Overseas service network

Please contact Daikin Sales Counter for servicing of Oil Cooling Unit in countries outside Japan.
Daikin is ready to offer you service in conjunction with the sales agents of our Air-conditioning and Hydraulic Divisions located in seven countries and regions worldwide.

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Locations</th>
<th>Company name</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Shanghai</td>
<td>DAIKIN HYDRAULICS (SUZHOU) CO., LTD. (Shanghai Branch)</td>
</tr>
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<td></td>
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<tr>
<td></td>
<td>Shenyang</td>
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<td>Seoul</td>
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<td>Taipei</td>
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<td>Singapore</td>
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<td>ZICOM PRIVATE LTD.</td>
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<td>Thailand</td>
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<td>India</td>
<td>New Delhi</td>
<td>DAIKIN AIR CONDITIONING INDIA PVT.LTD DELHI BRANCH</td>
</tr>
<tr>
<td>U.S.</td>
<td>Illinois</td>
<td>ALL WORLD MACHINERY</td>
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</tbody>
</table>

Sales agents of hydraulic equipment:
Others are the sales agent of air conditioning equipment.

Contents in this catalog are subject to change for improvement without prior notice.
Immersion-type oil cooling unit mounted directly on the coolant tank

It is a cooler that is placed on the coolant tank and cools the fluid inside the tank directly with a cooling coil.

* The circulation pump is not provided as an accessory and must be prepared separately by the customer.

High-accuracy model with the inverter-controlled compressor

The coolant temperature can be controlled within ±0.1°C over the entire cooling load range (from 0 to 100% load) and this helps to increase the accuracy of machine tools.

Further downsizing of the industry’s top-class compact design

- Comparison in the AKJ459 class (units: mm)
- Comparison in the AKJ359 class (units: mm)

Enhanced support for shallow tanks with reduced cooling coil depth

- Top-class compact design
- Further downsizing the industry’s
- High-accuracy model with the inverter-controlled compressor

Extension of cooling capacity control range

- 6th 1°C oil temperature control realized over a load range from 0% (no load) to 100%.

Achieve high energy-saving performance

- Achieve high-energy-saving performance with the adoption of a Daikin original IPM motor and R410A refrigerant for high COP characteristics.

Improved durability/maintainability

- The cooling coil construction suppresses the adhesion and accumulation of cutting/grinding chips.

Increased tolerance of harsh factory conditions including mist and dust

- The ingress protection of the control box has been upgraded (equivalent to IP54).
- Sulfur-free parts have been adopted for electronic components.

Increased tolerance of long-distance transportation

- The specifications for vibration durability during transport have been upgraded to reflect actual transportation conditions.

Predictive maintenance function prevents trouble in advance

- Predictive maintenance function
- A warning signal is output to notify that maintenance is required when the air filter or condenser becomes clogged.

Features

- 3 steps minimizing machine down time
- Autonomous compensation of overloaded operation
- Notifying the customer about inspection/maintenance by issuing a warning
- Continuing operation in an emergency mode, if operation is possible by restricting some functions and specifications

Simple monitoring of operating status

- The room temperature, tank fluid temperature and other internal data can be monitored at a personal computer using Hybrid-Win®. Operating status can be grasped easily with one list presenting all the data collectively.

* Hybrid-Win® is a software tool for monitoring the internal status at a personal computer.

You can download the tool itself and its instruction manual free of charge from the website (http://www.daikinpmc.com) after registering as a member.

* The communications cable and the monitor harness must be purchased separately.

Temperature warning function

- A warning signal can be output when the targeted fluid temperature or air temperature was out of the arbitrary setting range.

A warning signal is output to notify that maintenance is required.

Type of optional specification models in addition to the standard model for shorter product delivery terms

- The AC 230 V system (-046) has no transformer, while the AC 480 V (-047) and AC 480 V systems (-048) incorporate a transformer inside the product. The installation dimensions and footprint are the same as for the standard models.

Applications

- Example of major applications
  - Machine tools: Machining centers, NC lathes, grinding machines, etc.
  - NC specialized machines, NC electric discharge machines, etc.
  - Industrial machine: Molding machine, press, etc.

Cooling of cutting oil

- Temperature (viscosity) control
- Prevents deterioration of hydraulic oil’s lubricating performance
- Extension of tool life
- A 999-hour timer function (ON timer) is the operation start time can be set in a range between 0 and 999 hours (in hour units).

RoHS-compliant

- Complies with the RoHS Directive, e.g. by adopting printed circuit boards with lead-free solder.

Different voltage specifications (-046, -047, -048)

- The AC 230 V system (-046) has no transformer, while the AC 480 V (-047) and AC 480 V systems (-048) incorporate a transformer inside the product. The installation dimensions and footprint are the same as for the standard models.

Prepared as optional models

- Water cooler (RS232C communications cable included)
- Monitor harness for oil cooler units

With breaker

- CE compliance
- ISO9001:2015
- IP protection

Preparation of connection diagrams

- Connection diagrams for PLC and other connection diagrams are prepared on the website (http://www.daikinpmc.com) after registering as a member.

Specifications

- Four types of optional specification models
- In addition to the standard model for shorter product delivery terms

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* Comparison in the AKJ459 class (units: mm)

Enhanced support for shallow tanks with reduced cooling coil depth

* Comparison in the AKJ259 class (units: mm)

Extension of cooling capacity control range

- ±0.1°C oil temperature control realized over a load range from 0% (no load) to 100%.

Achieve high energy-saving performance

- Achieve high-energy-saving performance with the adoption of a Daikin original IPM motor and R410A refrigerant for high COP characteristics.

The power consumption can be checked on the operation panel.

* Comparison using a non-inverter model to have a power consumption of 100% measured during the Daikin model operation pattern.

Improved durability/maintainability

- The cooling coil construction suppresses the adhesion and accumulation of cutting/grinding chips.

Increased tolerance of harsh factory conditions including mist and dust

- The ingress protection of the control box has been upgraded (equivalent to IP54).
- Sulfur-free parts have been adopted for electronic components.

Increased tolerance of long-distance transportation

- The specifications for vibration durability during transport have been upgraded to reflect actual transportation conditions.

Predictive maintenance function prevents trouble in advance

- Predictive maintenance function
  - A warning signal is output to notify that maintenance is required when the air filter or condenser becomes clogged.
  - 3 steps minimizing machine down time
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Functions featured

- Refrigerant gas shortage detection function
  - When the refrigerant gas leak status occurs (cooling disabled), alarm signals are output.
  - Prevents damage to the machine and machining defects.

- Temperature warning function
  - A warning signal can be output when the targeted fluid temperature or air temperature was out of the arbitrary setting range.

- Autotuning function
  - This function substantially minimizes trial operation adjustment time by automatically setting the gain when fluid temperature control is not stable with the factory setting or when optimization is required.

- 999-hour timer function (OH timer)
  - The operation start time can be set in a range between 0 and 999 hours (in hour units).

RoHS-compliant

- Complies with the RoHS Directive, e.g. by adopting printed circuit boards with lead-free solder.

