

Freon Keeper

Refrigerant Leakage Detection System Freon Keeper

FK-TOP-3



IoT transformation for refrigeration equipment
Electricity cost reduction using a refrigerant
leakage management system



**This product received an Excellence Award of
the 37th Honors on Excellent Energy-Saving Facilities**

Organized by the Japan Association of Refrigeration and Air-conditioning Contractors (JARAC)
Cooperated with the Energy Conservation Center, Japan (ECCJ)

Freon Keeper

Refrigerant Leakage Detection System Freon Keeper

Freon Keeper is a leakage detection system designed to detect refrigerant leakage quickly. Early detection of refrigerant leakage provides you with three significant benefits.

Three Significant Benefits



Cost saving



Reduced amounts of leakage



Stable operation of equipment



1 Cost saving

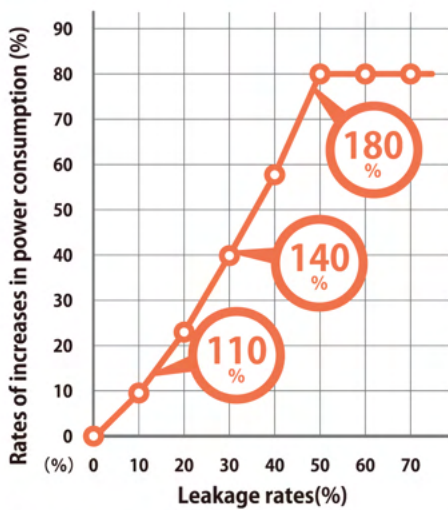
Freon Keeper can save power consumption by up to 45%*

* This value varies depending on the operating environment, use conditions, the refrigerant type and refrigeration equipment used.

Separate-type showcases, which are often used in supermarkets and the like, leaks approximately 16% of refrigerant per year on average. If the refrigeration equipment is continuously operated with over 50% of its refrigerant leaked, a shortage of its cooling capacity results in longer running time and an increase of 80% power consumption on average. Using refrigeration equipment with its refrigerant leaked not only reduces the operating efficiency of the equipment but also increases the risk of compressor problems.



Relationship between the amounts of refrigerant leakage and the increases in power consumption



Relationship between refrigerant leakage rates and rates of increases in power consumption (according to unified evaluation)

As part of the "Survey Commissioned Work on Understanding the Effects of Global Warming Countermeasures in the Freon Leakage Detection System Utilizing IoT Technology in the FY2021" by the Ministry of the Environment, we conducted practical tests on the power consumption of refrigeration equipment in response to changes in refrigerant refill levels, highlighting the significant impact of Freon leakage on increased power consumption of refrigeration and air conditioning equipment.

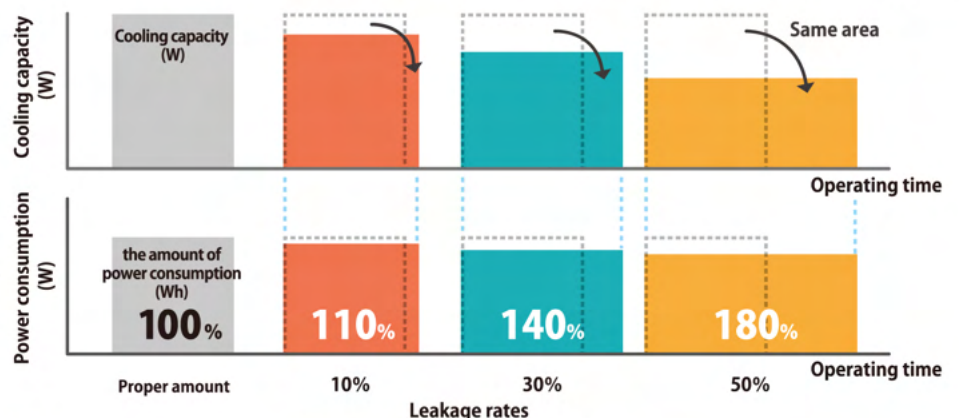
The result if the refrigeration equipment is continuously operated with over 10%, 30% and 50% of refrigerant leaked, it reduces the operating efficiency of the equipment and results that power consumption increases respectively 10%, 40% and 80%. Because refrigerant leaks very slowly in many cases, you will be consuming an excessive amount of power (up to 80%) until you realize that a leak has been happening. Specialized companies almost don't realize these facts. Freon Keeper can detect as small as about-10% of reduction in the amount of refrigerant and save power consumption by early detection of refrigerant leakage.

*The result of the test are expected to vary depending on the type, refrigeration capacity and refrigerant of refrigeration equipment (Source: FY2021 The Ministry of the Environment report of the study on understanding the effect of global warming mitigation measures by fluorocarbons leak detection system using IoT technology)

Impacts of reduced amounts of refrigerant on cooling capacity and power consumption

Due to reduced cooling capacity, the operating time to reach the set temperature will increase.

