
TELEA
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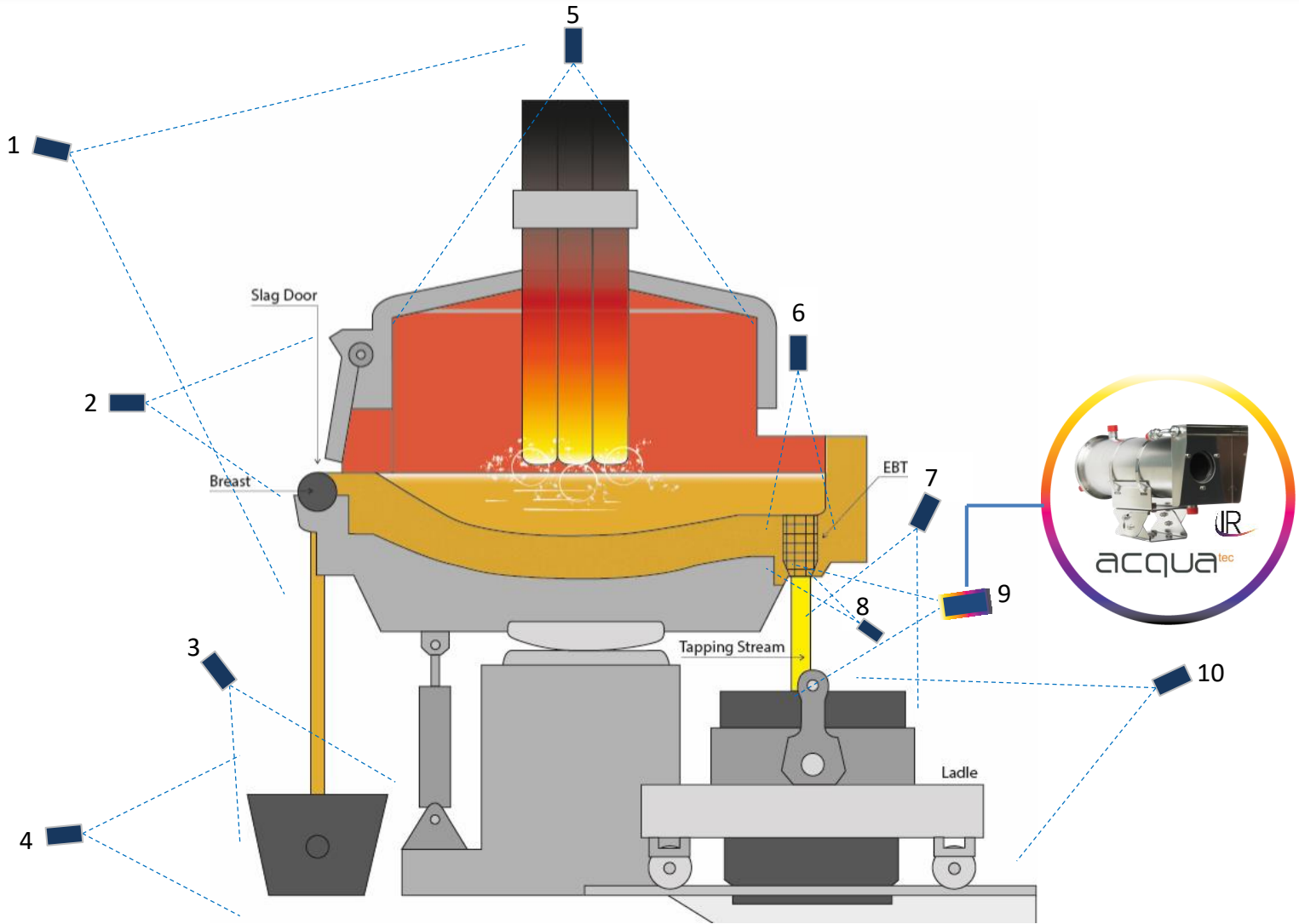
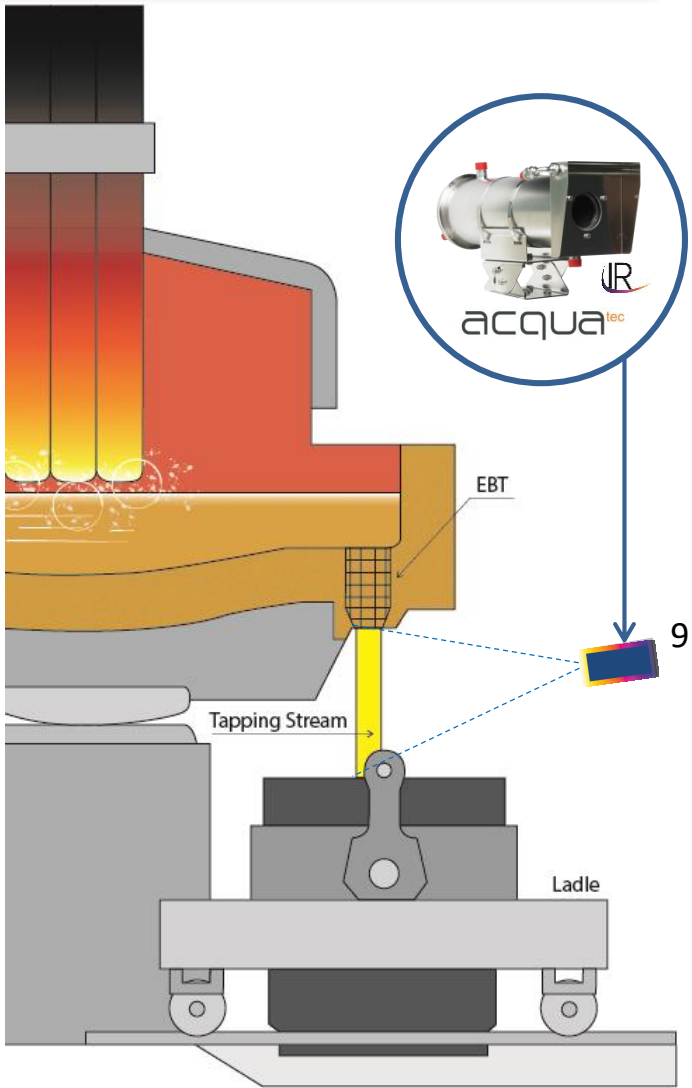
IRON&STEEL PLANTS
INFRARED SOLUTIONS FOR INDUSTRIAL SYSTEMS REQUIREMENTS

ELECTRICAL ARC FURNACE (EAF) APPLICATIONS

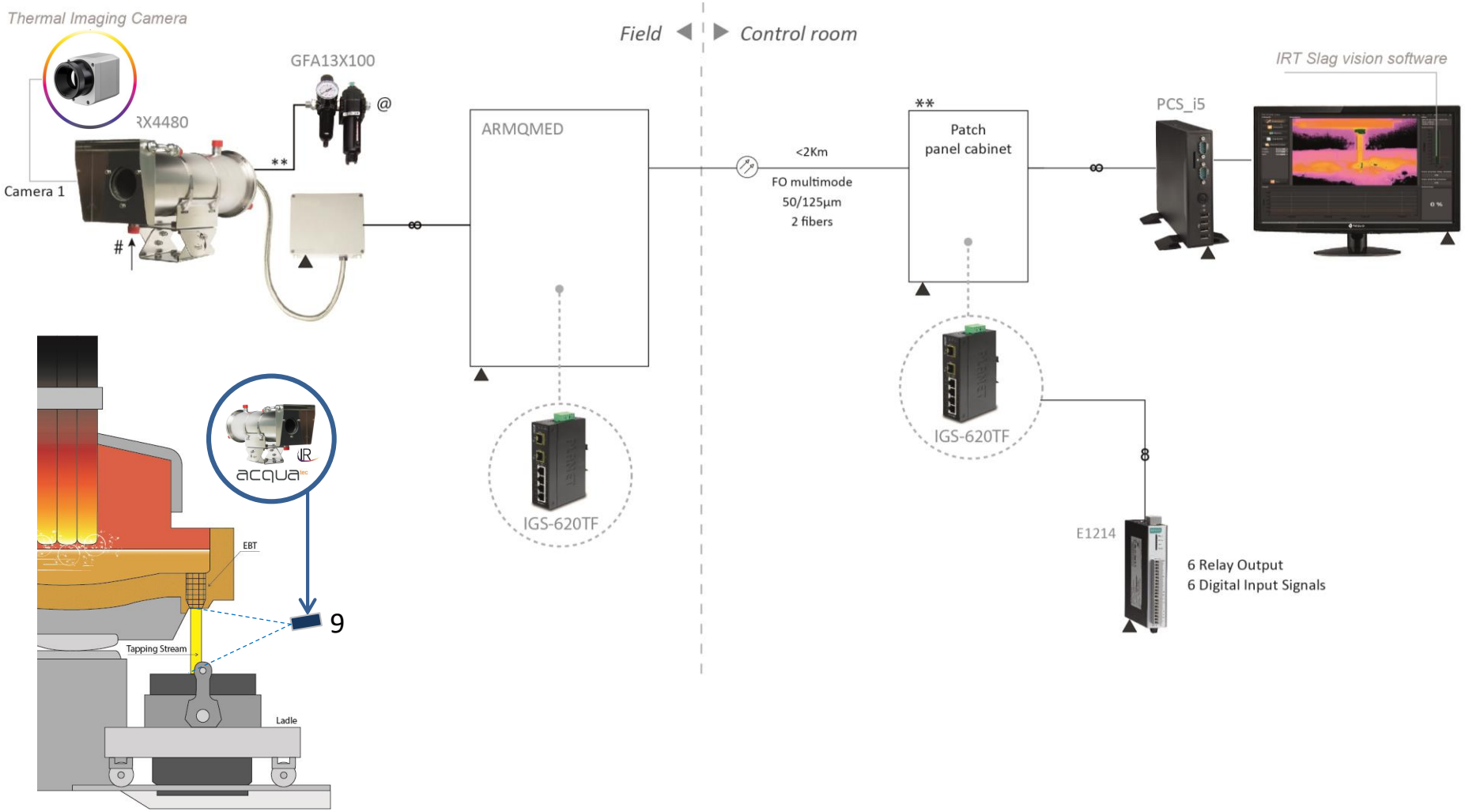


SLAG DETECTION (EAF)

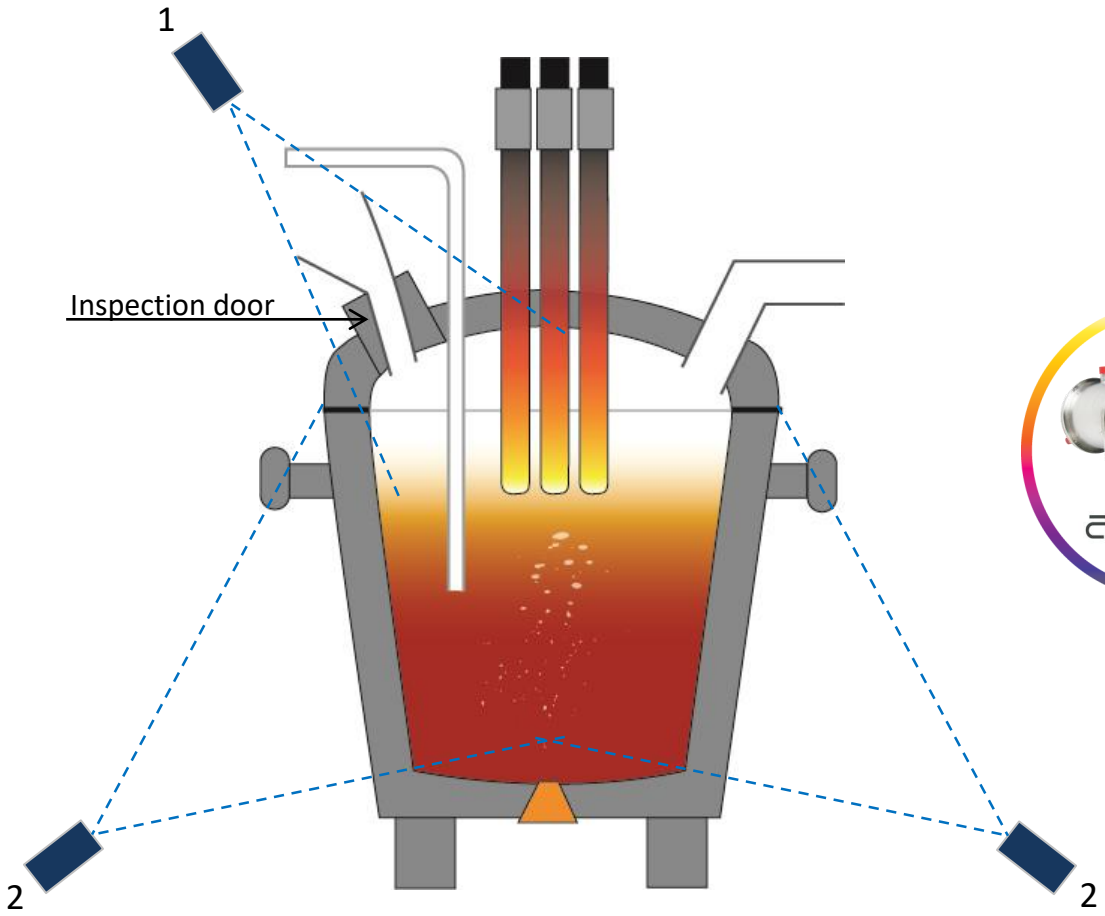
- Housing able to work with Infrared camera
- Germanium or Zinc-Selenium windows
- Resistant to high temperature



