

Thermophil[®] INFRAht R 310 / R 311 / R 312 / R 320

- Contactless measurement of temperature at high ambient temperatures.
- Sturdy and tight stainless steel housings to IP 64.
- Two-wire 4-20 mA technique in combination with TR 40 / TR 41 transmitter.
- Sensor heads uncooled up to 125 °C ambient temperature.



The **INFRAht R 310/311/312/320** family comprises stationary pyrometers with a remote transmitter for contactless measurement of temperature.

This technique is a big advantage, for example, if the object to be measured moves or is live. The contactless measuring principle also makes sense if the measured object is a poor conductor of heat (e.g. plastic films or paper) or if the measurement has to be completed quickly.

This results in a very broad range of applications, such as:

- Thermoforming machines for plastics,
- Extruders for plastics,
- Calendering lines for plastic films,
- Coating machines,
- Glassworking,
- Metalworking,
- Supervision of products on conveyor belts,
- Monitoring of plant overheating, etc.

With the R 311 and R 312 types, the infrared radiation is focused on the sensing element by a lens. The R 310 and R 320 types work with a high-gloss, gold-plated cone.

The pyrometers are extremely compact and connected to the transmitter by a teflon cable.

Cooling systems are available for ambient temperatures higher than 125 °C.

An air purging nozzle can be supplied for dusty or damp environments to keep the lens or the cone clean.

Fixing brackets and other accessories are also available.

The **INFRA TR 40** and **TR 41** transmitters integrate the evaluation electronics for the INFRA sensor heads in the INFRAht family (R310/311/312/320). They feature an analogue two-wire interface (4...20 mA).

Communication is controlled by a HART[®] protocol.

The transmitters can be used at ambient temperatures up to 70 °C.

The TR 40 transmitter is accommodated in sturdy die-cast aluminium housing and has no operator controls or displays.

The TR 41 transmitter is supplied in a plastic housing. It includes an LC display and a configuration keyboard.

- **Measuring ranges: 0...2000 °C in sub-ranges**
- **Power supply via transmitter: 12...30 V DC**
- **Smallest measuring field: 5 mm Ø**
- **Vibration-proof, no moving parts**
- **Interface: HART[®] protocol**
- **Configurable transmitter**
- **Cluster / category II2G Ex ib IIC T6 ... T4 for application in Ex zone 1 or zone 2**
- **Cluster / category II2D Ex ib IIIC T₁₀₀ 105°C/160°C for application in Ex zone 21 or zone 22**
- **IBExU06ATEX1089**
- **DTM and PDM for sensor management**
- **Temperature monitoring with ignition protection standard IPL 1, TÜV certificate no. 71332449**

HART[®] is a registered trademark of the HART Communication Foundation

Technical data: Sensors

Measuring range	
Overall	max. 0...+400 °C with R 310/R 320 max. 0...+2000 °C with R 311/R 312
Spectral response	8 to 14 µm; 2 ... 2.7 µm; 4.9 ... 5.5 µm; 7.9 µm (R 310/R 320 only)
Measuring field	Depending on distance (see "Distance ratio")

Ambient conditions				
Ex	Type	Ambient Temperature	Temperature Class	max. Surface Temperature
	R31x, R320	-20°C ... +70°C -20°C ... +125°C	T5 T4	T ₁₀₀ 105°C T ₁₀₀ 160°C
Permissible operating temperature	0...+125 °C			
Permissible storage temperature	-10...+125 °C			
Climatic class	KKF according to DIN 40040			

Mechanical data				
Type	R 310	R 311	R 312	R 320
Housing material	Stainless steel (material no. 1.4301)			
Degree of protection	IP 64			
Weight	925 g	925 g	980 g	520 g

Dimensions		
R 310 / R311	R 312	R 320
<p>215915.dwg</p>	<p>215915.dwg</p>	<p>222245.dwg</p>

