



XIX COBREAP | Foz do Iguaçu

INOVAÇÕES CIENTÍFICAS E TECNOLÓGICAS

AGOSTO 2017

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EXAME FOTOTÉRMICO – REALIZAÇÃO E INTERPRETAÇÃO

A Termografia é Utilizada a Muito Tempo...



- Década de 60

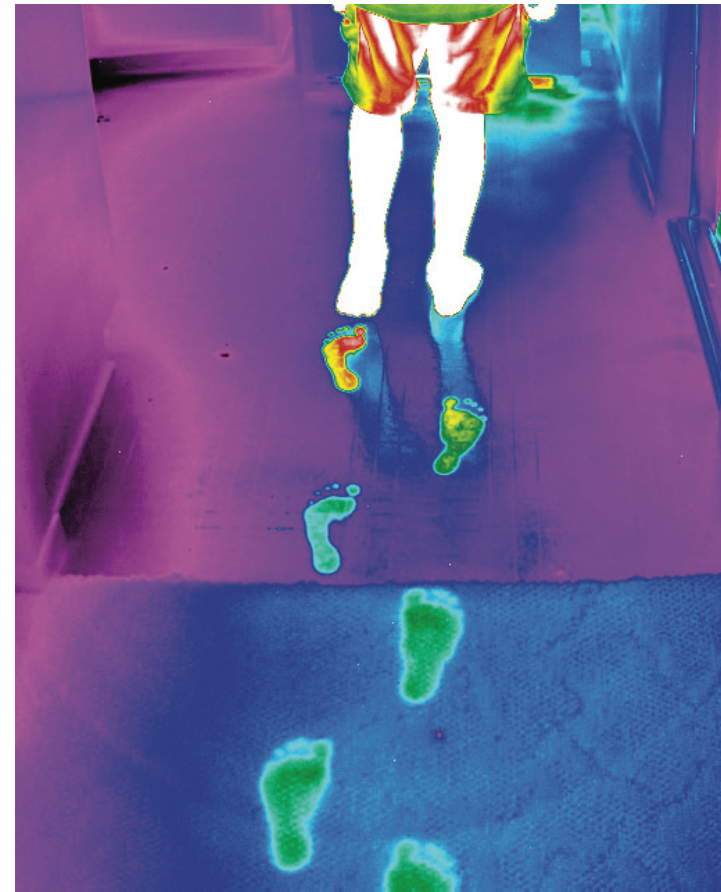
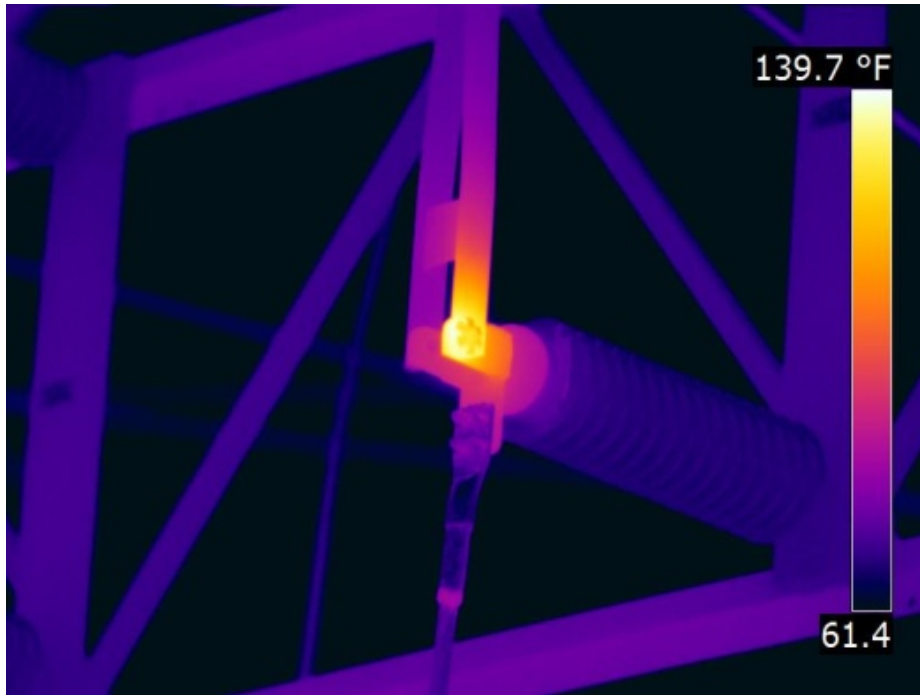


...em diferentes áreas...

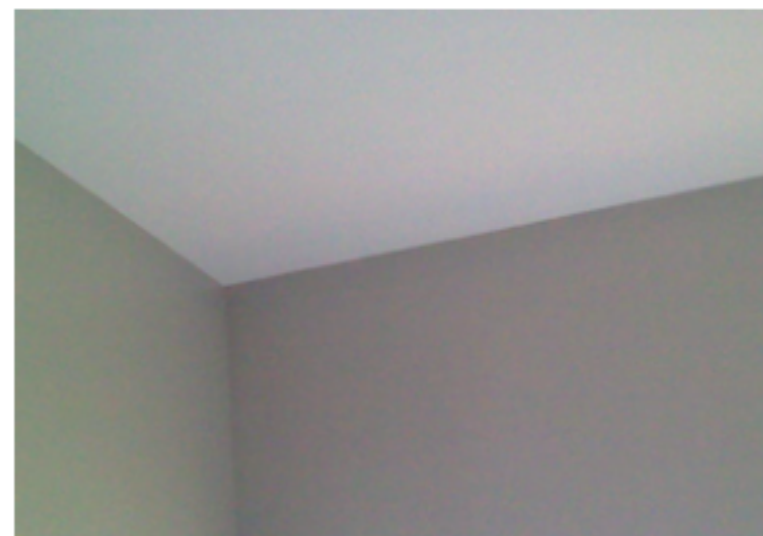
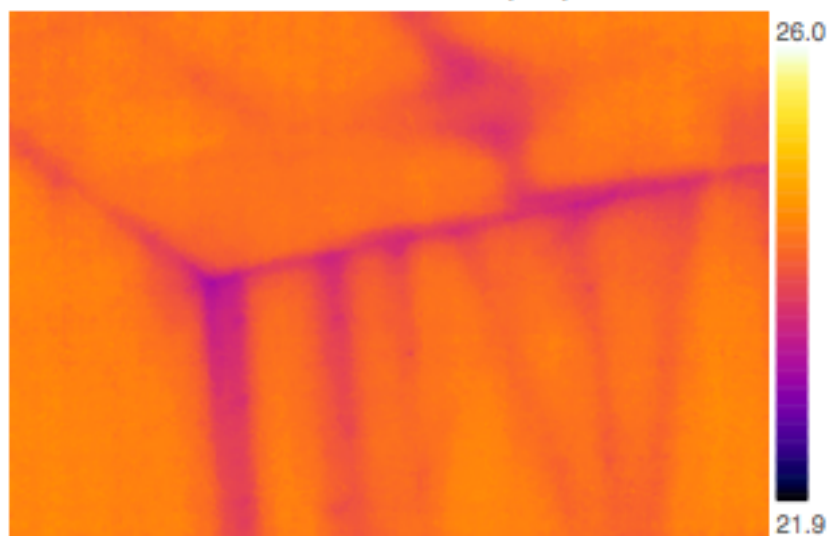


Termografia Infravermelha o porquê que é tão útil...

- Não precisa de Contato



- A imagem apresenta em duas Dimensões



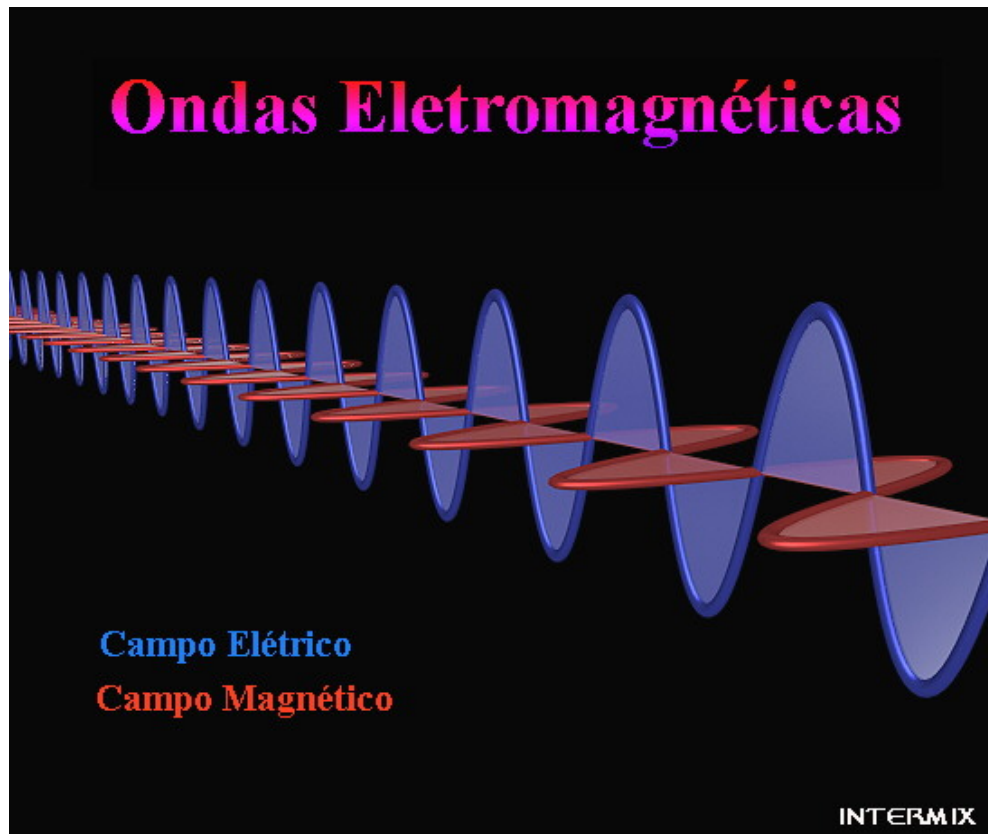
- Realizada em tempo Real

Definição Termografia Infravermelha

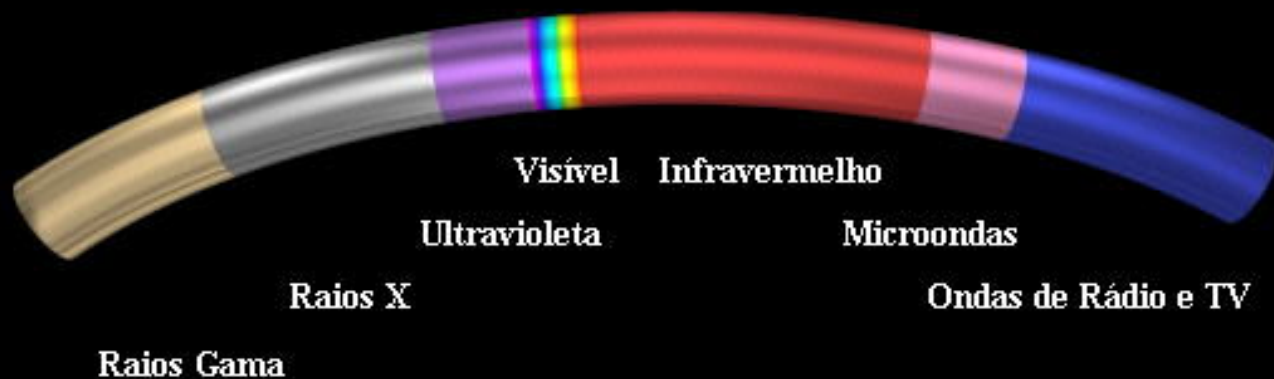
- É a ciência de aquisição e análise de informações térmicas a partir de dispositivos de obtenção de imagens térmicas sem contato