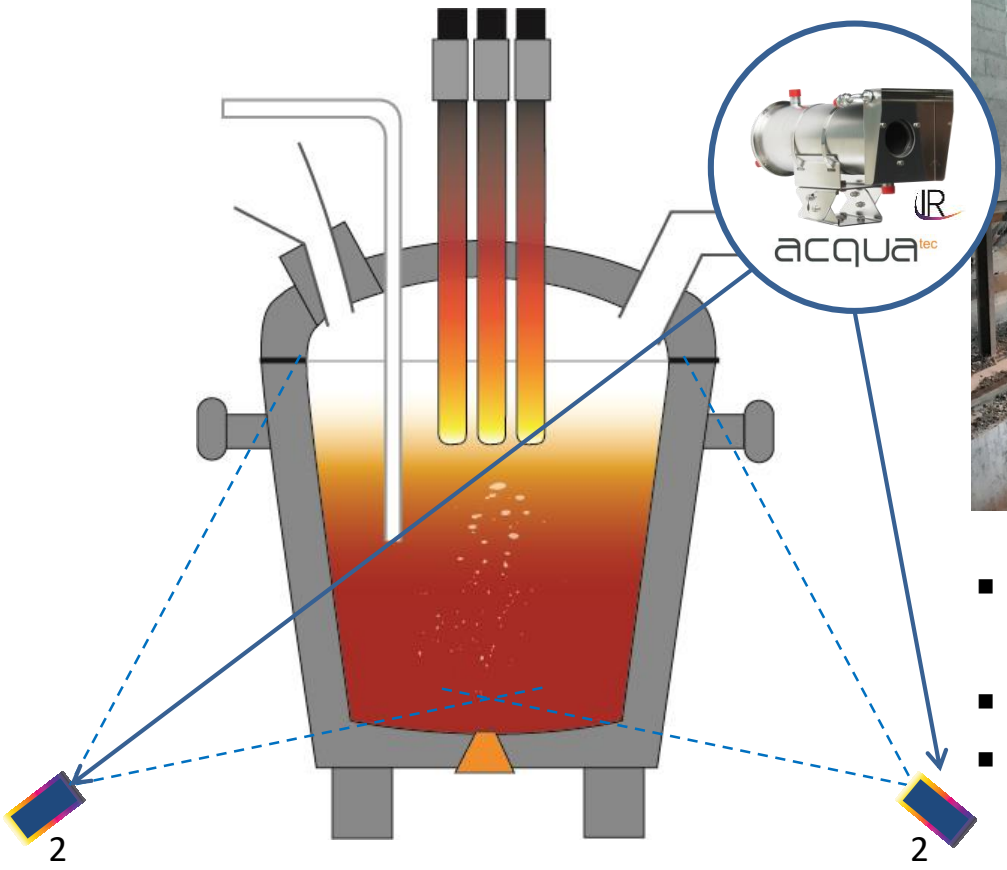
SLAG DETECTION MONITORING SYSTEM (EAF)



LADLE FURNACE (LF) APPLICATIONS

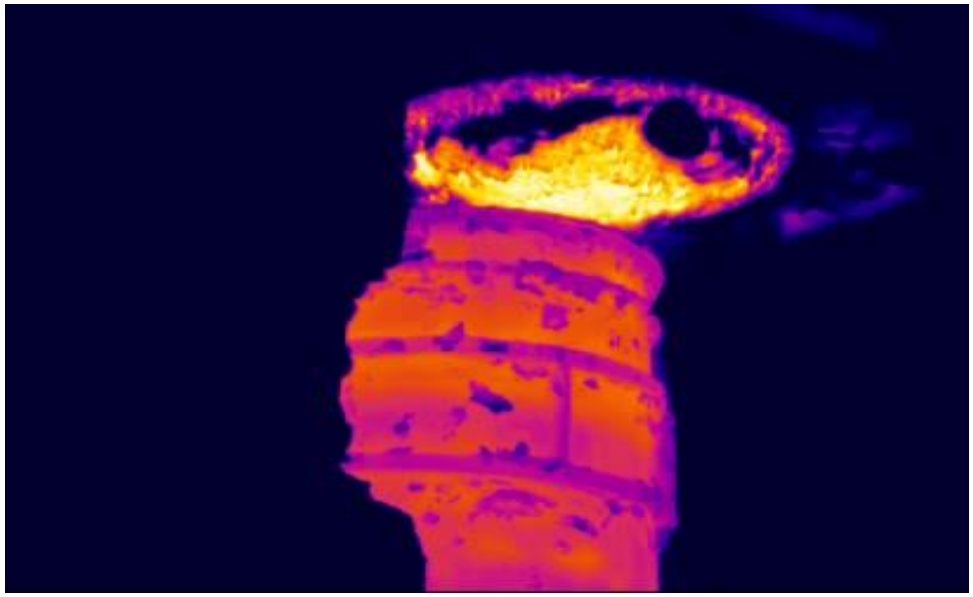


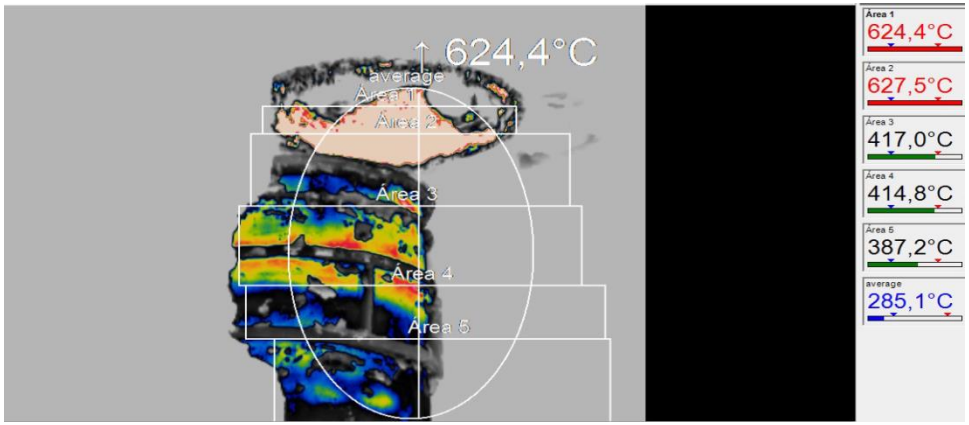
MILL LADLE REFRACTORY MONITORING (LF)



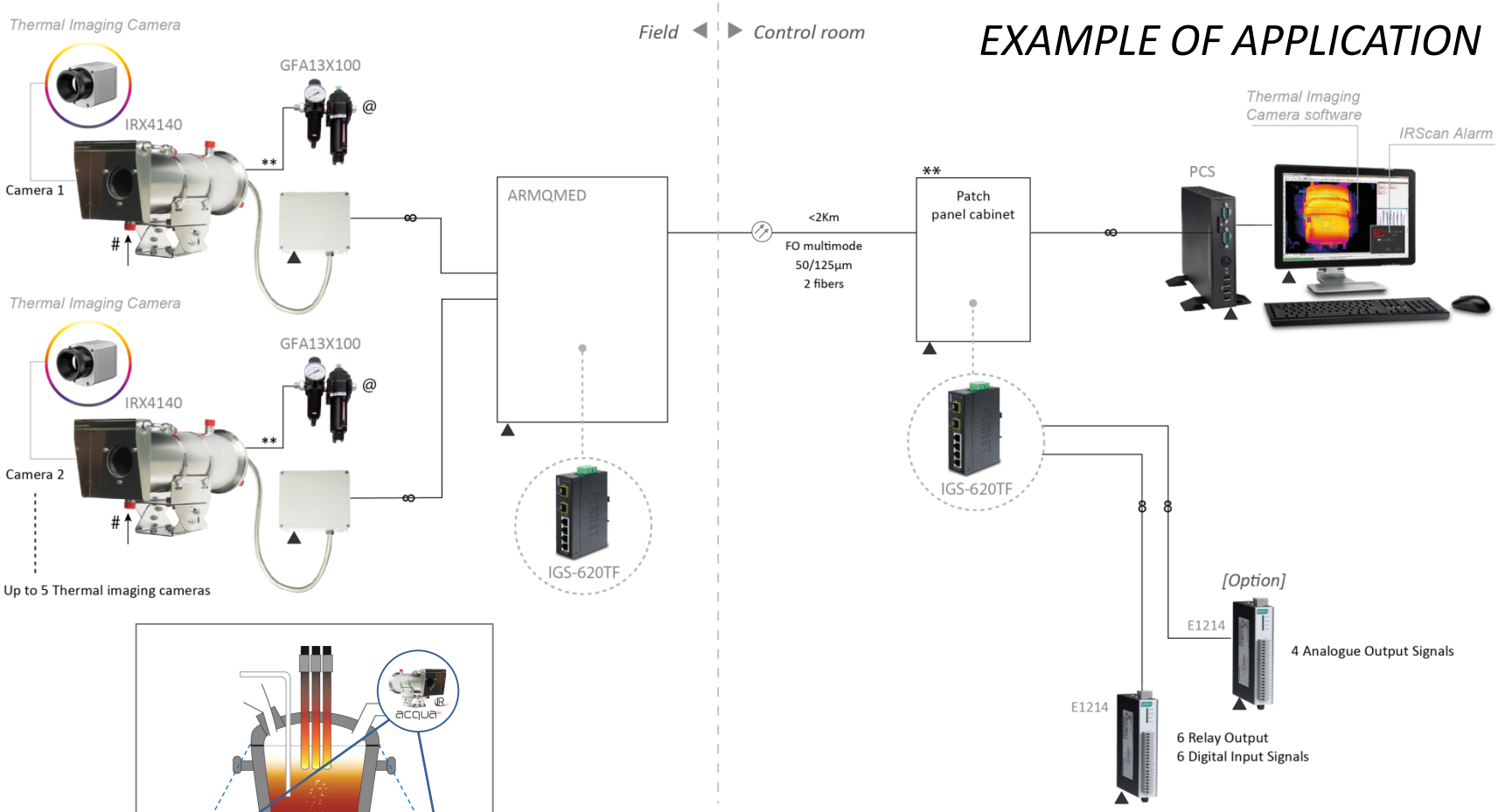
- Integrated IR cameras with Acquatec housings
- Germanium or Zinc-Selenium Windows
- Resistant to High temperature

MILL LADLE REFRACTORY MONITORING (LF)

