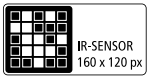
DE 02
GB 26
NL 50
FR 74
IT 98



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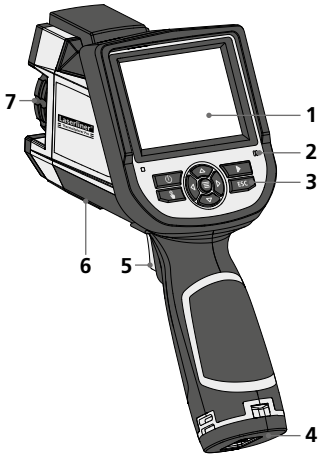
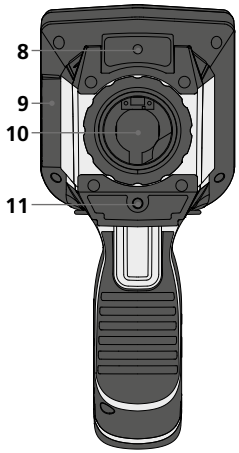
Innovation in Tools

! Lesen Sie vollständig die Bedienungsanleitung und das beiliegende Heft „Garantie- und Zusatzhinweise“. Befolgen Sie die darin enthaltenen Anweisungen. Diese Unterlagen gut aufbewahren.

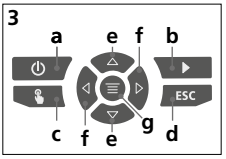
Funktion / Verwendung

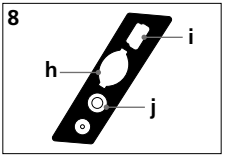
Die vorliegende Thermografiekamera ermöglicht die berührungslose Temperaturmessung von Oberflächen durch Bewertung der Strahlung im infraroten Wellenlängenbereich mit Hilfe des integrierten, ungekühlten Microbolometers. Mit der bildgebenden Darstellung des Sensors erhält man ein optisches Abbild der Temperaturverhältnisse am untersuchten Objekt. Durch die Einfärbung der verschiedenen Messtemperaturen in ein Thermogramm mit Falschfarbendarstellung wird eine optimale Visualisierung der Temperaturunterschiede erreicht. Die zusätzliche Digitalkamera kann gleichzeitig ein Foto von der untersuchten Szene aufnehmen, zur späteren Dokumentation im Gerät oder zur Weiterverarbeitung mit der beiliegenden Software. Mögliche Anwedungsgebiete sind die Detektion von Wärmebrücken und Isolierungsfehler, Lokalisierung von Überhitzung in elektr. oder mechanischen Bauteilen, Auffinden von Heizleitungen in Wand und Boden, Detektion von Leckagen, Lokalisieren von defekten Solarzellen in PV-Modulen und vieles mehr.



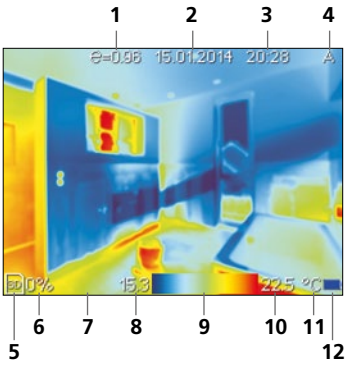


1 3,5“ TFT- Farbdisplay
2 integriertes Mikrofon
3 Direkttasten
4 Akkufach
5 Trigger:
Speichern
IR/Digital
Laser
Punkttemperatur
Flächentemperatur
6 1/4" Stativanschluss
7 Objektiv
8 Kamera
9 Schacht
10 Infrarot-Kameralinse
11 Laseraustritt



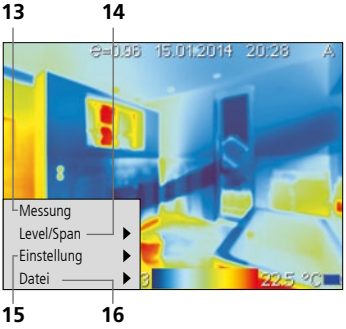


a ON/OFF
b Mediengalerie
c Messobjekte selektieren
d Abbruch
e Menü-Steuerung / Zoom ein / aus
f Menü-Steuerung / Umschaltung IR- / Digitalbild
g Hauptmenü
h Einschub Micro-SD-Karte
i USB-Schnittstelle
j Videoausgang



Standard-Messansicht

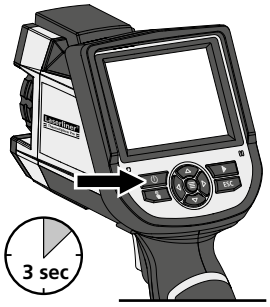
1 eingestellter Emissionsgrad
2 Datum
3 Uhrzeit
4 Ermittlung Temperaturmodus (man. / auto.)
5 Micro-SD-Karte eingelegt
6 Belegung Micro-SD-Karte
7 Thermografiebild
8 Temperatur Min.
9 Farbtabelle mit Temperaturbereich
10 Temperatur Max.
11 Temperatureinheit
12 Anzeige Batterieladung



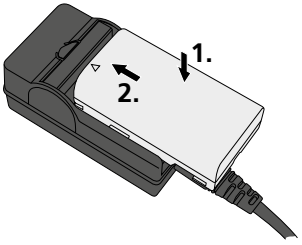
Hauptmenü

13 Hinzufügen von Messpunkten, -linien und -flächen
14 Temperaturbereich automatisch / manuell
15 allgemeine und messspezifische Einstellungen
16 Mediengalerie

1 ON / OFF

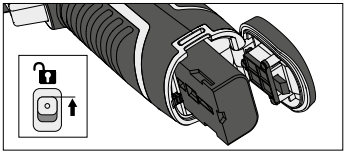


2 Li-Ion-Akkupack aufladen



3 Li-Ion-Akkupack austauschen

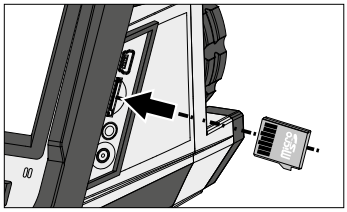
Zum Austausch des Li-Ion-Akkupacks die Verriegelung am Griff öffnen (siehe Abb. rechts). Den Akkupack entnehmen, den neuen Akkupack einsetzen und Verriegelung wieder schließen.



! Lagern Sie die Akkupacks in den entsprechenden Aufnahmen im Koffer, wenn die Kamera transportiert oder längere Zeit nicht benutzt wird.

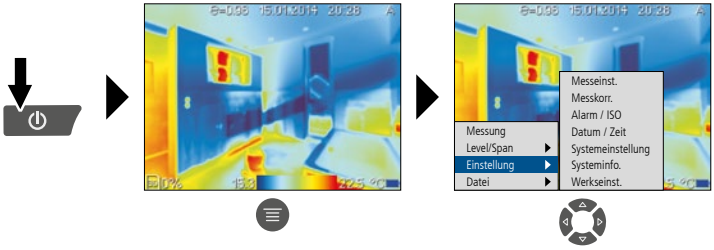
4 Micro-SD-Karte einlegen

Zum Einlegen einer Micro-SD-Karte zuerst die Gummiabdeckung öffnen und danach die Speicherkarte gemäß Abbildung einsetzen. Ohne Speichermedium sind keine Aufzeichnungen möglich.



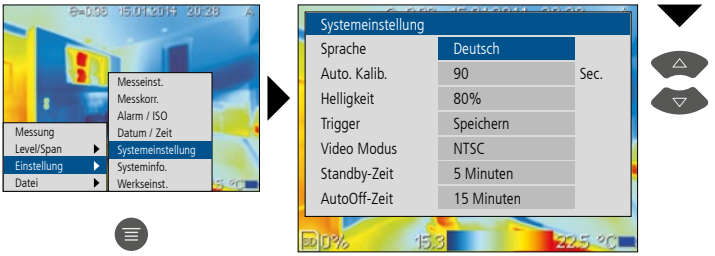
5 Hauptmenü

Über das Hauptmenü können allgemeine sowie messspezifische Einstellungen vorgenommen werden. Das Menü lässt sich über die vier Pfeiltasten steuern.

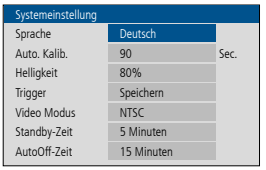


! Eingaben müssen durch Drücken der Menü-Taste (g) bestätigt werden. Ist die Trigger-Taste (4) auf „Speichern“ eingestellt, kann auch diese genutzt werden.

6.0 Allgemeine Einstellungen: **Systemeinstellungen**

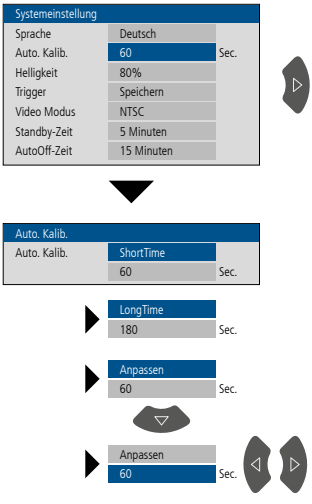


6.1 **Menüsprache einstellen** DE / GB / FR / ES / IT / PT / RU



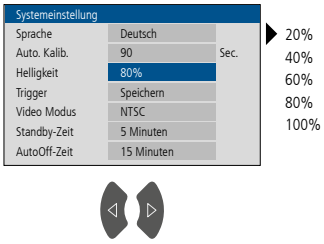
Italiano
Português
русский
English
Español
Francais
Deutsch

6.2 Auto-Kalibrierung



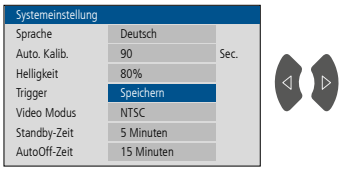
! Durch langes Drücken der Pfeiltasten erhöht bzw. verringert sich die Eingabe direkt um 10 Sekunden.

6.3 Display-Helligkeit



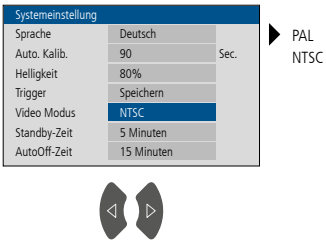
6.4 Trigger

Die Taste „Trigger" kann individuell mit folgenden Funktionen belegt werden:



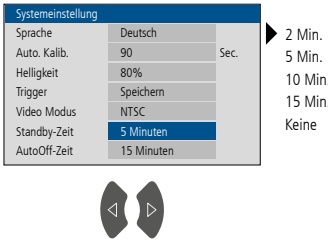
Speichern	IR-/Digitalbild speichern
IR-/Digital	Wechsel von IR- zu Digitalbild
Laser	Laser aktivieren
Punkt Temp.	Punkt hinzufügen / entfernen
Flächen Temp.	Fläche hinzufügen / entfernen

6.5 Modus Video-Ausgang



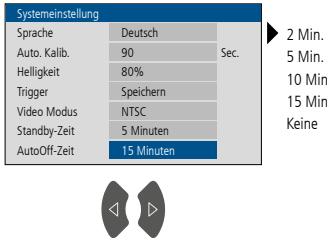
6.6 Automatische Displayabschaltung

Das Display schaltet sich nach eingestelltem Zeitraum der Inaktivität automatisch ab.

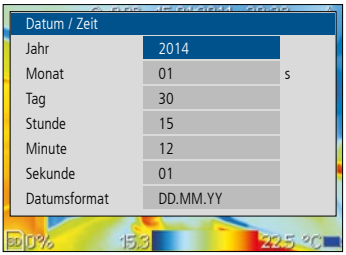


6.7 Automatische Abschaltung

Das Gerät schaltet sich nach eingestelltem Zeitraum der Inaktivität automatisch ab.

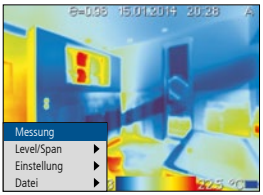


7 Allgemeine Einstellungen: **Datum / Zeit**



Auswahl Datumsformat

8 Messspezifische Einstellungen: **Messung**



Messpunkte hinzufügen
Es können zwei Messpunkte (S1 und S2) hinzugefügt werden.

Hot spot hinzufügen
Der Hot spot (SH) zeigt den heißesten Punkt an.

Cold spot hinzufügen
Der Cold spot (SC) zeigt den kältesten Punkt an.

Horizontale Linienmessung aktivieren (LH)

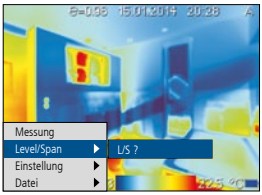
Vertikale Linienmessung aktivieren (LV)

Messflächen hinzufügen
Es können drei Messflächen (T1 bis T3) hinzugefügt werden.

! Durch Auswahl der Einstellung „Keine“ werden alle zugefügten Messpunkte, -linien und -flächen entfernt.

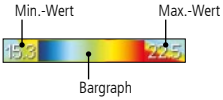
Siehe hierzu Kapitel 16.ff bis 20.f

9 Messspezifische Einstellungen: **Temperaturbereich A / M**



Auto ?

Temperaturbereich / Automatik (A)
Mit dieser Einstellung wird der Temperaturbereich des IR-Bildes eingestellt und die daraus resultierende Verteilung des Farbspektrums des Infrarotbildes. Das Farbspektrum des gemessenen IR-Bildes wird in Relation zum Temperaturbereich und zur Farbskala ermittelt.

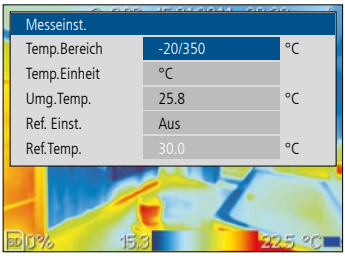


Die Farbverteilung des IR-Bildes wird anhand der gemessenen Min./Max.-Werte automatisch und dynamisch im Bargraph angepasst.

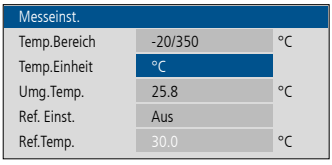
L/S ?

Temperaturbereich / Manuell (M)
In der manuellen Einstellung wird der Temperaturbereich nicht mehr durch die gemessenen Min.-/Max.-Werte automatisch eingestellt, sondern durch manuelle Werte festgelegt. Es muss der Temperaturbereich und die Temperaturspanne festgelegt werden. Siehe hierzu Kapitel 21

10.0 Messspezifische Einstellungen: **Messeinstellungen**

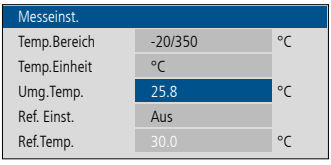


10.1 Temperatureinheit

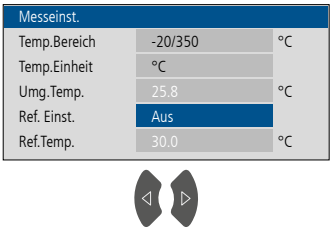


- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)

10.2 Umgebungstemperatur



10.3 Einstellen der Referenztemperatur



Ref.-Temp.
Punkt 1
Punkt 2
Hotspot
Coldspot
Fläche 1
Fläche 2
Fläche 3
Aus

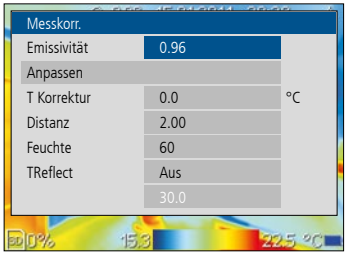
Über die Referenztemperatur wird die Temperaturdifferenz zwischen der eingestellten Referenztemperatur zu den Messpunkten, -flächen und -linien angezeigt.

Beispiel:
R = 30.0 °C
S1 = 35.9 °C

S1 wird mit der Differenztemperatur von 5.9 °C im Display angezeigt.

11.0 Messspezifische Einstellungen: **Einstellungen**

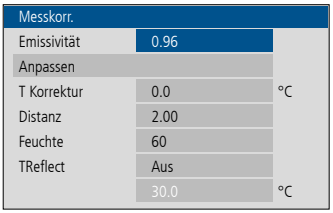
Vor jedem Einsatz sind die Messeinstellungen zur Infrarotmessung zu prüfen bzw. auf die gegebene Messsituation einzustellen, um eine korrekte Messung zu gewährleisten. Insbesondere sind hier die allgemeinen Parameter hinsichtlich Emissionsgrad, Entfernung zum Messobjekt und die Umgebungsbedingungen zu beachten.



11.1 Emissionsgrad

Der Grad der Infrarotabstrahlung, die jeder Körper material-/oberflächenspezifisch abgibt, wird durch den Emissionsgrad bestimmt (0,01 … 1,0). Zu einer korrekten Messung ist es zwingend erforderlich den Emissionsgrad einzustellen. Neben den vorgegebenen Emissionsgraden aus der Materialliste ist das Einstellen eines individuellen Emissionsgrades möglich.

Individuellen Emissionsgrad einstellen



! Durch langes Drücken der Pfeiltasten erhöht bzw. verringert sich die Eingabe direkt um 10 Sekunden.

Emissionsgradtabelle (Richtwerte mit Toleranzen)

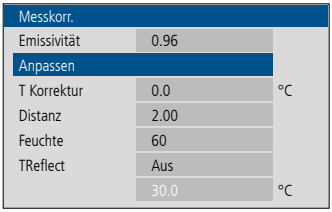
Metalle

Aluminium	
oxidiert	0,30
poliert	0,05
Alloy A3003	
oxidiert	0,20
geraut	0,20
Blei	
rau	0,40
Chromoxid	0,81
Eisen	
oxidiert	0,75
mit Rost	0,60
Eisen geschmiedet	
matt	0,90
Eisen, Guss	
nicht oxidiert	0,20
Schmelze	0,25
Inconel	
oxidiert	0,83
elektropoliert	0,15
Kupfer	
oxidiert	0,72
Kupferoxid	0,78
Messing	
poliert	0,30
oxidiert	0,50
Platin	
schwarz	0,90
Stahl	
kaltgerollt	0,80
geschliffene Platte	0,50
polierte Platte	0,10
Legierung (8% Nickel, 18% Chrom)	0,35
Stahl	
galvanisiert	0,28
oxidiert	0,80
stark oxidiert	0,88
frisch gewalzt	0,24
rauhe, ebene Fläche	0,96
rostig, rot	0,69
Blech, nickelbeschichtet	0,11
Blech, gewalzt	0,56
Edelstahl, rostfrei	0,45
Zink	
oxidiert	0,10

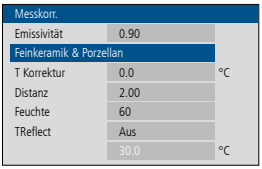
Nicht Metalle

Asbest	0,93
Asphalt	0,95
Basalt	0,70
Baumwolle	0,77
Beton, Putz, Mörtel	0,93
Eis	
glatt	0,97
mit starkem Frost	0,98
Erde	0,94
Estrich	0,93
Gips	0,88
Gipskartonplatten	0,95
Glas	0,90
Glaswolle	0,95
Grafit	0,75
Gummi	
hart	0,94
weich-grau	0,89
Holz	
unbehandelt	0,88
Buche gehobelt	0,94
Kalk	0,35
Kalksandstein	0,95
Kalkstein	0,98
Karborundum	0,90
Keramik	0,95
Steingut, matt	0,93
Kies	0,95
Kohle	
nicht oxidiert	0,85
Kühlkörper	
schwarz eloxiert	0,98
Kunststoff	
lichtdurchlässig	0,95
PE, P, PVC	0,94
Lack	
matt schwarz	0,97
hitzebeständig	0,92
weiß	0,90
Laminat	0,90
Marmor	
schwarz mattiert	0,94
gräulich poliert	0,93
Mauerwerk	0,93
Menschliche Haut	0,98
Papier	
alle Farben	0,96
Porzellan	
weiß glänzend	0,73
mit Lasur	0,92
Quarzglas	0,93
Sand	0,95
Schnee	0,80
Splitt	0,95
Stoff	0,95
Tapete (Papier) hell	0,89
Teer	0,82
Teerpapier	0,92
Ton	0,95
Transformatorenlack	0,94
Wasser	0,93
Zement	0,95
Ziegelstein rot	0,93

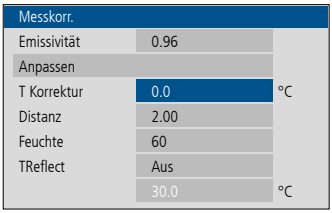
Emissionsgrad aus Materialliste auswählen



Auswahl aus 44 voreingestellten Materialie



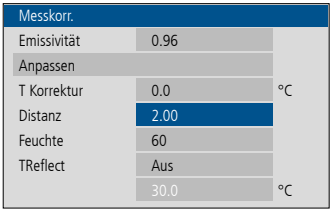
11.2 T Korrektur



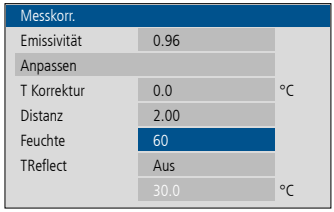
Korrektur der klimatischen Umgebungsbedingungen

Die nachfolgenden messspezifischen Einstellungen sind vor einer Messung an die klimatischen Umgebungsbedingungen anzupassen. Ab einer Messentfernung von 10 m sind die atmosphärischen Einflüsse der Luft auf jeden Fall zu berücksichtigen.

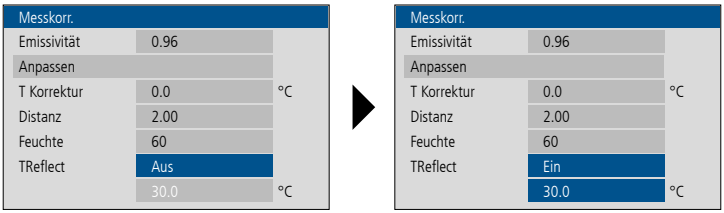
11.3 Distanz



11.4 Feuchte



11.5 TReflect



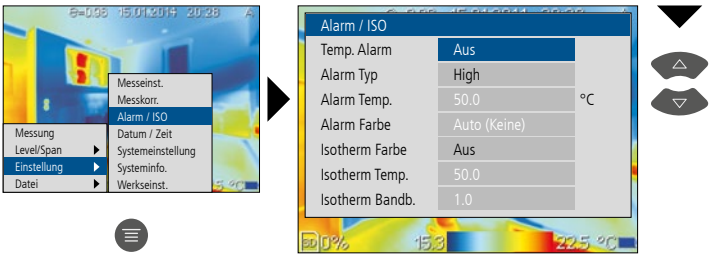
Einstellen der gewünschten Temperatur

Reflektionstemperatur

Bei der Infrarotmessung eines bestimmten Objektes kann die Messung durch die Reflektionsstrahlungen anderer in der Nähe befindlicher Objekte oder auch der Umgebungsluft beeinflusst werden, da das Messobjekt nicht vollständig isoliert werden kann. Mit Hilfe der Reflektionstemperatur können Fremdstrahlungen kompensiert werden. Im Regelfall beträgt die Reflektionstemperatur die der Umgebungstemperatur. Sollten sich jedoch größere Objekte mit wesentlich abweichender Temperaturdifferenz (ca. >20°C) in der Nähe der Messfläche befinden, so ist deren Einfluss auf die Messfläche zu berücksichtigen. Dabei ist folgendermaßen vorzugehen:

1. Emissionsgrad auf 1.0 einstellen
2. Fokus unscharf stellen (siehe hierzu Kapitel 25)
3. die Kamera in die entgegengesetze Richtung des eingentlichen Messobjektes richten
4. die Durchschnittstemperatur ermitteln
5. Durchschnittstemperatur als Reflektionstemperatur einstellen

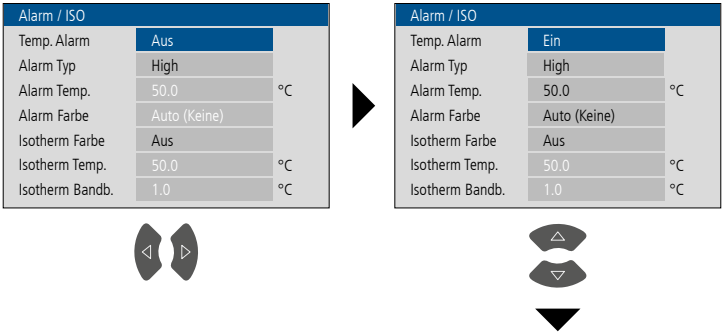
12.0 Messspezifische Einstellungen: **Alarm / ISO**



12.1 Temperaturalarm

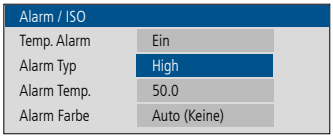
Durch einen Alarmton wird signalisiert, ob der eingestellet Temperaturbereich über- oder unterschritten bzw. der Taupunkt erreicht ist. Der Taupunkt wird automatisch berechnet.

! Zur Nutzung der Alarm-Funktion ist ein Messpunkt, eine Messfläche oder eine horizontale bzw. vertikale Linie erforderlich.



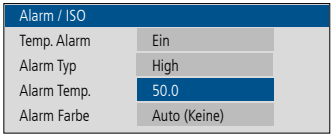
Alarm Typ

High	Temperatur überschritten
Low	Temperatur unterschritten
DP	Taupunkt erreicht



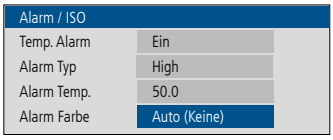
Alarm Temperatur

Temperaturgrenze einstellen



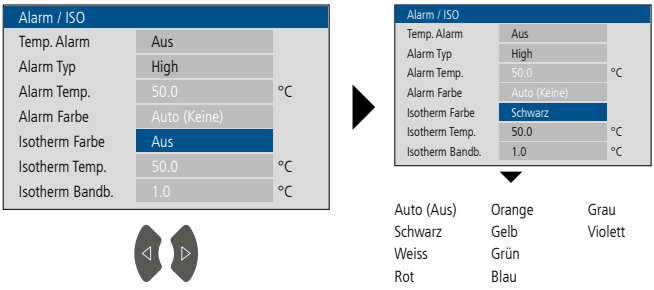
Alarm Farbe

Auto (Aus)	Orange	Grau
Schwarz	Gelb	Violett
Weiss	Grün	
Rot	Blau	

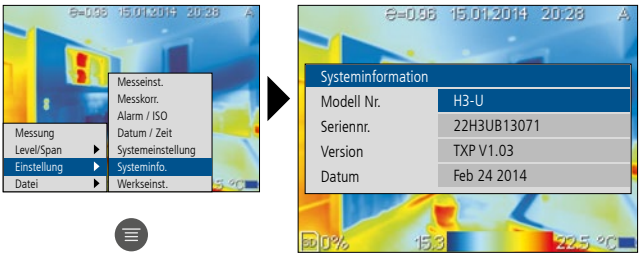


12.2 Isothermenfunktion

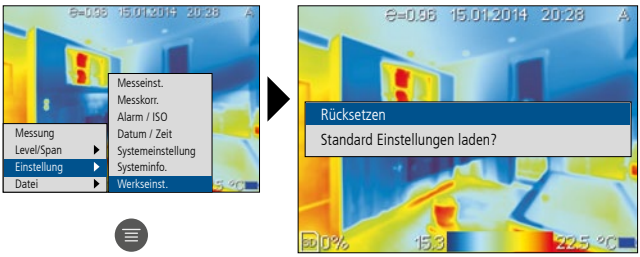
Mit Hilfe der Isothermenfunktion ist die Anzeige von definierbaren Temperaturbereichen mit gleicher Farbdarstellung möglich, vergleichbar mit einem Filter. Somit können besonders relevante Temperaturbereiche sichtbar gemacht werden. Die Isothermenfunktion ist über bestimmte Parameter je nach Messaufgabe einzustellen. Die Einstellungsparameter sind gleich einer "Wenn-Dann-Funktion". Bei Erfüllung der eingestellten Bedingung wird der Temperaturbereich entsprechend dargestellt.



13 Systeminformation



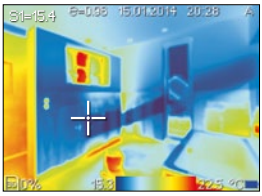
14 Werkseinstellung

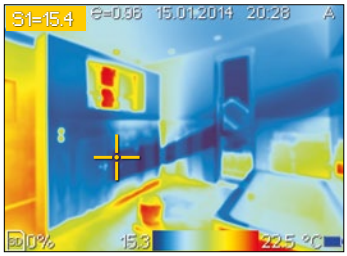


! Jegliche Einstellungen gehen verloren.

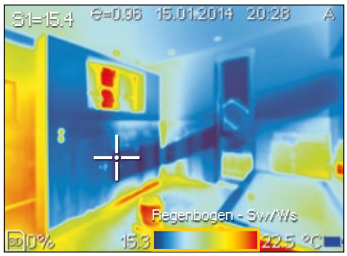
15 Messobjekte selektieren

Durch die Taste c „Bildobjekte selektieren“ werden nacheinander hinzugefügte Messpunkte, Messfelder, Messfläche sowie der Bargraph und die Min.-/Max-Temepraturen ausgewählt. Der ausgewählte Bereich wird gelb unterlegt und kann nach Drücken der Taste g „Hauptmenü“ angepasst werden.

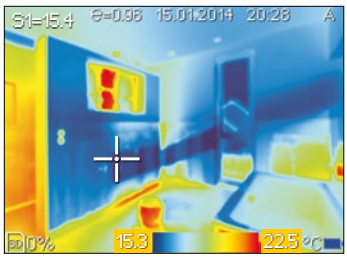




nächstes Objekt — Einstellungen



nächstes Objekt — Einstellungen

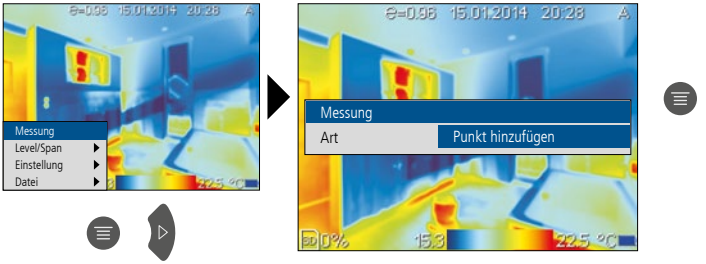


nächstes Objekt — Einstellungen

! Die Auswahl wird nach kurzer Zeit automatisch aufgehoben.

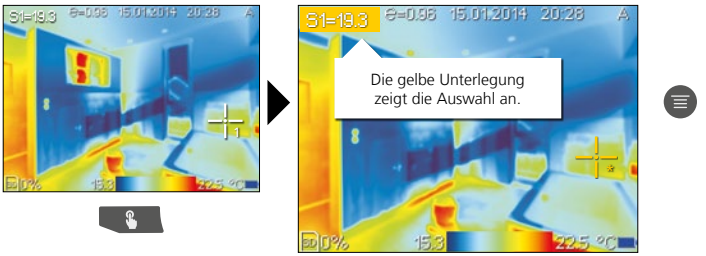
16.0 Messpunkte aktivieren/deaktivieren

Es können bis zu zwei Messpunkte gleichzeitig festgelegt werden, denen folgende Eigenschaften zugewiesen werden können (Max.-Temperatur, Min.-Temperatur, manuelle Positionierung) sowie messspezifische Parameter.



! Durch Auswahl der Einstellung „Keine" werden alle zugefügten Messpunkte, -linien und -flächen entfernt.

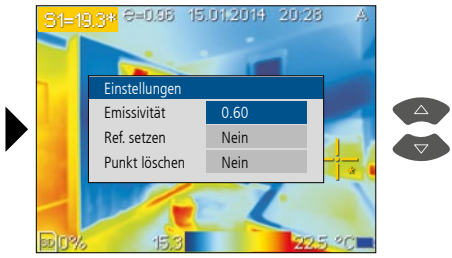
16.1 Messpunkte / Parameter



Emissivität

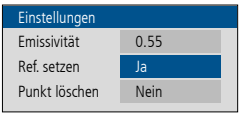
Emissionswert für Punkt 1 (S1) einstellen. Siehe auch Kapitel 11.1

! Sind für Messpunkte, -linien oder -flächen eigene Werte festgelegt, erscheint ein *-Symbol am Messwert.



