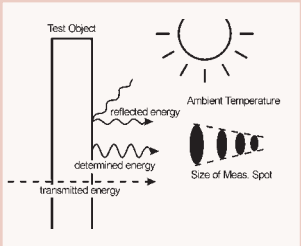
AMIR INFRARED MEASURING TECHNOLOGY

Why Infrared Measurements?

Infrared measuring instruments provide large advantages with regard to measuring tasks that cannot be solved with conventional contact thermometers. Examples:

- Measurements of very high temperatures not allowing the use of thermocouples.
- Measurements at surfaces with low thermal conduction and bodies with low thermal capacity.
- Measurements at moving, inaccessible or live parts with a high rate of response (<1s).
- Measurements at objects, which must not be influenced by contact measurements.

What is Infrared Radiation?



Every substance with a temperature above absolute zero emits an infrared radiation (spectral range of wavelengths from 0.7 to 1000µm) that corresponds to its temperature. This range is located below the longer red wavelength range and is not visible to the human eye. For measurements the most interesting range is located between 0.7 and 20µm.

The infrared radiation emitted by the test object follows the known optical rules and, therefore, can be deviated, bundled with lenses or reflected from catoptric elements.

The emissivity of a test object indicates how much infrared energy has been absorbed or released by radiation. The value can be between 0 and 1.0. The fact that the emissivity depends on the wavelength is relevant for measurements. With increasing object temperature the radiation maximum shifts to the short wave range. Therefore, IR thermometers are equipped with filters, which allow only one particular wavelength to pass through for the measurement. The spectral range for specific materials must be considered for the application.

How Infrared Thermometers Operate

The optical system of an infrared thermometer captures the energy emitted from a circular measuring spot and focuses it onto a detector. A material with a high transmission factor is used for the lenses. The energy captured by the detector is electronically amplified and converted into an electrical signal. The optical resolution results from the ratio of the measuring distance to the size of the measuring spot. The measuring spot must always be smaller than the test object or the measuring point of interest. The higher the optical resolution the smaller the measuring spots can be measured at further distances.

What is Intermittent Photometry?

Using intermittent photometry eliminates the thermal drift and immunes devices against thermal shock. The stability resulting from this, combined with noise-optimised signal processing, leads to an excellent temperature resolution and allows the measurement of smallest test objects and fast response times.

Special Infrared Pyrometers

Ratio Pyrometers determine the temperature from the ratio of the energy radiated in each of two wavelength ranges. This method allows for exact measuring results, even in case of a limited view to the test object due to vapour, steam, dust, dirty windows or lenses (up to 95% reduction of meas. signal). Furthermore, test objects, which are smaller than the measuring spot (e.g. measurement at wires), or low or varying emissivities at fast moving objects, do not affect the measuring result.

Line Scanners measure the object temperature along a line. Fixed installed line scanners provide coloured heat flow charts from a product passing under the measuring head (e.g. conveyors, rotary furnaces), but can also be moved to pass above objects (e.g. heat flow chart of a house wall). The infrared scanner measuring head AMiR 7880 scans up to 256 dots over an angle of 90°. 20 lines can be scanned within one second. One measuring tape can be divided into 3 sectors, side by side or overlapping.

AMIR INFRARED MEASURING TECHNOLOGY

Application Examples for Infrared Thermometers

Temperature Range	Spectral Sensitivity	Application Examples
approx. 0 … 800°C	8 to 14 µm 3 to 5 µm 7 to 15 µm 7 to 18 µm	All non-metals wood, paper, textiles, floor coverings, asphalt, lime floor, edibles, pharmaceuticals, as well as use with print, coating, laminating, drying/hardening, wave soldering and reflow soldering, for indoor installations, fire control, dust tips etc.
approx. 10 … 360°C	nominal 7.9 µm	Fabrication and processing of polyester foil, fluoroplastics, Teflon, acrylate, nylon (polyamide), acetylene cellulose, polyamides, polyurethanes, PVC, polycarbonates.
approx. 260 … 1650°C	nominal 5.0/5.2 µm	Surface measurement on glass for heating up, forming, sealing, laminating, bending.
approx. 200 … 1200°C	3.9 µm	Metal finishing, furnaces, melting furnaces, blast furnaces, measurements on thick glass. Measurements slightly influenced by CO2 atmosphere (combustion gases).
approx. 30 … 340°C	nominal 3.43 µm	Fabrication and processing of polyethylene, polypropylene, polystyrene and other foils.
approx. 400 … 3000°C	2 to 2.7 µm	Processing of ferrous and nonferrous metals, induction furnaces, glass production, melting furnaces, lab research.
approx. 200 … 1800°C	1.6 µm	Heat treatment of steel, bending, hardening, warming up.
approx. 500 … 3000°C	1 µm	Steel production, molten baths, for highest precision with shaping, casting and processing of metals, as well as the processing of glass, ceramics, semiconductors and chemicals.

Compact Glossary of Important Terms

Atmospheric Windows:	The wavelength ranges within the infrared spectrum, in which the atmospheric radiation energy is transmitted and the atmospheric absorption is minimal, approximately 3 … 5µm and 8 … 14µm.
Focal Point, Focal Distance:	Measuring distance where the maximum optical resolution is reached.
Far Field:	Measured distance, which is significantly larger than the focal length of a device, in most cases is larger than ten times the focal length.
Field of View:	The test object area, which is measured by the infrared thermometer; the diameter of the measuring spot is proportioned to the distance from the test object; often also specified as an angular variable at the focal point. Also see optical resolution.
Non-Selective Radiator:	Radiating body with an emissivity that, for all wavelengths, bears the same constant ratio to the emissivity of a full radiator at the same temperature, which is opaque to radiation of infrared energy.
Background Temperature:	From the view of the measuring instrument the ambient temperature or the temperature behind the test object.
Measuring Spot:	Diameter of the test object area, which is subject to a temperature measurement; the measuring spot is defined by the circular area, which typically allows to capture 90% of the infrared energy radiating from the test object to the optical receiving aperture of the measuring instrument.
Optical Resolution:	Also called the distance ratio: The ´measuring distance/measuring spot size´ ratio (distance ratio E:M) of an IR measuring spot. The measuring distance is typically defined as the distance from the focal point and the measuring spot size as the diameter of the IR measuring spot measured at the focal point (typically the 90% energy measuring spot diameter). The optical resolution can be also defined for the far field, by using the values for the measuring distance and measuring spot size within the far field.
Degree of Reflection:	Ratio of the radiation energy reflected from a surface to the incident radiation of the same surface; for a perfect mirror the value is approximately 1, for a full radiator the reflection is zero.
Full Radiator:	Also: black body; ideal radiator. Body, which absorbs the whole impinging radiation energy of all wavelengths and which does not reflect nor transmit any radiation. The surface of a full radiator has a uniform emissivity of 1.
Spectral Sensitivity:	Wavelength range for which an infrared thermometer is sensitive.

AMIR INFRARED MEASURING TECHNOLOGY

AMiR Infrared Measuring Technology and ALMEMO®

All ALMEMO® devices allow for setting limit values, corrections for measured values and for calling in max, min and average values. All data can be stored and subsequently selectively read out.
Special Windows® software allows for a convenient further processing of data.
Several ALMEMO® devices can be networked for a decentralised data acquisition.
Wireless remote transmission via radio modules is also possible.
Please do not hesitate to contact us for advice on your specific applications.

What You Should Consider For Infrared Measurements

What to do in case of dust, vapour and aerosols at the measuring point?

If the atmosphere at the measuring point is contaminated with dust, vapour and aerosols, the radiation energy impinging on the sensor can be influenced by contaminated lenses. This can be avoided by using an air blow attachment that keeps the lens clean.