Due to the increased operating time, the amount of power consumption (Wh) will also increase.



*This achievement is based on the results of commissioned work by the New Energy and Industrial Technology Development Organization (NEDO).

2 Reduced amounts of leakage

Freon Keeper can reduce refrigerant leakage by detecting an about-10% of leakage in the amount of refrigerant



3 Stable operation of equipment



Stable operation of refrigeration equipment will prevent the loss of product stock and sales opportunities, and it will help extend the lifetime of the equipment.

Typically, refrigerant leakage is detected when a temperature error occurs in freezing and refrigeration equipment and 50 to 80% of the refrigerant is already lost in this stage. The rise in refrigeration temperature affects the quality of product stock and sale, which not only impairs business profitability but also requires urgent large-scale repair. However, by monitoring the rate of flash gas generation in real time, Freon Keeper can detect about 10% of leakage in the amount of refrigerant and prevent profit loss, such as the loss of product stock and sales opportunities. At the same time, Freon Keeper allows you to take systematic and appropriate measures for improvements of the refrigeration equipment at proper costs.

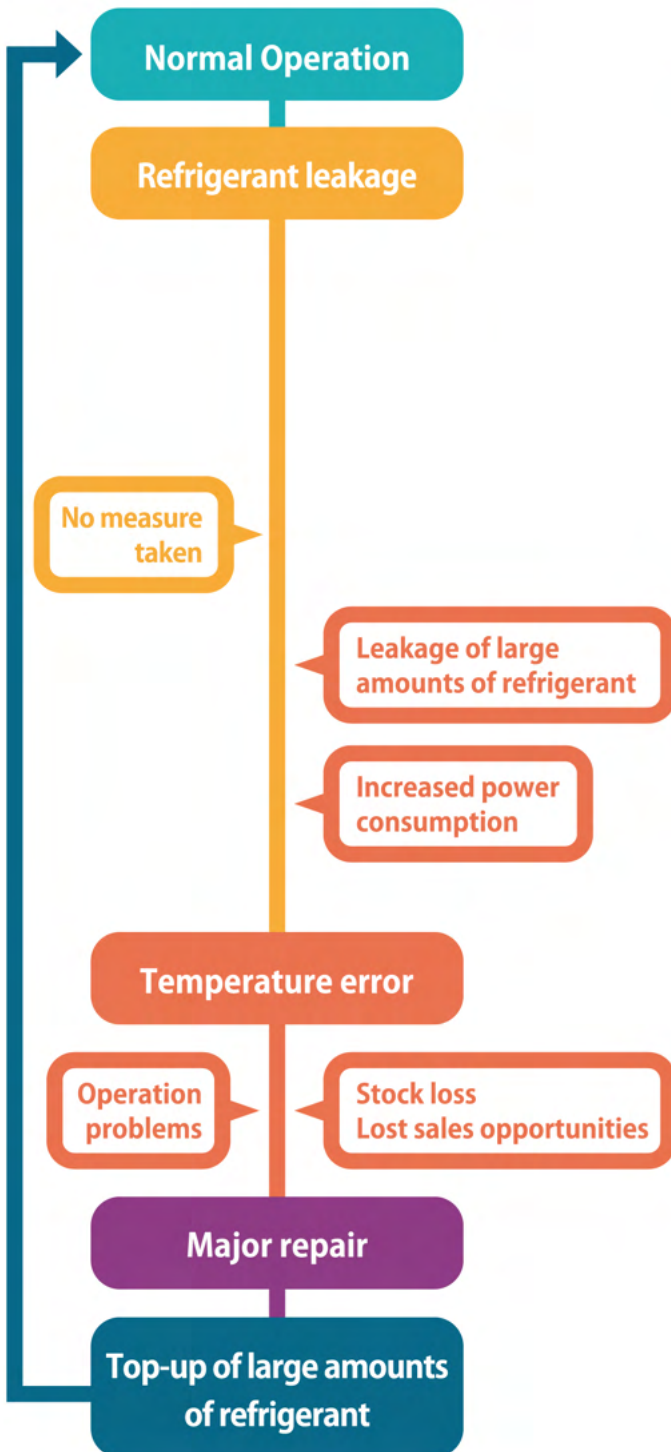
※ Flash gas refers to bubbles that appear in the liquid refrigerant pipe when the amount of refrigerant decreases. The generation of large amounts of flash gas deteriorates the refrigerant effect.

※ The generation rate of flash gas refers to an index that represents the frequency of flash gas generation per minute.