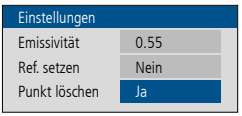
Ref. setzen

Die Temperatur von Punkt 1 (S1) gibt die Referenztemperatur (R) an. Siehe auch Kapitel 10.2

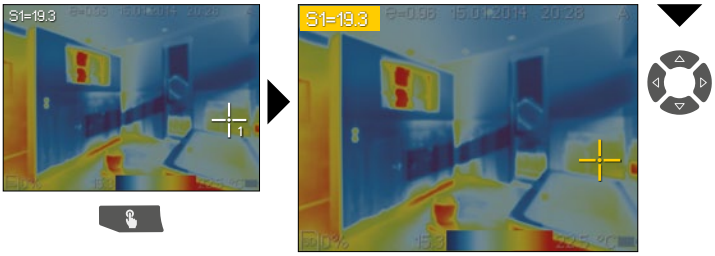


Punkt löschen

Der Punkt wird entfernt.

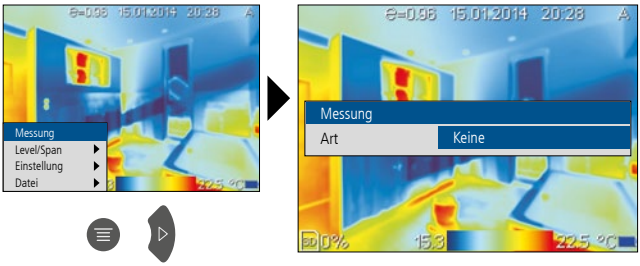


16.2 Messpunkte / Manuellen Messpunkt positionieren



17 Hot spot und Cold spot

Die Messpunkte Hot spot und Cold spot entsprichen der Funktion und Bedienung der Messpunkte (siehe Kapitel 16.ff) und sind nach dem gleichen Schema anzuwenden.

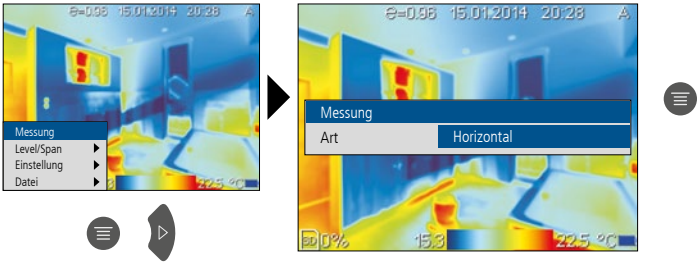


Hot spot hinzufügen
Der Hot spot (SH) zeigt den heißesten Punkt an.

Cold spot hinzufügen
Der Cold spot (SC) zeigt den kältesten Punkt an.

18.0 Horizontale Linienmessung aktivieren/deaktivieren

Die horizontale Linienmessung ermittelt die Objekttemperatur entlang einer verschiebbaren horizontalen Linie im Display, die insbesondere feine Temperaturunterschiede durch eine Kurvendarstellung grafisch verdeutlicht, in denen die farblichen Nuancen des IR-Bildes nicht ausreichend differenziert werden.

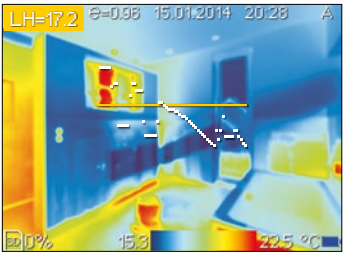


! Durch Auswahl der Einstellung „Keine“ werden alle zugefügten Messpunkte, -linien und -flächen entfernt.

18.1 Horizontale Linienmessung / Einteilung

Die horizontale Mitte liegt bei 120 (Display 240 Zeilen). Der Bargraph definiert die Grenzen des eingestellten Min./Max.-Temperaturbereichs (siehe Kapitel 21). Innerhalb dieses Temperaturbereichs werden anhand der dynamischen Temperaturkurve selbst geringste Temperaturveränderungen sichtbar gemacht, insbesondere wenn keine ausreichende Differenzierung durch die Farbgebung des IR-Bildes gegeben ist. Die Temperaturkurve bewegt sich nur innerhalb der im Bargraphen angezeigten Min./Max.-Temperatur.

18.2 Horizontale Linienmessung / Parameter



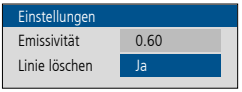
Emissivität

Emissionswert für die horizontale Linie (LH) einstellen. Siehe auch Kapitel 11.1

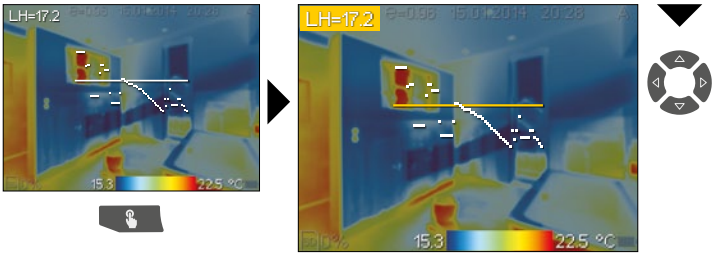
! Sind für Messpunkte, -linien oder -flächen eigene Werte festgelegt, erscheint ein *-Symbol am Messwert.

Linie löschen

Die Linie wird entfernt.

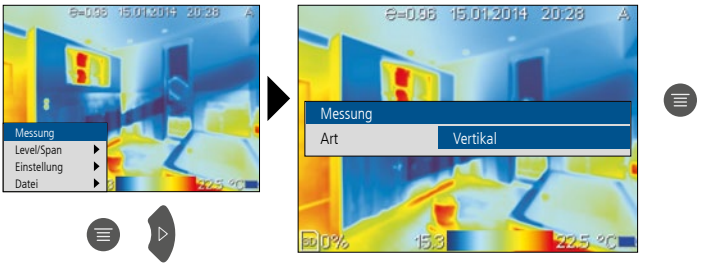


18.3 Horizontale Linien positionieren



19 Vertikale Linienmessung aktivieren/deaktivieren

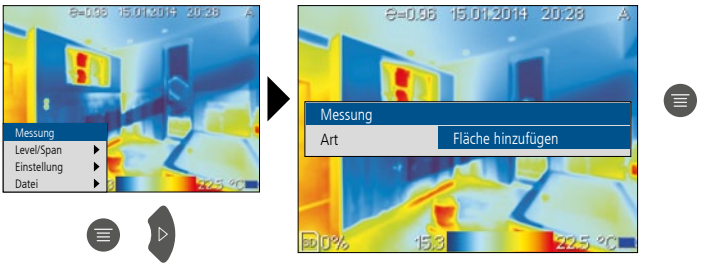
Die vertikale Linienmessung entspricht der Funktion und Bedienung der horizontalen Linienmessung (siehe Kapitel 18.ff) und ist nach dem gleichen Schema anzuwenden.



! Durch Auswahl der Einstellung „Keine“ werden alle zugefügten Messpunkte, -linien und -flächen entfernt.

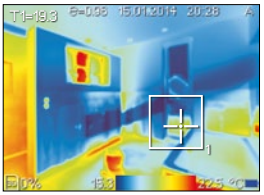
20.0 Flächenmessung aktivieren/deaktivieren

Es können bis zu drei Messflächen gleichzeitig festgelegt werden, denen folgende Eigenschaften zugewiesen werden können (Max.-Temperatur, Min.-Temperatur, Durchschnittstemperatur) sowie messspezifische Parameter.



! Durch Auswahl der Einstellung „Keine“ werden alle zugefügten Messpunkte, -linien und -flächen entfernt.

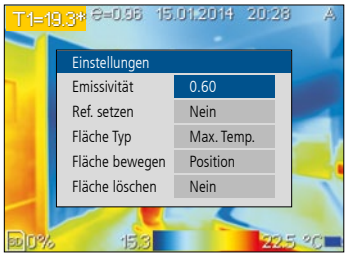
20.1 Flächenmessung / Parameter



Emissivität

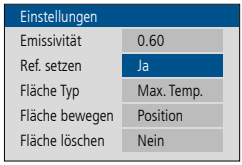
Emissionswert für Fläche 1 (T1) einstellen. Siehe auch Kapitel 11.1

! Sind für Messpunkte, -linien oder -flächen eigene Werte festgelegt, erscheint ein *-Symbol am Messwert.



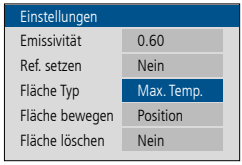
Ref. setzen

Die Temperatur von Fläche 1 (T1) gibt die Referenztemperatur (R) an. Siehe auch Kapitel 10.2



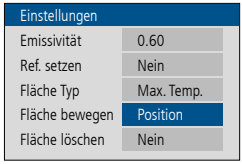
Fläche Typ

Max. Temp.	höchste Temperatur innerhalb der Messfläche
Min. Temp.	niedrigste Temperatur innerhalb der Messfläche
Durchschn. Temp.	durchschnittliche Temperatur innerhalb der Messfläche



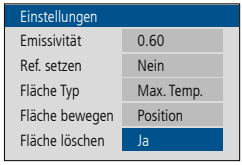
Fläche bewegen

Position	Die Position kann mittels der Pfeiltasten bewegt werden
Größe	Die Größe des Feldes kann mittels der Pfeiltasten verändert werden



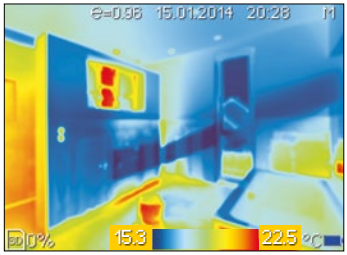
Fläche löschen

Die Fläche wird entfernt.



21 Manueller Temperaturbereich

In der manuellen Einstellung wird der Temperaturbereich nicht mehr durch die gemessenen Min.-/Max.-Werte automatisch eingestellt, sondern durch manuelle Werte festgelegt. Umschaltung automatisch / manuell siehe Kapitel 9



Die Min.-/Max.-Werte (Level) werden gleichzeitig erhöht.

Die Min.-/Max.-Werte (Level) werden gleichzeitig verringert.

Der Min.-/Max.-Temperaturbereich (Spanne) wird vergrößert.

Der Min.-/Max.-Temperaturbereich (Spanne) wird verringert.

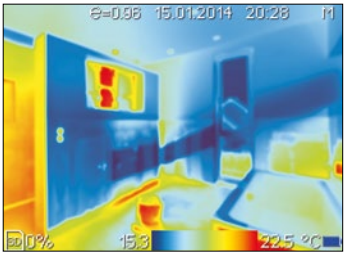
22 Farbpaletten IR-Bild

Für die Darstellung der erfassten Infrarottemperaturen stehen mehrere Standard-Farbpaletten zur Auswahl. Je nach gewählter Palette werden die gemessenen Temperaturen innerhalb des aktuellen Bildbereiches angepasst und im entsprechenden Farbraum dargestellt. Als Referenz der entsprechenden Temperatur-/Farbzuordnung dient der Bargraph zu den jeweiligen Min.-/Max.-Temperaturen des Gesamtbildes.

Eisen
Grau
Grau negativ
Bernstein
Metall heiss
Metall kalt
Regenbogen - Gr/Rt
Regenbogen - Bl/Rt
Regenbogen - Sw/Ws
Hochauflösend - Bl/Ge
Hochauflösend - Vi/Ws

23 Bildmodi

Es stehen 2 Bildmodi zur Verfügung.

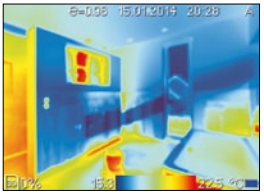


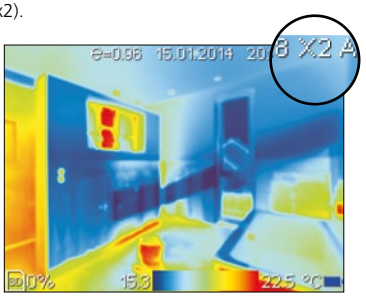
IR-Bild

Digitalbild

24 Zoom

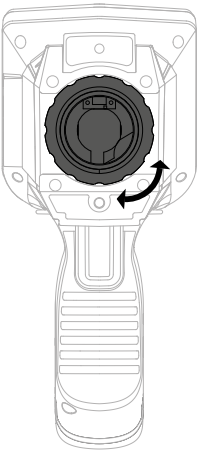
Die Ansicht kann gezoomt werden (x2).





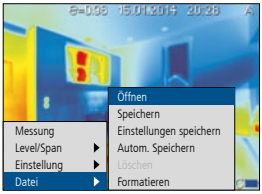
25 Kamerafokus

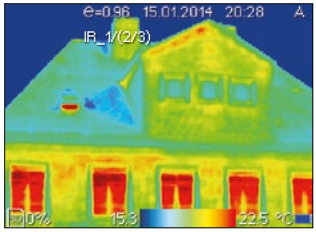
Neben den Basiseinstellungen im Messgerät sind der Kamerafokus sowie die Shutter-Funktion (Bildkalibrierung) wichtige Bestandteile für ein entsprechendes Thermografieergebnis. Das Messobjekt sollte bestmöglich fokusiert werden, sodass die Umrisse und Konturen deutlich im Display sichtbar sind.



26.0 Mediengalerie / Wiedergabemodus

In der Mediengalerie können alle mit der Thermokamera aufgenommenen Bilddaten aufgerufen werden. Die Mediengalerie kann entweder über das Menü oder über die Direkttaste aufgerufen werden. Um die Mediengalerie zu schließen, die Direkttaste „ESC“ drücken.

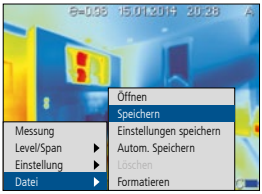


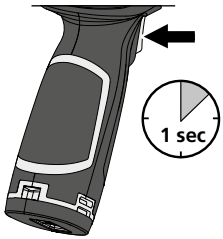


Ist die Taste „Trigger“ auf „IR / Digital“ eingestellt, kann damit im Wiedergabemodus zwischen dem IR- und dem zugehörigen Digitalbild gewechselt werden. Ist kein IR- oder Digitalbild vorhanden, ist das Display dunkel und es erscheint „Kein IR-Bild“ bzw. „Kein Digitalbild“.

26.1 Aufnahme Bild

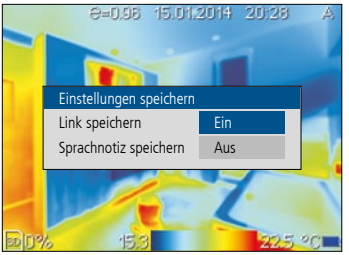
Über das Menü oder mit Hilfe der Taste „Trigger“ sind von jeder Messsituation Bildnahmen für die spätere Dokumentation zu erstellen.





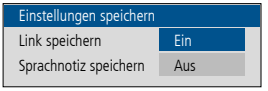
! Die Taste „Trigger“ muss auf „Speichern“ eingestellt sein, um Bilder aufzeichnen zu können. Siehe hierzu Kapitel 6.4

26.2 Einstellung Aufnahme



Link speichern

Durch Aktivieren der Funktion „Link speichern“ wird bei einer IR-Aufnahme gleichzeitig ein Digitalbild der Messsituation gespeichert.

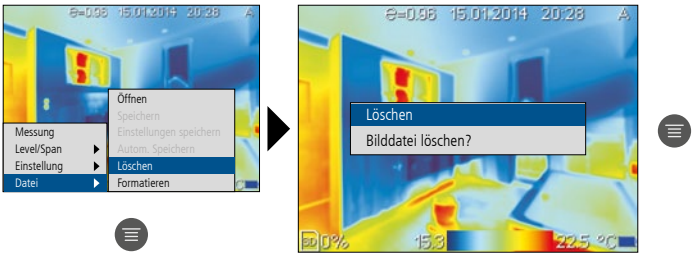


26.4 Automatische Aufnahme

Nach einmaligem Auslösen werden im eingestellten Intervall automatisch Bilder gespeichert.

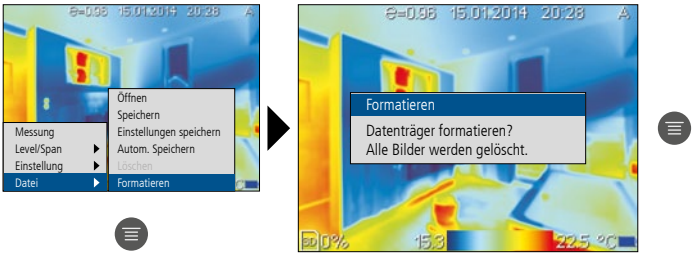
26.5 Aufnahmen löschen

Bilder können ausschließlich im Wiedergabemodus gelöscht werden.
Siehe hierzu Kapitel 26.0



! Durch Drücken der Taste „ESC“ wird der Vorgang abgebrochen.

26.6 SD-Karte formatieren



! Durch Drücken der Taste „ESC“ wird der Vorgang abgebrochen.

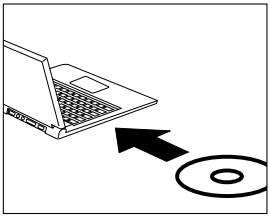
27 Ziellaser

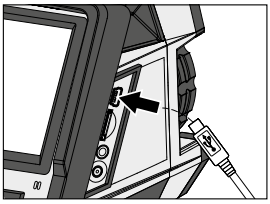
Mit Hilfe des Ziellasers werden bereichsspezifische Messungen durch einfaches Anvisieren erleichtert. Der Ziellaser kann im Menü der Taste „Trigger“ zugeordnet werden.

28 USB-Verbindung

Die auf der CD mitgelieferte Software ermöglicht es, die aufgezeichneten Daten auf den PC zu übertragen und zur weiteren Bearbeitung und Dokumentation zu nutzen. Legen Sie die mitgelieferte CD in das Laufwerk ein und folgen der Installationsroutine. Starten Sie nach erfolgreicher Installation die Applikation. Schließen Sie auf der einen Seite das mitgelieferte USB-Kabel an den Mini-USB Port des Gerätes an, das andere Ende an einen freien USB-Port Ihres Computers.
Die weitere Bedienung der Software entnehmen Sie bitte der Hilfe-Funktion, die eine detailierte Beschreibung der Funktionen beinhaltet.

! Eine Treiberinstallation ist nicht notwendig. Die Software arbeitet unter Windows XP / 7 und 8.



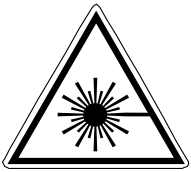


29 Hinweise zur Wartung

– Arbeiten an einem sauberen, staub- und wasserfreien Ort durchführen
– Kamera ausschalten, Batterie entfernen
– Vor statischer Aufladung durch Erdung sichern
– Objektive nicht an der Linse berühren
– Bei unsachgemäßer Anwendung erlischt der Garantieanspruch

Technische Daten	Technische Änderungen vorbehalten. 01.14
Infrarot-Sensor	160 x 120 Pixel Auflösung, ungekühltes Microbolometer 8-14 µm
Infrarot-Optik	Germanium-Objektiv, 25° x 19° Sichtfeld (FOV), 2,73 mrad räumliche Auflösung (IFOV) manueller Fokus, 0,4 m min.
Thermische Empfindlichkeit	0,1 °C, 100 mK NETD
Genauigkeit	± 2°C oder ± 2% vom Messwert
Messbereich	-20 °C ... 350 °C
Display	3,5" Farb-TFT-Display
Bildmodi	Infrarotbild, Digitalbild
Bildfunktion	1-2x digitaler Zoom
Digitalkamera	Auflösung: 640 x 480 Pixel
Format	JPEG Format, max. 640 x 480 Pixel
Speicherfunktion	Micro-SD-Kartenlaufwerk bis zu 16 GB
Ziellaser	Laserklasse 2, < 1 mW, 635-650 nm
Anschlüsse	USB, Micro-SD, Video
Schutzklasse	IP54, Falltest 2 m, Stoß 25g (IEC60068-2-29) Vibration 2g (IEC60068-2-6)
Stromversorgung / Ladezeit / Betriebsdauer	Li-Ion Akkupack 7,4V / 2,0Ah / ca. 7 Stunden / ca. 3 Std. je Akku
Abmessungen	298 mm x 104 mm x 149 mm
Gewicht	1,1 kg (inkl. Akkupack)

Allgemeine Sicherheitshinweise
Achtung: Nicht in den direkten oder reflektierten Strahl blicken. Der Laser darf nicht in die Hände von Kindern gelangen! Den Laserstrahl nicht auf Personen richten.



Laserstrahlung!
Nicht in den Strahl blicken!
Laser Klasse 2
< 1 mW · 635-650 nm
EN 60825-1:2007-10

EU-Bestimmungen und Entsorgung

Das Gerät erfüllt alle erforderlichen Normen für den freien Warenverkehr innerhalb der EU.

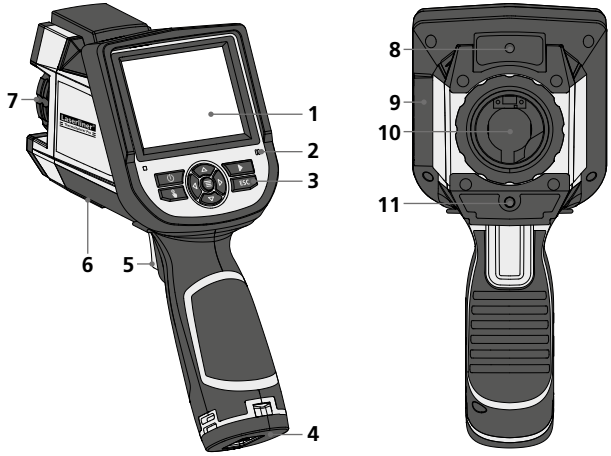
Dieses Produkt ist ein Elektrogerät und muss nach der europäischen Richtlinie für Elektro- und Elektronik-Altgeräte getrennt gesammelt und entsorgt werden.

Weitere Sicherheits- und Zusatzhinweise unter:
www.laserliner.com/info

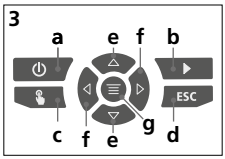
! Read the operating instructions and the enclosed brochure „Guarantee and additional notices“ completely. Follow the instructions they contain. Safely keep these documents for future reference.

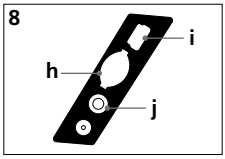
Function / Application

This thermographics camera allows for non-contact temperature measurement on surfaces by means of radiation in the infrared wavelength range via the integrated non-chilled microbolometer. The imaging technology of the sensor provides a visual image of the temperatures surrounding the inspected object. The temperature differences can be visualised by colour-coding the individual temperatures in a thermogram with false colour display. At the same time, the additional digital camera can capture images of the inspection area, which can then either documented later in the device or processed further using the included software. Possible application options include detecting thermal bridges and insulation flaws, locating overheating spots in electrical or mechanical building elements, finding heating pipes in walls or floors, detecting leaks, locating defective solar cells in PV modules etc.

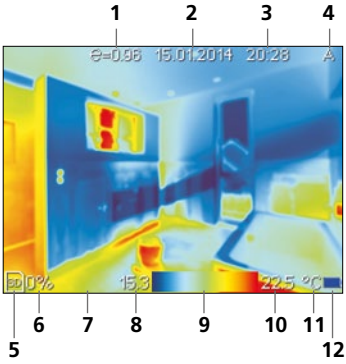


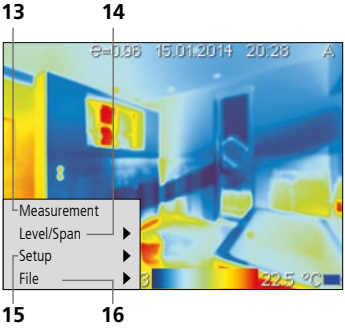
1 3.5“ TFT colour display
2 Integrated microphone
3 Hot keys
4 Battery compartment
5 Trigger:
Save
IR/CCD
Laser
Spot temperature
Area temperature
6 1/4" tripod connection
7 Lens
8 Camera
9 Shaft
10 Infrared camera lens
11 Laser output





a ON/OFF
b Media gallery
c Select target objects
d Cancel
e Control menu / Zoom on/off
f Control menu / IR/digital image changeover
g Main menu
h Micro-SD card slot
i USB interface
j Video output





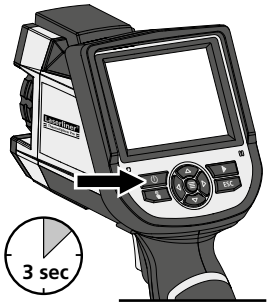
Standard measurement view

1 Set emissivity coefficient
2 Date
3 Time
4 Determine temperature mode (man./auto..)
5 Micro-SD card inserted
6 Used memory space (Micro-SD card)
7 Thermography image
8 Min. temperature
9 Colour spectrum with temperature range
10 Max. temperature
11 Temperature unit
12 Battery charge indicator

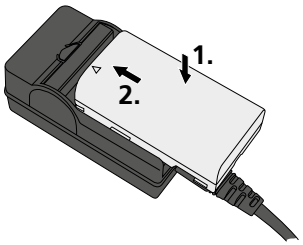
Main menu

13 Add measurement points, lines and areas
14 Temperature range automatic / manual
15 General and measurement-specific settings
16 Media gallery

1 ON / OFF

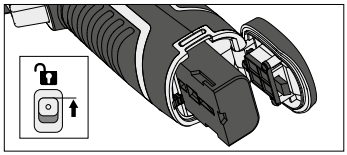


2 Charging the li-ion battery



3 Replace li-ion battery

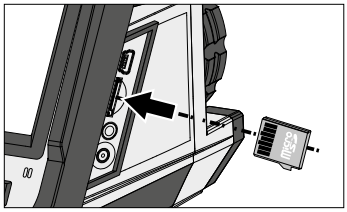
To replace the li-ion battery, unlock the handle (see image on right). Remove the battery pack, insert the new battery pack and lock the compartment again.



! Store the battery packs in the holders in the case when transporting the camera or when the camera is not used for longer periods.

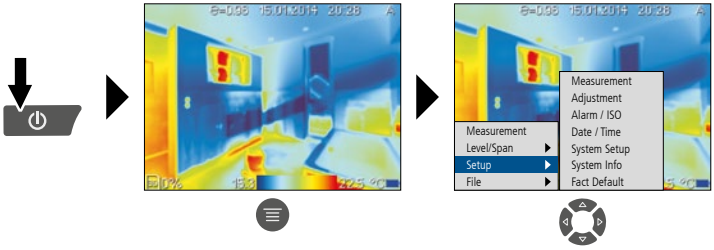
4 Inserting micro-SD card

To insert a micro-SD card, first open the rubber cover and then insert the memory card as illustrated. You cannot record anything without a storage medium.



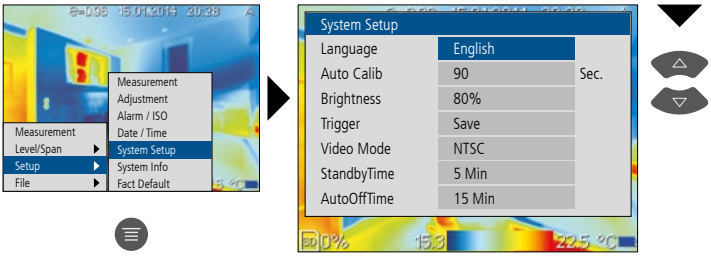
5 Main menu

General and measurement-specific settings can be made in the main menu. The menu is controlled with the four arrow buttons.

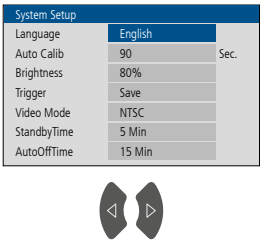


! Inputs must be confirmed by pressing the Menu button (g). You can also use the Trigger button (4) if it is set to „Save“.

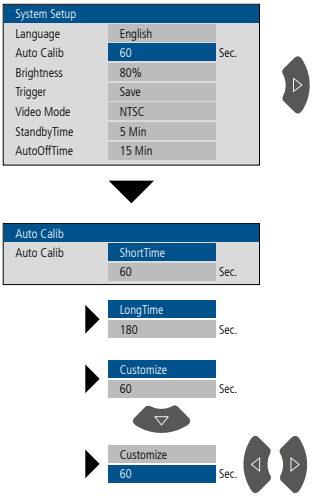
6.0 General settings: **System settings**



6.1 To set menu language DE / GB / FR / ES / IT / PT / RU

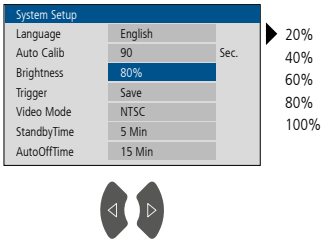


6.2 Autocalibration



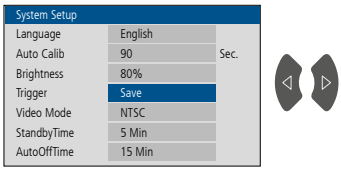
! The input is increased or decreased by 10 seconds by pressing and holding the arrow buttons.

6.3 Display brightness



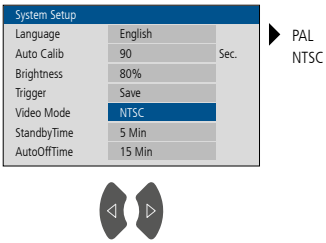
6.4 Trigger

The following functions can be assigned to the Trigger button:



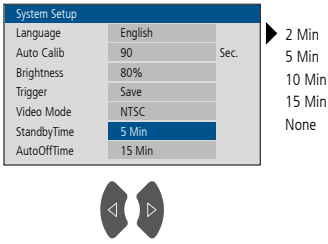
Save	Save IR/digital image
IR-/Digital	Change from IR to digital image
Laser	Activate laser
Spot Temp	Add / remove spot
Area Temp	Add / remove area

6.5 Video output mode



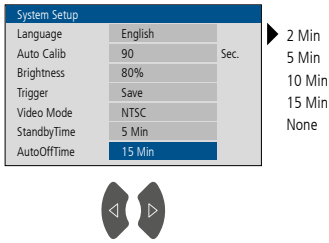
6.6 Auto display off

The display switches off automatically after a set period of inactivity.

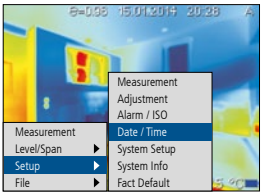


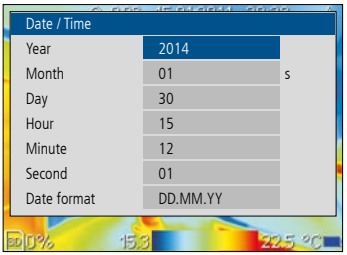
6.7 Auto power off

The device switches off automatically after a set period of inactivity.



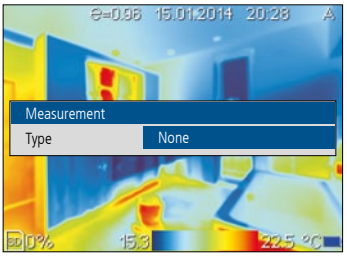
7 General settings: **Date / Time**





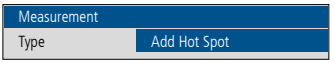
Selecting date format

8 Measurement-specific settings: **Measurement**



Add measurement points
Two measurement points (S1 and S2) can be added.

Add Hot Spot
Hot spot (SH) shows the hottest point.



Add Cold Spot
Cold spot (SC) shows the coldest point.

Activate horizontal line measurement (LH)

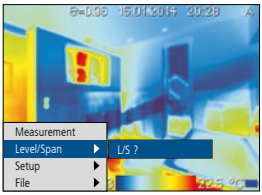
Activate vertical line measurement (LV)

Add measurement areas
Three measurement areas (T1 to T3) can be added.

