DAIKIN

AKJ9/AKJ9W SERIES Immersion type

AKC9 SERIES Circulation type

OIL COOLING UNIT

AKJ/AKJ-W AKC 9 SERIES

Exhaust-heat-free oil cooling unit Debuts







AKJ9 SERIES [Immersion Type]

AKJ9W SERIES [Immersion Type] Water cooled condenser type

AKC9 SERIES [Circulation Type]

INDEX

AKJ9 Series (Immersion Type)

Overview / Features / Applications	Pages 1 and 2
System Diagram Nomenclature	Pages 3 and 4
Specifications / Operating Range	Pages 5 and 6
Cooling Capacity Characteristic Chart	Pages 7 and 8
External Dimension Diagram	Pages 9 to 11
Installation Dimension Diagram	Page 12

AKJ9W Series (Immersion Type / Water cooled condenser type)

Overview / Features	Page 13
Nomenclature / Specifications	Page 14
Cooling Capacity Characteristic Chart / Operating Range / Notes on Installation and Handling	Page 15
External Dimension Diagram	Page 16

AKC9 Series (Circulation Type)

Overview / Features	Page 17
System Configuration / Nomenclature	Page 18
Specifications / Cooling Capacity Characteristic Charts / In-machine Pressure Losses / Flow Rate Characteristics for Models with a Pump	Pages 19 and 20
External Dimension Diagram	Page 21

Optional Parts

Thermistor	Page 23
Option Board for Communication (Serial Communication)	Page 24

Supplementary Information

Control Panel Operation Mode and Setting Method	Pages 25 and 26
Electric Wiring Diagram	Pages 27 to 29
Electric Wiring Connection Instruction Diagram	Page 30
Notes for Handling	Pages 31 and 32
Method of Selection Table of History	Pages 33 and 34
Service Network	Pages 35 and 36
Revised F-Gas Law in Japan	Page 37

DAIKIN INDUSTRIES, LTD.
Oil Hydraulic Division
Oil Hydraulic Equipment

9 AKJ SERIES | Immersion type |

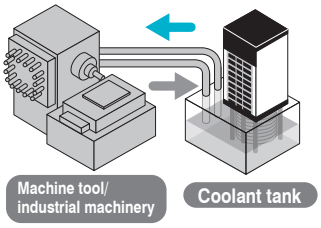
Overview / Features



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.



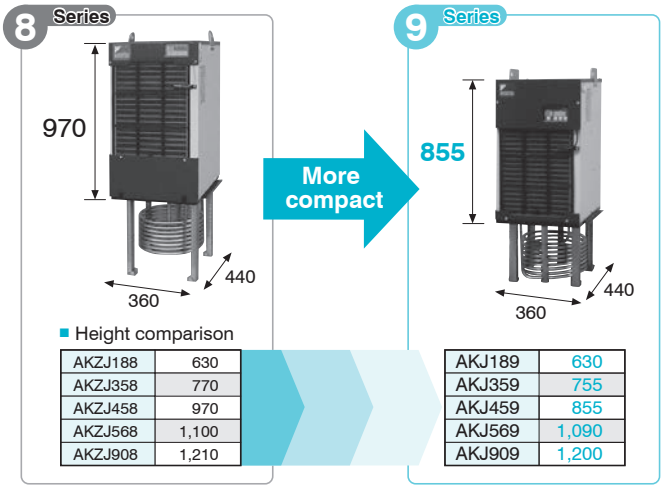
Highly accurate temperature control by inverter controlled compressor

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 the industry's top-class compact design

Installation compatibility with conventional products is secured.

* Comparison in the AKJ459 class (units: mm)



■ Height comparison

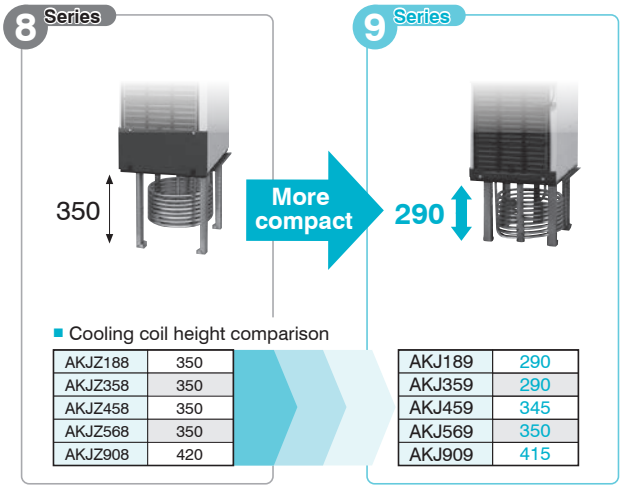
AKZJ188	630
AKZJ358	770
AKZJ458	970
AKZJ568	1,100
AKZJ908	1,210

AKJ189	630
AKJ359	755
AKJ459	855
AKJ569	1,090
AKJ909	1,200

Enhanced support for shallow tanks with reduced cooling coil depth

The cooling capacity is equivalent to that of conventional products.

* Comparison in the AKJ359 class (units: mm)



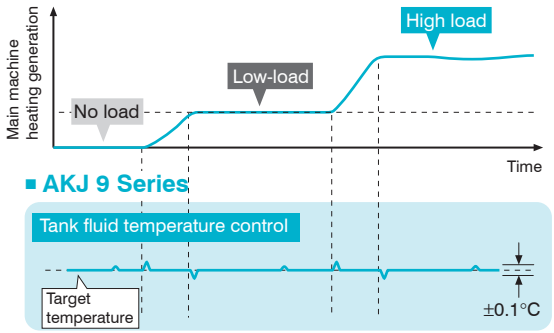
■ Cooling coil height comparison

AKJZ188	350
AKJZ358	350
AKJZ458	350
AKJZ568	350
AKJZ908	420

AKJ189	290
AKJ359	290
AKJ459	345
AKJ569	350
AKJ909	415

Extension of cooling capacity control range

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



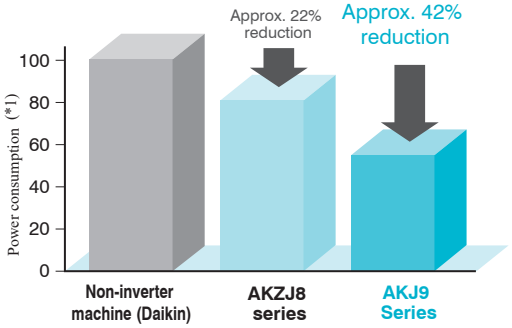
Note: Pattern diagram with the heating load stabilized at 0 - 100%

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 taking 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

- Specifications for permissible transport vibration have been extended in the low-frequency range, which is commonly encountered during actual transportation.

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

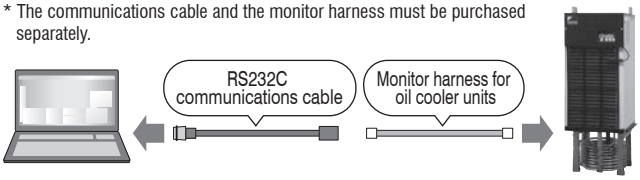
Step 1 Autonomous compensation of overloaded operation
Step 2 Notifying the customer about inspection/maintenance by issuing a warning
Step 3 Continuing operation in an emergency mode, if operation is possible by restricting some functions and specifications

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 (https://www.daikinpmc.com/en/) after registering as a member.

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



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.

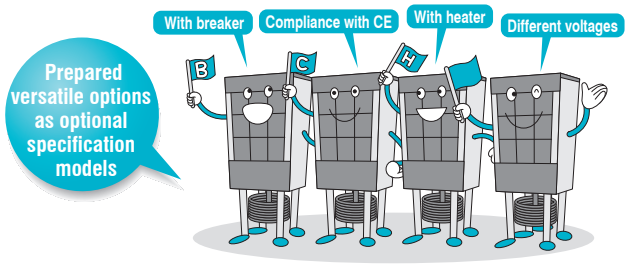
999-hour timer function (ON timer)

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

Reduced environmental load

- Complies with environmental regulations, 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



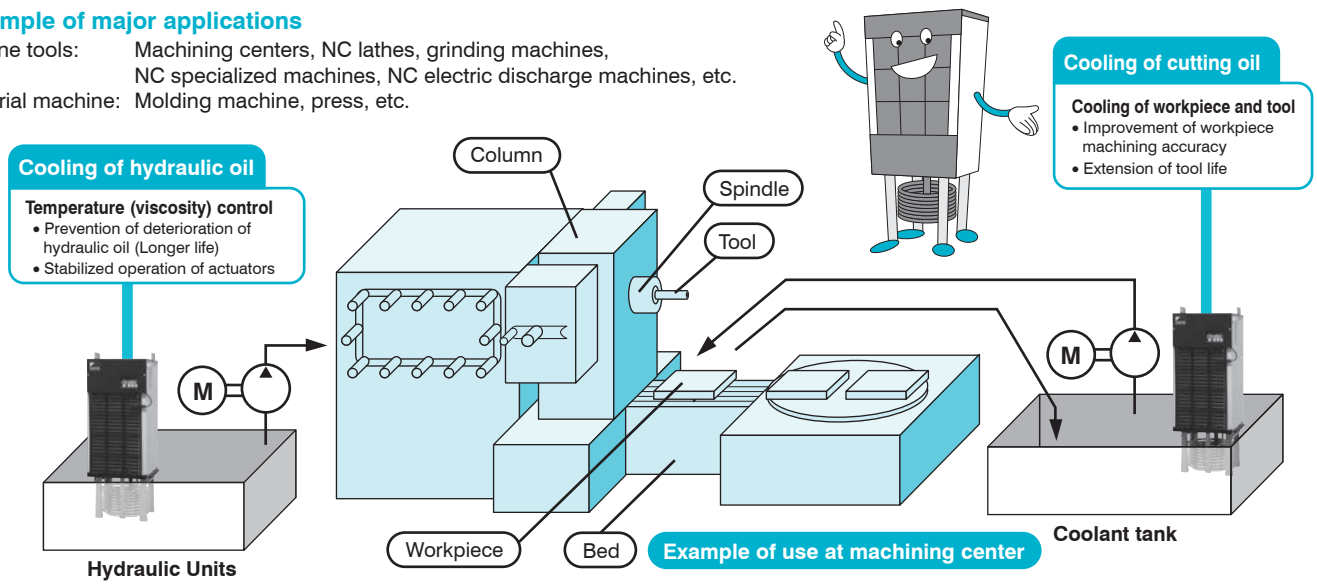
Different voltage specifications (-046, -047, -048)

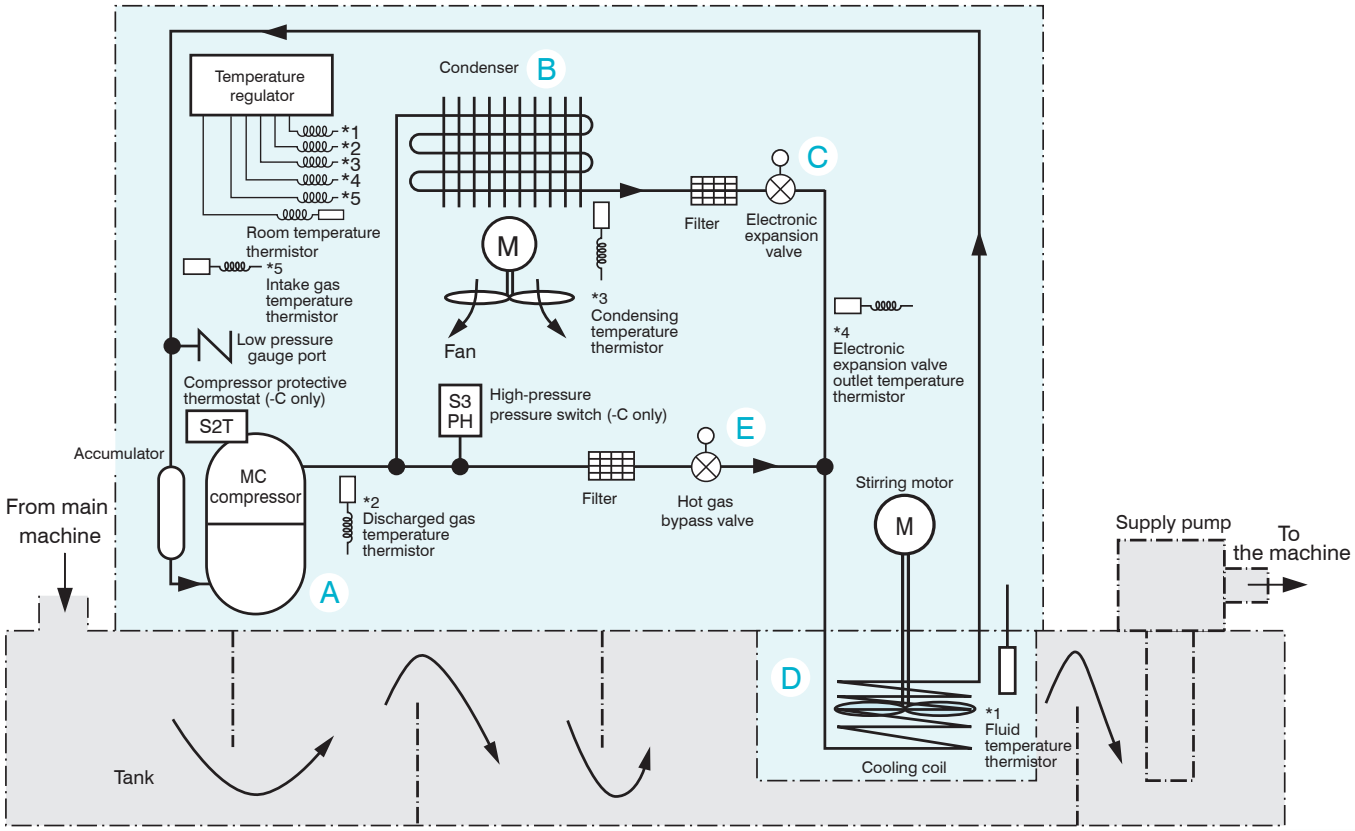
- The AC 230 V system (–046) has no transformer, while the AC 400 V (–047) and AC 480 V systems (–048) incorporate a transformer inside the product. The installation dimensions and footprint are the same as for the standard models.

Applications

Example of major applications

Machine tools: Machining centers, NC lathes, grinding machines, NC specialized machines, NC electric discharge machines, etc.
Industrial machine: Molding machine, press, etc.





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.

■ 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 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 by throttling it so that it can be easily evaporated in a cooling coil.

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.



AKJ	※※	9	–	※※※
1	2	3	4	

1 Oil cooling unit identification code

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

2 Cooling capacity (kW)

18：Cooling capacity 1.8 kW
35：Cooling capacity 3.5 kW
45：Cooling capacity 4.5 kW
56：Cooling capacity 5.6 kW
90：Cooling capacity 9.0 kW
150：Cooling capacity 15.0 kW

3 Symbol of series (Symbol to represent model change)

9: "9" series

4 Option Symbol

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

Special specifications

-※※※ (3-digit number), C※※※ (3-digit number), etc.
Please consult us about detailed information.

■ Options and their combinations

■ AKJ9 (Immersion type)

Option Symbol	With breaker	Compliance with CE	With heater	Different voltage type (1)	Different voltage type (2)	Different voltage type (3)
–B	✓	–	–	–	–	–
–C	–	✓	–	–	–	–
–H	–	–	✓	–	–	–
–046	–	–	–	✓	–	–
–047	✓	–	–	–	✓	–
–048	✓	–	–	–	–	✓
–BC	✓	✓	–	–	–	–
–BH	✓	–	✓	–	–	–
–CH	–	✓	✓	–	–	–
–BCH	✓	✓	✓	–	–	–
–001	✓	–	–	✓	–	–
–002	–	✓	–	✓	–	–
–003	–	–	✓	✓	–	–
–005	✓	✓	–	✓	–	–
–006	✓	–	✓	✓	–	–
–008	–	✓	✓	✓	–	–
–011	✓	✓	✓	✓	–	–
–017	✓	✓	–	–	✓	–
–018	✓	–	✓	–	✓	–
–023	✓	✓	✓	–	✓	–
–032	✓	✓	–	–	–	✓
–033	✓	–	✓	–	–	✓
–038	✓	✓	✓	–	–	✓

Different voltage type (1) Without transformer AC 220, 230 V 50/60 Hz
Different voltage type (2) With transformer AC 380, 400, 415 V 50/60 Hz, With breaker
Different voltage type (3) With transformer AC 440, 460, 480 V 50/60 Hz, With breaker

AKJ189, AKJ359, AKJ459

Oil cooling unit horsepower (HP)			0.5					1.2					1.5				
Model name			AKJ189					AKJ359					AKJ459				
			Standard	–B	–C	–H	Different voltage specifications*3	Standard	–B	–C	–H	Different voltage specifications*3	Standard	–B	–C	–H	Different voltage specifications*3
Cooling capacity (50/60 Hz)*1		kW	1.6/1.8					3.2/3.5					4.2/4.5				
Heater		kW	–			1	–	–			1	–	–			1	–
Supply power*2			Three-phase 200/200•220 VAC 50/60 Hz				*3	Three-phase 200/200•220 VAC 50/60 Hz				*3	Three-phase 200/200•220 VAC 50/60 Hz				*3
Power voltage	Main circuit																
	Operating circuit		DC12/24 V														
Maximum power consumption/ maximum current consumption	When cooling	200 V 50 Hz	0.82 kW/3.3 A				*8	1.37 kW/5.2 A				*8	1.46 kW/5.6 A				*8
		200 V 60 Hz	0.83 kW/3.2 A					1.38 kW/5.1 A					1.48 kW/5.4 A				
		220 V 60 Hz	0.83 kW/3.0 A					1.39 kW/4.8 A					1.48 kW/5.1 A				
	When heating	200 V 50 Hz	–		1.20 kW/3.8 A	–		–		1.20 kW/3.8 A	–		–		1.20 kW/3.8 A	–	
		200 V 60 Hz	–		1.20 kW/3.8 A	–		–		1.20 kW/3.8 A	–		–		1.20 kW/3.8 A	–	
		220 V 60 Hz	–		1.44 kW/4.2 A	–		–		1.44 kW/4.2 A	–		–		1.44 kW/4.2 A	–	
Transformer capacity			–				2.14 kVA	–				2.14 kVA	–				2.14 kVA
Exterior color			Ivory white														
External dimensions (H × W × D)		mm	920 × 360 × 440					1,045 × 360 × 440					1,200 × 360 × 440				
Compressor (Hermetic DC swing type)			Equivalent to 0.4 kW					Equivalent to 0.75 kW					Equivalent to 1.1 kW				
Evaporator			Open coil type														
Condenser			Cross-fin coil type														
Propeller fan	Motor		54 W														
Agitator	Motor		Three phase AC, 60 W, 4 P														
Temperature adjust (Selectable)	Synchronization type	Standard	Room temperature or machine temperature*4 (Set to "Room temperature: Mode 3" by default)														
		Object to be controlled	Tank fluid temperature														
		Synchronization range K	–9.9 to +9.9 against the standard temperature (Set at 0.0 by default)														
	Fixed type	Object to be controlled	Tank fluid temperature														
		Range °C	5 to 50														
Oil temperature controller resolution			±0.1°C														
Capacity control range			0 to 100%														
Timer function			ON timer: 1 to 999 hours (1-hour unit setting)														
Refrigerant control			Compressor revolutions by inverter + Opening of electric expansion valve														
Refrigerant (HFC R410A (GWP: 2090))*5 Filling amount		kg	0.55					0.76					0.99				
Protection devices/protective functions			Agitator internal thermostat, discharge pipe temperature thermostat, condenser temperature thermostat, reverse-phase protection device, restart prevention timer, low room temperature protection thermostat, high fluid temperature protection thermostat, low fluid temperature protection thermostat, refrigerant leakage detector, inverter protection device set, circuit breaker (–B type only), high-pressure pressure switch (–C type only), compressor protection thermostat (–C type only), heating prevention temperature switch (–H type only), and temperature fuse (–H type only).														
Operating range	Room temperature	°C	5 to 45														
	Tank fluid temperature	°C	5 to 50														
	Oil viscosity	mm^2/s	0.5 to 200														
Acceptable fluid			Water-soluble cutting/grinding fluid, cutting/grinding oil, lubrication oil, hydraulic oil, industrial water (Cannot be used for drugs, food products, and fuel)														
Operating sound (value equivalent to measurement in an anechoic chamber) (Front 1 m, height 1 m)		dB(A)	62														
Transport vibration performance			Up and down vibration 14.7 m/s² (1.5 G) × 2.5 hr (7.5 to 100 Hz sweep/five min.)														
Protective structure*6			IP2X														
Mass		kg	38		40	60		44		46	66		50:		52	72	
Molded-case circuit breaker (Rated current)		A	–	10	–			–	10	–			–	10	–		
Items prepared by the customer	Molded-case circuit breaker (Rated current)	A	10 (Required for types other than –B type) *7														
	Device other than molded-case circuit breaker		Tank, supply pump, float switch, return filter														

Note: *1. The cooling capacity indicates the value at the standard point (tank fluid temperature: 35°C, room temperature: 35°C, fluid used: ISO VG32 (water in the case of AKJ1509), 1 atm). This unit has about ±5% of product tolerance.