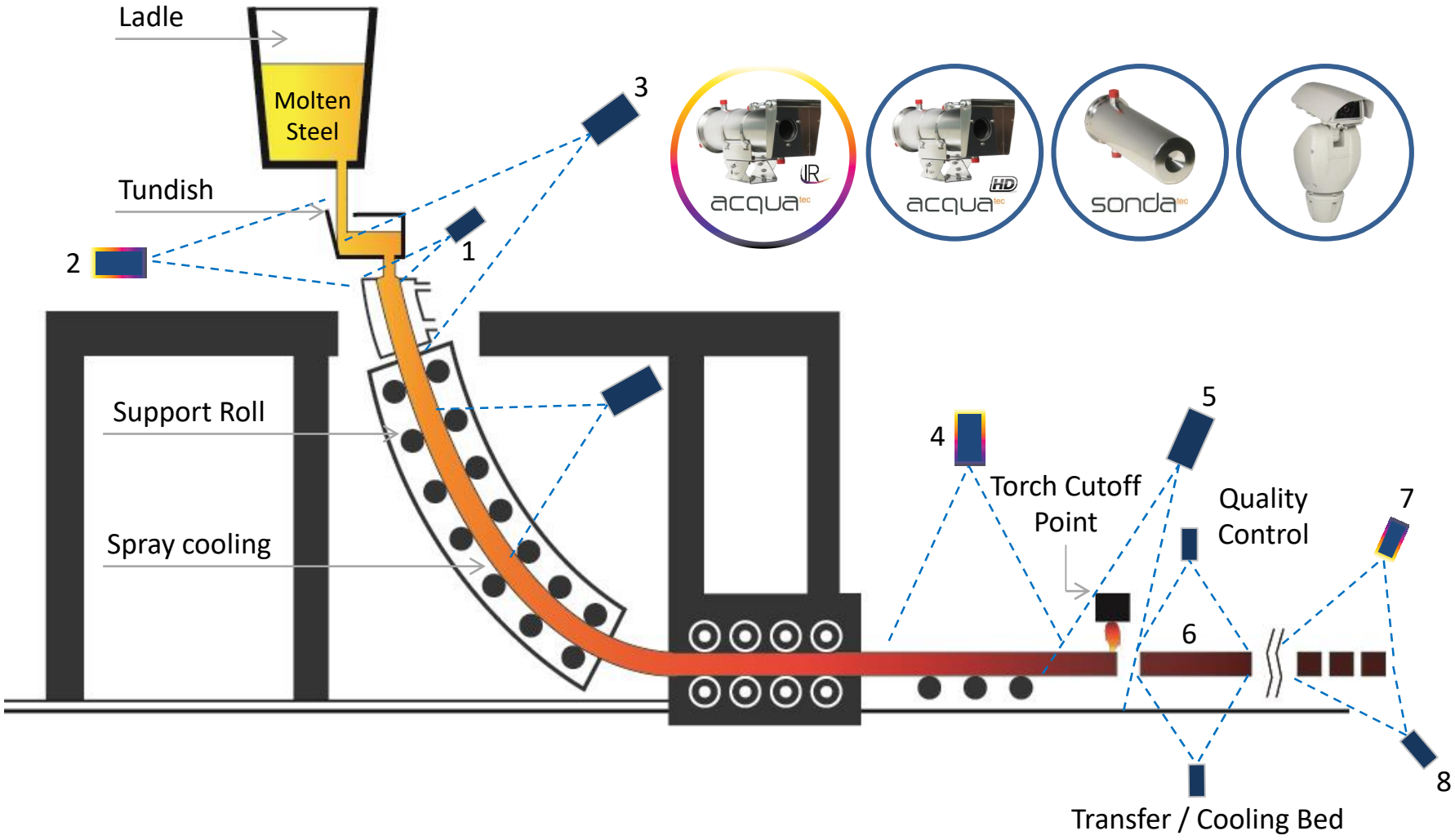




MILL LADLE REFRACTORY MONITORING (LF)

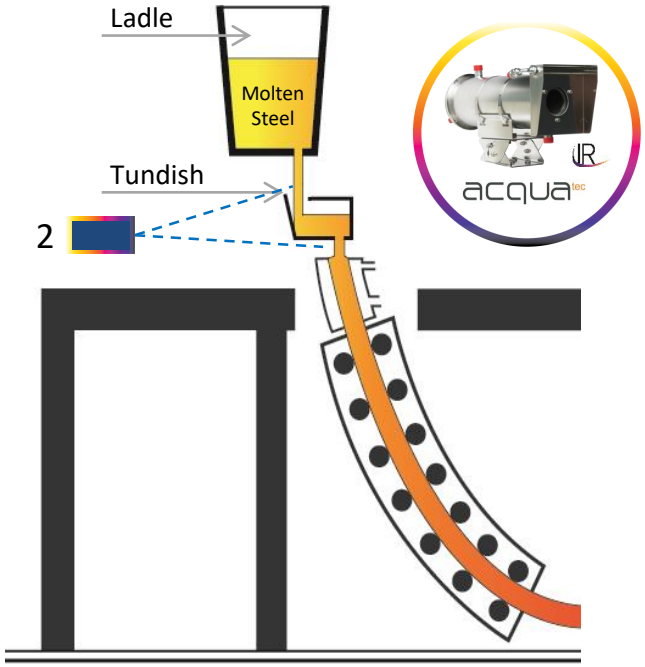


CONTINUOUS CASTING MACHINES (CCM) APPLICATIONS



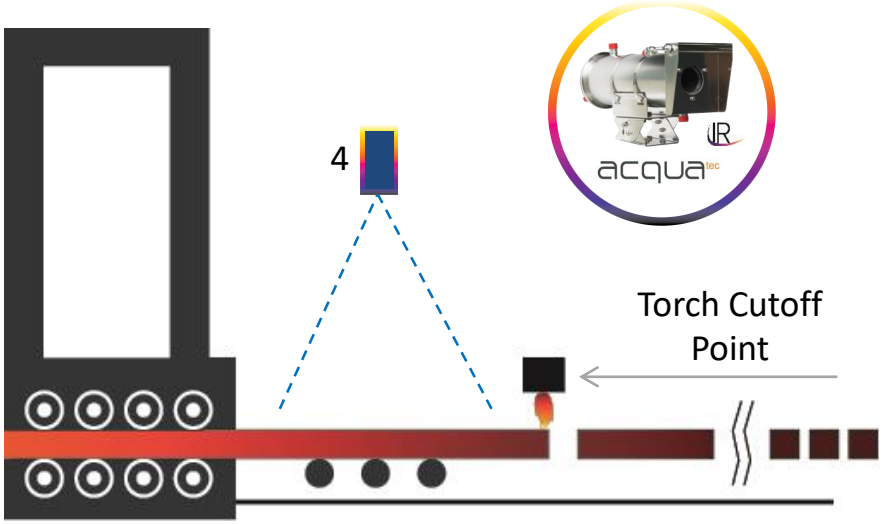
TUNDISH AREA MONITORING (CCM)

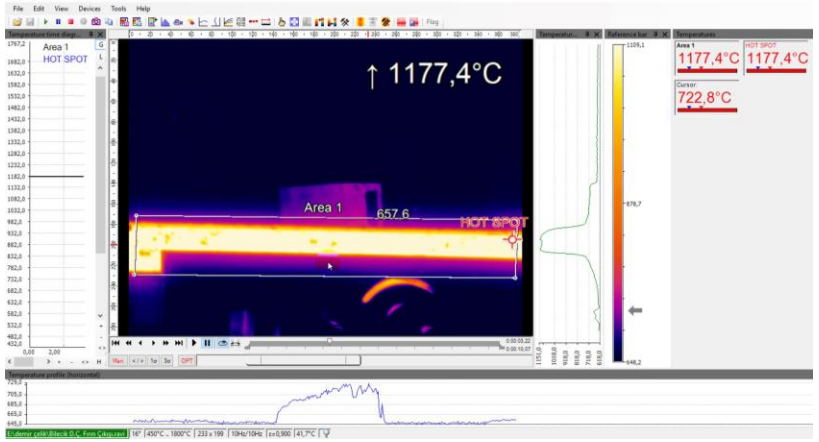
Metal pots carrying melted metal to dies in continuous casting called tundishes, are facing extreme hot materials inside. Surface temperature control is necessary to avoid any risks. Especially in the back side of tundishes, where the highest temperature values are exist.



DISCHARGING AREA (CCM)

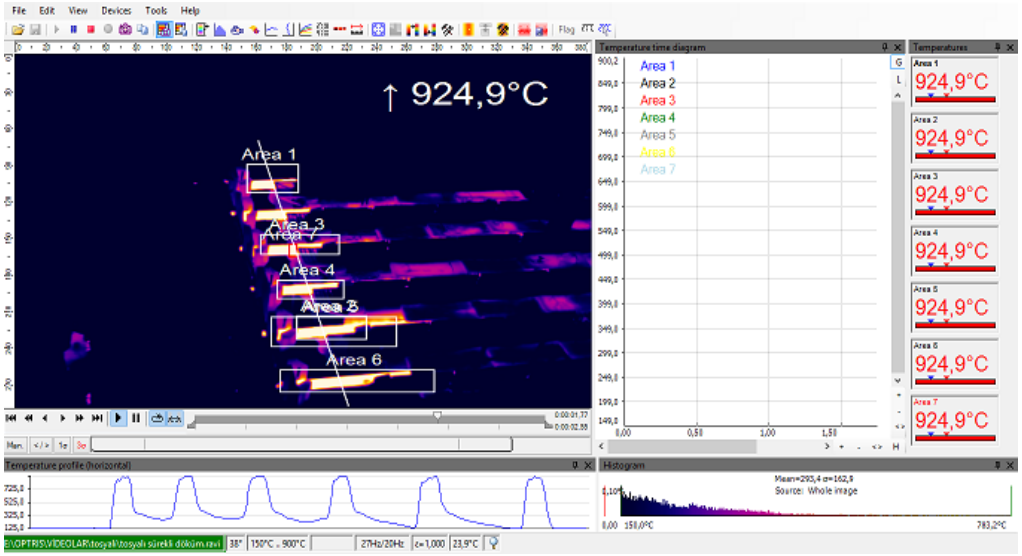
Product temperature measurement in discharge of continuous casting. Temperature detecting before cutting process is important for a high quality of slab and problem detecting in following processes. Datas receiving from pirometers in this area also can be used as hot metal detector.

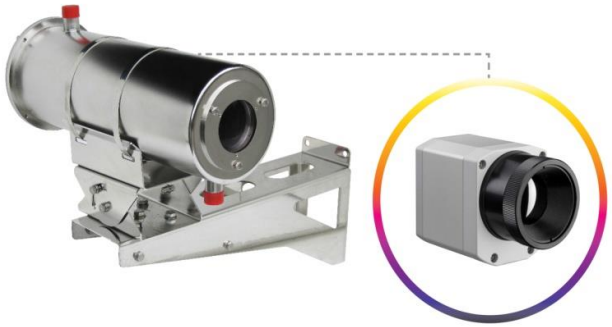


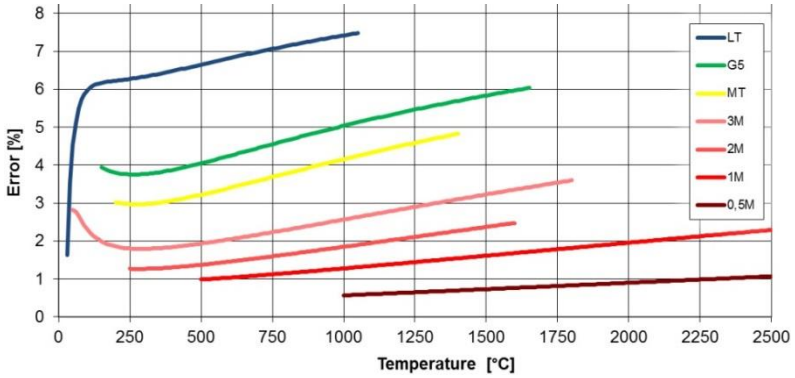


AFTER CUTTING PHASE (CCM)

The temperature measurement of all discharge lines on continuous casting can be done with one thermal camera. All temperature datas are being received simultaneously.