! All added measurement points, lines and areas are removed by selecting „None“.

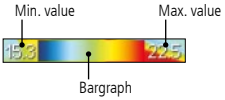
Refer to Section 16 ff to 20 f

9 Measurement-specific settings: **Temperature range A / M**



Auto ?

Temperature range / Auto (A)
This setting is used to adjust the temperature range of the IR image and the resulting distribution of the colour spectrum of the infrared image. The colour spectrum of the measured IR image is determined in relation to the temperature range and colour scale.

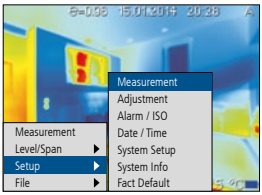


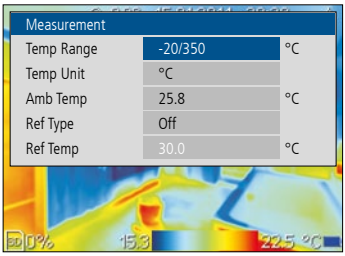
The colour distribution of the IR image is automatically and dynamically adjusted in the bargraph based on the measured min./max. values.

L/S ?

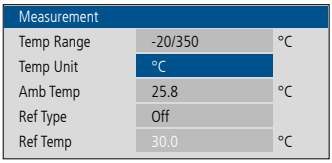
Temperature range / manual (M)
In manual settings mode, the temperature range is no longer set automatically based on the measured min./max. values but rather determined on the basis of manual values. The user must define the temperature range and span. Refer to Section 21.

10.0 Measurement-specific settings: **Measurement settings**



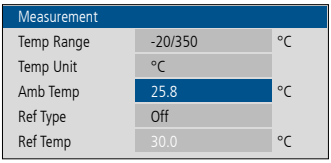


10.1 Temperature unit

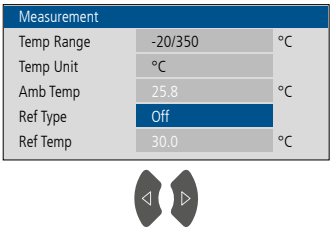


- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)

10.2 Ambient temperature



10.3 To set reference temperature



Ref Temp
Spot 1
Spot 2
Hotspot
Coldspot
Area 1
Area 2
Area 3
Off

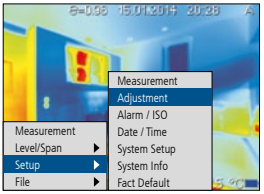
The reference temperature shows the temperature difference between the set reference temperature and the measurement points, lines and areas.

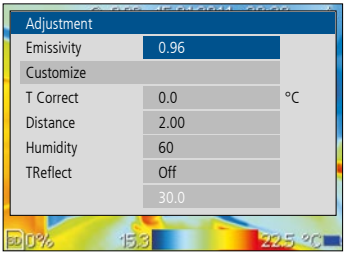
Example:
R = 30.0 °C
S1 = 35.9 °C

S1 is displayed with the temperature difference of 5.9 °C.

11.0 Measurement-specific settings: **Setup**

Before each use, check the settings for infrared measurement and adjust them to the respective measuring situation to ensure accurate measurements. In doing so, please pay particular attention to the general parameters with respect to emissivity coefficient, distance to target and ambient conditions.

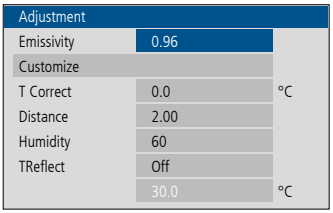




11.1 Emissivity coefficient

The level of infrared emissions given off by everything depends on the specific material and surface. This factor is determined by the emissivity coefficient (0.10 ... 1.0). For accurate measurements, it is absolutely essential that the emissivity coefficient is set first. The emissivity coefficient can either be custom set or selected based on the predefined emissivity coefficients from the material list.

To set individual emissivity



! The input is increased or decreased by 10 seconds by pressing and holding the arrow buttons.

Emissivity table (reference values with tolerances)

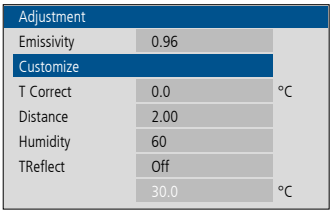
Metals

Aluminium	
Oxidised	0,30
Polished	0,05
Alloy A3003	
Oxidised	0,20
Roughened	0,20
Brass	
Polished	0,30
Oxidised	0,50
Chromium oxide	0,81
Copper	
Oxidised	0,72
Copper oxide	0,78
Inconel	
Oxidised	0,83
Electropolished	0,15
Iron	
Oxidised	0,75
With rust	0,60
Iron, cast	
Non-oxidised	0,20
Molten mass	0,25
Iron, forged	
Matt	0,90
Lead	
Rough	0,40
Platinum	
Black	0,90
Steel	
Cold rolled	0,80
Ground plate	0,50
Polished plate	0,10
Steel	
Alloy (8% nickel, 18% chromium)	0,35
Galvanised	0,28
Oxidised	0,80
Heavily oxidised	0,88
Freshly rolled	0,24
Rough, flat surface	0,96
Rusty, red	0,69
Sheet, nickel plated	0,11
Sheet, rolled	0,56
Stainless steel	0,45
Zinc	
Oxidised	0,10

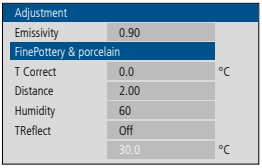
Nonmetals

Asbestos	0,93
Asphalt	0,95
Basalt	0,70
Brick, red	0,93
Carborundum	0,90
Cement	0,95
Ceramics	0,95
Earthenware, matt	0,93
China	
Untreated	0,73
Beech, planed	0,92
Clay	0,95
Coal	
Non-oxidised	0,85
Concrete, plaster, mortar	0,93
Cotton	0,77
Fabric	0,95
Glass	0,90
Glass wool	0,95
Graphite	0,75
Gravel	0,95
Grit	0,95
Gypsum	0,88
Gypsum cardboard	0,95
Heat sink	
Black, anodized	0,98
Human skin	0,98
Ice	
Clear	0,97
With heavy frost	0,98
Laminate	0,90
Lime	0,35
Lime malm brick	0,95
Limestone	0,98
Marble	
Black, dull finish	0,94
Greyish, polished	0,93
Masonry	0,93
Paint	
Black, matt	0,97
Heat-resistant	0,92
White	0,90
Paper	
All colours	0,96
Plastic	
Translucent	0,95
PE, P, PVC	0,94
Quartz glass	0,93
Rubber	
Hard	0,94
Soft, grey	0,89
Sand	0,95
Screed	0,93
Snow	0,80
Soil	0,94
Tar	0,82
Tar paper	0,92
Transformer paint	0,94
Wallpaper, light-coloured	0,89
Water	0,93
Wood	
Untreated	0,88
Beech, planed	0,94

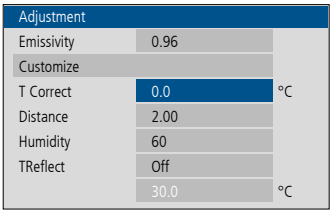
To select emissivity from material list



Selection from 44 preset materials



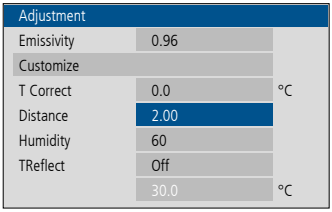
11.2 T Correct



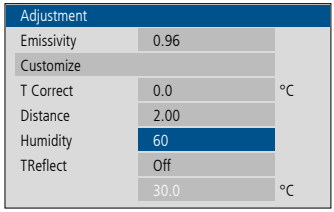
Correction of ambient climatic conditions

The following measurement-specific settings must be adjusted to the climatic conditions before starting measurements. Starting from 10 m distances, the atmospheric influences of the air must always be taken into account.

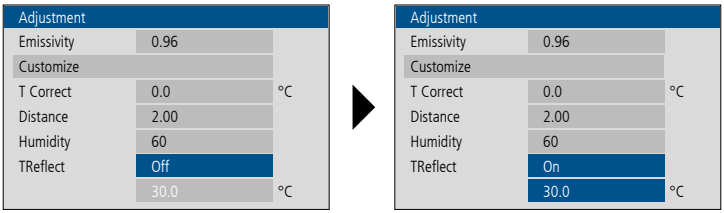
11.3 Distance



11.4 Humidity



11.5 TReflect



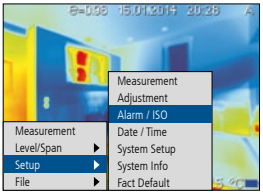
Setting the required temperature

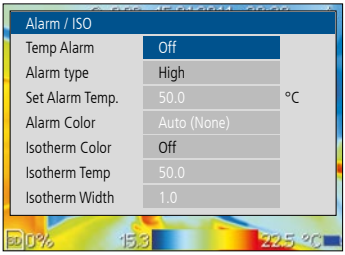
Reflection temperature

Infrared measurements of specific objects can be affected by reflection from other objects nearby or even from the ambient air because the measured object cannot be fully isolated. The reflection temperature setting can help compensate for the interference. The reflection temperature is generally the same as the ambient temperature. However, if larger objects with significantly different temperatures (approx. > 20 °C) are in close proximity to the measured area, its effects must be taken into account. For this purpose, follow these steps:

1. Set emissivity coefficient to 1.0
2. Blur the object out of focus (Refer to Section 25)
3. Aim the camera in the opposite direction of the actual measured object
4. Determine the average temperature
5. Set the average temperature as the reflection temperature

12.0 Measurement-specific settings: **Alarm / ISO**

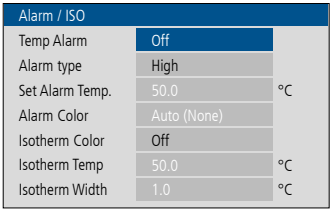


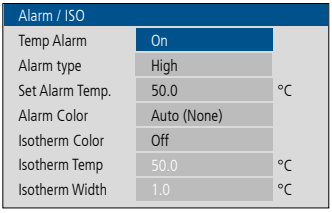


12.1 Temperature alarm

An alarm tone signals whether the set temperature range is overshot or undershot and whether the dew point is reached. The dew point is calculated automatically.

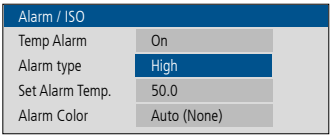
! A measurement point, a measurement area or a horizontal/vertical line is required to use the alarm function.





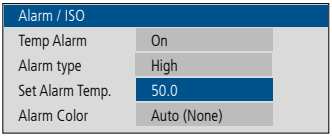
Alarm type

High	Temperature overshot
Low	Temperature undershot
DP	Dew point reached



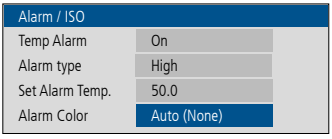
Alarm temperature

Set temperature limit



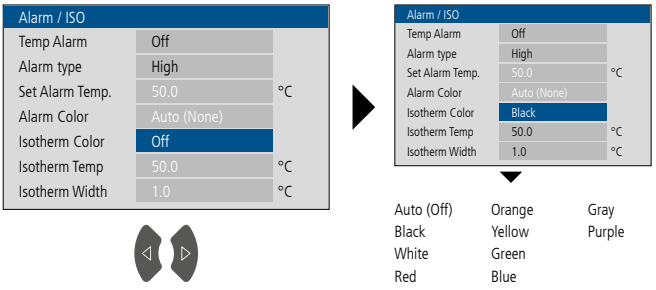
Alarm Color

Auto (Off)	Orange	Gray
Black	Yellow	Purple
White	Green	
Red	Blue	

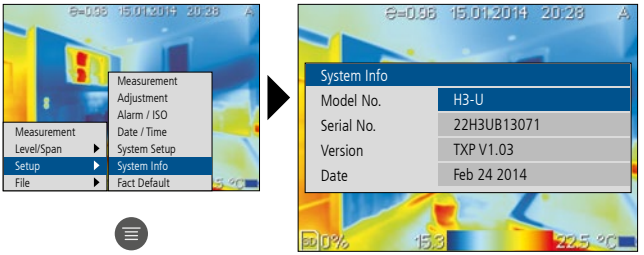


12.2 Isothermal function

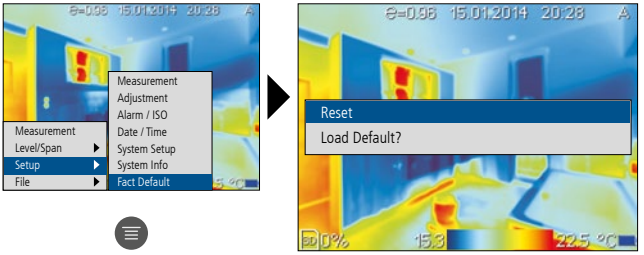
The isothermal function can display definable temperature ranges with the same colour scheme, similar to a filter. This allows the particularly relevant temperature ranges to be made visible. Using specific parameters, the isothermal function must be set for each specific measurement task. The settings parameters resemble a „if-then“ function. If the predefined condition is met, the temperature range is displayed as determined.



13 System Info



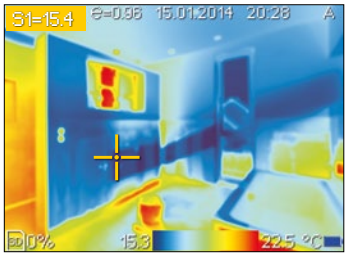
14 Fact Default



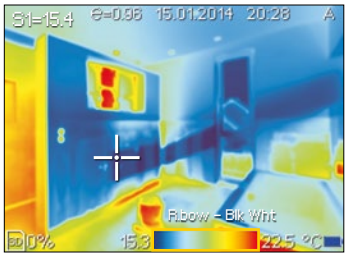
! All settings will be lost.

15 To select target objects

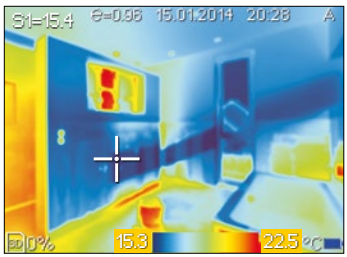
Added measurement points, measurement fields, measurement areas as well as the bar graph and the Min/Max temperatures are selected one after the other by pressing the „Select Image Objects“ button c. The selected area is highlighted yellow and can be adapted after pressing the „Main Menu“ button d.



Next object Setup



Next object Setup

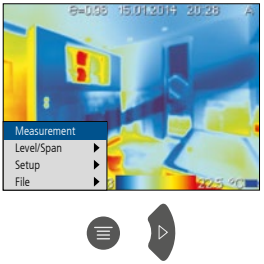


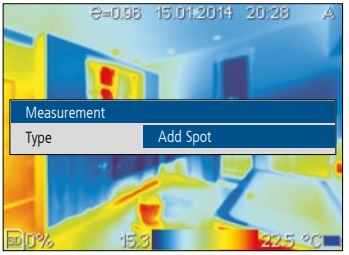
Next object Setup

! The selection is cancelled automatically after a short time.

16.0 Activate / deactivate measurement points

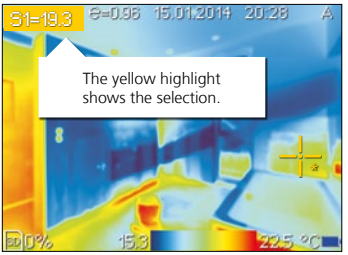
Up to two measurement points can be set at one time. They can be assigned measurement-specific parameters as well as the following properties: maximum temperature, minimum temperature, manual positioning.





! All added measurement points, lines and areas are removed by selecting „None“.

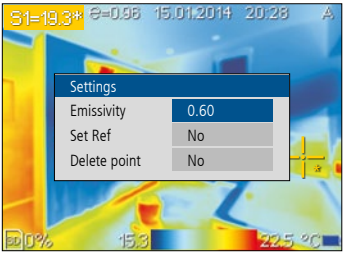
16.1 Measurement points / parameters



Emissivity

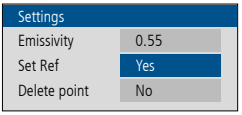
Set emissivity for point 1 (S1). Refer to Section 11.1.

! A * symbol is shown next to the measured value if values are defined for measurement points, lines or areas.



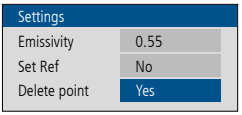
Set Ref

The temperature of point 1 (S1) shows the reference temperature (R). Refer to Section 10.2.

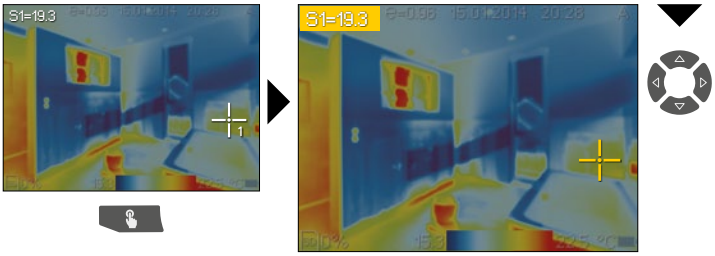


Delete point

The point is deleted.

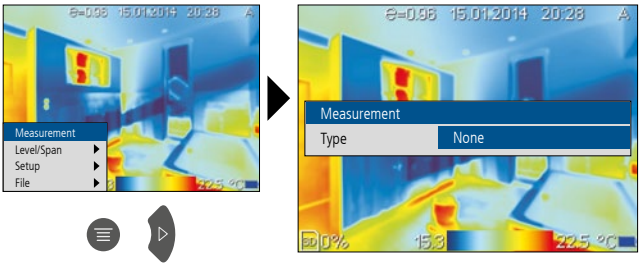


16.2 Measurement points / position manual measurement point

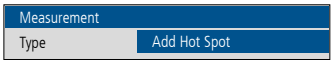


17 Hot spot and cold spot

In terms of function and operation, the hot spot and cold spot correspond to the measurement points (see Section 16 ff) and are to be used in the same way.



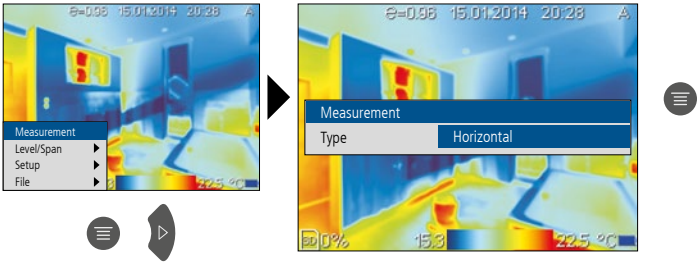
Add Hot spot
Hot spot (SH) shows the hottest point.



Add Cold spot
Cold spot (SC) shows the coldest point.

18.0 Activate / deactivate horizontal line measurement

Horizontal line measurement determines the temperature of an object along a flexible horizontal line on the display. It graphically displays particularly small temperature differences by means of a graph when the colour nuances of the IR image cannot be sufficiently distinguished.

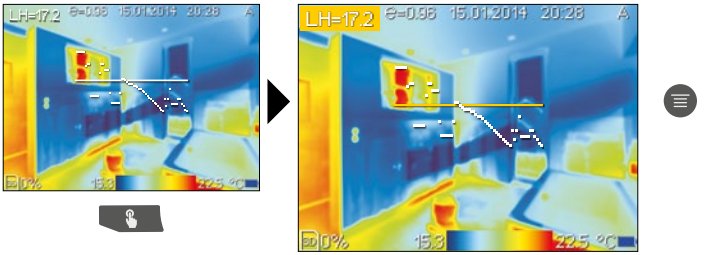


! All added measurement points, lines and areas are removed by selecting „None“.

18.1 Horizontal line measurement / arrangement

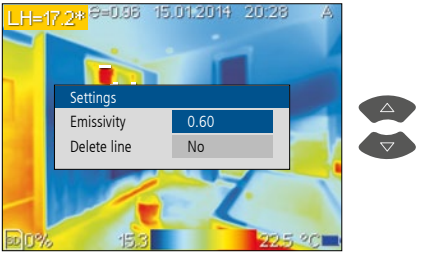
The horizontal line is at 120 (display 240 lines). The bargraph defines the limits of the set min./max. temperature range (see chapter 21). The dynamic temperature curve visualises even the smallest changes in temperature within that temperature range, especially if the colours of the IR image do not provide sufficient differentiation. The temperature curve only covers the min./max. temperatures shown in the bargraph.

18.2 Horizontal line measurement / parameters



Emissivity

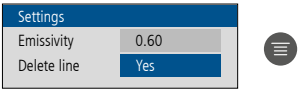
Set emissivity for the horizontal line (LH). Refer to Section 11.1.



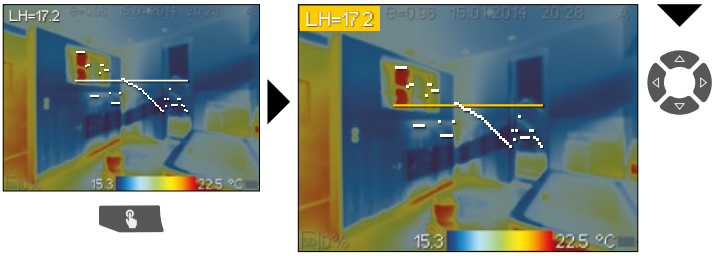
! A * symbol is shown next to the measured value if values are defined for measurement points, lines or areas.

Delete line

The line is deleted.

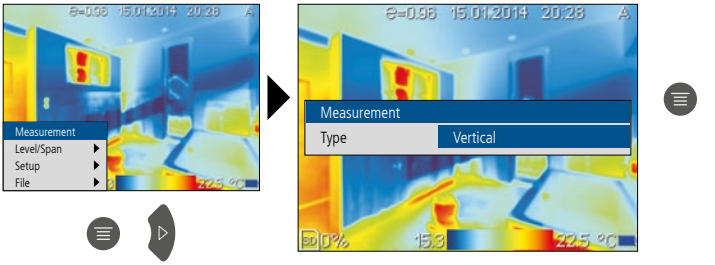


18.3 To position horizontal lines



19 Activate / deactivate vertical line measurement

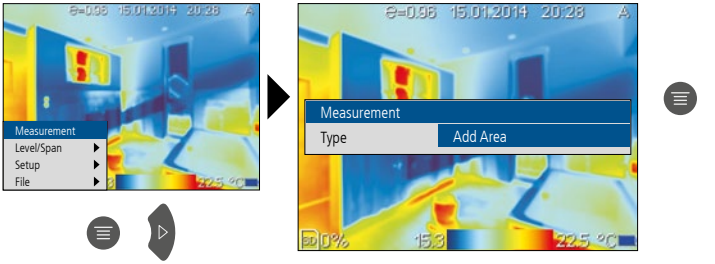
Vertical line measurement works just like horizontal line measurement (see chapter 18 ff.) and is used in the same manner.



! All added measurement points, lines and areas are removed by selecting „None“.

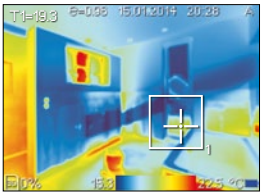
20.0 Activate / deactivate area measurement

Up to three measuring surfaces can be set at one time. They can be assigned measurement-specific parameters as well as the following properties: maximum temperature, minimum temperature, average temperature.



! All added measurement points, lines and areas are removed by selecting „None“.

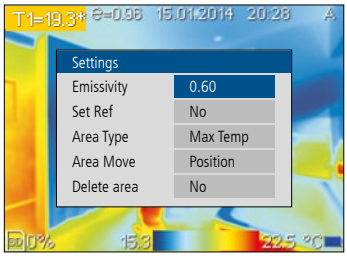
20.1 Area measurement / parameters



Emissivity

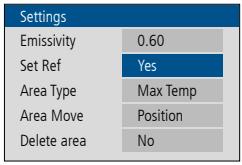
Set emissivity for area 1 (T1).
Refer to Section 11.1.

! A * symbol is shown next to the measured value if values are defined for measurement points, lines or areas.



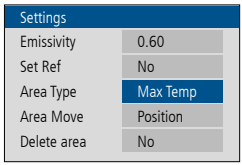
Set Ref

The temperature of area 1 (T1) shows the reference temperature (R). Refer to Section 10.2.



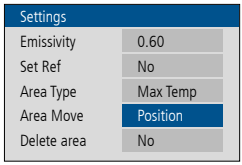
Area Type

Max Temp	Highest temperature within the measurement area
Min Temp	Lowest temperature within the measurement area
Avg Temp	Average temperature within the measurement area



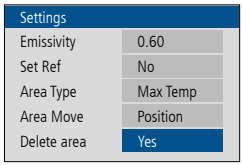
Area Move

Position	The position can be moved with the arrow buttons
Size	The size of the field can be changed with the arrow buttons



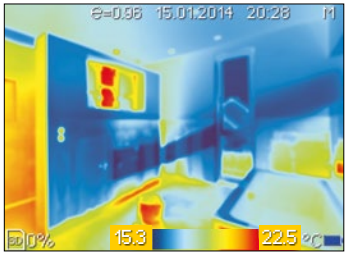
Delete area

The area is deleted.



21 Manual temperature range

In manual settings mode, the temperature range is no longer set automatically based on the measured min./max. values but rather determined on the basis of manual values. Switch auto / man, see Section 9



The min/max values (level) are increased simultaneously.

The min/max values (level) are decreased simultaneously.

The min/max temperature range (span) is increased.

The min/max temperature range (span) is decreased.

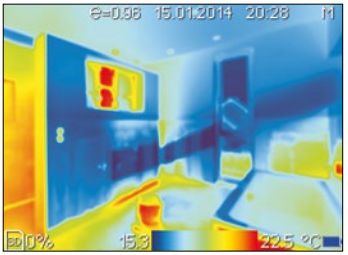
22 Colour ranges IR image

You can choose from several standard colour ranges to represent the measured infrared temperatures. Depending on the colour palette, the measured temperatures are adjusted within the current image section and displayed in the respective colour space. The bargraph for the respective minimum/maximum temperatures of the entire image serves as a reference for the corresponding temperature/colour mapping.

Ironbow
PosGrayscale
NegGrayscale
Amber
Hot Metal
Cool Metal
R.bow – Grn Red
R.bow – Blu Red
R.bow – Blk Wht
H.C. – Blu Yel
H.C. – Vio Wht

23 Image modes

There are 2 image modes to choose from.

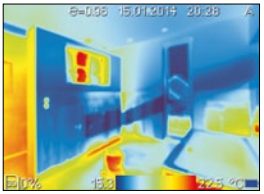


IR image

Digital image

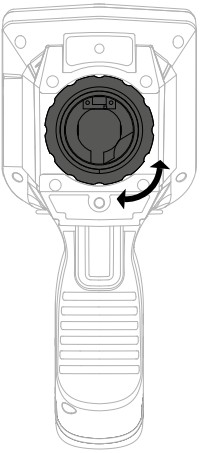
24 Zoom

The view can be zoomed (x2).



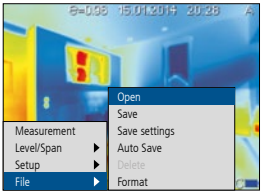
25 Camera focus

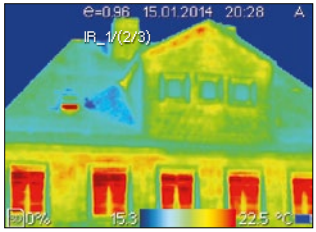
In addition to the basic settings in the measuring tool, the camera focus and the shutter function (image calibration) play an essential role in achieving high-quality thermography results. You should focus on the measured object as well as possible so that the outlines and contours are clearly visible on the display.



26.0 Media gallery / playback mode

In the media gallery, you can access all image data recorded with the thermal camera. You can access the media gallery either via the menu or via hot key. To close the media gallery, press the „ESC“ hot key.

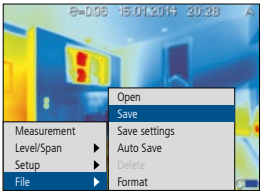


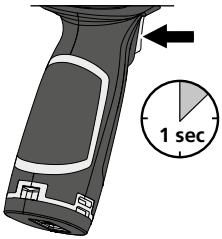


If the „Trigger“ button is set to „IR/Digital“, you can use it to switch between the IR and the corresponding digital image in playback mode. The display will remain blank if no IR or digital image is available and „No IR Image“ or „No Digital Image“ will be shown.

26.1 Image recording

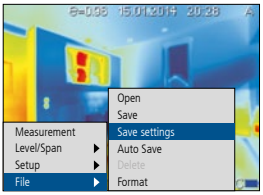
Image recordings of any measurement situation can be created for subsequent documentation in the menu or with the „Trigger“ button.

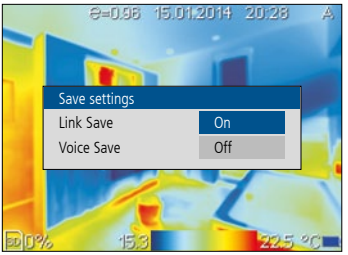




! The „Trigger“ button must be set to „Save“ in order to record images. Refer to Section 6.4.

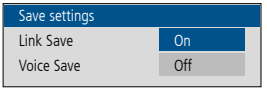
26.2 Recording settings



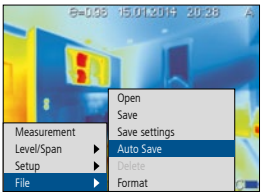


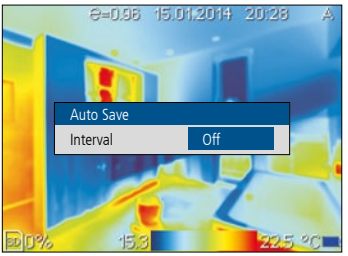
Link Save

By activating the „Save Link“ function, a digital image of the measurement situation is stored together with an IR recording.



26.4 Automatic recording

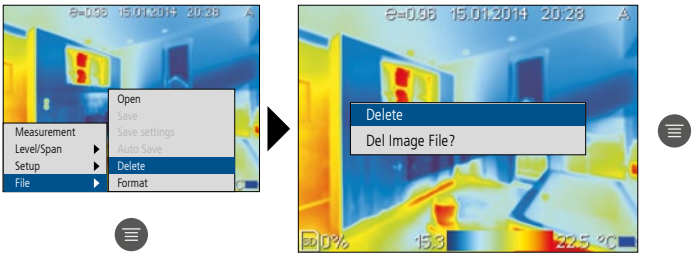




After triggering, images are stored automatically at the set interval.

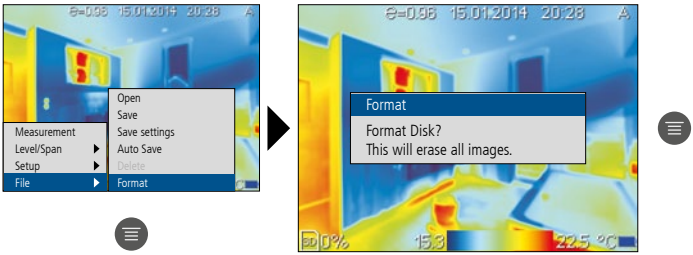
26.5 To delete recording

Images can only be deleted in playback mode. Refer to Section 26.0.



! Press the „ESC“ button to cancel.

26.6 To format SD card



! Press the „ESC“ button to cancel.

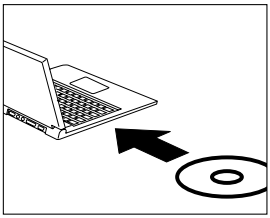
27 Target laser

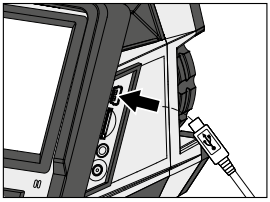
The target laser makes area-specific measurements easier by facilitating pinpointing. The target laser can be assigned to the „Trigger“ button in the menu.

28 USB connection

With the software provided on the CD it is possible to transfer the recorded data to a PC and to use the data for further processing and documentation. Load the CD in the drive and follow the installation routine. After successful installation, start the application. Connect one end of the supplied USB cable to the mini-USB port of the device and the other end to a free USB port on your computer. For further information on how to use the software, refer to the Help function that contains a detailed description of the functions.

