

Snímky byly exponovány dne 3. dubna 2013 v době od 22:23 do 22:54 kamerou Guide MobIR M8. Tato termokamera není vhodná pro noční snímkování, protože nedává dostatečně dlouhé expozice u své doplňkové kamery světelné, takže na některých, které nejsou podpořeny umělým osvětlením, není vidět nic než šum detektoru. Nicméně termografický průzkum tepelné propustnosti obálky budovy je vhodné dělat zpravidla právě v noci, kdy teploty povrchů nejsou ovlivněny osluněním, byť i rozptýleným hustými mraky. Bylo by samozřejmě možné snímkovat za úsvitu, ale taková doba, kdy už je dostatek světla pro takový fotoaparát s prostinkým softwarem, a současně ještě světlo předměty pozorovatelně neohřálo, je jen krátká a předem těžko odhadnout, nebudou-li podmínky horší než večer.

Je totiž výhodné, když při snímkování není jasno, a doopravdy ideální je souvislá vrstva nízké oblačnosti teploty nepříliš odlišné od teploty terénu. Taková situace při snímkování nepanovala, nicméně nebe nebylo zcela jasné.

Termosnímky byly pro kvantitativní přehled uloženy všechny ve stejné barevné škále, znázorňující rozmezí jasových (aneb černých) teplot od $-7,0\text{ }^{\circ}\text{C}$ do $16,6\text{ }^{\circ}\text{C}$ (jasové teploty se týkají zejména vlnových délek od $8\text{ }\mu\text{m}$ do $13\text{ }\mu\text{m}$). Střed rozmezí pro každou barvu je na sudém stupni Celsiovy stupnice, hrany mezi barvami jsou na lichém stupni, jasy v rámci každé barvy člení teploty po půl Celsiově stupni čili kelvinu.

Pro dobrou orientaci v tom, co snímky zachycují, jsou uloženy také ve škále šedé, s rozmezím zahrnujícím zpravidla už i předměty, které nejsou vyhřívány, a končícím tak, aby jen nejteplejší „body“ budov byly nad tímto rozmezím. Volba rozmezí byla manuální, s ohledem na scénu na snímku zachycenou.

U šedě škálovaného snímku je vlevo uvedeno také číslo dvojice [termosnímek, světelný snímek] a plně rozmezí jasových teplot zaznamenané kamerou, od maximální po minimální.

Tepelné toky skrze obálku budovy jsou úměrné teplotnímu rozdílu mezi daným povrchem budovy a srovnávacím povrchem, který je v tepelné rovnováze s okolím a není z opačné strany vyhříváný.

U svislých ploch se v době snímkování teplota nevyhříváných svislých předmětů, jako byly např. odrazové desky pro košíkovou, pohybovaly kolem $-2\text{ }^{\circ}\text{C}$. Teplota sněhu obráceného k nebi byla nižší.

Absolutní hodnoty jasových teplot mohou mít chybu až jeden kelvin, ale rozdíly jasových teplot různých částí téhož snímku nemají chyby přes čtvrt kelvinu, zpravidla jsou chyby, čili odchylky údajů od skutečnosti třikrát menší, díky tomu, že před pořízením snímku byla kamera většinou interně kalibrována.

Čelní strana školy obrácená k ulici (a pohledům z ní dosti skrytá za pásem stromů), se na termosnímcích jeví místy divoce – to je proto, že jsou na ní lidové malby provedené zčásti stříbřenkou. Takové povrchy s vysokým obsahem kovu (hliníku) odrážejí v dlouhovlnném infračerveném oboru své okolí, takže jejich jasová teplota je velmi vzdálena od jejich teplotě skutečné. Totéž samozřejmě platí i pro pozinkované kanály vzduchotechniky. V menší míře se onen problém týká i skel, v nichž se odráží nebe, mnohem studenější než terén. A ještě v menší míře omítek, které nejsou ani v oboru vlnových délek kolem $10\text{ }\mu\text{m}$ lesklé.

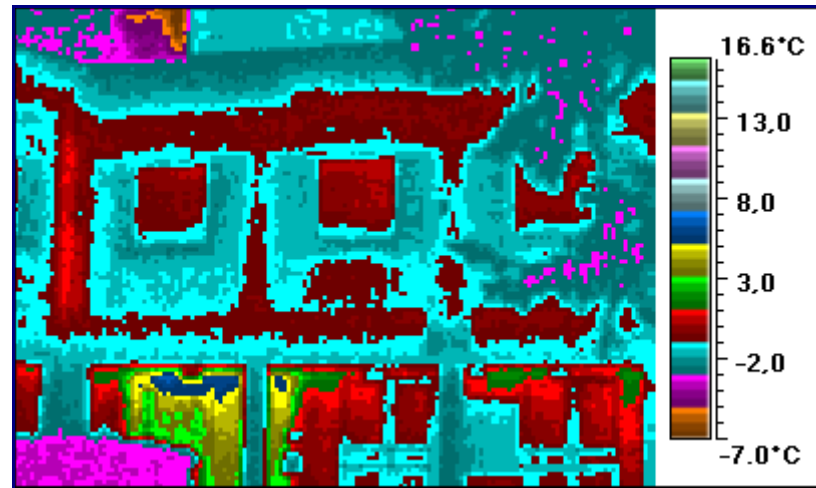
V závěrečné části série jsou pro srovnání zachyceny bytové domy na ulici pod školou a předtím i průhledy od školy na ulici Žižkovu a do dvora s bytovými domy.

Zobrazené snímky byly z původních souborů s označením „JPG“ s dlouhými názvy přečíslovány skriptem v jazyce bash a pak uloženy do uvedených tří bitmap firemním softwarem. Pak byly na linuxovém počítači převedeny z formátu *.bmp na úsporný bezstrátový formát *.png, světelné snímky zesvětleny užitím $\text{gamma}=2$ a opatřeny rámečkem znázorňujícím výřez, který zabírá termokamera. Tak je na většině alespoň náznak vizuální scény. Spolu s textovým výstupem firemního softwaru (rozsah teplot na snímku) byly dalším skriptem v jazyce bash seřazeny do souboru *.html a ten pak otevřen v OpenOffice, opatřen úvodem a uložen jako pdf.

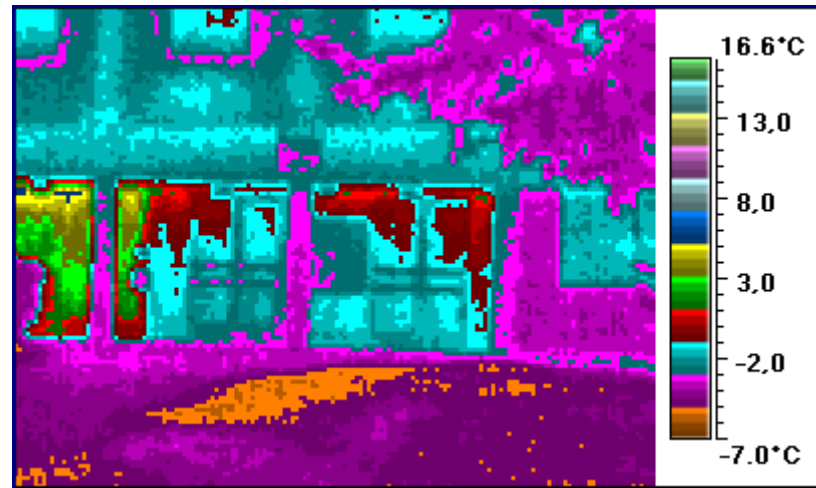
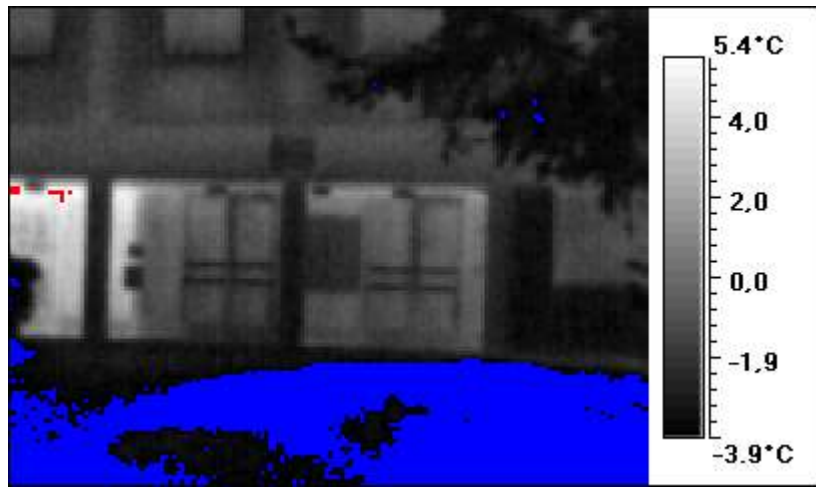
Interpretace takto souhrnně předložených snímků je na uživatelích, mohu event. doplnit dodatečné světelné snímky pro téže scény ve dne. Tento soubor, vychází *.odt a všechna data a sw jsou dostupná na adrese <http://amper.ped.muni.cz/LW-infrared/uvoz>, od 13. října 2013.

K interpretaci lze poradit alespoň to, že bylo téměř bezvětrí, a že tedy rozdíl teplot (budova - srovnávací plocha) násobený nějakými $12\text{ W/m}^2\text{K}$ dává odhad tepelného toku danou částí pláště budovy. Více viz disertace autora, http://amper.ped.muni.cz/pasiv/windows/JH_disertace/.

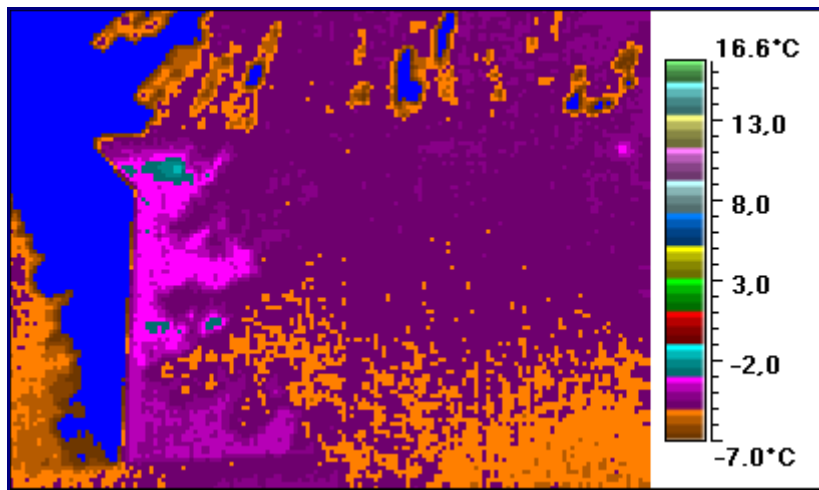
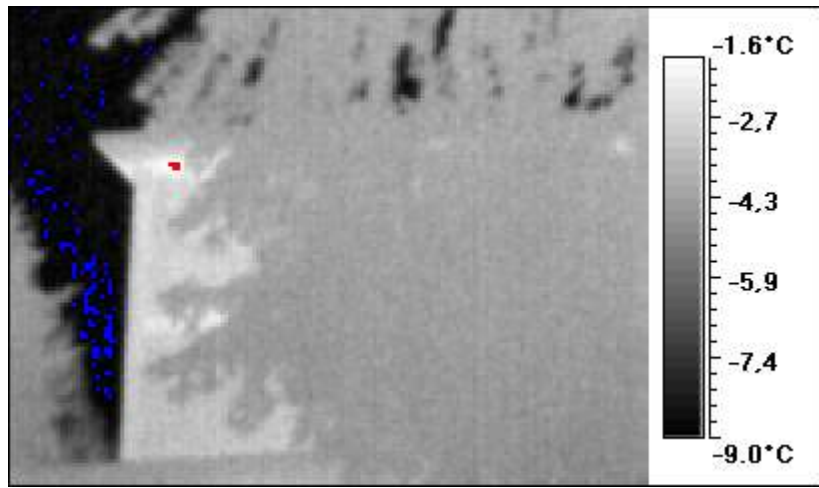
01 6,4 -6,5



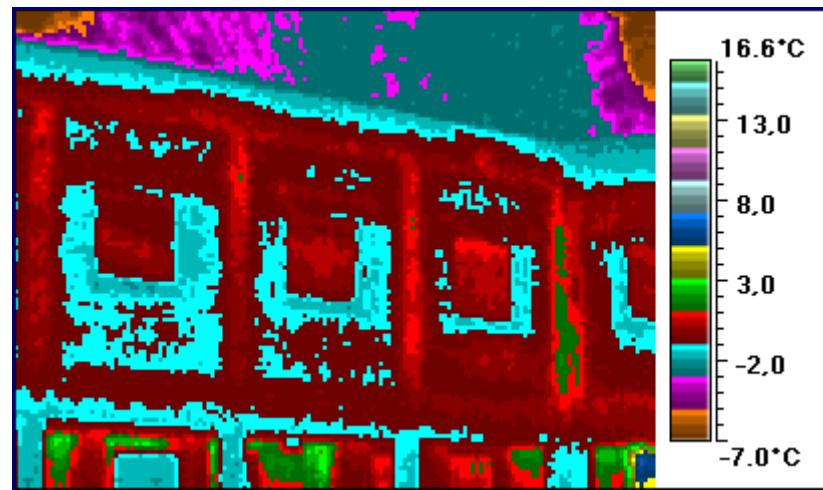
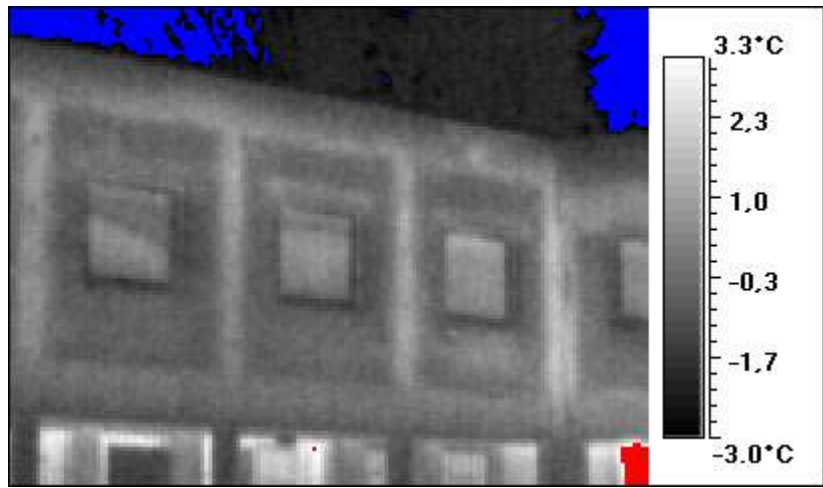
02 5,7 -5,2



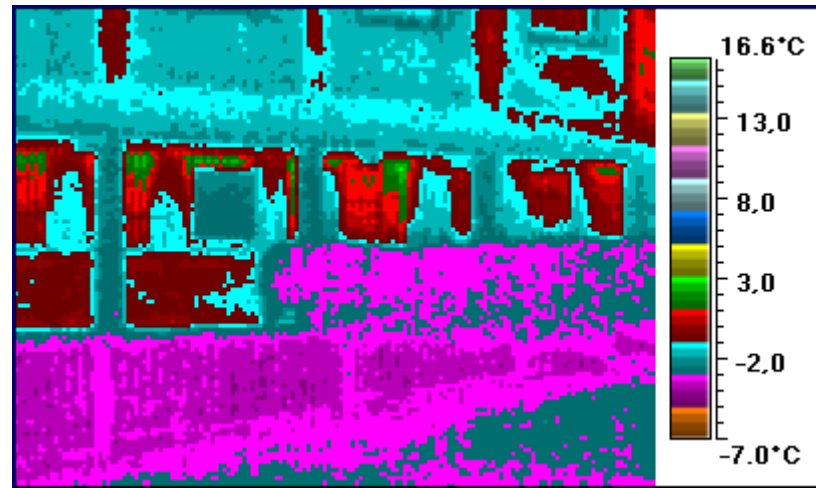
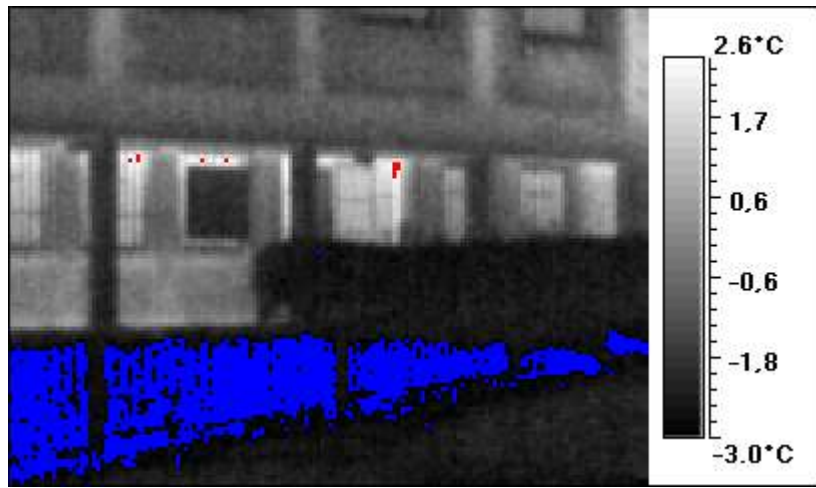
03 -1,3 -9,2



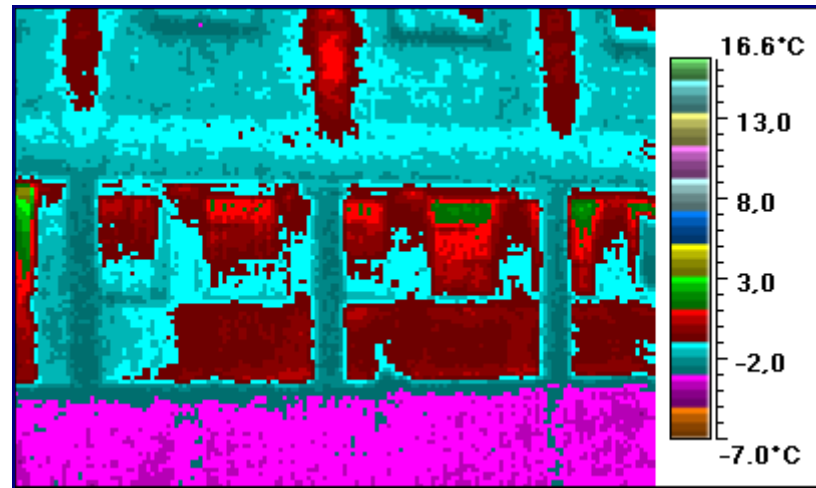
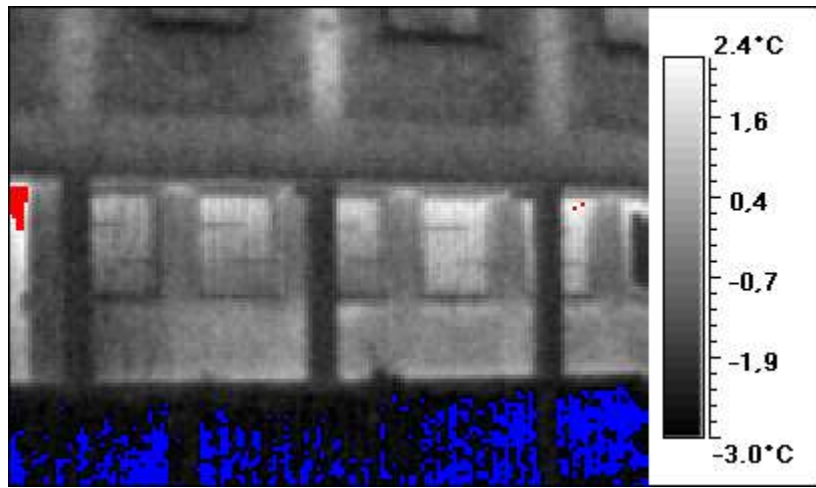
04 6,3 -6,5



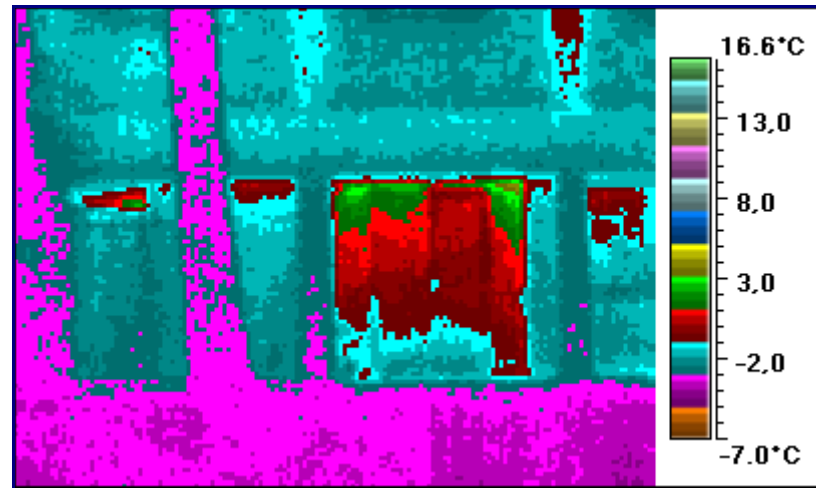
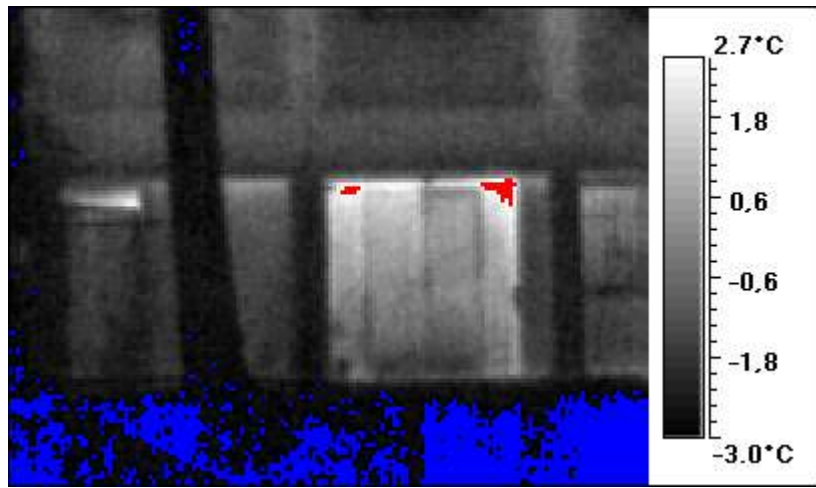
05 3,0 -3,6



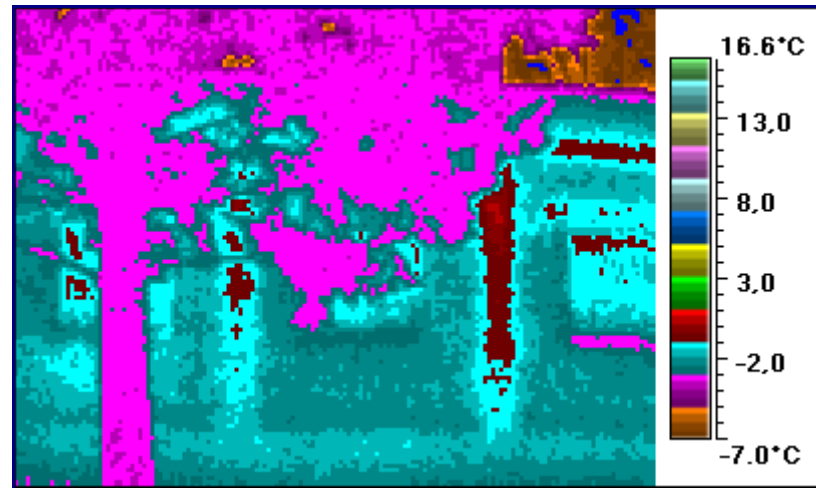
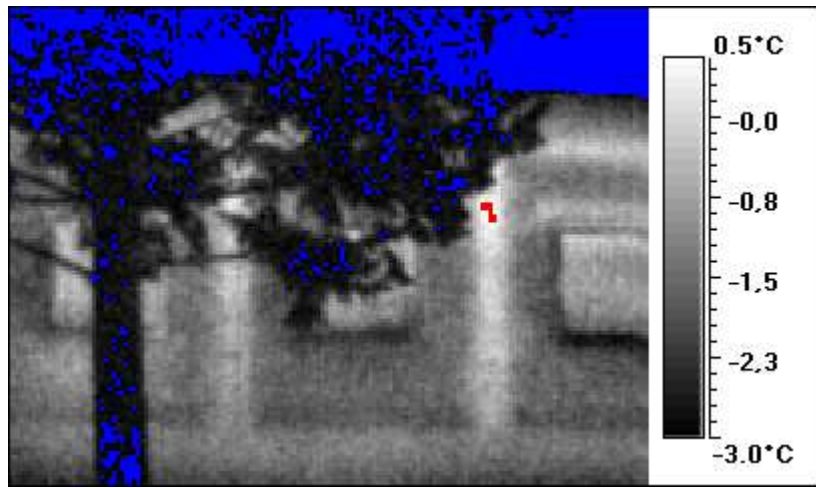
06 4,0 -3,5



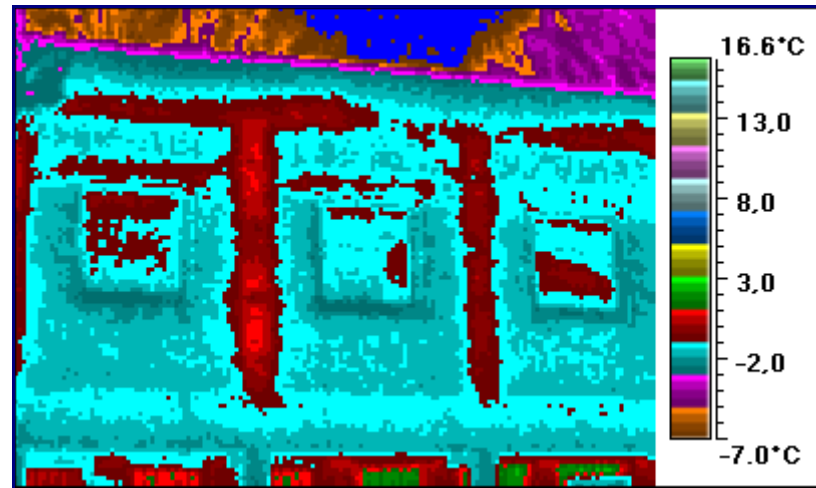
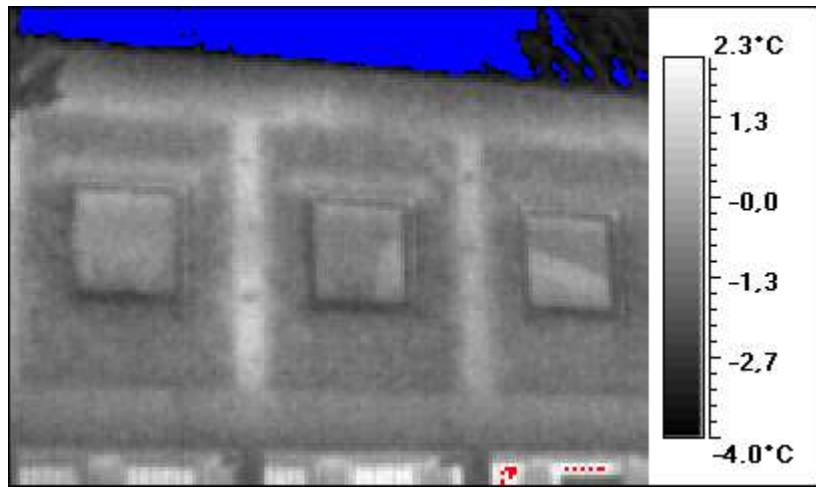
07 4,1 -3,9



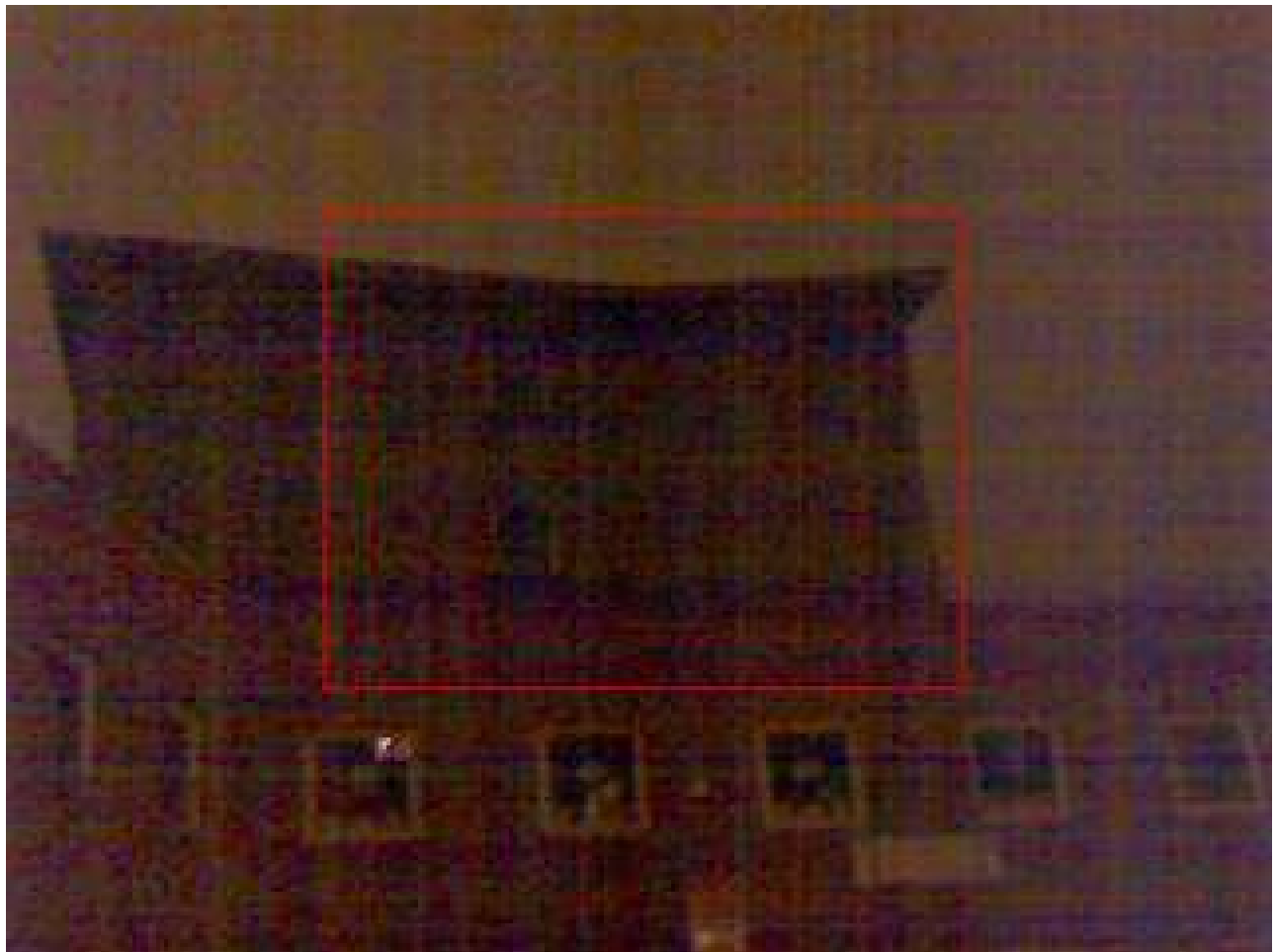
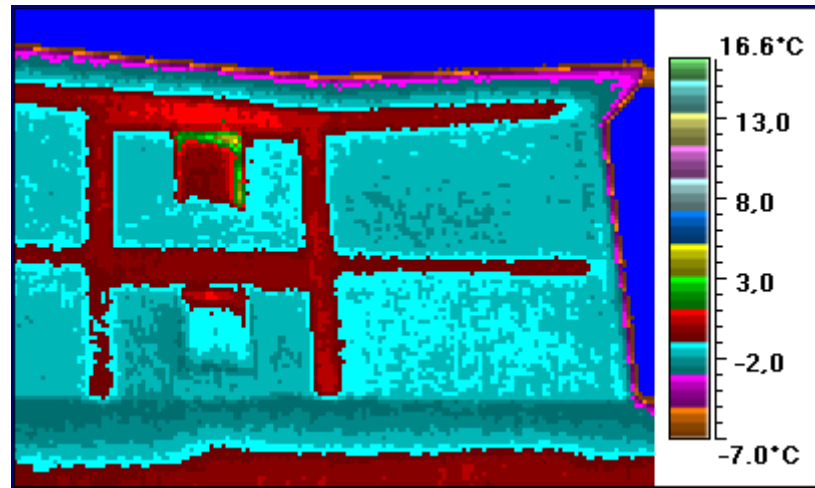
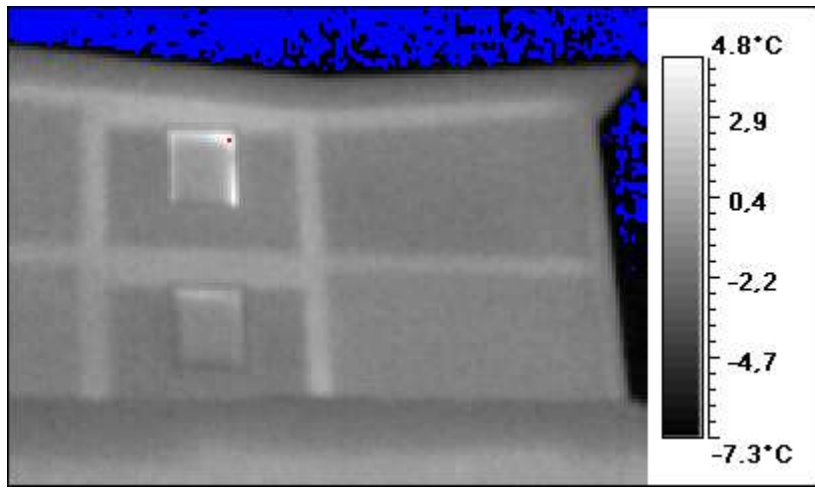
08 0,6 -7,1



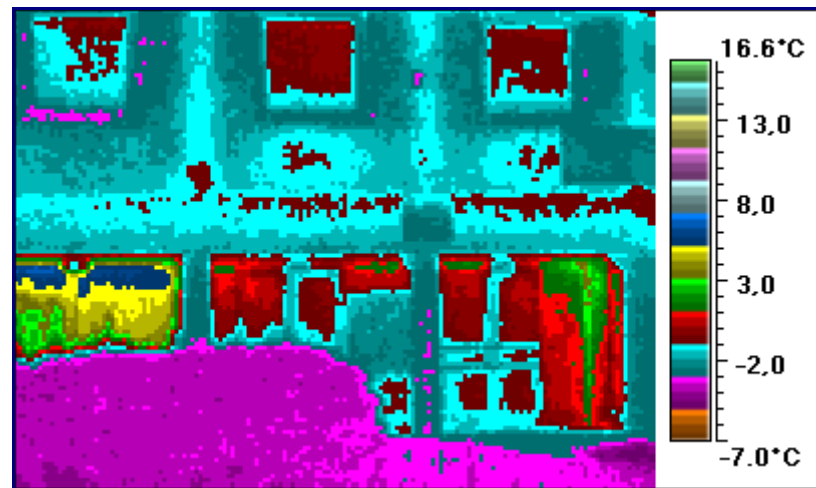
09 2,7 -7,3



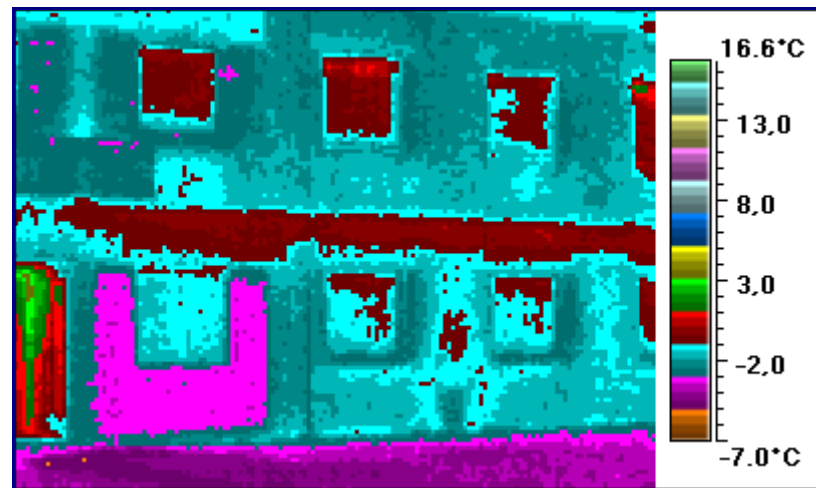
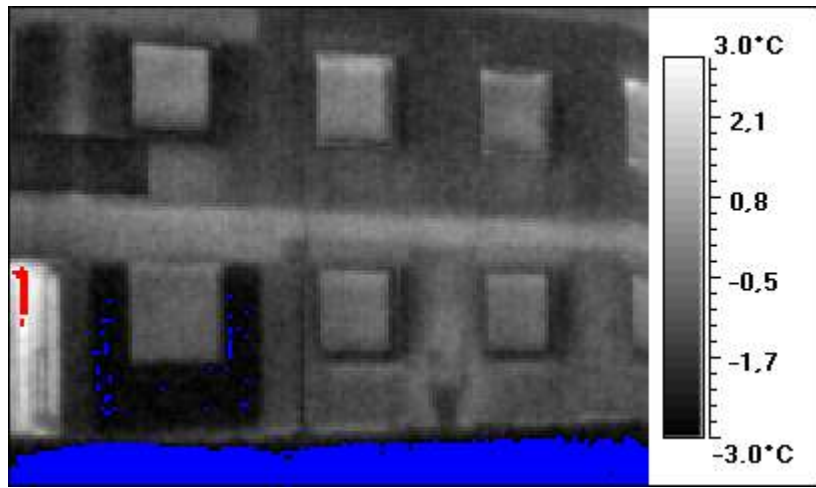
10 4,9 -7,7



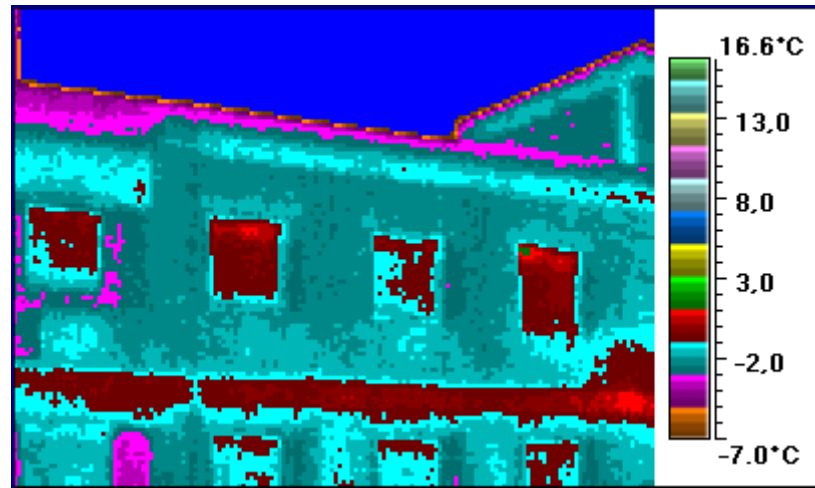
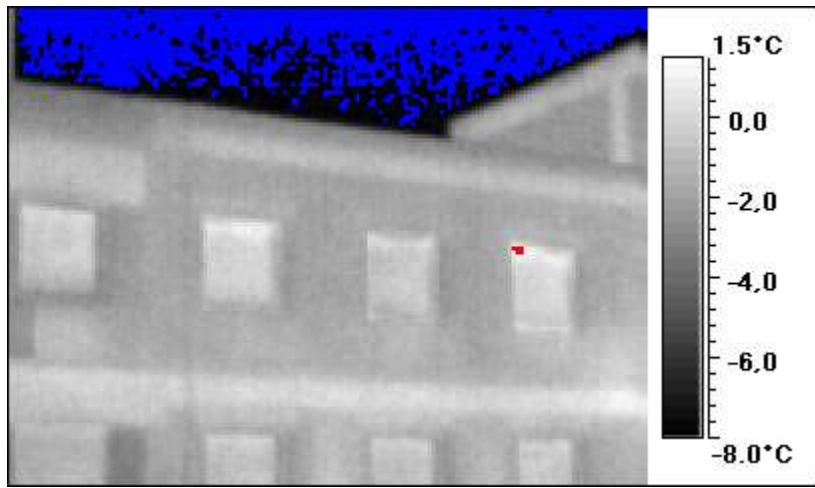
11 6,5 -4,2



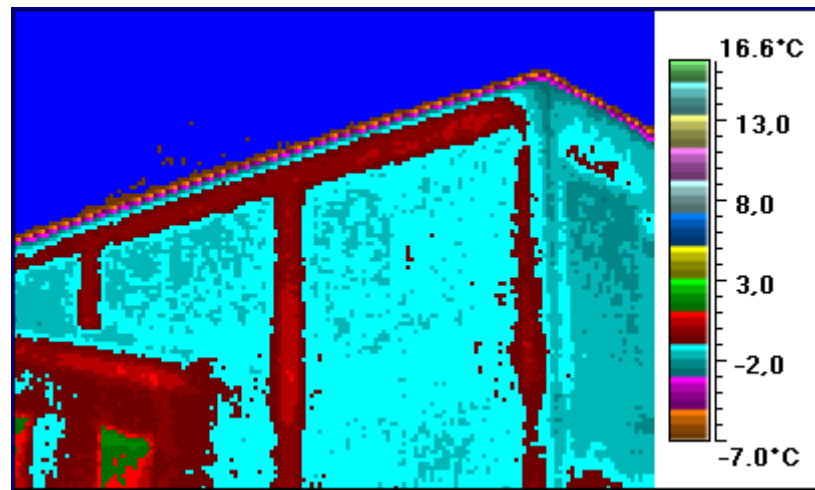
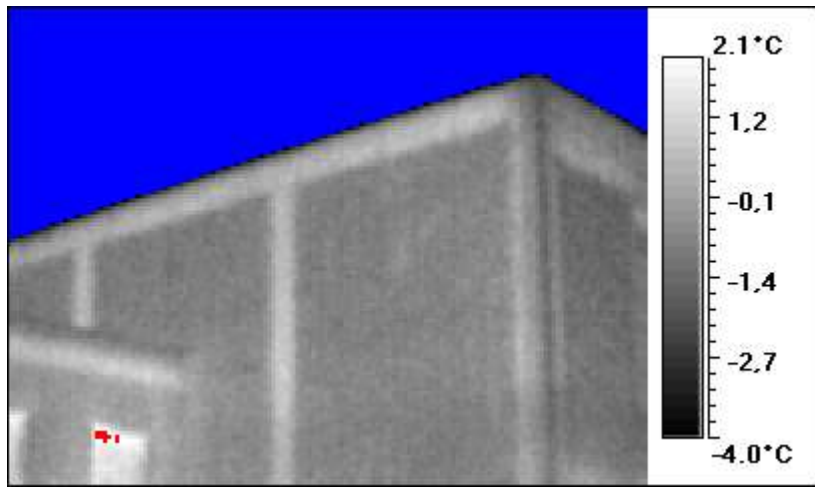
12 3,8 -4,6



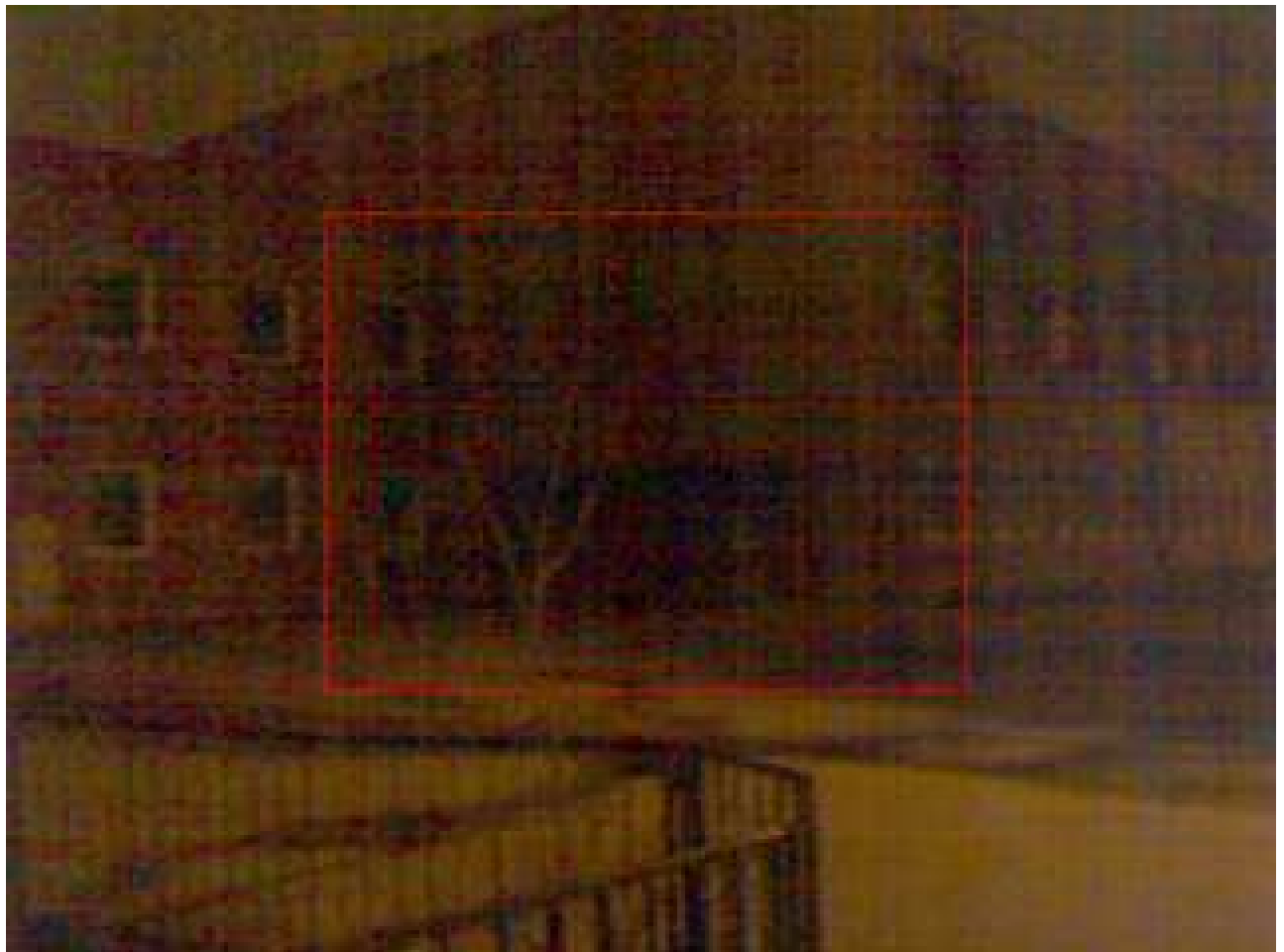
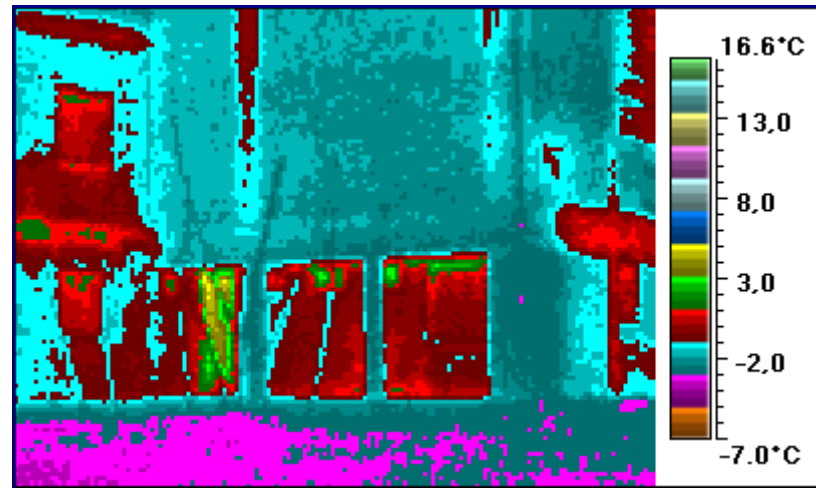
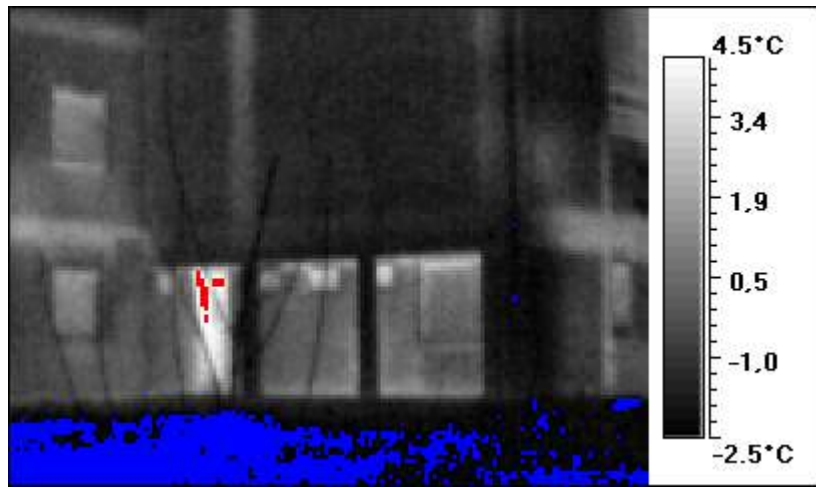
13 1,9 -8,5