Freon Keeper: Comparison of damage to refrigeration equipment

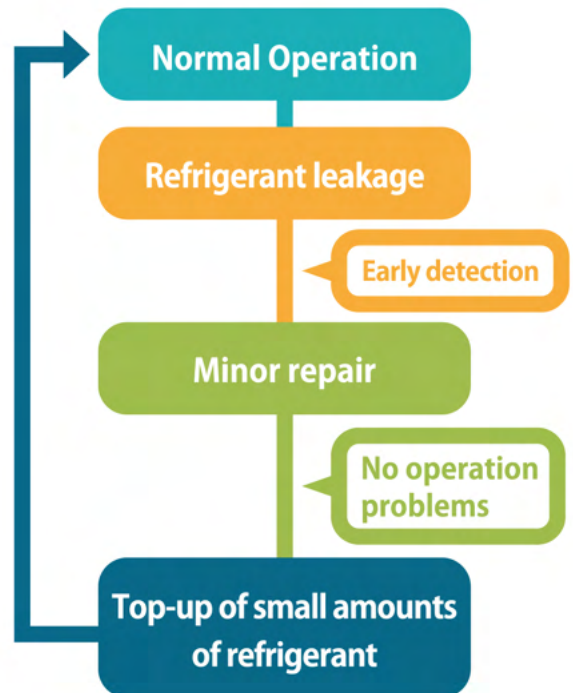
Without Freon Keeper

When a temperature error is detected, 50 to 80% of the refrigerant is already lost.



With Freon Keeper

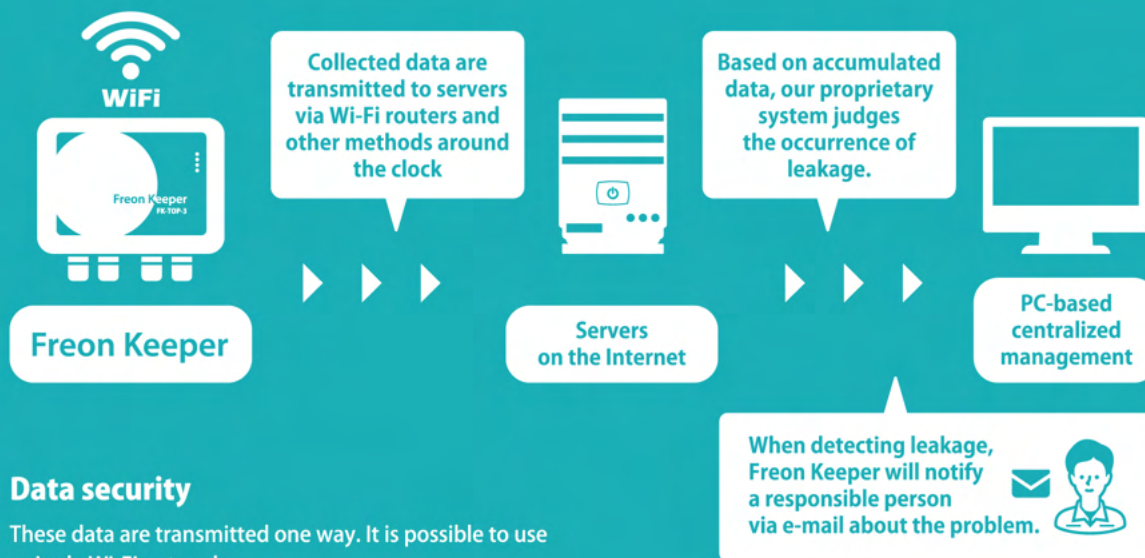
Freon Keeper can detect an about-10% reduction in the amount of refrigerant before a temperature error occurs.



IoT transformation for refrigeration equipment

By installing Freon Keeper, you can transform your refrigeration equipment into IoT-assisted equipment. Our proprietary system judges the occurrence of leakage by collecting, measuring, and monitoring various data such as ambient temperature, liquid refrigerant temperature, output temperature, input temperature, and power consumption (current) around the clock. This operation is like an experienced technician monitoring refrigeration equipment around the clock but Freon Keeper demonstrates even more reliable and higher accuracy than the technician. Collected data are automatically transmitted to servers every ten minutes, making it possible to manage refrigeration equipment installed in many stores in an integrated manner through the web without going to the sites. When detecting leakage, Freon Keeper will automatically send an e-mail to a responsible person to notify them of the problem.