! It is not necessary to install a driver. The software operates under Windows XP / 7 and 8.



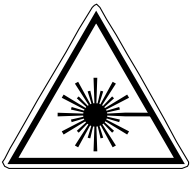


29 Instructions for maintenance

– Perform the task at a location that is clean and free of dust and water
– Switch off the camera, remove the battery
– Earth to protect from static charges
– Do not touch the lens
– Warranty expires in the case of improper handling

Technical data	Subject to technical alterations. 01.14
IR sensor	160 x 120 pixel resolution; uncooled microbolometer 8-14 µm
IR optics	Germanium interchangeable lens 25° x 19° FOV, 2,73 mrad IFOV manual focus 0.4 m min.
Thermal sensitivity	0,1 °C, 100 mK NETD
Precision	± 2°C or ± 2% of measured value
Measurement range	-20 °C ... 350 °C
Display	3,5" colour TFT display
Image modes	Infrared, Digital
Image function	1-2x digital zoom
Digital camera	Resolution: 640 x 480 pixels
Format	JPEG format, max. 640 x 480 pixels
Memory function	Micro-SD card up to 16 GB
Target Laser	Laser class 2, < 1 mW, 635-650 nm
Ports	USB, micro-SD, video
Protection class	IP54, drop test 2 m, Impact 25g (IEC60068-2-29) Vibration 2g (IEC60068-2-6)
Power supply / charging time / Operating time	Li-Ion pack battery 7.4V / 2.0Ah / approx. 7 hours / approx. 3 hours per battery
Dimensions	298 mm x 104 mm x 149 mm
Weight	1,1 kg (incl. battery pack)

General safety instructions
Caution: Do not look directly into the beam. Lasers must be kept out of reach of children. Never intentionally aim the device at people.



Laser radiation!
Do not stare into the beam!
Class 2 laser
< 1 mW · 635-650 nm
EN 60825-1:2007-10

EU directives and disposal

This device complies with all necessary standards for the free movement of goods within the EU.

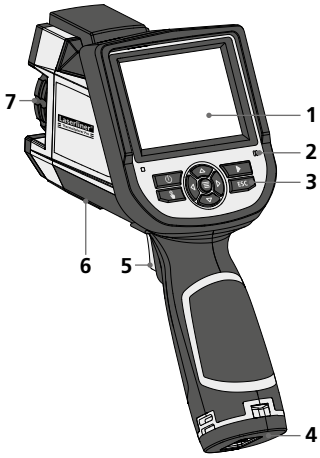
This product is an electric device and must be collected separately for disposal according to the European Directive on waste electrical and electronic equipment.

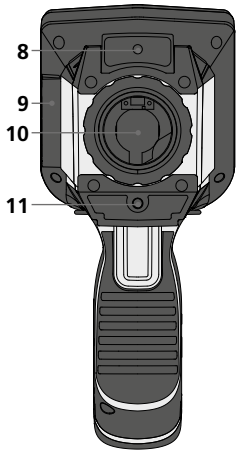
Further safety and supplementary notices at:
www.laserliner.com/info

! Lees de bedieningshandleiding en de bijgevoegde brochure ‚Garantie- en aanvullende aanwijzingen' volledig door. Volg de daarin beschreven aanwijzingen op. Bewaar deze documentatie goed.

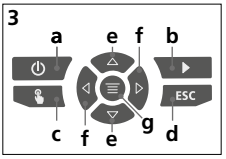
Functie / toepassing

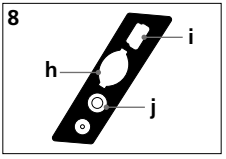
De onderhavige thermografische camera maakt met behulp van de geïntegreerde, ongekoelde microbolometer een contactloze temperatuurmeting van oppervlakken mogelijk door de beoordeling van de straling in het infrarode golflengtebereik. Met de beeldweergave van de sensor worden de temperatuurvoorwaarden aan het onderzochte object optisch weergegeven. Door een inkleuring van de verschillende meettemperaturen in een thermogram met weergave van verkeerde kleuren wordt een optimale visualisatie van de temperatuurverschillen bereikt. De extra voorhanden digitale camera kan tegelijkertijd een foto maken van de onderzochte situatie voor een eventuele latere documentatie in het apparaat of voor de verdere verwerking met de bijgeleverde software. Mogelijke toepassingsgebieden zijn: detectie van warmtebruggen en isolatiefouten, lokalisering van oververhitting in elektrische of mechanische onderdelen, opsporing van verwarmingsbuizen in wand en vloer, detectie van lekkages, lokalisering van defecte zonnecellen in pv-modules en nog vele andere.



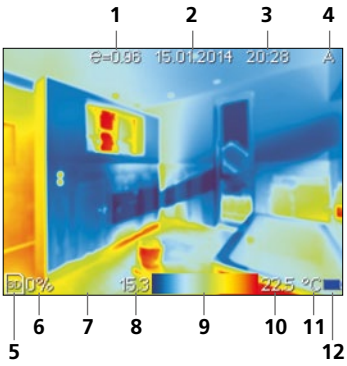


1 3,5“ TFT-kleurendisplay
2 Ingebouwde microfoon
3 Directe toetsen
4 Accuvakje
5 Trigger:
Opslaan
IR/digitaal
Laser
Punttemperatuur
Oppervlakte-temperatuur
6 1/4" statiefaansluiting
7 Objectief
8 Camera
9 Schacht
10 Infrarood-cameralens
11 Laseruitlaat



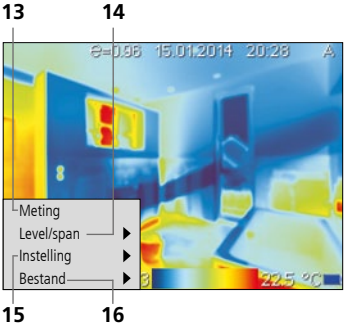


a ON/OFF
b Mediagalerij
c Meetobjecten selecteren
d Sloop
e Menubesturing / zoom aan / uit
f Menubesturing / omschakeling IR- / digitaal beeld
g Hoofdmenu
h Sleuf micro SD-kaart
i Usb-interface
j Video-uitgang



Standaard meetaanzicht

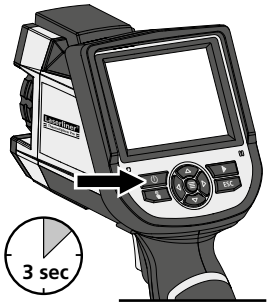
1 Ingestelde emissiegraad
2 Datum
3 Tijd
4 Bepaling temperatuurspanne (man. / auto.)
5 Micro-SD-kaart geplaatst
6 Indeling micro-SD-kaart
7 Thermografisch beeld
8 Temperatuur min.
9 Kleurentabel met temperatuurbereik
10 Temperatuur max.
11 Temperatuureenheid
12 Weergave batterijlading



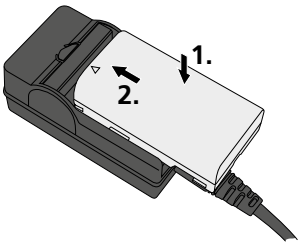
Hoofdmenu

13 Toevoegen van meetpunten, -lijnen en -oppervlakken
14 Temperatuurbereik automatisch / handmatig
15 Algemene en meetspecifieke instellingen
16 Mediagalerij

1 ON / OFF

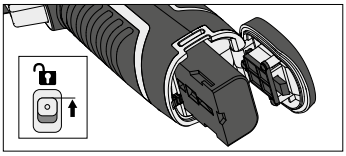


2 Li-ion-accupack opladen



3 Li-ion-accupack vervangen

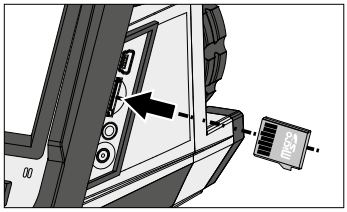
Voor de vervanging van het accupack opent u de vergrendeling aan de handgreep (zie afb. rechts) Verwijder het accupack, plaats het nieuwe accupack en sluit de vergrendeling weer.



! Bewaar de accu's in de betreffende houders in de koffer als u de camera transporteert of gedurende langere tijd niet gebruikt.

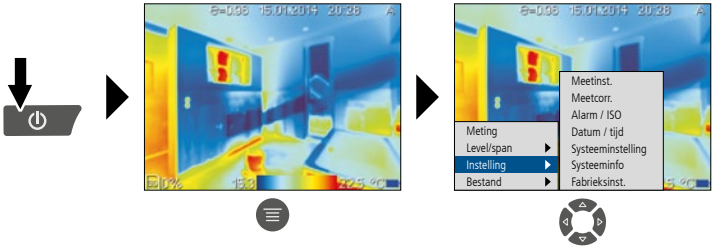
4 Micro SD-kaart plaatsen

Om een micro SD-kaart te plaatsen opent u eerst de rubberen afdekking en plaatst dan de geheugenkaart volgens de afbeelding in de sleuf. Zonder geheugenmedium kunnen geen opnames worden gemaakt.



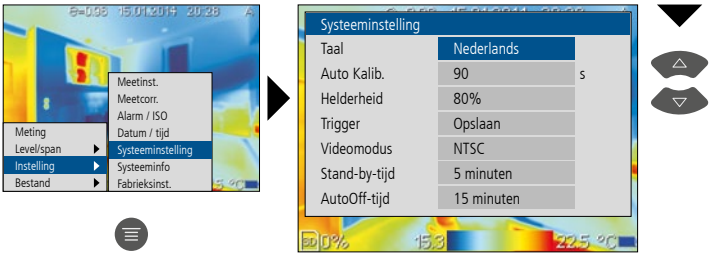
5 Hoofdmenu

Via het hoofdmenu kunnen zowel algemene als meetspecifieke instellingen worden uitgevoerd. Het menu wordt bestuurd door middel van de vier pijltoetsen.

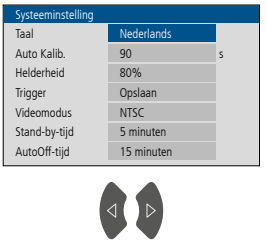


! Invoeren moeten worden bevestigd door het indrukken van de menutoets (g). Als de trigger-toets (4) op ‚opslaan' is ingesteld, kan deze ook worden gebruikt.

6.0 Algemene instellingen: **Systeeminstellingen**

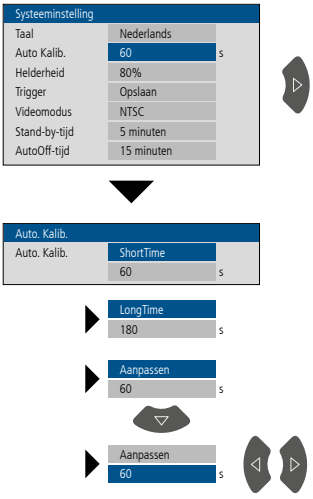


6.1 **Menutaal instellen** DE / GB / FR / ES / IT / PT / RU



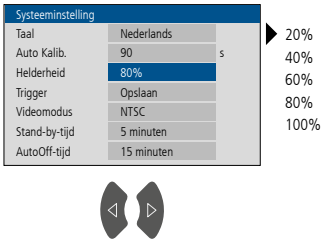
Italiano
Português
русский
English
Español
Francais
Deutsch

6.2 Autokalibratie



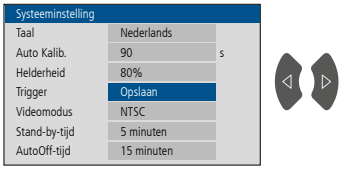
! Door het lang indrukken van de pijltoetsen wordt de invoer direct met 10 sec verhoogd of verminderd.

6.3 Displayhelderheid



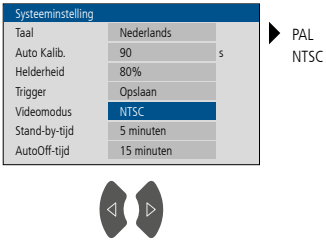
6.4 Trigger

Aan de toets ‚Trigger' kunnen individueel de volgende functies worden toegewezen:



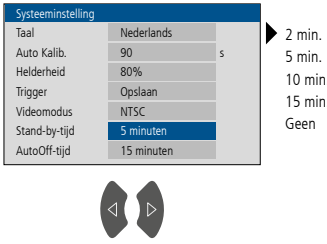
Opslaan	IR-/digitaal beeld opslaan
IR-/digitaal	Wissel van IR- naar digitaal beeld
Laser	Laser activeren
Punttemp.	Punt toevoegen / verwijderen
Opper-vlaktetemp.	Oppervlak toevoegen / verwijderen

6.5 Modus video-uitgang



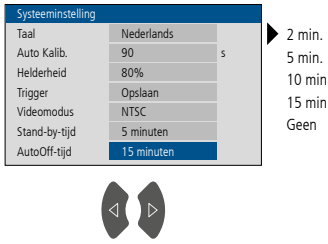
6.6 Automatische displayuitschakeling

Het display schakelt automatisch uit na afloop van de ingestelde periode van inactiviteit.

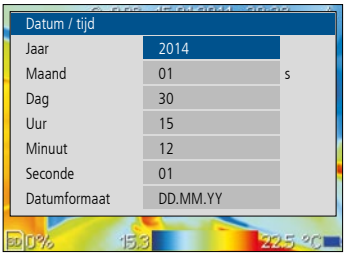


6.7 Automatische uitschakeling

Het apparaat schakelt automatisch uit na afloop van de ingestelde periode van inactiviteit.

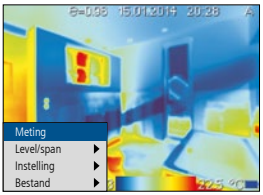


7 Algemene instellingen: **Datum / tijd**



Selectie datum-formaat

8 Meetspecifieke instellingen: **Meting**



Meetpunten toevoegen
Hier kunnen twee meetpunten (S1 en S2) worden toegevoegd.

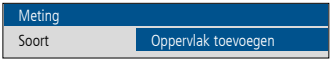
Hot spot toevoegen
De hot spot (SH) toont het heetste punt.

Cold spot toevoegen
De cold spot (SC) toont het koudste punt.

Horizontale lijnmeting activeren (LH)

Verticale lijnmeting activeren (LV)

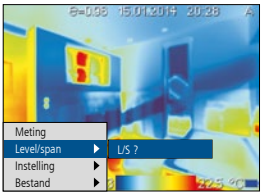
Meetoppervlak toevoegen
Hier kunnen drie meetoppervlakken (T1 t/m T3) worden toegevoegd.



! Door de selectie ‚geen' worden alle toegevoegde meetpunten, -lijnen en -oppervlakken verwijderd.

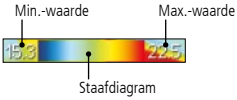
Zie hiertoe hoofdstuk 16 vv. t/m 20 v.

9 Meetspecifieke instellingen: **Temperatuurbereik A / M**



Auto ?

Temperatuurbereik / automatisch (A)
Met deze instelling worden het temperatuurbereik van het IR-beeld en de daaruit resulterende verdeling van het kleurenspectrum van het infrarood-beeld ingesteld. Het kleurenspectrum van het gemeten IR-beeld wordt bepaald in verhouding tot het temperatuurbereik en de kleurenschaal.

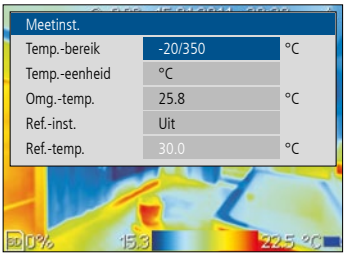


De kleurverdeling van het IR-beeld wordt aan de hand van de gemeten min.-/max.-waarde automatisch en dynamisch in het staafdiagram aangepast.

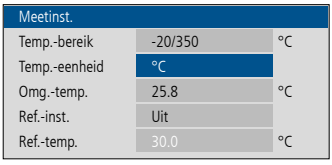
L/S ?

Temperatuurbereik / handmatig (M)
In de handmatige instelling wordt het temperatuurbereik niet meer automatisch ingesteld door de gemeten min.-/max.-waarde, maar ook bepaald door handmatige waarden. Hier moeten het temperatuurbereik en de temperatuurspanne vastgelegd worden. Zie hiertoe hoofdstuk 21

10.0 Meetspecifieke instellingen: **Meetinstellingen**

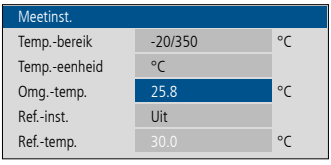


10.1 Temperatuureenheid

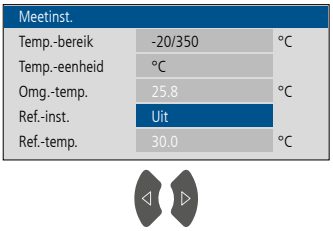


- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)

10.2 Omgevingstemperatuur



10.3 Instellen van de referentietemperatuur



Ref.-temp.
Punt 1
Punt 2
Hotspot
Coldspot
Oppervlak 1
Oppervlak 2
Oppervlak 3
Uit

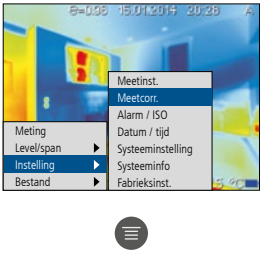
Via de referentietemperatuur wordt het temperatuurverschil tussen de ingestelde referentietemperatuur en de meetpunten, -lijnen en -oppervlakken weergegeven.

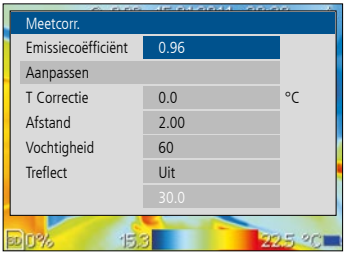
Voorbeeld:
R = 30.0 °C
S1 = 35.9 °C

S1 wordt met het temperatuurverschil van 5.9 °C op het display weergegeven.

11.0 Meetspecifieke instellingen: **Instellingen**

Vóór ieder gebruik moeten de meetinstellingen voor de infraroodmeting gecontroleerd resp. op de voorhanden meetsituatie ingesteld worden om een correcte meting te waarborgen. Hier moeten vooral de algemene parameters m.b.t. de emissiegraad, afstand tot het meetobject en de omgevingsvoorwaarden in acht worden genomen.

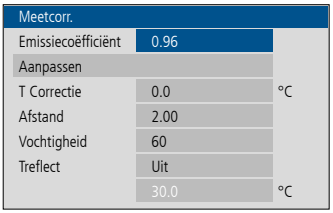




11.1 Emissiegraad

De graad van de infraroodafstraling die ieder lichaam materiaal-/oppervlaktespecifiek afgeeft, wordt bepaald door de emissiegraad (0, 10 ... 1,0). Voor een correcte meting is het strikt noodzakelijk om de emissiegraad in te stellen. Naast de voorgeschreven emissiegraden uit de materiaallijst kan een individuele emissiegraad worden ingesteld.

Individuele emissiegraad instellen



! Door het lang indrukken van de pijltoetsen wordt de invoer direct met 10 sec verhoogd of verminderd.

Tabel emissiegraden (richtwaarden met toleranties)

Metaal

Aluminium	
geoxideerd	0,30
gepolijst	0,05
Alloy A3003	
geoxideerd	0,20
geruwd	0,20
Chromen oxyde	0,81
Gesmeed ijzer	
mat	0,90
Gietijzer	
niet-geoxideerd	0,20
smelt	0,25
IJzer	
geoxideerd	0,75
met roest	0,60

Inconel	
geoxideerd	0,83
elektrisch gepolijst	0,15
Koper	
geoxideerd	0,72
Koper oxyde	0,78
Lood	
ruw	0,40
Messing	
gepolijst	0,30
geoxideerd	0,50
Platina	
zwart	0,90
Staal	
koudgewalst	0,80
geslepen plaat	0,50

Staal	
gepolijste plaat	0,10
legering (8 % nikkel, 18 % chroom)	0,35
gegalvaniseerd	0,28
geoxideerd	0,80
sterk geoxideerd	0,88
vers gewalst	0,24
ruw, vlak oppervlak	0,96
roestig, rood	0,69
plaatstaal,	
met nikkelcoating	0,11
plaatstaal, gewalst	0,56
Roestvrij staal	0,45
Zink	
geoxideerd	0,10

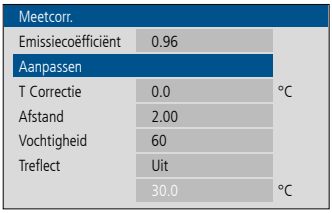
Niet-metaal

Aarde	0,94
Asbest	0,93
Asfalt	0,95
Baksteen rood	0,93
Basalt	0,70
Behang (papier) licht	0,89
Beton, pleister, mortel	0,93
Carborundum	0,90
Cement	0,95
Dekvloer	0,93
Gips	0,88
Gipsplaat	0,95
Glas	0,90
Glaswol	0,95
Grafiet	0,75
Grind	0,95
Gruis	0,95
Hout	
onbehandeld	0,88
beuken, geschaafd	0,94

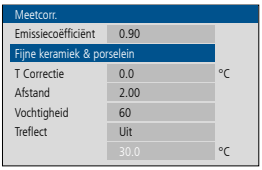
IJs	
glad	0,97
met sterke vorst	0,98
Kalk	0,35
Kalkzandsteen	0,95
Kalksteen	0,98
Katoen	0,77
Keramiek	0,95
Steengoed, mat	0,93
Klei	0,95
Koellichamen	
zwart geëloxeerd	0,98
Kool	
niet-geoxideerd	0,85
Kunststof	
lichtdoorlatend	0,95
PE, P, PVC	0,94
Kwartsglas	0,93
Lak	
mat zwart	0,97
hittebestendig	0,92
wit	0,90

Laminaat	0,90
Marmer	
zwart, gematteerd	0,94
grijsachtig gepolijst	0,93
Menselijke huid	0,98
Muurwerk	0,93
Papier	
alle kleuren	0,96
Porselein	
wit glanzend	0,73
met lazuur	0,92
Rubber	
hard	0,94
zacht-grijs	0,89
Sneeuw	0,80
Stof	0,95
Teer	0,82
Teerpapier	0,92
Transformatorenlak	0,94
Water	0,93
Zand	0,95

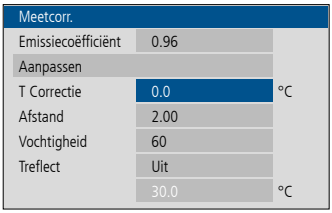
Emissiegraad uit de materiaallijst selecteren



Selectie van 44 vooringestelde materialen



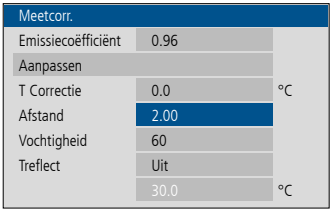
11.2 T Correctie



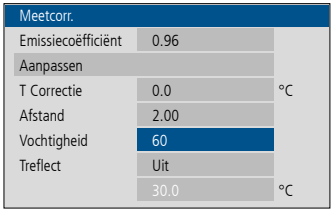
Correctie van de klimatische omgevingsvoorwaarden

De onderstaande meetspecifieke instellingen moeten vóór een meting worden aangepast aan de klimatische omstandigheden. Vanaf een meetafstand van 10 m moet in ieder geval rekening worden gehouden met de atmosferische invloeden van de lucht.

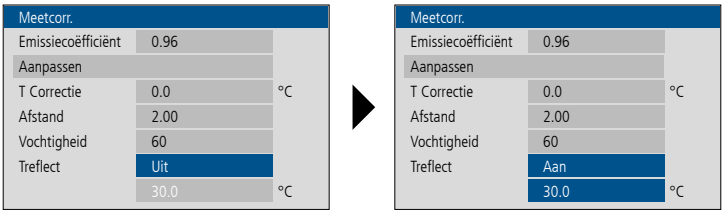
11.3 Afstand



11.4 Vochtigheid



11.5 Treflect



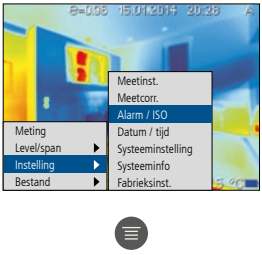
Instellen van de gewenste temperatuur

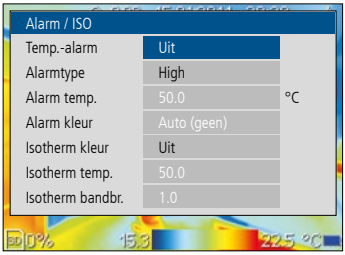
Reflectietemperatuur

Bij de infraroodmeting van een bepaald object kan de meting door de reflectiestralingen van andere in de buurt aanwezige objecten of ook van de omgevingslucht worden beïnvloed omdat het meetobject niet volledig kan worden afgeschermd. Met behulp van de refletietemperatuur kunnen externe stralingen worden gecompenseerd. Normaal gesproken is de reflectietemperatuur gelijk aan de omgevingstemperatuur. Indien echter grotere objecten met een aanzienlijk groter temperatuurverschil (ca. > 20 °C) in de buurt van het meetoppervlak voorhanden zijn, moet de invloed daarvan op het meetoppervlak in acht worden genomen. Ga daarbij als volgt te werk:

1. Stel de emissiegraad in op 1,0
2. Stel de focus onscherp (Zie hiertoe hoofdstuk 25)
3. Richt de camera in de tegenovergestelde richting van het eigenlijke meetobject
4. Bepaal de gemiddelde temperatuur
5. Stel de gemiddelde temperatuur in als reflectietemperatuur

12.0 Meetspecifieke instellingen: **Alarm / ISO**

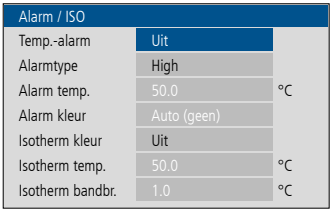


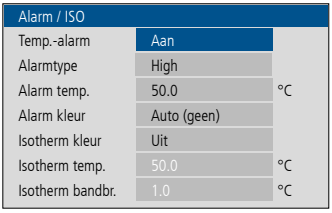


12.1 Temperatuuralarm

Door middel van een alarmsignaal wordt aangegeven of het ingestelde temperatuurbereik over- of onderschreden dan wel het dauwpunt bereikt is. Het dauwpunt wordt automatisch berekend.

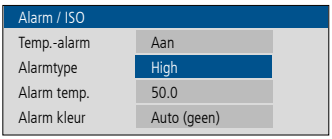
! Voor het gebruik van de alarmfunctie is een meetpunt, een meetoppervlak of een horizontale of verticale lijn vereist.





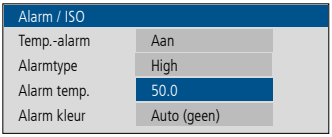
Alarmtype

High	Temperatuur overschreden
Low	Temperatuur onderschreden
DP	Dauwpunt bereikt



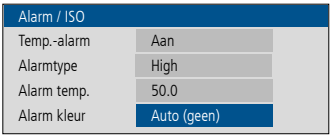
Alarmtemperatuur

Temperatuurgrens instellen



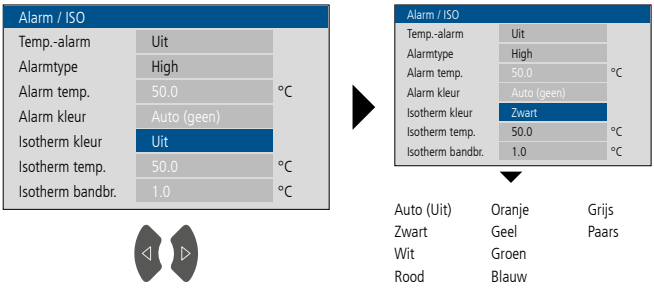
Alarm kleur

Auto (Uit)	Oranje	Grijs
Zwart	Geel	Paars
Wit	Groen	
Rood	Blauw	

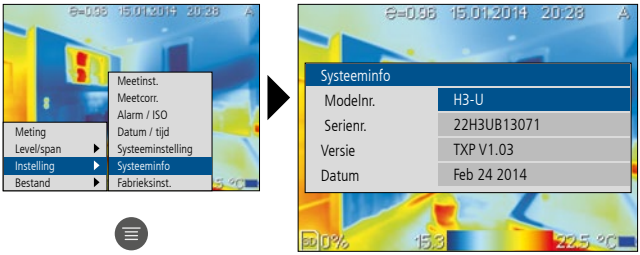


12.2 Isothermfunctie

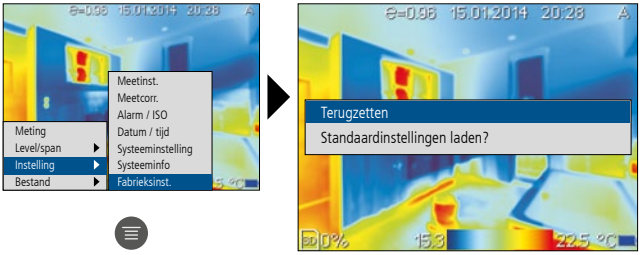
Met behulp van de isothermfunctie is de weergave van definieerbare temperatuurbereiken met dezelfde kleurgeving mogelijk, vergelijkbaar met een filter. Op deze wijze kunnen bijzonder relevante temperatuurbereiken zichtbaar worden gemaakt. De isothermfunctie moet al naargelang de meettaak worden ingesteld via bepaalde parameters. De instelparameters zijn gelijk aan een ‚als-dan functie'. Bij de vervulling van de ingestelde voorwaarde wordt het temperatuurbereik dienovereenkomstig weergegeven.



13 Systeeminfo



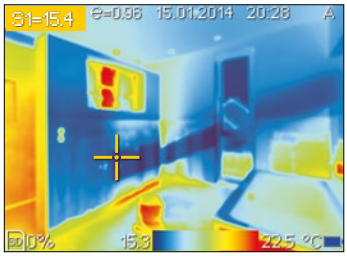
14 Fabrieksinstelling



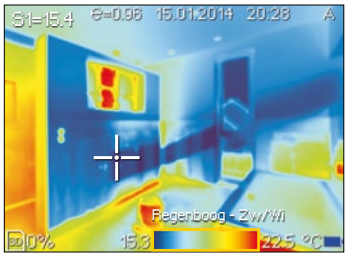
! Alle instellingen gaan verloren.

15 Meetobjecten selecteren

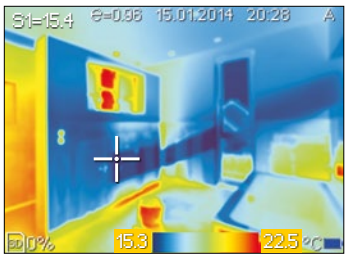
Door toets c ‚Beeldobjecten selecteren' worden na elkaar de toegevoegde meetpunten, meetvelden, meetoppervlakken, het staafdiagram en de min.- en max.-temperaturen geselecteerd. Het geselecteerde bereik wordt geel geaccentueerd en kan na het indrukken van toets g ‚hoofdmenu' worden aangepast.



volgend object Instellingen



volgend object Instellingen



volgend object Instellingen

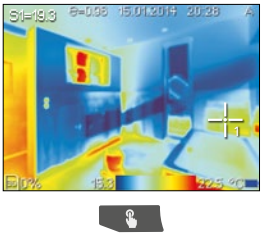
! Na korte tijd wordt de selectie automatisch opgeheven.

16.0 Meetpunten activeren/deactiveren

U kunt tot twee meetpunten tegelijkertijd vastleggen waaraan de volgende eigenschappen (max.-temperatuur, min.-temperatuur, handmatige positionering) en meetspecifieke parameters kunnen worden toegewezen.

! Door de selectie ‚geen' worden alle toegevoegde meetpunten, -lijnen en -oppervlakken verwijderd.

16.1 Meetpunten / parameters



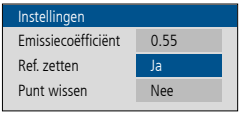
Emissiecoëfficiënt

Emissiewaarde voor punt 1 (S1) instellen. Zie ook hoofdstuk 11.1

! Als voor meetpunten, -lijnen of -oppervlakken eigen waarden zijn vastgelegd, verschijnt een *-symbool bij de meetwaarde.