*2. Use a commercial power supply for the power source. The use of an inverter power supply may cause burn damage to the machine. The voltage fluctuation range should be within ±10%. If the voltage fluctuation range is more than ±10%, please consult us.

*3. There are the following three types of different voltage specifications.
AC220, 230 V : Option code –046 (without transformer)
AC380, 400, 415 V : Option code –047 (with built-in transformer)
AC440, 460, 480 V : Option code –048 (with built-in transformer)
The main circuit voltage is the transformer's secondary side voltage of AC 200 V, 50/60 Hz.
(–046 units have no transformer and therefore have the same external dimensions and mass as standard units. Their main circuit voltage is 220/230 VAC, 50/60 Hz.)

*4. The optional thermistor for machine temperature synchronization is required. (Refer to Page 23 for details.)

*5. The SDS (Safety Data Sheet) of refrigerant R410A is attached to the -C type.

*6. Electric component box ingress protection: IP54 or equivalent (However, use piping conduits etc. rated at least IP54 at wiring ports.)

*7. The molded-case circuit breaker is not supplied with this product. Please prepare it yourself.

*8. The maximum power consumption/maximum current consumption of different voltage specifications are shown in the tables below.

■ AKJ189

Supply power		Power/current	
220V	50Hz	0.82kW	3.0A
	60Hz	0.83kW	3.0A
230V	50Hz	0.82kW	2.9A
	60Hz	0.83kW	2.8A
380V			1.8A
400V			1.7A
415V	50/60Hz	0.83kW	1.6A
440V			1.5A
460V			1.5A
480V			1.4A

■ AKJ359

Supply power		Power/current	
220V	50Hz	1.38kW	4.8A
	60Hz	1.38kW	4.8A
230V	50Hz	1.39kW	4.6A
	60Hz	1.38kW	4.6A
380V			2.8A
400V			2.6A
415V	50/60Hz	1.38kW	2.5A
440V			2.4A
460V			2.3A
480V			2.2A

■ AKJ459

Supply power		Power/current	
220V	50Hz	1.46kW	5.1A
	60Hz	1.48kW	5.1A
230V	50Hz	1.46kW	4.9A
	60Hz	1.48kW	4.7A
380V			3.0A
400V			2.8A
415V	50/60Hz	1.48kW	2.7A
440V			2.6A
460V			2.5A
480V			2.4A

■ AKJ569

Supply power		Power/current	
220V	50Hz	2.92kW	9.0A
	60Hz	2.83kW	8.9A
230V	50Hz	2.92kW	8.6A
	60Hz	2.83kW	8.3A
380V			4.9A
400V			4.7A
415V	50/60Hz	2.77kW	4.5A
440V			4.3A
460V			4.1A
480V			3.9A

■ AKJ909

Supply power		Power/current	
220V	50Hz	3.41kW	10.3A
	60Hz	3.43kW	10.2A
230V	50Hz	3.41kW	9.9A
	60Hz	3.44kW	9.8A
380V			5.7A
400V			5.4A
415V	50/60Hz	3.43kW	5.2A
440V			4.9A
460V			4.7A
480V			4.5A

■ AKJ1509

Supply power		Power/current	
220V	50Hz	5.38kW	15.8A
	60Hz	5.40kW	15.7A
230V	50Hz	5.38kW	15.4A
	60Hz	5.41kW	15.3A
380V			9.1A
400V			8.7A
415V	50/60Hz	5.40kW	8.4A
440V			7.9A
460V			7.5A
480V			7.3A

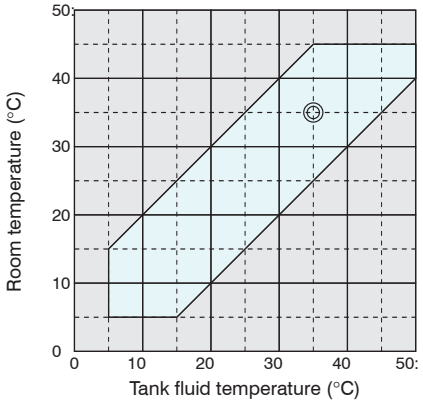
AKJ569, AKJ909, AKJ1509

Oil cooling unit horsepower (HP)				2.0					3.0					5.0				
Model name				AKJ569					AKJ909					AKJ1509				
				Standard	–B	–C	–H	Different voltage specifications*3	Standard	–B	–C	–H	Different voltage specifications*3	Standard	–B	–C	–H	Different voltage specifications*3
Cooling capacity (50/60 Hz)*1			kW	5.0/5.6					8.0/9.0					15.0/15.0				
Heater			kW	–			2	–	–			4	–	–			4	–
Supply power*2				Three-phase 200/200•220 VAC 50/60 Hz				*3	Three-phase 200/200•220 VAC 50/60 Hz				*3	Three-phase 200/200•220 VAC 50/60 Hz				*3
Power voltage	Main circuit																	
	Operating circuit			DC12/24 V														
Maximum power consumption/ maximum current consumption	When cooling	200V	50 Hz	2.77 kW/9.4 A				*8	3.38 kW/10.8 A				*8	5.40 kW/17.3 A				*8
		200V	60 Hz	2.72 kW/9.2 A					3.43 kW/10.7 A					5.37 kW/16.9 A				
		220V	60 Hz	2.83 kW/8.9 A					3.43 kW/10.2 A					5.40 kW/15.7 A				
	When heating	200V	50 Hz	–			2.32 kW/7.1 A	–	–			4.42 kW/13.1 A	–	–			4.60 kW/13.8 A	–
		200V	60 Hz	–			2.33 kW/7.1 A	–	–			4.45 kW/13.1 A	–	–			4.60 kW/13.7 A	–
		220V	60 Hz	–			2.79 kW/7.8 A	–	–			5.33 kW/14.4 A	–	–			5.49 kW/14.9 A	–
Transformer capacity				–				3.6 kVA	–				5.02 kVA	–				7.7 kVA
Exterior color				Ivory white														
External dimensions (H × W × D) mm				1,440 × 470 × 500					1,615 × 560 × 620					1,960 × 735 × 725				
Compressor (Hermetic DC swing type)				Equivalent to 1.5 kW					Equivalent to 2.2 kW					Equivalent to 1.5 kW + equivalent to 2.2 kW				
Evaporator				Open coil type														
Condenser				Cross-fin coil type														
Propeller fan	Motor			ϕ400 mm, 100 W					ϕ455 mm, 100 W					ϕ400 mm, 100 W + ϕ455 mm, 100 W				
Agitator	Motor			Three phase AC, 60 W, 4P														
Temperature adjust (Selectable)	Synchronization type	Standard		Room temperature or machine temperature*4 (Set to "Room temperature: Mode 3" by default)														
		Object to be controlled		Tank fluid temperature														
		Synchronization range	K	–9.9 to +9.9 against the standard temperature (Set at 0.0 by default)														
	Fixed type	Object to be controlled		Tank fluid temperature														
		Range	°C	5 to 50														
Oil temperature controller resolution				±0.1°C														
Capacity control range				0 to 100%														
Timer function				ON timer: 1 to 999 hours (1-hour unit setting)														
Refrigerant control				Compressor revolutions by inverter + Opening of electric expansion valve														
Refrigerant (HFC R410A (GWP: 2090))*5 Filling amount			kg	1.07					1.58					2.65				
Protection devices/protective functions				Agitator internal thermostat, discharge pipe temperature thermostat, condenser temperature thermostat, reverse-phase protection device, restart prevention timer, low room temperature protection thermostat, high fluid temperature protection thermostat, low fluid temperature protection thermostat, refrigerant leakage detector set, circuit breaker (–B type only), high-pressure pressure switch (–C type only), compressor protection thermostat (–C type only), heating prevention temperature switch (–H type only), and temperature fuse (–H type only).														
Operating range	Room temperature		°C	5 to 45														
	Tank fluid temperature		°C	5 to 50														
	Oil viscosity		mm^2/s	0.5 to 200														
Acceptable fluid				Water-soluble cutting/grinding fluid, cutting/grinding oil, lubrication oil, hydraulic oil, industrial water (Cannot be used for drugs, food products, and fuel)														
Operating sound (value equivalent to measurement in an anechoic chamber) (Front 1 m, height 1 m)			dB(A)	65					68					69				
Transport vibration performance				Up and down vibration 14.7 m/s^2 (1.5 G) × 2.5 hr (7.5 to 100 Hz sweep/five min.)														
Protective structure*6				IP2X														
Mass			kg	72			75	97	89			93	117	140			144	180
Molded-case circuit breaker (Rated current)			A	–	15		–		–	20		–		–	30		–	
Items prepared by the customer	Molded-case circuit breaker (Rated current)		A	15 (Required for types other than the -B type)*7					20 (Required for types other than the -B type)*7					30 (Required for types other than the -B type)*7				
	Device other than molded-case circuit breaker			Tank, supply pump, float switch, return filter														

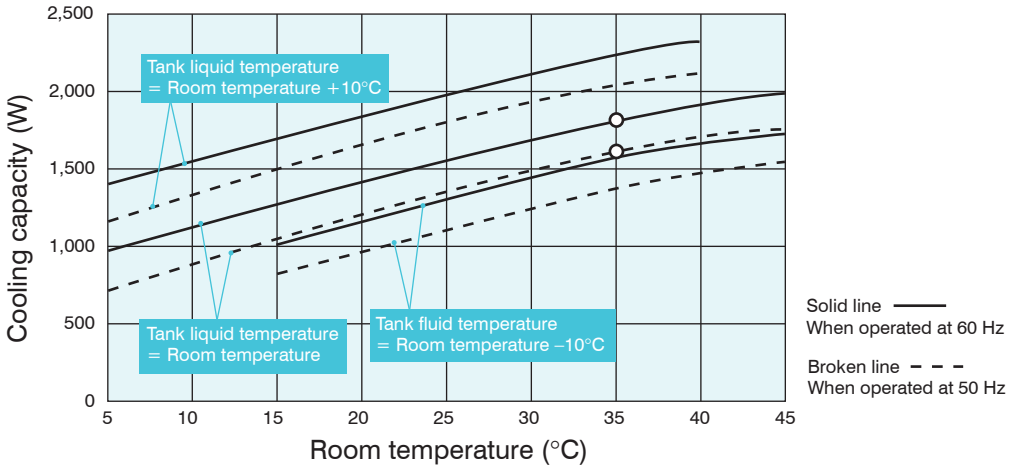
Refer to Page 5 for explanatory notes.

Operating range

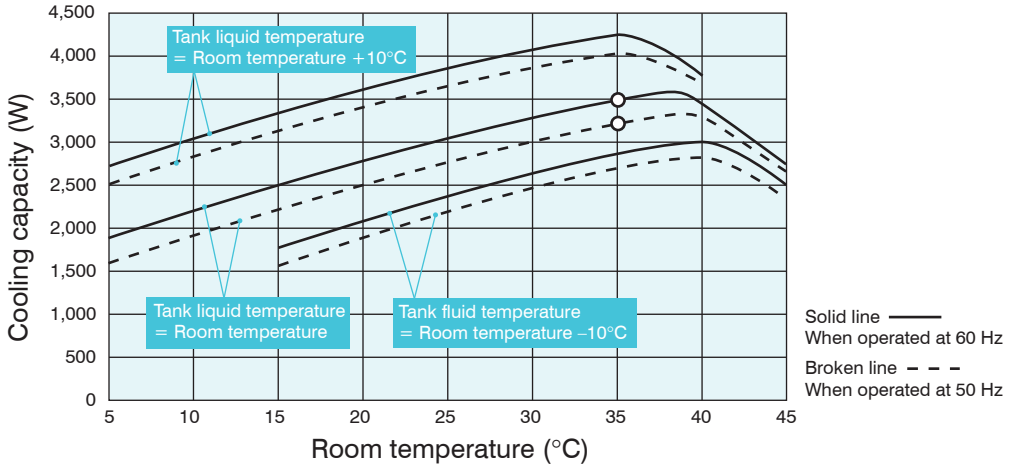
Note: 1. The mark ◎ shows the standard point.
2. Be sure to use the unit within the range of use specified in [ ].
(Use outside this range may cause unit failure.)