Four types of optional specification models in addition to the standard model for shorter product delivery terms

- Different voltage specifications (-046, -047, -048)
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Refrigerating cycle

A: Refrigerant gas is converted into compressed gas at high temperature and high pressure by a compressor so that gas can be easily cooled and liquefied by a condenser.
B: In the condenser, the gas at high temperature and high pressure generated in the compressor is cooled with air and converted into liquid at high temperature and high pressure.
C: The decomposition mechanism (electronic expansion valve) reduces the pressure of the liquid at high temperature and high pressure and converts it into liquid at low temperature and low pressure by throttling it so that it can be easily evaporated in a cooling coil.
D: In the cooling coil, the gas at high temperature and low pressure generated in the decomposition mechanism absorbs heat from the coolant, evaporates it, and converts it into gas at low temperature and low pressure.
E: The hot gas bypass valve controls the cooling capacity at low loads by adjusting the volume of gas at high temperature and high pressure supplied to the cooling coil.
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B. In the condenser, the gas at high temperature and high pressure generated in the compressor is cooled with air and converted into liquid at high temperature and high pressure.

C. The decompression mechanism (electronic expansion valve) reduces the pressure of the liquid at high temperature and high pressure and converts it into liquid at low temperature and low pressure.

D. In the cooling coil, liquid at low temperature and low pressure generated in the decompression mechanism absorbs heat from the coolant, evaporates (cools the coolant), and is converted into gas at low temperature and low pressure.

E. The hot gas bypass valve controls the cooling capacity at low loads by adjusting the volume of gas at high temperature and high pressure supplied to the cooling coil.

Note: 1. The enclosure indicates work that needs to be arranged locally.

2. The heater is only applicable to AKJ-H.

3. The piping system of AKJ1509 differs from that shown in this figure.

Different voltage type (1) Without transformer

- AC 220, 230 V
- 50/60 Hz

Different voltage type (2) With transformer

- AC 220, 230 V
- 440, 460, 480 V
- 50/60 Hz, With breaker

Different voltage type (3) With transformer

- AC 220, 230 V
- 440, 460, 480 V
- 50/60 Hz, With breaker

Options and their combinations

- AKJ9 (Immersion type)
- AKJ1509
- BCH

Options and their combinations

- Option Symbol
- Options and their combinations
  (Refer to the following table.)

Special specifications

- 9999 (3-digit number), C9999 (3-digit number), etc.

Please consult us about detailed information.

Symbols and their combinations

- Symbol of series (Symbol to represent model change)
  - 9-"W" series

Oil cooling unit identification code

- AKJ - High-accuracy inverter controlled oil cooling unit
- Immersion type for cutting/grinding fluid (oil)

Cooling capacity (kW)

- 15.0 kW
- 9.0 kW
- 5.6 kW
- 4.5 kW
- 3.5 kW
- 1.8 kW
- Various kW

Option Symbol

- Symbol of series (Symbol to represent model change)
- Options and their combinations
  (Refer to the following table.)

Option Symbol

- Option Symbol
- With breaker
- Compliance

Symbols and their combinations

- 9-"W" series
- BCH
- AKJ

Please consult us about detailed information.
### Specifications

#### AKJ189, AKJ359, AKJ459

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<thead>
<tr>
<th>Model name</th>
<th>8.5</th>
<th>1.5</th>
<th>1.5</th>
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<tbody>
<tr>
<td>Cooling tube horsepower</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Model name</strong></td>
<td>Break B</td>
<td>Break C</td>
<td>Break D</td>
<td>Break E</td>
</tr>
<tr>
<td><strong>Cooling capacity (kW/℃)</strong></td>
<td>1.48 kW/5.4 A</td>
<td>1.39 kW/4.8 A</td>
<td>3.38 kW/10.8 A</td>
<td>4.42 kW/13.1 A</td>
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<tr>
<td><strong>Maximum power consumption</strong></td>
<td>2.72 kW/8.9 A</td>
<td>2.72 kW/9.2 A</td>
<td>4.60 kW/13.7 A</td>
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<tr>
<td><strong>Transformer capacity</strong></td>
<td>2.79 kW/10.2 A</td>
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<tr>
<td><strong>Input power</strong></td>
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<td><strong>Operating sound (dB) when control object is room temperature (Set at 0.0 by default)</strong></td>
<td>73</td>
<td>75</td>
<td>99</td>
<td>117</td>
</tr>
<tr>
<td><strong>Operating sound (dB) when control object is 30°C (Set at 0.0 by default)</strong></td>
<td>71</td>
<td>72</td>
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<td><strong>Operating sound (dB) when control object is 50°C (Set at 0.0 by default)</strong></td>
<td>79</td>
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<tr>
<td><strong>Operating sound (dB) when control object is 70°C (Set at 0.0 by default)</strong></td>
<td>86</td>
<td>87</td>
<td>120</td>
<td>133</td>
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<tr>
<td><strong>Operating sound (dB) when control object is +90°C (Set at 0.0 by default)</strong></td>
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#### AKJ569, AKJ909, AK1509

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**Note:**
1. The maximum power consumption/maximum current consumption of different voltage specifications are shown in the tables below.
2. Be sure to use the unit within the range of use specified.
3. Use piping conduits etc. rated at least IP54 at wiring ports.
4. The optional thermistor for machine temperature synchronization is required. (Refer to Page 17 for details.)
5. There are the following three types of different voltage specifications.
6. Electric component box ingress protection: IP54 or equivalent (However, use piping conduits etc. rated at least IP54 at wiring ports.)
7. The main circuit voltage is the transformer's secondary side voltage of AC 200 V, 50/60 Hz.
8. The maximum power consumption/maximum current consumption of different voltage specifications are shown in the tables below.

---

**Specifications and Operating range**

---

**Note:**
1. The mark ◎ shows the standard point.
2. Use piping conduits etc. rated at least IP54 at wiring ports.
3. Use piping conduits etc. rated at least IP54 at wiring ports.
4. Use piping conduits etc. rated at least IP54 at wiring ports.
Specifications

AKJ189, AKJ359, AKJ459

Coil cooling unit horsepower (hp)

<table>
<thead>
<tr>
<th>Model name</th>
<th>B</th>
<th>C</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX30/1.48</td>
<td>2.3</td>
<td>2.2</td>
<td>1.6</td>
<td>1.5</td>
<td>1.2</td>
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<td>0.7</td>
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<td>1.5</td>
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<td>0.9</td>
<td>0.7</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Power voltage

Main circuit: Three phase 208/200 V, 50/60 Hz
Operating circuit: DC120v

Maximum power consumption

<table>
<thead>
<tr>
<th>When cooling</th>
<th>condenser</th>
<th>2021/12</th>
<th>2022/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.468 kW/1.8 A</td>
<td>0.468 kW/1.8 A</td>
<td>0.468 kW/1.8 A</td>
</tr>
<tr>
<td>2</td>
<td>0.718 kW/2.9 A</td>
<td>0.718 kW/2.9 A</td>
<td>0.718 kW/2.9 A</td>
</tr>
</tbody>
</table>

---

Specifications

AKJ659, AKJ909, AKJ1509

Coil cooling unit horsepower (hp)

<table>
<thead>
<tr>
<th>Model name</th>
<th>B</th>
<th>C</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX63/1.48</td>
<td>2.3</td>
<td>2.2</td>
<td>1.6</td>
<td>1.5</td>
<td>1.2</td>
<td>1.0</td>
<td>0.9</td>
<td>0.7</td>
<td>0.5</td>
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<tr>
<td>TX53/1.38</td>
<td>2.3</td>
<td>2.2</td>
<td>1.6</td>
<td>1.5</td>
<td>1.2</td>
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<td>0.9</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>TX46/1.20</td>
<td>2.3</td>
<td>2.2</td>
<td>1.6</td>
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<td>1.2</td>
<td>1.0</td>
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<td>0.5</td>
</tr>
</tbody>
</table>

Power voltage

Main circuit: Three phase 208/200 V, 50/60 Hz
Operating circuit: DC120v

Maximum power consumption

<table>
<thead>
<tr>
<th>When cooling</th>
<th>condenser</th>
<th>2021/12</th>
<th>2022/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.468 kW/1.8 A</td>
<td>0.468 kW/1.8 A</td>
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<tr>
<td>2</td>
<td>0.718 kW/2.9 A</td>
<td>0.718 kW/2.9 A</td>
<td>0.718 kW/2.9 A</td>
</tr>
</tbody>
</table>

---

Note:

1. The coil cooling unit horsepower is the value at the standard point (room temperature: 35°C, indoor air temperature: 20°C, outdoor air temperature: 40°C).