Termografia

- A Radiação Eletromagnética

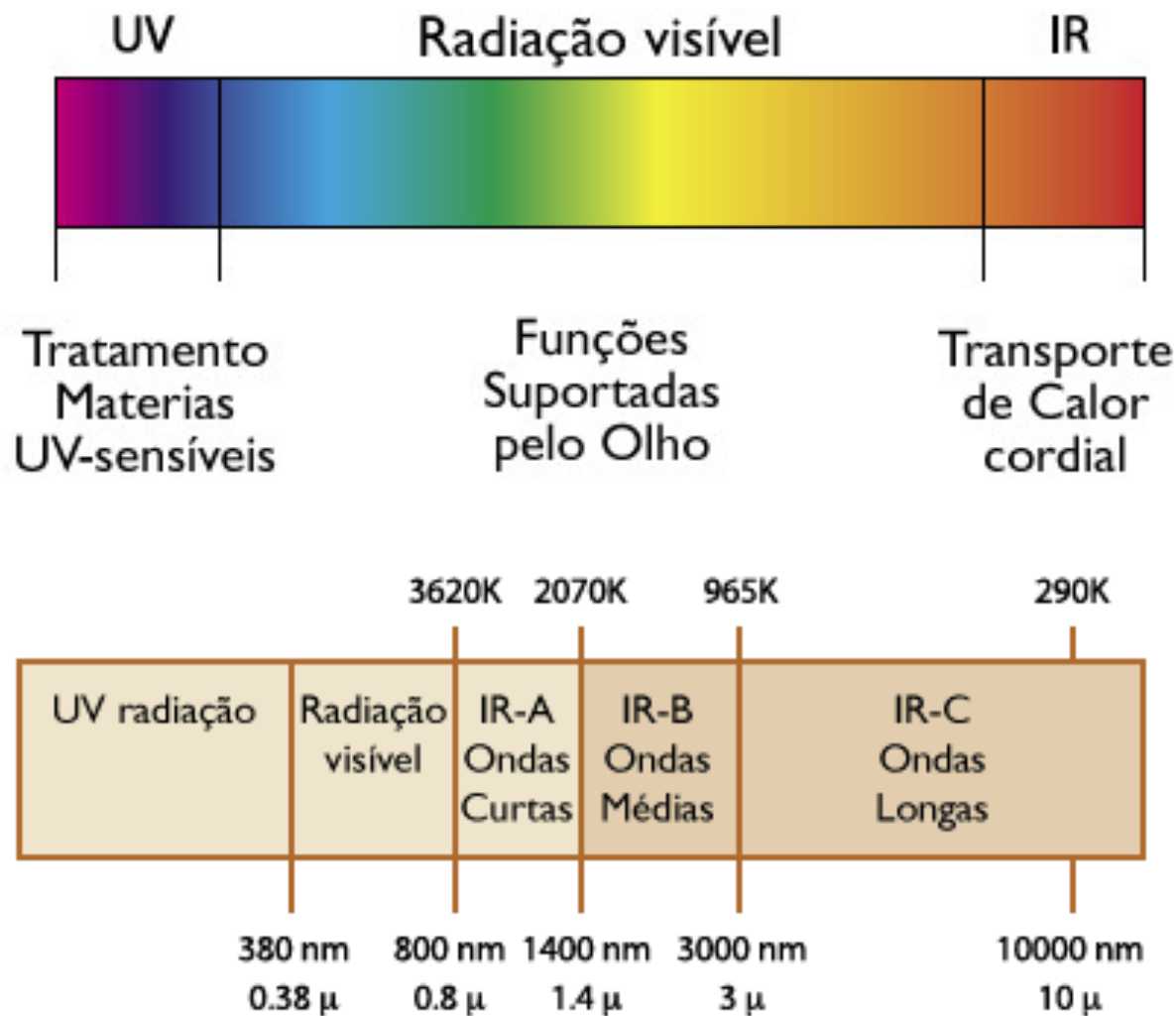


O Espectro Eletromagnético



INTERMIX

A faixa infravermelha do espectro é dividida em ondas curtas, ondas médias e ondas longas



O que é Temperatura?

- Medida do nível de agitação molecular.
- Medida em uma escala arbitrária com origem em zero grau absoluto, quando as moléculas teoricamente param de mover-se.

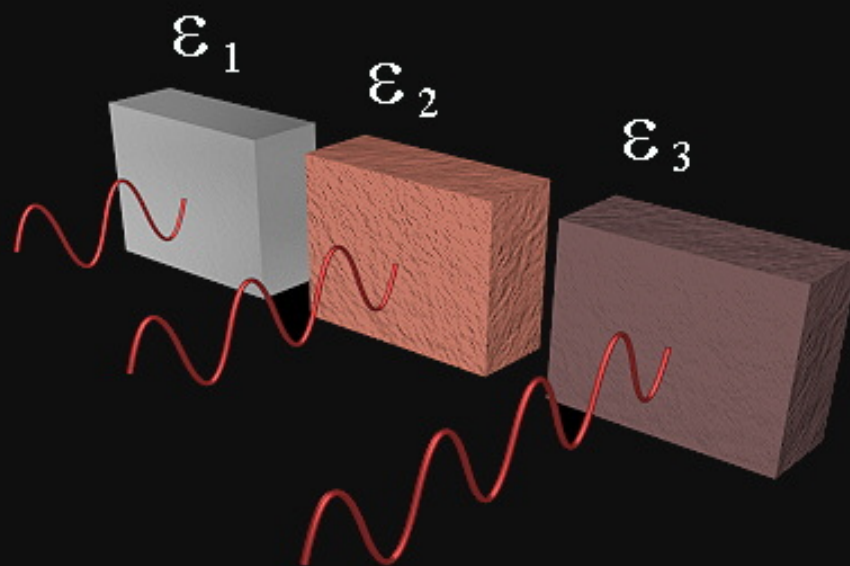
O que é Calor?

- O calor é a nomenclatura atribuída à energia sendo transferida de um sistema a outro exclusivamente em virtude da diferença de temperaturas entre eles

EMISSIVIDADE

Lei de Stefan-Boltzmann

$$w = \sigma \epsilon T^4$$



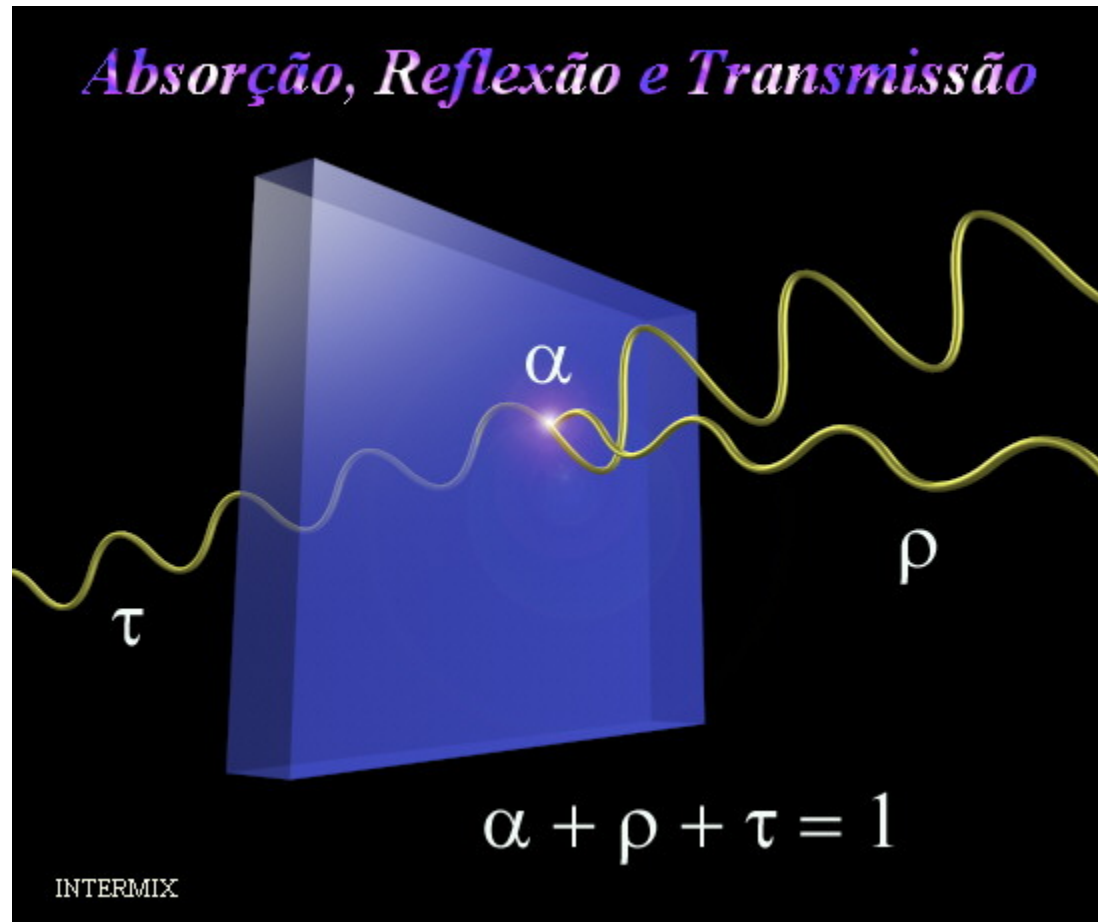
$$T_1 = T_2 = T_3 \quad \epsilon_1 < \epsilon_2 < \epsilon_3$$

INTERMIX

Emitâncias normais de vários materiais

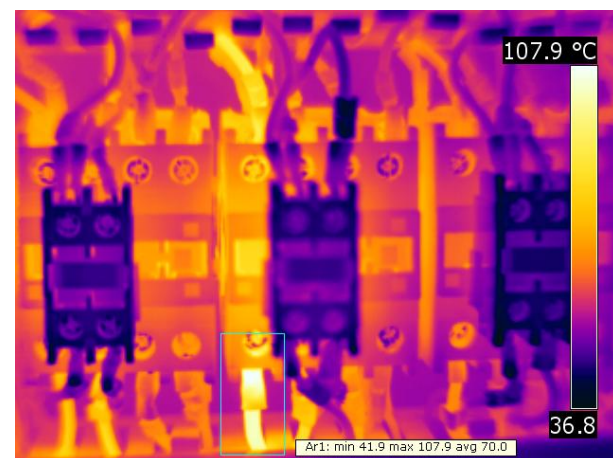
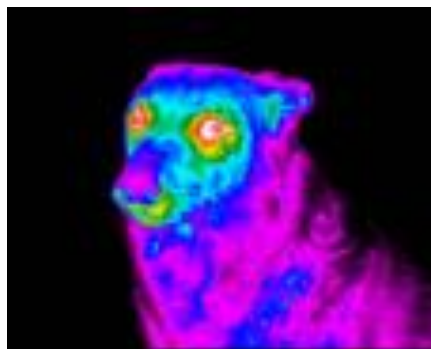
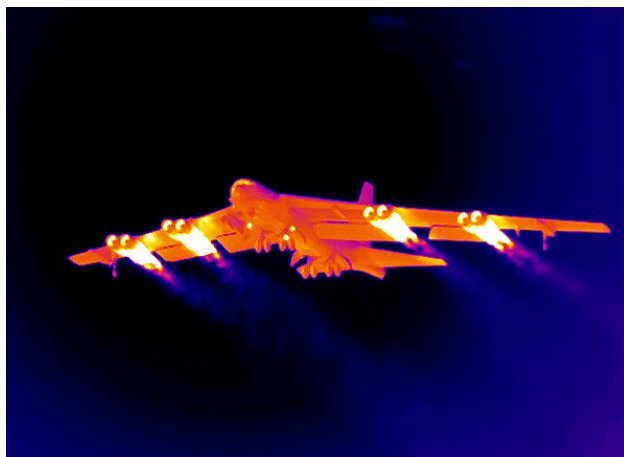
Material	Especificação	Temperatura °C	Espectro	Emitância	Ref.
Outros materiais					
Concreto		20	T	0.92	2
	seco	36	SW	0.95	7
	áspero	17	SW	0.97	5
	passagem	5	LLW	0.974	8
Ebonite			T	0.89	1
Esmeril	grosso	80	T	0.85	1
Esmalte		20	T	0.9	1
	verniz	20	T	0.85–0.95	1
Placa de fibra	dura, não tratada	20	SW	0.85	6
	porosa, não tratada	20	SW	0.85	6
	painel de partículas	70	SW	0.77	9
	painel de partículas	70	LW	0.89	9
	masonita	70	SW	0.75	9
	masonita	70	LW	0.88	9
Granito	polido	20	LLW	0.849	8
	áspero	21	LLW	0.879	8
	áspero, 4 amostras diferentes	70	SW	0.95–0.97	9
	áspero, 4 amostras diferentes	70	LW	0.77–0.87	9
Gesso		20	T	0.8–0.9	1
Gelo: Ver Água					
Verniz	alumínio em superfície áspera	20	T	0.4	1
	baquelite	80	T	0.83	1
	preto, fosco	100	T	0.97	2
	preto, meio-brilho	40–100	T	0.96–0.98	1
	preto, brilhante, borrifado em ferro	20	T	0.87	1
	resistente ao calor	100	T	0.92	1
	3 cores borrifado em alumínio	70	SW	0.50–0.53	9
	3 cores borrifado em alumínio	70	SW	0.9250–0.94	9
	branco	100	T	0.92	2
	branco	40–100	T	0.8–0.95	1
Couro	escurecido pelo sol		T	0.75–0.80	1
Cal			T	0.3–0.4	1
Argamassa		17	SW	0.87	5
	seco	36	SW	0.94	7
Óleo, lubrificante	filme em base Ni: somente base Ni	20	T	0.05	2

