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DAIKIN

OIL COOLING UNIT
Service Manual
(MODEL 10)

Circulation type
AKZ14A
AKZ32A
AKZ43A
AKZ56A
AKZ90A

DAIKIN INDUSTRIES,LTD.

DAIKIN
OIL COOLING UNIT(MODEL 10) Service Manual
2023.9

Preface

We would like to express our deepest gratitude for your continuous custom.
We have developed and pleased to present the Oil Cooling Unit (Model 10) Service Manual.
We Daikin provide an extensive lineup characterized high-accuracy temperature control and needs for energy saving with the Oil Cooling Unit.
This Service Manual gives information on troubleshooting and a variety of services.
Please make use of the Service Manual for your servicing of the Oil Cooling Unit.

Name of information	Models listed	Date of issue
OIL COOLING UNIT(MODEL 10) Service Manual	・AKZ14A-90A	September, 2023

September, 2023

DAIKIN INDUSTRIES,LTD.
After Sales Service Division

OIL COOLING UNIT(MODEL 10) Service Manual

OIL COOLING UNIT(MODEL 10) Service Manual

SAFETY PRECAUTIONS

Be sure to observe the precautions shown below.

The following section describes precautions to prevent personal injury or damage. Hazardous situations, which can occur due to mishandling of the equipment, are classified by the safety alert symbols shown below.

⚠ DANGER	⚠ WARNING	⚠ CAUTION
This section indicates an immensely hazardous situation, which, if not avoided, will result in death or serious injury.	This section indicates a potentially hazardous situation, which, if not avoided, can result in death or serious injury.	This section indicates a potentially human injury or hazardous situation, which, if not avoided, may result in obstacles or property damage.

⚠ DANGER

Have personnel with specialized knowledge do work.

MUST

Transport, installation, piping, wiring, running, operation, maintenance, and check of the unit must be conducted by persons who have specialized knowledge about the said work. Be sure to check applicable power supply (voltage, frequency) and current.

Do not run the unit with any equipment cover open.

PROHIBIT

Do not run the unit with opening the casing of equipment or the terminal cover of the motor or electrical parts. Doing so will result in an electric shock.

Check to be sure the specifications and then connect power supply wires.

MUST

Be sure to connect power supply wires as shown in the wiring diagram or the operation manual. Faulty wiring will result in an electric shock or a fire.

Do not use the unit out of spec.

MUST

Do not use the unit out of specifications set forth in catalogs or delivery specifications concerned. Doing so will result in serious accidents such as damage to the main machine, injury, a fire, or an electric shock.

Be sure to establish a proper ground.

CONNECT GROUND WIRE

The unit has a noise filter. Connecting no ground wire will result in an electric shock.

Check the mass and suspend from a specified position.

MUST

Check the unit for the mass and then suspend the unit from a position specified by the outline drawing, within the range of rated weight of a the carrier. If not heeded, the unit will drop or tumble, thus resulting in injury or damage.

Do not touch the unit with hands or body.

PROHIBIT

The casing surface may be quite hot during operation. Do not touch the unit directly with your hands or body to prevent burns.

Do not use in explosive atmospheres.

PROHIBIT

Do not install the unit in places with potential hazards for the generation, inflow, accumulation, or leak of flammable gas, or with suspended carbon fiber. Otherwise, you may get a burn.

Wait 5 minutes to conduct work after shutting down power.

PROHIBIT

Incomplete discharging from internal high-voltage live parts (e.g. capacitor) will result in an electric shock.

Do not splash water, or touch with wet hands.

PROHIBIT

Do not dip the unit in water or souse water over the unit. Doing so will result in short circuit or an electric shock. Also, do not touch the electrical components with wet hands. Doing so can result in an electric shock.

Turn OFF power and then conduct work.

MUST

Before conduct work, be sure to turn OFF the power supply. Conducting any live-wire work will result in an electric shock. Lock the power supply box (with a key) not to energize by mistake.

⚠ WARNING

Follow standards to conduct wiring work.

MUST

Conduct electric wiring in accordance with respective national and regional standards. Improper wiring may result in burnout or fire.

If refrigerant leaks, provide thorough ventilation.

MUST

If refrigerant leakage occurs while in work, be sure to ventilate the workpiece. If a large quantity of refrigerant penetrates the workpiece, anesthetic effect or asphyxiation can result.

Never come close to the unit while in transport with a hoisting attachment.

PROHIBIT

Never come close to the unit while in transport with the hoisting attachment. If not heeded, the unit can drop or tumble, thus resulting in injury or damage.

Do not put fingers or foreign matters in a clearance between equipment.

CAUTION

Guards or causing is provided with rotary parts for safety. Do not put fingers or foreign matters in the clearance. Doing so can result in injury.

Fasten the unit during operation.

MUST

Check to be sure the securing position referring to the outline drawing and then firmly secure the unit with bolts or foundation bolts. If the unit is installed in an overhead location, the unit can drop or tumble.

Immediately stop the unit when a malfunction occurs.

MUST

When a malfunction occurs, unless causes of the malfunction are definitely eliminated, do not run the unit. Doing so can result in damage, an electric shock, a fire, or injury.

Use commercial power supply.

MUST

Be sure to use commercial power supply. Using the inverter power supply or else will result in burnout.

Do not ride the unit.

PROHIBIT

Do not sit on or ride the equipment. Doing so may cause a drop from or a fall on the equipment, thus resulting in injury. Or, it may lead to damages to the unit causing an electric shock in the case of a contact to the charge section.

⚠ CAUTION

Do not use the unit in the special atmosphere.

PROHIBIT

Do not use the unit in the special atmosphere, such as that with dusts, oil mist, corrosive gasses (H_2S, SO_2, NO_2, CL_2, etc.) or at high temperature or humidity.

Check the main machine for safety conditions prior to test run.

MUST

Prior to the test run, check to be sure the main machine is in a safe state (i.e., the main machine does not operate, or even though the unit operates, no accidents occur.) Not doing so may result in injury or damage.

Be sure to secure the unit for transport.

MUST

Secure the unit so that it will not move due to vibrations or external force caused during transport. Excessive vibrations or external force may result in damage to the internal equipment.

Check the unit before operation.

CHECK

Before start of operation, make sure that the oil piping and electric wiring are properly conducted, and connecting parts are securely tightened.

⚠ CAUTION

Mount a flow switch to the main machine.

CHECK

If the oil-pump system malfunctions, no oil will be fed to the main machine. In this case, the unit normally detects this malfunction to give an alarm. Depending on malfunction mode, however, the malfunction may not be detected. If the main machine should be protected even under the said condition, mount a flow switch in the oil path of the main machine to monitor the oil flow.

Check to be sure the oil piping.

CHECK

Prior to or immediately after the connection of the oil cooling unit, check to be sure the oil piping on the main machine side is not blocked. Running the unit with the oil piping blocked may fracture an oil hose due to an oil temperature increase or make oil flow outside the oil cooling unit. Furthermore, when the oil temperature exceeds the upper limit, FH alarm will be given. In this case, stop the main machine side as quickly as possible.

List of Models

Type	Model Name	Page Listed		
Optional Specification		Standard Specification	Wiring Diagram	Piping Diagram
Standard type	AKZ14A	10	17	42
	AKZ32A	10	17	42
	AKZ43A	12	17	42
	AKZ56A	14	25	48
	AKZ90A	14	33	48
Standard type Different voltages Without transformer AC220, 230 V	AKZ14A-046	10	23	42
	AKZ32A-046	10	23	42
	AKZ43A-046	12	23	42
	AKZ56A-046	14	31	48
	AKZ90A-046	14	39	48
Standard type Different voltages Without transformer AC380, 400, 415 V	AKZ14A-500	10	18	42
	AKZ32A-500	10	18	42
	AKZ43A-500	12	18	42
	AKZ56A-500	14	26	48
	AKZ90A-500	14	34	48
Standard type Different voltages With transformer AC440, 460, 480 V	AKZ14A-048	10	24	42
	AKZ32A-048	10	24	42
	AKZ43A-048	12	24	42
	AKZ56A-048	14	32	48
	AKZ90A-048	14	40	48
Equipped with circuit breaker	AKZ14A-B	10	19	42
	AKZ32A-B	10	19	42
	AKZ43A-B	12	19	42
	AKZ56A-B	14	27	48
	AKZ90A-B	14	35	48
Equipped with circuit breaker Different voltages Without transformer AC380, 400, 415 V	AKZ14AB500	10	20	42
	AKZ32AB500	10	20	42
	AKZ43AB500	12	20	42
	AKZ56AB500	14	28	48
	AKZ90AB500	14	36	48

Type	Model Name	Page Listed		
Optional Specification		Standard Specification	Wiring Diagram	Piping Diagram
CE/UKCA Safety Standard compatible	AKZ14A-C	10	17	42
	AKZ32A-C	10	17	42
	AKZ43A-C	12	17	42
	AKZ56A-C	14	25	48
	AKZ90A-C	14	33	48
CE/UKCA Safety Standard compatible Different voltages Without transformer AC380, 400, 415 V	AKZ14AC500	10	18	42
	AKZ32AC500	10	18	42
	AKZ43AC500	12	18	42
	AKZ56AC500	14	26	48
	AKZ90AC500	14	34	48
Equipped with heater	AKZ14A-H	10	21	44
	AKZ32A-H	10	21	44
	AKZ43A-H	12	21	44
	AKZ56A-H	14	29	50
	AKZ90A-H	14	37	50
Equipped with heater Different voltages Without transformer AC380, 400, 415 V	AKZ14AH500	10	22	44
	AKZ32AH500	10	22	44
	AKZ43AH500	12	22	44
	AKZ56AH500	14	30	50
	AKZ90AH500	14	38	50
Equipped with tank	AKZ14A-T	10	17	46
	AKZ32A-T	10	17	46
	AKZ43A-T	12	17	46
	AKZ56A-T	14	25	52
	AKZ90A-T	14	33	52
Equipped with tank Different voltages Without transformer AC380, 400, 415 V	AKZ14AT500	10	18	46
	AKZ32AT500	10	18	46
	AKZ43AT500	12	18	46
	AKZ56AT500	14	26	52
	AKZ90AT500	14	34	52

1 Oil cooling unit identification symbols
AK: Oil cooling unit for hydraulic equipment

2 Basic specifications
Z: Circulation type

3 Nominal capacity (kW) x10
Example) "14" represents a nominal capacity of 1.4 kW.
14, 32, 43, 56, 90 and others

4 Series symbols (model change symbols)
A: 10 series

5 Optional symbols/Non-standard number
Options and their combinations.
(Refer to the following table.)

6 Special specifications
(dual pumps, specified paint colors, etc.)
-500: Normal (380 V/400 V/415 V)

7 Special specifications
(specified packing, optional communications, etc.)

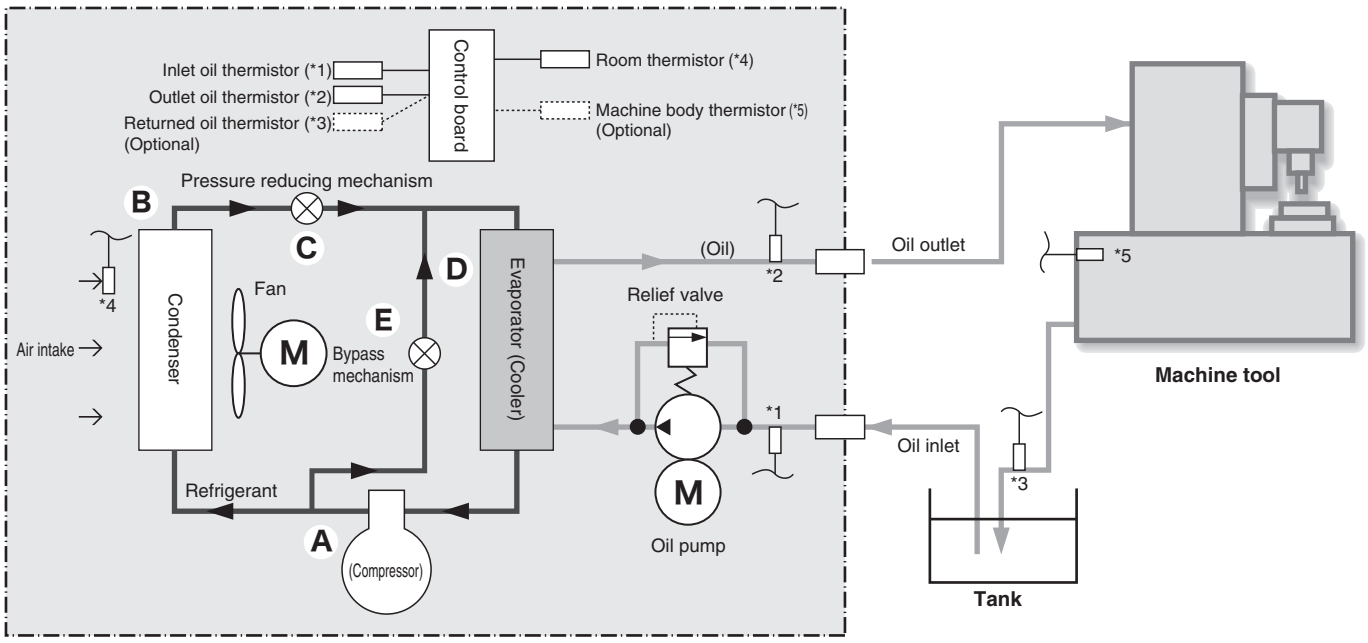
Options and their combinations
■ AKZ 10 Oil Cooling Unit (Circulation type)

Optional symbols	With breaker	Compliance with CE/UKCA	With heater	With tank	Different voltages (1)	Different voltages (2)	Different voltages (3)
-B	Yes	—	—	—	—	—	—
-C	—	Yes	—	—	—	—	—
-H	—	—	Yes	—	—	—	—
-T	—	—	—	Yes	—	—	—
-046	—	—	—	—	Yes	—	—
-500	—	—	—	—	—	Yes	—
-048	Yes	—	—	—	—	—	Yes
-BC	Yes	Yes	—	—	—	—	—
-BH	Yes	—	Yes	—	—	—	—
-BT	Yes	—	—	Yes	—	—	—
-CH	—	Yes	Yes	—	—	—	—
-CT	—	Yes	—	Yes	—	—	—
-HT	—	—	Yes	Yes	—	—	—
-BCH	Yes	Yes	Yes	—	—	—	—
-BCT	Yes	Yes	—	Yes	—	—	—
-BHT	Yes	—	Yes	Yes	—	—	—
-CHT	—	Yes	Yes	Yes	—	—	—
-BCHT	Yes	Yes	Yes	Yes	—	—	—
-001	Yes	—	—	—	Yes	—	—
-002	—	Yes	—	—	Yes	—	—
-003	—	—	Yes	—	Yes	—	—
-004	—	—	—	Yes	Yes	—	—
-005	Yes	Yes	—	—	Yes	—	—
-006	Yes	—	Yes	—	Yes	—	—
-007	Yes	—	—	Yes	Yes	—	—
-008	—	Yes	Yes	—	Yes	—	—
-009	—	Yes	—	Yes	Yes	—	—
-010	—	—	Yes	Yes	Yes	—	—
-011	Yes	Yes	Yes	—	Yes	—	—
-012	Yes	Yes	—	Yes	Yes	—	—
-013	Yes	—	Yes	Yes	Yes	—	—
-014	—	Yes	Yes	Yes	Yes	—	—
-015	Yes	Yes	Yes	Yes	Yes	—	—

Optional symbols	With breaker	Compliance with CE/UKCA	With heater	With tank	Different voltages (1)	Different voltages (2)	Different voltages (3)
B500	Yes	—	—	—	—	Yes	—
C500	—	Yes	—	—	—	Yes	—
H500	—	—	Yes	—	—	Yes	—
T500	—	—	—	Yes	—	Yes	—
D500	Yes	Yes	—	—	—	Yes	—
E500	Yes	—	Yes	—	—	Yes	—
G500	Yes	—	—	Yes	—	Yes	—
K500	—	Yes	Yes	—	—	Yes	—
M500	—	Yes	—	Yes	—	Yes	—
N500	—	—	Yes	Yes	—	Yes	—
P500	Yes	Yes	Yes	—	—	Yes	—
Q500	Yes	Yes	—	Yes	—	Yes	—
R500	Yes	—	Yes	Yes	—	Yes	—
S500	—	Yes	Yes	Yes	—	Yes	—
V500	Yes	Yes	Yes	Yes	—	Yes	—
-032	Yes	Yes	—	—	—	—	Yes
-033	Yes	—	Yes	—	—	—	Yes
-034	Yes	—	—	Yes	—	—	Yes
-038	Yes	Yes	Yes	—	—	—	Yes
-039	Yes	Yes	—	Yes	—	—	Yes
-040	Yes	—	Yes	Yes	—	—	Yes
-044	Yes	Yes	Yes	Yes	—	—	Yes

2 Standard Specifications

1 Principle of Oil Cooling Unit



[Description of Refrigeration Cycle]

A : Through the compressor, the refrigerant gas turns to be high-temperature and high-pressure compressed gas for facility cooling and liquefaction with the condenser.

B : The high-temperature and high-pressure gas produced through the compressor is cooled and condensed through the condenser with air to convert the gas into high-temperature and high-pressure liquid.

C : At the pressure reducing mechanism, this high-temperature and high-pressure liquid is throttled and decompresses to convert into low-temperature and low-pressure liquid for facilitating evaporation with the cooler.

D : Through the cooler, the low-temperature and low-pressure gas produced through the pressure reducing mechanism draws heat from oil evaporation (cool the oil) and turns to low-temperature and low-pressure gas.

E : The bypass mechanism allows control of the cooling capacity under a low load condition by adjustment of hot and high-pressure gas volume supplied to the cooler.

The Oil Cooling Unit is using a refrigeration cycle shown in Figure above same as Air conditioners, just different cooling object. Consequently, knowledge required for basic services is the same as that for air conditioners but different in some points particularly from the air conditioners. The following section describes these different points.

1. Functions of EEV (for main circuit) and MOV (for hot gas)

The electronic expansion valve for main circuit and the motor operated valve for hot gas are used for capacity control at the minimum compressor operating frequency or less. Required to adjust as follows.

Setting: The fully closed point of electronic expansion valve for main circuit and motor operated valve for hot gas [fully closed pulse of EEV for main circuit] and [fully closed pulse of motor operated valve for hot gas] should be set on the control board by each unit. (When replacing the EEV for main circuit, motor operated valve for hot gas or control board, pay close attention.)

2. Oil Pump

Since the Oil Cooling Unit is subject to cooling of oil, oil pump is equipped instead of a fan on the Air-Con indoor side. The following section describes the features of the oil pump.

①When the external resistance pressure reaches 0.5 MPa or more, (AKZ14A), 0.6 MPa or more (AKZ32A, 43A, 56A, 90A), the relief valve will be activated.

②Since the external resistance point (field piping) is an item to be designed by users, check carefully.

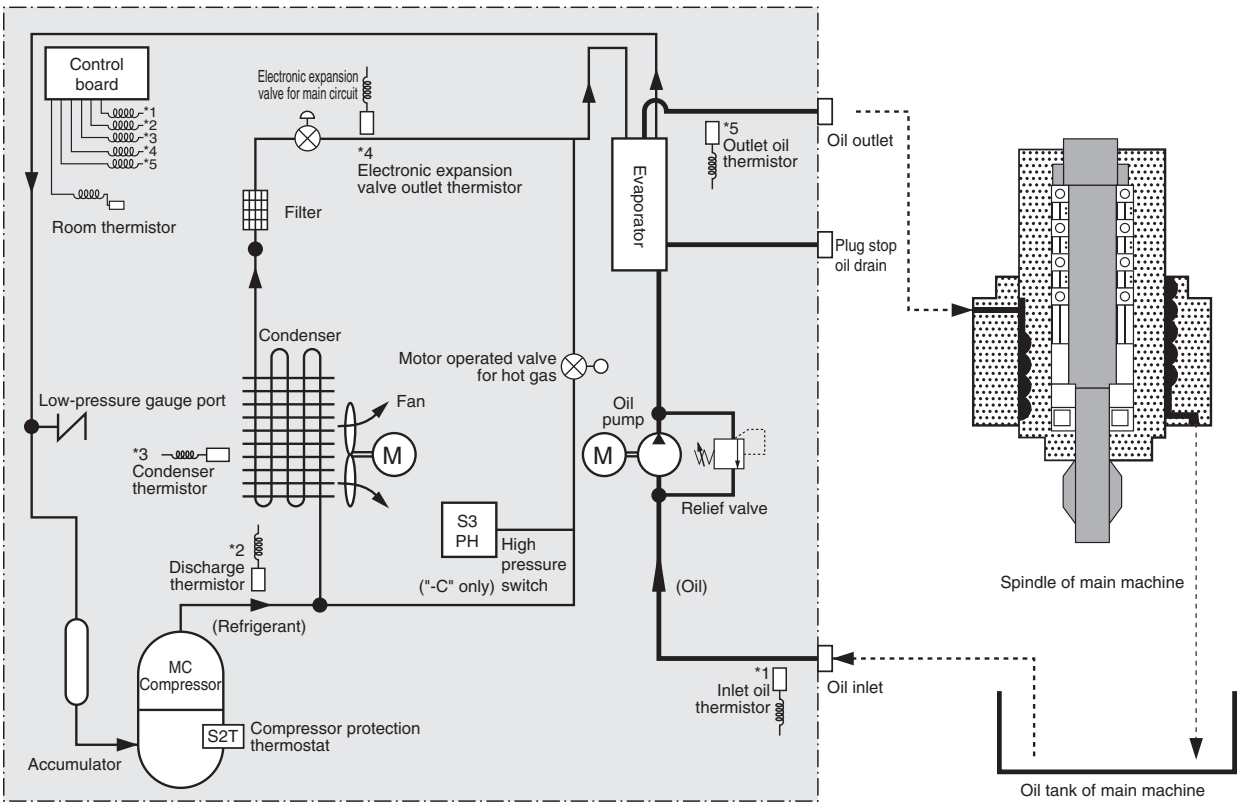
3. Characteristics of Electrical System

Basically, the electrical system is the same as that of air conditioners but has the following characteristics.

①The Oil Cooling Unit has nothing equivalent to the operation switch. Be noted that the Oil Cooling Unit starts running as soon as the power supply turns ON. Normally, the Oil Cooling Unit exchanges signals with a machine controller, and runs under ON-OFF signal from the machine tool side.

②The Oil Cooling Unit has an enhanced readout function of internal operation data. Refer to information in "7 Troubleshooting" to conduct servicing.

■Details of piping system



2 List of Basic Performance/Specifications

2-1. Specifications (AKZ14A, 32A)

Oil Cooling Unit equivalent horsepower (HP)			0.5							1.2								
Model name			AKZ14A							AKZ32A								
			Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3	Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3		
Cooling capacity (50/60 Hz) *1		kW	1.3/1.4							2.8/3.2								
Heater (at 200 V)		kW	–				1	–		–				1	–			
Power supply *2			3-phase, AC200/200, 220 V 50/60Hz						*3	3-phase, AC200/200, 220 V 50/60Hz						*3		
Circuit voltage	Main circuit *3		3-phase, AC200/200, 220 V 50/60Hz															
	Operation circuit		DC12/24 V															
Max. power consumption	Cooling 200V 50Hz		0.90 kW/3.9A						*11	1.36 kW/5.2A						*11		
	Cooling 200V 60Hz		0.91 kW/3.6A							1.43 kW/5.1A								
	Cooling 220V 60Hz		0.91 kW/3.5A							1.43 kW/4.9A								
Max. current consumption	Heating 200V 50Hz		–				1.29 kW/4.1A	–		–				1.51 kW/5.4A	–			
	Heating 200V 60Hz		–				1.32 kW/4.2A	–		–				1.60 kW/5.4A	–			
	Heating 220V 60Hz		–				1.55 kW/4.5A	–		–				1.83 kW/5.7A	–			
Transformer capacity			–						2.6 kVA	–						2.6 kVA		
Coated color			Ivory white															
Outline dimensions (HxWxD)		mm	650×360×440				950×360×440	810×360×465	950×360×440	775×360×440				1075×360×440	965×360×465	1075 x 360 x 440		
Compressor (Hermetic DC swing type)			0.4 kW or equivalent							0.75 kW or equivalent								
Evaporator			Cross fin coil type															
Condenser			Cross fin coil type															
Propeller fan	Motor		54 W															
Oil pump	Motor		0.4 kW × 4P															
	Discharge rate	L/min	12/14.4							24/28.8								
	Clacking pressure	MPa	0.5							0.6								
Temperature control (Selectable) Tuning type	Reference		Room temperature or machine temperature *4 (Factory setting: Room temperature: Mode 3)															
	Control target		Inlet oil temperature or outlet oil temperature (Factory setting: Inlet oil temperature)															
	Tuning range	°C	Within ±9.9 relative to reference temperature (Factory setting: 0.0)															
Temperature control (Selectable) Fixed type	Control target		Inlet oil temperature or outlet oil temperature															
	Range	°C	5–50															
Refrigerant control			Inverter compressor rotation speed + Electronic expansion valve opening															
Refrigerant: R410A (GWP:2090) *5	Loading weight	kg	0.54							0.81								
	CO2 equivalent	tCO_2eq	1.13							1.70								
Protection device			Over-current relay (Pump motor), Reverse-phase protector, Restart prevention timer, Low room temperature protection thermistor, High oil temperature protection thermistor, Low oil temperature protection thermistor, Pump relief valve, Discharge pipe temperature thermistor, Condenser temperature thermistor, Refrigerant leak detector, Inverter protector, High-pressure pressure switch (“-C” only), Compressor protection thermostat, Overheat protection temperature switch (“-H” only), Oil lack prevention switch (“-H” only), Circuit breaker (“-B” only)															
Operating range	Room temperature	°C	5–45															
	Inlet oil temperature	°C	5–50															
	Oil viscosity	mm^2/s	1.4–200 (ISO VG2–32)															
	External pressure loss	Discharge	0.5MPa or less															
		Suction	Within –30.7kPa															

Oil Cooling Unit equivalent horsepower (HP)			0.5							1.2						
Model name			AKZ14A							AKZ32A						
			Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3	Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3
Applicable oil			Lubrication oil, Mineral hydraulic oil (Phosphoric ester hydraulic oil, water/water-soluble liquid, chemical, food, fuel, cutting/grinding fluid cannot be used.)													
Connection pipe	Oil inlet		Rc3/4													
	Oil outlet		Rc3/4				Rc1 1/4	Rc3/4		Rc3/4				Rc1 1/4	Rc3/4	
	Oil drain		Rc1/4 (Fastened with plug)													
Sound level (Measured at 1 m from front of unit, at 1.55 m height, in anechoic room) *7		dB (A)	62							65						
Transportation vibration resistance *8			Vertical: 14.7m/s^2 × 2.5hr (7.5 to 100Hz sweep/5min)													
Ingress protection			IP2X*6													
Weight		kg	57				83	77	93	63				89	83	99
Internal wiring circuit breaker (Rated current)		A	–	10			–			–	10			–		
Oil tank (Volume)		L	–					15*10	–	–					20*10	–
Local procurement item	Earth leakage circuit breaker (Rated current) *9	A	10													

*1: Cooling capacity is the value at standard point (inlet oil temperature and room temperature: 35°C, ISO VG32 oil, 1 atm). The product tolerance is approx. ±5%.
*2: Be sure to use a commercial power supply. Using an inverter power supply may result in burnout.
Voltage fluctuation range should be within ±10%. If voltage fluctuation exceeds ±10%, consult Nearby Service Network.
*3: There are three types of different-voltage models, -046, -048 and -500, depending on the power supply. -048 is supported with a transformer.
Main circuit voltage with a transformer is the transformer secondary voltage AC200 V 50/60Hz.
(Since the -046 and -500 model do not have a transformer, the external dimensions and weight are the same as the standard model. The main circuit voltage is as follows: -046 models: AC 220/230 V 50/60Hz; -500 models: AC 380, 400 and 415 V 50/60Hz.)
*4: The optional thermistor is required. (For details, see page 152.)
*5: The fluorinated greenhouse gases are contained in hermetically sealed. The "-C" model is supplied with SDS (Safety Data Sheet) for refrigerant R410A.
*6: Electric unit protective structure: IP54 or equivalent. (Use conduits higher than IP54 for the knock out hole.)
*7: For energy-saving purposes, the rotation speed of a fan will vary according to the room temperature. This may change its noise level as well, but it does not constitute a failure.
*8: Performance for transportation vibration refers to the performance of standard units.
*9: No line breaker is included in this product. It must be separately provided by the customer.
*10: The yellow line on the tank liquid level gauge shows the highest oil level, and the red line shows the lowest liquid level.
*11: The table below shows the maximum power consumption and maximum current consumption for different-voltage models.

■AKZ14A

Power supply		Power/Current	
220V	50/60Hz	0.91 kW	3.6A
230V		0.91 kW	3.4A
380V		1.01 kW	2.3A
400V		1.02 kW	2.2A
415V		1.03 kW	2.2A
440V		0.92 kW	1.8A
460V		0.92 kW	1.7A
480V		0.92 kW	1.7A

■AKZ32A

Power supply		Power/Current	
220V	50/60Hz	1.43 kW	4.8A
230V		1.43 kW	4.6A
380V		1.59 kW	3.1A
400V		1.60 kW	3.0A
415V		1.60 kW	2.9A
440V		1.45 kW	2.4A
460V		1.45 kW	2.3A
480V		1.45 kW	2.2A

2-2. Specifications (AKZ43A)

Oil Cooling Unit equivalent horsepower (HP)			1.5							
Model name			AKZ43A							
			Stan -dard	-B	-C	-J	-H	-T	Different-voltage *3	
Cooling capacity (50/60 Hz) *1		kW	3.8/4.3							
Heater (at 200 V)		kW	–				1	–		
Power supply *2			3-phase, AC200/200, 220 V 50/60Hz						*3	
Circuit voltage		Main circuit *3	3-phase, AC200/200, 220 V 50/60Hz							
		Operation circuit	DC12/24 V							
Max. power consumption / Max. current consumption	Cooling	200V 50Hz	1.80 kW/6.6A						*11	
		200V 60Hz	1.88 kW/6.4A							
		220V 60Hz	1.88 kW/6.1A							
	Heating	200V 50Hz	–				1.51 kW/5.4A	–		
		200V 60Hz	–				1.60 kW/5.4A	–		
		220V 60Hz	–				1.83 kW/5.7A	–		
Transformer capacity			–						2.6 kVA	
Coated color			Ivory white							
Outline dimensions (HxWxD)		mm	875×360×440				1175×360×440	1065×360×465	1175×360×440	
Compressor (Hermetic DC swing type)			1.1 kW or equivalent							
Evaporator			Cross fin coil type							
Condenser			Cross fin coil type							
Propeller fan		Motor	54 W							
Oil pump		Motor	0.4 kW × 4P							
		Discharge rate L/min	24/28.8							
		Clacking pressure MPa	0.6							
Temperature control (Selectable)	Tuning type	Reference	Room temperature or machine temperature *4 (Factory setting: Room temperature: Mode 3)							
		Control target	Inlet oil temperature or outlet oil temperature (Factory setting: Inlet oil temperature)							
		Tuning range °C	Within ±9.9 relative to reference temperature (Factory setting: 0.0)							
	Fixed type	Control target	Inlet oil temperature or outlet oil temperature							
		Range °C	5–50							
Refrigerant control			Inverter compressor rotation speed + Electronic expansion valve opening							
Refrigerant: R410A (GWP:2090) *5	Loading weight	kg	0.83							
	CO2 equivalent	tCO_2eq	1.74							
Protection device			Over-current relay (Pump motor), Reverse-phase protector, Restart prevention timer, Low room temperature protection thermistor, High oil temperature protection thermistor, Low oil temperature protection thermistor, Pump relief valve, Discharge pipe temperature thermistor, Condenser temperature thermistor, Refrigerant leak detector, Inverter protector, High-pressure pressure switch (“-C” only), Compressor protection thermostat, Overheat protection temperature switch (“-H” only), Oil lack prevention switch (“-H” only), Circuit breaker (“-B” only)							
Operating range	Room temperature	°C	5–45							
	Inlet oil temperature	°C	5–50							
	Oil viscosity	mm^2/s	1.4–200 (ISO VG2–32)							
	External pressure loss	Discharge	0.5MPa or less							
		Suction	Within –30.7kPa							

Oil Cooling Unit equivalent horsepower (HP)		1.5						
Model name		AKZ43A						
		Stan -dard	-B	-C	-J	-H	-T	Different-voltage *3
Applicable oil		Lubrication oil, Mineral hydraulic oil (Phosphoric ester hydraulic oil, water/water-soluble liquid, chemical, food, fuel, cutting/grinding fluid cannot be used.)						
Connection pipe	Oil inlet	Rc3/4						
	Oil outlet	Rc3/4				Rc1 1/4	Rc3/4	
	Oil drain	Rc1/4 (Fastened with plug)						
Sound level (Measured at 1 m from front of unit, at 1.55 m height, in anechoic room) *7	dB (A)	65						
Transportation vibration resistance *8		Vertical: 14.7m/s^2 × 2.5hr (7.5 to 100Hz sweep/5min)						
Ingress protection		IP2X*6						
Weight	kg	65				95	82	103
Internal wiring circuit breaker (Rated current)	A	–	10	–				
Oil tank (Volume)	L	–					20*10	–
Local procurement item: Earth leakage circuit breaker (Rated current) *9	A	10						

*1: Cooling capacity is the value at standard point (inlet oil temperature and room temperature: 35°C, ISO VG32 oil, 1 atm). The product tolerance is approx. ±5%.
*2: Be sure to use a commercial power supply. Using an inverter power supply may result in burnout.
Voltage fluctuation range should be within ±10%. If voltage fluctuation exceeds ±10%, consult Nearby Service Network.
*3: There are three types of different-voltage models, -046, -048 and -500, depending on the power supply. -048 is supported with a transformer.
Main circuit voltage with a transformer is the transformer secondary voltage AC200 V 50/60Hz.
(Since the -046 and -500 model do not have a transformer, the external dimensions and weight are the same as the standard model. The main circuit voltage is as follows: -046 models: AC 220/230 V 50/60Hz; -500 models: AC 380, 400 and 415 V 50/60Hz.)
*4: The optional thermistor is required. (For details, see page 152.)
*5: The fluorinated greenhouse gases are contained in hermetically sealed. The “-C” model is supplied with SDS (Safety Data Sheet) for refrigerant R410A.
*6: Electric unit protective structure: IP54 or equivalent. (Use conduits higher than IP54 for the knock out hole.)
*7: For energy-saving purposes, the rotation speed of a fan will vary according to the room temperature. This may change its noise level as well, but it does not constitute a failure.
*8: Performance for transportation vibration refers to the performance of standard units.
*9: No line breaker is included in this product. It must be separately provided by the customer.
*10: The yellow line on the tank liquid level gauge shows the highest oil level, and the red line shows the lowest liquid level.
*11: The table below shows the maximum power consumption and maximum current consumption for different-voltage models.

■AKZ43A

Power supply		Power/Current	
220V	50/60Hz	1.88 kW	6.0A
230V		1.88 kW	5.8A
380V		1.99 kW	3.6A
400V		1.99 kW	3.5A
415V		2.00 kW	3.4A
440V		1.90 kW	3.0A
460V		1.90 kW	2.9A
480V		1.90 kW	2.8A

2-3. Specifications (AKZ56A, 90A)

Oil Cooling Unit equivalent horsepower (HP)			2.0							3.0						
Model name			AKZ56A							AKZ90A						
			Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3	Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3
Cooling capacity (50/60 Hz) *1		kW	5.0/5.6							8.0/9.0						
Heater (at 200 V)		kW	–				2	–		–				3	–	
Power supply *2			3-phase, AC200/200, 220 V 50/60Hz						*3	3-phase, AC200/200, 220 V 50/60Hz						*3
Circuit voltage		Main circuit *3	3-phase, AC200/200, 220 V 50/60Hz													
		Operation circuit	DC12/24 V													
Max. power consumption	Cooling	200V 50Hz	2.22 kW/7.6A						*11	4.25 kW/13.5A						*11
		200V 60Hz	2.30 kW/7.5A							4.30 kW/13.4A						
		220V 60Hz	2.30 kW/7.2A							4.30 kW/12.9A						
Max. current consumption	Heating	200V 50Hz	–				2.59 kW/9.3A	–		–				3.64 kW/12.4A	–	
		200V 60Hz	–				2.68 kW/9.0A	–		–				3.73 kW/12.2A	–	
		220V 60Hz	–				3.11 kW/9.7A	–		–				4.37 kW/13.2A	–	
Transformer capacity			–						4.0 kVA	–						6.0 kVA
Coated color			Ivory white													
Outline dimensions (HxWxD)		mm	1110×470×500				1410×470×560	1375×470×580	1360×470×590	1220×560×620				1520×560×680	1485×560×700	1470×560×695
Compressor (Hermetic DC swing type)			1.5 kW or equivalent							2.2 kW or equivalent						
Evaporator			Brazed plate type													
Condenser			Cross fin coil type													
Propeller fan		Motor	100 W													
Oil pump		Motor	0.7 kW × 4P													
		Discharge rate L/min	30/36													
		Clacking pressure MPa	0.6													
Temperature control (Selectable)	Tuning type	Reference	Room temperature or machine temperature *4 (Factory setting: Room temperature: Mode 3)													
		Control target	Inlet oil temperature or outlet oil temperature (Factory setting: Inlet oil temperature)													
		Tuning range °C	Within ±9.9 relative to reference temperature (Factory setting: 0.0)													
	Fixed type	Control target	Inlet oil temperature or outlet oil temperature													
		Range °C	5–50													
Refrigerant control			Inverter compressor rotation speed + Electronic expansion valve opening													
Refrigerant: R410A (GWP:2090) *5	Loading weight	kg	1.02							1.37						
	CO2 equivalent	tCO_2eq	2.14							2.87						
Protection device			Over-current relay (Pump motor), Reverse-phase protector, Restart prevention timer, Low room temperature protection thermistor, High oil temperature protection thermistor, Low oil temperature protection thermistor, Pump relief valve, Discharge pipe temperature thermistor, Condenser temperature thermistor, Refrigerant leak detector, Inverter protector, High-pressure pressure switch (“-C” only), Compressor protection thermostat, Overheat protection temperature switch (“-H” only), Oil lack prevention switch (“-H” only), Circuit breaker (“-B” only)													
Operating range	Room temperature	°C	5–45													
	Inlet oil temperature	°C	5–50													
	Oil viscosity	mm^2/s	1.4–200 (ISO VG2–32)													
	External pressure loss	Discharge	0.5MPa or less													
		Suction	Within –30.7kPa													

Oil Cooling Unit equivalent horsepower (HP)			2.0							3.0						
Model name			AKZ56A							AKZ90A						
			Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3	Stan-dard	-B	-C	-J	-H	-T	Different-voltage *3
Applicable oil			Lubrication oil, Mineral hydraulic oil (Phosphoric ester hydraulic oil, water/water-soluble liquid, chemical, food, fuel, cutting/grinding fluid cannot be used.)													
Connection pipe	Oil inlet		Rc1 1/4					Rc1	Rc1 1/4	Rc1 1/4					Rc1	Rc1 1/4
	Oil outlet		Rc1 1/4													
	Oil drain		Rc1/4 (Fastened with plug)													
Sound level (Measured at 1 m from front of unit, at 1.55 m height, in anechoic room) *7		dB (A)	65							67						
Transportation vibration resistance *8			Vertical: 14.7m/s^2 × 2.5hr (7.5 to 100Hz sweep/5min)													
Ingress protection			IP2X*6													
Weight		kg	86				120	119	149	104				145	139	182
Internal wiring circuit breaker (Rated current)		A	–	15			–			–	20			–		
Oil tank (Volume)		L	–					50*10	–	–					70*10	–
Local procurement item	Earth leakage circuit breaker (Rated current) *9	A	15							20						

*1: Cooling capacity is the value at standard point (inlet oil temperature and room temperature: 35°C, ISO VG32 oil, 1 atm). The product tolerance is approx. ±5%.
*2: Be sure to use a commercial power supply. Using an inverter power supply may result in burnout.
Voltage fluctuation range should be within ±10%. If voltage fluctuation exceeds ±10%, consult Nearby Service Network.
*3: There are three types of different-voltage models, -046, -048 and -500, depending on the power supply. -048 is supported with a transformer.
Main circuit voltage with a transformer is the transformer secondary voltage AC200 V 50/60Hz.
(Since the -046 and -500 model do not have a transformer, the external dimensions and weight are the same as the standard model. The main circuit voltage is as follows: -046 models: AC 220/230 V 50/60Hz; -500 models: AC 380, 400 and 415 V 50/60Hz.)
*4: The optional thermistor is required. (For details, see page 152.)
*5: The fluorinated greenhouse gases are contained in hermetically sealed. The "-C" model is supplied with SDS (Safety Data Sheet) for refrigerant R410A.
*6: Electric unit protective structure: IP54 or equivalent. (Use conduits higher than IP54 for the knock out hole.)
*7: For energy-saving purposes, the rotation speed of a fan will vary according to the room temperature. This may change its noise level as well, but it does not constitute a failure.
*8: Performance for transportation vibration refers to the performance of standard units.
*9: No line breaker is included in this product. It must be separately provided by the customer.
*10: The yellow line on the tank liquid level gauge shows the highest oil level, and the red line shows the lowest liquid level.
*11: The table below shows the maximum power consumption and maximum current consumption for different-voltage models.

■AKZ56A

Power supply		Power/Current	
220V	50/60Hz	2.30 kW	7.3A
230V		2.30 kW	7.0A
380V		2.49 kW	4.6A
400V		2.54 kW	4.6A
415V		2.54 kW	4.5A
440V		2.32 kW	3.5A
460V		2.32 kW	3.3A
480V		2.32 kW	3.2A

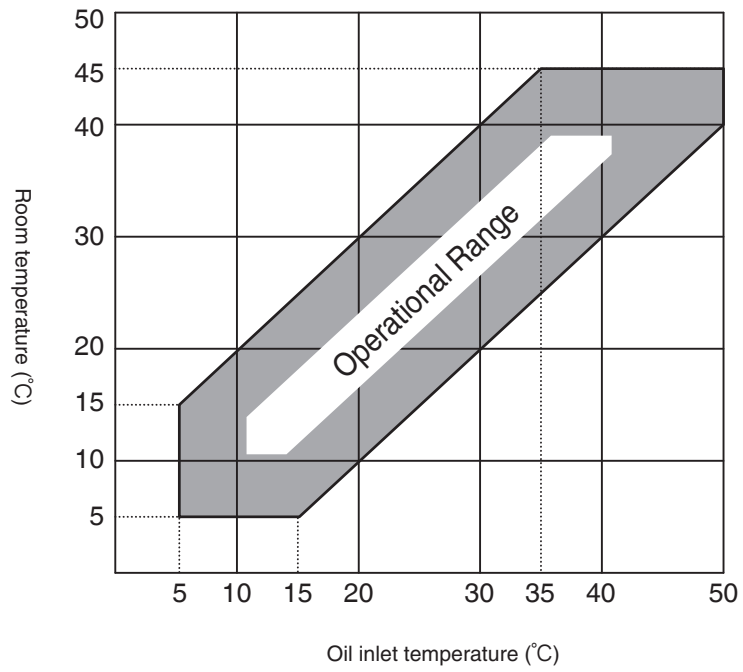
■AKZ90A

Power supply		Power/Current	
220V	50/60Hz	4.30 kW	13.0A
230V		4.30 kW	12.4A
380V		4.39 kW	8.4A
400V		4.42 kW	8.2A
415V		4.38 kW	8.1A
440V		4.33 kW	6.2A
460V		4.33 kW	5.9A
480V		4.33 kW	5.7A

3 Operating Limits

3-1. Operating Range

The Oil Cooling Unit has its operating limits.
Be sure to use the Oil Cooling Unit in the range shown below.



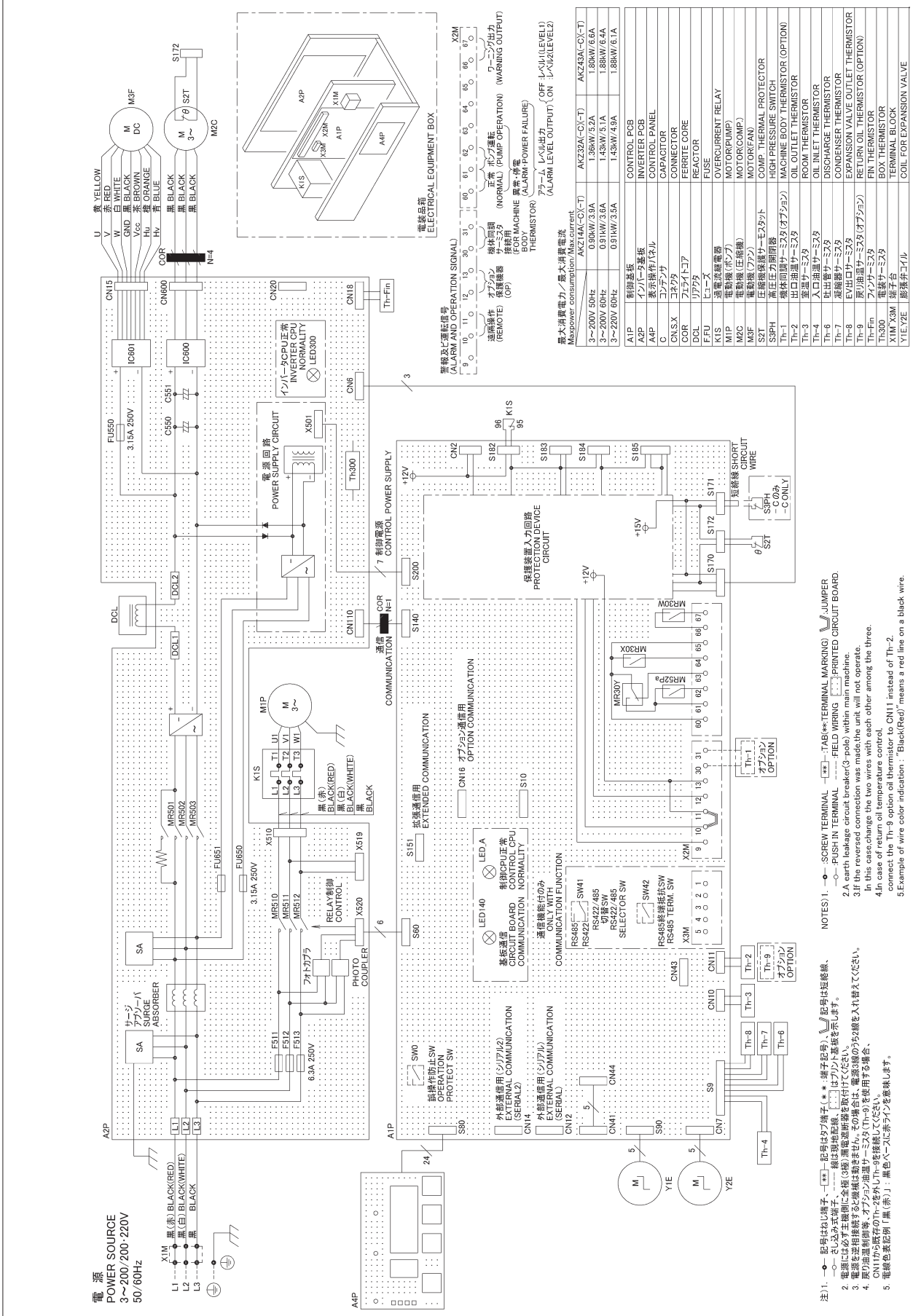
3-2. Applicable Oil

Since this Oil Cooling Unit is designed for lubricating oils and hydraulic oil (of mineral oil base), the following oil (liquid) is not applicable.