2. The voltage fluctuation range should be within ±5% of the rated voltage. The power voltage should be supplied at ±5% of the rated voltage.

3. The condenser horsepower is the value at the standard point (room temperature: 35°C, indoor air temperature: 20°C, outdoor air temperature: 40°C).

4. The operating range is for the standard air condition: room temperature 20°C, indoor air temperature 20°C, outdoor air temperature 40°C.

---

Operating range

Note:

1. This unit is designed for use in environments with a relative humidity of 85% or less and a temperature range of 0°C to 45°C.

2. The maximum output capacity is the value at the standard point (room temperature: 20°C, indoor air temperature: 20°C, outdoor air temperature: 35°C).

---

Notes:

1. The condenser horsepower is the value at the standard point (room temperature: 35°C, indoor air temperature: 20°C, outdoor air temperature: 40°C).

2. The power voltage is the value at the standard point (room voltage: 220/230 V, 50/60 Hz).

---

Specifications and Operating range

---

Figures and tables provided in the document include:

- Specifications for coil cooling units
- Power voltage requirements
- Maximum power consumption values
- Operating ranges
- Notes on product use and installation

---

Refer to the page for explanatory notes.
1. The ◆ symbol indicates the standard point. (Room temperature: 35°C/ tank fluid temperature: 35°C/ oil used: ISO VG32)
2. The cooling capacity varies depending on conditions including the room temperature, tank fluid temperature and the kinematic viscosity of the oil, etc.
Cooling Capacity Characteristic Chart

1. The symbol indicates the standard point. (Room temperature: 35°C, tank fluid temperature: 35°C, Fluid used: Water for AKJ 1509 / Oil; ISO VG 32 for others)
2. The cooling capacity varies depending on conditions including the room temperature, tank fluid temperature and the kinematic viscosity of the oil, etc.
External Dimension Diagram

Note: Refer to Page 5 for more details.

* For the machining dimensions of the holes for installation on the tank, refer to page 12.

The positions of the bolt holes used for installing the product on the tank top plate are compatible with the AKJ359 series, but the positions of the power supply/signal cable inlet ports are not.

AKJ189 (-B, -C, -H, -046, -047, -048)

AKJ359 (-B, -C, -H, -046, -047, -048)

AKJ569 (-B, -C, -H, -046, -047, -048)
Note: Refer to Page 5 for more details.

For the machining dimensions of the holes for installation on the tank, refer to page 12.
Example of basic installation onto tank

1. Separate the fluid tank into at least three sections. Use the overflow system and take measures so that foreign matter such as cutting chips and debris does not get into the suction line directly.
2. Arrange and locate the partition plate and piping position properly so that high-temperature fluid returned from the main machine and low-temperature fluid cooled by the Oil Cooling Unit are evenly mixed.
3. Design the tank so that the tank inside can be cleaned with ease (For instance, the tank upper plate can be removed).

4. Tank material: Stainless steel is recommended, but compatibility with the cooling fluid should be adequately considered. (Some grinding fluid tanks are made of general structural steel with the interior coated with epoxy resin.)

- Notes for manufacturing of tank

- Dimensions of installation tank (Plan view)

- Separate type

- Notes for manufacturing of tank

1. Separate the fluid tank into at least three sections. Use the overflow system and take measures so that foreign matter such as cutting chips and debris does not get into the suction line directly.
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- Dimensions of installation tank (Plan view)

- Separate type

- Notes for manufacturing of tank
Notes for manufacturing of tank

1. Separate the fluid tank into at least three sections. Use the over-flow system and take measures so that foreign matter such as cutting chips and debris does not get into the suction line directly.

2. Arrange and locate the partition plates and piping position properly so that high-temperature fluid returned from the main machine and low-temperature fluid cooled by the Oil Cooling Unit are evenly mixed.

3. Design the tank so that the tank inside can be cleaned with ease. (For instance, the tank upper plate can be removed.)

4. Tank material: Stainless steel is recommended, but compatibility with the cooling fluid should be adequately considered. (Some grinding fluid tanks are made of general structural steel with the interior coated with epoxy resin.)

Dimensions of installation tank (Plan view)

Example of basic installation onto tank

Separate type

When the depth of the tank is the “H” dimension in the figure above or less
Inline type cooling unit for coolant

The inline type unit can be installed with only piping regardless of the depth of the coolant tank. This unit also can be used for retrofitting in an existing tank. Optional models with a built-in pump are also available.

Highly accurate temperature control model by inverter control

The coolant temperature can be controlled within ±0.1°C over the entire cooling load range (from 0 to 100% load) and this helps to increase the accuracy of machine tools.

![Diagram of inline type cooling unit for coolant]

Simple monitoring of operating status

Alarm information, operation time, etc., can be monitored from a personal computer.

- This is useful for speeding up the replacement of parts that need maintenance according to the “Alarm information” readout and shortening machine down times.

- The “Operation time” is a guide to determining the replacement timing for consumables and maintenance intervals.

* Monitoring from a personal computer requires a software tool (Hybrid-Win), the communications cable and the monitor harness.

Complies with RoHS Directives such as Lead-Free (Environmentally friendly unit)

The environmental load has been reduced in conformance with the RoHS Directive by restricting hazardous substances to levels below the reference value, etc.

Easy maintenance

The evaporator coil design has been improved to give more durability against clogging. It is also easy to disassemble and clean the evaporator coil.

Greater durability against oil mist and dust

Ingress protection range for the control box is IP54 (When wired with IP54 or higher conduit tube or other protection on the wiring port.).

Ratings and specifications

Power consumption

- When testing: 1.19 kW@50 Hz, 1.13 kW@60 Hz
- When heating: 1.43 kW@50 Hz, 1.38 kW@60 Hz

Condenser temperature controller resolution

- 0.8°C

Oil cooling unit identification code

- AKC (high-accuracy inverter controlled oil cooling unit [Circulating type])

Cooling capacity

- 35°C: Cooling capacity of 3.5 kW
- 56°C: Cooling capacity of 5.6 kW

Symbol of series

- 9: “9” series
- −: “−” series

Special specifications (different voltages, with casters, etc.)

- N: (3 numerical digits), C: + (3 numerical digits), etc.