Absorvidade + Refletividade + Transmissividade = 1



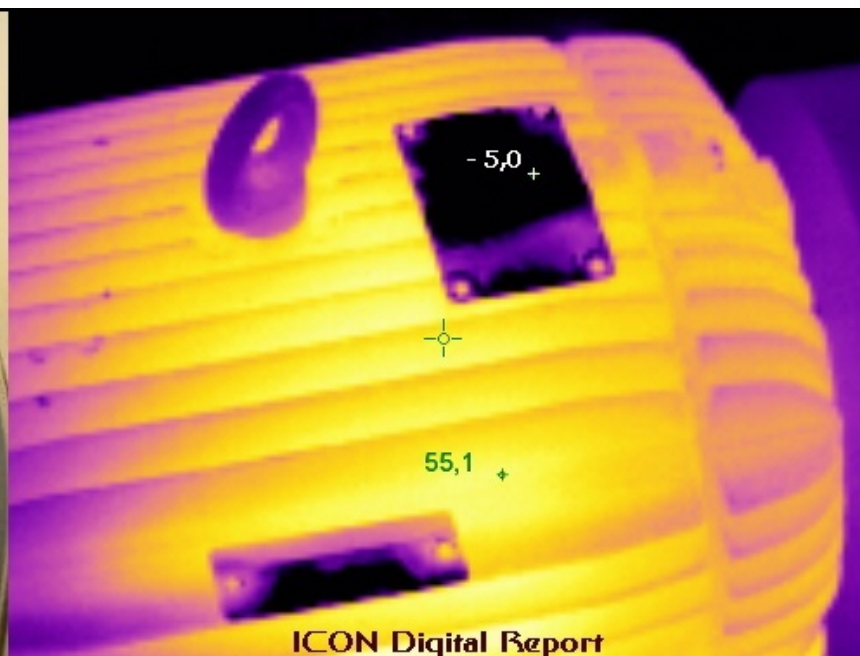
Radiação Infravermelha

- A radiação infravermelha é naturalmente emitida pelos corpos, em função de sua temperatura



“corpos muito reflexivos tem baixa emissividade”

“corpos que refletem pouca radiação tem alta emissividade”



Capacidade Transiente



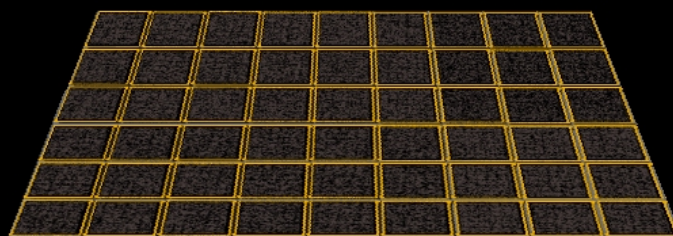
Figura 5:13 Indicação do nível do tanque

Detectores

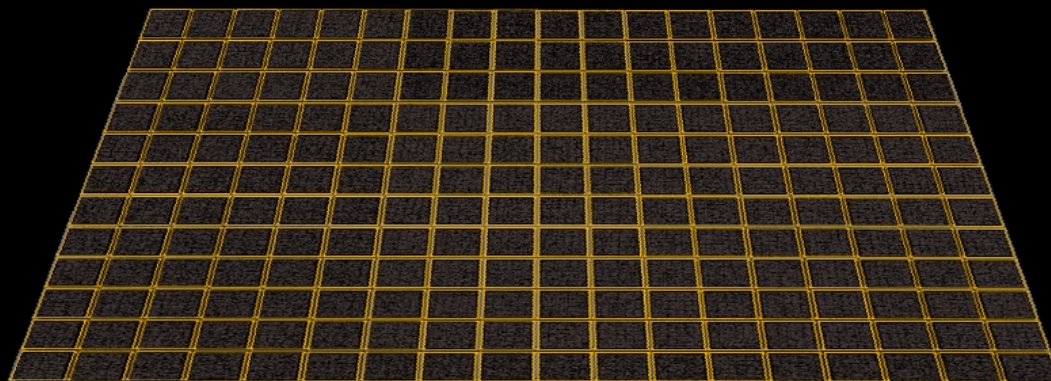
- 160 X 120 (19.200 elementos sensores)
- 240 X180 (43.200 elementos sensores)
- 320 X 240 (76.800 elementos sensores)
- 640 x 480 pixels (307.200 elementos sensores)
- 1024 X 646 pixels (661.502 elementos sensores)

RESOLUÇÃO

Matriz de Plano Focal - Focal Plane Array



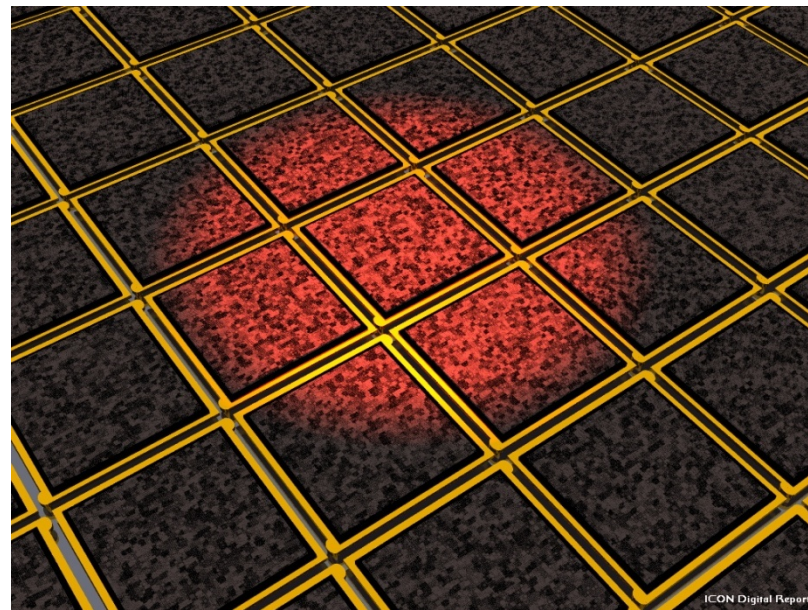
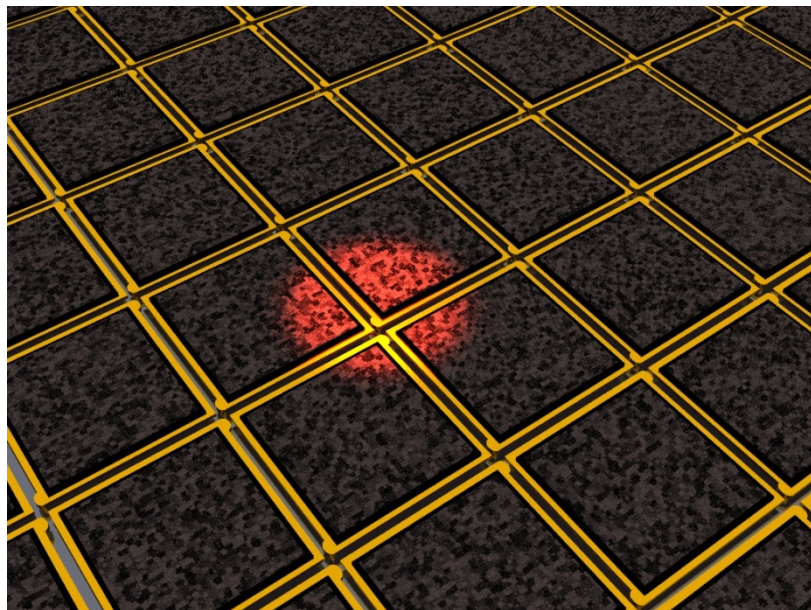
$9 \times 6 = 54$ pixels