1) Flame-resistant hydraulic fluid
   - Phosphate ester base
   - Chlorinated hydrocarbon base
   - Water + Glycol base
   - W/O, O/W emulsion base
2) Water and water-soluble liquid
3) Chemical liquid and fluid food
4) Cutting oil (fluid) and grinding oil (fluid)
5) Fuels including kerosene, gasoline, and others

1 AKZ14A–43A (-C) (-T)

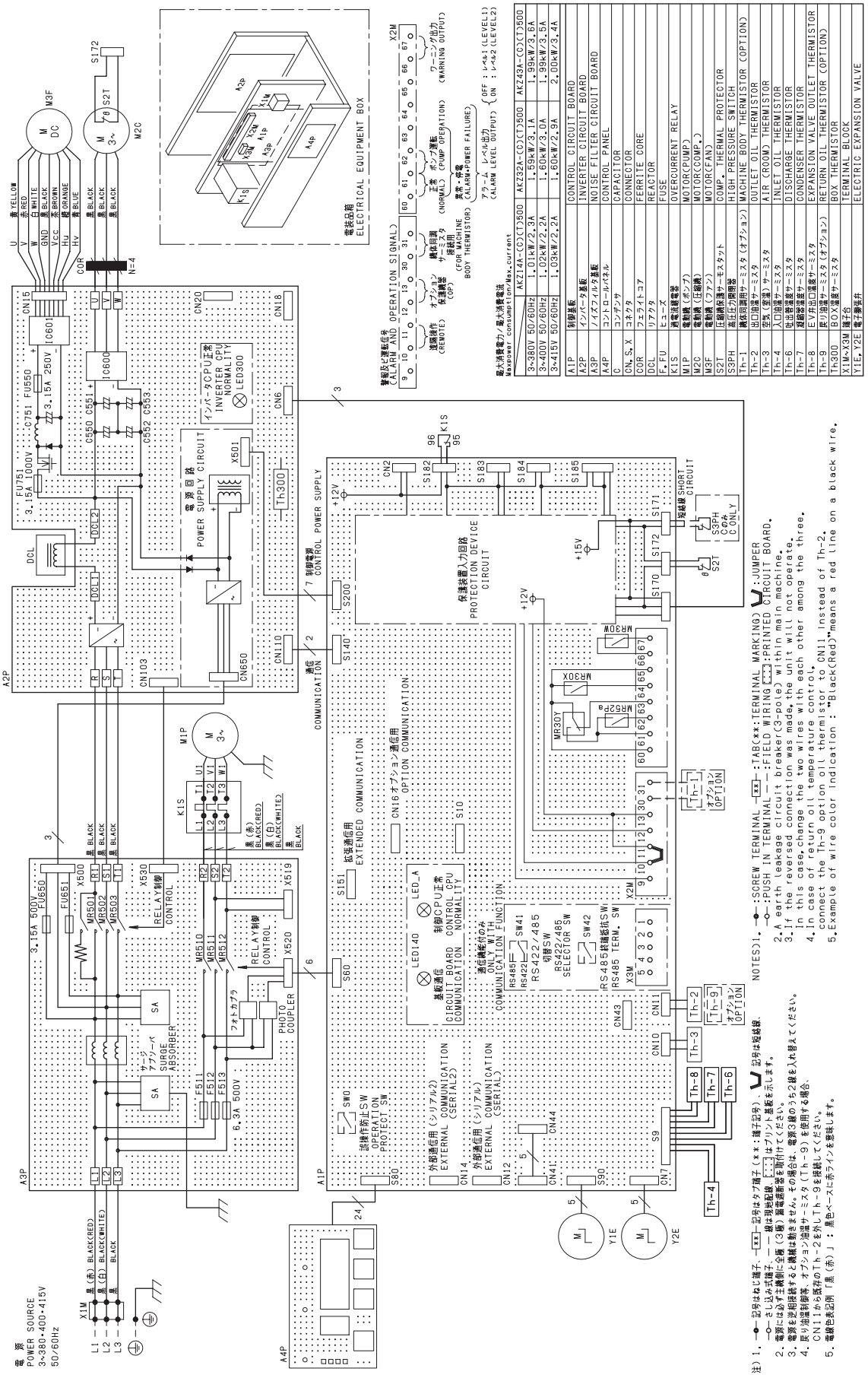
■Wiring Diagrams



C：PH207885

2 AKZ14A–43A- (C) (T) 500

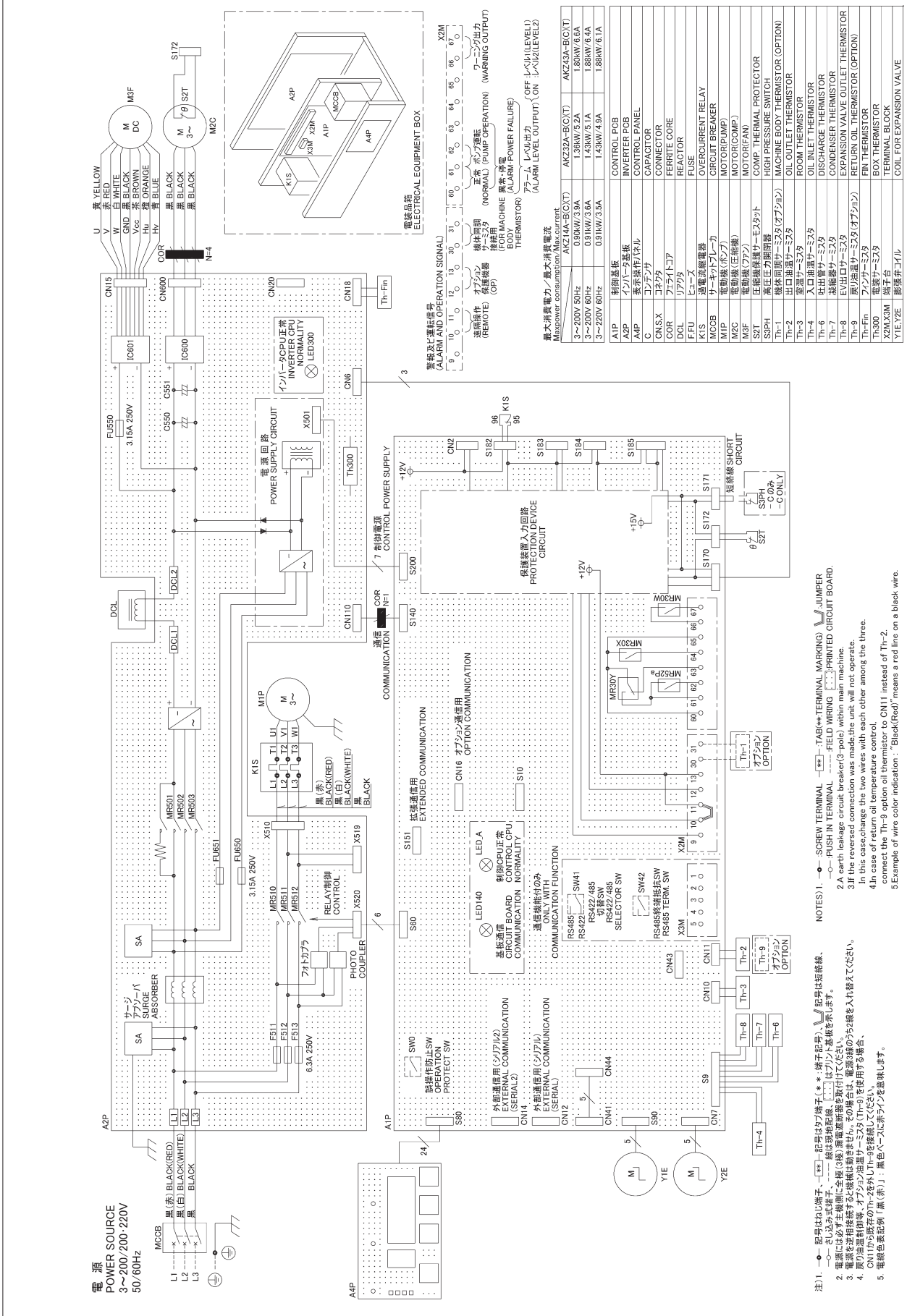
■Wiring Diagrams



C：PH207413

3 AKZ14A–43A-B

■Wiring Diagrams



最大消費電力／最大消費電流
Maxpower consumption/Max.current

	AKZ14A–B(C)(T)	AKZ32A–B(C)(T)	AKZ43A–B(C)(T)
3～200V 50Hz	0.90kW/3.9A	1.36kW/5.2A	1.80kW/6.6A
3～200V 60Hz	0.91kW/3.6A	1.43kW/5.1A	1.88kW/6.4A
3～220V 60Hz	0.91kW/3.5A	1.43kW/4.9A	1.88kW/6.1A

A1P	制御基板 CONTROL PCB
A2P	インバータ基板 INVERTER PCB
A4P	表示操作パネル CONTROL PANEL
C	コンデンサ CAPACITOR
CN,S,X	コネクタ CONNECTOR
COR	フェライトコア FERRITE CORE
DCL	リアクタ REACTOR
F/U	ヒューズ FUSE
K1S	過電流継電器 OVERCURRENT RELAY
MCCB	サーキットブレーカ CIRCUIT BREAKER
M1P	電動機(ポンプ) MOTOR(PUMP)
M2C	電動機(圧縮機) MOTOR(COMP.)
M3F	電動機(ファン) MOTOR(FAN)
S2T	圧縮機保護サーモスタット COMP. THERMAL PROTECTOR
S3PH	高圧圧力開閉器 HIGH PRESSURE SWITCH
Th-1	機体内調サーミスタ(オプション) MACHINE BODY THERMISTOR (OPTION)
Th-2	出口油温サーミスタ OIL OUTLET THERMISTOR
Th-3	室温サーミスタ ROOM THERMISTOR
Th-4	入口油温サーミスタ OIL INLET THERMISTOR
Th-6	吐出管サーミスタ DISCHARGE THERMISTOR
Th-7	凝縮器サーミスタ CONDENSER THERMISTOR
Th-8	EV出口サーミスタ EXPANSION VALVE OUTLET THERMISTOR
Th-9	戻り油温サーミスタ(オプション) RETURN OIL THERMISTOR (OPTION)
Th-Fin	フィンサーミスタ FIN THERMISTOR
Th300	電装サーミスタ BOX THERMISTOR
X2M,X3M	端子台 TERMINAL BLOCK
Y1E,Y2E	膨張弁コイル COIL FOR EXPANSION VALVE

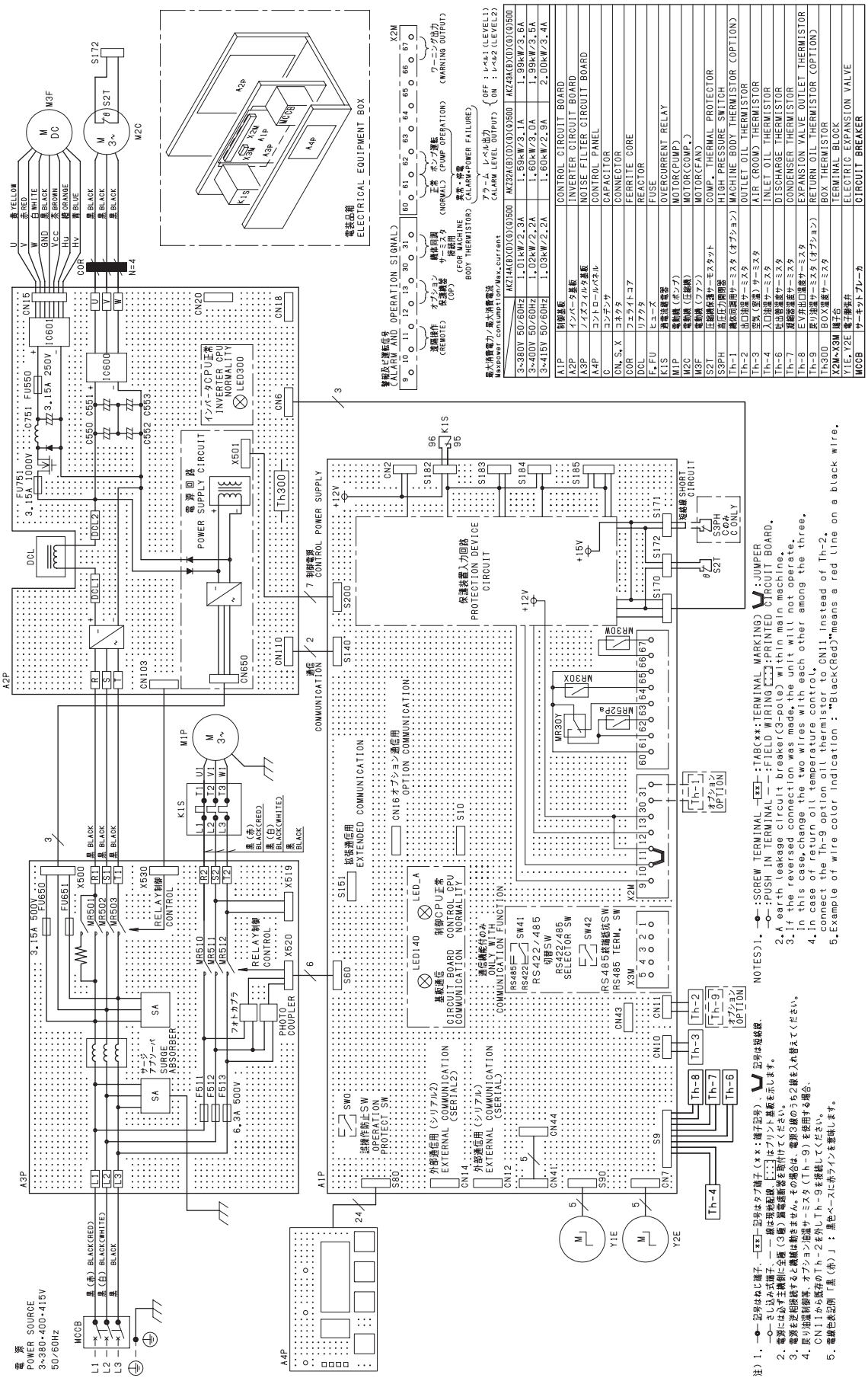
注)1. ⊸ 記号はねじ端子、[**]－記号はタブ端子(＊＊:端子記号)、▲ 記号は短絡線。
⊸ さし込み式端子、---- 線は現地配線、[ ] はプリント基板を示します。
2. 電源には必ず主機側に全極(3極)漏電遮断器を取付けてください。
3. 電源を逆相接続すると機械は動きません。その場合は、電源3線のうち2線を入れ替えてください。
4. 戻り油温制御等、オプション油温サーミスタ(Th-9)を使用する場合、
CN11から既存のTh-2を外しTh-9を接続してください。
5. 電線色表記例「黒(赤)」：黒色ベースに赤ライン を意味します。

NOTES)1. ⊸ SCREW TERMINAL [**] TAB(**:TERMINAL MARKING) ▲ JUMPER
⊸ PUSH IN TERMINAL ---- FIELD WIRING [ ] PRINTED CIRCUIT BOARD.
2.A earth leakage circuit breaker(3-pole) within main machine.
3.If the reversed connection was made,the unit will not operate.
In this case,change the two wires with each other among the three.
4.In case of return oil temperature control,
connect the Th-9 option oil thermistor to CN11 instead of Th-2.
5.Example of wire color indication : 'Black(Red)' means a red line on a black wire.