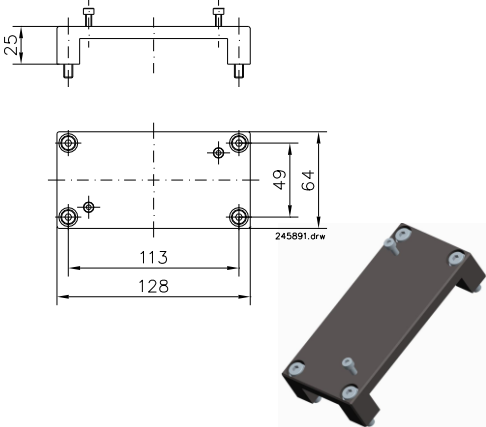
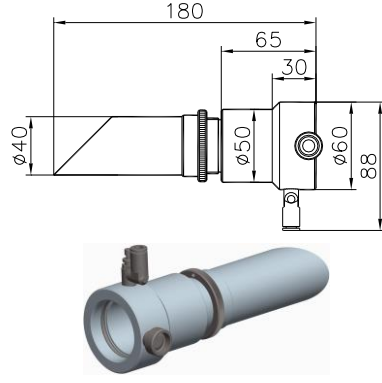
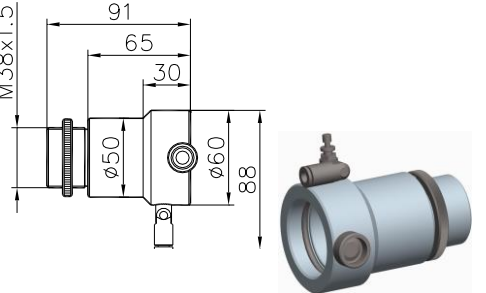
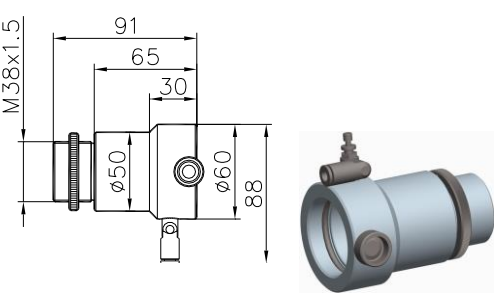
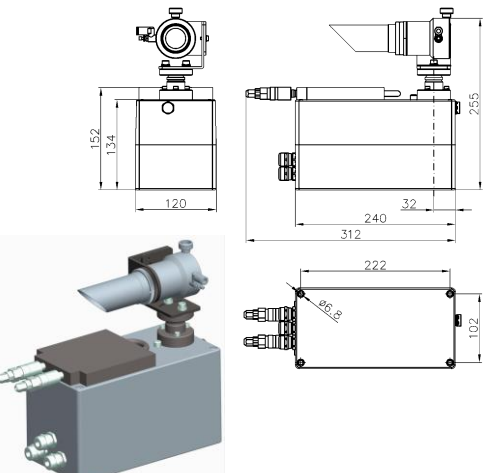
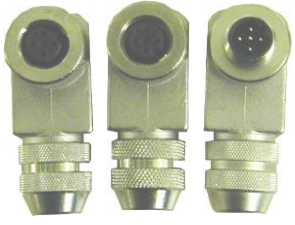

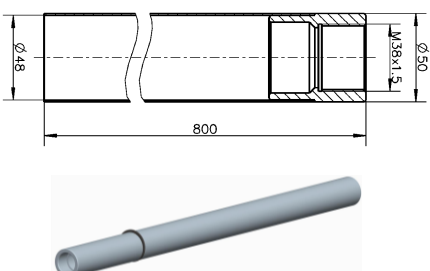
Distance ratio		
R 310 / R320	R 311	R 312
<p>measuring distance a</p> <p>field of view ϕ (95 %)</p> <p>for field a : $\phi = 1.7$</p> <p>215910.dwg</p>	<p>measuring distance a</p> <p>field of view ϕ (95 %)</p> <p>exact point at 100mm 20:1 for field 6:1</p> <p>215912.dwg</p>	<p>measuring distance a</p> <p>field of view ϕ (95 %)</p> <p>exact point at 1000mm 33:1 for field 25:1</p> <p>215913.dwg</p>