What to do in case of high ambient temperatures?

If the ambient temperature exceeds the temperature specified for the measuring head of the IR sensor, the measuring head must be protected by mounting an air or water cooling system along with an air blow attachment (to avoid water condensing on the lens). Furthermore, cables and cable routings with high temperature stability must be used.

What to do in case of heat sources located next to the measuring object?

If heat sources are located next to the test object, these can transmit or reflect additional energy. Such ambience radiations occur, for example, at measurements in industrial furnaces where the wall temperature is often higher than the temperature of the test object. Many infrared instruments allow for a compensation of the ambient temperature.

What to do in case of measurements in a vacuum?

In case of vacuum furnaces and similar applications it is necessary to mount the measuring head outside of the vacuum area and to perform the measurement through a window. When selecting the measuring window the transmission values of the window must match the spectral sensitivity of the sensor. Quartz glass or quartz are typically used for high temperatures. In case of low temperatures within the 8 to 14mm band the use of a special material, which is translucent for IR, is necessary, e.g. germanium, amtir, zinc selenide or sapphire. When selecting the window the temperature requirements, window thickness and pressure difference, as well as the possibility of keeping the window on both sides clean, must be considered. It might be advisable to consider an additional blooming coat on the window to increase the transmission capacity. Furthermore, it must be considered that not all window materials are translucent in the visible range.

Why is the emissivity so important?

In case of ideal radiators the reflected and transmitted energy equals zero and the emitted energy corresponds 100% to the characteristic temperature. However, many bodies emit less radiation at the same temperature (non-selective radiator). The ratio of real radiation value and that of the ideal radiator is defined as the emissivity ε. For example, a mirror has an emissivity of 0.1 while a so-called ´black body´ has an emissivity of 1.0. Many nonmetals such as wood, rubber, stone, and organic materials have only low reflecting surfaces and, as a result, high emissivities between 0.8 and 0.95. However, metals, especially if they have glossy surfaces, can have $\varepsilon = 0.1$. Therefore, IR thermometers provide an option for setting the emissivity. The emissivity should be known as exact as possible. If a too high emissivity has been set, the indicated temperature is lower than the actual temperature, given that the temperature of the test object is higher than the ambient temperature. For example, if 0.95 has been set, while the emissivity is actually only 0.9, a temperature that is lower than the actual temperature will be indicated.

How can the emissivity be determined?

Several methods can be used to determine the emissivity. As a first starting point, the following emissivity table can be consulted. The table data only represents average values, as the emissivity of a material is influenced by various factors. These include: temperature, angle of measurement, surface geometry (plane, concave, convex), thickness, surface quality (polished, rough, oxidised, sand-blasted), spectral range of the measurement and transmission capacity (e.g. in case of thin plastic foils).

Emissivities of Various Materials Depending on the Spectral Range

Metals		**1 µm**	**2.2 µm**	**5.1 µm**	**8–14 µm**
Aluminium	non-oxidised	0.1–0.2	0.02–0.2	0.02–0.2	0.02–0.1
	oxidised	0.4	0.2–0.4	0.2–0.4	0.2–0.4
Alloy A3003,	oxidised	–	0.4	0.4	0.3
	etched	0.2–0.8	0.2–0.6	0.1–0.4	0.1–0.3
	polished	0.1–0.2	0.02–0.1	0.02–0.1	0.02–0.1
Lead	polished	0.35	0.05–0.2	0.05–0.2	0.05–0.1
	etched	0.65	0.5	0.4	0.4
	oxidised	–	0.3–0.7	0.2–0.7	0.2–0.6
Chromium		0.4	0.05–0.3	0.03–0.3	0.02–0.2
Iron	oxidised	0.4–0.8	0.7–0.9	0.6–0.9	0.5–0.9
	non-oxidised	0.35	0.1–0.3	0.05–0.25	0.05–0.2
	rusty	–	0.6–0.9	0.5–0.8	0.5–0.7
	molten	0.35	0.4–0.6	–	–
Iron, cast	oxidised	0.7–0.9	0.7–0.95	0.65–0.95	0.6–0.95
	non-oxidised	0.35	0.3	0.25	0.2
	molten	0.35	0.3–0.4	0.2–0.3	0.2–0.3
Iron, wrought	dull	0.9	0.95	0.9	0.9
Gold		0.3	0.01–0.1	0.01–0.1	0.01–0.1
Haynes	alloy	0.5–0.9	0.6–0.9	0.3–0.8	0.3–0.8
Inconel	oxidised	0.4–0.9	0.6–0.9	0.6–0.9	0.7–0.95
	sand-blasted	0.3–0.4	0.3–0.6	0.3–0.6	0.3–0.6
	electropolished	0.2–0.5	0.25	0.15	0.15
Copper	polished	0.05	0.03	0.03	0.03
	etched	0.05–0.2	0.05–0.2	0.05–0.15	0.05–0.1
	oxidised	0.2–0.8	0.7–0.9	0.5–0.8	0.4–0.8
Magnesium		0.3–0.8	0.05–0.2	0.03–0.15	0.02–0.1
Brass	polished	0.8–0.95	0.01–0.05	0.01–0.05	0.01–0.05
	high polished	–	0.4	0.3	0.3
	oxidised	0.6	0.6	0.5	0.5
Molybdenum	oxidised	0.5–0.9	0.4–0.9	0.3–0.7	0.2–0.6
	non-oxidised	0.25–0.35	0.1–0.3	0.1–0.15	0.1
Monel (Ni–Cu)		0.3	0.2–0.6	0.1–0.5	0.1–0.14
Nickel	oxidised	0.8–0.9	0.4–0.7	0.3–0.6	0.2–0.5
	electrolytic	0.2–0.4	0.1–0.2	0.1–0.15	0.05–0.15
Platinum	black	–	0.95	0.9	0.9
Mercury		–	0.05–0.15	0.05–0.15	0.05–0.15
Silver		0.04	0.02	0.02	0.02
Steel	cold-rolled	0.8–0.9	–	0.8–0.9	0.7–0.9
	heavy plate	–	0.6–0.7	0.5–0.7	0.4–0.6
	polished sheet metal	0.35	0.2	0.1	0.1
	melt steel	0.35	0.25–0.4	0.1–0.2	–
	oxidised	0.8–0.9	0.8–0.9	0.7–0.9	0.7–0.9
	stainless	0.35	0.2–0.9	0.15–0.8	0.1–0.8
Titanium	polished	0.5–0.75	0.2–0.5	0.1–0.3	0.05–0.2
	oxidised	–	0.6–0.8	0.5–0.7	0.5–0.6
Tungsten	polished	0.35–0.4	0.1–0.3	0.05–0.25	0.03–0.1
Zinc	oxidised	0.6	0.15	0.1	0.1
	polished	0.5	0.05	0.03	0.02
Tin	(non-oxidised)	0.25	0.1–0.3	0.05	0.05
Nonmetals		**1 µm**	**2.2 µm**	**5.1 µm**	**8–14 µm**
Asbestos		0.9	0.8	0.9	0.95
Asphalt		–	–	0.95	0.95
Basalt		–	–	0.7	0.7
Concrete		0.65	0.9	0.9	0.95
Ice		–	–	–	0.98
Soil		–	–	–	0.9–0.98
Paint	(non alkaline)		–	–	0.9–0.95
Gypsum		–	–	0.4–0.97	0.8–0.95
Glass	pane	–	0.2	0.98	0.85
	molten mass	–	0.4–0.9	0.9	–
Rubber		–	–	0.9	0.95
Wood, natural		–	–	0.9–0.95	0.9–0.95
Limestone		–	–	0.4–0.98	0.98
Carborundum		–	0.95	0.9	0.9
Ceramics		0.4	0.8–0.95	0.85–0.95	0.95
Pebble stones		–	–	0.95	0.95
Carbon	non-oxidised	0.8–0.95	0.8–0.9	0.8–0.9	0.8–0.9
	graphite	0.8–0.9	0.8–0.9	0.7–0.9	0.7–0.8
Paper	(any colour)	–	–	0.95	0.95
Plastic	(translucent, over 0.5µm)	–	–	0.95	0.95
Fabric	(cloth)	–	–	0.95	0.95
Sand		–	–	0.9	0.9
Snow		–	–	–	0.9
Argil		–	0.8–0.95	0.85–0.95	0.95
Water		–	–	–	0.93

