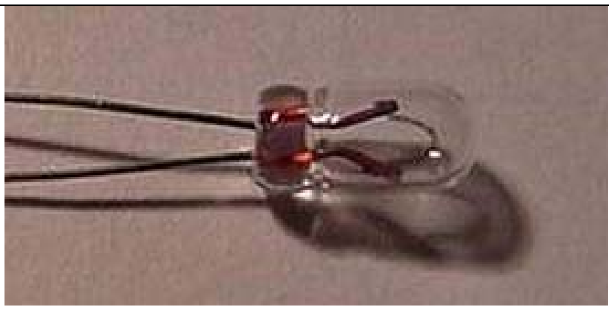
PerkinElmer optoelectronics

product data infrared sources

IRL 715 preliminary!

Infrared source 5 V, 115 mA, 3.17 mm diameter

- **Features:**
  - **Incandescent infrared source up to 4.4 µm,**
  - **high reliability,**
  - **stable output,**
  - **short time constant.**
- **Applications:**
  - **Excitation source for infrared absorption gas sensing.**



Glass housed infrared source IRL 715.

Contents

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1 General product description

1.1 Introduction

The IRL 715 is an incandescent lamp of size T-1, i.e. max. diameter 3.17 mm. It has been specified to be employed in gas detectors based on infrared (IR) absorption. The accessible wavelength range amounts from the visible up to about 4.4 μm.

The IR-source is especially well suited for the detection of carbon hydroxides at 3..3.5 μm and carbon dioxide (CO_2) at around 4.15...4.4 μm. For this application the modulation frequency can be chosen up to 3 Hz. There is only a limited suitability of the source for the detection of carbon monoxide (CO) around 4.6 μm, since for this band the glass transmission is already decreasing. The cut-off wavelength is at 5 μm.

1.2 Name of the product; device marking

PerkinElmer IRL 715 infrared source.

Identification: Device number (Bau No.) IRL 715 / 9538 2047.

2 Technical data

2.1 Mechanical and electrical data

	Parameter	Value	Tolerance	Unit	Conditions / Comments
Electr. specs.	Voltage, *U*	5		V	design voltage
	Current, *I*	115	±10%	mA	AQL 0.4; MIL-STD-105D Table II-A
	Power, *P*	0.575	±10%	W	$P = U \cdot I$
Optical specs.	Radiation intensity, Φ	0.15	±15%	MSCP	"mean spherical candle power", for visible spectrum AQL 0.65; MIL-STD-105D, Table II-A
	Time constant, τ	290		ms	characteristic value for the 3..5 μm IR-region; time to reach 63% of nominal intensity
	Lifetime theoretical – accelerative	40000 2000		h h	5V AC characteristic value for 6.5 V AC
Housing	Filament	C-2R			coil, bowed between electrodes
	Diameter	3.17	max.	mm	AQL 0.65; MIL-STD-105D, Table II-A
	Length	6.35	max.	mm	AQL 0.65; MIL-STD-105D, Table II-A
	Thickness of glass	0.3		mm	characteristic value
	Lead length	25.4	min.	mm	AQL 2.5; MIL-STD-105D, Table II-A
	Lead thickness	0.25	±0.02	mm	AQL 1.0; MIL-STD-105D, Table II-A
Mech. tests	Vibration test	9		h	peak 10 G, 10..500 Hz, AQL 1.5, MIL-STD-202E, method 204C-A
	Shock test	5		times	50 G, AQL 1.5, MIL-STD-202E, method 202D-C
	Drop test	5		times	50 cm, AQL 1.5

2.2 Absolute maximum ratings; handling requirements

Parameter	Symbol	Limits			Units	Conditions
		Min	*Typ*	*Max*		
Ambient Temperature Range				tbd	°C	Operation / Storage

Stresses above the absolute maximum ratings may cause damages to the device.

Hand soldering and wave soldering may be applied with a maximum temperature of 260°C for a dwell time less than 10s. Avoid heat exposure to the glass. Reflow soldering is not recommended.

3 Typical performance characteristics

3.1 Spectral data

The Fig. 1 shows a plot of the lamp glass transmittance over the wavelength. Though this curve does not resemble the spectral radiation intensity, it is a useful parameter for a lamp comparison.

The vertical lines indicate the position of the absorption bands of selected gases. The G-numbers are the respective PerkinElmer IR bandpass filter identifiers.