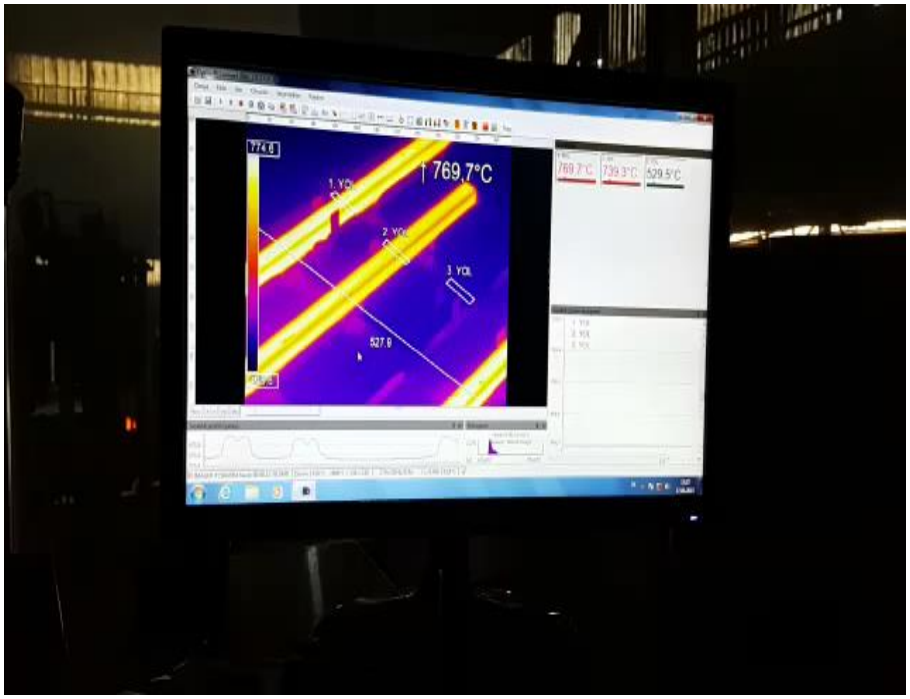


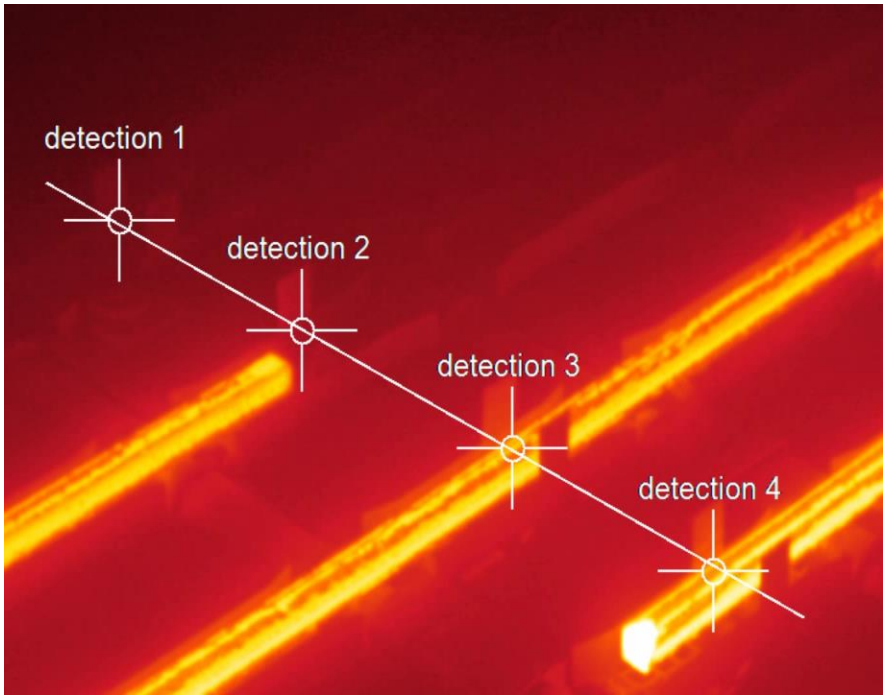




Optional output signals for online process automation are also served for applications.

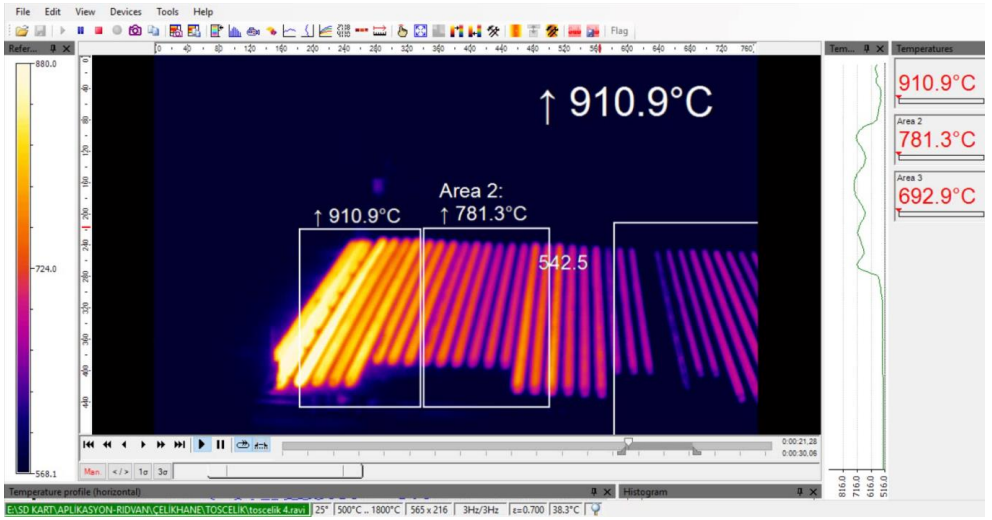
AFTER CUTTING PHASE (CCM)

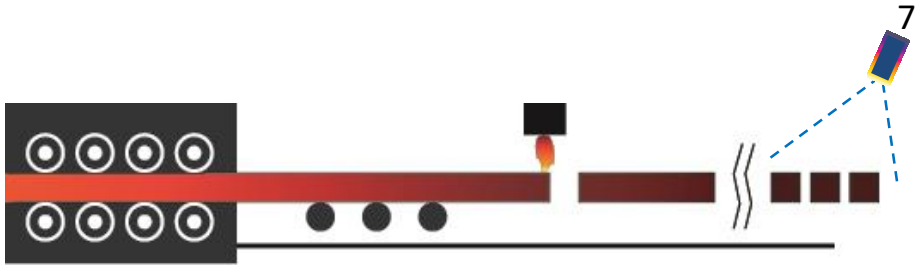




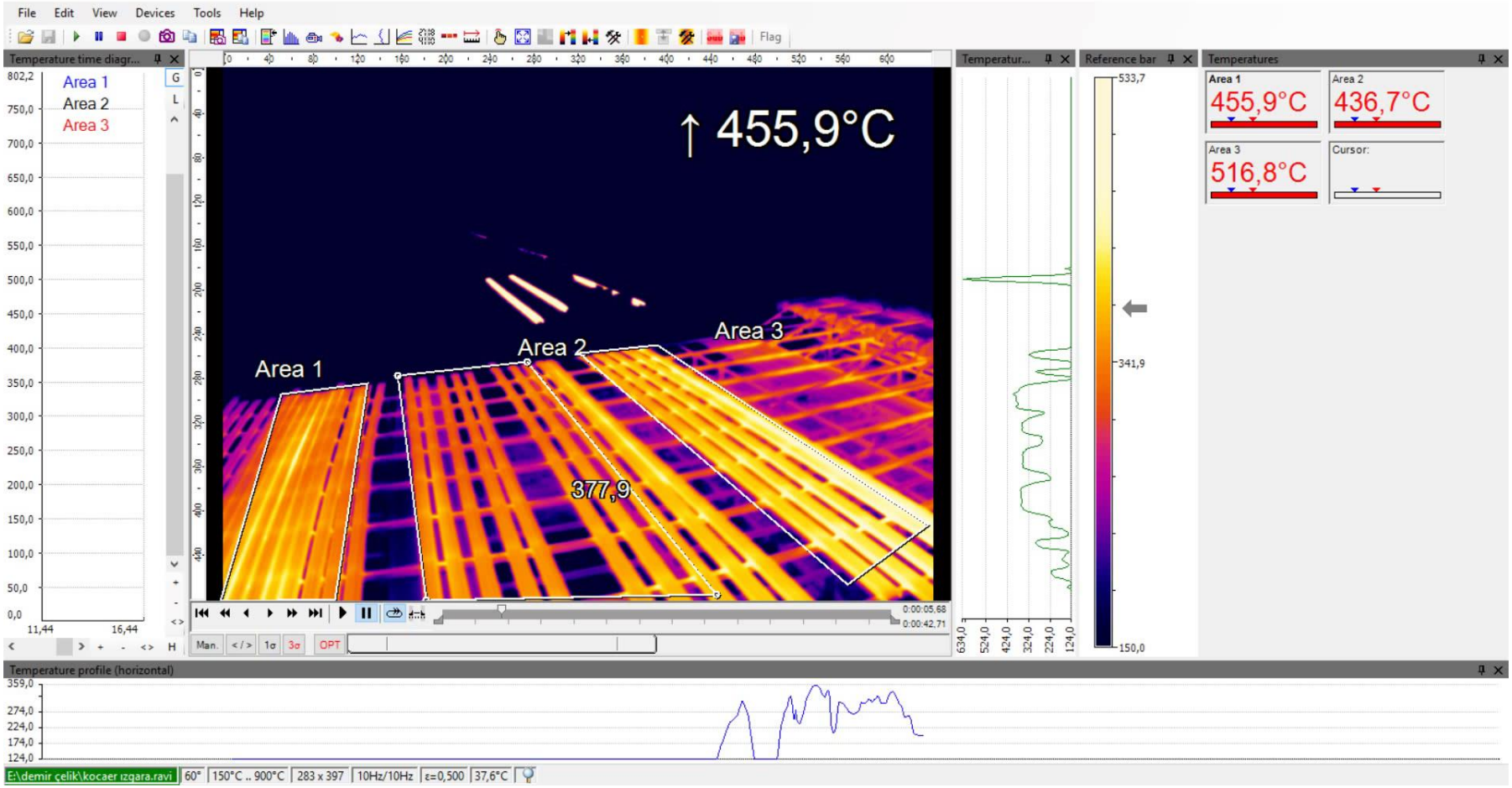
CONTINUOUS CASTING (CCM)

Cooling scales of products coming from cutting process can be analysed by thermal cameras in line. Datas are being saved as thermal or normal images.