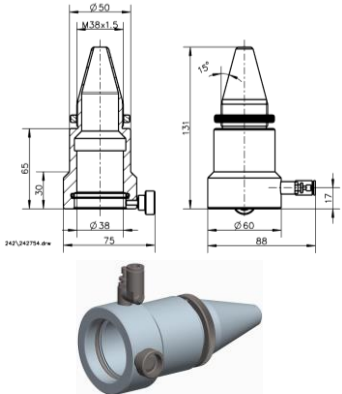



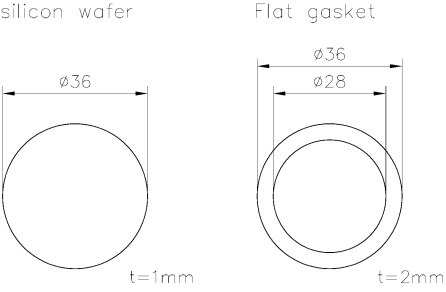
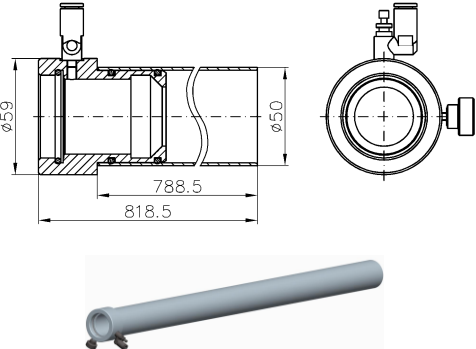
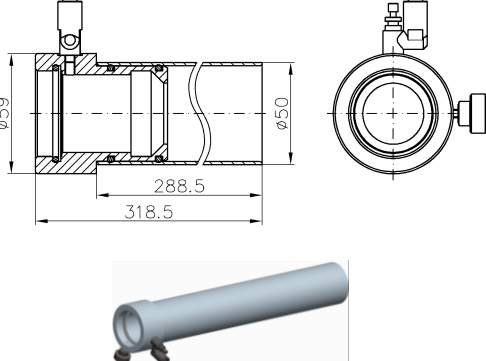
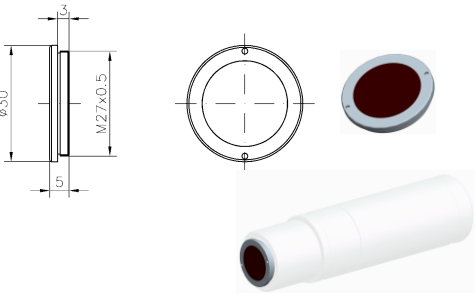
Technical data: Transmitters	
Input	For R 310, R 311, R 312, R 320 PT100 for ambient temperature (TR 41-10)
Interface	HART® protocol (FSK BELL 202, 1.2 kbit/s)
Functions (configurable via HART® interface, with TR 41-10 also via keyboard)	
Unit of measurement	°C or °F
Lower/upper range limits	0...2000 °C (32...3632 °F)
Emission factor	0.1...1
Transmission factor	0.1...1

Ambient temperature alarm	20...70 or 125 °C (68...158 or 257 °F), sensor-dependent		
Damping	0...999.9 s		
Maximum mode	0...999.9 s		
Minimum mode	0...999.9 s		
Fault current	3.9...21.5 mA		
Fieldbus address	0...15 (0 = point to point, 1...15 = multidrop)		
Display	LC display (TR 41-10)		
Analogue output			
Output signal	4...20 mA, linear		
Permissible load	≤ 500 Ω for standard version/U _H = 24 V		
	Intrinsically-safe circuit Ex ib IIC		
	max. input voltage	U _i = 28 V	
	max. input current	I _i = 105 mA	
	max. input power	P _i = 1,0 W	
	max. internal capacitance	C _i = 12 nF	
	max. internal inductance	L _i = 0,2 mH	
Accuracy			
Measuring accuracy	≤ 1 % of measuring range (at 23 °C and for ε = 1) R 312: ≤ 1% above 50 °C objekt temperature, less than 50 °C ≤ 3%		
Temperature sensitivity	≤ 0.03 %/C°		
Response time	t _{0.9} = 0.2 s (without damping)		
Power supply			
U _H = 12...30 V DC, max. 23 mA, residual ripple ≤ 150 mV rms			
Sensor connection			
<i>Pin</i>	<i>Signal</i>	<i>Colour</i>	<i>Description</i>
1	–	–	
2	–	–	
3	R+	RD	Thermistor
4	R–	OG	Thermistor
5	U–	BK	Thermopile –
6	U+	BN	Thermopile +
Ambient conditions			
Permissible operating temperature	0...+60 °C		
Permissible storage temperature	-10...+70 °C		
Climatic class	KWF according to DIN 40040		
Mechanical data			
Type	TR 40-10	TR 41-10	
Housing material	Die-cast aluminium	Plastic	
Weight	480 g	520 g	
Degree of protection	IP 65		
Dimensions			
TR 40-10		TR 41-10	