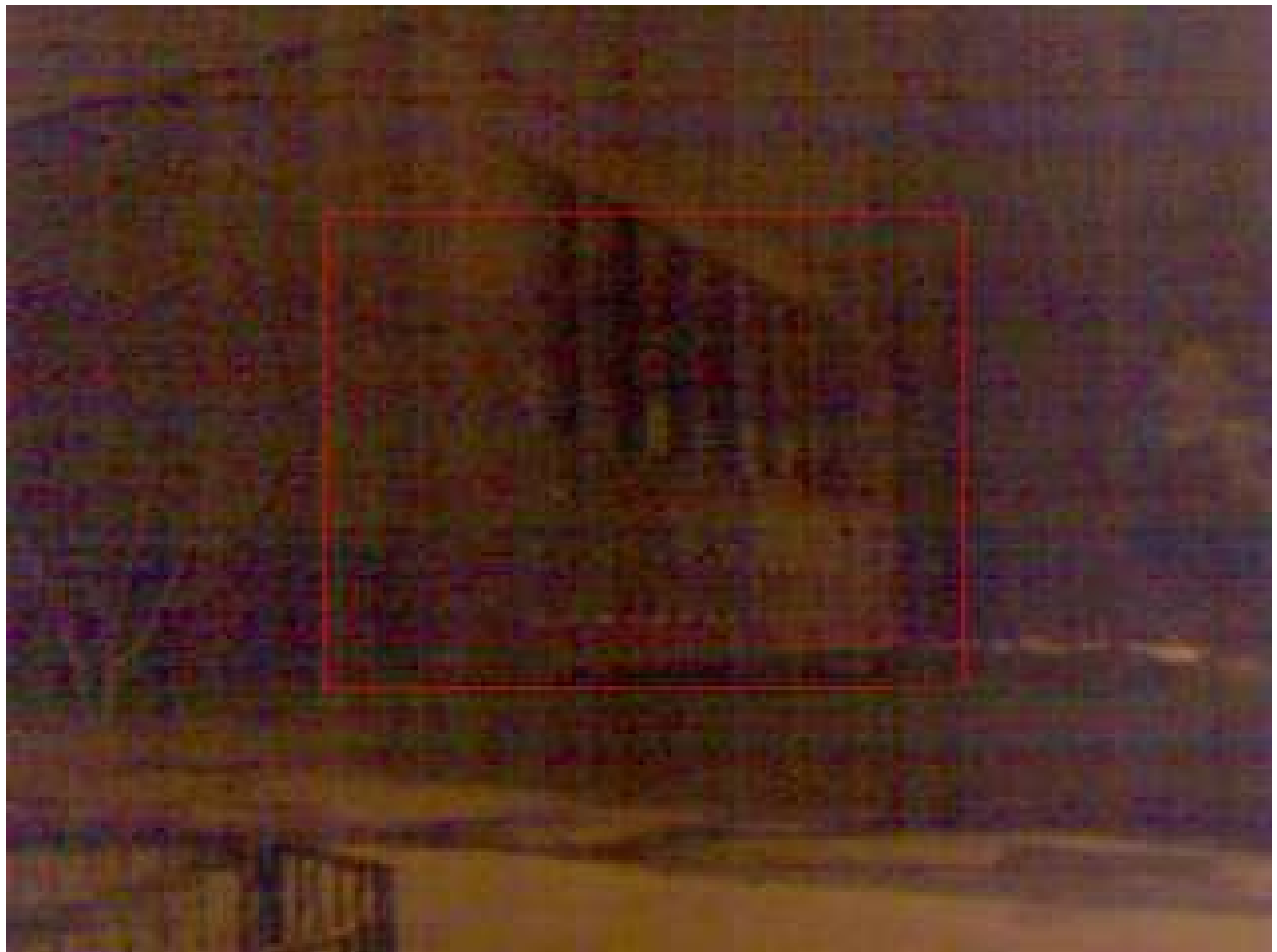
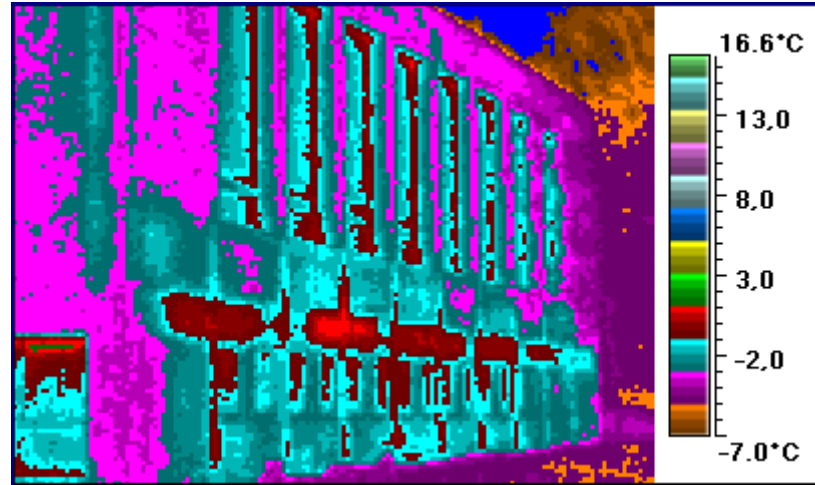
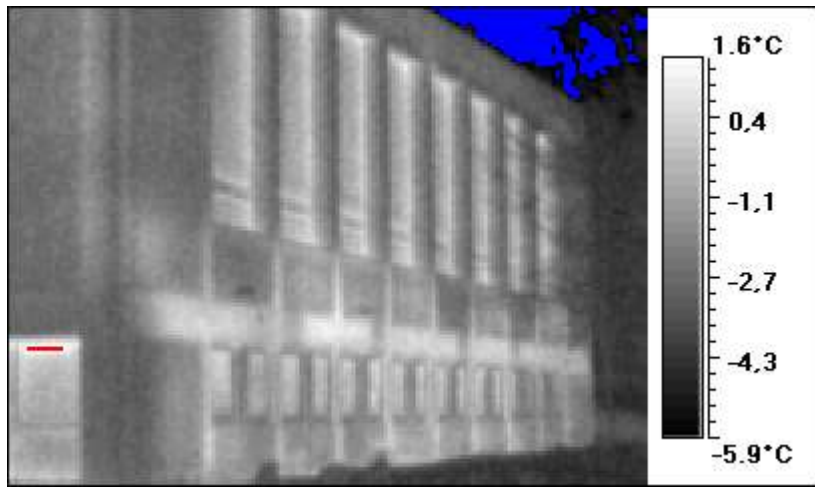
14 2,2 -7,4



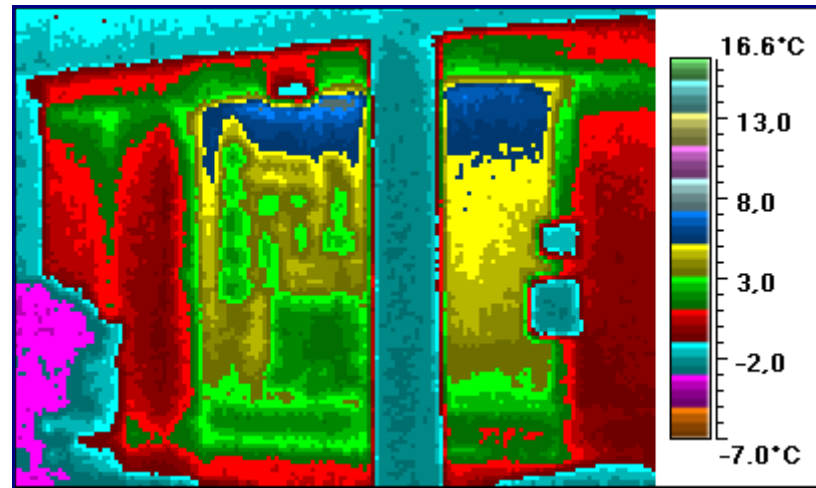
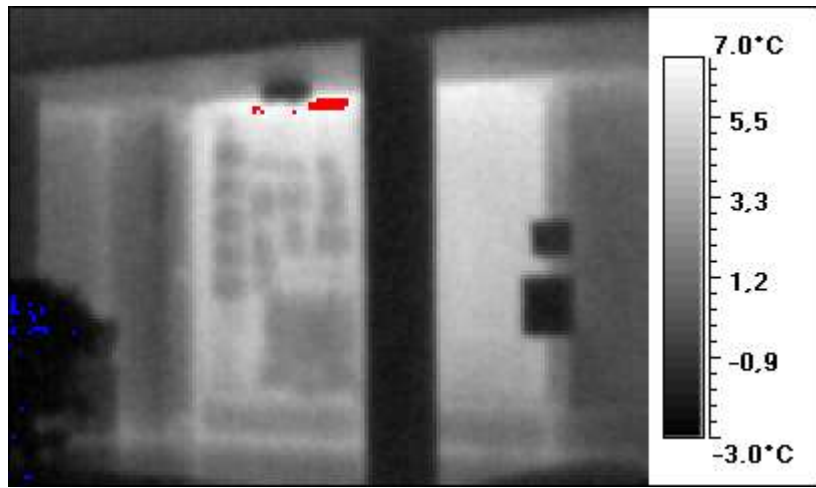
15 5,0 -3,3



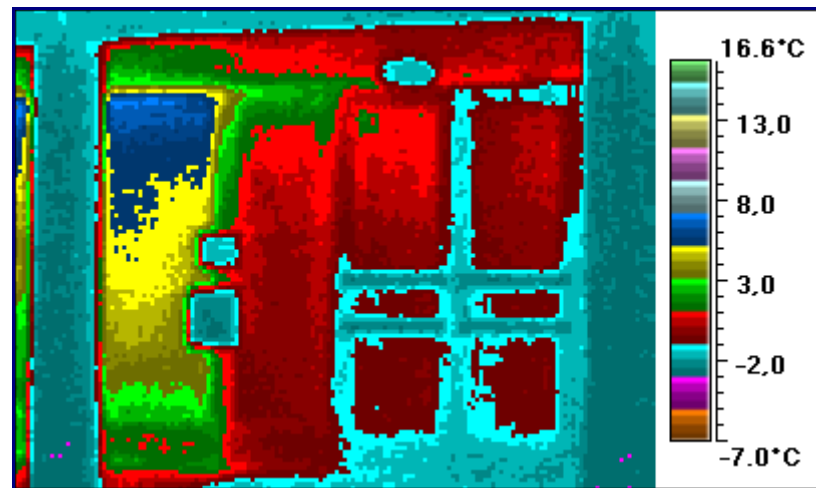
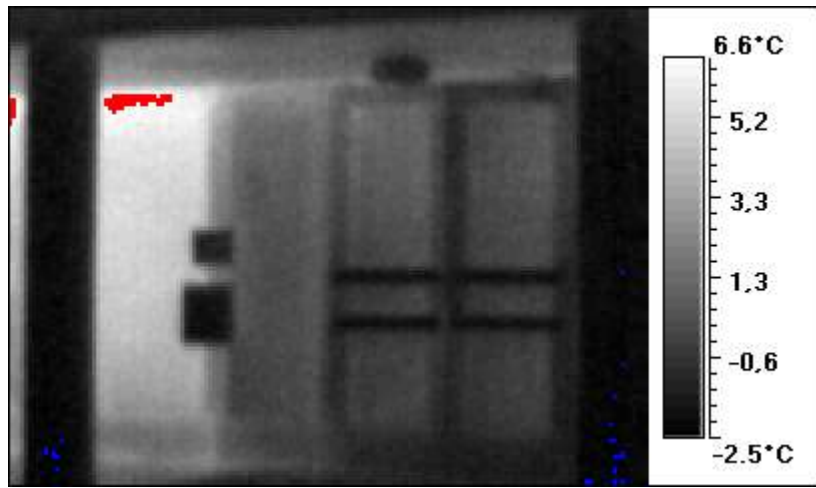
16 1,8 -8,6



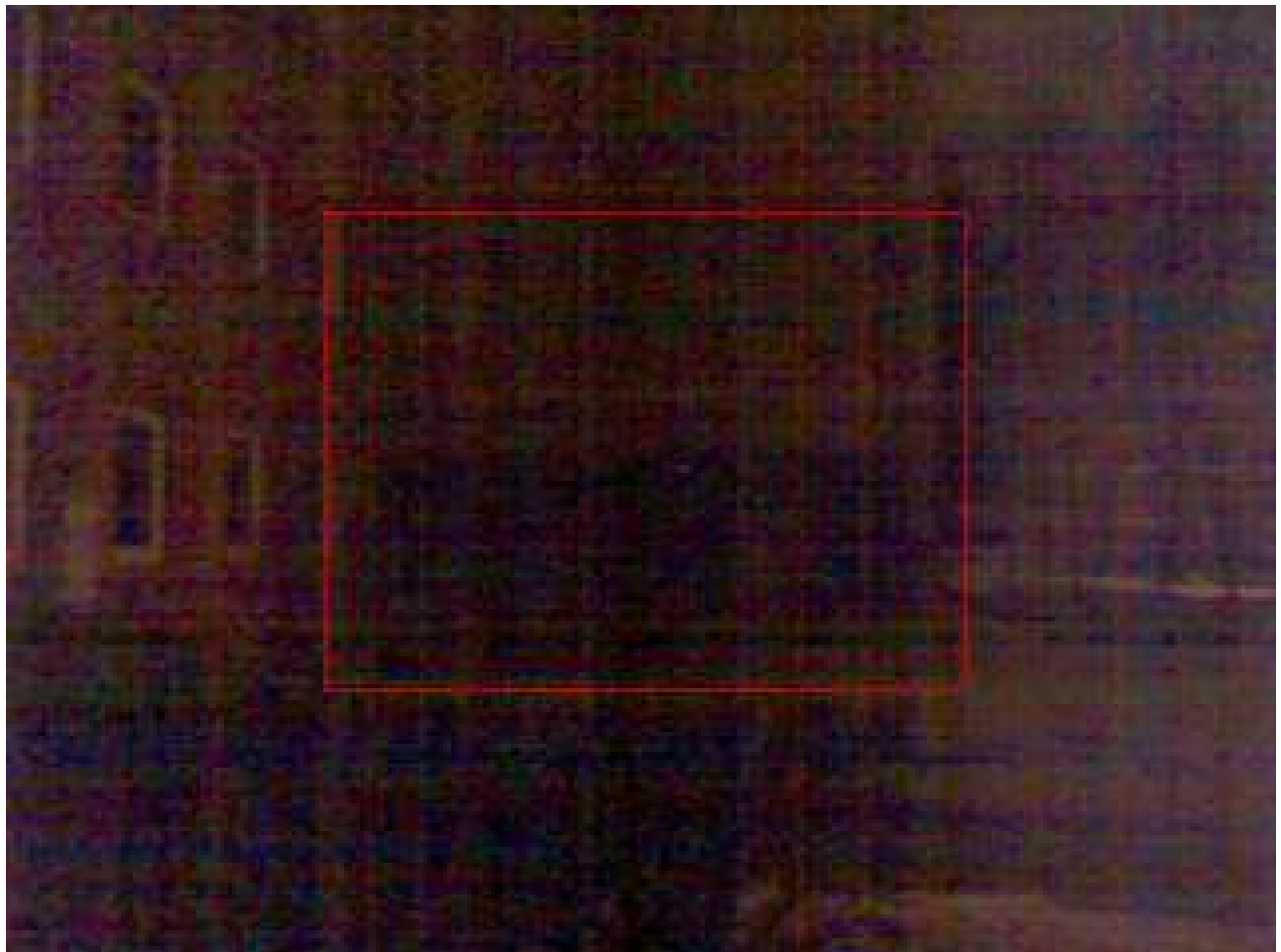
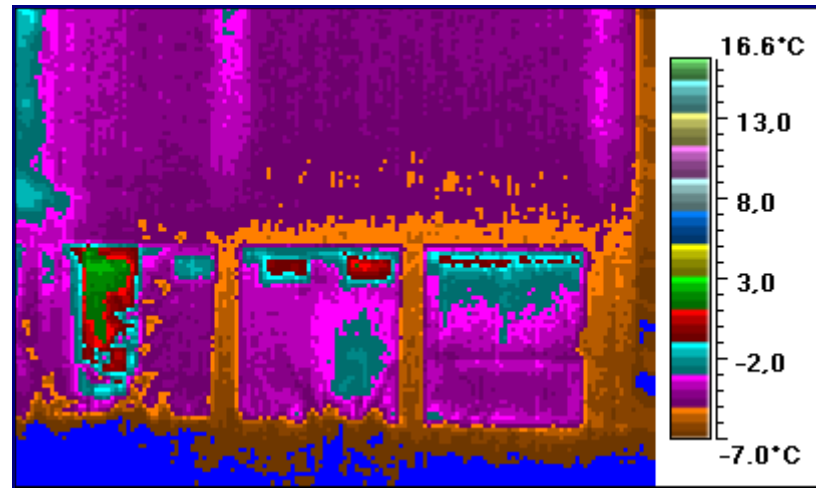
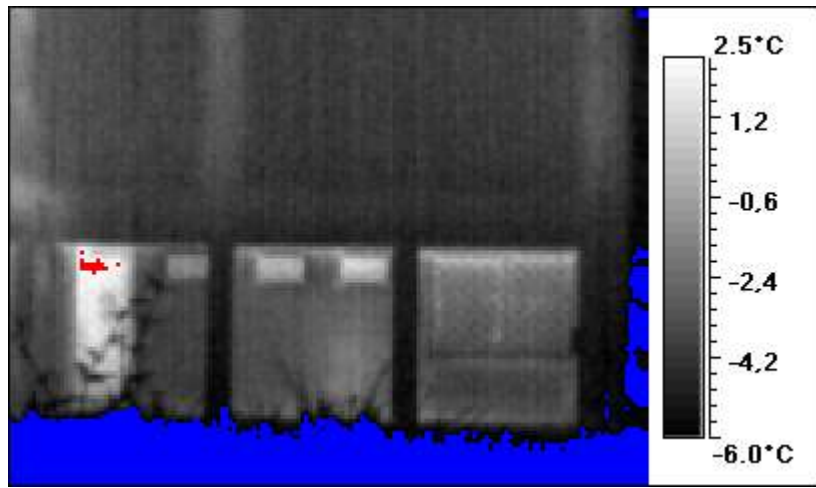
17 7,6 -3,2



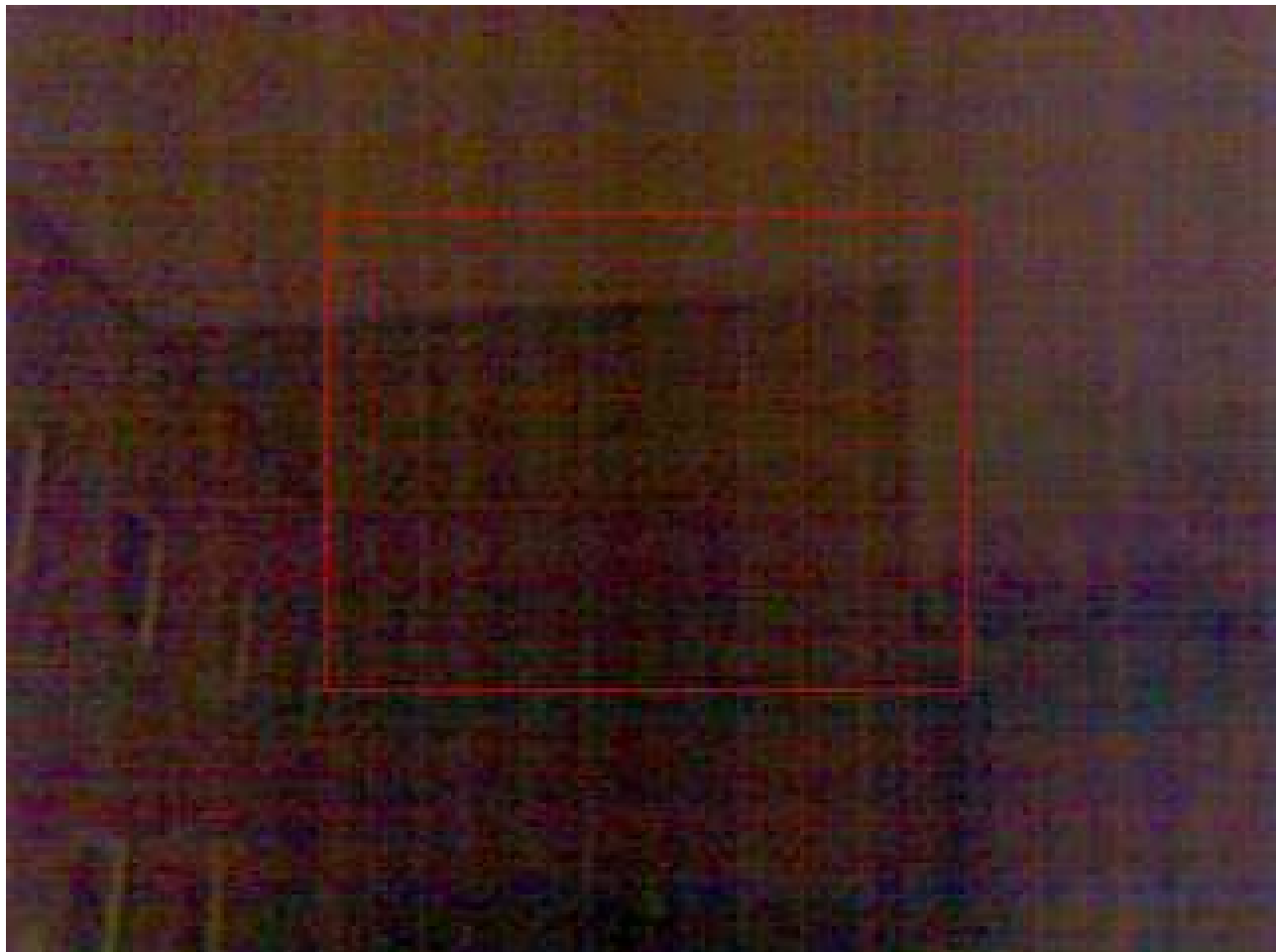
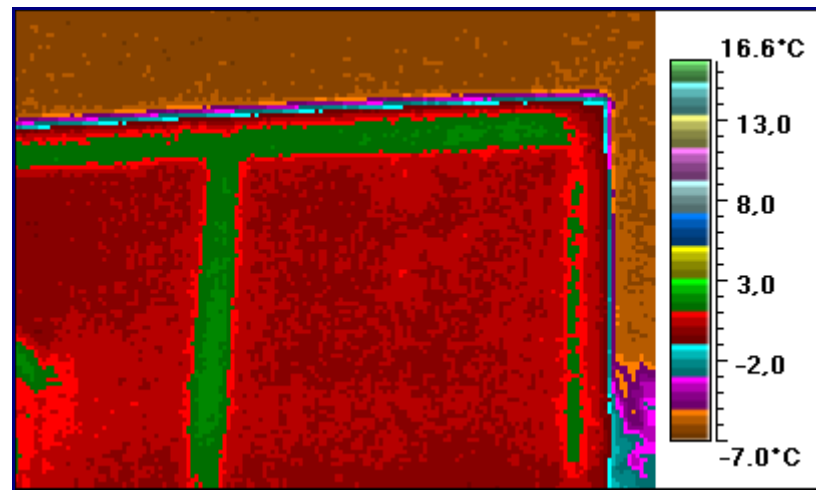
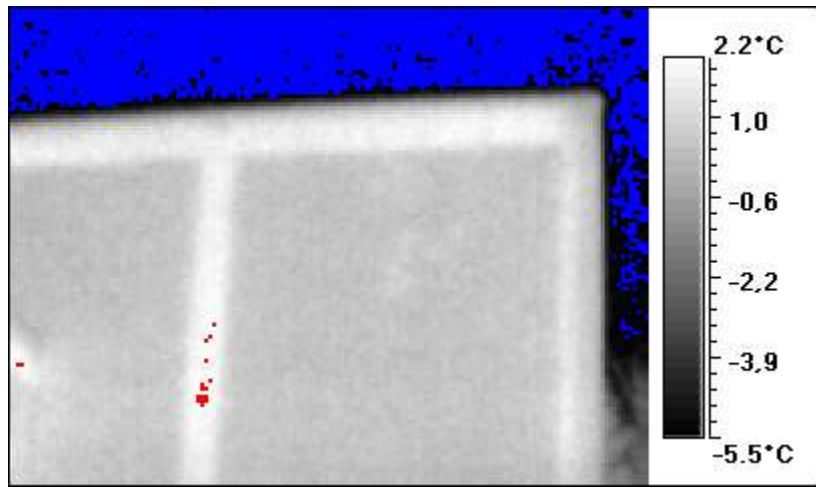
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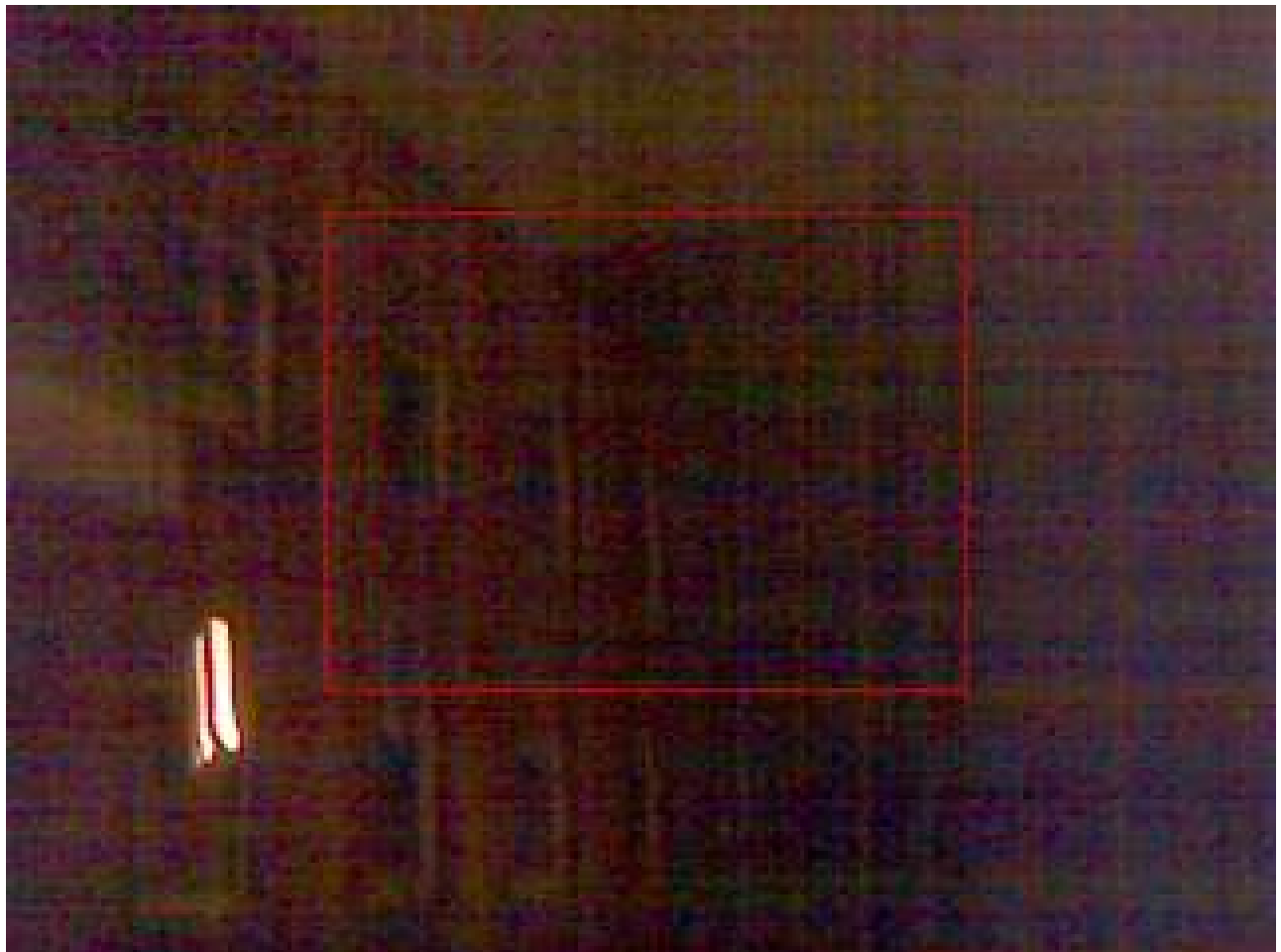
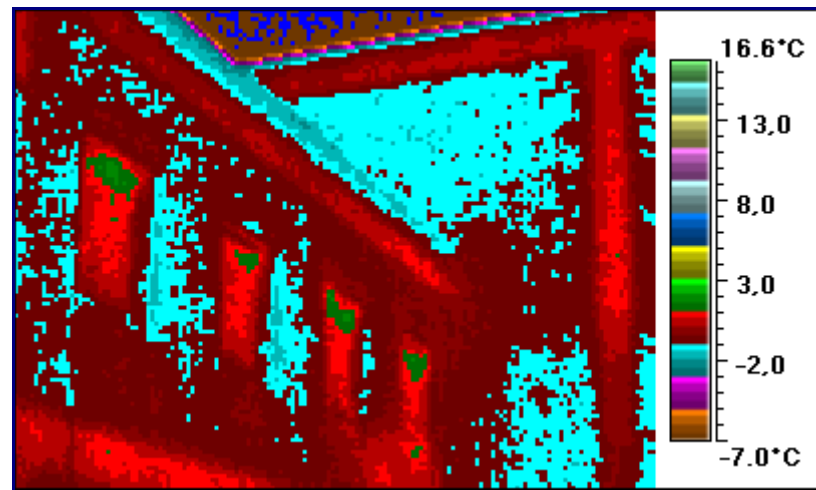
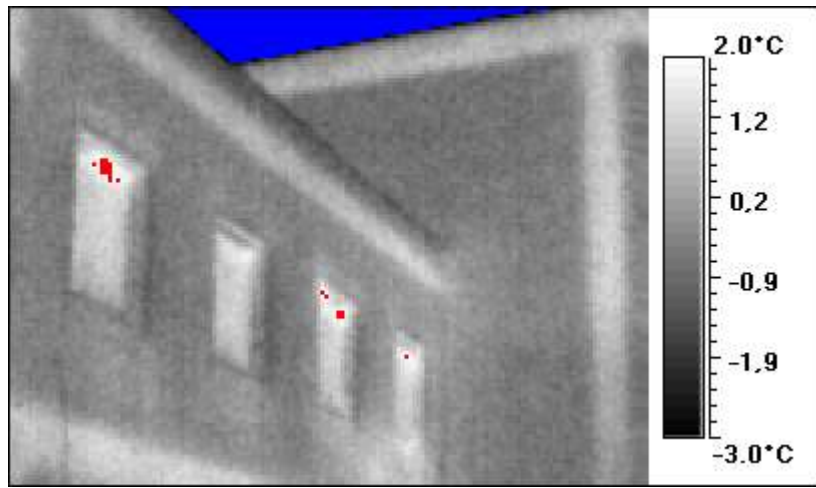
19 2,9 -7,7



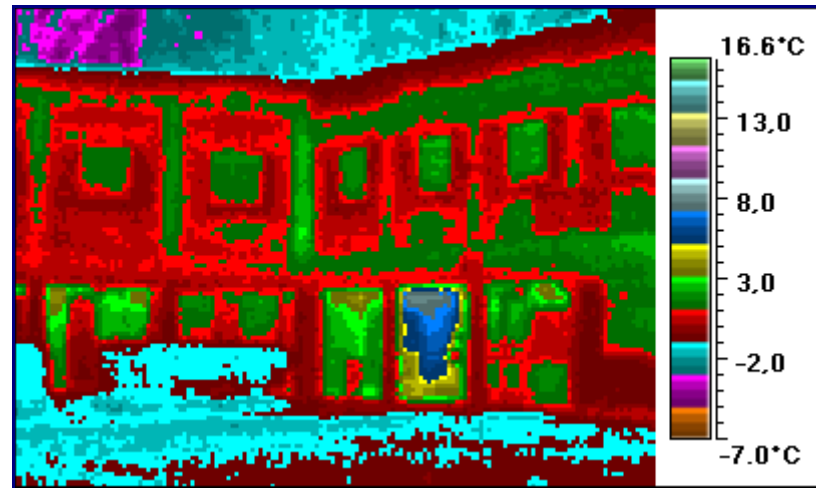
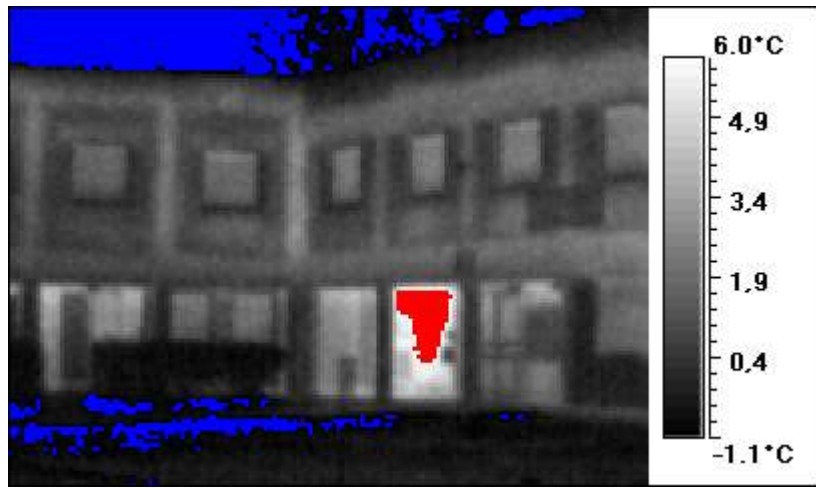
21 2,4 -6,0



22 2,2 -7,0

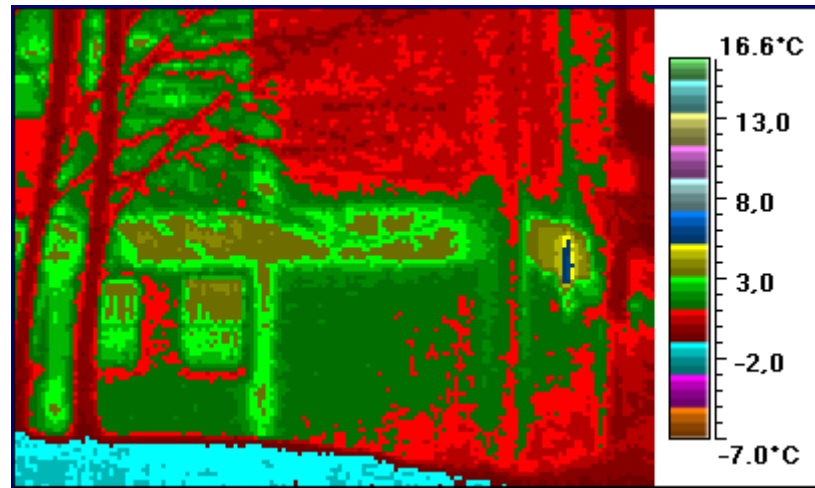


23 7,9 -4,5

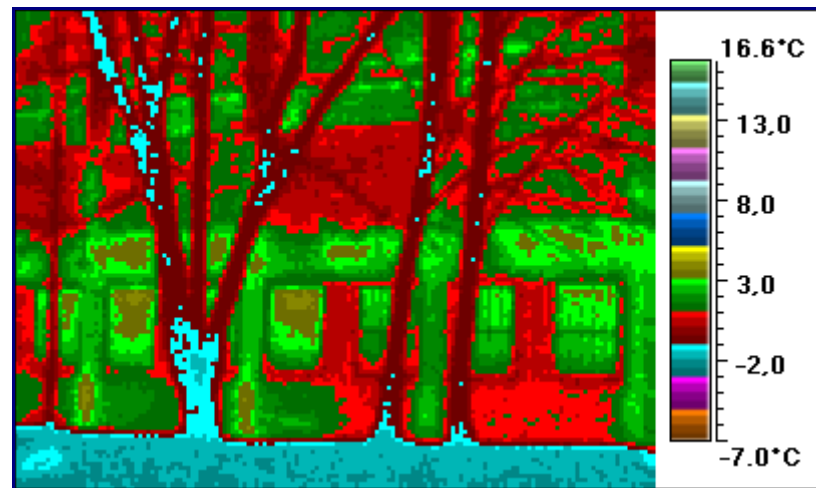
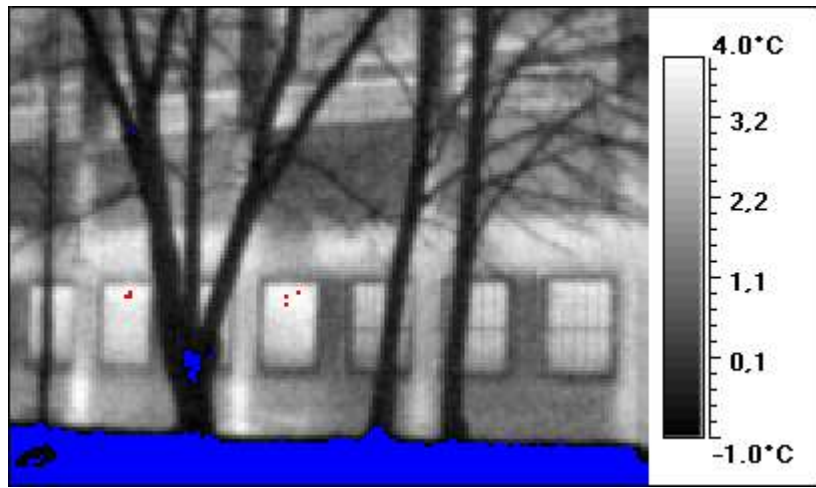




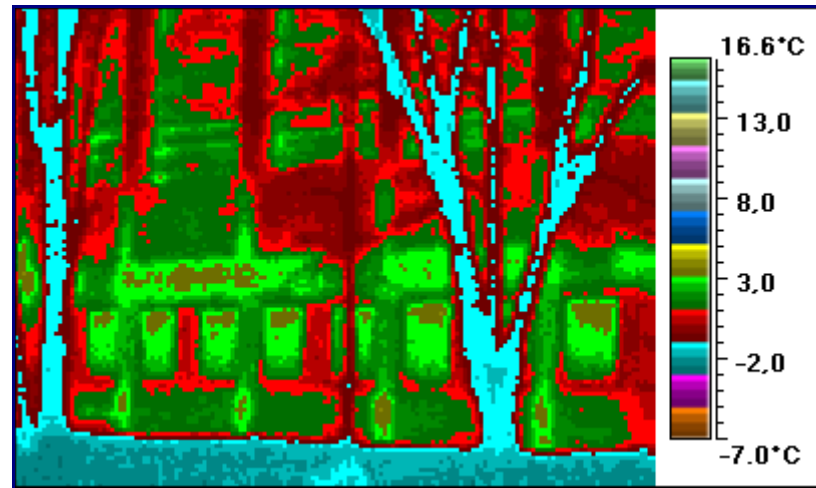
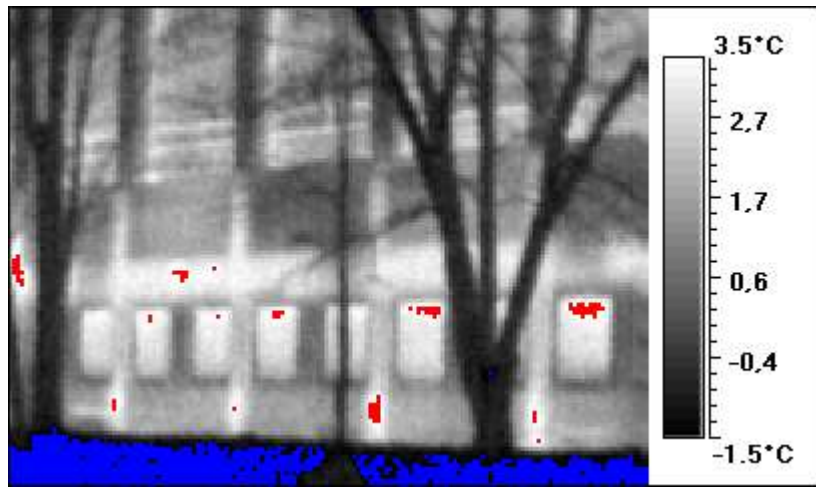
24 6,2 -1,3



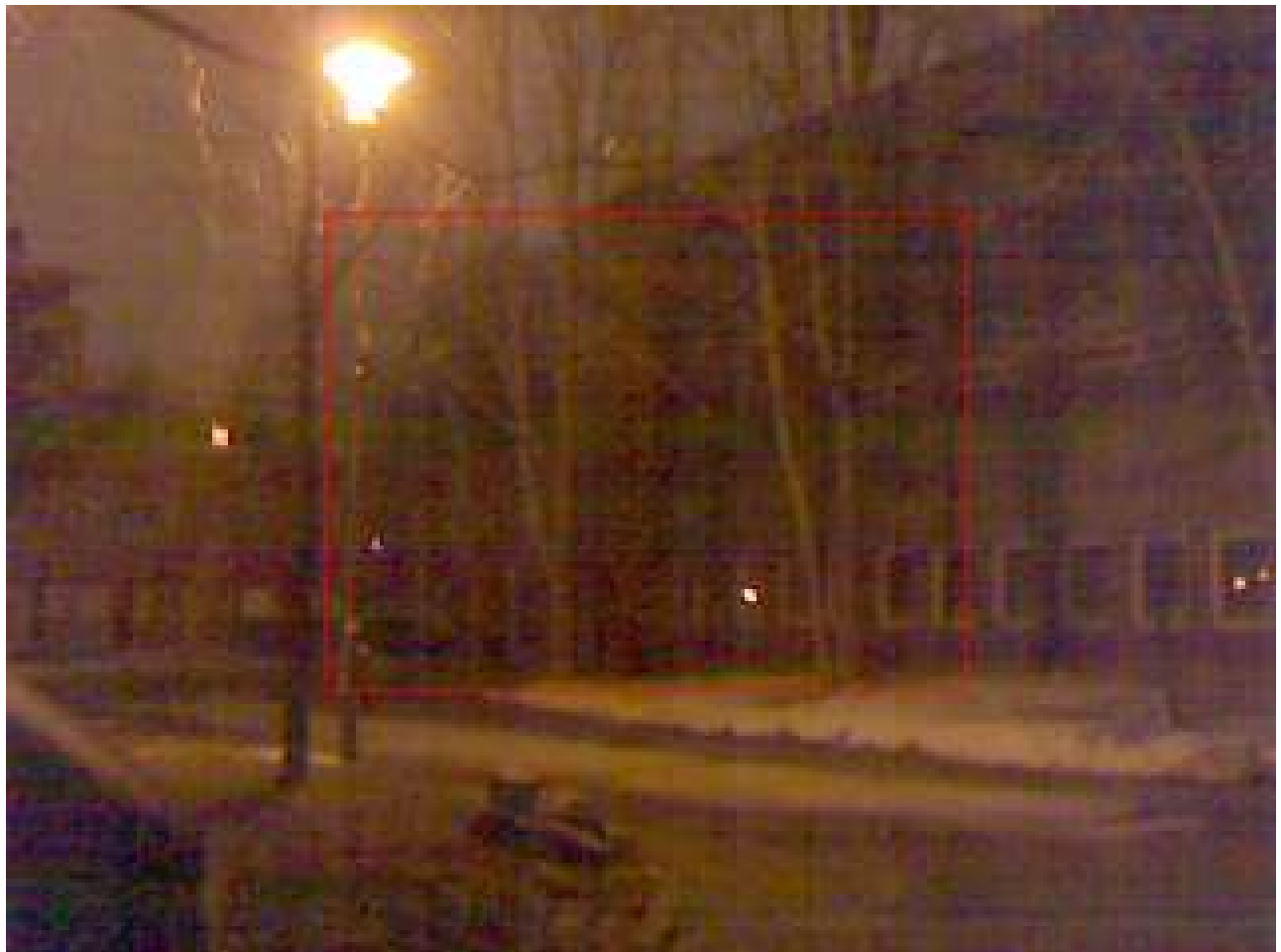
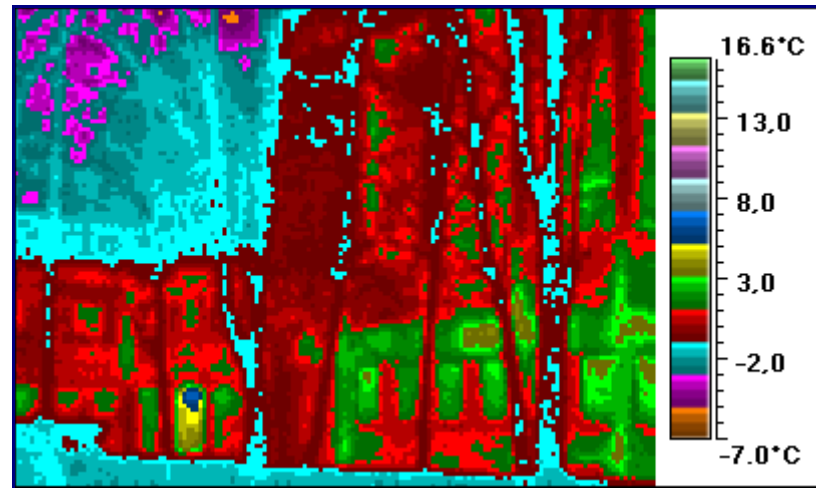
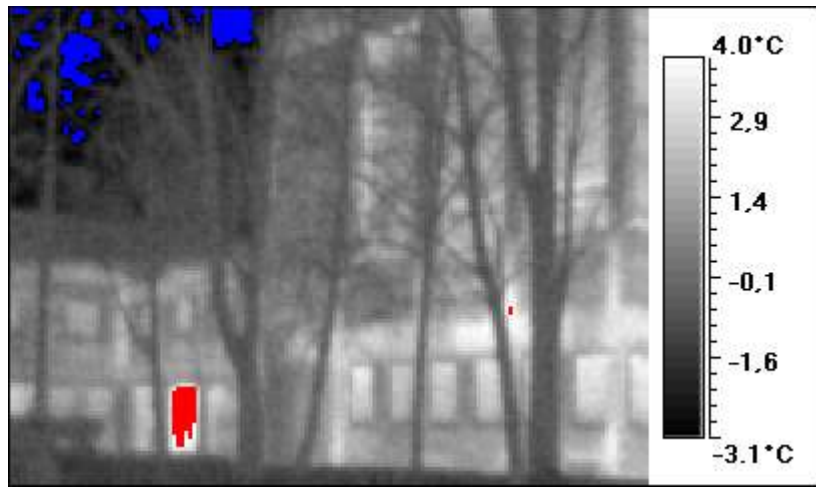
25 4,2 -1,9



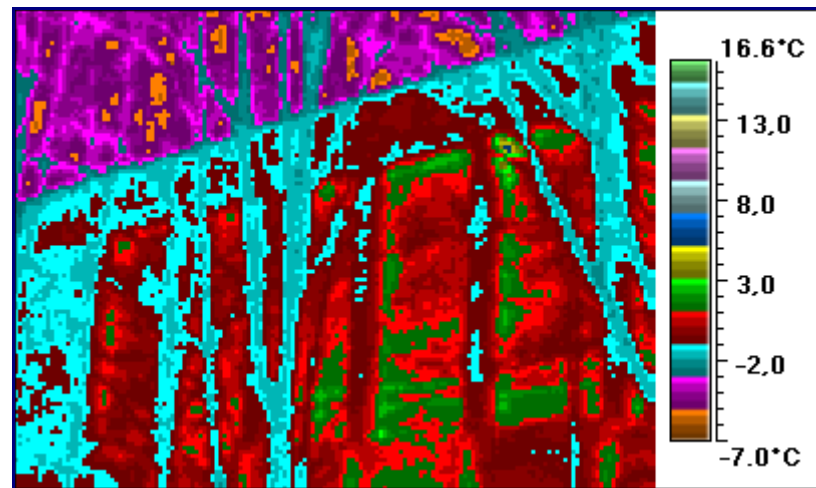
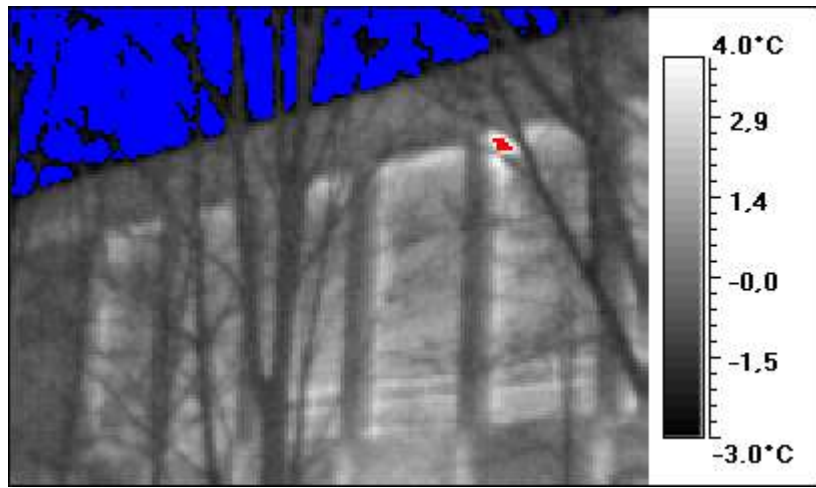
26 3,9 -2,1



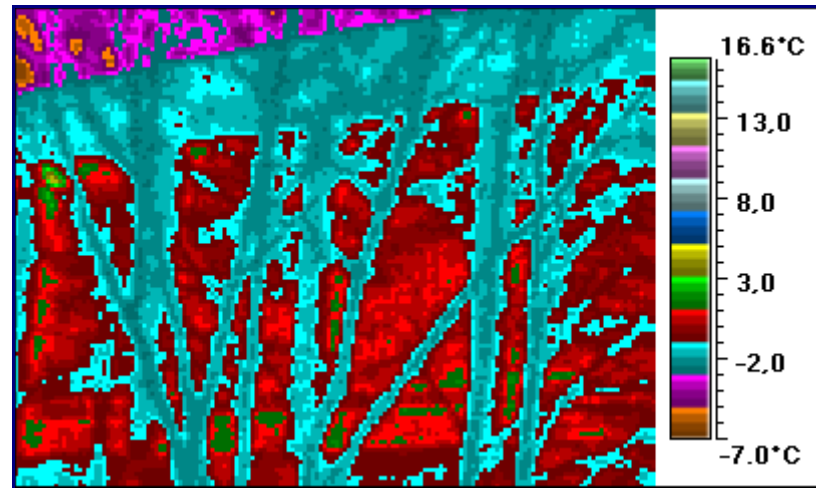
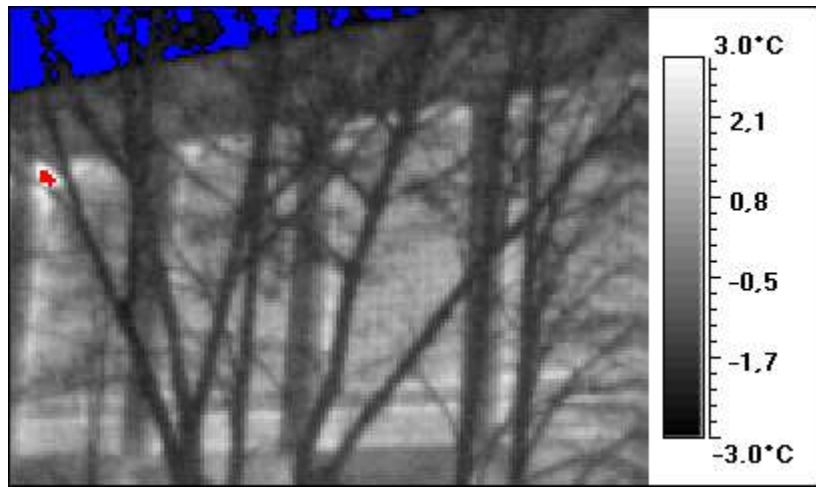
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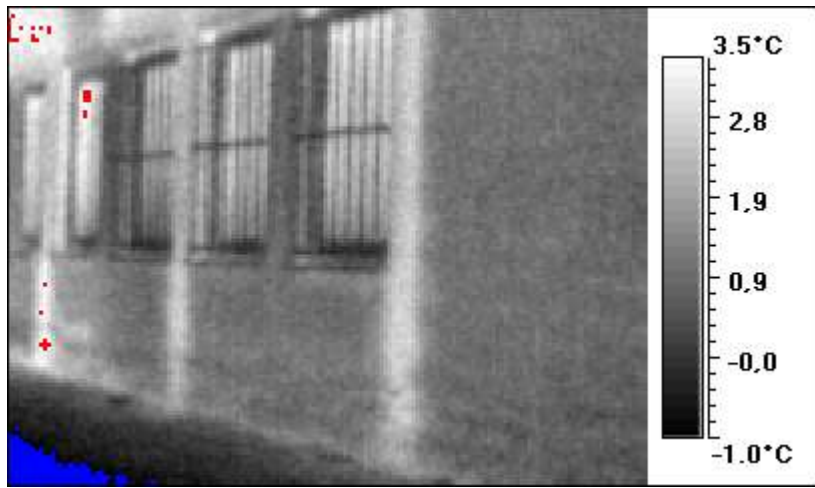


