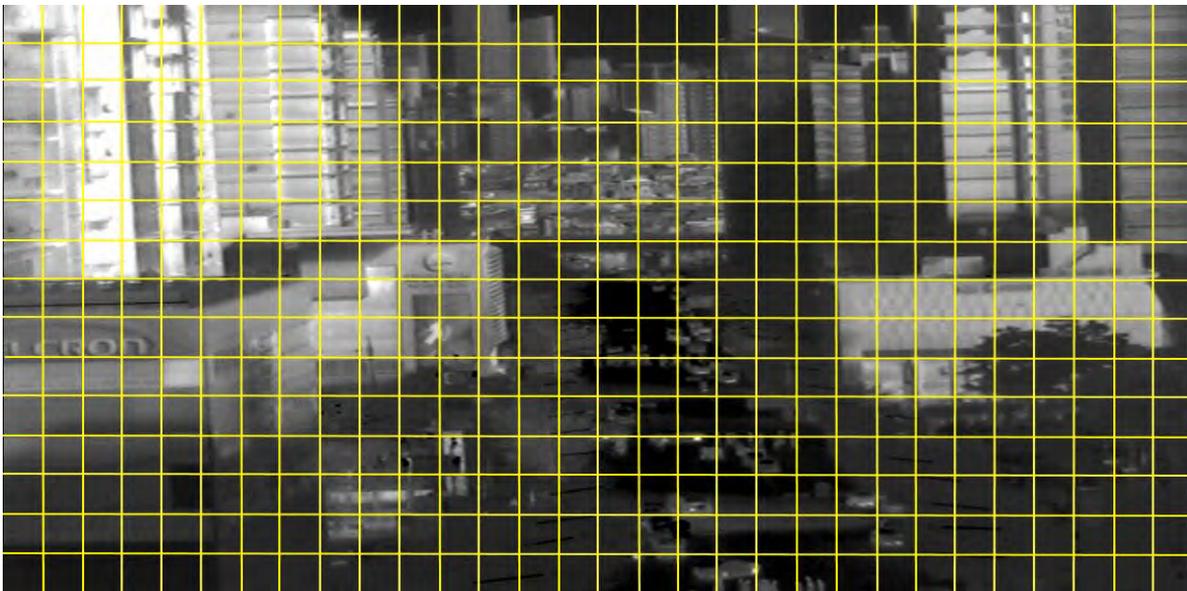
(Thermal network cameras of measuring temperature in 300 ROIs)

CG320-IP and CG640-IP are thermal network cameras transmitting video data and temperature data simultaneously. Core of these thermal network cameras is exactly same as CG320 or CG640, with normal temperature detection mode (measure up to 120°C) or high temperature detection mode (measure up to 650°C), respectively, and those thermal network cameras are new concept of thermal network camera and fundamentally different from other thermal network cameras already in the market.

CG320-IP and CG640-IP are very unique thermal network cameras transmitting compressed video data and temperature data of each section in the image including temperature alarm data simultaneously via IP network. User can set alarm temperature in each section which is 32 pixels x 32 pixels area in the image (20 sections x 15 sections in case of CG640-IP and it corresponds to 300 even size of ROIs) or in the group of sections in min., max., or average temperature. If temperature of any section or group of sections exceeds set temperature, corresponding camera sends alarm data in addition to compressed video data to alarm management software. Then alarm management software starts to record for set period of time (alarm recording) and pop up corresponding channel to show image in bigger size with detail data including section number and temperature in the section where measured temperature exceeded set temperature.

Setting max., min., or average temperature in each section or in group of section, is done in the temperature setting page in web viewer, while user see image as following picture.

After finishing temperature in each section of in group of section, than user transmit setting value to the corresponding camera, to make camera ready to issue temperature alarm when measured temperature in specific section or in group of section exceeds set value.