C：PH207909

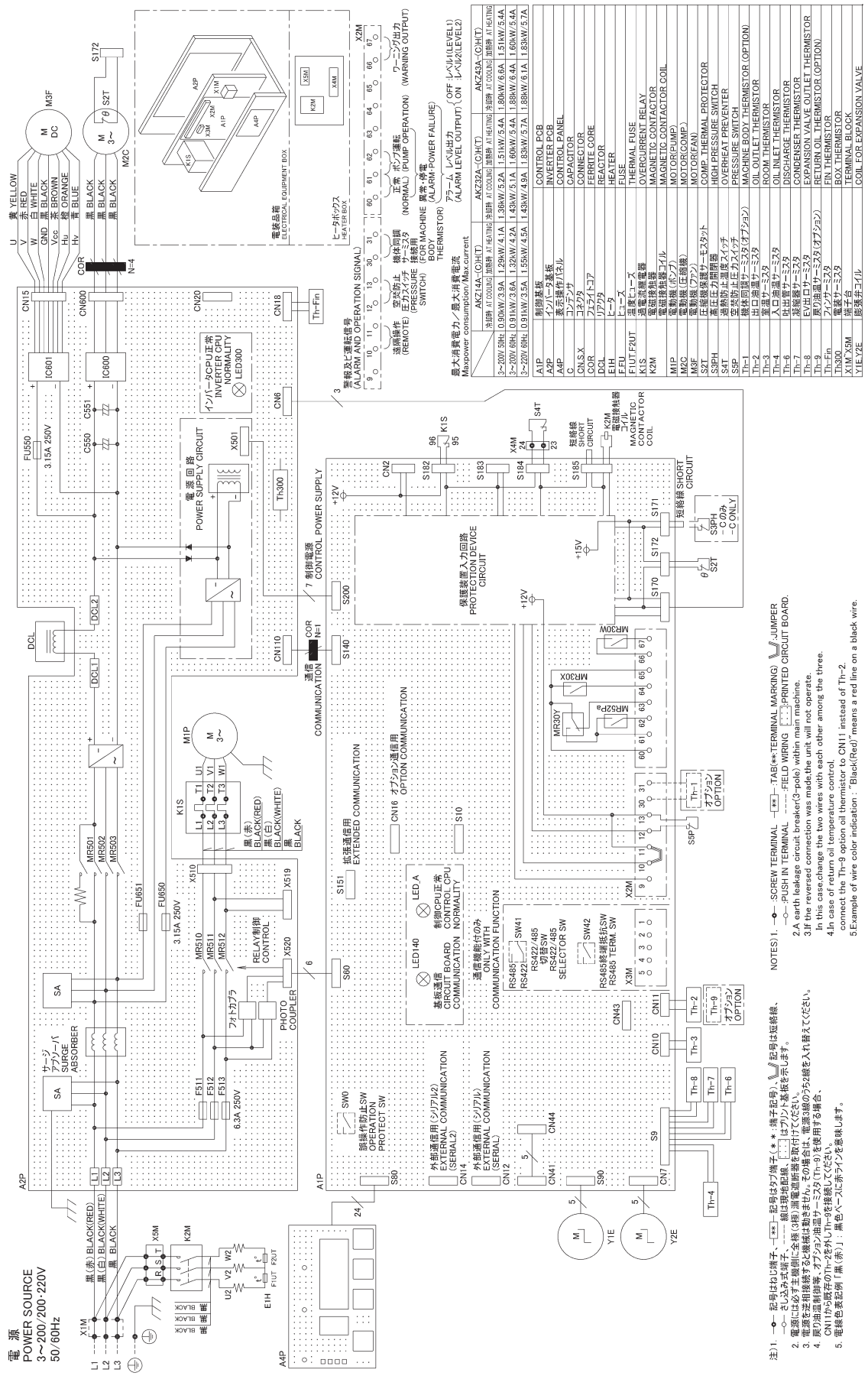
4 AKZ14A–43AB500

■Wiring Diagrams



5 AKZ14A–43A-H

■Wiring Diagrams

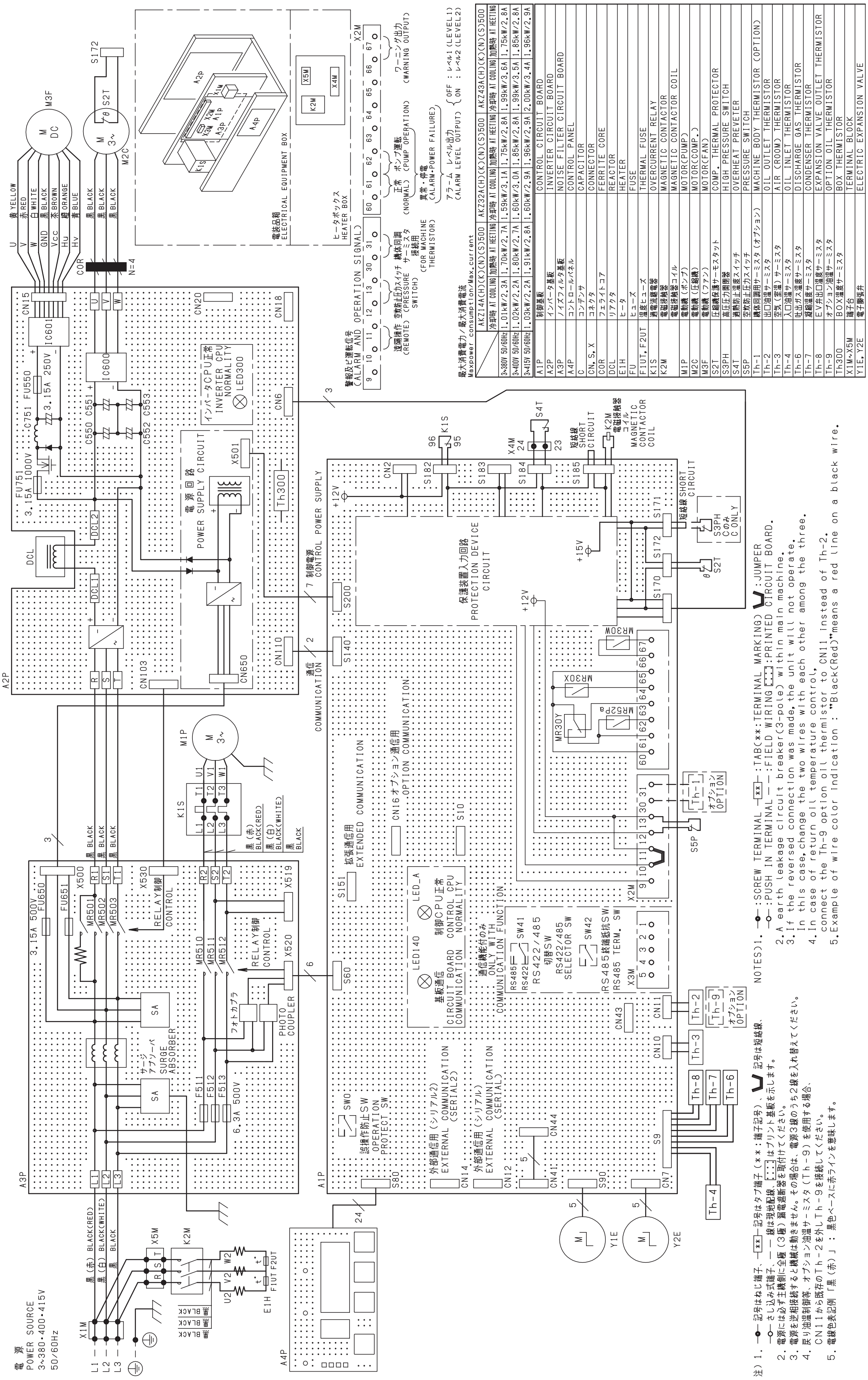


C：PH207911

3 Wiring Diagrams

6 AKZ14A–43AH500

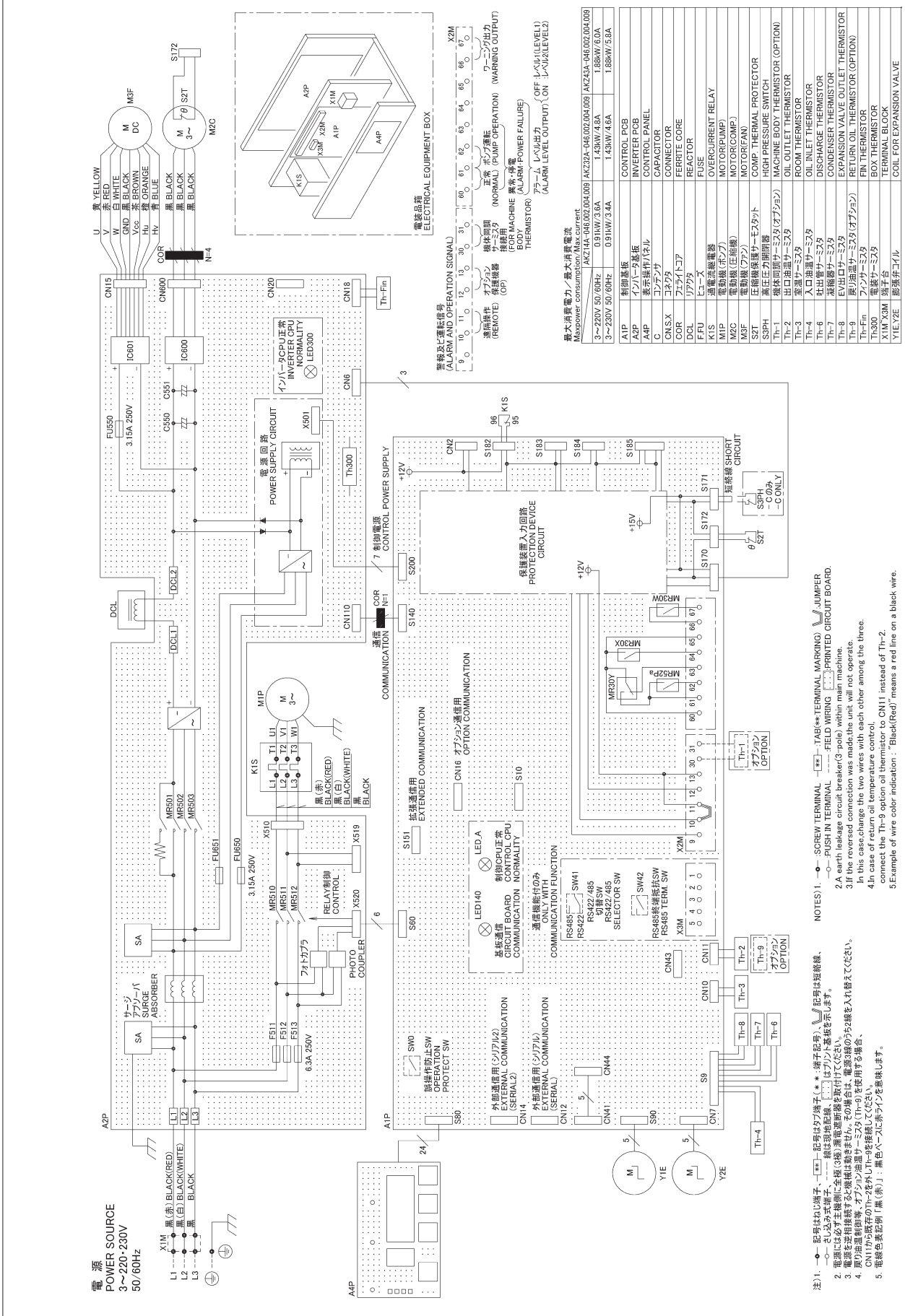
■Wiring Diagrams



C：PH207559

7 AKZ14A–43A-046

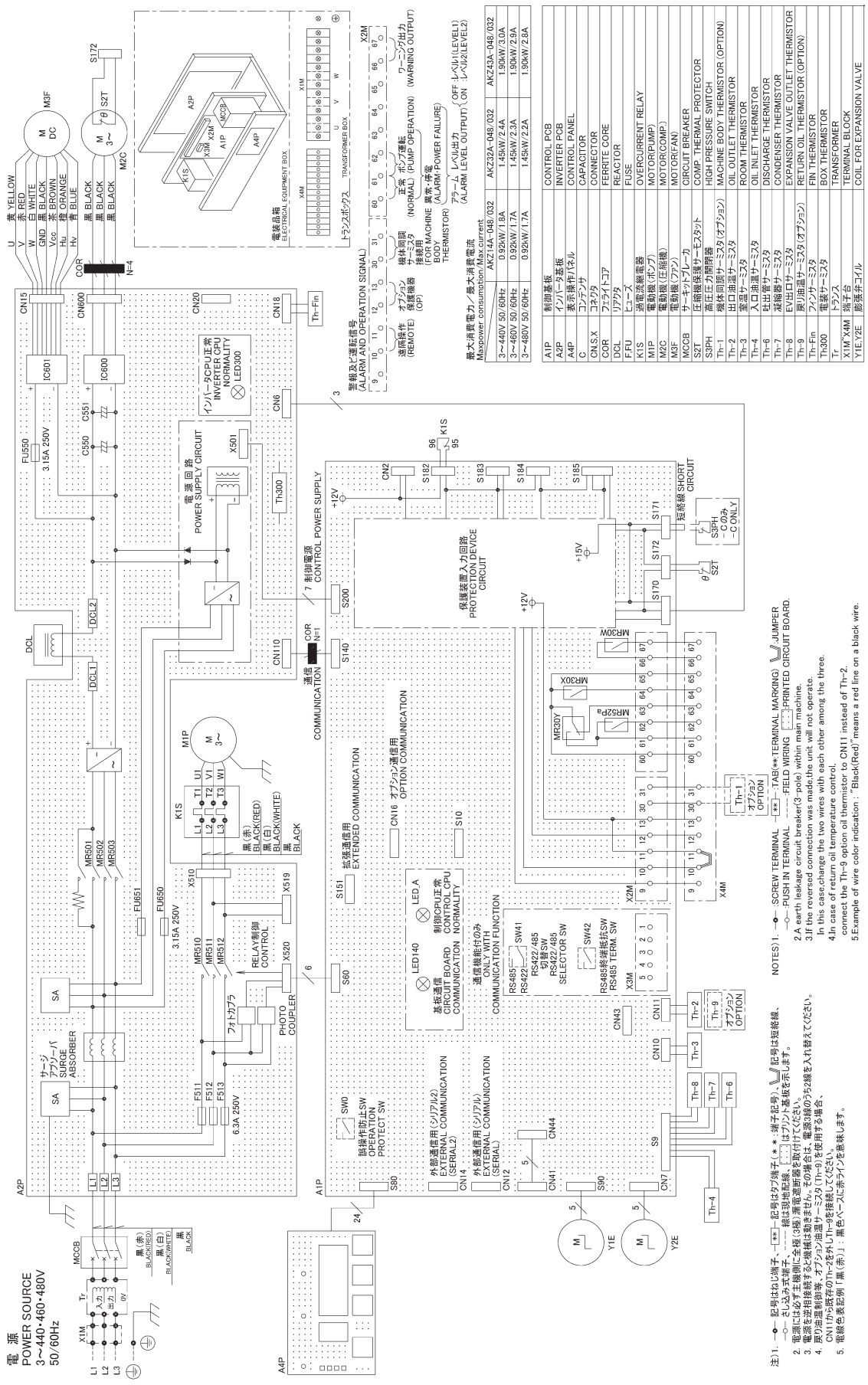
■Wiring Diagrams



C：PH208107

8 AKZ14A–43A-048

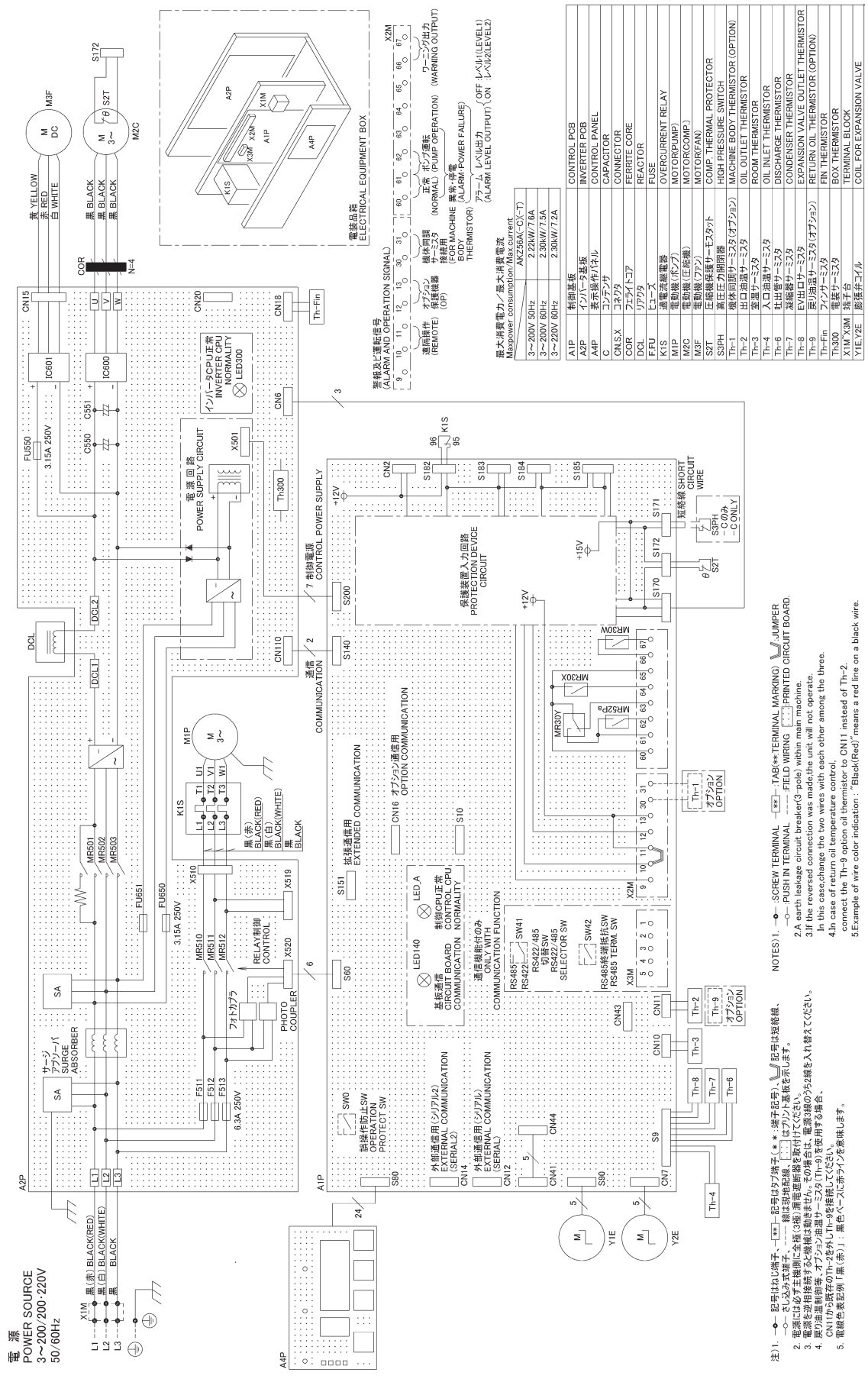
■Wiring Diagrams



C：PH207916

9 AKZ56A (-C) (-T)

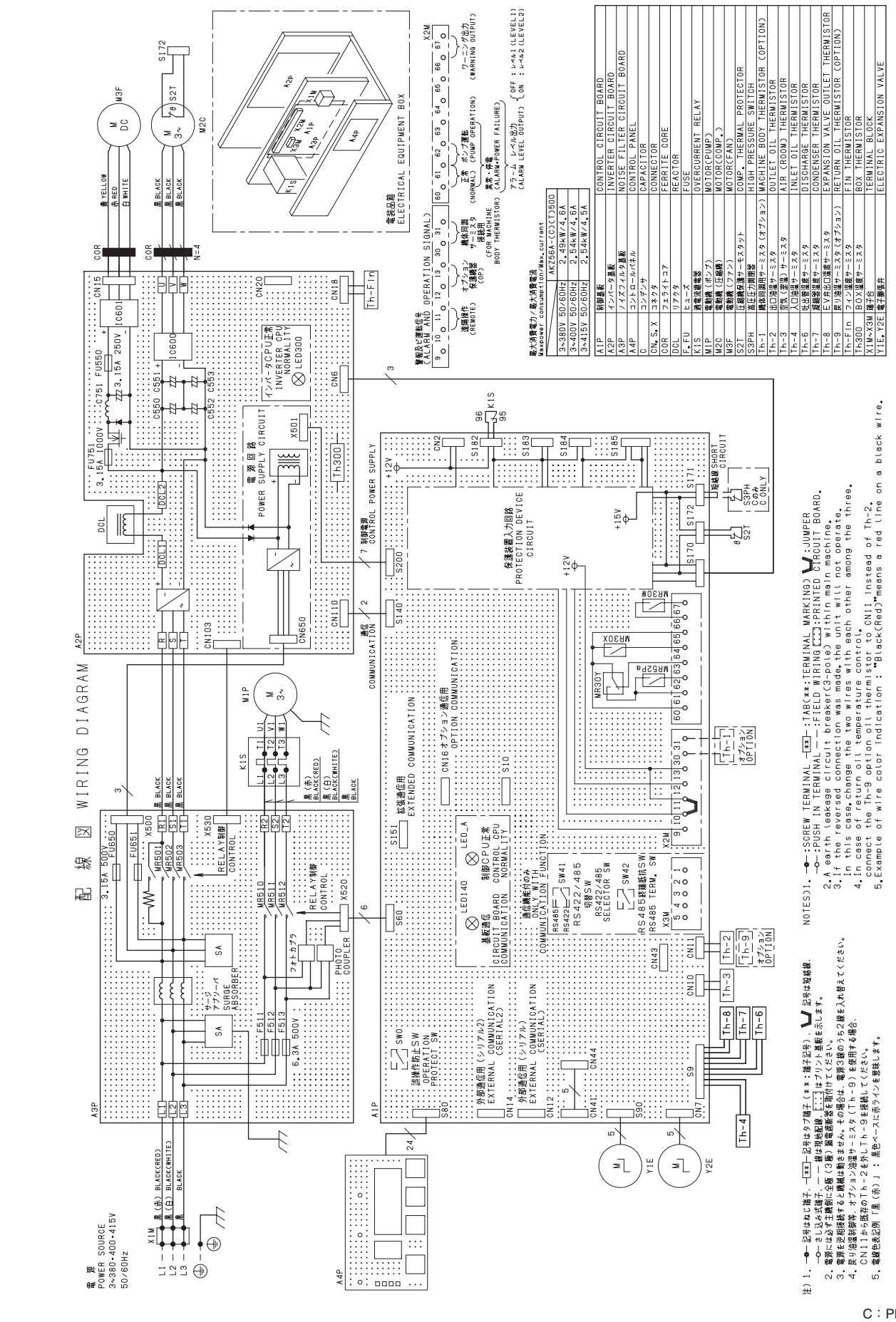
■Wiring Diagrams



C：PH208112

10 AKZ56A- (C) (T) 500

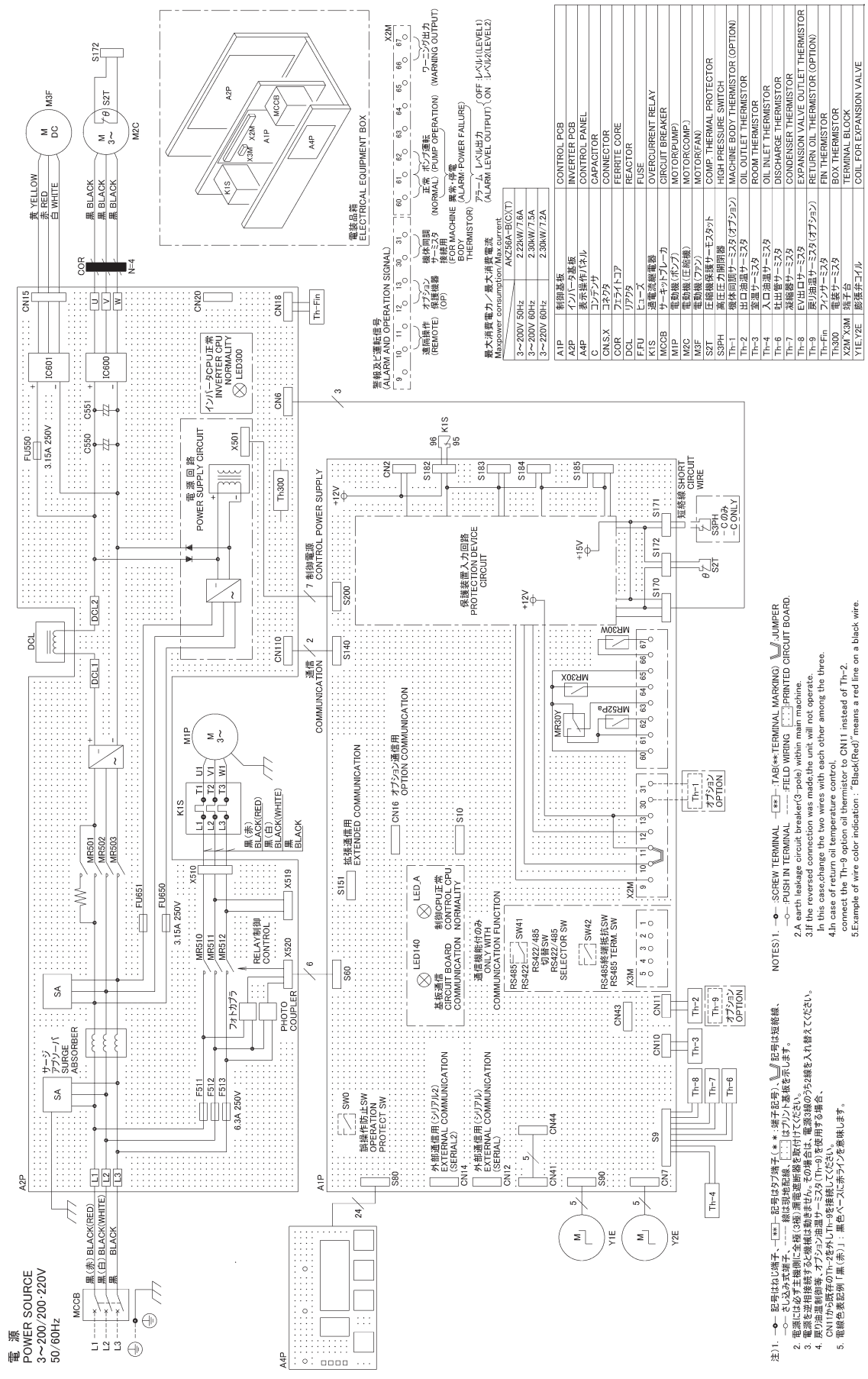
■Wiring Diagrams



C : PH207712A

11 AKZ56A-B

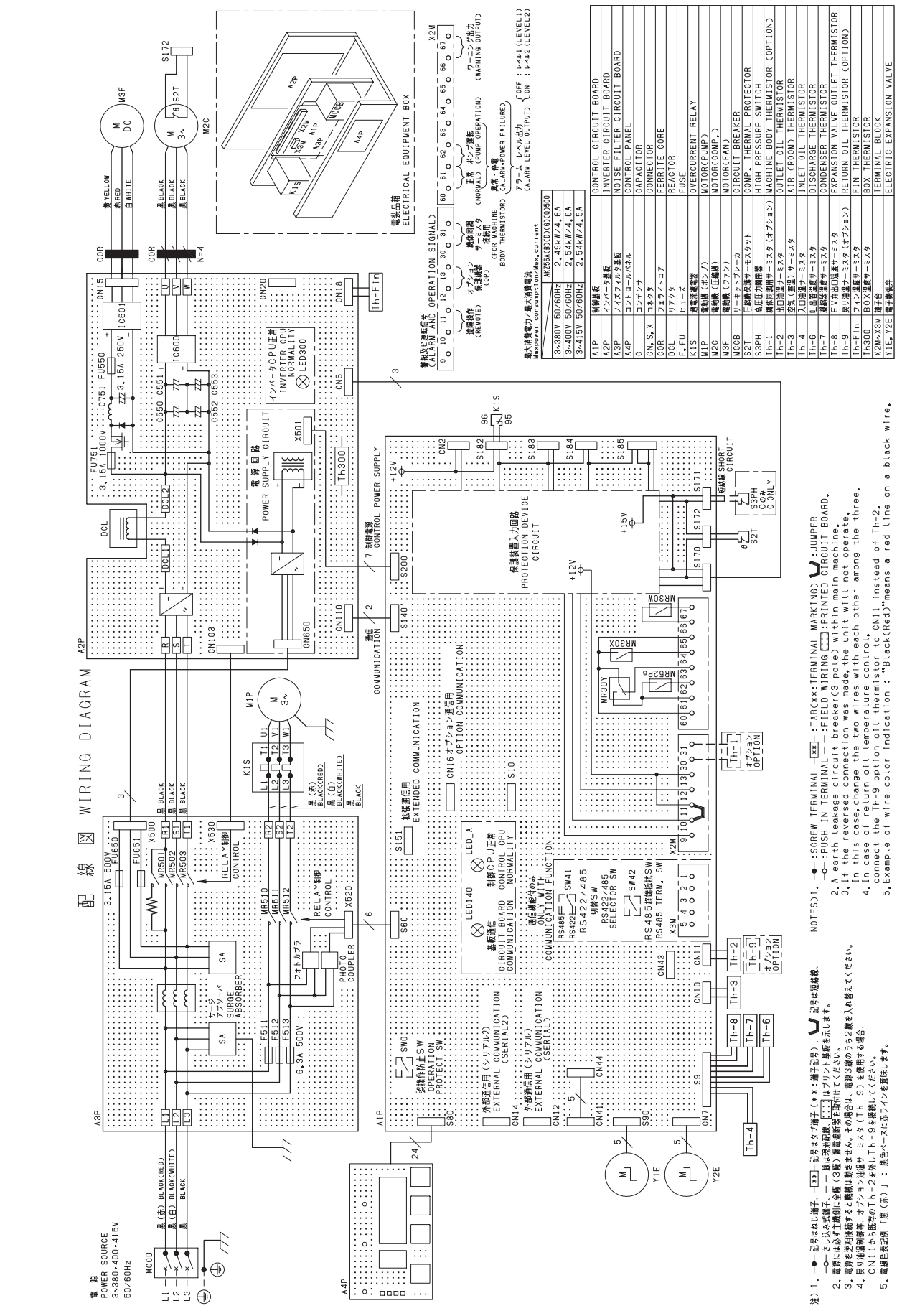
■Wiring Diagrams



C：PH208114

12 AKZ56AB500

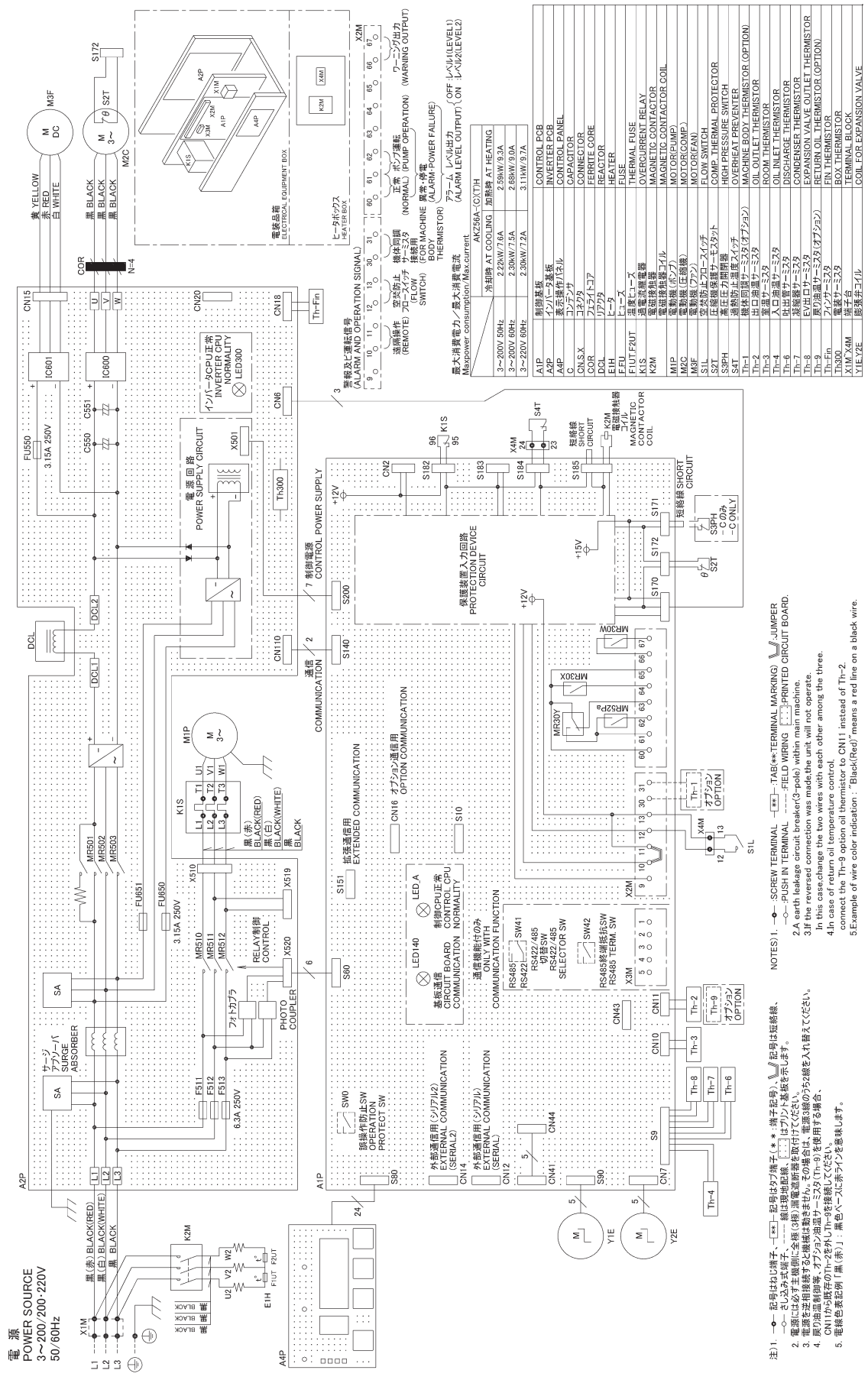
■Wiring Diagrams



C：PH207723A

13 AKZ56A-H

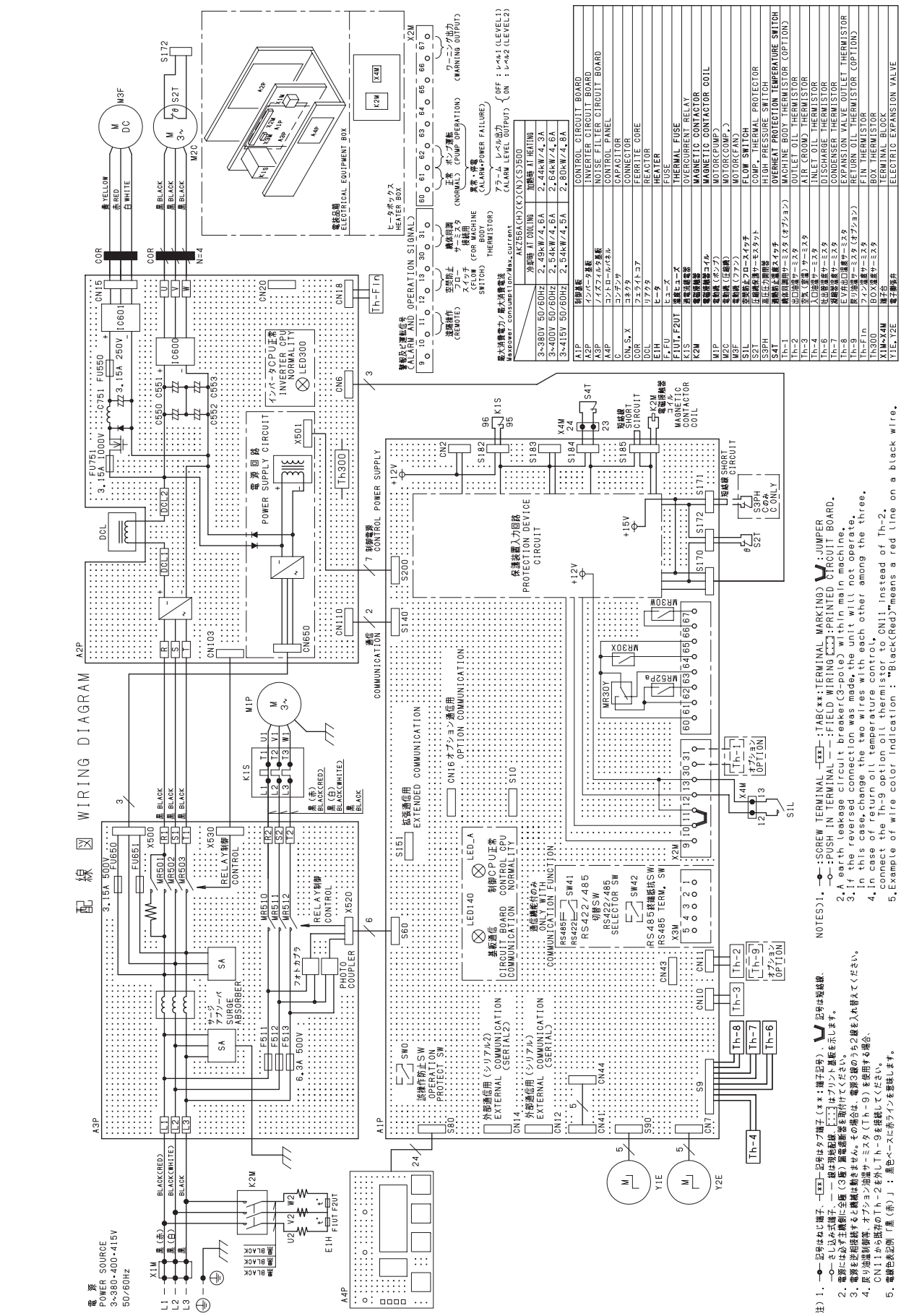
■Wiring Diagrams



C：PH208116

14 AKZ56AH500

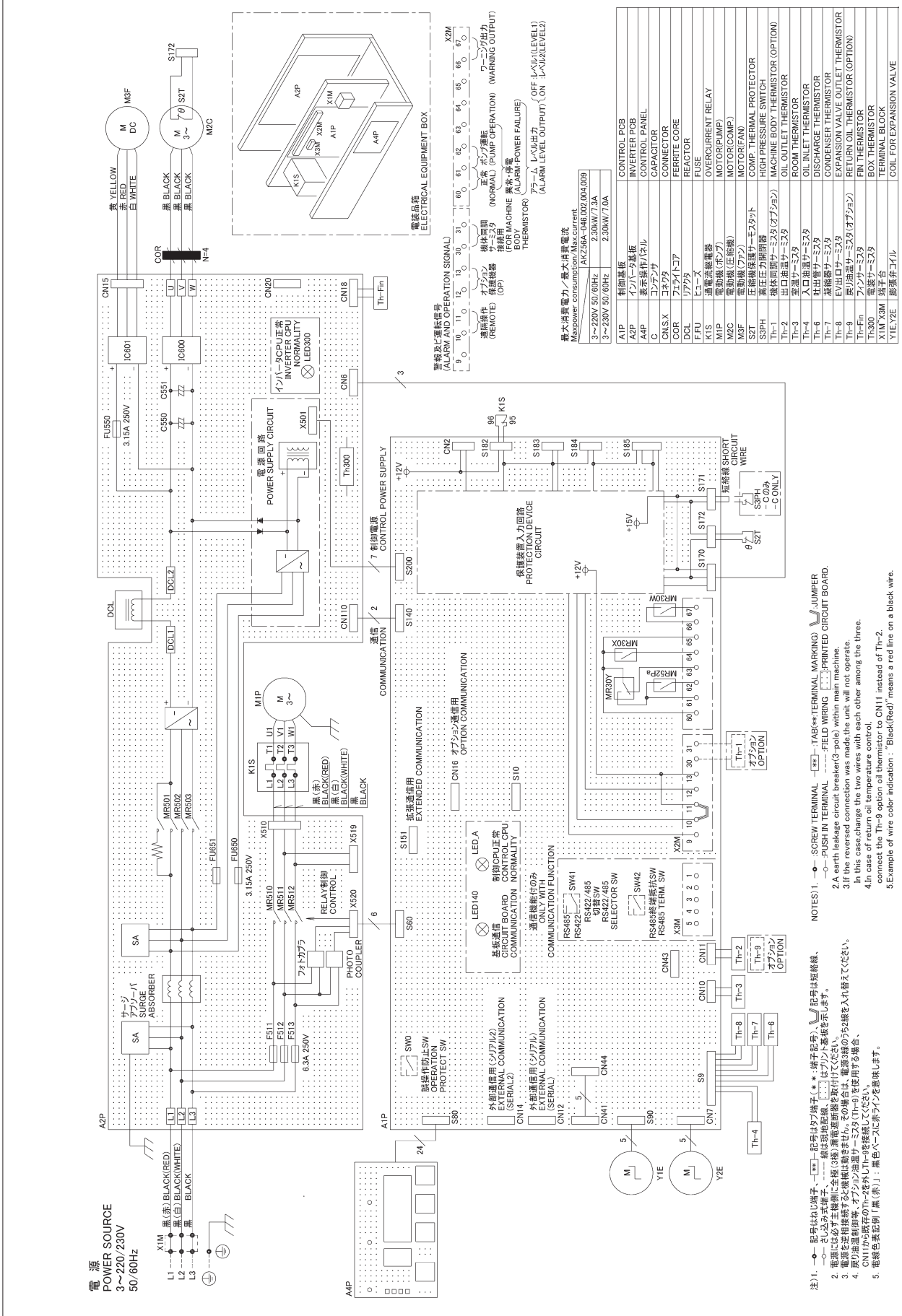
■Wiring Diagrams



C：PH207816A

15 AKZ56A-046

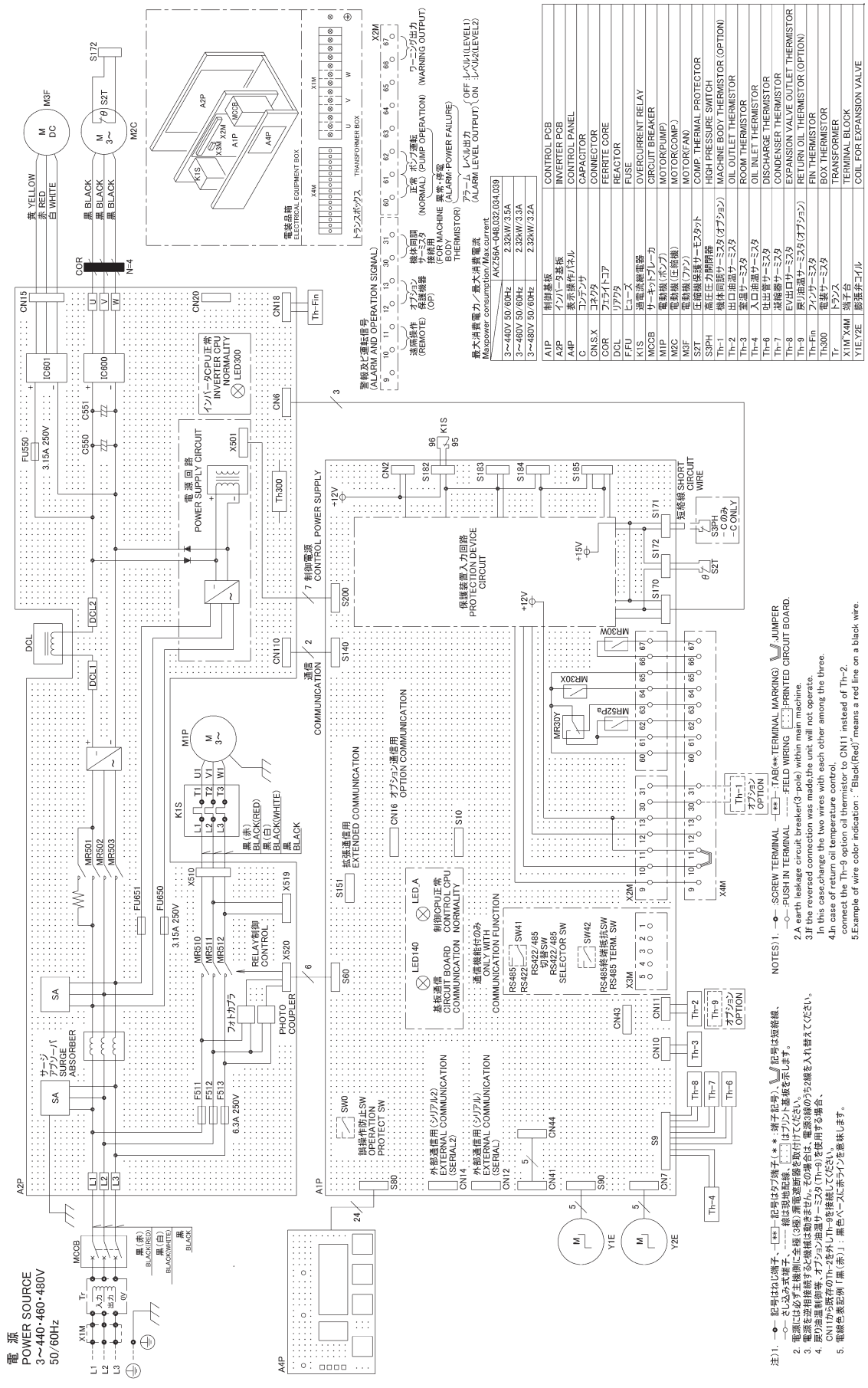
■Wiring Diagrams



C：PH208117

16 AKZ56A-048

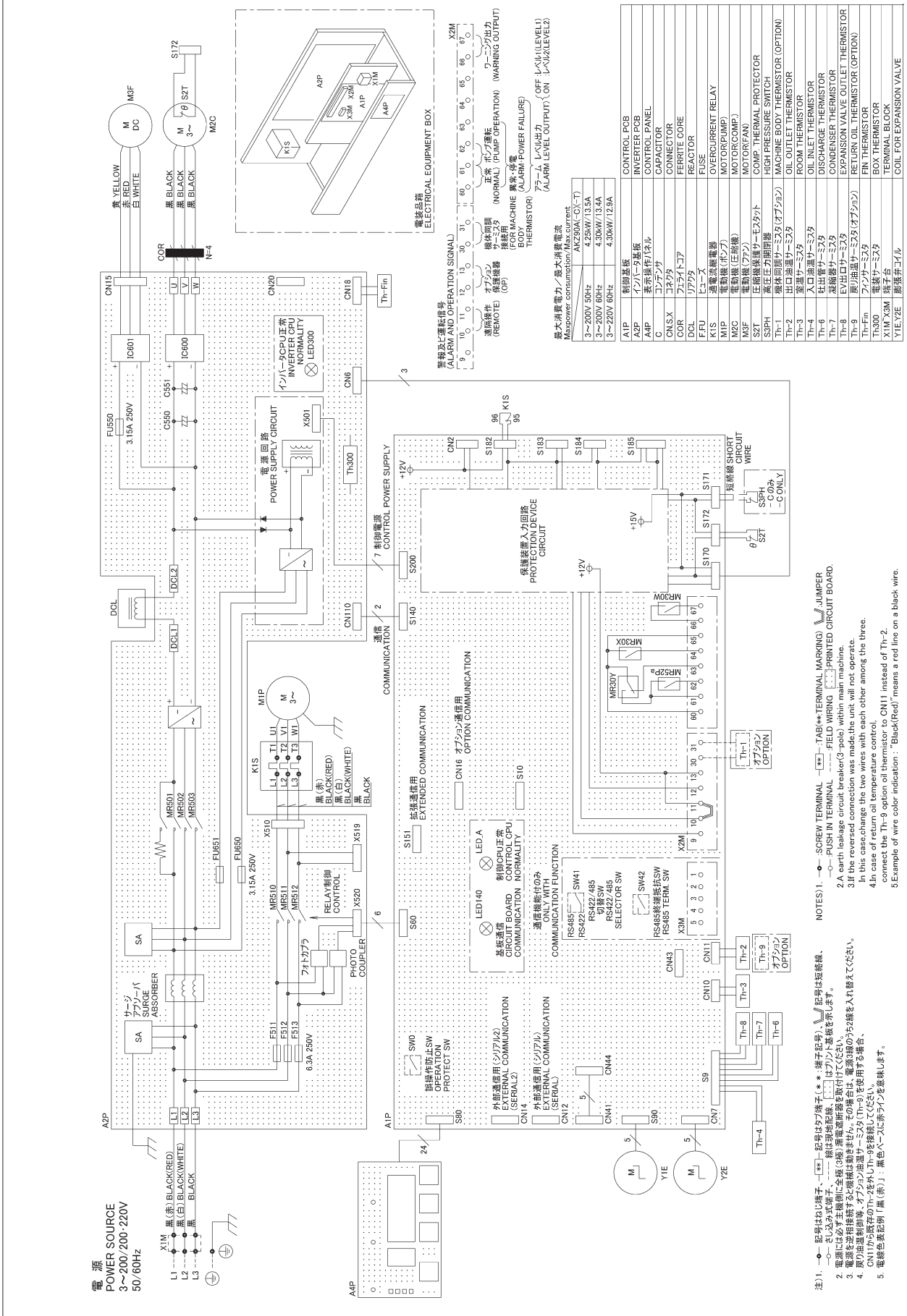
■Wiring Diagrams



C：PH208118

17 AKZ90A (-C) (-T)

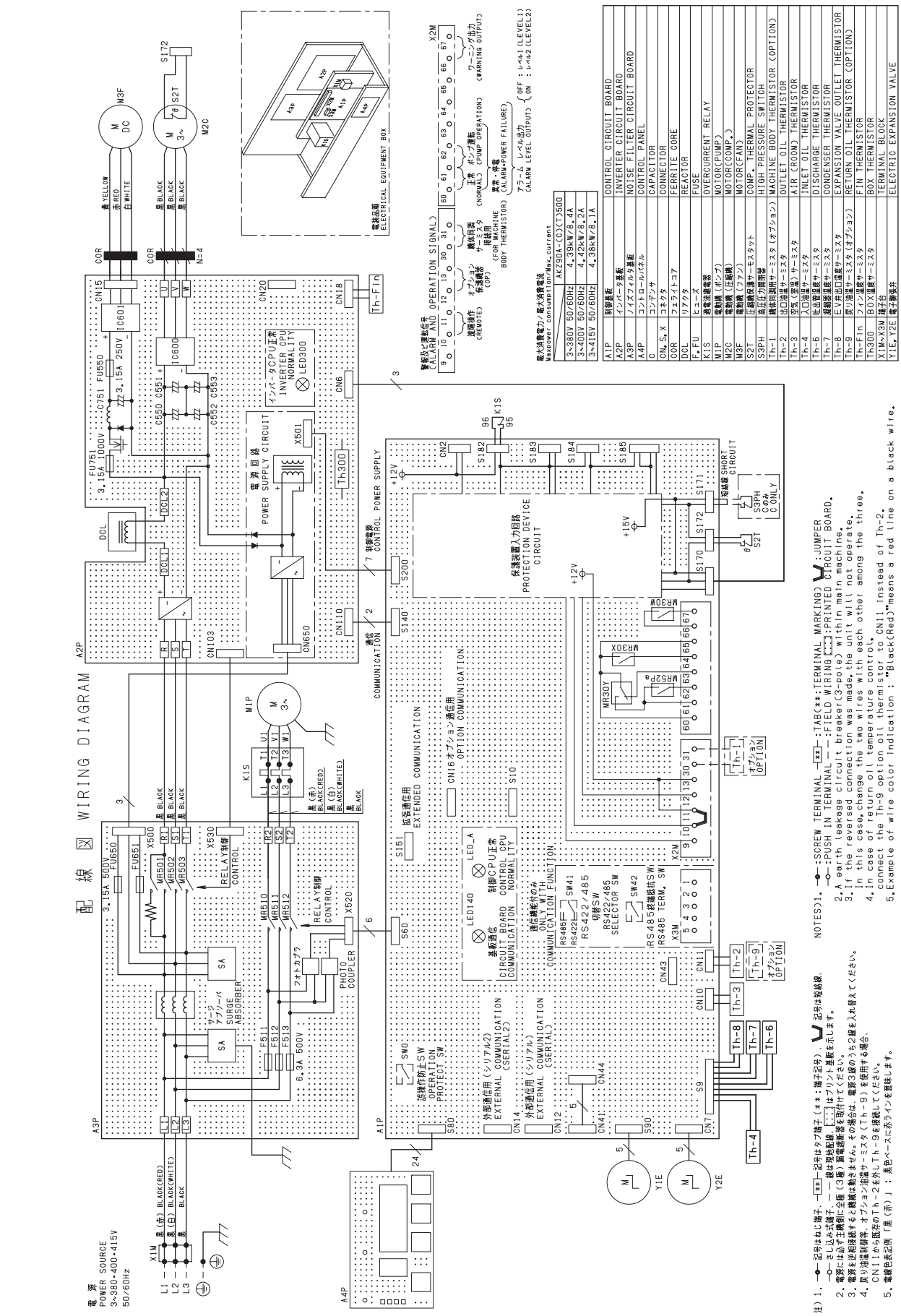
■Wiring Diagrams



C：PH208113

18 AKZ90A- (C) (T) 500

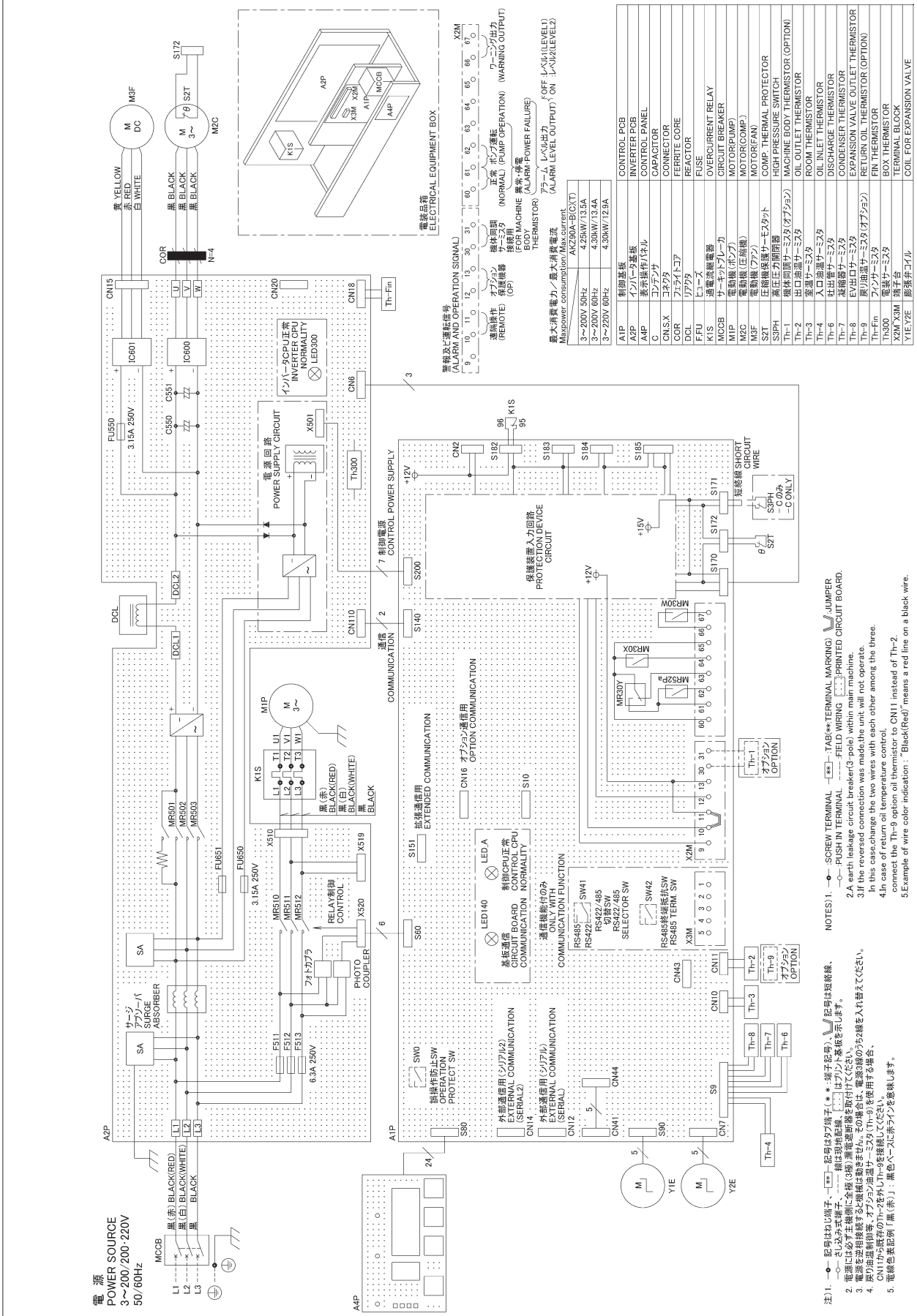
■Wiring Diagrams



C：PH207713A

19 AKZ90A-B

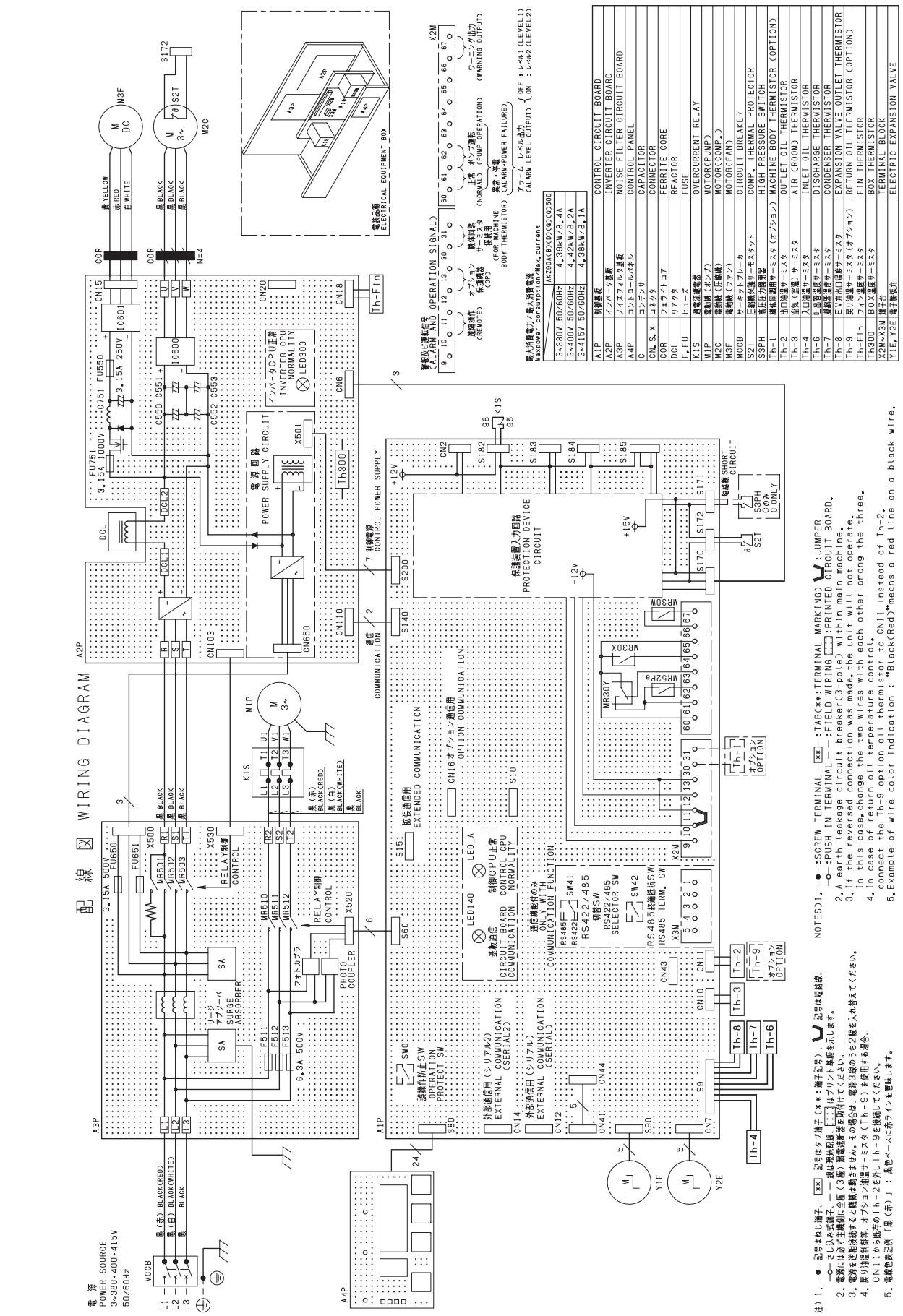
■Wiring Diagrams



C：PH208120

20 AKZ90AB500

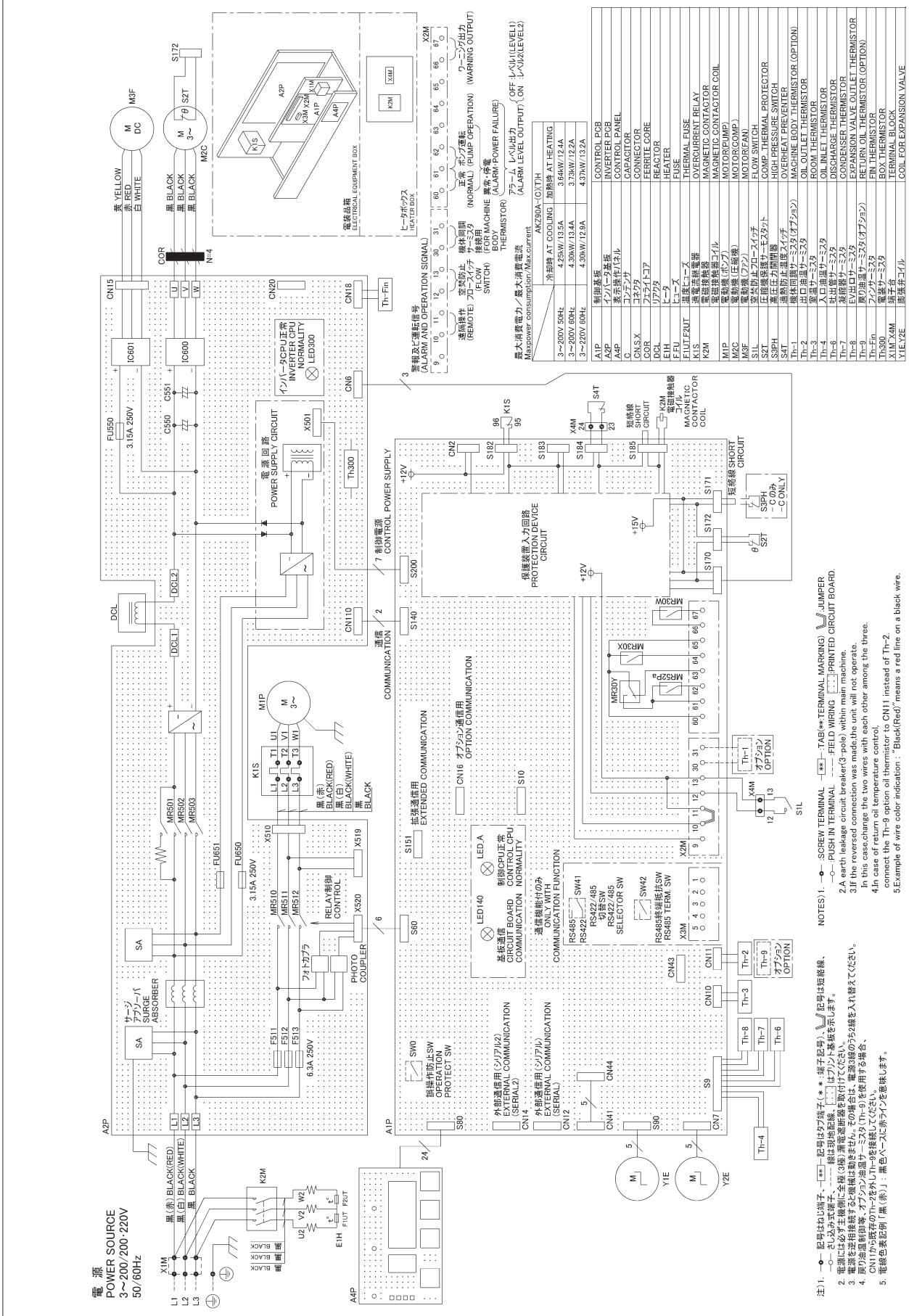
■Wiring Diagrams



C：PH207724A

21 AKZ90A-H

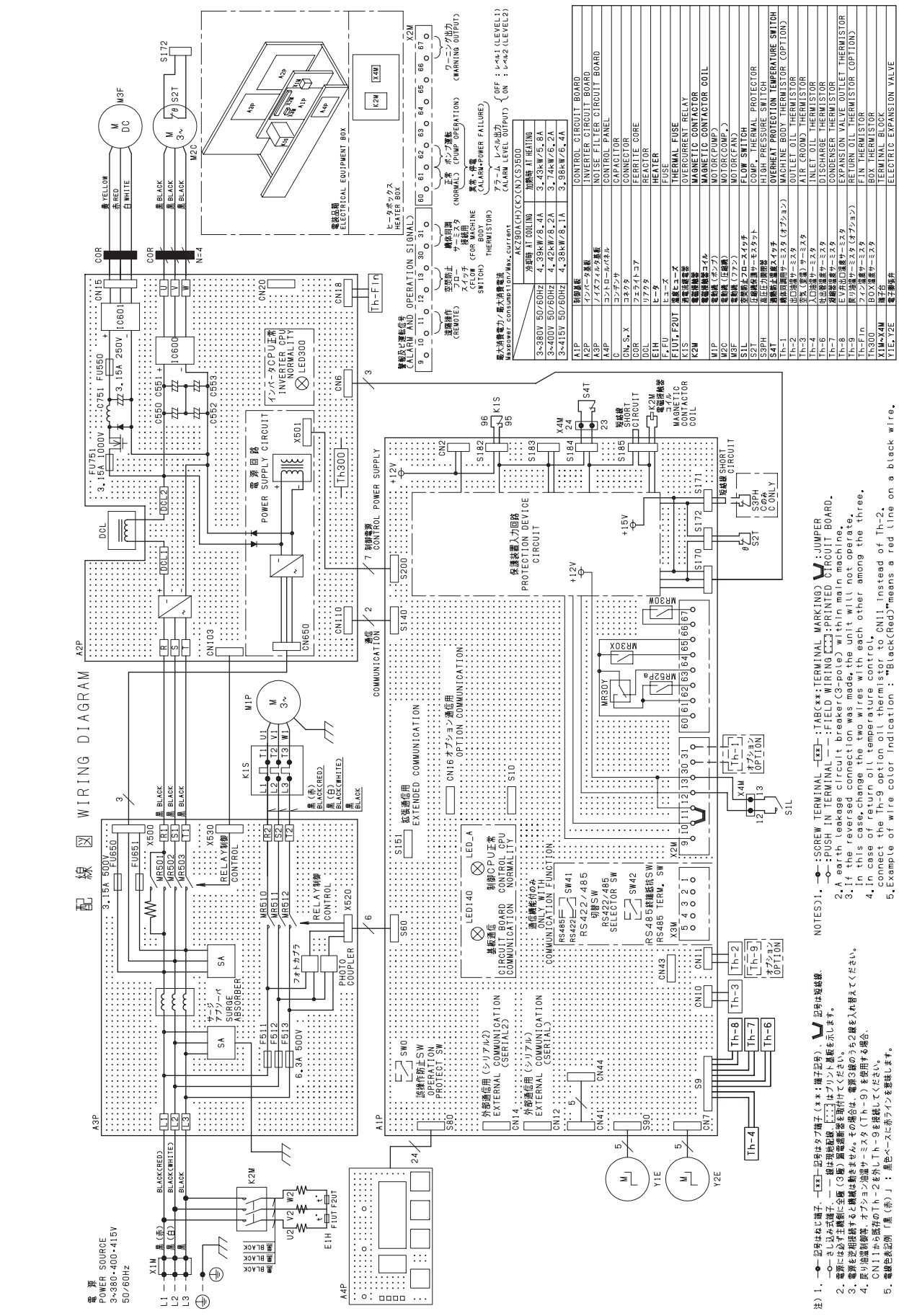
■Wiring Diagrams



C：PH208122

22 AKZ90AH500

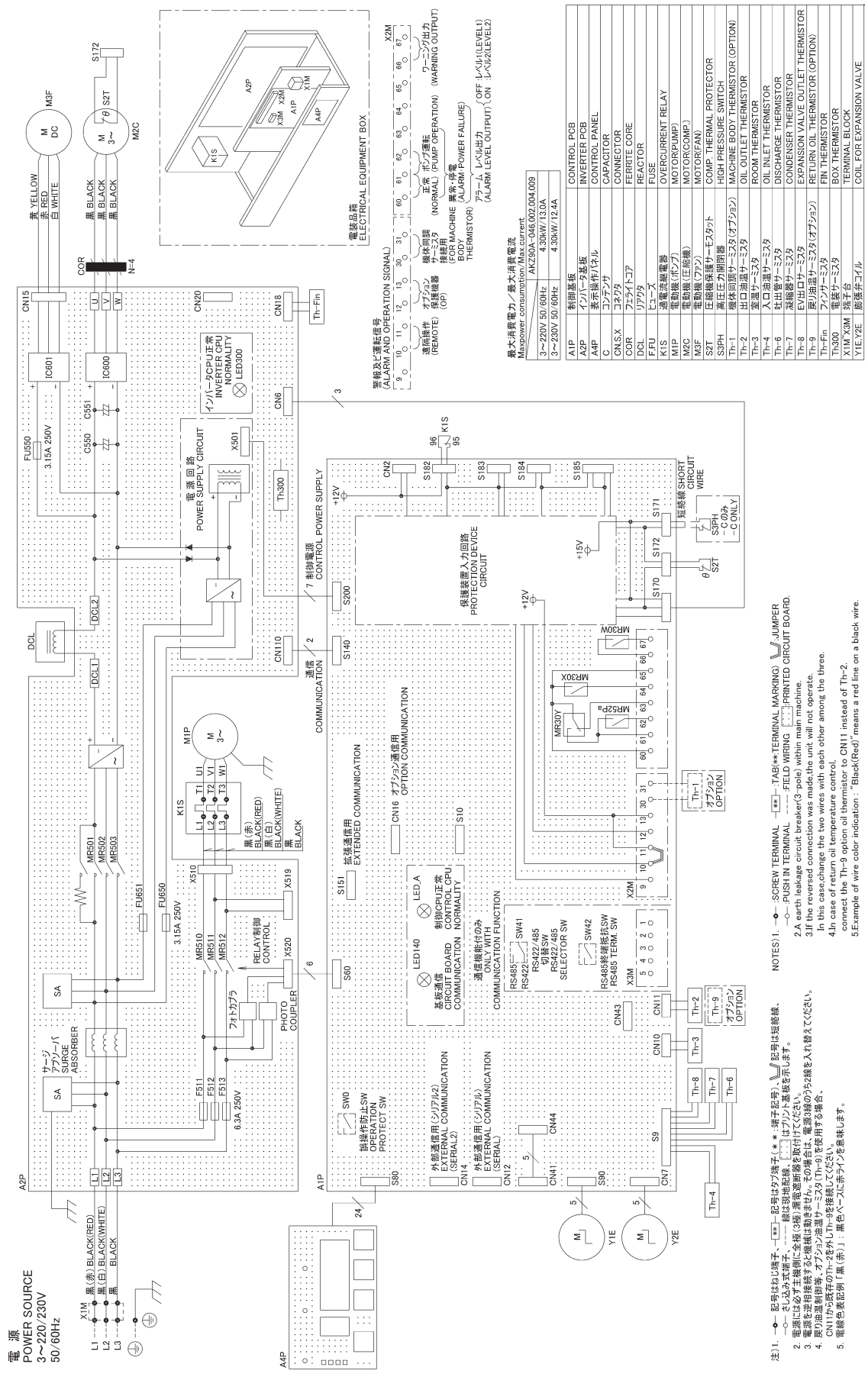
■Wiring Diagrams



C：PH207817A

23 AKZ90A-046

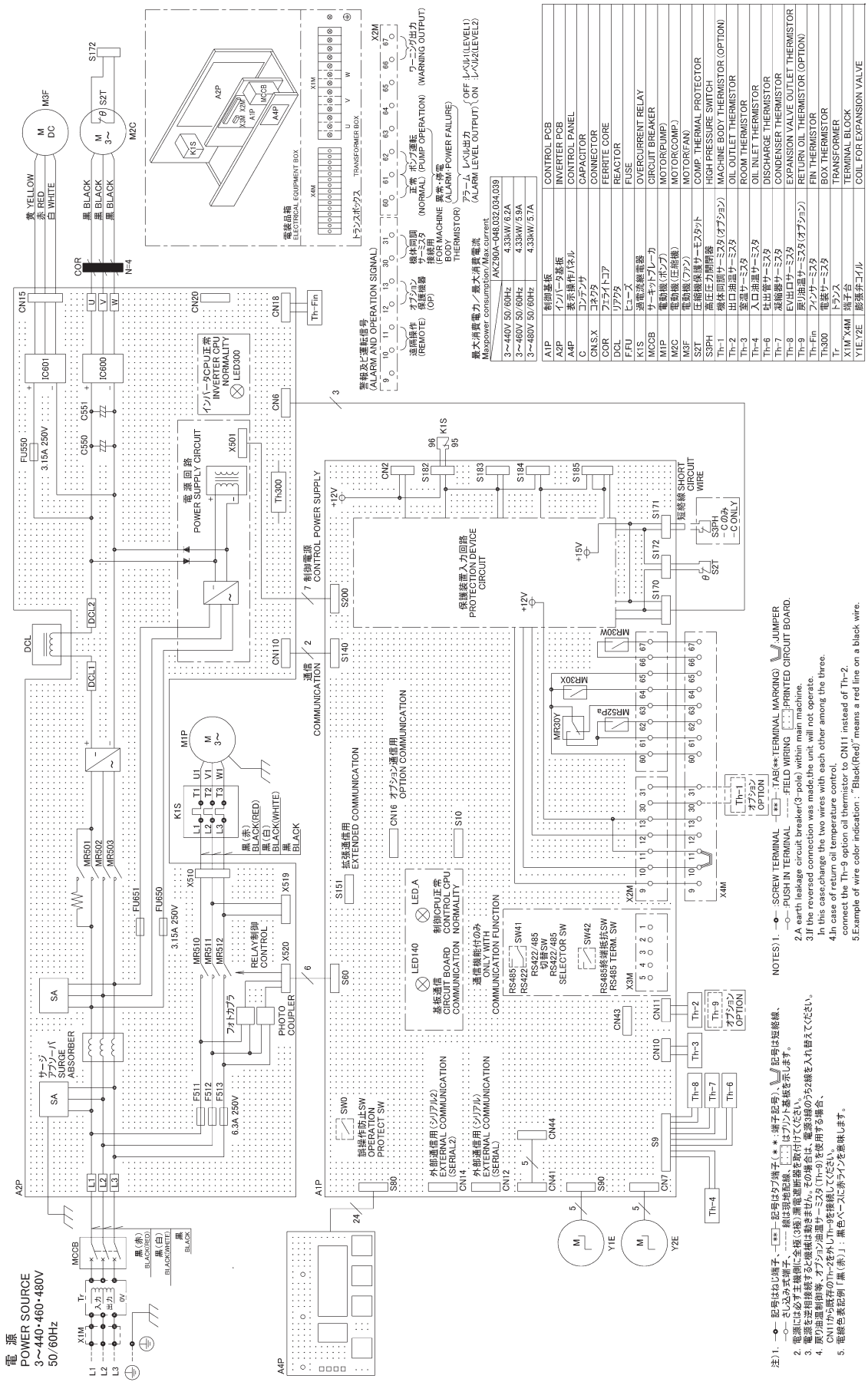
■Wiring Diagrams



C：PH208123

24 AKZ90A-048

■Wiring Diagrams



C：PH208124

MEMO

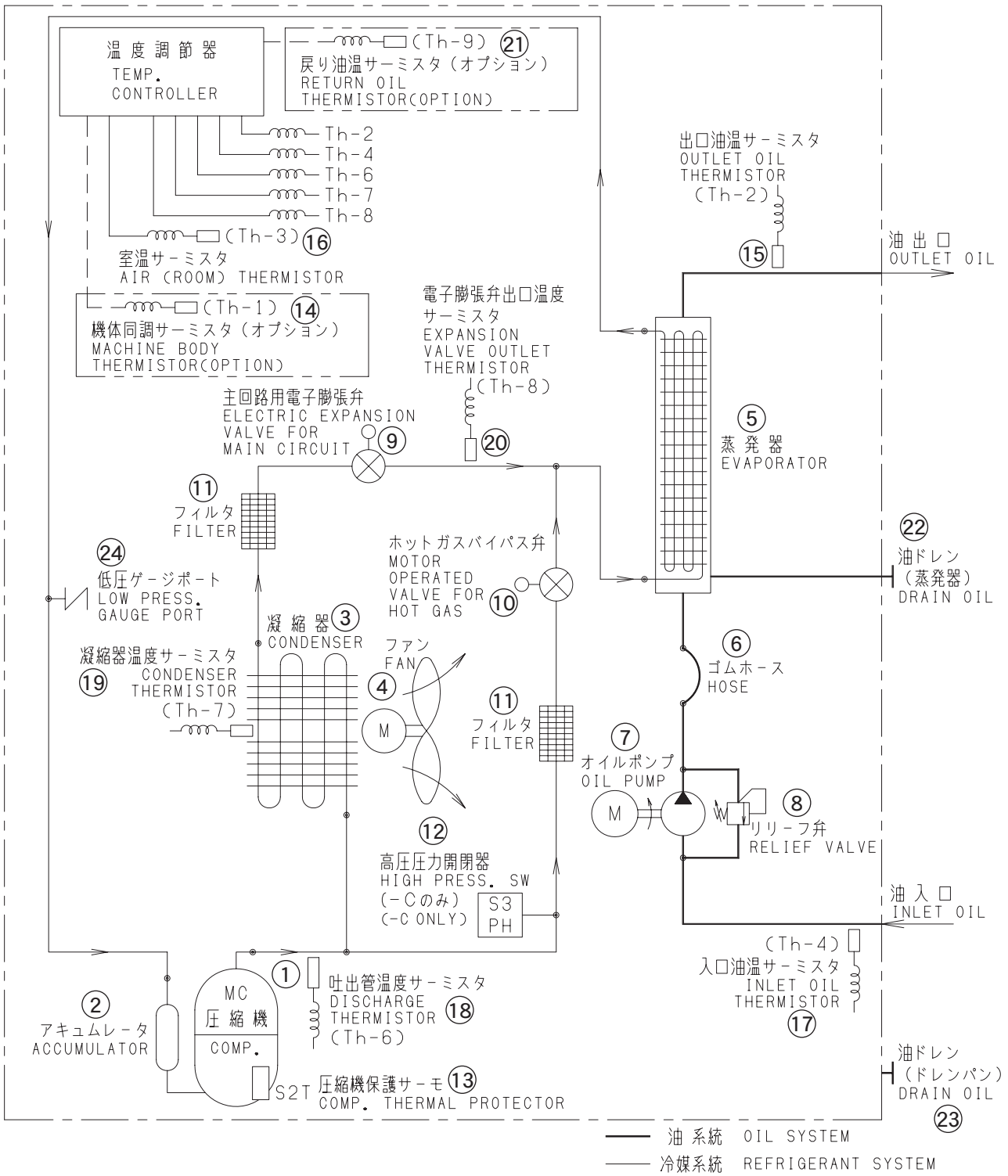
4 Piping Diagrams

1 AKZ14A–43A (-B) (-C) (-046) (-048) (-500)

No.	Part Name	Symbol	Function
①	Compressor	M2C	This compressor is a swing compressor with a built-in DC motor. The compressor is driven under the inverter control by changing the operating frequency according to values specified under the capacity control.
②	Accumulator	—	The accumulator is installed before the compressor suction and used to prevent the entry of liquid refrigerant in the compressor and further efficiently return lubricating oil to the compressor.
③	Condenser	—	Used to air-cool the refrigerant to turn it from high-temperature and-pressure gaseous state to high-temperature and -pressure liquid state.
④	Fan	M3F	The feedback control of fan revolutions is performed for heat exchange through the condenser.
⑤	Evaporator	—	Used to heat low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve (with oil being cooled) to make it low-temperature, low-pressure gas.
⑥	Rubber hose	—	Located at the entrance to and the exit of the oil pump and used to prevent the vibrations of the oil pump from transmitting to the piping system and equipment.
⑦	Oil pump	M1P	Used to circulate oil.
⑧	Relief valve	—	The relief valve is a protective device to be activated when the pressure of oil piping system reaches the specified level or higher, thus setting the pressure back to the normal level.
⑨	Electronic expansion valve for main circuit (EEV)	Y1E	The valve varies its opening according to values specified under the capacity control, thus making the control of refrigerant recirculation quantity.
⑩	Motor operated valve for hot gas (MOV)	Y2E	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑪	Filter	—	Used to prevent the entry of foreign matters in the valves (for both valves).
⑫	High pressure switch ("-C" only)	S3PH	In order to avoid an increase of high pressure when a malfunction occurs, used to display the alarm code “E3” if the high pressure reaches 4.1 MPa, thus stopping the system due to malfunction.
⑬	Compressor protection thermostat	S2T	When the compressor body exceeds a temperature of 125℃, used to display the alarm code “E5”, thus stopping the system due to malfunction.
⑭	Machine body thermistor (optional)	Th-1	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑮	Outlet oil thermistor	Th-2	Used to detect the oil outlet temperature (targeted control temperature) from the evaporator.
⑯	Room thermistor	Th-3	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑰	Inlet oil thermistor	Th-4	Used to detect the oil inlet temperature (targeted control temperature) to the evaporator.
⑱	Discharge thermistor	Th-6	Used to detect the discharge pipe temperature and, when the discharge pipe temperature exceeds 100℃, thus displaying the malfunction code “E5” to stop the system due to malfunction.
⑲	Condenser thermistor	Th-7	Used to detect the condensing temperature and, when the condenser temperature exceeds 62℃, thus displaying the malfunction code “E3” to stop the system due to malfunction.
⑳	Electronic expansion valve outlet thermistor	Th-8	While in zero point adjustment, used to detect variations in the electronic expansion valve outlet temperature, thus recognizing the Fully Closed point.
㉑	Returned oil thermistor (optional)	Th-9	Detect the oil temperature of the main engine oil pipe (returned pipe).
㉒	Oil drain (evaporator)	—	Closed by plug Rc1/4. (The evaporator oil can be discharged from this oil drain for maintenance.)
㉓	Oil drain (drain pan)	—	Used to drain oil from the bottom of the oil cooling unit.
㉔	Low-pressure gauge port	—	Used to mount a gauge for maintenance.

*For the layout of parts, refer to information on pages 54 and 55.

■AKZ14A–43A (-B) (-C) (-046) (-048) (-500)



C：PH400494

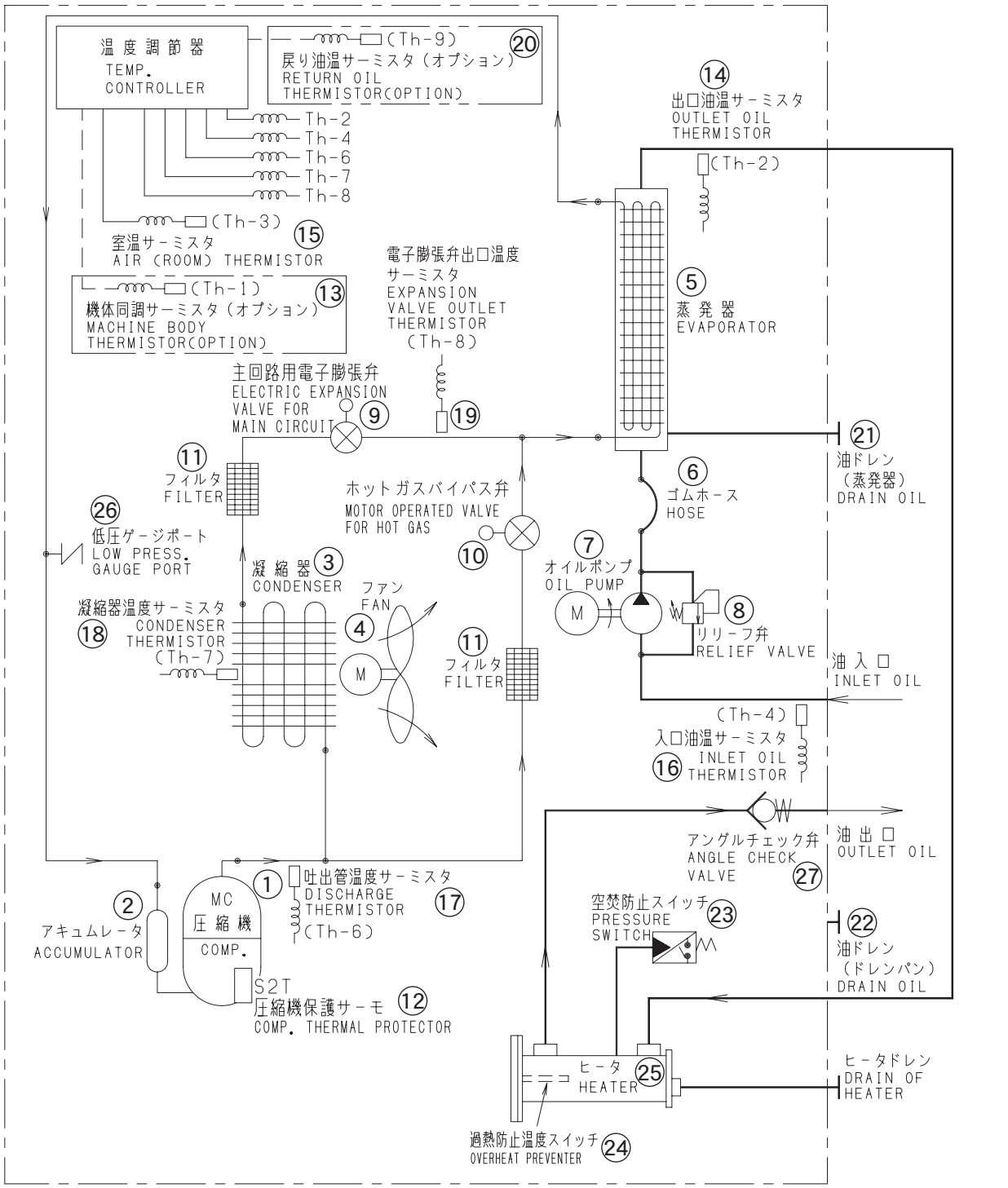
4 Piping Diagrams

2 AKZ14A–43A-H, AKZ14A–43AH500

No.	Part Name	Symbol	Function
①	Compressor	M2C	This compressor is a swing compressor with a built-in DC motor. The compressor is driven under the inverter control by changing the operating frequency according to values specified under the capacity control.
②	Accumulator	—	The accumulator is installed before the compressor suction and used to prevent the entry of liquid refrigerant in the compressor and further efficiently return lubricating oil to the compressor.
③	Condenser	—	Used to air-cool the refrigerant to turn it from high-temperature and -pressure gaseous state to high-temperature and -pressure liquid state.
④	Fan	M3F	The feedback control of fan revolutions is performed for heat exchange through the condenser.
⑤	Evaporator	—	Used to heat low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve (with oil being cooled) to make it low-temperature, low-pressure gas.
⑥	Rubber hose	—	Located at the entrance to and the exit of the oil pump and used to prevent the vibrations of the oil pump from transmitting to the piping system and equipment.
⑦	Oil pump	M1P	Used to circulate oil.
⑧	Relief valve	—	The relief valve is a protective device to be activated when the pressure of oil piping system reaches the specified level or higher, thus setting the pressure back to the normal level.
⑨	Electronic expansion valve for main circuit (EEV)	Y1E	The valve varies its opening according to values specified under the capacity control, thus making the control of refrigerant recirculation quantity.
⑩	Motor operated valve for hot gas (MOV)	Y2E	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑪	Filter	—	Used to prevent the entry of foreign matters in the valves (for both valves).
⑫	Compressor protection thermostat	S2T	When the compressor body exceeds a temperature of 125℃, used to display the alarm code “E5”, thus stopping the system due to malfunction.
⑬	Machine body thermistor (optional)	Th-1	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑭	Outlet oil thermistor	Th-2	Used to detect the oil outlet temperature (targeted control temperature) from the evaporator.
⑮	Room thermistor	Th-3	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑯	Inlet oil thermistor	Th-4	Used to detect the oil inlet temperature (targeted control temperature) to the evaporator.
⑰	Discharge thermistor	Th-6	Used to detect the discharge pipe temperature and, when the discharge pipe temperature exceeds 100℃, thus displaying the malfunction code “E5” to stop the system due to malfunction.
⑱	Condenser thermistor	Th-7	Used to detect the condensing temperature and, when the condenser temperature exceeds 62℃, thus displaying the malfunction code “E3” to stop the system due to malfunction.
⑲	Electronic expansion valve outlet thermistor	Th-8	While in zero point adjustment, used to detect variations in the electronic expansion valve outlet temperature, thus recognizing the Fully Closed point.
⑳	Returned oil thermistor (optional)	Th-9	Detect the oil temperature of the main engine oil pipe (returned pipe).
㉑	Oil drain (evaporator)	—	Closed by plug Rc1/4. (The evaporator oil can be discharged from this oil drain for maintenance.)
㉒	Oil drain (drain pan)	—	Used to drain oil from the bottom of the oil cooling unit.
㉓	Boil-dry protection pressure switch	S5P	Used to detect a drop of pressure in the piping system through a pressure switch, thus stopping the system due to malfunction.
㉔	Overheat prevention temperature switch	S4T	Used to indicate the malfunction code “AA” to stop the system due to malfunction when heater oil temperature exceeds 80℃.
㉕	Heater	E1H	This is an electric heater used to heat oil.
㉖	Low-pressure gauge port	—	Used to mount a gauge for maintenance.
㉗	Angle check valve	—	This valve is a “check valve” so as not to malfunction the pressure switch. Without the angle check valve, the system may erroneously recognize that there is no oil to stop running due to malfunction “AA”.