Accessories

<p>Cooling jacket/air nozzle combined Type WN 268, series B</p>	<p>For Sensor R 320</p> <p>Order No. U 03012268</p>	<p>Mounting nut Type R 300-00-024</p>	<p>For sensor R 310 R 311 R 312</p> <p>Order No. 216989</p>
<p>Cooling jacket Type R 300-102</p>	<p>Für Sensor R 310 R 311 R 312</p> <p>Bestell-Nr. 216711</p>	<p>Laser pointer Type R 300-101</p>	<p>For sensor R 310 R 311 R 312</p> <p>Order No. 216299</p>
<p>Fixed bracket Type R 300-105</p>	<p>For sensor R 310 R 311 R 312</p> <p>Order No. 216975</p>	<p>Adjustable bracket Type R 300-106</p> <p>equal hole pattern various assembly options</p>	<p>For sensor R 310 R 311 R 312</p> <p>Order No. 216976</p>
<p>RS 232/HART[®] modem incl. software Type R 300-107</p>	<p>For sensor R 310 R 311 R 312 R 320</p> <p>Order No. 220930</p>	<p>Sensor bracket with air flush Type R300-111</p>	<p>For sensor R 311 R 312</p> <p>Order No. 242754</p>

<p>Mounting plate for TR40-10 Typ R300-112</p> 	<p>For Sensor R 310 R 311 R 312 R 320</p> <p>Order No. 245891</p>	<p>Sensor bracket with air flush (plastics) Type R300-113</p> 	<p>For sensor R 311 R 312</p> <p>Order No. 246173</p>
<p>Sensor bracket with air flush (without cable protection) Type R300-114</p> 	<p>For sensor R 310 R 311 R 312</p> <p>Order No. 247210</p>	<p>Sensor bracket with air flush (without cable protection) Type R300-115</p> 	<p>For sensor R 310 R 311 R 312</p> <p>Order No. 247802</p>
<p>Pyrometer slewing device Type R300-116</p> 	<p>For sensor R 312</p> <p>Order No. 277319</p>	<p>Connecting kit for pyrometer slewing device Type R300-117</p> 	<p>For sensor R 300-116</p> <p>Order No. 277409</p>
<p>Cooling water connecting kit for pyrometer Type R 300-132</p> 	<p>For sensor R 300-116</p> <p>Order No. 286185</p>	<p>Pyrometer Protection tube (stainless steel) Type R300-118</p> 	<p>For sensor R 312</p> <p>Order No. 277420</p>

<p>Sensor bracket with air nozzle (aluminium) Type R300-123</p> 	<p>For sensor R 311</p> <p>Order No. 279031</p>	<p>USB/HART-modem incl. software Type R300-125</p> 	<p>For sensor R 310 R 311 R 312 R 320</p> <p>Order No. 281175</p>
<p>USB/Profibus-modem incl. software Type R300-126</p> 	<p>For sensor R 310 R 311 R 312 R 320</p> <p>Order No. 281176</p>	<p>Cleaning kit for pyrometer Type R300-128</p> 	<p>For sensor R 310 R 311 R 312 R 320</p> <p>Order No. 282302</p>
<p>IR silicon slice with seal Type R 300-129 e.g. together with R 300-111, R 300-113</p> <p>silicon wafer Flat gasket</p> 	<p>For sensor R 311 R 312</p> <p>Order No. 285141</p>	<p>Pyrometer protection tube D = 50 mm, L= 800 mm Type 300-130</p> 	<p>For sensor R 312</p> <p>Order No. 285875</p>
<p>Pyrometer protection tube D = 50 mm, L= 300 mm Type 300-131</p> 	<p>For sensor R 312</p> <p>Order No. 285876</p>	<p>IR safety glass Zn-Se Type R 300-136</p> 	<p>For sensor R 311 R 312</p> <p>Order No. 301954</p>