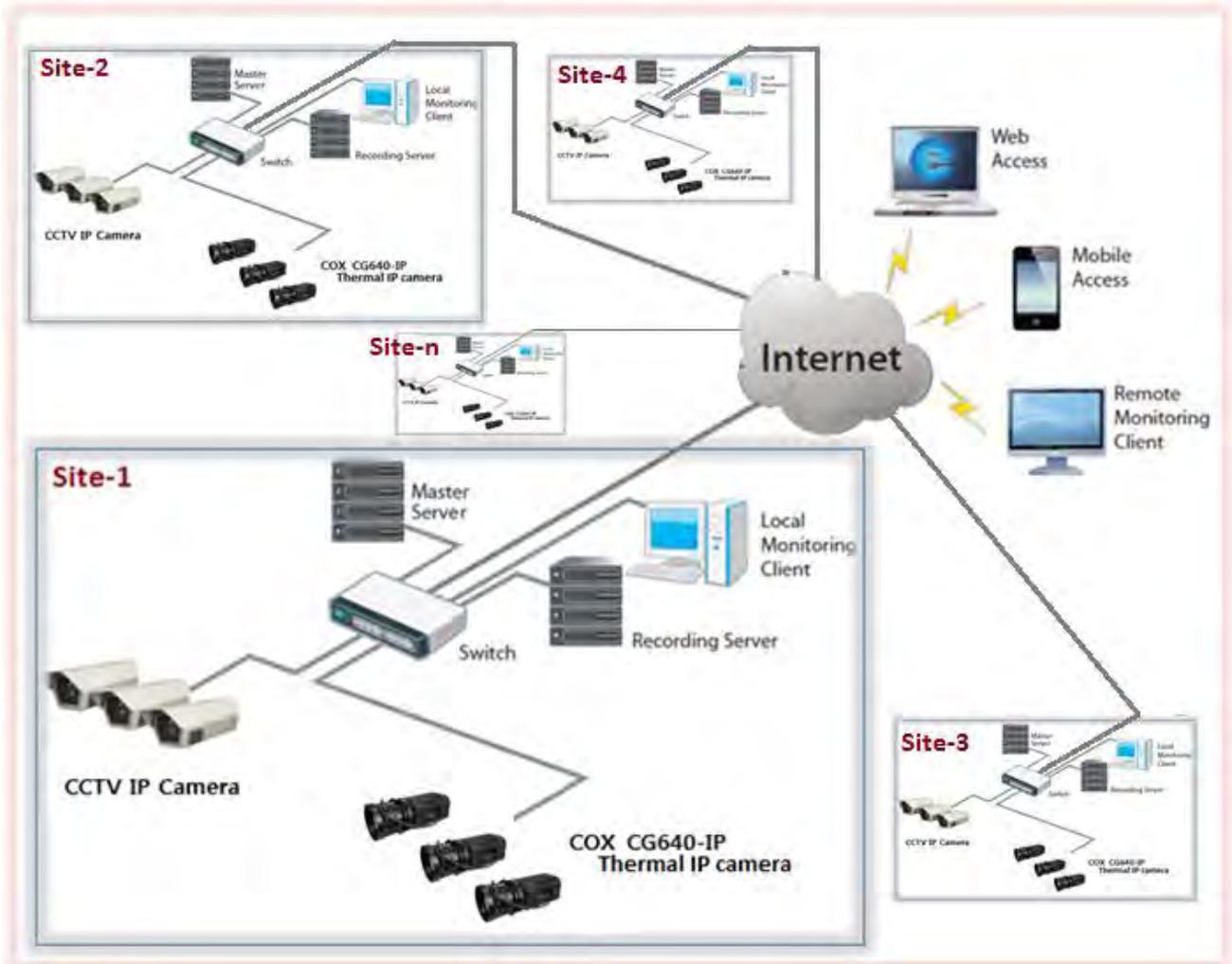
Section of 32 pixels x 32 pixels corresponds to

- 1) 300 ROIs (20 sections horizontally and 15 sections vertically) in case of 640x480 pixels thermal network camera, which is, CG640-IP
- 2) 108 ROIs (12 sections horizontally and 9 sections vertically) in case of 384x288 pixels thermal network camera, which is, CG320-IP

CG320-IP and CG640-IP thermal network cameras are very suitable for following application:

- 1) Fire prevention (detection) covering wide area(wild fire, waste management, sugar cane waste, other
- 2) Preventive maintenance in industrial plant
- 3) Intrusion detection (human, animal) in wide area
- 4) Fire and intrusion detection in yacht basin

Alarm management software has the same structure of VMS which is very popular in CCTV field. Alarm management software is based on VuRix which is developed by Innodet Inc. who is the biggest VMS company in Korea and competing with Genetec or Milestone in the world market.