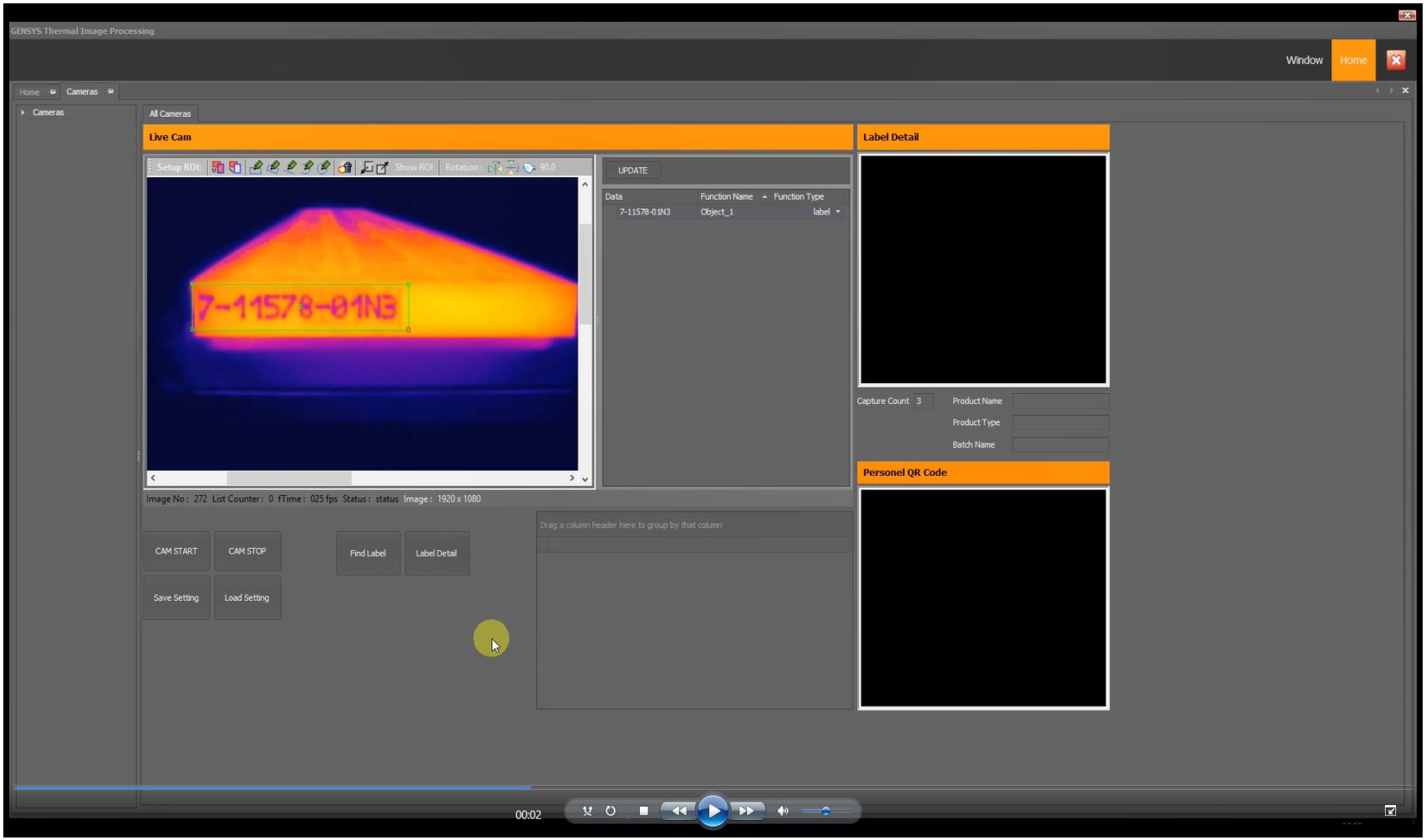




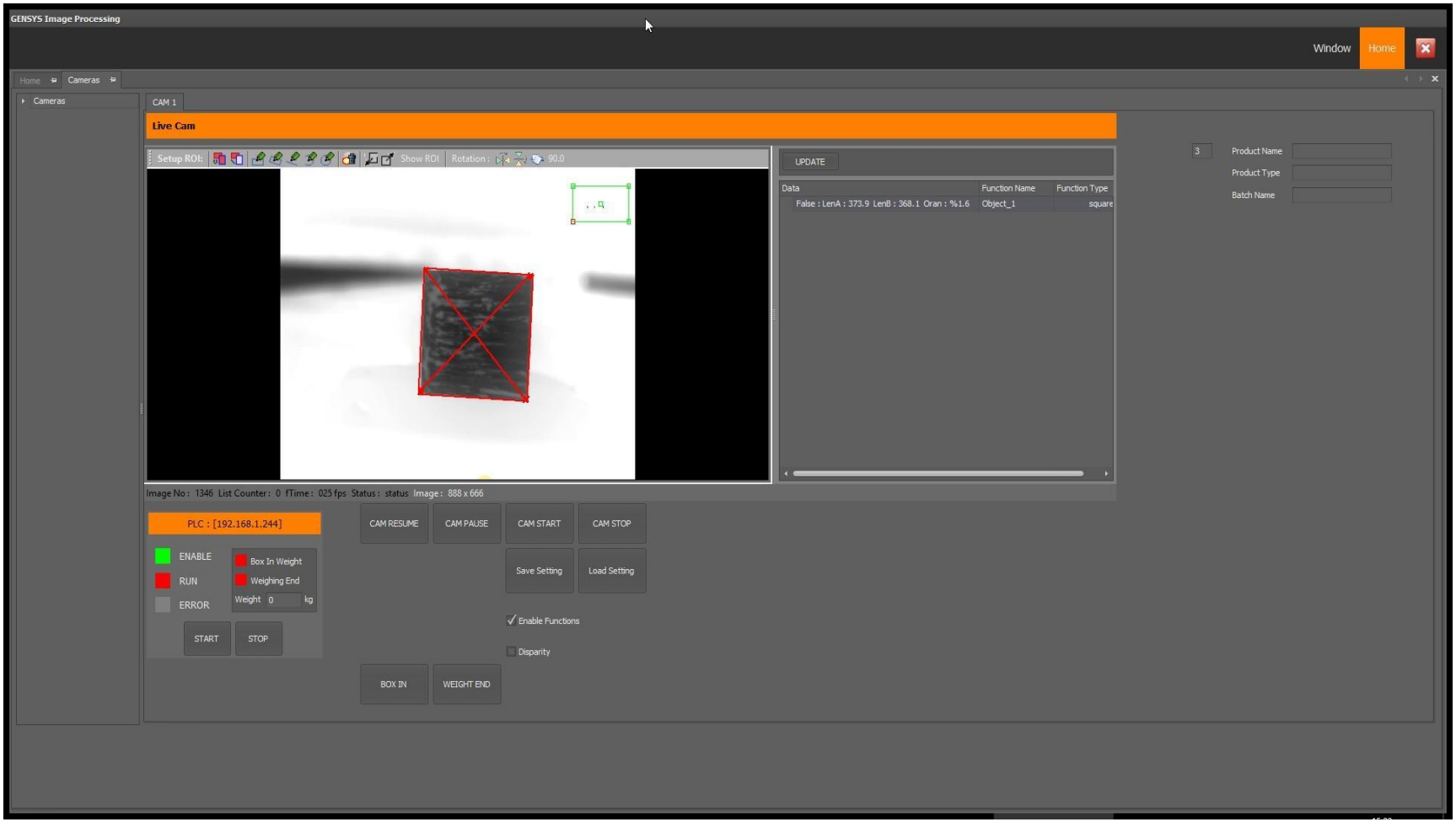
CONTINUOUS CASTING (CCM)