Please consult us separately about special specifications.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>9AKC-569</th>
<th>9AKC-869</th>
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</thead>
<tbody>
<tr>
<td>Machine type</td>
<td>Valve</td>
<td>Valve</td>
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<tr>
<td>Power voltage</td>
<td>200 V 50 Hz</td>
<td>200 V 60 Hz</td>
</tr>
<tr>
<td>Fluid mass</td>
<td>0.2 kg</td>
<td>0.3 kg</td>
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<tr>
<td>Fluid temperature</td>
<td>35°C</td>
<td>35°C</td>
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<tr>
<td>Fluid temperature controller resolution</td>
<td>0.8°C</td>
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<td>Condenser temperature controller resolution</td>
<td>0.8°C</td>
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</tr>
<tr>
<td>Capacity control range</td>
<td>+10% to −10%</td>
<td>+10% to −10%</td>
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<tr>
<td>Refrigerant control</td>
<td>+10% to −10%</td>
<td>+10% to −10%</td>
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<tr>
<td>Fluid temperature controller resolution</td>
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<td>35°C</td>
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</tbody>
</table>
Overview / Features

Inline type cooling unit for coolant

The inline type unit can be installed with only piping regardless of the depth of the coolant tank. This unit can also be used for retrofitting in an existing tank. Optional models with a built-in pump are also available.

Highly accurate temperature control model by inverter control

The coolant temperature can be controlled within ±0.1°C over the entire cooling load range (from 0% to 100% load) and this helps to increase the accuracy of machine tools.

Excellent energy savings

A Daikin original high efficiency IPM motor is adopted on the compressor. High energy savings are realized with inverter control technology built up through our air conditioning experience and R410A refrigerant that has high COP characteristics. (Approx. 30% energy savings compared to the 8 Series)

Complies with RoHS Directives such as Lead-Free (Environmentally friendly unit)

The environmental load has been reduced in conformity with the RoHS Directive by restricting hazardous substances to levels below the reference value, etc.

Easy maintenance

The evaporator coil design has been improved to give more durability against clogging. It is also easy to disassemble and clean the evaporator coil.

Greater durability against oil mist and dust

Ingress protection range for the control box is improved, including upgrade to IP54 and adoption of sulfur-free parts.

System Configuration

Easy retrofit into the existing tank
Evaporator improved for greater durability against clogging

Nomenclature

<table>
<thead>
<tr>
<th>Option Symbol</th>
<th>Compliance with CE</th>
<th>With heater</th>
<th>Unit with pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/H/200</td>
<td>–</td>
<td>–</td>
<td>–</td>
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</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Oil cooling unit horsepower (3 Ph)</th>
<th>1.2/3.5/4.5 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model code</td>
<td>AKC359</td>
</tr>
<tr>
<td>Max. continuous rating current</td>
<td>1.19 kW/7.2 A</td>
</tr>
<tr>
<td>Max. continuous rated temperature</td>
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<tr>
<td>Rated volume</td>
<td>1,200 × 470 × 670</td>
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<tr>
<td>Weight (With pump)</td>
<td>10/15 m</td>
</tr>
<tr>
<td>Weight (Without pump)</td>
<td>0.5 m</td>
</tr>
</tbody>
</table>

Oil cooling unit topology code

- AKC: High-accuracy inverter controlled oil cooling unit [Circulating cooling type]

Cooling capacity

35: Cooling capacity of 3.5 kW
56: Cooling capacity of 5.6 kW

Symbol of series

(9) “9” series

Nomenclature

<table>
<thead>
<tr>
<th>Symbol of option type (C/H/200)/Non-standard number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options and their combinations</td>
</tr>
<tr>
<td>Option Symbol</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>C/H/200</td>
</tr>
</tbody>
</table>

Special specifications (different voltages, with casters, etc.)

(3 numerical digits), C (C/200), H (H/200), etc.

Please consult us separately about special specifications.
Cooling Capacity Characteristic Chart

AKC359

- Fluid outlet (external pressure loss taken into account)
- Fluid inlet (external pressure loss taken into account)
- Fluid inlet temperature: Room temperature + 10°C

AKC569

- Fluid outlet (external pressure loss taken into account)
- Fluid inlet temperature: Room temperature + 10°C

Internal Pressure Loss

- Fluid outlet (external pressure loss taken into account)
- Fluid inlet temperature: Room temperature + 10°C

Flow Rate Characteristics for Models with a Pump

- Internal pressure loss included
- Minimum operating flow rate: 15 L/min or greater

Flow Rate Characteristics

- Fluid outlet: 75 mm²/s Oil
- Fluid inlet: ISO VG32

Note: Refer to Page 5 for more details.
- For the machining dimensions of the holes for installation on the tank, refer to page 12.

External Dimension Diagram
1. The ○ symbols indicate standard points. (Room temperature: 35°C, fluid temperature: 35°C, flow rate: 35 L/min, fluid used: ISO VG32)
2. The cooling capacity varies depending on the room temperature, fluid temperature, the kinematic viscosity of the fluid, etc.

**Internal Pressure Loss**
For the selection of the oil pump size and piping system, such as diameter and length of pipes, refer to the chart below. Pay attention to making the oil flow rate 15 L/min or greater.

### Cooling Capacity Characteristic Chart

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling capacity (W)</th>
<th>Fluid inlet temperature</th>
<th>Fluid outlet temperature</th>
<th>Fluid temperature</th>
<th>Kinematic viscosity</th>
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<td></td>
</tr>
</tbody>
</table>

---

**Flow Rate Characteristics for Models with a Pump**

For Models with a Pump

<table>
<thead>
<tr>
<th>Model</th>
<th>Flow rate (L/min)</th>
<th>Motor head (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKC359</td>
<td>15-60</td>
<td>1.5-12</td>
</tr>
<tr>
<td>AKC569</td>
<td>20-70</td>
<td>2.0-15</td>
</tr>
</tbody>
</table>

---

**External Dimension Diagram**

Note: Refer to Page 5 for more details.

- For the machining dimensions of the holes for installation on the tank, refer to page 2.
Optional Parts

Thermistor (Compatible with all types of Oil Cooling Unit 9 series)

-Thermistor models and applications-
When this optional part is installed in the main machine or oil piping, the thermistor detects the temperature to allow the control of oil temperature.

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Length of lead wire L (m)</th>
<th>Application (To be installed by you)</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKZ 9-OP-K5</td>
<td>5 m</td>
<td>For machine temperature synchronization control (implanted in the main machine)</td>
<td>AKJ9 Series, AKC9 Series</td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-K10</td>
<td>10 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-K15</td>
<td>15 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-A5</td>
<td>5 m</td>
<td>For machine temperature synchronization control (attached to the surface of the main machine)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-A10</td>
<td>10 m</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermistor characteristics: Resistance value ... R25 (Resistance value at 25°C) = 20 kΩ, Tolerance: ±3%

-Instruction for installation and connection-

For AKZ 9-OP-K

Rc 1/8 (To be machined on the main machine side) Drill hole φ8, 20 or more in depth
Connect to oil cooling unit X2M terminal Nos. 30 and 31.
Fill the hollow portion with silicon grease.
Recommended grease: Heat dissipating grease No. K569 made by Shin-Etsu Chemical Co., Ltd.

For AKZ 9-OP-A

The customer should prepare the cable tie and mounting screw.
Connect to oil cooling unit X2M terminal Nos. 30 and 31.
Place the sensor on the surface of the machine and cover it with putty.

Extension board for main machine communication

The following functions are enabled by mounting this option board on the Oil Cooling Unit and connecting it to the main machine:
1. The operation mode and the operation setting can be changed from the main machine.
2. The alarm code and temperature data (machine temperature, room temperature, tank fluid temperature, inverter frequency) of the Oil Cooling Unit can be read from the main machine.

-----------------------|-------|-----------------------|-----------------|----------------------
Serial communication only | AKZ9-OP-CS | Installation plate inside control box | AKJ189, AKJ359, AKJ459, AKJ569, AKJ909, AKJ1509, AKC359, AKC569 | P30400564

Note: 1. Refer to the specification sheet for the communication procedure and specifications.