Power supply 230 V, output 24 V DC in rail-mounting housing Type 5906-3



For sensor

R 310
R 311
R 312
R 320

Order No.
U8901159063

Power supply 230 V, output 24 V DC in surface housing Type 5906-4



For sensor

R 310
R 311
R 312
R 320

Order No.
U8901159064

Ordering information: Sensors

Model	Type	Spectral range	Measuring range	Connection ²⁾	Cable length						
Neutral	0	R 310	10	8...14µm	1	Default	00	PG on rear	2	3 m	03
Standard	1					0...200 °C	02			6 m	06
Ex Zone 1/2/21/22	3					0...250 °C	03			12 m	12
						0...400 °C	04				
						Setpoint	99				
		R 311	11	8...14µm	1	Default	00	PG on rear	2	3 m	03
		R 312	12			0...200 °C	02			6 m	06
						0...250 °C	03			12 m	12
						0...400 °C	04				
						0...600 °C	06				
						0...1000 °C	10				
						Vorgabe	99				
				2...2,7µm	2	500...2000 °C	15	PG on rear	2	3 m	03
						Setpoint	99			6 m	06
										12 m	12
				3,9µm	4	200...1000 °C	13	PG on rear	2	3 m	03
						Setpoint	99			6 m	06
										12 m	12
				4,9...5,5µm	5	250...1400 °C	14	PG on rear	2	3 m	03
						Setpoint	99			6 m	06
										12 m	12
		R 320	20	8...14µm	1	Default	00	PG on rear	2	3 m	03
						0...200 °C	02	PG at the side	3	6 m	06
						0...250 °C	03			12 m	12
						0...400 °C	04				
						Setpoint	99				

Order No.	743	 	 	 	 	 	 	 	 	 	
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Meaning of the order code

Select the required configuration from each column and enter the corresponding code digits in the order number fields.

Model	Neutral:	Neutral rating plate
	Standard:	BARTEC rating plate
Type	R 310/320	INFRA IR sensor in two-wire technique with cone 1.7 : 1, for ambient temperatures up to 125 °C ⁽¹⁾ The 7.9 µm spectral range is only available for the R 310 and R 320 types.
	R 311	INFRA IR sensor in two-wire technique with lens 20 : 1, for ambient temperatures up to 125 °C
	R 312	INFRA IR sensor in two-wire technique with lens 33 : 1, for ambient temperatures up to 125 °C
	R 320	Same as R 310, but has the design of the old R 22
Spectral range	8...14 µm	Possible measuring range: 0...200 °C, 0...400 °C, 0...600 °C, 0...1000 °C
	2...2.7 µm	For steel; possible measuring range: 500...2000 °C
	3.9 µm	Med. temperature, glass, objects behind gases; poss. measuring range: 200...1000 °C
	4.9...5.5 µm	For glass; possible measuring range 250...1400 °C
	7.9 µm	For plastic; possible measuring range: 25...350 °C
Connection	screwed cable gland on rear	
	screwed cable gland at the side available for the R 320 type	
Cable length	3 m	
	6 m	
	12 m	
Measuring range	Default:	Maximum measuring range, not programmable
	Setpoint:	Programmable according to customer requirements

²⁾ Cable connection at the side only for R320 available.

Ordering information: Transmitters

Model	Type	Measuring range
neutral ⁽¹⁾	TR 40-10	Default
Standard	TR 41-10	0...200 °C
		0...250 °C
		0...400 °C
		0...600 °C
		0...1000 °C
		25...350 °C
		200...1000 °C
		250...1400 °C
		500...2000 °C
		-50...200 °C
		Setpoint

Order No.

743 0 04 1 10 00

Meaning of the order code

Select the required configuration from each column and enter the corresponding code digits in the order number fields.

Model	Neutral:	Neutral rating plate
		⁽¹⁾ The neutral option is not available for the TR 41-10 type!
	Standard:	BARTEC rating plate
Type	TR 40-10	2-wire transmitter for INFRA sensing heads in die-cast aluminium housing without display and keyboard
	TR 41-10	2-wire transmitter for INFRA sensing heads in plastic housing with display and keyboard
Measuring range	Default:	Maximum measuring range, not programmable
	Setpoint:	Programmable according to customer requirements