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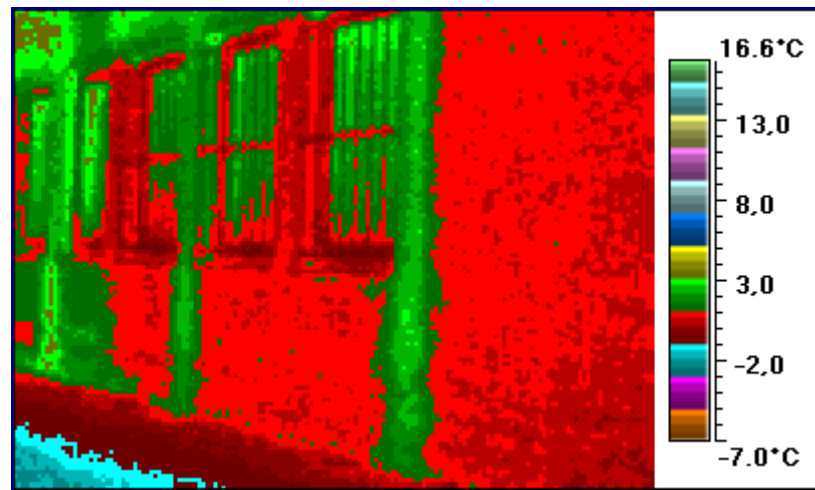


29 4,7 -5,8

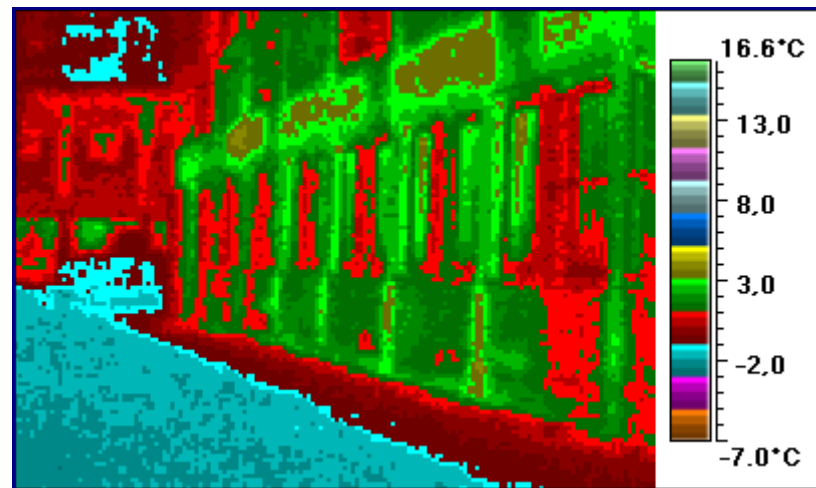
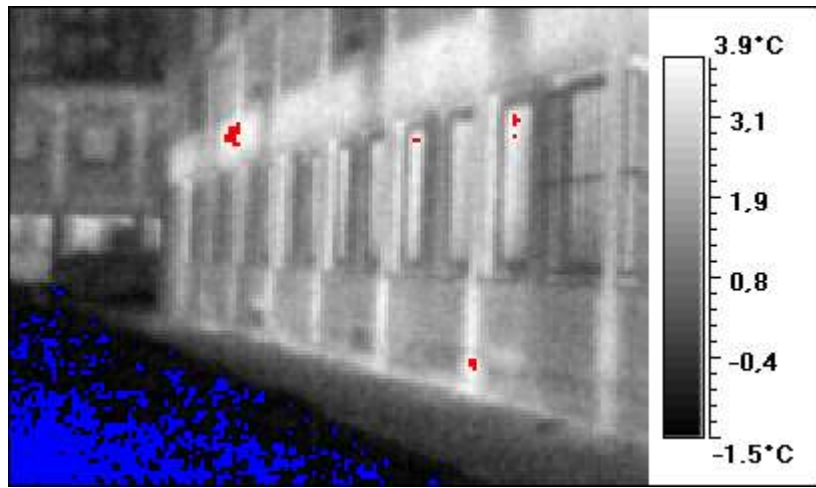




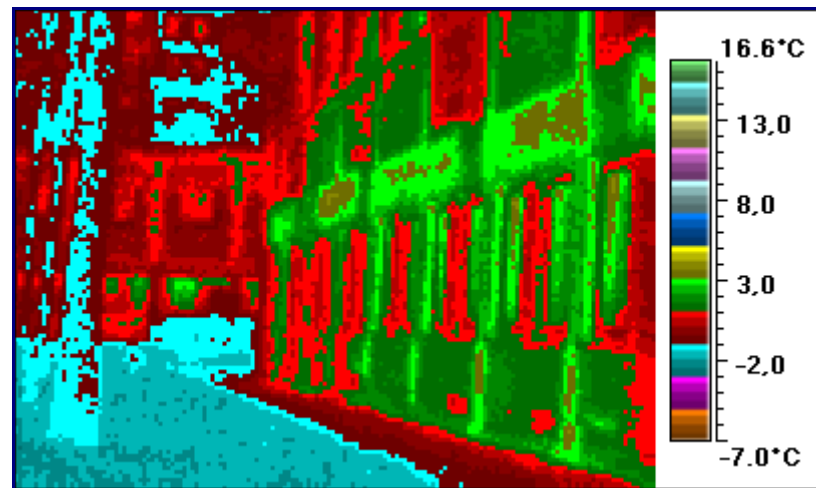
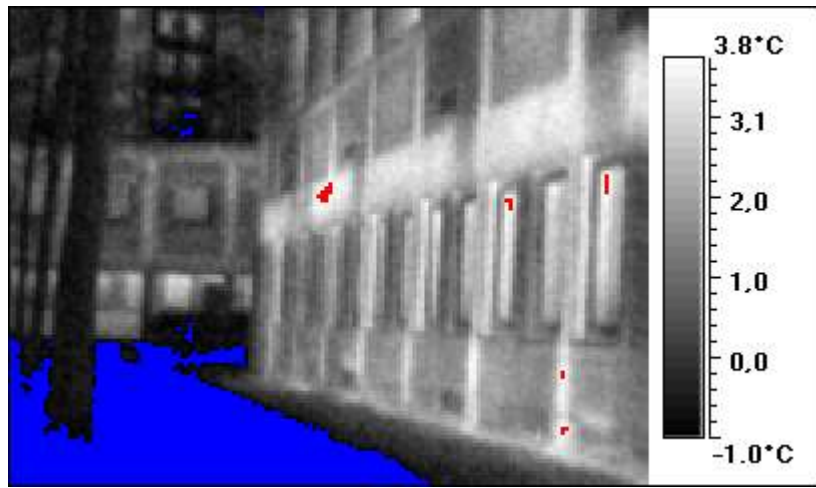
30 3,8 -1,9



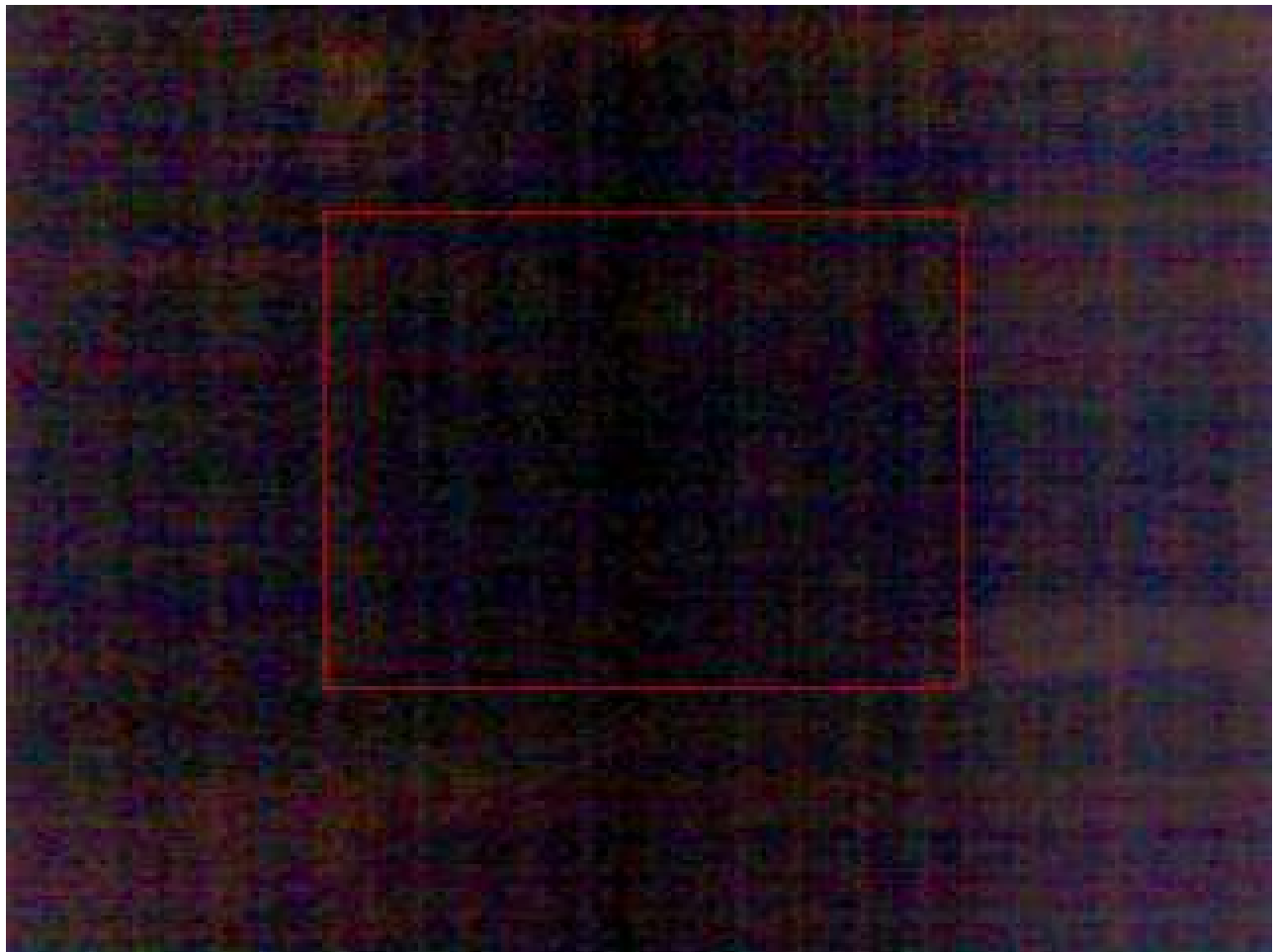
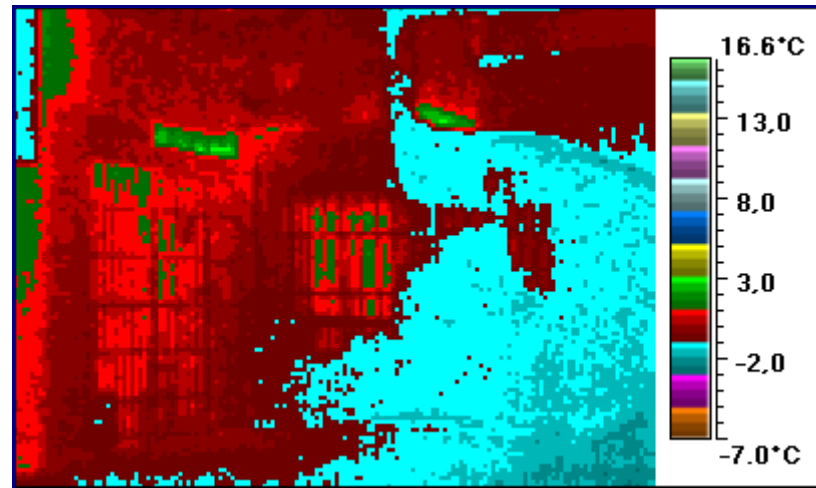
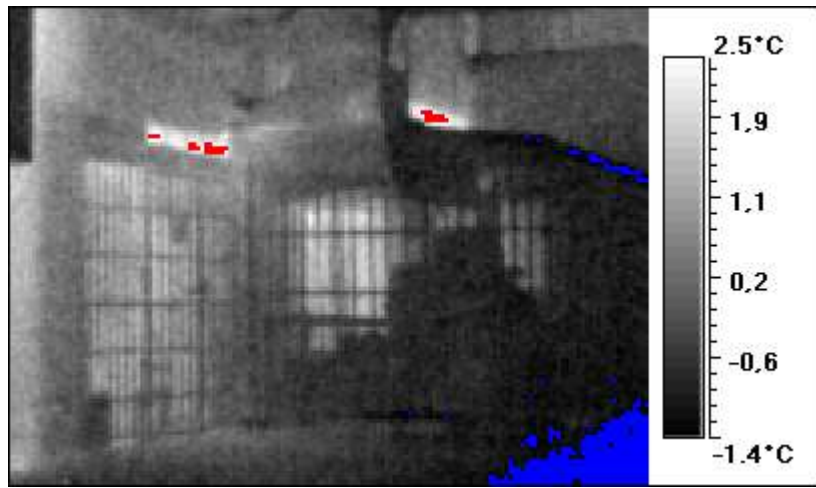
31 4,2 -2,0



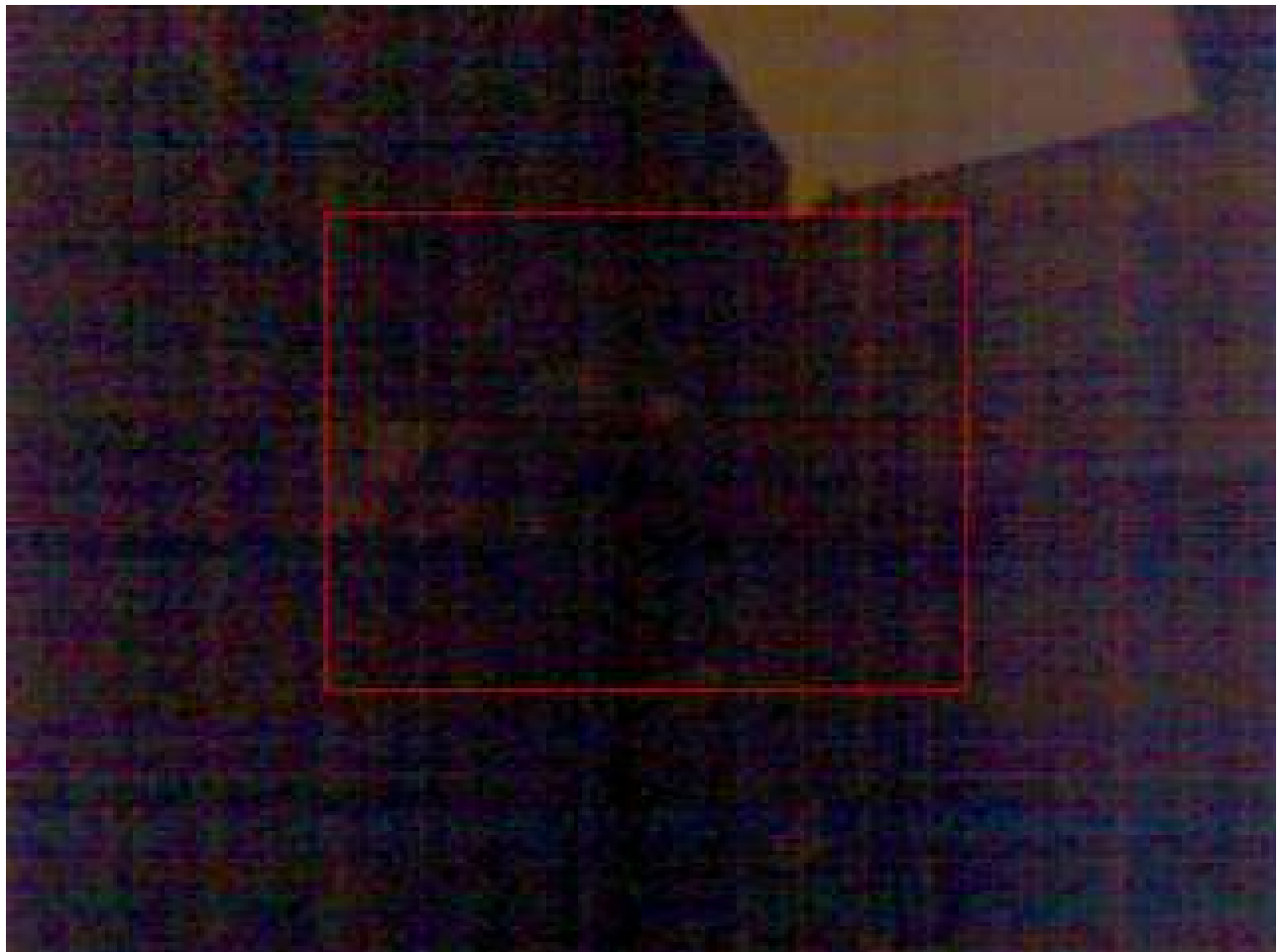
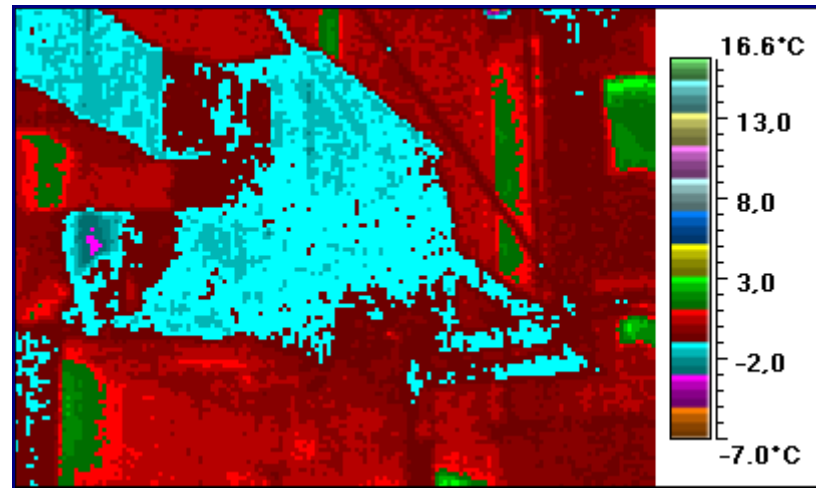
32 3,9 -2,0



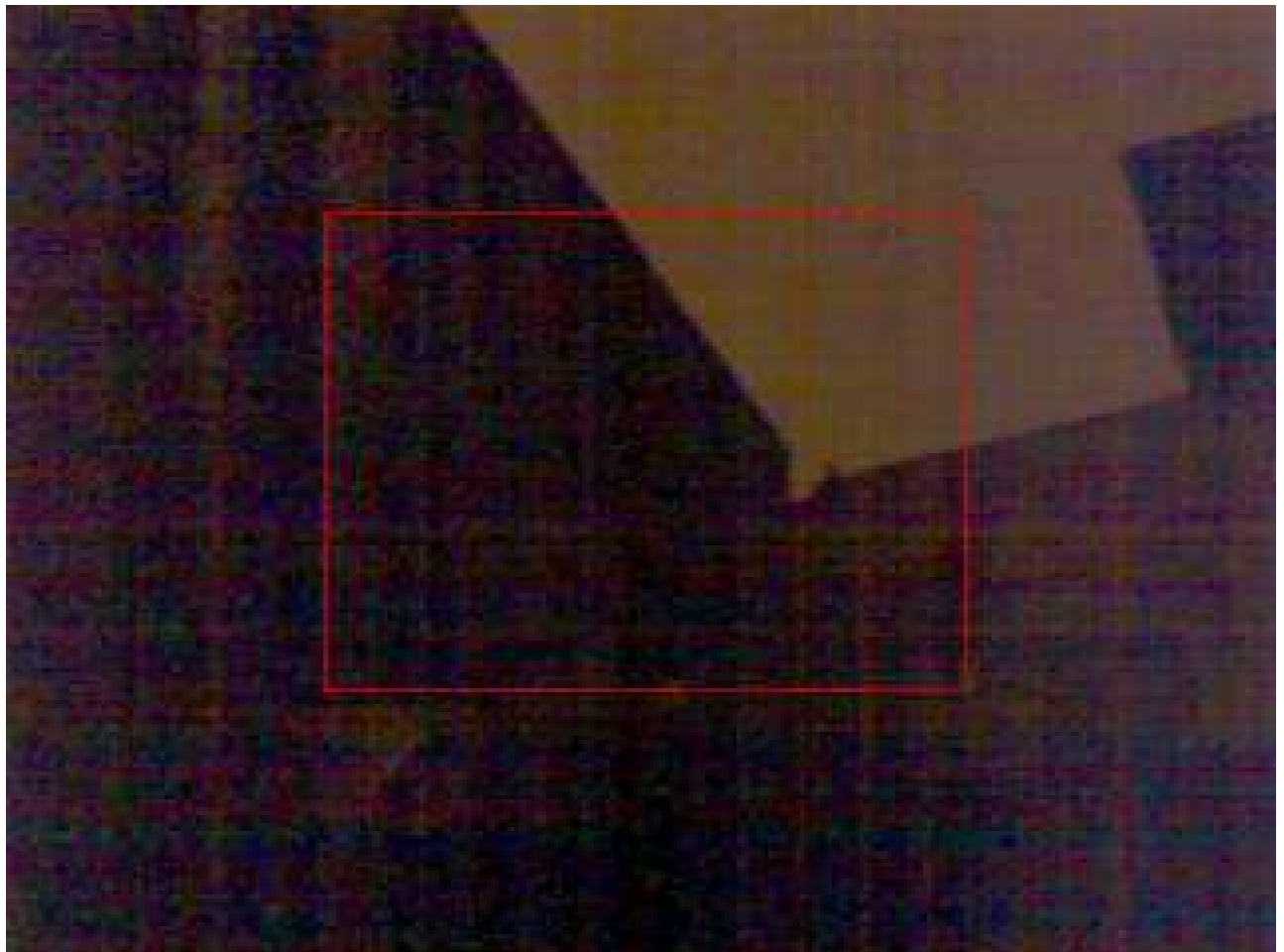
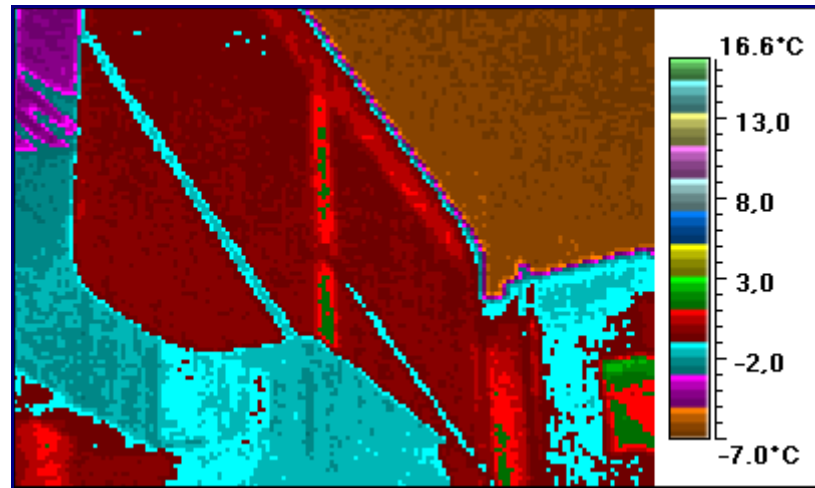
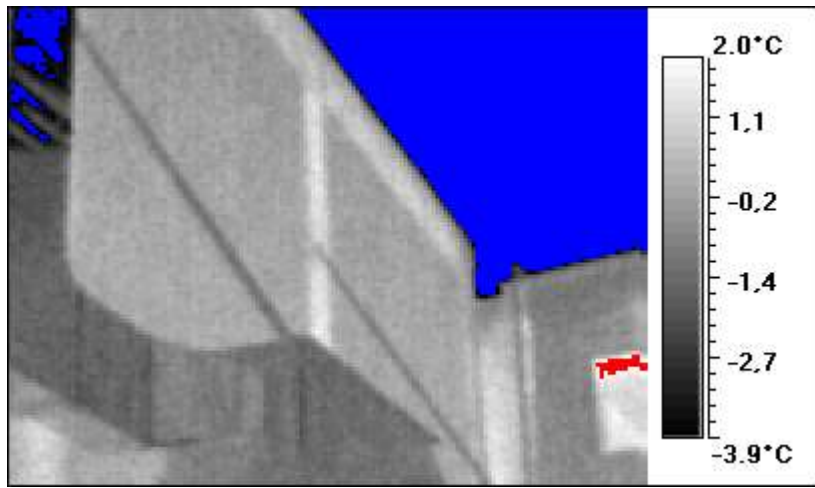
33 3,1 -2,0



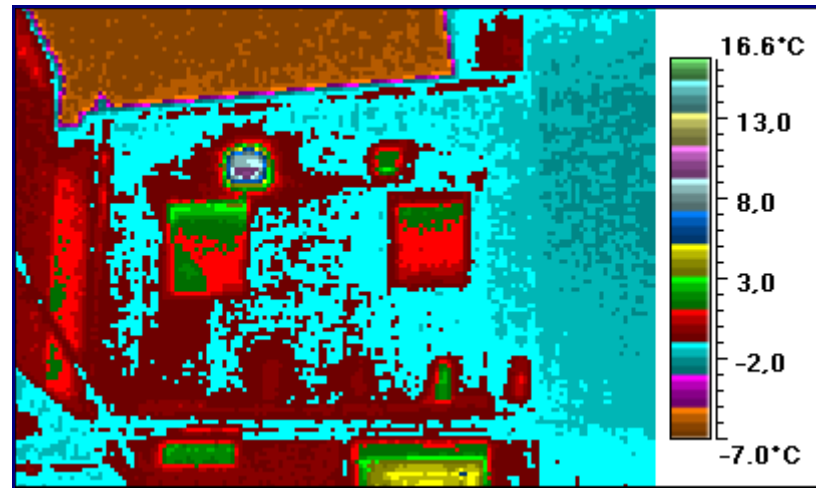
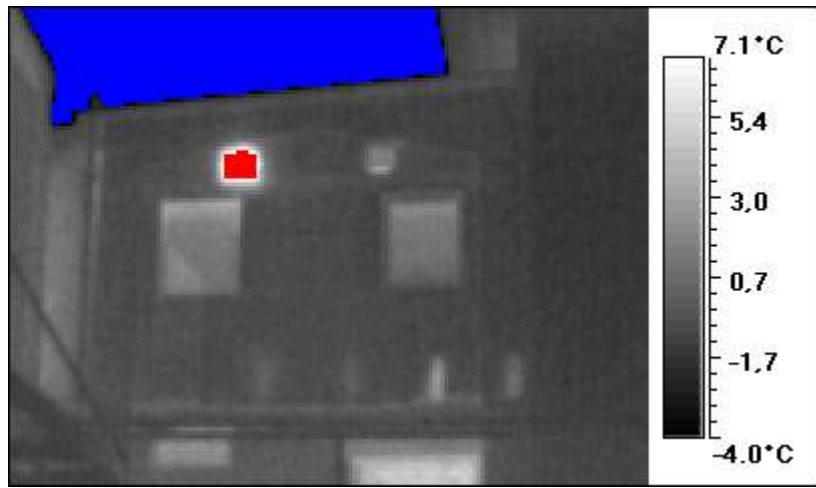
34 3,3 -4,7



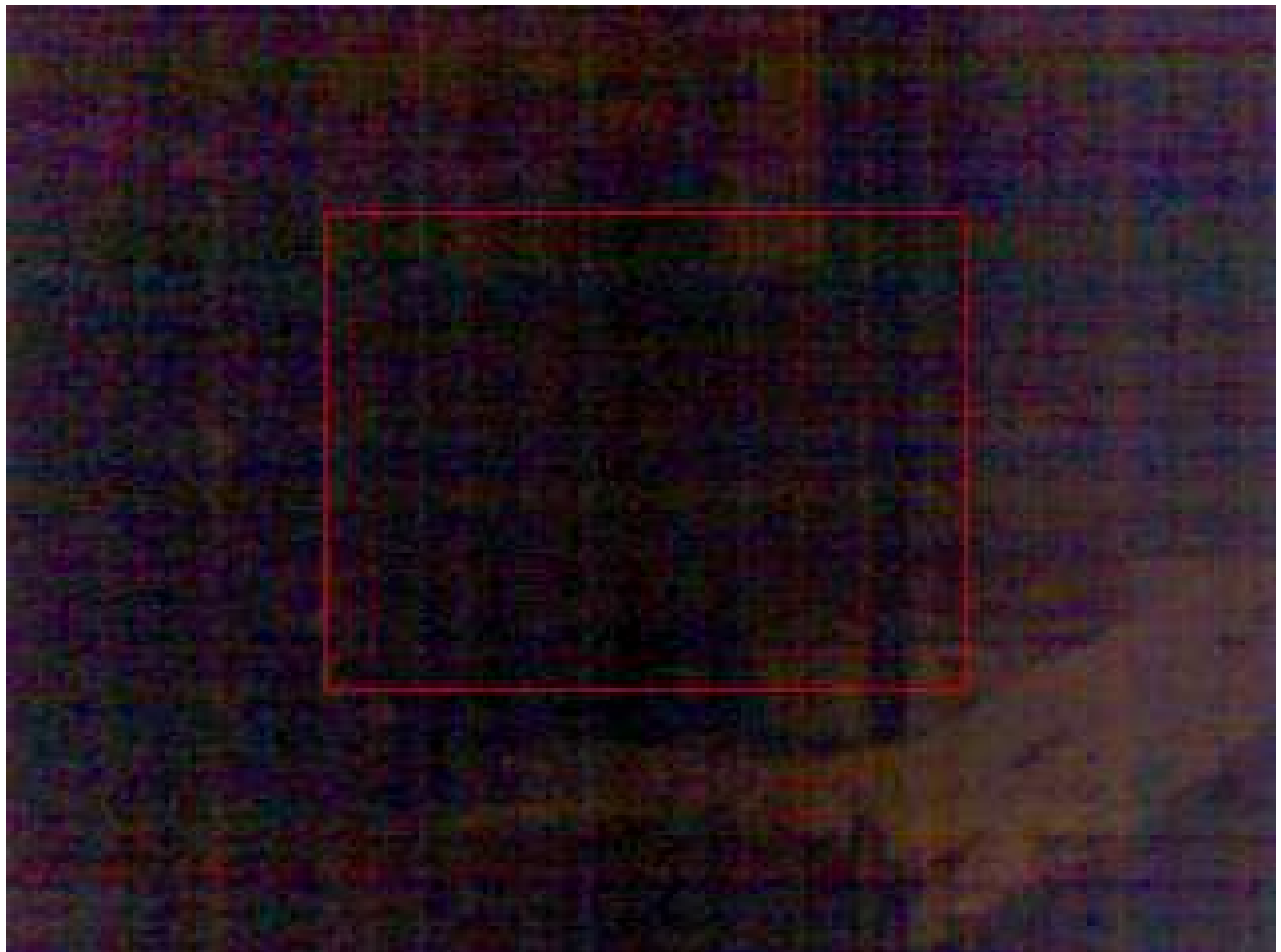
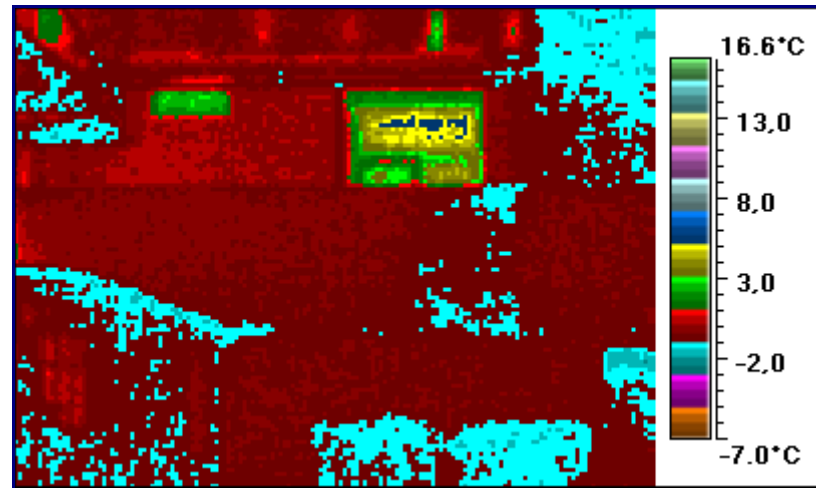
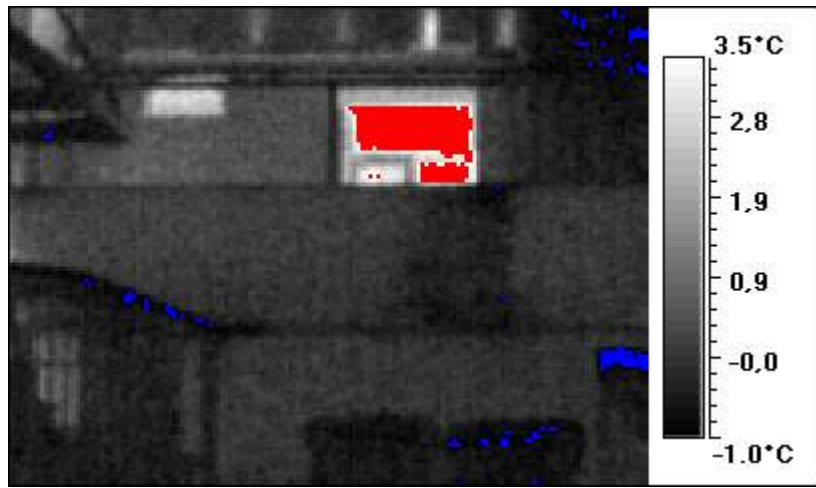
35 2,7 -6,3



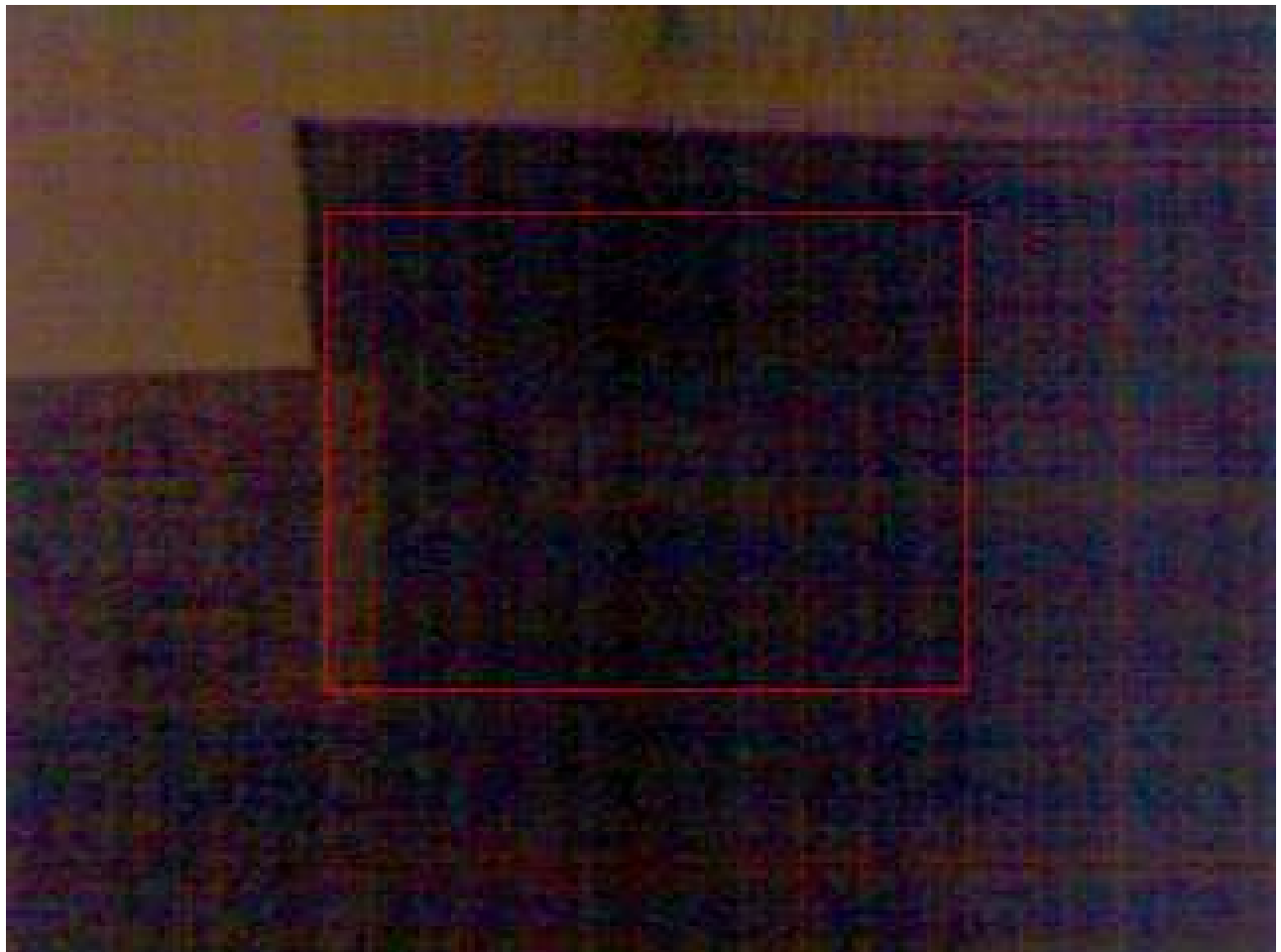
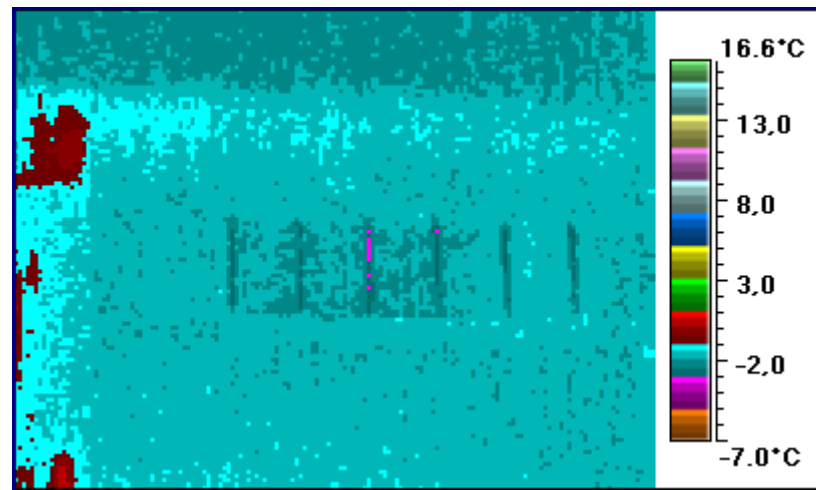
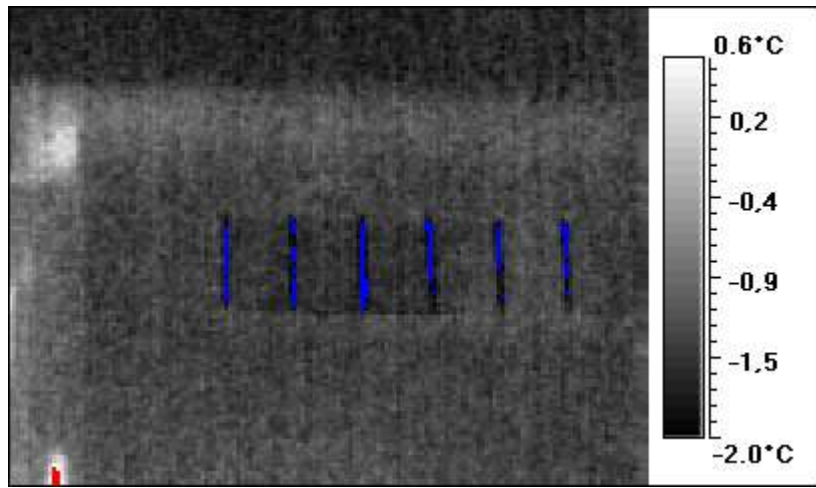
36 9,6 -6,0



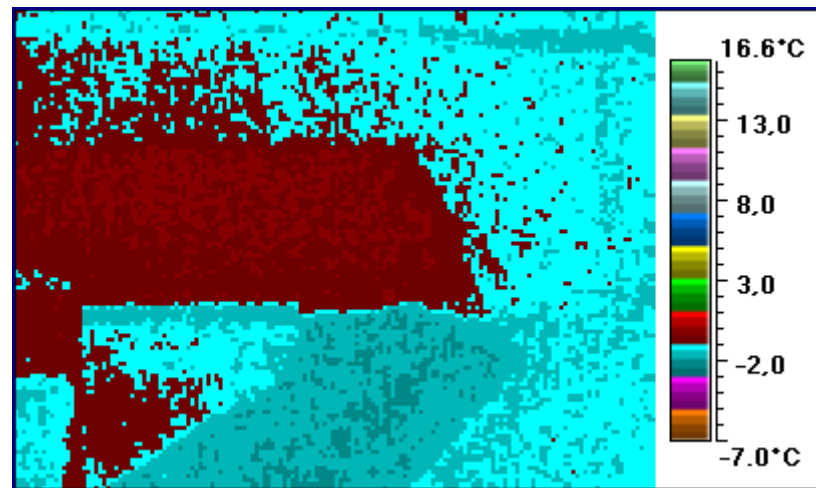
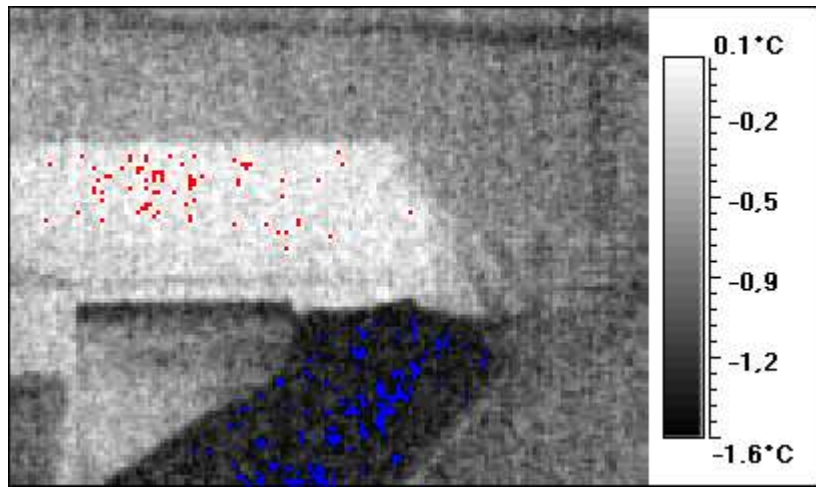
37 5,6 -1,5



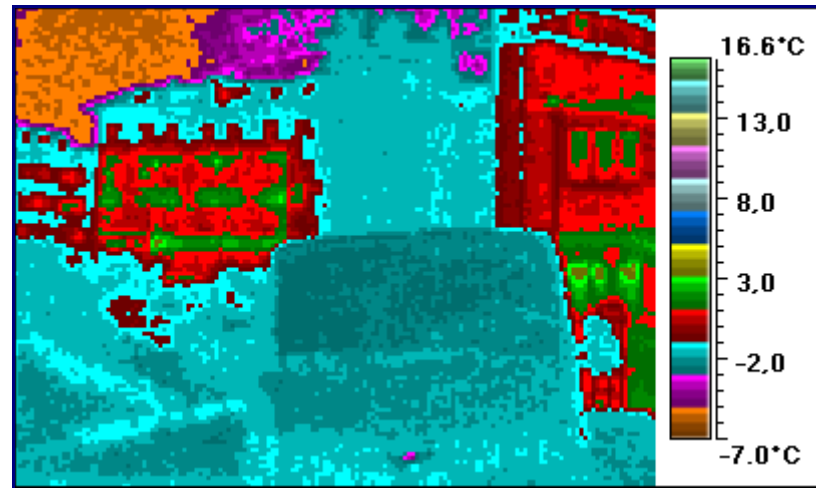
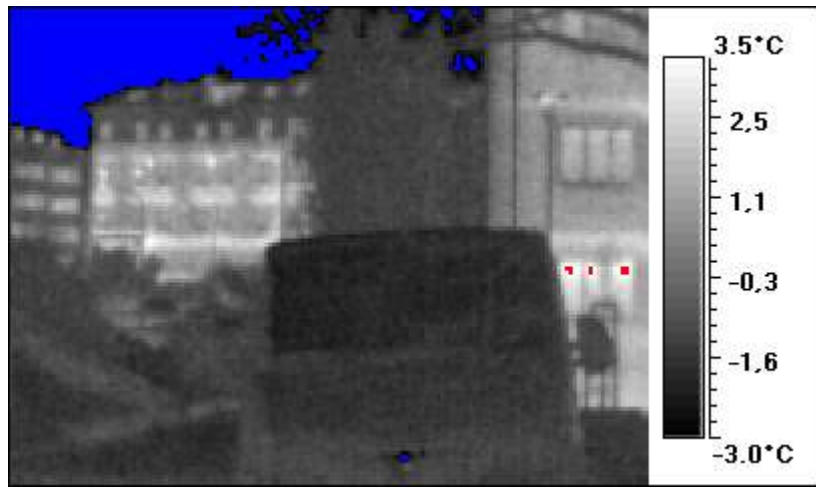
38 0,7 -2,7



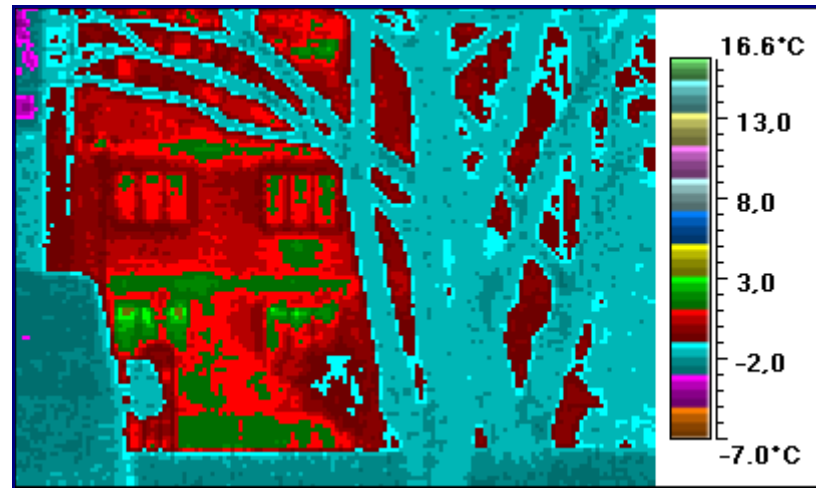
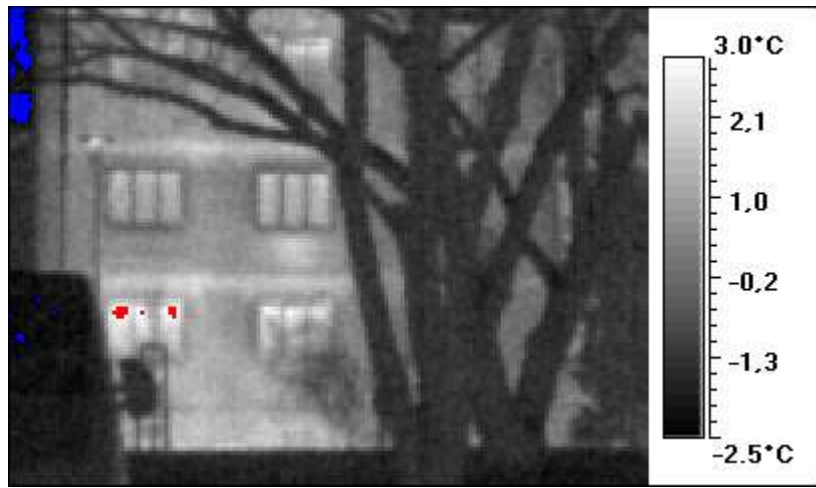
39 0,3 -1,8



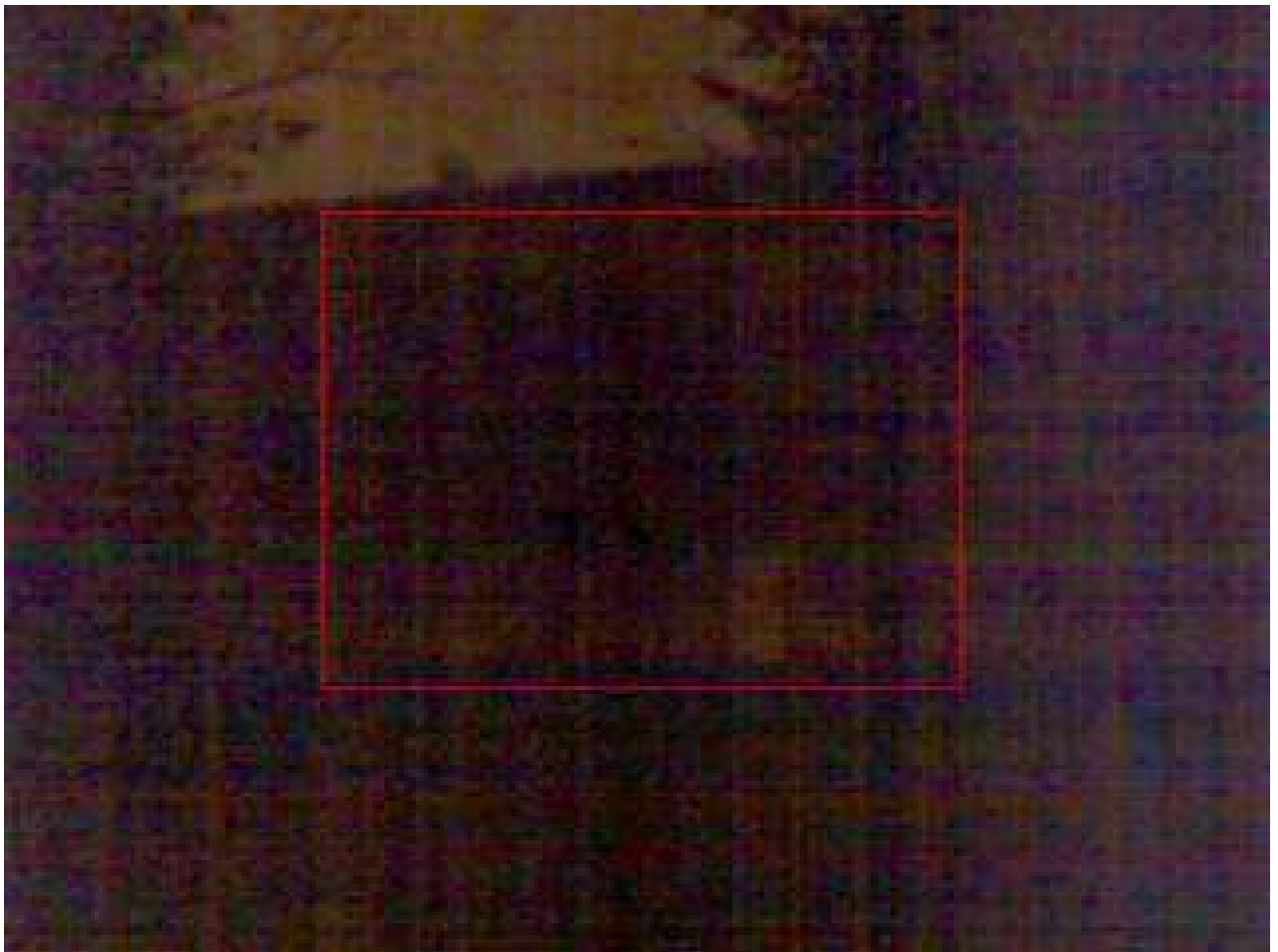
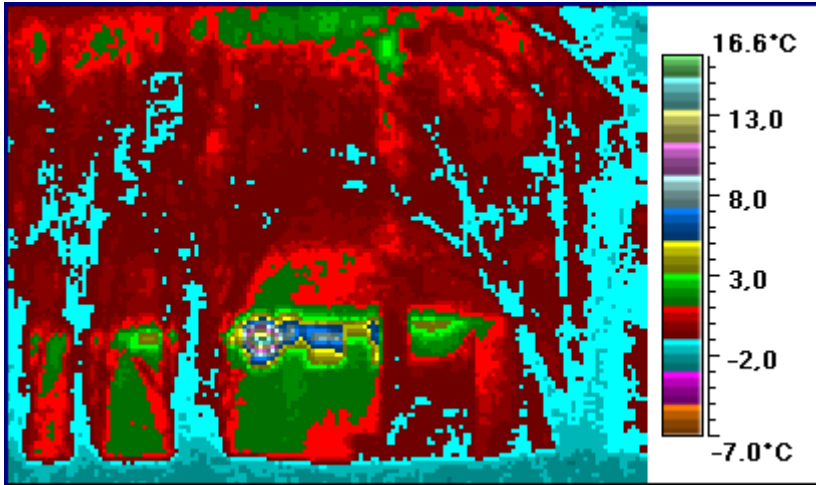
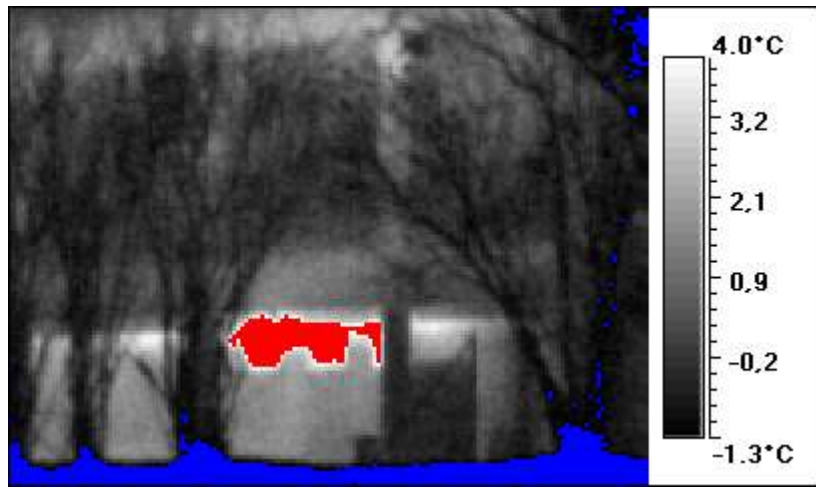
40 3,8 -5,5