Installation position for AKZ9-OP-CS (serial communication only)

- Dimensions of communication board (W × H): 40 × 50
- The communication board is secured at four positions by locking support.
Thermistor (Compatible with all types of Oil Cooling Unit 9 series)

**Thermistor models and applications**
When this optional part is installed in the main machine or oil piping, the thermistor detects the temperature to allow the control of oil temperature.

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Length of lead wire L (m)</th>
<th>Application (To be installed by you)</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKZ 9-OP-K5</td>
<td>5 m</td>
<td></td>
<td>For machine temperature synchronization control (implanted in the main machine)</td>
<td>AKJ Series, AKC Series</td>
</tr>
<tr>
<td>AKZ 9-OP-K10</td>
<td>10 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-K15</td>
<td>15 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-A5</td>
<td>5 m</td>
<td></td>
<td>For machine temperature synchronization control (attached to the surface of the main machine)</td>
<td></td>
</tr>
<tr>
<td>AKZ 9-OP-A10</td>
<td>10 m</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermistor characteristics: Resistance value ... R25 (Resistance value at 25°C) = 20 kΩ, Tolerance: ±3%

**Instruction for installation and connection**

For AKZ 9-OP-K

1. Rc 1/8 (To be machined on the main machine side) Drill hole ø8, 20 or more in depth
2. Fill the hollow portion with silicon grease
4. Connect to Oil Cooling Unit X2M Terminal box Nos. 30 and 31.
5. The operation mode and the operation setting can be changed from the main machine.
6. The alarm code and temperature data (machine temperature, room temperature, tank fluid temperature, inverter frequency) of the Oil Cooling Unit can be read from the main machine.

For AKZ 9-OP-A

1. The customer should prepare the cable tie and mounting screw
2. Connect to oil cooling unit X2M terminal box Nos. 30 and 31.
3. Place the sensor on the surface of the machine and cover it with putty.

**Installation positions of the thermistors for machine temperature synchronization.**

The following functions are enabled by mounting this option board on the Oil Cooling Unit and connecting it to the main machine:
1. The operation mode and the operation setting can be changed from the main machine.
2. The alarm code and temperature data (machine temperature, room temperature, tank fluid temperature, inverter frequency) of the Oil Cooling Unit can be read from the main machine.

**Extension board for main machine communication**

The following functions are enabled by mounting this option board on the Oil Cooling Unit and connecting it to the main machine:

- Connect to Oil Cooling Unit X2M Terminal box Nos. 30 and 31.
- Dimensions of communication board (W × H): 40 × 50
- The communication board is secured at four positions by locking support.
Complementary Information

Part Names, Functions and Operation of Control Panel

**NO.** | **Item** | **Description**
---|---|---
1 | Power lamp (Green) | The lamp is continuously on while power is supplied.
2 | Error warning lamp (Red) | When an error occurs:
  - Level 1 alarm: The lamp is blinking.
  - Level 2 alarm: The lamp is turned on.
3 | Warning lamp (Green) | When a warning occurs:
  - Level 1 warning: The lamp is blinking.
  - Level 2 warning: The lamp is turned on.
4 | Timer mode lamp (Red) | The lamp keeps blinking while the machine is at a stop in the timer mode.
5 | Operation mode display | Displays the mode of the control panel:
  - NORMAL: Normal mode
  - SETTING: Operation setting mode
  - TIMER: Timer setting mode
6 | Operation mode / Data No. display | Displays the current operation mode (normal mode), operation setting mode, or data number of the data currently displayed on the data display.
7 | Data [SELECT] Select key | Selects the operation mode.
8 | [DOWN] key | Decreases the value of the operation mode, data number or data by 1.
9 | [UP] key | Increments the value of the operation mode, data number or data by 1.
10 | [ENT] (Confirm) key | Determines the operation mode, data number, and data to be changed.

### Operation for change to each mode

A mode can be changed by operating the [SELECT] key in general. To enter a special mode, hold down a number of keys in combination for more than five seconds.

#### Changing the Operation Mode

1. **Turn on the power**
2. **Hold down for more than five seconds.**
3. **Operation lock mode**
4. **Normal mode**
5. **Operation setting mode**
6. **Timer setting mode**
7. **Auto tuning mode**
8. **Monitor mode**
9. **Parameter setting mode**

**CAUTION**

- The default setting is “operation lock mode”.
- To start operation, perform the unlocking operation as shown above.
- The default settings for a standard machine are:
  - **AKJ9 SERIES**: Tank liquid temperature, room temperature synchronization control
  - **AKC9 SERIES**: Room temperature synchronization, inlet fluid temperature control

**Temperature difference: 0.0 (K)**

### Setting procedure

#### Default setting: Set to operation mode 3, and a temperature of "0.0 °C"

When you use your machine at a setting other than the default setting, change the setting following the procedure shown below.

1. **Power ON**
2. **Release the operation lock mode before starting operation for the first time.** (Hold down the [SELECT] keys together for at least 5 seconds.)
3. **Select the "SETTING" operation setting mode (press the [SELECT] key once).**

#### Checking Data in the Monitor Mode

The following data can be checked in the monitor mode.

**Note:** Refer to Page 17 for details of required optional parts.

<table>
<thead>
<tr>
<th>NO.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operation Mode No.</td>
<td>Operation mode 3: Room temperature synchronization, inlet fluid temperature control</td>
</tr>
<tr>
<td>2</td>
<td>Description</td>
<td>Tank liquid temperature, room temperature synchronization control</td>
</tr>
<tr>
<td>3</td>
<td>Necessary optional part</td>
<td>Machine synchronization thermostat</td>
</tr>
</tbody>
</table>

### Setting temperature range

- **0**: Machine body temperature (Th1)
- **1**: Outlet fluid temperature (Th2)
- **2**: Room temperature (Th4)
- **3**: Tank fluid temperature (Th5)
- **4**: Intake gas temperature (Th6)

**Note:**

- *1*: If the thermometer is not connected or has a broken wire, -99.9 °C is displayed.
- *2*: With the default setting, 0 °C is displayed. Note that display is enabled when parameter NO. 1602 is "1" or the optional communication extension board is installed.
- *3*: This is the roughly calculated value with a power supply voltage of 230 V (the error is approximately 20%).