AMIR INFRARED MEASURING TECHNOLOGY

Compact infra-red probe head AMiR FIA 844
Suitable for all ALMEMO® devices

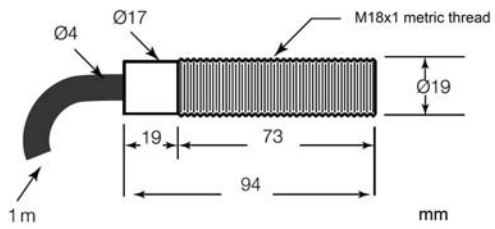
new!

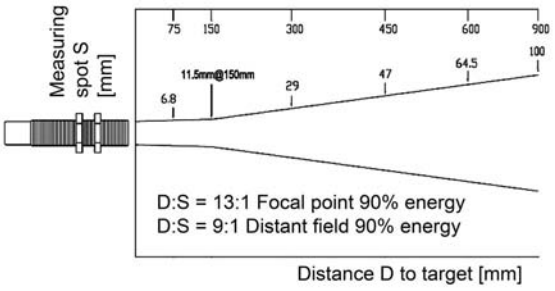
Technical features

- Compact inexpensive infra-red probe head for measuring surface temperature
- Other measuring ranges -20 to +500 °C
- High optical resolution Measuring spot 11.5 mm at distance 150 mm, in distant field 9:1
- Sturdy stainless steel housing Protection IP65
- Quick and easy to install thanks to screw-fit housing
- Integrated electronics, cable permanently fitted
- Can be connected directly to the ALMEMO® device using an ALMEMO® connector

Variants (including 2 mounting nuts)

ALMEMO® infra-red probe head Measuring range -20 to +500 °C with permanently fitted cable and ALMEMO® connector, Cable length = 1 meter	**Order no. FIA844**
Same as above Cable length = 3 meters	**Order no. FIA844L3**





Accessories

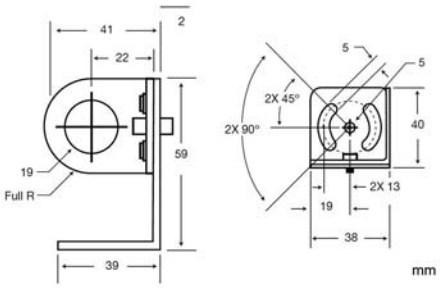
Mounting bracket, rigid	Order no. ZR7844FB
Mounting bracket, adjustable	Order no. ZR7844JB
Air blower attachment Thread M18x1	Order no. ZR7844APM
90° deflecting mirror Thread M18x1	Order no. ZR7844RAM
Protective window Thread M18x1	Order no. ZR7844PWM

AMIR INFRARED MEASURING TECHNOLOGY

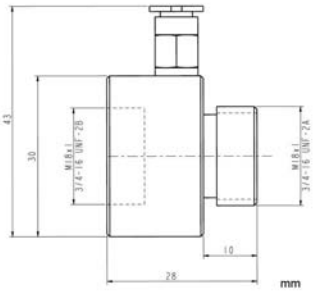
Technical data

Temperature range	-20 to +500 °C
Spectral sensitivity	8 to 14 mm
Optical resolution (90 % energy)	13:1 (11.5 mm at 150 mm distance), distant field 9:1
Accuracy	±1.5 % of measured value or ±2 K (whichever value is higher) ±3.5 K for measured values <0 °C
Reproducibility	±0.5 % of measured value or ±1 K (whichever value is higher)
Nominal conditions	23 °C ±5 K, Emissivity 0.95
Temperature resolution	0.1 K
Response time	150 ms (95 %)
Emissivity	0.95, fixed setting
Voltage supply	via ALMEMO® connector (12 VDC)
Protection	IP65
Ambient temperature	0 to +70 °C
Storage temperature	-20 to +85 °C
Relative atmospheric humidity	10 to 95 % non-condensing
Housing	Stainless steel
Dimensions	Length 94 mm Thread M18x1
Connecting cable	permanently fitted, 1 or 3 meters, -30 to +105 °C including ALMEMO® connector, programmed
Weight	approx. 160 g (1-meter cable)

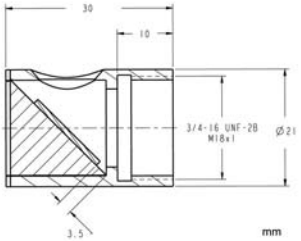
Mounting bracket, adjustable
Order no. ZR7844JB



Air blower attachment
Thread M18x1
Order no. ZR7844APM



90° deflecting mirror
Thread M18x1
Order no. ZR7844RAM



AMIR INFRARED MEASURING TECHNOLOGY

Infrared Measuring Heads in Two-Wire Design AMiR 7838

Technical Features:

- Compact, robust and precise infrared measuring heads.
- Wide range of versions for applications in intelligent process control and monitoring systems, as well as in production and test lab.
- Low cost standard version with fixed set temperature and output current range and emissivity can be manually set at the measuring head.
- The standard version without programming functions is ideally suitable for connecting to ALMEMO® devices.
- Measuring heads also available as addressable and remotely programmable versions.

Types (incl. rigid mounting angle and fastening screw):

For universal applications, standard optics OR7838OS1 (Fresnel Lens) Meas. range –18 to 500°C, spectral range 8 to 14 µm, response time 165ms, optical resolution 15:1	**Order no. MR783810(P)**
For universal applications, standard optics OR7838OS3 (Amtir Lens) Meas. range –18 to 500°C, spectral range 8 to 14 µm, response time 165ms, optical resolution 33:1	**Order no. MR783811(P)**
For high temperature measurements in metal finishing and in rotary tubular kilns, standard optics OR7838OS3 (Sapphire Lens) Meas. range 200 to 1000°C, spectral range 3.9 µm, response time 165ms, optical resolution 33:1	**Order no. MR783821(P)**
For maximum temperature measurements in metal finishing, standard optics OR7838OS6 (Float Glass Lens) Meas. range 500 to 2000°C, spectral range 2.2 µm, response time 100ms, optical resolution 60:1	**Order no. MR783851(P)**
For high temperature measurements in glass production and at heating up and hardening, standard optics OR7838OS3 (Calcium Fluoride Lens) Meas. range 250 to 1650°C, spectral range 5.0 µm, response time 165ms, optical resolution 33:1	**Order no. MR783831(P)**
For low temperature measurements in the production of plastic foils and normal foils, standard optics OR7838OS3 (Calcium Fluoride Lens) Meas. range 10 to 360°C, spectral range 7.9 µm, response time 165ms, optical resolution 33:1	**Order no. MR783841(P)**

(P) Measuring heads remotely programmable

Options:

Other focus point optics (also see page 18.12/18.13)	
Water/air cooling housing including air blow attachment, factory mounted	Order no. OR7838KL
Inherent safety (Eex in IIC T4), only available with programmable meas. heads without cooling jacket	Order no. OR7838IS2
Zener barrier including current supply	Order no. OR7838ZB
Factory test certificate, based on DKD/NIST certified sensors (only with delivery of new devices)	Order no. OR7800KZ1