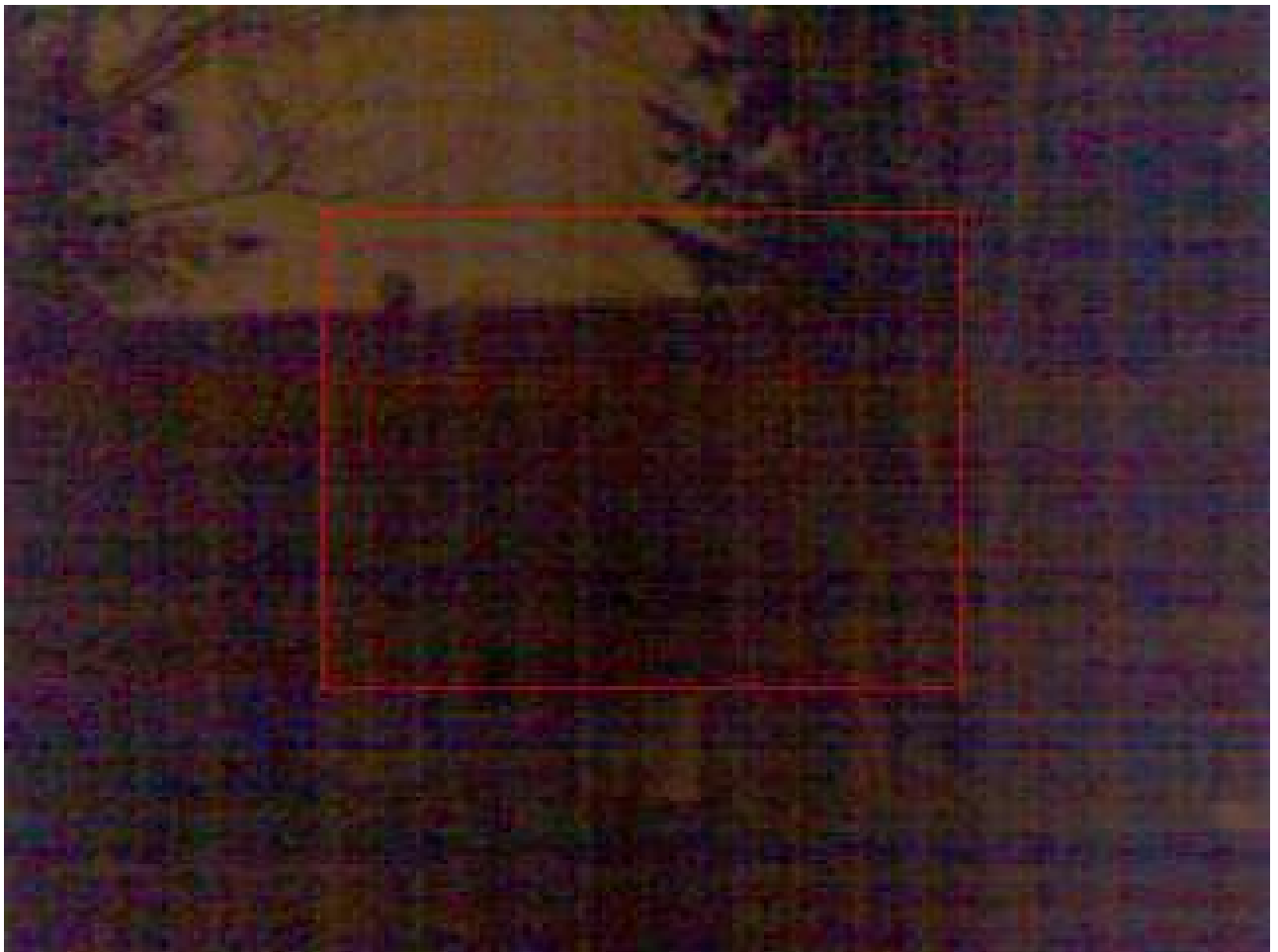
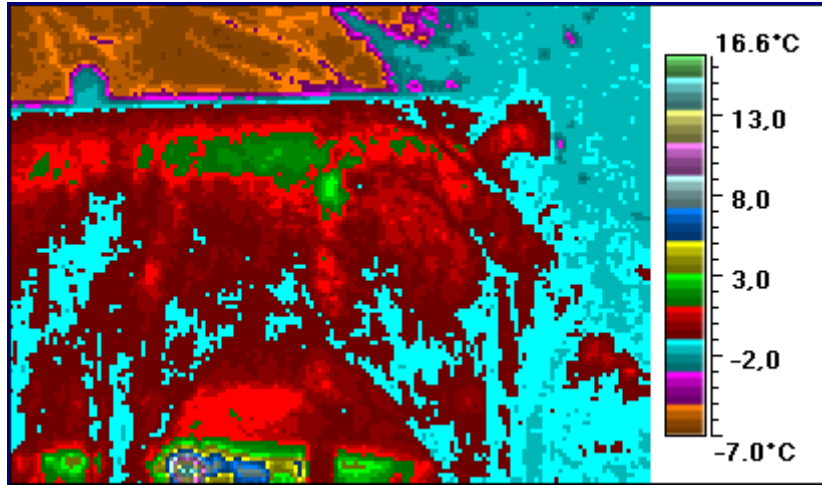
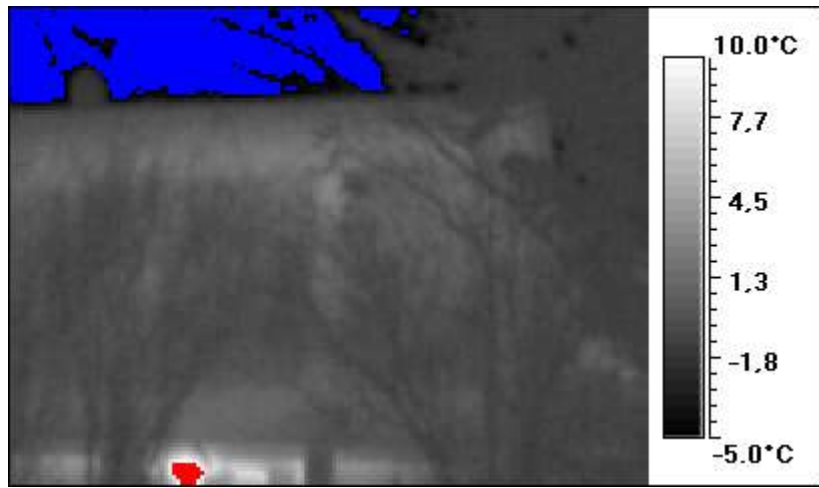
41 3,5 -4,1



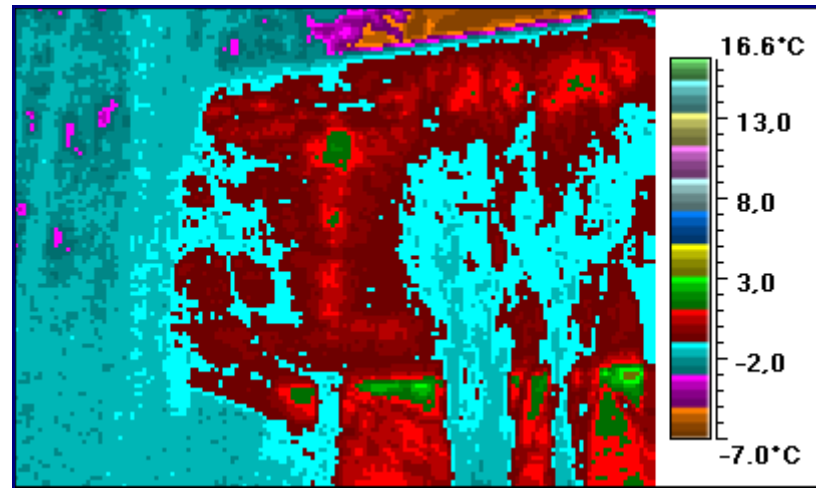
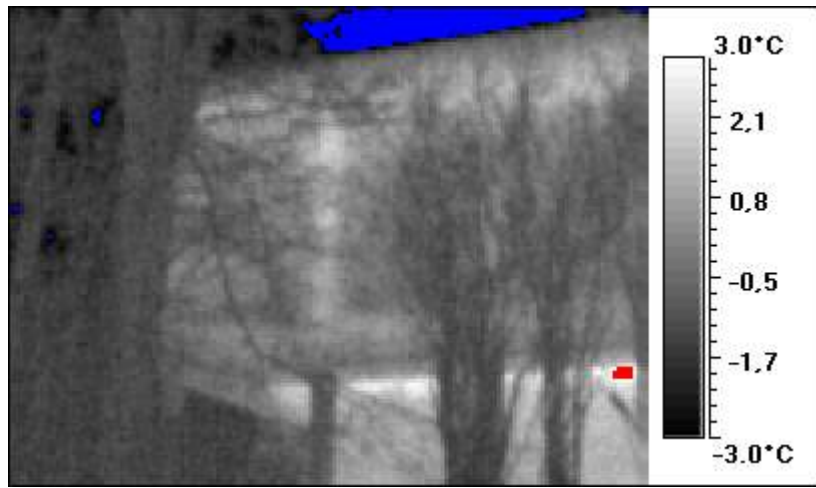
42 14,5 -2,0



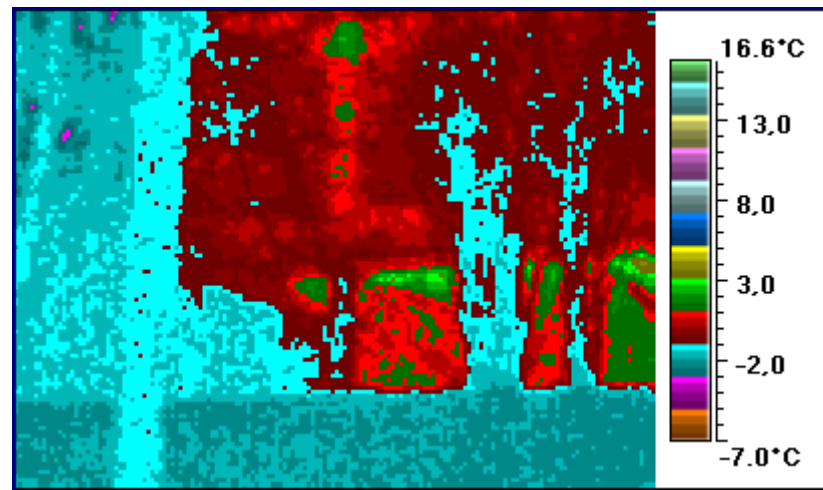
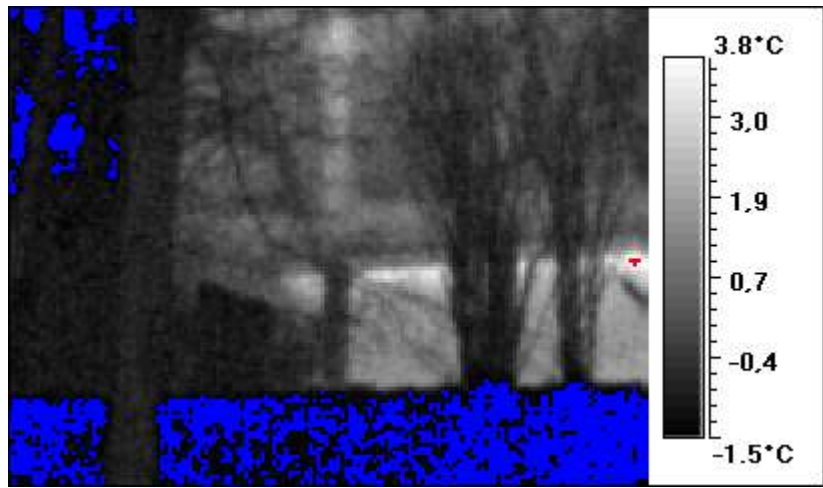
43 14,5 -6,1



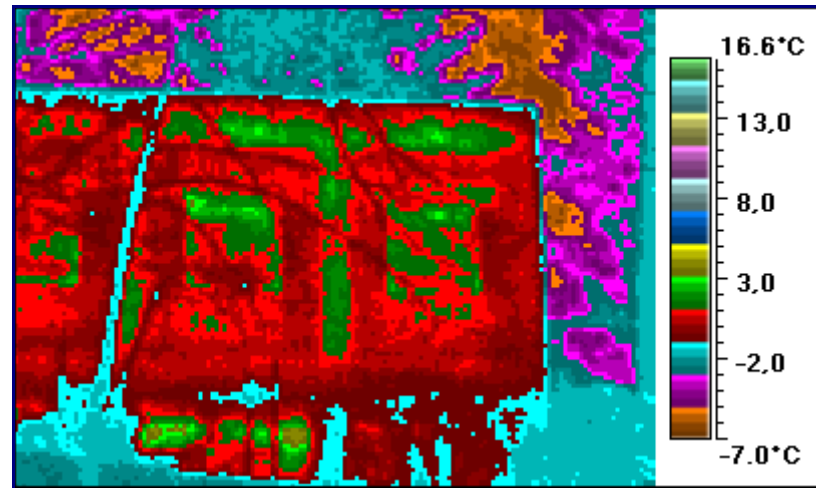
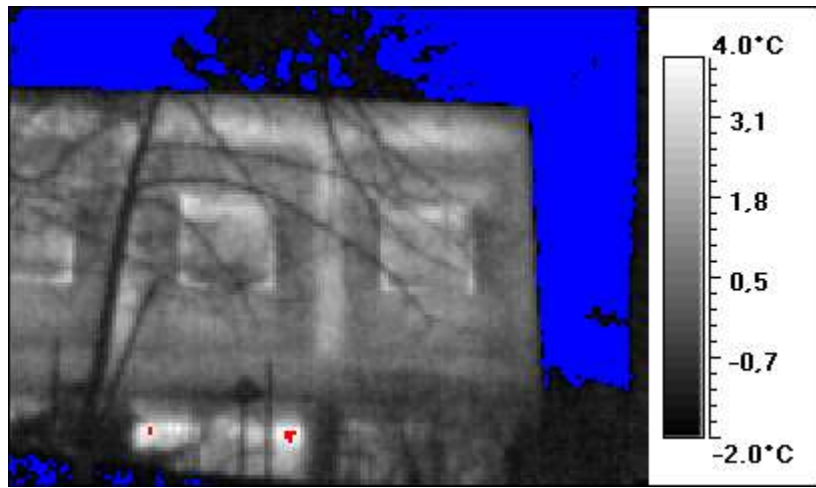
44 3,6 -6,0



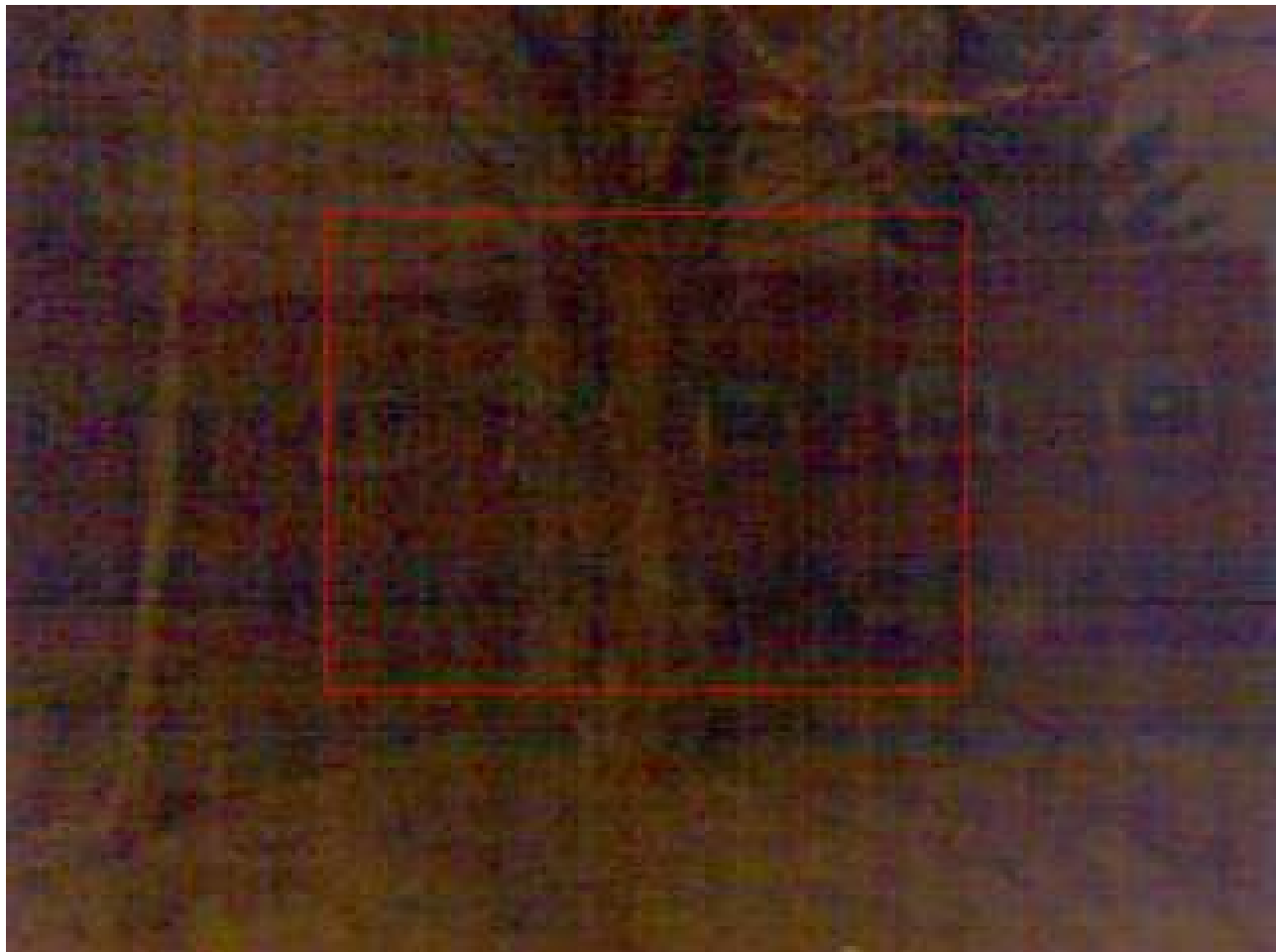
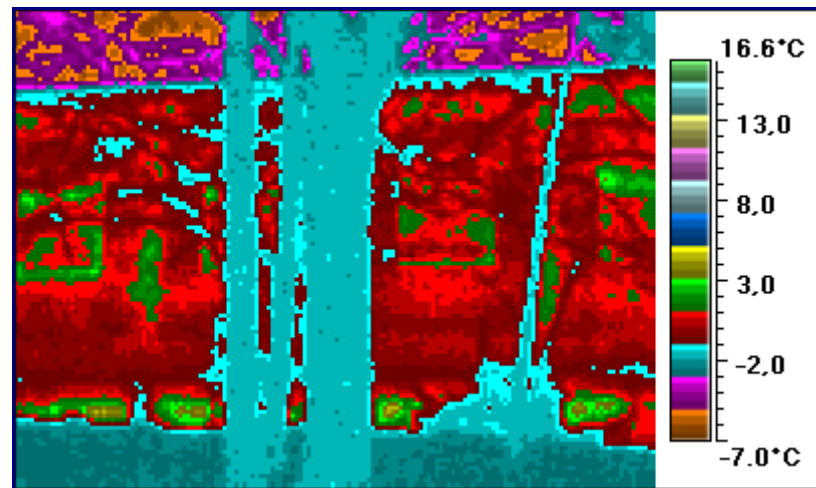
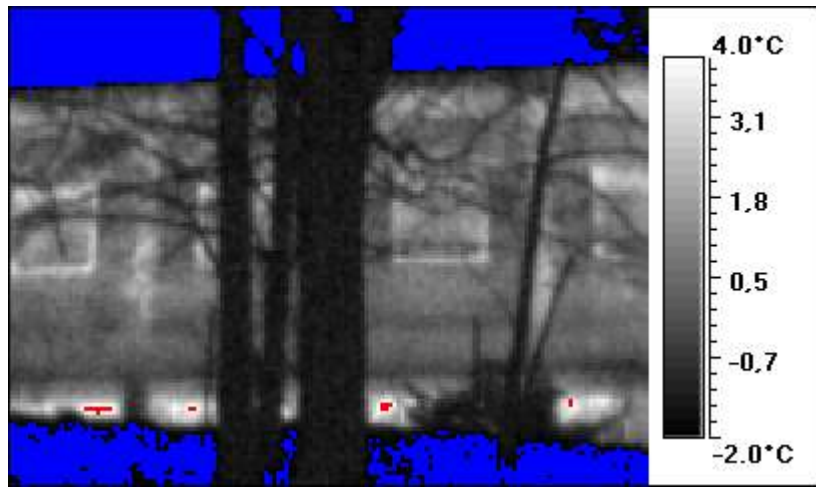
45 4,0 -3,1



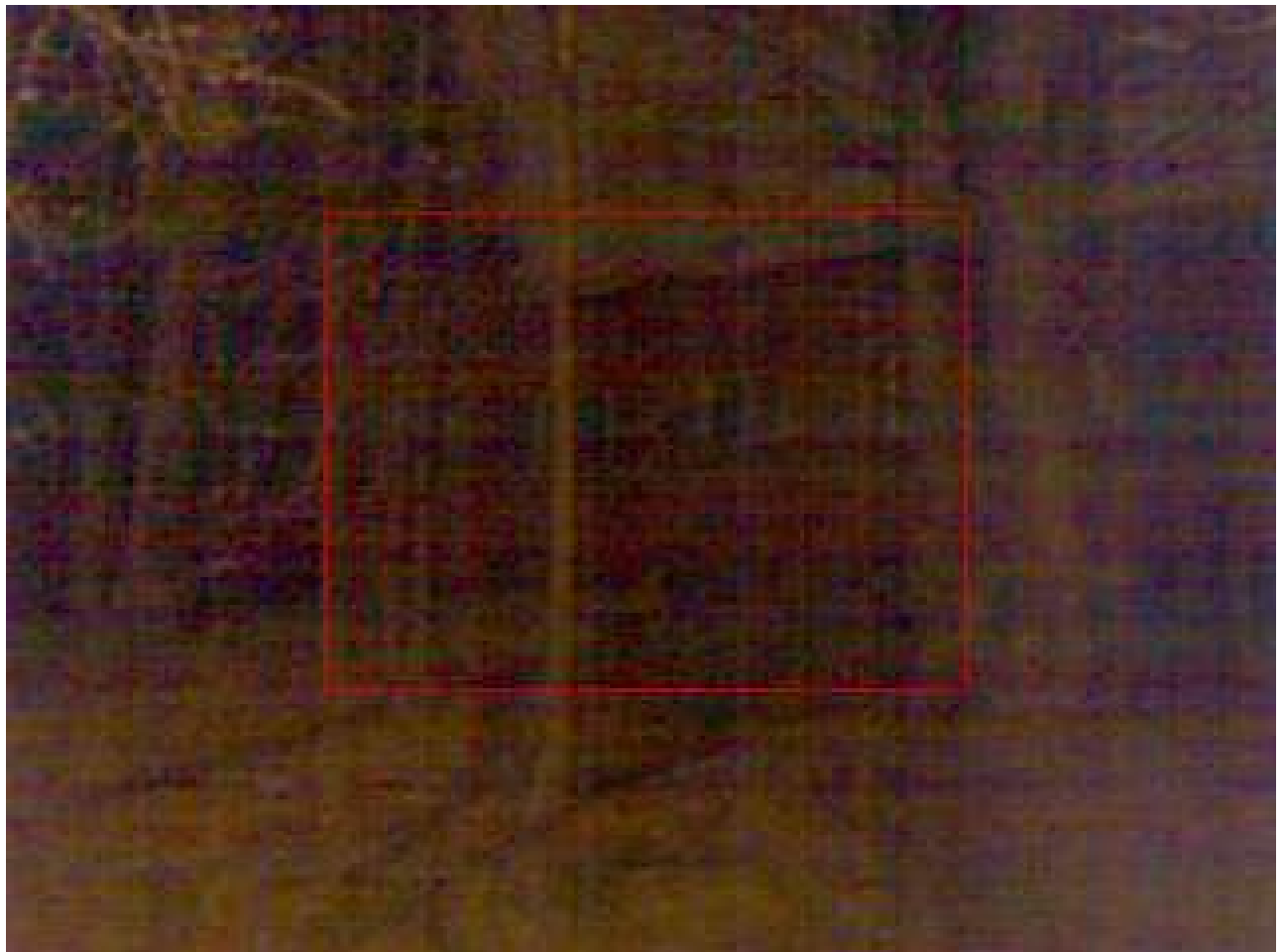
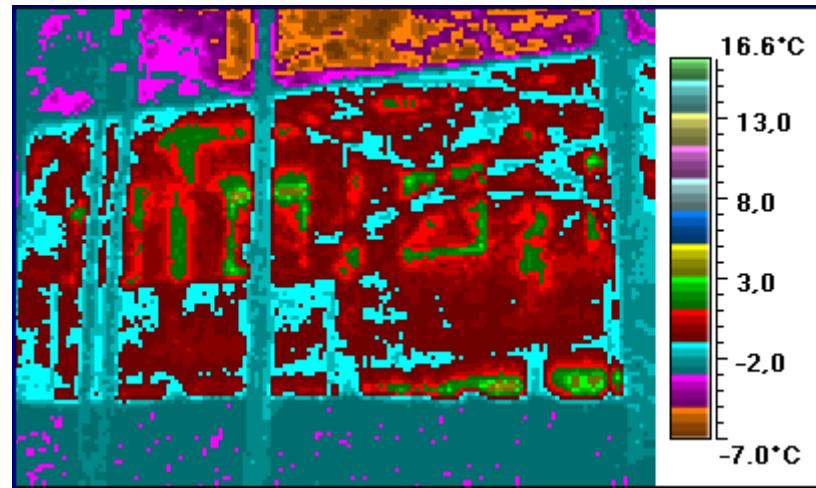
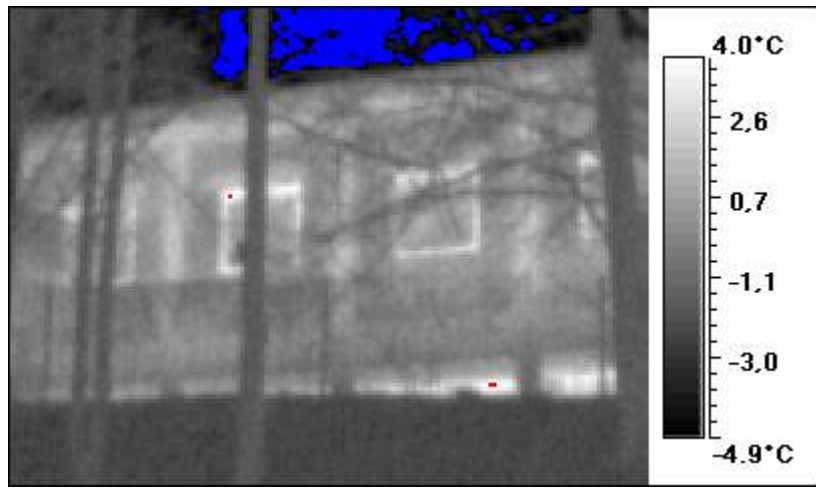
46 4,2 -6,0



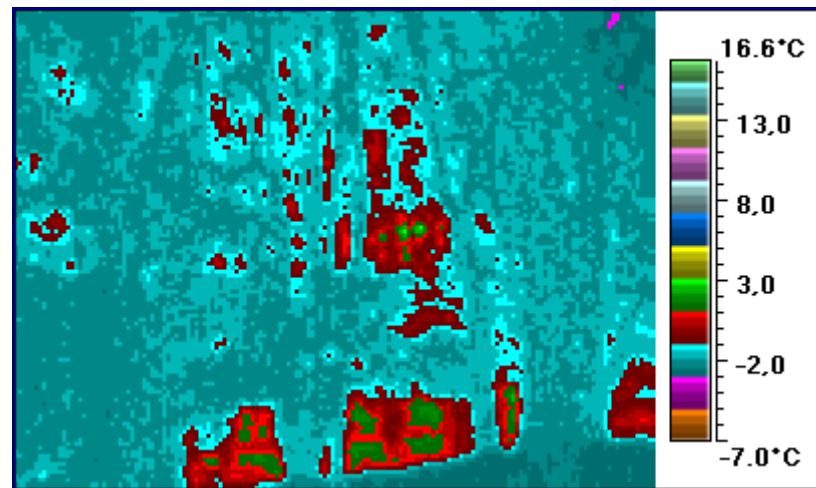
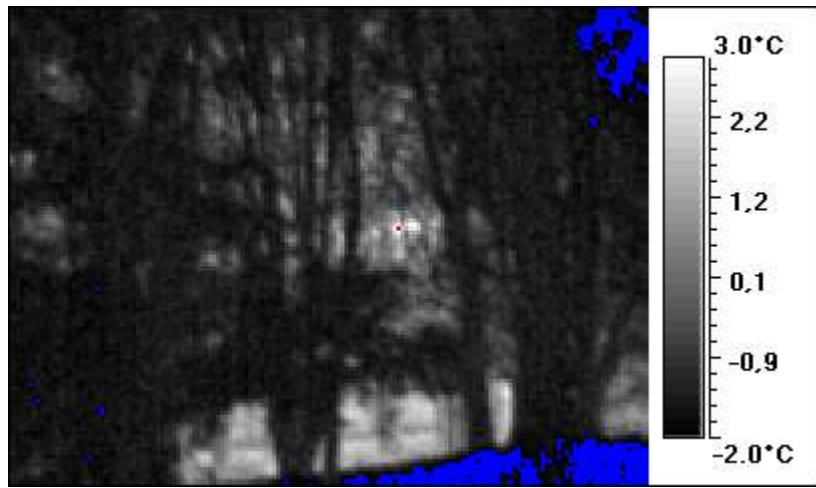
47 4,7 -5,9



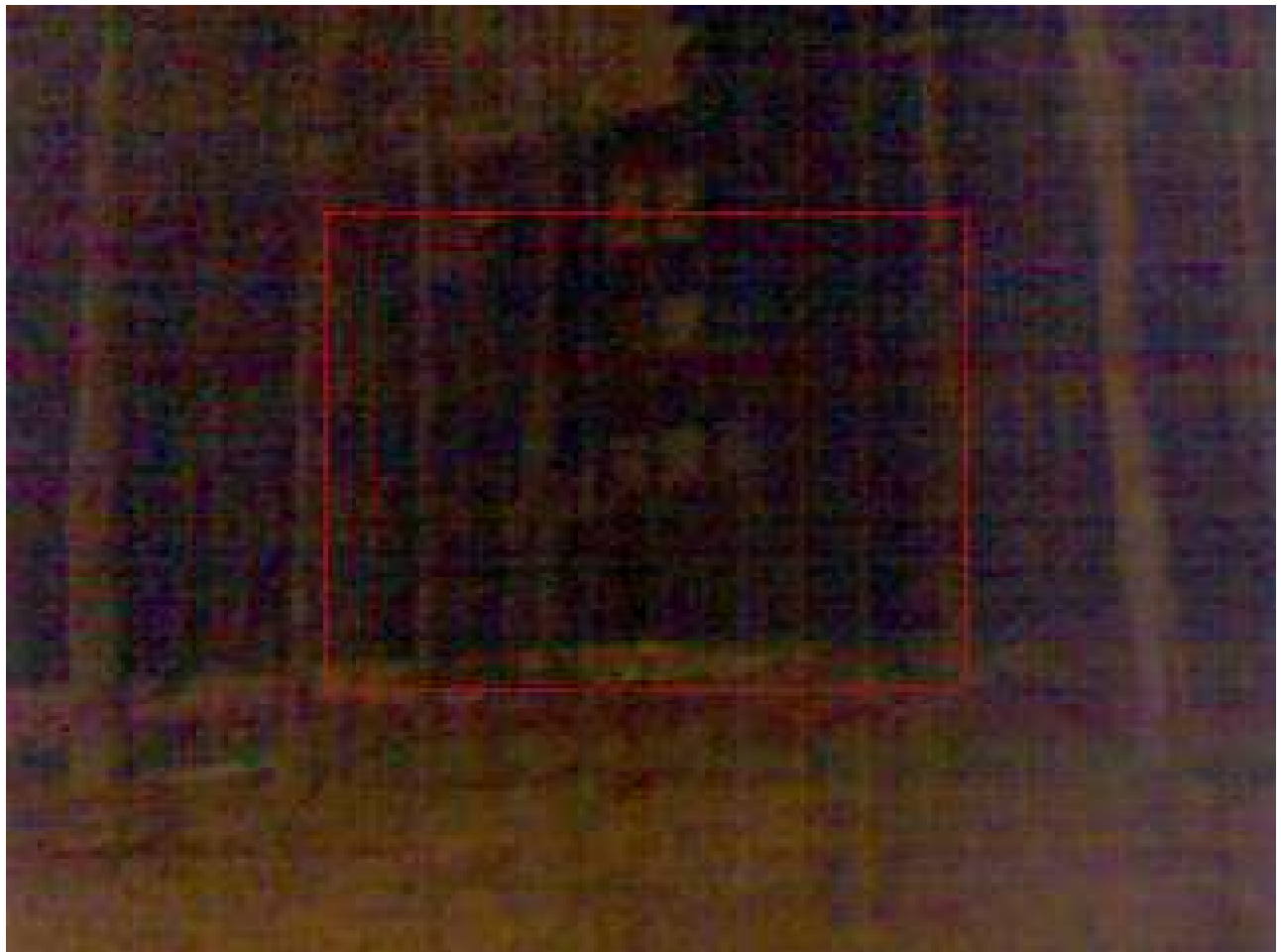
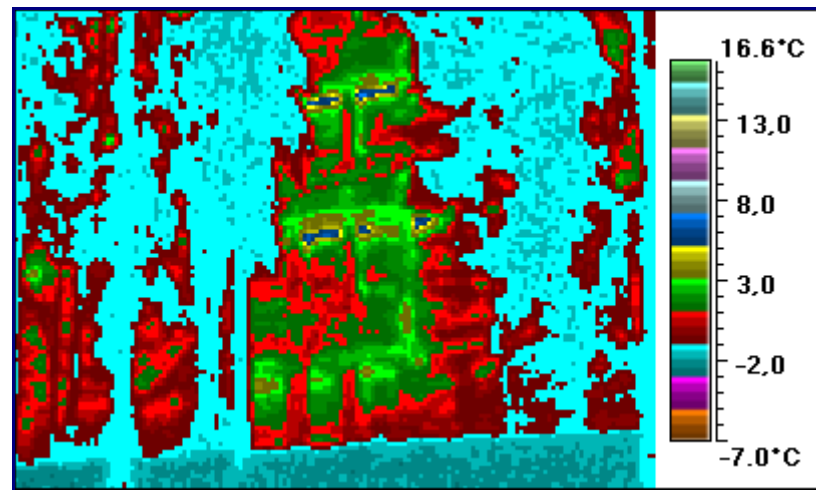
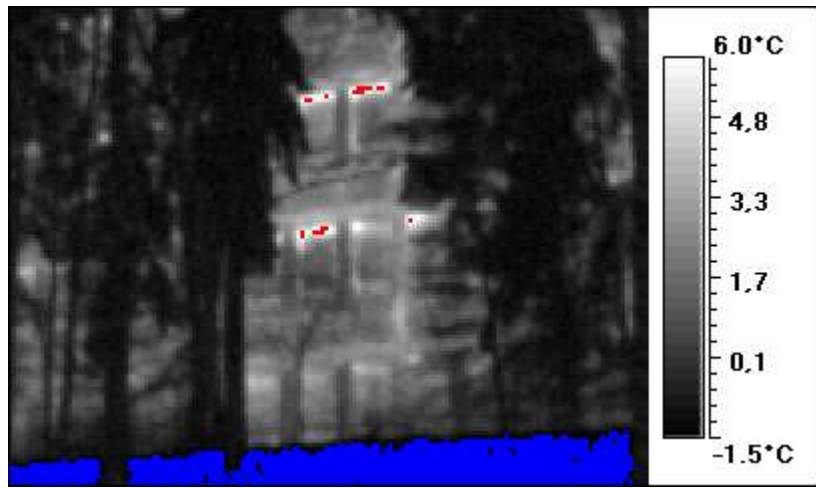
48 4,5 -6,3



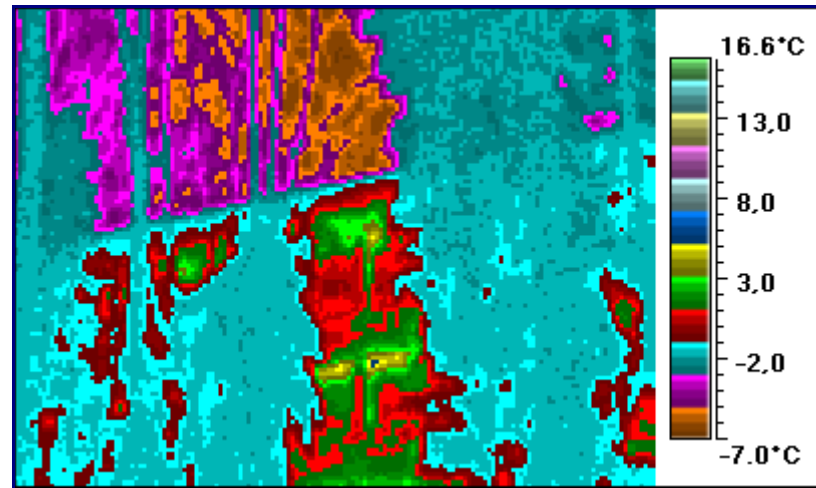
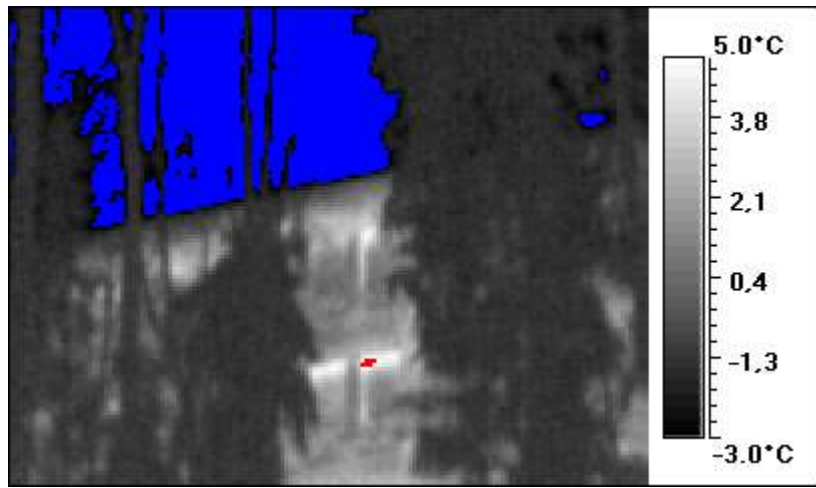
49 3,2 -2,7



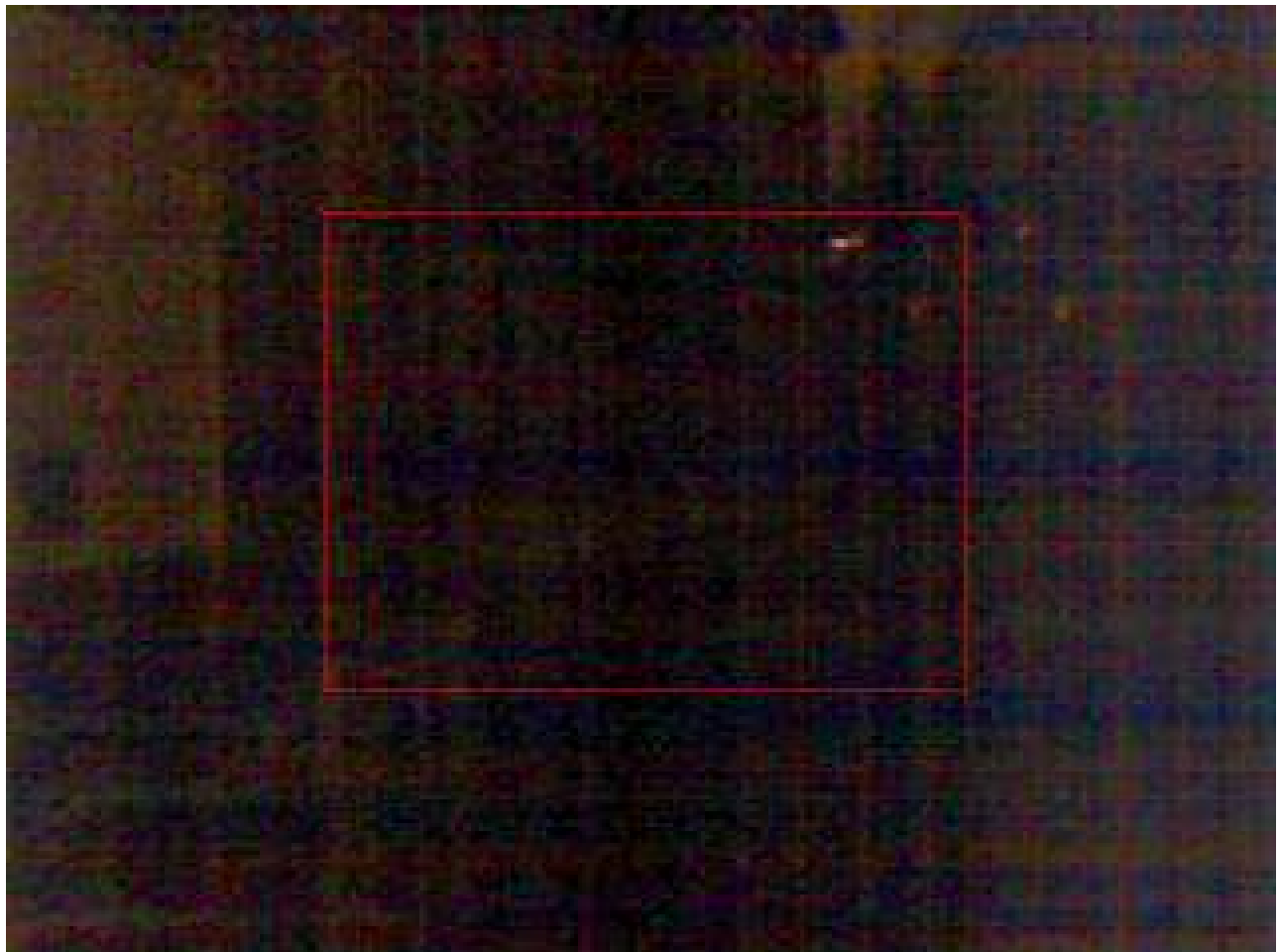
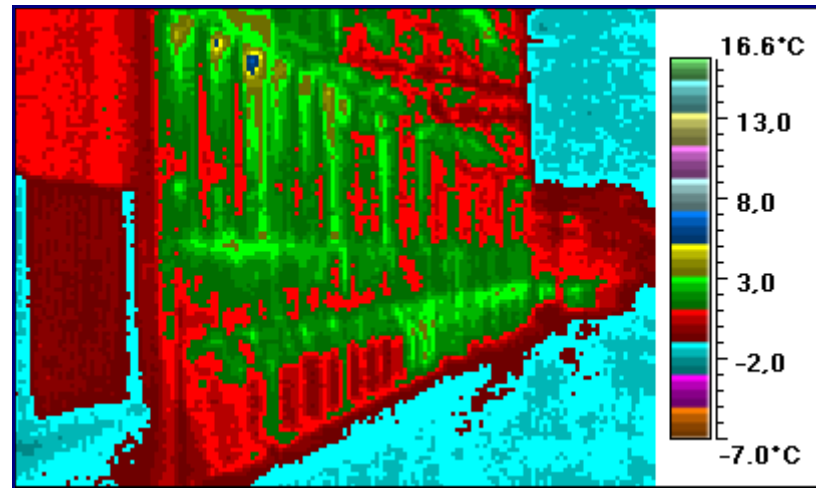
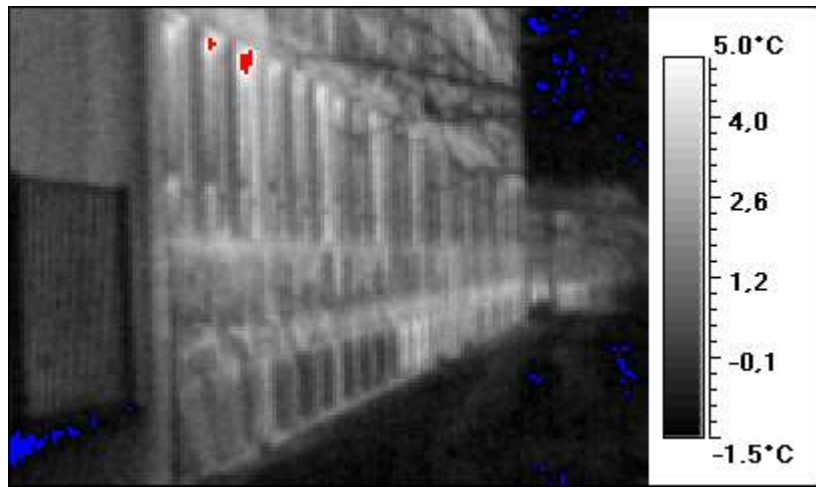
50 6,8 -2,1



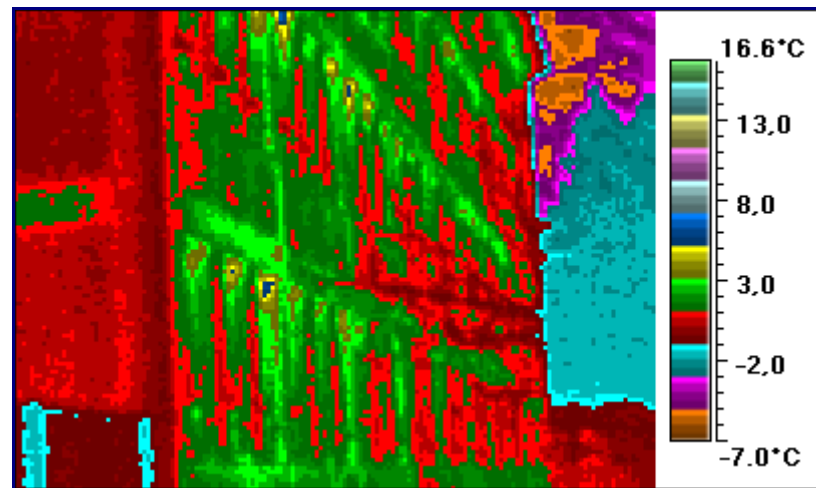
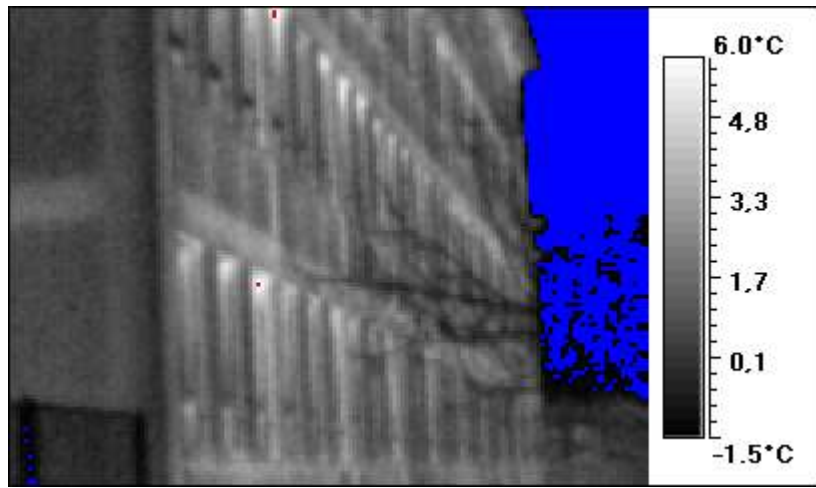
51 5,5 -6,2