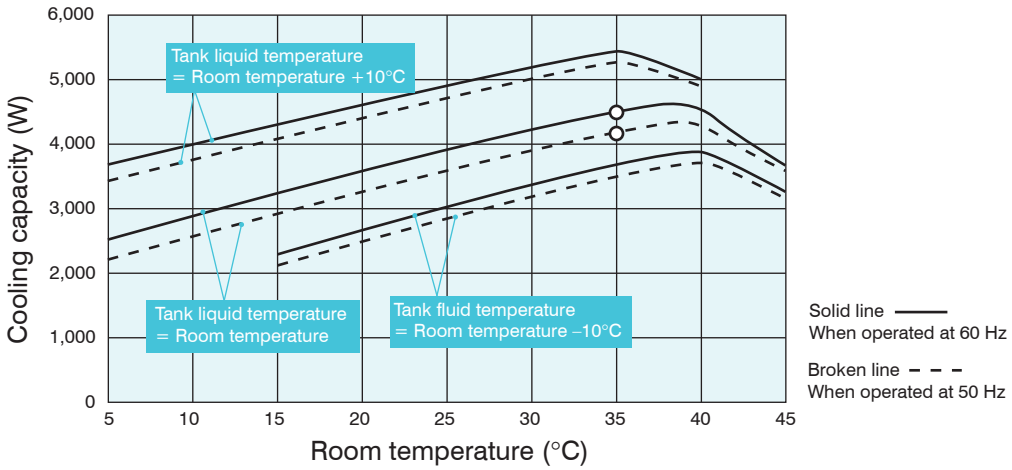
AKJ189



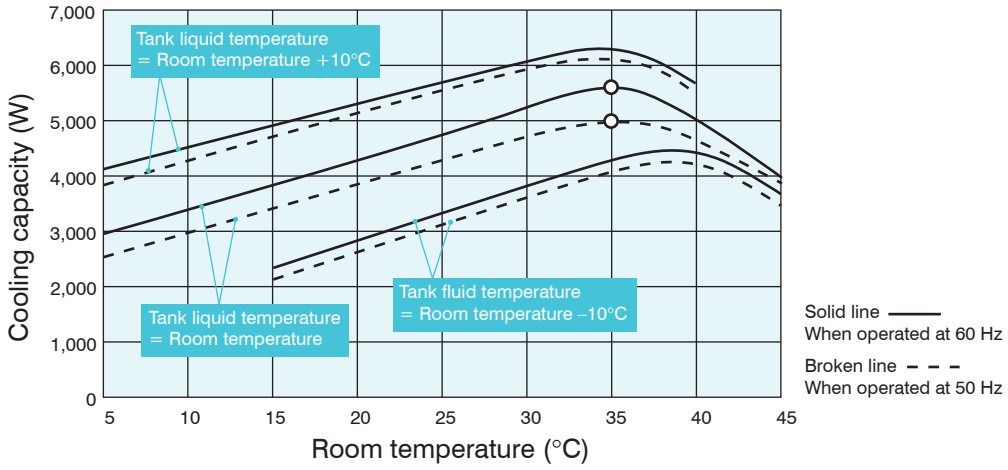
AKJ359



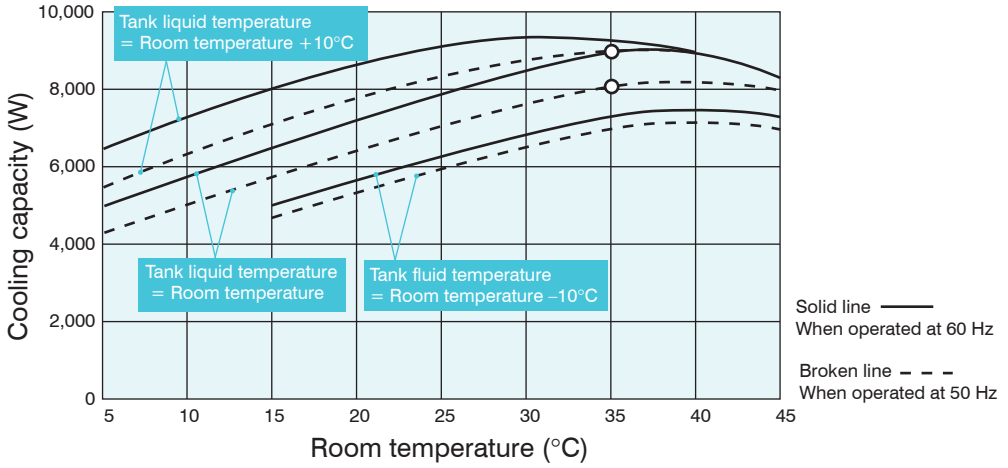
AKJ459



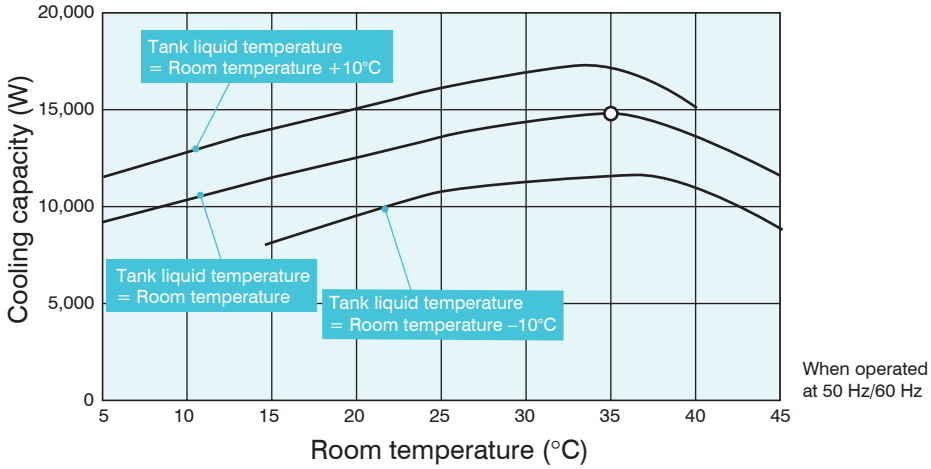
AKJ569



AKJ909



AKJ1509

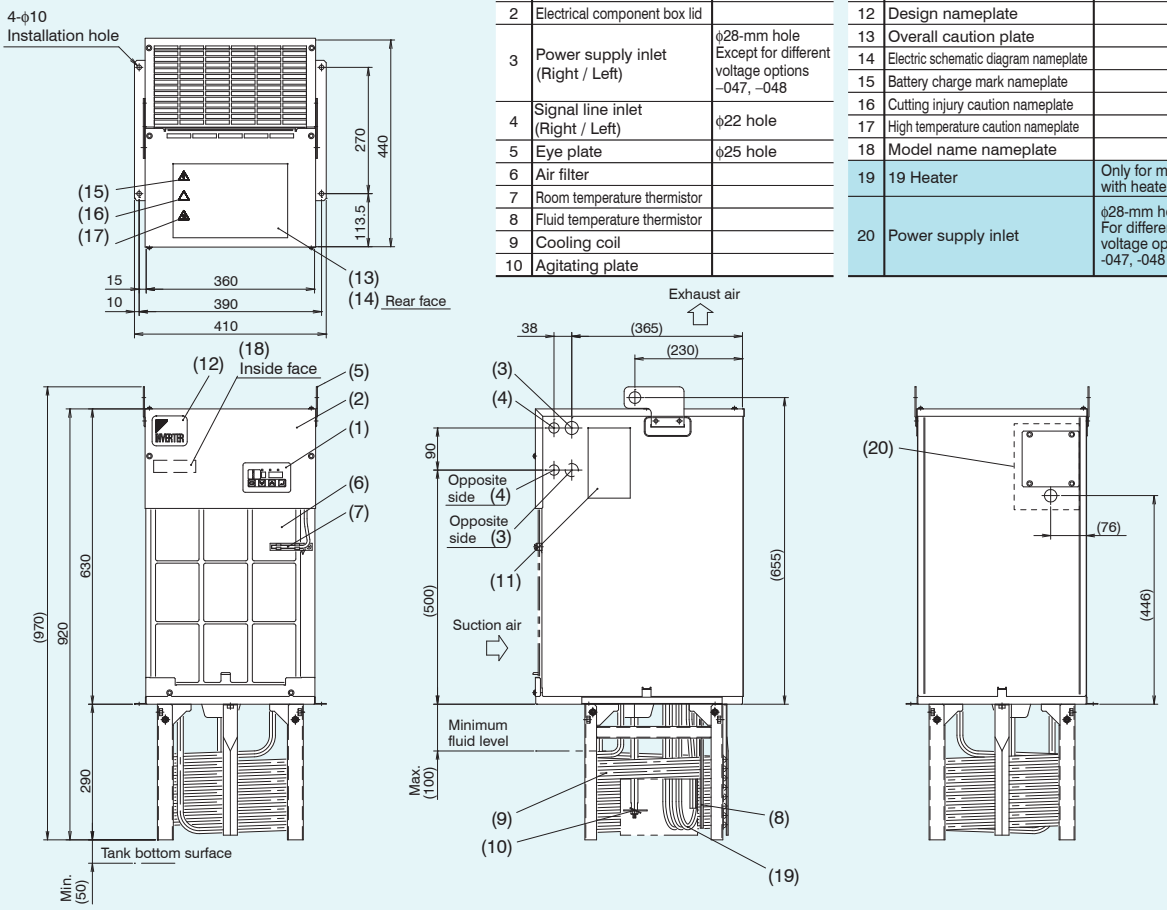


1. The mark "○" shows the standard point. (Room temperature: 35°C, Tank fluid temperature: 35°C, Oil used: ISO VG32 (water in the case of AKJ1509), 1 atm)
2. The cooling capacity varies depending on conditions including the room temperature, tank fluid temperature and the kinematic viscosity of the oil, etc.

Note: Refer to Pages 5 and 6 for more details.

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

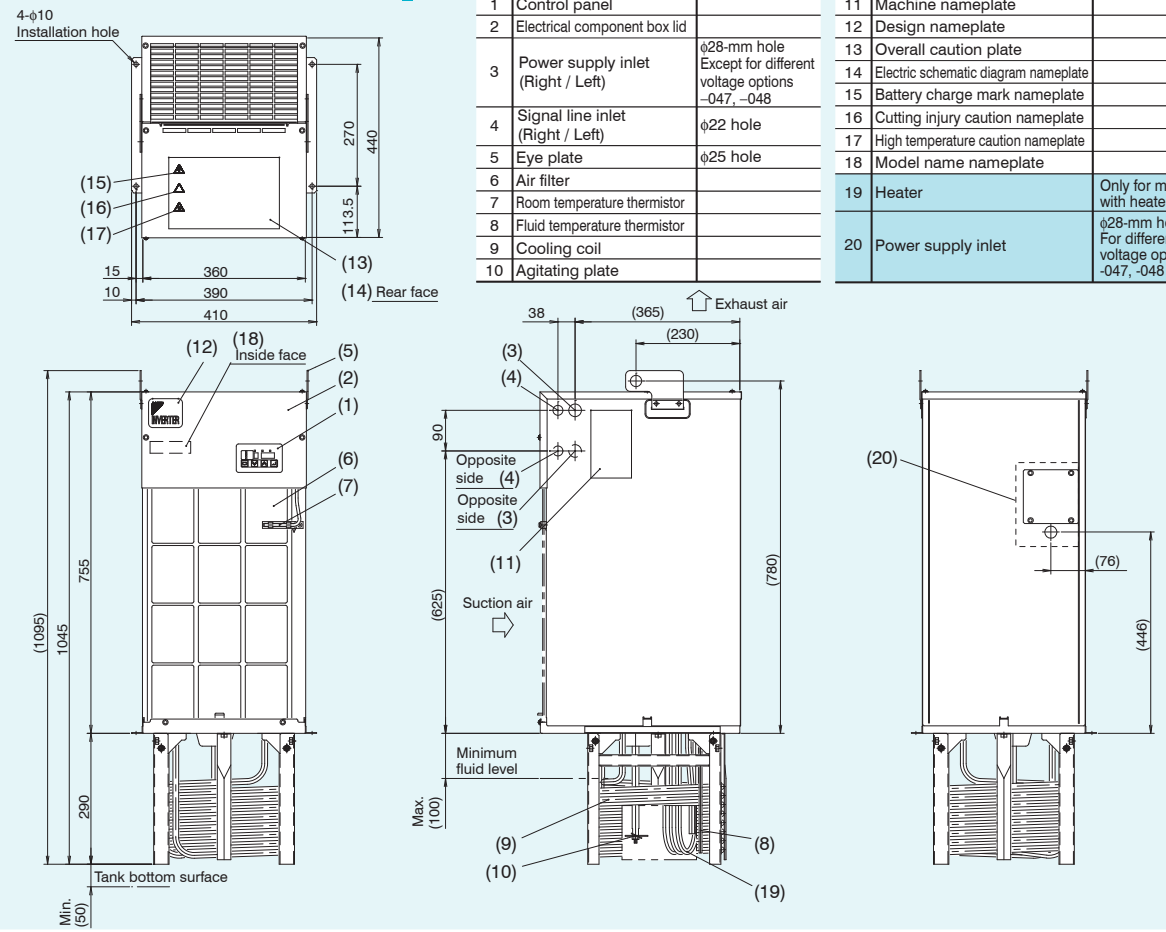
AKJ189 (-B, -C, -H, -046, -047, -048)



Part No.	Name	Description
1	Control panel	
2	Electrical component box lid	
3	Power supply inlet (Right / Left)	ϕ28-mm hole Except for different voltage options –047, –048
4	Signal line inlet (Right / Left)	ϕ22 hole
5	Eye plate	ϕ25 hole
6	Air filter	
7	Room temperature thermistor	
8	Fluid temperature thermistor	
9	Cooling coil	
10	Agitating plate	

Part No.	Name	Description
11	Machine nameplate	
12	Design nameplate	
13	Overall caution plate	
14	Electric schematic diagram nameplate	
15	Battery charge mark nameplate	
16	Cutting injury caution nameplate	
17	High temperature caution nameplate	
18	Model name nameplate	
19	19 Heater	Only for models with heater
20	Power supply inlet	ϕ28-mm hole For different voltage options -047, -048 only

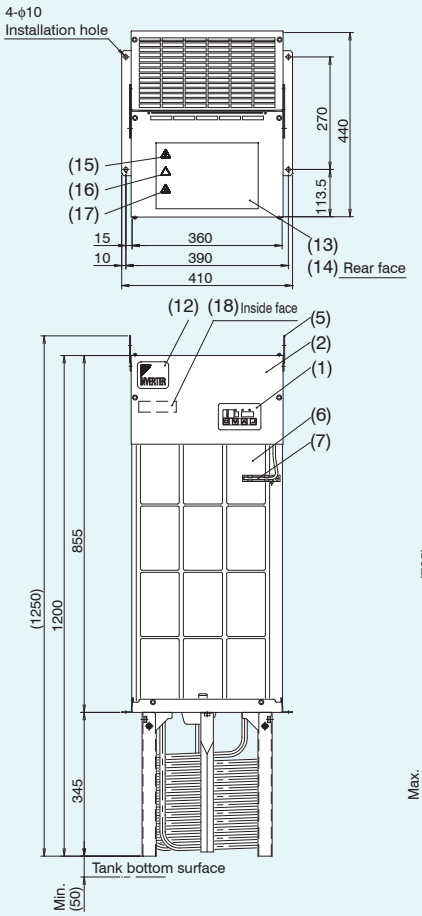
AKJ359 (-B, -C, -H, -046, -047, -048)



Part No.	Name	Description
1	Control panel	
2	Electrical component box lid	
3	Power supply inlet (Right / Left)	ϕ28-mm hole Except for different voltage options –047, –048
4	Signal line inlet (Right / Left)	ϕ22 hole
5	Eye plate	ϕ25 hole
6	Air filter	
7	Room temperature thermistor	
8	Fluid temperature thermistor	
9	Cooling coil	
10	Agitating plate	

Part No.	Name	Description
11	Machine nameplate	
12	Design nameplate	
13	Overall caution plate	
14	Electric schematic diagram nameplate	
15	Battery charge mark nameplate	
16	Cutting injury caution nameplate	
17	High temperature caution nameplate	
18	Model name nameplate	
19	Heater	Only for models with heater
20	Power supply inlet	ϕ28-mm hole For different voltage options -047, -048 only

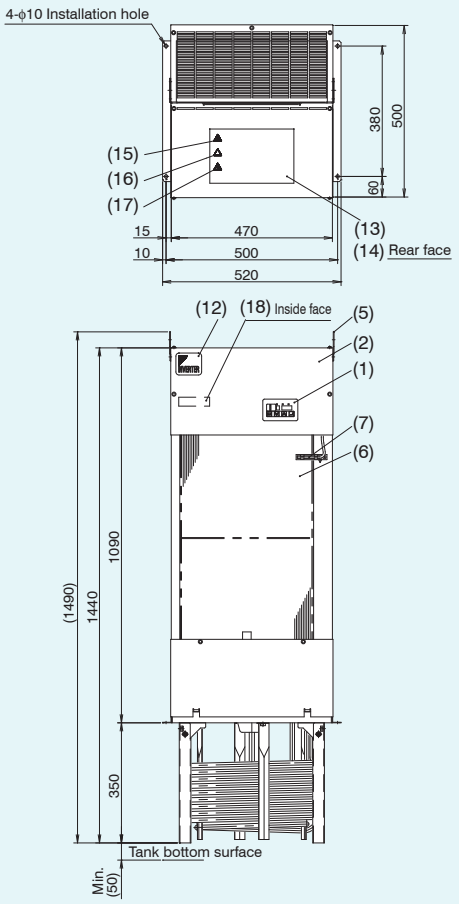
AKJ459 (-B, -C, -H, -046, -047, -048)



Part No.	Name	Description
1	Control panel	
2	Electrical component box lid	
3	Power supply inlet (Right / Left)	ϕ28-mm hole Except for different voltage options –047, –048
4	Signal line inlet (Right / Left)	ϕ22 hole
5	Eye plate	ϕ25 hole
6	Air filter	
7	Room temperature thermistor	
8	Fluid temperature thermistor	
9	Cooling coil	
10	Agitating plate	

Part No.	Name	Description
11	Machine nameplate	
12	Design nameplate	
13	Overall caution plate	
14	Electric schematic diagram nameplate	
15	Battery charge mark nameplate	
16	Cutting injury caution nameplate	
17	High temperature caution nameplate	
18	Model name nameplate	
19	Heater	Only for models with heater
20	Power supply inlet	ϕ28-mm hole For different voltage options -047, -048 only

AKJ569 (-B, -C, -H, -046, -047, -048)



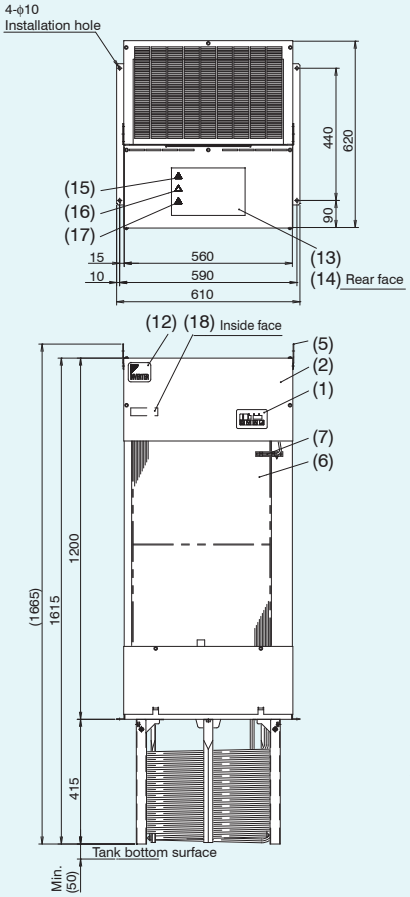
Part No.	Name	Description
1	Control panel	
2	Electrical component box lid	
3	Power supply inlet (Right / Left)	ϕ28-mm hole Except for different voltage options –047, –048
4	Signal line inlet (Right / Left)	ϕ22 hole
5	Eye plate	ϕ25 hole
6	Air filter	
7	Room temperature thermistor	
8	Fluid temperature thermistor	
9	Cooling coil	
10	Agitating plate	

Part No.	Name	Description
11	Machine nameplate	
12	Design nameplate	
13	Overall caution plate	
14	Electric schematic diagram nameplate	
15	Battery charge mark nameplate	
16	Cutting injury caution nameplate	
17	High temperature caution nameplate	
18	Model name nameplate	
19	Heater	Only for models with heater
20	Power supply inlet	ϕ28-mm hole For different voltage options -047, -048 only

Note: Refer to Page 6 for more details.

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

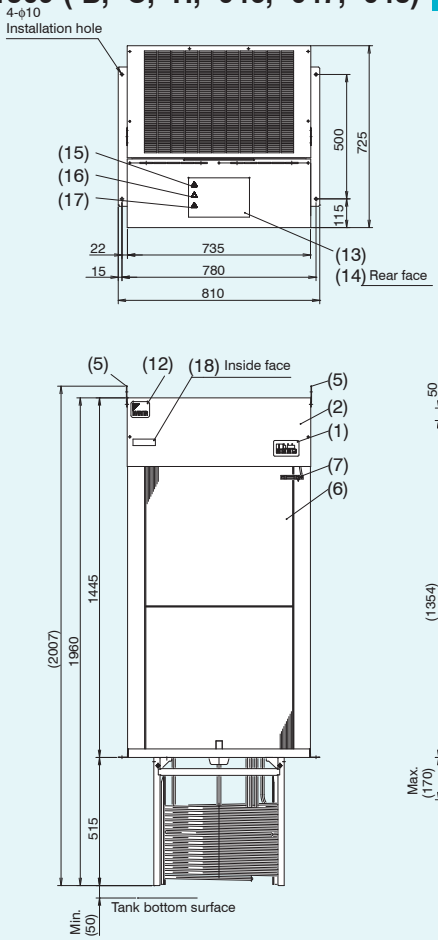
AKJ909 (-B, -C, -H, -046, -047, -048)



Part No.	Name	Description
1	Control panel	
2	Electrical component box lid	
3	Power supply inlet (Right / Left)	ϕ28-mm hole Except for different voltage options –047, –048
4	Signal line inlet (Right / Left)	ϕ22 hole
5	Eye plate	ϕ25 hole
6	Air filter	
7	Room temperature thermistor	
8	Fluid temperature thermistor	
9	Cooling coil	
10	Agitating plate	

Part No.	Name	Description
11	Machine nameplate	
12	Design nameplate	
13	Overall caution plate	
14	Electric schematic diagram nameplate	
15	Battery charge mark nameplate	
16	Cutting injury caution nameplate	
17	High temperature caution nameplate	
18	Model name nameplate	
19	Heater	Only for models with heater
20	Power supply inlet	ϕ28-mm hole For different voltage options -047, -048 only

AKJ1509 (-B, -C, -H, -046, -047, -048)



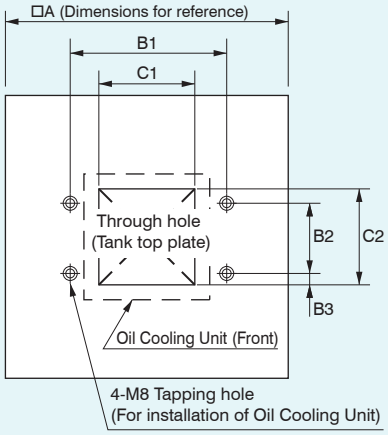
Part No.	Name	Description
1	Control panel	
2	Electrical component box lid	
3	Power supply inlet (Right / Left)	ϕ28-mm hole Except for different voltage options –047, –048
4	Signal line inlet (Right / Left)	ϕ22 hole
5	Eye plate	ϕ25 hole
6	Air filter	
7	Room temperature thermistor	
8	Fluid temperature thermistor	
9	Cooling coil	
10	Agitating plate	

Part No.	Name	Description
11	Machine nameplate	
12	Design nameplate	
13	Overall caution plate	
14	Electric schematic diagram nameplate	
15	Battery charge mark nameplate	
16	Cutting injury caution nameplate	
17	High temperature caution nameplate	
18	Model name nameplate	
19	Heater	Only for models with heater
20	Power supply inlet	ϕ28-mm hole For different voltage options -047, -048 only

• 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 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)

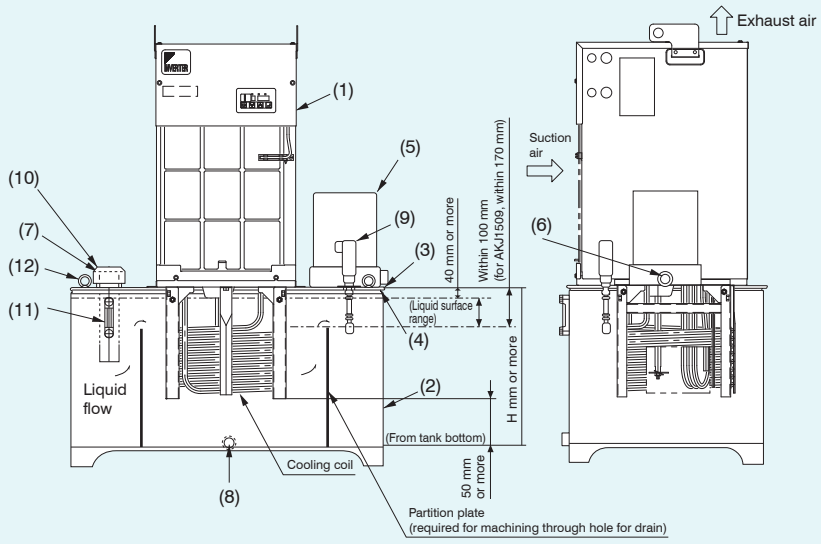


Oil Cooling Unit series \ Tank	Size A	Depth H	Tank hole pitch B1	B2	B3	Through hole C1	C2	Installation Compatibility (✓: Compatible) With 8 Series	With 7 Series
AKJ 189	500 or more	340 or more	390	270	15	325	325	✓ AKZJ188	Note: ✓ AKZJ187
AKJ 359								✓ AKZJ358	Note: ✓ AKZJ357
AKJ 459		395 or more						✓ AKZJ458	–
AKJ 569	690 or more	400 or more	500	380	45	440	440	✓ AKZJ568	✓ AKZJ567
AKJ 909	770 or more	465 or more	590	440	30	500	500	✓ AKZJ908	✓ AKZJ907
AKJ1509	1000 or more	565 or more	780	500	30	560	560	–	–

Note: The Oil Cooling Unit projects beyond the tank about 50 mm to the front.
(It is necessary to check whether there is any obstruction to the front.)