Accessories:

ALMEMO® connecting cable, 2 meters, ALMEMO® connector, programmed for the probe head's temperature range, Sensor supply via ALMEMO® device (use of the device mains unit is recommended) (cable not suitable for ALMEMO® 4490-2, available here on request)	Order no. ZA7838AK
for programmable measuring heads MR7838xP	
Protective window, snap-on, according to above lens detail	Order no. ZR7838SF
Remote control set incl. HART adapter and software	Order no. OR7838SH
Industrial mains adapter 110/220V – 24VDC	Order no. ZR7838NT

AMIR INFRARED MEASURING TECHNOLOGY

Device Functions:

only AMiR 7838-xxP (programmable AMiR Heads)

Programming:	through PC via HART® adapter (OR7838SH)
Emissivity:	0.10 to 1.00 programmable
Data functions:	max, min, average value hold, compensation of ambience radiation
Limit value programming:	1 limit value incl. hysteresis, also usable for monitoring the temperature of the measuring head
ALMEMO® application:	To acquire and save measured values using those measuring head variants which cannot be addressed and remotely programmed we recommend our ALMEMO® 4390-2 panel meters. For other ALMEMO® devices please see Chapter 01.

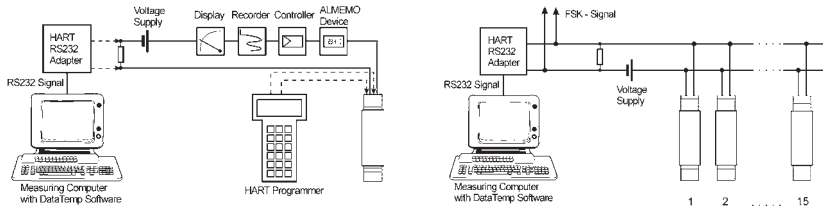
Technical Data:

Accuracy:	±1% of meas. value or ±1.4°C, the higher value of either is always valid
Reproducibility:	±0.5% of meas. value or ±0.7°C, the higher value of either is always valid
Response time:	165ms, at 7838 - 51(P) 100ms
Nominal temperature:	+23°C, ±5°C
Temperature resolution:	AMiR 7838 -10, -11: 0.125°C, AMiR 7838 -21, -31, -41, -51: 1°C
Relative humidity:	10 to 95%, non-condensing, at 30°C max.
Power supply:	12–24VDC, for AMiR 7838xxP: 24VDC
Output signal:	4 … 20mA linear, two-wire technology
Emissivity:	0.10 to 1.00 manually adjustable at measuring head (only noprogrammable heads)
Operating temperature:	without cooling: 0 to 70°C, with air cooling: 0 to 120°C with water cooling: 0 to 175°C, with protective housing: 0 to 315°C
Protection system:	IP 65, (IEC 529)
Shock:	IEC 68-2-27 (MIL STD 810D), 50G, each axis, 11ms
Vibration:	IEC 68-2-6 (MIL STD 810D), 3G, each axis, 11 to 200Hz
Dimensions:	without water cooling housing: 187mm long, Ø 42mm with water cooling housing: 187mm long, Ø 60mm
Weight:	without water cooling housing: 330 g with water cooling housing: 595 g

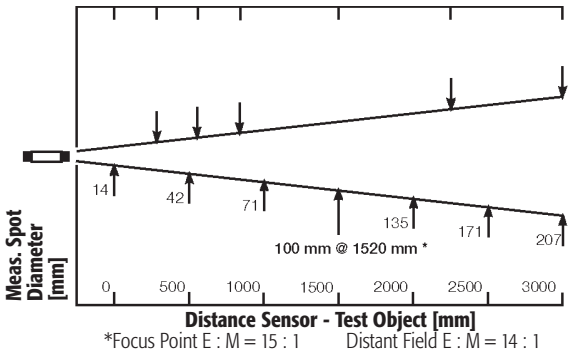
AMIR INFRARED MEASURING TECHNOLOGY

Digital Signal Processing and Configuration:

HART® protocol:	The Hart® protocol ('Highway Accessible Remote Transducer Protocol') is one of the most popular intelligent field bus protocols. It is more often used in industry than any other protocol and is supported by a large number of products and software of other manufacturers. The Hart® signal combines the standard output of 4 to 20mA with a simultaneously running digital remote data transmission. As a result, the measuring heads can, additionally, digitally communicate through the 2-conductor current loop (4 to 20mA) with the measuring computer.
Single installation:	The most frequently used installation method is the single current loop. Analog displays and controls, recorders or measuring equipment within the current loop will not be influenced by digital signals in the current loop.
Parallel working:	Up to 15 measuring heads can be switched in parallel and the measured values can be digitally further processed. For evaluation a powerful software with a menu-driven and user-friendly interface is available. It allows a graphical display of the ONLINE data including storing the measured values as an ASCII file for data export to other applications.
Configuration examples:	Single installation Parallel working

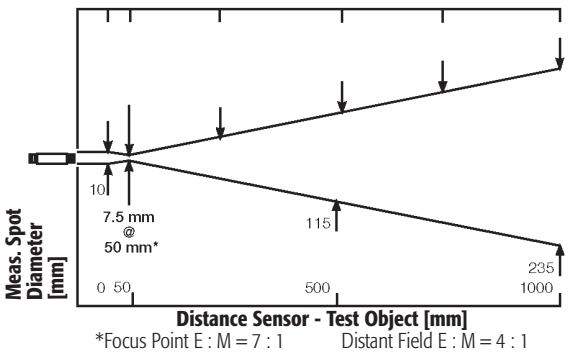


Measuring Field Diagrams: AMiR 7838-10(P)



*Focus Point E : M = 15 : 1 Distant Field E : M = 14 : 1

Standard Optics OS1

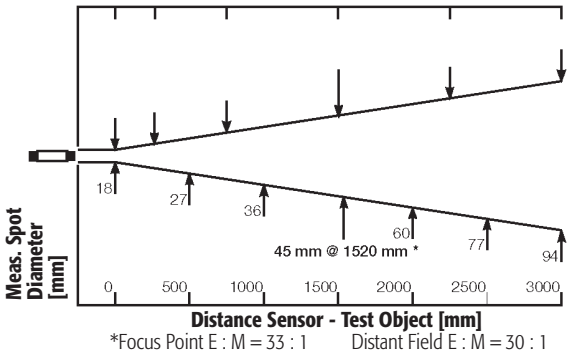


*Focus Point E : M = 7 : 1 Distant Field E : M = 4 : 1

Focal Point Optics OS2 **Ord. No. OR7838OS2**

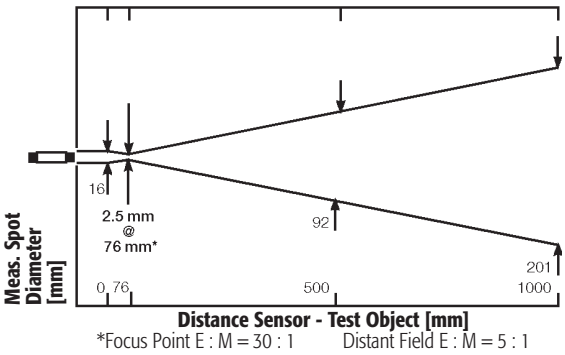
AMIR INFRARED MEASURING TECHNOLOGY

Measuring Field Diagrams: AMiR 7838-11(P)/-21(P)/-31(P)/-41(P)