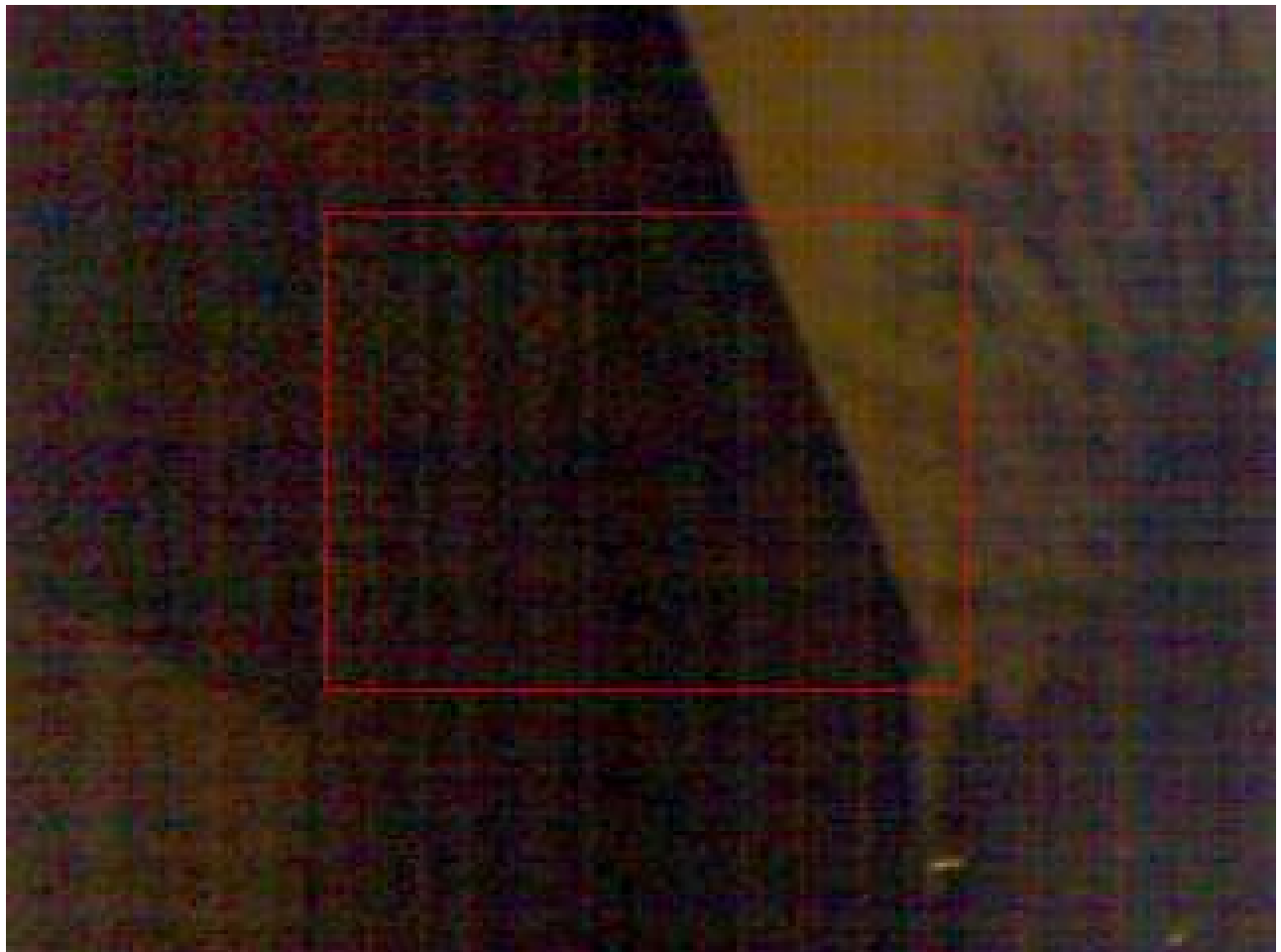
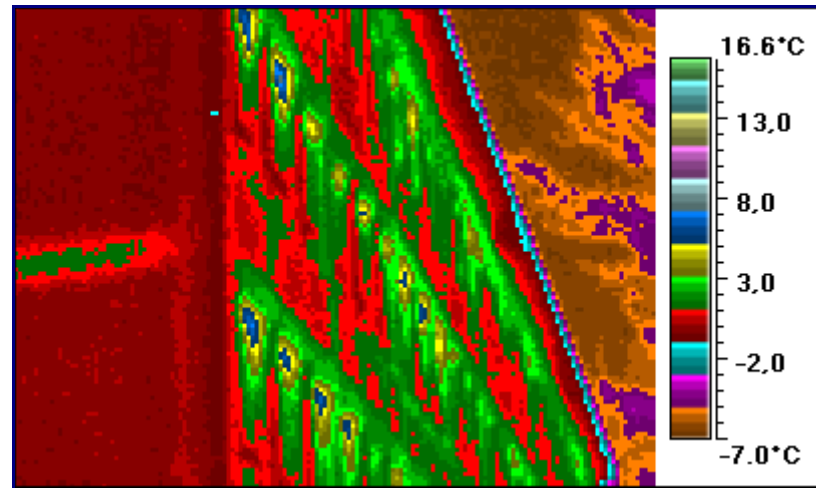
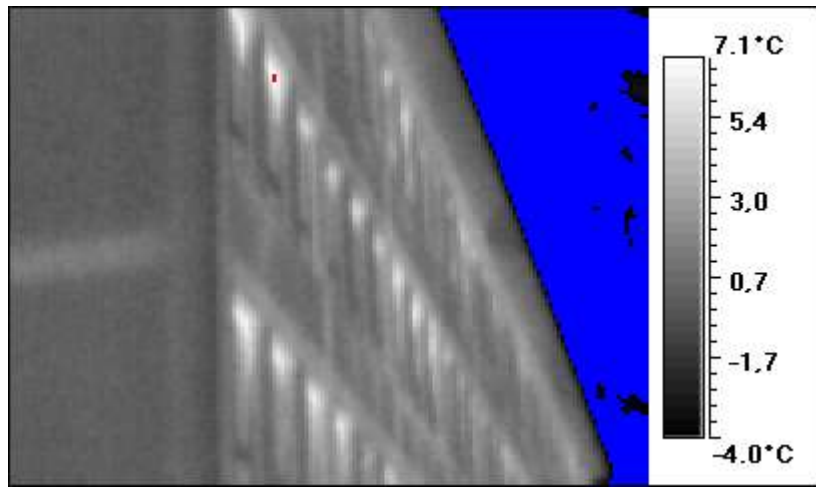
52 6,2 -1,9



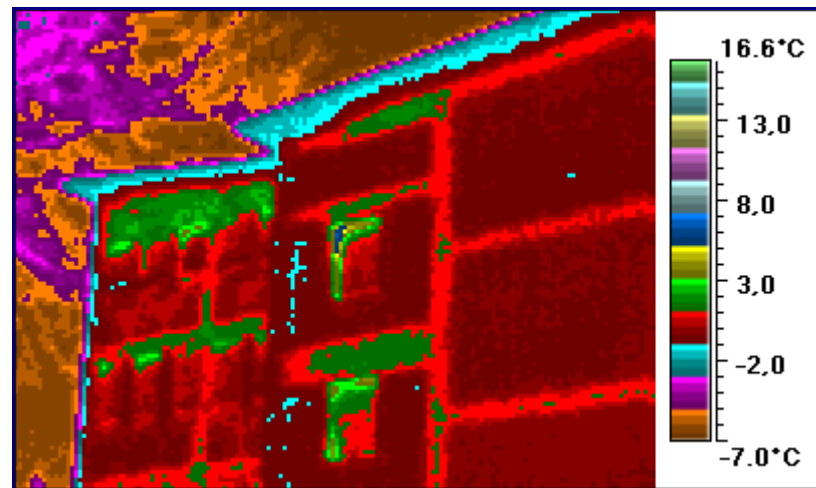
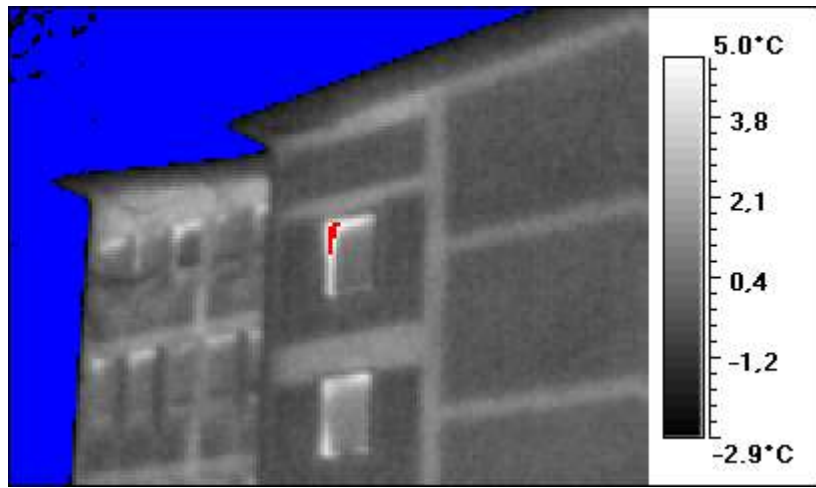
53 6,4 -5,6



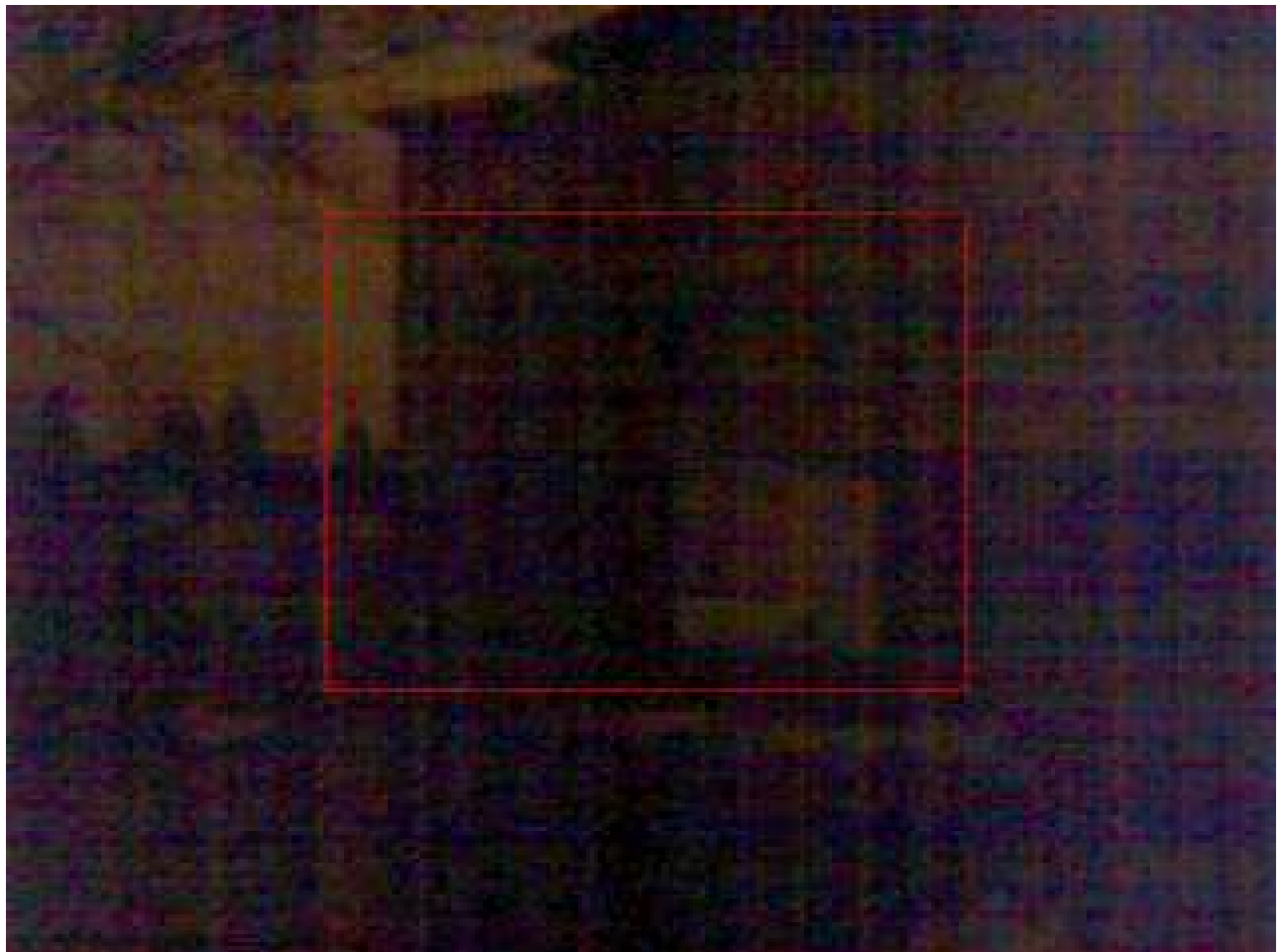
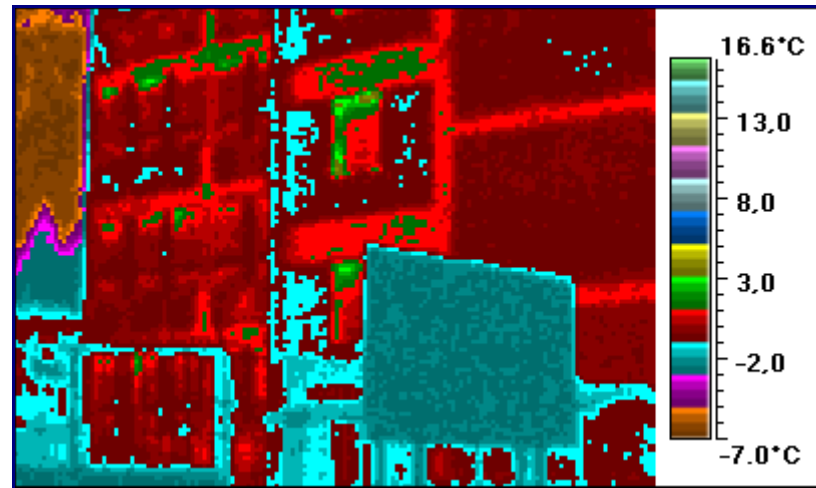
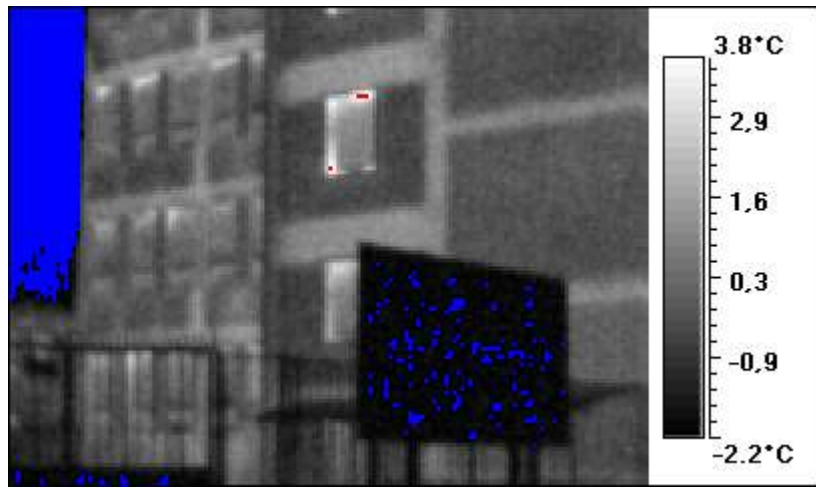
54 7,3 -6,5



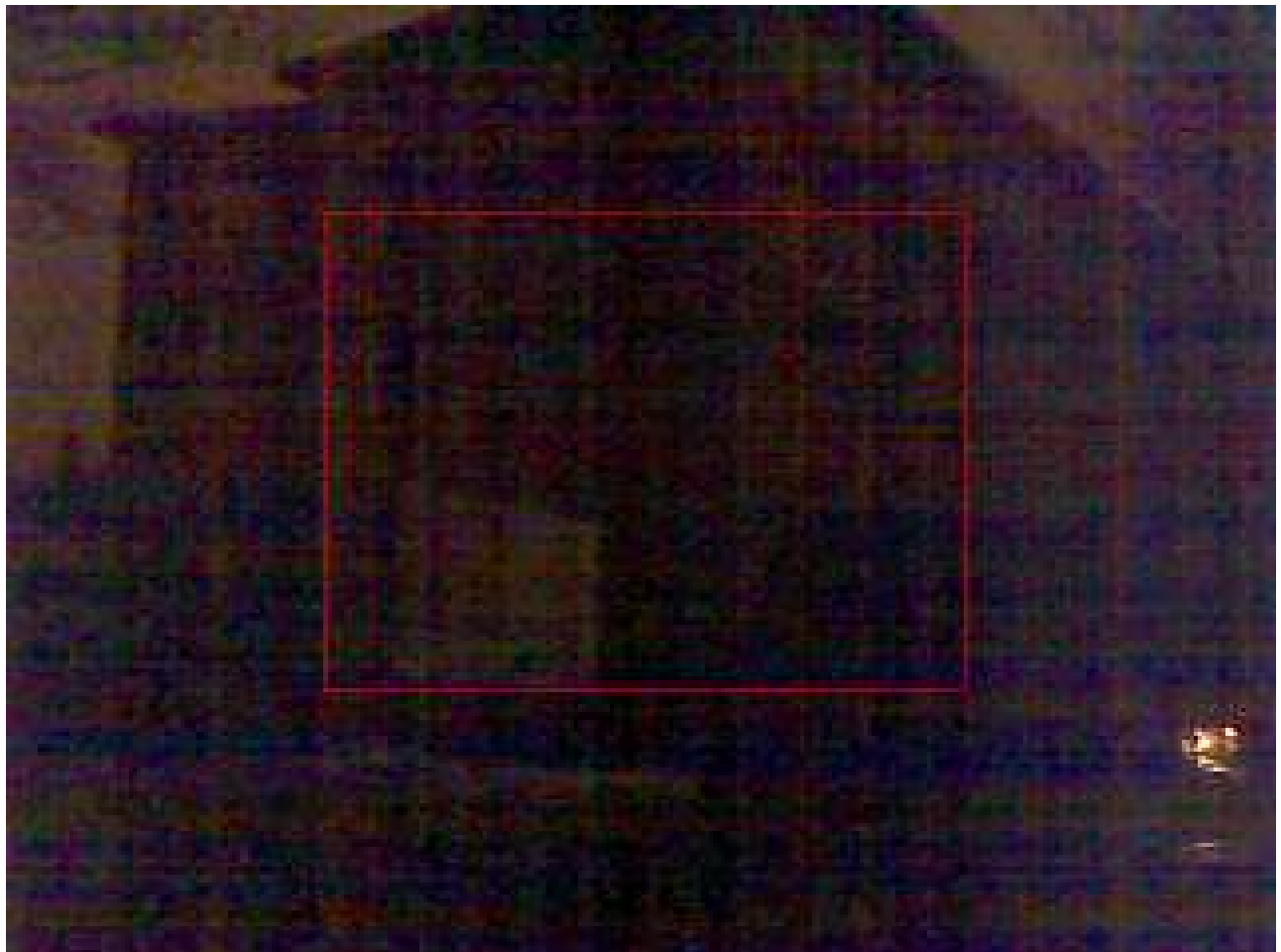
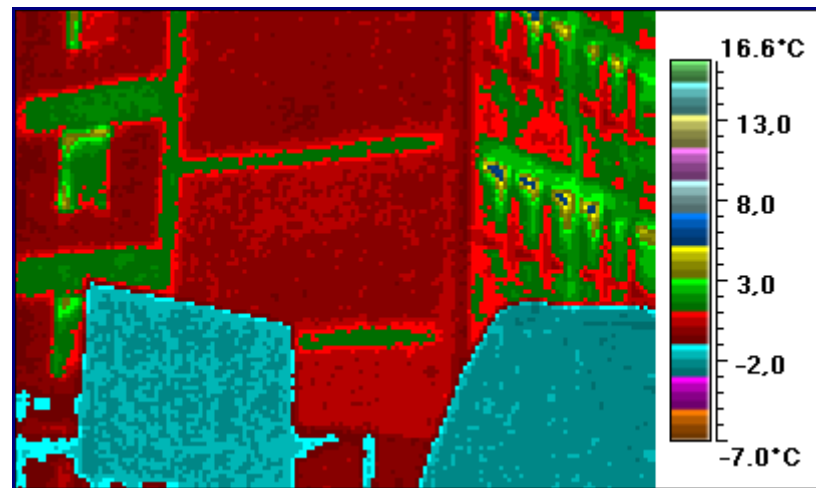
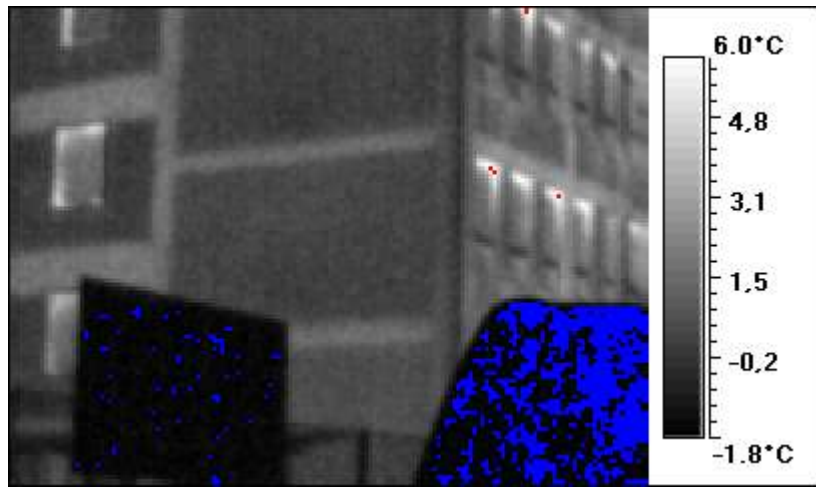
55 6,2 -6,5



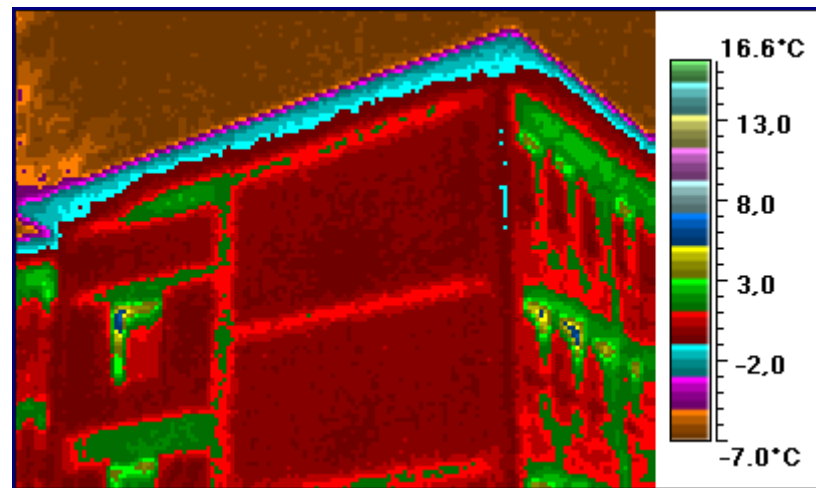
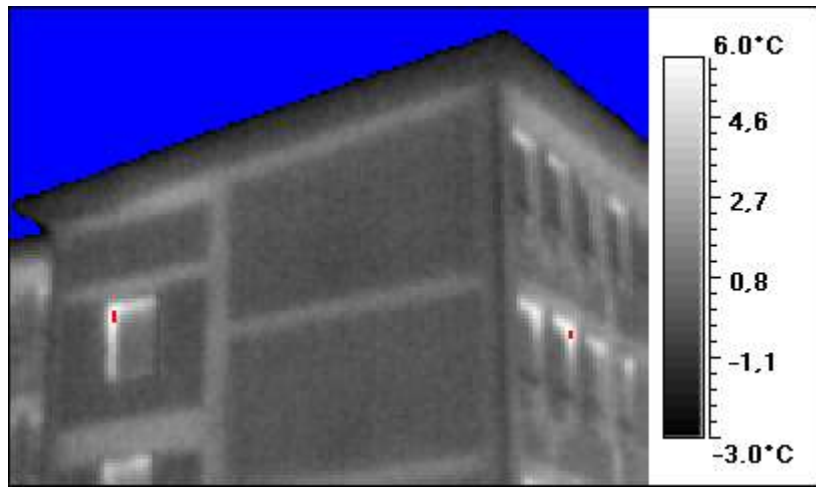
56 4,0 -6,5



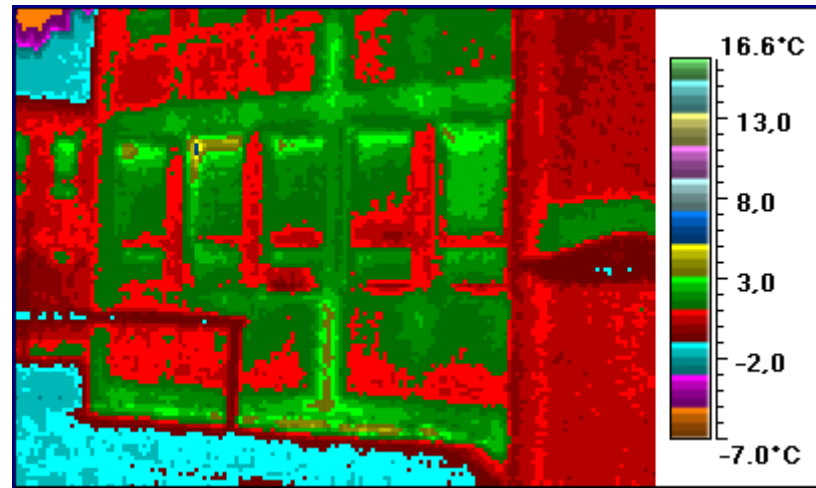
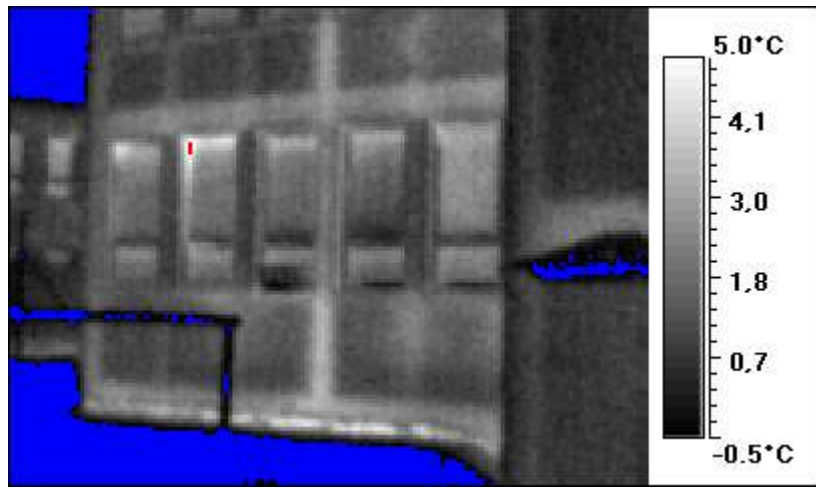
57 6,4 -2,3



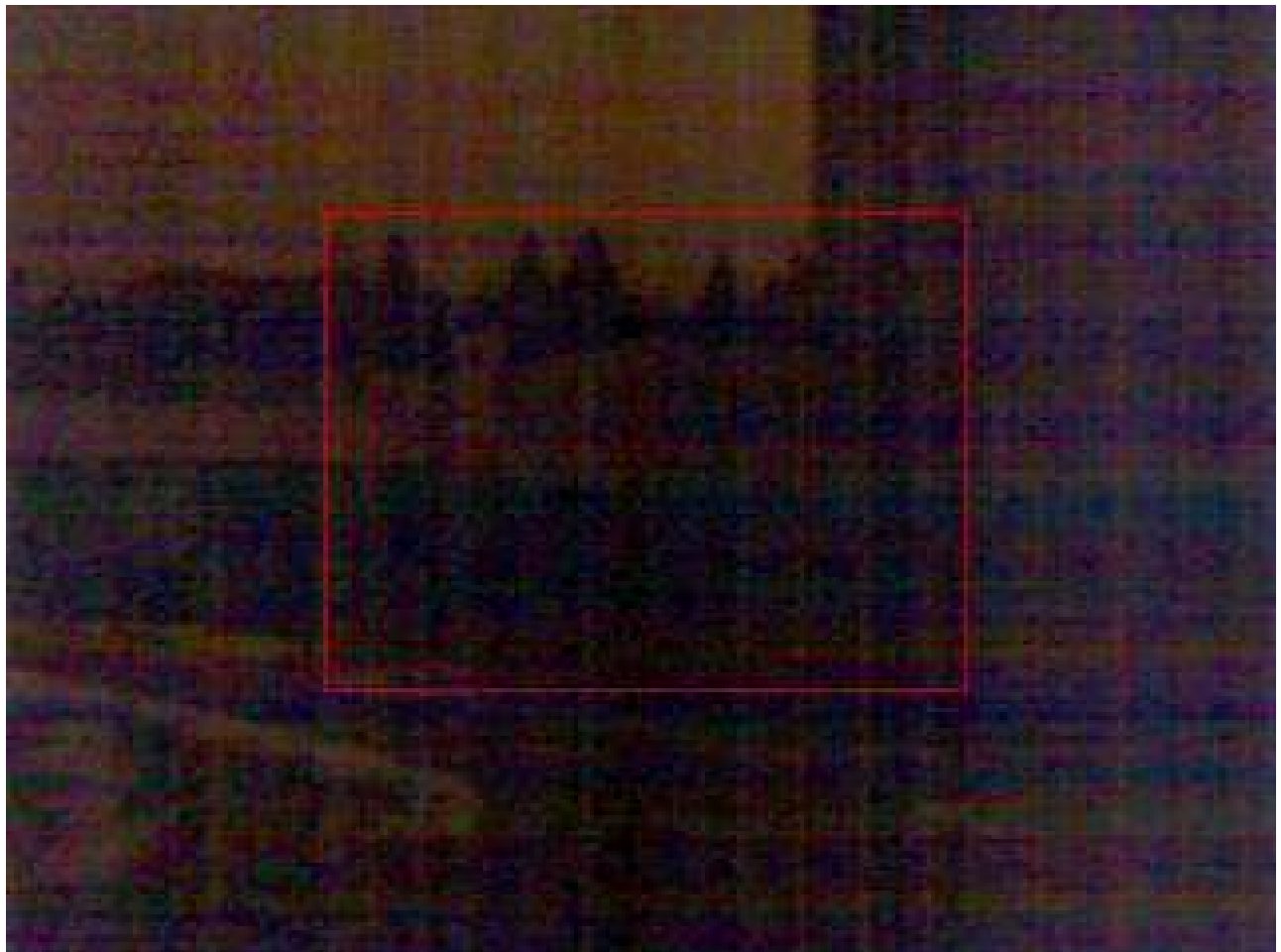
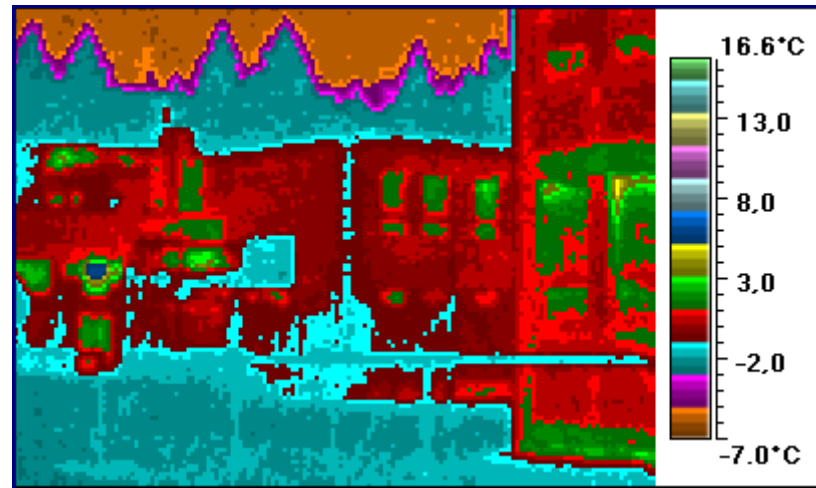
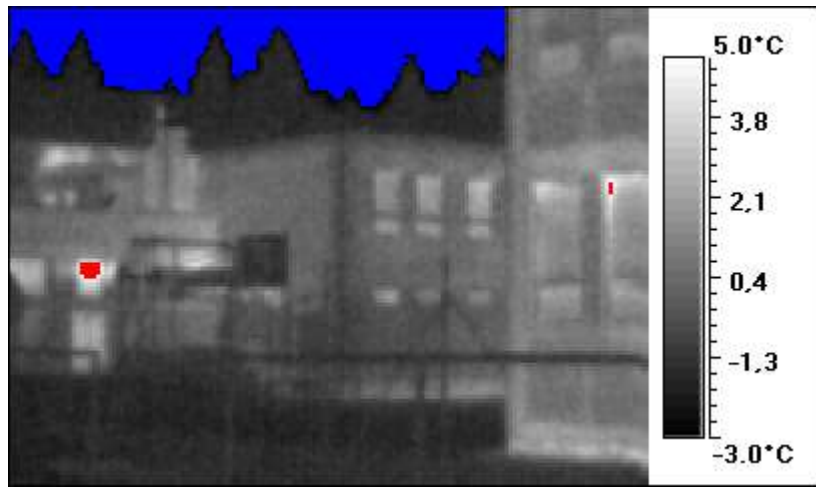
58 6,5 -6,5



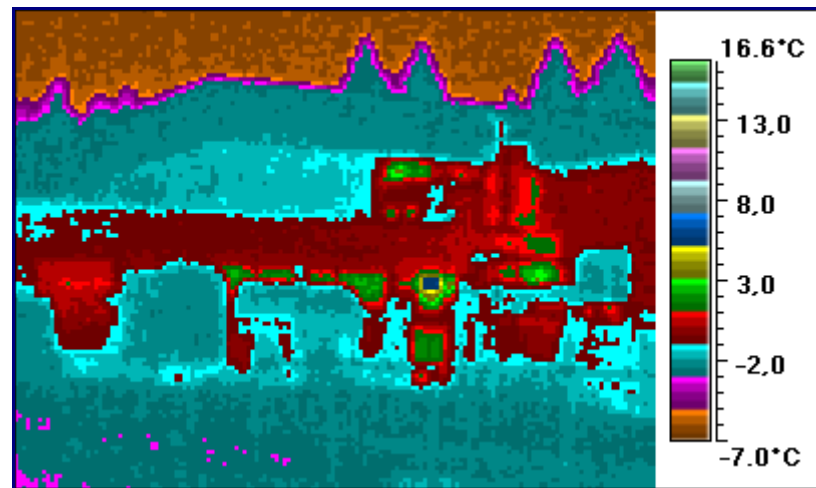
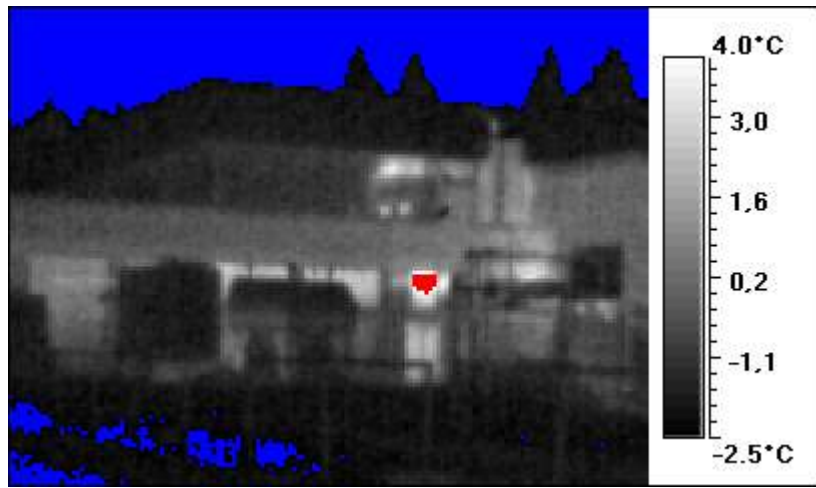
59 5,9 -4,9



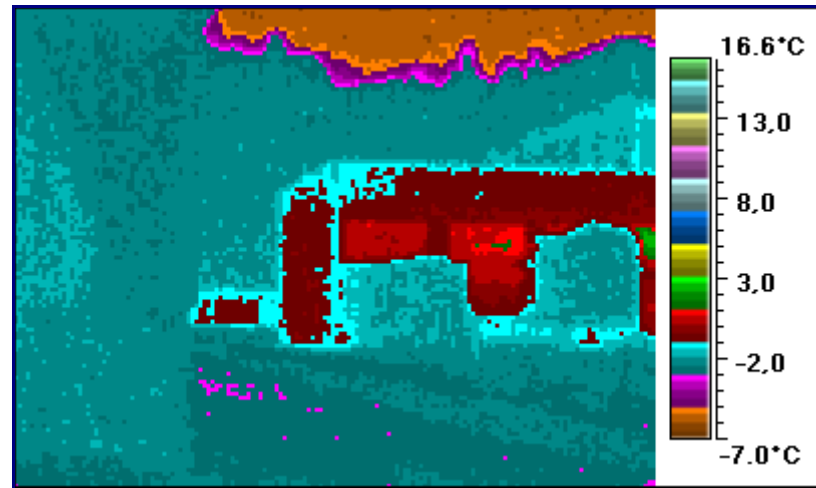
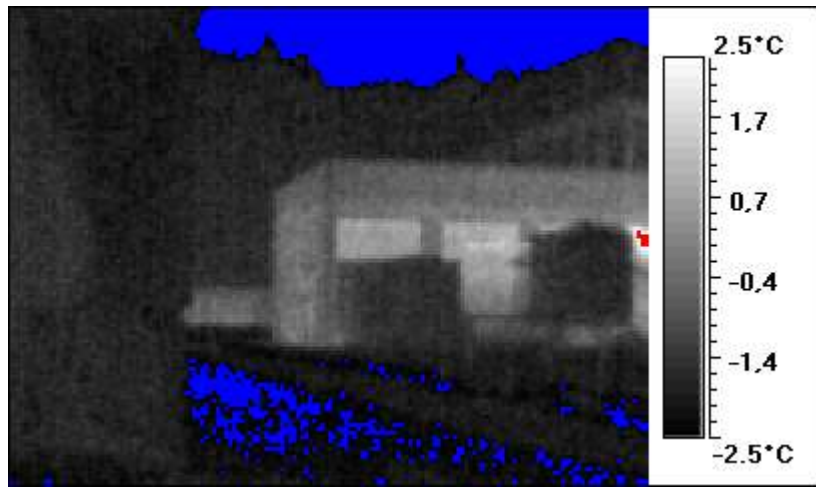
60 6,0 -5,6



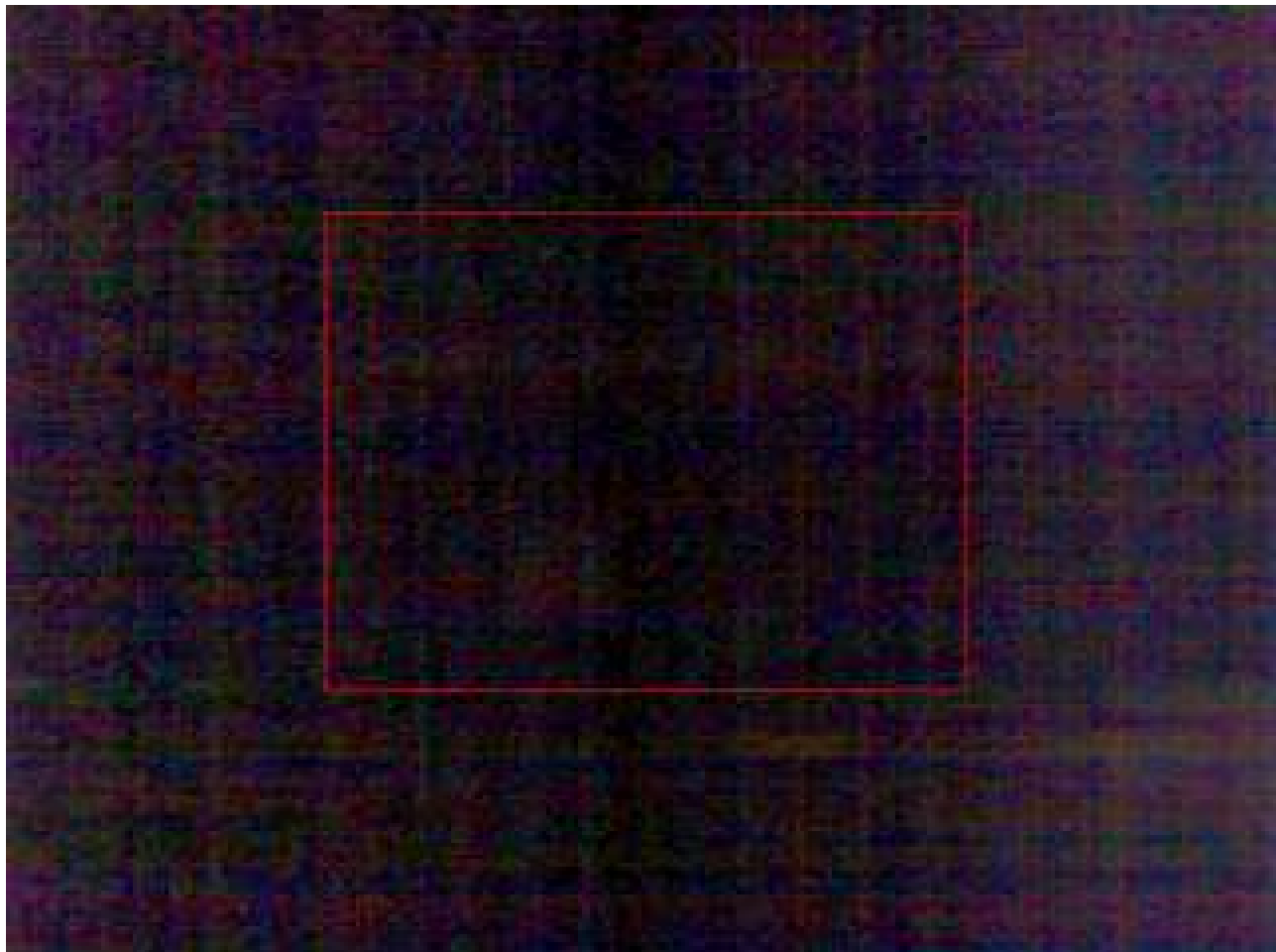
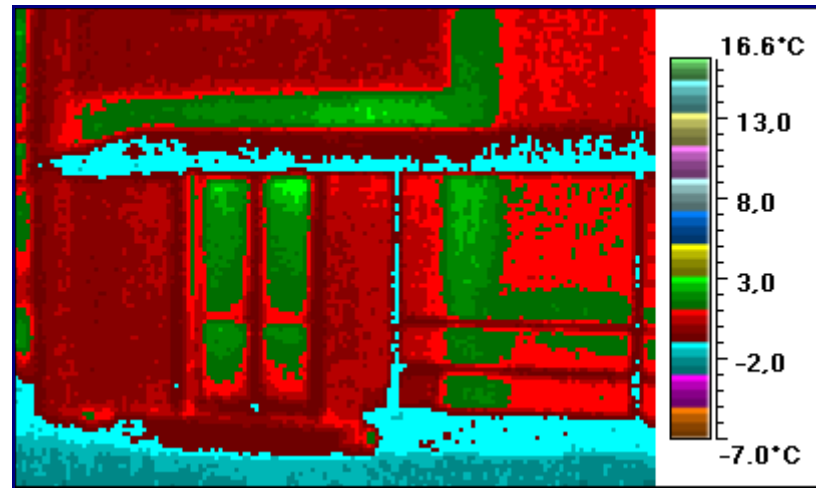
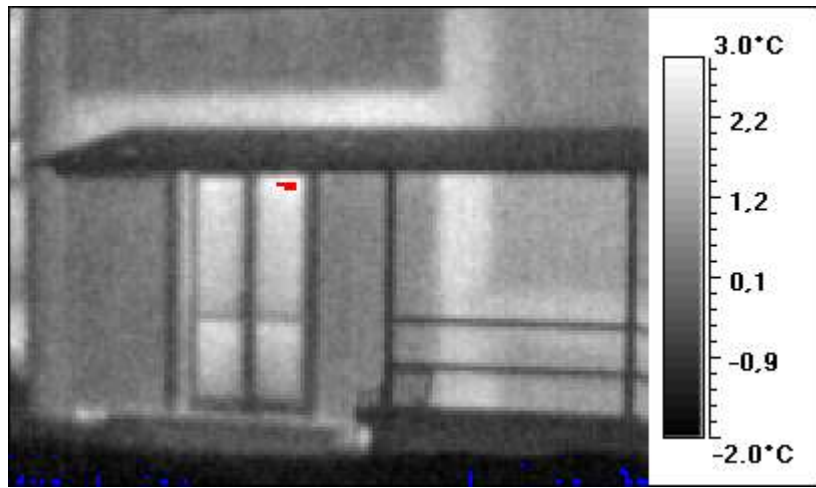
61 6,0 -6,1



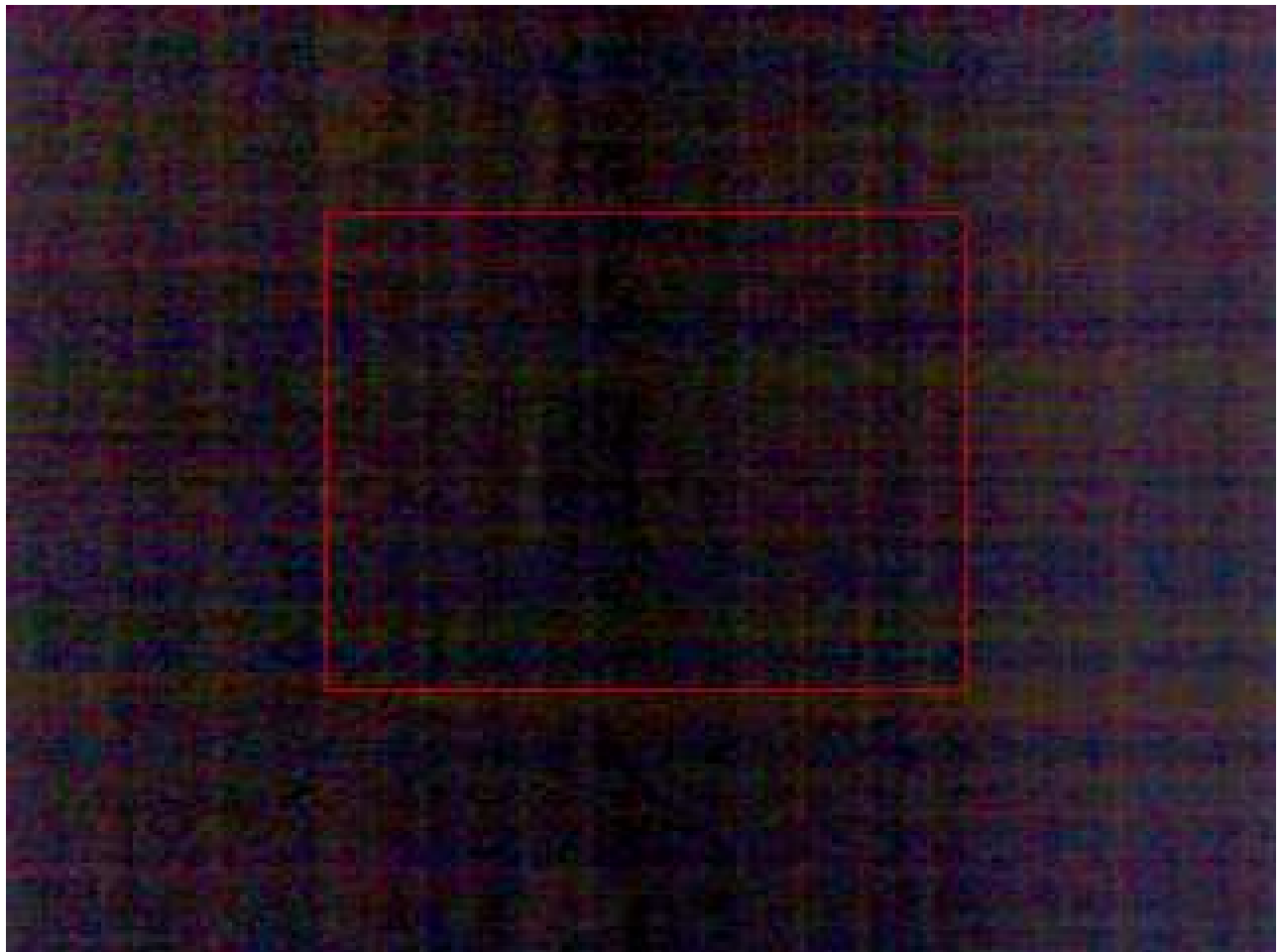
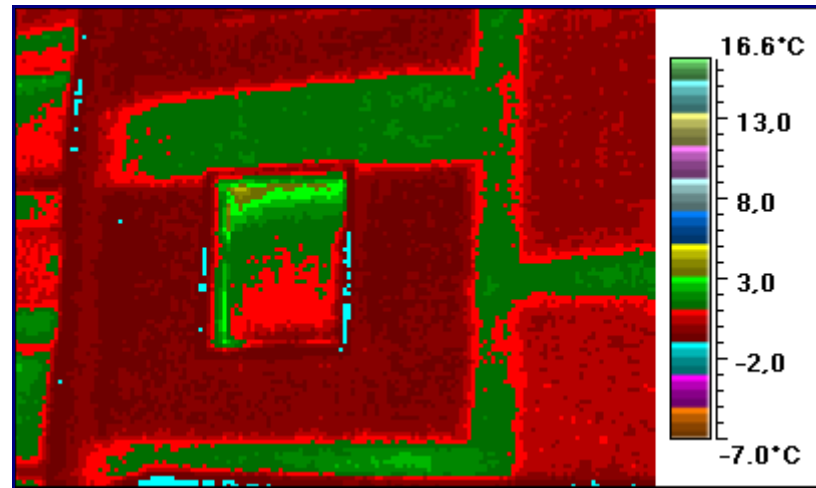
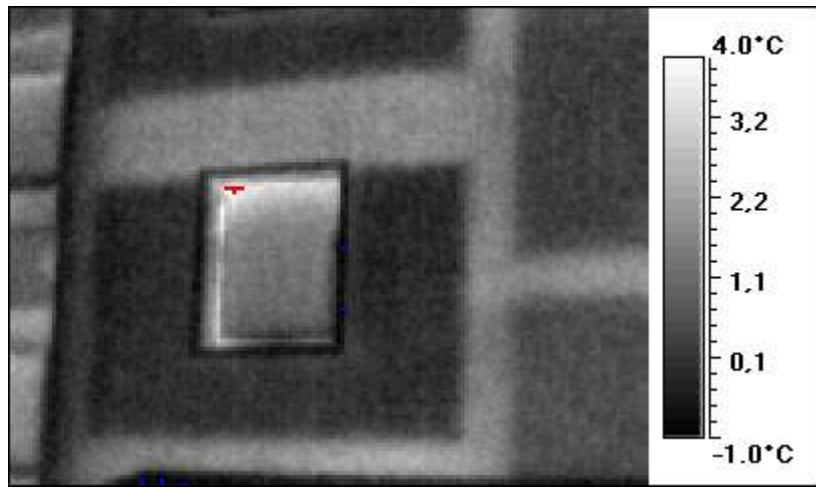
62 2,7 -5,6