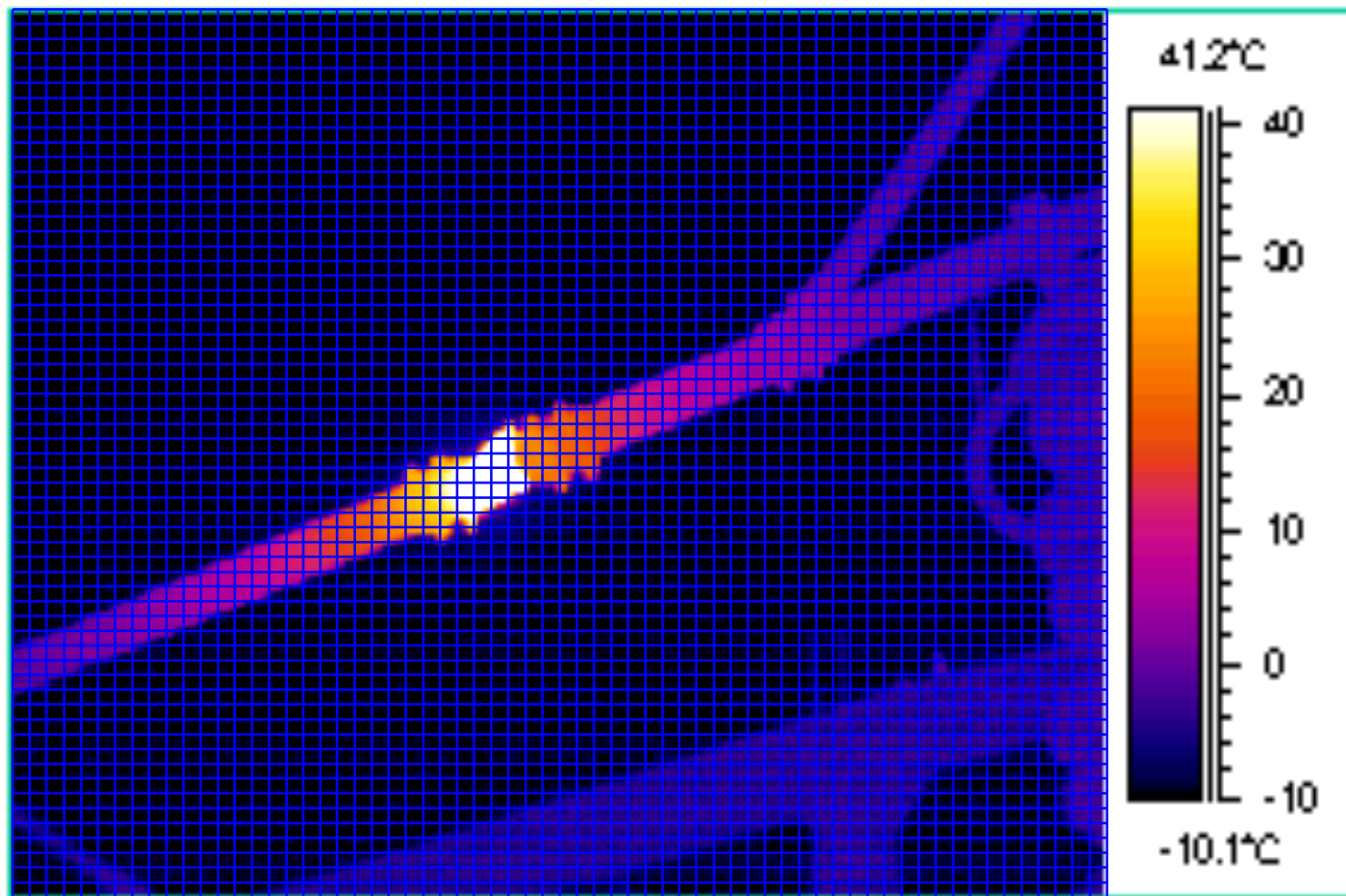


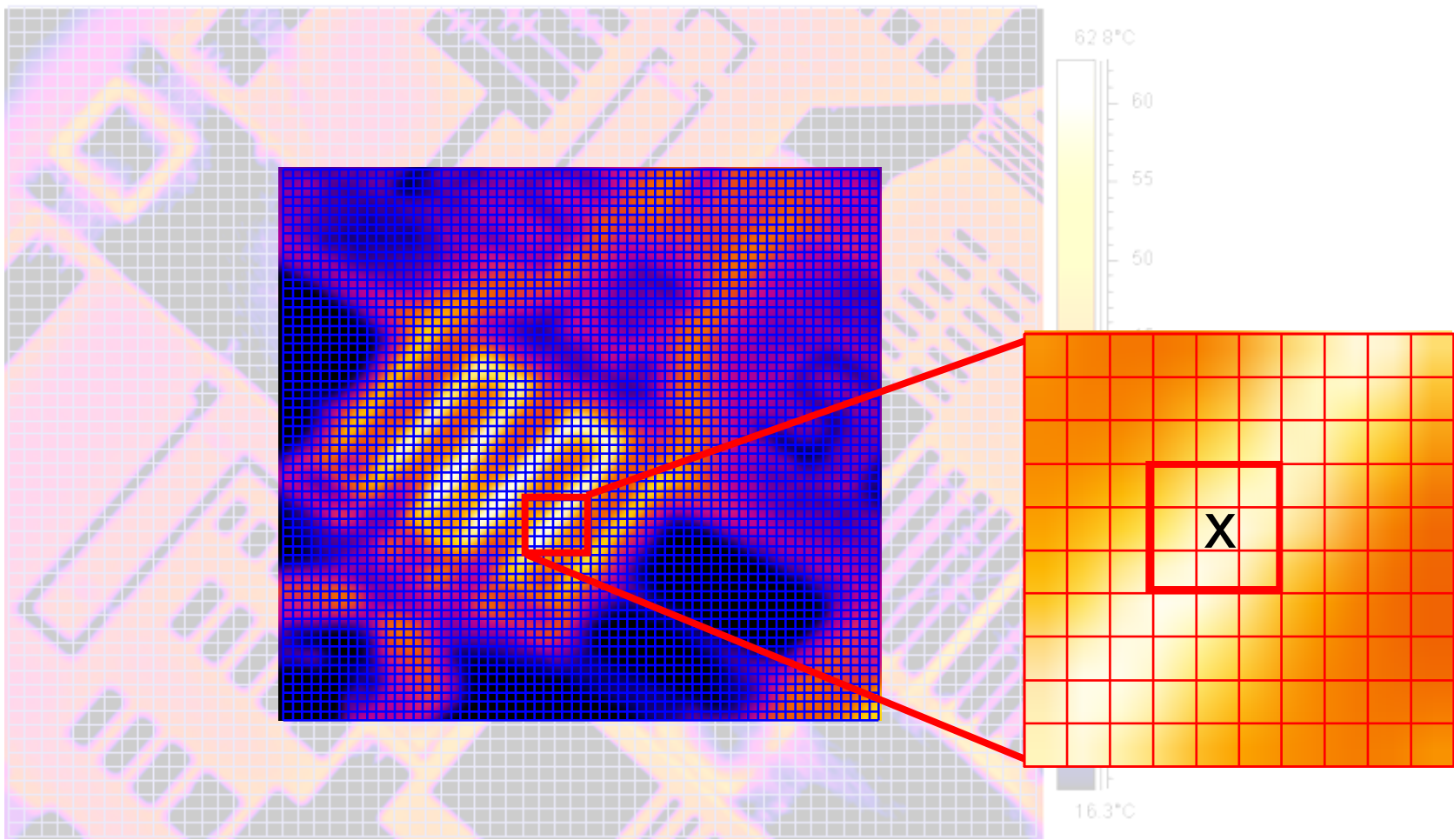
$18 \times 12 = 216$ pixels

ICON Tecnologia

- Temos que garantir de que pelo menos um pixel seja completamente coberto pela radiação que vem do objeto





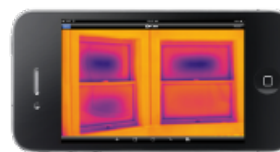
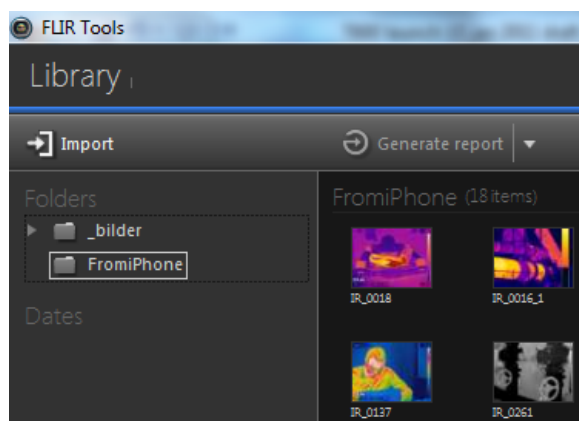


O Produto Correto para Cada Aplicação



Comunicação sem fio - WiFi

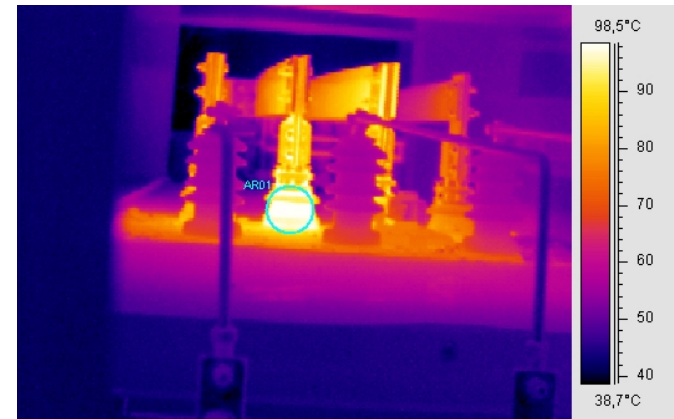
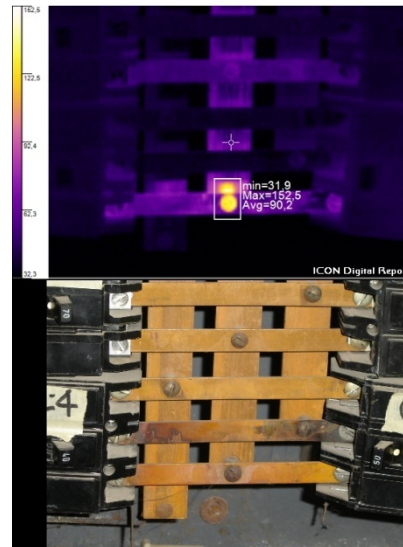
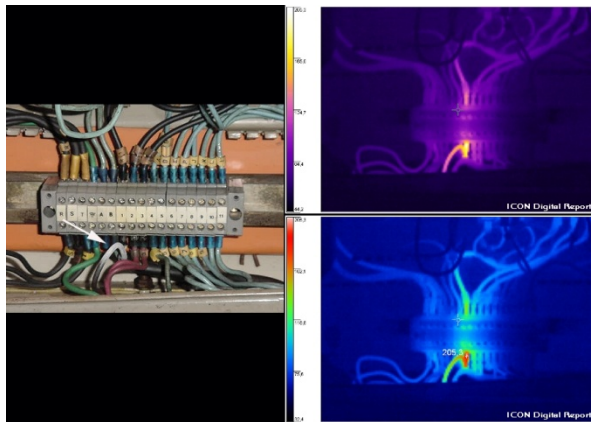
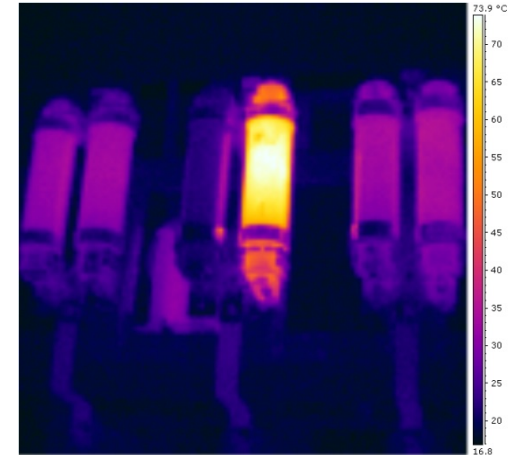
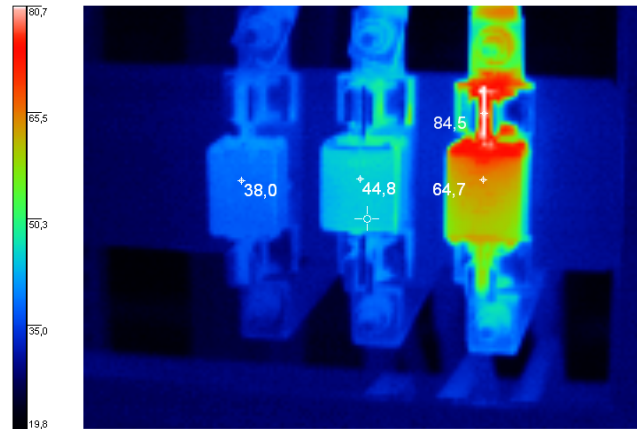
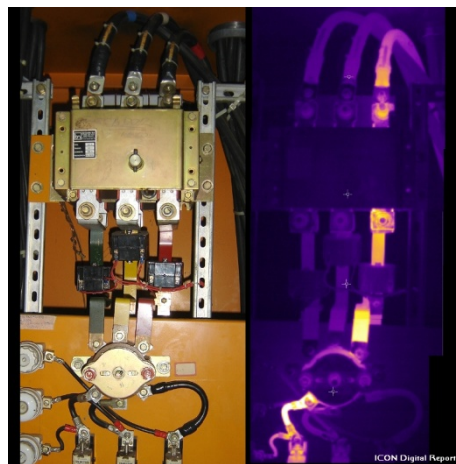
- Hoje é possível enviar imagens diretamente ao seu iPhone, iPad ou Ipod Touch
- Publique imagens diretamente em campo (por exemplo usando DropBox) para compartilhar informações e relatórios
- Consulte uma segunda opinião sem sair do lugar.



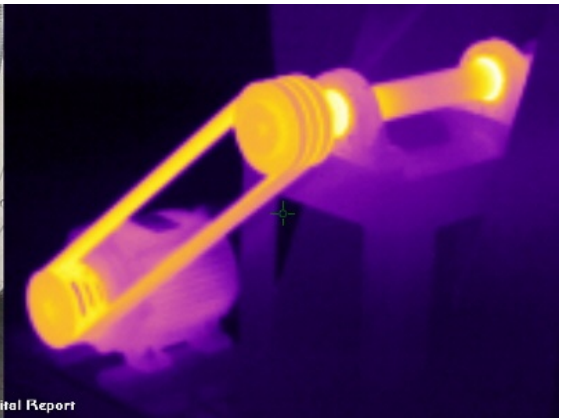
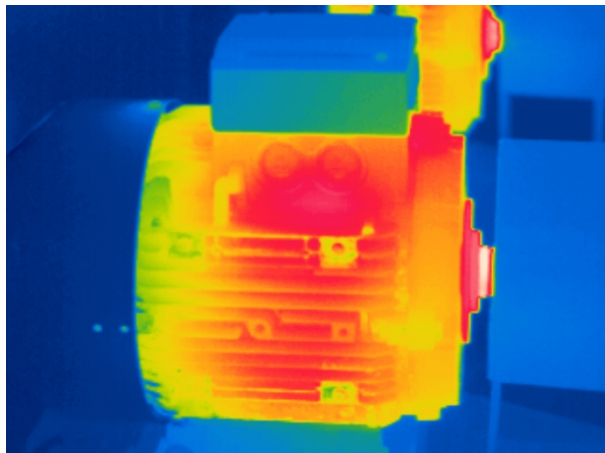
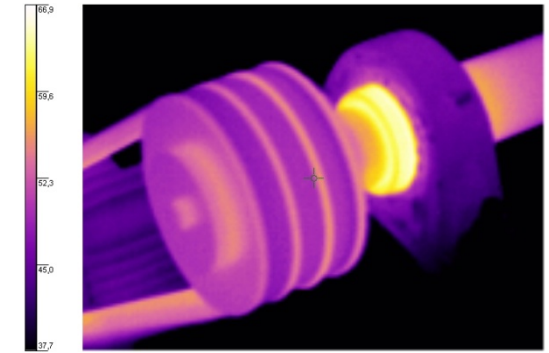
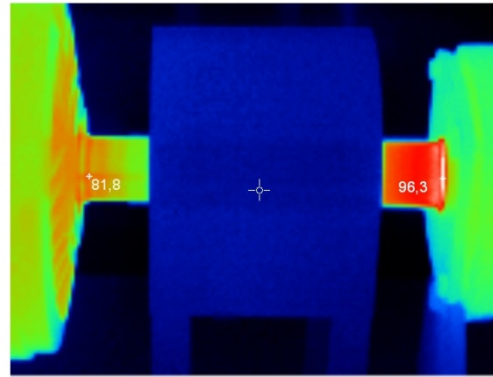
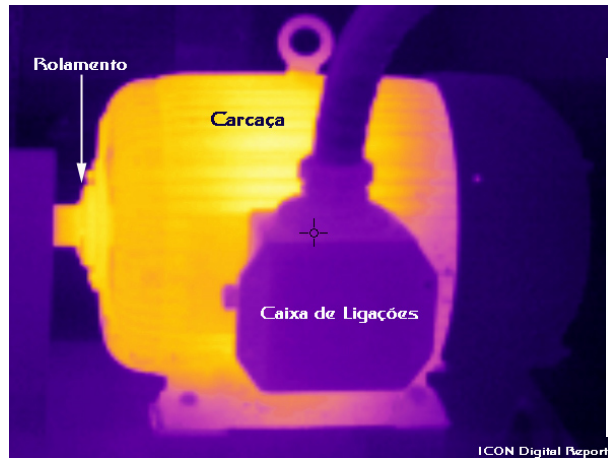
CONECTIVIDADE