SPECIAL APPLICATIONS: OCR reading

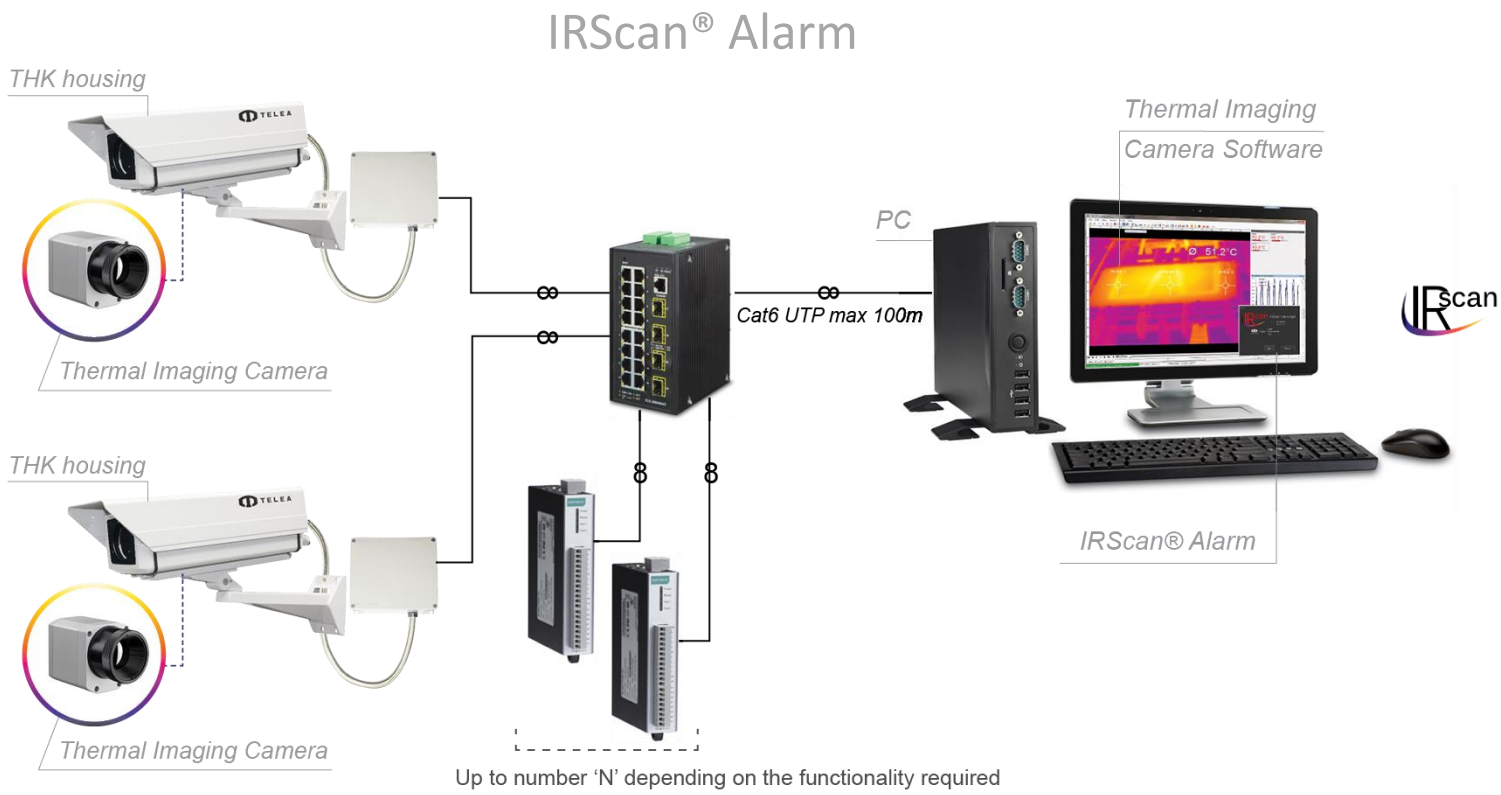


SPECIAL APPLICATIONS: Rombic dimension control



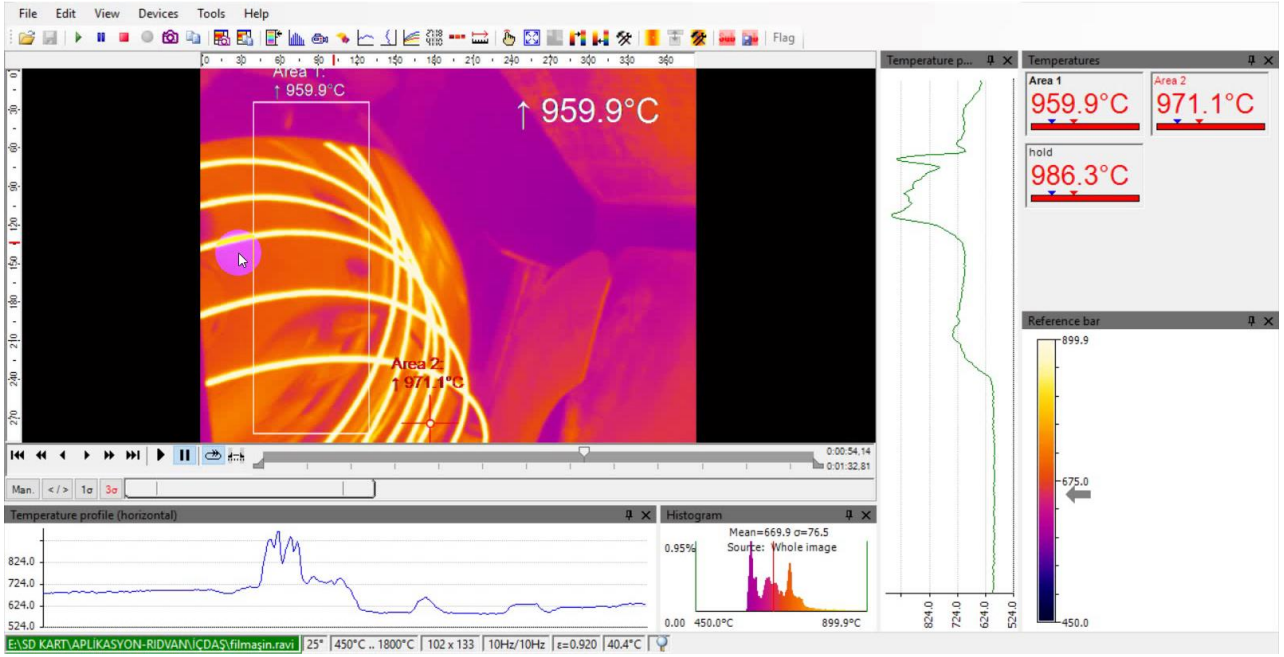
SOLUTIONS FOR THERMAL IMAGING CAMERA APPLICATIONS

EXAMPLE of BASIC SYSTEM CONFIGURATION



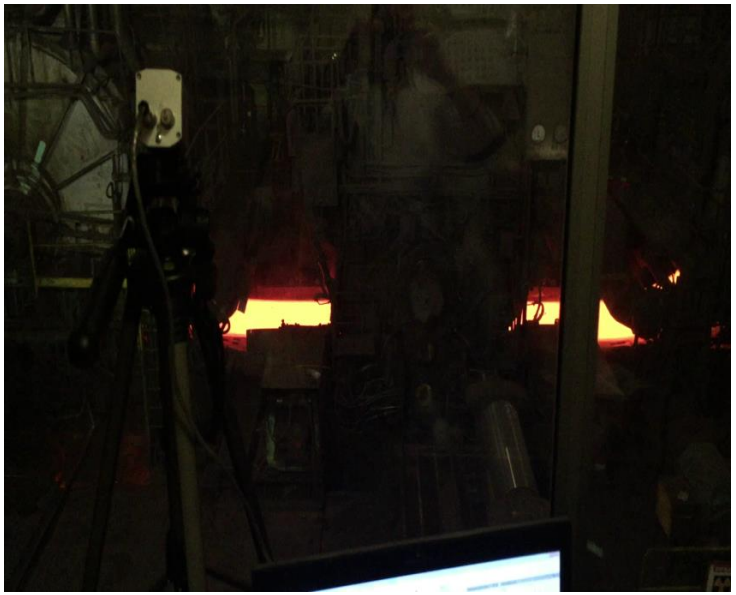
ROLLING MILL

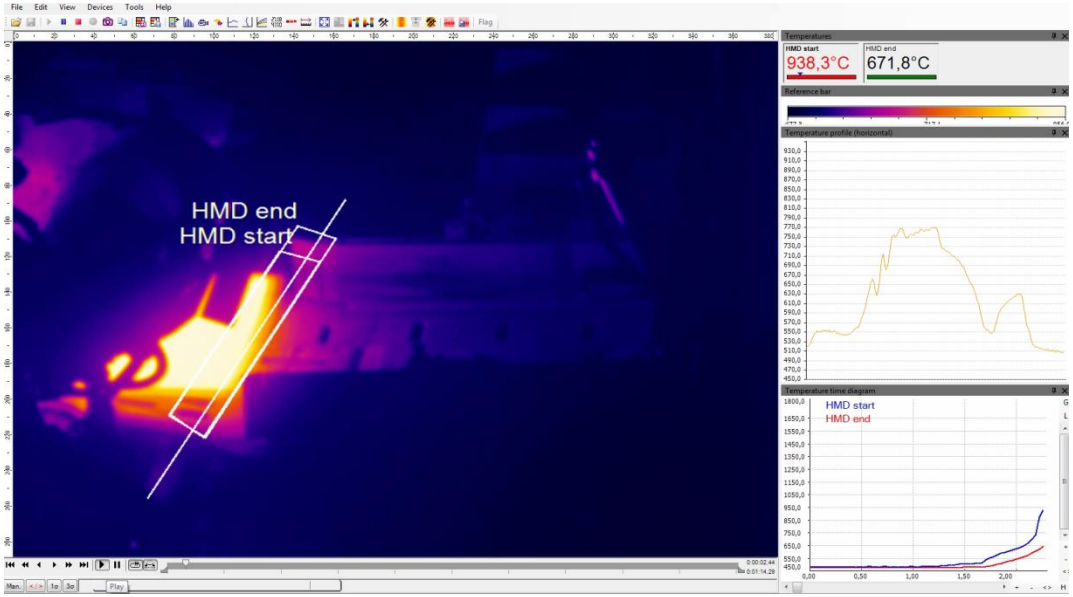
Thermal cameras are being used for thermal distribution control and detection of wire rods manufacture.



ROLLING MILL

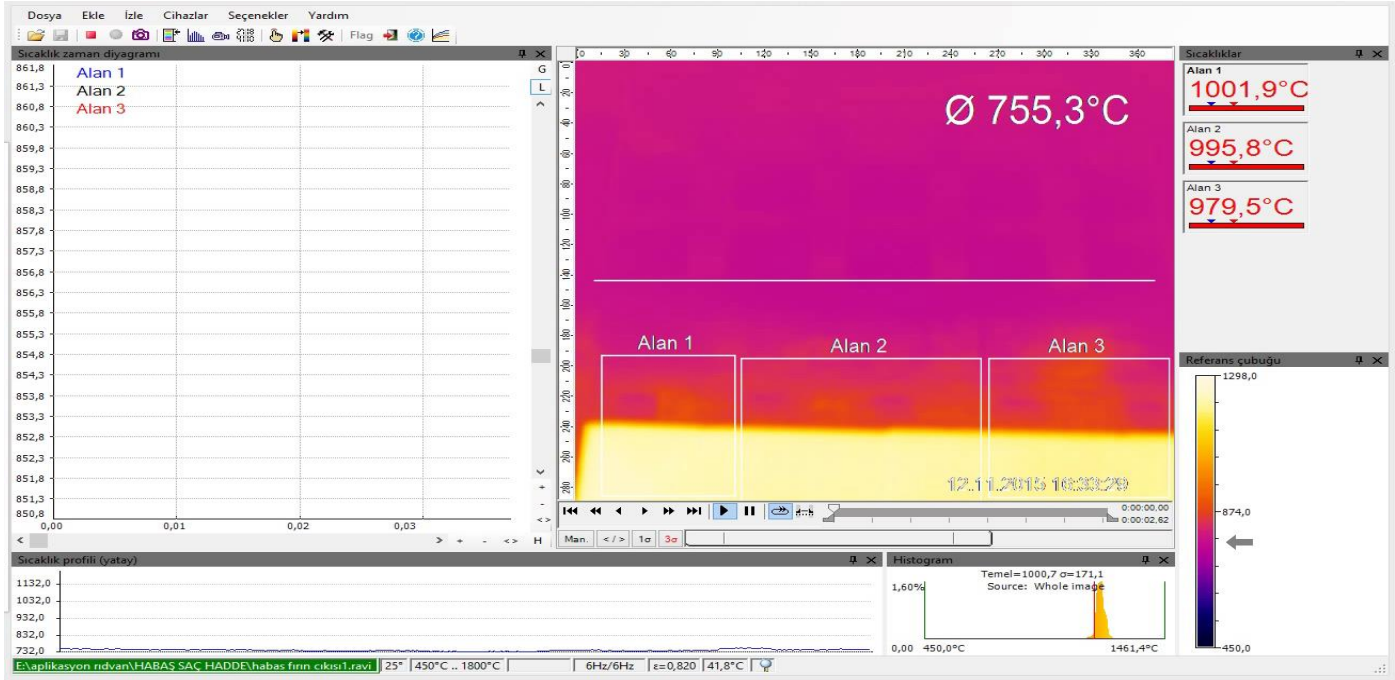
As well as thermal cameras are used for temperature measurement, lately also they are used for Hot Material Detecting (HMD) thanks to process triger ability by analog outputs. With water cooling jacket protectors they can be used under very hot working conditions.



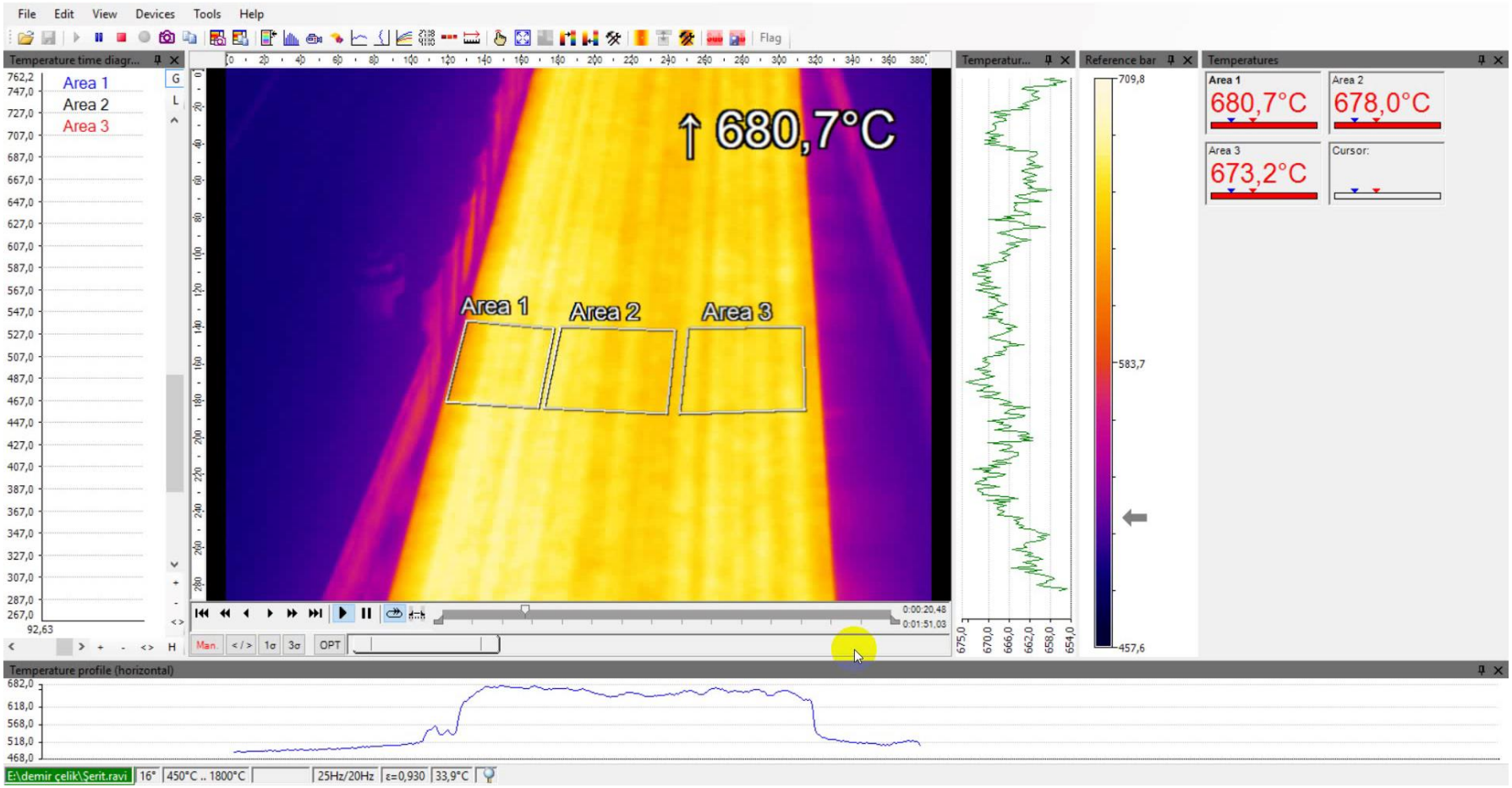


ROLLING MILL – Sheet Metal Applications

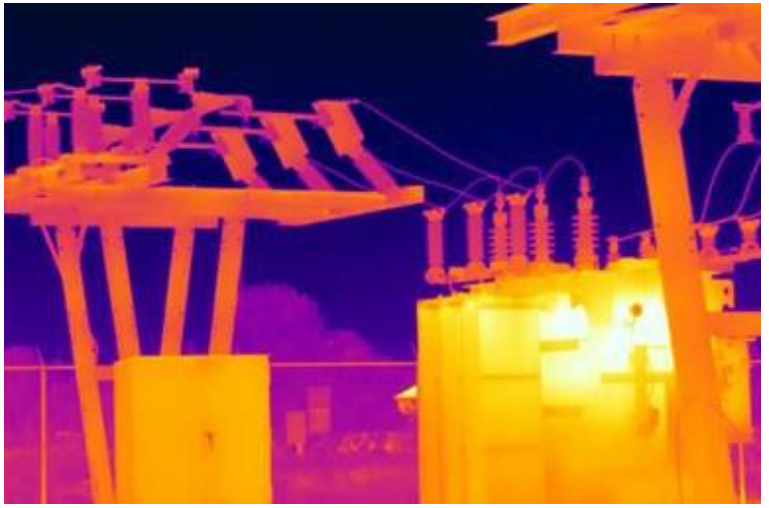
In sheet metal applications, cooling guns may be defected, false angled etc. This causes to regional temperature differences on surface. These noncooled areas may cause many mechanical problems in use. By using thermal camera, we can avoid this kind of undesirable problems.



ROLLING MILL – Sheet Metal Applications



ELECTRICAL SUBSTATION MONITORING

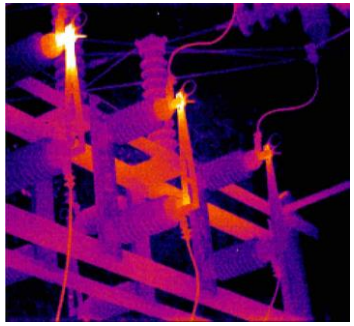


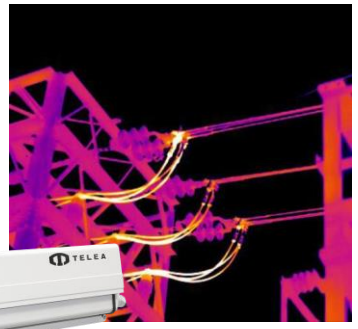
By using thermal imaging cameras and centralization software, impending equipment failures and security breaches can be detected anytime, day or night, at a remote monitoring location. The net effect is increased reliability and reduced cost.