As show in above configuraition, user can mix CCTV network cameras and CG320-IP/CG640-IP thermal network cameras as many as required in the project, and VuRix VMS is in operation in many site with up to several thousands of network cameras.

COX suplies 16 channels and single site version of alarm management software free of charge for customers getting CG320-IP and CG640-IP thermal network cameras.

Alarm management software to which user can connect several tens or several hundreds of CCTV network cameras or COX thermal network cameras from muliti sites shall be charged to the minimum.

Thermal camera for automotive night vision

COX developed thermal cameras for automotive night vision application, just as FLIR Path Finder II, and started to supply to motors companies in cooperation with LG group company who developed tracking software detecting human or animal in the image on both sides of road in front of car in the dark. Processing algorithm of thermal camera for automotive night vision is prepared in such a way that tracking software detect human or animal which have a certain body temperature in very high probability.

Specification of COX automotive night vision system

Thermal Imaging Performance	
Sensor type	Uncooled micro bolometer developed specially for automobile application
Field of view	19.4° x 14.6°
Spectral band	8 – 14 um
Resolution	384 x 288 pixels
Time to Image	< 10 sec.
Pixel pitch and NETD of sensor	17 um, 40mK @ f1.0, 30Hz, 300K
Focal length and focus range	18.8 mm f1.0 athermalized lens, 2.4 m to infinity
IP rating, lens protection	IP67, Ge window with built-in heater for defrosting
Outputs	
Video (from ECU)	CVBS analogue(NTSC/PAL), HDMI(480p, 576p, 720p, 1080i, 1080p selectable)
Connector type	BNC Connector for Video out 8-pin custom connector for power in, audio out
Frame Rate	PAL: 25 fps, NTSC: 30fps, HDMI(Selectable)
Power	
Power requirments	12 VDC nominal (range 9V to 60V)
Enviromental	
Operating Temperature	-40°C to +85°C for camera -20°C to +70°C for ECU The operating temperature range of the Camera is -40°C to +85°C when operating in a closed compartment with heat sink to chassis. In a ventilated area, the heat sink between ECU and vehicle chassis may be removed, in which case the temperature range is -40°C to +70°C.
Storage Temperature	Ambient temperature, storage:-55°C to +95°C limited by the environmental temperature diurnal.
Impact protection/Water resistance	ES95400(Engineering specification of Hyundai Motors Company)
EMI/EMC	ES96200(Engineering specification of Hyundai Motors Company)

Evaluation Kit
(Tracking software not included)



Components of automotive night vision

- Thermal imager
- ECU and tracking software
- (Display unit)
- LVDS cable between camera and ECU
- Video cable (HDMI or Composite)
- Power cable (cigar jack)



Thermal camera for automotive night vision

- Thermal sensor 384 x 288 pixels, 17 μ m pixel pitch
- Athermalized lens 18.8mm f1.0
- HFOV 19.4°, VFOV 14.6° (Specially designed for automotive night vision)
- 2t, 32mm Ge window with DLC coating with built-in heater for defrosting
- IP67
- Size: 57mm (W) x 57mm (H) x 65.4mm (L)

Images by thermal camera for automotive night vision (without tracking software)



Low luminance camera (visible camera)

Automotive night vision (with tracking software)



Only with eye identification with headlights on, driver cannot detect two men on the center line of road

Tracking software of automotive night vision detects two men on the center line of road

We can apply thermal cameras for automotive night vision for other application. We are working on a special project installing those thermal cameras with wider view angle lens, FOV about 50°, on military vehicles in operation, for driving at relatively slow speed without turning on headlights in the dark.