INSPEÇÕES ELÉTRICAS



INSPEÇÕES MECÂNICAS - MOTORES, ROLAMENTOS E POLIAS



INSPEÇÕES EM CÉLULAS SOLARES

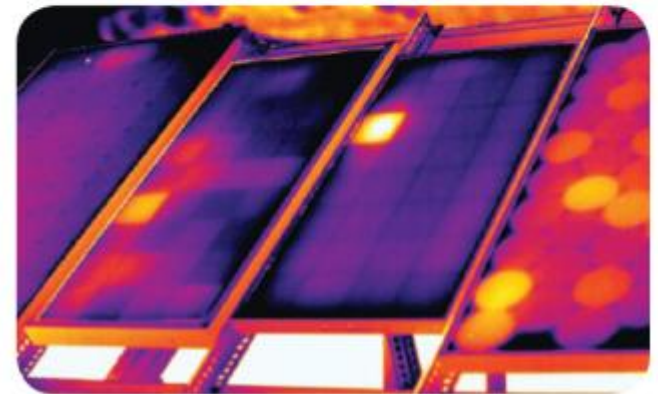
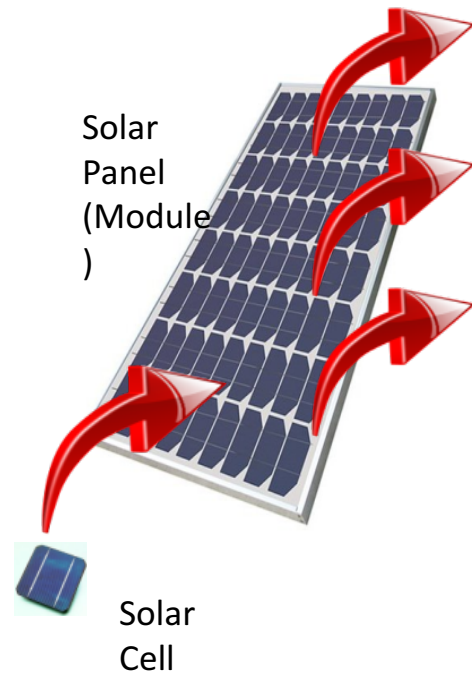
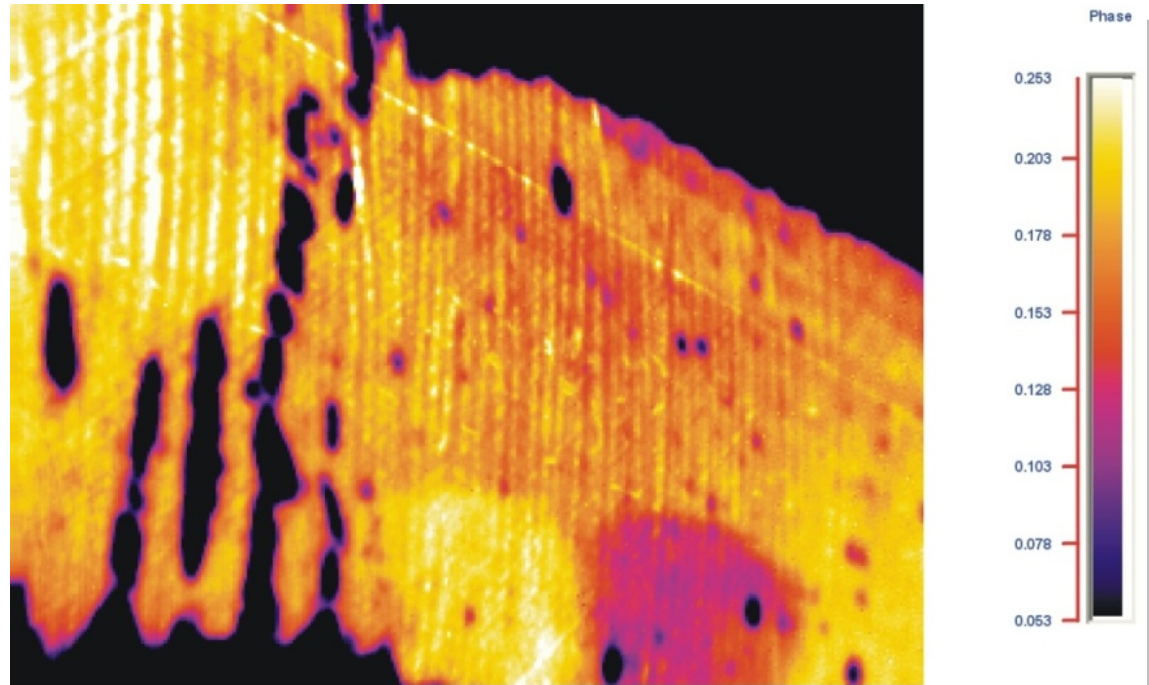


Figure 3. Solar cell testing using an uncooled microbolometer handheld camera.

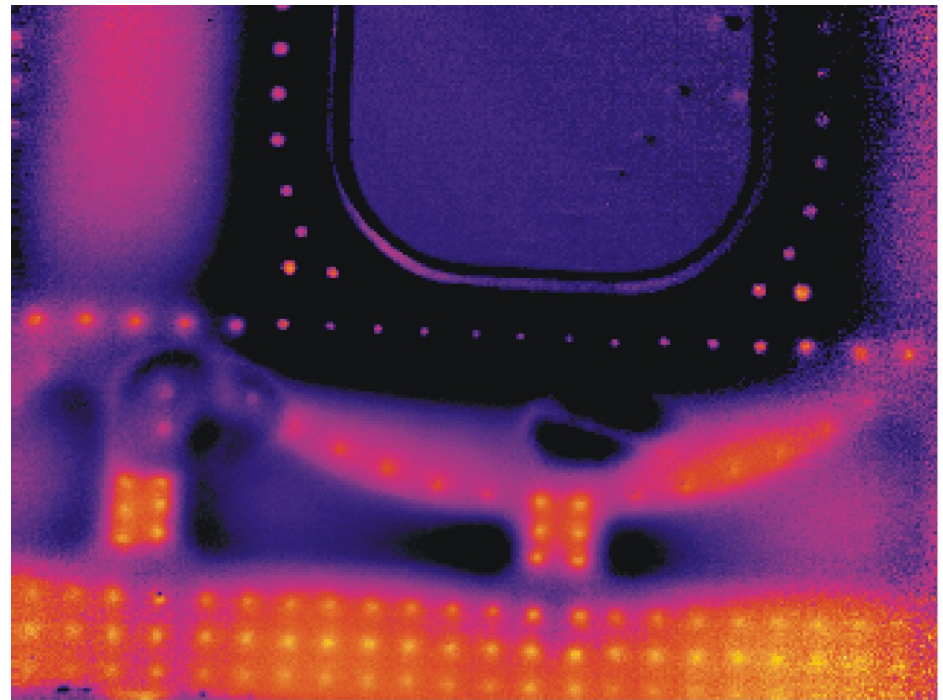
INSPEÇÕES EM SISTEMAS EÓLICOS



INSPEÇÕES DE AERONAVES



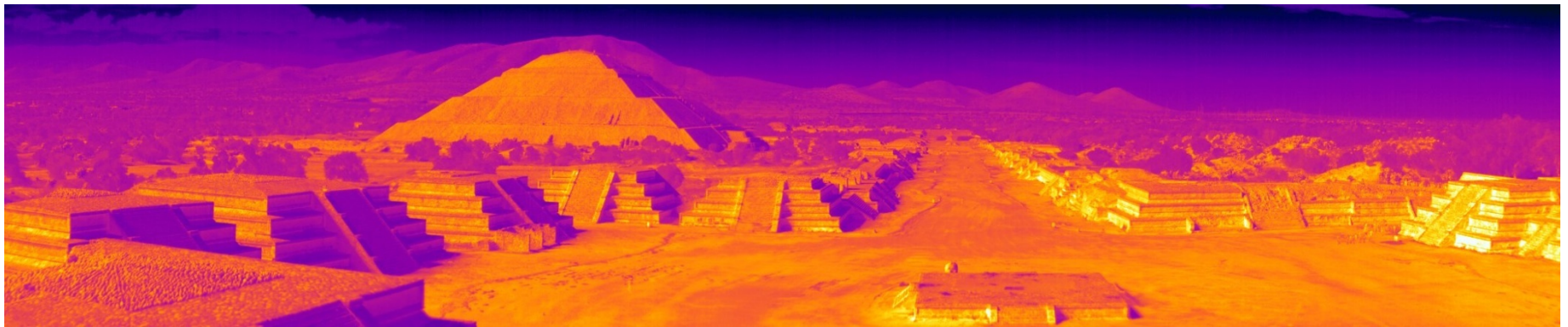
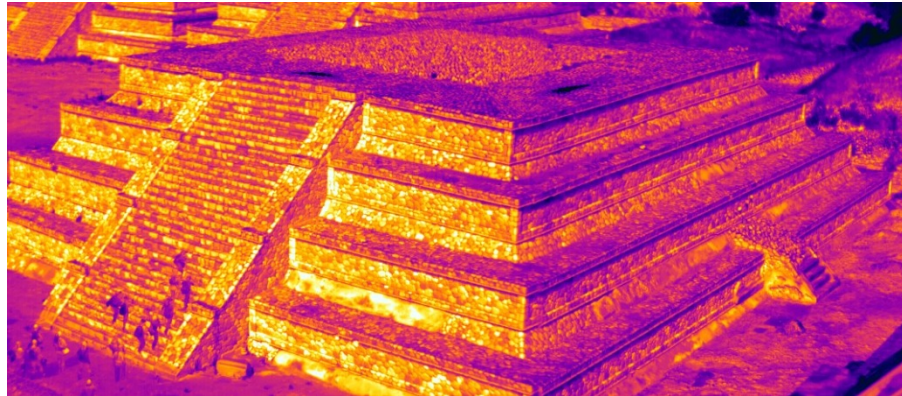
Boeing B737



Delaminação da fuselagem do B737



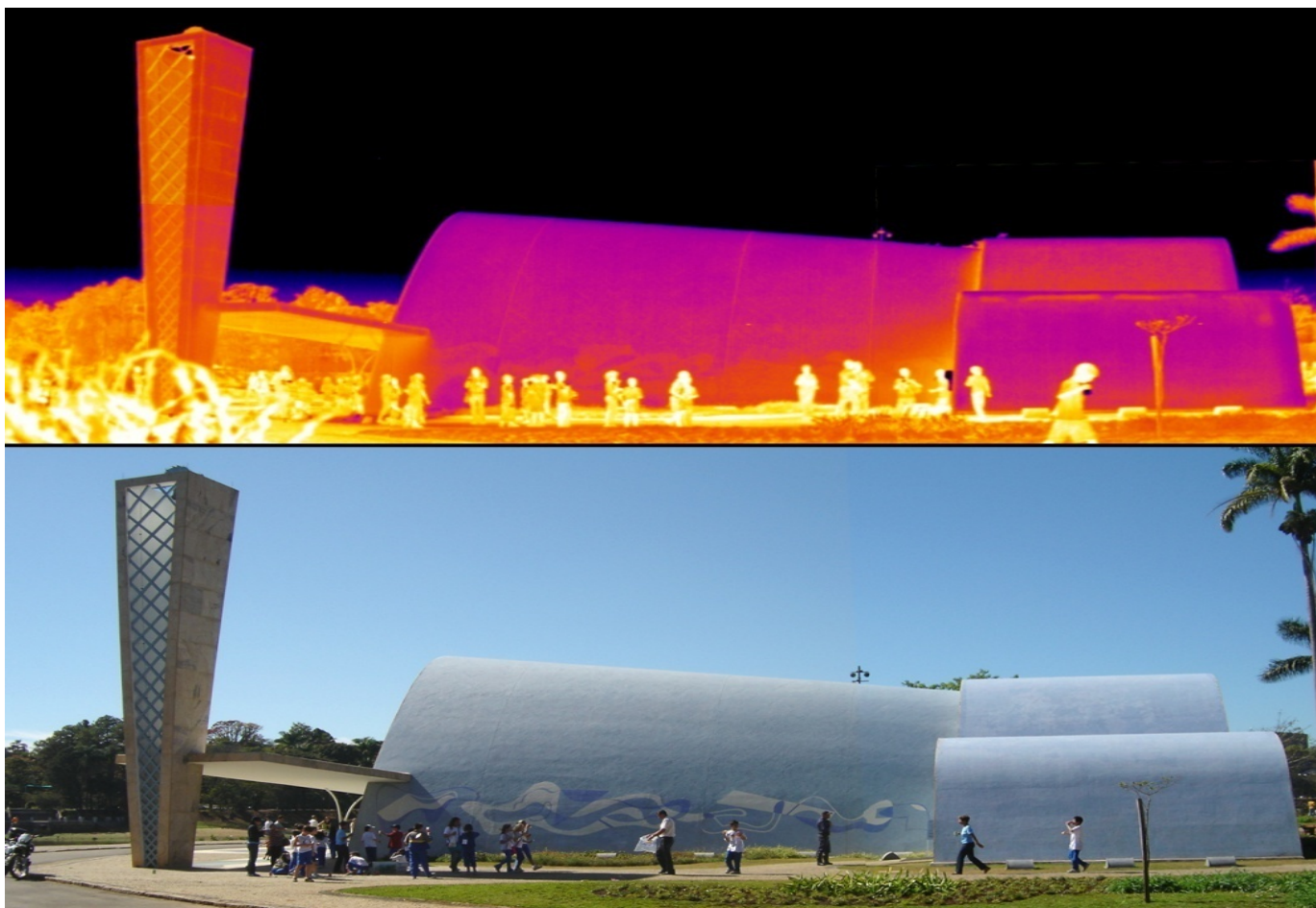
INSPEÇÕES ARQUEOLÓGICAS



INSPEÇÕES NA CONTRUÇÃO CIVIL

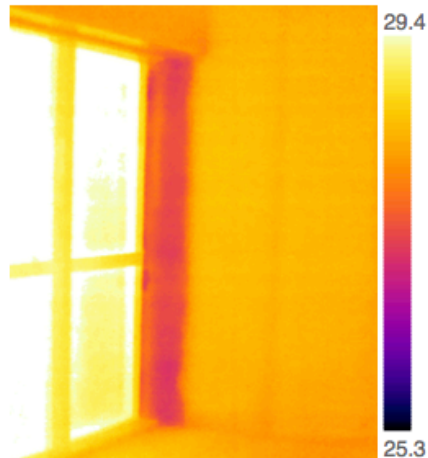
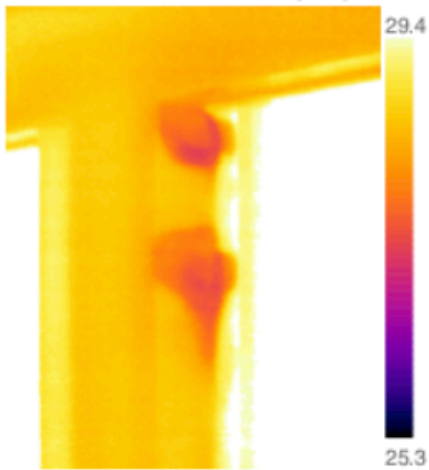