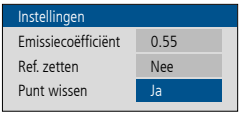
Ref. zetten

De temperatuur van punt 1 (S1) geeft de referentietemperatuur (R) aan. Zie ook hoofdstuk 10.2

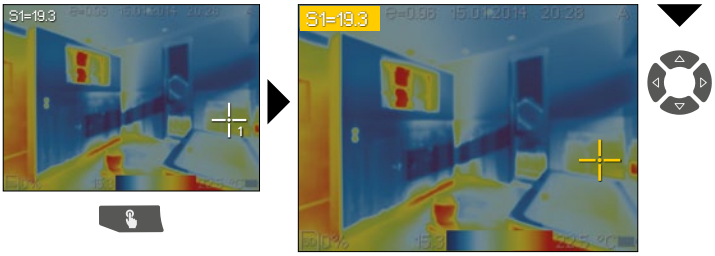


Punt wissen

Het punt wordt verwijderd.

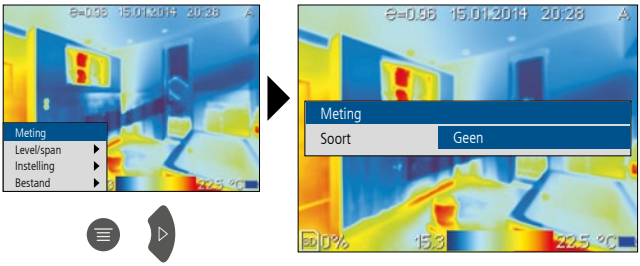


16.2 Meetpunten / handmatig meetpunt positioneren



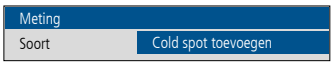
17 Hot spot en cold spot

De meetpunten ‚hot spot' en ‚cold spot' komen overeen met de functie en bediening van de meetpunten (zie hoofdstuk 16 vv) en worden volgens hetzelfde schema toegepast.



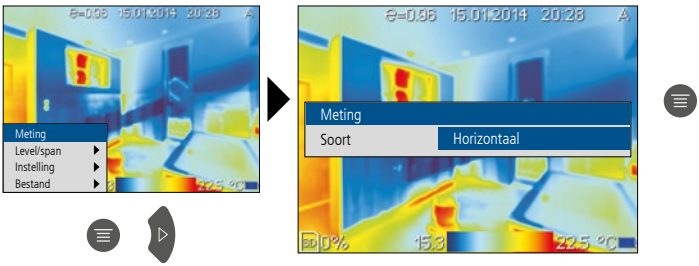
Hot spot toevoegen
De hot spot (SH) toont het heetste punt.

Cold spot toevoegen
De cold spot (SC) toont het koudste punt.



18.0 Horizontale lijnmeting activeren/deactiveren

De horizontale lijnmeting bepaalt de objecttemperatuur langs een verschuifbare horizontale lijn op het display. Deze lijn verduidelijkt grafisch fijne temperatuurverschillen door middel van een curvediagram als de gekleurde nuances van het IR-beeld niet goed kunnen worden onderscheiden.

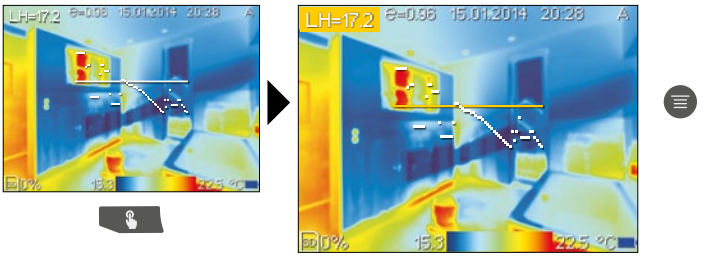


! Door de selectie ‚geen' worden alle toegevoegde meetpunten, -lijnen en -oppervlakken verwijderd.

18.1 Horizontale lijnmeting / indeling

Het horizontale midden ligt bij 120 (display 240 regels). Het staafdiagram definieert de grenzen van het ingestelde min.-/max.-temperatuurbereik (zie hoofdstuk 21). Binnen dit temperatuurbereik worden aan de hand van de dynamische temperatuurcurve zelfs de kleinste temperatuurverschillen goed zichtbaar gemaakt, vooral als geen goede onderscheiding door de kleurgeving van het IR-beeld mogelijk is. De temperatuurcurve beweegt zich slechts binnen de in het staafdiagram weergegeven min.-/max.-temperatuur.

18.2 Horizontale lijnmeting / parameters



Emissiecoëfficiënt

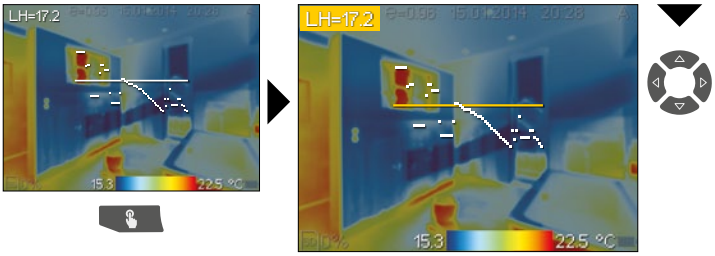
Emissiewaarde voor de horizontale lijn (LH) instellen. Zie ook hoofdstuk 11.1

> **!** Als voor meetpunten, -lijnen of -oppervlakken eigen waarden zijn vastgelegd, verschijnt een *-symbool bij de meetwaarde.

Lijn wissen

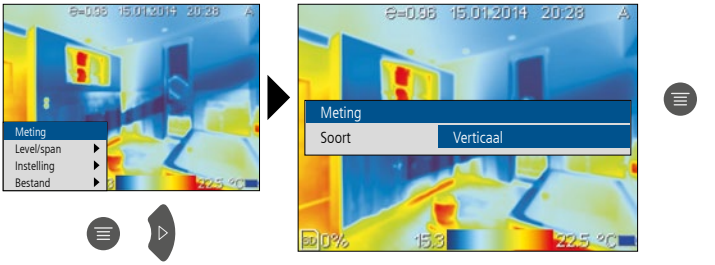
De lijn wordt verwijderd.

18.3 Horizontale lijnen plaatsen



19 Verticale lijnmeting activeren/deactiveren

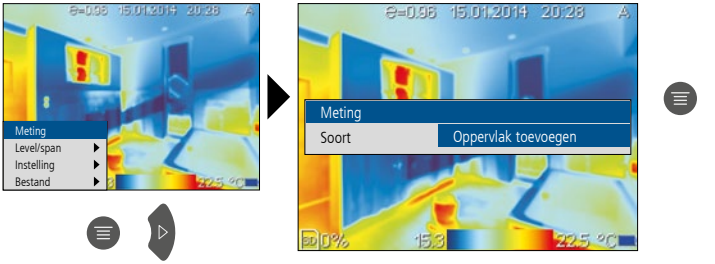
De verticale lijnmeting komt m.b.t de functie en de bediening overeen met de horizontale lijnmeting (zie hoofdstuk 18 vv) en wordt volgens hetzelfde schema toegepast.



! Door de selectie ‚geen' worden alle toegevoegde meetpunten, -lijnen en -oppervlakken verwijderd.

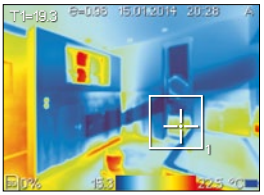
20.0 Oppervlaktemeting activeren/deactiveren

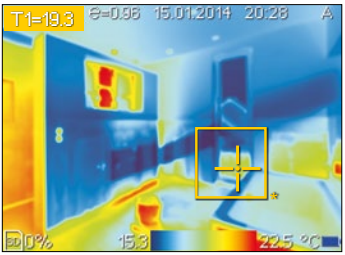
U kunt tot drie meetoppervlakken tegelijkertijd vastleggen waaraan de volgende eigenschappen (max.-temperatuur, min.-temperatuur, gemiddelde temperatuur) en meetspecifieke parameters kunnen worden toegewezen.



! Door de selectie ‚geen' worden alle toegevoegde meetpunten, -lijnen en -oppervlakken verwijderd.

20.1 Oppervlaktemeting / parameters





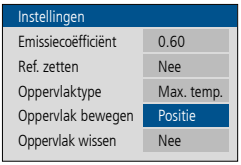
Emissiecoëfficiënt

Emissiewaarde voor oppervlak 1 (T1) instellen. Zie ook hoofdstuk 11.1

! Als voor meetpunten, -lijnen of -oppervlakken eigen waarden zijn vastgelegd, verschijnt een *-symbool bij de meetwaarde.

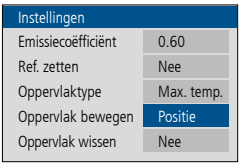
Ref. zetten

De temperatuur van oppervlak 1 (T1) geeft de referentietemperatuur (R) aan. Zie ook hoofdstuk 10.2



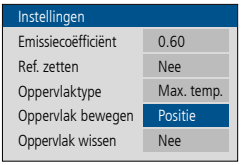
Oppervlaktype

Max. temp.	hoogste temperatuur binnen het meetoppervlak
Min. temp.	laagste temperatuur binnen het meetoppervlak
Gem. temp.	gemiddelde temperatuur binnen het meetoppervlak



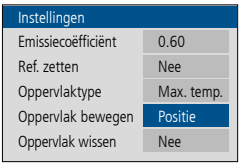
Oppervlak bewegen

Positie	De positie kan worden bewogen door middel van de pijltoetsen
Afmeting	De afmeting van het veld kan worden gewijzigd door middel van de pijltoetsen



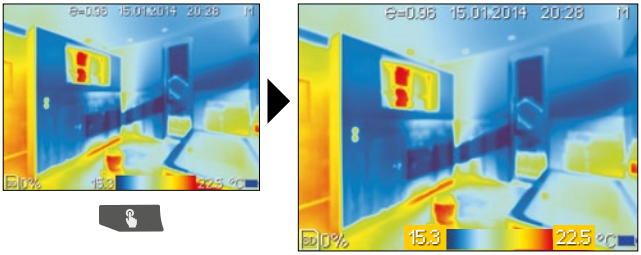
Oppervlak wissen

Het oppervlak wordt verwijderd.



21 Handmatig bediend temperatuurbereik

In de handmatige instelling wordt het temperatuurbereik niet meer automatisch ingesteld door de gemeten min.-/max.-waarde, maar ook bepaald door handmatige waarden. Schakel automatisch / handmatig, zie hoofdstuk 9



De min.-/max.-waarden (levels) worden gelijktijdig verhoogd.

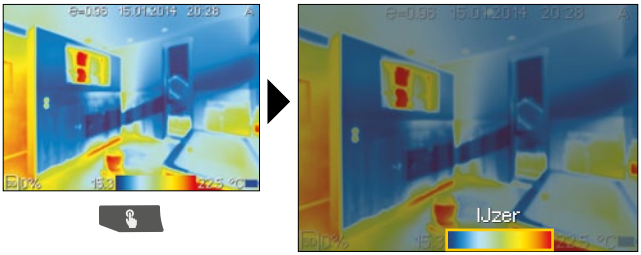
De min.-/max.-waarden (levels) worden gelijktijdig verlaagd.

Het min.-/max-temperatuurbereik (spanne) wordt vergroot.

Het min.-/max-temperatuurbereik (spanne) wordt verkleind.

22 Kleurenpaletten IR-beeld

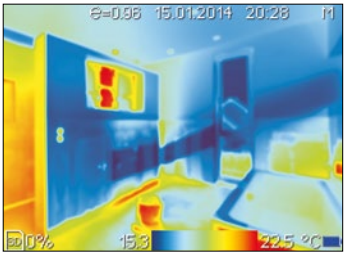
Voor de weergave van de geregistreerde infraroodtemperaturen staan meerdere standaard kleurenpaletten ter beschikking. Al naargelang het gekozen palet worden de gemeten temperaturen binnen het actuele beeldbereik aangepast en in het dienovereenkomstige kleurenspectrum weergegeven. Het staafdiagram bij de betreffende min-/max-temperaturen van het totale beeld fungeert als referentie van de betreffende temperatuur-/kleurtoewijzing.



IJzer
Grijs
Grijs negatief
Barnsteen
Metaal heet
Metaal koud
Regenboog - Gr/Rd
Regenboog - Bl/Rd
Regenboog - Zw/Wi
Hoge resolutie - Bl/Ge
Hoge resolutie - Pa/Wi

23 Beeldmodi

Er staan 2 beeldmodi ter beschikking.

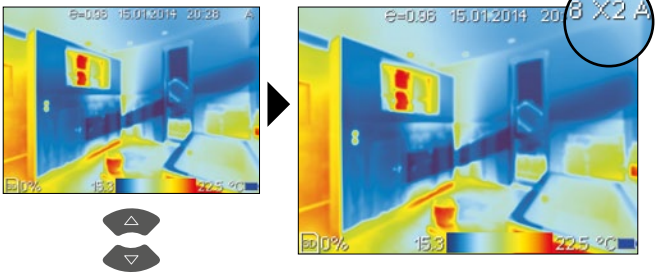


IR-beeld

Digitaal beeld

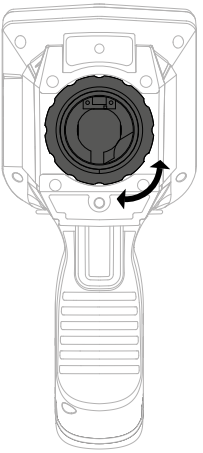
24 Zoom

Het aanzicht kan gezoomd worden (x2).



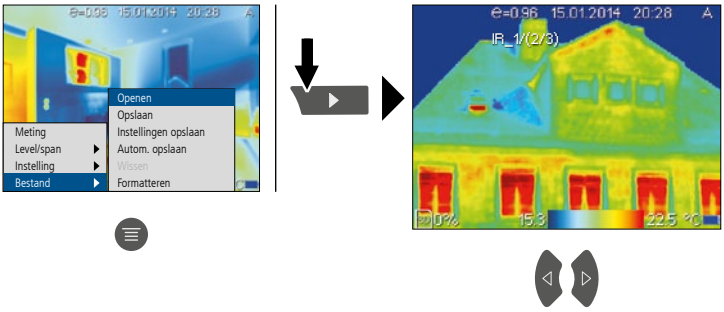
25 Camerafocus

Naast de basisinstellingen in het meettoestel zijn de camerafocus en de shutterfunctie (beeldkalibratie) belangrijk voor een dienovereenkomstig thermografisch resultaat. Het meetobject dient zo goed mogelijk te worden gefocusseerd, zodat de omrandingen en de contouren op het display goed zichtbaar zijn.



26.0 Mediagalerij / weergavemodus

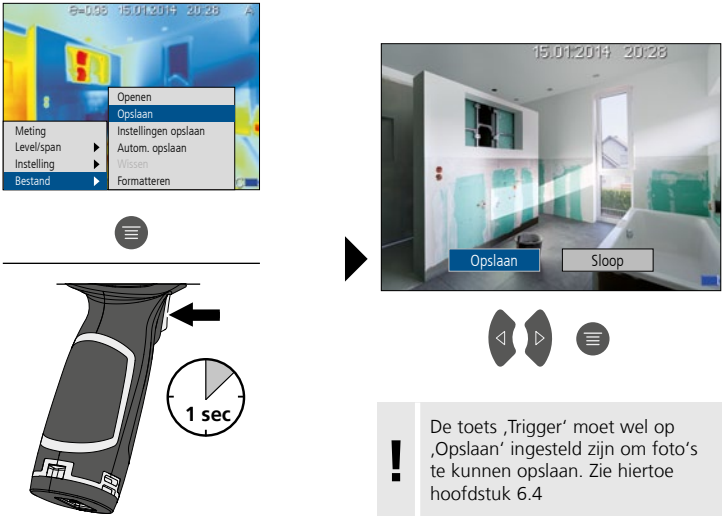
In de mediagalerij kunnen alle met de thermocamera opgenomen fotogegevens opgeroepen worden. De mediagalerij kan via het menu of via de directe toets worden opgeroepen. Druk op de directe toets ‚ESC' om de mediagalerij te sluiten.



Als de toets ‚Trigger' op ‚IR / digitaal' is ingesteld, kan daarmee in de weergavemodus worden gewisseld tussen de weergave van het IR- en het bijbehorende digitale beeld. Als geen IR- of digitaal beeld voorhanden is, is het display donker en verschijnt de melding ‚geen IR-beeld' of ‚geen digitaal beeld'.

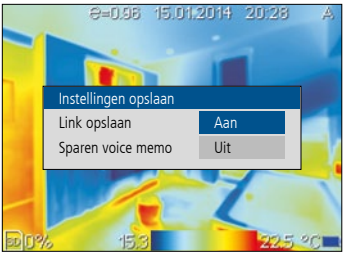
26.1 Opname foto

Via het menu of via de toets ‚Trigger' kunnen van elke meetsituatie foto's worden gemaakt voor de latere documentatie.



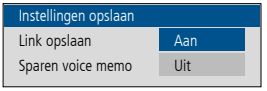
! De toets ‚Trigger' moet wel op ‚Opslaan' ingesteld zijn om foto's te kunnen opslaan. Zie hiertoe hoofdstuk 6.4

26.2 Instelling opname

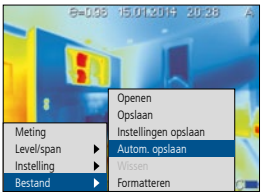


Link opslaan

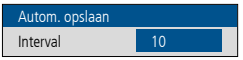
Door het activeren van de functie ‚Link opslaan' wordt bij een IR-opname een digitaal beeld van de meetsituatie opgeslagen.



26.4 Automatische opname

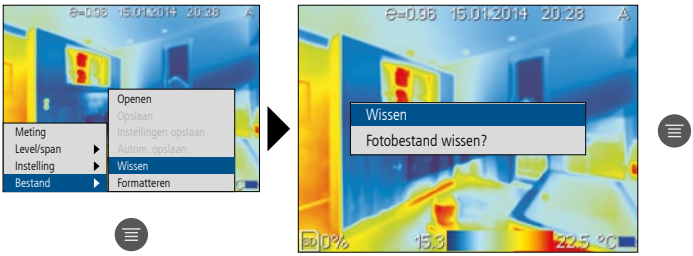


Na het éénmaal activeren worden in de ingestelde intervallen automatisch opnames opgeslagen.



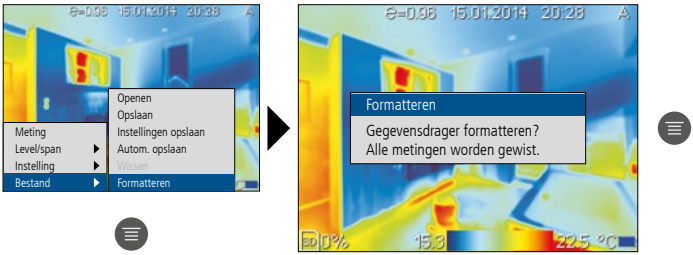
26.5 Opnames wissen

Foto's kunnen uitsluitend worden gewist in de weergavemodus.
Zie hiertoe hoofdstuk 26.0



! Door het drukken op de toets ‚ESC' wordt het proces geannuleerd.

26.6 SD-kaart formatteren



! Door het drukken op de toets ‚ESC' wordt het proces geannuleerd.

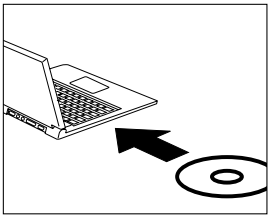
27 Doellaser

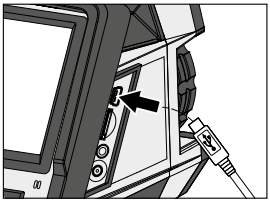
Met behulp van de doellaser worden bereiksspecifieke metingen vereenvoudigd door eenvoudig peilen. De doellaser kan in het menu aan de toets ‚Trigger' worden toegewezen.

28 Usb-verbinding

Met de op cd bijgeleverde software is het mogelijk om de opgenomen gegevens naar de pc over te dragen voor verdere bewerking en documentatie. Plaats de bijgeleverde cd in het station en volg de installatieroutine. Start de applicatie na de succesvolle installatie. Sluit de bijgeleverde usb-kabel met het ene uiteinde aan op de mini usb-port van het toestel en het andere uiteinde op een vrije usb-port van uw pc.
Voor de verdere bediening van de software verwijzen wij naar de help-functie die een gedetailleerde beschrijving van de functies bevat.

! Het is niet nodig om een besturingsprogramma te installeren.
De software functioneert onder Windows XP / 7 en 8.



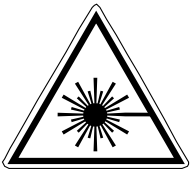


29 Opmerkingen over onderhoud

– voer de werkzaamheden uit op een schone, stof- en watervrije plaats
– schakel de camera uit en verwijder de batterijen
– beveilig de camera door middel van aarding tegen statische lading
– raak het objectief niet aan de lens aan
– bij ondeskundig gebruik komt het recht op garantieverlening te vervallen

Technische gegevens	Technische veranderingen voorbehouden. 01.14
IR-sensor	160 x 120 pixels resolutie; ongekoelde microbolometer 8-14 µm
IR-optiek	Germanium-wisselobjectief 25° x 19° zichtveld (FOV), 2,73 mrad ruimtelijke resolutie (IFOV) handmatige focus, 0,4 m min.
Thermische gevoeligheid	0,1 °C, 100 mK NETD
Nauwkeurigheid	± 2°C of ± 2% van de meetwaarde
Meetbereik	-20 °C ... 350 °C
Display	3,5“ kleuren-TFT-display
Beeldmodi	Infrarood beeld, digitaal beeld
Beeldfunctie	1-2 x digitale zoom
Digitale camera	Resolutie: 640 x 480 pixels
Formaat	JPEG-formaat, max. 640 x 480 pixels
Beeldmodi	micro-SD-kaartstation tot 16 GB
Doellaser	Laserklasse 2, < 1 mW, 635-650 nm
Aansluitingen	usb, micro-SD, video
Beschermingsklasse	IP54, valtest 2 m, stoot 25g (IEC60068-2-29) trilling 2g (IEC60068-2-6)
Voeding / laadtijd / Geheugenfunctie	li-ion-accupak 7,4V / 2,0Ah / ca. 7 uur / ca. 3 uur per accu
Afmetingen	298 mm x 104 mm x 149 mm
Gewicht	1,1 kg (incl. accupak)

Algemene veiligheid
Let op: Niet direct in de laserstraal kijken, de laser buiten bereik van kinderen houden en de laser niet onnodig op anderen richten.



Laserstraling!
Niet in de straal kijken!
Laser klasse 2
< 1 mW · 635-650 nm
EN 60825-1:2007-10

EU-bepalingen en afvoer

Het apparaat voldoet aan alle van toepassing zijnde normen voor het vrije goederenverkeer binnen de EU.

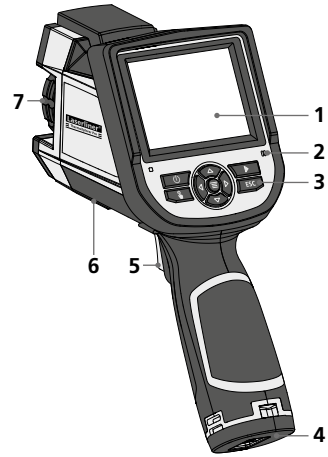
Dit product is een elektrisch apparaat en moet volgens de Europese richtlijn voor oude elektrische en elektronische apparatuur gescheiden verzameld en afgevoerd worden.

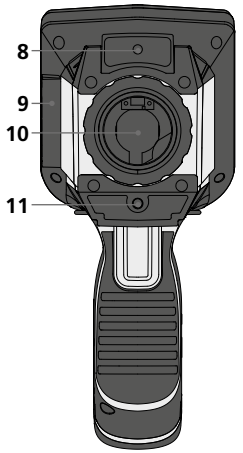
Verdere veiligheids- en aanvullende instructies onder:
www.laserliner.com/info

! Lisez entièrement le mode d'emploi et le carnet ci-joint „Remarques supplémentaires et concernant la garantie" ci-jointes. Suivez les instructions mentionnées ici. Conservez ces informations en lieu sûr.

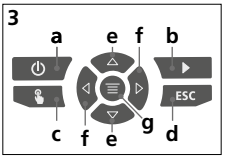
Fonction / Utilisation

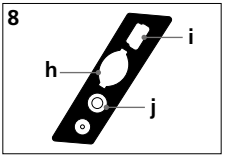
La caméra thermographique faisant l'objet de ce manuel permet une mesure de la température sans contact des surfaces en évaluant les rayonnements dans la gamme d'ondes infrarouges en utilisant un microbolomètre intégré non refroidi. La représentation imagée du capteur permet d'obtenir une reproduction visuelle des rapports de températures du bâtiment examiné. La coloration des différentes températures mesurées dans un thermogramme à représentation en couleurs fausses permet de visualiser les différences de températures. La caméra numérique supplémentaire permet de prendre en même temps une photo de la scène examinée à des fins de documentation ultérieure sur l'appareil ou de traitement ultérieur en utilisant le logiciel fourni avec l'instrument. On compte parmi les domaines d'application possibles la détection des ponts thermiques et des erreurs d'isolation, la localisation de la surchauffe dans les composants électriques ou mécaniques, la détection de lignes chauffantes dans le mur et le sol, la détection de fuites, la localisation de cellules solaires défectueuses dans les modules photovoltaïques et bien plus.



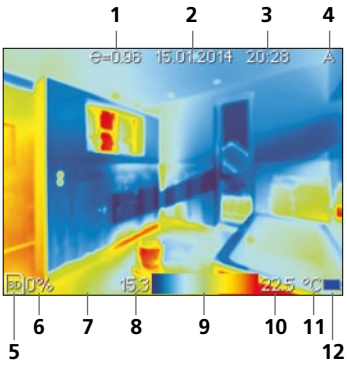


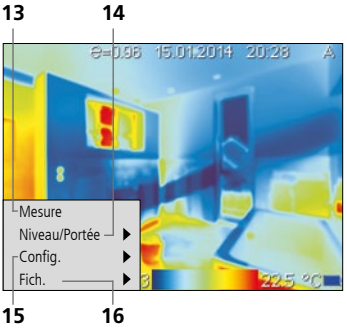
1 Écran TFT couleur de 3,5 po
2 Microphone intégré
3 Touches directes
4 Compartiment à accu
5 Déclenchement :
Sauvg
IR/CCD
Laser
Température du point
Température de la surface
6 Raccordement à un trépied de ¼ po
7 Objectif
8 Caméra
9 Regard
10 Lentille de la caméra infrarouge
11 Sortie du laser





a MARCHE / ARRÊT
b Vue d'ensemble des médias
c Sélection des objets à mesurer
d Annuler
e Commande des menus / Zoom activé / désactivé
f Commande des menus / Commutation image IR / image numérique
g Menu principal
h Fente d'insertion de la micro carte SD
i Interface USB
j Sortie vidéo





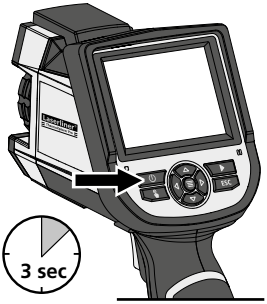
Vue de mesure standard

1 Degré d'émission réglé
2 Date
3 Heure
4 Détermination du mode de température (man. / auto.)
5 Carte de mémoire SD insérée
6 Pourcentage de mémoire utilisé sur la carte micro SD
7 Image thermographique
8 Température min.
9 Tableau des couleurs associées aux plages de température
10 Température max.
11 Unité d'affichage de la température
12 Affichage de l'état de charge du pack d'accus

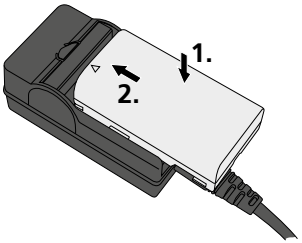
Menu principal

13 Ajout de points, de lignes et de surfaces de mesure
14 Plage de la température automatique / manuelle
15 Réglages généraux et spécifiques à la mesure
16 Vue d'ensemble des médias

1 MARCHE / ARRÊT

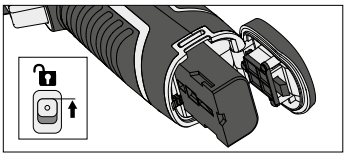


2 Chargement du pack d'accus Li-ion



3 Remplacement du pack d'accus Li-ion

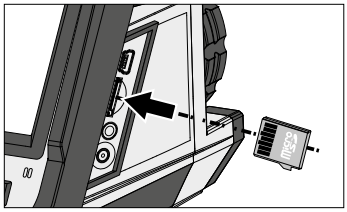
Ouvrez le verrouillage de la poignée pour pouvoir remplacer le pack d'accus Li-ion (voir ill. de droite). Retirez le pack d'accus, introduisez le nouveau pack d'accus, puis refermez le verrouillage.



! Veuillez stocker les packs d'accus dans les compartiments correspondants de la mallette lors du transport de la caméra ou si cette dernière n'est pas utilisée pendant une longue durée.

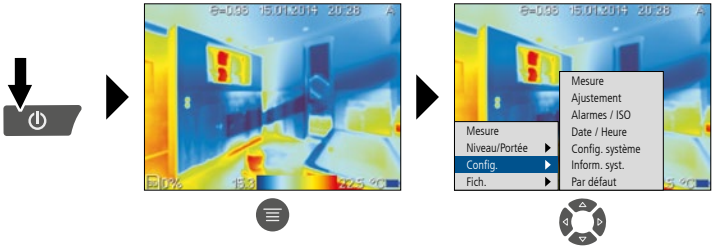
4 Introduction de la micro carte SD

Pour introduire une micro carte SD, ouvrez tout d'abord le couvercle en caoutchouc, puis placez la carte de mémoire comme illustrée. Aucun enregistrement n'est possible sans support de mémorisation.



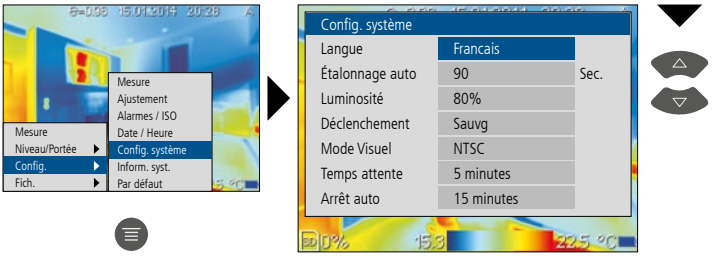
5 Menu principal

Il est possible de procéder aux réglages généraux et spécifiques à la mesure dans le menu principal. Quatre touches fléchées permettent de commander le menu.

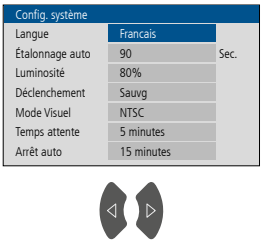


! Il est nécessaire de confirmer les saisies en appuyant sur la touche menu (g). Il est possible d'utiliser la touche de déclenchement (4) lorsqu'elle est sur « Enregistrer ».

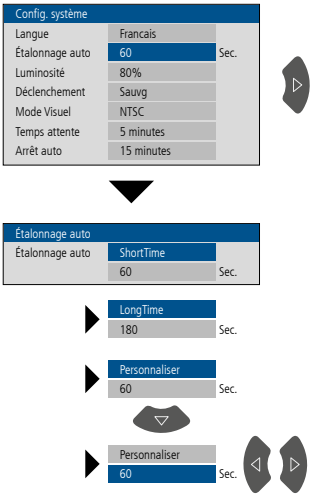
6.0 Réglages généraux : **Réglages système**



6.1 **Réglage de la langue du menu** DE / GB / FR / ES / IT / PT / RU

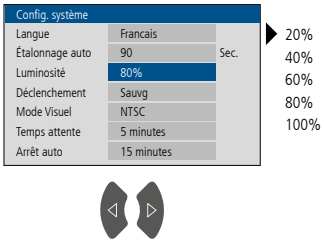


6.2 Autocalibrage



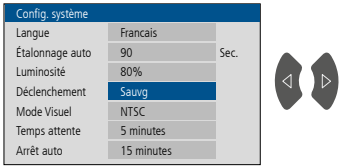
! Il suffit d'appuyer longuement sur les touches fléchées pour augmenter ou diminuer la saisie directement de 10 secondes.

