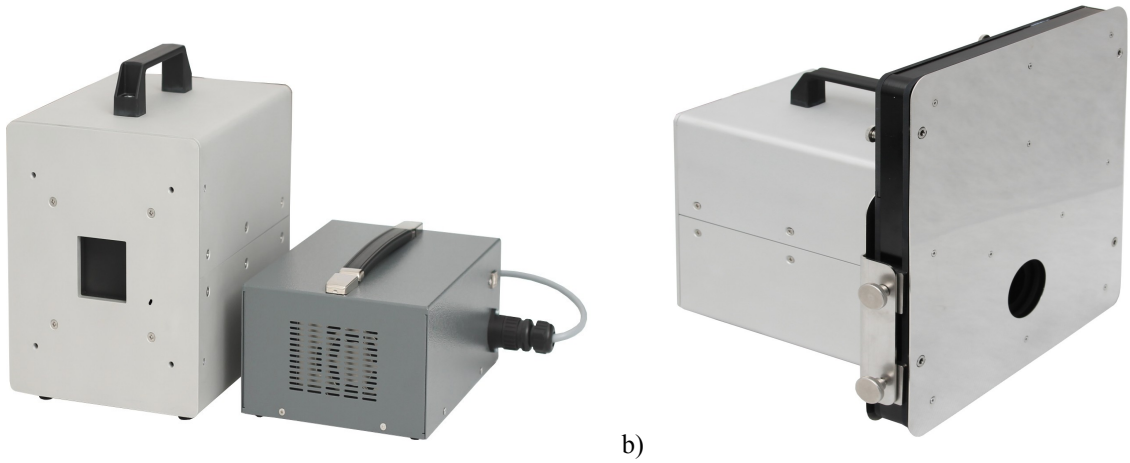
VSB

Vacuum space blackbody



a) b)

Fig.1. Photo of VSB blackbody set: a) VSB blackbody head and VDC power supply, b) VSB blackbody head integrated with MRW-8 rotary wheel

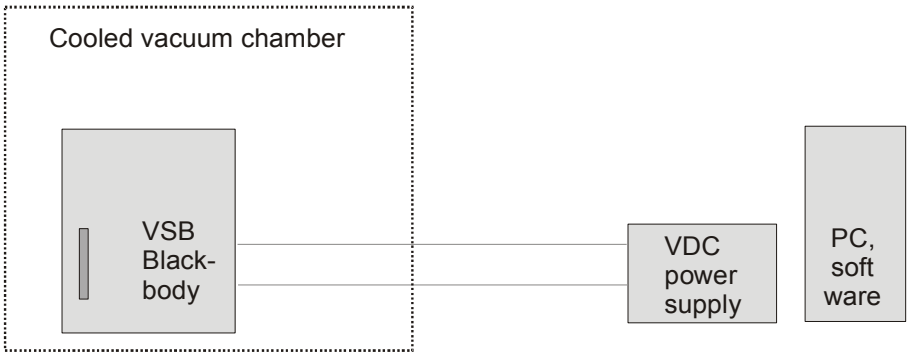


Fig.2. Block diagram of VSB-2D blackbody

BASIC INFORMATION:

Testing infrared systems to be sent into space missions is typically done using blackbodies located in cooled vacuum chambers that simulate space conditions. Design of required blackbodies is a technological challenge due to a set of special requirements: ability to work in vacuum conditions, ability to withstand extremely low temperatures, precision regulation of temperature of blackbody emitter, and remote control of the blackbody located in the vacuum chamber from the control center located outside the chamber. VSB blackbodies are a new type of blackbodies offered by Inframet to meet demands of space laboratories.

VSB blackbodies are ultra precision, area blackbodies designed to simulate low/medium temperature targets (-10°C to +200°C) while working in cooled vacuum chambers of ambient temperature -173ºC to -33ºC. In other words, VSB blackbodies simulate Earth temperature targets while working in space ambient conditions.

Blackbody emitter of VSB blackbody varies from 50x50mm to 150x150mm. Temperature of the emitter is regulated by an array of heating elements attached to the emitter. Stabilization of temperature is done using ultra precision algorithms.

VSB blackbody is optimized for long distance control and blackbody located in the vacuum chamber can be controlled from a PC located outside chamber. Further on, the blackbody is optimized to cooperate with MRW-8 wheel.

VSB blackbody is built a set of four blocks: VSB blackbody head, VDC power supply, PC set, and VSB Control computer program. Only VSB blackbody head can be inserted to the vacuum chamber. The VSB blackbody can be optionally delivered with MRW-8 rotary wheel.

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FEATURES:

- Ability to work in vacuum chambers
- Ability to withstand extremely low ambient temperatures
- Due to use of heating elements for temperature regulation only temperatures higher than ambient temperature can be reached.
- Remote control at distances as long as 50m
- Extremely good temperature resolution 1 mK
- Very good temporal stability: ±10 mK
- High speed, easy control from PC
- Very high resistance to EMI (blackbody is integrated with controller)
- Emitter size from 50x50 (VSB-2D) to 150x150mm (VSB 6D)
- Optimized for cooled vacuum chambers but can be optionally used in normal air conditions (attention: temperatures below ambient temperature cannot be reached)

SPECIFICATIONS

Parameter or functionality	VSB-2D/VSB-4D	VSB-6D
Aperture	50 x 50mm or 100x100mm	150 x 150mm
Emitter temperature range	-10°C to +200°C (if ambient temperature is below -33ºC)	-10°C to +200°C (if ambient temperature is below -33ºC)
Working ambient temperature range	-173ºC to -33ºC (optionally up to +5°C)	-173ºC to -33ºC (optionally up to +5°C)
Set point and resolution	0,001°C	0,001°C
Emissivity	0,96 ± 0,01	0,96 ± 0,01
Temperature uncertainty	0,07°C or 0,002x(T-25)°C	0,07°C or 0,002x(T-25)°C
Temperature uniformity[1]	> 97%	> 97%
Settling Time[2]	< 15 min	< 15 min
Temperature Increasing Velocity	> 20°C per minute	> 15°C per minute
Temperature Decreasing Velocity	> 3°C per minute	> 2°C per minute
Regulation stability	0,01°C	0,01°C
Computer control	RS-485	RS-485
Max control cable length	50m	50m
Power supply	115-230VAC 50/60Hz	115-230VAC 50/60Hz
Storage temperature	From -10°C to +60°C	From -10°C to +60°C
Dimensions	10x23x25 cm	15x27x35 cm

Version 1.1

CONTACT: Tel: +48 604061817 Fax: +48 22 3987244 Email: info@inframet.com

[1] Uniformity is measured for central part of the blackbody emitter (at least 90% of area of the emitter)

[2] Settling time is stabilization time from time when temperature of the blackbody reaches desired temperature with 1K tolerance until time when it reaches desired temperature at 0.1K tolerance.