

# **General Catalogue**

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AIR COOLED CHILLER - HQA Series

# RAAF



**CHILLER**

**FAN COIL**

**ICE THERMAL STORAGE SYSTEM**

**CHU & AHU**

**BOILER**





# Introduction

## Compressor

COPELAND Semi-Hermetic scroll type  
With highly efficient performance  
Anti-Vibration joint  
Oil heater system  
Dehumidifier filter dryer  
Safety valve for protect compressor at high-pressure  
Liquid line solenoid valve  
Liquid line pressure switch and pressure-transmitter

## Condenser

Microchannel condenser coil  
Advanced design for enhanced efficiency  
High quality material; Constructed from aluminum  
Compact size, big performance  
Environmentally friendly with a reduced refrigerant charge  
Pressure and corrosion resistance  
Low maintenance with fewer mechanical joints and potential leak points

## Hot Gas Bypass Circuit (optional)

Capacity regulation  
Enhanced stability  
Lower repair needs  
Quieter operation  
Freezing prevention  
Suitable for year-round applications

## Evaporator

Brazed Plate Heat Exchanger  
Efficiency up to 95%  
Stainless Steel 316  
Operating pressure: up to 30 bar  
Test pressure: 45 bar  
Anti-Freeze system

## Fan

Axial low noise model  
Variable frequency drive for saving energy and reducing sound level (optional)  
S&P or EBM papsttrademark with "IP54" grading

## Automatic Ethylene Glycol Injection System (optional)

Optimal ethylene glycol storage  
Automatic and precise operation  
Extended system life  
Protection of the plate heat exchanger  
Lower maintenance costs

## Electrical and safety equipment

invotech PLC

Ability to synchronize with BMS

Compatible with network connection protocols

HYUNDA trademark high pressure and low-pressure sensor

Switch cabinet with IP54

Switch cabinet with HYUNDA trademark;

Main switching (optional), Phase control, Contactor, MSPS

UPS buffered controller to prevent damage during operating (optional)

Light and socket in the switch cabinet Alarm system for faults

(Siemens brand for Switch cabinet equipment is available at the customer's choice and upon payment of a fee)

## PLC Programming

Automatic troubleshooting

Display the performance status of all control parameters

Display operating hours

Display number of start times of compressors separately

Complete observance of the operation schedule of the compressors

Recording of the latest errors that have occurred

## Body

Galvanized steel sheet with electrostatic paint coated

Sound insulation for reducing sound level

Manufactured with NC & CNC machines

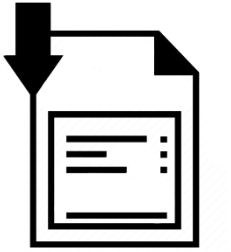
Air arteries on the columns of body to allow more air to pass through the condenser