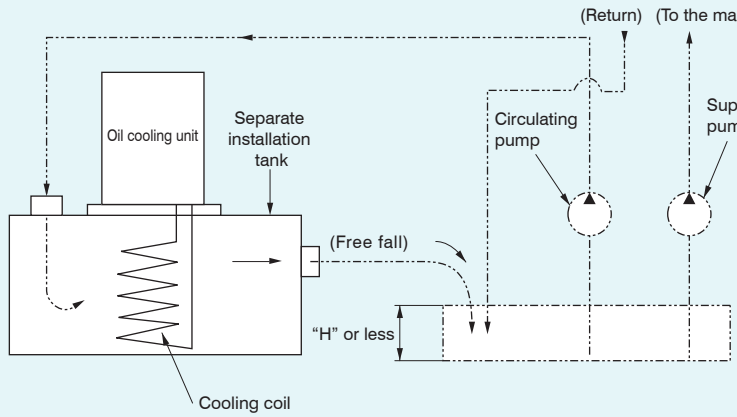
Part No.	Name	Q'ty/unit	Part No.	Name	Q'ty/unit
1	Oil cooling unit	1	7	Return port	1
2	Tank body	1	8	Tank drain	1
3	Tank top plate	1	9	Float switch	1
4	Tank packing	1	10	Oil filler port-cum-air breather	1
5	Supply pump	1	11	Oil level gauge	1
6	Discharge port	1	12	Hanging bolt	4

Note: Part Nos. 2 to 12 are not included in the scope of Daikin's products.



Notes 1: Ensure that the fluid surface is in the range of 40 to 100 mm from the top plate of the tank (for AKJ1509, 40 to 170 mm).
2: Do not expose the cooling coil extending above the fluid surface.
3: The height of the partition plate should be higher than the lowest fluid level of the fluid level range

• Separate type When the depth of the tank is the "H" dimension in the figure above or less



Note 1. If it is expected that cutting chips and debris will get into the tank, install efficient filters in the supply or return line.

Note 2. If foreign matter such as cutting chips and debris deposit on and adhere to the cooling coil surface, the cooling capacity is deteriorated and this may result in failure.

9AKJ W SERIES

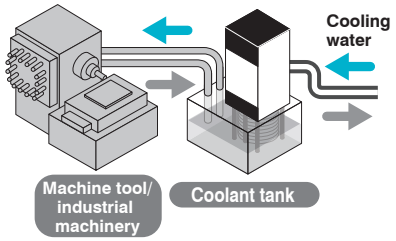
Immersion type

Water cooled condenser type

Overview / Features



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.

Highly accurate temperature control by 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 improve the accuracy of machine tools.

The water cooled condenser type oil cooling units are “exhaust heat free”.

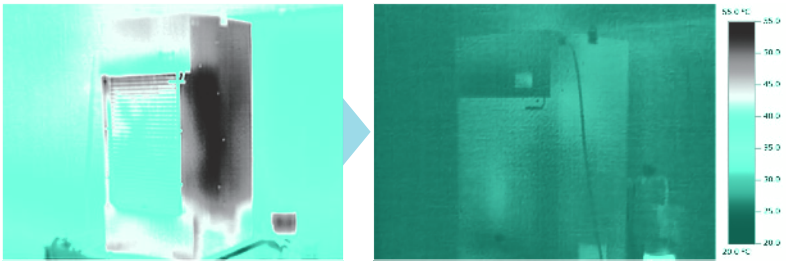
The exhaust heat from the oil cooling unit is removed by cooling water.

* Please prepare cooling water that meets water quality standards.

No "exhaust heat" from the oil cooling unit in the factory any more. * Excluding exhaust heat from electrical parts.

- Enables work in a comfortable environment
- “Exhaust-heat-free” system which can reduce the air-conditioning load in the factory and save energy
- Realize stable performance of machines that require precise temperature control in the factory

Comparison of oil cooling unit surface temperatures during operation



Air-cooled type | Water cooled condenser type

Time spent cleaning condenser clogging can be greatly reduced.

- Adopted a double tube condenser, which is clogging resistant.
- Reliable unit for long term use.



Specifications are compatible with the air-cooled units. (Cooling capacity, external dimensions, etc.)

- Easy to replace an existing air cooled condenser type unit with this water cooled model if cooling water can be suppled to the unit.

Nomenclature

AKJ	※※	9	W	-	※※※
1	2	3	4	5	

1 Oil cooling unit identification code

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

2 Cooling capacity (kW)

56 : 5.6 kW
90 : 9.0 kW

3 Symbol of series (Symbol to represent model change)

9: "9" series

4 Water cooled condenser type oil cooling unit identification codes

W : Water-cooled oil cooling unit

5 Symbol of option type

Options and their combinations (See the table to the right.)

Special specifications

- ※※※ (3-digit number),
C ※※※ (3-digit number), etc.
Please consult us about detailed information.

Options and their combinations

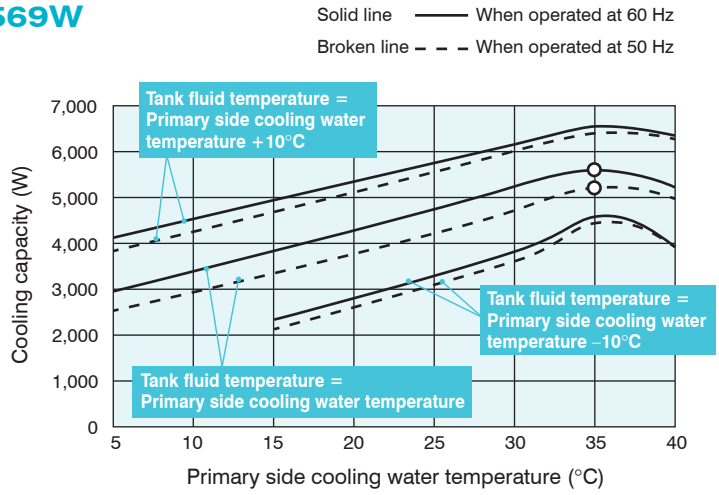
Symbol of option type	With breaker	Compliance with CE	With heater
-B	✓	–	–
-C	–	✓	–
-H	–	–	✓
-BC	✓	✓	–
-BH	✓	–	✓
-CH	–	✓	✓
-BCH	✓	✓	✓

Specifications

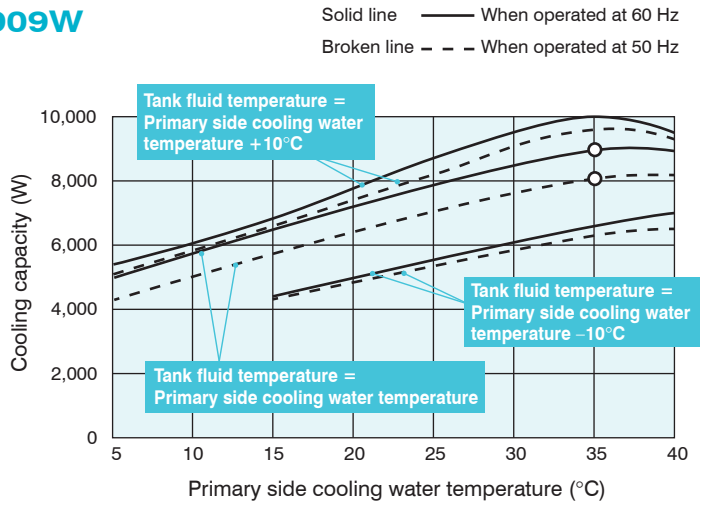
Oil cooling unit horsepower (HP)			2.0				3.0			
Model name			AKJ569W				AKJ909W			
			Standard	–B	–C	–H	Standard	–B	–C	–H
Cooling capacity (50/60 Hz)*1 kW			5.0/5.6				8.0/9.0			
Heater kW			–			2	–			4
Supply power*2			Three phase AC 200/200•220 V 50/60 Hz				Three phase AC 200/200•220 V 50/60 Hz			
Circuit voltage	Main circuit									
	Operating circuit		DC12/24 V							
Max. power consumption Max. current consumption	When cooling	200 V 50 Hz	2.25 kW/7.7 A				4.13 kW/13.5 A			
		200 V 60 Hz	2.25 kW/7.4 A				4.14 kW/13.3 A			
		220 V 60 Hz	2.24 kW/6.9 A				4.13 kW/12.1 A			
	When heating	200 V 50 Hz	–			2.32 kW/7.1 A	–			4.42 kW/13.1 A
		200 V 60 Hz	–			2.33 kW/7.1 A	–			4.45 kW/13.1 A
		220 V 60 Hz	–			2.79 kW/7.8 A	–			5.33 kW/14.4 A
Exterior color			Ivory white							
External dimensions (H × W × D) mm			1,440 × 470 × 500				1,615 × 560 × 620			
Compressor (Totally enclosed DC swing type)			Equivalent to 1.5 kW				Equivalent to 2.2 kW			
Evaporator			Open coil type							
Condenser			Double tube type							
Fan (50/60 Hz) Motor			20/19 W							
Agitator Motor			Three phase AC, 60 W, 4 pole							
Temperature adjust (Selectable)	Synchronization type	Standard	Room temperature or machine temperature*3 (Set to "Room temperature: Mode 4" by default)							
		Object to be controlled	Tank liquid temperature							
		Synchronization range K	–9.9 to 9.9 against the reference temperature (Set at 0.0 by default)							
	Fixed type	Object to be controlled	Tank liquid temperature							
		Range °C	5 to 50							
Oil temperature controller resolution			±0.1°C							
Capacity control range			0 to 100%							
Timer function			ON timer: 1 to 999 hours (1-hour unit setting)							
Refrigerant control			Rotation speed control of compressor by inverter + Opening rate control of electric expansion valve							
Refrigerant (HFC R410A (GWP: 2090))*4 Filling amount kg			0.78				1.07			
Protection devices/ protective functions			Agitator inner thermostat, discharge piping temperature thermostat, condenser temperature thermostat, reversed-phase protection device, restart prevention timer, high fluid temperature protection thermostat, low fluid temperature protection thermostat, refrigerant leakage detection, set of inverter protection devices, circuit breaker (-B only), high-pressure switch, compressor protection thermostat (-C type only), overheat prevention temperature switch (-H type only), temperature fuse (-H type only)							
Operating range	Room temperature °C		5 to 45							
	Tank liquid temperature °C		5 to 50							
	Primary side cooling water temperature °C		5 to 40							
	Primary side cooling water volume L/min		Primary side cooling water temperature 5 to within 35°C: 13 to 60 35 to 40°C : 30 to 60				Primary side cooling water temperature 5 to within 35°C : 19 to 60 35 to 40°C : 42 to 60			
	Oil viscosity mm^2/s		0.5 to 200							
Acceptable fluid			Water-soluble cutting fluid, grinding fluid, cutting oil, grinding oil, lubricant, hydraulic oil, industrial water (Cannot be used for drugs, food products, and fuel)							
Operating sound (value equivalent to measurement in an anechoic chamber) (Front 1 m, height 1 m) dB(A)			55				64			
Permissible transport vibration			Up and down vibration 14.7 m/s^2 (1.5 G) × 2.5 hr (7.5 to 100 Hz sweep/5 min.)							
Ingress protection*5			IP2X							
Mass kg				86		89		107		111
Molded-case circuit breaker (Rated current) A			–	15	–		–	20	–	
Items prepared by the customer	Molded-case circuit breaker (Rated current) A		15 (Required for types other than the –B type)*6				20 (Required for types other than the –B type)*6			
	Device other than molded-case circuit breaker		Tank, supply pump, float switch, return filter, water strainer							

Note:
*1. The cooling capacity indicates the value at the standard point (tank fluid temperature: 35°C, primary side cooling water temperature: 35°C, primary side cooling water volume: 42 L/min, fluid used: ISO VG32, 1 atm). This unit has about ±5% of product tolerance.
*2. Use a commercial power supply for the power source. The use of an inverter power supply may cause burn damage to the oil cooling unit.
The voltage fluctuation range should be within ±10%. If it is more than ±10%, please consult us.
*3. The optional thermistor for machine temperature synchronization is required.
*4. The SDS (Safety Data Sheet) of refrigerant R410A is attached to the –C type.
*5. Electric component box ingress protection: IP54 or equivalent (However, use piping conduits etc. rated at least IP54 at wiring ports.)
*6. The molded-case circuit breaker is not supplied with this product. Please prepare it yourself.

AKJ569W

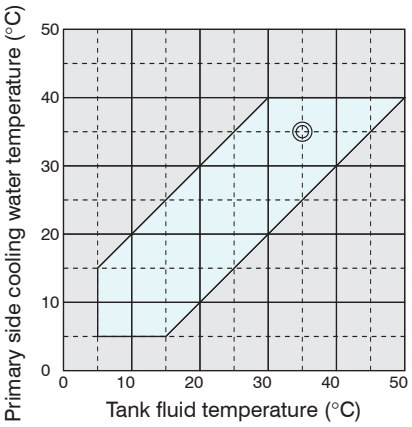


AKJ909W



1. The mark "O" shows the standard point.
   (Primary side cooling water temperature: 35°C, primary side cooling water volume: 42 L/min, tank fluid temperature: 35°C, oil used: ISO VG32, 1 atm)
2. The cooling capacity varies depending on conditions such as the primary side cooling water temperature, primary side cooling water volume, tank fluid temperature, oil dynamic viscosity and other factors

Operating range



Note: 1. The mark "◎" shows the standard point.
2. Be sure to use the unit within the range of use specified in ▭.
(Use outside the usable range significantly reduces cooling capacity. There is also a risk of moisture condensation.)

Notes on Installation and Handling

1. Request to install a water strainer

Install a strainer (20 to 40 mesh) with low pressure loss in the water piping system.

- Operation without installing a strainer at the primary side water pipe inlet will cause debris in the water piping to clog the inside of the condenser, causing unit stoppages due to abnormalities, or failure of the unit.
- Much of the debris in the water piping system adheres to the strainer during trial operation and adjustment, so please clean or replace the strainer before performing full-scale operation.
  In addition, please inspect and clean the strainer regularly.
- Do not use water other than that of the specified water quality when using industrial water for the primary side cooling water and cooled fluid.

2. Water quality standards

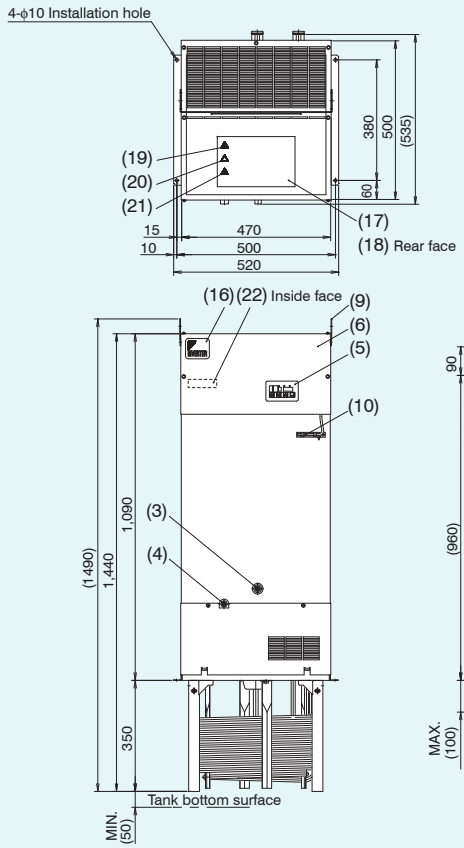
*Use water that satisfies the following standard for tap water level.

■ Guideline of Water Quality for Refrigeration and Air Conditioning Equipment JRA-GL-02-1994

	Item	Chemical formula	Water quality standard	Unit
Standard items	pH	–	6.5 to 8.2	pH (25°C)
	Electrical conductivity	–	0.2 to 30	ms/m (25°C)
	Chloride ion	Cl^-	50 maximum	mg/L (ppm)
	Sulfate ion	SO_4^{2-}	50 maximum	mg/L (ppm)
	Acid consumption (pH4.8)	$CaCO_3$	50 maximum	mg/L (ppm)
	Total hardness	–	70 maximum	mg/L (ppm)
	Calcium hardness	$CaCO_3$	50 maximum	mg/L (ppm)
	Ionic silica	SiO_2	30 maximum	mg/L (ppm)
Reference items	Iron	Fe	0.3 maximum	mg/L (ppm)
	Copper	Cu	0.1 maximum	mg/L (ppm)
	Sulfide ion	S^{2-}	Not to be detected	mg/L (ppm)
	Ammonium ion	NH_4^+	0.1 maximum	mg/L (ppm)
	Residual chlorine	Cl	0.3 maximum	mg/L (ppm)
	Free carbon dioxide	CO_2	4.0 maximum	mg/L (ppm)
	Stability index	–	6.0 to 7.0	–

Note: Refer to Page 14 for more details.
● For the machining dimensions of the holes for installation on the tank, refer to page 12.