*For the layout of parts, refer to information on pages 54 and 55.

■AKZ14A–43A-H, AKZ14A–43AH500



C：PH400505

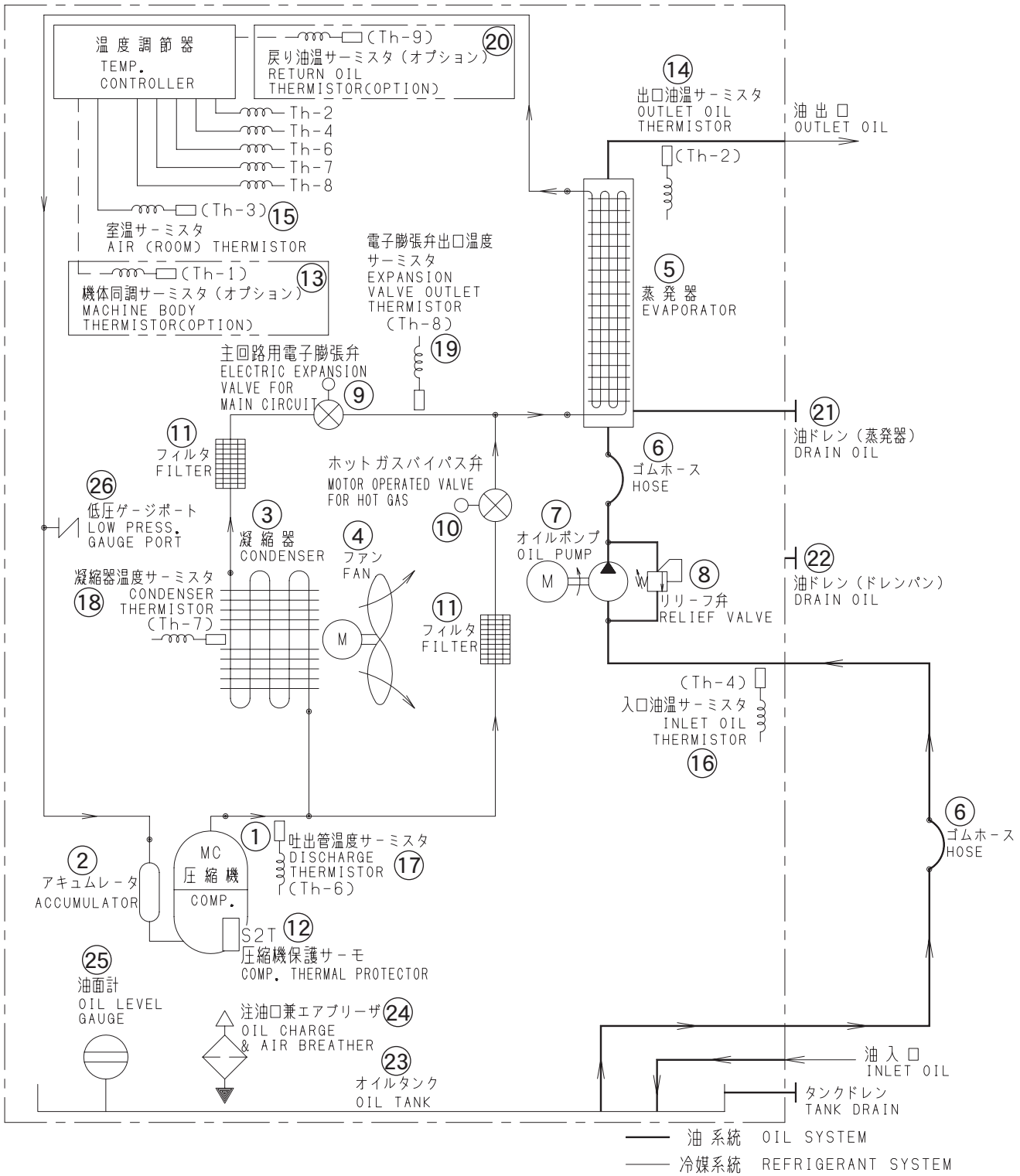
4 Piping Diagrams

3 AKZ14A–43A-T, AKZ14A–43AT500

No.	Part Name	Symbol	Function
①	Compressor	M2C	This compressor is a swing compressor with a built-in DC motor. The compressor is driven under the inverter control by changing the operating frequency according to values specified under the capacity control.
②	Accumulator	—	The accumulator is installed before the compressor suction and used to prevent the entry of liquid refrigerant in the compressor and further efficiently return lubricating oil to the compressor.
③	Condenser	—	Used to air-cool the refrigerant to turn it from high-temperature and -pressure gaseous state to high-temperature and -pressure liquid state.
④	Fan	M3F	The feedback control of fan revolutions is performed for heat exchange through the condenser.
⑤	Evaporator	—	Used to heat low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve (with oil being cooled) to make it low-temperature, low-pressure gas.
⑥	Rubber hose	—	Located at the entrance to and the exit of the oil pump and used to prevent the vibrations of the oil pump from transmitting to the piping system and equipment.
⑦	Oil pump	M1P	Used to circulate oil.
⑧	Relief valve	—	The relief valve is a protective device to be activated when the pressure of oil piping system reaches the specified level or higher, thus setting the pressure back to the normal level.
⑨	Electronic expansion valve for main circuit (EEV)	Y1E	The valve varies its opening according to values specified under the capacity control, thus making the control of refrigerant recirculation quantity.
⑩	Motor operated valve for hot gas (MOV)	Y2E	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑪	Filter	—	Used to prevent the entry of foreign matters in the valves (for both valves).
⑫	Compressor protection thermostat	S2T	When the compressor body exceeds a temperature of 125℃, used to display the alarm code “E5”, thus stopping the system due to malfunction.
⑬	Machine body thermistor (optional)	Th-1	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑭	Outlet oil thermistor	Th-2	Used to detect the oil outlet temperature (targeted control temperature) from the evaporator.
⑮	Room thermistor	Th-3	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑯	Inlet oil thermistor	Th-4	Used to detect the oil inlet temperature (targeted control temperature) to the evaporator.
⑰	Discharge thermistor	Th-6	Used to detect the discharge pipe temperature and, when the discharge pipe temperature exceeds 100℃, thus displaying the malfunction code “E5” to stop the system due to malfunction.
⑱	Condenser thermistor	Th-7	Used to detect the condensing temperature and, when the condenser temperature exceeds 62℃, thus displaying the malfunction code “E3” to stop the system due to malfunction.
⑲	Electronic expansion valve outlet thermistor	Th-8	While in zero point adjustment, used to detect variations in the electronic expansion valve outlet temperature, thus recognizing the Fully Closed point.
⑳	Returned oil thermistor (optional)	Th-9	Detect the oil temperature of the main engine oil pipe (returned pipe).
㉑	Oil drain (evaporator)	—	Closed by plug Rc1/4. (The evaporator oil can be discharged from this oil drain for maintenance.)
㉒	Oil drain (drain pan)	—	Used to drain oil from the bottom of the oil cooling unit.
㉓	Oil tank	—	Used to store oil at all times, thus responding to a sharp fluctuation in oil quantity in the piping system.
㉔	Oil charge port & Air breather	—	Used to fill oil into the oil tank and normally serve as a ventilation hole for the oil tank.
㉕	Oil level indicator	—	Used to indicate oil quantity in the oil tank.
㉖	Low-pressure gauge port	—	Used to mount a gauge for maintenance.

*For the layout of parts, refer to information on pages 54 and 55.

■AKZ14A–43A-T, AKZ14A–43AT500



C：PH400506

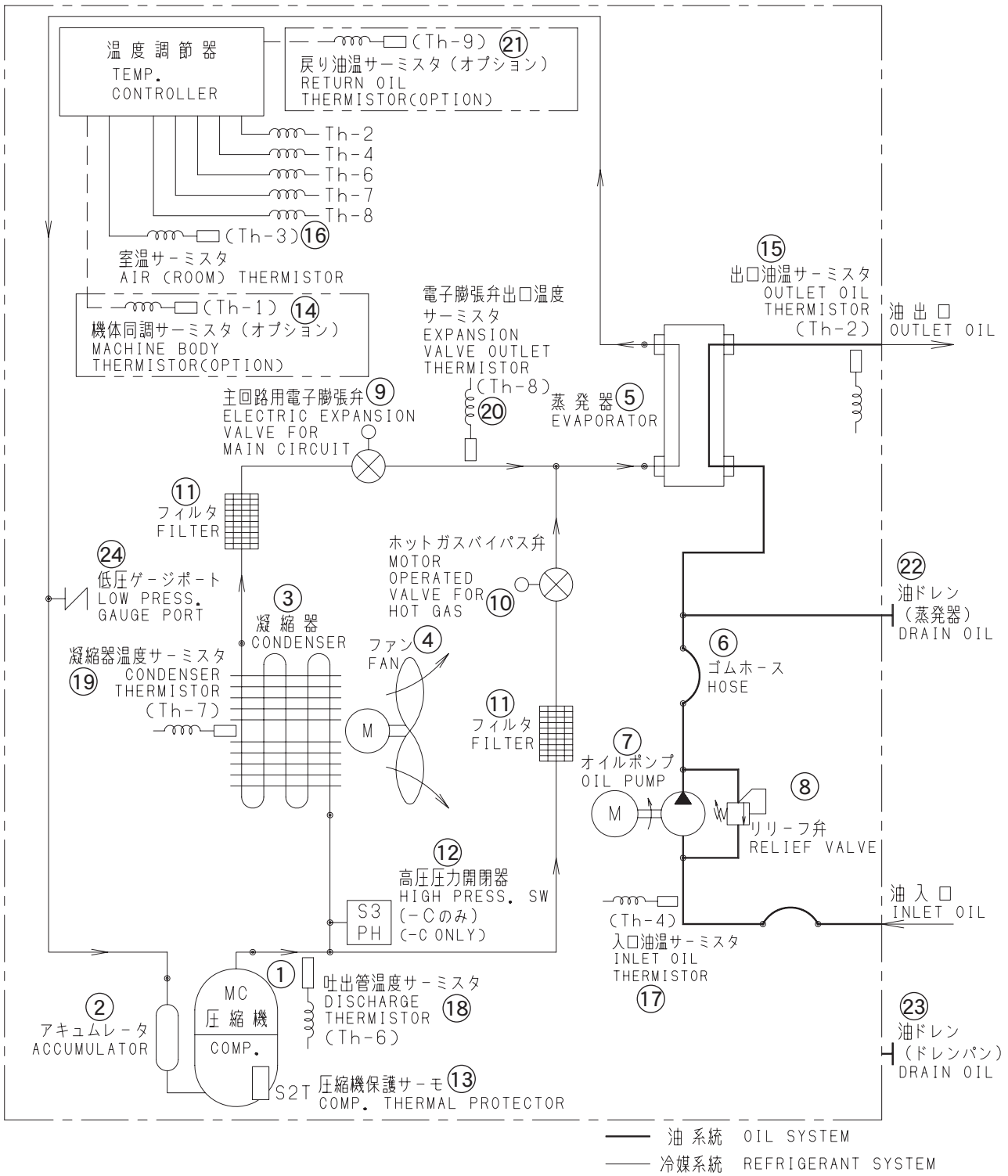
4 Piping Diagrams

4 AKZ56A/90A (-B) (-C) (-046) (-048) (-500)

No.	Part Name	Symbol	Function
①	Compressor	M2C	This compressor is a swing compressor with a built-in DC motor. The compressor is driven under the inverter control by changing the operating frequency according to values specified under the capacity control.
②	Accumulator	—	The accumulator is installed before the compressor suction and used to prevent the entry of liquid refrigerant in the compressor and further efficiently return lubricating oil to the compressor.
③	Condenser	—	Used to air-cool the refrigerant to turn it from high-temperature and-pressure gaseous state to high-temperature and -pressure liquid state.
④	Fan	M3F	The feedback control of fan revolutions is performed for heat exchange through the condenser.
⑤	Evaporator	—	Used to heat low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve (with oil being cooled) to make it low-temperature, low-pressure gas.
⑥	Rubber hose	—	Located at the entrance to and the exit of the oil pump and used to prevent the vibrations of the oil pump from transmitting to the piping system and equipment.
⑦	Oil pump	M1P	Used to circulate oil.
⑧	Relief valve	—	The relief valve is a protective device to be activated when the pressure of oil piping system reaches the specified level or higher, thus setting the pressure back to the normal level.
⑨	Electronic expansion valve for main circuit (EEV)	Y1E	The valve varies its opening according to values specified under the capacity control, thus making the control of refrigerant recirculation quantity.
⑩	Motor operated valve for hot gas (MOV)	Y2E	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑪	Filter	—	Used to prevent the entry of foreign matters in the valves (for both valves).
⑫	High pressure switch ("-C" only)	S3PH	In order to avoid an increase of high pressure when a malfunction occurs, used to display the alarm code “E3” if the high pressure reaches 4.1 MPa, thus stopping the system due to malfunction.
⑬	Compressor protection thermostat	S2T	When the compressor body exceeds a temperature of 125℃, used to display the alarm code “E5”, thus stopping the system due to malfunction.
⑭	Machine body thermistor (optional)	Th-1	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑮	Outlet oil thermistor	Th-2	Used to detect the oil outlet temperature (targeted control temperature) from the evaporator.
⑯	Room thermistor	Th-3	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑰	Inlet oil thermistor	Th-4	Used to detect the oil inlet temperature (targeted control temperature) to the evaporator.
⑱	Discharge thermistor	Th-6	Used to detect the discharge pipe temperature and, when the discharge pipe temperature exceeds 115℃, thus displaying the malfunction code “E5” to stop the system due to malfunction.
⑲	Condenser thermistor	Th-7	Used to detect the condensing temperature and, when the condenser temperature exceeds 62℃, thus displaying the malfunction code “E3” to stop the system due to malfunction.
⑳	Electronic expansion valve outlet thermistor	Th-8	While in zero point adjustment, used to detect variations in the electronic expansion valve outlet temperature, thus recognizing the Fully Closed point.
㉑	Returned oil thermistor (optional)	Th-9	Detect the oil temperature of the main engine oil pipe (returned pipe).
㉒	Oil drain (evaporator)	—	Closed by plug Rc1/4. (The evaporator oil can be discharged from this oil drain for maintenance.)
㉓	Oil drain (drain pan)	—	Used to drain oil from the bottom of the oil cooling unit.
㉔	Low-pressure gauge port	—	Used to mount a gauge for maintenance.

*For the layout of parts, refer to information on pages 56 and 57.

■AKZ56A/90A (-B) (-C) (-046) (-048) (-500)



C：PH400512

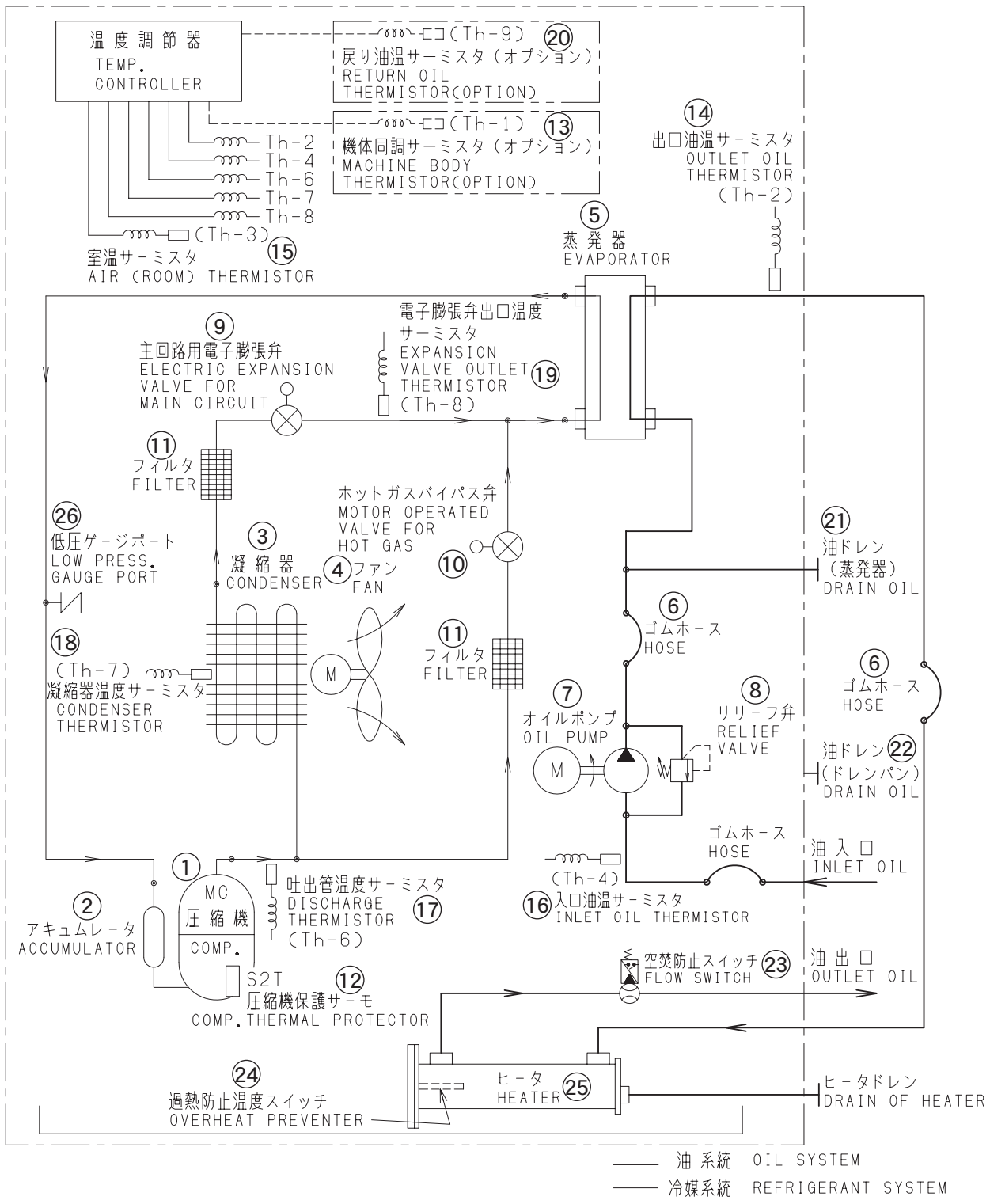
4 Piping Diagrams

5 AKZ56A/90A-H, AKZ56A/90AH500

No.	Part Name	Symbol	Function
①	Compressor	M2C	This compressor is a swing compressor with a built-in DC motor. The compressor is driven under the inverter control by changing the operating frequency according to values specified under the capacity control.
②	Accumulator	—	The accumulator is installed before the compressor suction and used to prevent the entry of liquid refrigerant in the compressor and further efficiently return lubricating oil to the compressor.
③	Condenser	—	Used to air-cool the refrigerant to turn it from high-temperature and -pressure gaseous state to high-temperature and -pressure liquid state.
④	Fan	M3F	The feedback control of fan revolutions is performed for heat exchange through the condenser.
⑤	Evaporator	—	Used to heat low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve (with oil being cooled) to make it low-temperature, low-pressure gas.
⑥	Rubber hose	—	Located at the entrance to and the exit of the oil pump and used to prevent the vibrations of the oil pump from transmitting to the piping system and equipment.
⑦	Oil pump	M1P	Used to circulate oil.
⑧	Relief valve	—	The relief valve is a protective device to be activated when the pressure of oil piping system reaches the specified level or higher, thus setting the pressure back to the normal level.
⑨	Electronic expansion valve for main circuit (EEV)	Y1E	The valve varies its opening according to values specified under the capacity control, thus making the control of refrigerant recirculation quantity.
⑩	Motor operated valve for hot gas (MOV)	Y2E	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑪	Filter	—	Used to prevent the entry of foreign matters in the valves (for both valves).
⑫	Compressor protection thermostat	S2T	When the compressor body exceeds a temperature of 125℃, used to display the alarm code “E5”, thus stopping the system due to malfunction.
⑬	Machine body thermistor (optional)	Th-1	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑭	Outlet oil thermistor	Th-2	Used to detect the oil outlet temperature (targeted control temperature) from the evaporator.
⑮	Room thermistor	Th-3	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑯	Inlet oil thermistor	Th-4	Used to detect the oil inlet temperature (targeted control temperature) to the evaporator.
⑰	Discharge thermistor	Th-6	Used to detect the discharge pipe temperature and, when the discharge pipe temperature exceeds 115℃, thus displaying the alarm code “E5” to stop the system due to malfunction.
⑱	Condenser thermistor	Th-7	Used to detect the condensing temperature and, when the condenser temperature exceeds 62℃, thus displaying the malfunction code “E3” to stop the system due to malfunction.
⑲	Electronic expansion valve outlet thermistor	Th-8	While in zero point adjustment, used to detect variations in the electronic expansion valve outlet temperature, thus recognizing the Fully Closed point.
⑳	Returned oil thermistor (optional)	Th-9	Detect the oil temperature of the main engine oil pipe (returned pipe).
㉑	Oil drain (evaporator)	—	Closed by plug Rc1/4. (The evaporator oil can be discharged from this oil drain for maintenance.)
㉒	Oil drain (drain pan)	—	Used to drain oil from the bottom of the oil cooling unit.
㉓	Boil-dry protection pressure switch	S5P	Used to detect a decrease in oil quantity in the piping system through a flow switch, thus stopping the system due to malfunction.
㉔	Overheat prevention temperature switch	S4T	Used to indicate the malfunction code “AA” to stop the system due to malfunction when heater oil temperature exceeds 70℃.
㉕	Heater	E1H	This is an electric heater used to heat oil.
㉖	Low-pressure gauge port	—	Used to mount a gauge for maintenance.

*For the layout of parts, refer to information on pages 56 and 57.

■AKZ56A/90A-H, AKZ56A/90AH500



C：PH400515

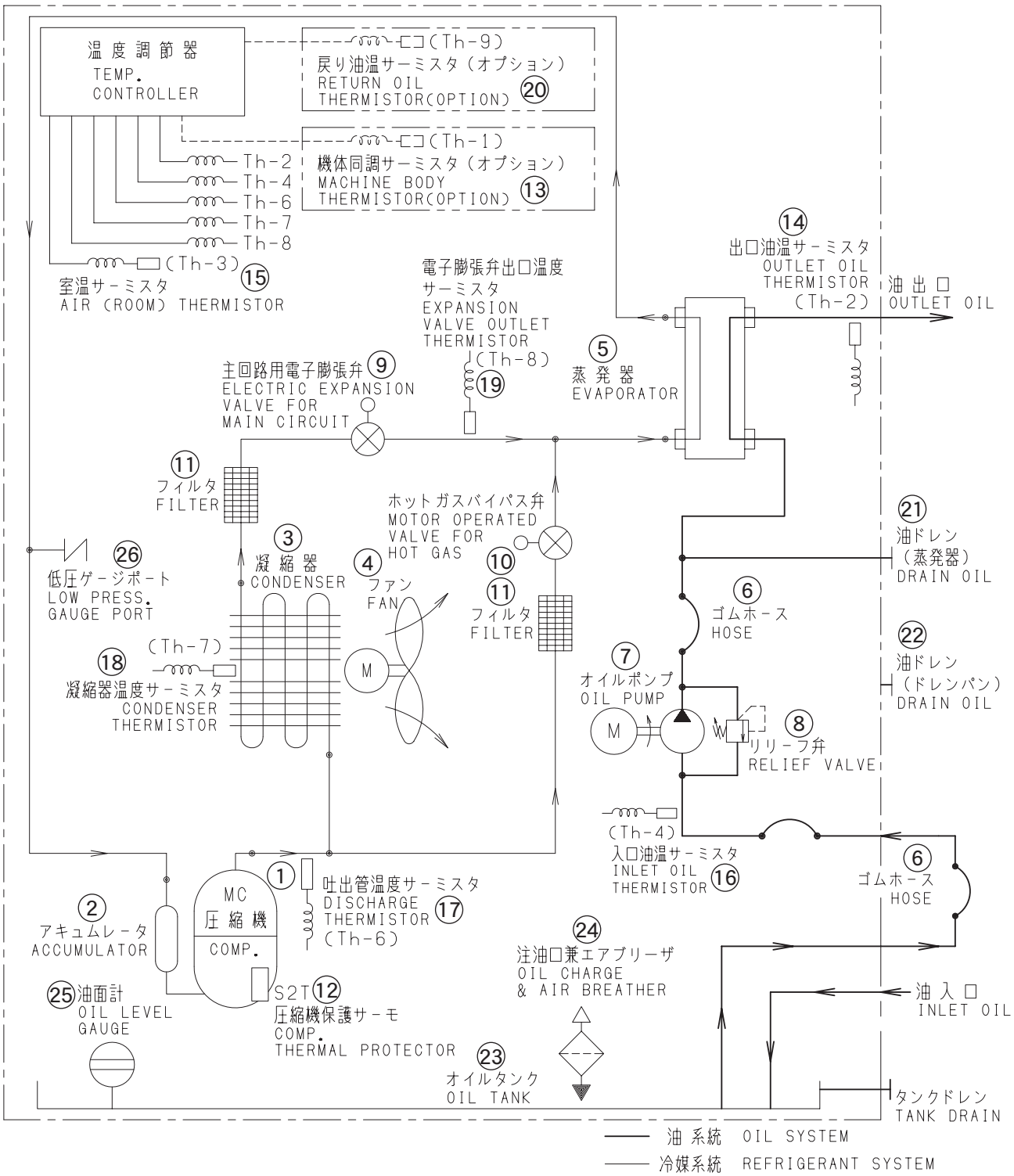
4 Piping Diagrams

6 AKZ56A/90A-T, AKZ56A/90AT500

No.	Part Name	Symbol	Function
①	Compressor	M2C	This compressor is a swing compressor with a built-in DC motor. The compressor is driven under the inverter control by changing the operating frequency according to values specified under the capacity control.
②	Accumulator	—	The accumulator is installed before the compressor suction and used to prevent the entry of liquid refrigerant in the compressor and further efficiently return lubricating oil to the compressor.
③	Condenser	—	Used to air-cool the refrigerant to turn it from high-temperature and -pressure gaseous state to high-temperature and -pressure liquid state.
④	Fan	M3F	The feedback control of fan revolutions is performed for heat exchange through the condenser.
⑤	Evaporator	—	Used to heat low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve (with oil being cooled) to make it low-temperature, low-pressure gas.
⑥	Rubber hose	—	Located at the entrance to and the exit of the oil pump and used to prevent the vibrations of the oil pump from transmitting to the piping system and equipment.
⑦	Oil pump	M1P	Used to circulate oil.
⑧	Relief valve	—	The relief valve is a protective device to be activated when the pressure of oil piping system reaches the specified level or higher, thus setting the pressure back to the normal level.
⑨	Electronic expansion valve for main circuit (EEV)	Y1E	The valve varies its opening according to values specified under the capacity control, thus making the control of refrigerant recirculation quantity.
⑩	Motor operated valve for hot gas (MOV)	Y2E	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑪	Filter	—	Used to prevent the entry of foreign matters in the valves (for both valves).
⑫	Compressor protection thermostat	S2T	When the compressor body exceeds a temperature of 125℃, used to display the alarm code “E5”, thus stopping the system due to malfunction.
⑬	Machine body thermistor (optional)	Th-1	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑭	Outlet oil thermistor	Th-2	Used to detect the oil outlet temperature (targeted control temperature) from the evaporator.
⑮	Room thermistor	Th-3	Used to detect the synchronization source temperature while in temperature tuning control mode.
⑯	Inlet oil thermistor	Th-4	Used to detect the oil inlet temperature (targeted control temperature) to the evaporator.
⑰	Discharge thermistor	Th-6	Used to detect the discharge pipe temperature and, when the discharge pipe temperature exceeds 115℃, thus displaying the malfunction code “E5” to stop the system due to malfunction.
⑱	Condenser thermistor	Th-7	Used to detect the condensing temperature and, when the condenser temperature exceeds 62℃, thus displaying the malfunction code “E3” to stop the system due to malfunction.
⑲	Electronic expansion valve outlet thermistor	Th-8	While in zero point adjustment, used to detect variations in the electronic expansion valve outlet temperature, thus recognizing the Fully Closed point.
⑳	Returned oil thermistor (optional)	Th-9	Detect the oil temperature of the main engine oil pipe (returned pipe).
㉑	Oil drain (evaporator)	—	Closed by plug Rc1/4. (The evaporator oil can be discharged from this oil drain for maintenance.)
㉒	Oil drain (drain pan)	—	Used to drain oil from the bottom of the oil cooling unit.
㉓	Oil tank	—	Used to store oil at all times, thus responding to a sharp fluctuation in oil quantity in the piping system.
㉔	Oil charge port & Air breather	—	Used to fill oil into the oil tank and normally serve as a ventilation hole for the oil tank.
㉕	Oil level indicator	—	Used to indicate oil quantity in the oil tank.
㉖	Low-pressure gauge port	—	Used to mount a gauge for maintenance.

*For the layout of parts, refer to information on pages 56 and 57.

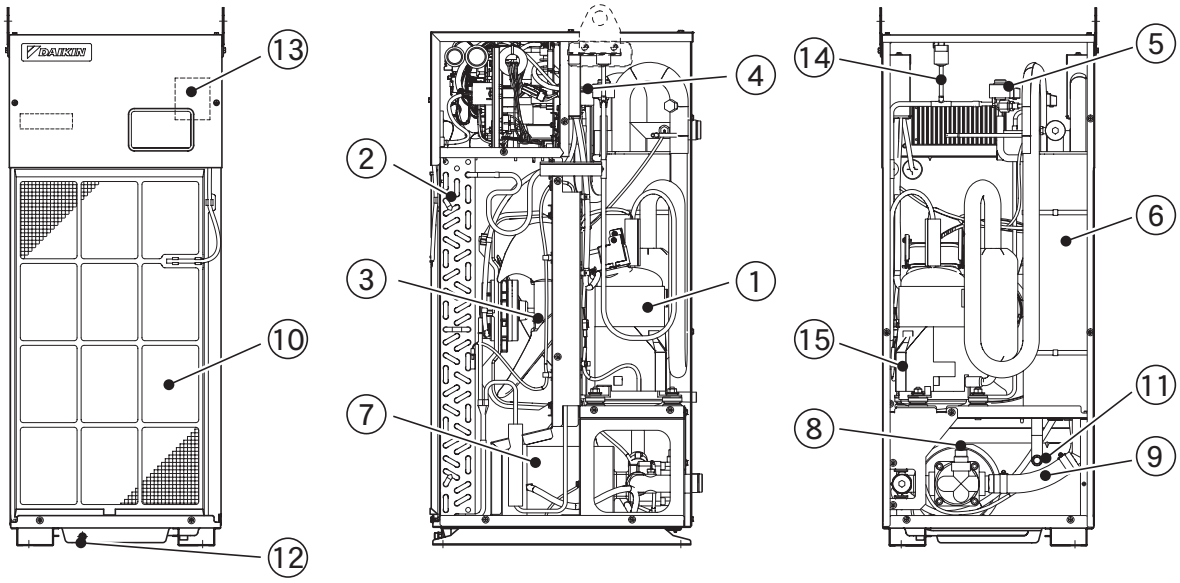
■AKZ56A/90A-T, AKZ56A/90AT500



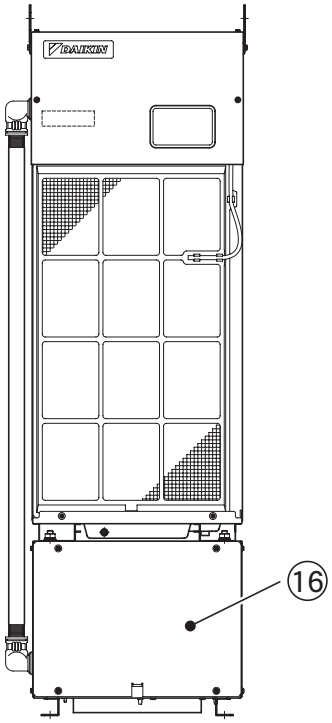
C：PH400514

7 Layout of Functional Parts

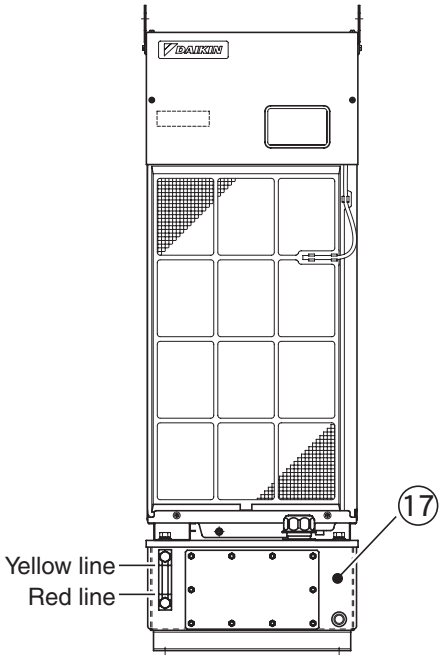
AKZ14A–43A (-B) (-C) (-046) (-500)



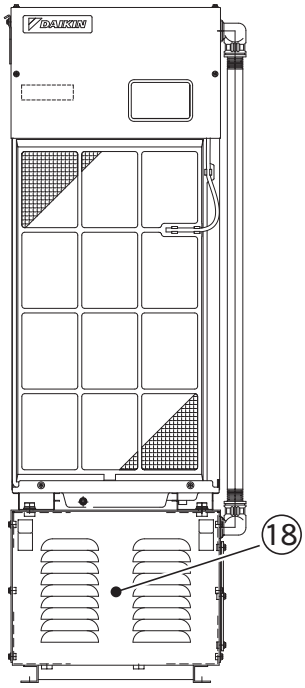
AKZ14A–43A-H
AKZ14A–43AH500



AKZ14A–43A-T
AKZ14A–43AT500

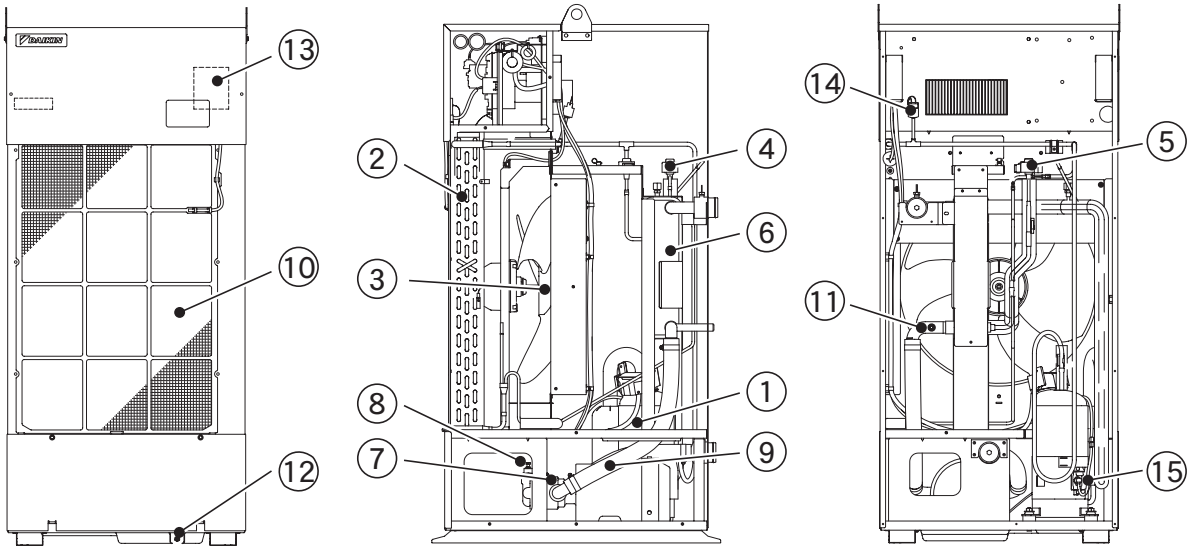


AKZ14A–43A-048

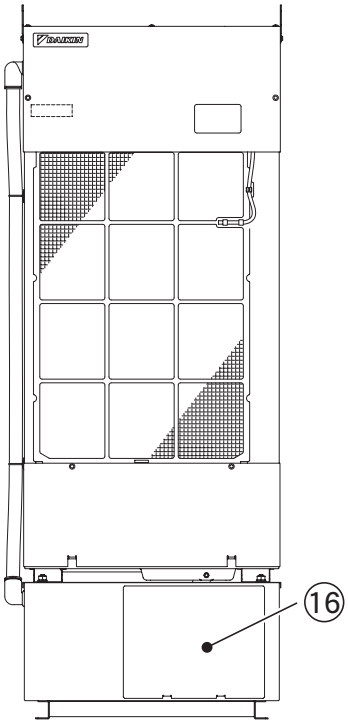


No.	Part Name	Function
①	Compressor	This compressor sucks in and compresses low-temperature and -pressure gas refrigerant generated by evaporator to make it into high-temperature and -pressure liquid refrigerant.
②	Condenser	Used to make the high-temperature and -pressure gas refrigerant generated by the compressor to turn to high-temperature and -pressure liquid state.
③	Fan (for condenser)	Used to accelerate heat exchange with the refrigerant in the condenser by forcible blowing.
④	Electronic expansion valve for main circuit (EEV)	The valve mechanism reduces pressure of the high-temperature, high-pressure liquid refrigerant produced in the condenser, to produce low-temperature, low-pressure liquid/gas mixed refrigerant.
⑤	Motor operated valve for hot gas (MOV)	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
⑥	Evaporator	Used to make low-temperature, low-pressure liquid refrigerant decompressed through the electronic expansion valve into low-temperature and -pressure gas by heat exchange and evaporation with oil.
⑦	Oil pump	Used to draw oil from the unit outside and discharge it to the outside through the evaporator.
⑧	Relief valve	The relief valve controls the outlet side pressure to the specified level.
⑨	Rubber hose	This is the portion of the oil piping used on the discharge side of the oil pump.
⑩	Air filter	This filter is installed in front of the evaporator to prevent drop of cooling capacity caused by dust attached to the condenser by drawn air.
⑪	Oil drain (evaporator)	The evaporator oil can be discharged from this oil drain for maintenance of the oil cooling unit.
⑫	Oil drain (drain pan)	Used to drain oil from the bottom of the oil cooling unit.
⑬	Circuit breaker ("-B" only)	The circuit breaker activates in case of overcurrent to protect the wiring system in the unit.
⑭	High pressure switch ("-C" only)	In order to protect the refrigerant system in the compressor, it activates in case of high-pressure error.
⑮	Compressor protection thermostat	In order to protect the compressor, it activates in case of high-pressure error of the compressor.
⑯	Heater ("-H" only)	Used to heat oil to the temperature preset by the electric heater at warm-up in winter.
⑰	Oil tank ("-T" only)	It receives oil in the oil piping system with the main machine, and deals with fluctuations in oil level.
⑱	Transformer ("-048" only)	Intended for the different-voltage model.

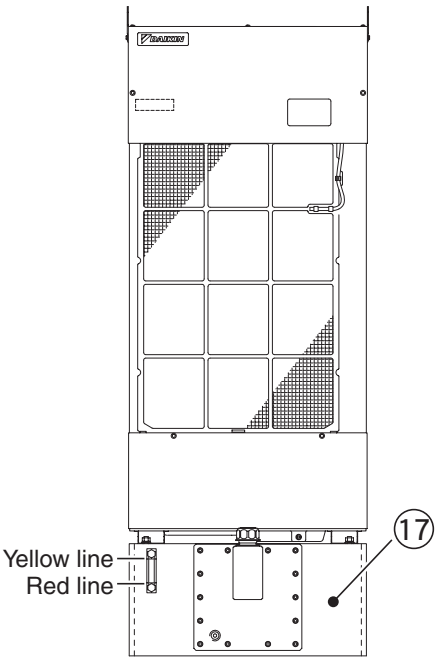
AKZ56A–90A (-B) (-C) (-046) (-500)



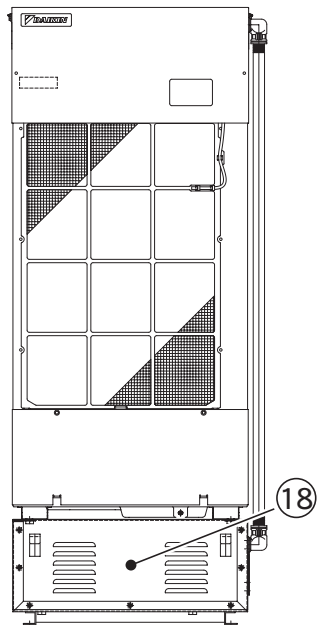
AKZ56A/90A-H
AKZ56A/90AH500



AKZ56A/90A-T
AKZ56A/90AT500



AKZ56A/90A-048



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⑤	Motor operated valve for hot gas (MOV)	This valve controls cooling capacity under low load by bypassing refrigerant from the high pressure side to the low one.
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⑦	Oil pump	Used to draw oil from the unit outside and discharge it to the outside through the evaporator.
⑧	Relief valve	The relief valve controls the outlet side pressure to the specified level.
⑨	Rubber hose	This is the portion of the oil piping used on the discharge side of the oil pump.
⑩	Air filter	This filter is installed in front of the evaporator to prevent drop of cooling capacity caused by dust attached to the condenser by drawn air.
⑪	Oil drain (evaporator)	The evaporator oil can be discharged from this oil drain for maintenance of the oil cooling unit.
⑫	Oil drain (drain pan)	Used to drain oil from the bottom of the oil cooling unit.
⑬	Circuit breaker ("-B" only)	The circuit breaker activates in case of overcurrent to protect the wiring system in the unit.
⑭	High pressure switch ("-C" only)	In order to protect the refrigerant system in the compressor, it activates in case of high-pressure error.
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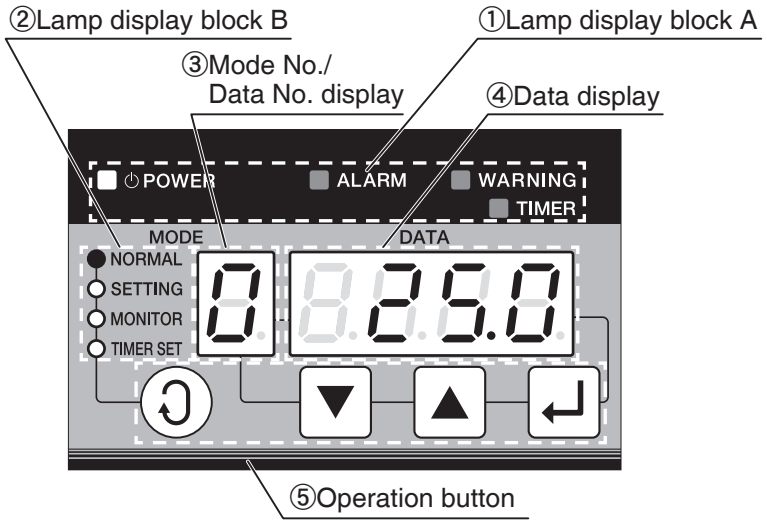
⑰	Oil tank ("-T" only)	It receives oil in the oil piping system with the main machine, and deals with fluctuations in oil level.
⑱	Transformer ("-048" only)	Intended for the different-voltage model.

5 Control Panel

1 Name and Function of Each Part



No.	Item	Display section		Operation and function
		Display	Designations	
①	Lamp display block A	■POWER	POWER lamp	It is always lit up while the power is supplied.
		■ALARM	ALARM lamp	It flashes or is lit up when an alarm occurs. (level 1: flash, level 2: lit up)
		■WARNING	WARNING lamp	It flashes or is lit up when a warning occurs. (level 1: flash, level 2: lit up)
		■TIMER	TIMER lamp	It flashes while the unit stops in the timer mode.
②	Lamp display block B	■NORMAL	Normal mode	It is lit up in the normal mode, and flashes in the auto-tuning mode or special monitor mode.
		■SETTING	Operation setting mode	It is lit up in the operation setting mode, and flashes in the parameter setting mode.
		■MONITOR	Monitor mode	It is lit up in the monitor setting mode, and flashes in the service monitor mode.
		■TIMER SET	Timer setting mode	It is lit up in the timer setting mode.
③	Mode No./data No. display	MODE	——	In the respective setting modes, contents below are displayed. • In the case of setting the normal mode or operation setting mode: The current operation mode No. is displayed. • In the case of setting the monitor mode: The data No. of the date displayed in the data display section. • In the case of setting the parameter setting mode: "P" is displayed druing the parameter setting.
④	Data display	DATA	——	Various data is dipslayed. (The displayed data varies depending on the setting morde or data No.) "ACF" lights for a few seconds after turning OFF the power supply.
⑤	Operation button		Selector button	It is used for changing the modes.
			Down button	It is used to decrease the value of mode No./data No./data (-1/-0.1). If it is pressed and held for a while, the value is -10 (-1).
			Up button	It is used to increase the value of mode No./data No./data (+1/+0.1). If it is pressed and held for a while, the value is +10 (+1).
			Confirmation button	It is used to confirm the setting of mode No./data No./data being changed.

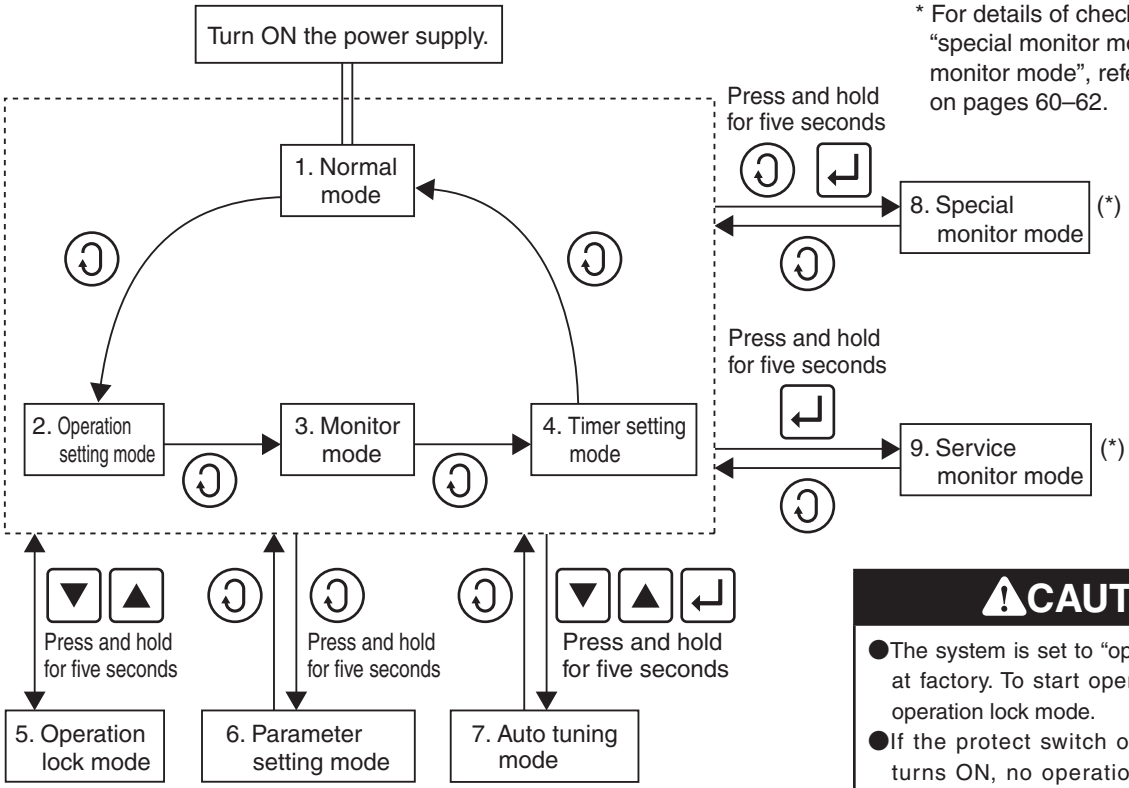
Nine operation modes listed in Table below are available on the control panel.
For normal operation, use only 6 modes (1-4,8,9).
Other modes 5, 6, and 7 may interfere with the operation of the Oil Cooling Unit. Therefore, before using, be sure to thoroughly understand the functions of these modes.