6.3 Luminosité de l'écran



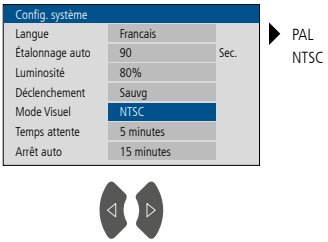
6.4 Déclenchement

Il est possible d'affecter individuellement les fonctions suivantes à la touche « Déclenchement » :



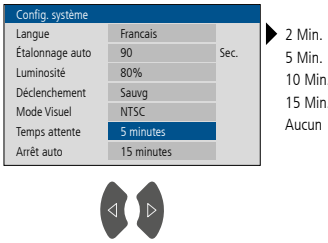
Sauvg	Enregistrer l'image IR / numérique
IR/CCD	Commutation entre l'image IR et l'image numérique
Laser	Activer le laser
Temp. point	Ajouter / Supprimer un point
Temp. zone	Ajouter / Supprimer une surface

6.5 Mode sortie vidéo



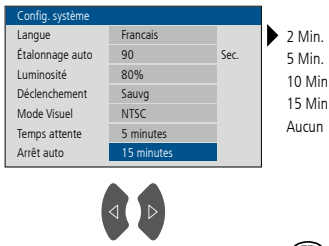
6.6 Désactivation automatique de l'écran

L'écran s'éteint automatiquement dès que la durée d'inactivité réglée est écoulée.

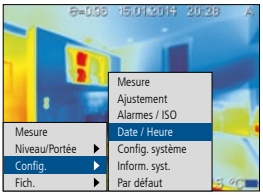


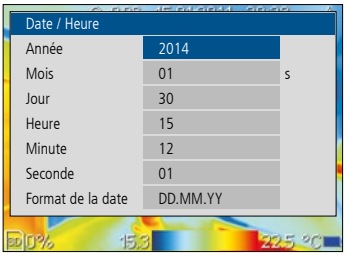
6.7 Arrêt automatique

L'appareil s'éteint automatiquement dès que la durée d'inactivité réglée est écoulée.



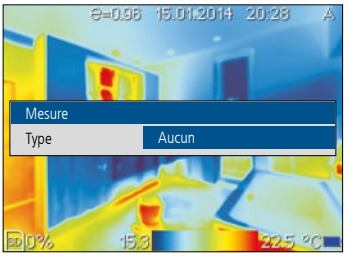
7 Réglages généraux : **Date / Heure**





Sélection du format de la date

8 Réglages spécifiques à la mesure : **Mesure**



Ajouter des points de mesure
Il est possible d'ajouter deux points de mesure (S1 et S2).

Ajouter point chaud
Le hot spot (SH) indique le point le plus chaud.

Ajouter point froid
Le cold spot (SH) indique le point le plus froid.

Activation de la mesure horizontale des lignes (LH)

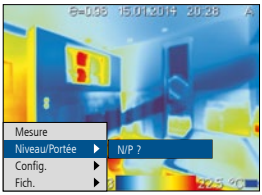
Activation de la mesure verticale des lignes (LV)

Ajouter des surfaces de mesure
Il est possible d'ajouter trois surfaces de mesure (T1 à T3).

! En choisissant le réglage « Aucun », tous les points, les lignes et les surfaces de mesure ajoutés sont supprimés.

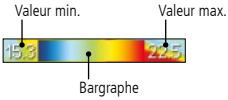
Voir à ce sujet les chapitres 16.0, 16.1 et 16.2 jusqu'à 20.0 et 20.1

9 Réglages spécifiques à la mesure : **Plage de température A / M**



Auto ?

Plage de température / Réglage automatique (A)
Ce réglage permet de régler la plage de température de l'image IR et la répartition du spectre chromatique de l'image infrarouge en résultant. Le spectre chromatique de l'image IR mesurée se modifiant en fonction de la plage de température et de l'échelle des couleurs.

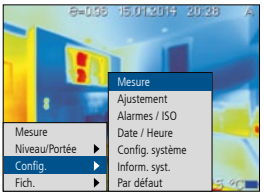


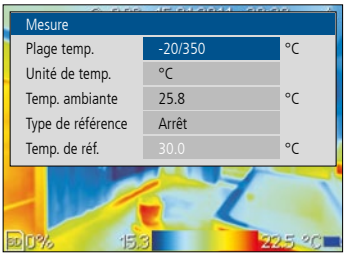
La répartition des couleurs de l'image infrarouge est adaptée au moyen des valeurs min./max. mesurées et de manière dynamique dans le bargraphe.

N/P ?

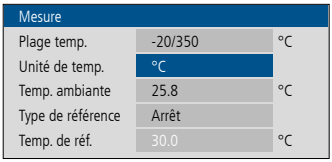
Plage de température / Réglage manuel (M)
Pour le réglage manuel, la plage de température n'est plus réglée automatiquement par les valeurs min./max. mesurées, mais est réglée par les valeurs manuelles. Il est nécessaire de déterminer la plage de température et la marge de température. Voir à ce sujet le chapitre 21

10.0 Réglages spécifiques à la mesure : **Réglage de la mesure**



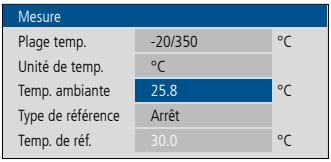


10.1 Unité d'affichage de la température

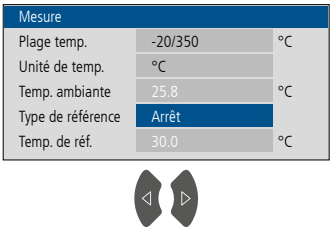


- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)

10.2 Température ambiante



10.3 Réglage de la température de référence



Temp. de réf.
Point 1
Point 2
Hotspot
Coldspot
Zone 1
Zone 2
Zone 3
Arrêt

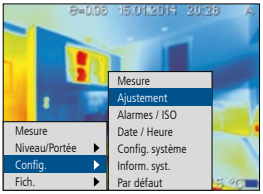
La température de référence permet d'afficher la différence de température entre la température de référence réglée par rapport aux points, aux surfaces et aux lignes de mesure.

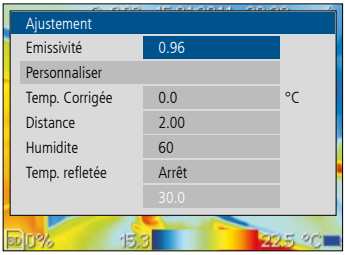
Exemple :
R = 30.0 °C
S1 = 35.9 °C

S1 s'affiche à l'écran avec la température de différence de 5,9 °C.

11.0 Réglages spécifiques à la mesure : **Réglages**

Avant chaque intervention, il convient de vérifier les réglages de mesure pour la mesure infrarouge ou de les régler en fonction de la mesure en question afin de pouvoir garantir une mesure exacte. Il faut en particulier faire attention aux paramètres généraux en rapport avec le degré d'émission, la distance par rapport au bâtiment à mesurer et aux conditions environnantes.

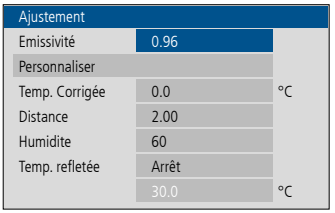




11.1 Degré d'émission

Le degré du rayonnement infrarouge émis par chaque corps en fonction du matériau ou de la surface est déterminé par le degré d'émission (compris entre 0,10 et 1,0). Il est impératif de régler le degré d'émission afin d'obtenir une mesure exacte. En plus des degrés d'émission prescrits, il est également possible de régler un degré d'émission particulier en consultant la liste des matériaux.

Réglage du degré d'émission individuel



! Il suffit d'appuyer longuement sur les touches fléchées pour augmenter ou diminuer la saisie directement de 10 secondes.

Tableau des degrés d'émission (Valeurs indicatives avec tolérances)

Métaux

Acier	
roulé à froid	0,80
plaque meulée	0,50
plaque polie	0,10
Alliage (8 % de nickel, 18 % de chrome)	0,35
galvanisé	0,28
oxydé	0,80
fortement oxydé	0,88
juste laminé	0,24
surface rugueuse, lisse	0,96
rouillé, rouge	0,69
tôle, revêtue de nickel	0,11
tôle, laminée	0,56
acier inoxydable	0,45

Alliage A3003	
oxydé	0,20
gratté	0,20
Aluminium	
oxydé	0,30
poli	0,05
Chrome oxyde	0,81
Cuivre	
oxydé	0,72
Cuivre oxyde	0,78
Fer	
oxydé	0,75
rouillé	0,60
Fer forgé	
mat	0,90

Fer, fonte	
oxydé	0,20
Fonte	0,25
Inconel	
oxydé	0,83
électropoli	0,15
Laiton	
poli	0,30
oxydé	0,50
Platine	
noir	0,90
Plomb	
rugueux	0,40
Zink	
oxidiert	0,10

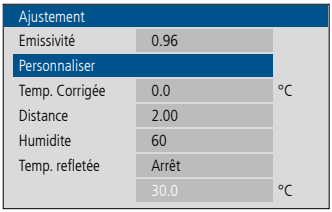
Métalloïdes

Amiante	0,93
Argile	0,95
Basalte	0,70
Béton, crépi, mortier	0,93
Bitume	0,95
Bois	
non traité	0,88
Hêtre raboté	0,94
Brique rouge	0,93
Calcaire arénacé	0,95
Caoutchouc	
dur	0,94
souple-gris	0,89
Carbone	
non oxydé	0,85
Carborundum	0,90
Céramique	0,95
Grès mat	0,93
Chaux	0,35
Ciment	0,95
Corps de réfrigération	
noir anodisé	0,98

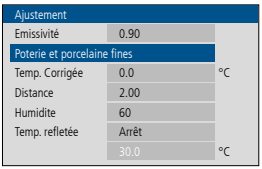
Coton	0,77
Eau	0,93
Glace	
lisse	0,97
à traces de gel importantes	0,98
Goudron	0,82
Graphite	0,75
Gravillon	0,95
Terre	0,94
Laine de verre	0,95
Laïus	0,93
Laque	
noire mate	0,97
résistante aux températures élevées	0,92
blanche	0,90
Laque pour transformateurs	0,94
Maçonnerie	0,93
Marbre	
noir, mat	0,94
grisâtre, poli	0,93

Matière plastique	
transparent	0,95
PE, P, PVC	0,94
Neige	0,80
Papier	
tous les coloris	0,96
Papier goudronné	0,92
Papier peint (papier) clair	0,89
Peau humaine	0,98
Pierre à chaux	0,98
Plaque de plâtre	0,95
Plâtre	0,88
Porcelaine	
blanche brillante	0,73
à glacis	0,92
Pyrite	0,95
Sable	0,95
Stratifié	0,90
Tissu	0,95
Verre	0,90
Verre de silice	0,93

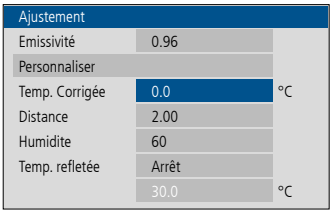
Sélectionner le degré d'émission à partir de la liste des matériaux



Sélection possible entre 44 matériaux préréglés



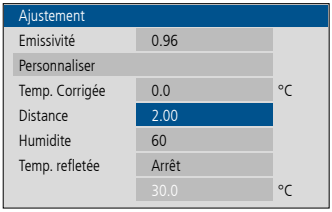
11.2 Temp. Corrigée



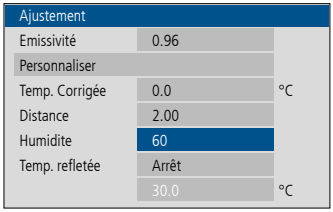
Correction des conditions climatiques environnantes

Avant de procéder à une mesure, il convient d'adapter les réglages spécifiques à la mesure suivants aux conditions climatiques ambiantes. À partir d'une distance de mesure de 10 m, il faut en tout cas tenir compte des influences atmosphériques de l'air.

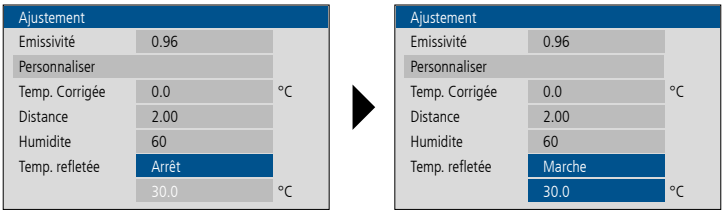
11.3 Distance



11.4 Humidite



11.5 Temp. refletée



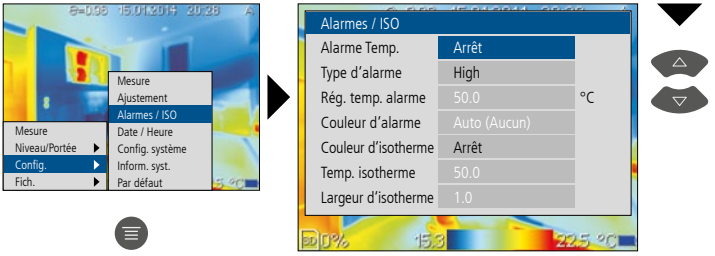
Réglage de la température souhaitée

Température réfléchie

En ce qui concerne la mesure infrarouge d'un bâtiment particulier, des rayonnements réfléchis provenant d'autres bâtiments se trouvant à proximité ou l'air ambiant peuvent avoir une influence sur la mesure étant donné qu'il est impossible d'isoler complètement le bâtiment à mesurer. La température réfléchie permet de compenser les rayonnements étrangers. En règle générale, la température réfléchie correspond à la température ambiante. Si, toutefois, des bâtiments plus importants ayant une différence de température nettement divergente (env. >20 °C) se trouvaient à proximité de la surface de mesure, il faut alors tenir compte de leur influence sur la surface de mesure. Il faut alors procéder comme suit :

1. Réglez le degré d'émission sur 1.0
2. Réglez le foyer sur „flou" (Voir à ce sujet le chapitre 25)
3. Orientez la caméra dans le sens inverse du bâtiment de mesure proprement dit
4. Calculez la température moyenne
5. Réglez la température moyenne comme température réfléchie

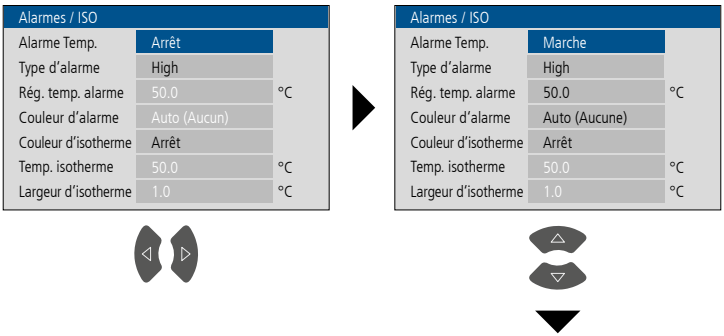
12.0 Réglages spécifiques à la mesure : **Alarmes / ISO**



12.1 Alarme pour la température

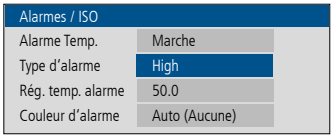
Un signal sonore d'alarme signale si la plage de température réglée est dépassée ou n'est pas atteinte ou si le point de rosée est atteint. Le point de rosée est calculé automatiquement.

! Un point de mesure, une surface de mesure ou une ligne verticale ou horizontale est nécessaire pour pouvoir utiliser la fonction d'alarme.



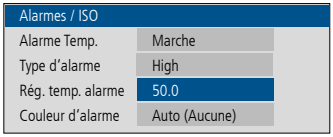
Type d'alarme

High	Température maximale dépassée
Low	Température minimale pas atteinte
DP	Point de rosée atteint



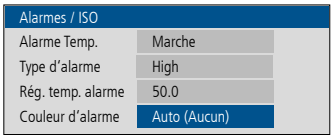
Alarme pour la température

Réglage de la limite de température



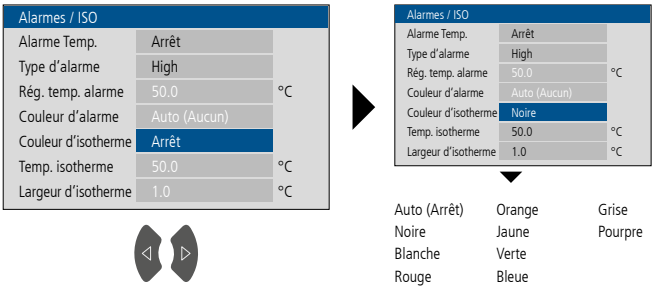
Couleur d'alarme

Auto (Arrêt)	Orange	Grise
Noire	Jaune	Pourpre
Blanche	Verte	
Rouge	Bleue	

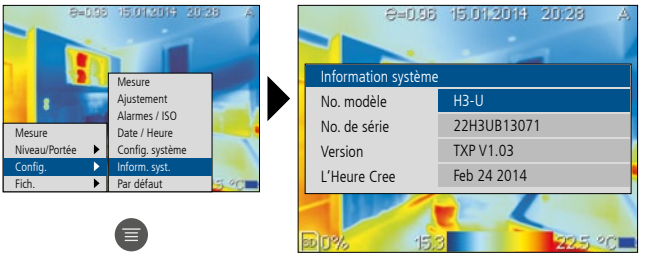


12.2 Fonctions des isothermes

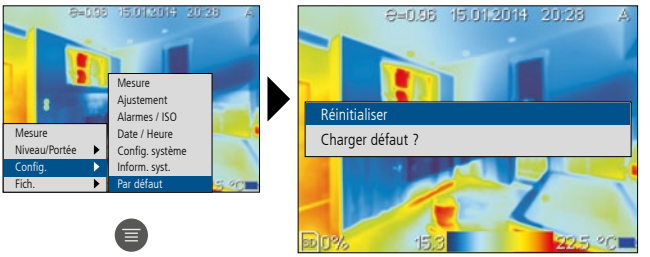
La fonction des isothermes permet d'afficher les plages de température définissables avec la même représentation des couleurs, comme avec un filtre. Il est ainsi possible de rendre visible des plages de température particulièrement importantes. La fonction des isothermes est réglable via des paramètres définis en fonction de la mesure à effectuer. Les paramètres de réglage sont identiques à une „Fonction si alors". Si la condition réglée est satisfaite, la plage de température s'affiche en conséquence.



13 Information système



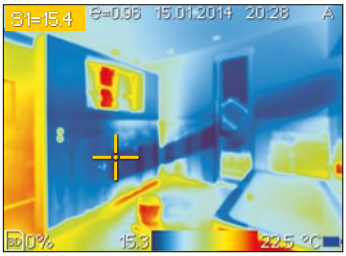
14 Impostazioni predefinite



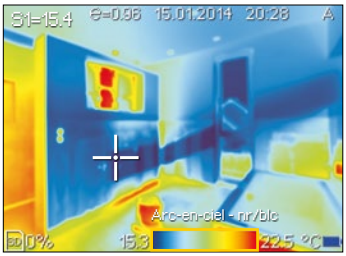
! Tous les réglages sont perdus.

15 Sélection des objets à mesurer

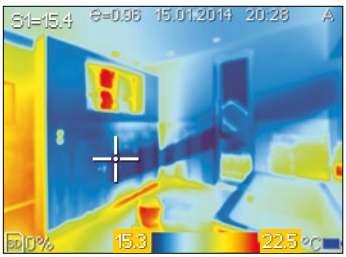
La touche c « Sélectionner objets dans l'image » permet de sélectionner les points de mesure, les champs de mesure et la surface de mesure ajoutés l'un(e) après l'autre ainsi que le graphique par barres et les températures min./max.. La zone sélectionnée apparaît sur fond jaune et peut être adaptée en appuyant sur la touche g « Menu principal ».



Objet suivant Réglages



Objet suivant Réglages

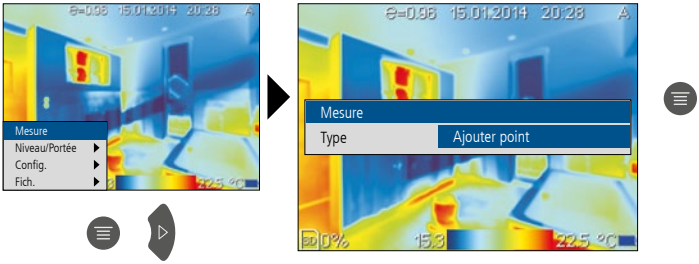


Objet suivant Réglages

! La sélection est automatiquement supprimée après une courte période.

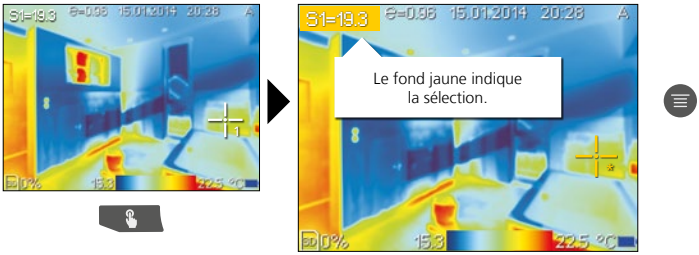
16.0 Activer/Désactiver les points de mesure

Il est possible de fixer simultanément jusqu'à deux points de mesure auxquels on peut leur attribuer les propriétés suivantes (température max., température min., positionnement manuel) ainsi que les paramètres spécifiques à la mesure.



! En choisissant le réglage « Aucun », tous les points, les lignes et les surfaces de mesure ajoutés sont supprimés.

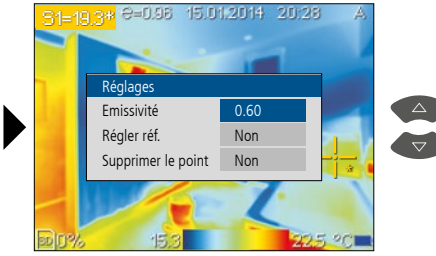
16.1 Points de mesure / Paramètres



Emissivité

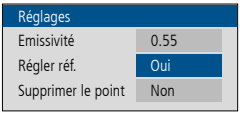
Régler la valeur d'émission pour le point 1 (S1). Voir également le chapitre 11.1

! Si des valeurs particulières sont fixées pour les points, les lignes ou les surfaces de mesure, un symbole* s'affiche à la valeur de mesure.



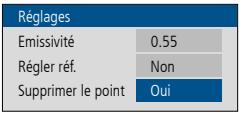
Régler réf.

La température du point 1 (S1) indique la température de référence (R). Voir également le chapitre 10.2

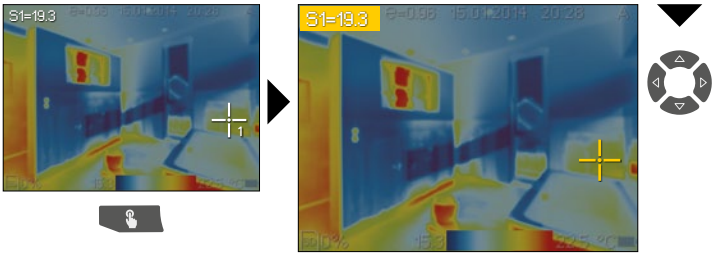


Supprimer le point

Le point est supprimé.

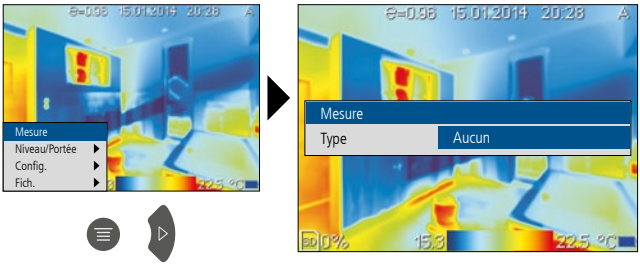


16.2 Points de mesure / Positionnement du point de mesure manuel



17 Hot spot et cold spot

Les points de mesure hot spot et cold spot correspondent à la fonction et à la commande des points de mesure (voir les chapitres 16.0, 16.1 et 16.2) et doivent être utilisés de la même manière.

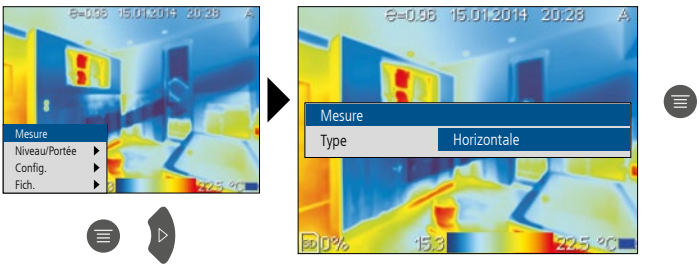


Ajouter point chaud
Le hot spot (SH) indique le point le plus chaud.

Ajouter point froid
Le cold spot (SH) indique le point le plus froid.

18.0 Activation/Désactivation de la mesure horizontale des lignes

La mesure horizontale des lignes détermine la température du bâtiment le long d'une ligne horizontale s'affichant à l'écran qui met graphiquement en évidence surtout les différences de température minimes en les représentant par une courbe qui ne différencie pas suffisamment les nuances de couleur de l'image IR.

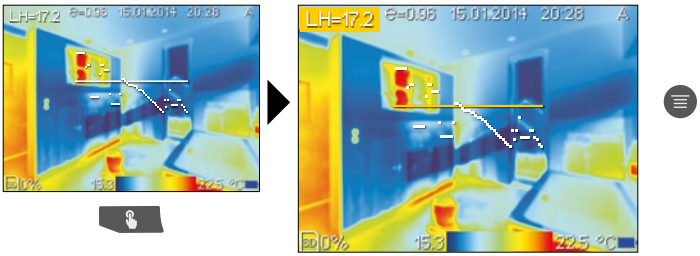


! En choisissant le réglage « Aucun », tous les points, les lignes et les surfaces de mesure ajoutés sont supprimés.

18.1 Mesure horizontale des lignes / Répartition

Le centre horizontal est sur la 120e ligne (l'écran est composé de 240 lignes). Le bargraphe définit les limites de la plage de température min./max. réglée (voir le chapitre 14.4). Même les plus petites variations de la température sont visibles dans les limites de cette plage de la température au moyen de la courbe dynamique de la température, en particulier également en cas de différentiation insuffisante via les couleurs de l'image IR. La mites de la température min./max. indiquée dans le bargraphe.courbe de la température ne varie que dans les limites de la température min./max. indiquée dans le bargraphe.

18.2 Mesure horizontale des lignes / Paramètres



Emissivité

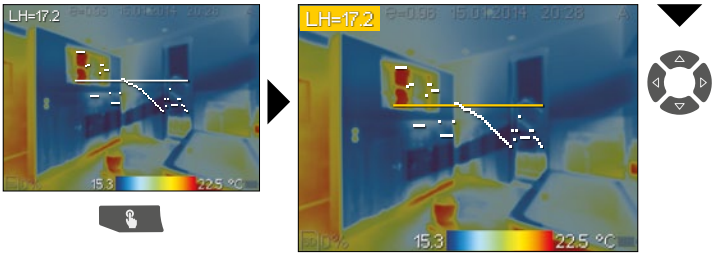
Réglage de la valeur d'émission pour la ligne horizontale (HL). Voir également le chapitre 11.1

> **!** Si des valeurs particulières sont fixées pour les points, les lignes ou les surfaces de mesure, un symbole* s'affiche à la valeur de mesure.

Suppression de la ligne

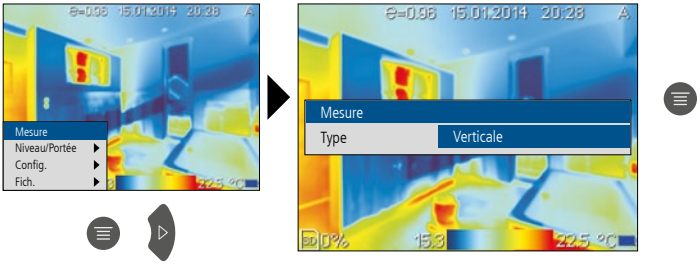
La ligne est supprimée.

18.3 Positionner des lignes horizontales



19 Activation/Désactivation de la mesure verticale des lignes

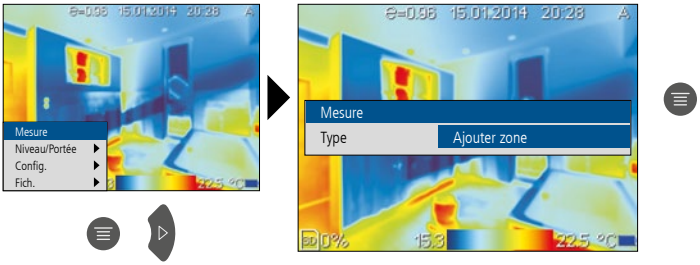
La mesure verticale des lignes correspond à la fonction et à la commande de la mesure des lignes horizontale (voir le chapitre 18 et suivants) et doit être utilisée de la même manière.



! En choisissant le réglage « Aucun », tous les points, les lignes et les surfaces de mesure ajoutés sont supprimés.

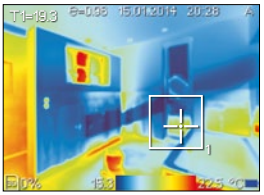
20.0 Activer/Désactiver la mesure de la surface

Il est possible de fixer simultanément jusqu'à trois surfaces de mesure auxquelles on peut attribuer les propriétés suivantes (température max., température min., température moyenne) ainsi que les paramètres spécifiques à la mesure.



! En choisissant le réglage « Aucun », tous les points, les lignes et les surfaces de mesure ajoutés sont supprimés.

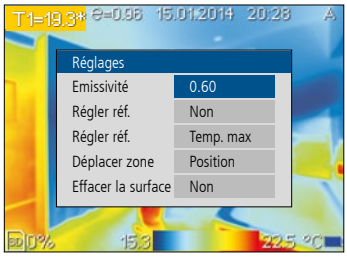
20.1 Mesure de la surface / Paramètres



Emissivité

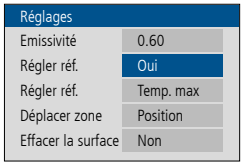
Régler la valeur d'émission pour la surface 1 (T1). Voir également le chapitre 11.1

! Si des valeurs particulières sont fixées pour les points, les lignes ou les surfaces de mesure, un symbole* s'affiche à la valeur de mesure.



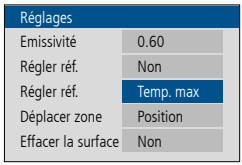
Régler réf.

La température de la surface 1 (T1) indique la température de référence (R). Voir également le chapitre 10.2



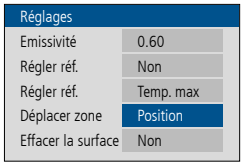
Régler réf.

Temp. max	température maximale dans la surface de mesure
Temp. min	température minimale dans la surface de mesure
Temp. Moyenne	température moyenne dans la surface de mesure



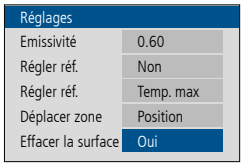
Déplacer zone

Position	Il est possible de déplacer la position en utilisant les touches fléchées
Taille	Il est possible de modifier la taille du champ en utilisant les touches fléchées



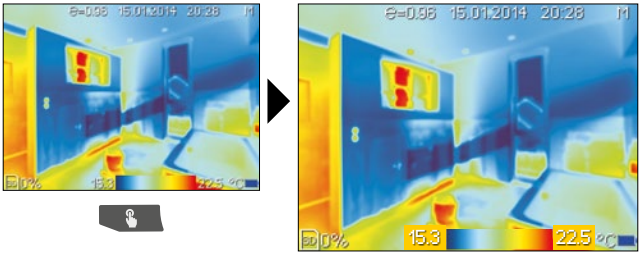
Effacer la surface

La surface est supprimée.