*Focus Point E : M = 33 : 1 Distant Field E : M = 30 : 1

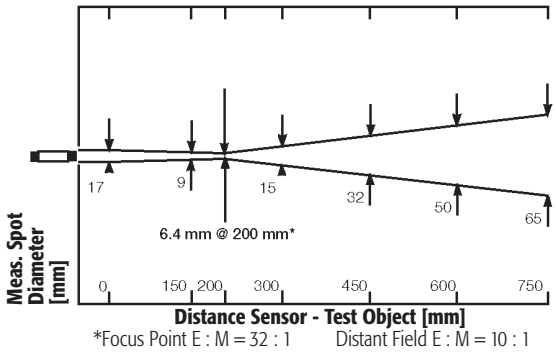
Standard Optics OS3



*Focus Point E : M = 30 : 1 Distant Field E : M = 5 : 1

Focal Point Optics OS4 **Ord. No. OR7838OS4**

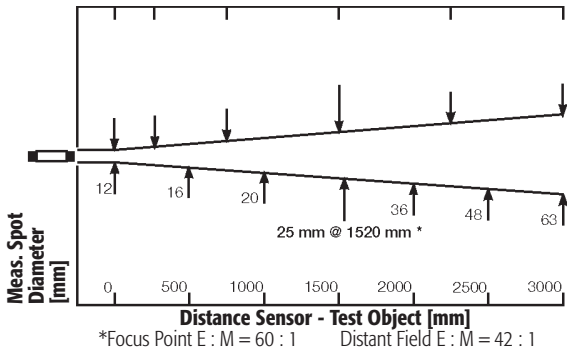
The devices AMiR 7838-31(P) and AMiR 7838-41(P) are only available with standard optics OS3.



*Focus Point E : M = 32 : 1 Distant Field E : M = 10 : 1

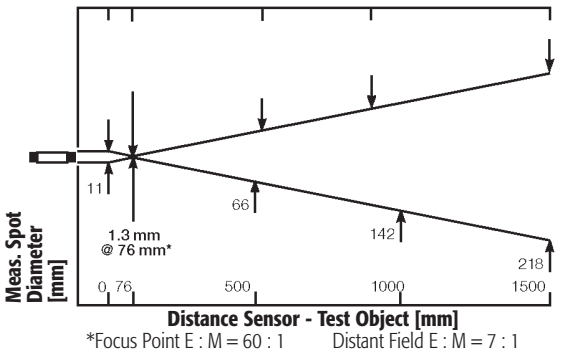
Focal Point Optics OS5 **Ord. No. OR7838OS5**

Measuring Field Diagrams: AMiR 7838-51(P)



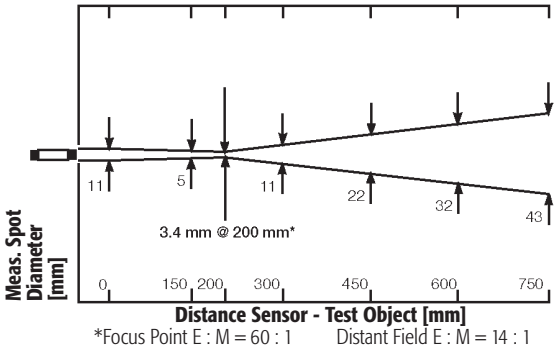
*Focus Point E : M = 60 : 1 Distant Field E : M = 42 : 1

Standard Optics OS6



*Focus Point E : M = 60 : 1 Distant Field E : M = 7 : 1

Focal Point Optics OS7 **Ord. No. OR7838OS7**

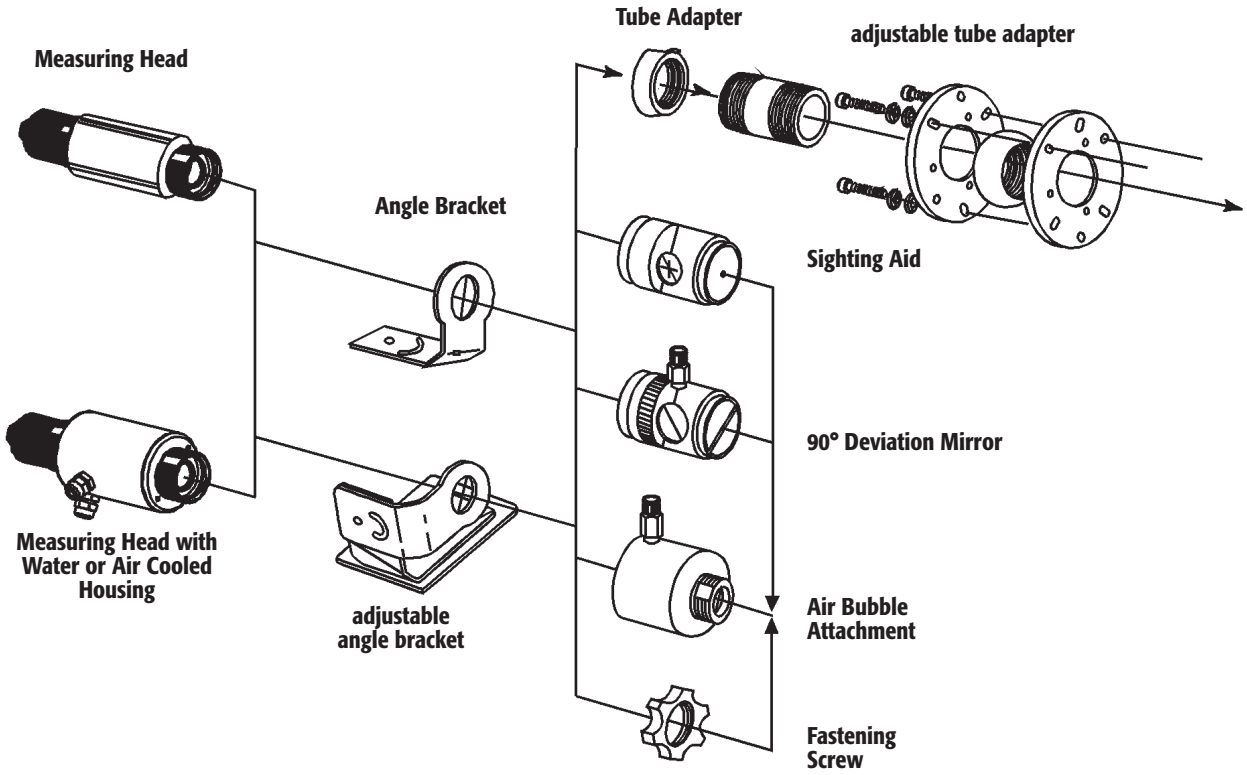


*Focus Point E : M = 60 : 1 Distant Field E : M = 14 : 1

Focal Point Optics OS8 **Ord. No. OR7838OS8**

AMIR INFRARED MEASURING TECHNOLOGY

Accessories for All Measuring Heads AMiR 7838, 7845, 7850 Without Use of the Thermojacket Protective Housing