	Mode	Function	LED status
1	Normal mode	Used to display the current “operation mode” and “target temperature”.	“NORMAL” lamp ON
2	Operation setting mode	Used to change the setting of “operation mode” and “target temperature”	“SETTING” lamp ON
3	Monitor mode	Used to display values detected by each sensor.	“MONITOR” lamp ON
4	Time setting mode	Used to make ON timer setting.	“TIMER” lamp ON
5	Operation lock mode (factory setting)	Used to stop the operation of Oil Cooling Unit regardless of setting conditions.	All lamps except for “POWER” OFF
6	Parameter setting mode	Used to make settings shown below. ①To make setting of combination of signals output to external contact when a malfunction or warning occurs. ②To make manual setting of controlled variables for PI control. ③To make warning setting for the protection of devices.	“SETTING” lamp blinking
7	Auto tuning mode	Used to automatically compute controlled variables for PI control and set them with parameters.	“NORMAL” lamp blinking
8	Special monitor mode	Used to check for a variety of current data.	“NORMAL” lamp blinking
9	Service monitor mode	Used to check for the history of alarm and warning codes and a variety of data when alarm or warning occurs.	“MONITOR” lamp blinking

(1) Mode shifting operation

Normally, use the ↻ button to shift mode.

In order to shift to special mode, press and hold multiple buttons in combination for a period of five seconds.



* For details of checking procedure for “special monitor mode” and “service monitor mode”, refer to information on pages 60–62.

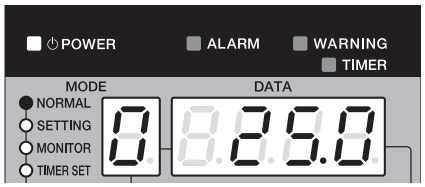
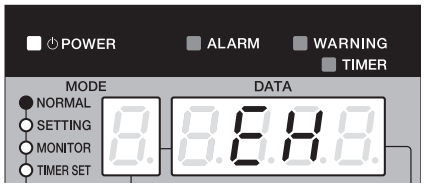
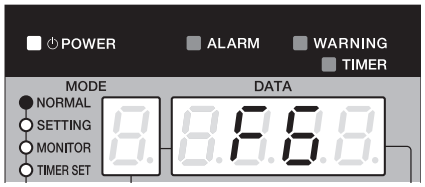
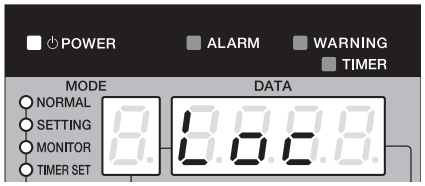
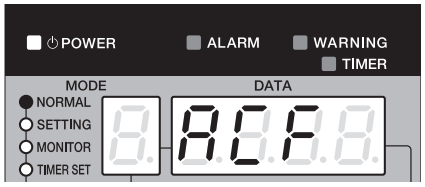
⚠CAUTION

- The system is set to “operation lock mode” at factory. To start operation, release the operation lock mode.
- If the protect switch on the main board turns ON, no operation settings will be made. If so, turn OFF this switch.

2 Operation Procedure by Mode

2-1. Normal mode

When the power supply turns ON, the system will be automatically brought to this mode. This mode is used to display the following contents according to the status of the Oil Cooling Unit.

Status	Display of control panel	Remarks
Normal operation		・POWER lamp: ON ・MODE: Operation mode No. displayed ・DATA: Target operating temperature displayed
Alarm		・POWER lamp: ON ・ALARM lamp: Flashes when the alarm level 1 occurs ON when the alarm level 2 occurs ・MODE: OFF ・DATA: Flashing alarm code displayed
Warning		・POWER lamp: ON ・WARNING lamp: Flashes when the alarm level 1 occurs ON when the alarm level 2 occurs ・MODE: OFF ・DATA: Flashing warning code displayed
Operation Lock		・POWER lamp: ON ・MODE: OFF ・DATA: Blinking “Loc” displayed To unlock, press and hold the “ ▼ ” and “ ▲ ” for a period of five seconds. In the operation lock mode, the Oil Cooling Unit stops all operations including the pump operation.
AC failure		When the main power supply is OFF, “ACF” is displayed for a few seconds (during charging of the inverter board, the main power supply is OFF).

2-2. Operation Setting Mode

This mode is used to make settings of operation mode and target temperature.

Furthermore, if the malfunction prevention switch on the main board turns ON, no operation mode settings will be made. In this case, turn OFF this switch to make these settings.

[Setting procedure]

(1) Turn ON the power supply.

When the power supply turns ON, the system will be automatically brought to “normal mode” to display the current operation mode and target control value.

To enter the “Operation lock” mode when the power is supplied, press and hold the keys “ ▼ ▲ ” for five seconds for release.

(2) Shift to “operation setting mode”.

While in normal mode, press the ↻ button to shift to “operation setting mode”. (The MODE display will blink.)

(3) Setting of operation mode.

Press the ▼ or ▲ button to select a desired mode No. (The MODE display will remain blinking.)

Press the ↵ button to save the mode No. (The MODE display will light up and the DATA display will blink.)

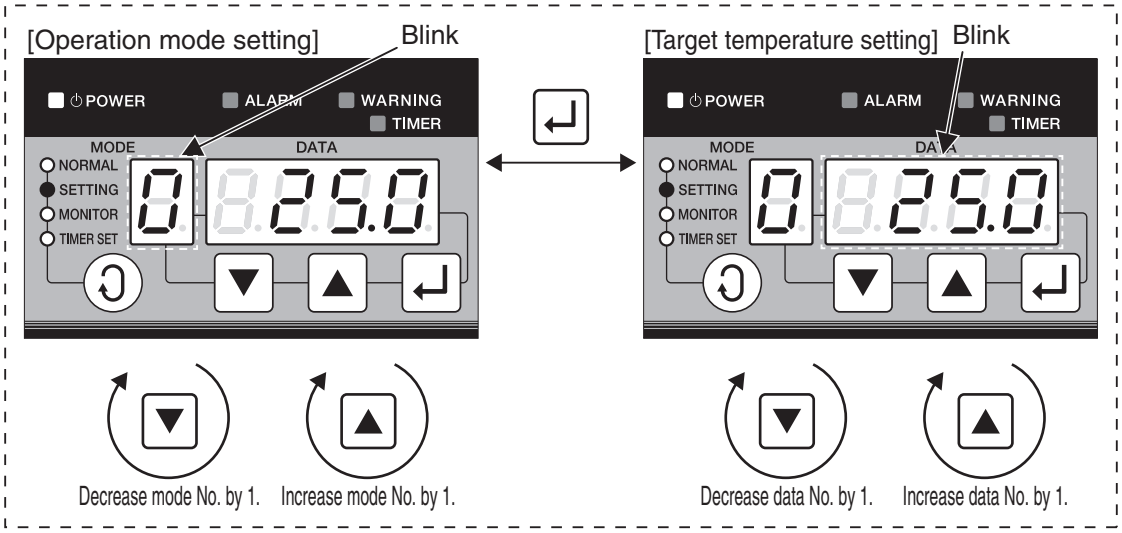
(4) Setting of target temperature.

Press the ▼ or ▲ button to set to a desired target temperature. (The DATA display will remain blinking.)

Press the ↵ button to save the target temperature. (The DATA display will light up.)

(5) Return to normal mode.

Press the ↻ button three times to return to normal mode.



(For reference) Mode and data will be saved when the ↵ button is pressed with the data block blinking and displayed.

If the ↻ button is pressed before saving, the mode and data in process of changing will be discarded, and the system will keep running under the previous setting.

■List of operation modes

Mode No.	Setting item AKZ Series	Settable range
0	Inlet oil temperature under fixed temperature control (*1)	5.0 to 50.0℃ (Factory set to 20.0℃)
1	Outlet oil temperature under fixed temperature control (*1)	
2	(Not used)	—
3 (Factory setting)	Inlet oil temperature offset value under room temperature tuning control (*2)	-9.9 to 9.9℃ (Factory set to 0.0℃)
4	Inlet oil temperature offset value under machine temperature tuning control (*2)	
5	Outlet oil temperature offset value under room temperature control (*2)	
6	Outlet oil temperature offset value under machine temperature tuning control (*2)	
7	(Not used)	—
8	(Not used)	—
9	Cooling capacity under direct capacity control (*3)	0 to 100% (Factory set to 0.0℃)

*1. Fixed temperature control: The set value is used as a target temperature for this control.

*2. Tuning control: The target temperature is used as a value calculated by the following expression for this control.

Target temperature = Base temperature for synchronization + Offset value

Offset value → Set value above

Base temperature for synchronization →
- In the case of room temperature tuning control, a value detected by the room thermistor (Th-3)
- In the case of machine temperature tuning control, a value detected by the machine body thermistor (Th-1: Optional)

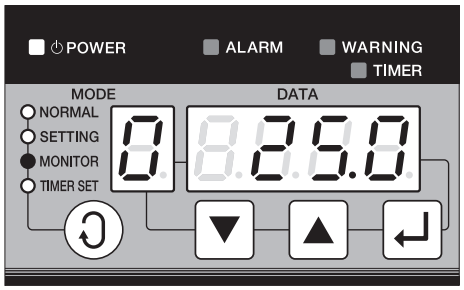
However, if the result of calculation falls short of 5.0℃, the target temperature will be adjusted to 5.0℃. If it exceeds 50.0℃, the target temperature will be adjusted to 50.0℃.

*3. Direct capacity control: Used to control the cooling capacity as set. (Setting the capacity to 0% will stop the compressor.)

Note 1) Neither operation mode No. 4 nor No. 6 can be used without the machine body thermistor (Th-1: Optional).
2) Depending on the model of Oil Cooling Unit, some of the operation modes will not be functional.
If the operation mode selected is not functional, the data block will display “- - -” to disable settings.

2-3. Monitor Mode

This mode is used to display temperatures detected by each sensor of Oil Cooling Unit and Inlet/Outlet status.
Using the ▼ or ▲ button makes it possible to select data No.



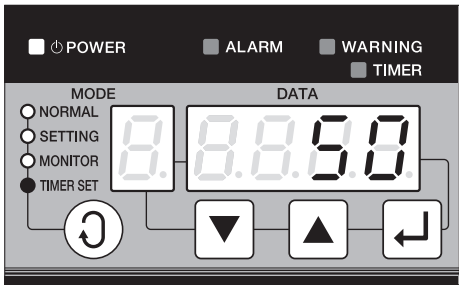
(Example) The screen above displays that the machine temperature is 25℃.

Data No.	Contents AKZ Series	
0	Machine temperature (Th-1)	*1
1	Outlet oil temperature (Th-2)	*1
2	Room temperature (Th-3)	*1
3	Inlet oil temperature	*1
4	Spare	
5	Difference in temperature between oil inlet and outlet (Th-4 - Th-2)	*1
6	Value instructed by direct capacity control (%)	*2
7	Revolutions of inverter compressor (rps)	
8	Power consumption (kW)	
9	Setting status with communication board (optional) mounted	

*1: If the thermistor is not connected or contains a broken wire, -99.9 will be displayed for the temperature.
*2: DATA display flashes during reduced compressor operation at time of overload.

2-4. Timer Setting Mode

This mode is used to display ON timer setting and timer value (in hours up to the maximum of 999 hours).
Use the " ▼ " or " ▲ " button to make setting of the timer value. Saving the input with the " ↵ " button will put the system into the timer status, thus stopping the Oil Cooling Unit operation.
To release the timer status, set the timer value to "0".

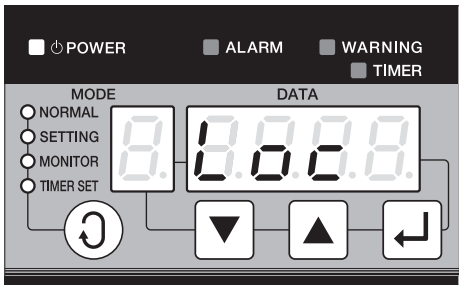


2-5. Operation Lock Mode

This mode is used to lock the Oil Cooling Unit to the stop status and prohibit operations of buttons except for the UNLOCK button.

While in a normal use mode (i.e., normal, operation setting, or monitor mode), press and hold the " ▼ " and " ▲ " buttons for a period of five seconds. "Loc" on the data display block will flash to put the system into locked status.

To release the operation lock mode, also press and hold the ▼ or ▲ button for a period of five seconds.



In order to start or stop the Oil Cooling Unit on the control panel, start with this operation.

2-6. Parameter Setting Mode

This mode is used to make settings of the following parameters to determine the basic operation of Oil Cooling Unit.

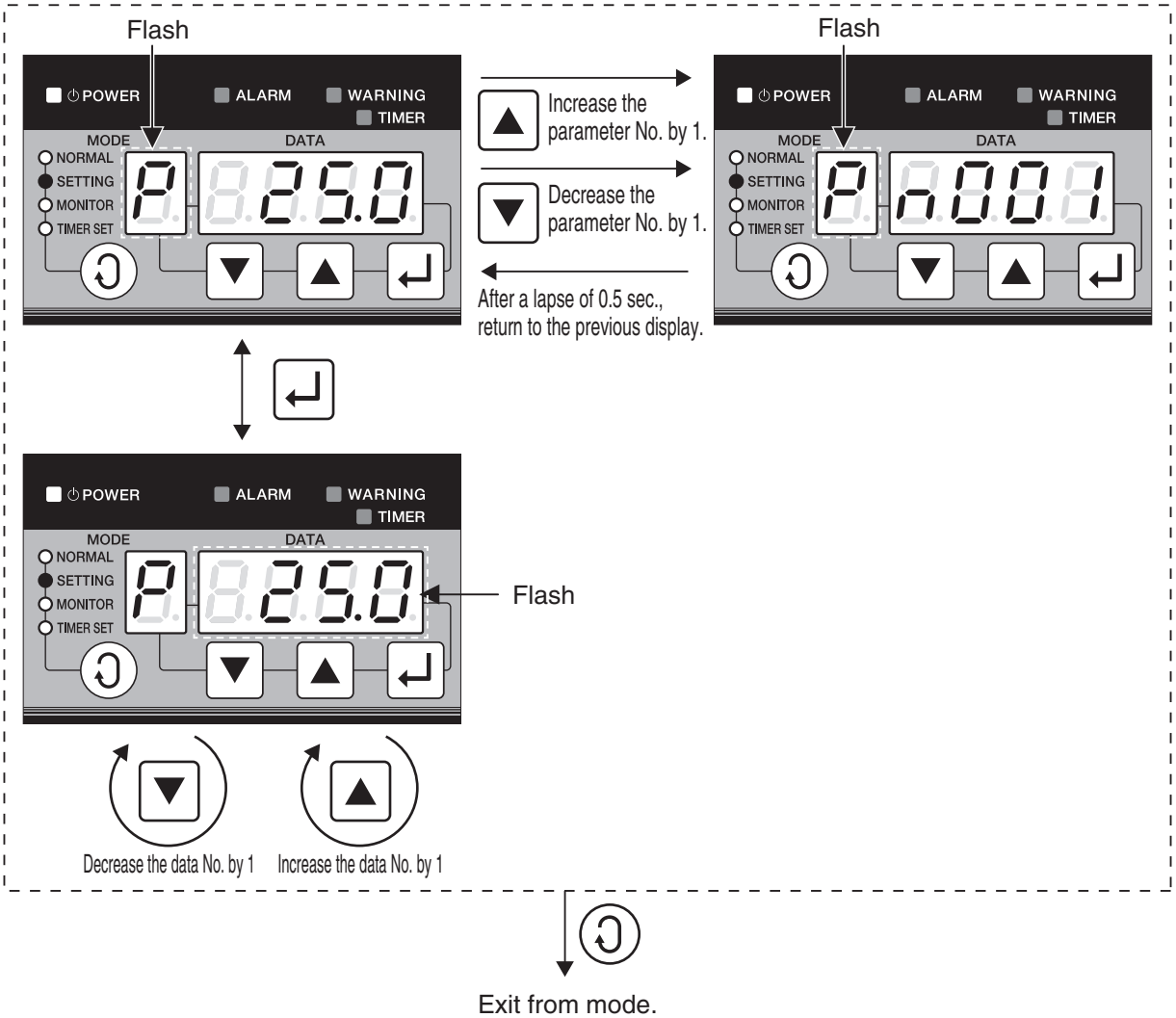
- ○Setting of external output procedure when an alarm or warning occurs…n001 to n003
- ○Setting of conditions for auto tuning ……n004, n005
- ○Setting of gain rate for temperature control ……n006 to n009
- ○Setting of monitoring subject for temperature warning ……n010, n012, n014, n016, n018
- ○Setting of operating temperature (difference) for temperature warning …n011, n013, n015, n017, n019
- ○Setting of YES or NO of use of parallel communication……n020
- ○Setting of minimum pulse for electronic expansion valve ……n024

Furthermore, if the malfunction prevention switch on the main board turns ON, no operation mode settings will be made. In this case, turn OFF this switch to make these settings.

(1) Parameter setting procedure

With 'P' blinking in the MODE block, use the ▼ or ▲ button to select a parameter No.
The DATA block displays the parameter No. selected for a period of approximately 0.5 seconds and then data.
When the ↵ button is pressed, the DATA block will start blinking and displaying.
Use the ▼ or ▲ button to change data and the ↵ button to save the data.
Pressing the ↺ button before saving the data will discard the data to return to the previous value.

[Note] Parameters are classified into two groups: One group of parameters becomes enabled on the spot, while the other group of parameters requires turning ON the power supply again.
Determine which group the parameters belong to, refer to List of parameters.



(2) List of parameters

Parameter No.	Item	Min. value	Max. value	Default value at factory setting	Power reset required	Remarks
n000	(Not used)	0	0	0	—	————
n001	External output when an alarm or warning occurs	0	11	0	○	Refer to page 66.
n002	Operation setting 1 for external signal input	0	3	0	—	
n003	Operation setting 2 for external signal input	0	2	0	—	
n004	Setting of auto tuning end conditions	0.0	10.0	8.0	—	Setting of oil outlet drop temperature
n005	Setting of response coefficient for auto tuning	0.1	10.0	2.0	—	————
n006	Setting of control gain P (in the case of small temperature differential)	1	999	(40)	—	The default value varies by model. (Automatically set by auto tuning)
n007	Setting of control gain I (in the case of small temperature differential)	1	999		—	
n008	Setting of control gain P (in the case of large temperature differential)	1	999		—	
n009	Setting of control gain I (in the case of large temperature differential)	1	999		—	
n010	Setting of monitoring subject for warning 1	0	465	0	—	Settings of “monitoring subject” and “operating temperature” to issue a temperature warning. Setting of a total of 5 items can be made. For details, refer to information in section “(4) Temperature warning” (on page 69 and later).
n011	Setting of operating temperature for warning 1	0.0	60.9	0.0	—	
n012	Setting of monitoring subject for warning 2	0	465	0	—	
n013	Setting of operating temperature for warning 2	0.0	60.9	0.0	—	
n014	Setting of monitoring subject for warning 3	0	465	0	—	
n015	Setting of operating temperature for warning 3	0.0	60.9	0.0	—	
n016	Setting of monitoring subject for warning 4	0	465	0	—	
n017	Setting of operating temperature for warning 4	0.0	60.9	0.0	—	
n018	Setting of monitoring subject for warning 5	0	465	0	—	
n019	Setting of operating temperature for warning 5	0.0	60.9	0.0	—	
n020	Setting of YES or NO of use of parallel communication	0	1	0	○	————
n021 ≀ n023	(Not used)	—	—	—	—	Never change the setting of these parameters. Doing so will result in a malfunction.
n024	Setting of minimum pulse for electronic expansion valve	0	999	(Depends on the equipment)	—	When replacing the control board or valves (for main circuit and hot gas), setting of “minimum pulse 0” and “fully closed pulse detection operation” are required. (see pages 149 and 150.)
n025 ≀ n034	(Not used)	—	—	—	—	Never change the setting of these parameters. Doing so will result in a malfunction.
n035	Reset of system control data (zero clear)	0	001F	0000	○	Used for reset of operation accumulation time when the compressor or pump is replaced or reset of the micro computer (see the list on page 67).
n036	Reset of alarm/warning history data	0	0003	0000	○	Used for reset of alarm/warning history data (see the list on page 68).
n037 n038	(Not used)	—	—	—	—	Never change the setting of these parameters. Doing so will result in a malfunction.

(3) Parameter No.

○n001: External output when an alarm or warning occurs used to make setting of combination of output to each contact.

First digit: Used to set the alarm output logic (60-61, 60-63) and warning output logic (66-67) of the signal terminal block. (as for 2 to 9 other than 1, operation is the same as that of 1)

Setting / Output	Terminal No.	0 (Factory setting) Normal	0 (Factory setting) Power failure	0 (Factory setting) Alarm	1 Normal	1 Power failure	1 Alarm
Alarm output	60-61	ON	OFF	OFF	OFF	OFF	ON
	60-63	OFF	ON	ON	ON	ON	OFF

Setting / Output	Terminal No.	0 (Factory setting) Normal	0 (Factory setting) Power failure	0 (Factory setting) Warning	1 Normal	1 Power failure	1 Warning
Warning output	66-67	ON	OFF	OFF	OFF	OFF	ON

○n002: OP contact level

Used to make setting of operation for input signal (OP signal) to the terminals (12-13: OP terminals) of optional safety device on the terminal block (X2M).

"0": OP terminal is not used. (Factory setting)
"1": When OP contact turns OFF, Alarm Level 1 is activated.
"2": When OP contact turns OFF, Alarm Level 2 is activated.
"3": When OP contact is not ON after 30 seconds from pump operation start, Alarm Level 1 is activated. (When flow switch is used)
"4": When OP contact continues to be OFF after 5 seconds have passed, Alarm Level 1 is activated. (When level switch is used)

[Note] Just connecting the optional safety device to the OP terminals will not enable the protective function. Be sure to make this parameter setting. It may be used for an option at factory setting.

○n003: OP2 contact level

Used to setting of operation for input signal to the CN2 (OP2) on the Control board (A1P).

"0": OP2 terminal is not used. (Factory setting)
"1": When OP2 contact turns OFF, Alarm Level 1 is activated.
"2": When OP2 contact turns OFF, Alarm Level 2 is activated.
"3": When OP contact is not ON after 30 seconds from pump operation start, Alarm Level 1 is activated. (When flow switch is used)
"4": When OP2 contact continues to be OFF after 5 seconds have passed, Alarm Level 1 is activated.

[Note] Just connecting the optional safety device to the OP2 terminals will not enable the protective function. Be sure to make this parameter setting. It may be used for an option at factory setting.

○n004: Setting of auto tuning end conditions

While in auto tuning mode, if the oil outlet temperature falls by the degree set with this parameter, the auto tuning will end. (For details, refer to information in Section 2-7.)

○n005: Setting of response coefficient for auto tuning

Used to make setting of response coefficient to calculate the optimum control variable for auto tuning (Section 2-7).
①Make this value smaller: Stability will be upgraded, but responsiveness will be degraded.
②Make this value larger: Responsiveness will be upgraded, but stability will be degraded.

○n006–n009: Setting gain rate for temperature control

・n006: Control gain P (in the case of small temperature differential)
・n007: Control gain I (in the case of small temperature differential)
・n008: Control gain P (in the case of large temperature differential)
・n009: Control gain I (in the case of large temperature differential)

Parameters n006 to n009 are used to make setting of gain for temperature control.
In the case of small temperature differential between the control target and the control subject, use gains of n006 or n007.
In the case of large temperature differential between the control target and the control subject, use gains of n008 or n009.

○n010, n012, n014, n016, n018: Setting of monitoring subject for temperature warning

Used to make setting of monitoring subject for temperature warning and also operation contents when conditions are met.

○n011, n013, n015, n017, n019: Setting of operating temperature (differential) for temperature warning

Used to make setting of operating temperature (differential) to issue a temperature warning.

○n020: Setting of YES or NO of use of parallel communication

Used to make setting of whether or not to perform parallel data communication with the main machine.
"0": Not performed (Factory setting)
"1": Performed

Setting this parameter to "0" with a communication extension board (optional) connected will make it possible to use parallel output from the extension board as individual output of alarm status or temperature warning.

○n021–n023: Not used

Never change the setting of these parameters. Doing so will result in a malfunction.

○n024: Setting of minimum pulse for electronic expansion valve

Used to make optimum setting of the minimum pulse for the electronic expansion valve for each equipment. (Factory setting to the optimum pulse for electronic expansion valve concerned at that time.)

○n025–n034: Not used

Never change the setting of these parameters. Doing so will result in a malfunction.

○n035: Resetting system control data (zero clear)

Used for reset of operation accumulation time when the compressor or pump is replaced or reset of the micro computer (see the list below)

List of resetting parameter n035 system control data

Cumulative compressor running time reset	0011
Cumulative pump running time reset	0012
Cumulative power supply time reset	0014
Power supply frequency reset	0018
Micro computer reset	0010
Reset all the above	001F

◯n036: Resetting alarm/warning history data

Used for reset of alarm/warning history data.

List of resetting parameter n036 alarm/warning history data

Alarm history data reset	0001
Warning history data reset	0002
Reset all the above	0003

For n036, a power cycle is required to make the set parameter change effective.

◯n037–n038: Not used

Never change the setting of these parameters. Doing so will result in a malfunction.

(4) Temperature warning

■Outline of the function

- As a special function of the Oil Cooling Unit, you can set up the **"Temperature range warning"** function. This function allows you to specify a desired temperature range within the Oil Cooling Unit operating range. When the control temperature exceeds the preset range, the unit informs you of the "Temperature range warning" condition.
- The operation at the time of temperature range warning activated can be selected by setting (Operation mode after temperature range warning is activated (c) on page 70).

■Parameter setting

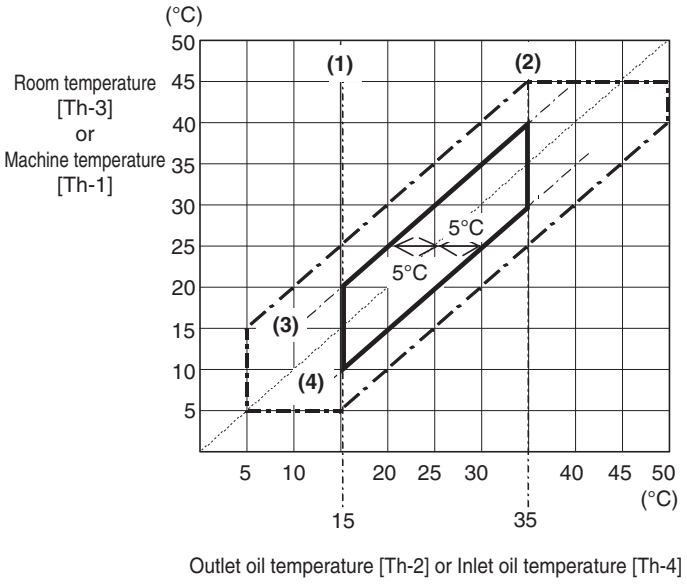
- For temperature range warning, up to 5 settings are available as shown in the table here below. Also, input the set value for each parameter number to set the warning occurrence condition. (Refer to "Parameter setting procedure" on page 64)

Item	Monitoring target and operation setting		Operation temperature setting		Display	
	Parameter number	Set value	Parameter number	Set value	Warning	Alarm
(1)	n010	a,b,c	n011	d,e	1E	F1
(2)	n012		n013		2E	F2
(3)	n014		n015		3E	F3
(4)	n016		n017		4E	F4
(5)	n018		n019		5E	F5

* The "monitoring target and operation" set value is composed of "monitoring target (a)", "comparison target (b)", and "operation at time of warning occurrence (c)".

* The "operation temperature" set value is composed of "warning temperature (d)" and "differential value (e)".

Example of temperature range warning



: Oil Cooling Unit operating range

: Temperature range warning setting

(1) When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is 15°C or lower, the compressor stops. (Warning)

(2) When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is 35°C or higher, the compressor stops (F1 to F5 alarm), and terminal [66]-[67] output turns ON or OFF.

(3) When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is at least 5°C lower than the room temperature [Th-3] (or machine temperature [Th-1]), terminal [66]-[67] output turns ON or OFF.

(4) When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is at least 5°C higher than the room temperature [Th-3] (or machine temperature [Th-1]), terminal [66]-[67] output turns ON or OFF.

■About monitoring target and operation (a) (b) (c) settings

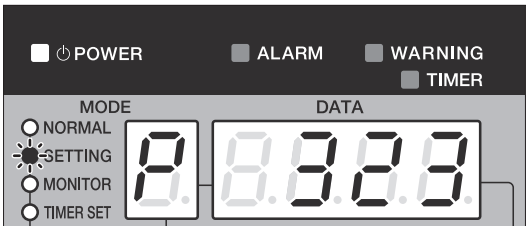
* To avoid a temperature range warning during setting, input the following items (d) and (e) before setting (a), (b) and (c).

(1) Set the “temperature range warning temperature (d)” with “monitoring target (a)” and “comparison target (b)” based on the following formula.

Settings for monitoring target (a) | Settings for comparison target (b) ≥(*1) | Temperature range warning temperature (d)

*1: When the setting No. of comparison target (b) is 5 or 6, it becomes “≥ fixed value” or “≤ fixed value”.

(2) Set “operation at time of warning (c)”.



Monitoring target (a)

Setting No.	Settings
0	(Without using the warning function)
1	Machine temperature (Th-1) *2
2	Outlet oil temperature (Th-2) *3
3	Room temperature (Th-3)
4	Inlet oil temperature (Th-4)

*2: The machine temperature tuning thermistor option is required.

*3: Use this setting No. also for the returned oil temperature thermistor option.

Comparison target (b)

Setting No.	Settings
0	(Without using the warning function)
1	-Machine temperature (Th-1)
2	-Outlet oil temperature (Th-2)
3	-Room temperature (Th-3)
4	-Inlet oil temperature (Th-4)
5	≥ fixed value
6	≤ fixed value

Operation mode after temperature range warning is activated (c)

Setting No.	Display	Compressor start/stop and reset method		External output (*4)	
				Terminal [60]-[61]/[60]-[63]	Terminal [66]-[67]
0	(Without using the warning function)				
1	Warning (1E to 5E) display	Operation		No output	Output
2		Compressor only forced stop	Automatic reset		No output
3					Output
4	Alarm (F1 to F5) display		Manual reset (power supply is turned ON again)	Output	No output
5					Output

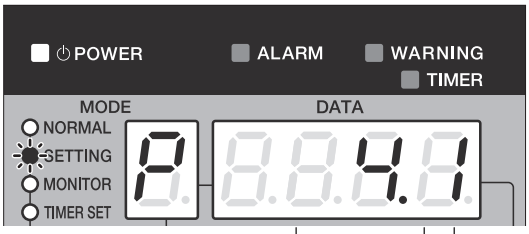
*4: Output to the external terminal follows the parameter setting n001 in accordance with page 66.

■**Parameter (d) (e) settings**

(3) Set the following "differential value (e)" to specify the reset temperature in order to release the temperature range warning.

Return temperature or return temperature difference = Temperature range warning temperature (d) – (*5) Differential value (e)

*5: However, when the comparison target (b) is "≤ fixed value", it becomes "+".



Parameter number	Temperature range warning temperature (d) or the temperature difference		Differential value (e) Set temperature difference for automatic reset *6
	Tens place	Ones place	First decimal place
n011	0 to 60 (°C)		1 to 9 (°C)
n013			
n015			
n017			
n018			Note) 0.1 (°C) when it is 0

*6: When the operation at time of temperature range warning (c) is set to 4 or 5, it is invalid because it does not automatically reset.

■**Temperature range warning setting example**

Example of parameter settings (for temperature range warning: See page 69.)

(1)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is 15℃ or lower, the compressor stops. (Warning)	n010	262 (462)
(2)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is 35℃ or higher, the compressor stops (F1 to F5 alarm), and terminal [66]-[67] output turns ON or OFF.	n012	255 (455)
(3)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is at least 5℃ lower than the room temperature [Th-3] (or machine temperature [Th-1]), terminal [66]-[67] output turns ON or OFF.	n014	121 (141)
(4)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is at least 5℃ higher than the room temperature [Th-3] (or machine temperature [Th-1]), terminal [66]-[67] output turns ON or OFF.	n016	211 (411)

Example of parameter settings (for temperature range warning: See page 69.)

(1)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is 15℃ or lower, the compressor stops. (Warning) [When outlet oil temperature [Th-2] becomes 17℃, the warning status will be automatically reset.]	n011	15.2*7
(2)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is 35℃ or higher, the compressor stops (F1 to F5 alarm), and terminal [66]-[67] output turns ON or OFF.	n013	35.0
(3)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is at least 5℃ lower than the room temperature [Th-3] (or machine temperature [Th-1]), terminal [66]-[67] output turns ON or OFF. [When the difference between room temperature [Th-3] and outlet oil temperature [Th-2] becomes 4℃ or less, the warning status will be automatically reset.]	n015	5.1*8
(4)	When the outlet oil temperature [Th-2] (or inlet oil temperature [Th-4]) is at least 5℃ higher than the room temperature [Th-3] (or machine temperature [Th-1]), terminal [66]-[67] output turns ON or OFF. [When the difference between room temperature [Th-3] and outlet oil temperature [Th-2] becomes 3℃ or less, the warning status will be automatically reset.]	n017	5.2*9

*7: 17 (Temperature range warning reset temperature) – 15 (Temperature range warning temperature) = 2
*8: 5 (Temperature range warning temperature) – 4 (Temperature range warning reset temperature) = 1
*9: 5 (Temperature range warning temperature) – 3 (Temperature range warning reset temperature) = 2

2-7. Auto Tuning Mode

This mode is used to automatically compute controlled variables for PI control and set them with parameters n006 to n009.

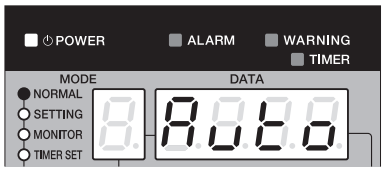
(1) Setting procedure

Turning ON power supply:

①Turn ON the power supply. (The system will be automatically put into “normal mode”.)

Auto tuning mode:

②Pressing and holding the “ ▼ ” “ ▲ ” “ ↵ ” buttons for a period of five seconds or more will put the system into the “auto tuning mode”.



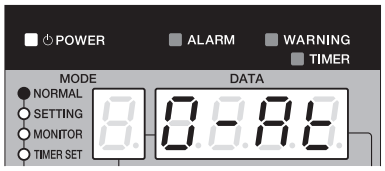
(Previous operation mode remains unchanged.)

③Pressing the ↵ button will initiate the auto tuning.

(The system will automatically go through the following steps.)

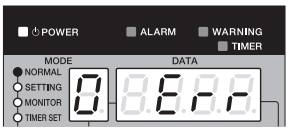
Step 0

Used to check for auto tuning conditions.



(Previous operation mode remains unchanged.)

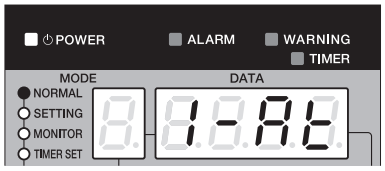
An error occurs.



(Previous operation mode remains unchanged.)

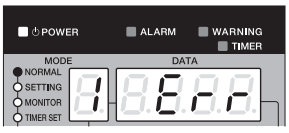
Step 1

Used to operate for the stabilization of initial conditions.



(Running at 1% capacity)

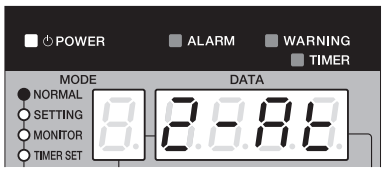
An error occurs.



(Running at 0% capacity: Stop)

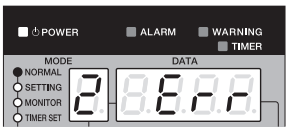
Step 2

Used to operate for gathering data on control subject.



(Running at 100% capacity)

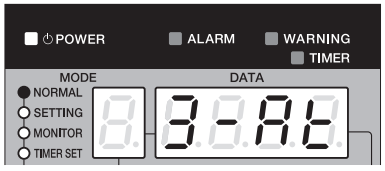
An error occurs.



(Running at 0% capacity: Stop)

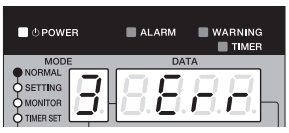
Step 3

Used to compute and set the result with a parameter.



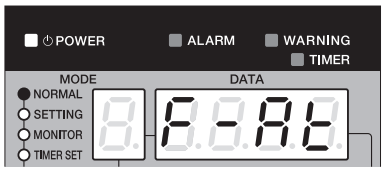
(Running at 0% capacity: Stop)

An error occurs.



(Running at 0% capacity: Stop)

End of auto tuning



(Running at 0% capacity: Stop)

④Pressing the ↺ button will return the system to “normal mode”.

Note) 1. Before putting the system into the auto tuning mode, be sure to set the operation mode (except for mode No. 9 while in operation setting mode) in order to determine the thermistor subject to control.

2. Initiate auto tuning from the state in which the room temperature is approximately equal to the oil temperature (i.e., stable state). Furthermore, perform the auto tuning with no load (in a stop state) on the main machine side.

3. If an “error” occurs while in auto tuning, the auto tuning will be disabled. In this case, press the ⏻ button to return the system to “normal mode”.

   Probe the causes of the error to take measures against the error and then perform the auto tuning again.

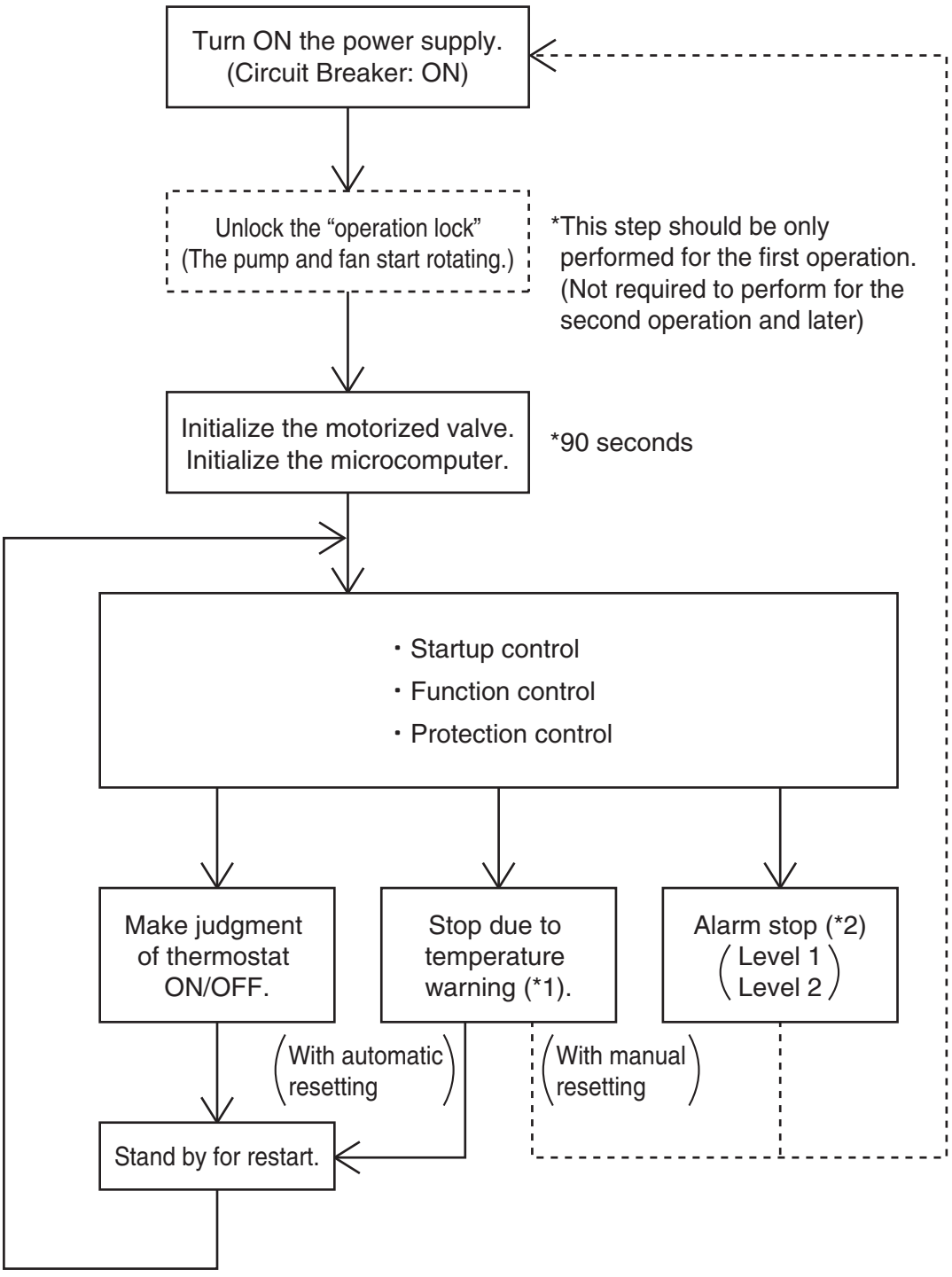
4. In Step 2, the system runs at 100% capacity. Consequently, oil may be overcooled. Make adjustment of overcooled oil with parameter n004 (Setting of auto tuning end conditions). (Set the conditions to as large value as possible to the extent that no damage is caused to the machine.)

5. In order to compute the optimum control variable based on data gathered, the setting of response coefficient should be made with the parameter n005. (Making the variable smaller provides a higher level of stability, while making it larger provides a higher level of responsiveness.)

6. Depending on the conditions of control subject (machine), the optimum control gain may not be computed at one time. In this case, perform multiple calculations to take an average value or use a mode value (except for an extreme value).

6 Functions

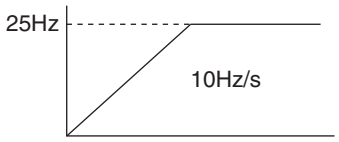
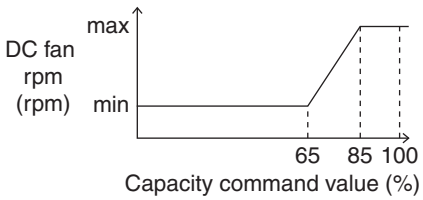
1 Operation Flowchart



*1: With “automatic setting”, restart operation after a lapse of standby for restart. With “manual resetting”, probe the cause to take measures, and then turn ON the power supply again.

*2: Probe the causes of stop due to alarm to take measures, and then turn ON the power supply again.

2 Functions

<table>
<tr><th></th><th colspan="2">Function</th><th>Description</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Stop</td><td>Stop due to alarm</td><td>When a malfunction occurs while in running, used to stop compressor or else for protection.
Stop due to alarm is classified into the following two levels.
・Alarm level 1: All the compressor, pump, and fan stop operation.
・Alarm level 2: Only the compressor stops running. (The pump and fan keep operating.)</td></tr>
<tr><td>Stop due to temperature warning</td><td>When the monitoring temperature exceeds the set temperature while in operation, used to stop the compressor or else.
・Operation in stop: Only the compressor stops operation. (The pump and fan keep operating.)
・Resetting procedure (Two procedures are available according to setting.)
Ⓐ Automatic resetting - After a lapse of “standby for restart”, the system will automatically restart operation.
Ⓑ Manual resetting - After resetting the power supply on manual control, turning ON the circuit breaker again will restart operation.
*For details of temperature warning setting procedure, refer to information on page 69 and later.</td></tr>
<tr><td>2</td><td>Standby</td><td>Standby for restart</td><td>In order to prevent frequent ON/OFF operations of the compressor and equalize pressure within the refrigerant system, used to stand by for the restart of the compressor for a period of 90 seconds after the compressor stops.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Startup control</td><td>Startup control</td><td>In order to start the compressor, used to increase the operating frequency to 25Hz once, and then, operate the compressor at the minimum operating frequency.
 
</td></tr>
<tr><td>ON/OFF thermostat setting</td><td>ON/OFF settings of the thermostat under the following conditions against the set temperature.
Thermostat ON condition: Detected temperature > Set (target) temperature
Thermostat OFF condition: Detected temperature ≦ Thermostat OFF temperature</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Function control</td><td rowspan="2">(High-accuracy) oil temperature control</td><td>Compressor control</td><td>In medium/high load regions, used to control the compressor operating frequency, thus making the oil temperature matching with the target temperature.</td></tr>
<tr><td>Electronic expansion valve control</td><td>In low load regions, used to control opening of the EEV for main circuit and MOV for hot gas, thus making the oil temperature matching with the target temperature.</td></tr>
<tr><td colspan="2">Auto tuning control</td><td>Used to compute P/I gain for temperature control and then set it to parameter concerned.</td></tr>
<tr><td colspan="2">Fan rpm control</td><td>In order to reduce running noise, rpm of the DC fan is decreased depending on the capacity command value.
<table>
<tr><th></th><th>AKZ14A</th><th>AKZ32A</th><th>AKZ43A</th><th>AKZ56A</th><th>AKZ90A</th></tr>
<tr><td>max</td><td>1400</td><td>1350</td><td>1390</td><td>1100</td><td>1050</td></tr>
<tr><td>min</td><td>1400</td><td>1100</td><td>1100</td><td>850</td><td>850</td></tr>
</table>
*Note that the fan is run at the minimum rpm when the room temperature is 30℃ or less, while it is run at the maximum rpm when it is 35℃ or more.
 
</td></tr>
</table>

	Function		Description
5	(Reference) Running condition in normal status	Temperature and pressure of respective sections	The table below shows the guideline of temperatures and pressures during normal running.

Unit: ℃

	Standard point (room temperature/oil temperature=35/35℃) Capacity command value=100%				Reference point (room temperature/oil temperature=25/25℃) Capacity command value=10%			
	Th-6	Th-7	Th-8	LP☆1 (MPa)	Th-6	Th-7	Th-8	LP☆1 (MPa)
AKZ14A-500	76	53	14	1.01	33	27	20	1.35
AKZ32A-500	81	54	18	1.01	42	26	12	1.02
AKZ43A-500	80	56	22	1.08	40	27	13	1.10
AKZ56A-500	91	54	10	0.95	42	27	15	1.12
AKZ90A-500	74	53	5	0.71	50	27	8	0.82

*1 Temperatures and pressures above are measured under the conditions shown below. Power supply: 200 V (50Hz), oil used: VG32, pump discharge pressure: 0.2MPa, clean air filter and compressor are used.
*2 For pressure measurement of ☆1, connection of a pressure gauge to the low-pressure gauge port is required.

Current value of respective functional parts

The table below shows the guideline of output current values of respective functional parts during normal running.

Unit: A

	Power supply	Pump	Compressor	DC fan
AKZ14A	200V (50Hz)	1.3	2.5	0.13
	200V (60Hz)	1.1		
AKZ32A	200V (50Hz)	1.4	3.7	0.27
	200V (60Hz)	1.2		
AKZ43A	200V (50Hz)	1.4	5.0	0.27
	200V (60Hz)	1.2		
AKZ56A	200V (50Hz)	2.7	5.3	0.37
	200V (60Hz)	2.2		
AKZ90A	200V (50Hz)	2.7	10.3	0.55
	200V (60Hz)	2.2		

	Power supply	Pump	Compressor	DC fan
AKZ14A-500	400V (50Hz)	0.38	1.4	0.05
	400V (60Hz)	0.25		
AKZ32A-500	400V (50Hz)	0.42	2.1	0.10
	400V (60Hz)	0.35		
AKZ43A-500	400V (50Hz)	0.42	2.6	0.10
	400V (60Hz)	0.35		
AKZ56A-500	400V (50Hz)	0.84	2.9	0.12
	400V (60Hz)	0.70		
AKZ90A-500	400V (50Hz)	0.84	6.6	0.30
	400V (60Hz)	0.70		

*1 Current values above are measured under the conditions shown below. Oil used: VG32, outside of unit pressure loss: 0, pump discharge pressure: 0.2MPa, clean air filter and condenser are used.
*2 Respective parts have variation between the legs. Use the table as the guide of intermediate values of the phases.

	Function		Description
6	Protection control	High pressure protection function	When high pressure shows an abnormal rise, used to stop only the compressor due to malfunction. ◯Stop due to detection by the thermistor of condenser (subject to all applicable models) Actuating temperature: 62℃ or more ◯Stop due to detection by the high-pressure switch (only on "-C" models) Operating pressure: 4.1MPa
		Inverter protection function	AKZ14A–43A-500: When the temperature output of the inverter IPM is detected to be abnormal, only the compressor is stopped. Operating temperature: 114℃ AKZ90A, AKZ56A-500, AKZ90A-500: When the temperature of the inverter radiator fin is detected to be abnormal, only the compressor is stopped. Operating temperature: 101.4℃ (AKZ90A) 93.8℃ (AKZ56A-500) 87.9℃ (AKZ90A-500) * For models AKZ14A–56A, the IPM itself detects the temperature and if there is an abnormality, only the compressor is stopped.

3 List of Alarms/Warnings

When an alarm or warning occurs while in operation, the equipment will stop operation in progress and the status will be displayed as shown below.

1. In order to protect functional parts, the compressor, oil pump, fan, or else stops.
2. In order to alert the customer of the alarm or warning, it is displayed by code or lamp.

●In case of alarm

Alarm level	Running/stop				Notification		Object
	Compressor/heater	Oil pump	Fan	Restoration	Display	Alarm lamp	
Level 1	Stop	Stop	Stop	Manual	Alarm code display	Flash	Alarm code (A6 to UJ) For details, see P.84 and 85
Level 2	Stop	Running	Running	Manual		ON	
—	Stop	Running	Running	Automatic	No display	OFF	①Low room temperature protection (*1) ②Low oil temperature protection (*2)

*1: Actuates when the room thermistor detects a temperature of -2℃ or lower.

*2: Actuates when the inlet oil thermistor detects a temperature of 2℃ or lower.

●In case of warning

Warning level	Running/stop				Notification		Object
	Compressor	Oil pump	Fan	Restoration	Display	Warning lamp	
Level 2	Stop	Running	Running	Automatic	Temperature warning display (1E to 5E)	ON	Temperature warning display (1E to 5E) For details, see P.69–71
	Running	Running	Running	—			
Level 1*	Running	Running	Running	—	Warning code display	Flash	Warning code (A5 to F6) For details, see P.111
Level 2						ON	
—					No display (history only)	OFF	

*Warning at level 1 will be alarm after cumulative running time has reached 150 hours.

1 Troubleshooting According to Symptoms

If an operation shows an abnormality even though no alarm code is displayed, refer to the following information to take measures.