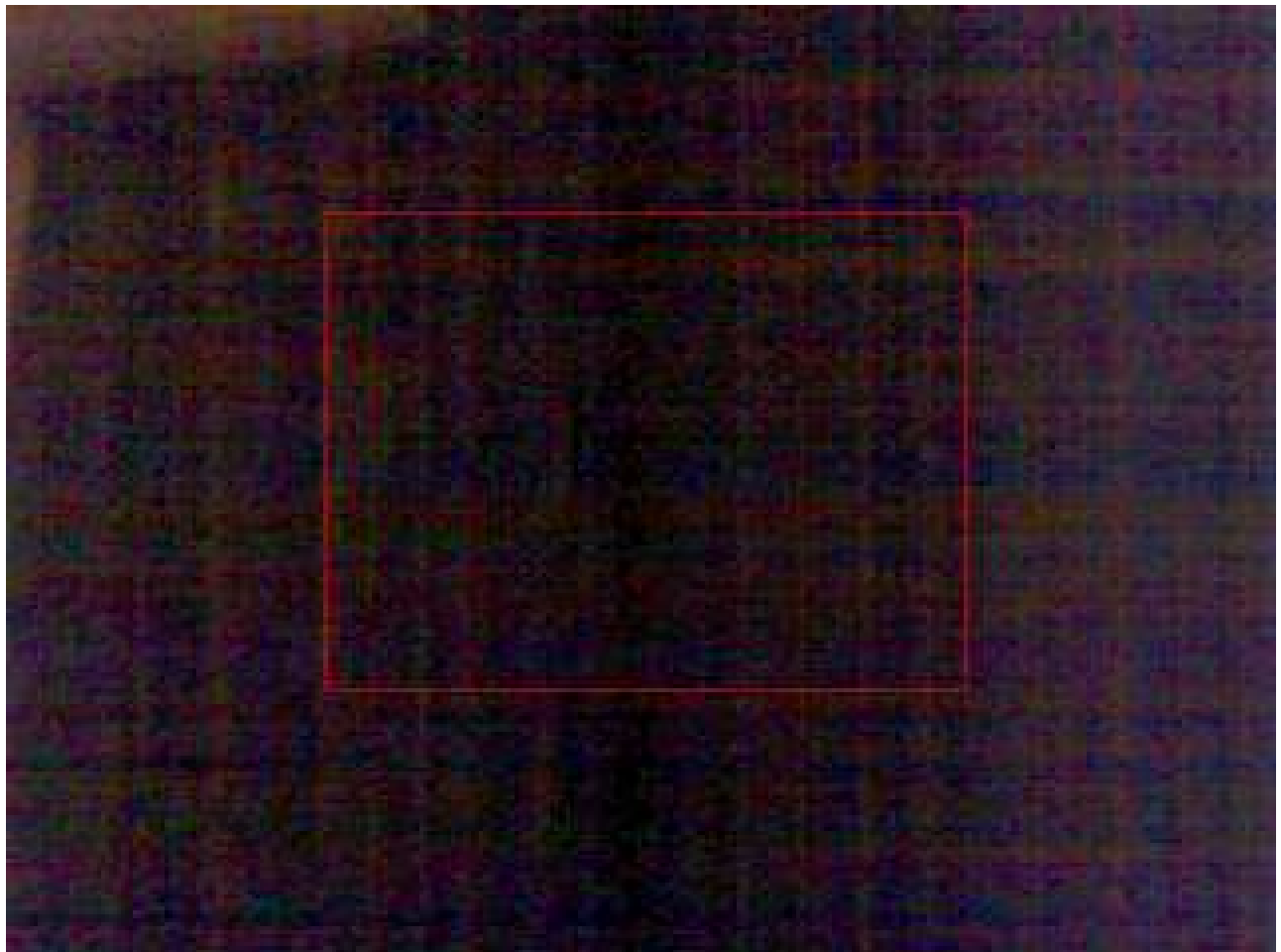
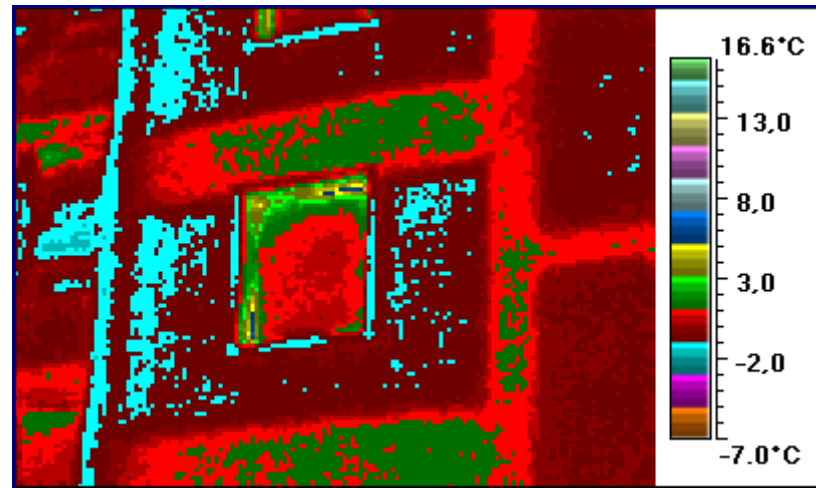
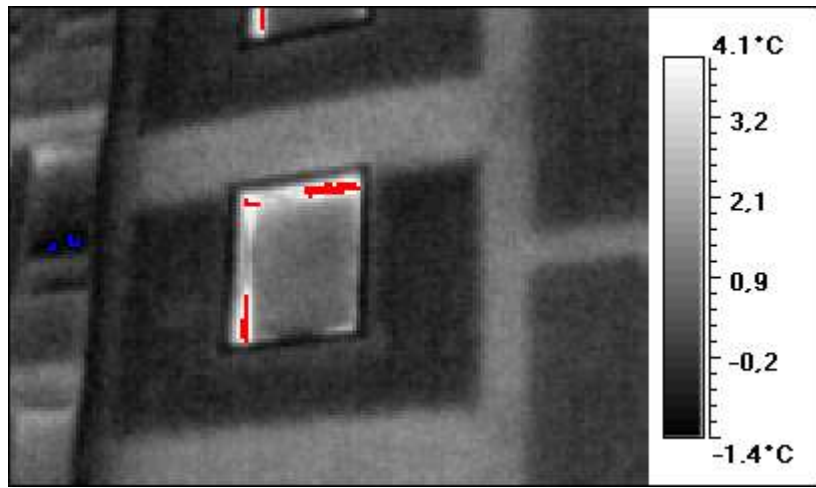
63 3,1 -2,2



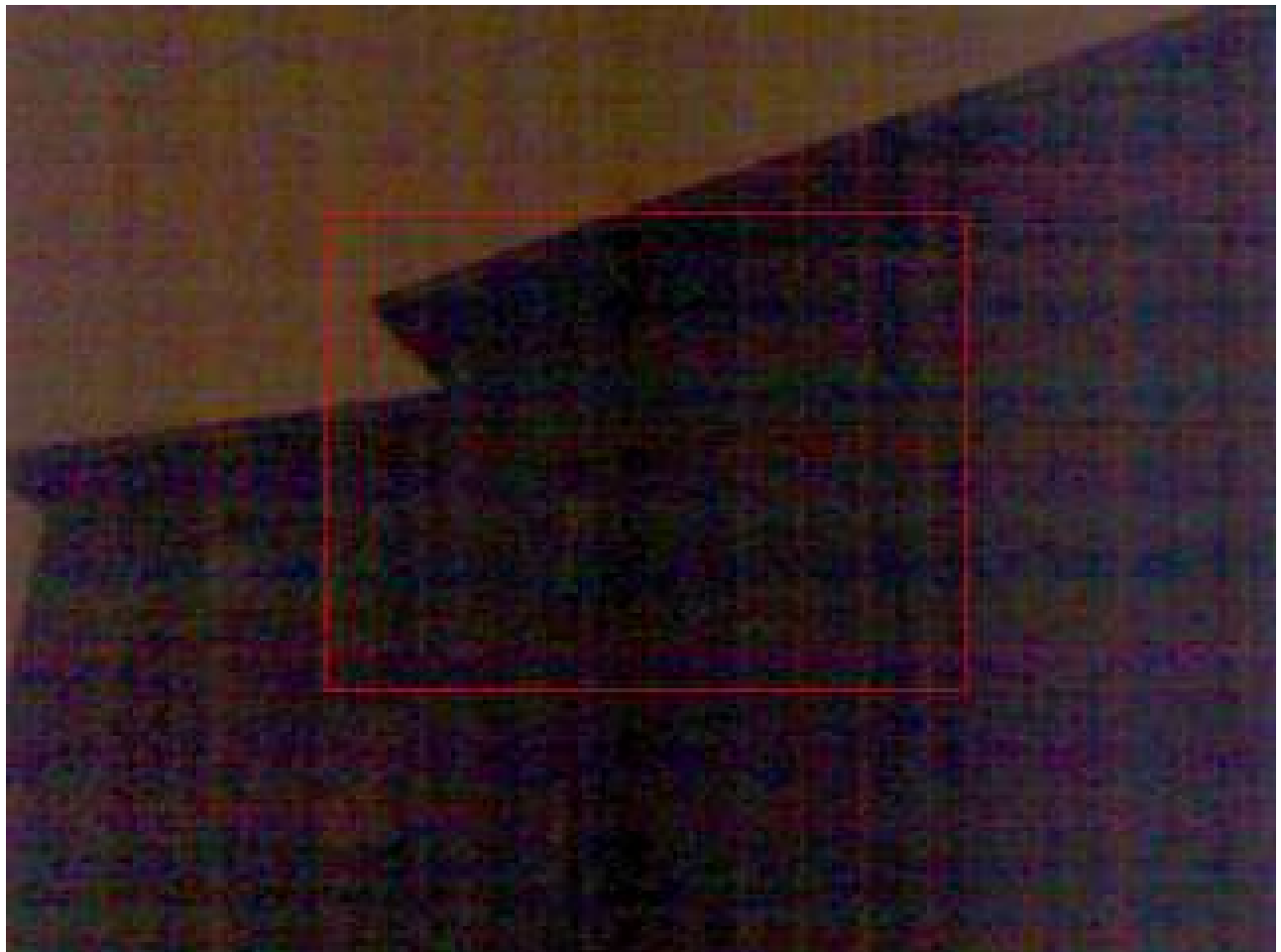
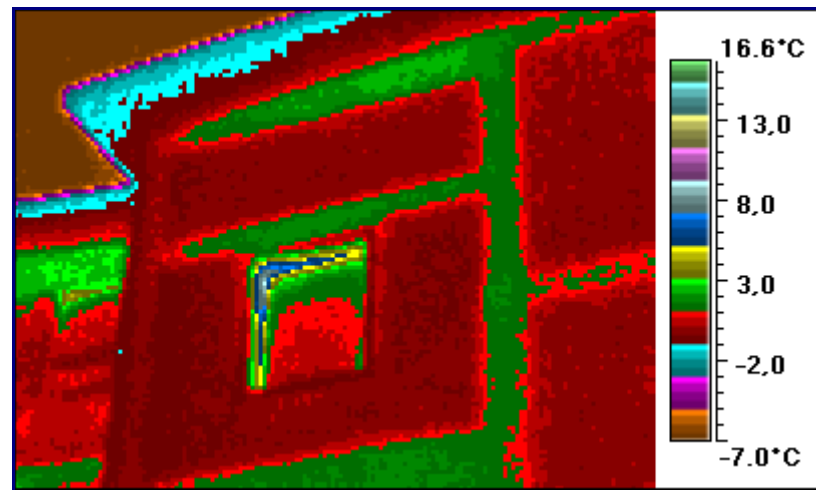
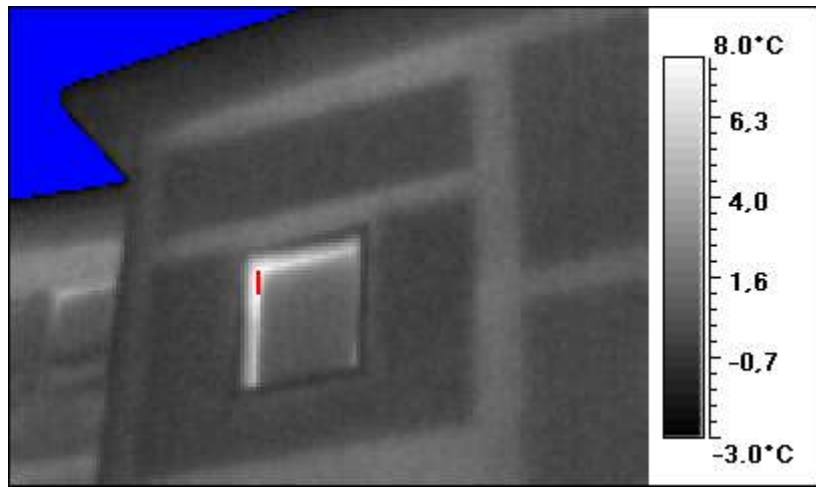
64 4,7 -1,1



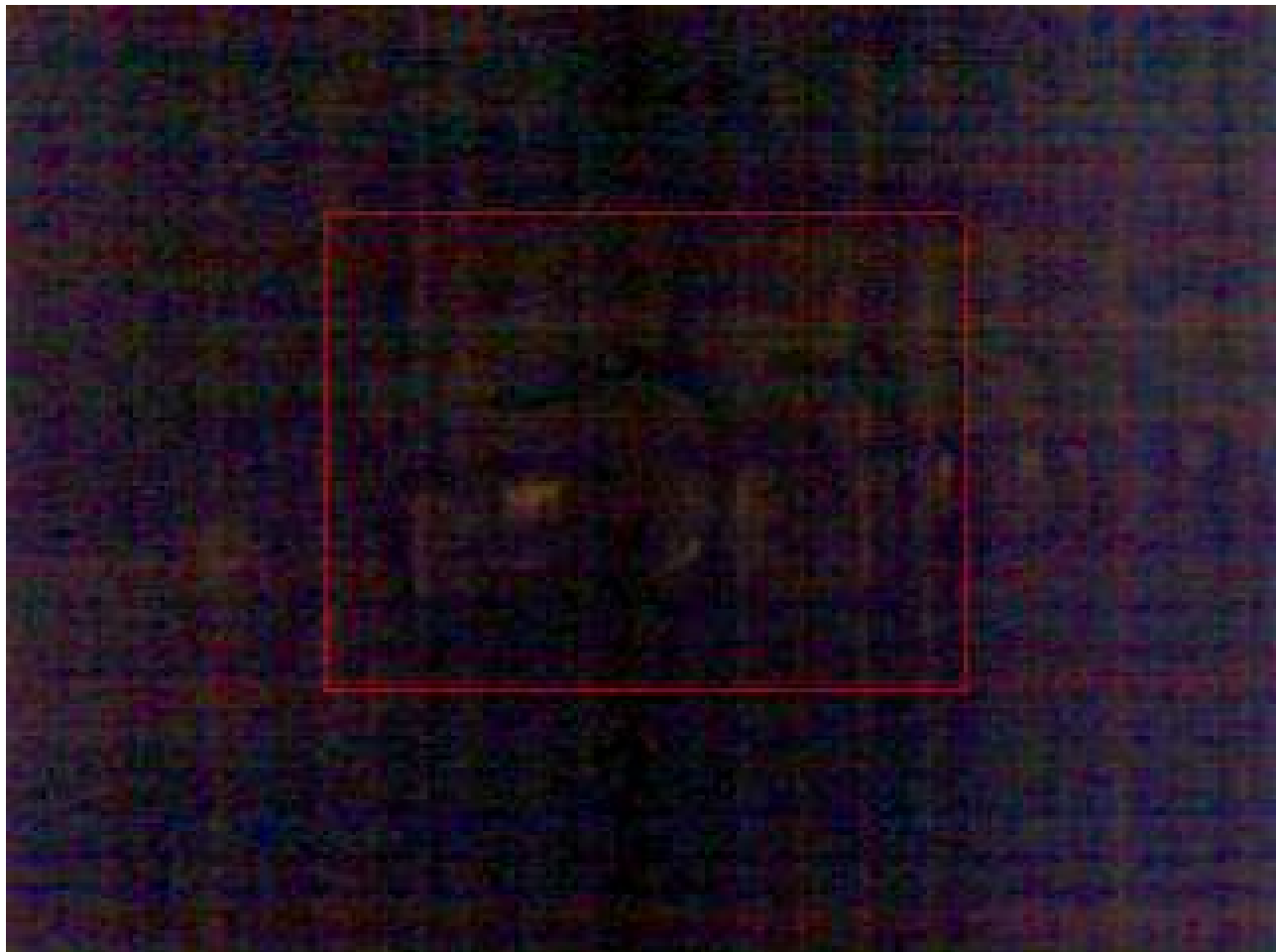
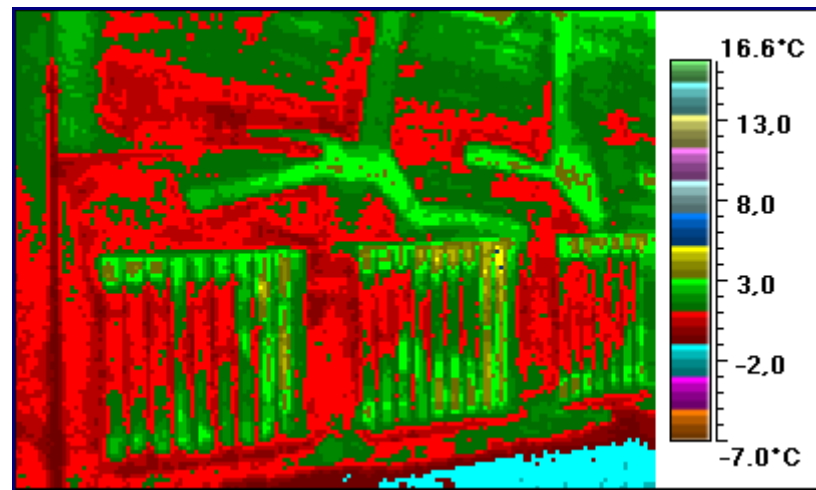
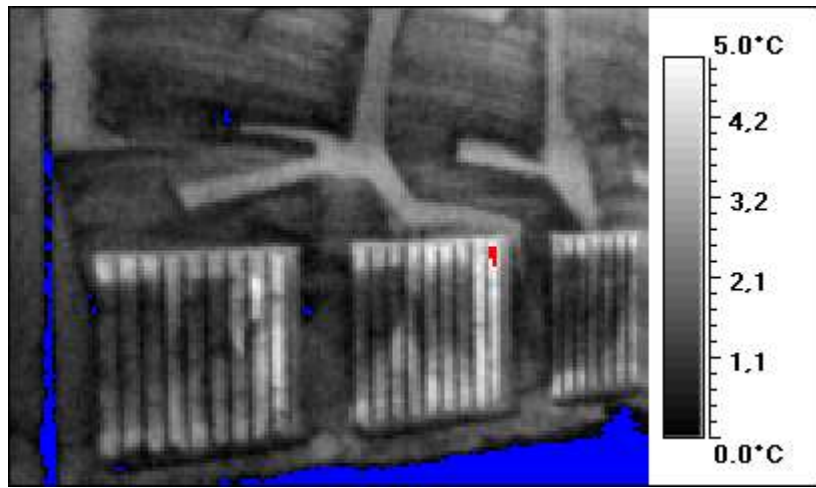
65 6,2 -1,5



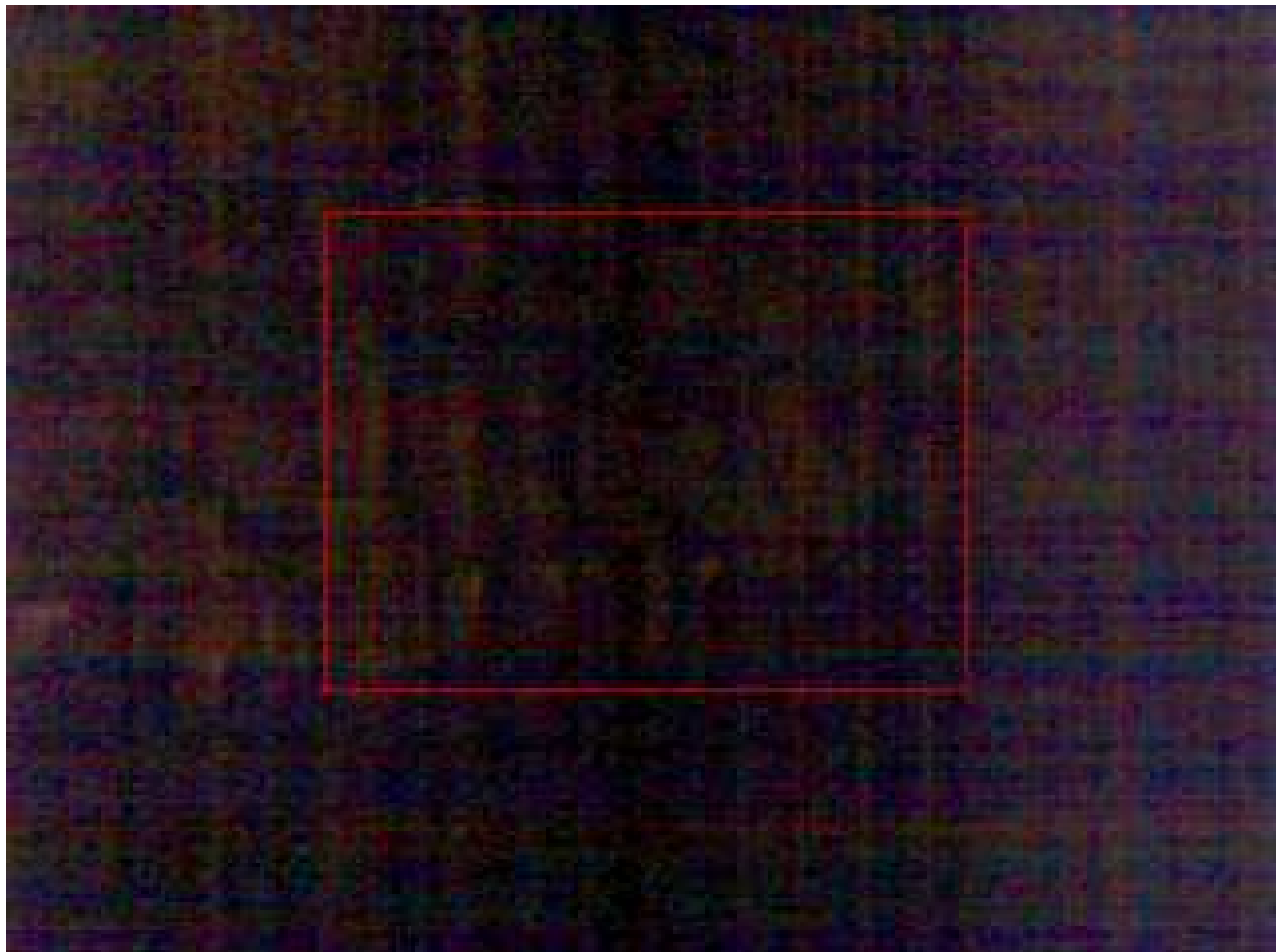
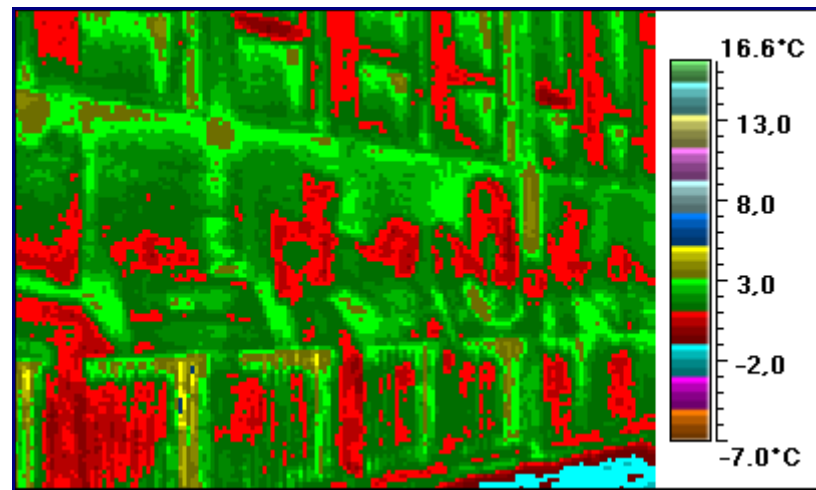
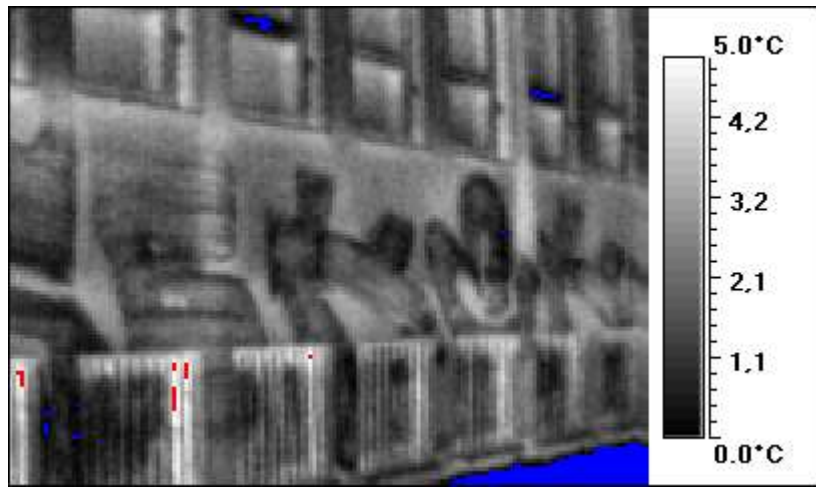
66 8,6 -6,7



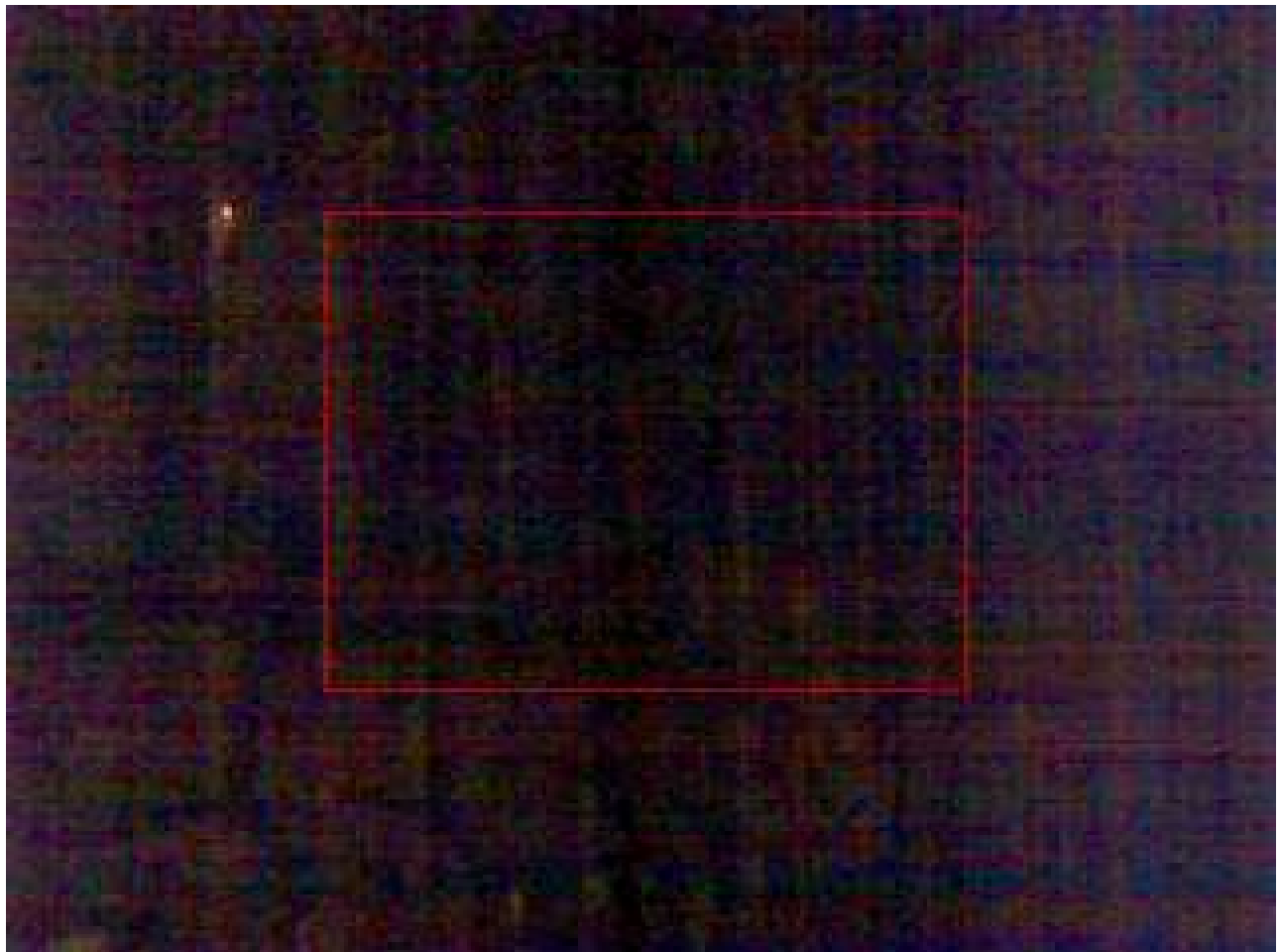
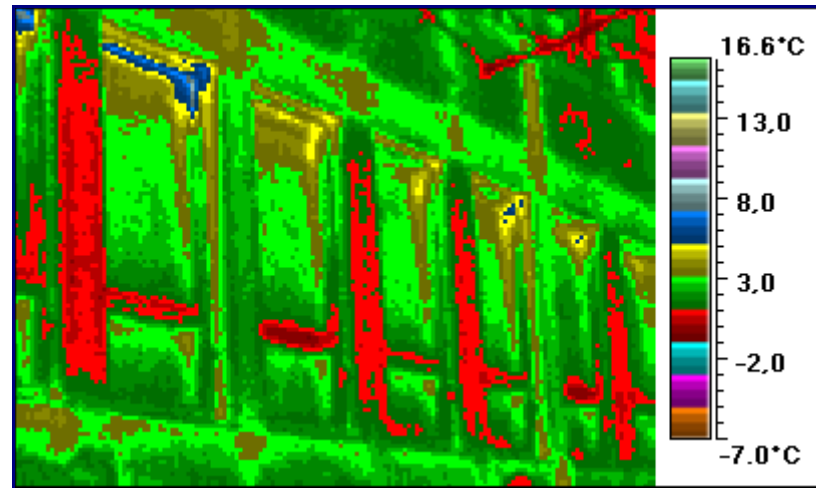
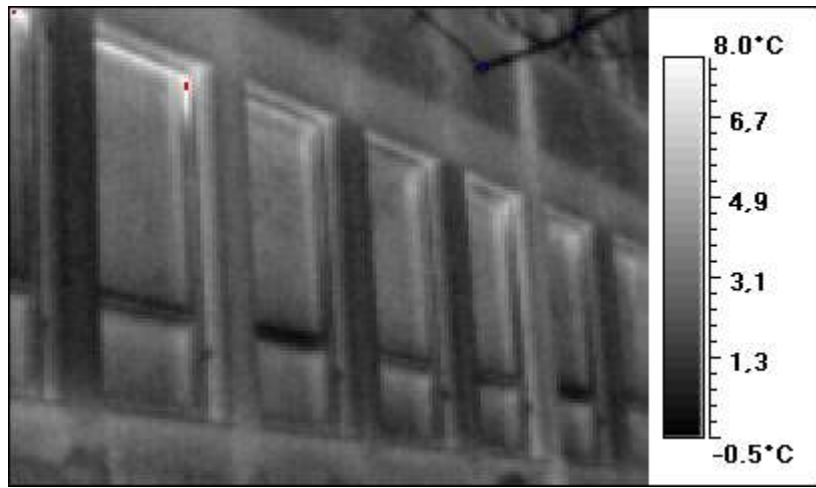
67 5,1 -1,3



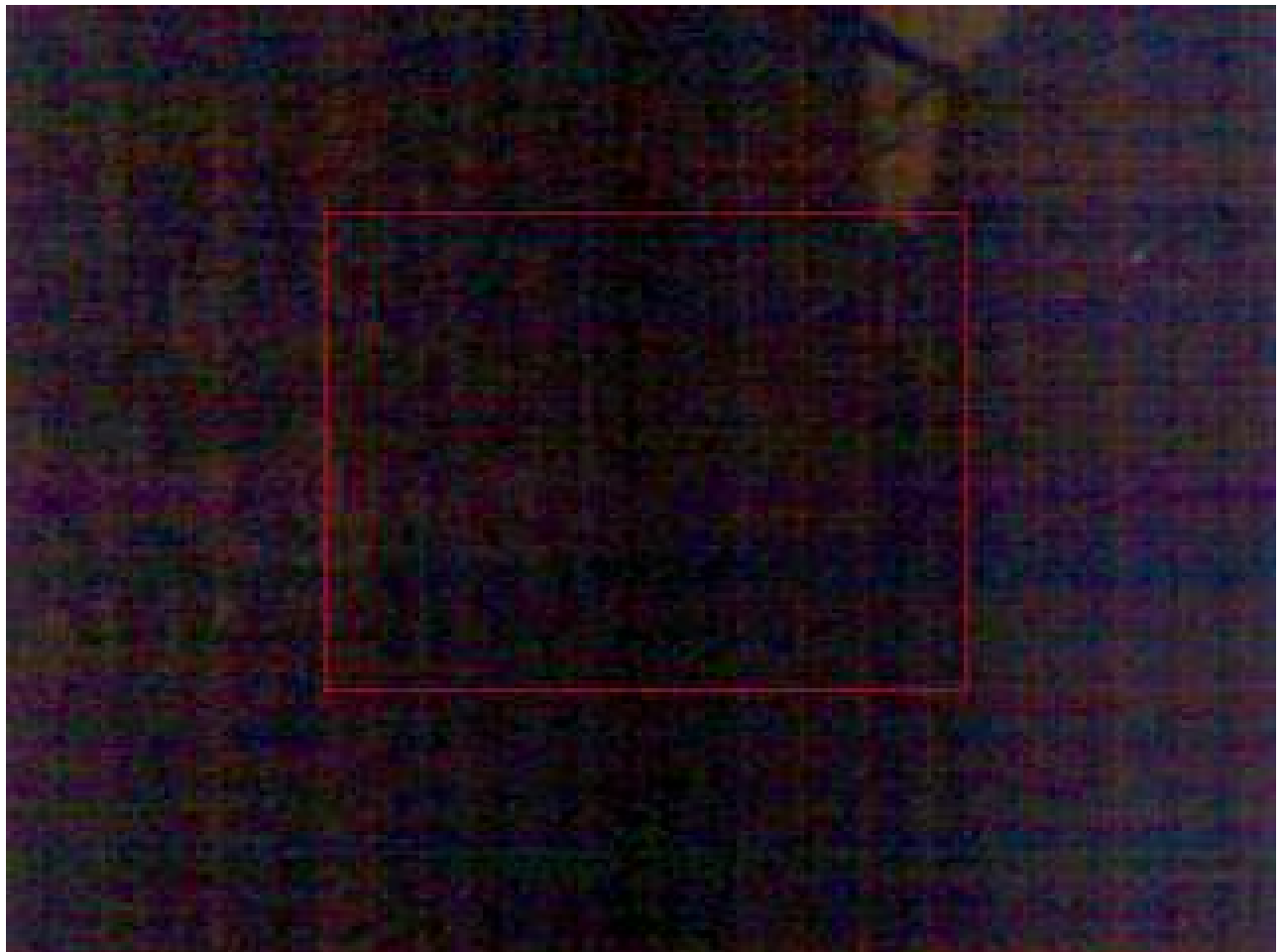
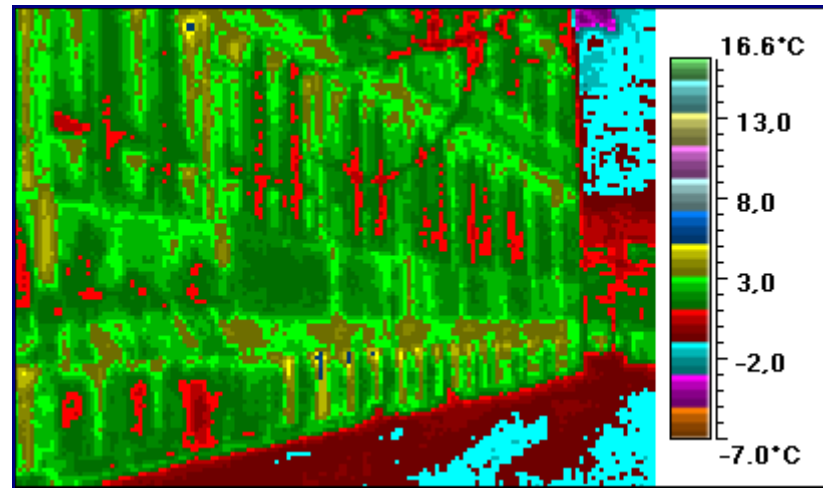
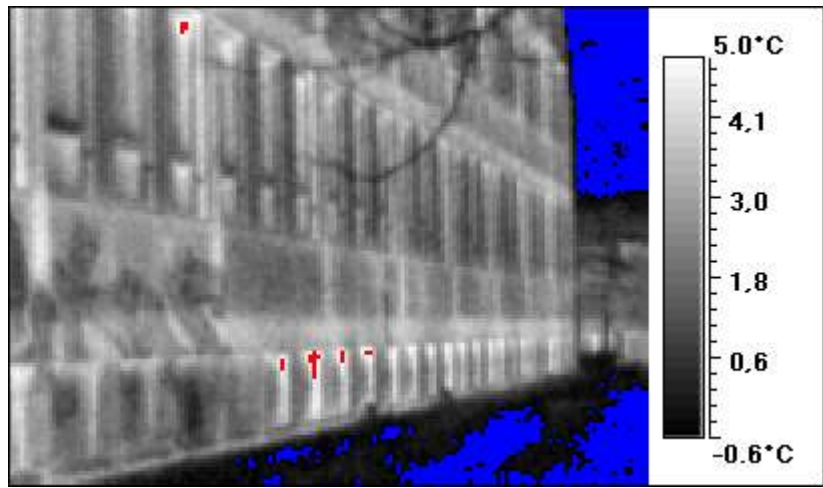
68 5,3 -1,3



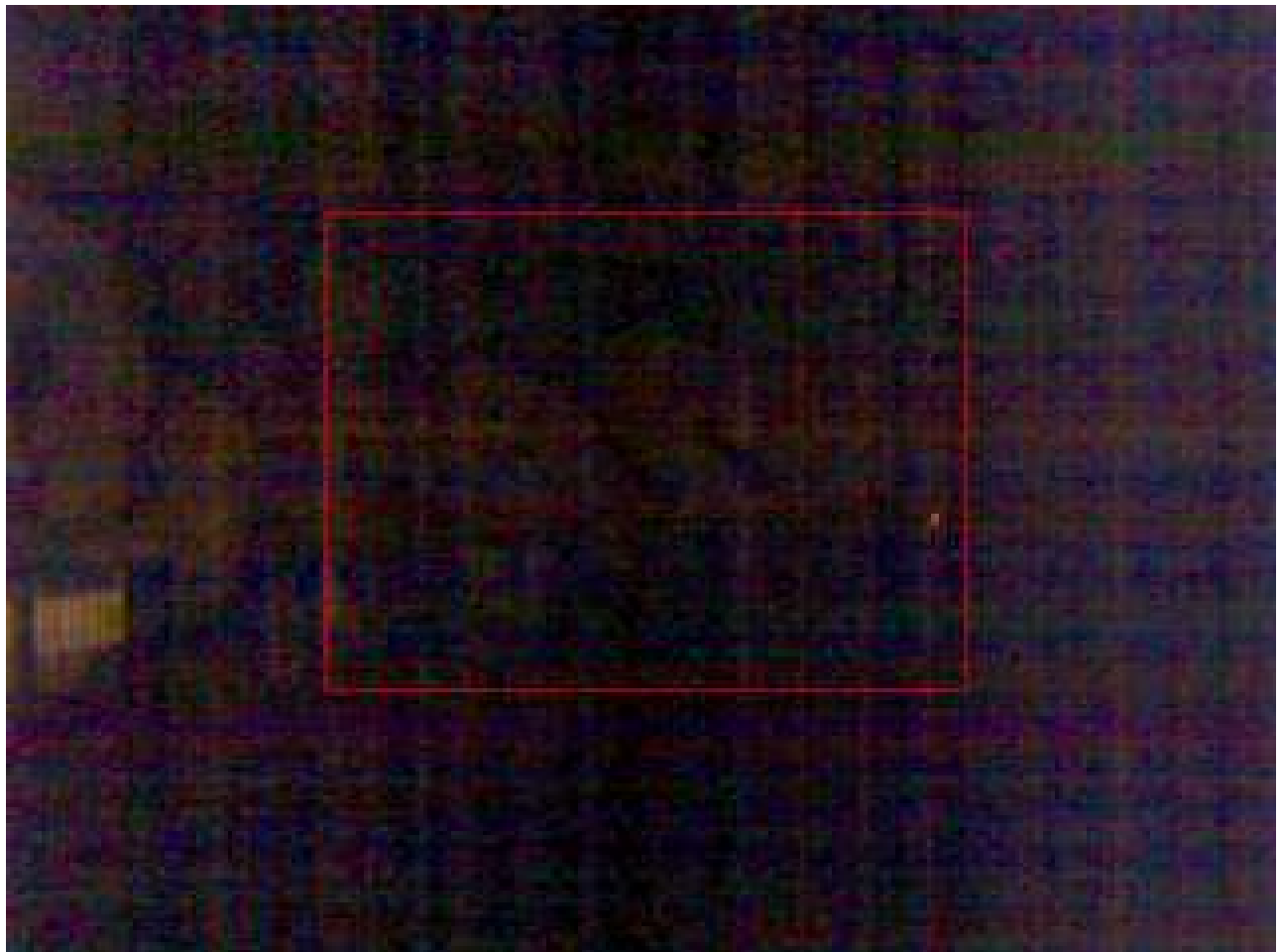
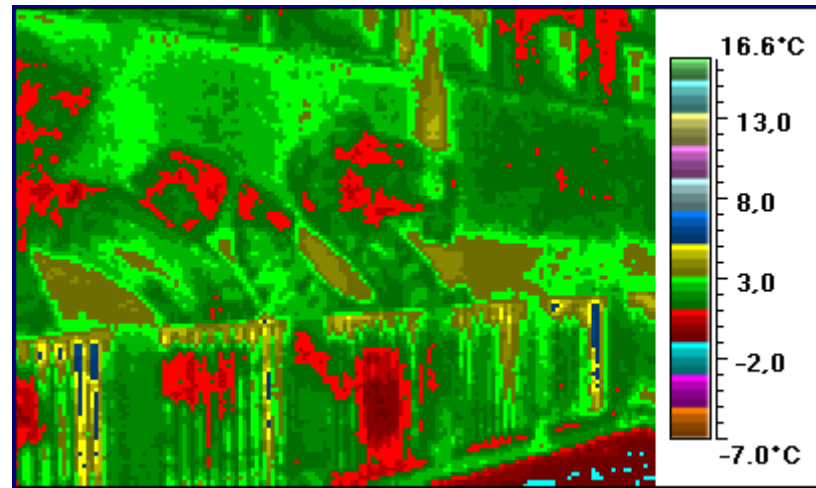
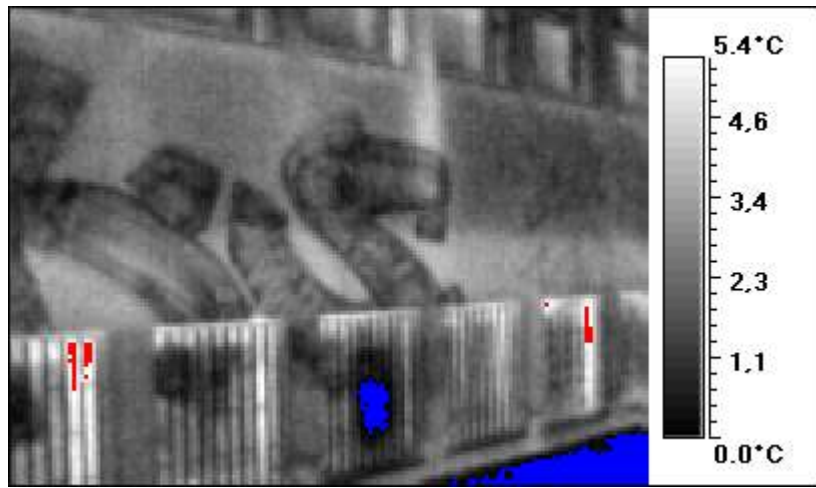
69 8,1 -0,5



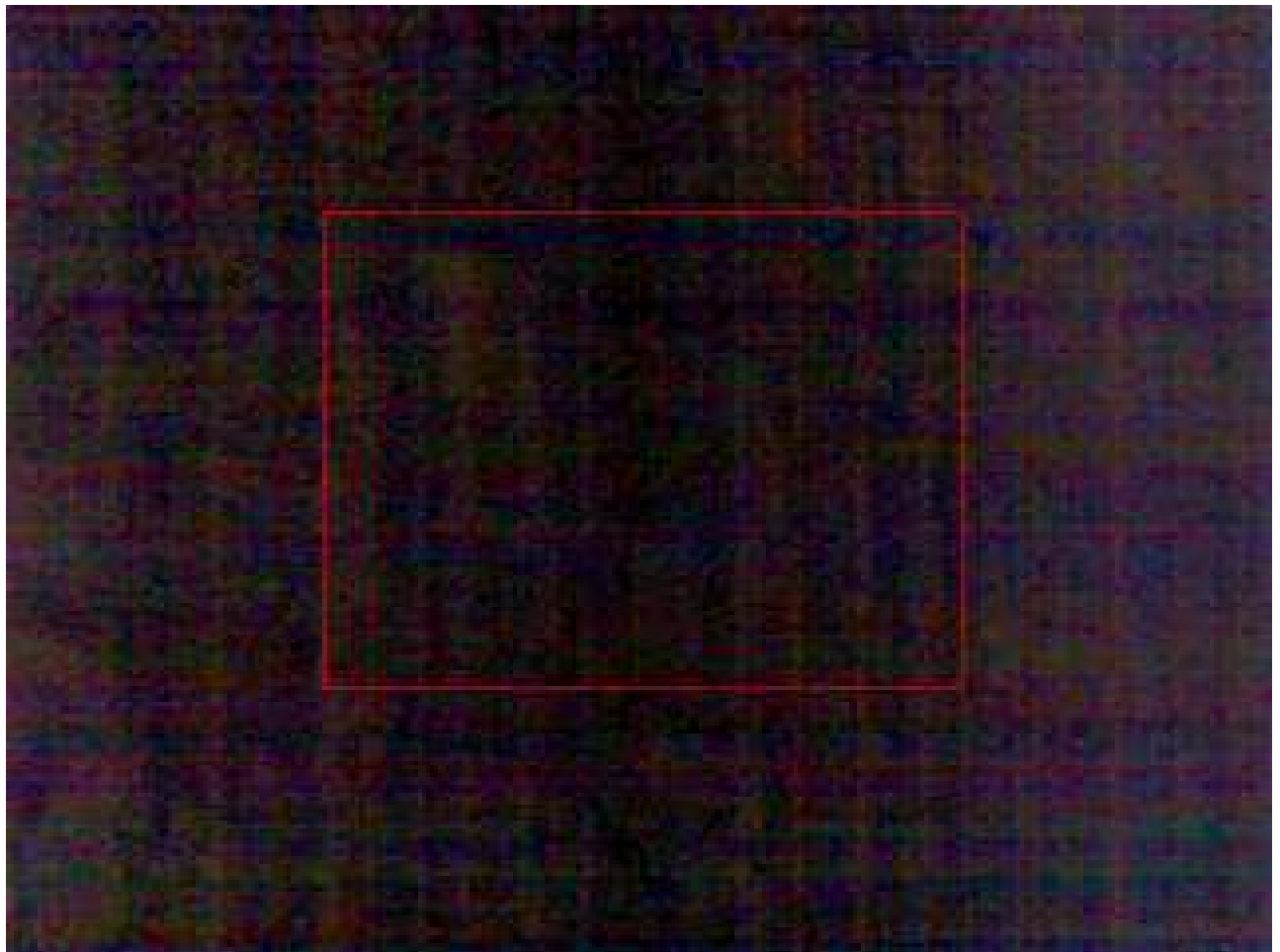
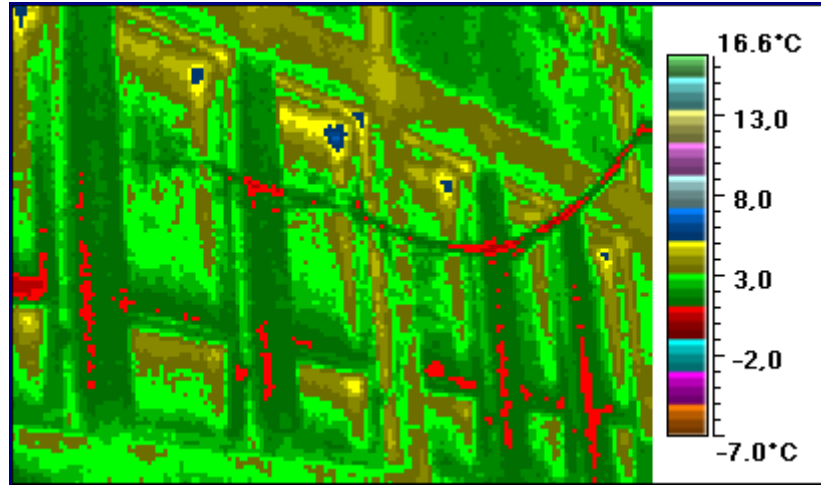
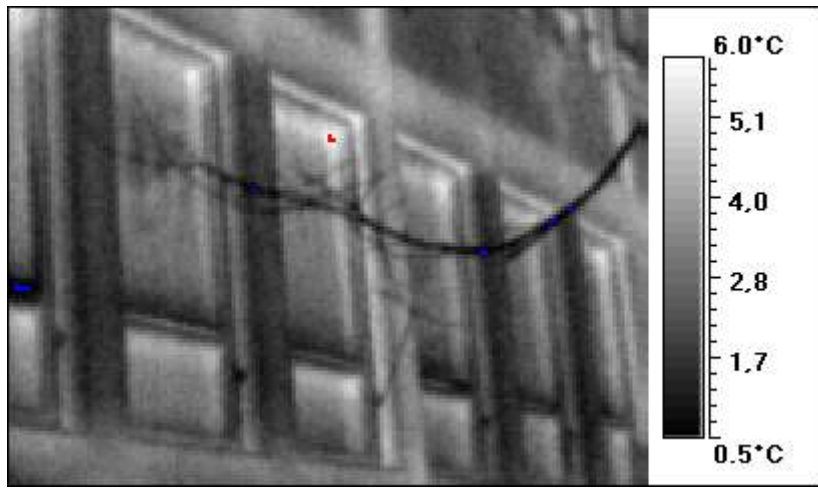
70 5,9 -4,3