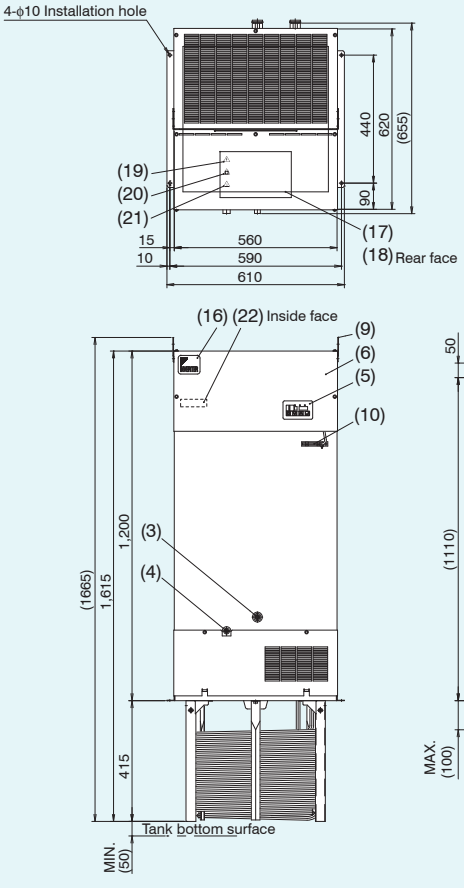
AKJ569W



Part No.	Name	Description
1	Primary side cooling water inlet	Rc3/4 Plastic plug fitted
2	Primary side cooling water outlet	Rc3/4 Plastic plug fitted
3	Condenser drain port	Rc3/8 Plugged
4	Condenser drain pan port	Rc1/4 Plugged
5	Control panel	
6	Electrical component box cover	
7	Power supply inlet (Right / Left)	ϕ28 Hole
8	Signal line inlet (Right / Left)	ϕ22 hole
9	Eye plate	ϕ25 Hole
10	Room temperature thermistor	
11	Fluid temperature thermistor	
12	Cooling coil	

Part No.	Name	Description
13	Agitating plate	
14	Unit nameplate	
15	Instruction faceplate	
16	Design nameplate	
17	Overall caution nameplate	
18	Electric schematic diagram faceplate	
19	Battery charge mark nameplate	
20	Cutting injury caution plate	
21	High temperature caution plate	
22	Model name nameplate	
23	Heater	Only for models with heater

AKJ909W



Part No.	Name	Description
1	Primary side cooling water inlet	Rc3/4 Plastic plug fitted
2	Primary side cooling water outlet	Rc3/4 Plastic plug fitted
3	Condenser drain port	Rc3/8 Plugged
4	Condenser drain pan port	Rc1/4 Plugged
5	Control panel	
6	Electrical component box cover	
7	Power supply inlet (Right / Left)	ϕ28 Hole
8	Signal line inlet (Right / Left)	ϕ22 hole
9	Eye plate	ϕ25 Hole
10	Room temperature thermistor	
11	Fluid temperature thermistor	
12	Cooling coil	

Part No.	Name	Description
13	Agitating plate	
14	Unit nameplate	
15	Instruction faceplate	
16	Design nameplate	
17	Overall caution nameplate	
18	Electric schematic diagram faceplate	
19	Battery charge mark nameplate	
20	Cutting injury caution plate	
21	High temperature caution plate	
22	Model name nameplate	
23	Heater	Only for models with heater

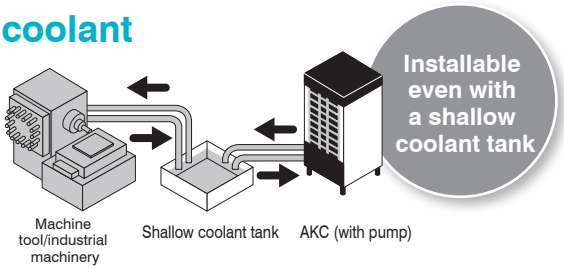
9 AKC SERIES | Circulating type |



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 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.

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)

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

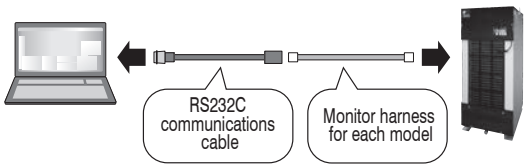
Ingress protection range for the control box is improved, including upgrade to IP54 and adoption of sulfur-free parts.

Simple monitoring of operating status

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

- This is useful for speeding up the identification 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.
* Hybrid-Win and the instruction manual can be downloaded free of charge from our website (https://www.daikinpmc.com/en/) after user registration.
* The communications cable and the monitor harness must be purchased separately.



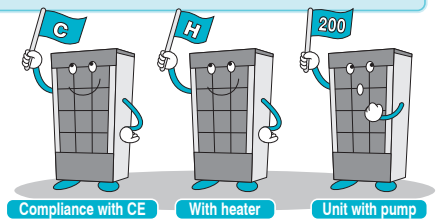
Functions featured

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

Reduced environmental load

- Complies with environmental regulations, e.g. by adopting printed circuit boards with lead-free solder.

3 options available in addition to standard specifications

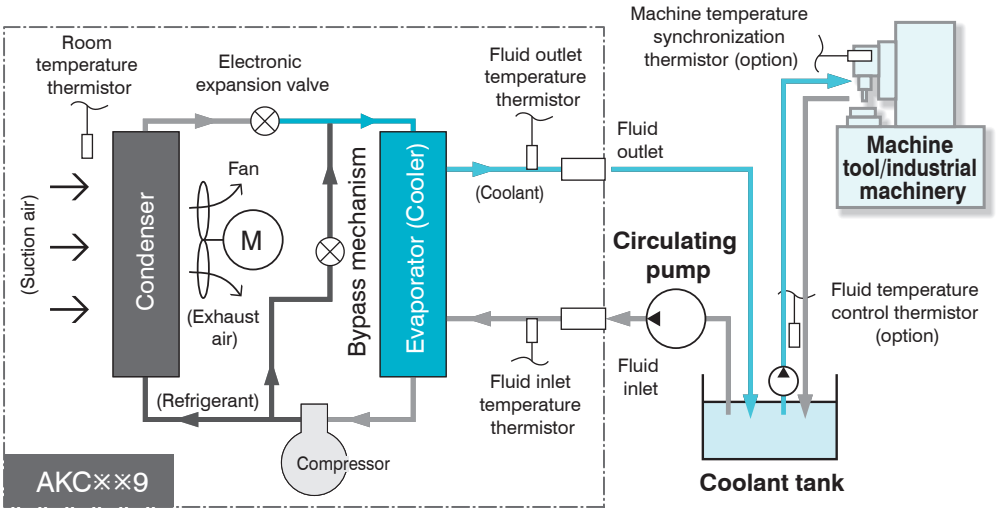


System Configuration

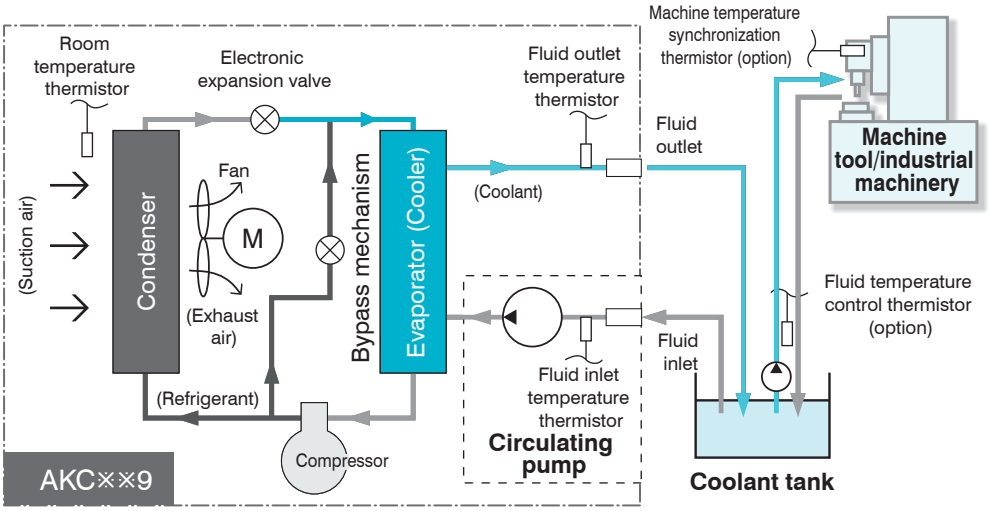
Explained in an easy-to-understand video!
URL https://www.daikinpmc.com/en/mv/oilcon_garbage.html

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

Unit without pump



Unit with pump



Nomenclature

AKC	※※	9	−※※※
1	2	3	4

1 Oil cooling unit identification code

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

2 Cooling capacity

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

3 Symbol of series (Symbol to represent model change)

9: "9" series

4 Symbol of option type (C/H/200)/Non-standard number

Options and their combinations

Option Symbol	Compliance with CE	With heater	Unit with pump
−C	✓	–	–
−H	–	✓	–
−200	–	–	✓
−CH	✓	✓	–
C200	✓	–	✓
H200	–	✓	✓
K200	✓	✓	✓

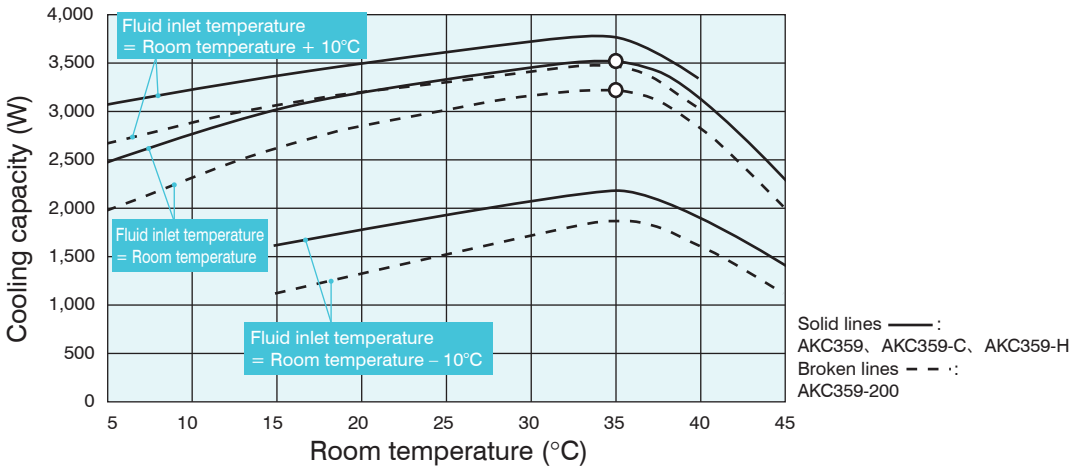
Special specifications

- ※※※ (3 numerical digits), C ※※※ (3 numerical digits), etc.
Please consult us separately about special specifications.

Oil cooling unit horsepower (HP)			1.2				2.0			
Model name			AKC359				AKC569			
			Standard	–C (CE compliant type)	–H (With heater)	–200 (With pump)	Standard	–C (CE compliant type)	–H (With heater)	–200 (With pump)
Cooling capacity (50/60 Hz)*1		kW	3.5/3.5			3.2/3.2	5.6/5.6			5.3/5.3
Heater		kW	–		1	–	–		2	–
Supply power*2			Three-phase 200/200•220 VAC 50/60 Hz							
Power voltage	Main circuit		Three-phase 200/200•220 VAC 50/60 Hz							
	Operation circuit		DC12/24 V							
Maximum power consumption Maximum current consumption	200 V 50 Hz		1.17 kW/4.2 A			1.44 kW/5.3 A	1.78 kW/6.2 A			2.10 kW/7.4 A
	200 V 60 Hz		1.22 kW/4.3 A			1.60 kW/5.5 A	1.87 kW/6.3 A			2.30 kW/7.6 A
	220 V 60 Hz		1.21 kW/4.1 A			1.60 kW/5.2 A	1.86 kW/6.1 A			2.30 kW/7.3 A
Exterior color			Ivory white							
External dimensions (H × W × D)		mm	995 × 450 × 560				1,200 × 470 × 670			
Compressor (Hermetic DC swing type)			Equivalent to 0.75 kW				Equivalent to 1.5 kW			
Evaporator			Shell-end coil type							
Condenser			Cross-fin-coil type							
Propeller fan	Motor		ϕ300, 54 W				ϕ400, 100 W			
Pump	Motor		–			0.4 kW-2P	–			0.4 kW-2P
	Total head (standard point, 50/60 Hz)		–			10/15 m	–			10/15 m
	Suction lift		–			0.5 m*4	–			0.5 m*4
Temperature control (Selectable)	Synchronization type: Standard		Room temperature or machine temperature *5 (Set to “Room temperature: Mode 3” by default)							
	Synchronization type: Object to be controlled		Fluid inlet temperature or fluid outlet temperature (Set to fluid inlet temperature by default)							
	Synchronization type: Synchronization range	K	–9.9 to 9.9 against the reference temperature (Set at 0.0 by default)							
	Fixed type: Object to be controlled		Fluid inlet temperature or fluid outlet temperature							
	Fixed type: Range	°C	5 to 50							
Refrigerant control			Compressor revolutions by inverter + Opening of electric expansion valve							
Refrigerant (HFC R410A (GWP: 2090))*6 Filling amount		kg	0.80				1.25			
Protection devices/protective functions			A set of overcurrent relay (for a pump motor), discharge pipe temperature thermostat, condenser temperature thermostat, reverse-phase protection device, restart prevention timer, low room temperature protection thermostat, high fluid temperature protection thermostat, low fluid temperature protection thermostat, refrigerant leakage detector, evaporator clogging detection (intake pipe temperature thermostat), inverter protection device, circuit breaker, temperature fuse (-H type only), overheat prevention temperature switch (-H type only), high pressure switch (-C type only), and compressor thermal protection thermostat (-C type only)							
Operation range	Room temperature	°C	5 to 45							
	Fluid inlet temperature	°C	5 to 50							
	Fluid viscosity	mm²/s	200 maximum (water soluble to ISO VG32)							
	Withstanding pressure	MPa	0.2							
	Rated circulating volume	L/min	35							
	Circulating volume	L/min	15 minimum							
Usable fluids *7			Lubrication oil, hydraulic oil, cutting oil, (water soluble) coolant, (grinding oil *8) (Use clean fluid that can pass through filter equipment with a 40-mesh or finer screen.)							
Connecting tube	Fluid inlet		Rc3/4							
	Fluid outlet		Rc3/4							
	Fluid drain port		Rc1							
	Priming port *9		Rc1/2							
	Oil pan drain		–			Rc3/8	–			Rc1/2
Noise level *10 (Value measured at 1m high in front, value equivalent as measured in anechoic chamber)		dB (A)	62				65			
Permissible transport vibration			Up and down vibration 14.7 m/S² × 2.5 hr (7.5 to 100 Hz sweep/5 min.)							
Ingress protection			IP2X*11							
Mass		kg	83		86	105	100		106	122
Molded-case circuit breaker (Rated current)		A	10				15			
Items prepared by the customer			Circulating pump			–	Circulating pump			–

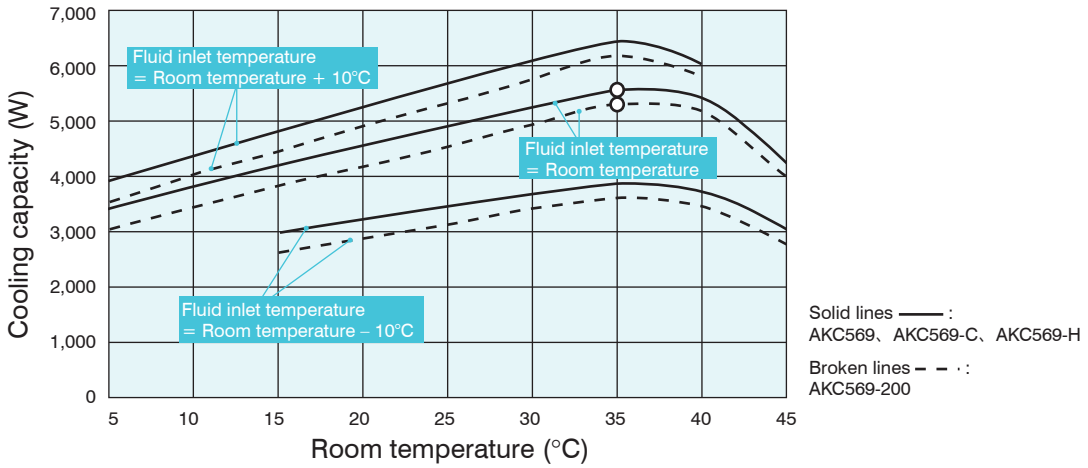
Note:
*1. The cooling capacity indicates the value at the standard point (fluid inlet temperature: 35°C, room temperature: 35°C, fluid used: ISO VG32, flow rate: rated circulating volume, 1 atm). This unit has about ±5% of product tolerance
*2. Use a commercial power supply for the power source. The use of an inverter power supply may cause burn damage to the unit. The voltage fluctuation range should be within ±10%. If it is more than ±10%, please consult us.
*3. The maximum power consumption/maximum current consumption indicates the value when heating fluid with the heater. The values when cooling fluid with the cooler are the same as with the standard models.
*4. Indicates the maximum value with clean fresh water. For the first operation, the priming fluid is required.
*5. The optional thermistor for machine temperature synchronization is required.
*6. The SDS (Safety Data Sheet) of refrigerant R410A is attached to the –C type.
*7. This unit is cannot be used for water, chemicals, foods or fuels.
*8. If the unit is used for a grinding machine or similar equipment, the evaporator tends to become clogged with foreign material, necessitating frequent maintenance of the evaporator or leading to significantly shorter pump service life due to wear of the pump parts (mainly the mechanical seals).
*9. Not applicable to models without a pump
*10. The rotational speed of the fan varies depending on the room temperature to conserve energy. Therefore, it is normal for its operating sound to vary accordingly.
*11. Ingress protection for switch box: equivalent to IP54 (When wired with IP54 or higher conduit tube or other protection on the wiring port.)

AKC359



Solid lines ——:
AKC359、AKC359-C、AKC359-H
Broken lines – – ·:
AKC359-200

AKC569



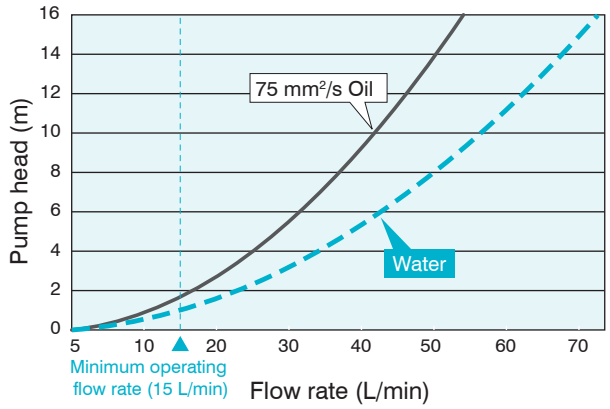
Solid lines ——:
AKC569、AKC569-C、AKC569-H

Broken lines – – ·:
AKC569-200

1. The "O" mark shows the standard point.
   (Room temperature: 35°C, fluid inlet temperature: 35°C, flow rate: 35 L/min, fluid used: ISO VG32, 1 atm)
2. The cooling capacity varies depending on the room temperature, fluid temperature, the kinematic viscosity of the fluid, etc.

Internal Pressure Loss

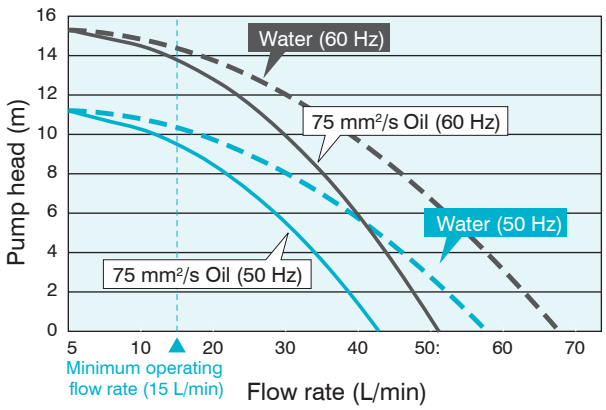
For the selection of the oil pump size and piping system, such as diameter and length of pipes, refer to the chart below. Pay attention to making the oil flow rate 15 L/min or greater.