Item	Condition	Cause	Measure
1	The unit does not run at all. (The POWER lamp on the control panel is unlit.)	(1) The main power supply is OFF.	Check that power is supplied to the power supply terminal.
		(2) (for models with a breaker) The electric component breaker has tripped. Or, it has not been turned ON.	Open the switch box cover and check if the breaker has tripped.
		(3) The wiring that supplies power to the control board is disconnected or broken.	Check the wiring between the control board and the inverter board.
2	The control panel displays “ACF” and then turns off.	(1) The main power supply is OFF.	This is the normal operation when the main power supply is OFF. Check that power is supplied to the power supply terminal.
3	The pump/fan is operating, but the control panel is unlit.	(1) The wiring for the control panel is disconnected or broken.	Check the wiring between the control board and the control panel.
4	Pump/fan does not run.	(1) The remote control input ([10]–[11]) is OFF.	Check the connection of the remote control input.
		(2) The unit has been set to the operation lock mode. (With the factory setting, the operation Lock mode is selected.)	Cancel the operation Lock mode on the control panel. (See page 60.)
		(3) The pump wiring is disconnected.	Check the pump wiring.
5	Oil does not flow, although the pump is running. Because the oil circulation quantity is insufficient, the pump sound level is large.	(1) The pump suction pipe connection is loose.	Check the seal of the pipe and retighten.
		(2) The suction strainer is clogged.	Clean the suction strainer. If the oil in the oil tank is dirty, replace the oil. (See page 161.)
		(3) The oil level in the oil tank has decreased.	Refill oil into the oil tank.
		(4) Because of a large pressure loss in the oil discharge pipe, the pump relief valve is activated.	Increase the oil pipe diameter, and shorten the pipe length. Check that the oil viscosity is within the specified operating range.
		(5) Because of a large pressure loss in the oil suction pipe, cavitation has occurred with the pump.	
6	The compressor does not run, although the pump is running.	(1) The compressor is stopped under temperature control.	– – –
		(2) The compressor restart prevention timer has been activated.	Check if the compressor starts after elapse of the timer time (about 2 minutes).
		(3) The low oil temperature protection device has been activated. (Inlet oil temperature is 2℃ or lower.)	Check if the compressor normally operates at 5℃ or higher oil temperature.
		(4) The low ambient temperature protection device has been activated. (Room temperature is –2℃ or lower.)	Check if the compressor normally operates at 0℃ or higher room temperature.
		(5) The capacity setting is 0% (Operation mode 9).	Operate in an operation mode appropriate for use.

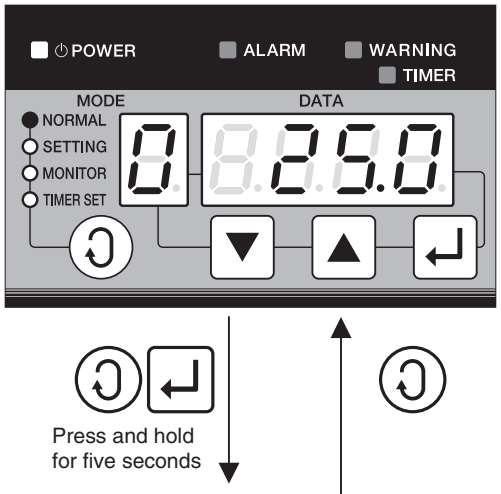
Item	Condition	Cause	Measure
7	Although both pump and compressor are running, oil cannot be cooled.	(1) There is an obstacle near the air intake/exhaust port.	Do not place any object that blocks ventilation at 500 mm or shorter distance from the air intake/exhaust port.
		(2) The air filter is clogged.	Clean the air filter.
		(3) The unit is running under capacity suppressing control, because the room temperature is high.	Check the capacity in the operating temperature range with the catalog, and select a model with appropriate capacity.
		(4) Heat load is large.	
		(5) The oil viscosity is high.	The higher the oil viscosity, the lower the cooling capacity. Select a model with appropriate capacity.
		(6) The temperature setting is high.	Change the temperature setting to an appropriate temperature.
		(7) If the exhaust air temperature is almost equal to the room temperature although the compressor is in operation, the refrigerant gas is low.	Contact Nearby Service Network.
8	The operation settings cannot be changed.	(1) If “---” appears on the data display, the temperature sensor corresponding to the selected operation mode is not connected.	Connect the required temperature sensor before changing the operation settings. The machine temperature tuning thermistor option is required for machine temperature tuning control.
		(2) If “---” instantaneously appears when the [ENT] key (at the right end of the control panel) is pressed, the protect switch is set to ON.	Turn OFF the protect switch on the control board.
9	Alarm output operation ([64]-[65]) is different from that of conventional signal output.	(1) The alarm output signal connection has been partially changed depending on the series.	The [60]-[63] outputs are compatible with the AKS5 and AKZ6 series, but after the 7 series, signal operations and connections of the [64]-[65] outputs have been changed.

2 Equipment Data checking Procedure

Using the control panel to put the system into “special monitor mode” will acquire a variety of data on the current equipment.

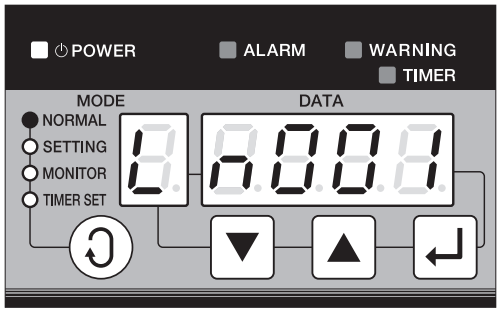
[Operation procedure]

<Normal mode>



While in normal mode (with the NORMAL lamp ON), press and hold the “ ⏻ ” and “ ↵ ” buttons for a period of five seconds, the NORMAL lamp will start flashing to shift to special monitor mode.

<Special monitor mode>



Pressing the ▼ or ▲ button will make it possible to change data No. (display in the MODE block).

After data number is displayed on the data display section for 0.5 seconds, data is displayed.

Furthermore, pressing the ⏻ button while in special monitor mode will return the system to normal mode.

Display item of special monitor mode

Data No.	Item
n000	[Current] EE valve (for main circuit) opening
n001	[Current] MO valve (for hot gas) opening
n002	[Current] Main circuit DC voltage (0.1V)
n003	[Current] Main circuit DC current value (0.1A)
n004	[Current] IPM temperature (AKZ14A–43A-500) Radiation fin temperature (AKZ14A–90A, AKZ56A-500, AKZ90A-500)
n005	[Current] Electric component box inside temperature
n006	[Current] Discharge pipe temperature
n007	[Current] Condenser temperature
n008	[Current] EE valve outlet temperature
n009	[Current] DC fan rpm
n010	Power supply frequency detected
n011	— (used for technical test) *
n012	— (used for technical test) *
n013	— (used for technical test) *
n014	— (used for technical test) *

Data No.	Item
n015	Power supply frequency (total)
n016	Compressor running cumulative (total) hour, minute (in 24-hour)
n017	Compressor running cumulative (total) day (32767 max.)
n018	Pump running cumulative (total) hour, minute (in 24-hour)
n019	Pump running cumulative (total) day (32767 max.)
n020	Power supply cumulative (total) hour, minute (in 24-hour)
n021	Power supply cumulative (total) day (32767 max.)
n022	Power supply time, minute, second
n023	Power supply time, hour (32767 max.)
n024	Power consumption kWh
n025	Control, program revision
n026	Inverter, program revision

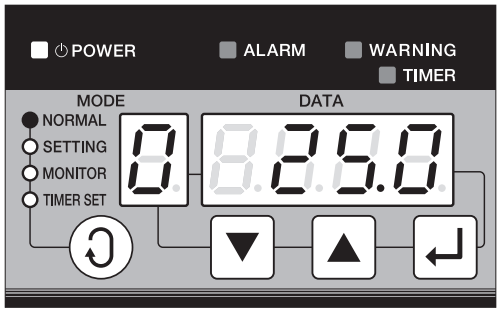
*: Since the data is used for technical test, do not change the setting on site.

3 Troubleshooting According to Alarm Code

Using the control panel to put the system into “service monitor mode” will make it possible to check the history of alarm codes and data when an alarm or warning occurs.

3-1. Control Panel Operation Procedure

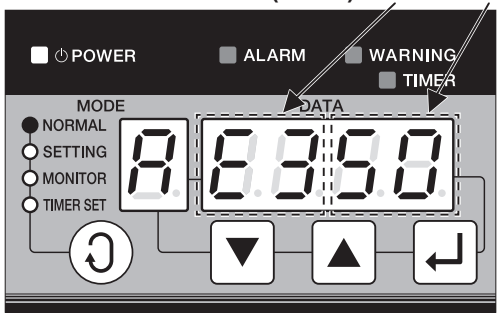
<Normal mode>



Press and hold for five seconds

While in normal mode (with the NORMAL lamp ON), press and hold the [↵] button for a period of five seconds, the MONITOR lamp will start flashing to shift to service monitor mode.

<Service monitor mode (Alarm) > Code Class



When alarm codes and their detailed data are displayed, “A” is displayed in the “MODE” section, “E” is displayed while warning codes and their detailed data are displayed.

As for alarm code, the left 2 digits of the DATA section represent a code and the right 2 digits represent the classification.

The current data number can be changed with the “ [▼] ” “ [▲] ” buttons.

The desired data number is displayed in the data display section for about 0.5 seconds, and then, data will be displayed.

If “ [↵] ” button is pressed, detailed data is skipped, and alarm code or warning code of the last one is displayed.

If “ [↺] ” button is pressed in the service monitor mode, the operation mode returns to the normal one.

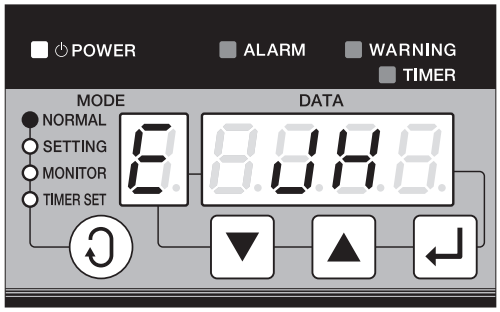
Display item of Service monitor mode (Alarm)

Data No.	Item
n0.00	Alarm code 0 (latest)
n0.01	Machine temperature (when an alarm occurs)
n0.02	Outlet oil temperature (when an alarm occurs)
n0.03	Room temperature (when an alarm occurs)
n0.04	Inlet oil temperature (when an alarm occurs)
n0.05	Spare, suction pipe temperature (when an alarm occurs)
n0.06	Discharge pipe temperature (when an alarm occurs)
n0.07	Condenser temperature (when an alarm occurs)
n0.08	EE valve outlet temperature (when an alarm occurs)
n0.09	IPM temperature (AKZ14A–43A-500 when an alarm occurs) Radiator fin temperature (AKZ90A, AKZ56A-500, AKZ90A-500 when an alarm occurs)
n0.10	Electric component box inside temperature (when an alarm occurs)
n0.11	Compressor command revolutions (when an alarm occurs)
n0.12	EE valve opening (when an alarm occurs)
n0.13	MO valve opening (when an alarm occurs)
n0.14	DC fan rpm (when an alarm occurs)
n0.15	DC voltage (when an alarm occurs)
n0.16	DC current value (when an alarm occurs)
n0.17	Alarm occurrence frequency (total)
n0.18	Power supply frequency (total)
n0.19	Cumulative time (total) of compressor running to alarm occurrence in hour and minute (in 24 hours)
n0.20	Same as the above, day (32767 max.)
n0.21	Cumulative time (total) of pump running to alarm occurrence in hour and minute (in 24 hours)
n0.22	Same as the above, day (32767 max.)

Data No.	Item
n0.23	Cumulative power supply time (total) hour, minute (in 24 hours)
n0.24	Same as the above, days (32767 max.)
n0.25	Power supply time from power on to alarm occurrence, minute, second
n0.26	Same as the above, hour (32767 max.)
n1.00	Alarm code 1 (last time) ···Detailed data (26 data) to n1.26
n2.00	Alarm code 2 (last but one) ···Detailed data (26 data) to n2.26
n3.00	Alarm code 3 (last but two) ···Detailed data (26 data) to n3.26
n4.00	Alarm code 4 (last but three) ···Detailed data (26 data) to n4.26
n5.00	Alarm code 5 (last but four) ···Detailed data (26 data) to n5.26
n6.00	Alarm code 6 (last but five) ···Detailed data (26 data) to n6.26
n7.00	Alarm code 7 (last but six) ···Detailed data (26 data) to n7.26
n8.00	Alarm code 8 (last but seven) ···Detailed data (26 data) to n8.26
n9.00	Alarm code 9 (last but eight) ···Detailed data (26 data) to n9.26
···Maximally, ten alarm codes and their detailed data (26 data) are stored as history.	

Though alarm and warning that occur within a minute after power is supplied are displayed on the control panel, they are not stored as history.

<Service monitor mode (Warning) >



Display item of Service monitor mode (Warning)

Data No.	Item
n0.00	Warning code 0 (latest)
n0.01	Machine temperature (when a warning occurs)
n0.02	Outlet oil temperature (when a warning occurs)
n0.03	Room temperature (when a warning occurs)
n0.04	Inlet oil temperature (when a warning occurs)
n0.05	Spare, suction pipe temperature (when a warning occurs)
n0.06	Discharge pipe temperature (when a warning occurs)
n0.07	Condenser temperature (when a warning occurs)
n0.08	EE valve outlet temperature (when a warning occurs)
n0.09	IPM temperature (AKZ14A–43A-500 when a warning occurs) Radiator fin temperature (AKZ90A, AKZ56A-500, AKZ90A-500 when a warning occurs)
n0.10	Electric component box inside temperature (when a warning occurs)
n0.11	Compressor command revolutions (when a warning occurs)
n0.12	EE valve opening (when a warning occurs)
n0.13	MO valve opening (when a warning occurs)
n0.14	DC fan revolutions (when a warning occurs)
n0.15	DC voltage (when a warning occurs)
n0.16	DC current value (when a warning occurs)
n0.17	Warning occurrence frequency (total)
n0.18	Power supply frequency (total)
n0.19	Cumulative time (total) of compressor running to warning occurrence in hour and minute (in 24 hours)
n0.20	Same as the above, day (32767 max.)
n0.21	Cumulative time (total) of pump running to warning occurrence in hour and minute (in 24 hours)
n0.22	Same as the above, day (32767 max.)
n0.23	Cumulative power supply time (total) hour, minute (in 24 hours)
n0.24	Same as the above, days (32767 max.)
n0.25	Power supply time from power on to warning occurrence, minute, second
n0.26	Same as the above, hour (32767 max.)
n0.27	Cumulative warning running (total) time, minute (in 24 hours)
n0.28	Same as the above, day (32767 max.)

Data No.	Item
n1.00	Warning code 1 (last time) …Detailed data (28 data) to n1.28
n2.00	Warning code 2 (last but one) …Detailed data (28 data) to n2.28
n3.00	Warning code 3 (last but two) …Detailed data (28 data) to n3.28
n4.00	Warning code 4 (last but three) …Detailed data (28 data) to n4.28
n5.00	Warning code 5 (last but four) …Detailed data (28 data) to n5.28
n6.00	Warning code 6 (last but five) …Detailed data (28 data) to n6.28
n7.00	Warning code 7 (last but six) …Detailed data (28 data) to n7.28
n8.00	Warning code 8 (last but seven) …Detailed data (28 data) to n8.28
n9.00	Warning code 9 (last but eight) …Detailed data (28 data) to n9.28
…Maximally ten alarm codes and their detailed data (28 data) are stored as history.	

3-2. List of Alarm Code

Alarm code	Alarm level	Malfunction	Class	Operating condition	Measure (Page)
A6	2	DC fan motor system malfunction	70	When the main circuit for fan has abnormal instantaneous overcurrent.	P.86
			71	When the hall sensor of the fan motor is abnormal.	
			72	When an error signal is detected from the power device.	
			73, 74	When the main circuit for fan has an abnormal voltage.	
			76	When the fan does not rotate.	
			80, 81	When the main circuit for fan has abnormal instantaneous current.	P.87
			82	When the fan does not rotate.	
			83, 85	When the fan motor loses steps.	
			86	When the fan is overloaded when started.	
			89, 90, 94	When the main circuit for fan is abnormal.	
			96	When the main circuit for fan has an abnormal voltage.	
AA	2	Overheated heater ("-H" only)	51	When the heater overheat prevention is activated.	P.88
E1	1	System malfunction	10, 70	Combination of control board and inverter board is wrong.	Replace the control board
E3	2*	Malfunction due to high pressure or condenser temperature	10	The condenser thermistor exceeds 62℃.	P.89, 90
			50	When the high pressure switch is actuated.	
E5	2*	Malfunction due to discharge pipe temperature or overheated compressor	10	The discharge thermistor exceeds 100℃. (AKZ14A–43A) The discharge thermistor exceeds 115℃. (AKZ56A, 90A)	P.91, 92
			50	When the compressor protection thermostat is actuated.	
E6	2	Compressor lock at startup	70	The compressor revolutions are not detected at startup.	Replace the compressor
E9	2	Malfunction of electronic expansion valve for main circuit or motor operated valve for hot gas	10	Abnormality in detection of minimum opening of the electronic expansion valve for main circuit.	P.93, 94
			11	Blown fuse abnormality of the electronic expansion valve for main circuit.	
			12	Blown fuse abnormality of the motor operated valve for hot gas.	
EH	1	Actuation of pump overcurrent relay	50	When the overcurrent relay for pump motor is actuated.	P.95
EJ	1 or 2	Actuation of overheat protection switch or actuation of optional safety device	50–53	①AKZ14A–43A-H Actuating (open) pressure: 0.02 MPa or less ②AKZ56A, 90A-H Actuating (open) flow rate: 15 L/min or less ③Other than AKZ** A-H Actuating (open) of the optional safety devices.	P.96
FE	1	Malfunction due to oil temperature (rise in oil temperature)	10	The inlet temperature exceeds 65℃.	P.97
FH	2	Rise in oil inlet temperature	10	The inlet temperature exceeds 60℃.	P.98
H0	2	Malfunction of machine body thermistor	10	When disconnection or short circuit of the thermistor is detected.	P.99
H1	2	Malfunction of room thermistor	10	When disconnection or short circuit of the thermistor is detected.	
J3	2	Malfunction of discharge thermistor	99	When 150 hours have passed with the thermistor disconnected or short-circuited.	
J4	2	Malfunction of EE valve outlet thermistor	99	When 150 hours have passed with the thermistor disconnected or short-circuited.	
J6	2	Malfunction of condenser thermistor	99	When 150 hours have passed with the thermistor disconnected or short-circuited.	
JH	2	Malfunction of inlet oil thermistor	10	When disconnection or short circuit of the thermistor is detected.	
JJ	2	Malfunction of outlet oil thermistor or optional thermistor	10	When disconnection or short circuit of the thermistor is detected.	
L4	2	Malfunction of IPM temperature or radiation fin temperature	70	When the detected temperature of IPM temperature exceeds a threshold.	P.100
			71	When the detected temperature of radiation fin temperature exceeds a threshold.	

Alarm code	Alarm level	Malfunction	Class	Operating condition	Measure (Page)
L5	2	Instantaneous overcurrent of power device	70	When compressor step-out is detected (within 3 minutes after startup).	P.101
			71	When compressor step-out is detected (after 3 minutes after startup).	
			72	When an IPM error signal is detected.	
L8	2	Compressor overload	70	When compressor step-out is detected.	P.102
			71	When low voltage abnormality is detected.	
L9	2	Faulty compressor startup	70	The compressor does not rotate smoothly.	P.103
			71	When single-phase open phase of the compressor is detected.	
			72	When two- or three-phase open phase or current abnormality of the compressor is detected.	
LA	2	Malfunction of power device	70	When current abnormality is detected.	P.104
			71	When voltage abnormality is detected.	
LC	2	Malfunction of transmission between inverter CPU and temperature control CPU	10, 11	When the transmission is not performed normally for a period of given time or more.	P.105
U0	2	Shortage of refrigerant	10	①Command capacity ≧95% ②Condenser temperature - EE valve outlet temperature ≦5℃ ① and ② continue for a period of three minutes.	P.106
U1	1	Reverse phase/open phase of power supply or wire broken in fuse, low voltage (power supply voltage)	10	When reverse phase is detected in the power supply circuit immediately after the power is turned on.	P.107
			11	When L1 is detected in the power supply circuit immediately after the power is turned on.	
			12	When L2 is detected in the power supply circuit immediately after the power is turned on.	
			13	When L3 is detected in the power supply circuit immediately after the power is turned on.	
			14	When single-phase open phase of L1, L2, or L3 is detected during use.	
			15	When two-phase open phase of L1, L2, or L3 is detected during use.	
U2	2	Low voltage (inverter main circuit DC voltage)	70	When the main circuit voltage is insufficient.	P.108
			71	When the main circuit voltage does not rise due to charging circuit failure.	
U9	2	Malfunction of transmission with slave unit	10	When transmission between the master unit and the slave unit is not performed normally for a period of given time or more.	P.109
UH	2	System-related failure	10–13	EEPROM causes a failure.	Replace the control board
			70–72	Inverter control software error.	Replace the inverter board
			80–83	Temperature control software error.	Replace the control board
UJ	1 or 2	Actuation of external safety device	50–53	The protective device connected to the CN2 on the control board is actuated.	P.110

Alarm level 1 ··· Pump OFF + Compressor (heater) OFF + Fan OFF
Alarm level 2 ··· Pump ON + Compressor (heater) OFF + Fan ON

*E3/E5 (Class: 50) : the fan stops at the same time.

(Notes) Emergency operation

- In case of malfunction of room thermistor ····· Emergency operation is enabled in operation mode 0, 1, 4, 6, or 9 (H1 warning display)
- In case of malfunction of machine body thermistor ····· Emergency operation is enabled in operation mode 0, 1, 3, 5, or 9
- In case of malfunction of inlet oil thermistor ····· Emergency operation is enabled in operation mode 1, 5, 6, or 9 (JH warning display)
- In case of malfunction of outlet oil thermistor····· Emergency operation is enabled in operation mode 0, 3, 4, or 9

3-3. Troubleshooting Flowchart

Control panel display	Malfunction of DC Fan Motor
A6	

1 Applicable Models

AKZ14A–43A

2 Methods of Malfunction Detection

1. DC voltage in the main circuit at the inverter board (A2P) input section
2. Detected fan revolutions
3. Faulty signal between the fan motor (M3F) and the inverter board (A2P)

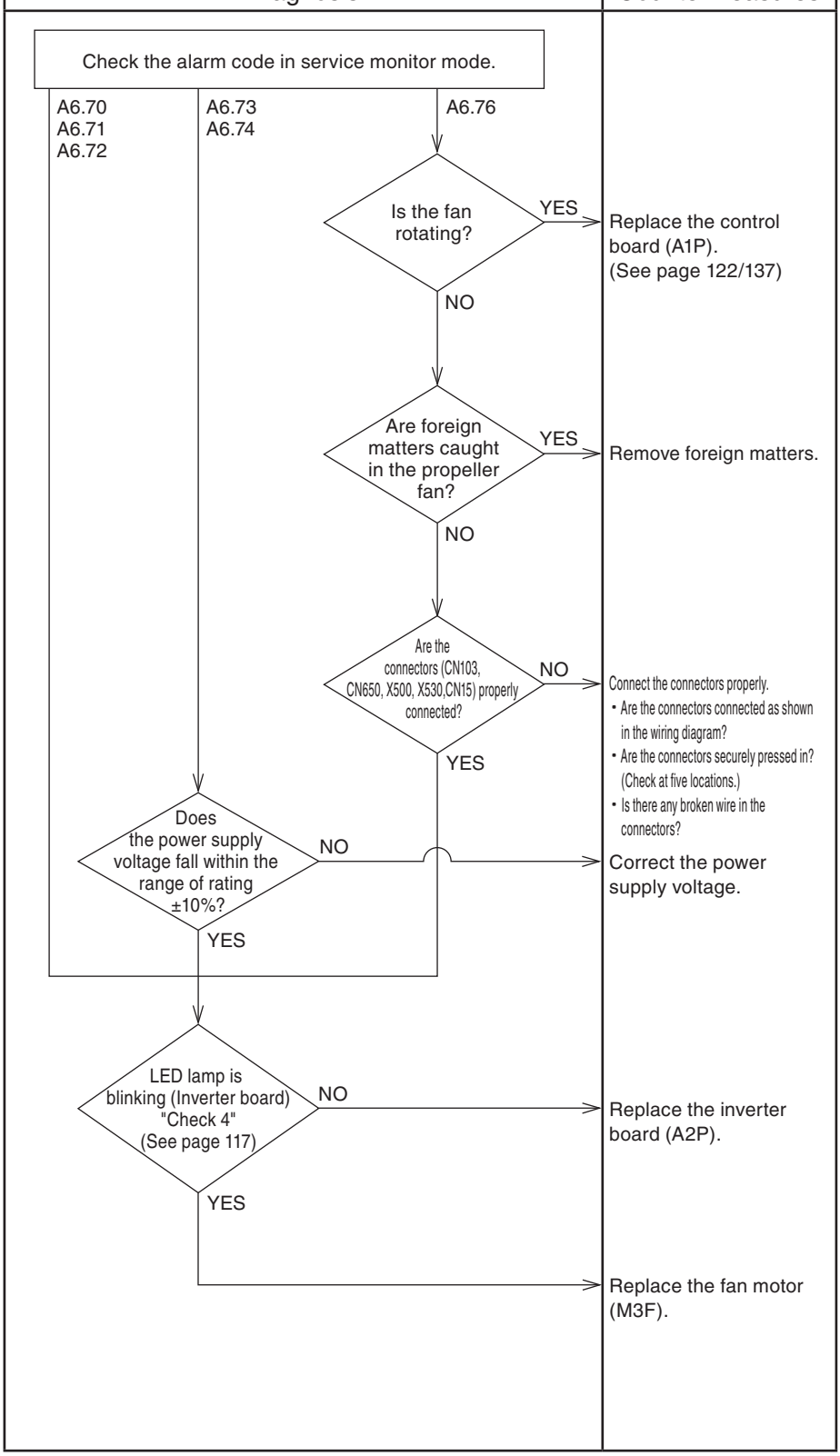
3 Malfunction Decision Conditions

Class	Conditions
70	When the main circuit for fan has abnormal instantaneous overcurrent.
71	When the hall sensor of the fan motor is abnormal.
72	When an error signal is detected from the power device.
73, 74	When the main circuit for fan has an abnormal voltage.
76	When the fan does not rotate.

4 Supposed Causes

- Faulty connector connection
- Disconnected wiring
- Faulty control board (A1P)
- Faulty inverter board (A2P)
- Faulty fan motor (M3F)
- Surge in power supply
- Noise from power supply

5 Troubleshooting



Control panel display **A6**

Malfunction of DC Fan Motor

1 Applicable Models

AKZ56A, 90A

2 Methods of Malfunction Detection

1. DC voltage in the main circuit at the inverter board (A2P) input section
2. Detected fan revolutions
3. Faulty signal between the fan motor (M3F) and the inverter board (A2P)

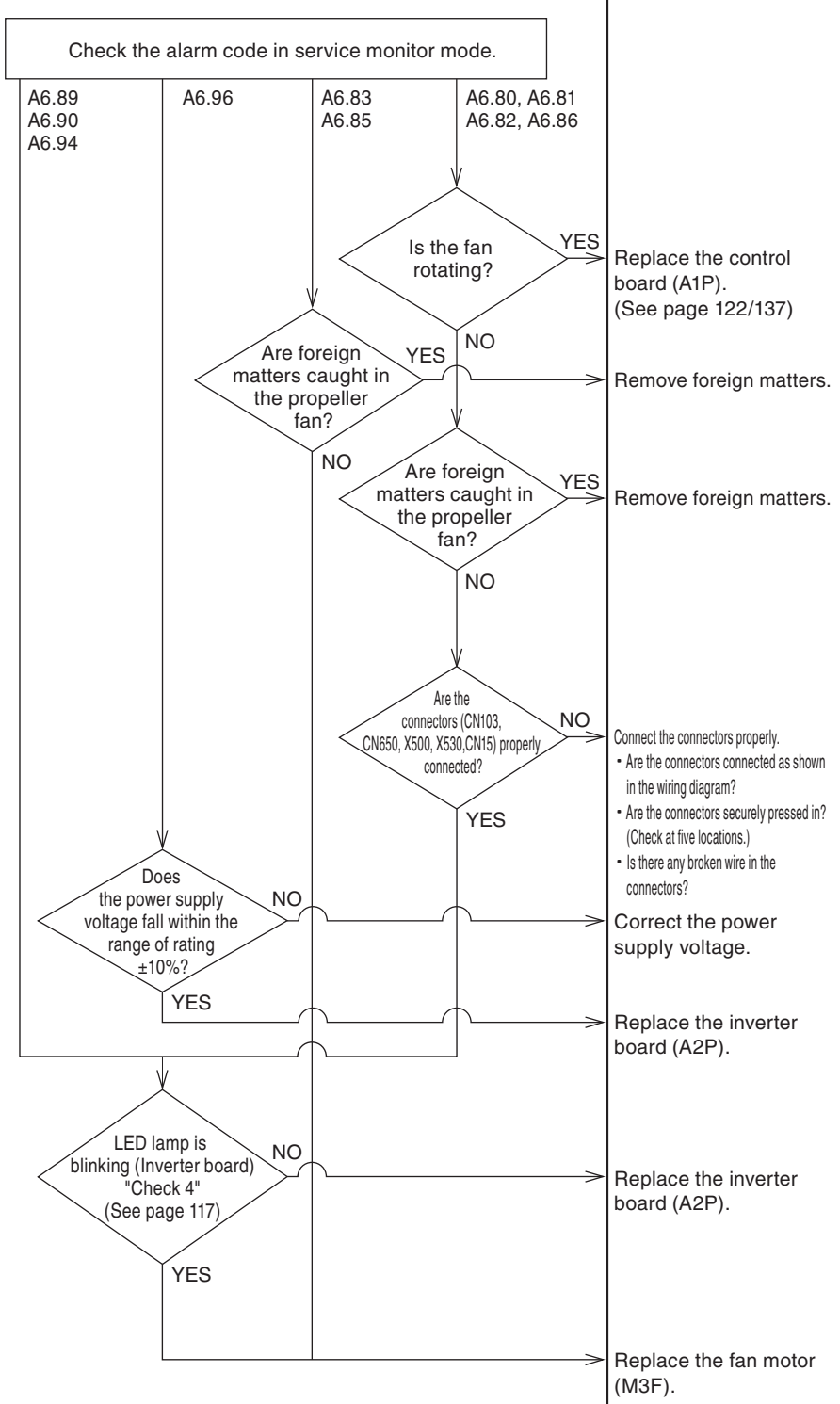
3 Malfunction Decision Conditions

Class	Conditions
80, 81	When the main circuit for fan has abnormal instantaneous current.
82	When the fan does not rotate.
83, 85	When the fan motor loses steps.
86	When the fan is overloaded when started.
89, 90, 94	When the main circuit for fan is abnormal.
96	When the main circuit for fan has an abnormal voltage.

4 Supposed Causes

- Faulty connector connection
- Disconnected wiring
- Faulty control board (A1P)
- Faulty inverter board (A2P)
- Faulty fan motor (M3F)
- Surge in power supply
- Noise from power supply

5 Troubleshooting



Control panel display: AA

Overheated Heater

1 Applicable Models

AKZ**A-H
(All models equipped with heater)

2 Methods of Malfunction Detection

Superheat prevention temperature switch (S4T)

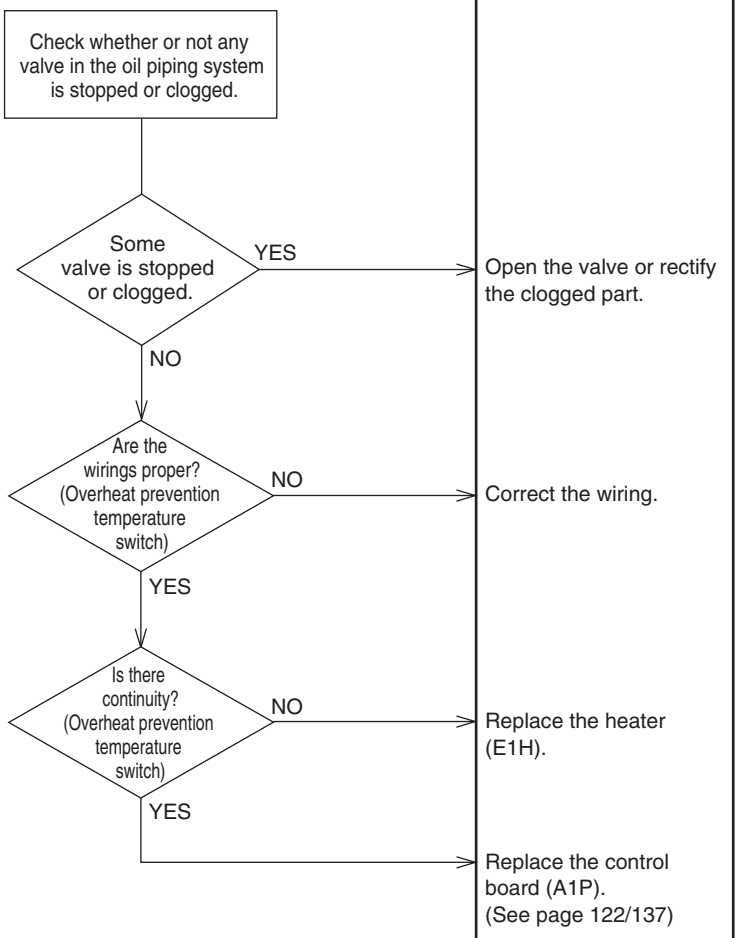
3 Malfunction Decision Conditions

Class	Conditions
51	When the heater overheat prevention is activated. Actuating temperature: 80℃ (AKZ14A–43A-H) 70℃ (AKZ56A, 90A-H)

4 Supposed Causes

- Inadequate oil quantity refilled
- Inadequate oil flow rate
- Faulty wiring of pump
- Faulty magnetic contactor
- Faulty control board (A1P)

5 Troubleshooting



Control panel display **E3**

Malfunction due to High Pressure or Condenser Temperature

1 Applicable Models

1. Malfunction due to condenser temperature
   AKZ**A
   (All series including "-C" models)
2. Malfunction due to high pressure
   AKZ**A-C

2 Methods of Malfunction Detection

1. Detect with the condenser thermistor (Th-7)
   (located in the middle of the condenser)
2. Detect the presence/absence of conduction with the high pressure switch (S3PH)
   (located in the discharge pipe)

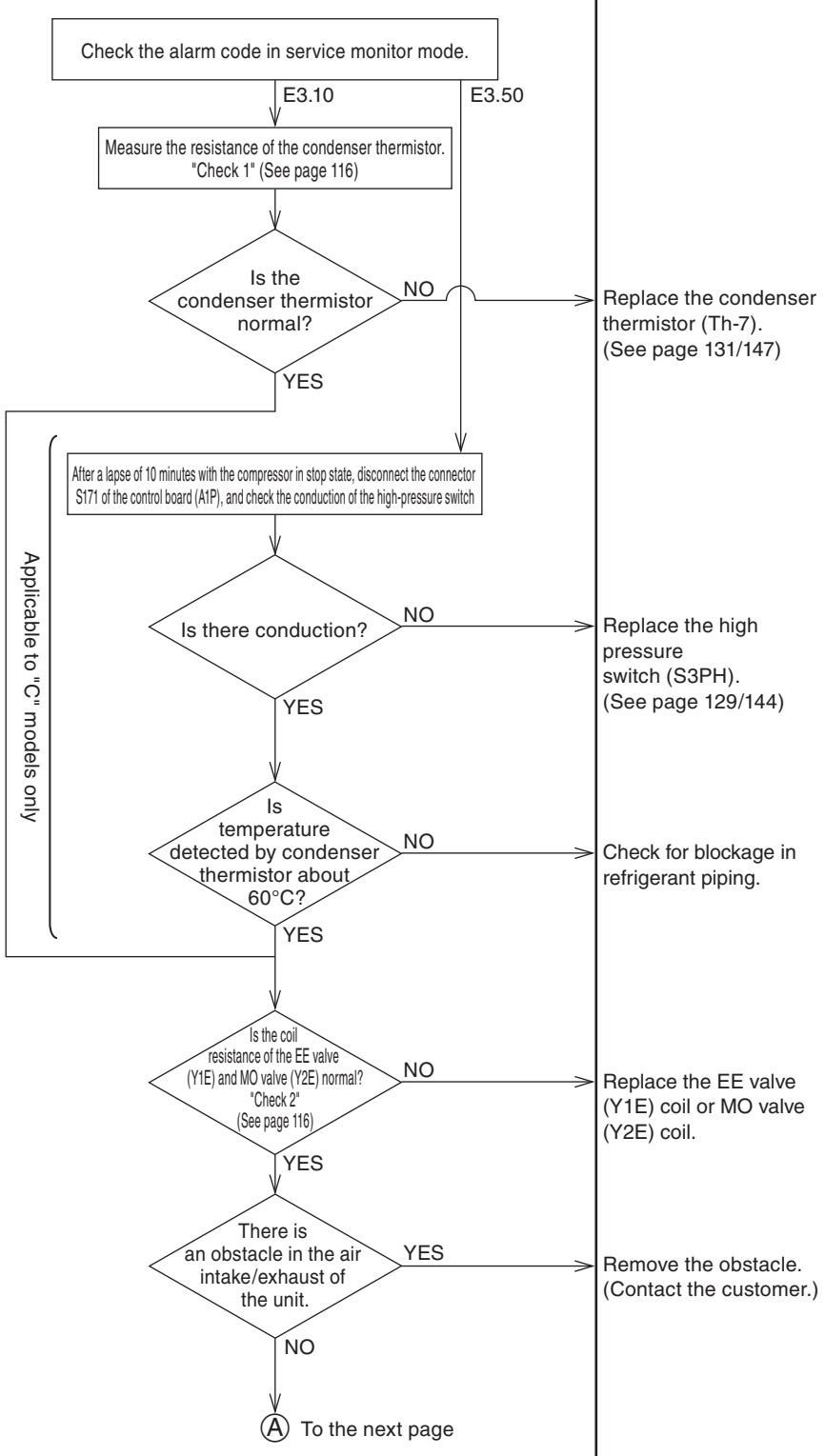
3 Malfunction Decision Conditions

Class	Conditions
10	The condenser thermistor exceeds 62℃.
50	When the high pressure switch is actuated. Actuating pressure: 4.1 MPa Resetting pressure: 3.2 MPa

4 Supposed Causes

- Obstacle around the equipment
- Dirty air filter
- Room temperature too high
- Oil inlet temperature too high
- Faulty condenser thermistor (Th-7)
- Faulty high pressure switch (S3PH)
- Faulty EE valve (Y1E) or MO valve (Y2E)
- Dirty or clogged condenser
- Faulty fan
- Short circuit of intake and exhaust

5 Troubleshooting



Control panel display	Malfunction due to High Pressure or Condenser Temperature
E3	

5 Troubleshooting

Diagnosis	Countermeasures
From the previous page Ⓐ	
The air filter gets clogged. — YES	Clean the air filter.
NO	
The room temperature is 45℃ or less. (*1) — NO	Use the unit at the room temperature of 45℃ or less. (Contact the customer.)
YES	
The inlet oil temperature is 50℃ or less. (*2) — NO	Check the main machine for presence/absence of abnormal heat generation. (Contact the customer.) ↓ If there is no abnormal heat generation, the model should be re-selected.
YES	Replace the control board (A1P). (See page 122/137)

*1: Check while in monitor mode No. 2. (See page 63)
*2: Check while in monitor mode No. 3. (See page 63)

Control panel display **E5**

Malfunction due to Discharge Pipe Temperature or Overheated Compressor

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

1. Detect with the discharge thermistor (Th-6).
2. Detect the compressor protection thermostat (S2T).

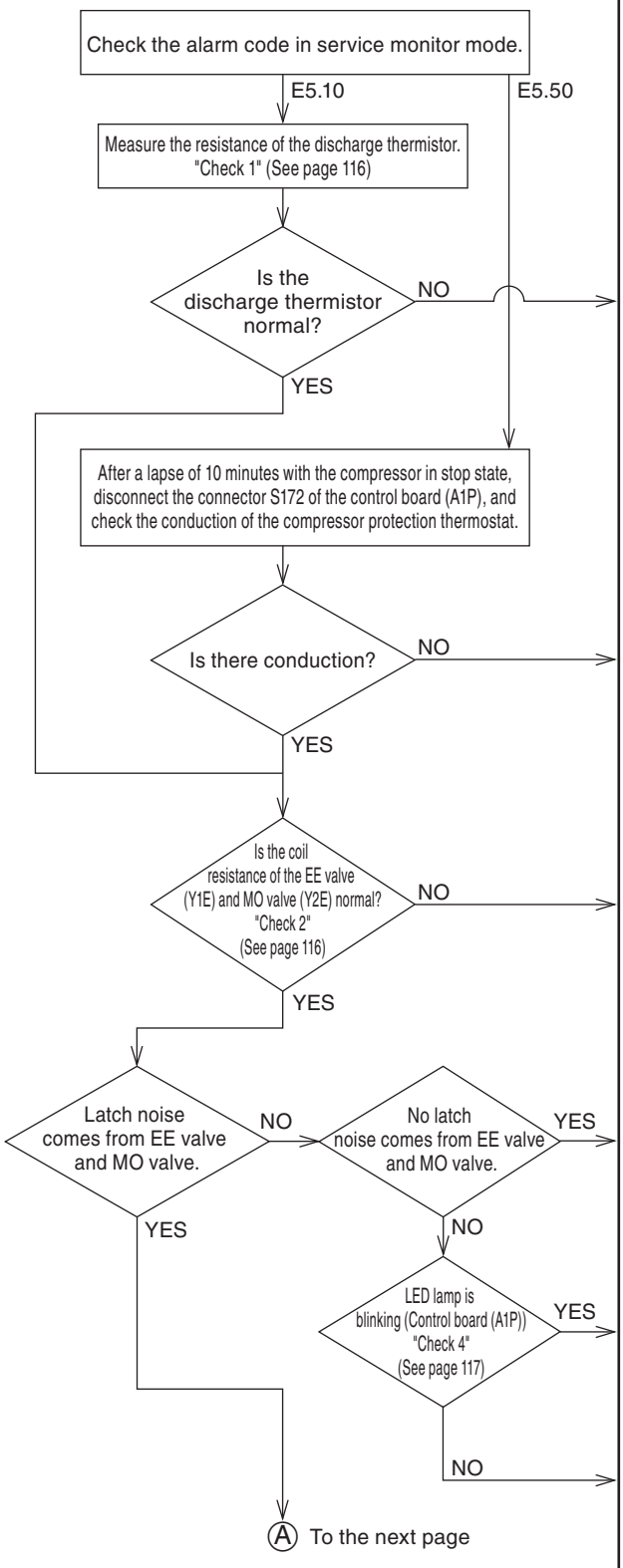
3 Malfunction Decision Conditions

Class	Conditions
10	When the discharge thermistor detects a temperature of the following. Operating temperature: 100℃ (AKZ14A–43A) 115℃ (AKZ56A, 90A)
50	When the compressor protection thermostat is actuated. Actuating temperature: 125℃ Resetting temperature: 110℃

4 Supposed Causes

- Obstacle around the equipment
- Dirty air filter
- Room temperature too high
- Oil inlet temperature too high
- Faulty discharge thermistor (Th-6)
- Faulty compressor (M2C)
- Inadequate refrigerant quantity (including slow leakage)
- Heat generated due to worn compressor shaft
- Faulty EE valve (Y1E) or MO valve (Y2E)
- Dirty or clogged condenser
- Short circuit of intake and exhaust
- Faulty compressor protection thermostat (S2T)

5 Troubleshooting



Control panel display	Malfunction due to Discharge Pipe Temperature or Overheated Compressor
E5	

5 Troubleshooting

Diagnosis	Countermeasures
From the previous page Ⓐ	
Are insulation and coil resistance of the compressor normal? "Check 3" (See page 117) — NO	Replace the compressor (M2C). (See page 132/148)
YES	
Is the refrigerant leaking? — NO	After repairing the leak, refill the refrigerant.
YES	Replace the control board (A1P). (See page 122/137)

Control panel display **E9**

Malfunction of Electronic Expansion Valve for main circuit (EEV), Motor Operated Valve for hot gas (MOV)

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect the malfunction according to the opening during "Pulse detection operation with EEV (MOV) fully closed" and EE valve outlet temperature.

- EEV for main circuit (Y1E)
- MOV for hot gas (Y2E)
- Detect a blown fuse immediately after turning power on
- Detect wiring fall-out

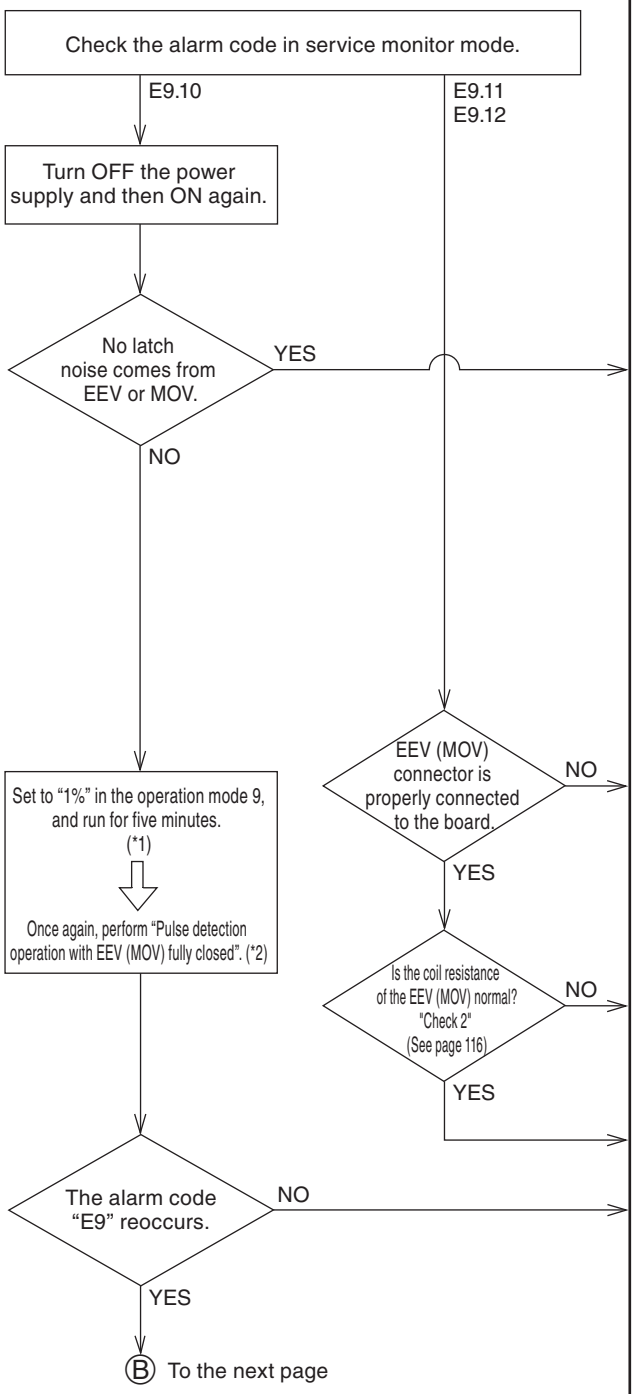
3 Malfunction Decision Conditions

Class	Conditions
10	Abnormality in detection of minimum opening of the electronic expansion valve for main circuit.
11	Blown fuse abnormality of the electronic expansion valve for main circuit.
12	Blown fuse abnormality of the motor operated valve for hot gas.

4 Supposed Causes

- Faulty EEV (Y1E) coil or MOV (Y2E) coil
- Faulty control board (A1P)
- Faulty mounting of EEV (Y1E) coil or MOV (Y2E) coil
- Inadequate oil level
- Faulty operation of EEV (Y1E) or MOV (Y2E)

5 Troubleshooting



*1: For setting procedures of operation mode, see page 61.
*2: "Pulse detection operation with EEV (MOV) fully closed" running procedures.
While in parameter setting mode, input "0" to data of the parameter n024.
↓
The "Pulse detection operation with EEV (MOV) fully closed" will be initiated and then, completed in a period of approximately five minutes.

Control panel display	Malfunction of Electronic Expansion Valve for main circuit (EEV), Motor Operated Valve for hot gas (MOV)
E9	

5 Troubleshooting

Diagnosis	Countermeasures
From the previous page Ⓑ Is the coil resistance of the EEV (MOV) normal? "Check 2" (See page 116) NO	Replace faulty EEV (Y1E) or MOV (Y2E) coil. (See page 128/143/150)
YES	Replace the control board (A1P). (See page 122/137)

Control panel display **EH**

Actuation of Pump Overcurrent Relay

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect with the pump motor overcurrent relay (K1S).