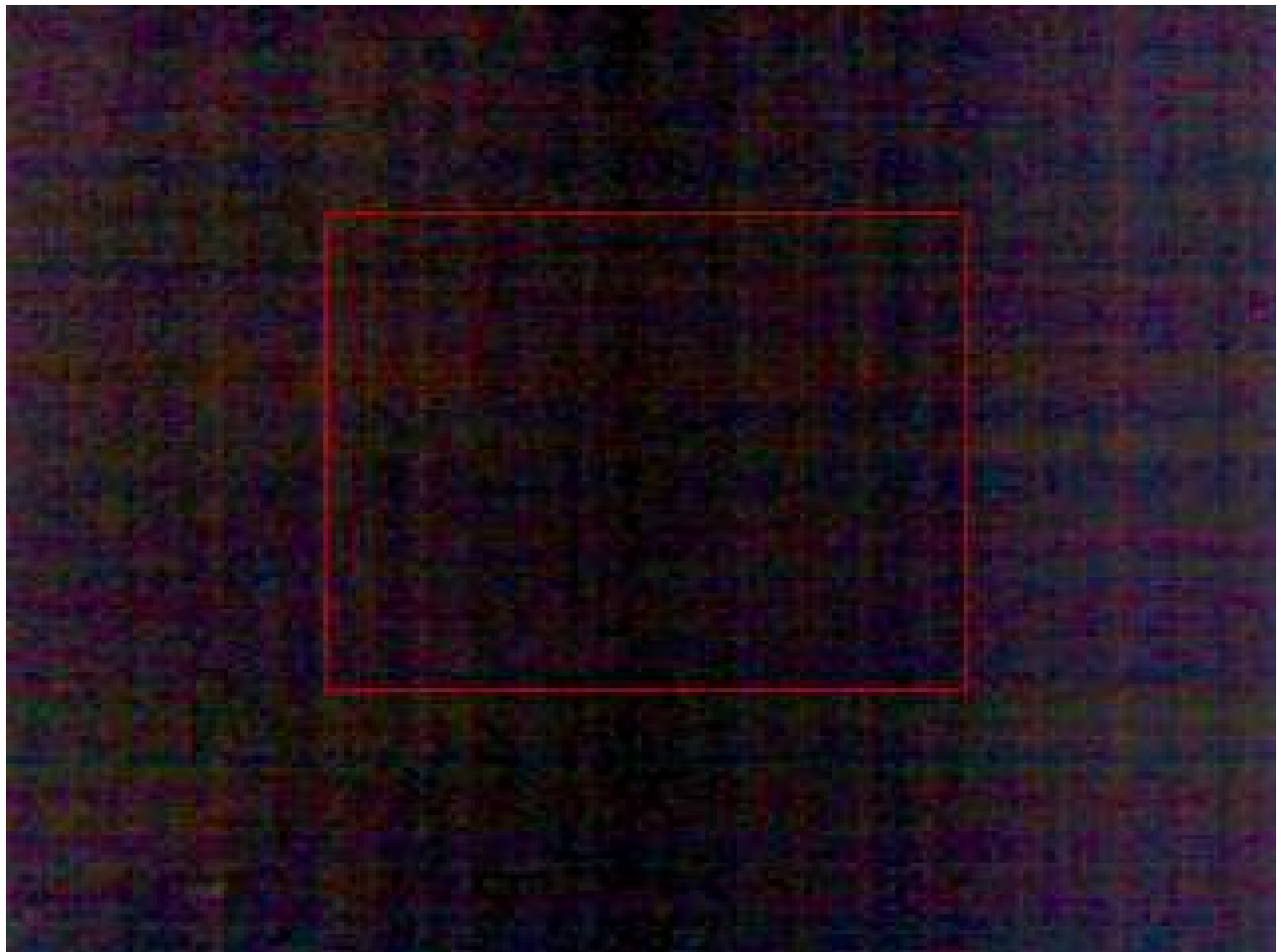
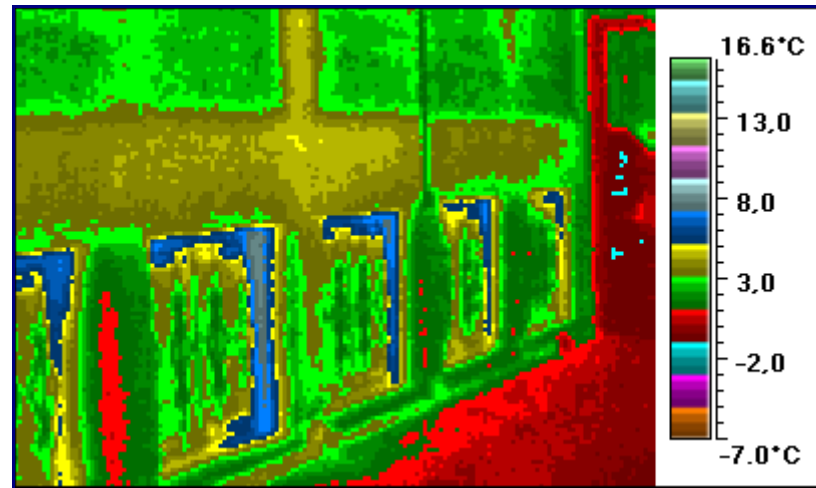
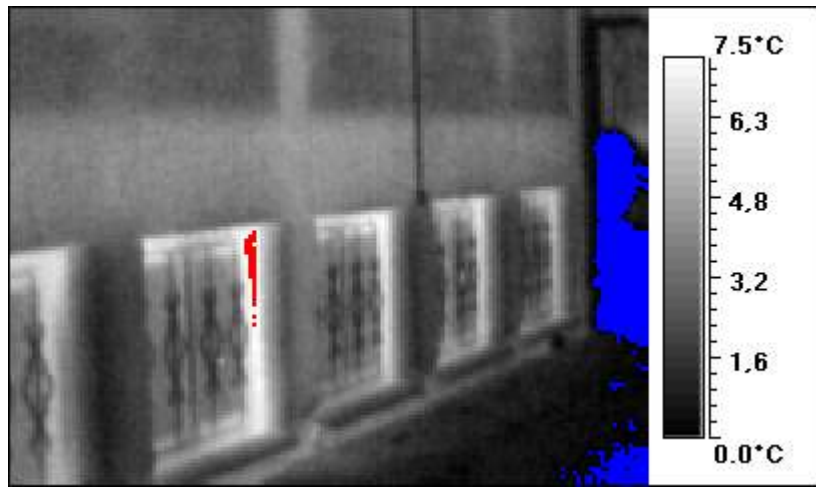
71 6,0 -1,0



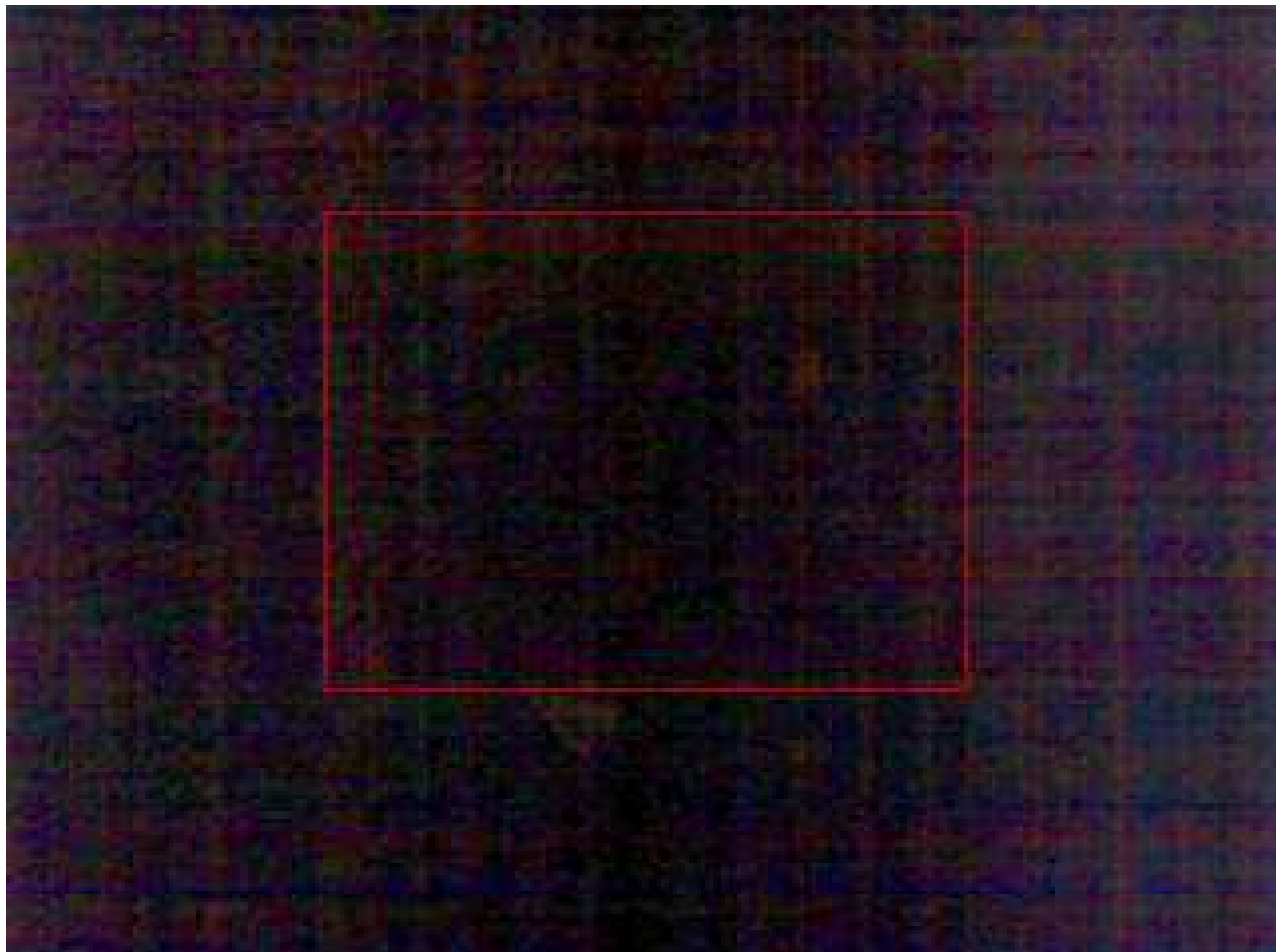
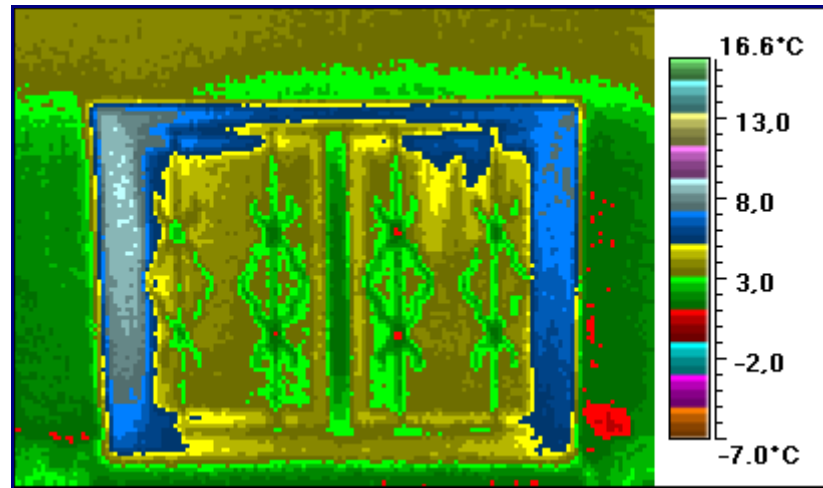
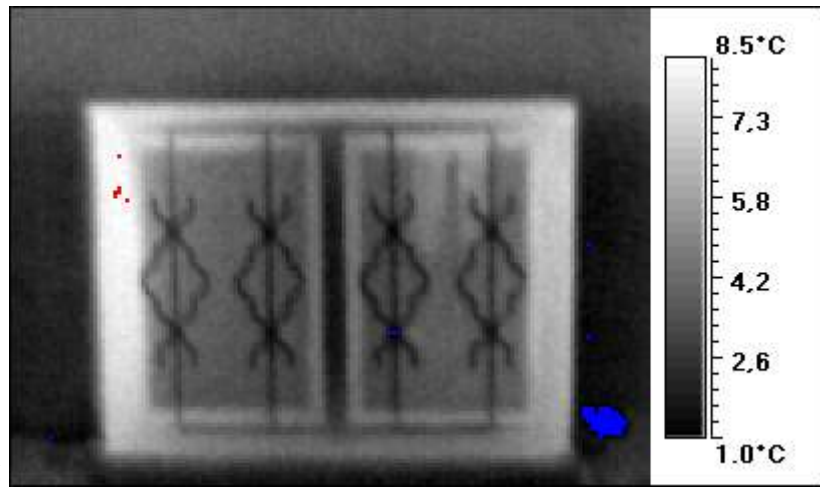
72 6,2 0,5



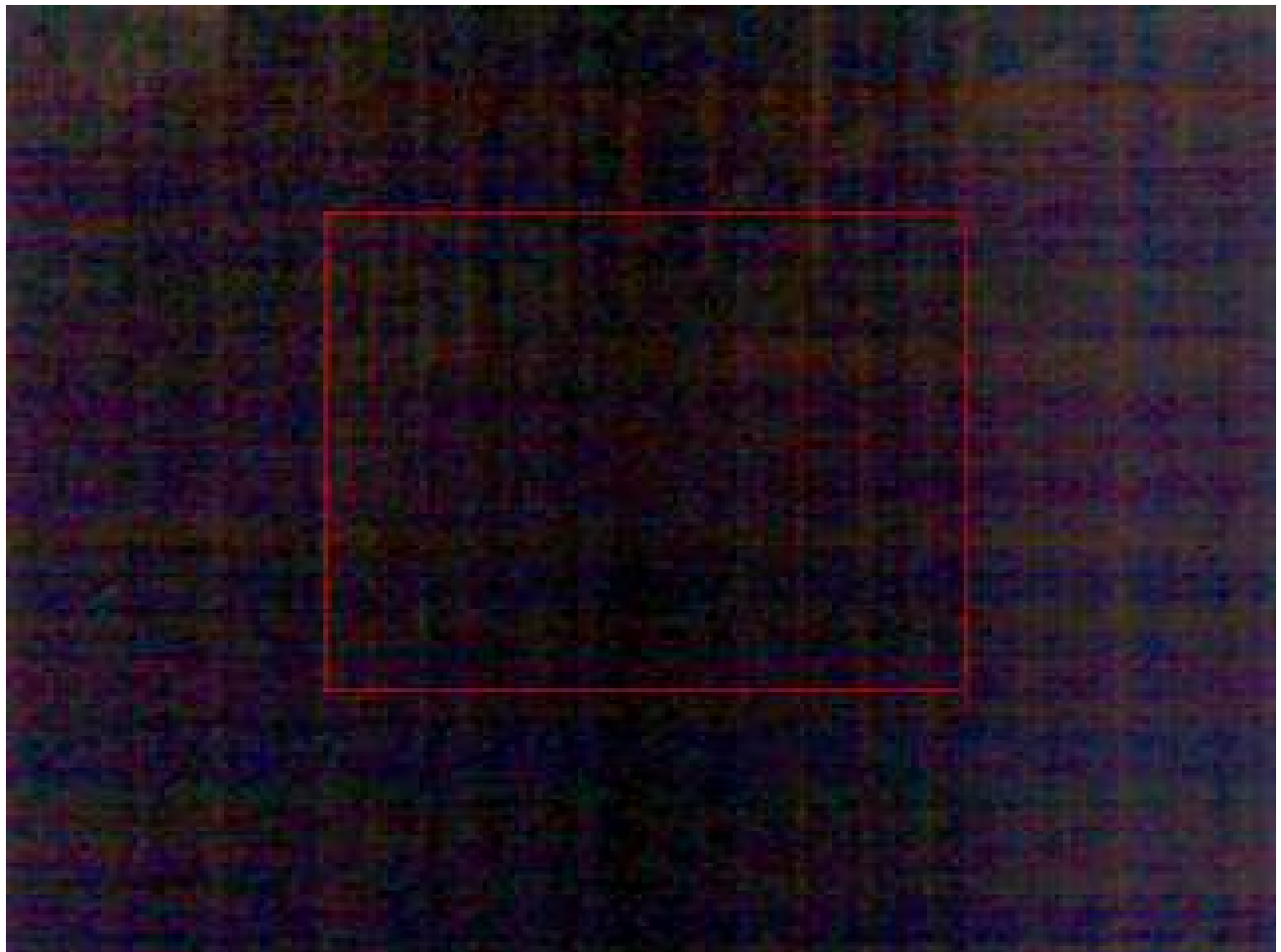
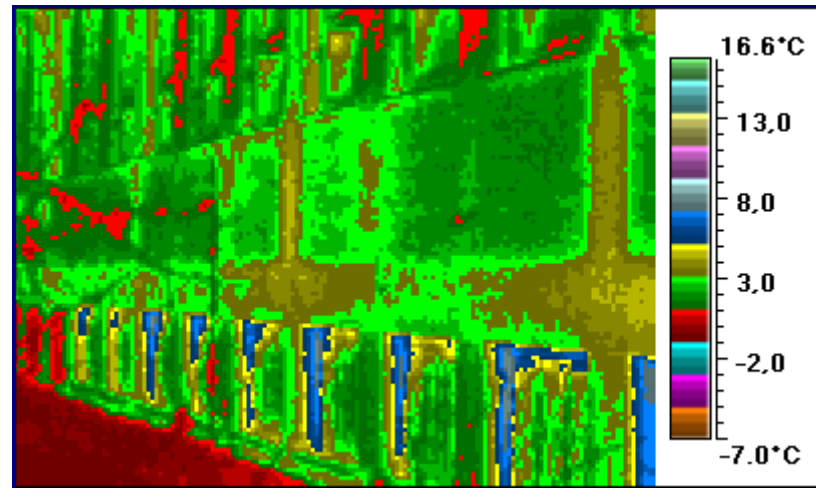
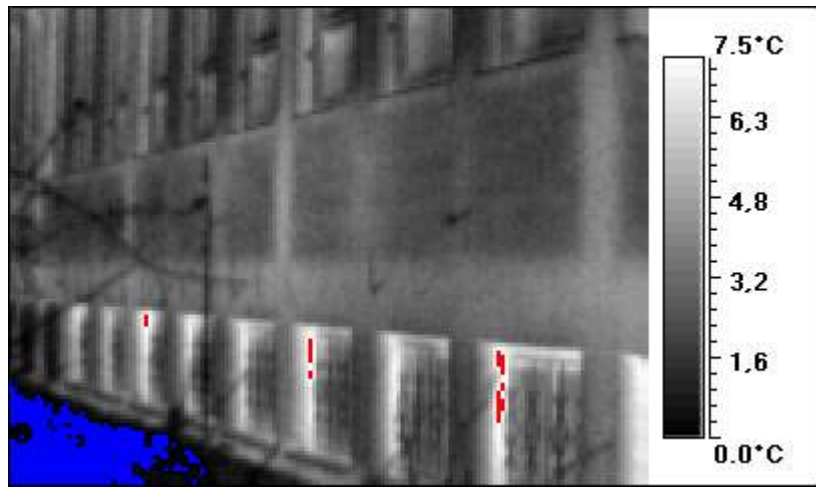
73 7,9 -0,9



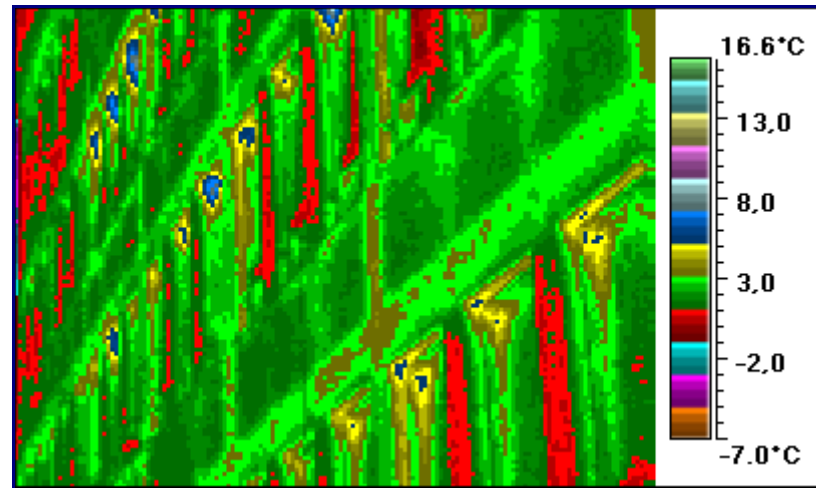
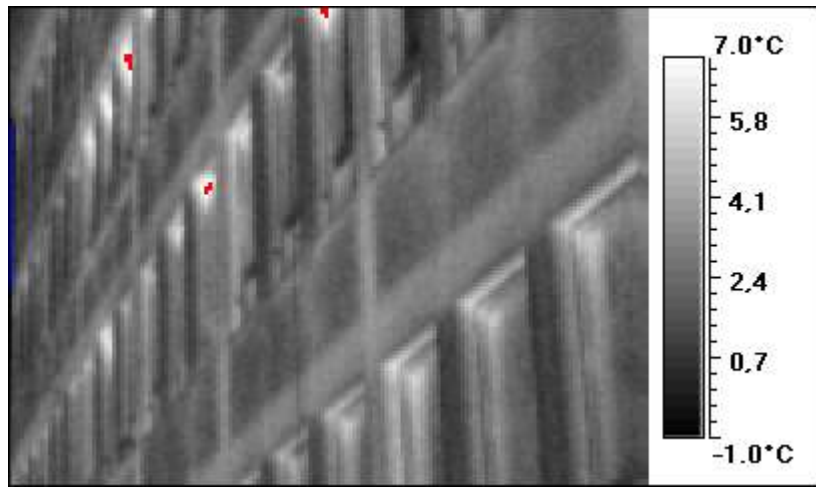
74 8,70,5



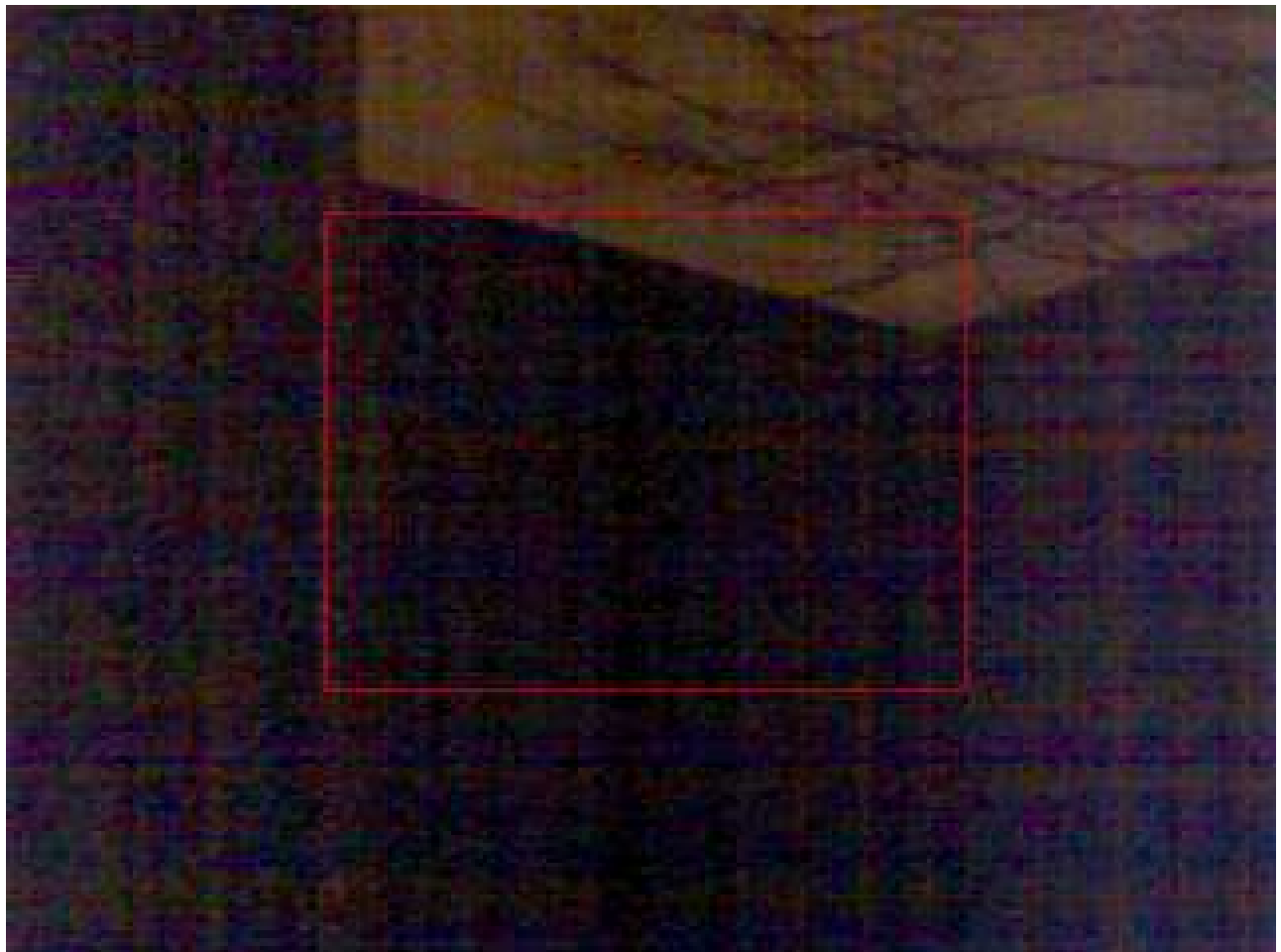
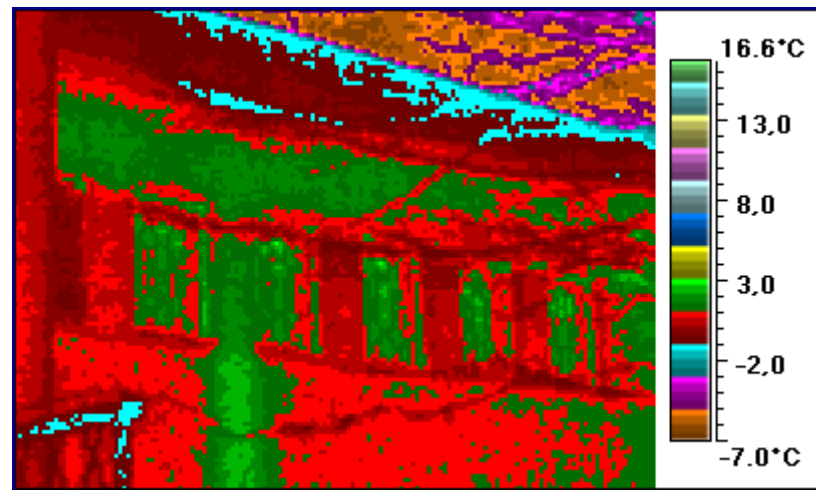
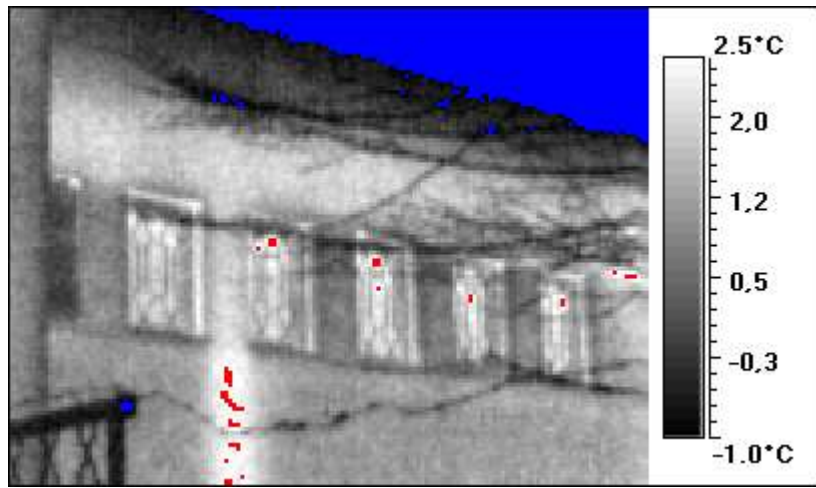
75 7,9 -0,6



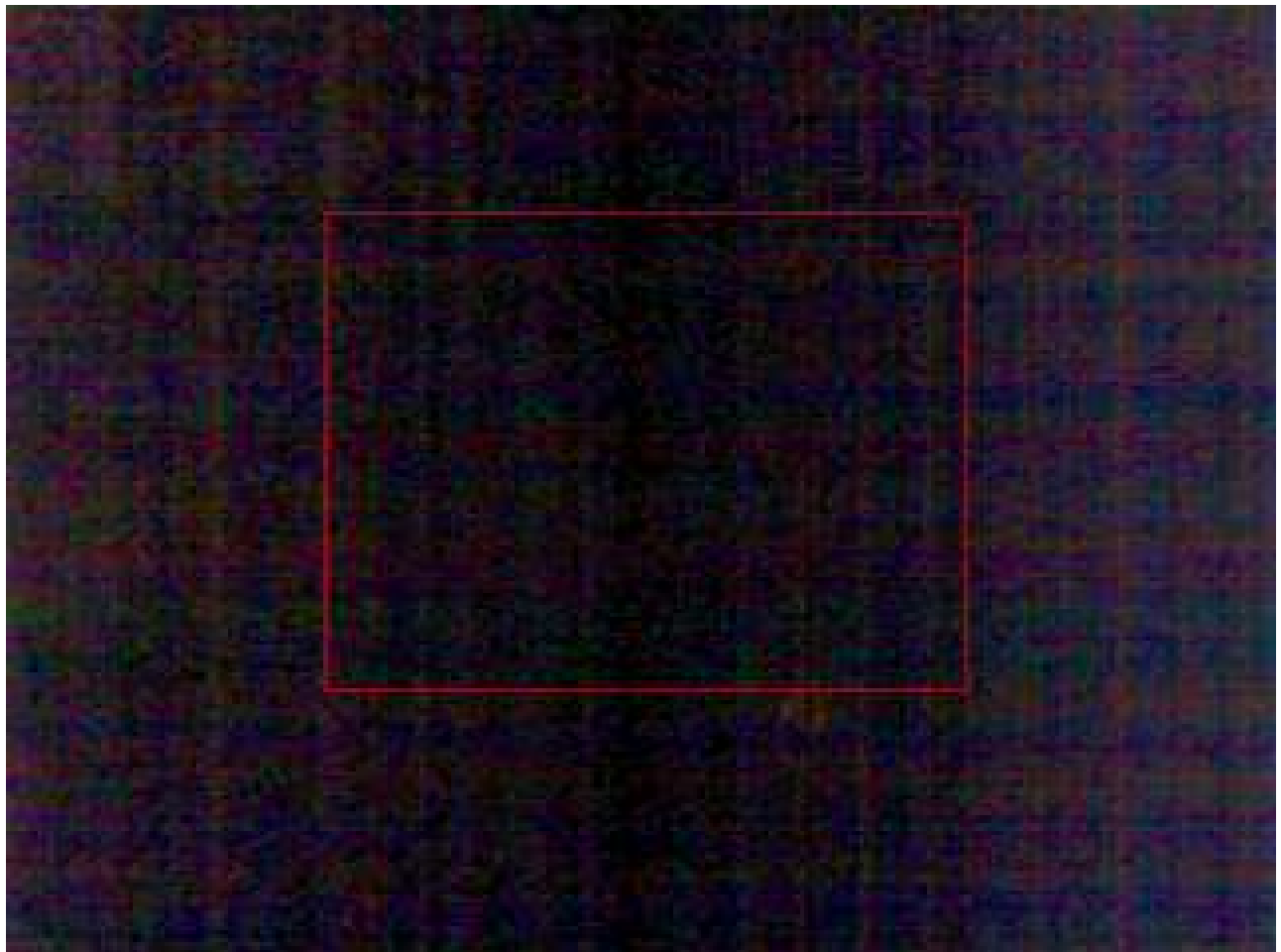
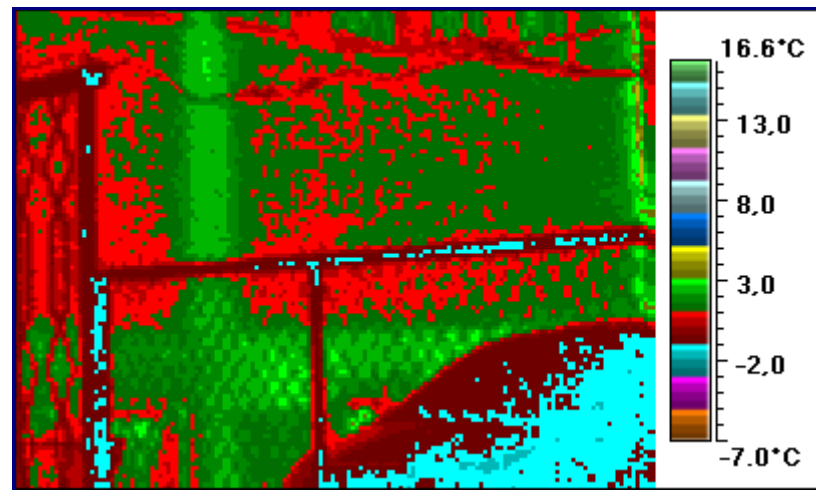
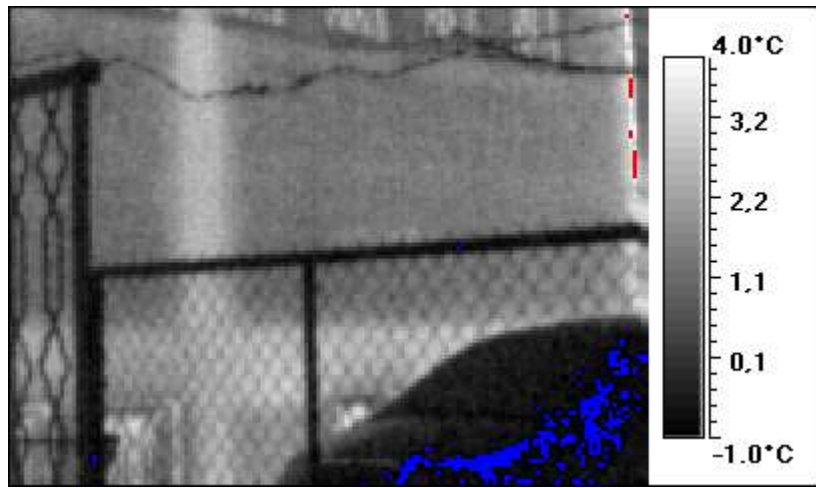
76 8,6 -3,8



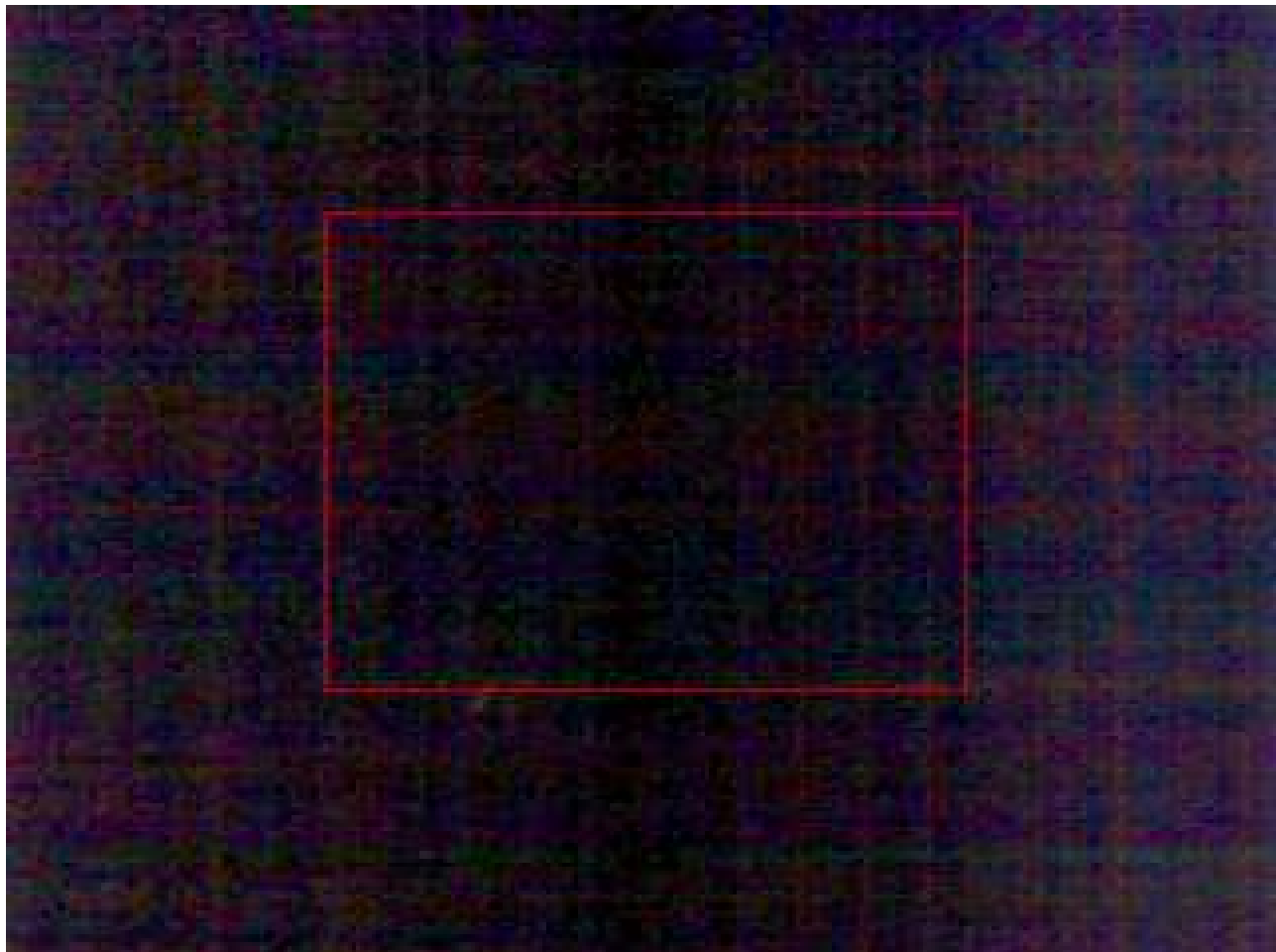
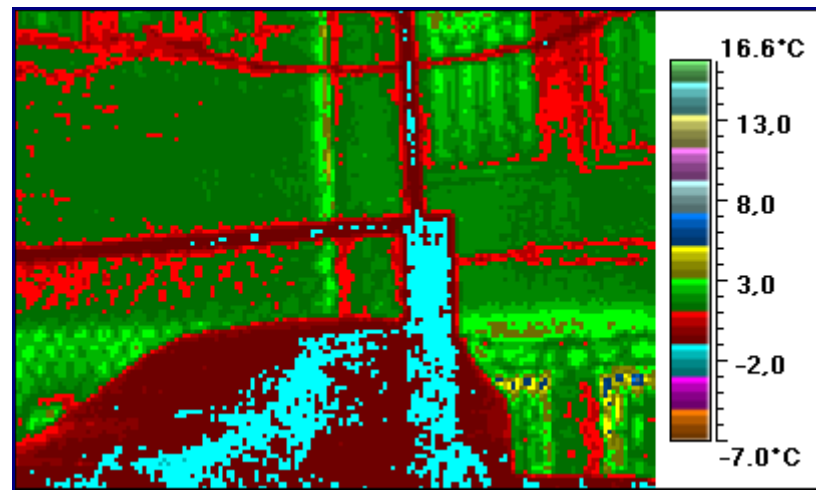
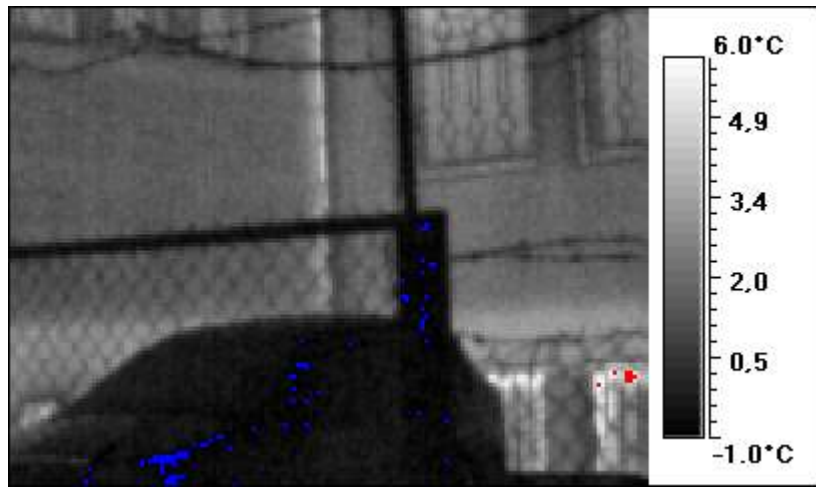
77 2,9 -5,8



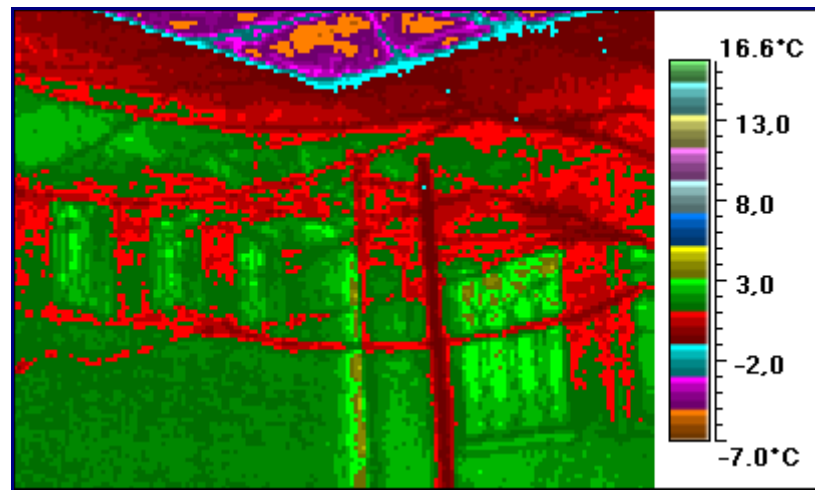
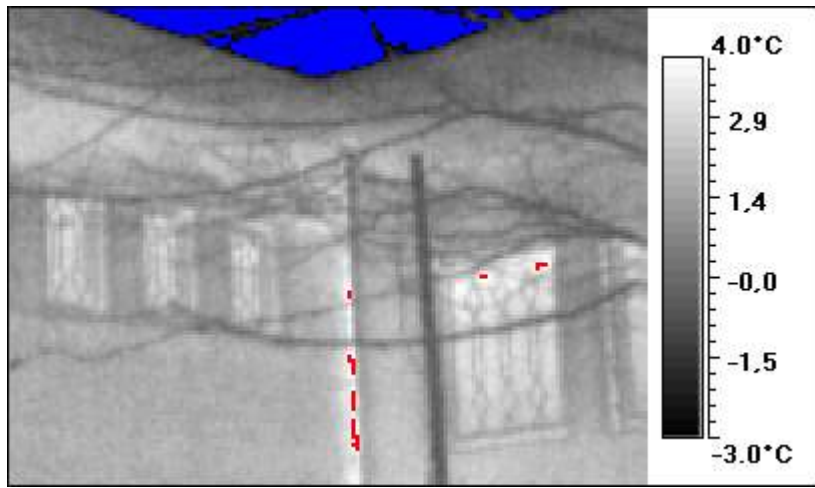
78 4,6 -1,4



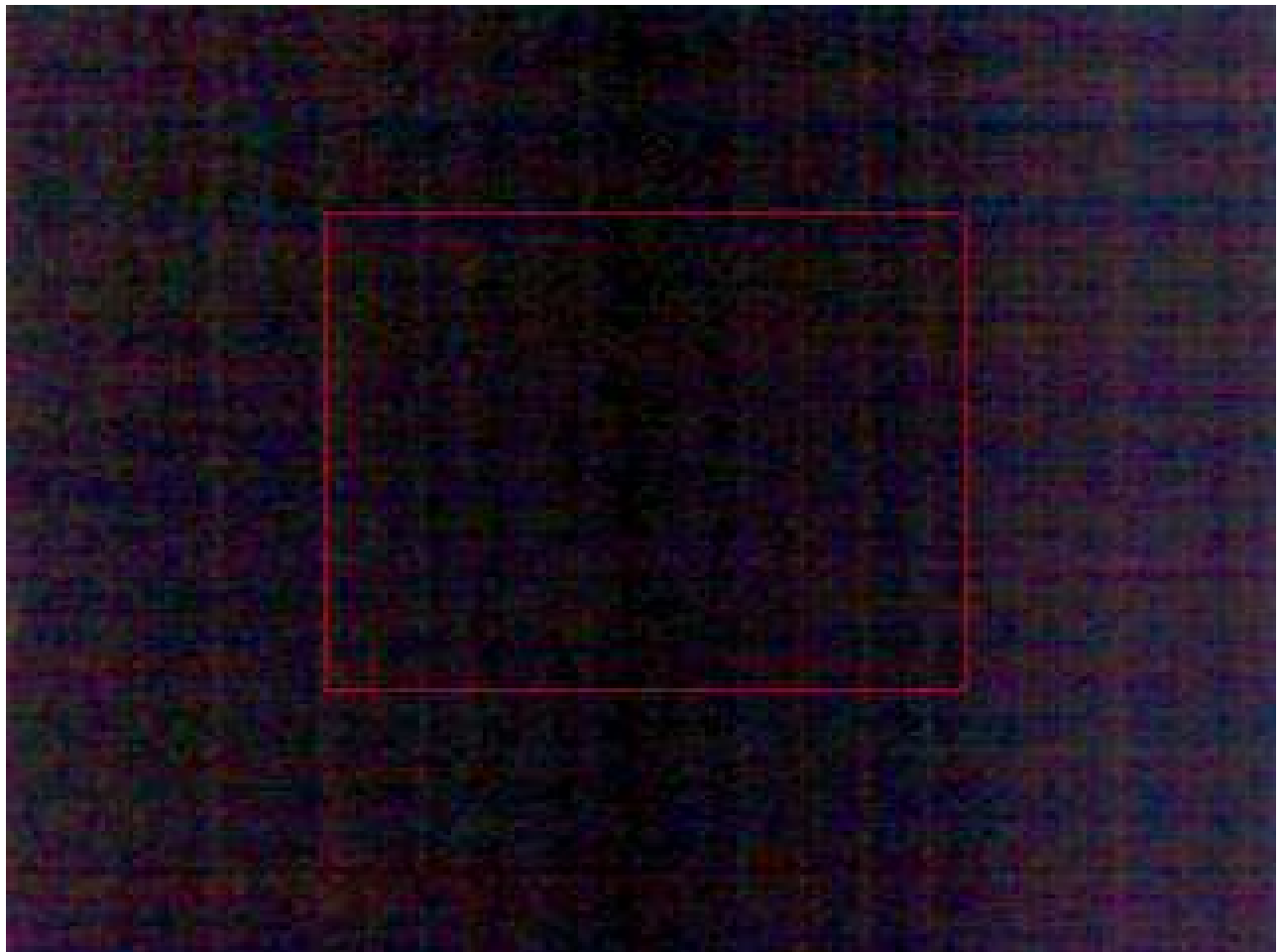
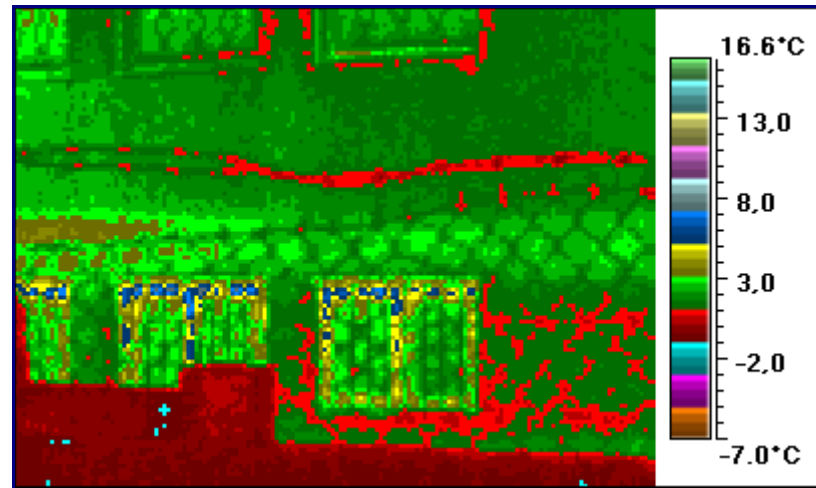
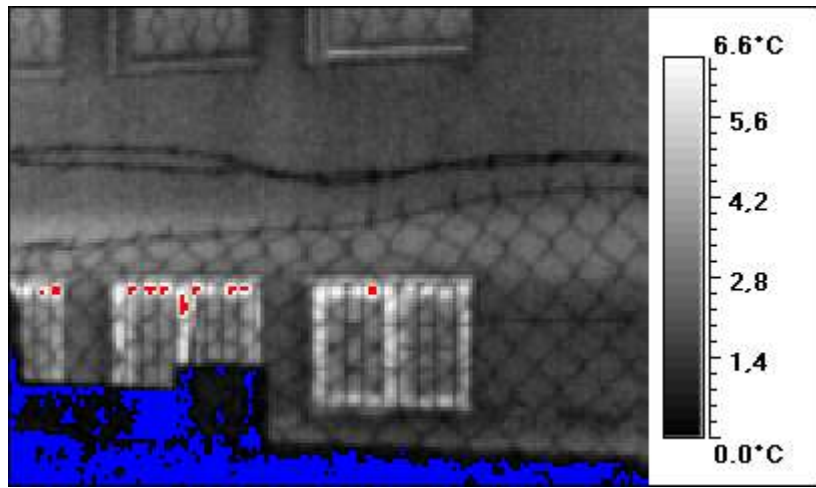
79 7,3 -1,2



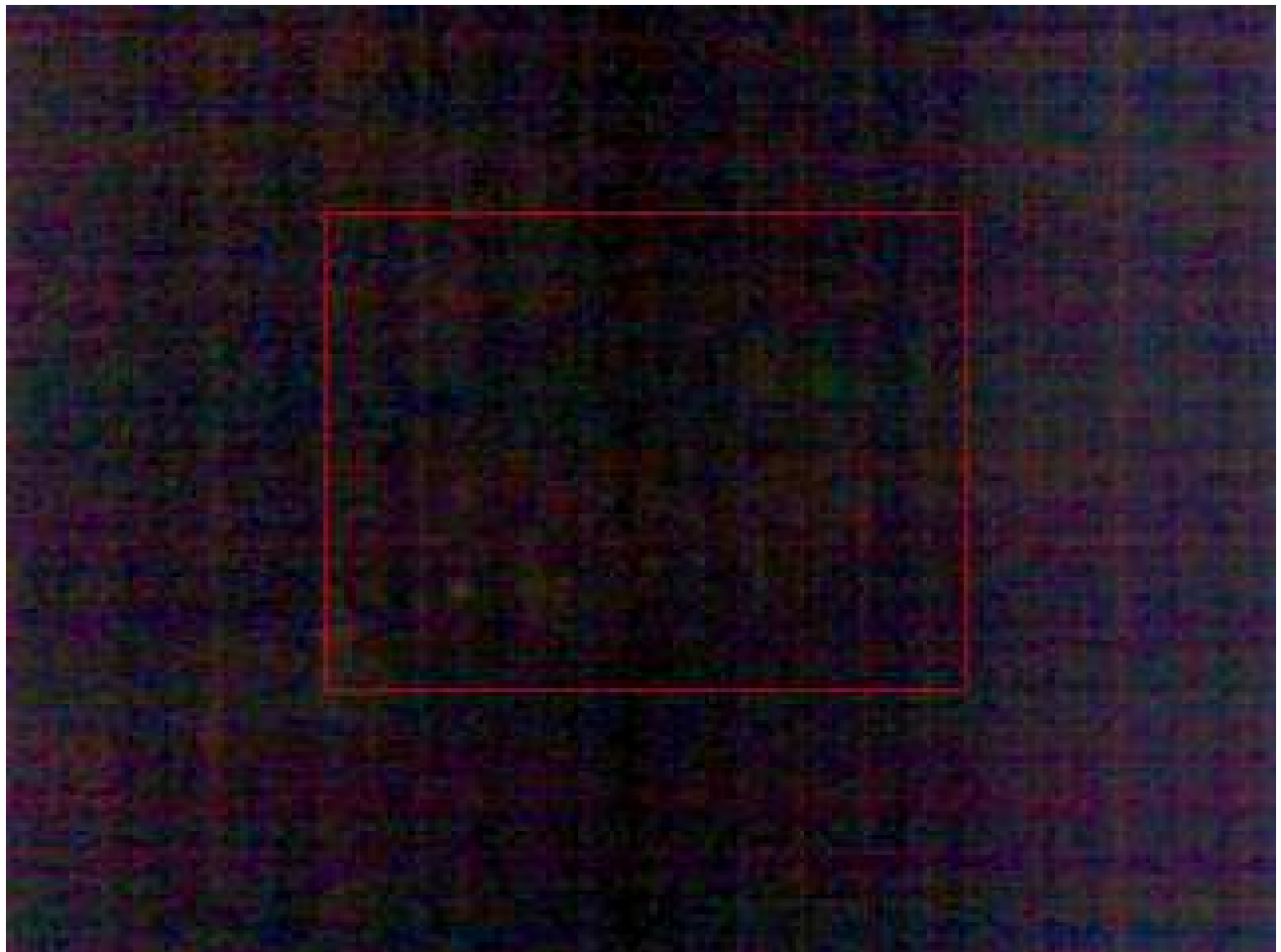
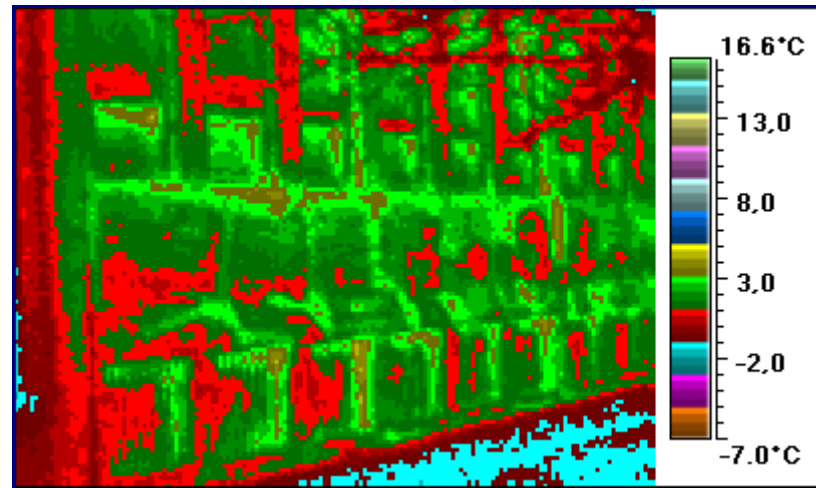
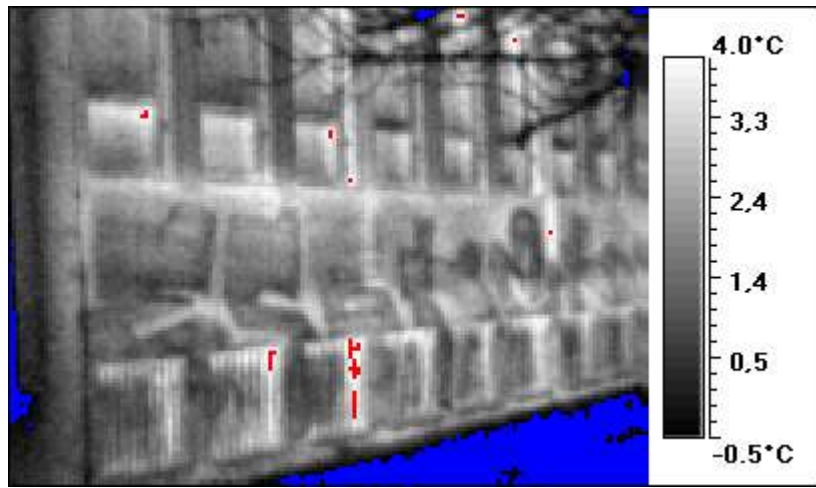
80 4,6 -5,2