21 Gamme de température manuelle

Pour le réglage manuel, la plage de température n'est plus réglée automatiquement par les valeurs min./max. mesurées, mais est réglée par les valeurs manuelles. Mettez automatique / manuelle, voir le chapitre 9



Les valeurs min./max. (niveau) sont augmentées en même temps.

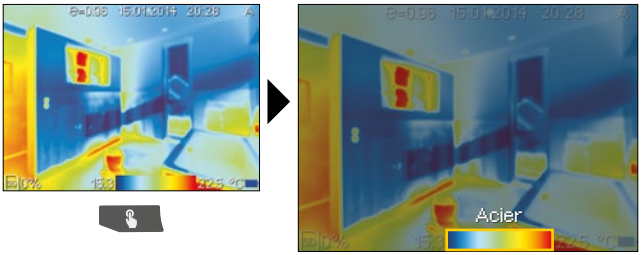
Les valeurs min./max. (niveau) sont diminuées en même temps.

La plage de la température min./max. (fourchette) augmente.

La plage de la température min./max. (fourchette) baisse.

22 Gamme des couleurs de l'image IR

Vous avez le choix entre plusieurs gammes de couleurs standard pour représenter les températures infrarouges saisies. En fonction de la gamme sélectionnée, les températures mesurées dans la zone actuelle de l'image sont ajustées et s'affichent dans l'espace de couleur correspondant. Le bargraphe des températures min./max. de l'ensemble de l'image sert de référence pour l'assignation des températures/couleurs.



Acier
Échelle de gris pos.
Échelle de gris nég.
Ambre
Métal chaud
Métal froid
Arc-en-ciel - vt/rg
Arc-en-ciel - bl/rg
Arc-en-ciel - nr/blc
H.C. - bl/jn
H.C. - vt/blc

23 Modes d'images

Vous disposez de 2 modes d'images différents.

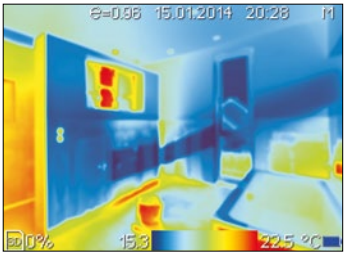
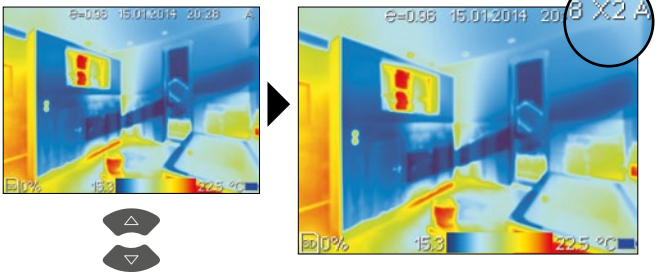


Image IR

Photo numérique

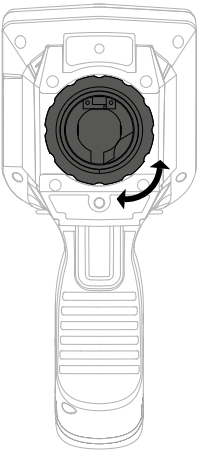
24 Zoom

Il est possible de zoomer la vue (grossissement 2 fois).



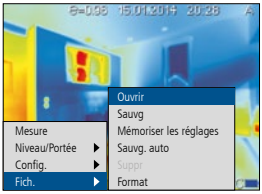
25 Foyer de la caméra

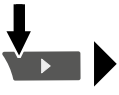
En plus des réglages de base sur l'appareil de mesure, le foyer de la caméra et la fonction „obturateur" (calibrage de la photo) sont des composantes permettant d'obtenir un résultat thermographique adapté. Il faut régler le mieux possible la mise au point sur le bâtiment si bien que la silhouette et les contours soient nettement reconnaissables à l'écran.

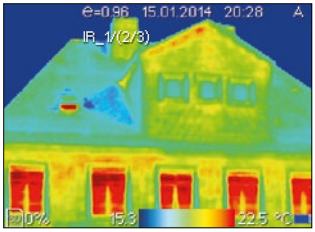


26.0 Vue d'ensemble des médias / Mode de lecture

La vue d'ensemble des médias permet de sélectionner toutes les données images enregistrées avec la caméra thermographique. Il est possible de sélectionner la vue d'ensemble des médias soit via le menu, soit via la touche directe. Appuyez sur la touche directe „ESC" afin de quitter la vue d'ensemble des médias.



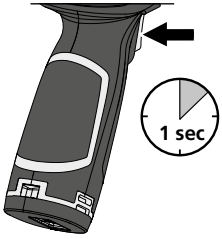




Si la touche « Déclenchement » est réglée sur « IR / Numérique », il est possible de commuter entre l'image numérique IR et l'image correspondante dans le mode lecture. En cas d'absence d'image IR ou numérique, l'écran est sombre et « Pas d'image IR » ou Pas d'image numérique ».

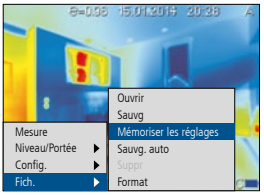
26.1 Immagine della ripresa

La touche « Déclenchement » permet de réaliser des photos de toutes les situations de mesure existantes à des fins de documentation ultérieure.



! La touche « Déclenchement » doit être réglée sur « Enregistrement » afin de pouvoir enregistrer des photos. Voir à ce sujet le chapitre 6.4

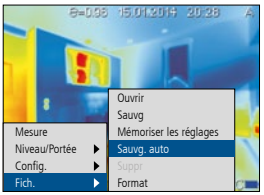
26.2 Réglage l'image



Sauvg. Lien

En activant la fonction „Enregistrer le lien", une image numérique de la situation de mesure est enregistrée en même temps dans le cas d'une image IR.

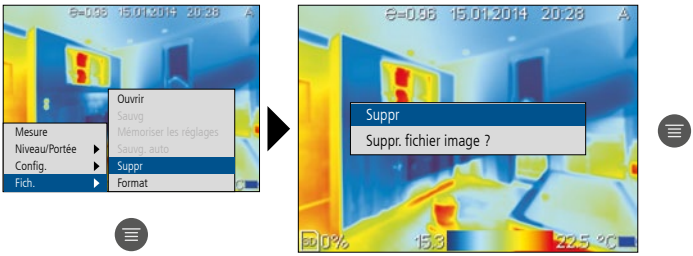
26.4 Ripresa automatica



Des images sont automatiquement enregistrées à l'intervalle réglé après un seul déclenchement.

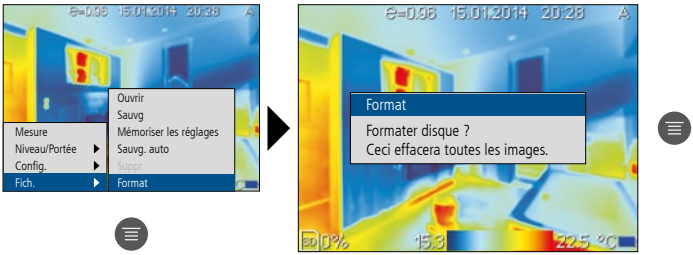
26.5 Effacer les enregistrements

Il est seulement possible de supprimer les images dans le mode de lecture.
Voir à ce sujet le chapitre 26.0



! Il suffit d'appuyer sur la touche « ESC » pour interrompre l'opération.

26.6 Formater la carte SD



! Il suffit d'appuyer sur la touche « ESC » pour interrompre l'opération.

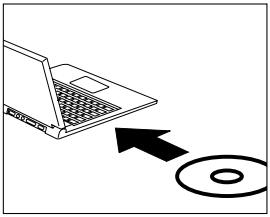
27 Laser de visée

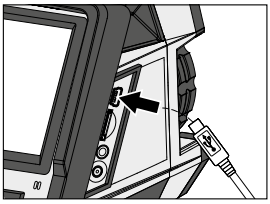
Le laser de visée facilite les mesures spécifiques à un domaine grâce à une visée simple. Dans le menu, il est possible d'attribuer le laser cible à la touche « Déclenchement ».

28 Connexion USB

Le logiciel fourni sur le CD permet de transférer les données enregistrées (sur le PC et de les utiliser pour un traitement ou une documentation ultérieur(e). Introduisez le CD fourni avec l'instrument dans le lecteur de CD et suivez les instructions d'installation. Démarrez l'application après une installation réussie. Branchez une extrémité du câble USB fourni avec l'instrument sur le port USB mini de l'instrument et l'autre extrémité sur un port USB libre de votre ordinateur.
Consultez la fonction Aide qui vous donne une description détaillée des fonctions pour savoir comment utiliser le logiciel.

! Il n'est pas nécessaire d'installer des pilotes. Le logiciel fonctionne sous Windows XP / 7 et 8.



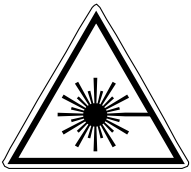


29 Remarques relatives à la maintenance

– Effectuez ces opérations à un endroit propre, sans poussières ni eau
– Éteignez la caméra puis retirez le pack d'accus
– Mettez l'appareil à la terre afin de vous protéger des charges statiques
– Ne touchez pas la lentille de l'objectif
– Le droit à la garantie expire en cas d'utilisation de l'appareil non conforme à la destination prévue.

Données techniques	Sous réserve de modifications techniques. 01.14
Capteur IR	résolution de 160 x 120 pixel; microbolomètre non refroidi 8-14 µm
Optique IR	Objectif interchangeable en germanium Champ de vision 25° x 19° (FOV), Résolution spatiale 2,73 mrad (IFOV) mise au point manuelle, 0,4 m min.
Sensibilité thermique	0,1 °C, 100 mK NETD
Précision	± 2°C ou ± 2% de la valeur mesurée
Plage de mesure	-20 °C ... 350 °C
Écran	Écran couleur tactile TFT de 3,5 pouces
Modes d'images	infrarouge, numérique
Fonction image	zoom numérique 1-2x,
Caméra numérique	Résolution : 640 x 480 pixels
Format	Format JPEG, max, 640 x 480 pixel
Fonction de mémorisation	carte micro SD jusqu'à 16 GB
Laser de visée	Laser de classe 2, < 1 mW, 635-650 nm
Connexions	USB, micro SD, vidéo
Degré de protection	IP54, test de chute 2 m, impact 25 g (IEC60068-2-29) vibration 2 g (IEC60068-2-6)
Alimentation électrique / Temps de charge / Durée de fonctionnement	Pack d'accu Li-ion 7,4V / 2,0Ah / env. 7 heures / env. 3 heures en fonction de l'accu
Dimensions	298 mm x 104 mm x 149 mm
Poids	1,1 kg (piles incluses)

Consignes générales de sécurité
Attention : Ne pas regarder directement le rayon! Le laser ne doit pas être mis à la portée des enfants! Ne pas l'appareil sur des personnes sauf si nécessaire.



Rayonnement laser!
Ne pas regarder dans
le faisceau.
Appareil à laser de classe 2
< 1 mW · 635-650 nm
EN 60825-1:2007-10

Réglementation UE et élimination des déchets

L'appareil est conforme à toutes les normes nécessaires pour la libre circulation des marchandises dans l'Union européenne.

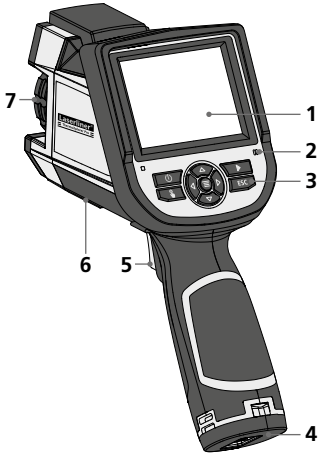
Ce produit est un appareil électrique et doit donc faire l'objet d'une collecte et d'une mise au rebut sélectives conformément à la directive européenne sur les anciens appareils électriques et électroniques (directive DEEE).

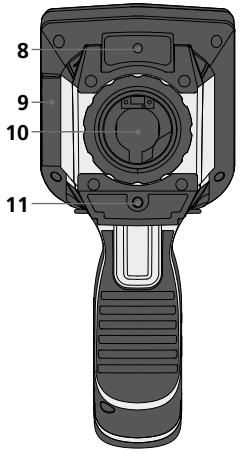
Autres remarques complémentaires et consignes de sécurité sur **www.laserliner.com/info**

! Leggere completamente le istruzioni per l'opuscolo allegato „Indicazioni aggiuntive e di garanzia". Attenersi alle indicazioni ivi riportate. Conservare con cura questa documentazione.

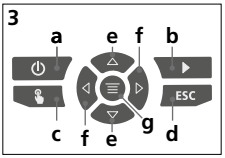
Funzione / utilizzo

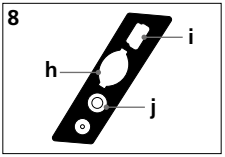
La presente telecamera termografica permette di misurare senza contatto la temperatura di superfici, valutando la radiazione nel campo delle lunghezze d'onda a infrarossi con l'ausilio di un microbolometro integrato non raffreddato. Con la rappresentazione per immagini del sensore si ottiene una riproduzione ottica dei rapporti di temperatura sull'oggetto analizzato. Grazie alla diversa colorazione delle temperature misurate in un termogramma con rappresentazione a falsi colori, si ottiene una visualizzazione ottimale delle differenze di temperatura. Allo stesso tempo si può fotografare la scena analizzata con la telecamera digitale, per una successiva documentazione nell'apparecchio o per l'elaborazione con il software in dotazione. L'apparecchio può essere utilizzato, per esempio, per il rilevamento di ponti termici ed errori di isolamento, per localizzare surriscaldamenti in componenti elettrici o meccanici, per il rilevamento di condotte di riscaldamento nella parete e nel pavimento, per riscontrare perdite, localizzare celle solari difettose in moduli PV e molto altro ancora.



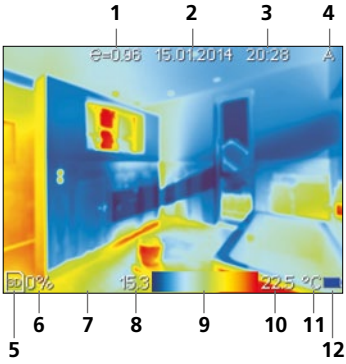


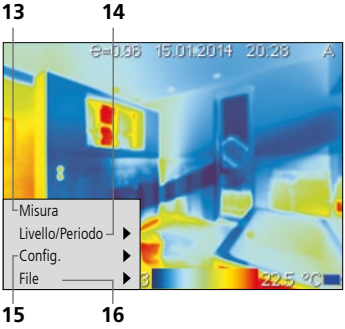
1 Display a colori TFT di 3,5"
2 Microfono integrato
3 Tasti di avvio rapido
4 Vano batteria ricaricabile
5 Grilletto:
Salvar
Infrarosso/CCD
Laser
Temperatura puntuale
Temperatura superficiale
6 Attacco treppiede da 1/4"
7 Obiettivo
8 Telecamera
9 Vano
10 Lente della telecamera a infrarossi
11 Uscita del raggio laser





a ON/OFF
b Galleria dei media
c Selezione oggetti da misurare
d Annullare
e Controllo del menu / Zoom ON / OFF
f Controllo del menu / Commutazione immagine IR/digitale
g Menu principale
h Scomparto per microscheda SD
i Interfaccia USB
j Uscita video





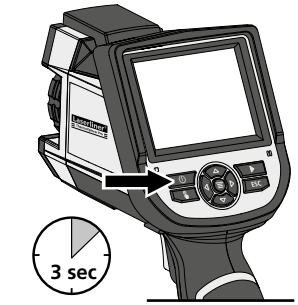
Visualizzazione standard della misura

1 Grado di emissione impostato
2 Data
3 Ora
4 Rilevamento della modalità di temperatura (man. / auto)
5 Microscheda SD inserita
6 Impegno scheda microSD
7 Immagine termografica
8 Temperatura min.
9 Spettro colori con gamma temperature
10 Temperatura max.
11 Unità di misura della temperatura
12 Indicazione carica della batteria

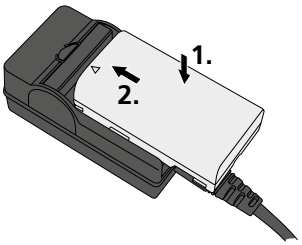
Menu principale

13 Inserimento di punti, linee e superfici di misura
14 Gamma di temperature automatica / manuale
15 Impostazioni generali e specifiche per la misurazione
16 Galleria dei media

1 ON / OFF

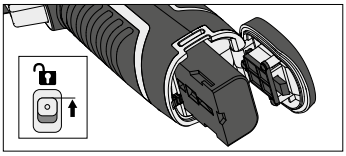


2 Carica del pacco batterie al litio-ioni



3 Sostituzione del pacco batterie al litio-ioni

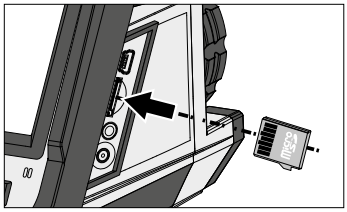
Per la sostituzione delle batterie al litio-ioni, aprire il blocco sull'impugnatura (si veda immagine a destra). Rimuovere le batterie, inserire quelle nuove e richiudere il blocco.



! Se la telecamera viene trasportata o non viene utilizzata per un lungo periodo, mettere il pacco batterie nell'apposito spazio della valigetta.

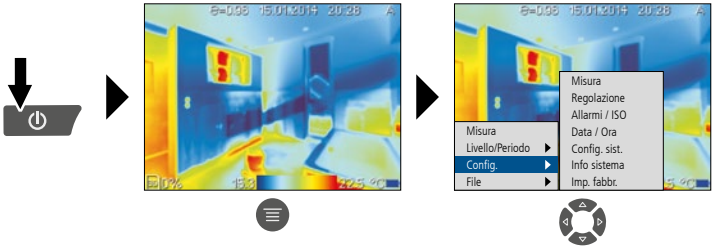
4 Inserimento della microscheda SD

Per inserire la microscheda SD, aprire la copertura in gomma e inserire la scheda come indicato nell'immagine. Senza un supporto di memorizzazione non sono possibili le registrazioni.



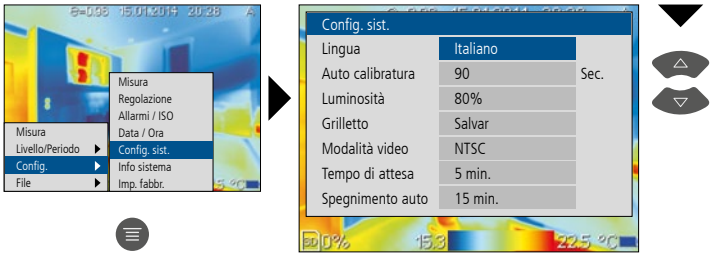
5 Menu principale

Dal menu principale si posso eseguire impostazioni generali o specifiche per la misurazione. Ci si può spostare nel menu con i quattro tasti freccia.



! Le immissioni devono essere confermate premendo il tasto del menu (g). Si può utilizzare anche il tasto trigger (4) se è impostato su „Salva".

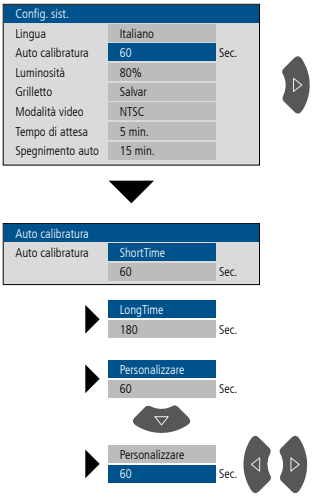
6.0 Impostazioni generali: **Impostazioni del sistema**



6.1 **Impostare la lingua del menu** DE / GB / FR / ES / IT / PT / RU

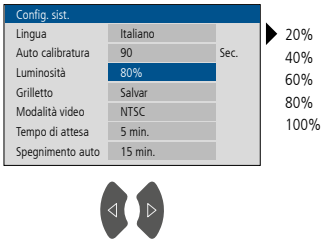
Italiano
Português
русский
English
Español
Francais
Deutsch

6.2 Auto calibratura



! Premendo a lungo i tasti freccia si può aumentare o diminuire il tempo di 10 secondi.

6.3 Luminosità del display

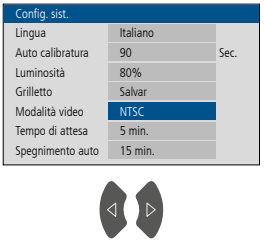


6.4 Grilletto

Con il tasto „Trigger" si possono impostare le seguenti funzioni:

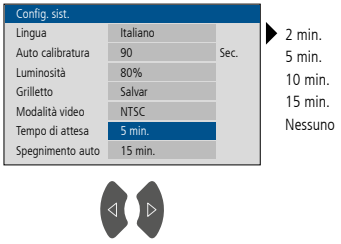
Salvar	salvataggio immagine IR/digitale
Infrarosso/CCD	commutazione da immagine a infrarossi a digitale
Laser	attivazione del laser
Temp. Punto	inserire / rimuovere punto
Temp. zona	inserire / rimuovere superficie

6.5 Modalità di uscita video



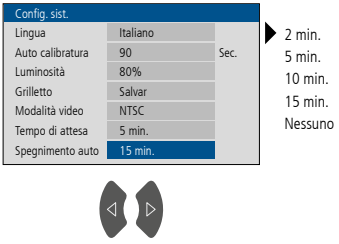
6.6 Spegnimento automatico del display

Il display si disattiva automaticamente dopo il periodo di inattività impostato.

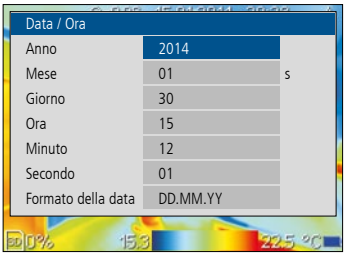


6.7 Spegnimento automatico

L'apparecchio si disattiva automaticamente dopo il periodo di inattività impostato.



7 Impostazioni generali: **Data / Ora**



Selezione formato data

8 Impostazioni specifiche di misurazione: **Misura**

Immissione punti di misura
Si possono inserire due punti di misura (S1 e S2).

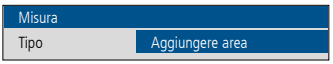
Aggiungere punto caldo
L'Hot spot (SH) indica il punto più caldo.

Aggiungere punto freddo
Il Cold spot (SC) indica il punto più freddo.

Attivazione della misurazione lineare orizzontale (LH)

Attivazione della misurazione lineare verticale (LV)

Immissione superfici di misura
Si possono inserire tre superfici di misura (da T1 a T3).



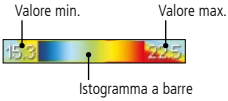
! Selezionando l'impostazione „Nessuno", vengono rimossi tutti i punti, le linee e le superfici di misura inseriti.

Si veda da capitolo 16 segg. al capitolo 20 seg.

9 Impostazioni specifiche di misurazione: **Gamma di temperatura A / M**

Auto ?

Gamma di temperatura / Regolazione automatica (A)
Con questa impostazione si regola la gamma di temperature dell'immagine IR e la distribuzione risultante dello spettro cromatico dell'immagine a infrarossi. Viene rilevato lo spettro cromatico dell'immagine a infrarossi misurata in relazione alla gamma di temperature e alla scala cromatica.

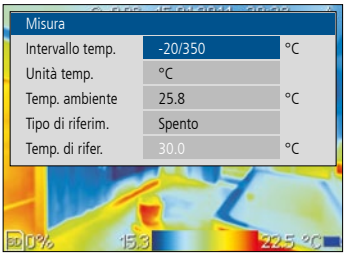


La distribuzione dei colori dell'immagine IR viene adattata automaticamente e dinamicamente nell'istogramma in base ai valori minimi e massimi misurati.

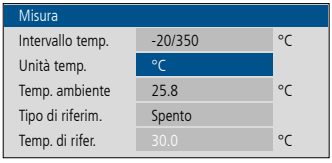
L/P ?

Gamma di temperatura / Regolazione manuale (M)
Nell'impostazione manuale, la gamma di temperature non viene più impostata automaticamente tramite i valori di temperatura min. e max. misurati, ma definita con i valori manuali. Si devono determinare la gamma e il campo di temperatura. Si veda il capitolo 21

10.0 Impostazioni specifiche di misurazione: **Impostazioni di misura**

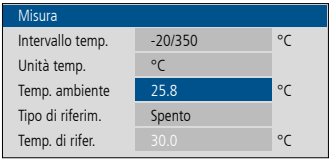


10.1 Unità di misura della temperatura

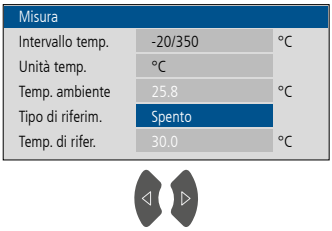


- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)

10.2 Temperatura ambiente



10.3 Impostazione della temperatura di riferimento



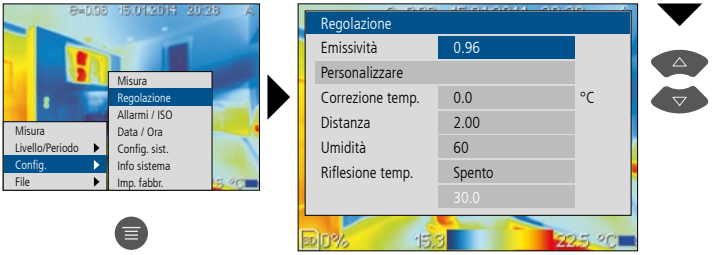
Nel campo della temperatura di riferimento viene indicata la differenza di temperatura tra quella di riferimento impostata e i punti, le superfici e le linee di misura.

Esempio:
R = 30.0 °C
S1 = 35.9 °C

S1 viene visualizzato a display con la differenza di temperatura di 5.9 °C.

11.0 Impostazioni specifiche di misurazione: **Impostazioni**

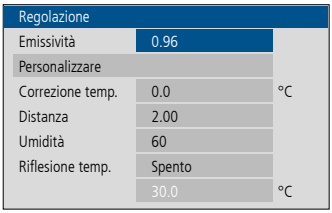
Prima di ogni impiego si devono controllare le impostazioni per la misurazione a infrarossi e impostarle in base alle attuali necessità, per assicurare una misurazione corretta e facendo particolare attenzione ai parametri generali relativi al grado di emissione, alla distanza dall'oggetto da misurare e alle condizioni ambientali.



11.1 Grado di emissione

Il grado di radiazione infrarossa emesso da qualsiasi corpo, a seconda del tipo di materiale o della superficie, viene determinato dal grado di emissione (da 0,10 a 1,0). Affinché la misurazione sia corretta, è assolutamente necessario impostare il grado di emissione. Oltre ai gradi di emissione prestabiliti contenuti nella lista dei materiali, si possono anche impostare gradi di emissione individuali.

Impostazione del grado di emissione individuale



! Premendo a lungo i tasti freccia si può aumentare o diminuire il tempo di 10 secondi.

Tabella dei gradi di emissione (valori indicativi con tolleranze)

Metalli

Acciaio	
rullato a freddo	0,80
pannello rettificato	0,50
pannello lucidato	0,10
lega (8% nichel, 18% cromo)	0,35
galvanizzato	0,28
ossidato	0,80
molto ossidato	0,88
laminato di fresco	0,24
superficie grezza, piana	0,96
arrugginito, rosso	0,69
lamiera, rivestita di nichel	0,11
lamiera, laminata	0,56
Acciaio inossidabile	0,45
Alluminio	
ossidato	0,30
lucido	0,05

Alloy A3003	
ossidato	0,20
ruvido	0,20
Ferro	
ossidato	0,75
con ruggine	0,60
Ferro fucinato	
opaco	0,90
Ferro, ghisa	
non ossidato	0,20
Massa fusa	0,25
Inconel	
ossidato	0,83
lucidato per via elettrolitica	0,15
Ossido di cromo	0,81

Ottone	
lucido	0,30
ossidato	0,50
Piombo	
grezzo	0,40
Platino	
nero	0,90
Rame	
ossidato	0,72
Ossido di rame	0,78
Zinco	
ossidato	0,10

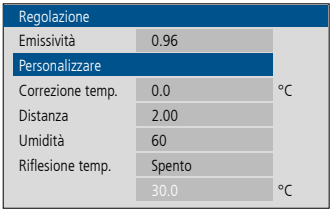
Non metalli

Acqua	0,93
Amianto	0,93
Arenaria	0,95
Argilla	0,95
Asfalto	0,95
Basalto	0,70
Calcare	0,98
Calce	0,35
Calcestruzzo, intonaco, malta	0,93
Carbone	
non ossidato	0,85
Carborundum	0,90
Carta	
tutti i colori	0,96
Carta catramata	0,92
Carta da parati chiara	0,89
Catrame	0,82
Cemento	0,95
Ceramica	0,95
Pietra opaca	0,93

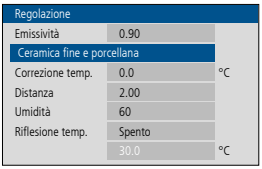
Cotone	0,77
Dissipatore di calore	
nero anodizzato	0,98
Gesso	0,88
Ghiaccio	
liscio	0,97
a bassa temperatura	0,98
Ghiaia	0,95
Gomma	
dura	0,94
tenera-grigia	0,89
Grafite	0,75
Laminato	0,90
Lana di vetro	0,95
Legno	
non trattato	0,88
faggio piallato	0,94
Marmo	
nero opaco	0,94
lucidato in grigio	0,93
Massetto	0,93
Mattone rosso	0,93

Muratura	0,93
Neve	0,80
Pelle umana	0,98
Piastre in cartongesso	0,95
Pietrisco	0,95
Plastica	
trasparente	0,95
PE, P, PVC	0,94
Porcellana	
bianca lucida	0,73
smaltata	0,92
Sabbia	0,95
Smalto per trasformatori	0,94
Stoffa	0,95
Terra	0,94
Vernice	
nera opaca	0,97
resistente al calore	0,92
bianca	0,90
Vetro	0,90
Vetro di quarzo	0,93

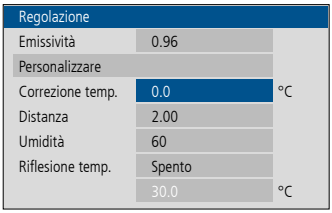
Selezione del grado di emissione nella lista dei materiali



44 materiali disponibili preimpostati



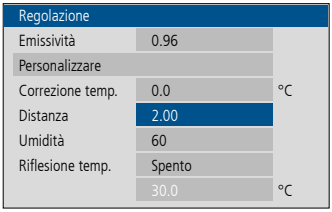
11.2 Correzione temp.



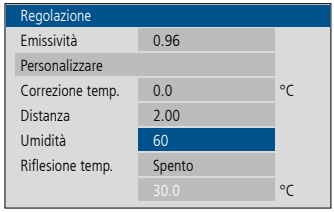
Correzione delle condizioni ambientali climatiche

Le seguenti impostazioni specifiche devono essere adattate alle condizioni climatiche ambientali prima di iniziare la misurazione. A partire da una distanza di misurazione superiore ai 10 m, si devono assolutamente considerare gli influssi atmosferici dell'aria.