Flow Rate Characteristics for Models With a Pump

(Internal pressure loss included)

The chart below shows the flow rate characteristics of the pumps with the internal pressure loss taken into account. Select the diameters and lengths of pipes by referring to the chart below so that a circulating volume of 15 L/min or greater can be maintained.

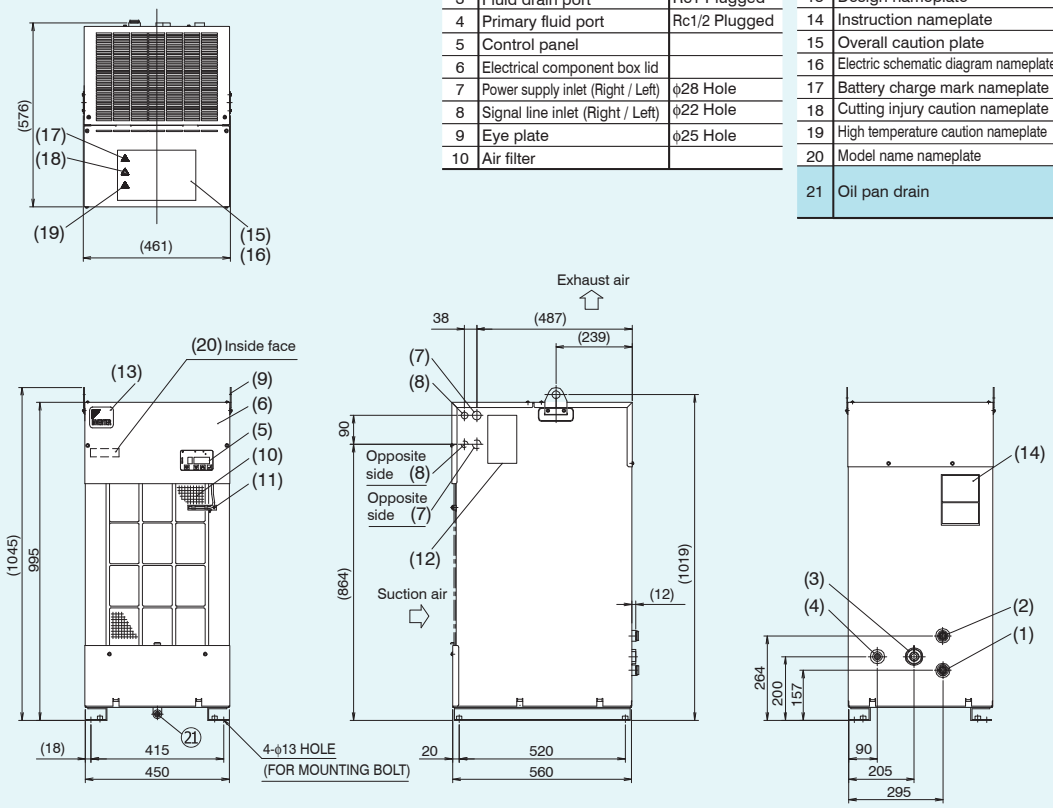


Note: Refer to Page 19 for more details.
● For the machining dimensions of the holes for installation on the tank, refer to page 12.

AKC359 (-C) (-H) (-200)

Part No.	Name	Description
1	Fluid inlet	Rc3/4
2	Fluid outlet	Rc3/4
3	Fluid drain port	Rc1 Plugged
4	Primary fluid port	Rc1/2 Plugged
5	Control panel	
6	Electrical component box lid	
7	Power supply inlet (Right / Left)	ϕ28 Hole
8	Signal line inlet (Right / Left)	ϕ22 Hole
9	Eye plate	ϕ25 Hole
10	Air filter	

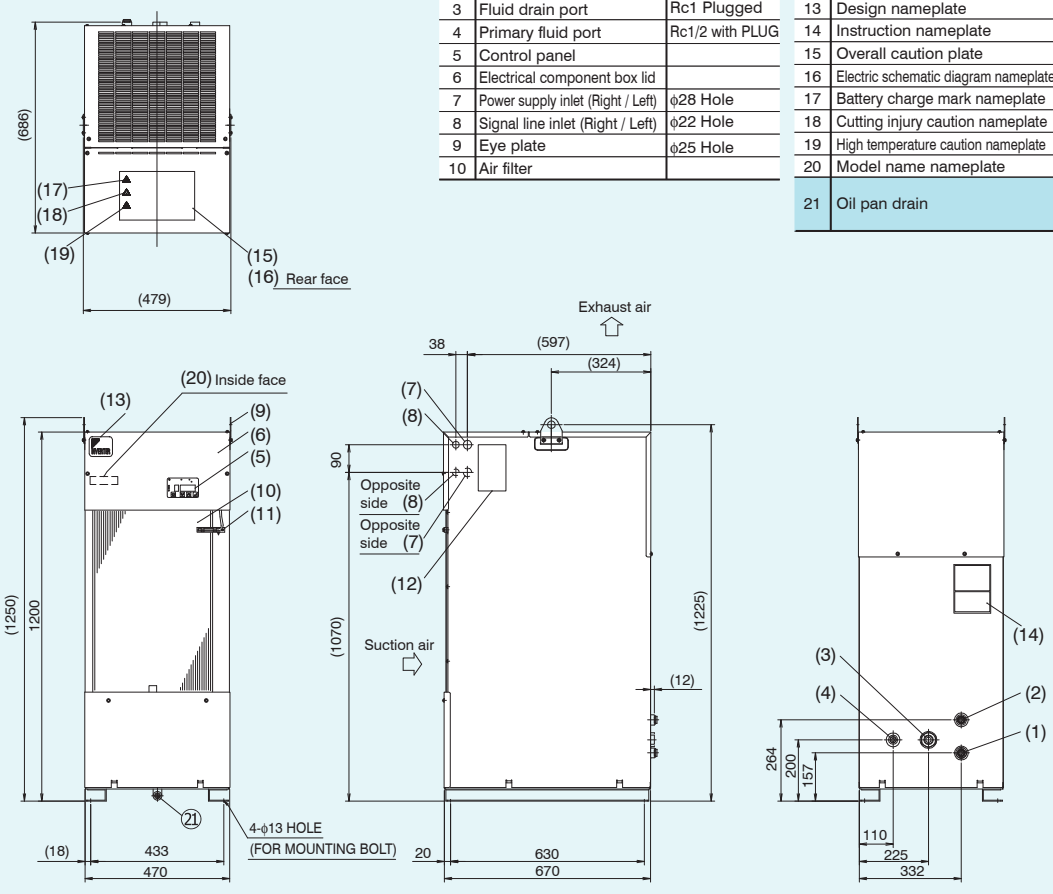
Part No.	Name	Description
11	Room temperature thermistor	
12	Machine nameplate	
13	Design nameplate	
14	Instruction nameplate	
15	Overall caution plate	
16	Electric schematic diagram nameplate	
17	Battery charge mark nameplate	
18	Cutting injury caution nameplate	
19	High temperature caution nameplate	
20	Model name nameplate	
21	Oil pan drain	Rc3/8 Plugged Models with a pump only



AKC569 (-C) (-H) (-200)

Part No.	Name	Description
1	Fluid inlet	Rc3/4
2	Fluid outlet	Rc3/4
3	Fluid drain port	Rc1 Plugged
4	Primary fluid port	Rc1/2 with PLUG
5	Control panel	
6	Electrical component box lid	
7	Power supply inlet (Right / Left)	ϕ28 Hole
8	Signal line inlet (Right / Left)	ϕ22 Hole
9	Eye plate	ϕ25 Hole
10	Air filter	

Part No.	Name	Description
11	Room temperature thermistor	
12	Machine nameplate	
13	Design nameplate	
14	Instruction nameplate	
15	Overall caution plate	
16	Electric schematic diagram nameplate	
17	Battery charge mark nameplate	
18	Cutting injury caution nameplate	
19	High temperature caution nameplate	
20	Model name nameplate	
21	Oil pan drain	Rc3/8 Plugged Models with a pump only

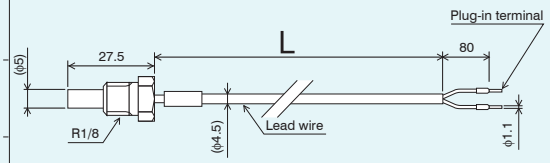
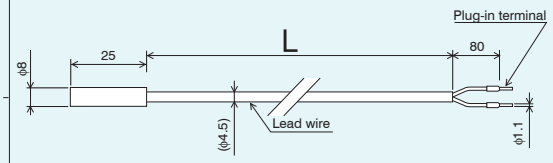


MEMO

Thermistor (Compatible with All Types of Oil Cooling Unit 9 series)

■ Thermistor models and applications

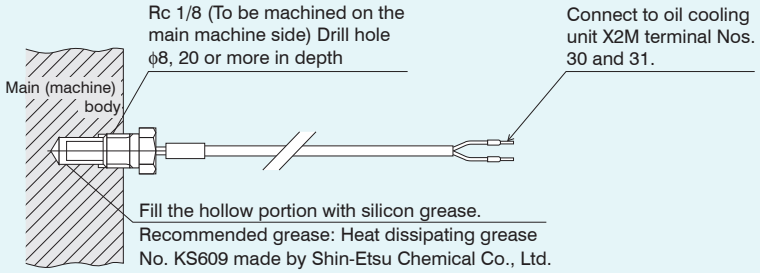
When this optional part is installed in the main machine or oil piping, the thermistor detects the temperature to allow the control of oil temperature.

Name	Model	Length of lead wire L (m)	Figure	Application (To be installed by you)	Applicable model
Thermistor for machine body synchronization	AKZ 9-OP-K5	5 m		For machine temperature synchronization control (implanted in the main machine)	AKJ9 (W) Series, AKC9 Series
	AKZ 9-OP-K10	10 m			
	AKZ 9-OP-K15	15 m			
	AKZ 9-OP-A5	5 m		For machine temperature synchronization control (attached to the surface of the main machine)	
	AKZ 9-OP-A10	10 m			

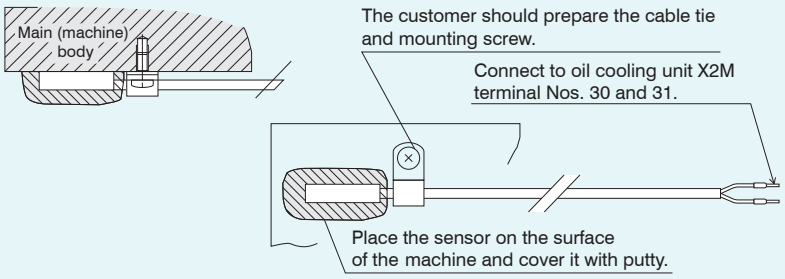
Thermistor characteristics: Resistance value … R25 (Resistance value at 25°C) = 20 kΩ, Tolerance: ±3%

■ Instruction for installation and connection

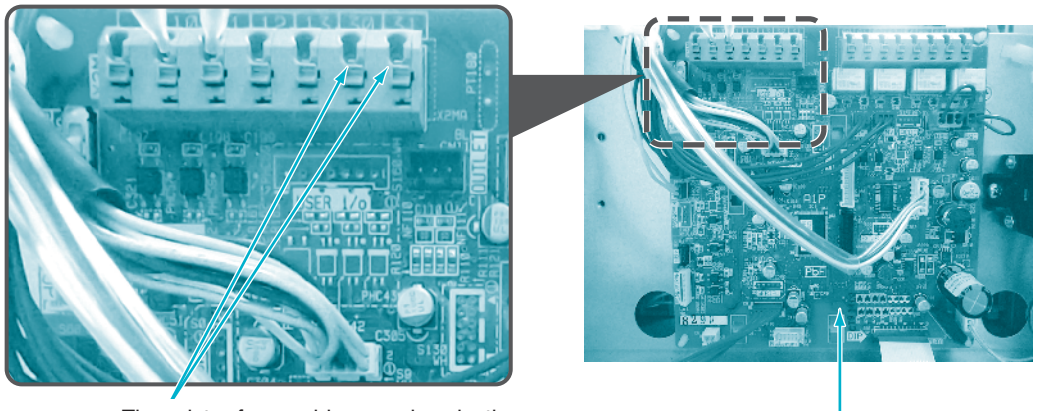
For AKZ 9-OP-K



For AKZ 9-OP-A



■ Installation positions of the thermistors for machine temperature synchronization.



Thermistor for machine synchronization
Installation position (No. 30 / 31 pin)

Control board

Option Board for Communication (Serial Communication / Parallel Communication)

The following can be achieved by mounting this option board on the Oil Cooling Unit's control board and communicating with the machine.

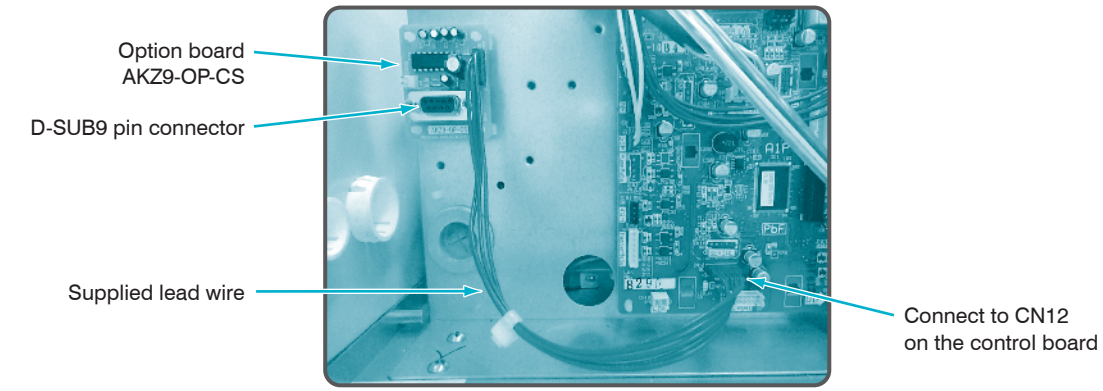
1. Changing the operation mode and the operation setting from the machine
2. Reading various data such as the alarm code and temperature-related data (machine temperature, room temperature, tank fluid temperature, inverter frequency) of the Oil Cooling Unit from the machine.

Communication method		Model	Installation position	Applicable model
Serial communication	RS232C	AKZ9-OP-CS	Installation plate inside control box	AKJ189, AKJ359, AKJ459, AKJ569 (W), AKJ909 (W), AKJ1509
		AKC9-OP-CS	Inside control box	AKC359, AKC569
	RS422	AKZ9-OP-CS4	Installation plate inside control box	AKJ189, AKJ359, AKJ459、AKJ569 (W), AKJ909 (W), AKJ1509
		AKC9-OP-CS4	Inside control box	AKC359, AKC569
Parallel Communication		AKZ9-OP-CP	Inside control box	AKJ189, AKJ359, AKJ459, AKJ569 (W), AKJ909 (W), AKJ1509

Note: For details on the communication procedure and specifications, refer to the Instruction Manual.

■ Mounting the AKZ9-OP-CS serial communication option board

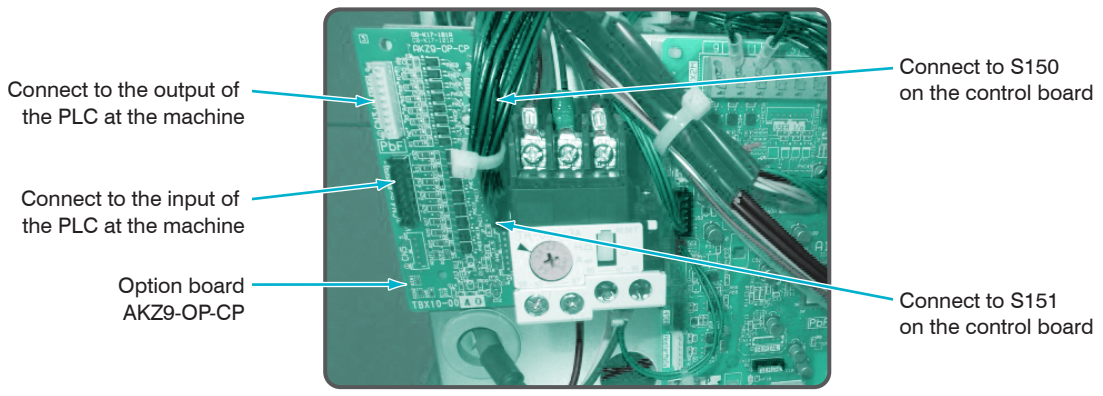
[For the AKJ9 Series]



- Dimensions of communication board (W × H): 40 × 50
- The communication board is secured at four positions by locking support.

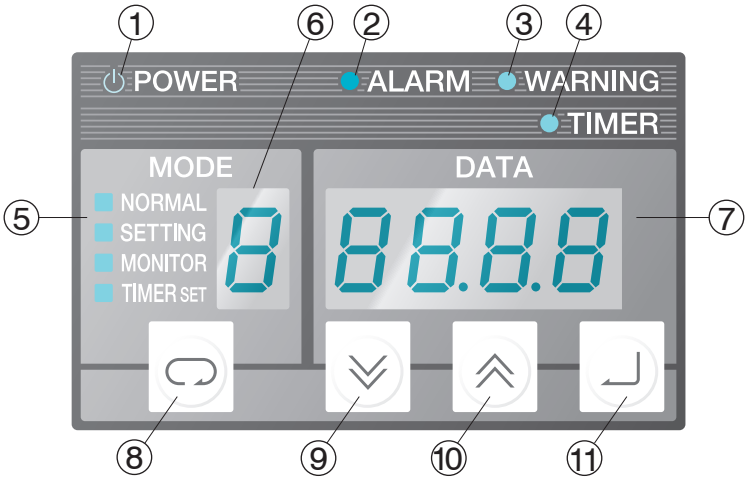
■ Mounting the AKZ9-OP-CP parallel communication option board

[For AKJ189, 359, 459]



- Dimensions of communication board (W × H): 50 × 105
- The communication board is secured at four positions by locking support.

Part Names, Functions and Operation of Control Panel

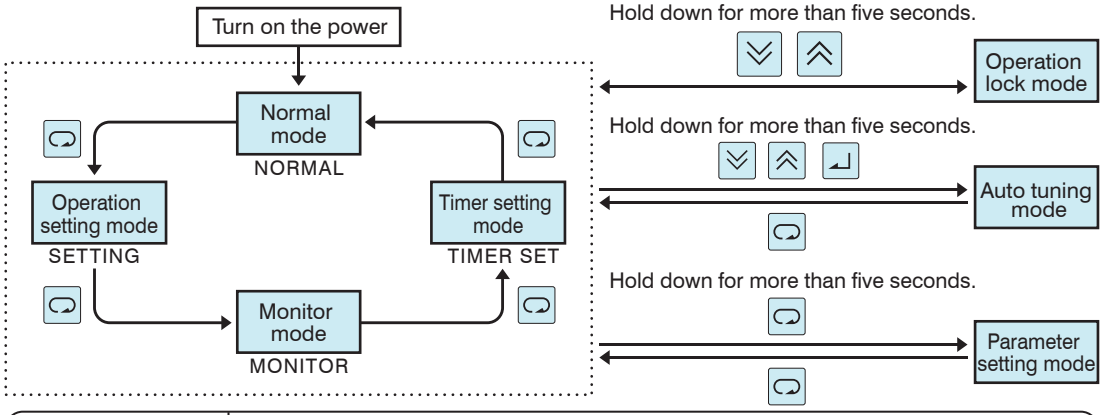


NO.	Item	Description
①	Power lamp (Green)	The lamp is continuously on while power is supplied.
②	Error warning lamp (Red)	When an error occurs: Level 1 alarm: The lamp keeps blinking. Level 2 alarm: The lamp is turned on
③	Warning lamp (Green)	When a warning occurs: Level 1 warning: The lamp keeps blinking. Level 2 warning: The lamp is turned on.
④	Timer mode lamp (Green)	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 MONITOR: Monitor 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 display	Displays various data. The data displayed differs depending on the operation mode and data number.
⑧	[SELECT] Select key	Selects the operation mode.
⑨	[DOWN] key	Decrements the value of the operation mode, data number or data by 1. When held for two seconds or longer, decrements the values by 10.
⑩	[UP] key	Increments the value of the operation mode, data number or data by 1. When held for two seconds or longer, increments the values by 10.
⑪	[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 ↻ key in general.