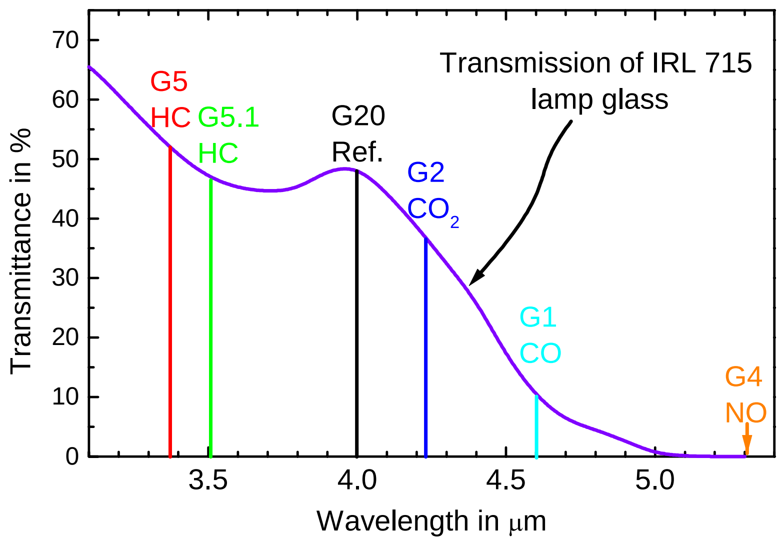

Figure 1: Transmittance of IRL 715 lamp glass of 1 mm thickness together with the position of selected gas absorption bands. The G-numbers are the PerkinElmer IR filter identifiers.

3.2 Modulation depth as a function of pulsing frequency

The Fig. 2 shows a typical resulting AC-signal at 4 µm IR wavelength when the lamp is excited by a 5 V square wave signal of variable frequency. The curve exhibits a low pass behavior, from which a thermal time constant of 290 ms is derived.

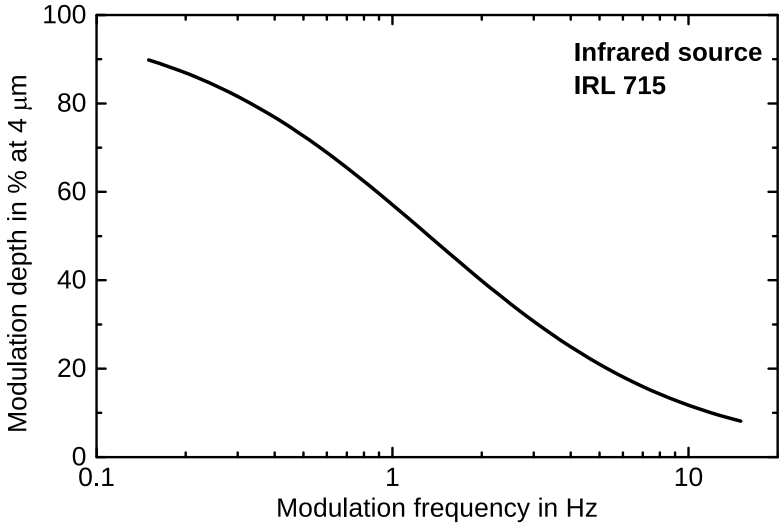

Figure 2: Modulation depth as a function of driving frequency measured at 4.26 µm. The source is driven by a 5 V square-wave signal of variable frequency. The -3 dB level at 71% relative output level defines the cutoff frequency f_{co} and thus the time constant τ via $\tau = 1/2\pi \; f_{co}$.

3.3 Aging characteristics

The Fig. 3 shows the change in intensity through aging. Two different operation mode have been tested:

a) continuous operation at the nominal voltage of 5 V in DC mode and

b) operation in pulse mode at a pattern of 1 sec on-time at 5 V DC and 5 sec off-time.

The data have been obtained on a sample batch of 15 pieces each. The plotted curves are a fit to the derived data and have to be seen as trend curves. In continuous mode the intensity decreases steadily to about 95% of the original value after 1500 h. After that value a stable plateau is seen, followed by a slight increase again.

For the pulse mode operation, the output radiation intensity does not change up to an operation time of 1000 h. Only for longer operation times a significant rise in intensity is observed.

The data show that the IRL 715 lamp at 5 V operation indeed shows an aging, which has to be taken into account in the design of a gas detector. The preferred mode of operation is in pulse mode, where the length of the initial plateau, where the lamp shows stable output can be extended by choosing a longer pause time.

It has to be noted, however, that all data are taken at the nominal operation conditions. Decreasing the supply voltage will significantly lengthen the initial stable operation. Experiments at 4.5 V operation are ongoing and will later be added to the given data.