Images of IoT-assisted services



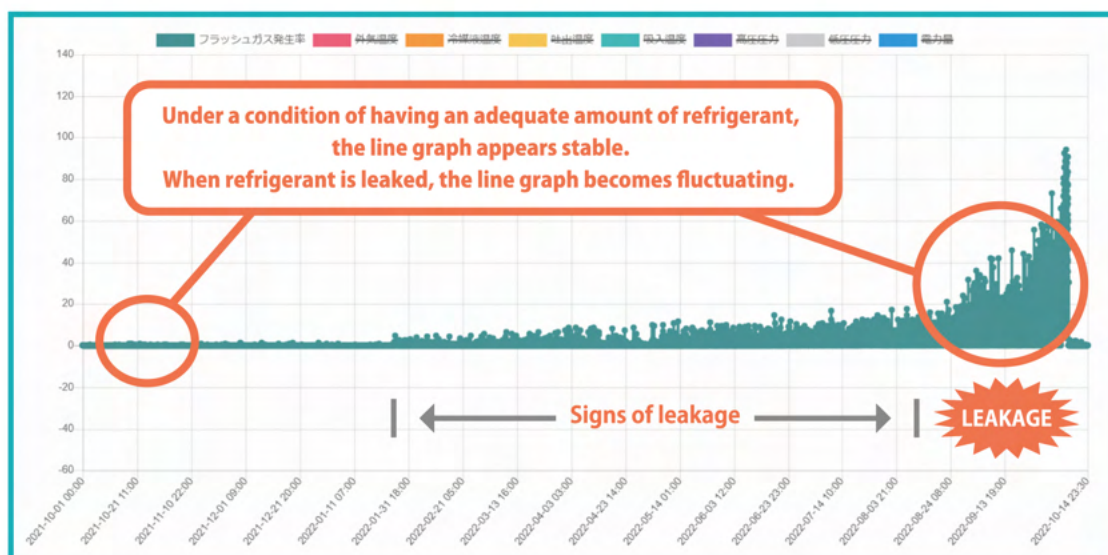
Data security

These data are transmitted one way. It is possible to use a single Wi-Fi network.

WEB management screen

※ The appearance of this screen may change without prior notice due to continual improvements.

You can display and manage collected data of equipment operation, such as ambient temperature and liquid refrigerant temperature, using tables and charts. It is also possible to download CSV data.



A mechanism for early leakage detection

Freon Keeper detects refrigerant leakage instantaneously utilizing ultrasonic waves.

When refrigerant leaks, the liquid-state refrigerant circulating within the refrigeration equipment cannot be condensed completely, generating very small bubbles which are quite difficult for human eyes to perceive. With a Freon Keeper sensor attached to the liquid refrigerant pipe, Freon Keeper can detect these small bubbles instantaneously by ultrasonic waves, enabling to detect refrigerant leakage earlier than a temperature alarm does.

The sensor is simply attached to the outside of the pipe. For this reason, you can install the sensors without stopping the operation of the refrigeration equipment.

※You can see these bubbles through the sight glass (a glass window through which you can see the condition in the refrigerant pipe).



A mechanism for early leakage detection

Appearance of the sight glass in normal and abnormal conditions



A

Normal
cooling temperature

No leakage

This is the appearance of the sight glass when there is no leakage. Bubbles are not generated.



B

Normal
cooling temperature

Small amounts of leakage

Although even an experienced technician would have difficulty detecting it, there is a bubble in the sight glass, which is evidence of the presence of small amounts of leakage. Freon Keeper can detect the leakage as early as at this stage.



C

Abnormal
cooling temperature

Large amounts of leakage

Due to large amounts of bubbles, the sight glass is turbid. In this case, about 50% of the refrigerant is leaked. This condition is causing abnormal temperatures and increased power consumption in the refrigeration unit.

Main specification FK-TOP-3

Input voltage DC5V

Consumption current 500 mA

Power consumption 1W

Operating temperature 0°C to 60°C

Controller display LCD panel

Sensor input
Temperature sensor × 4
Pressure sensor × 2
Ultrasonic sensor × 2

CT
Current Transformer MAX200A

Communication
WiFi
※The customer needs to make a Wi-Fi service contract.

Detectable refrigerants
R22 R134A
R404A R410A
R407C R507F
R12 R502
R407F R507A
R32 R448A
R449A R463A

※R410A and R32 can be detectable only for refrigeration equipment.
※This product is not applicable to hydrocarbon refrigerants.
※R744 will be verified in the future.

Temperature sensor

Operating temperature range -55°C to 125°C

Ultrasonic sensor

Input voltage DC5V

Service life Approximately 10 years

Pipe diameters

※Other materials, pipe diameters, and wall thicknesses should be discussed separately

Copper pipes $\varnothing 9.52$ to $\varnothing 31.75$ ※

STPG pipes 15A to 50A (1/2B ~ 2B) ※

SUS pipes 15A to 50A (1/2B ~ 2B) ※

Supplied accessories

Power adapter, current sensor, ultrasonic sensor, and temperature sensor

Optional accessories

Pressure sensor



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※This catalog is as of July 2024. This product's specifications, standards, and appearance may change without prior notice due to continual improvements.

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