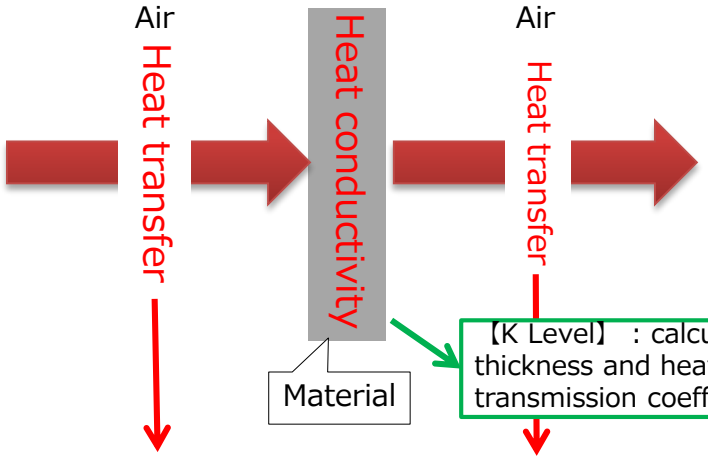
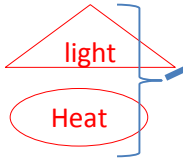
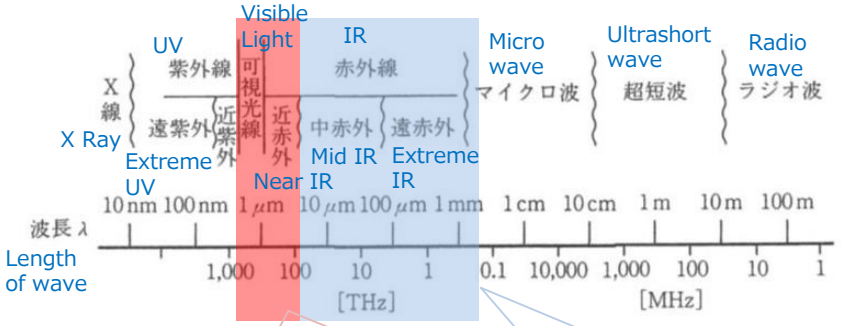
Flow of heat conductivity



●Transfer of radiated heat

- ●Visible light, Near infrared radiation
- ●Middle and Extreme infrared radiation





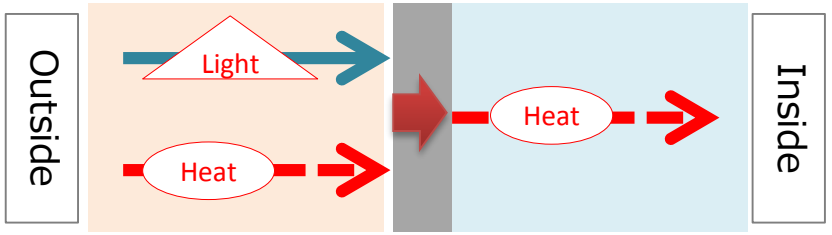
Radiated by high-temperature material under natural condition (higher than hundreds ℃)

Radiated by all materials with heat (Even -50℃ material radiates)

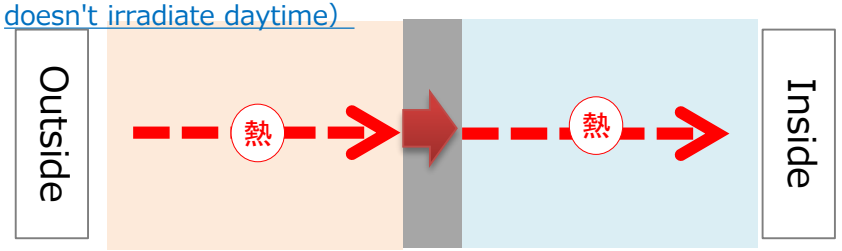
●Convected heat transfer

Heat transfer which is caused when air touched material directly.
(strongly effected by the speed of airflow)