From the experience in lifetime behavior over supply voltage it is expected that a reduction of the supply voltage of 10% (i.e. 4.5 V) will stretch the curve on the time scale by a factor of 4, thus allowing 4000 h of aging-free operation. A further reduction to 4 V will even extend the stable operation time further.

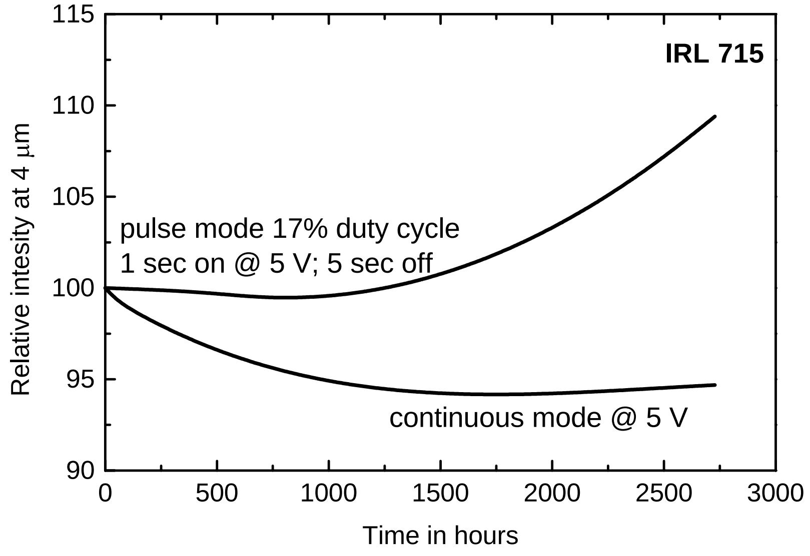

Figure 3: Relative radiation intensity at 4 µm IR wavelength as a function of operation time. Two different operation modes have been tested.

3.4 Radiation intensity as a function of operation voltage

All data in section 2.1 are given for the nominal conditions of 5 V operation voltage. Figure 4 shows the change in output intensity for the IR and the visible region, when decreasing the supply voltage.

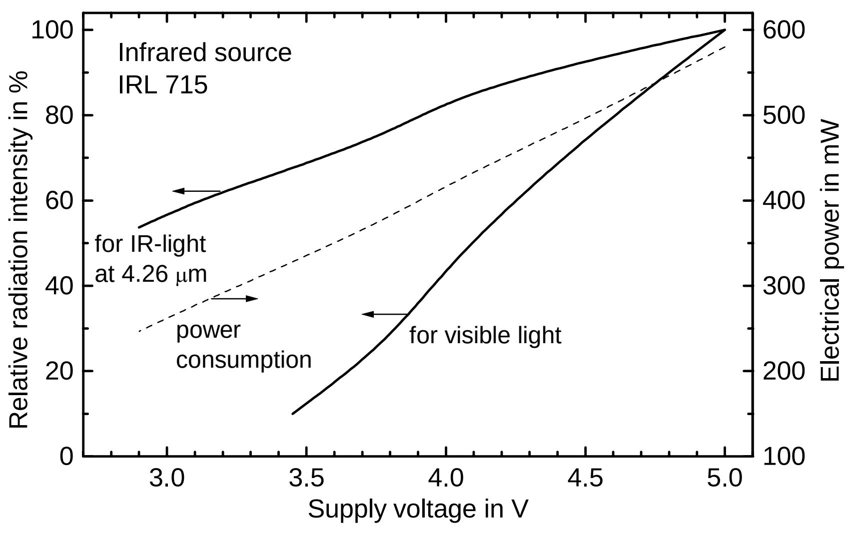

Figure 4: Relative output intensity as a function of supply voltage for the infrared and for the visible light regions. The ordinate on the right shows the source power *vs.* supply voltage.

In order to increase the lifetime and to depress aging of the lamp, an operation at reduced voltage is recommended. With decreasing supply voltage, the visible light intensity reduces much faster than that in the IR region. At 4 V the IR-intensity still amounts to 80% its original value, but the aging properties are greatly reduced. It is therefore recommended to operate the IRL 715 in optical gas detection at a voltage not larger than 4 V.

4 Quality statement

PerkinElmer Optoelectronics is an ISO 9001 certified manufacturer with established SPC and TQM. All materials are checked according to specifications and final goods meet the specified tests.

All infrared lamps are fully burned-in after production.

5 Contact PerkinElmer Optoelectronics

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As any incandescent lamp, the here described product have inherently a certain rate of failure. It is therefore necessary to protect against injury, damage or loss from such failures by incorporating safety design measures into the equipment.