### Operation Mode and Setting Method

<table>
<thead>
<tr>
<th>AKJ9 Series</th>
<th>Operation Mode No.</th>
<th>Mode name</th>
<th>Description</th>
<th>Setting temperature range</th>
<th>Necessary optional part</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Inlet fluid temperature, fixed temperature control</td>
<td>Maintains the inlet fluid at a fixed temperature within the preset temperature range.</td>
<td>5 to 99 °C</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Outlet fluid temperature, machine synchronization control</td>
<td>Synchronizes the outlet fluid temperature with the room temperature</td>
<td>Room temperature -9.9 to +99.9 (K)</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Inlet fluid temperature, machine synchronization control</td>
<td>Synchronizes the inlet fluid temperature with the room temperature</td>
<td>Room temperature -9.9 to +99.9 (K)</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AKC9 Series</th>
<th>Operation Mode No.</th>
<th>Mode name</th>
<th>Description</th>
<th>Setting temperature range</th>
<th>Necessary optional part</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Inlet fluid temperature, fixed temperature control</td>
<td>Maintains the inlet fluid at a fixed temperature within the preset temperature range.</td>
<td>5 to 99 °C</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Outlet fluid temperature, fixed temperature control</td>
<td>Maintains the outlet fluid at a fixed temperature within the preset temperature range.</td>
<td>5 to 99 °C</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Inlet fluid temperature, room temperature synchronization control</td>
<td>Synchronizes the inlet fluid temperature with the room temperature</td>
<td>Room temperature -9.9 to +99.9 (K)</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Outlet fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the outlet fluid temperature with the machine temperature</td>
<td>Machine temperature -9.9 to +99.9 (K)</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Inlet fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the inlet fluid temperature with the machine temperature</td>
<td>Machine temperature -9.9 to +99.9 (K)</td>
<td>Machine synchronization thermostat</td>
<td></td>
</tr>
</tbody>
</table>
Complementary Information

Part Names, Functions and Operation of Control Panel

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power lamp (Green)</td>
<td>The lamp is continuously on while power is supplied.</td>
</tr>
<tr>
<td>2</td>
<td>Error warning lamp (Red)</td>
<td>Level 1 alarm: The lamp keeps blinking. Level 2 alarm: The lamp is turned on.</td>
</tr>
<tr>
<td>3</td>
<td>Warning lamp (Green)</td>
<td>Level 1 warning: The lamp keeps blinking. Level 2 warning: The lamp is turned on.</td>
</tr>
<tr>
<td>4</td>
<td>Timer mode lamp (Red)</td>
<td>The lamp keeps blinking while the machine is at a stop in the timer mode.</td>
</tr>
<tr>
<td>5</td>
<td>Operation mode display</td>
<td>Displays the mode of the control panel: NORMAL: Normal mode, MONITOR: Monitor mode.</td>
</tr>
<tr>
<td>6</td>
<td>Operation mode / Data No. display</td>
<td>Displays the current operation mode (normal mode / operation setting mode) or data number of the data currently displayed on the data display.</td>
</tr>
<tr>
<td>7</td>
<td>[SELECT] Select key</td>
<td>Selects the operation mode.</td>
</tr>
<tr>
<td>8</td>
<td>[DOWN] key</td>
<td>Decreases the value of the operation mode, data number or data by 1. When held for two seconds or longer, decreases the values by 10.</td>
</tr>
<tr>
<td>9</td>
<td>[UP] key</td>
<td>Increases the value of the operation mode, data number or data by 1. When held for two seconds or longer, increases the values by 10.</td>
</tr>
<tr>
<td>10</td>
<td>[ENT] (Confirm) key</td>
<td>Determines the operation mode, data number, and data to be changed.</td>
</tr>
</tbody>
</table>

Operation mode for change to each mode

A mode can be changed by operating the [SELECT] key in general. To enter a special mode, hold down a number of keys in combination for more than five seconds.

Operation lock mode

Hold down for more than five seconds.

Normal mode

Hold down for more than five seconds.

Operation setting mode

Hold down for more than five seconds.

Timer setting mode

Hold down for more than five seconds.

Auto tuning mode

Hold down for more than five seconds.

Parameter setting mode

Hold down for more than five seconds.

Complementary Information

Operation Mode and Setting Method

AKJ9 Series

<table>
<thead>
<tr>
<th>Operation Mode No.</th>
<th>Mode name</th>
<th>Description</th>
<th>Setting temperature range</th>
<th>Necessary optional part</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
<td>Maintains the tank fluid at a fixed temperature</td>
<td>5 to 90° C</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Set fluid temperature, fixed temperature control</td>
<td>Maintains the tank fluid at a fixed temperature</td>
<td>5 to 90° C</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Tank fluid temperature, room temperature synchronization control</td>
<td>Synchronizes the tank fluid temperature with the room temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Inlet fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the inlet fluid temperature with the machine temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Outlet fluid temperature, room temperature synchronization control</td>
<td>Synchronizes the outlet fluid temperature with the room temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Output fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the outlet fluid temperature with the machine temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Outlet fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the outlet fluid temperature with the machine temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
</tbody>
</table>

AKC9 Series

<table>
<thead>
<tr>
<th>Operation Mode No.</th>
<th>Mode name</th>
<th>Description</th>
<th>Setting temperature range</th>
<th>Necessary optional part</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
<td>Maintains the tank fluid at a fixed temperature</td>
<td>5 to 90° C</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Set fluid temperature, fixed temperature control</td>
<td>Maintains the tank fluid at a fixed temperature</td>
<td>5 to 90° C</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Tank fluid temperature, room temperature synchronization control</td>
<td>Synchronizes the tank fluid temperature with the room temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Inlet fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the inlet fluid temperature with the machine temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Outlet fluid temperature, machine temperature synchronization control</td>
<td>Synchronizes the outlet fluid temperature with the machine temperature</td>
<td>Room temperature: -9.9 to +9.9 (°C)</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Inlet fluid temperature, fixed temperature control</td>
<td>Maintains the inlet fluid at a fixed temperature</td>
<td>5 to 90° C</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Outlet fluid temperature, fixed temperature control</td>
<td>Maintains the outlet fluid at a fixed temperature</td>
<td>5 to 90° C</td>
<td>-</td>
</tr>
</tbody>
</table>

Setting procedure

Default setting: Set to operation mode 3, and a temperature of '0.0' °C

When you use your machine at a setting other than the default setting, change the setting following the procedure shown below.

1. Power ON
   Release the operation lock mode before starting operation for the first time. (Hold down the [SELECT] key for at least 5 seconds.)

2. Select the "SETTING" operation setting mode (press the [SELECT] key once).

3. Return to the "NORMAL" mode by pressing the [SELECT] key three times.

4. Hold down the [UP] and [DOWN] keys together for at least 5 seconds.

Checking Data in the Monitor Mode

The following data can be checked in the monitor mode.

<table>
<thead>
<tr>
<th>Monitor No.</th>
<th>AKJ9</th>
<th>Description</th>
<th>AKC9</th>
<th>Description</th>
<th>Note</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Machine body temperature (°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Inlet fluid temperature (°C)</td>
<td></td>
<td>Outlet fluid temperature (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Room temperature (°C)</td>
<td></td>
<td>Room temperature (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Tank fluid temperature (°C)</td>
<td></td>
<td>Inlet fluid temperature (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Outlet fluid temperature (°C)</td>
<td></td>
<td>Outlet fluid temperature (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Tank liquid temperature (°C)</td>
<td></td>
<td>Room temperature (°C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\Delta T$ [Th1 - Th2]  $\Delta T$ [Th2 - Th3]  $\Delta T$ [Th3 - Th4]

*1. If the thermistor is not connected or has a broken wire, -99.9 is displayed.
*2. With the default setting, 0 is displayed. Note that display is enabled when parameter n020 is "1" or the optional communication extension board is installed.
*3. This is the roughly calculated value with a power supply voltage of 230 V (the error is approximately 20%).
[Complementary Information]

**Electric Wiring Connection Instruction Diagram**

1. **Power supply capacity:**
   - Power supply capacity ... Power supply capacity ...
   - Refer to the maximum power consumption/current consumption panel of the specification list (Pages 5, 6 and 14).

2. **Connection to power supply terminal block (X1M, Tr):**
   - (1) AKJ + K9: With the standard and optional (C, H, -046) types.
     - Connect to X1M.
   - (2) AKJ + K9: With the “with breaker” (B) specifications.
     - AKC + K9: All models.
     - Connect to the breaker.
   - (3) AKJ + K9: With different voltage types (with transformer: -047, -048).
     - Connect to the terminal block supplied with the transformer.