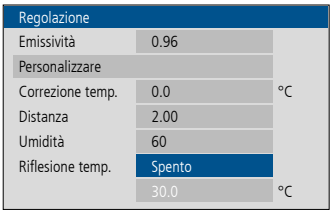
11.3 Distanza

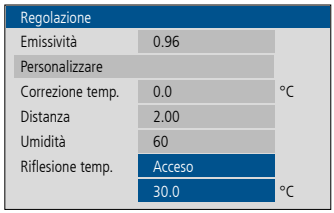


11.4 Umidità



11.5 Riflesione temp.





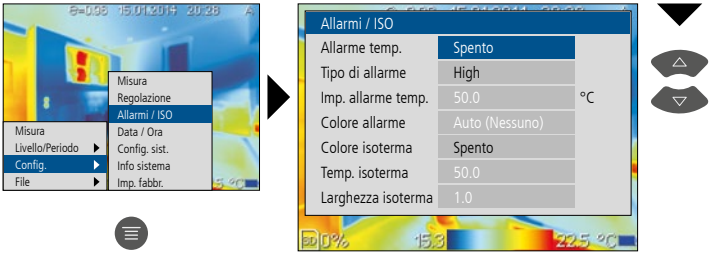
Impostazione della temperatura desiderata

Temperatura riflessa

La misurazione a infrarossi di un determinato oggetto può essere influenzata dalle radiazioni riflesse da oggetti limitrofi o anche dall'aria atmosferica, perché l'oggetto non può essere isolato completamente. Con l'ausilio della temperatura riflessa, si possono compensare tali interferenze. La temperatura riflessa è generalmente uguale a quella ambiente. Se nelle vicinanze della superficie da misurare si dovessero però trovare degli oggetti particolarmente grandi, con scarti di temperatura molto elevati (ca. >20 °C), bisogna considerarne l'influsso. Procedere quindi nel modo seguente:

1. Impostare il grado di emissione su 1.0.
2. Sfocare la messa a fuoco. (Si veda il capitolo 25)
3. Orientare la telecamera nella direzione opposta a quella dell'oggetto che deve essere misurato.
4. Determinare la temperatura media.
5. Impostare la temperatura media come temperatura riflessa.

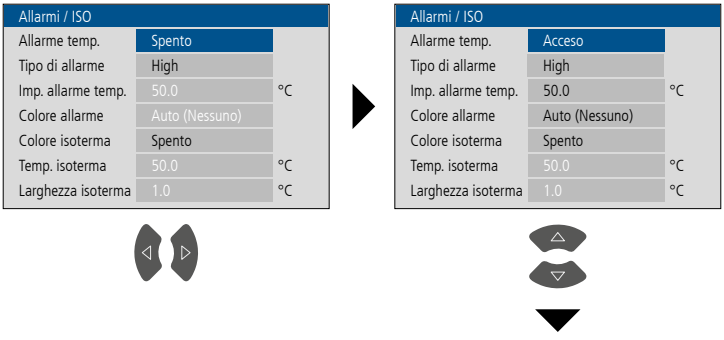
12.0 Impostazioni specifiche di misurazione: **Allarmi / ISO**



12.1 Allarme temperatura

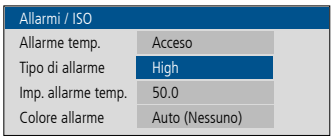
Il segnale di allarme segnala se la gamma di temperature impostata è stata superata per eccesso o per difetto e se il punto di rugiada è stato raggiunto. Il punto di rugiada viene calcolato automaticamente.

! Per poter utilizzare la funzione di allarme, sono necessari o un punto o una superficie di misura oppure una linea orizzontale/verticale.



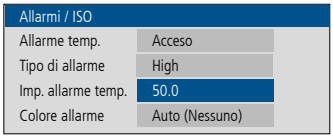
Tipo di allarme

High	Temperatura superata per eccesso
Low	Temperatura superata
DP	Temperatura non raggiunta



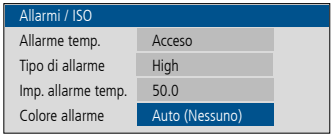
Allarme della temperatura

Impostare i limiti di temperatura



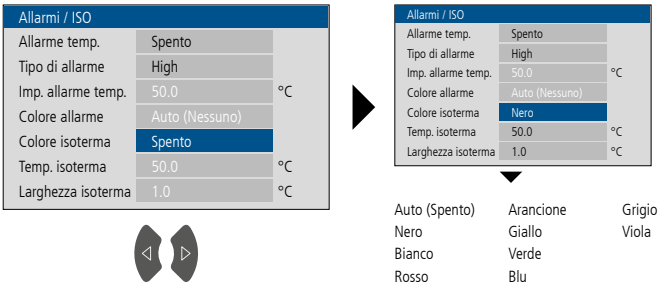
Colore allarme

Auto (Spento)	Arancione	Grigio
Nero	Giallo	Viola
Bianco	Verde	
Rosso	Blu	

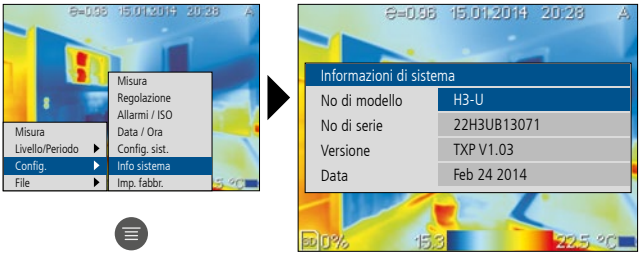


12.2 Funzione isotermica

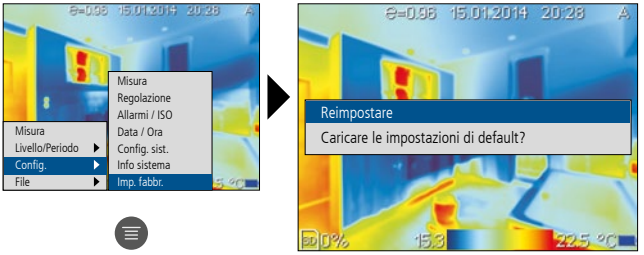
Con l'ausilio della funzione isotermica è possibile visualizzare le gamme di temperatura definite con la stessa rappresentazione cromatica, come con un filtro. In questo modo si possono rendere visibili soprattutto le gamme di temperature importanti. La funzione isotermica deve essere impostata tramite determinati parametri a seconda della misurazione da svolgere. I parametri di impostazione sono uguali a una funzione „Nel caso in cui". Se viene soddisfatta la condizione impostata, la gamma di temperature viene visualizzata come definita.



13 Informazioni di sistema



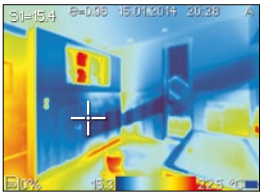
14 Impostazioni predefinite

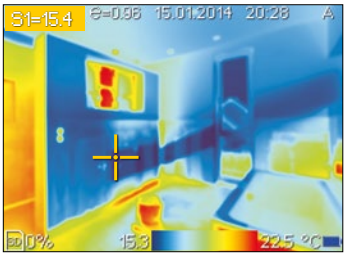


! Si perdono tutte le impostazioni.

15 Selezione oggetti da misurare

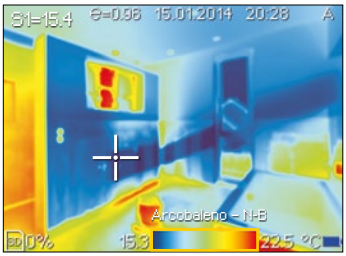
Con il tasto c „Seleziona oggetto immagine“ si possono selezionare i punti, i campi e le superfici di misura inseriti di seguito, così come l'istogramma e le temperature min/max. L'area selezionata viene contrassegnata in giallo e può essere modificata premendo il tasto g „Menu principale“.





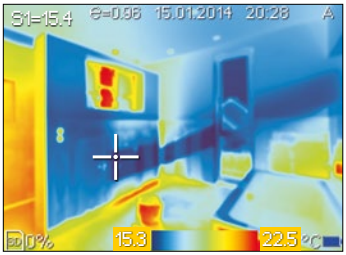
Oggetto successivo

Impostazioni



Oggetto successivo

Impostazioni



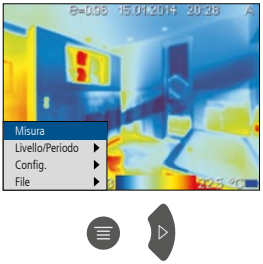
Oggetto successivo

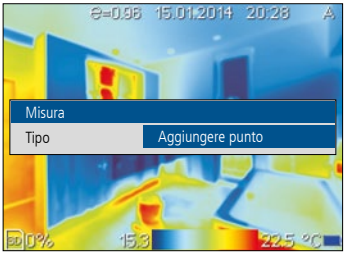
Impostazioni

! La selezione viene annullata automaticamente dopo un breve periodo.

16.0 Attivazione e disattivazione dei punti di misura

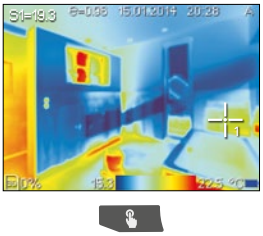
Si possono determinare fino a due punti di misura contemporanei, ai quali assegnare le seguenti caratteristiche (temperatura max, temperatura min, posizionamento manuale) e parametri specifici di misurazione.





! Selezionando l'impostazione „Nessuno", vengono rimossi tutti i punti, le linee e le superfici di misura inseriti.

16.1 Punti di misura / Parametri



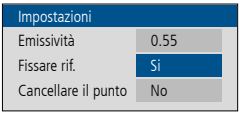
Emissività

Impostare il valore di emissione per il punto 1 (S1). Si veda anche il capitolo 11.1

! Se sono stati definiti dei valori per i punti, l e linee o le superfici di misura, sul valore misurato appare un *.

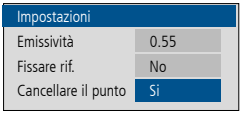
Fissare rif.

La temperatura del punto 1 (S1) indica la temperatura di riferimento (R). Si veda anche il capitolo 10.2

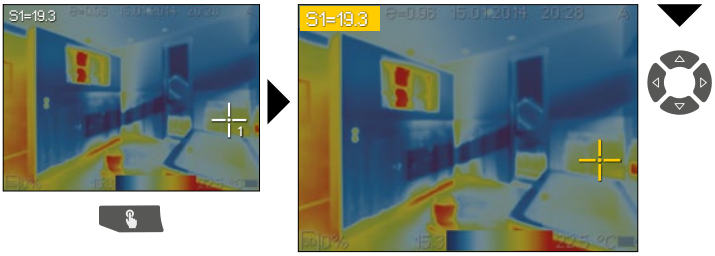


Cancellare il punto

Il punto viene rimosso.

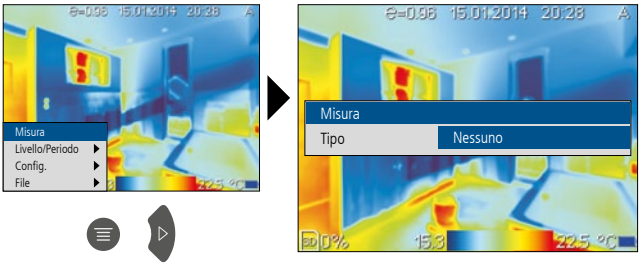


16.2 Punti di misura / Posizionamento del punto di misura manuale



17 Hot spot e Cold spot

I punti di misura Hot spot e Cold spot presentano la stessa funzione e lo stesso comando dei punti di misura (si veda il Capitolo 16 segg.) e devono essere utilizzati seguendo lo stesso schema.

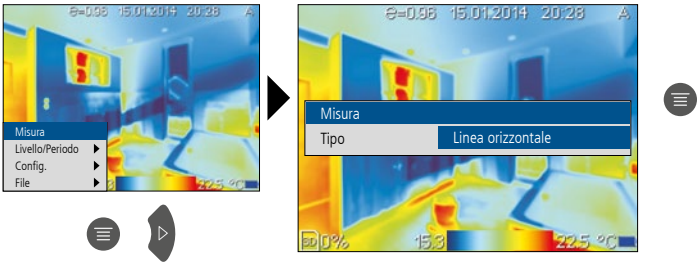


Aggiungere punto caldo
L'Hot spot (SH) indica il punto più caldo.

Aggiungere punto freddo
Il Cold spot (SC) indica il punto più freddo.

18.0 Attivazione/Disattivazione della misurazione lineare orizzontale

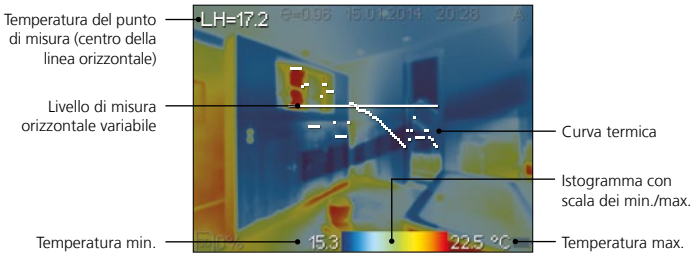
Con la misurazione lineare orizzontale si può rilevare la temperatura dell'oggetto lungo una linea orizzontale che può essere spostata sul display, e visualizzare, tramite un grafico a curve, soprattutto le differenze di temperatura minime, quando le sfumature cromatiche dell'immagine IR non sono sufficientemente distinguibili.



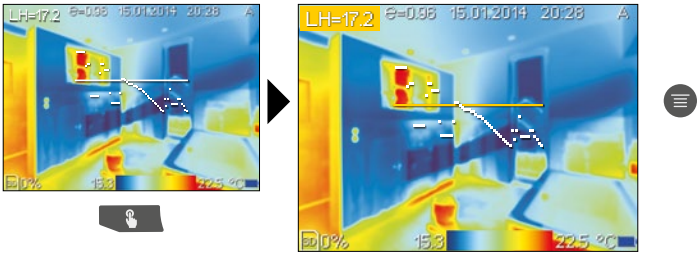
! Selezionando l'impostazione „Nessuno", vengono rimossi tutti i punti, le linee e le superfici di misura inseriti.

18.1 Misurazione lineare orizzontale / Assegnazione

Su un display a 240 righe, il centro in senso orizzontale si trova sulla riga 120. L'istogramma definisce i limiti della gamma di temperature min. e max. impostate (si veda il capitolo 14.4). In questa gamma di temperature, vengono visualizzate anche le più piccole modifiche della temperatura grazie alla curva termica dinamica, specialmente quando i colori dell'immagine IR non offrono una differenziazione sufficiente. La curva termica copre solo i limiti di temperatura min./max. indicati nell'istogramma.



18.2 Misurazione lineare orizzontale / Parametri



Emissività

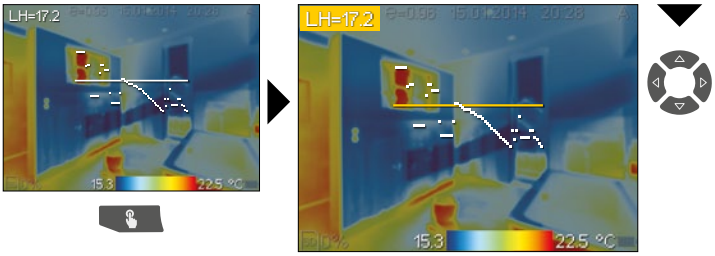
Impostare il valore di emissione per la linea orizzontale (LH). Si veda anche il capitolo 11.1

> **!** Se sono stati definiti dei valori per i punti, le linee o le superfici di misura, sul valore misurato appare un *.

Cancellare la linea

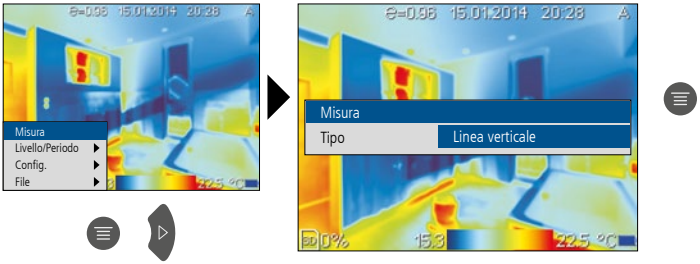
La linea viene rimossa.

18.3 Posizionamento delle linee orizzontali



19 Attivazione/Disattivazione della misurazione lineare verticale

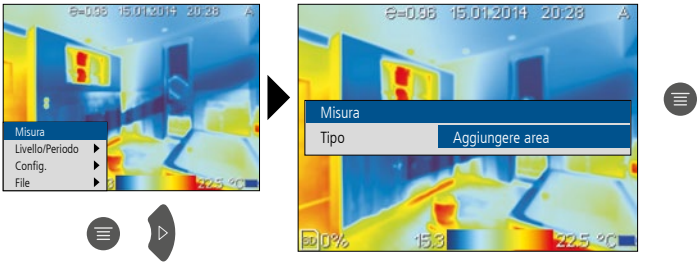
La funzione e il comando della misurazione lineare verticale corrispondono a quelli della misurazione orizzontale (si veda il capitolo 18 segg.) e devono essere eseguiti nello stesso modo.



! Selezionando l'impostazione „Nessuno", vengono rimossi tutti i punti, le linee e le superfici di misura inseriti.

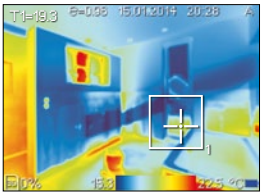
20.0 Attivazione e disattivazione della misura dell'area

Si possono determinare fino a tre aree di misura contemporaneamente, alle quali assegnare le seguenti caratteristiche (temperatura max, temperatura min, temperatura media) e i parametri specifici di misurazione.



! Selezionando l'impostazione „Nessuno", vengono rimossi tutti i punti, le linee e le superfici di misura inseriti.

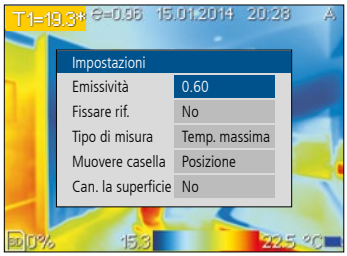
20.1 Misura dell'area / Parametri



Emissività

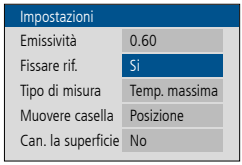
Impostare il valore di emissione per la superficie 1 (T1). Si veda anche il capitolo 11.1

> **!** Se sono stati definiti dei valori per i punti, le linee o le superfici di misura, sul valore misurato appare un *.



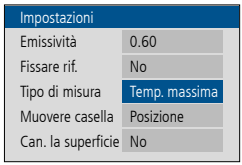
Fissare rif.

La temperatura della superficie 1 (T1) indica la temperatura di riferimento (R). Si veda anche il capitolo 10.2



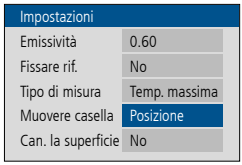
Tipo di misura

Temp. massima	temperatura massima sulla superficie di misura
Temp. minima	temperatura minima sulla superficie di misura
Temp. media	temperatura media sulla superficie di misura



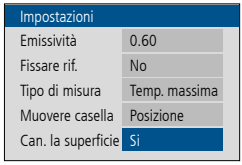
Muovere casella

Posizione	La posizione può essere modificata con i tasti freccia
Dimensioni	Le dimensioni del campo possono essere modificate con i tasti freccia



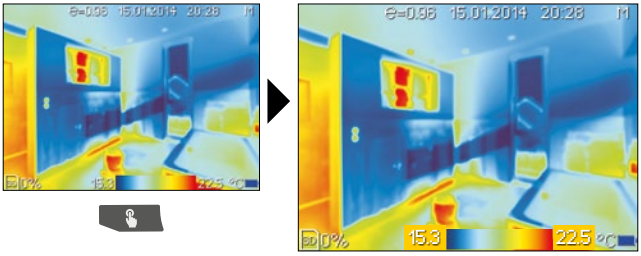
Cancellare la superficie

La superficie viene rimossa.



21 Gamma di temperature manuale

Nell'impostazione manuale, la gamma di temperature non viene più impostata automaticamente tramite i valori di temperatura min. e max. misurati, ma definita con i valori manuali. Interruttore automatico / manuale, vedere il capitolo 9



I valori di min/max (livello) vengono aumentati contemporaneamente.

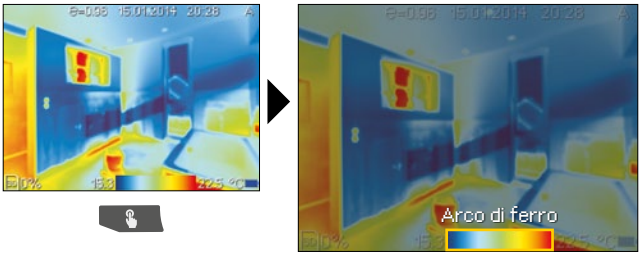
I valori di min/max (livello) vengono diminuiti contemporaneamente.

La gamma di temperature min / max (campo) viene ampliata.

La gamma di temperature min / max (campo) viene ridotta.

22 Scala delle tonalità di colore dell'immagine IR

Per la rappresentazione delle temperature a infrarossi rilevate sono disponibili diverse scale di tonalità standard. A seconda della scala scelta, le temperature misurate vengono adattate all'interno dell'attuale spazio di visualizzazione e rappresentate nel relativo spazio cromatico. L'istogramma delle rispettive temperature minime e massime di tutta l'immagine serve come riferimento per l'attribuzione della temperatura/del colore relativi.



Arco di ferro
Pos. scala di grigi
Neg. scala di grigi
Ambra
Metallo caldo
Metallo freddo
Arcobaleno – V-R
Arcobaleno – B-R
Arcobaleno – N-B
A.C. – B-G
A.C. – V-B

23 Modalità d'immagine

Le modalità d'immagine disponibili sono 2.

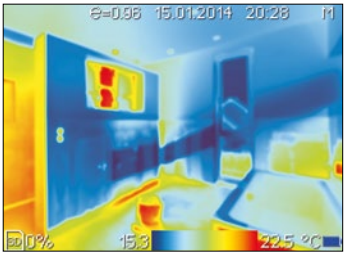
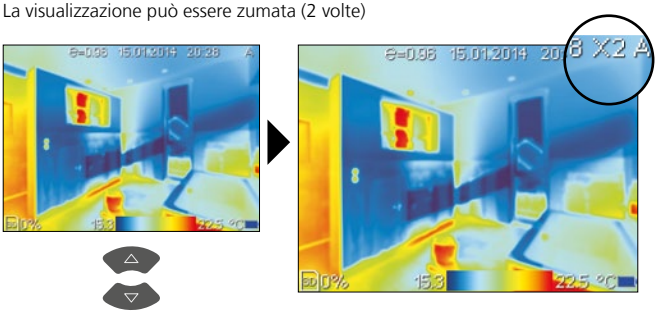


Immagine IR

Immagine digitale

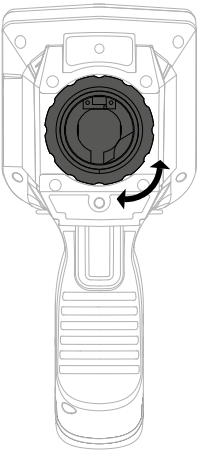
24 Zoom

La visualizzazione può essere zumata (2 volte)



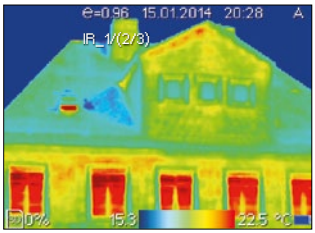
25 Fuoco telecamera

Non solo le impostazioni base del misuratore, ma anche il fuoco della telecamera e la funzione „Otturatore" (calibrazione immagine) sono importanti per ottenere un corretto risultato termografico. La messa a fuoco dell'oggetto da misurare deve essere il più precisa possibile, tanto da permettere il chiaro riconoscimento di contorni e profili sul display.



26.0 Galleria dei media / Modalità di riproduzione

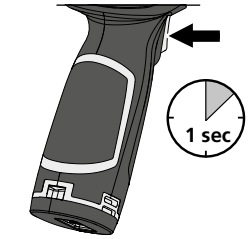
Nella galleria dei media si possono richiamare tutti i dati immagine ripresi con la termocamera. La galleria dei media viene richiamata o tramite menu o con il tasto di avvio rapido. Per chiuderla premere il tasto di avvio rapido ESC.



Se il tasto „Trigger" è impostato su „IR/Digitale", lo si può utilizzare per passare dall'immagine a infrarossi alla corrispettiva digitale nella modalità di riproduzione. Se non ci sono immagini disponibili, viene visualizzata l'informazione „Nessuna immagine IR" oppure „Nessuna immagine digitale" su uno sfondo scuro.

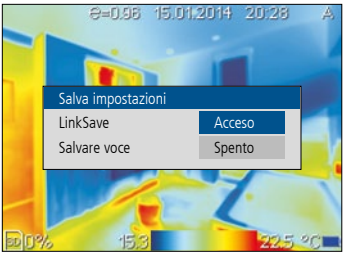
26.1 Immagine della ripresa

Tramite il menu o con il tasto „Trigger" si possono riprendere le immagini di ogni situazione di misurazione per una successiva documentazione.



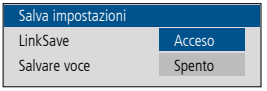
! Per poter registrare le immagini il tasto „Trigger" deve essere su „Salva". Si veda il capitolo 6.4

26.2 Impostazione della ripresa

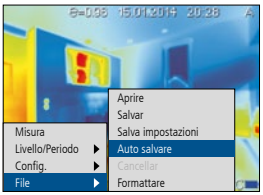


LinkSave

Attivando la funzione „Salva link“, viene memorizzata un'immagine digitale della situazione di misura ad ogni ripresa a infrarossi.



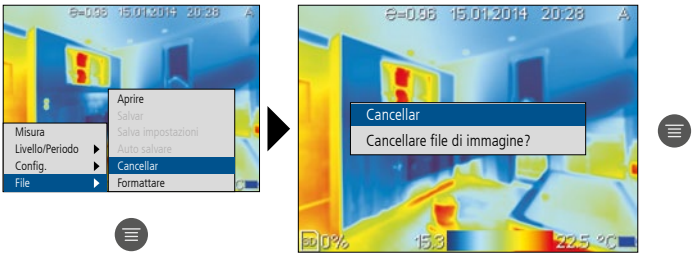
26.4 Ripresa automatica



Le immagini vengono salvate automaticamente alla distanza di tempo impostata dopo aver attivato la funzione.

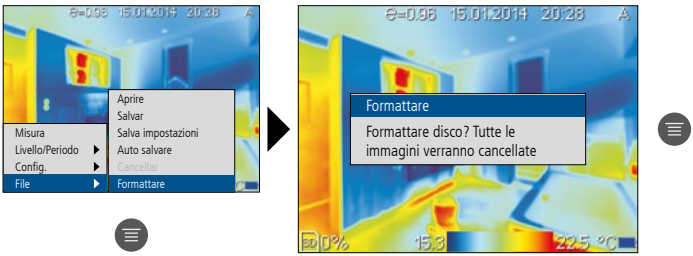
26.5 Rimozione delle riprese

Le immagini possono essere cancellate solo nella modalità di riproduzione.
Si veda il capitolo 26.0



! Premendo il tasto „ESC“ si interrompe il procedimento.

26.6 Formattazione della scheda SD



! Premendo il tasto „ESC“ si interrompe il procedimento.

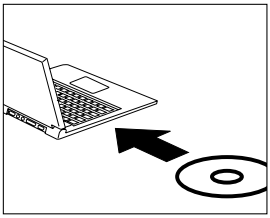
27 Laser di puntamento

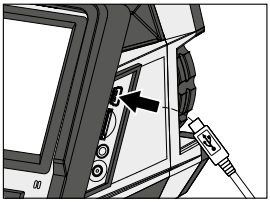
Con l'ausilio del laser di puntamento vengono facilitate le misurazioni specifiche grazie a una semplice mira. Il laser di puntamento può essere assegnato al tasto „Trigger" nel menu.

28 Collegamento USB

Il software fornito su CD permette la trasmissione dei dati registrati al PC a fini di documentazione o per ulteriori utilizzi. Inserire il CD in dotazione nel drive e seguire le indicazioni di installazione. Avviare l'applicazione a installazione avvenuta. Collegare un'estremità del cavo USB in dotazione alla miniporta USB dell'apparecchio, l'altra estremità a una porta USB libera del computer.
Per l'ulteriore comando del software vedere la funzione Help che contiene una descrizione dettagliata delle funzioni.

! Non è necessario installare un driver. Il software funziona con Windows XP / 7 e 8.



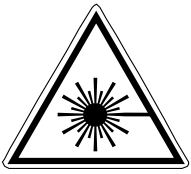


29 Indicazioni di manutenzione

– Eseguire i lavori in un luogo pulito e privo di polvere e acqua
– Spegnere la telecamere, rimuovere la batteria
– Collegare a terra per proteggere da cariche statiche
– Non toccare la lente dell'obiettivo
– La garanzia non copre i danni causati da un uso improprio

Dati tecnici	Con riserva di modifiche tecniche. 01.14
Sensore IR	Risoluzione 160 x 120 pixel; Microbolometro non raffreddato 8-14 µm
Otttica a infrarossi	Obiettivo intercambiabile al germanio Campo visivo (FOV) 25° x 19°, risoluzione spaziale (IFOV) 2,73 mrad, fuoco manuale, 0,4 m min.
Sensibilità termica	0,1 °C, 100 mK NETD
Precisione	± 2°C o ± 2% del valore misurato
Campo di misura	-20 °C ... 350 °C
Display	Display a colori TFT da 3,5“
Modalità d’immagine	Infrarossi, digitale
Funzione immagine	1-2 zoom digitali
Telecamera digitale	Risoluzione: 640 x 480 pixel
Formato	Formato JPEG, max. 640 x 480 pixel
Funzione di memoria	Drive scheda microSD fino a 16 GB
Puntatore laser	Laser classe 2, < 1 mW, 635-650 nm
Attacchi	USB, microSD, Video
Classe di protezione	IP54, prova di caduta 2 m, urto 25g (IEC60068-2-29) vibrazione 2g (IEC60068-2-6)
Alimentazione / Durata di carica / Durata di esercizio	Pacco batterie al litio-ioni 7,4V / 2,0Ah / ca. 7 ore / ca. 3 ore per ogni batteria
Dimensioni	298 mm x 104 mm x 149 mm
Peso	1,1 kg (con batterie litio-ioni)

Norme generali di sicurezza
Attenzione: Non guardare direttamente il raggio! Tenre il laser fuori dalla portata dei bambini! Non indirizzare l’apparecchio inutilmente verso le persone.



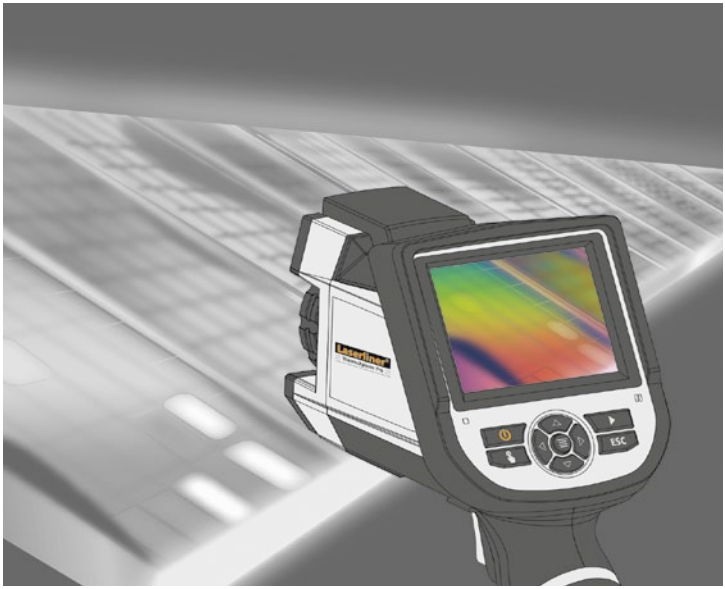
Radiazione laser!
Non guardare direttamente
il raggio!
Laser classe 2
< 1 mW · 635-650 nm
EN 60825-1:2007-10

Garanzia, manutenzione e smaltimento

L’apparecchio soddisfa tutte le norme necessarie per la libera circolazione di merci all’interno dell’UE.

Questo prodotto è un apparecchio elettrico e deve pertanto essere raccolto e smaltito separatamente in conformità con la direttiva europea sulle apparecchiature elettriche ed elettroniche usate.

Per ulteriori informazioni ed indicazioni di sicurezza:
www.laserliner.com/info



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