To enter a special mode, hold down a number of keys in combination for more than five seconds.



⚠ 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: Operation mode 3
(tank fluid temperature/room temperature synchronization control)

AKJ9W Series: Operation mode 4
(tank fluid temperature/room temperature synchronization control)

AKJ9 Series: Operation mode 3
(inlet fluid temperature/room temperature synchronization control)

Temperature difference: 0.0 (K)

Operation Mode and Setting Method

AKJ9 Series

Operation Mode No.	Mode name	Description	Setting temperature range	Necessary optional part
0	Tank fluid temperature, fixed temperature control	Maintains the tank fluid at a fixed temperature	5 to 50°C	
3	Tank fluid temperature, room temperature synchronization control	Synchronizes the tank fluid temperature with the room temperature	Room temperature −9.9 to +9.9 (K)	
4	Tank fluid temperature / machine temperature synchronization control	Synchronizes the tank fluid temperature with the machine temperature	Machine temperature −9.9 to +9.9 (K)	Machine synchronization thermistor

AKJ9W Series

Operation Mode No.	Mode name	Description	Setting temperature range	Necessary optional part
0	Tank fluid temperature, fixed temperature control	Maintains the tank fluid at a fixed temperature	5 to 50°C	
4	Tank fluid temperature, room temperature synchronization control	Synchronizes the tank fluid temperature with the room temperature	Room temperature −9.9 to +9.9 (K)	
	Tank fluid temperature / machine temperature synchronization control	Synchronizes the tank fluid temperature with the machine temperature	Machine temperature −9.9 to +9.9 (K)	Machine synchronization thermistor

AKC9 Series

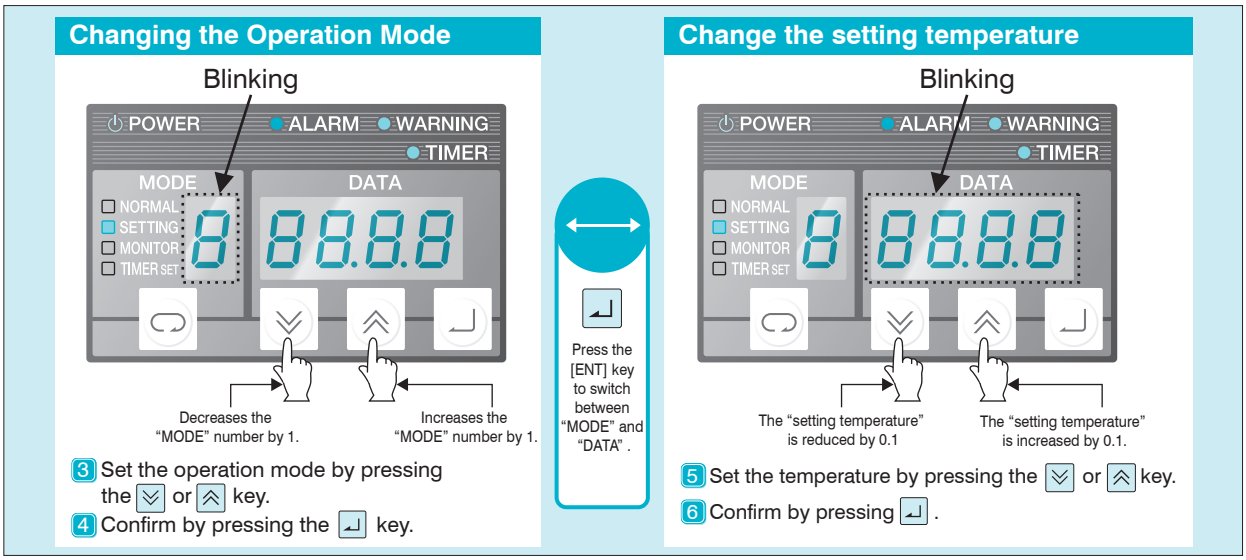
Operation Mode No.	Mode name	Description	Setting temperature range	Necessary optional part
0	Inlet fluid temperature, fixed temperature control	Maintains the inlet fluid at a fixed temperature	5 to 50°C	
1	Outlet fluid temperature, fixed temperature control	Maintains the outlet fluid at a fixed temperature	5 to 50°C	
3	Inlet fluid temperature, room temperature synchronization control	Synchronizes the inlet fluid temperature with the room temperature	Room temperature −9.9 to +9.9 (K)	
4	Inlet fluid temperature / machine temperature synchronization control	Synchronizes the inlet fluid temperature with the machine temperature	Machine temperature −9.9 to +9.9 (K)	Machine synchronization thermistor
5	Output fluid temperature / room temperature synchronization control	Synchronizes the outlet fluid temperature with the room temperature	Room temperature −9.9 to +9.9 (K)	
6	Outlet fluid temperature / machine temperature synchronization control	Synchronizes the outlet fluid temperature with the machine temperature	Machine temperature −9.9 to +9.9 (K)	Machine synchronization thermistor

Note: Refer to Page 23 for details of required optional parts.

■ Setting procedure

1 Power ON Release the operation lock mode before starting operation for the first time. (Hold down the ⩛ and ⩚ keys together for at least 5 seconds.)

2 Select the “SETTING” operation setting mode (press the ↩ key once).



7 Return to the “NORMAL” mode by pressing the ↩ key three times.

Checking Data in the Monitor Mode

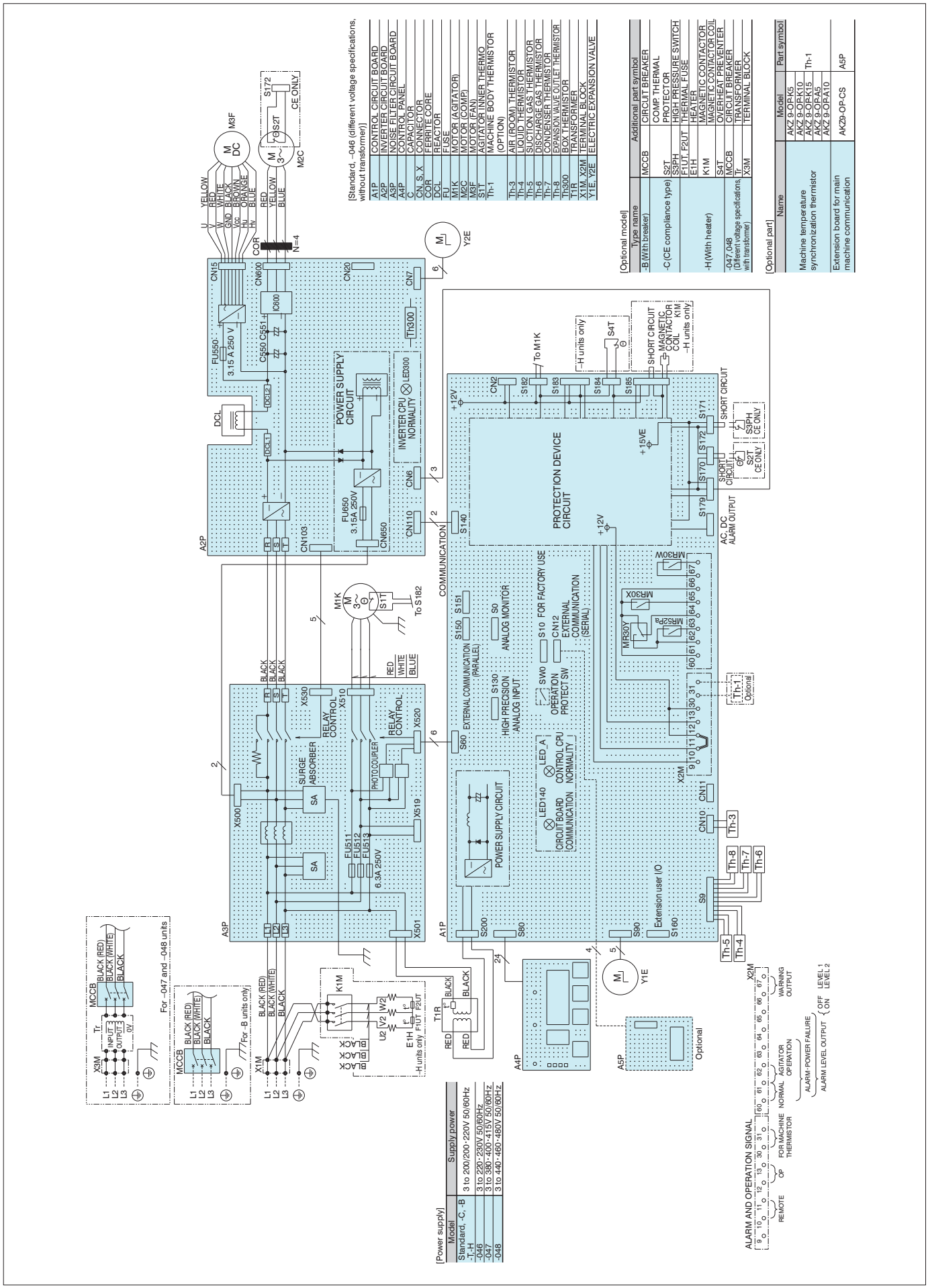
The following data can be checked in the monitor mode.

Monitor No.	Description			Note
	AKJ9	AKJ9W	AKC9	
0	Machine body temperature [Th1]	Room temperature or machine body temperature [Th1]	Machine body temperature [Th1]	*1
1	–		Outlet fluid temperature [Th2]	*1
2	Room temperature [Th3]	Primary side cooling water temperature [Th3]	Room temperature [Th3]	*1
3	Tank fluid temperature [Th4]		Inlet fluid temperature [Th4]	*1
4	Intake gas temperature [Th5]			*1

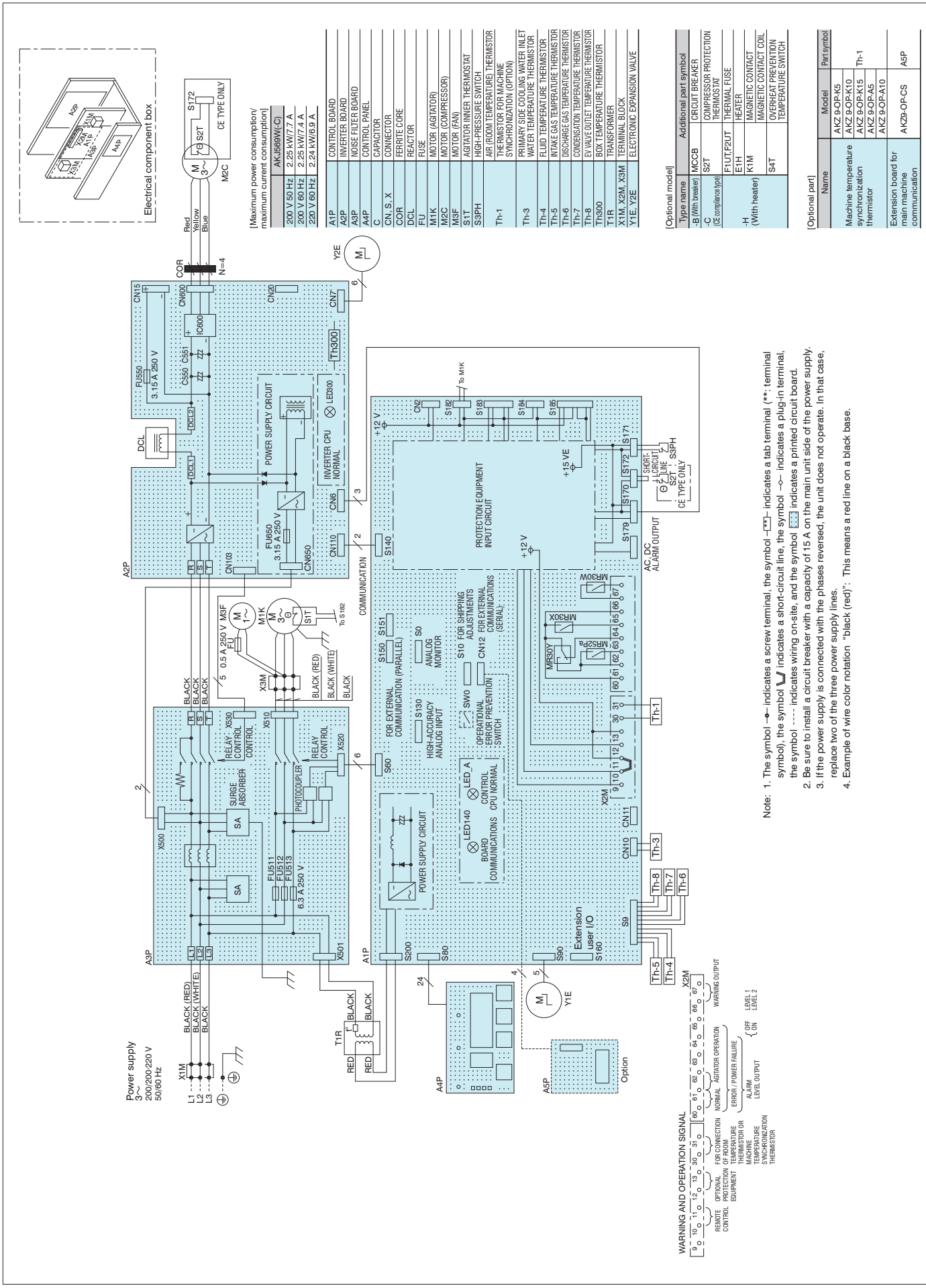
Monitor No.	Description			Note
	AKJ9	AKJ9W	AKC9	
5	–		ΔT [Th4 - Th2]	*1
6	Cooling capacity control command value (%)			–
7	Compressor inverter rotational speed (rps)			–
8	Power consumption (kW)			*3
9	Extended DIN (hundreds digit), DOUT (tens digit) status			*2

*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 200 V (the error is approximately 20%).

Electric Wiring Diagram (Representative Model of AKJ9 Series)



Electric Wiring Diagram (representative model of AKJ9W Series)



[Maximum power consumption/ maximum current consumption]

	AKJ569W(-C)
200 V 50 Hz	2.25 kW/7.7 A
200 V 60 Hz	2.25 kW/7.4 A
220 V 60 Hz	2.24 kW/6.9 A

A1P	CONTROL BOARD
A2P	INVERTER BOARD
A3P	NOISE FILTER BOARD
A4P	CONTROL PANEL
C	CAPACITOR
CN, S, X	CONNECTOR
COR	FERRITE CORE
DCL	REACTOR
FU	FUSE
M1K	MOTOR (AGITATOR)
M2C	MOTOR (COMPRESSOR)
M3F	MOTOR (FAN)
S1T	AGITATOR INNER THERMOSTAT
S3PH	HIGH-PRESSURE SWITCH
Th-1	AIR (ROOM TEMPERATURE) THERMISTOR THERMISTOR FOR MACHINE SYNCHRONIZATION (OPTION)
Th-3	PRIMARY SIDE COOLING WATER INLET WATER TEMPERATURE THERMISTOR
Th-4	FLUID TEMPERATURE THERMISTOR
Th-5	INTAKE GAS TEMPERATURE THERMISTOR
Th-6	DISCHARGE GAS TEMPERATURE THERMISTOR
Th-7	CONDENSATION TEMPERATURE THERMISTOR
Th-8	EV VALVE OUTLET TEMPERATURE THERMISTOR
Th300	BOX TEMPERATURE THERMISTOR
T1R	TRANSFORMER
X1M, X2M, X3M	TERMINAL BLOCK
Y1E, Y2E	ELECTRONIC EXPANSION VALVE

[Optional model]

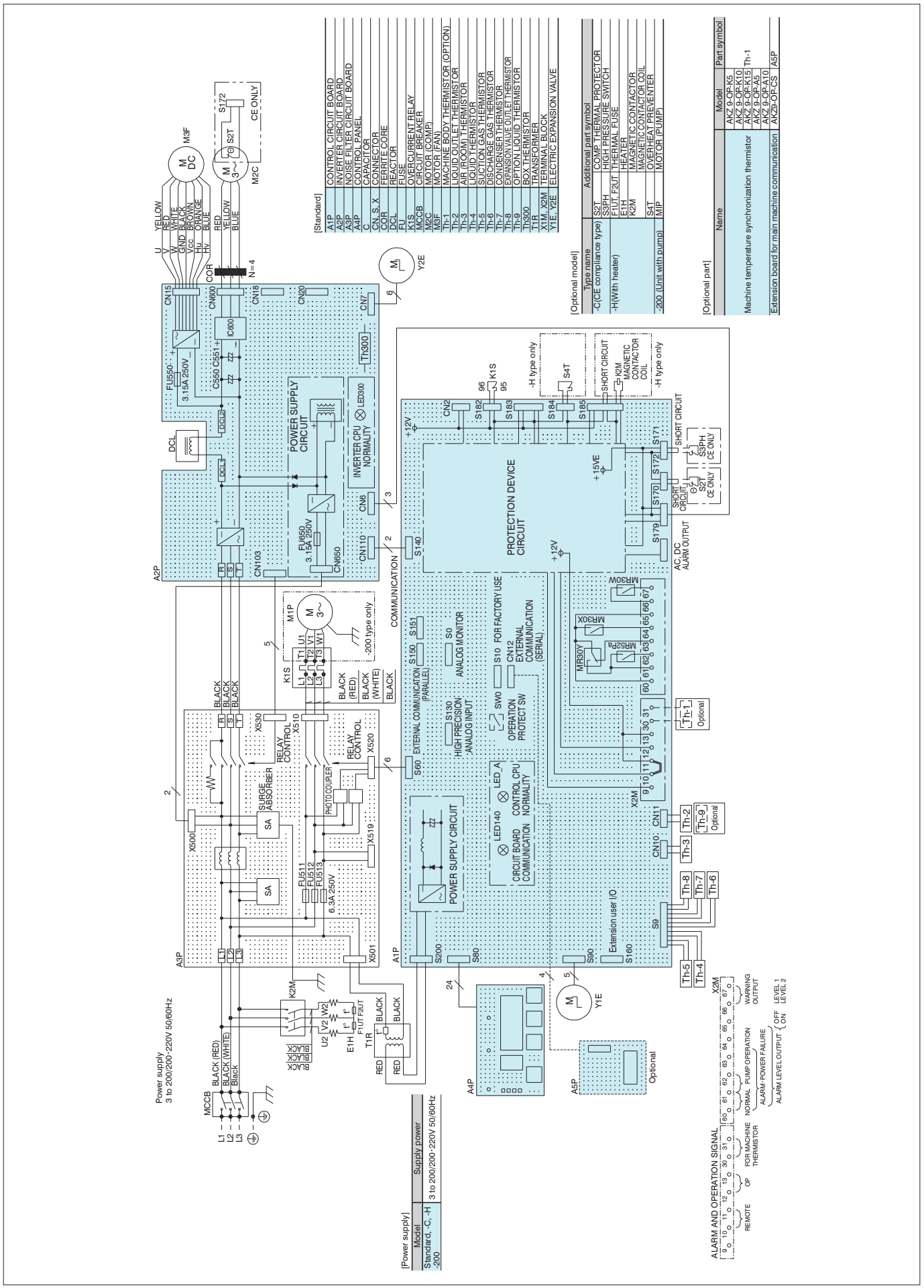
Type name	Additional part symbol	
-B (With breaker)	MCCB	CIRCUIT BREAKER
-C (CE compliance type)	S2T	COMPRESSOR PROTECTION THERMOSTAT
	F1UT,F2UT	THERMAL FUSE
-H (With heater)	E1H	HEATER
	K1M	MAGNETIC CONTACT
	S4T	MAGNETIC CONTACT COIL OVERHEAT PREVENTION TEMPERATURE SWITCH

[Optional part]

Name	Model	Part symbol
Machine temperature synchronization thermistor	AKZ 9-OP-K5	Th-1
	AKZ 9-OP-K10	
	AKZ 9-OP-K15	
	AKZ 9-OP-A5	
	AKZ 9-OP-A10	
Extension board for main machine communication	AKZ9-OP-CS	A5P

Note: 1. The symbol ⊸ indicates a screw terminal, the symbol ⊣**⊢ indicates a tab terminal (**: terminal symbol), the symbol ⏦ indicates a short-circuit line, the symbol ⊸○⊸ indicates a plug-in terminal, the symbol ---- indicates wiring on-site, and the symbol ⊡ indicates a printed circuit board.
2. Be sure to install a circuit breaker with a capacity of 15 A on the main unit side of the power supply.
3. If the power supply is connected with the phases reversed, the unit does not operate. In that case, replace two of the three power supply lines.
4. Example of wire color notation "black (red)": This means a red line on a black base.