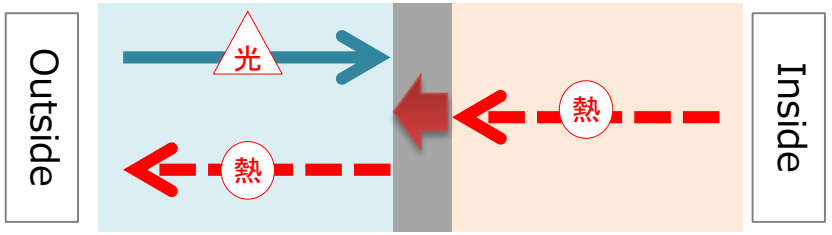
①Daytime in summer（Direct irradiation spot）



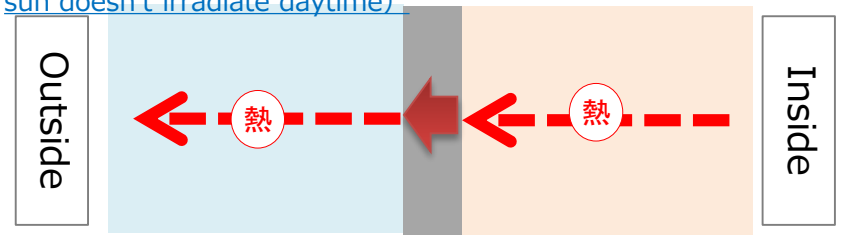
②Nighttime in summer（includes the spot where sun doesn't irradiate daytime）



③Daytime in winter（Direct irradiation spot）



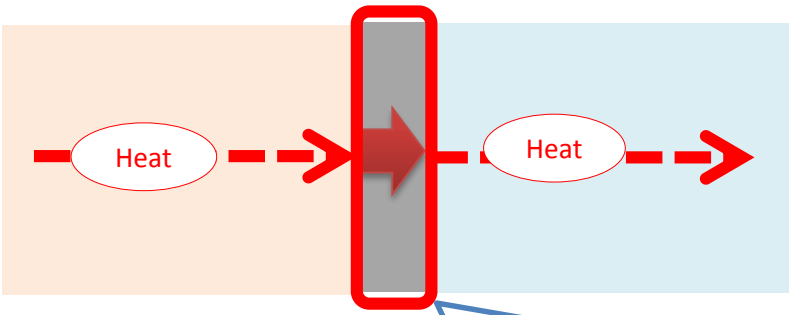
④Nighttime in winter（includes the spot where sun doesn't irradiate daytime）



	Heat transfer	Time	Light	Heat
Summer	Out ⇒ In	①Day	○	○
		②Night	×	○
Winter	In ⇒ Out	③Day	○	○
		④Night	×	○

Measurement method

● Previous measurement

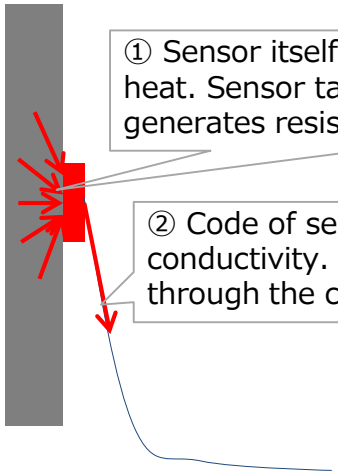


Evaluating energy saving level by measuring passing-through heat quantity

Sensor: contact type sensor (heat flowmeter, thermometer)

Thick structure such as wall can be measured, but thin film cannot be measured.