3. **Screw terminal and wiring diameter:**
   - Use stranded wires for electric connection.

4. **Agitator operation (NO contact):**
   - Error level (“a” contact)
   - Normal (“a” contact)

5. **Signal output:**
   - Straight pin terminals
   - APA-1.25N (Daido Solderless Terminal)

6. **AKJ 189, 359, 459, 569**
   - Signal output time chart
   - MR30Y
   - MR30X
   - CAUTION:
     - 3. Before opening the electric component box, always turn off the power,
     - 2. Always ground the machine. Since a noise filter is installed, there is a
     - risk of electrical shock without proper grounding.
     - 3. Before opening the electric component box, always turn off the power,
     - and wait for 5 minutes until internal high voltage has been discharged.
     - 4. Do not energize the equipment with the electric component box kept
     - open.

7. **DANGER:**
   - Always install an all-pole (3-pole) circuit breaker* (to be prepared by the
   - customer) of the specified capacity on the main power supply.
   - * All contact diameters must be at least 5 mm.
   - Always ground the machine. Since a noise filter is installed, there is a
   - risk of electrical shock without proper grounding.
   - Connect to this terminal

8. **Notes for Handling:**
   - Important notes to be observed regarding the main machine side (machine tools and industrial machinery)
     - 1. When rough transport conditions are expected while transporting the machine overseas or elsewhere, special precautions should be taken
     - in the packaging and transportation method so as to avoid the application of excessive force on the oil cooling unit (this unit).
     - 2. Oil Cooling Unit (this machine) does not incorporate a flow switch for checking the oil supply and a temperature switch for abnormal
     - supply of oil temperature (high temperature or low temperature). So, please provide a protection device such as a flow.
   - Notes for operation and cooling capacity
     - 1. Do not use the oil cooling unit to cool a fluid from 50°C or higher. Start to operate the oil cooling unit at the same time as the main
     - machine or before the fluid temperature rises to 40°C.
     - 2. Do not place an object that hinders ventilation within 500 mm of the air-intake or exhaust.
     - 3. If the air filter is clogged, the cooling capacity is reduced. Clean the air filter (wash with hot water or clean with air) periodically
     - once every two weeks to prevent clogging.
     - 4. If cutting chips and powder-like chips deposit on and adhere to the cooling coil (evaporator) in the AK93 series, the cooling
     - capacity should be diminished and it could cause failure. To avoid the adherence of deposits on the cooling coil, install an efficient
     - return filter on the return side (fluid inlet of the tank and periodically clean the tank inside.
   - Notes regarding fluid usable with Oil Cooling Unit
     - 1. The fluid usable with the oil cooling unit is listed in the table below for each series. (* symbol … Can be used, “Unusable” symbol … Cannot be used)
     - 2. Do not use fluid listed below as “unusable”
## Electric Wiring Connection Instruction Diagram

### Power supply capacity
- Refer to the maximum power consumption/current consumption panel of the specifications list (Pages 5, 6 and 14).

### Connection to power supply terminal block (X1M, Tr)
1. **AKJ9, X31, X32, X58, X59, X63, X64**
   - Screw terminal and wiring diameter

### Connection to signal terminal block (X2M)
1. Screw terminal and wiring diameter
2. Use a round crimp-style terminal for connection.
3. Use a straight crimp-style terminal for connection.

### Signal output time chart

#### (1) Alarm/operation status output chart

<table>
<thead>
<tr>
<th>Signal status</th>
<th>Description</th>
<th>Normal</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td></td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

#### (2) Warning output chart

<table>
<thead>
<tr>
<th>Waring output</th>
<th>Description</th>
<th>Normal</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

### Notes for Handling

#### Complementary Information
- **Alarm/operation status output chart**
- **Use a round crimp-style terminal for connection.**
- **Use a straight crimp-style terminal for connection.**
- **Recommended models and manufacturers:** TGN TC-1.25-9T (NICHIFU Co., Ltd.)
- **The wiring size is 0.5 mm².**

#### Important notes to be observed regarding the main machine side (machine tools and industrial machinery)

#### Notes for operation and cooling capacity

1. Do not use the oil cooling unit to cool a fluid from 50°C or higher. Start to operate the oil cooling unit at the same time as the main machine or before the fluid temperature rises to 40°C.
2. Do not place an object that hinders ventilation within 500 mm of the air-intake or exhaust.
3. If the air filter is clogged, the cooling capacity is reduced. Clean the air filter (wash with hot water or clean with air) periodically once every two weeks to prevent clogging.
4. If cutting chips and powder-like chips deposit on and adhere to the cooling coil (evaporator) in the AKJ9 series, the cooling capacity should be diminished and it could cause failure. To avoid the adherence of deposits on the cooling coil, install an efficient return filter on the return side (fluid inlet) of the tank and periodically clean the tank inside.

#### Notes regarding fluid usable with Oil Cooling Unit

1. The fluid usable with the oil cooling unit is listed in the table below for each series. (‘+’ symbol … Can be used, “Unusable” symbol … Cannot be used)
2. Do not use fluid listed below as “unusable”:

- **Lubrication oil**
- **Mineral hydraulic oil**
- **Nonflammable hydraulic oil**
- **Chlorinated hydrocarbon series**
- **Water - Glycol series**
- **Non water-soluble cutting and grinding oil**
- **Ethylene glycol (Antifreeze liquid)**
- **Water (Industrial water)**
- **Inflammable liquid like fuel**
- **Drugs**
- **Liquid for food products**

- **Desirable**
- **Unusable**
In this case of cooling of cutting and grinding fluid

1. The amount of heat generation from the cutting and grinding fluid system should be roughly estimated according to the following formula as the tank capacity and pump flow rate are generally large. After a rough estimation, the amount of heat generation should be determined by conducting tests on the actual machine to select the oil cooling unit.

2. Formula for rough calculation of amount of heat generation

\[ Q = Q_1 + Q_2 + Q_3 \]

- **Q**: Heat load of the entire machine tool system
- **Q1**: Amount of heat generated during machining on a machine tool
- **Q2**: Amount of heat generation of the pump motor for coolant pump (Amount of heat transferred to coolant)
- **Q3**: Heat balance of the coolant fluid passing through the coolant tank and the room temperature

\[ Q_1 = \eta \cdot Q \]

\[ Q_2 = \frac{2.2 + 2.2 + 3.7}{1000} = 1.2 \text{ kW} \]

\[ Q_3 = \frac{20 \times 4 \times (35 - 25) \times 1000}{1000} = 8 \text{ kW} \]

\[ Q_3 = 2.778 \times 10^{-7} C_p \gamma \Delta T \]

- **Cp**: Constant pressure specific heat (J/kg°C)
- **\gamma**: Weight volume ratio (kg/m³)
- **V**: Total oil volume (m³)
- **\Delta T**: Temperature difference (°C)

3. For testing, determine the amount of heat generation according to the method shown below.

**Guidelines of Hydraulic System**

- **K**: Heat load of the entire machine tool system

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\[ Q = \frac{\gamma \cdot V \cdot \Delta T}{(\text{room temperature} - \text{ambient temperature})} \]

- **\Delta T**: Temperature difference (°C)
- **\eta**: Heat transfer efficiency

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Method of Selection of Oil Cooling Unit