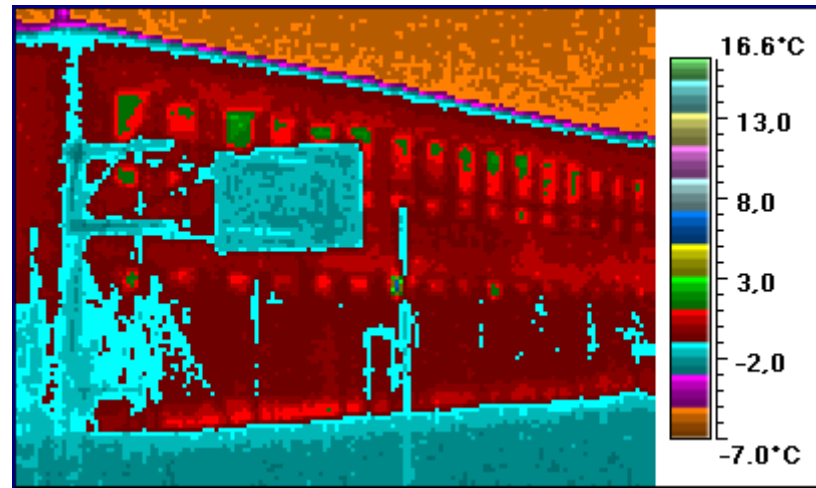
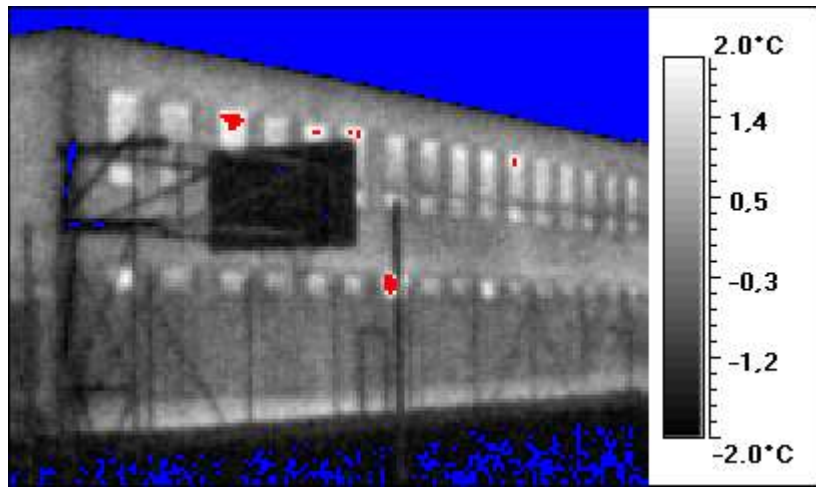
81 7,5 -0,8



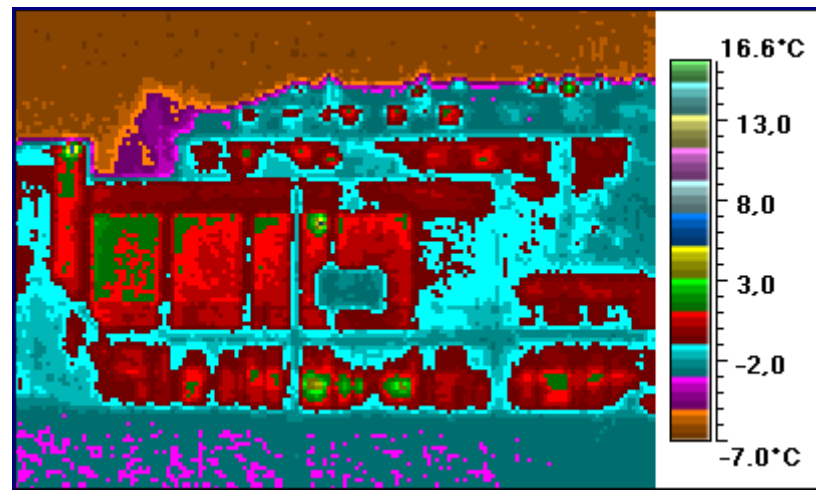
82 4,6 -1,3



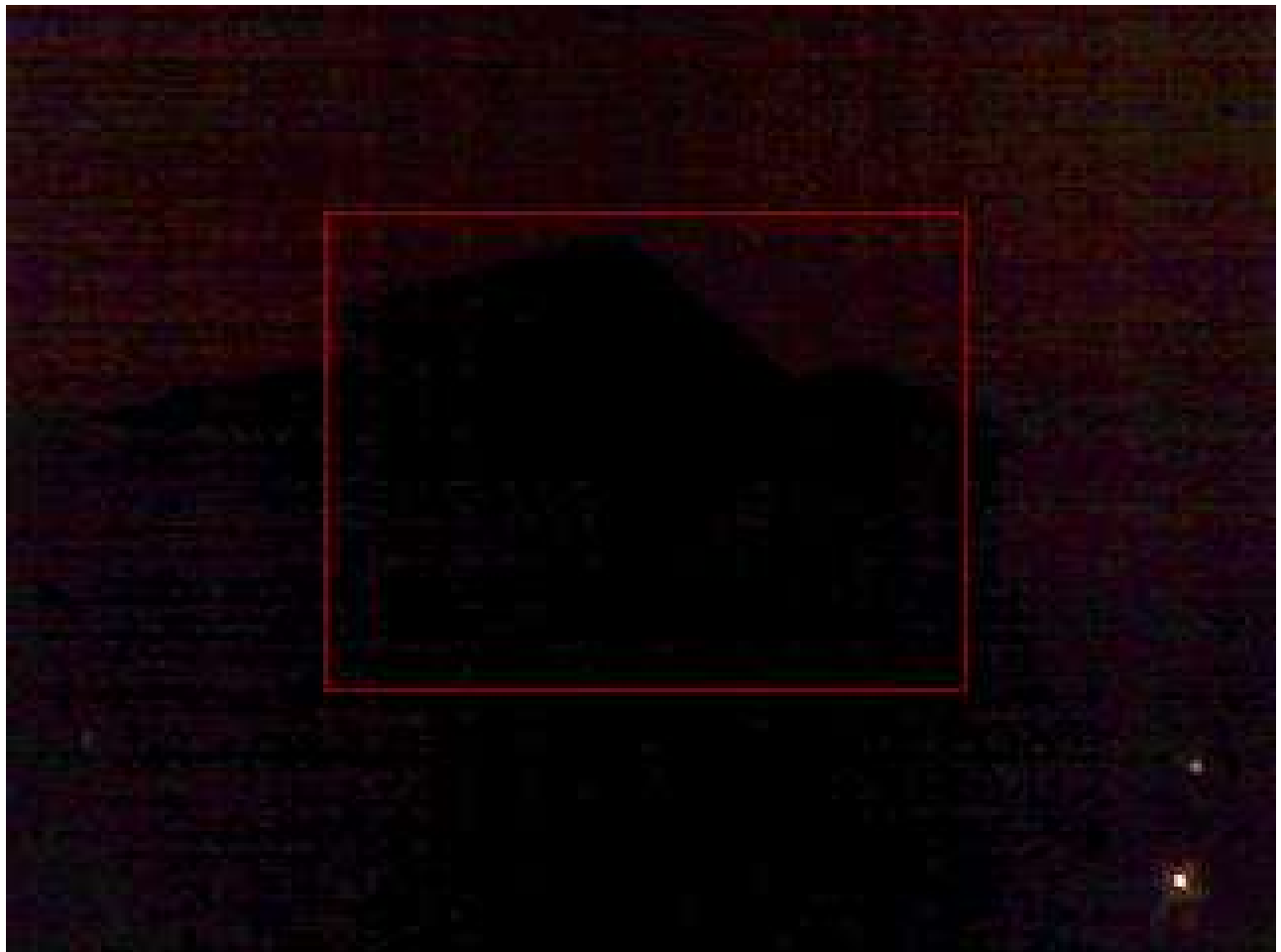
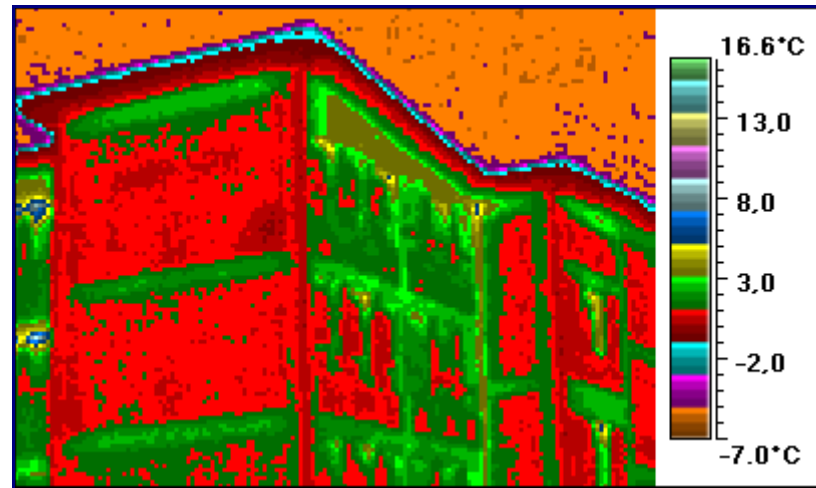
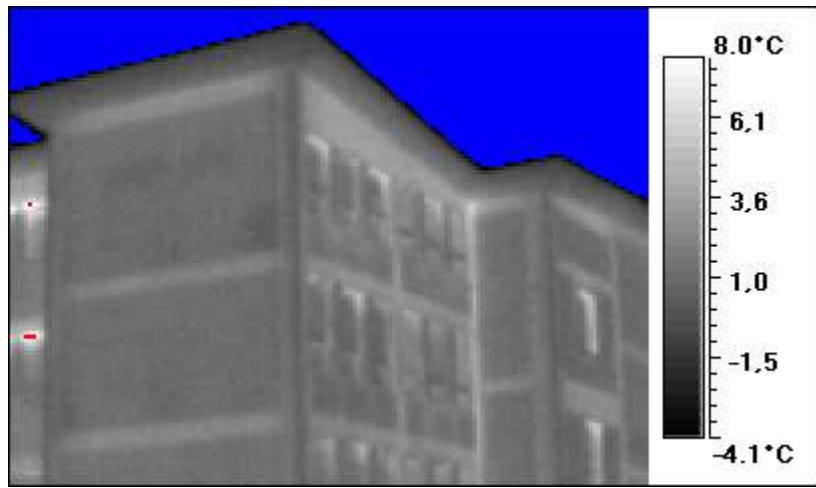
83 6,4 -5,5



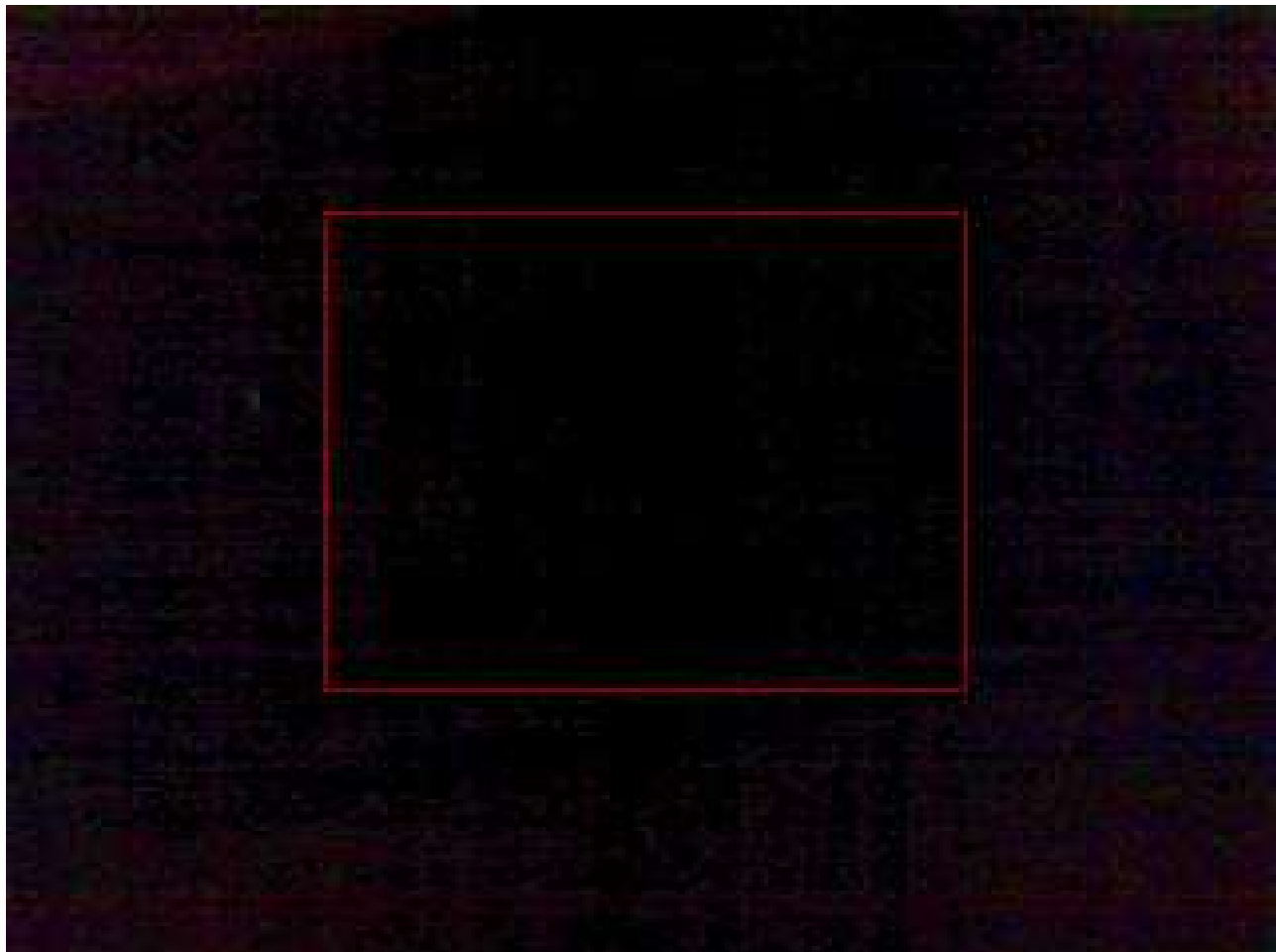
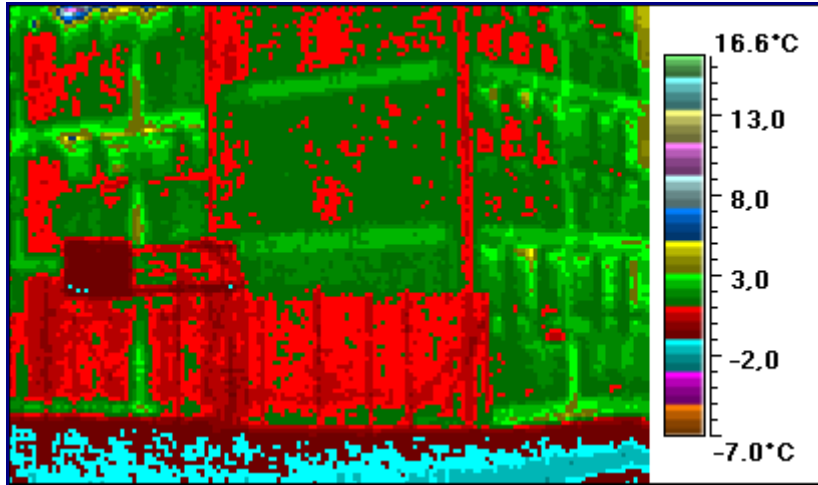
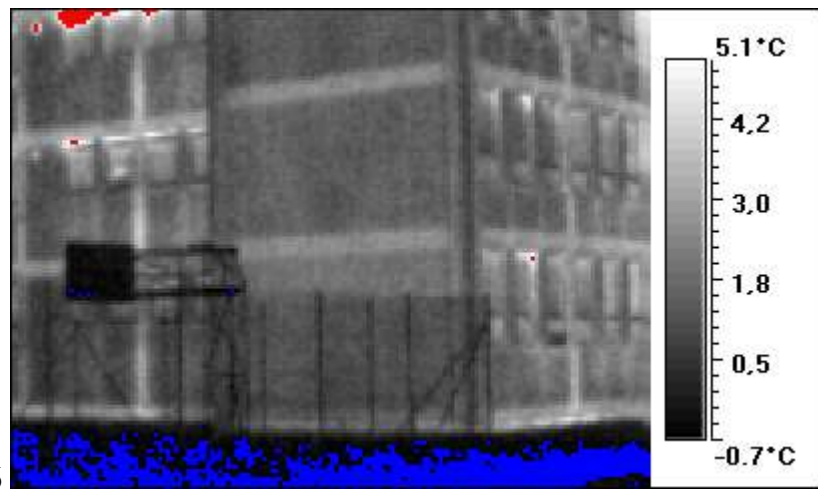
84 6,4 -6,2



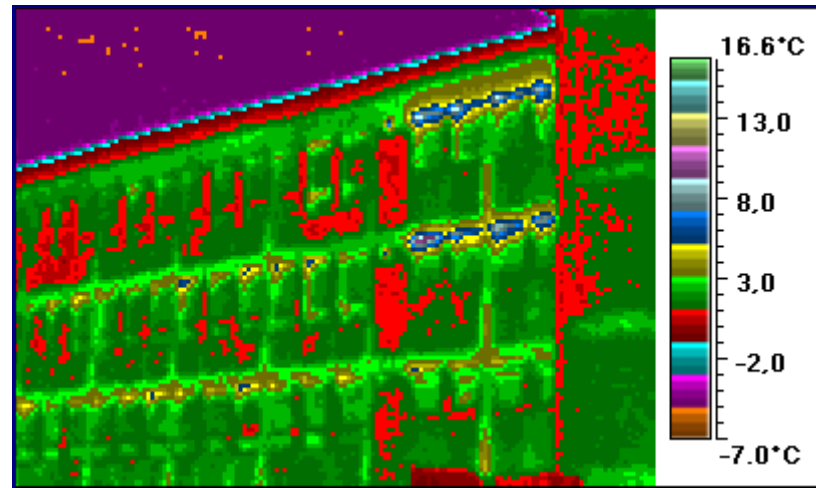
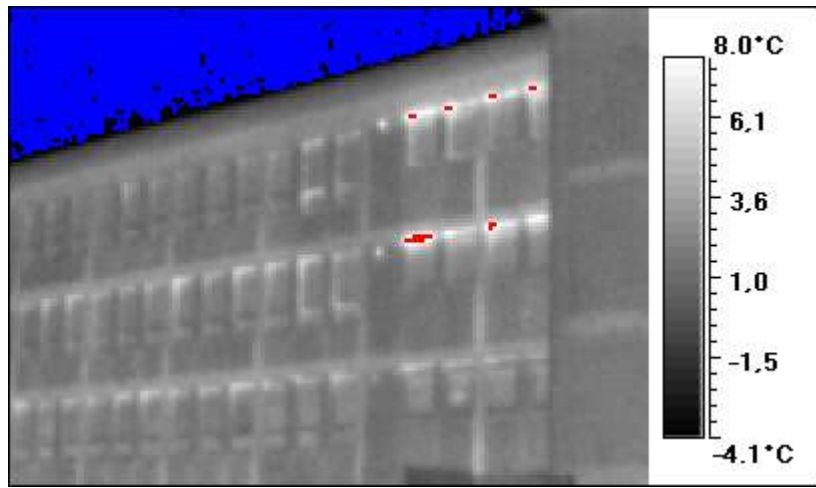
85 8,8 -5,2



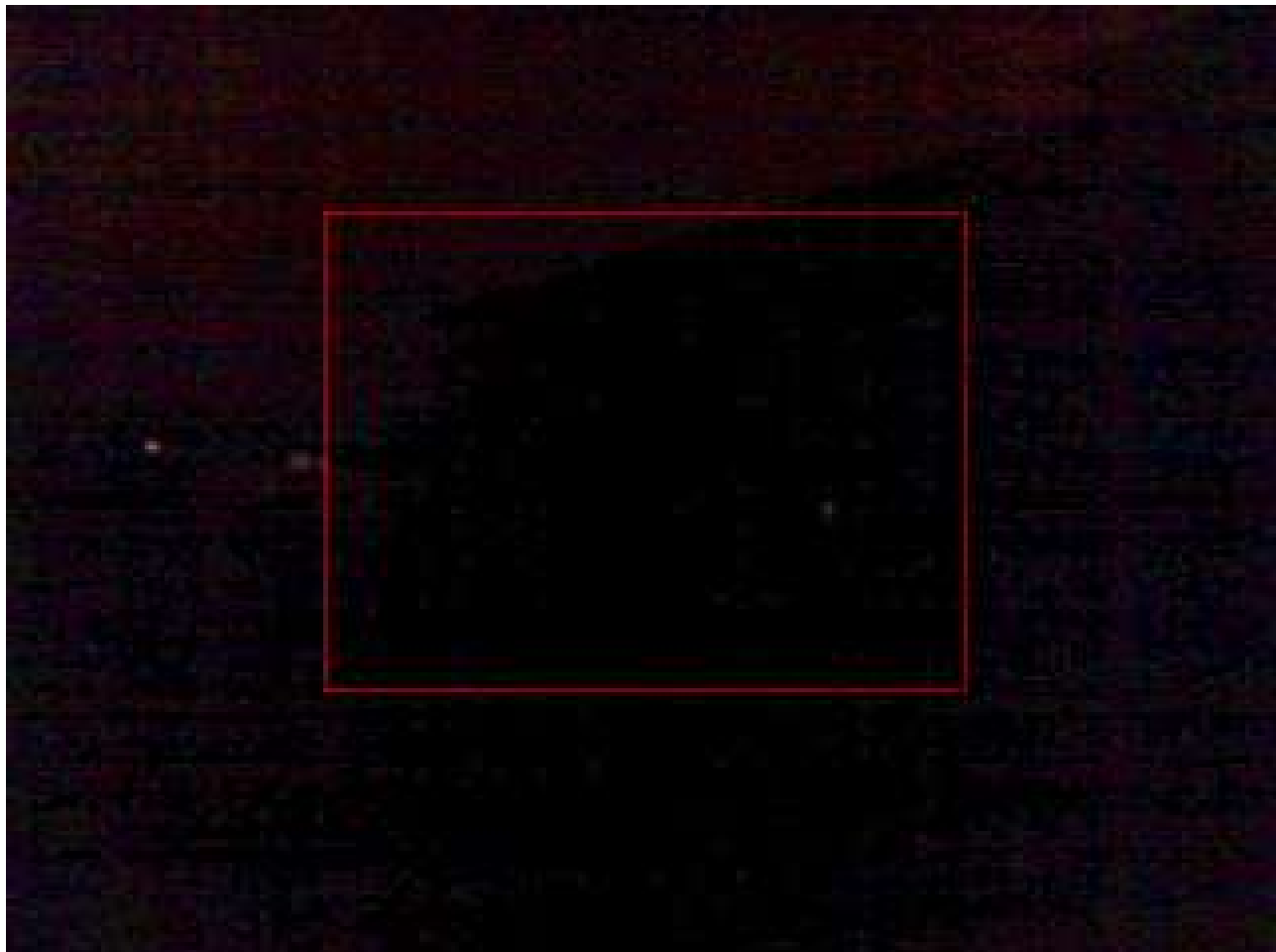
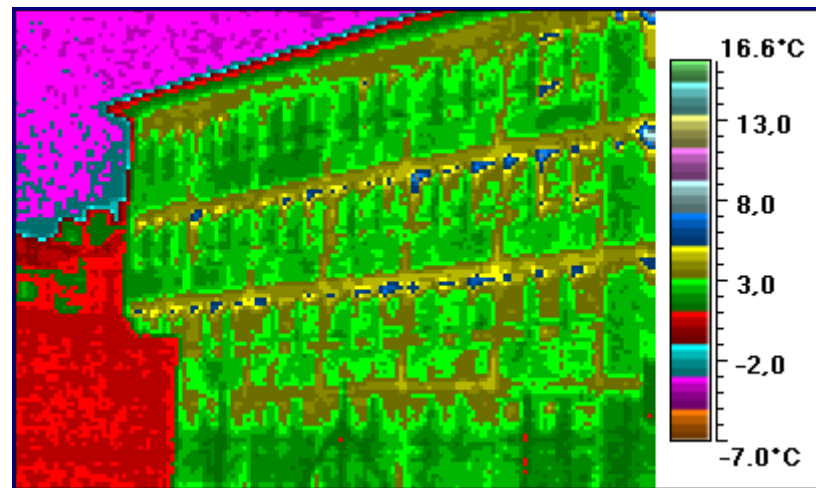
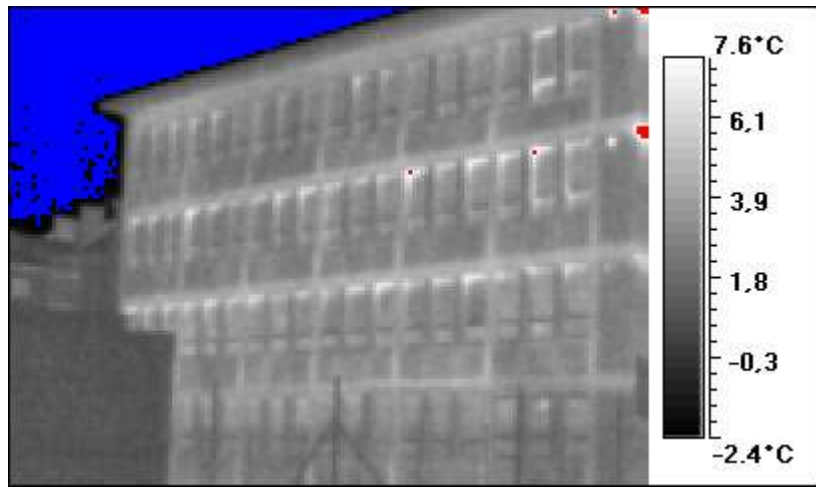
86 10,7 -1,6



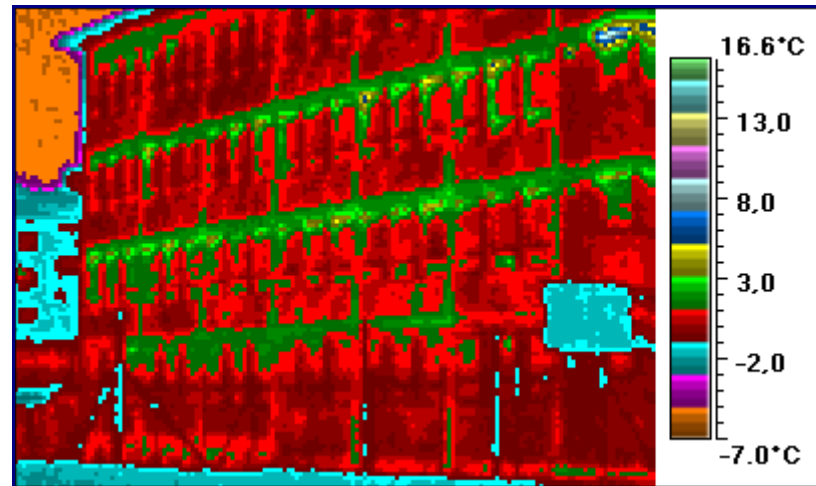
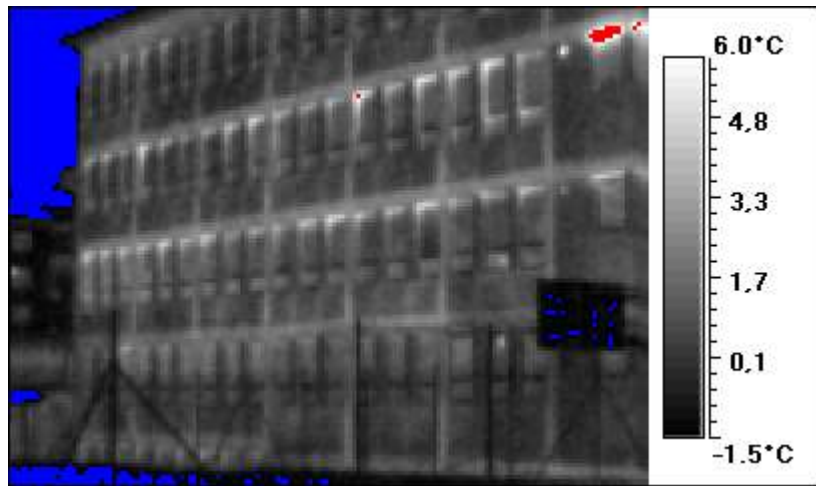
87 9,8 -4,7



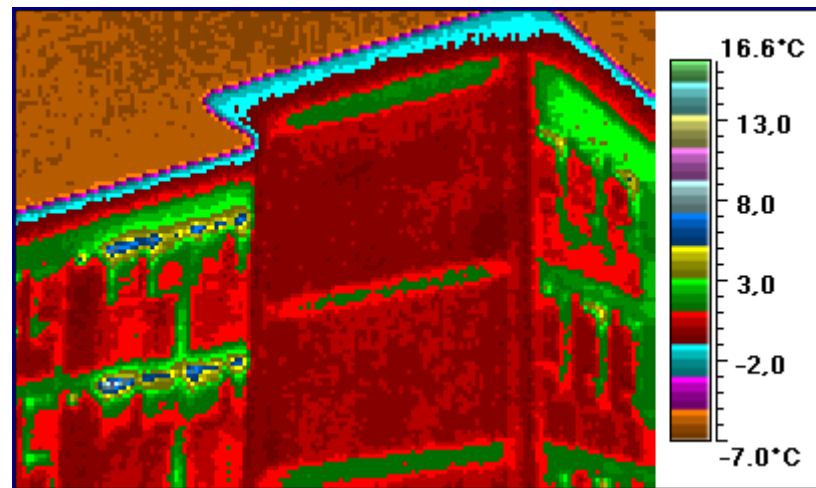
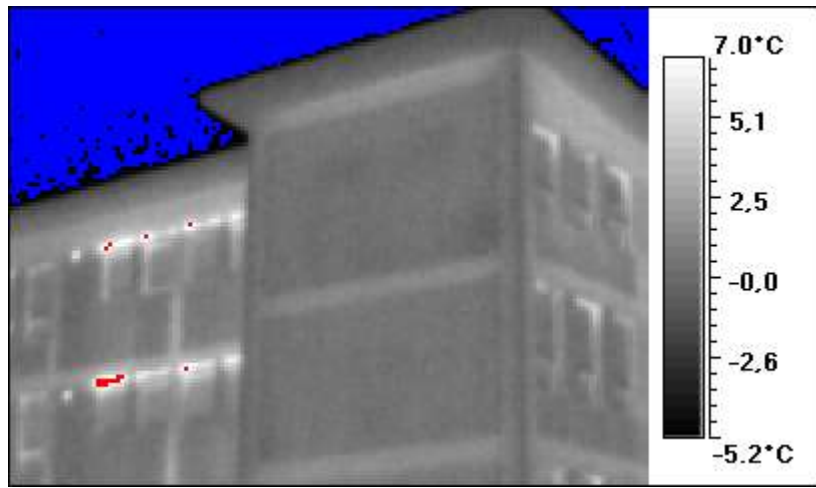
88 9,2 -3,3



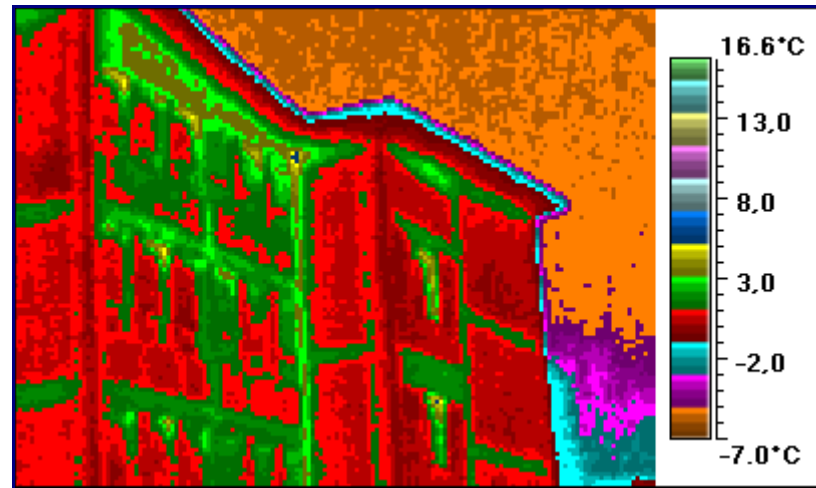
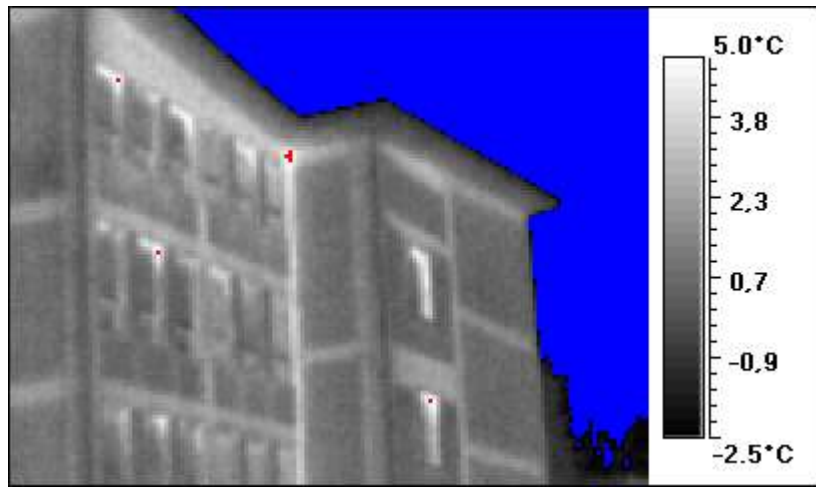
89 8,9 -5,2



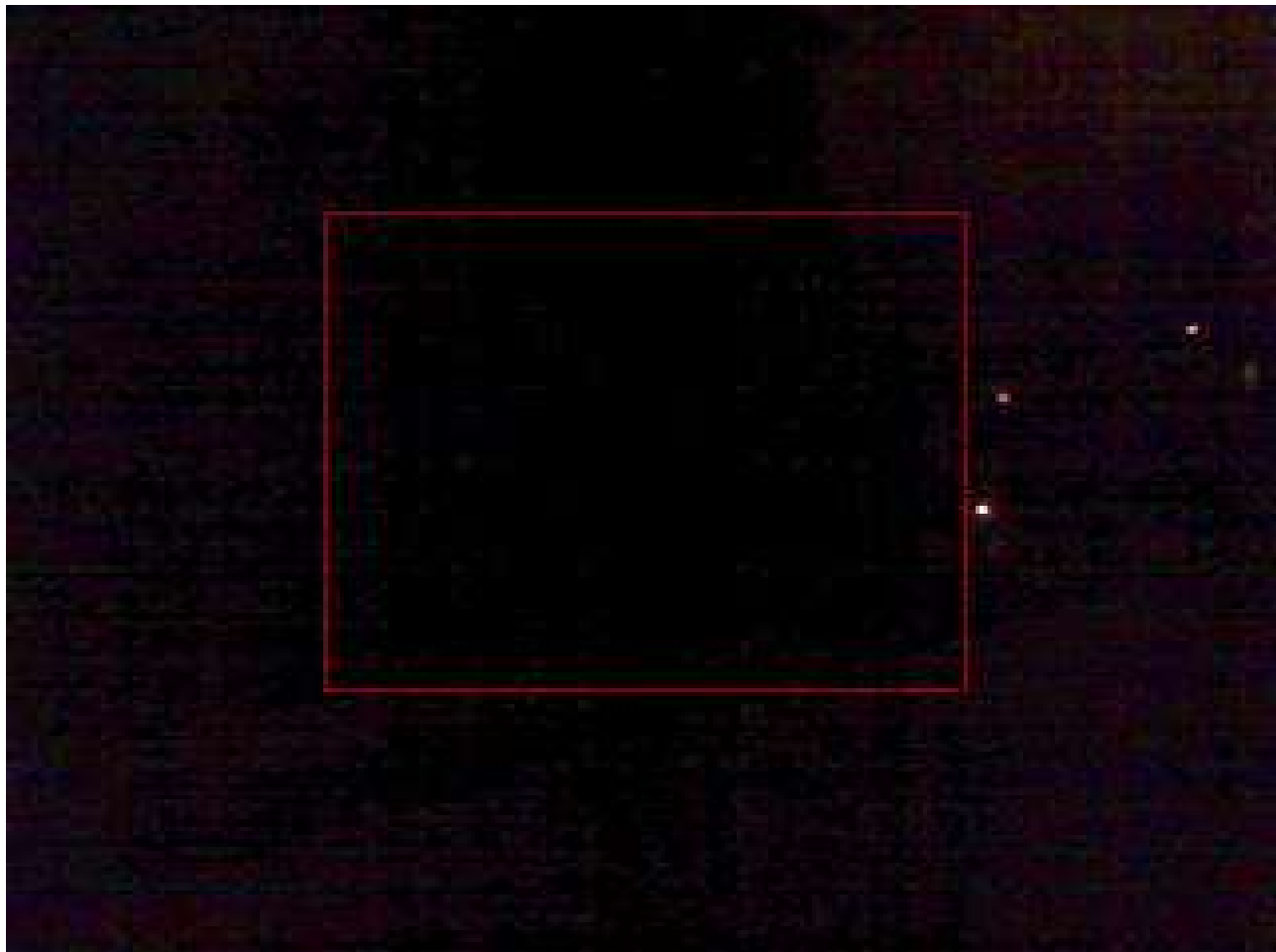
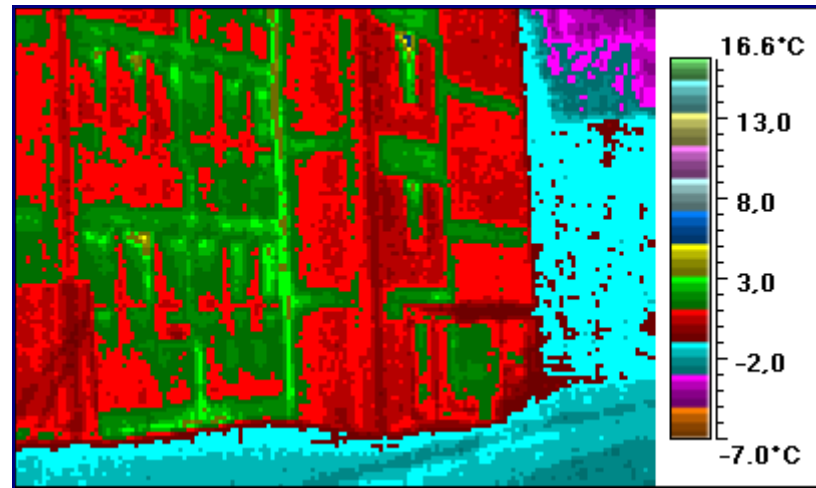
90 9,0 -5,9



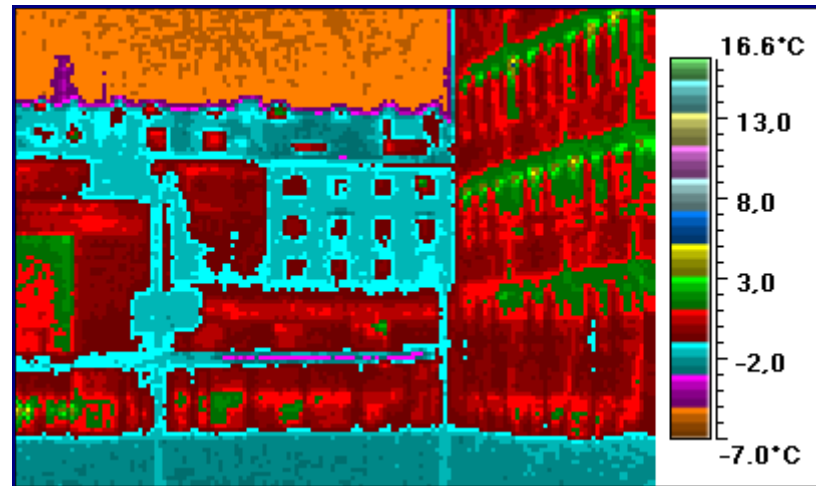
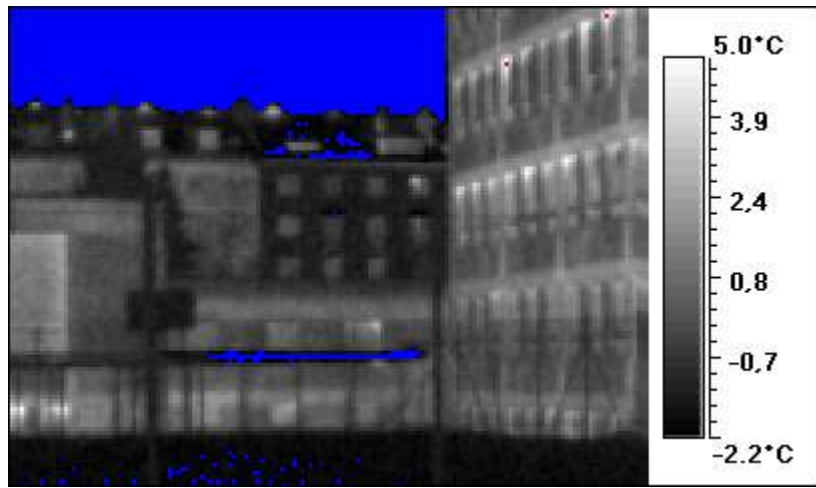
91 5,6 -5,5



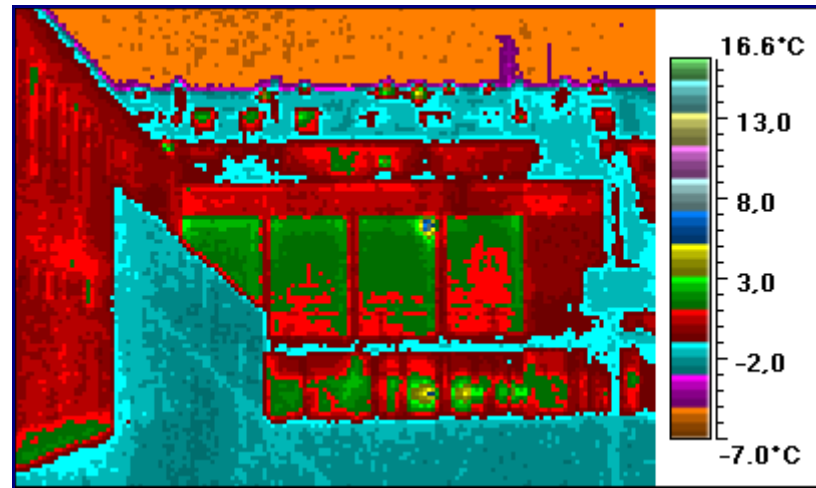
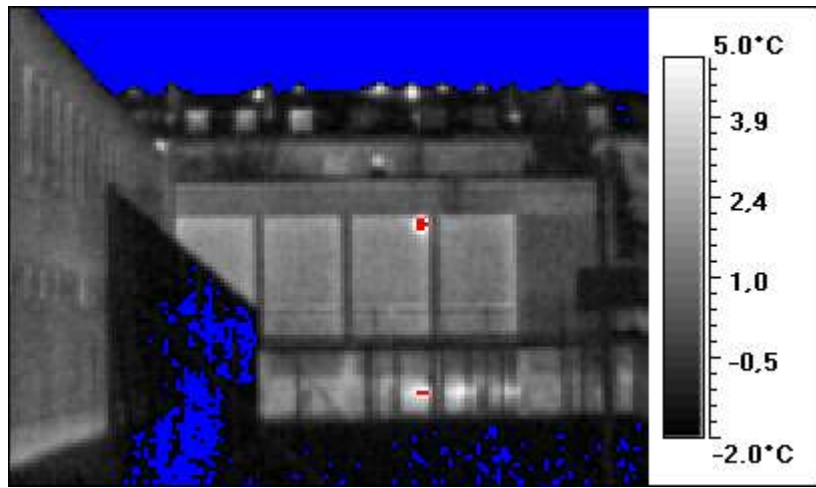
92 5,9 -4,3



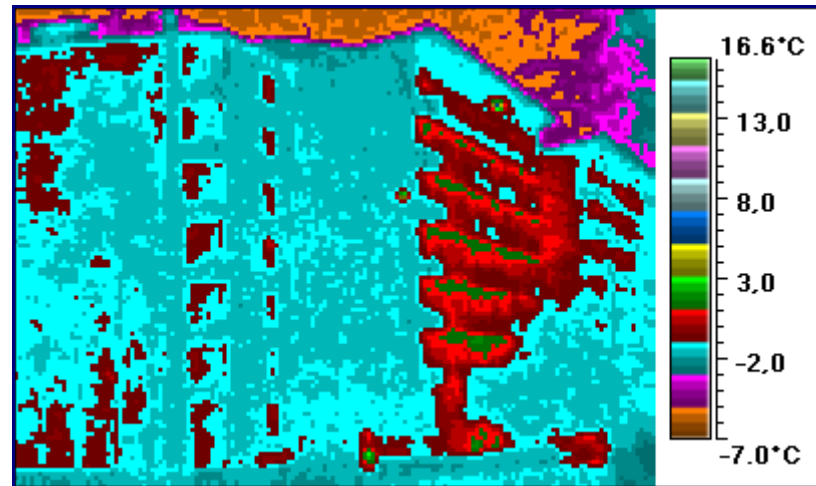
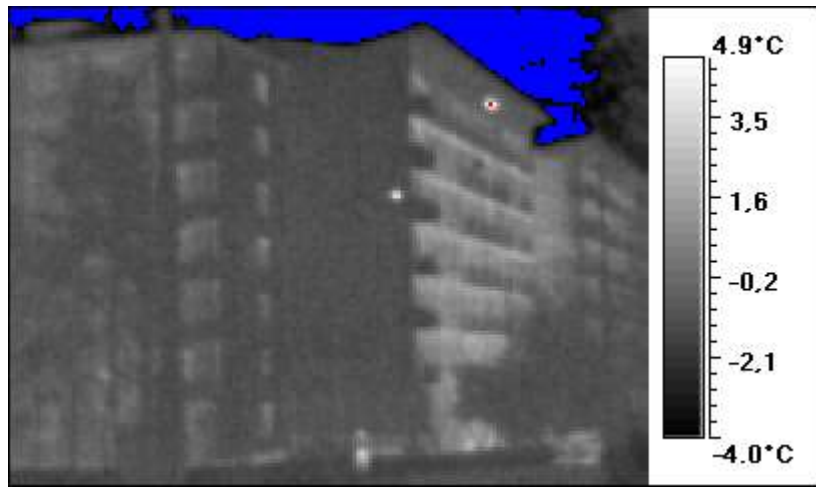
93 5,2 -5,4



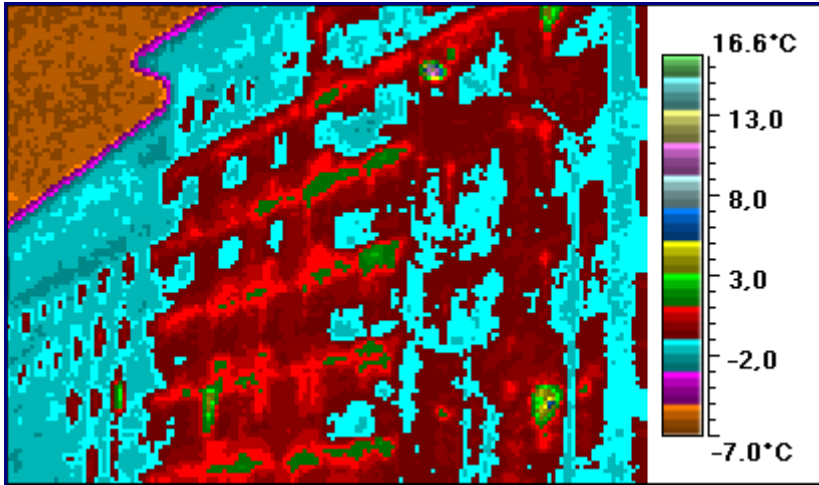
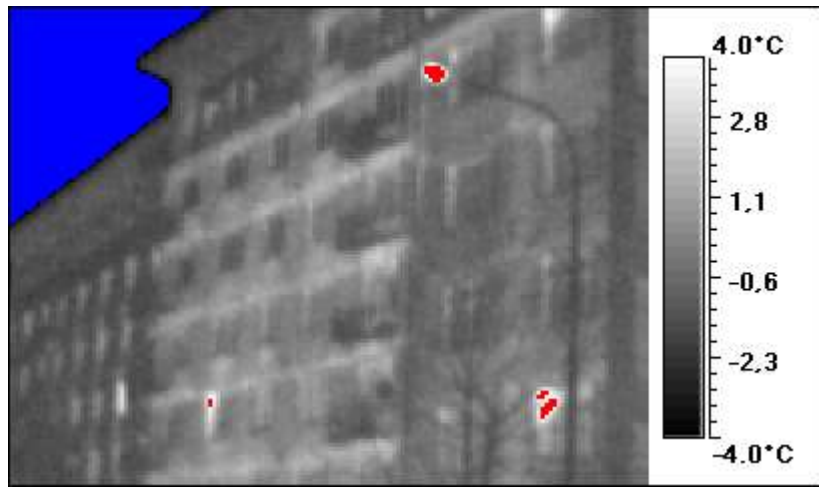
94 7,5 -5,3



95 6,0 -5,3



96 11,8 -5,9



97 4,7 -6,0