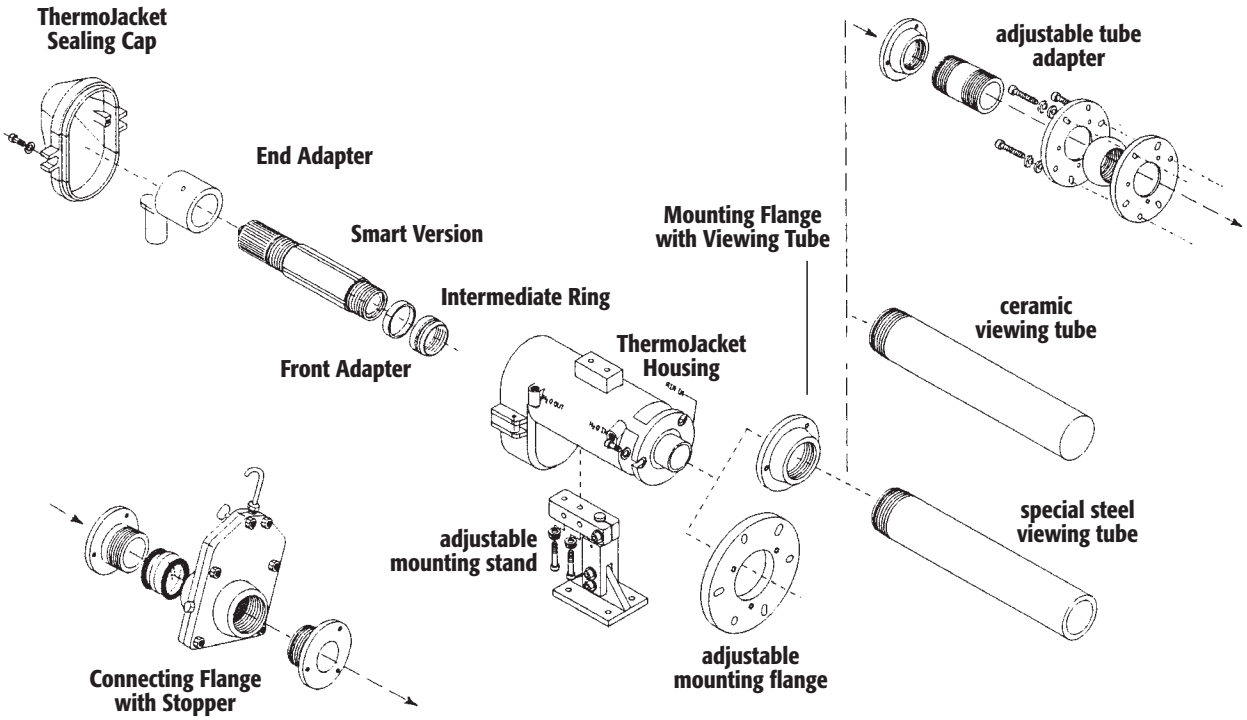


Accessories:

Rigid mounting angle (spare)	Order no. ZR7838H
Adjustable mounting angle	Order no. ZR7838JH
Fastening screw (spare)	Order no. ZR7838BM
Sighting aid, screw-on	Order no. ZR7838VS
90° deviation mirror	Order no. ZR7838US
Air blow attachment	Order no. ZR7838LB
Tube adapter onto $1^1/_2$" NPT	Order no. ZR7838RA
Adjustable tube adapter with Tube adapter onto $1^1/_2$" NPT	Order no. ZR7838OA

AMIR INFRARED MEASURING TECHNOLOGY

Accessories for All Measuring Heads AMiR 7838, 7845, 7850 With Use of the Thermojacket Protective Housing

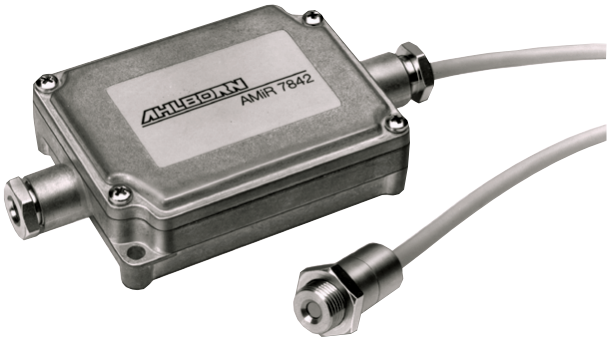


Accessories:

Thermojacket protective housing (3.26kg)	Order no. ZR7838SH
Adjustable mounting stand	Order no. ZR7838MF
Adjustable mounting flange	Order no. ZR7838JM
Mounting flange for anti-reflective tube	Order no. ZR7838FR
30cm anti-reflective tube, special steel	Order no. ZR7838RE
30cm anti-reflective tube, ceramics	Order no. ZR7838RK
Adjustable tube adapter	Order no. ZR7838JR
Connecting flange with stopper and Amtir window (from 3.9 to 14 µm)	Order no. ZR7838SA
Connecting flange with stopper and quartz window (from 1 to 2.2 µm)	Order no. ZR7838SQ
Water quantity regulator	Order no. ZR7838WR
Air quantity/pressure regulator	Order no. ZR7838LR

AMIR INFRARED MEASURING TECHNOLOGY

Miniature Infrared Temperature Measuring Heads AMiR 7842



Technical Features:

- Measuring system consisting of a miniature sensor and a separate electronics box within a robust metal housing.
- Measuring head with compact dimensions for problem-free installations, even under restricted space conditions.
- Measuring head made from special steel and, therefore, particularly suitable for continuous operation under severe conditions.
- Due to the outstanding optical characteristics and the short response time this compact device performs equally good as high-end systems, which are typically much larger.
- Ideal for multiple installations and temperature profile measurements in production processes.
- Economical alternative for contact-based temperature measurements.

Variants (including mounting nut, 1-meter cable, and electronics unit)

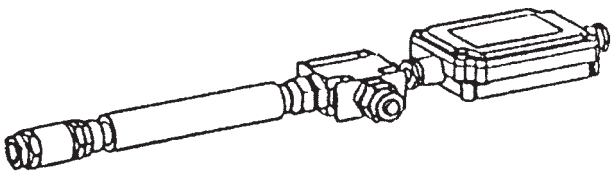
Measuring ranges for all types -40 to +600 °C

Optical resolution 2:1 Ambient temperature Probe head up to +85 °C	Order no. MR784211D
Optical resolution 10:1 Ambient temperature Probe head up to +85 °C	Order no. MR784231D
New Optical resolution 22:1 Ambient temperature Probe head up to +85 °C	Order no. MR784241D
Optical resolution 2:1 Ambient temperature Probe head up to +125 °C	Order no. MR784212D
Optical resolution 10:1 Ambient temperature Probe head up to +125 °C incl. factory test certificate	Order no. MR784232D
New Optical resolution 22:1 Ambient temperature Probe head up to +125 °C incl. factory test certificate	Order no. MR784242D
Optical resolution 10:1 Ambient temperature Probe head up to +180 °C incl. factory test certificate	Order no. MR784233D
New Optical resolution 22:1 Ambient temperature Probe head up to +180 °C incl. factory test certificate	Order no. MR784243D

Options:

Sensor cable 3m long, fixed mounted	Order no. OR 7842 VL3
Sensor cable 8m long, fixed mounted	Order no. OR 7842 VL8
Sensor cable 15m long, fixed mounted	Order no. OR 7842 VL15
Factory test certificate, based on DKD/NIST certified sensors (only with delivery of new devices)	Order no. OR7800KZ1

For other calibrations please see page 20.08.