Electric Wiring Diagram (Representative Model of AKC9 Series)



Electric Wiring Connection Instruction Diagram

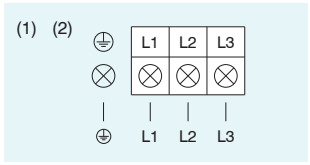
1 Power supply capacity … Refer to the maximum power consumption/maximum current consumption panel of the specifications list (Pages 5, 6, 14 and 19).

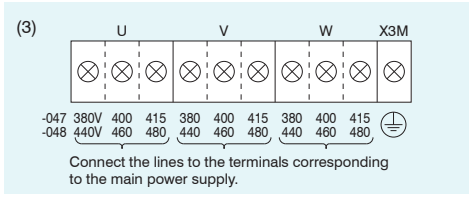
2 Connection to power supply terminal block (X1M, Tr)

(1) AKJ※※9 (W): With the standard and optional (-C, -H, -046) types:
- Connect to X1M.

(2) AKJ※※9 (W): With the “with breaker” (-B) specifications:
AKC※※9: All models:
- Connect to the breaker.

(3) AKJ※※9: With different voltage types (with transformer: -047, -048):
- Connect to the terminal block supplied with the transformer.



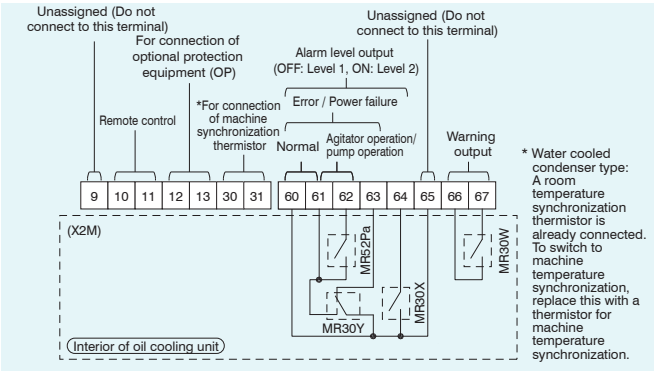


1. Screw terminal and wiring diameter

Series	Terminal block	Screw terminal	Wiring diameter		
			JIS cable	IEC cable	UL cable
AKJ 189, 359, 459, 569 (W) AKC 359, 569	X1M	M4	2.0 mm² or more	2.5 mm² or more	AWG#14 or more
	Breaker	M5			
AKJ 909 (W),1509	X1M	M5	3.5 mm² or more	4.0 mm² or more	AWG#12 or more
	Breaker	M5			

2. Use a round crimp-style terminal for connection.
3. The terminal block is for three poles and the ground wire is to be secured on the enclosure with a screw.

3 Connection to signal terminal block (X2M)



1. Straight crimp terminal and wiring diameter

Straight pin terminals	Wiring diameter		
	JIS cable	IEC cable	UL cable
*	0.25 mm² to 1.25 mm²	0.3 mm² to 1.5 mm²	AWG#22 to #16

2. Use a straight crimp-style terminal for connection.
3. Use stranded wires for electric connection.
4. The wiring size is 0.5 mm² to 1.5 mm² in the case of duplex cable according to IEC. If using stripped wires, make the stripped length 9 to 10 mm.

* Recommended models and manufacturers:
TGN TC-1.25-9T (NICHIFU Co., Ltd.)

DANGER

1. 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 distances must be at least 3 mm.
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.

CAUTION

1. To avoid the effects of noise, connect the power wire by cutting it to the proper length so that no excess wire comes into contact with the control board or others.
2. To perform remote control, remove the short-circuit wire between [10] and [11] and install an operation switch (to be prepared by the customer).
3. The mode is set to “Lock mode (Stop mode)” by default. Before starting operation, follow the procedure to release the Lock mode from the operation panel. Refer to the operation manual for the unlocking procedure.
4. The unit is provided with a misoperation prevention switch (PROTECT) to reject setting from the operation panel. If you want to use this function, make the necessary setting referring to the operation manual.

4 Signal output time chart

(1) Alarm/operation status output chart

Signal output \ Operation status			Remote operation (between [10] and [11])							
			ON				OFF			
			Normal	Level 1 error or Lock	Level 2 error	Power failure (Power OFF)	Normal	Level 1 error or Lock	Level 2 error	Power failure (Power OFF)
Normal (“a” contact)	60 - 61	ON								
		OFF								
Error / Stop (Power OFF) (“b” contact)	60 - 63	ON								
		OFF								
Error level (“a” contact)	60 - 64	ON								
		OFF								
Agitator operation (NO contact)	61 - 62	ON								
		OFF								

(2) Warning output chart

Signal output \ Operation status			Non-warning status				Warning status			
			Normal	Level 1 error or Lock	Level 2 error	Power failure (Power OFF)	Normal	Level 1 error or Lock	Level 2 error	Power failure (Power OFF)
Warning output (NO contact)	66 - 67	ON								
		OFF								

CAUTION

1. The following electric wires can be used on the terminal block for straight crimp-style terminals.
   Single wire: ϕ0.57 to ϕ1.44 (AWG#22～#16)
   Stranded wire: 0.25 mm² to 1.25 mm² (AWG#22～16)
2. Load applicable to [60 - 64] and [66 - 67] is as follows:
   Min. applicable load: 10mV DC, 10 μA or more
   Max. applicable load: 30 V DC, 2 A (Resistance load)
3. For [10] to [13], please prepare contacts to meet the condition of minimum applicable load 12 V DC and 5 mA.
4. When the length of the thermistor to be connected to [30] - [31] is longer than 10m, or the wiring is routed in a poor noise environment, use shielded wire.

Notes for Handling

• Important notes to be observed regarding the 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 switch and temperature switch.

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 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 (W) 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”

	Description	AKJ 9 (W) Series	AKC 9 Series
Lubrication oil **Mineral hydraulic oil**	• Oil that is classified as third class petroleum or fourth class petroleum of the fourth group hazardous materials stipulated in the Fire Defense Law and that corresponds to discoloration No. 1 in the copper corrosion test method (JIS K2513) of petroleum products	✓	✓
Nonflammable hydraulic oil • Phosphate ester hydraulic fluid • Chlorinated hydrocarbon series • Water - Glycol series • W/O - O/W emulsion series (High-aqueous hydraulic oil)	———	Unusable	Unusable
Coolant fluid • Water-soluble cutting and grinding fluid • Non water-soluble cutting and grinding oil	———	✓	✓
Ethylene glycol (Antifreeze liquid)	Fluid not including any ingredient that corrodes the SUS304 material used for the evaporator coil	✓	Unusable
Water (Industrial water)		✓	Unusable
Inflammable liquid like fuel	Liquid equivalent to special flammables, alcohol, first class petroleum and second class petroleum of the fourth group hazardous materials specified according to the Fire Defense Law	Unusable	Unusable
Drugs	———	Unusable	Unusable
Liquid for food products	Drinking water, water for cooling food products, etc.	Unusable	Unusable

Notes for Handling

* Before operating the product, be sure to read and understand the operation manual supplied with it.

• Instructions for safe operation

(Signs and Instructions)

⚠ DANGER	Filure to observe the instruction may cause an imminent hazardous situation that may result in death or serious injury.
⚠ WARNING	Failure to observe the instruction may result in death or serious injury.
⚠ CAUTION	Failure to observe the instruction may result in personal injury or damage to property.

① General instructions

[⚠ DANGER] ① Use the product only in accordance with the intended specifications (specified in brochure, specification sheet, operation manual, and caution plates).

[⚠ DANGER] ② Never operate the equipment in an explosive atmosphere

[⚠ DANGER] ③ Do not disassemble, repair or modify the equipment by yourself.

[⚠ DANGER] ④ 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).

[⚠ WARNING] ⑤ 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 inhalation of a great deal of refrigerant, contact with skin, or refrigerant in the eye, seek medical attention immediately.

[⚠ WARNING] ⑥ In the event of an abnormal condition, stop operation promptly, investigate the cause of the problem and take appropriate remedial measures.

[⚠ CAUTION] ⑦ Do not use the unit in atypical environments (locations subject to high temperatures, high humidity, or a lot of dust, contamination, steam, oil mist or corrosive gases: H_2S, SO_2, NO_2 or $C\ell_2$).

[⚠ CAUTION] ⑧ Install a flow switch and temperature switch on the main machine to protect the main shaft and others.

[⚠ CAUTION] ⑨ Do not get on the equipment or place an object on the equipment.

[⚠ CAUTION] ⑩ Use the unit at an altitude of up to 2,000 m.
At altitudes in excess of 1,000 m the cooling capacity decreases by around 20 to 30%, so please select a model with adequate leeway in terms of cooling capacity.

② Instructions for transportation

[⚠ DANGER] ① When hoisting the equipment, check its weight and use the eye plates and hangers on the equipment properly.

[⚠ WARNING] ② Do not get approach the equipment while it is being hoisted and moved.

[⚠ CAUTION] ③ When moving the equipment, take appropriate measures for fall prevention.

[⚠ CAUTION] ④ Do not tilt the equipment 30 degrees or more while transporting the equipment (including during storage).

③ Instructions for installation

[⚠ WARNING] ① Install the equipment on a rigid, level foundation and secure it appropriately.

[⚠ CAUTION] ② Do not place an object near the suction port and discharge port of the equipment.

④ Instructions for wiring and piping installation

[⚠ DANGER] ① Wiring and piping installation should be performed by a person with specialized knowledge and skills.

[⚠ DANGER] ② Always use a commercial power supply for the power source. (The use of an inverter power supply may cause burn damage).

[⚠ DANGER] ③ Connect the wiring for power supply in accordance with the electric wiring instruction diagram of the specification sheet and operation manual.

[⚠ DANGER] ④ Ground the equipment properly.

[⚠ WARNING] ⑤ Install the wiring in accordance with the standard by checking the electric schematic diagram.

[⚠ CAUTION] ⑥ Always install a dedicated breaker (all-pole (3-pole) molded case circuit breaker) appropriate for the capacity of the Oil Cooling Unit on the main power supply on site.

[⚠ CAUTION] ⑦ Check that piping for coolant has a pressure resistance of at least 1 MPa and make proper connections. (For AKC)

⑤ Instructions for trial run

[⚠ CAUTION] ① Check to see that the machine is in a safe status (not activated) before starting the trial run.

[⚠ CAUTION] ② Check to see that the fluid piping and electric wiring are correctly connected to the machine and that there is no looseness in connections and joints.

[⚠ CAUTION] ③ Disable the operation lock of the equipment (Oil Cooling Unit) before starting the machine.

[⚠ CAUTION] ④ Check that the tank contains the correct volume of the fluid used. (For AKJ)

[⚠ CAUTION] ⑤ Check that the fluid piping system contains the required amount of fluid, and that the piping is not blocked part way through. (For AKC)

⑥ Instructions during operation

[⚠ DANGER] ① Do not splash water or fluid on the equipment.

[⚠ WARNING] ② Do not push your finger or an object into gaps of the equipment.

[⚠ CAUTION] ③ Do not touch the heated exhaust port of the equipment.

⑦ Instructions for maintenance and inspection

[⚠ DANGER] ① Perform maintenance and inspection with the equipment kept open. Working in a closed status may result in suffocation due to the leak of refrigerant.

[⚠ DANGER] ② Always turn off the main power supply before starting maintenance and inspection.

[⚠ DANGER] ③ Wait for five minutes after turning off the main power supply and start maintenance and inspection operation.

[⚠ DANGER] ④ Do not operate the equipment with the cover of the equipment opened.

[⚠ CAUTION] ⑤ Wear protective gear such as gloves and an eye protector when performing maintenance, inspection and cleaning.

[⚠ CAUTION] ⑥ Clean the air filter periodically (once every two weeks in general).

[⚠ CAUTION] ⑦ Clean the cooling coil periodically to ensure that there is no accumulation/adhesion of chips, etc. (For AKJ)

Method of Selection of Oil Cooling Unit

In the case of cooling of cutting and grinding fluid

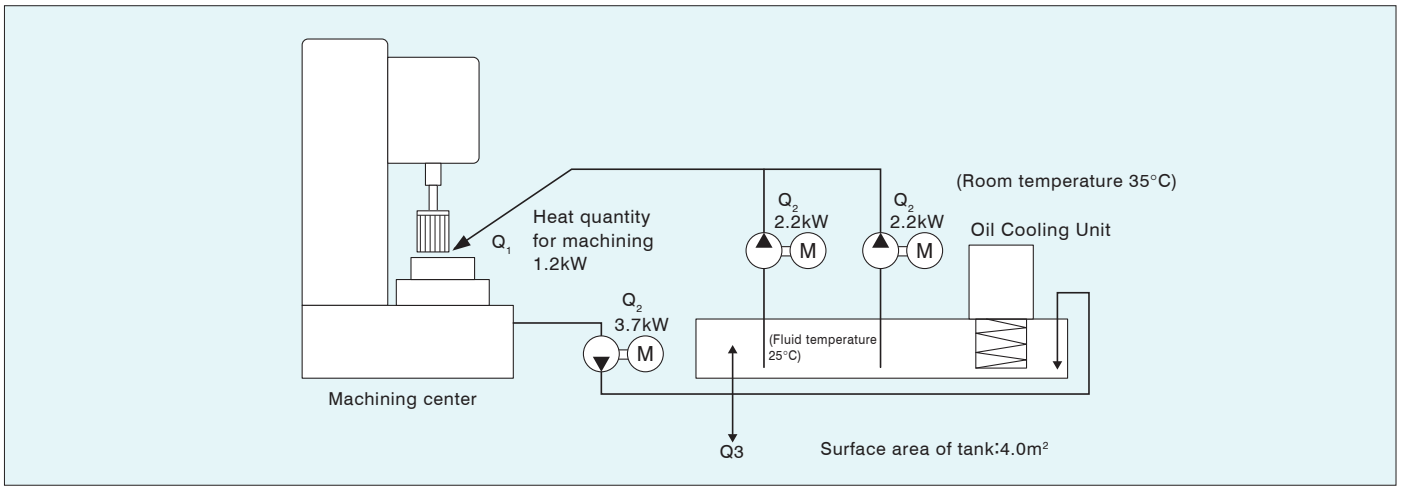
1. The amount of heat generation from the cutting and grinding fluid system should be roughly estimated according to the following formula as the tank capacity and pump flow rate are generally large. After rough estimation, the amount of heat generation should be determined by conducting tests on the actual machine to select the oil cooling unit.
2. Select a model with a cooling capacity 20 to 30% larger than the amount of heat generation from the machine tool.
3. Formula for rough calculation of amount of heat generation

$$Q = Q1 + Q2 + Q3$$

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)
: $Q2 = \text{pump motor output (kW)} \times \frac{\eta}{100}$
Q3 : Heat balance of the coolant fluid passing through the coolant tank and the room temperature
$Q3 = K \cdot A \cdot \triangle T$ K : Rate of heat passage ($W/m^2 \cdot °C$), generally K = 11.6 to 23.2
A : Surface area of the tank in contact with the fluid (m^2)
$\triangle T$: Room temperature – controlled temperature of fluid in tank (°C)

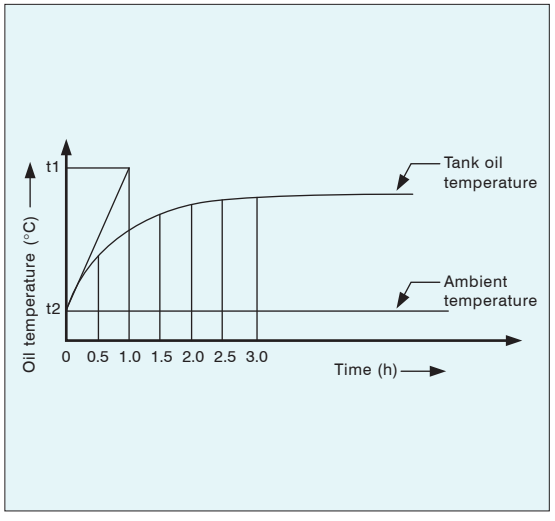
4. For testing, determine the amount of heat generation according to the method shown below.

General guide for heat generation



E.g.) In the diagram above,
When Q1 = 1.2 kW
$Q2 = (2.2 + 2.2 + 3.7) \times \frac{50}{100} \approx 4.1$ kW (For a coolant pump, "η" is generally 50%.)
$Q3 = 20 \times 4 \times (35 - 25) / 1000 = 0.8$ kW
$\therefore Q = Q_1 + Q_2 + Q_3$
$= 1.2 + 4.1 + 0.8$
$= 6.1$ kW

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



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.)

$$Q = 2.778 \times 10^{-7} Cp \cdot \gamma \cdot V \cdot \triangle t / H$$

Q : Heat release value (kW)
Cp : Constant pressure specific heat (J/kg°C) …
1967.4 (with VG32 as the hydraulic fluid), 4178 (with water)
γ : Weight volume ratio (kg/m^3)…
876 (with VG32 as the hydraulic fluid), 1000 (with water)
V : Total oil quantity (m^3)
△t : Temperature difference (°C) … t_1-t_2
H : Time (h)

E.g.) When the total oil volume is 300 L (0.3 m^3) and "△t" is 10°C.
$Q = \underline{2.778 \times 10^{-7} \times 1967.4 \times 876} \times 0.3 \times 10$
$= \underline{0.479} \times 0.3 \times 10 \approx 1.4$ kW

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