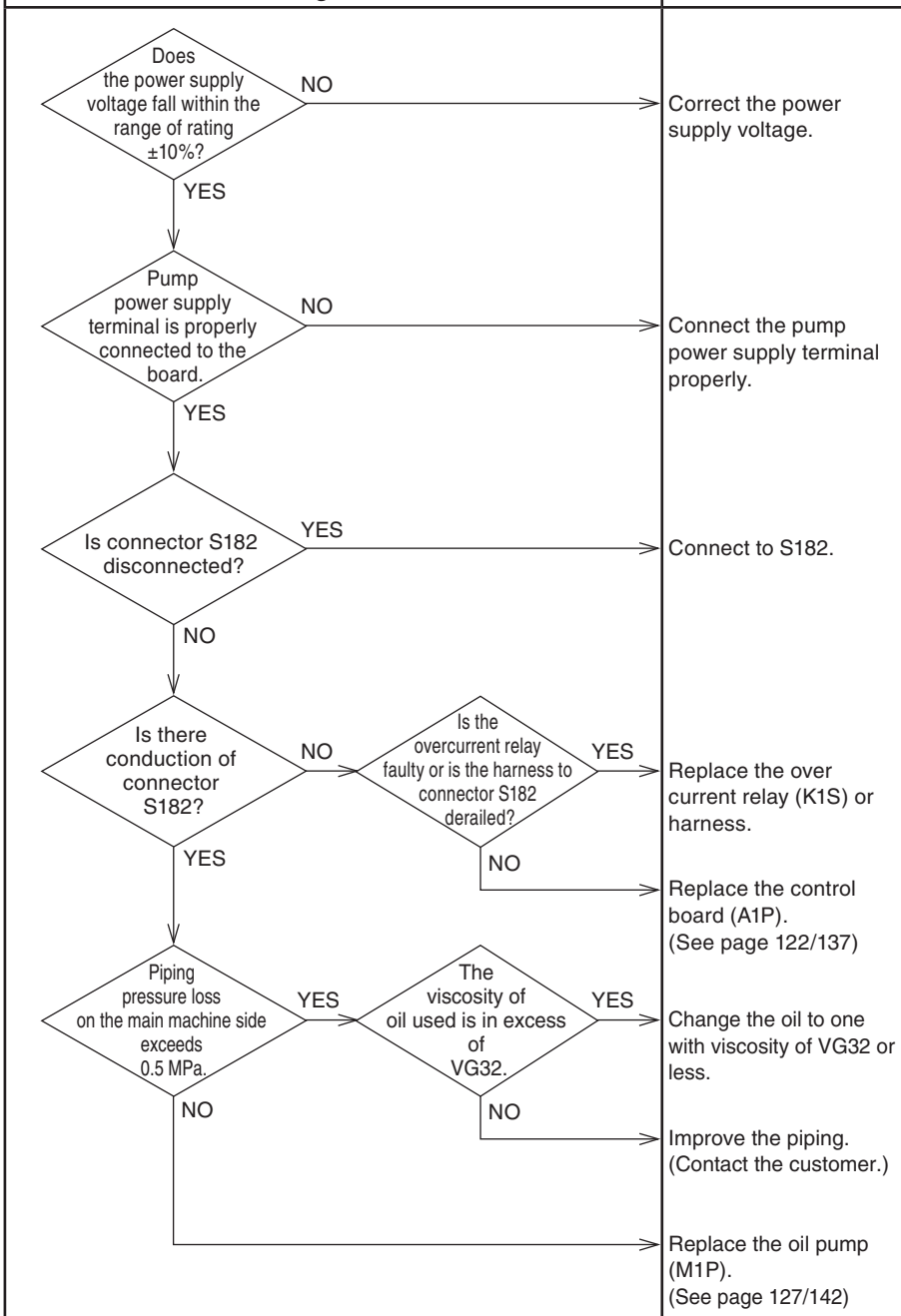
3 Malfunction Decision Conditions

Class	Conditions
50	When the pump motor over current relay is actuated.

4 Supposed Causes

- Defective oil piping by customer
- Faulty oil pump (M1P)
- Incompatible viscosity of oil used
- Faulty pump motor over current relay (K1S)
- Faulty control board (A1P)

5 Troubleshooting



Control panel display	Actuation of boil-dry Prevention Switch or Optional Safety devices
EJ	

1 Applicable Models

①AKZ**A-H
②Models other than AKZ**A-H with optional safety device mounted

2 Methods of Malfunction Detection

①AKZ**A-H
Detect with the boil-dry prevention switch (S5P).
②Models other than AKZ**A-H
Detect with the optional safety devices.

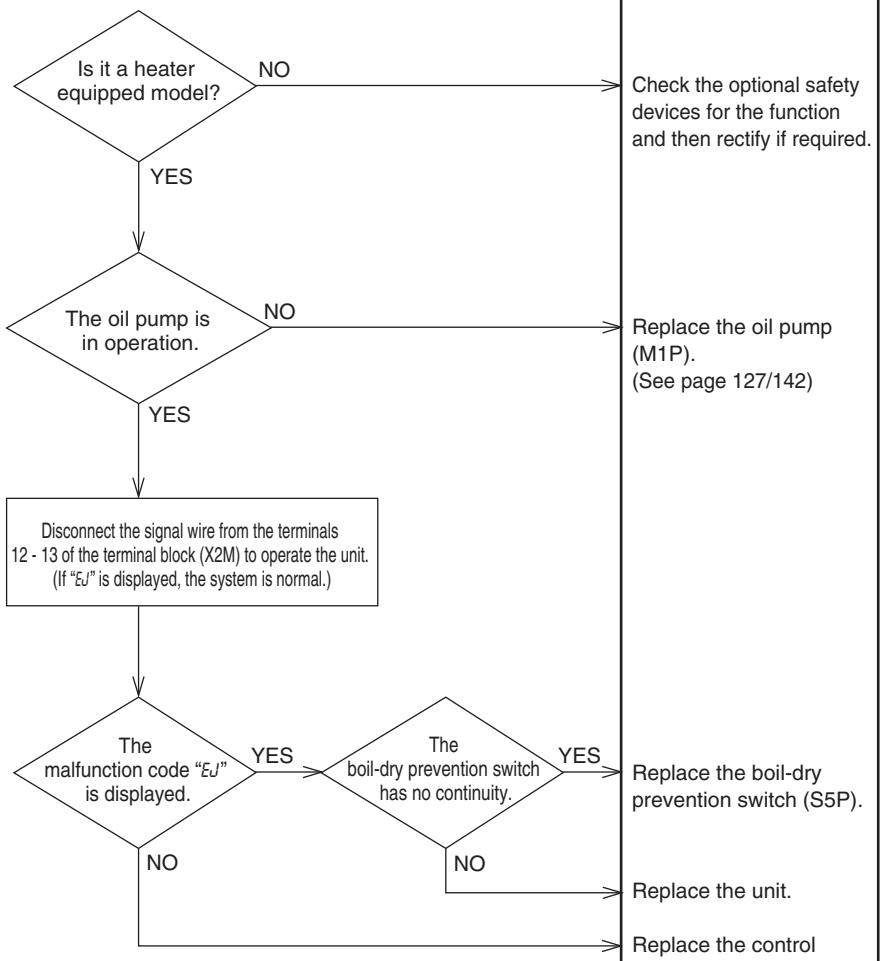
3 Malfunction Decision Conditions

Class	Conditions
50–53	①AKZ14A–43A-H Actuating (open) pressure: 0.02MPa or less ②AKZ56A, 90A-H Actuating (open) flow rate: 15L/min or less ③Models other than AKZ**A-H Actuating (open) pressure of the optional safety devices.

4 Supposed Causes

- Faulty optional device
- Faulty boil-dry prevention switch (S5P)
- Faulty control board (A1P)

5 Troubleshooting



Control panel display
FE

Malfunction due to High Oil Temperature (Rise in Oil Temperature)

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect with the inlet oil thermistor (Th-4)

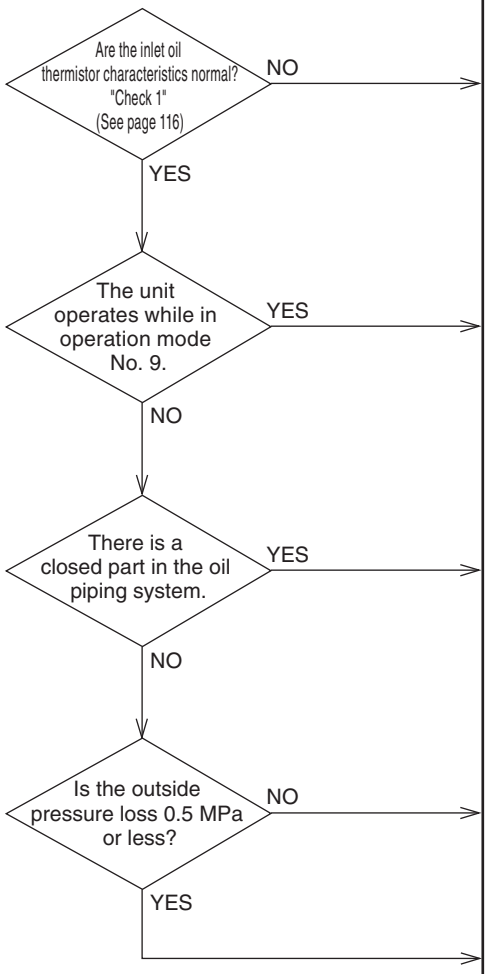
3 Malfunction Decision Conditions

Class	Conditions
10	The inlet oil temperature exceeds 65℃ for a period of consecutive 10 seconds.

4 Supposed Causes

- Faulty inlet oil thermistor (Th-4)
- Improper operation mode
- Defective oil piping
- Faulty control board (A1P)

5 Troubleshooting



Control panel display: FH

Rise in Oil Inlet Temperature

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect with the inlet oil thermistor (Th-4)

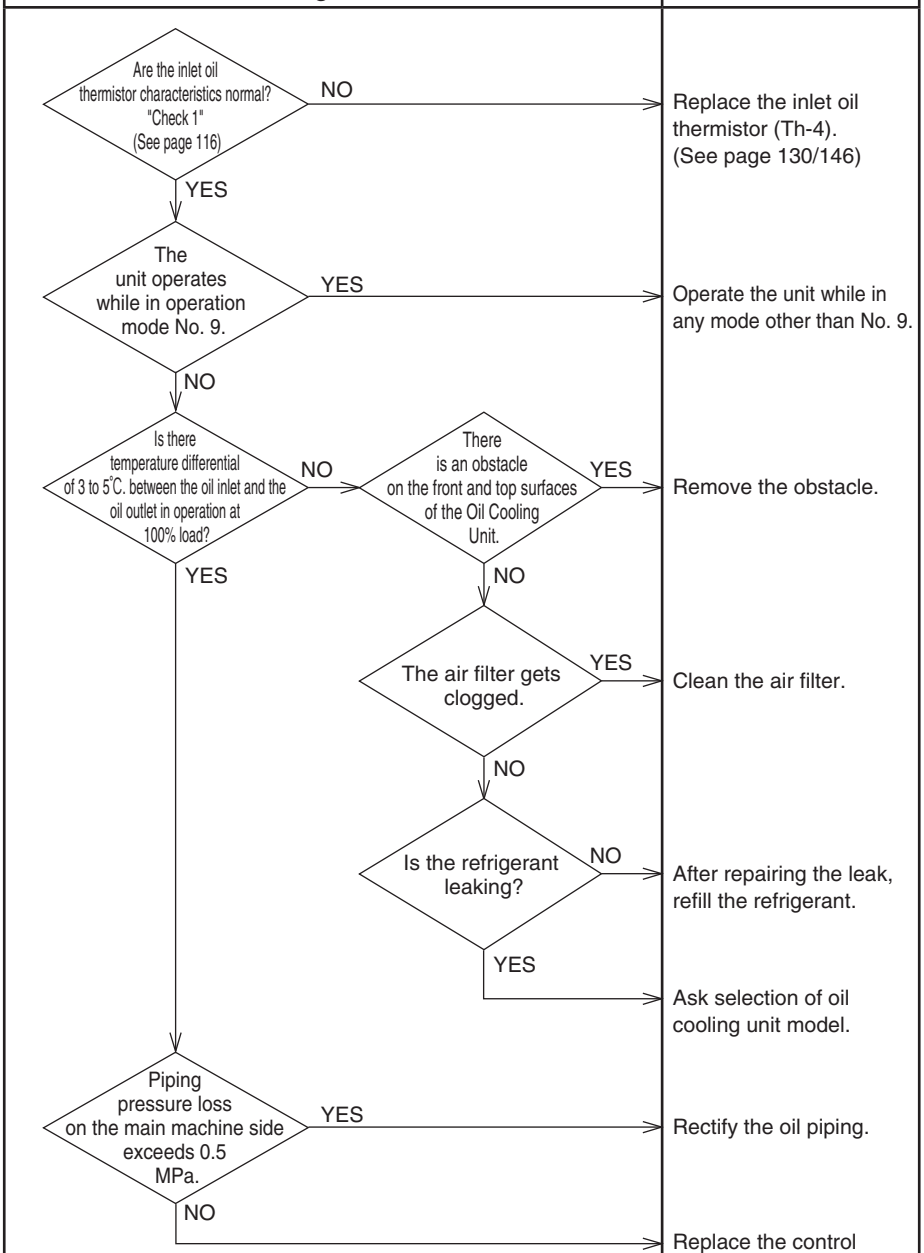
3 Malfunction Decision Conditions

Class	Conditions
10	The inlet oil temperature exceeds 60℃ for a period of consecutive 60 seconds.

4 Supposed Causes

- Faulty inlet oil thermistor (Th-4)
- Improper model selection
- Dirty air filter
- Improper operation mode
- Defective oil piping
- Faulty control board (A1P)
- Refrigerant shortage

5 Troubleshooting



Control panel display
H0,H1,J3,J4
J6,JH,JJ

Malfunction of Thermistors

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect malfunction according to resistance detected with thermistor.

3 Malfunction Decision Conditions

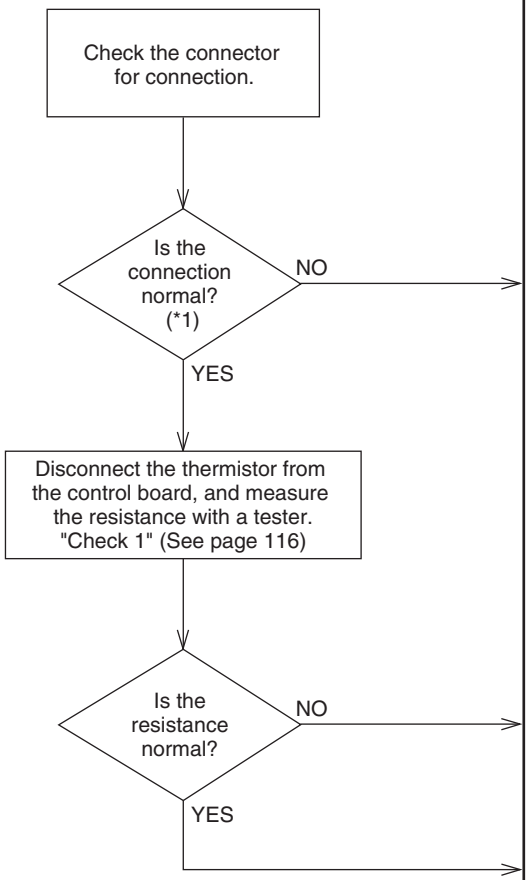
Class	Conditions
10	When disconnection or short circuit of the thermistor is detected.
99	When 150 hours have passed with the thermistor disconnected or short-circuited.

4 Supposed Causes

- Faulty thermistor
- Faulty control board (A1P)
- Faulty thermistor connection

5 Troubleshooting

Diagnosis



Countermeasures

Properly connect the connector.

Replace the thermistor. (See page 130–131/146–147)

Replace the control board (A1P). (See page 122/137)

*1: Alarm code and corresponding thermistor

Alarm code (a)	Corresponding thermistor	Symbol	Connector No.
H0	Machine body thermistor (b)	Th-1	30-31 (X2M terminal block)
H1	Room thermistor (b)	Th-3	CN10
J3	Discharge thermistor (c)	Th-6	S9
J4	EE valve outlet thermistor (c)	Th-8	
J6	Condenser thermistor (c)	Th-7	
JH	Inlet oil thermistor (b)	Th-4	
JJ	Outlet oil thermistor (b)	Th-2	CN11
	Optional thermistor	Th-9	

(a) The alarm code represents "control panel display (service monitor history display)".
(b) If it is not used as control, the alarm code will not be displayed.
(c) The alarm code will be displayed 150 hours after the warning code is displayed.

*2: For H1, JH, and JJ, emergency operation (warning display and output) is enabled by changing to the operation mode without use of faulty thermistor. For J3, J4, and J6, emergency operation (warning display and output) is enabled by turning the power on again. Take any measures before alarm is displayed again and the unit is stopped after cumulative 150 hours of operation.

Control panel display: L4

Rise in IPM Temperature or Radiation Fin Temperature

1 Applicable Models

AKZ90A
AKZ14A–90A-500

2 Methods of Malfunction Detection

Detect with the IPM temperature or radiation fin temperature (Th-Fin) on the inverter board.

3 Malfunction Decision Conditions

Class	Conditions
70	When the temperature detected with the IPM temperature exceeds any of the following values. ・Operating temperature: 114℃ (AKZ14A–43A-500)
71	When the temperature detected with the fin temperature exceeds any of the following values. ・Operating temperature: 101.4℃ (AKZ90A) 93.8℃ (AKZ56A-500) 87.9℃ (AKZ90A-500)

4 Supposed Causes

- Faulty inverter board (A2P)
- Blocked air inlet and outlet
- Dirty radiator fin
- Ambient temperature too high

5 Troubleshooting

Diagnosis	Countermeasures
While in service monitor mode (refer to page 82), check to be sure the IPM temperature when an alarm occurs.	
Has the IPM temperature or radiation fin temperature reached the value shown on the left? YES	Remove causes of rise in the temperature. ・Blocked air inlet and outlet of the unit. ・Dirty radiation fin ・Ambient temperature too high
NO	Replace the inverter board (A2P). (See page 126/141)

Control panel display **L5**

Instantaneous Overcurrent of Power Device or IPM Temperature Abnormality (AKZ14A–56A only)

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect according to current passing through the power device.
Detected with error signal at the time of IPM temperature abnormality. (AKZ14A–56A only)

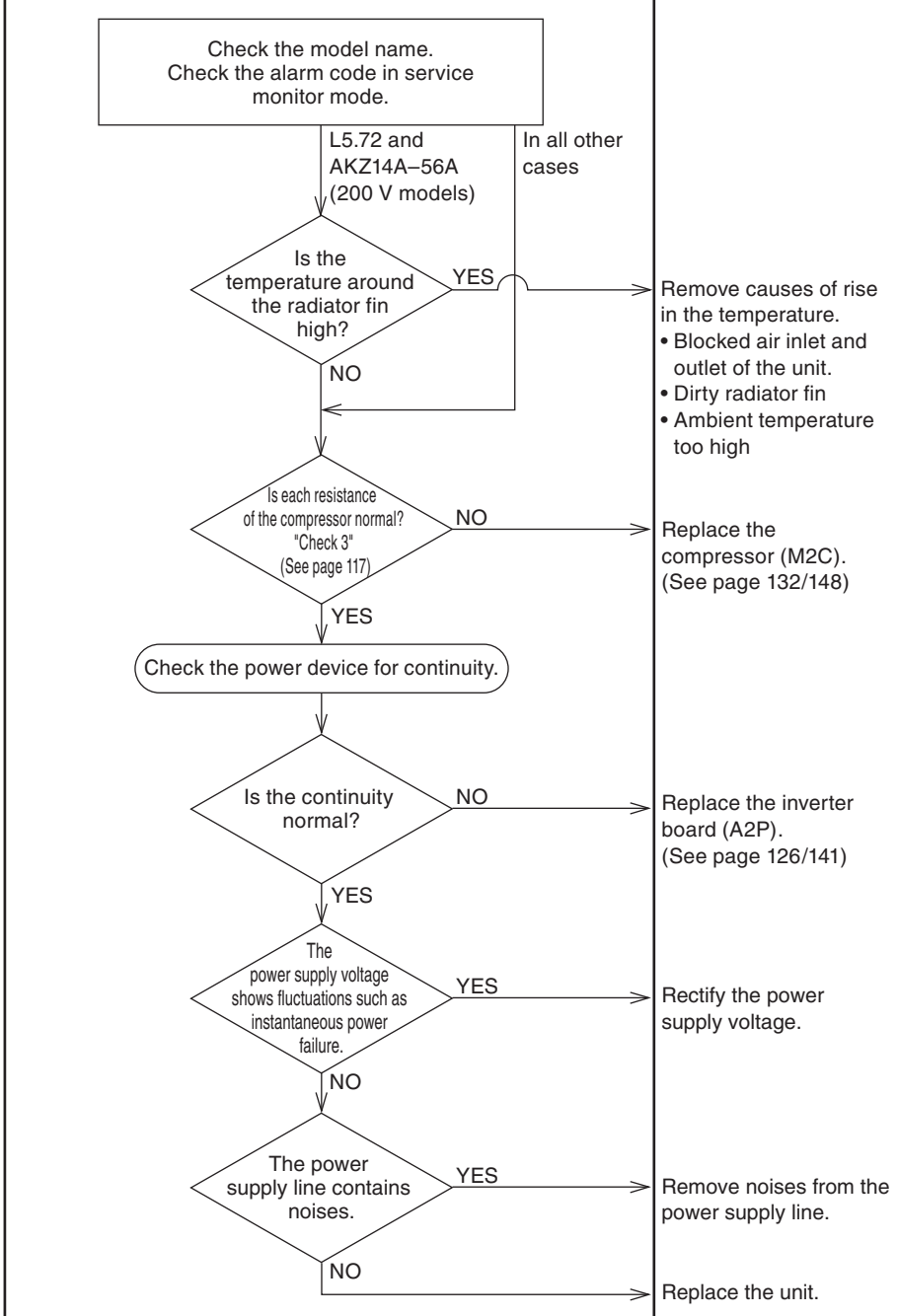
3 Malfunction Decision Conditions

Class	Conditions
70	When compressor step-out is detected (within 3 minutes after startup). (Retry: 3 times)
71	When compressor step-out is detected (after 3 minutes after startup). (Retry: 3 times)
72	When an IPM error signal is detected. (Retry: 3 times)

4 Supposed Causes

- Faulty compressor coil (M2C)
- Overcurrent due to the stall of compressor (M2C)
- Faulty power device
- Noise to power supply line
- Faulty inverter board (A2P)
- Blocked air inlet and outlet (AKZ14A–56A only)
- Dirty radiator fin (AKZ14A–56A only)
- Ambient temperature too high (AKZ14A–56A only)

5 Troubleshooting



Control panel display: L8

Compressor Overloaded

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect according to the output revolutions of the compressor (M2C).

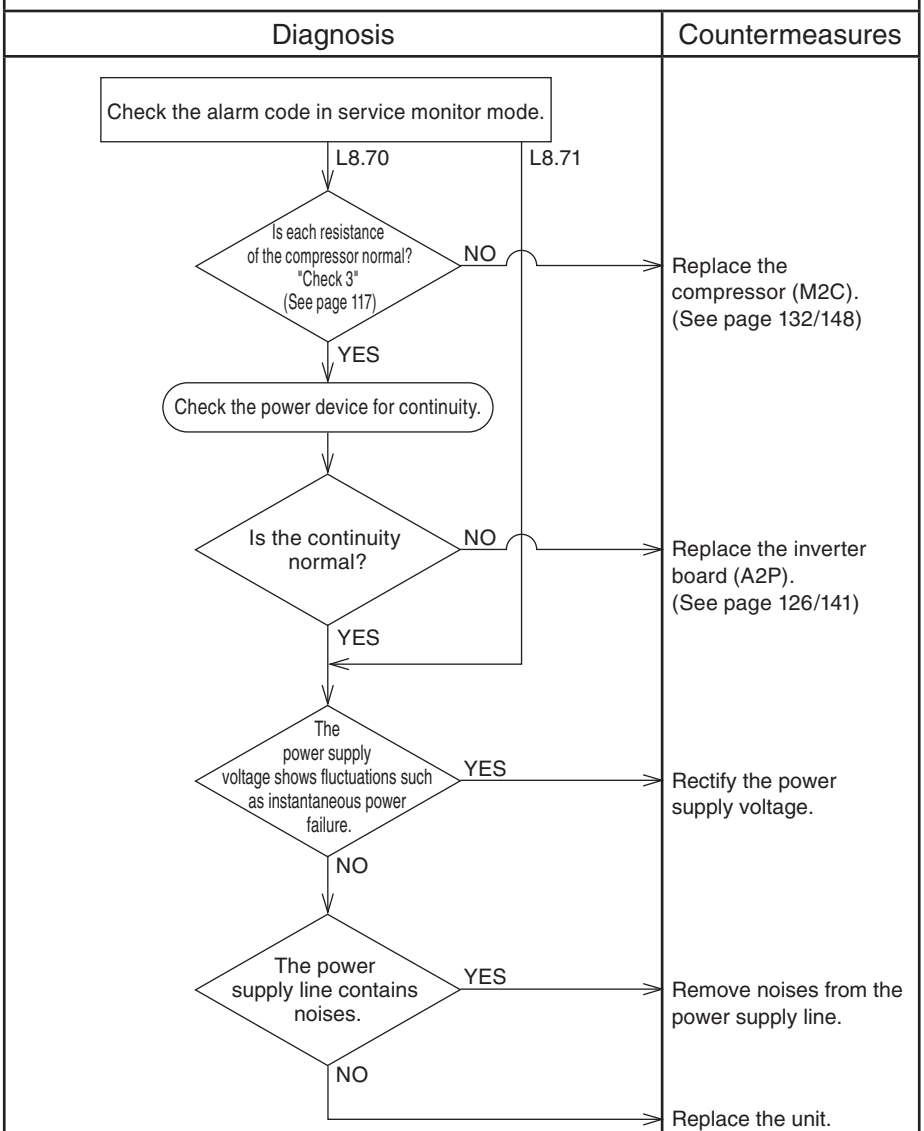
3 Malfunction Decision Conditions

Class	Conditions
70	When compressor step-out is detected. (Retry: 3 times)
71	When low voltage abnormality is detected. (Retry: 3 times)

4 Supposed Causes

- Compressor (M2C) overloaded
- Compressor (M2C) mechanically locked
- Faulty inverter board (A2P)
- Faulty power supply voltage (e.g. instantaneous power failure or slow-down of voltage)
- Noises present in the power supply line
- Lightning surge

5 Troubleshooting



Control panel display **L9**

Faulty Compressor Startup

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect according to the compressor (M2C) revolutions at startup.

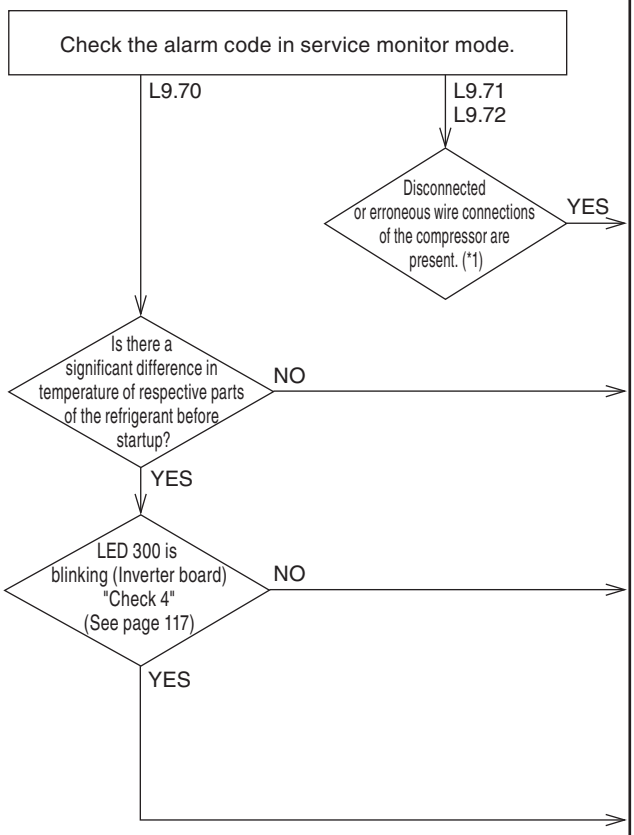
3 Malfunction Decision Conditions

Class	Conditions
70	The compressor does not rotate smoothly. (Retry: 3 times)
71	When single-phase open phase of the compressor is detected. (Retry: 3 times)
72	When two- or three-phase open phase or current abnormality of the compressor is detected. (Retry: 3 times)

4 Supposed Causes

- Faulty pressure equalization
- Faulty compressor (M2C) wire connections
- Faulty compressor (M2C) (incomplete lock)
- Faulty inverter board (A2P)
- Faulty EE valve (Y1E)

5 Troubleshooting



*1: If the compressor stops immediately after the compressor rotating sound is heard, it is highly possible that the wire is disconnected.

Control panel display: LA

Instantaneous Overcurrent of Power Device

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect by signals from current sensor and voltage sensor.

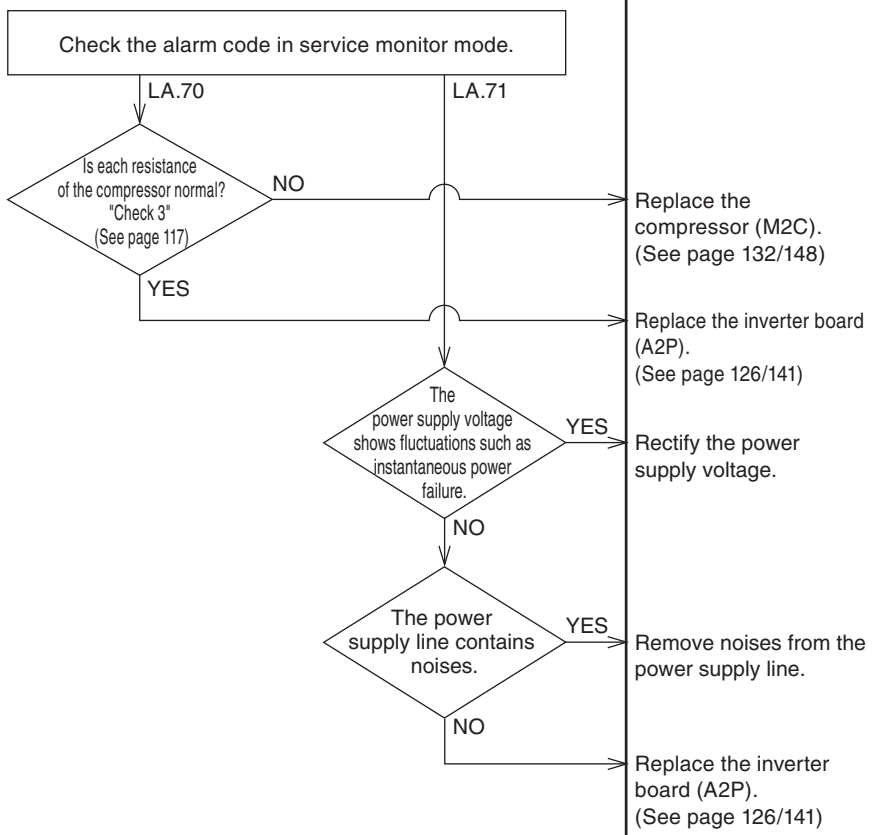
3 Malfunction Decision Conditions

Class	Conditions
70	When current abnormality is detected. (Retry: 3 times)
71	When voltage abnormality is detected. (Retry: 3 times)

4 Supposed Causes

- Faulty compressor (M2C) coil
- Overcurrent due to the stall of compressor (M2C)
- Faulty power device
- Noise to power supply line
- Faulty inverter board (A2P)

5 Troubleshooting



Control panel display: LC

Malfunction of Transmission between Inverter CPU and Temperature Control CPU

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Check communication conditions between the inverter microcomputer and the temperature control microcomputer

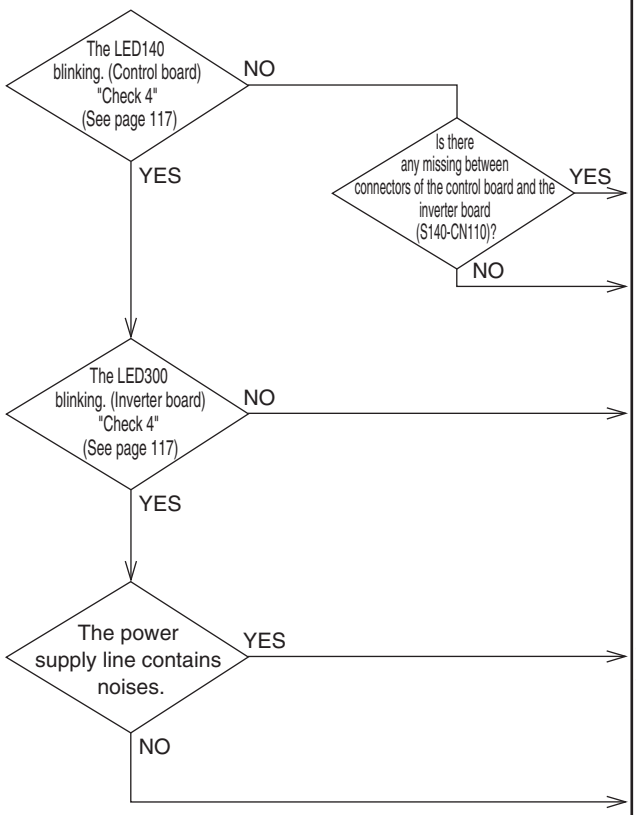
3 Malfunction Decision Conditions

Class	Conditions
10, 11	When the transmission is not performed normally for a period of given time or more. (Retry: 20 times)

4 Supposed Causes

- Faulty control board (A1P)
- Faulty inverter board (A2P)
- External noises or else

5 Troubleshooting



Control panel display: U0

Shortage of Refrigerant

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect the condenser temperature (Th-7) and the EE valve outlet temperature (Th-8) and make judgment of refrigerant quantity.

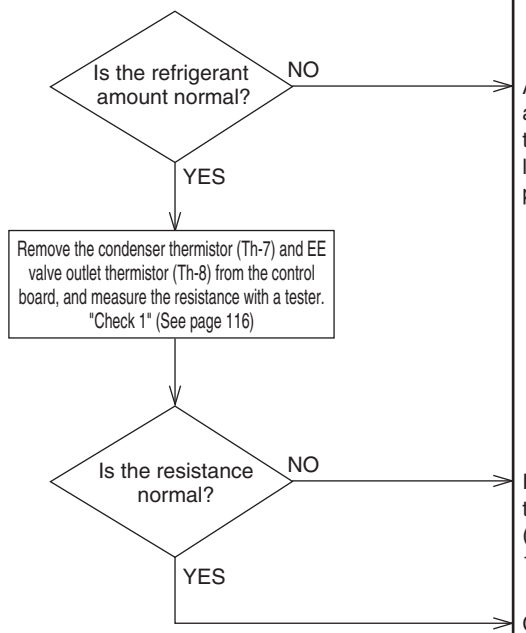
3 Malfunction Decision Conditions

Class	Conditions
10	When ① and ② continue for a period of 180 seconds. ①Command capacity ≧95% ②Condenser temperature − EE valve outlet temperature ≦5℃

4 Supposed Causes

- Shortage of refrigerant
- Clogged refrigerant piping
- Moisture choke
- Broken piping
- Faulty condenser thermistor (Th-7)
- Faulty EE valve outlet thermistor (Th-8)

5 Troubleshooting



Control panel display **U1**

Reverse Phase/Open Phase of Power Supply (Broken Wire in Fuse)

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect each phase in power supply phase detection circuit.

3 Malfunction Decision Conditions

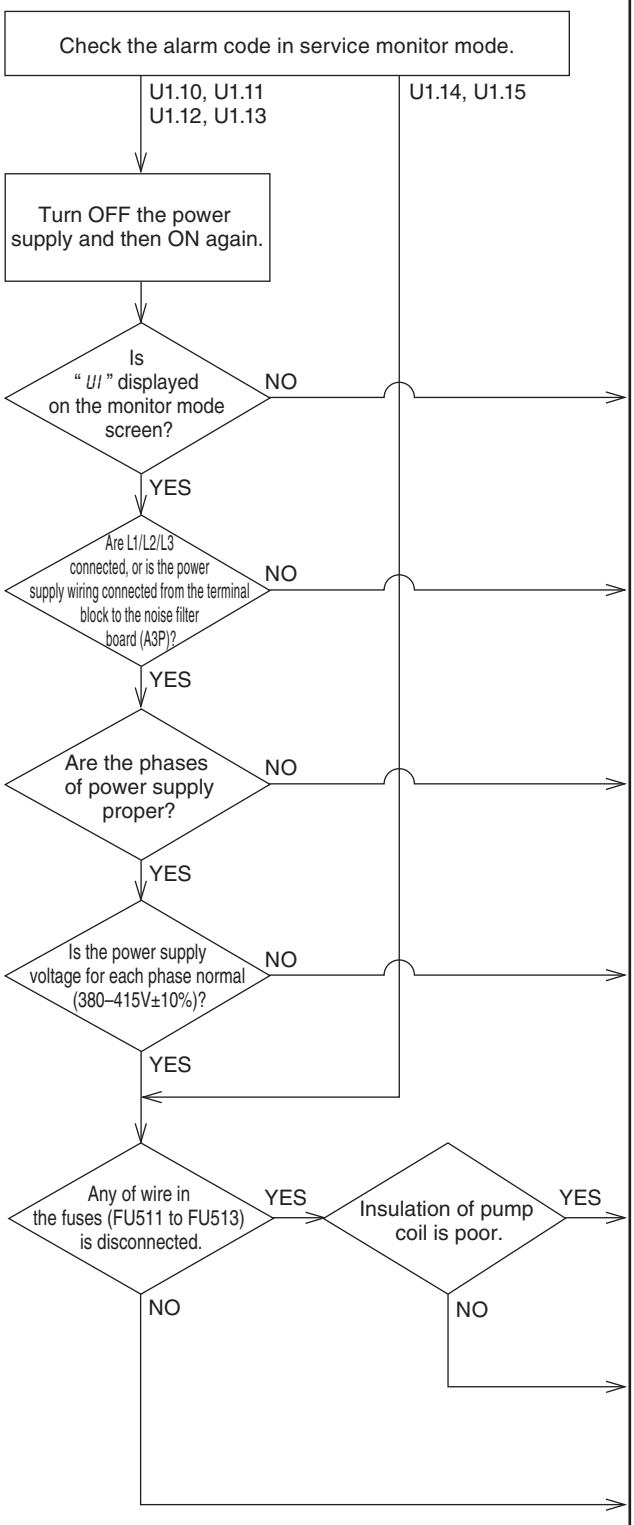
Class	Conditions
10	When reverse phase is detected in the power supply circuit immediately after the power is turned on.
11	When L1 is detected in the power supply circuit immediately after the power is turned on.
12	When L2 is detected in the power supply circuit immediately after the power is turned on.
13	When L3 is detected in the power supply circuit immediately after the power is turned on.
14	When single-phase open phase of L1, L2, or L3 is detected during use.
15	When two-phase open phase of L1, L2, or L3 is detected during use.

*If the power supply voltage is high or low, the conditions for classifications 11 and 12 may be reversed.

4 Supposed Causes

- Reverse phase in power supply line
- Open phase in power supply line
- Faulty noise filter board (A3P)
- Overloaded operation of oil pump
- Short circuit or poor insulation of oil pump coil
- Noises in power supply line
- Faulty control board (A1P)

5 Troubleshooting



Control panel display	Low voltage (Inverter Main Circuit DC voltage)
U2	

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect according to voltages of the inverter power supply DC unit.

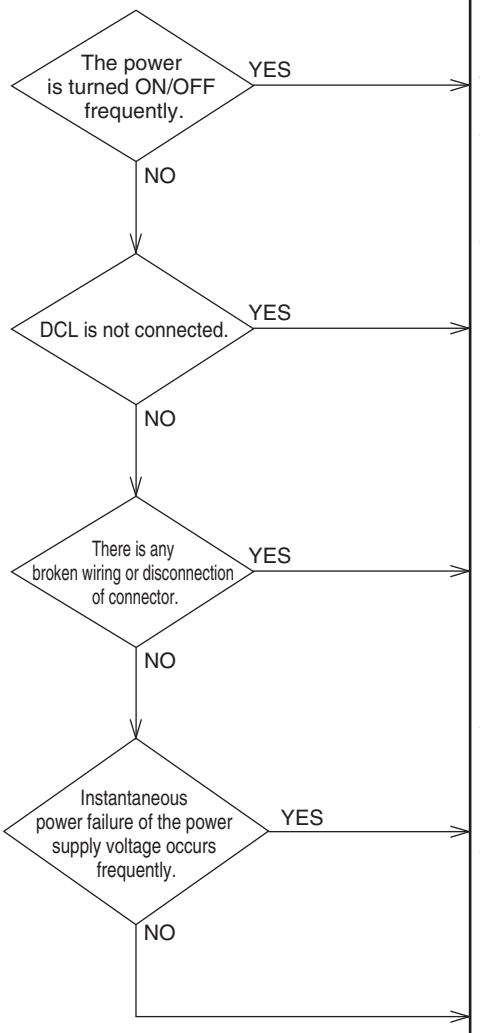
3 Malfunction Decision Conditions

Class	Conditions
70	When the main circuit voltage is insufficient.
71	When the main circuit voltage does not rise due to charging circuit failure. When the relay of the noise filter board is faulty.

4 Supposed Causes

- Inadequate power supply voltage
- Instantaneous power failure
- Faulty noise filter board (A3P)

5 Troubleshooting



Control panel display **U9**

Malfunction of Transmission with Slave Unit

1 Applicable Models

Master unit side of model using the communication board (optional)

2 Methods of Malfunction Detection

Check with the microcomputer whether or not the transmission with the slave unit is normally performed.

3 Malfunction Decision Conditions

Class	Conditions
10	When the transmission between the master unit and the slave unit is not performed normally for a period of given time or more.

4 Supposed Causes

- Faulty control board (A1P)
- Faulty connection in the transmission line
- Faulty communication board
- External noises or else

5 Troubleshooting

Diagnosis	Countermeasures
Check the communication line with the slave unit for connections.	
Normal? NO	Correct the connections.
YES	Replace the control board (A1P) and communication board. (Control board: see page 122/137)

Control panel display: UJ

Actuation of External Safety Device

1 Applicable Models

AKZ**A connected to the external safety device

2 Methods of Malfunction Detection

Detect open or short circuit between terminals through the CN2 terminal on the control board (A1P).

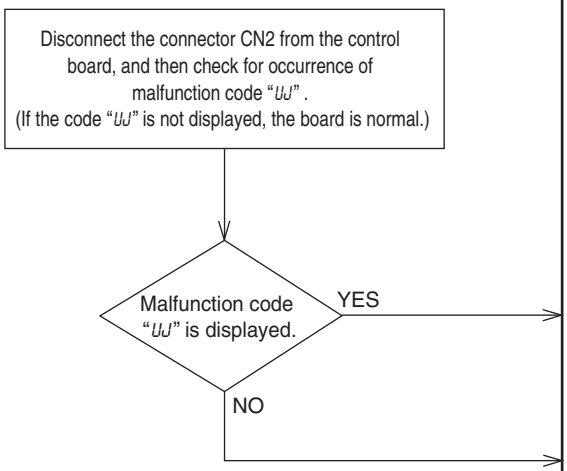
3 Malfunction Decision Conditions

Class	Conditions
50–53	The protective device connected to the CN2 on the control board is actuated.

4 Supposed Causes

- Actuation of external safety device
- Faulty control board (A1P)
- Without mounting the external safety device, parameter setting mode is enabled. (Set to any bit other than "0" with parameter No. 3.)

5 Troubleshooting



3-4. List of warning codes

Warning code	Warning level	Details	Operating conditions	Remarks	Reference
A5	—	Low oil level	①Clog of suction filter ②Increased pressure loss of oil circuit ③Use of viscous oil	Warning history record only	P.112
A7	—	Rise in power supply voltage for fan	Fan power supply voltage exceeds 380 V	Warning history record only	Keep the power supply voltage within the specified range.
E9	—	Electronic expansion valve for main circuit correction	Faulty EE valve or MO valve operation	Warning history record only	P.113
H1	2	Faulty room thermistor	The thermistor is disconnected or short-circuited (when not used for control)		P.114
J3	1	Faulty discharge thermistor	The thermistor is disconnected or short-circuited	To protect the oil cooling unit, alarm occurs after 150 hours of running, and then the unit is stopped.	P.114
J4	1	Faulty EE valve outlet thermistor	The thermistor is disconnected or short-circuited	To protect the oil cooling unit, alarm occurs after 150 hours of running, and then the unit is stopped.	P.114
J6	1	Faulty condenser thermistor	The thermistor is disconnected or short-circuited	To protect the oil cooling unit, alarm occurs after 150 hours of running, and then the unit is stopped.	P.114
JH	2	Faulty inlet oil thermistor	The thermistor is disconnected or short-circuited (when not used for control)		P.114
JJ	—	Faulty outlet or optional oil thermistor	The thermistor is disconnected or short-circuited (when not used for control)	Warning history record only	P.114
P3	—	Faulty switch box thermistor	The thermistor is disconnected or short-circuited	Warning history record only	P.114
P4	2	Faulty fin thermistor	The thermistor is disconnected or short-circuited	AKZ90A, AKZ56A/90A-500 only	P.114
L3	—	High tempetature switch box	Switch box temperature exceeds the threshold	Warning history record only	Check if there are any problems with the following. ①Are there any obstacles in the intake and exhaust ports of the unit? ②Is the radiation fin clean? ③Is the ambient temperature too high?
LH	—	Rise in main circuit voltage	When the following main circuit voltage values are detected • AKZ14A–90A: 380 V • AKZ14A–90A-500: 760 V	Warning history record only	Keep the power supply voltage within the specified range.
F6	2	Rise in pressure	①Decreased air volume (clog of air filter or obstacles around suction and exhaust port) ②Running out of high temperature range		P.115
U0	—	Malfunction of EE valve for main circuit	When ① and ② continue for 180 seconds. ①Command capacity ≧95% ②Condenser temperature - EE valve outlet temperature ≦5℃	Warning history record only If the alarm code U0 is in the history data, check the troubleshooting for alarm U0. (See page 106)	Unit automatically performs operation to remove blockages from EE valve for main circuit (no action by operator)

Warning level 1: Warning lamp blinks + Warning code display + alarm occurs after 150 hours of running
Warning level 2: Warning lamp lit + Warning code display
—: Warning lamp off + No display (warning history record only)

3-5. Troubleshooting Flowchart

Control panel display
A5
History record only

Low Oil Flow

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect decrease in pump flow by difference in temperature of the oil inlet and that of the oil outlet (Th-4 - Th-2).

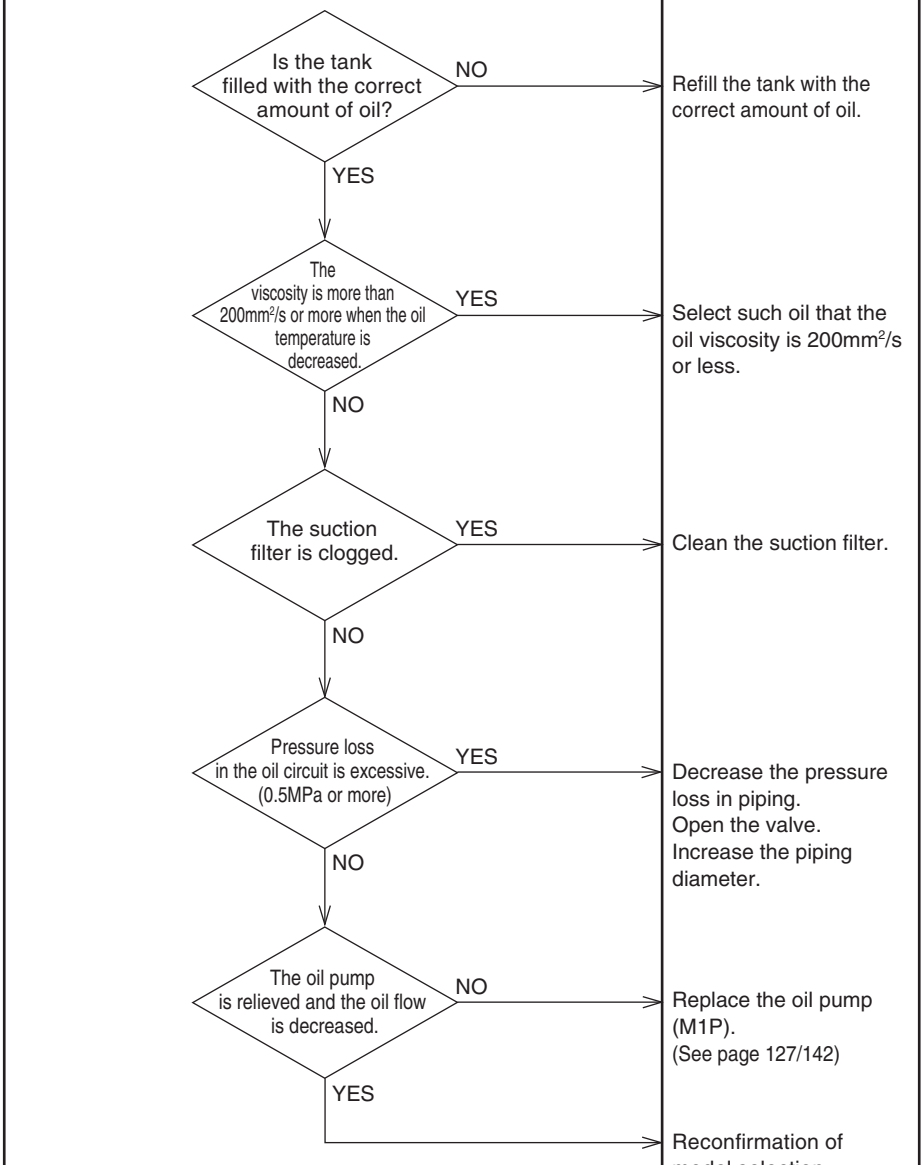
3 Malfunction Decision Conditions

Difference in temperature of the oil inlet and that of the oil outlet is as shown below.
AKZ14A＞5℃
AKZ32A＞6℃
AKZ43A＞11℃
AKZ56A＞9℃
AKZ90A＞14℃

4 Supposed Causes

- Low tank liquid level
- Clog of suction filter
- Increase in resistance in oil circuit (closed valve, etc.)
- Viscous oil

5 Troubleshooting



Control panel display
E9
History record only

Electronic expansion valve for main circuit correction

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

● Detect by the status of the minimum opening correction of the EE valve.

<Requisition of EE valve minimum opening correction>
When the EE valve outlet temperature lower than the levels shown below is detected, the EE valve minimum opening is corrected by +1 pulse (corrected to 12 pulses maximally).