Accessories:

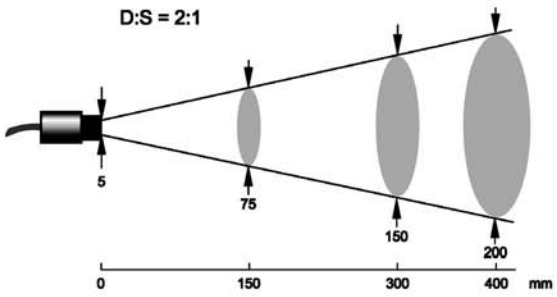
ALMEMO® connecting cable, 2 meters, ALMEMO® connector, programmed for 0 to 500 °C, Sensor supply via ALMEMO® device (use of the device mains unit is necessary)	Order no. ZA7842AK
Rigid mounting angle	Order no. ZR7842H
Adjustable mounting angle	Order no. ZR7842JH
Air blow attachment	Order no. ZR7842LB
Air cooling housing and Tee branch incl. 0.8m air hose, insulation and air blow attachment	Order no. ZR7842KL1
As above, but with 2.8m air hose	Order no. ZR7842KL2
90° deflecting mirror (only for air cooling housings or air blow attachment)	Order no. ZR7842US
90° deflecting mirror with integrated air blower attachment	Order no. ZR7842US1

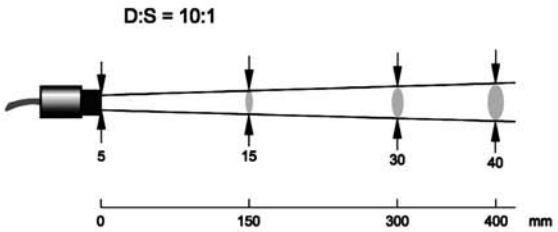
AMIR INFRARED MEASURING TECHNOLOGY

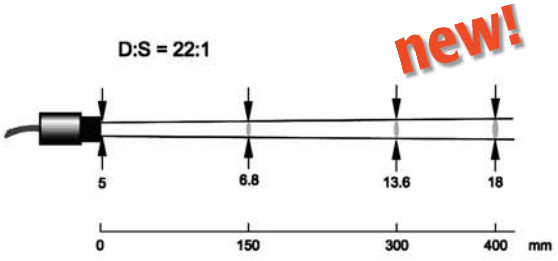
Technical Data:

System accuracy	±1 % of measured value or ±1 K (whichever value is higher) ±2 K for measured values <20 °C for thermocouple output ±1 % of measured value or ±2.5 K (whichever value is higher)	
Reproducibility	±0.5 % of measured value or ±0.5 K (whichever value is higher)	
Nominal conditions	23 ±5 °C	
Temperature resolution	0.25 K	
Response time	150 ms	
Emissivity factor	0.100 to 1.100 adjustable in electronics unit in steps of 0.001	
Signal processing	Saving of maximum and minimum values, average value, retention period adjustable up to 998 seconds	
Voltage supply	12 to 26 VDC, maximum 100 mA	
Output signal (selectable)	0-20 mA, 4-20 mA, 0-5 V (scalable) Thermocouple K and J (Type J, range -25 to +600 °C)	
Output resistance	For thermocouple output 20 Ω	
Minimum load resistance	for mV output 100 KΩ	
Maximum loop resistance (mA)	500 Ω (at 24 VDC supply voltage)	
Protection	IP 65 (NEMA 4) NOT for optics 2:1 (MR784211D/12D)	
Permissible ambient temp.	Probe head	MR784211/31/41 without cooling 0.0 to +85 °C, with air cooling 0.0 to +200 °C MR784212/32/42 without cooling 0.0 to +125 °C, with air cooling 0.0 to +200 °C MR784233/43 without cooling 0.0 to +180 °C, with air cooling 0.0 to +200 °C
	Electronics unit	without cooling 0.0 to +65 °C
Storage temperature	–10 to +85 °C	
Relative atmospheric humidity	10 to 95 %, at 30 °C, non-condensing	
Materials	Probe head	Stainless steel
	Probe head cable	MR784211D/31D Teflon, otherwise PUR
	Electronics unit	Zinc die casting
Dimensions	Probe head L 28 mm x Ø 14 mm, Thread M12x1 Electronics unit 80 x 60 x 25 mm (LxWxH)	
Weight	Probe head 50 g (with 1-meter cable) Electronics unit 270 g	

Measuring Field (90 % energy)







AMIR INFRARED MEASURING TECHNOLOGY

AMIR INFRARED MEASURING TECHNOLOGY

Low Cost Infrared Temperature Measuring Instruments AMiR 7805 and AMiR 7806

Technical Features:

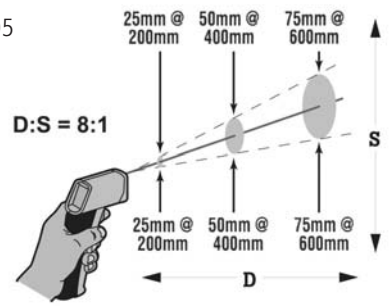
- Suitable for fast and reliable control measurements at home, or anywhere.
- Easy-to-read display with background lighting.
- Laser marking for the measuring spot.
- Application examples: car diagnosis, maintenance of electrical installations, examination of cooling and heating systems, food storage.

Technical Data:

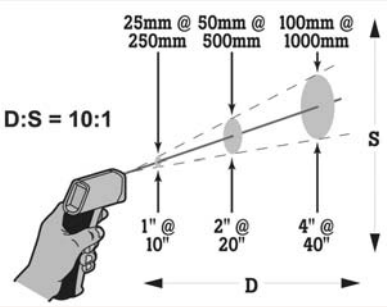
	AMiR 7805	AMiR 7806
Measuring range:	-18 to +275°C	-30 to +500°C
Distance ratio:	8:1	10:1
Emissivity:	0,95 fixed setting	0,95 fixed setting
Spectral sensitivity:	7 to 18 µm	6,5 to 18 µm
Response time:	500 ms (95%)	500 ms (95%)
Accuracy:	±2% of meas.val. or ±2°C at -1 to +260°C, (whichever is higher) ±3°C at -18 to -1 °C	±1°C at 10 to +30°C, ±1,5% of meas.val. or ±1,5°C, (whichever is higher) ±2°C at < -10 °C
Reproducibility:	±2% of meas.val. or ±2°C (whichever is higher)	±0,5% of meas.val. or ±1°C (whichever is higher)
Nominal temperature:	23°C ±2 K	23°C ±2 K
Resolution:	0,5°C	0,2°C
Power supply:	9 V battery, operating life time 12hrs	9 V battery, operating life time 12hrs
Permiss. ambient temp.:	0 to 50 °C	0 to 50 °C
Relative humidity:	10 to 95% at 30°C, non-condensing	10 to 95% at 30°C, non-condensing
Dimensions:	L 101 x W 38 x H 152	L 101 x W 38 x H 152
Weight:	227 g	200 g

Measuring Field:

AMiR 7805



AMiR 7806



Accessories:

Bag with carrying loop	Order no. ZR7805BT
9V battery	Order no. ZB2000B9
charger unit with 9V recharg. battery	Order no. ZB2000LS
9V rechargeable battery, single	Order no. ZB2000A9

Types:

AMiR 7805, low cost infrared temperature measuring instrument **Order no. MR7805**

AMiR 7806, infrared temperature measuring instrument including carry bag **Order no. MR7806**

AMIR INFRARED MEASURING TECHNOLOGY

Portable Infrared Temperature Measuring Instruments AMiR 7811

MR781120B

MR781145B
MR781150B

Technical Features:

- Low cost, easy-to-use hand-held instrument.
- No complicated focusing or adjusting required - just aim at test object, trigger the measurement and read the temperature on the display.
- Suitable for control measurements in many fields of industry and craft e.g. for car diagnosis, maintenance of electrical installations, examination of cooling and heating systems, monitoring of production processes, road construction and building trade, paper production and printing processes, food production and storage, plastics production and processing.