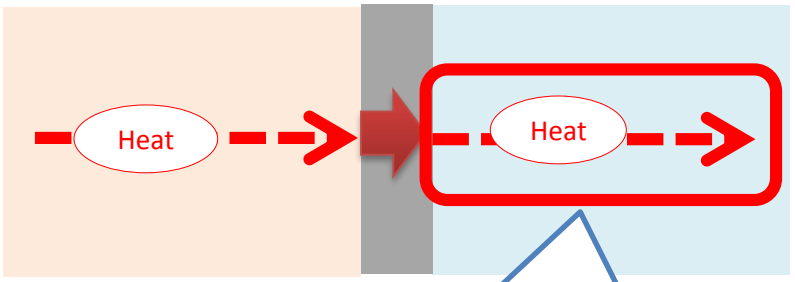
The reason why we can't measure



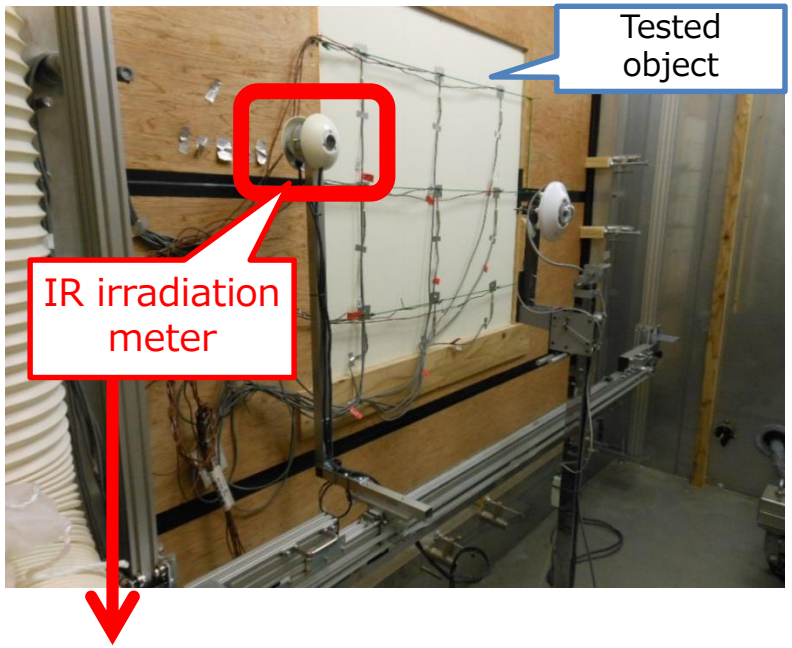
① Sensor itself has large capacity of heat. Sensor takes energy away, generates resistance.

② Code of sensor has high heat conductivity. Energy flows away through the code.

● Measurement of thin film



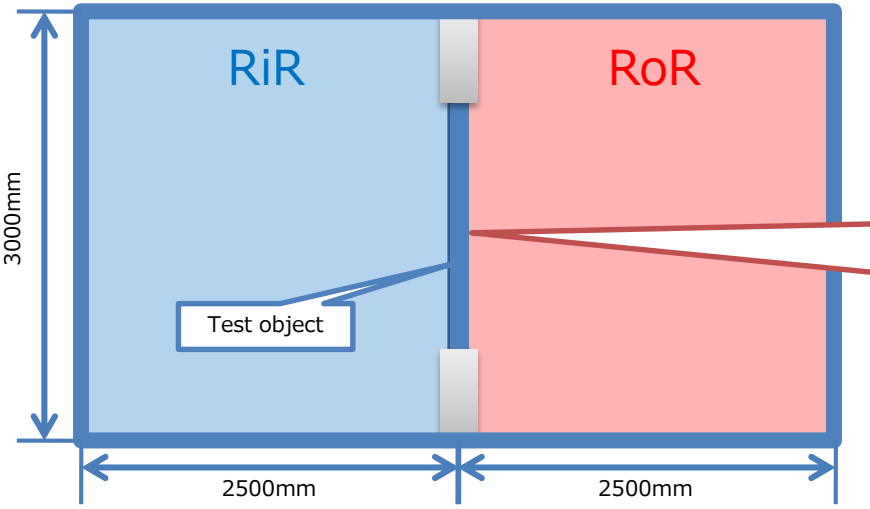
Evaluating energy saving level by measuring irradiation quantity



Non-contact type sensor.
It doesn't indicate gap caused by sensor touching.
Because this type of sensor doesn't touch the tested object.

Test condition

①Room in room (RiR), Room out of room (RoR) can control temperature individually.



Room size (RiR and Ror)
W 2500 × D 3000 × H 3000 mm

② By creating temperature gap between RiR and RoR, we measured heat transferring quantity through the test object.