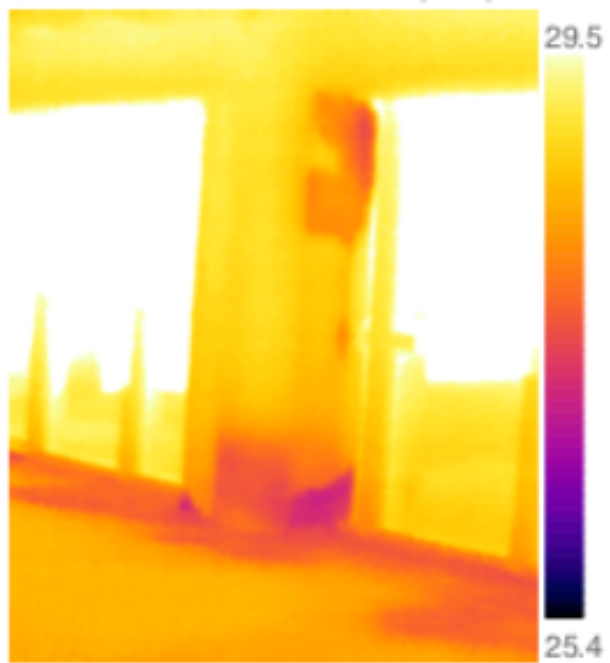
INSPEÇÕES NA CONTRUÇÃO CIVIL



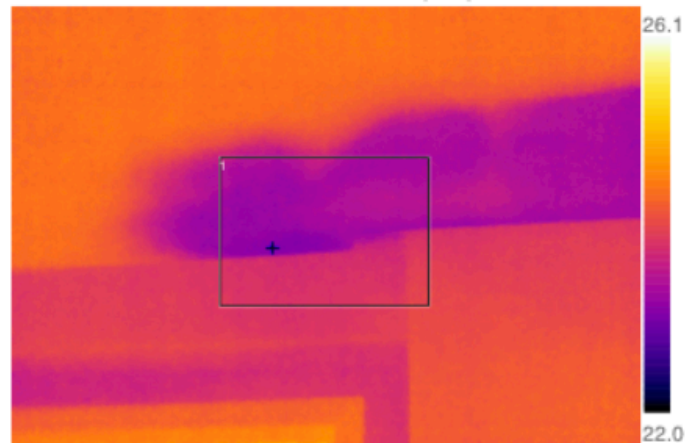
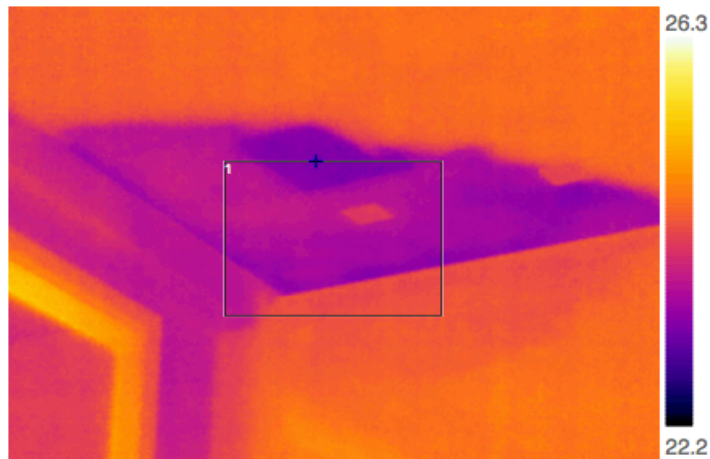
Igreja de São Francisco de Assis - MG

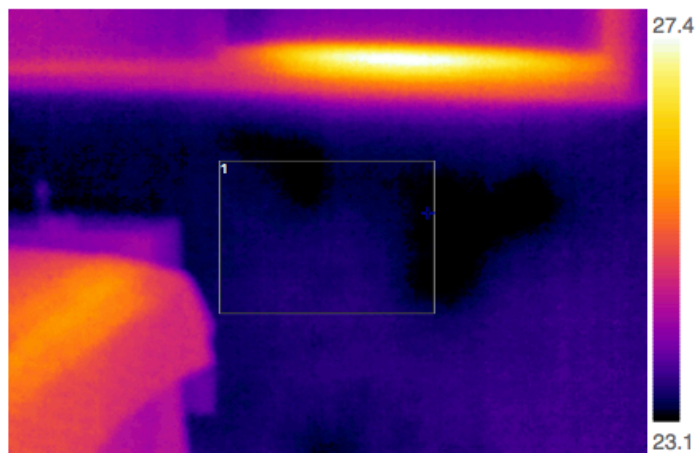
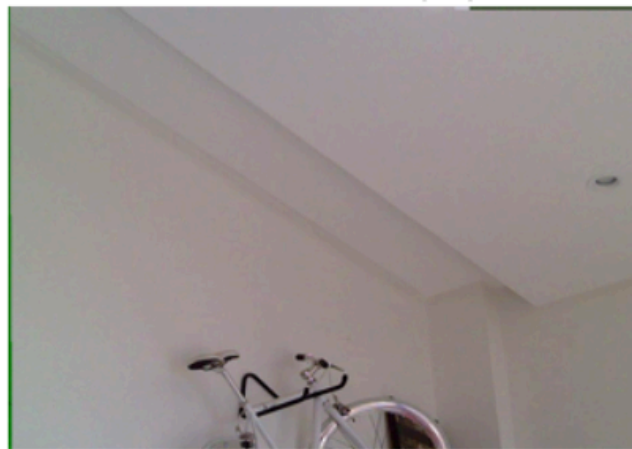
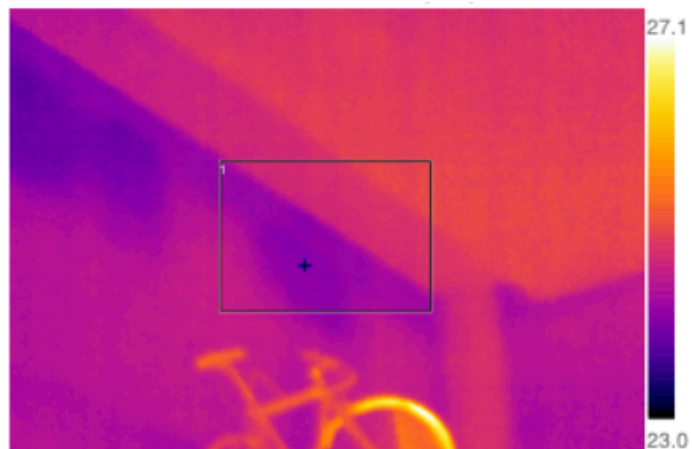
Caso 1



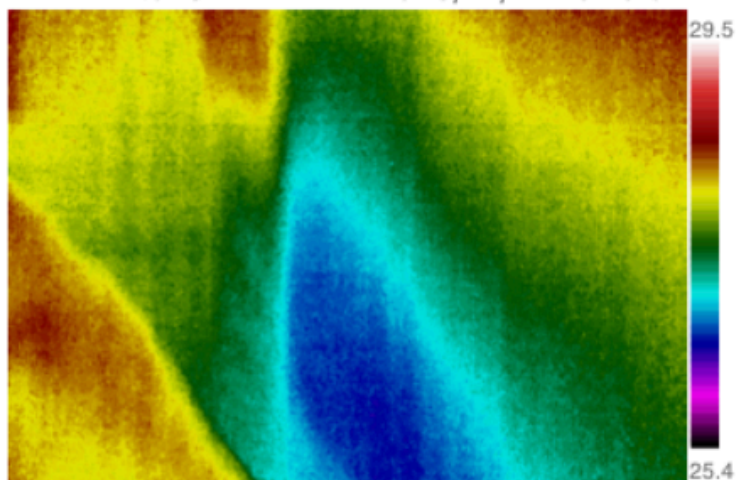
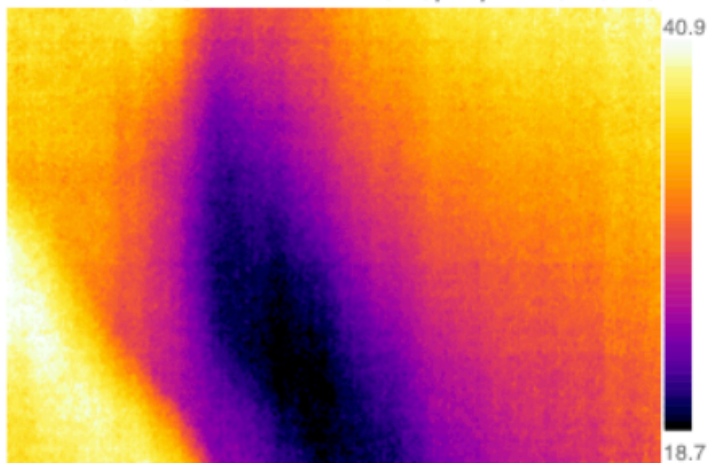


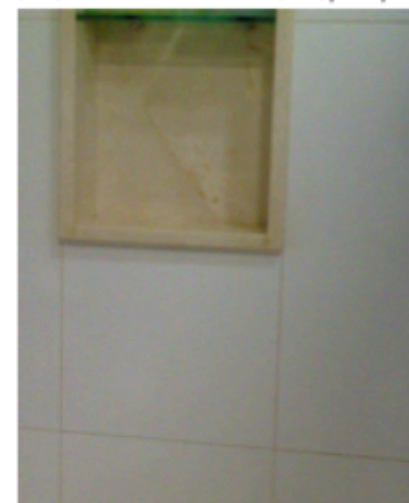
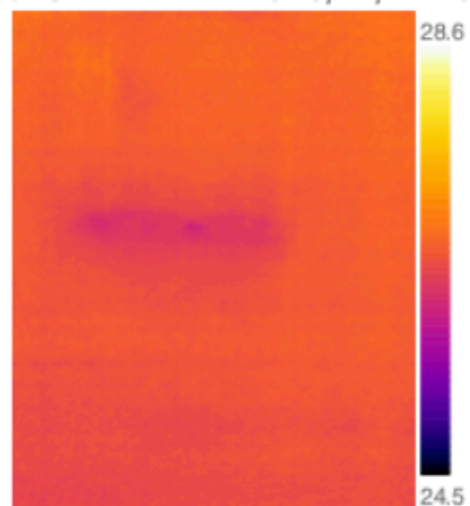
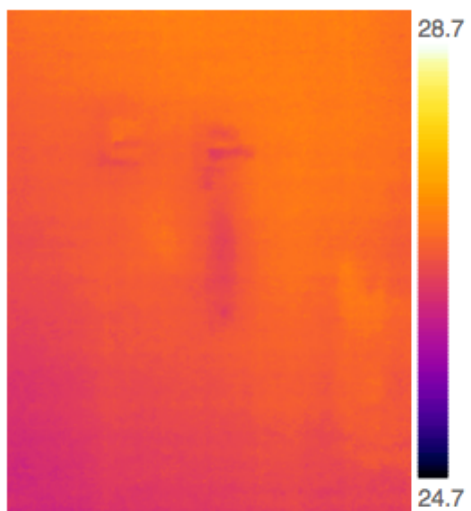
Caso 2