ELECTRICAL SUBSTATION MONITORING

KEY ADVANTAGES:

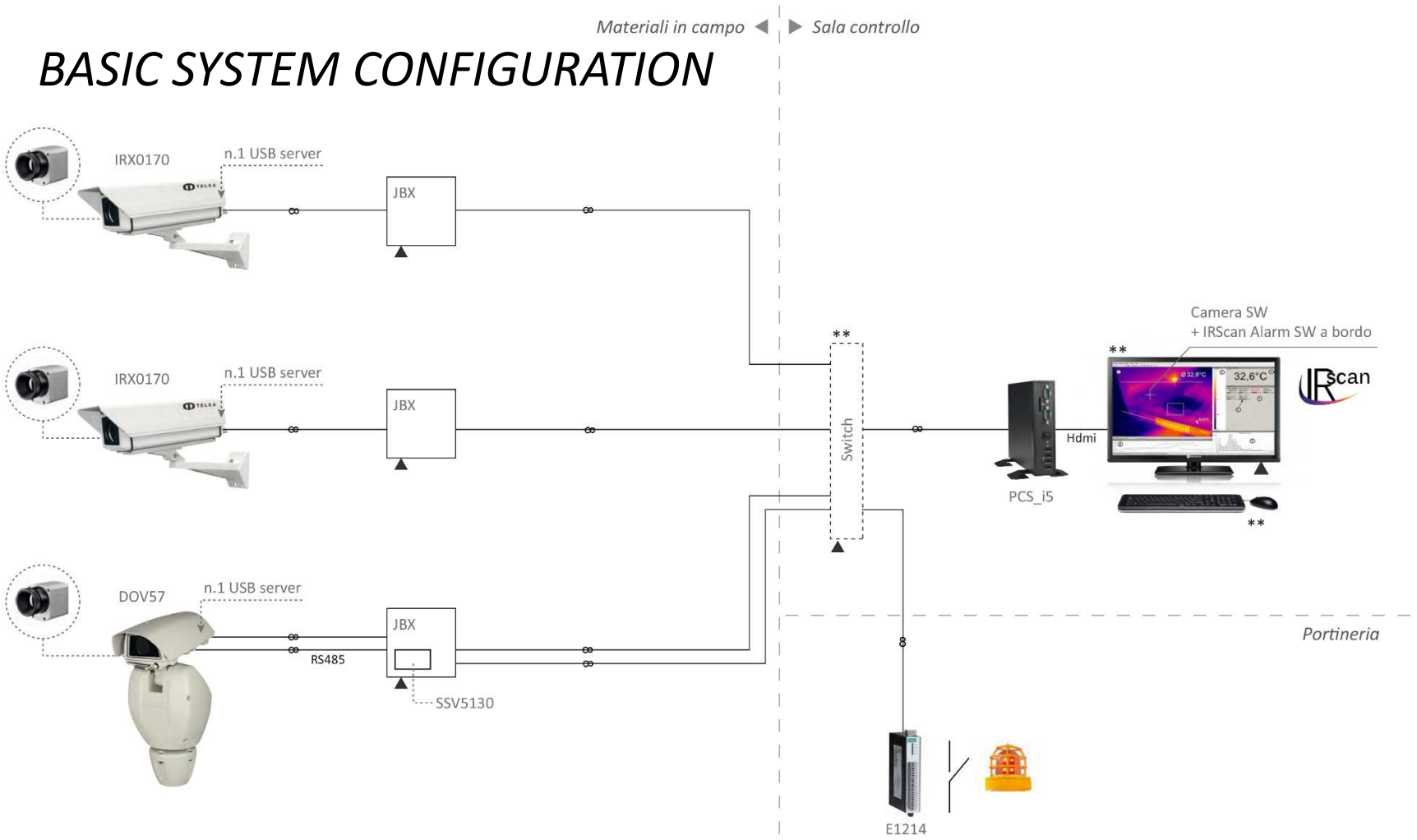
- Reliable 24/7 conditions monitoring of substations;
- Early detection of critical conditions by continuous analyzing of temperature trends;
- Automatic evaluation of thermal images and alarming for quickest possible danger prevention;
- Maintenance free operation;





ELECTRICAL SUBSTATION MONITORING

BASIC SYSTEM CONFIGURATION



TECHNOLOGIES & PRODUCTS

Telea Tecnovision proposes integrated solutions with thermal imaging cameras for different applications in Iron&Steel plants:

INTEGRATED SOLUTIONS: THERMAL IMAGING CAMERA + HOUSING

- Different type of thermal imaging cameras available depending on type of application;
- Different detectors and resolutions;
- Wide range of angle of view;
- TPIX integrated software;
- Transparent glass, Zn-Se or Ge windows;

INTEGRATED SOLUTIONS: IR CAMERAS

- 2 families of thermal imaging cameras:

FPA detector

Temperature range: -20…1000°C, 0…250°C, 150°…900°C*;

Resolution: 640x480px VGA
Frame rate: 32Hz

Resolution: 382x288px VGA
Frame rate: 80Hz

CMOS detector

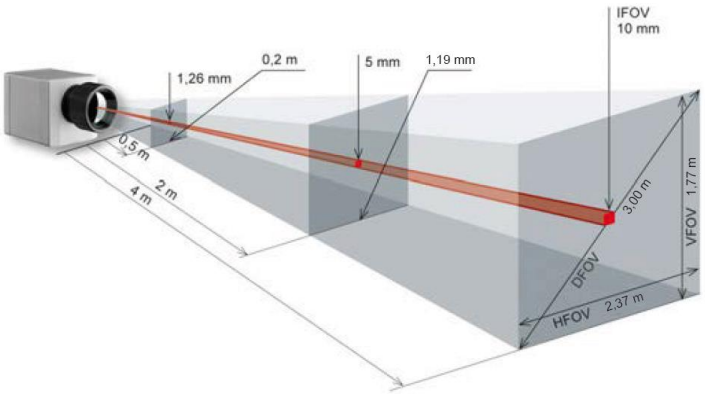
Temperature range: 450°…1800°C;

Resolution: 764x480px
Frame rate: Up to 1kHz

*additional range available: 200°C…1500°C;

CHOICE OF THE MOST SUITABLE IR CAMERA

- Different types of thermal imaging cameras with different lens available:



Legend:

HFOV	Horizontal expansion of the total measuring field on the object plane
VFOV	Vertical expansion of the total measuring field on the object plane
IFOV	Size of individual pixels on the object plane
DFOV	Diagonal expansion of the total measuring field on the object plane

Example of field measurement of IR camera FPA 640x480px, representing the 33°x25° lens (focal length: 18,7mm).

CHOICE OF THE MOST SUITABLE IR CAMERA

Optical Data														
640 x 480 pixels	Focal length [mm]	Angle	Minimum measurement distance	Distance to measurement object [m]										
					0.1	0.2	0.3	0.5	1	2	4	6	10	30	100
O33 Standard lens	18.7	33°	0.2m	HFOV [m]	0.059	0.12	0.18	0.3	0.59	1.19	2.37	3.56	5.9	17.8	59.3
		25°		VFOV [m]	0.044	0.09	0.13	0.22	0.44	0.88	1.77	2.65	4.4	13.2	44.1
		41°		DFOV [m]	0.075	0.15	0.22	0.37	0.75	1.50	3.00	4.50	7.5	22.5	74.9
		0.909 mrad		IFOV [mm]	0.1	0.2	0.3	0.5	0.9	1.8	3.6	5.5	9.1	27.3	90.9
O15 Tele lens	41.5	15°	0.4m	HFOV [m]	0.03	0.05	0.08	0.13	0.26	0.52	1.05	1.57	2.6	7.9	26.2
		11°		VFOV [m]	0.02	0.04	0.06	0.10	0.20	0.39	0.79	1.18	2.0	5.9	19.7
		19°		DFOV [m]	0.03	0.07	0.10	0.16	0.33	0.66	1.31	1.97	3.3	9.8	32.8
		0.41 mrad		IFOV [mm]	0.0	0.1	0.1	0.2	0.4	0.8	1.6	2.5	4.1	12.3	41.0
O60 Wide angle lens	10.5	60°	0.2m	HFOV [m]	0.115	0.23	0.35	0.58	1.15	2.31	4.62	6.92	11.5	34.6	115.4
		45°		VFOV [m]	0.082	0.16	0.25	0.41	0.82	1.65	3.30	4.95	8.2	24.7	82.4
		75°		DFOV [m]	0.155	0.31	0.46	0.77	1.55	3.09	6.18	9.27	15.5	46.4	154.6
		1.62 mrad		IFOV [mm]	0.2	0.3	0.5	0.8	1.6	3.2	6.5	9.7	16.2	48.6	161.9
O90 Super wide angle lens	7.33	90°	0.2m	HFOV [m]	0.203	0.41	0.61	1.01	2.03	4.06	8.11	12.17	20.3	60.8	202.8
		66°		VFOV [m]	0.130	0.26	0.39	0.65	1.30	2.60	5.20	7.79	13.0	39.0	129.9
		120°		DFOV [m]	0.356	0.71	1.07	1.78	3.56	7.12	14.24	21.37	35.6	106.8	356.1
		2.32 mrad		IFOV [mm]	0.2	0.5	0.7	12	2.3	4.6	9.3	13.9	23.2	69.6	231.9

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CHOICE OF THE MOST SUITABLE IR CAMERA

Optical Data																
382 x 288 pixels	Focal length [mm]	Angle	Minimum measurement distance	Distance to measurement object [m]												
					0.02	0.1	0.2	0.3	0.5	1	2	4	6	10	30	100
O29 Standard lens	18.7	29°	0.2m	HFOV [m]		0.060	0.11	0.16	0.27	0.53	1.0	2.1	3.1	5.2	15.6	52.1
		22°		VFOV [m]		0.045	0.08	0.12	0.20	0.40	0.78	1.6	2.3	3.9	11.7	39.0
		37°		DFOV [m]		0.074	0.14	0.20	0.33	0.66	1.3	2.6	3.9	6.5	19.5	65.1
		1.34 mrad		IFOV [mm]		0.1	0.3	0.4	0.7	1.3	2.7	5.4	8.0	13.4	40.1	133.7
O38 Standard lens	15	38°	0.2m	HFOV [m]	0.024	0.079	0.15	0.21	0.35	0.70	1.39	2.76	4.14	6.9	20.7	68.9
		29°		VFOV [m]	0.018	0.060	0.11	0.16	0.26	0.52	1.04	2.07	3.11	5.2	15.5	51.7
		48°		DFOV [m]	0.030	0.099	0.18	0.27	0.44	0.87	1.73	3.46	5.18	8.6	25.9	86.2
		1.67 mrad		IFOV [mm]	0.1	0.2	0.4	0.5	0.9	1.7	3.4	6.7	10.0	16.7	50.0	166.7
O13 Telephoto lens	41	13°	0.5m	HFOV [m]					0.12	0.23	0.47	0.94	1.40	2.3	7.0	23.4
		10°		VFOV [m]					0.09	0.17	0.35	0.70	1.05	1.7	5.2	17.5
		17°		DFOV [m]					0.15	0.29	0.58	1.17	1.75	2.9	8.8	29.2
		0.61 mrad		IFOV [mm]					0.3	0.6	1.2	2.5	3.7	6.1	18.4	61.2
O53 Wide angle lens	10,5	53°	0.2m	HFOV [m]		0.11	0.21	0.31	0.51	1.0	2.0	4.0	6.0	9.9	29.7	99.0
		40°		VFOV [m]		0.08	0.15	0.23	0.37	0.73	1.4	2.9	4.3	7.2	21.6	71.9
		66°		DFOV [m]		0.14	0.26	0.38	0.63	1.2	2.5	4.9	7.4	12.2	36.7	122.3
		2.38 mrad		IFOV [mm]		0.2	0.5	0.7	1.2	2.4	4.8	9.5	14.3	23.8	71.5	238.4
O62 Wide angle lens	11	62°	0.5m	HFOV [m]	0.040	0.136	0.26	0.38	0.62	1.22	2.42	4.83	7.23	12.0	36.1	120.3
		49°		VFOV [m]	0.030	0.103	0.19	0.28	0.47	0.92	1.83	3.65	5.47	9.1	27.3	90.9
		79°		DFOV [m]	0.050	0.170	0.32	0.47	0.77	1.53	3.03	6.05	9.06	15.1	45.2	150.8
		2.27 mrad		IFOV [mm]	0.1	0.2	0.5	0.7	1.2	2.29	4.6	9.1	13.7	22.7	68.2	227.3
O80 Super wide angle lens	7.7	80°	0.2m	HFOV [m]		0.182	0.35	0.84	0.84	1.65	3.29	6.55	9.82	16.4	49.0	163.4
		56°		VFOV [m]		0.119	0.23	0.55	0.54	1.08	2.14	4.28	6.41	10.7	32.0	106.6
		97°		DFOV [m]		0.218	0.41	1.00	1.00	1.97	3.92	7.83	11.73	19.5	58.5	195.1
		3.25 mrad		IFOV [mm]		0.3	0.7	1.6	1.6	3.3	6.5	13.0	19.5	32.5	97.4	324.7