Previous testing device of measuring heat insulation property

Setting of environmental temperature

	RiR Temp	RoR Temp	Gap
①	30℃	10℃	20℃
②	10℃	30℃	20℃

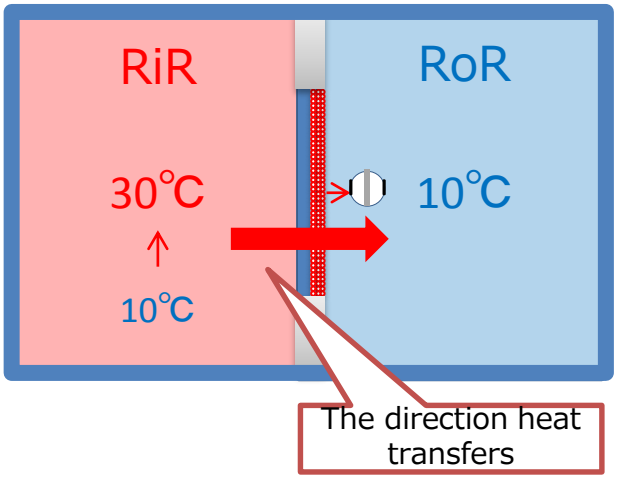
This gap has been used to measure previous test of heat transmission coefficient. (20℃)

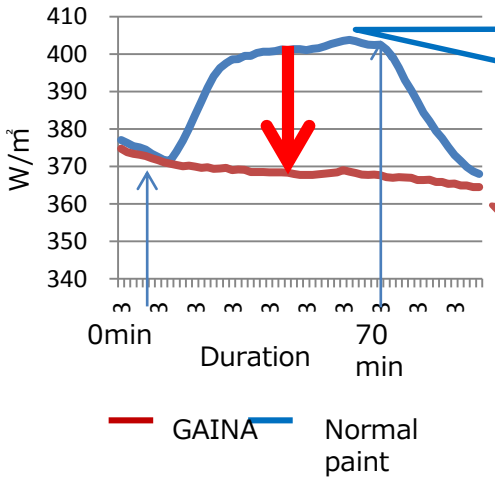
With considering to use GAINA as finishing paint, we measured two directions of heat transfer. One is the surface of paint film, another is the backside of paint film.

Result of measurement

Excluding influence of sun irradiation

① Reaction against heat from the backside of paint film





Increase of heat transfer

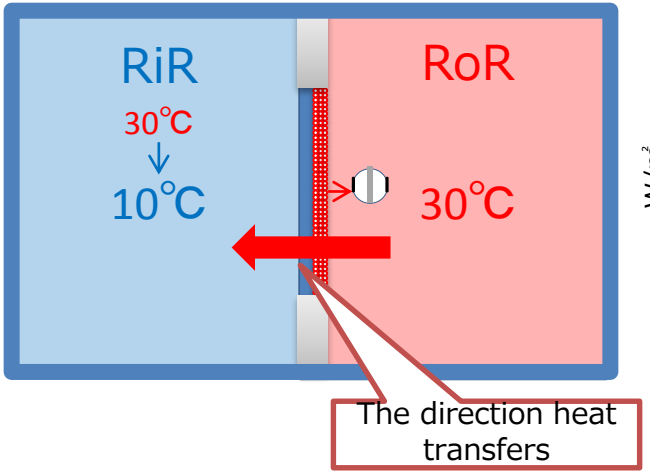
【Normal paint】
Heat from RiR is conducted to the surface of painted film of RoR, irradiation to RoR is increased.

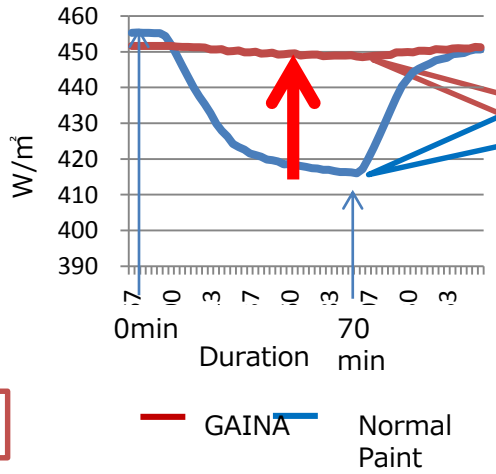
【GAINA】
When temperature in RiR increased, there was no change in the irradiation to RoR.

No heat transfer

30W/m² reduction

② Reaction against heat from the surface of paint film





Increase of heat transfer

【Normal Paint】
Heat is taken into RiR, irradiation quantity from the surface of painted film in RoR decreased.

【GAINA】
When temperature in RiR decreased, there was no change in the irradiation to RoR.

30W/m² reduction

No heat transfer