## Liquid Line Equipment

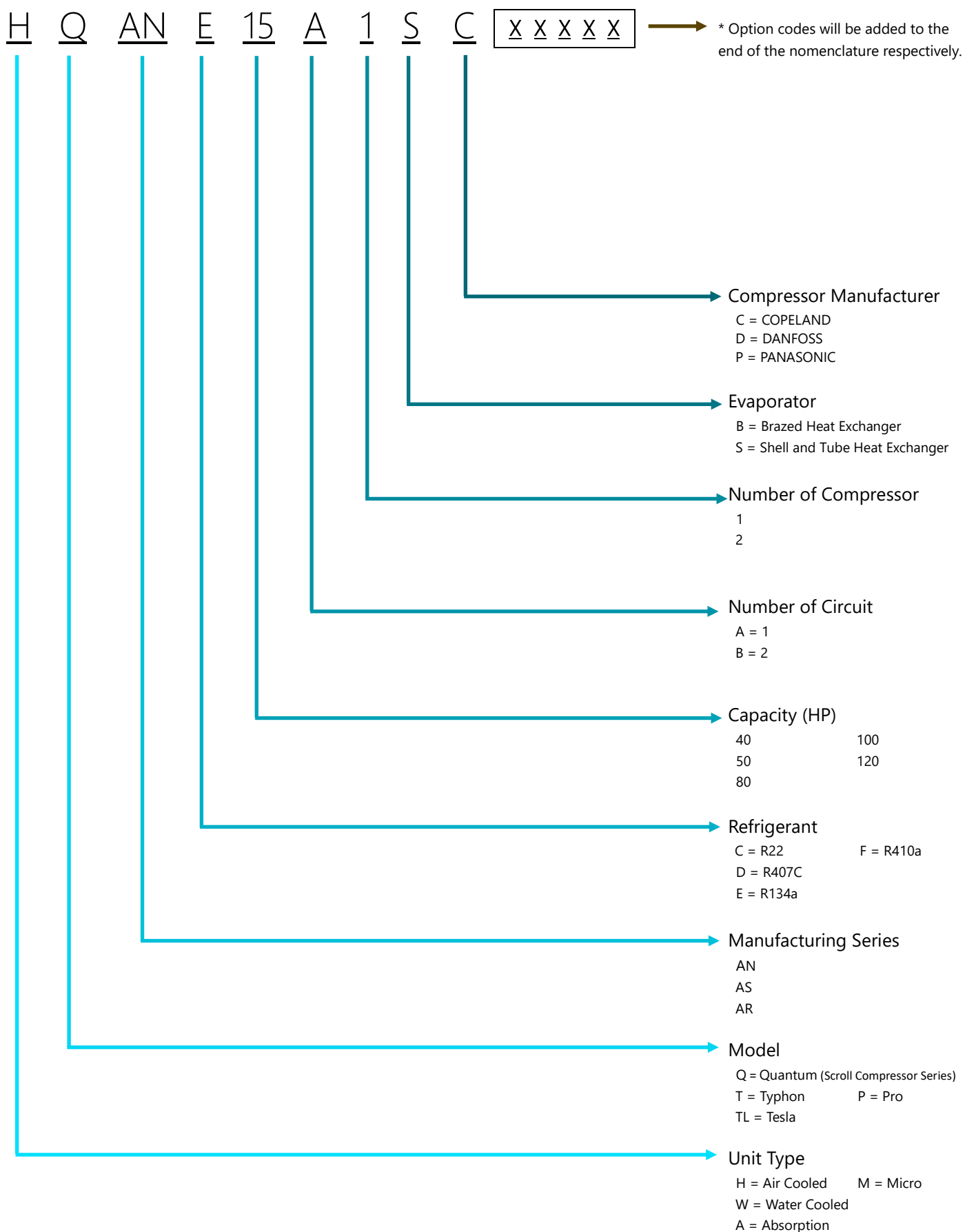
Danfoos EEV

Sight glass and filter dryer for dehumidification refrigerant

Liquid receiver with rotalock valve



Nomenclature



## Scroll Compressors - Modern Operations

Scroll compressors are among the most advanced and efficient types of compressors used in HVAC and refrigeration industries. Due to their unique design and quiet, efficient operation, these compressors have gained significant attention in many industrial and commercial applications. Particularly in scenarios where high performance and low maintenance are required, they are considered an ideal choice and play a crucial role in enhancing efficiency and reducing operational costs.

## Tandem Compressors

In refrigeration and air conditioning systems, the use of tandem compressors is recognized as an efficient and effective solution for load management under varying and high-demand environmental conditions. This technology is widely utilized in many commercial and industrial applications, especially in situations where there is a need for high cooling capacity and stable operation over extended periods.

Tandem compressors are designed to operate either simultaneously or alternately. Under normal conditions, when full capacity is not required, the system achieves the desired cooling by activating only one compressor. This approach leads to reduced energy consumption and less wear on the internal components of the compressor. By adopting this method, the system can operate more efficiently, significantly reducing operational costs.



In the design of Afra chillers, in addition to these features, the system operates with a single compressor when the ambient temperature rises excessively, ensuring efficient operation before activating the second compressor to complete the process.

## Advantages of Using Tandem Compressors

- **Reduced Energy Consumption:** When the cooling load is less than the maximum capacity, only one compressor is activated, which results in lower energy consumption. Using two compressors with half capacity, as opposed to a single large compressor at full capacity, can enhance energy efficiency and reduce associated costs.
- **Improved System Stability:** In full load conditions and when the ambient temperature rises significantly, the system intelligently activates the second compressor. This ensures the system operates at full capacity, continuously meeting cooling demands.
- **Reduced Wear and Tear:** The alternating operation of compressors in tandem systems allows each compressor to experience less individual wear and tear. This method increases the overall lifespan of the system and reduces the need for maintenance and repairs.
- **Smart Load Management:** Modern systems equipped with advanced controls monitor the system load in real-time and activate the second compressor as needed. This smart load management not only enhances system performance but also prevents excessive stress on any one compressor.