Complementary Information

1. General instructions
   - Use the product only in accordance with the intended specifications (specified in brochure, specification sheet, operation manual, and caution plates).
   - Never operate the equipment in an explosive atmosphere.
   - Do not disassemble, repair or modify the equipment by yourself.
   - Always comply with the laws and regulations for safety (Industrial Safety and Health Law, Fire Defense Law, and JIS B 8361 Guidelines of Hydraulic System).
   - Caution in the event of refrigerant leak
     - Ventilate the room adequately (to avoid the risk of suffocation).
     - Avoid direct contact of the refrigerant with skin (to avoid the risk of cryogenic burns).
   - In the event of evaporation of a great deal of refrigerant, contact with skin, or refrigerant in the eye, seek medical attention immediately.
   - In the event of an abnormal condition, stop operation promptly, investigate the cause of the problem and take appropriate remedial measures.
   - Do not use the unit in atypical environments (locations subject to high temperatures, high humidity, or a lot of dust, contamination, steam, oil or corrosive gases: H2S, SO2, NOx or Cl2).
   - Install a flow switch and temperature switch on the main machine to protect the main shaft and others.
   - Do not go on the equipment or place an object on the equipment.
   - When hoisting the equipment, check its weight and use the eye plates and hangers on the equipment properly.
   - Do not get in the way of the equipment while it is being hoisted and moved.
   - When storing the equipment, take appropriate measures for fall prevention.
   - Do not tilt the equipment 30 degrees or more while transporting the equipment (including during storage).
   - Clean the cooling coil periodically to ensure that there is no accumulation/adhesion of chips, etc. (For AKJ)
   - Clean the air filter periodically (once every two weeks in general).
   - Install the equipment in accordance with the standard by checking the electric schematic diagram.
   - Wiring and piping installation should be performed by a person with specialized knowledge and skills.
   - Install the wiring on a rigid, level foundation and secure it appropriately.
   - Do not get in the way of the equipment while it is being hoisted and moved.
   - When removing the equipment, take appropriate measures for fall prevention.
   - Install the equipment on a rigid, level foundation and secure it appropriately.
   - Do not splash water or fluid on the equipment.
   - Avoid direct contact of the refrigerant with skin (to avoid the risk of cryogenic burns).
   - Always comply with the laws and regulations for safety (Industrial Safety and Health Law, Fire Defense Law, and JIS B 8361 Guidelines of Hydraulic System).
   - In the event of inhalation of a great deal of refrigerant, contact with skin, or refrigerant in the eye, seek medical attention immediately.

2. Instructions for installation
   - Install the equipment on a rigid, level foundation and secure it appropriately.
   - Do not place an object near the suction port and discharge port of the equipment.
   - Install the wiring in accordance with the standard by checking the electric schematic diagram.
   - Wiring and piping installation should be performed by a person with specialized knowledge and skills.
   - Always use a commercial power supply for the power source. (The use of an inverter power supply may cause burns damage.)
   - Connect the wiring for power supply in accordance with the electric wiring instruction-diagram of the specification sheet and operation manual.
   - Ground the equipment properly.
   - Install the wiring in accordance with the standard by checking the electric schematic diagram.
   - Always install a dedicated breaker (all-pole / 3-pole / molded case breaker) appropriate for the capacity of the Oil Cooling Unit on the main power supply on site.
   - Check that piping for coolant has a pressure resistance of at least 1 MPa and make proper connections. (For AKC)
   - Check that cooling coil periodically to ensure that there is no accumulation/adhesion of chips, etc. (For AKC)

3. Instructions for wiring and piping installation
   - Check to see that the main machine is in a safe status (not activated) before starting the trial run.
   - Check to see that the fluid piping and electric wiring are correctly connected to the main machine and that there is no looseness in connections and joints.
   - Disable the operation lock of the equipment (Oil Cooling Unit) before starting the main machine.
   - Check that the tank contains the correct volume of the fluid used. (For AKJ)
   - Check that the fluid piping system contains the required amount of fluid, and that the piping is not blocked part way through. (For AKJ)
   - Do not splash water or fluid on the equipment.
   - Do not push your finger or any object into gaps of the equipment.
   - Do not touch the heated exhaust port of the equipment.
   - Perform maintenance and inspection with the equipment kept open. Working in a closed status may result in suffocation due to the lack of refrigerant.
   - Always turn off the main power supply before starting maintenance and inspection.
   - Wait for five minutes after turning off the main power supply and start maintenance and inspection operation.
   - Do not perform maintenance and inspection operation within 30 minutes after turning off the main power supply.
   - Wear protective gear such as gloves and an eye protector when performing maintenance, inspection and cleaning.
   - Clean the air filter periodically (once every two weeks in general).
   - Clean the cooling coil periodically to ensure that there is no accumulation/adhesion of chips, etc. (For AKJ)

4. Instructions for trial run
   - Machining center
     - Find the maximum gradient of the fluid temperature rise.
     - To do this, it is necessary to measure ∆T every minute during the first 10 minutes.
     - Q = 2,778 × 10^4CpρV + ∆T/H
     - Q : Heat release value (kW)
     - Cp : Constant pressure specific heat (J/kg°C) ⋅ 1967.4 J/kg°C
     - ρ : Weight volume ratio (kg/m^3) ⋅ 876 mg/m^3
     - V : Total oil quantity (m^3)
     - ∆T : Temperature difference (°C) ⋅ 1°C
     - H : Time (h)
     - E.g.) When the total oil volume is 300 L (0.3 m^3) and “∆T” is 10°C.
     - Q = 2,778 × 10^4 × 1967.4 × 876 × 0.3 × 10·0.479 × 0.3 × 10 = 1.4 kW

5. Instructions for maintenance and inspection
   - Perform maintenance and inspection with the equipment kept open. Working in a closed status may result in suffocation due to the lack of refrigerant.
   - Always turn off the main power supply before starting maintenance and inspection.
   - Wait for five minutes after turning off the main power supply and start maintenance and inspection operation.
   - Do not operate the equipment with the cover of the equipment opened.
   - Wear protective gear such as gloves and an eye protector when performing maintenance, inspection and cleaning.
   - Clean the air filter periodically (once every two weeks in general).
   - Clean the cooling coil periodically to ensure that there is no accumulation/adhesion of chips, etc. (For AKJ)

Method:Estimating the amount of heat generation from the rate of increase of the fluid temperature in the tank

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     - Q3 : Heat balance of the coolant fluid passing through the coolant tank and the room temperature
   - Q3 = K A ∆T
     - K : Rate of heat passage (W/m²°C), generally K = 11.6 to 23.2
     - A : Surface area of the tank in contact with the fluid (m²)
     - ∆T : Room temperature – controlled temperature of fluid in tank (°C)

3. For testing, determine the amount of heat generation according to the method shown below.

   - General guide for heat generation
     - Machining center
       - Find the maximum gradient of the fluid temperature rise. (To do this, it is necessary to measure ∆T every minute during the first 10 minutes.)
       - Q = 2,778 × 10^4CpρV + ∆T/H
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Overseas service network

Please contact Daikin Sales Counter for servicing of Oil Cooling Unit in countries outside Japan. Daikin is ready to offer you service in conjunction with the sales agents of our Air-conditioning and Hydraulic Divisions located in seven countries and regions worldwide.

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<tr>
<th>Country/Region</th>
<th>Locations</th>
<th>Company name</th>
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<td>Shanghai</td>
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<td>Daikin Air Conditioning India Pvt. Ltd. (Delhi Branch)</td>
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<td>All World Machinery</td>
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