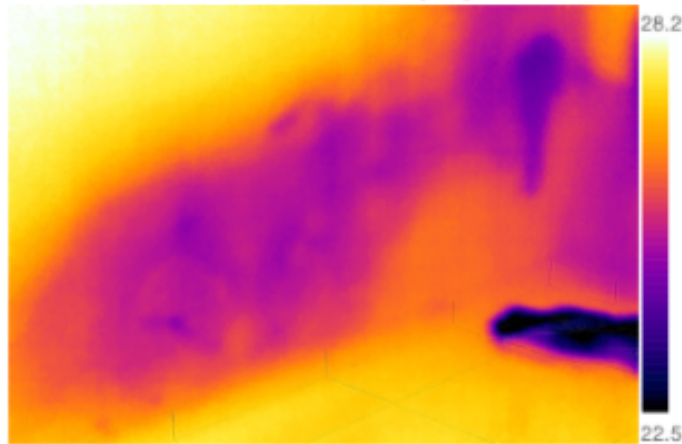


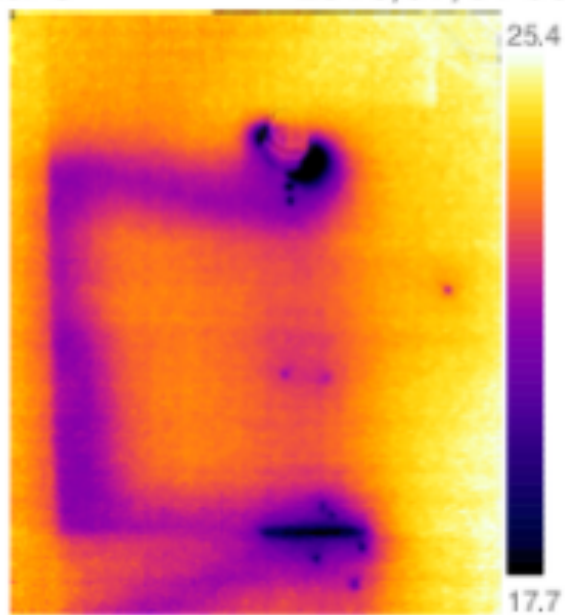
Caso 3



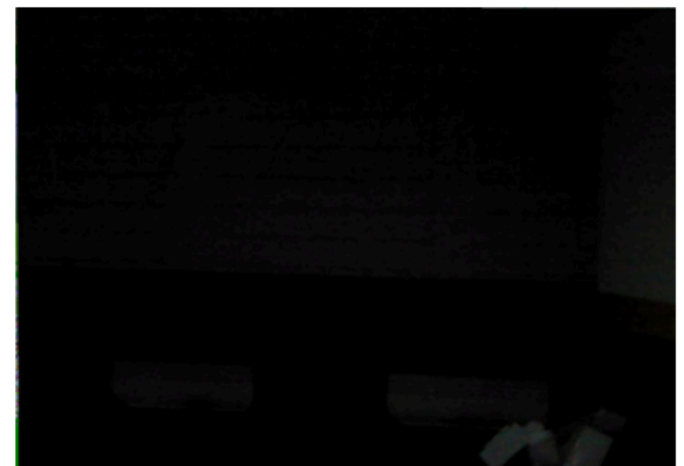
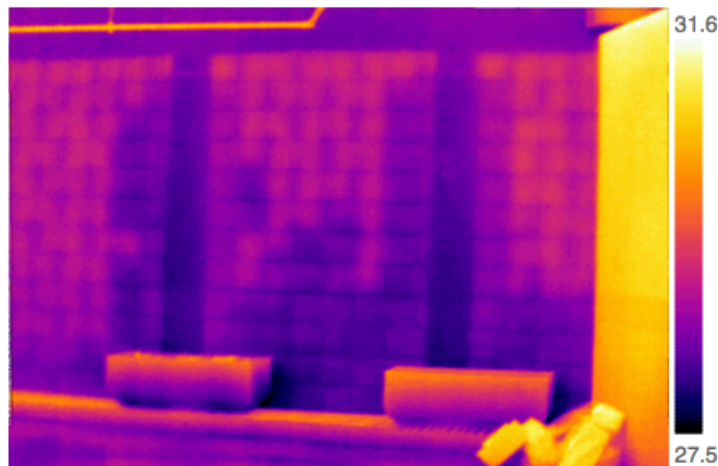
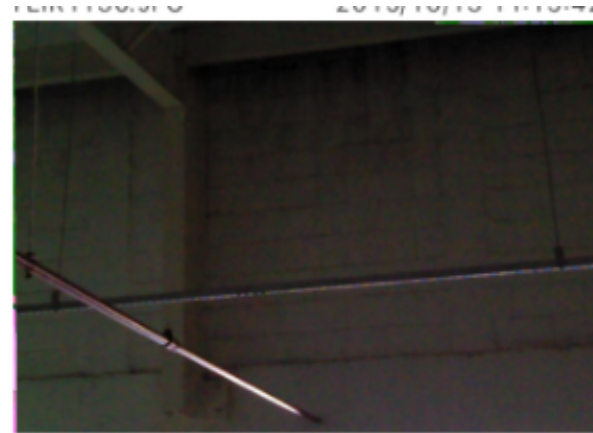
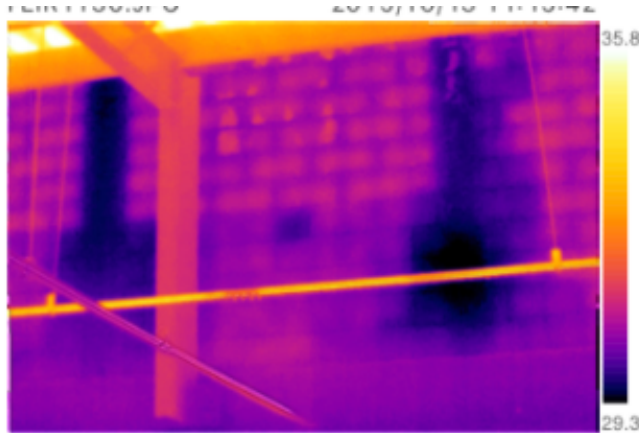


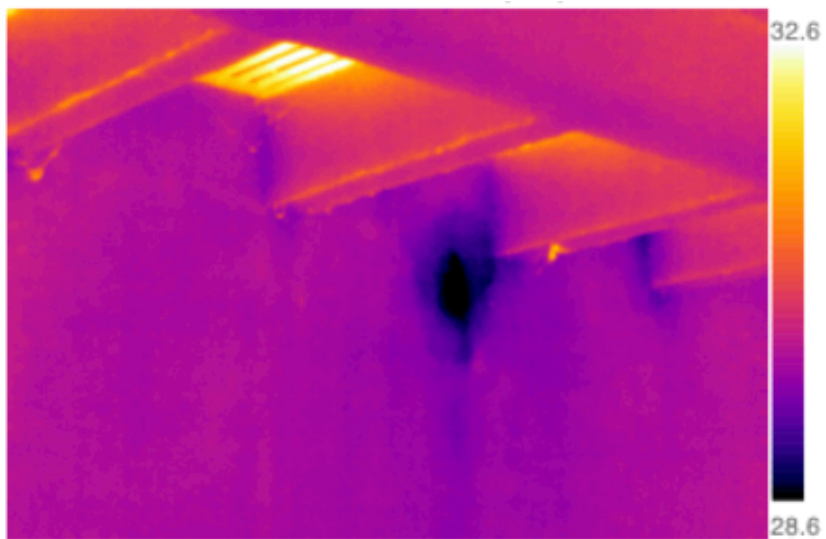
Caso 4



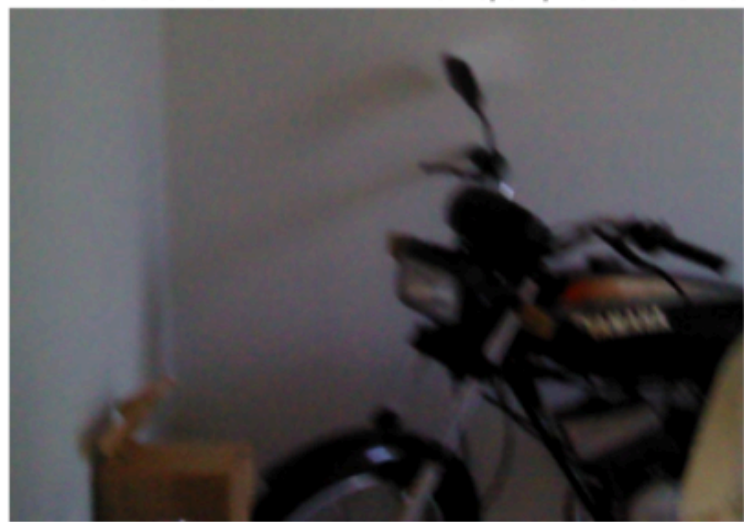
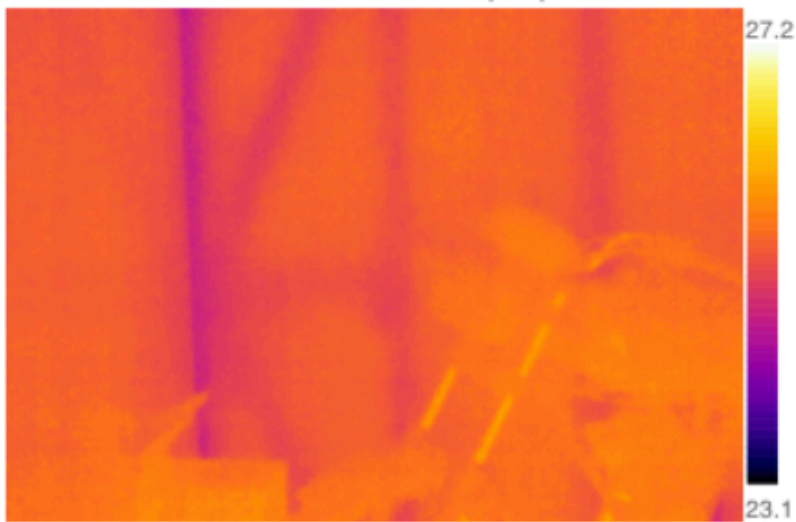
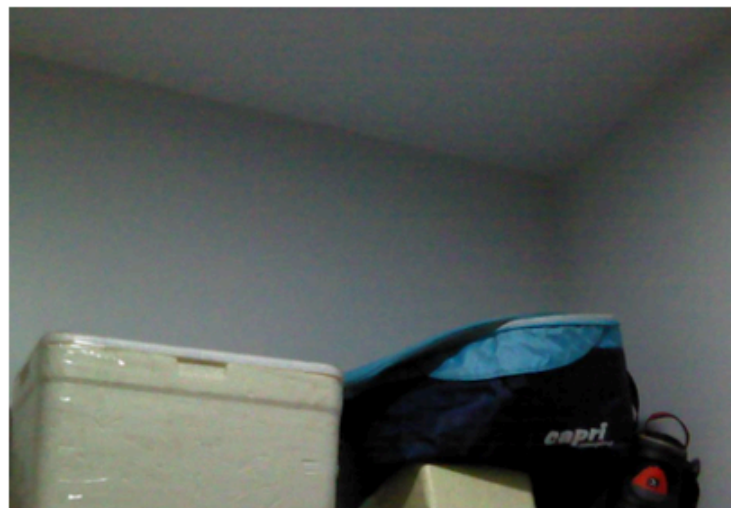
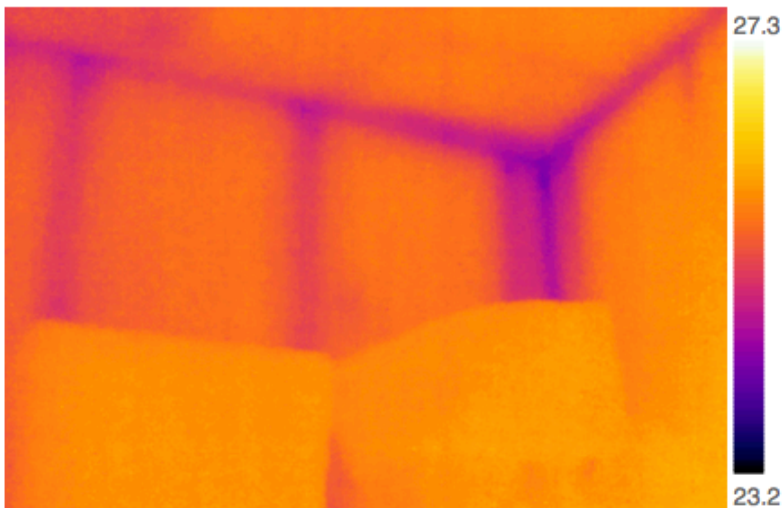