Scroll compressors are at the forefront of modern HVAC and refrigeration technologies, representing a leap forward in efficiency, reliability, and quiet operation. These compressors, known for their innovative design, have become a cornerstone in both industrial and commercial applications where consistent performance and minimal maintenance are critical. In the context of modern operations, scroll compressors are engineered to deliver superior efficiency, reduce operational costs, and extend the lifespan of systems, making them a vital component in the evolution of cooling technologies.

The use of tandem compressors in refrigeration and air conditioning systems is recognized as an efficient strategy for load management and energy optimization. This technology plays a critical role in extending the lifespan of compressors, reducing operational costs, and enhancing system stability, contributing significantly to the long-term efficiency and cost-effectiveness of cooling systems.

## Microchannel Condenser Coil

### Superior Heat Transfer Efficiency

- High Surface Area: The microchannel design maximizes surface area relative to volume, allowing for more efficient heat transfer compared to traditional tube-and-fin condensers.
- Enhanced Cooling Performance: With a higher heat exchange rate, microchannel coils offer superior cooling performance even under demanding conditions.
- Faster Response Time: The increased heat transfer efficiency results in quicker response times, improving the overall system performance.



### Compact and Lightweight Design

- Space-Saving: Microchannel coils are significantly more compact than traditional counterparts, making them ideal for applications where space is at a premium.
- Reduced Weight: The use of aluminum and the efficient design contribute to a lighter coil, which is beneficial in automotive and aerospace applications where weight reduction is crucial.
- Installation Flexibility: The compact design allows for easier integration into various systems, providing greater flexibility in design and installation.

### Environmental and Cost Benefits

- Lower Refrigerant Charge: Microchannel coils require less refrigerant to achieve the same cooling capacity, leading to cost savings and reduced environmental impact.
- Energy Efficiency: The higher efficiency of these coils reduces the energy consumption of the system, contributing to lower operational costs and a smaller carbon footprint.
- Eco-Friendly: By reducing the amount of refrigerant and energy used, microchannel coils help meet stricter environmental regulations and sustainability goals.

### Durability and Reliability

- Corrosion Resistance: Constructed primarily from aluminum, these coils offer excellent resistance to corrosion, extending their lifespan even in harsh environments.
- Pressure Tolerance: Designed to withstand high operating pressures, microchannel coils are suitable for both low and high-pressure systems, ensuring reliability across a wide range of applications.
- Vibration Resistance: The robust construction of microchannel coils reduces the risk of damage from vibration, a common issue in mobile and industrial applications.

### Maintenance and Serviceability

- Low Maintenance: The all-aluminum construction with fewer mechanical joints reduces the potential for leaks and the need for frequent maintenance, resulting in lower long-term service costs.
- Ease of Cleaning: The flat surface of microchannel coils allows for easier cleaning compared to traditional coils, which helps maintain efficiency and extends the coil's operational life.

### Technical Specifications

- Material: High-grade aluminum with optional anti-corrosion coatings
- Efficiency: Heat transfer efficiency exceeding 95%
- Test Pressure: up to 450 PSI
- Refrigerant Compatibility: Compatible with a wide range of refrigerants, including R134a, R410A, and newer low-GWP refrigerants.
- Customizability: Available in various sizes and configurations to meet specific application needs, with options for fin design, tube spacing and coating

### Future-Proofing

- Adaptability to New Refrigerants: As regulations evolve, microchannel coils are designed to be compatible with next-generation refrigerants, ensuring compliance with future standards.
- Scalability: Suitable for use in both small-scale and large-scale systems, providing a versatile solution for future system expansions.



## Sell - tube evaporator

### TYPES OF PRODUCTS

This section of the catalogue refers to the evaporator series single pass. This series of heat exchangers can be used as evaporators in a compressor-driven refrigerating cycle, with a coolant (HCFC – HFC – HFO) that flows and evaporates inside the exchanger tubes and a secondary fluid water or others (anti-freezing fluids) that cools on the outside of the tubes and inside the shell. The drawing above shows an evaporator with the description of its main components.