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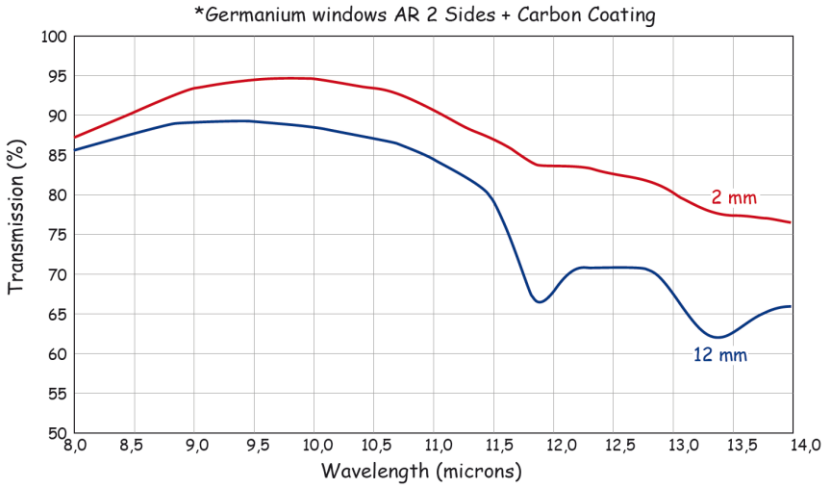
CHOICE OF THE MOST SUITABLE IR CAMERA

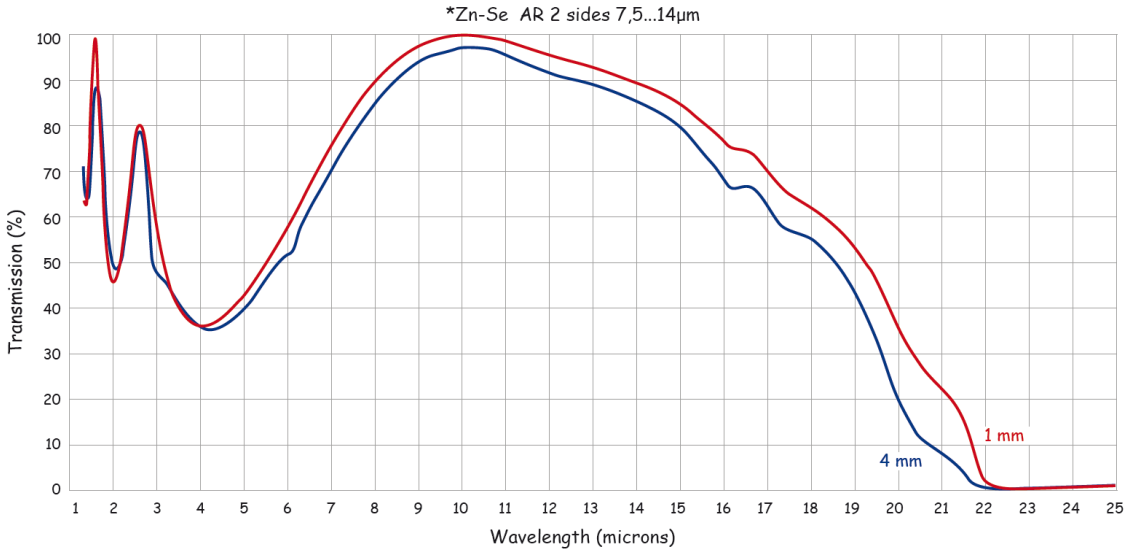
Optical Data														
764 x 480 pixels	Focal length [mm]	Angle	Minimum measurement distance	Distance to measurement object [m]										
					0.1	0.2	0.3	0.5	1	2	4	6	10	30	100
OF16	16	39°	0.2m	HFOV [m]		0.14	0.21	0.36	0.72	1.43	2.87	4.30	7.2	21.5	71.6
		25°		VFOV [m]		0.09	0.14	0.23	0.45	0.90	1.80	2.70	4.5	13.5	45.0
		46°		DFOV [m]		0.17	0.25	0.42	0.85	1.69	3.38	5.08	8.5	25.4	84.6
		0.94 mrad		IFOV [mm]		0.2	0.3	0.5	0.9	1.9	3.8	5.6	9.4	28.1	93.8
OF25	25	26°	0.5m	HFOV [m]	0.046	0.09	0.14	0.23	0.46	0.92	1.83	2.75	4.6	13.8	45.8
		16°		VFOV [m]	0.029	0.06	0.09	0.14	0.29	0.58	1.15	1.73	2.9	8.6	28.8
		30°		DFOV [m]	0.054	0.11	0.16	0.27	0.54	1.08	2.17	3.25	5.4	16.2	54.1
		0.60 mrad		IFOV [mm]	0.1	0.1	0.2	0.3	0.6	1.2	2.4	3.6	6.0	18.0	60.0
OF50	50	13°	1.5m	HFOV [m]				0.11	0.23	0.46	0.92	1.38	2.3	6.9	22.9
		8°		VFOV [m]				0.07	0.14	0.29	0.58	0.86	1.4	4.3	14.4
		15°		DFOV [m]				0.14	0.27	0.54	1.08	1.62	2.7	8.1	27.1
		0.30 mrad		IFOV [mm]				0.2	0.3	0.6	1.2	1.8	3.0	9.0	30.0
O75	75	9°	2.0m	HFOV [m]					0.15	0.31	0.61	0.92	1.5	4.6	15.3
		5°		VFOV [m]					0.10	0.19	0.38	0.58	1.0	2.9	9.6
		10°		DFOV [m]					0.18	0.36	0.72	1.08	1.8	5.4	18.0
		0.2 mrad		IFOV [mm]					0.2	0.4	0.8	1.2	2.0	6.0	20.0

CHOICE OF THE MOST SUITABLE IR CAMERA

Characteristic curve of Germanium window:



Characteristic curve of Zinco-Selenium window:



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TECHNOLOGIES & PRODUCTS

INTEGRATED SOLUTIONS: HOUSINGS

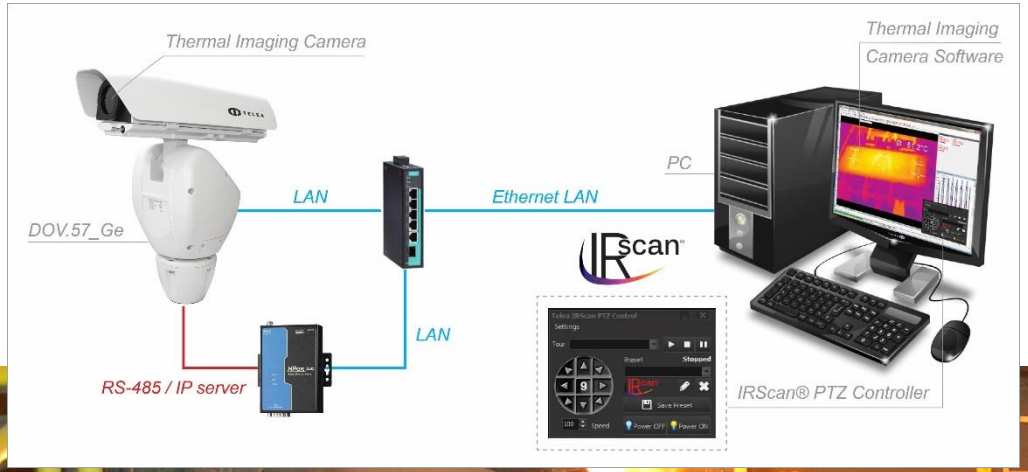
Integrated Pan & Tilt unit

Integrated water and air cooled housing

Integrated air cooled housing

CHOICE OF THE MOST SUITABLE HOUSING

Thermographic camera protected inside a high performance PTZ with integrated telemetry receiver and IP67 camera housing with special Germanium or transparent glass window.



Complete solution to capture sharp infrared pictures and video for process optimization.

CHOICE OF THE MOST SUITABLE HOUSING

Thermographic camera protected inside compressed air and water cooled housing with transparent glass, Germanium or Zinco-Selenium window.

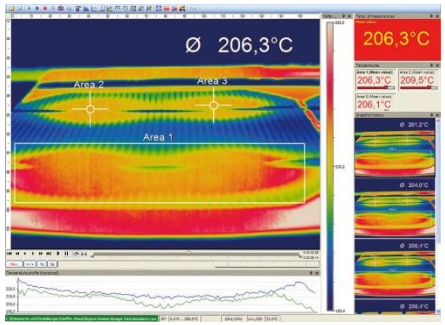
- Allows the use with operating temperature up to 200°C.

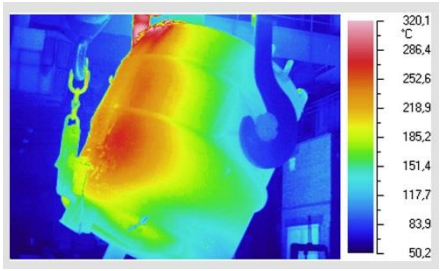
Thermographic camera protected inside air cooled housing with transparent glass or Germanium window.

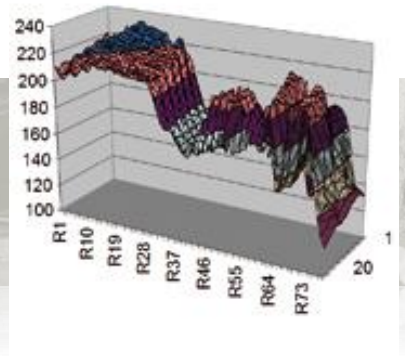
- Allows the use with operating temperature up to 90°C.

MANAGEMENT IR SOFTWARE

- Remote camera control possible through related software:
  - Extensive infrared camera software
  - Extensive online & offline data analysis
  - High level of individualization for Customer
  - Automatic process & quality control
  - Video recording & snapshot function (IR or Bi-spectral)
  - Temperature data analysis & documentation







SOLUTIONS FOR THERMAL IMAGING CAMERA APPLICATIONS

I R X A B C D

Part Number Configurator
for INTEGRATED THERMAL CAMERA

I R X

A — Type of housing

- 0: THK525 (with Ge window Ø 55mm)
- 1: THK with transparent glass
- 2: THK525 (with Ge window Ø 30mm)
- 3: ACQUATEC with Ge window
- 4: ACQUATEC with Zn-Se window
- 5: ACQUATEC with transparent glass
- 6: DOV.57 with Ge window Ø 55mm
- 7: DOV.57 with Ge window Ø 30mm
- 8: DOV.57
- 9: CF.E.05.IR50
- A: AIRTEC
- B: ATEX CF.EX.129IRL
- C: ATEX CF.EX.129.IRSWL
- D: IRScanDOV54

B — Type of camera

- 1: FPA 382 x 288 pixels
- 2: FPA 640 x 480 pixels
- 3: CMOS 764 x 480 pixels
- 4: FPA 320 x 240 pixels
- 5: FPA -F 640 x 480 pixels
- 6: FPA HT 382 x 288 pixels
- 7: FPA HT 382 x 288 pixels

C — Focal length

- 2: 41 mm
- 4: 7.7 mm
- 5: 18.7 mm
- 6: 41.5 mm
- 7: 10.5 mm
- 8: 18 mm + 30mm
- 9: 41.8 mm
- A: 16 mm
- B: 25 mm
- C: 50 mm
- D: 75 mm
- E: 3.3 mm
- F: 5.7 mm
- G: 10 mm
- H: 35.5 mm

D — Versions

PROGRESSIVE VERSION:

Is identified with progressive numbering 1, 2, 3, or other symbol.. for change the original project classified with 0

T: Extended temperature