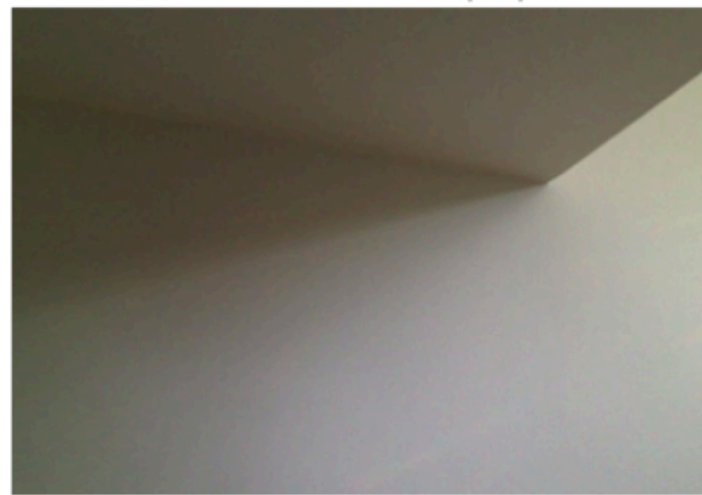
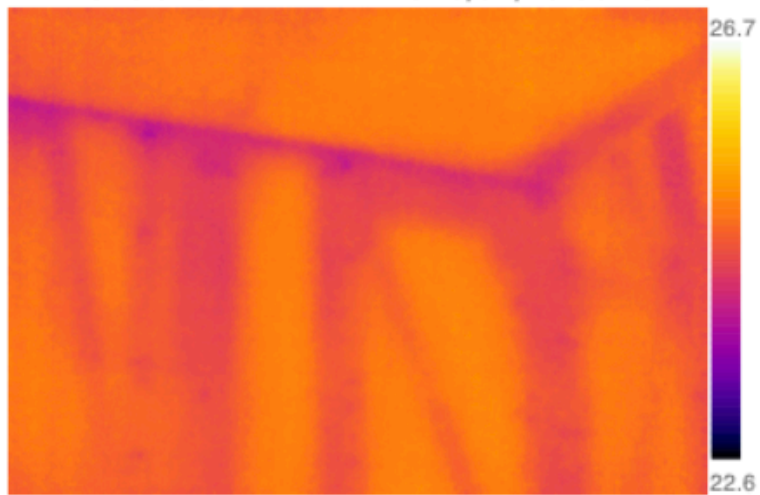
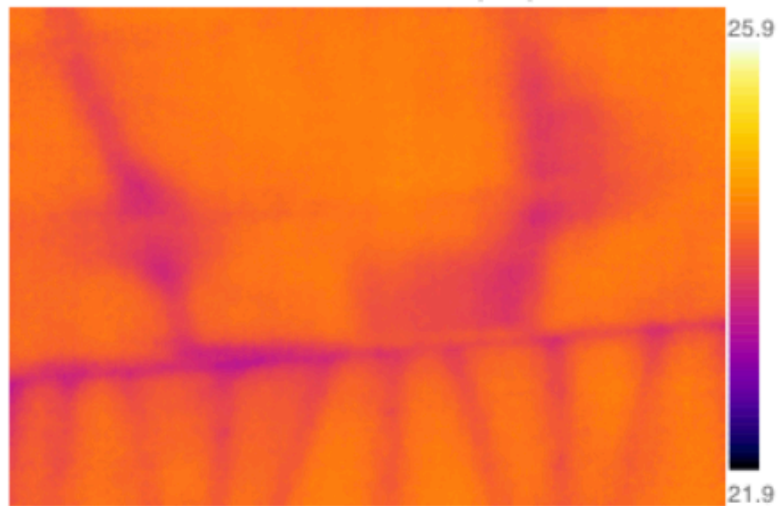
Caso 5

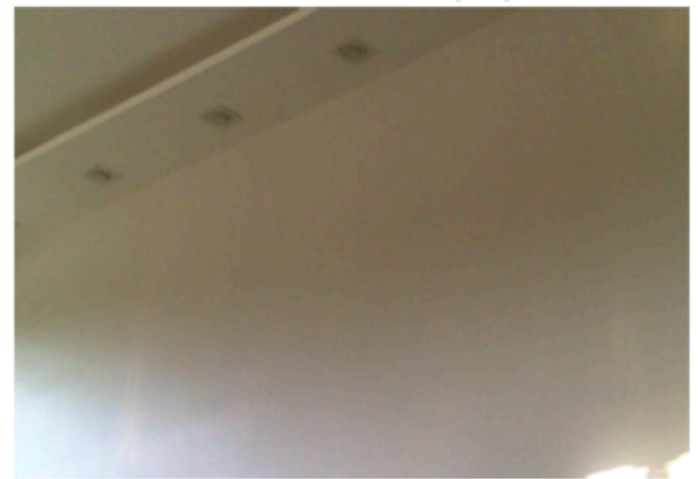
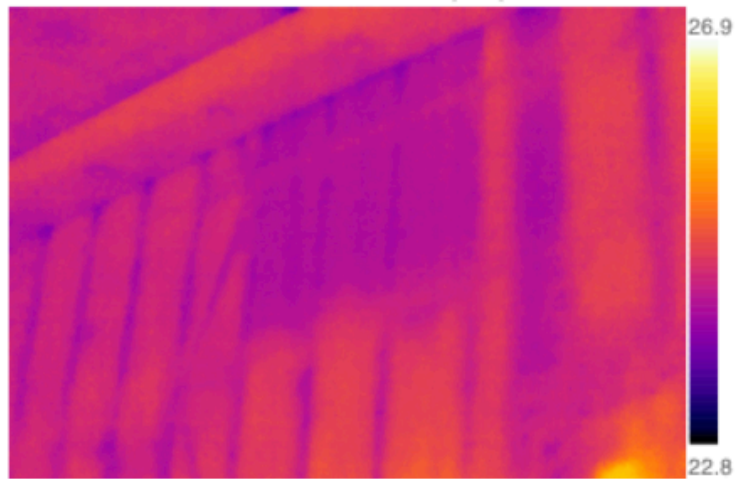
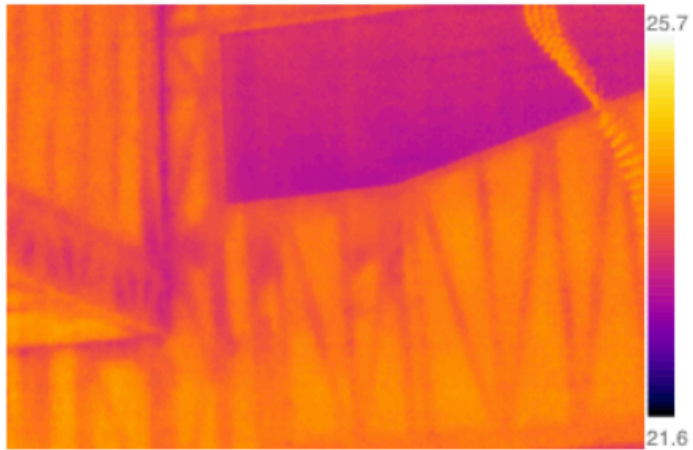




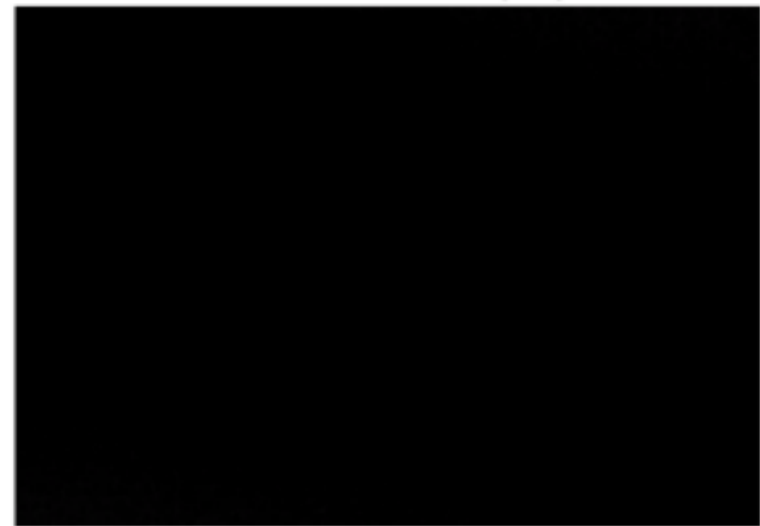
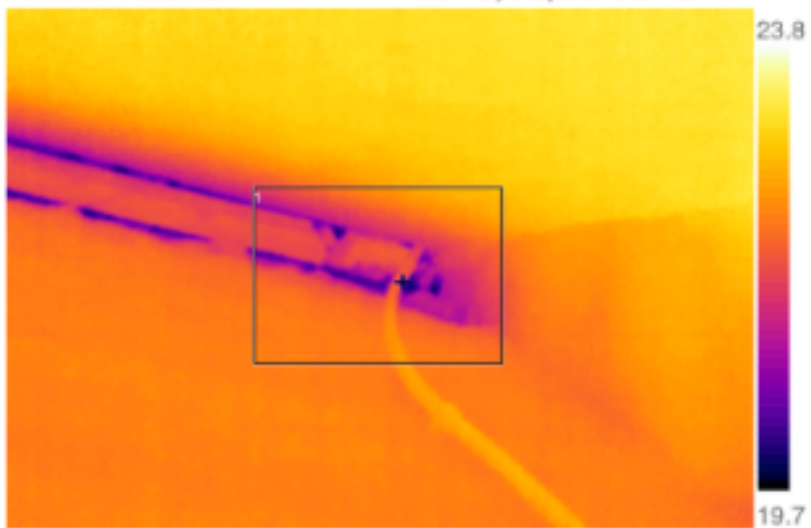
Caso 6

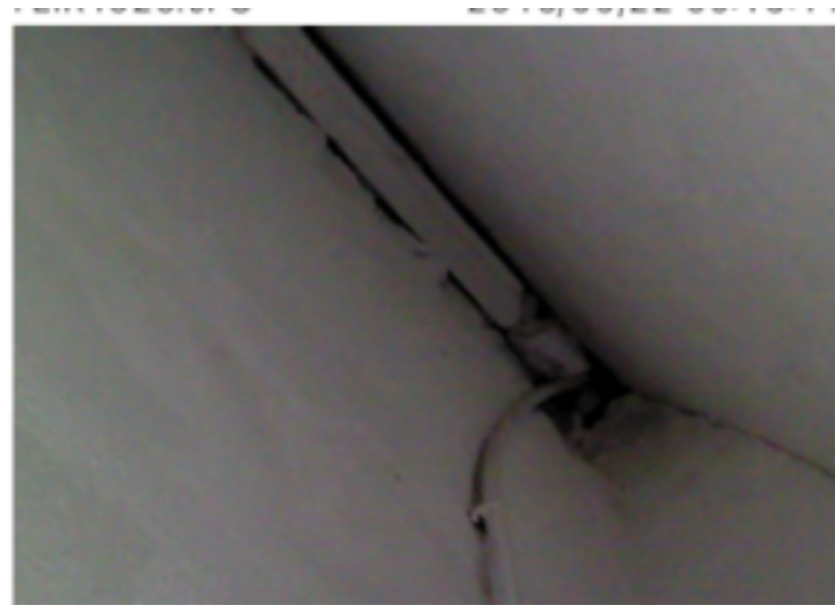
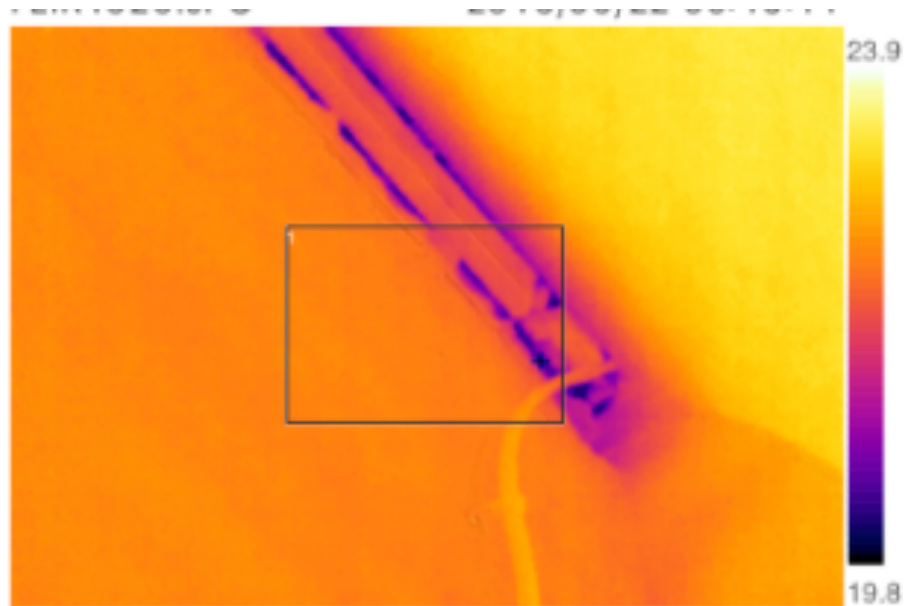






Caso 7





Obrigado

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 - Tel.: (62) 99688-0507