### COMPATIBLE FLUIDS

The heat exchangers are designed according to the pressure and temperature limits and with the materials described here below. The main data of the heat exchanger, according to Art. 4 of Annex 1 of the European Directive 2014/68/UE, are indicated on the unit's name plate.

### MATERIALS

The choice of the materials used in the evaporators is the result of strict quality checks carried out in compliance with the PED norm (Dir. 2014/68/UE) and the European norms regulating the construction of pressure vessels. The standard components are: - carbon steel: head (medium-large sizes in cast iron), tube sheet, shell and refrigerant and water connections, - copper alloy C12200 – EN12452/SB359 with inner finned surface suitable for exchanger pipes, - asbestos free gaskets suitable for the use of HCFC, HFC, HFO refrigerants, - PVC plastic baffles, - bonded steel bolts fit for the temperatures generated during the use.

### TEST, QUALITY AND IDENTIFICATION

All tests comply with the procedures of our internal quality manual UNI EN ISO 9001 and specifically all the evaporators undergo the following: - Pneumatic pressure test refrigerant and water side (coefficient x 1,43), - Test with penetration liquids (PT) on the weldings according to the norms, - Separate pressure test for each single refrigerant circuit, - Hydrostatic test with the use of a helium leakage detector (accepted max. level of 3 g/year of R22). Once the tests are over and before shipping, the refrigerant circuits are dried and protected against humidity by means of moisture absorber bags.

| Model No.              |                     |                   | HQAND40B2SC      | HQAND50B2SC          | HQAND80B2SC    |
|------------------------|---------------------|-------------------|------------------|----------------------|----------------|
| 1                      | Cooling capacity    | KW                | 108.6            | 135.8                | 217.2          |
|                        |                     | RT                | 31               | 39                   | 62             |
|                        | Total input power   | KW                | 32.9             | 40                   | 65.8           |
|                        | Total rated current | A                 | 56.6             | 70.6                 | 113.2          |
|                        | EER                 | -                 | 3.30             | 3.39                 | 3.30           |
| 2                      | Cooling capacity    | KW                | 101.8            | 126.4                | 203.6          |
|                        |                     | RT                | 29               | 36                   | 58             |
|                        | Total input power   | KW                | 36.4             | 44.2                 | 72.8           |
|                        | Total rated current | A                 | 61.2             | 76                   | 122.4          |
|                        | EER                 | -                 | 2.80             | 2.86                 | 2.80           |
| Evaporator             | Type                | -                 | Shell and tube   |                      |                |
|                        | Brand               | -                 | WTK              |                      |                |
|                        | Water flow rate     | gpm               | 77               | 96                   | 154            |
|                        |                     | m <sup>3</sup> /h | 17.5             | 22                   | 35             |
|                        | Water pressure drop | kPa               | 46               | 43                   | 45             |
|                        | Max design pressure | Mpa               | 0.8              |                      |                |
| Condenser              | Type                | -                 | V Shape          |                      |                |
|                        | Heat exchanger      | -                 | Micro-channel    |                      |                |
| Fan                    | Type                | -                 | Axial fan        |                      |                |
|                        | Brand               | -                 | S&P or EBM papst |                      |                |
|                        | Number              | -                 | 2                |                      | 4              |
|                        | Speed               | rpm               | 900              |                      |                |
|                        | Diameter            | mm                | 800              |                      |                |
|                        | Air flow rate       | m <sup>3</sup> /h | 22000            |                      |                |
|                        | Discharge           | Side/Top          | Top              |                      |                |
|                        | Compressor          | Type              | -                | Semi-Hermetic Scroll |                |
| Brand                  |                     | -                 | COPELAND         |                      |                |
| Model                  |                     | -                 | ZR250KCE-TWD     | ZR310KCE-TWD         | ZR250KCE-TWD   |
| Combination            |                     | Pieces            | 2                |                      | 4              |
| Capacity               |                     | hp                | 40               | 50                   | 80             |
| Oil heater             |                     | -                 | -                |                      |                |
| Refrigerant            | Type                | -                 | R407C            |                      |                |
| Ambient temp. range    |                     | °C                | 21 ~ 46          |                      |                |
| Command control system | Type                | -                 | invotech PLC     |                      |                |
| Sound pressure level   |                     | dB(A)             | ~ 99             |                      |                |
| Power supply           |                     | Ø , V , Hz        | 3 , 400 , 50     |                      |                |
| Dimension              |                     | WxHxD mm          | 2120x2335x1220   |                      | 2120x2335x2420 |
| Net weight             |                     | kg                | ~                |                      |                |