Types (incl. plastic box):

With spot laser as sighting aid, measuring range –32 to +535°C, optical resolution 12:1	**Order no. MR781120B**
With extra-bright laser point sight, measuring range –32 to +600°C, optical resolution 30:1	**Order no. MR781145B**
With extra-bright laser point sight, measuring range -32 to +760 °C, optical resolution : 50:1	**Order no. MR781150B**

Option:

Factory test certificate, based on DKD/NIST certified sensors (only with delivery of new devices)	Order no. OR7811KZ1

Accessories:

9 V battery	Order no. ZB2000B9
charger unit with 9V rechargeable battery	Order no. ZB2000LS
9 V rechargeable battery, single	Order no. ZB2000A9
Emissivity label (ε = 0.95), diameter 30mm, resistant up to 300°C, 35 pieces	Order no. ZR7000EK
Emission lacquer up to 400°C	Order no. ZX1070EL4

AMIR INFRARED MEASURING TECHNOLOGY

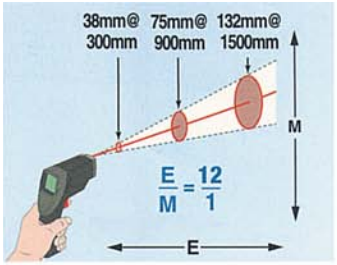
Device Functions:

Function:	AMiR 7811-20B	AMiR 7811-45B	AMiR 7811-50B
Max:	✔	✔	✔
Min, DIFF, average value AVG:		✔	✔
Call for last meas. value:		✔	✔
Hold function for m.v., 7s:	✔	✔	✔
Limit value alarm max, min audible and visual:		✔	✔
Display lighting:	✔	✔	✔
Laser (Class II):	single laser	extra-bright laser point	extra-bright laser point
Emissivity:	0.95	0.1 to 1.0 adjustable	0.1 to 1.0 adjustable
Display resolution:	0.2°C	0.1°C	0.1°C
Data memory:		12 values	12 values

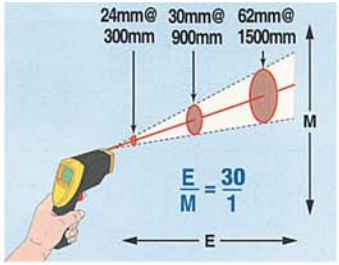
Technical Data:

Display	7-segment LCD display, 4-digit, lighting can be switched on/off
Accuracy (in nominal conditions)	±1 % of measured value or ±1 K (whichever value is higher) for meas. value +23 °C and higher ±2 °C at -18 to +23 °C, ±2.5 °C at -26 to -18 °C, ±3 °C at -32 to -26 °C
Reproducibility	±0.5 % of measured value or ±1 K (whichever value is higher)
Response time	(95%) 500 ms
Spectral sensitivity	8 to 14 mm
Nominal temperature	23°C +2 °C
Voltage supply	9V alkaline-manganese battery (IEC 6 LR 61) or 9V NiCd rechargeable battery with charger integrated in connector
Operating / storage temp.	0 to +50 °C / –20 to +60 °C (without batteries)
Relative atmospheric humidity	10 to 90 %, at maximum 30 °C, non-condensing
Dimensions	160 x 55 x 200 mm (LxWxH)
Weight	320 g

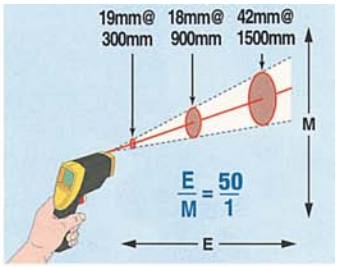
Measuring Field:



AMiR 7811-20B



AMiR 7811-45B



AMiR 7811-50B

AMIR INFRARED MEASURING TECHNOLOGY

Portable Infrared Temperature Measuring Instruments AMiR 7814

Technical Features:

- Easy and convenient to operate - thanks to precise 3-point laser sight.
- High optical resolution for safe measurements even from far distances. Just aim at the test object, trigger the measurement and read the temperature on the display.
- Additional bar graph display for trend representation of a fast measurement.
- Suitable for professional control measurements in many application fields: e.g. for maintenance of electrical installations, switch cabinets, cooling and heating systems, car diagnosis, as well as for monitoring product and process temperatures.
- The AMiR 7814-20 can also be used for long term measurements with the measured values being available as digital and analog output signals.

Types (incl. plastic case):

Infrared temperature measuring instrument for control measurements with laser marking corresponding to the size of the measuring field	**Order no. MR781410B**
Infrared temperature measuring instrument, as 7814-10, but with additional measuring functions, input for thermocouples (type K and J) and thermistors, as well as data output incl. mains adapter unit, data cable, surface temperature sensor and PC software for Windows®	**Order no. MR781420SB**

Options:

Focal point optics 6mm at 300mm distance	Order no. OR7814CF
Factory test certificate, based on DKD/NIST certified sensors (only with delivery of new devices)	Order no. OR7800KZ1

Accessories:

Tripod stand	Order no. ZX9000ST3
Thermoprinter	Order no. ZR7814TD
Printer cable, 1.5m, 25-pin connector	Order no. ZR7814DK
Temperature sensitive paper (5 rolls)	Order no. ZR7814TP
ALMEMO® connecting cable, 1.5 meters, ALMEMO® connector programmed for 1 mV / °C	Order no. ZA7814RK
Recording cable, 1.5m, banana plug	Order no. ZR7814RK
Data cable RS232, 1.5m long with SUB-D-9 adapter	Order no. ZR7814 DV
Mains adapter unit (7,5V)	Order no. ZR7814NA
Emissivity label (ε = 0.95), resistant up to 300°C, 35 pieces	Order no. ZR7000EK
Emission lacquer up to 400°C	Order no. ZX1070EL4

Other type available on request

Portable infra-red temperature measuring instrument
AMiR 7813
for higher temperatures ,up to 3000 °C

AMIR INFRARED MEASURING TECHNOLOGY

Device Functions:

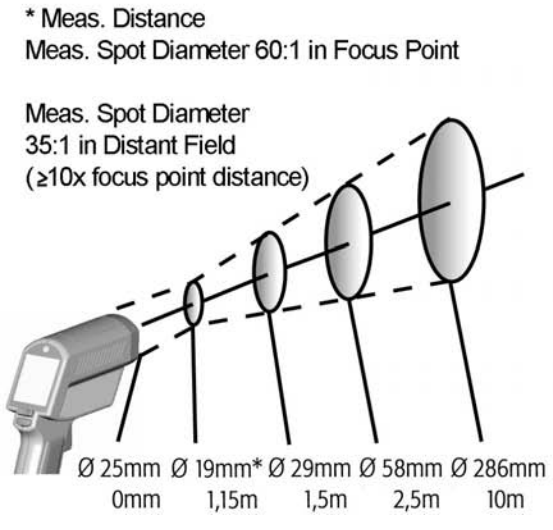
Function:	AMiR 7814-10B	AMiR 7814-20B
Max, Min:	✔	✔
Difference, average value:		✔
Limit value alarm, min, audible and visual:		✔
Limit value alarm, max, audible and visual:	✔	✔
3-point laser sight (Class 2):	✔	✔
Emissivity, adjustable	✔	✔
Materials table (preset emissivities):		✔
Graphical display with lighting::	✔	✔
Internal data memory (100 items):		✔
Data output RS232/1mV/°C:		✔
Inputs for thermocouples (type K and J) and thermistor		✔

Technical Data:

Display:	digital LCD display with bar graph representation
Measuring range:	–30 to 900°C
Optical resolution:	60 : 1
Smallest measuring field:	19mm at a distance of 1.15m
Accuracy:	±0.75% of meas. value or ±0.75K, the higher value of either is valid for meas. val. 0°C and higher, ±2K for –30 to 0°C
Reproducibility:	0.5% of meas. value or ±1°C, the higher value of either
Spectral sensitivity:	8 to 14 µm
Response time:	(95%) 250ms
Display resolution:	0.1°C
Nominal temperature:	25°C
Power supply:	2 x 1.5V round cell R6 (AA), AMiR 7814-20 additionally with DC voltage input
Operating/storage temperature:	0 to 50°C (during laser operation 45°C max.) / –20 to 50°C (without batteries)
Relative humidity:	10 to 95%, non-condensing at 30°C
Dimensions:	L 200 x W 50 x H 170mm
Weight:	480g

Measuring Field:

Standard optics



Focal point optics (Option OR7814CF)