1 : Chilled water inlet / outlet : 12 °C / 7 °C  
 Outdoor ambient temp. : 35 °C DB  
 Sea level : 4000 ft  
 Fan input power included  
 Pump input power not included

2 : Chilled water inlet / outlet : 12 °C / 7 °C  
 Outdoor ambient temp. : 40 °C DB  
 Sea level : 4000 ft  
 Fan input power included  
 Pump input power not included

- Evaporating SST : 3 °C  
 - Water side fouling factor : 0.000043 m<sup>2</sup> . °C / KW  
 - Measuring sound pressure level at 3m away and ±3dB tolerance.  
 - The characteristics of water flow rate and water pressure drop are given based on case "1".

| Model No.              |                     |                   | HQAND100B2SC         | HQAND120B2SC   |
|------------------------|---------------------|-------------------|----------------------|----------------|
| 1                      | Cooling capacity    | KW                | 271.6                | 332.8          |
|                        |                     | RT                | 77                   | 95             |
|                        | Total input power   | KW                | 80                   | 99.2           |
|                        | Total rated current | A                 | 141.6                | 173.6          |
|                        | EER                 | -                 | 3.39                 | 3.35           |
| 2                      | Cooling capacity    | KW                | 252.8                | 311.2          |
|                        |                     | RT                | 72                   | 88             |
|                        | Total input power   | KW                | 88.4                 | 109.2          |
|                        | Total rated current | A                 | 152                  | 187.6          |
|                        | EER                 | -                 | 2.86                 | 2.85           |
| Evaporator             | Type                | -                 | Shell and tube       |                |
|                        | Brand               | -                 | WTK                  |                |
|                        | Water flow rate     | gpm               | 192                  | 236            |
|                        |                     | m <sup>3</sup> /h | 43.6                 | 53.6           |
|                        | Water pressure drop | kPa               | 44                   | 41             |
|                        | Max design pressure | Mpa               | 0.8                  |                |
| Condenser              | Type                | -                 | V Shape              |                |
|                        | Heat exchanger      | -                 | Micro-channel        |                |
| Fan                    | Type                | -                 | Axial fan            |                |
|                        | Brand               | -                 | S&P or EBM papst     |                |
|                        | Number              | -                 | 4                    | 6              |
|                        | Speed               | rpm               | 900                  |                |
|                        | Diameter            | mm                | 800                  |                |
|                        | Air flow rate       | m <sup>3</sup> /h | 22000                |                |
|                        | Discharge           | Side/Top          | Top                  |                |
| Compressor             | Type                | -                 | Semi-Hermetic Scroll |                |
|                        | Brand               | -                 | COPELAND             |                |
|                        | Model               | -                 | ZR310KCE-TWD         | ZR380KCE-TWD   |
|                        | Combination         | Pieces            | 4                    |                |
|                        | Capacity            | hp                | 100                  | 120            |
|                        | Oil heater          | -                 | -                    |                |
| Refrigerant            | Type                | -                 | R407C                |                |
| Ambient temp. range    |                     | °C                | 21 ~ 46              |                |
| Command control system | Type                | -                 | invotech PLC         |                |
| Sound pressure level   |                     | dB(A)             | ~ 99                 |                |
| Power supply           |                     | Ø, V, Hz          | 3, 400, 50           |                |
| Dimension              | WxHxD               | mm                | 2120x2335x2420       | 2120x2335x3390 |
| Net weight             |                     | kg                | ~                    |                |

1 : Chilled water inlet / outlet : 12 °C / 7 °C  
 Outdoor ambient temp. : 35 °C DB  
 Sea level : 4000 ft  
 Fan input power included  
 Pump input power not included

2 : Chilled water inlet / outlet : 12 °C / 7 °C  
 Outdoor ambient temp. : 40 °C DB  
 Sea level : 4000 ft  
 Fan input power included  
 Pump input power not included

- Evaporating SST : 3 °C  
 - Water side fouling factor : 0.000043 m<sup>2</sup> . °C / KW  
 - Measuring sound pressure level at 3m away and ±3dB tolerance.  
 - The characteristics of water flow rate and water pressure drop are given based on case "1".

[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.





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