・AKZ14A, 56A, 90A: -15℃ or lower
AKZ32A, 43A: -10℃ or lower

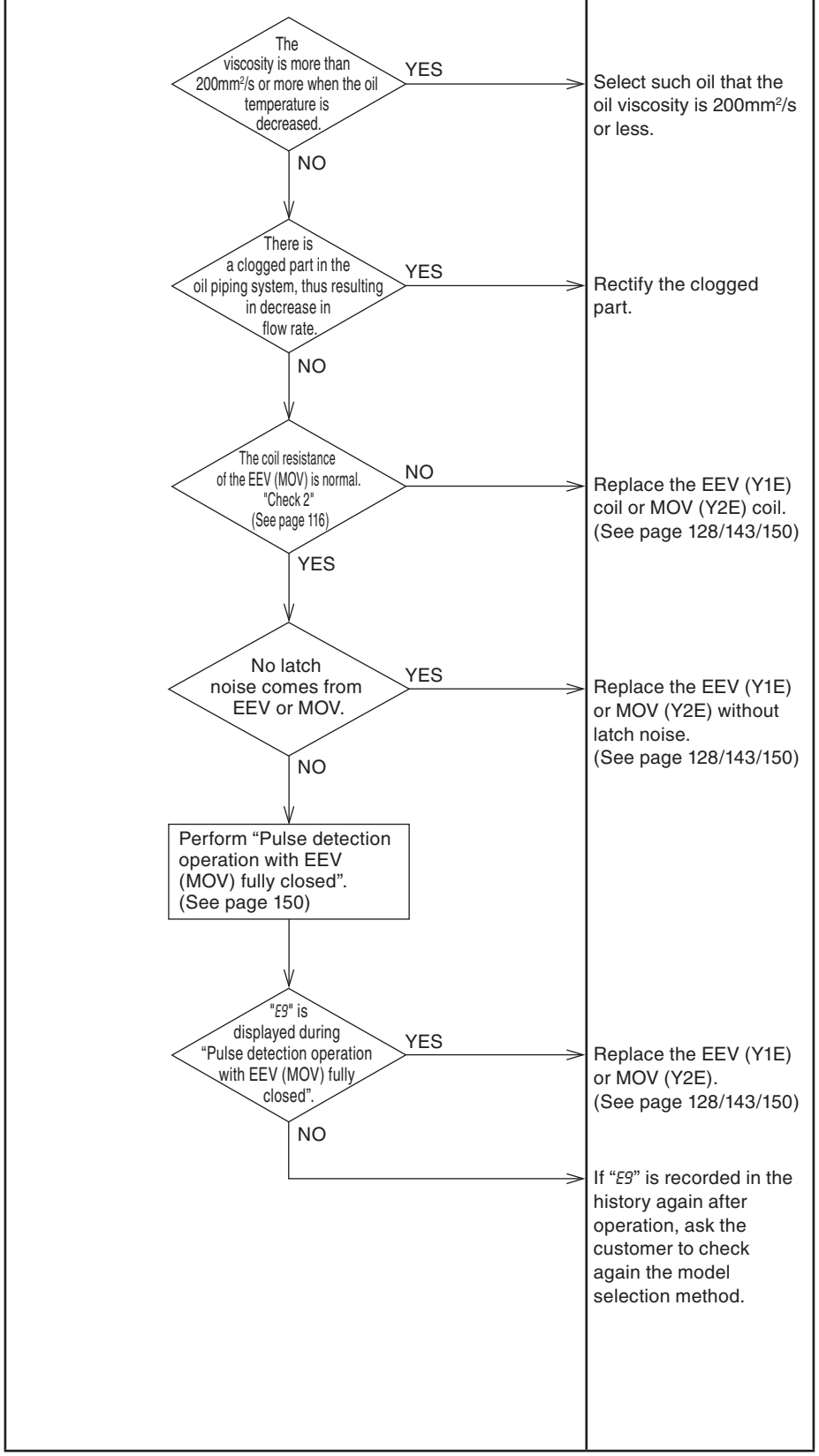
3 Malfunction Decision Conditions

The EE valve minimum opening correction is carried out for twelve times (12 pulses).

4 Supposed Causes

● Wrong EE valve minimum pulse setting (set to n024).
● Faulty electronic expansion valve for main circuit (EEV) (Y1E) operation.
● Faulty motor operated valve for hot gas (MOV) (Y2E) operation.

5 Troubleshooting



Control panel display	Malfunction of Thermistors
H1,J3,J4, J6,JH,JJ,P3,P4	

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect by the resistance detected by the thermistor.

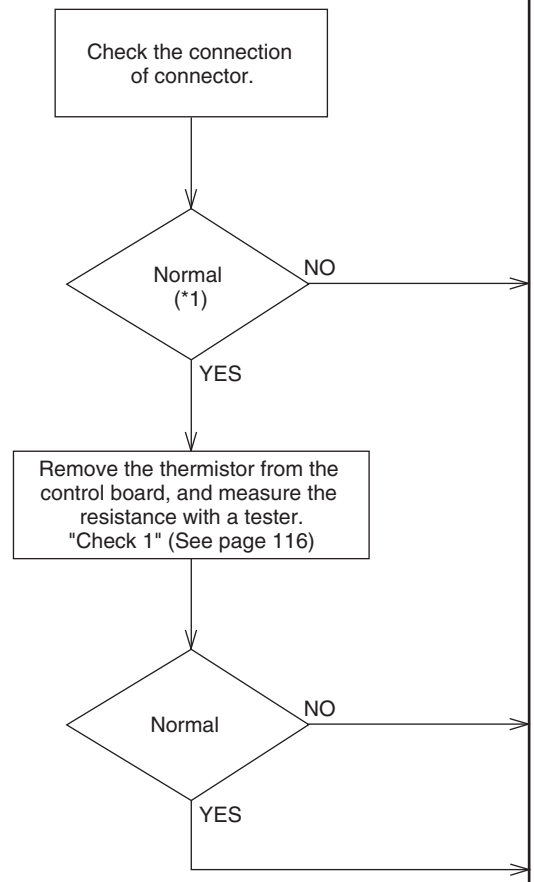
3 Malfunction Decision Conditions

The thermistor disconnection or short-circuit is detected.

4 Supposed Causes

- Faulty thermistor
- Faulty control board (A1P)
- Faulty thermistor connection

5 Troubleshooting



*1: Warning codes and applicable thermistors

Warning code (a)	Applicable thermistor	Symbol	Connector No.
H1 (H1)	Room thermistor (b)	Th-3	CN10
J3 (J3)	Discharge thermistor	Th-6	S9
J4 (J4)	EE valve outlet thermistor	Th-8	
J6 (J6)	Condenser thermistor	Th-7	
JH (JH)	Inlet oil thermistor (b)	Th-4	
- (JJ)	Outlet oil thermistor (b)	Th-2	CN11
	Optional thermistor	Th-9	
- (P3)	Switch box thermistor	Th-300	—
P4 (P4)	Radiation fin thermistor	Th-Fin	CN18

(a) The warning code represents “control panel display (service monitor history display)”.
(b) If it is not used as control, the warning code will not be displayed.

Control panel display **F6** — High-pressure

1 Applicable Models

AKZ**A (All series)

2 Methods of Malfunction Detection

Detect by the reduced compressor operation (discharge pipe temperature or condenser temperature) status. Reduced compressor operation condition: Discharge pipe temperature≧95℃ or condenser temperature≧57℃.

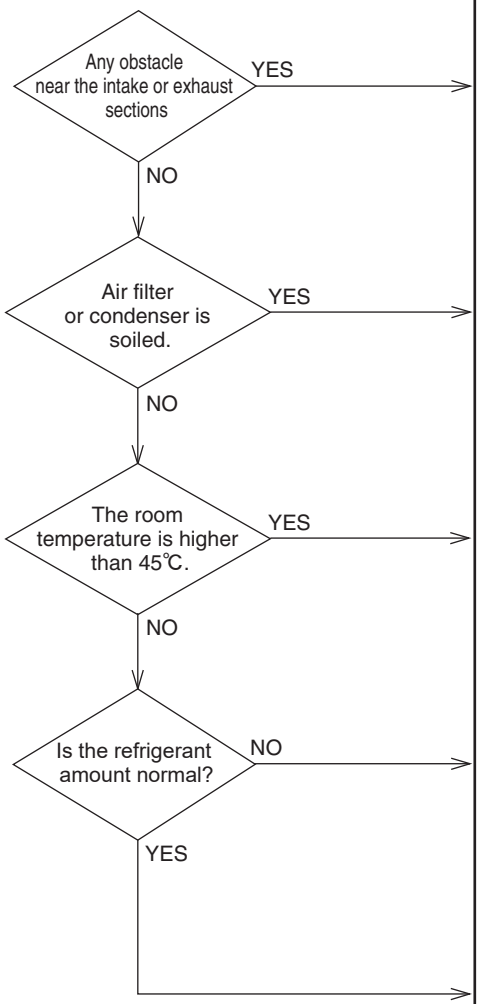
3 Malfunction Decision Conditions

①Reduced compressor operation is executed when the room temperature is 30℃ or lower
②Reduced compressor speed starts at the point of warning capacity command value. Warning capacity command values are: 60% for AKZ14A, 30% for AKZ32A–90A.

4 Supposed Causes

- Obstacles around the intake or exhaust sections
- Soiled air filter or condenser
- Higher room temperature
- Shortage of refrigerant (Slow leak)
- Clogged refrigerant piping

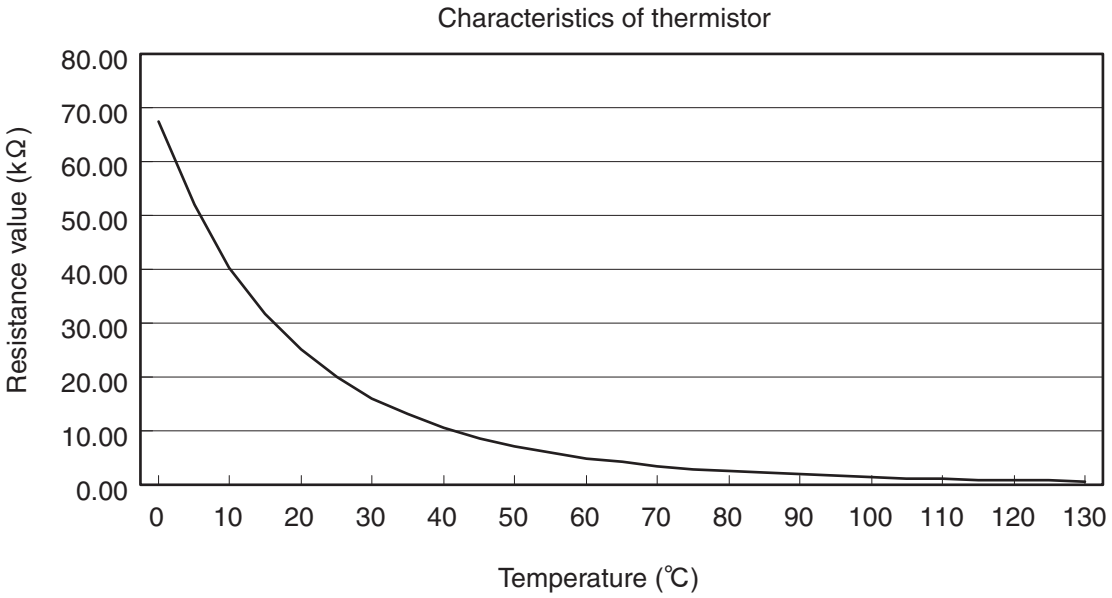
5 Troubleshooting



4 Check

Check 1 Check the thermistor resistance value

Remove each thermistor and connector, and measure the resistance value of each thermistor with a tester.
The relationship between temperature and resistance during normal operation is as shown in the graph and table below.



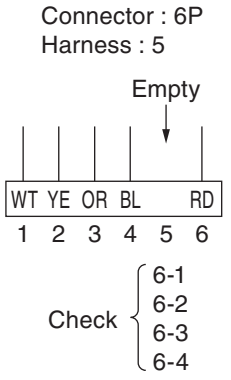
Temperature (℃)	0	10	15	20	25	30	35	40	45	50	55	60	65
Resistance value (kΩ)	67.33	40.38	31.69	25.08	20.00	16.07	13.01	10.60	8.69	7.17	5.95	4.97	4.17

Temperature (℃)	70	75	80	85	90	95	100	105	110	115	120	125	130
Resistance value (kΩ)	3.51	2.98	2.54	2.17	1.86	1.61	1.39	1.21	1.06	0.92	0.81	0.72	0.63

Check 2 Check the motor operated valve

Check the motor operated valve according to the following items.
①Check if the motor operated valve connector is properly inserted on the control board, and check the harness of the motor operated valve coil against the connector number.
②Check if there is any rattling latch noise when the power supply is turned off and then turned on again.
③If there is no noise in ② above, remove the connector and check the resistance of the motor operated valve coil.

*Normal motor operated valve coil resistance
Electronic expansion valve for main circuit (Y1E): 46 ± 4Ω (20℃)
Motor operated valve for hot gas (Y2E): 46 ± 3Ω (20℃)



Check 3 Check the compressor resistance

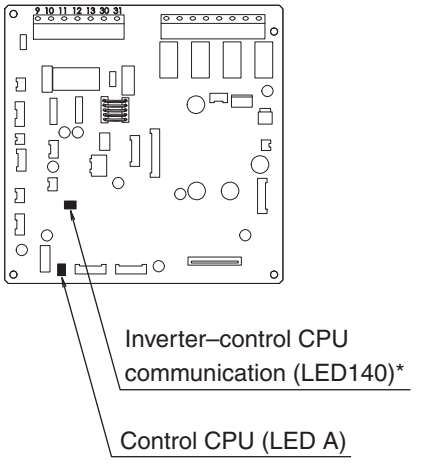
①Turn off the power supply, and then disconnect wires (U, V, W) from the compressor.
②Measure insulation resistance between each of the terminals and the casing of the compressor.
③Measure resistance between terminals of the compressor.

*Normal compressor coil resistance (±5%)

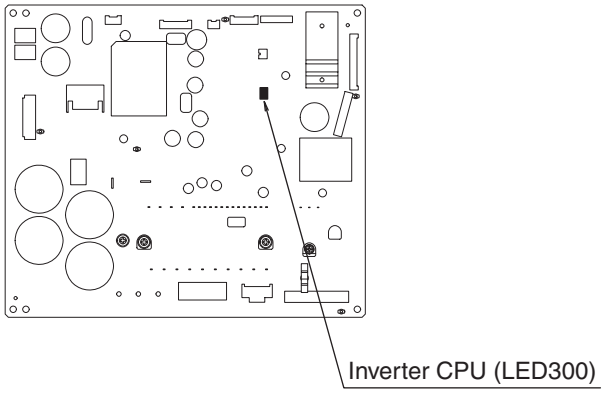
Applicable compressor (model with equipped)	1Y091AKAX1C (AKZ14A, 32A, 43A)	2Y147AKAX1S (AKZ56A)	2Y260APAX2S (AKZ90A)
Coil resistance Ω (20℃) (Mean value between terminals)	1.764	1.114	0.310

Check 4 LED lamp position on the control board

Check that the control CPU LED, inverter CPU LED, and inverter–control CPU communication LED are blinking green in the 3 positions shown below.
It is normal that the LED lamp on the board blinks.
If the LED lamp turns ON or OFF, that shows an abnormality.



Control board (A1P)



Inverter board (A2P)

*The inverter–control CPU communication LED blinks faster than the other 2 LEDs.

Disassembling Procedure

1 AKZ14A–43A

Procedure for Removing Outside Panel Block

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

1. Removing filter, top panel, and related parts

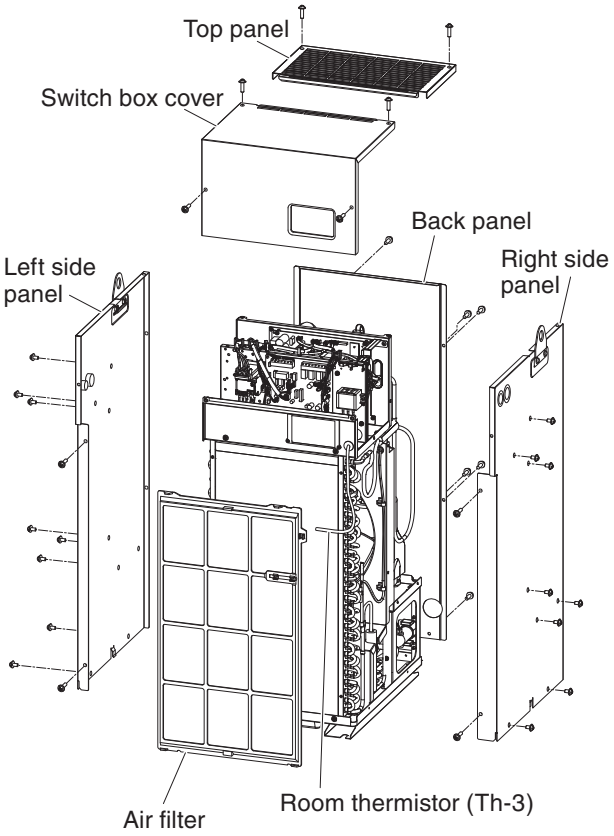
① Remove the room thermistor (Th-3) from the air filter.
② Remove the air filter.
③ Unscrew the four screws that hold the switch box cover. (*1)
④ Unscrew the two screws that hold the top panel, and remove it.

2. Removing back panel, side panel, and related parts

① Unscrew the six screws that hold the back panel.
② Unscrew the screws (no. of pcs.: A) that hold the left side panel, and pull it out upward.
③ Unscrew the screws (no. of pcs.: B) that hold the right side panel, and pull it out upward.

(pcs.)

	A	B
AKZ14A	9	9
AKZ32A	9	9
AKZ43A	10	10



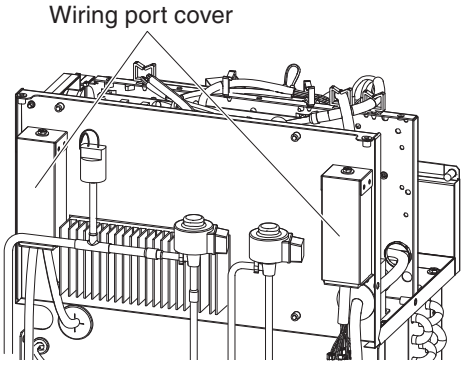
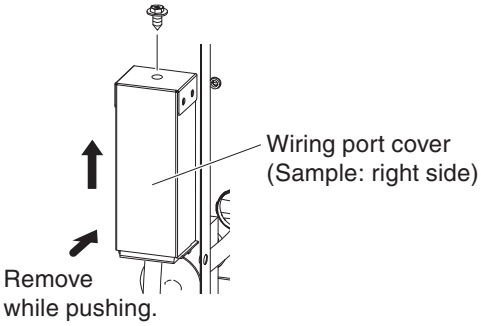
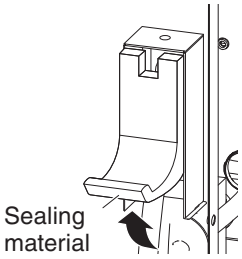
Point

*1
Notes on mounting switch box cover

① Check for any damage on the sealing material on the back of the cover. If any damage is found, replace with new one.
② Adjust the screw tightening torque to 1N-m ±10% during mounting. Use the screws dedicated for the switch box cover. (DO NOT use the tapped screws for plate of cross-recessed hexagon head bolt with flat washer M4 x 12 causing damage to screw hole.)

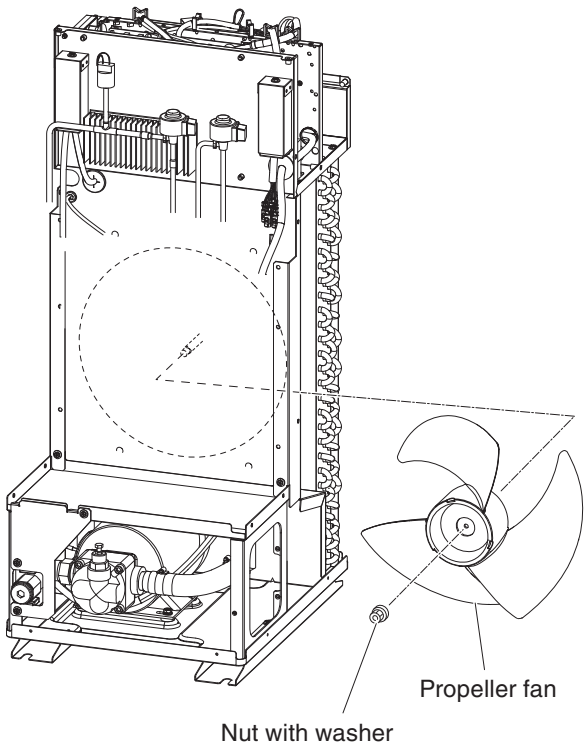
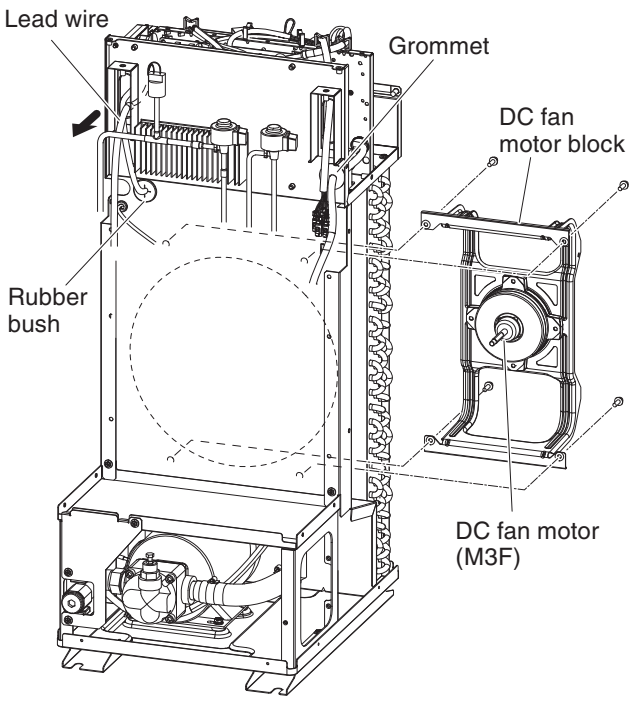
Procedure for Removing Wiring Inside Wiring Port

⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Many of the DC fan motor (M3F), electronic expansion valve for main circuit (Y1E), motor operated valve for hot gas (Y2E), high pressure switch (S3PH), and connection wiring (lead wires) to the other electrical components pass through the left and right wiring ports, instead of the conventional grommet. To remove these wires, follow the procedure below.		
1. Removing the wiring port cover and sealing material.		
① Unscrew one screw and remove the wiring port cover.		
② Peel off the sealing material inside. (*1) ③ Pull out the lead wire of the part to be replaced.		*1 Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded. ⬇ Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Propeller Fan, DC Fan Motor

⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.118)".		
1. Removing propeller fan ① Remove the nut with washer fixing the propeller fan. ② Remove the propeller fan, and take it out from the left side when viewed from the front.* * Take out the DC fan motor (M3F) after removing the DC fan motor block. (Refer to "2. Removing DC fan motor (M3F)".)		
2. Removing DC fan motor (M3F) ① Disconnect the DC fan motor connector (CN15) from the inverter board (A2P). ② Cut the banding band of the lead wires. ③ Take the lead wire off the wiring port cover. (See page 119) (*1) ④ Unscrew the four screws fixing the DC fan motor block with the DC fan motor (M3F) mounted to remove it from the left side when viewed from the front. ⑤ Unscrew the four screws to remove the DC fan motor (M3F) from the DC fan motor block.		*1 Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded. ⬇ Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Switch Box *1

⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.118)".

1. Removing control panel mounting plate

① Disconnect the display board connector located back of the control panel. (*2)
② Disconnect the room thermistor connector (CN10) from the control board (A1P).
③ Unscrew the two screws fixing the control panel mounting plate to take it.

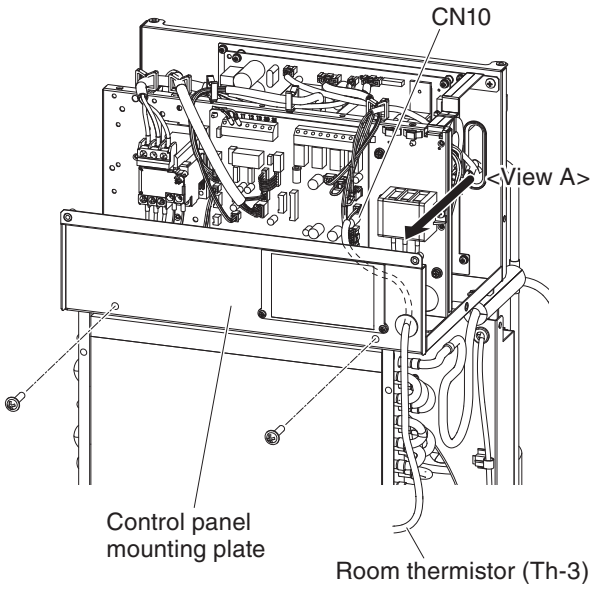
2. Removing connected wiring to switch box

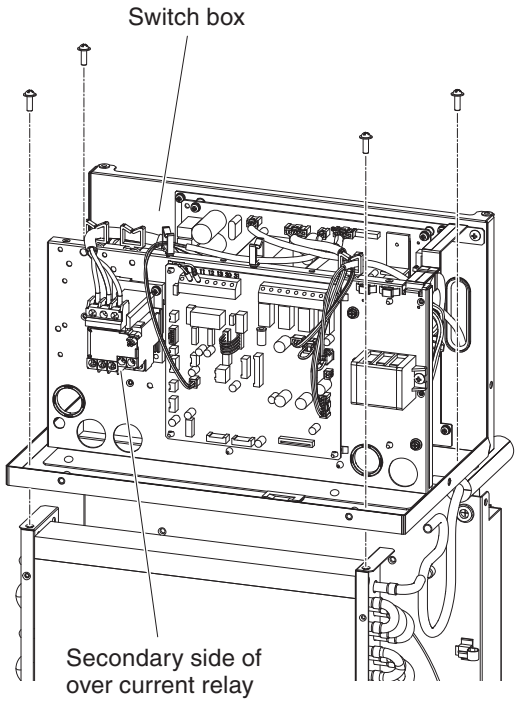
① Disconnect all the connectors and wiring connected from outside into the switch box.
- Primary side of power supply terminal block (to be wired by customer)
- Secondary side of over current relay (*3)
- Control board (A1P)
  1) Thermistor assembly (S9)
  2) Outlet oil thermistor (CN11)
  3) EE valve coil (S90)
  4) MO valve coil (CN7)
  5) High pressure switch (S171)*
     * "C" models only
  6) Compressor protective thermostat (S172)
  7) Signal terminal block (X2M)
- Inverter board (A2P)
  1) Compressor (relay connector in switch box)
  2) DC fan motor (CN15)

② Take the lead wire off the wiring port cover. (See page 119) (*4)

3. Removing switch box

① Unscrew the four screws fixing the switch box.
② Pull up and remove the switch box.



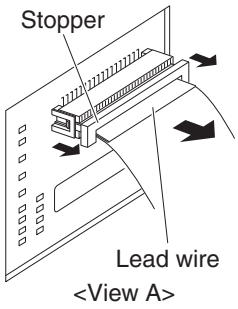


Point

*1
When replacing the switch box, change the setting data referring to "Replacing Control Board" (P.149).

*2
Disconnecting display board

Pull up the stopper of the connector from both sides, and disconnect the lead wire.



*3
Unless the control panel mounting plate is removed first, wiring of the secondary side of the over current relay cannot be disconnected.

*4
Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded.
⬇
Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Control Board *1

WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

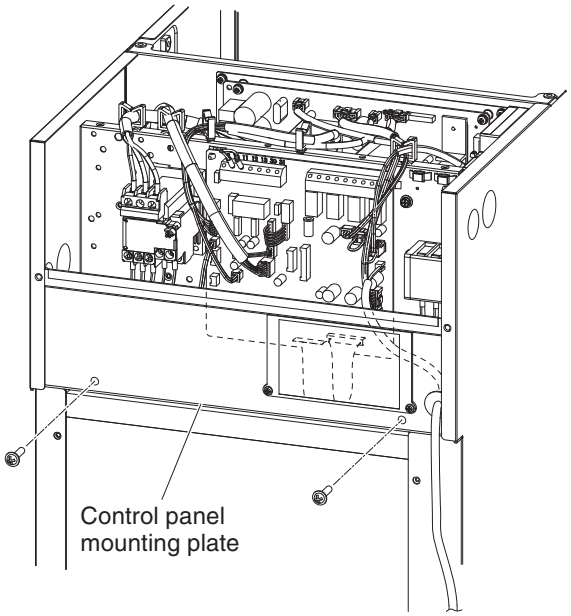
- Remove the switch box cover in accordance with “Procedure for Removing Outside Panel Block (P.118)”.
- Remove the control panel mounting plate in accordance with “Procedure for Removing Switch Box (P.121)”.

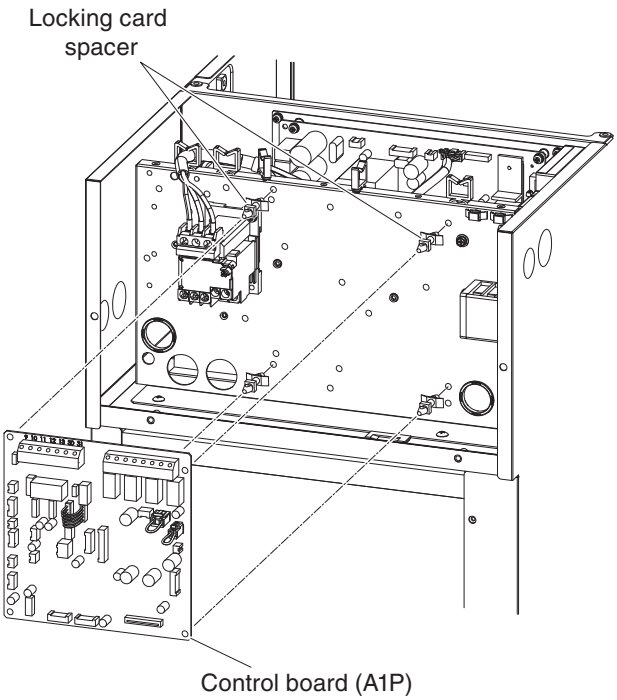
1. Removing control board (A1P)

① Disconnect all the wiring connected on the control board (A1P).
- 1) Thermistor assembly (S9)
- 2) Outlet oil thermistor (CN11)
- 3) EE valve coil (S90)
- 4) MO valve coil (CN7)
- 5) High pressure switch (S171)*2
- 6) Compressor protective thermostat (S172)
- 7) Signal terminal block (X2M)*3
- 8) Inverter board power supply wire (S200)
- 9) Inverter board signal wire 1 (S170)
- 10) Inverter board signal wire 2 (S140)
- 11) Inverter board signal wire 3 (S60)
- 12) Over current relay signal wire (S182)
- 13) Optional board signal wire*3

*2: "-C" models only
*3: connected units only

② Remove the four locking card spacers to take off the control board (A1P).





*1
When replacing the control board, change the setting data referring to the “Replacing Control Board” (P.149).

Procedure for Removing Noise Filter Board (AKZ14A–43A-500)

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

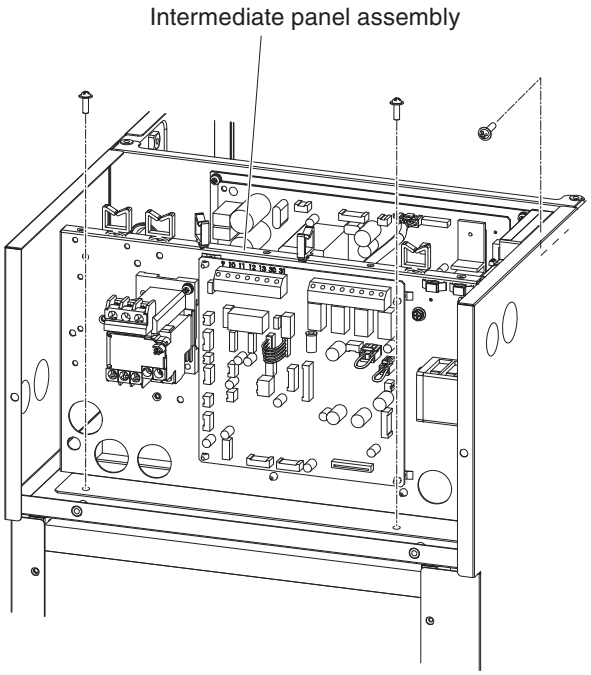
- Remove the switch box cover in accordance with "Procedure for Removing Outside Panel Block (P.118)".
- Remove the control panel mounting plate in accordance with "Procedure for Removing Switch Box (P.121)".

1. Removing intermediate panel

① Unscrew the three screws fixing the intermediate panel assembly.

② Disconnect the wiring connected to the intermediate panel assembly.

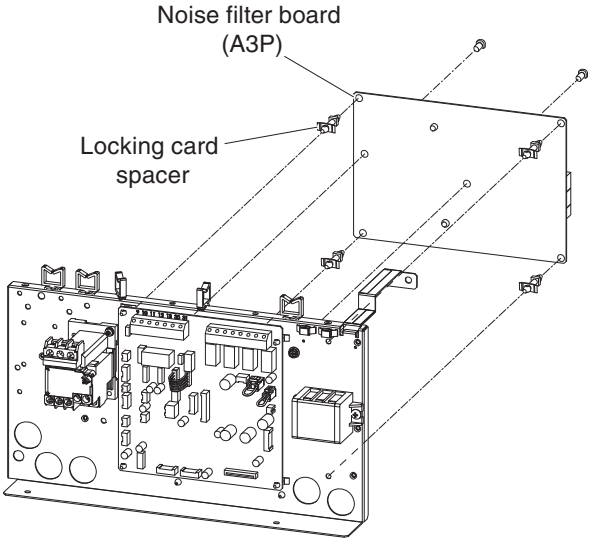
- Primary side of power supply terminal block (to be wired by customer)
- Secondary side of over current relay
- Control board (A1P)
  See the last page "1. Removing control board (A1P)."
- Noise filter board (A3P)
  1) Main circuit power supply wire (R1: F504, S1: F505, T1: F506)
  2) Inverter board signal wire 1 (X530)
  3) Inverter board signal wire 2 (X500)



2. Removing noise filter board (A3P)

① Disconnect all the wiring connected to the noise filter board (A3P).
  1) Power supply wire (L1: HS501, L2: HS502, L3: HS503)
  2) Control board signal wire (X520)
  3) Over current relay (pump power supply wire): (R2: F507, S2: F508, T2: F509)

② Remove the four locking card spacers and two screws to take out the noise filter board (A3P).



Procedure for Removing Inverter Board (AKZ14A–43A) (1/2)

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

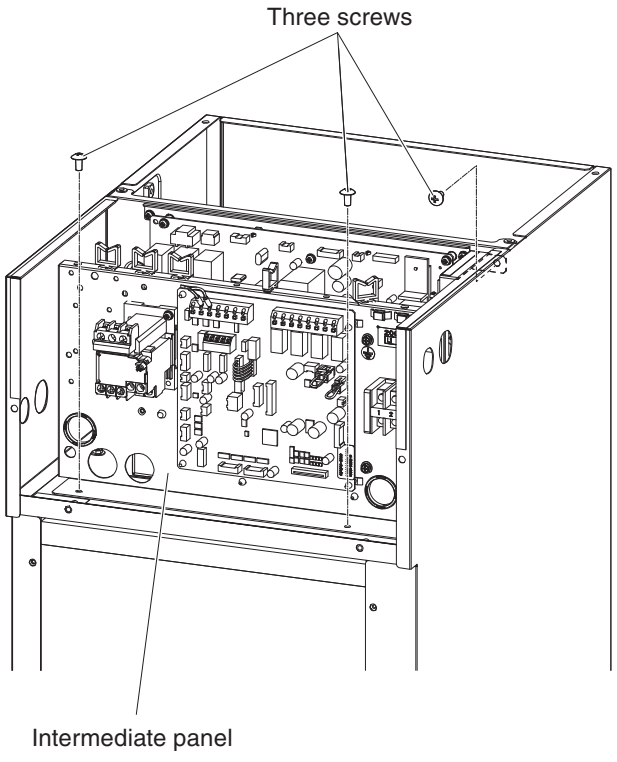
- Remove the switch box cover in accordance with "Procedure for Removing Outside Panel Block (P.118)".
- Remove the control panel mounting plate in accordance with "Procedure for Removing Switch Box (P.121)".

1. Removing inverter board (A2P)

① Unscrew the three screws fixing the intermediate panel.

② Disconnect all the wiring connected to the inverter board (A2P).

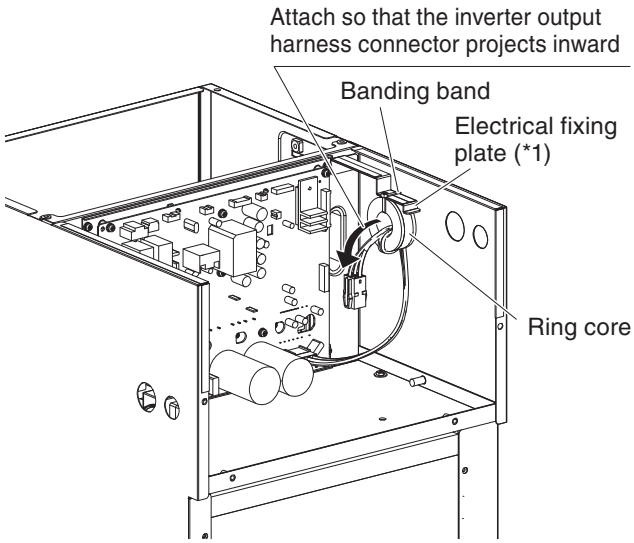
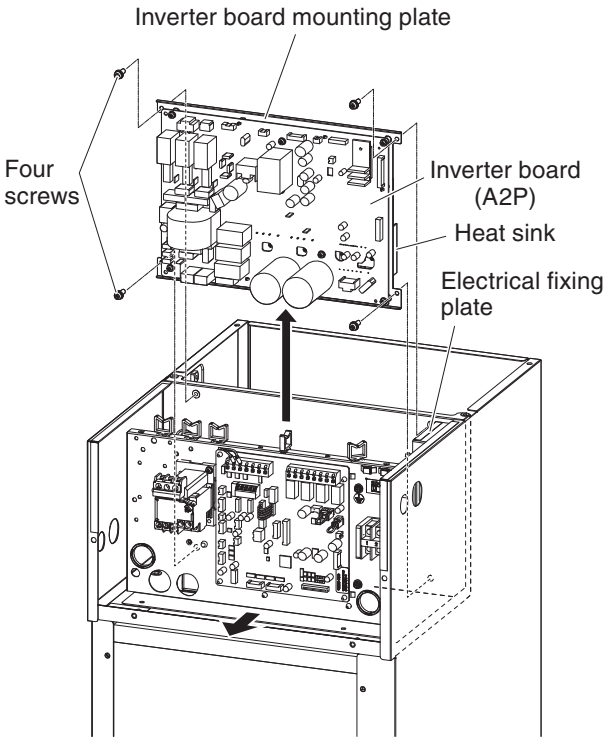
1) Compressor (relay connector in switch box)
2) DC fan motor (CN15)
3) Inverter board signal wire 1 (CN6)
4) Inverter board signal wire 2 (CN110)
5) Inverter board power supply wire (X501)
6) Inverter board signal wire 3 (X520)
7) Main circuit power supply wire (R1: HS501, S1: HS502, T1: HS503)
8) Reactor (DCL1, DCL2)
9) Pump power supply harness (X510)



Procedure for Removing Inverter Board (AKZ14A–43A) (2/2)

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
③ Remove the ring core fixed to the electrical fixing plate by cutting the cable tie.		*1 When installing the inverter board assembly, a cable tie (Part number: NE43027-4, Model: T-30R, Quantity: 1) is required to attach the ring core to the electrical fixing plate.
④ Slide the intermediate panel forward. ⑤ When removing the inverter board (A2P), unscrew the four screws on the inverter board mounting plate, and remove the inverter board with heat sink attached to the inverter board mounting plate. (*2)		*2 When replacing the inverter board (A2P), handle it as the "inverter board assembly", i.e., inverter board integrated with heat sink. Never replace the inverter board (A2P) only. Replacement of the inverter board only may cause degradation of the radiation performance of the heat sink, leading to smoke or ignition.

Procedure for Removing Inverter Board (AKZ14A–43A-500)

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

- Remove the switch box cover in accordance with “Procedure for Removing Outside Panel Block (P.118)”.
- Remove the control panel mounting plate in accordance with “Procedure for Removing Switch Box (P.121)”.

1. Removing inverter board (A2P)

① Unscrew the three screws fixing the intermediate panel.

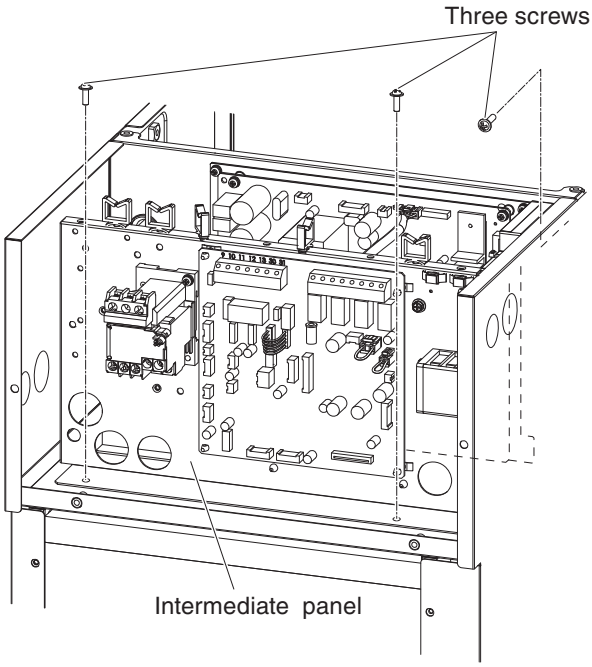
② Disconnect all the wiring connected to the inverter board (A2P).

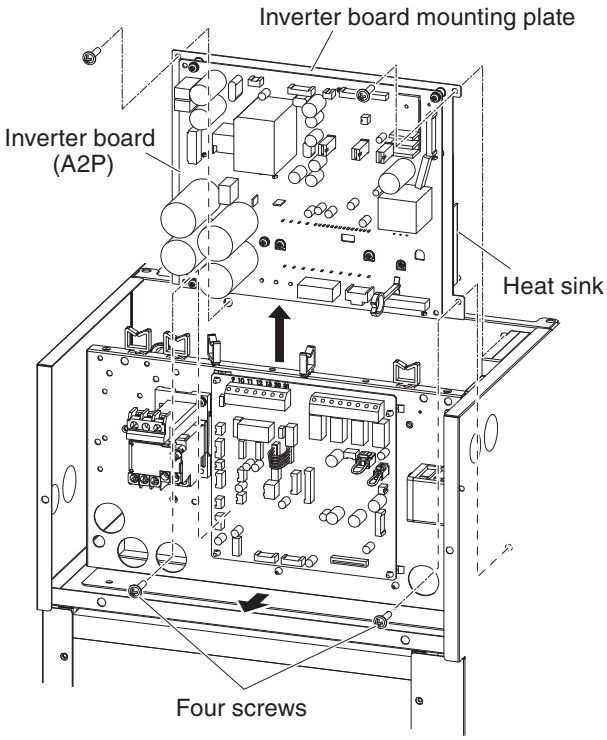
1) Compressor (relay connector in switch box)
2) DC fan motor (CN15)
3) Control board signal wire 1 (CN6)
4) Control board signal wire 2 (CN110)
5) Noise filter board signal wire 1 (CN650)
6) Noise filter board signal wire 2 (CN103)
7) Main circuit power supply wire (R1: F504, S1: F505, T1: F506)*
8) Reactor (DCL1, DCL2)

*Connector is located on the noise filter board (A3P) side.

③ Slide the intermediate panel forward.

④ When removing the inverter board (A2P), unscrew the four screws on the inverter board mounting plate, and remove the inverter board with heat sink attached to the inverter board mounting plate. (*1)





*1
When replacing the inverter board, handle it as the “inverter board assembly”, i.e., inverter board integrated with heat sink.

Never replace the inverter board only. Replacement of the inverter board only may cause degradation of the radiation performance of the heat sink, leading to smoke or ignition.

Procedure for Removing Oil Pump *1

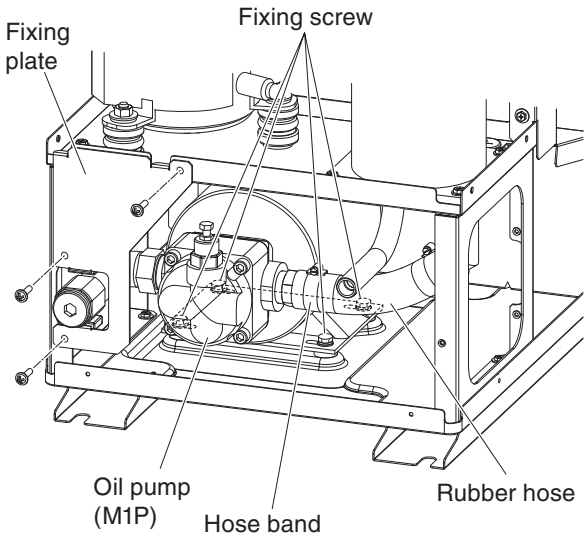
⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with “Procedure for Removing Outside Panel Block (P.118)”.
- Remove the control panel mounting plate in accordance with “Procedure for Removing Switch Box (P.121)”.
- Place a receptacle to receive oil under the evaporator.

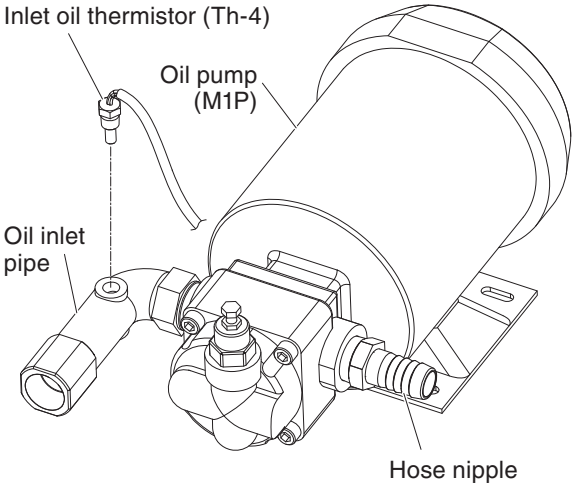
1. Discharging oil

① Unscrew the three screws to take off the fixing plate.
② Loosen the hose band at the oil pump (M1P) outlet, and discharge oil.
③ Remove the inlet oil thermistor (Th-4).



2. Removing oil pump (M1P)

① Disconnect the oil pump lead wire connected to the secondary side of the overcurrent relay in the switch box (*2), and pull it out from the grommet (*3) of the switch box. Remove the band banding the oil pump lead wires in the oil cooling unit.
② Unscrew the four fixing screws from the pump.
③ Pull the rubber hose out of the hose nipple and remove the oil pump (M1P).
④ Remove the oil inlet pipe.
⑤ Remove the hose nipple.



Point

*1
After the oil pump (M1P) is replaced, the cumulative oil pump (M1P) running time must be reset.

Input “0012” into the parameter n035, and reset the cumulative pump running time.
(refer to page 67)

*2
Unless the control panel mounting plate is removed first, wiring on the secondary side of the overcurrent relay cannot be removed.

*3
Removing grommet

Grommet is used to maintain dust preventive performance in the switch box.

⬇

If any lead wire is taken out from the grommet hole, be sure to replace the grommet.

Procedure for Removing EEV (for main circuit) and MOV (for hot gas) *1

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

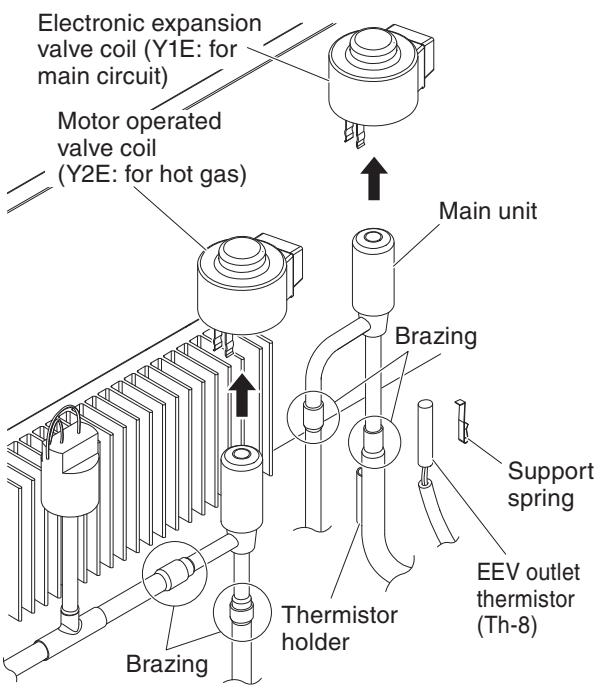
- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.118)".

1. Removing EE valve (for main circuit) (Y1E)

① Remove the dew proofing material.
② Recover refrigerant from the service port.
③ Detach the EEV (Y1E) coil by pulling out it upward. When replacing the coil, disconnect the connector (S90) on the control board, and pull out the coil lead wire from the wiring port (see page 119) (*2). Remove the band banding the coil lead wires in the oil cooling unit.
④ Remove the EEV outlet thermistor (Th-8) from the thermistor holder.
⑤ Disconnect the two brazing sections to remove the EE valve (for main circuit) (Y1E) main unit.

2. Removing MO valve for hot gas (Y2E)

① Recover refrigerant from the service port.
② Pull out the MOV (Y2E) coil. When replacing the coil, disconnect the connector (CN7) on the inverter board, and pull out the coil lead wire from the wiring port (see page 119) (*2). Remove the band banding the coil lead wires in the oil cooling unit.
③ Disconnect the two brazing sections to remove the MO valve for hot gas (Y2E) main unit.



Point

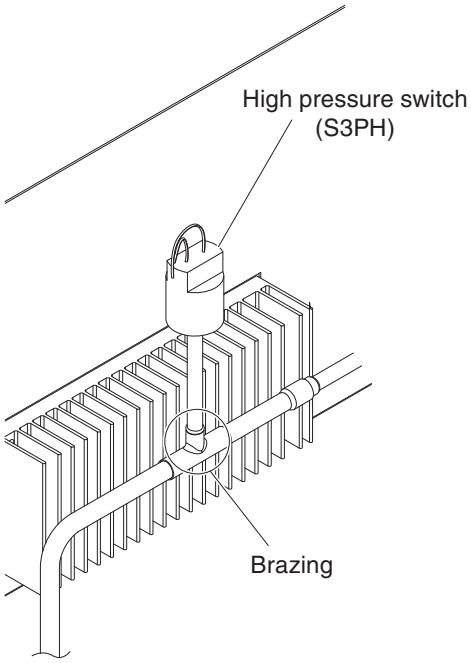
*1
After the motor operated valve (for main circuit and hot gas) main unit is replaced, the fully closed pulse must be set up for each valve. Be sure to perform the pulse detection operation with EEV (MOV) fully closed. (refer to page 150)

*2
Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded.
⬇
Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing High Pressure Switch

⚠ WARNING

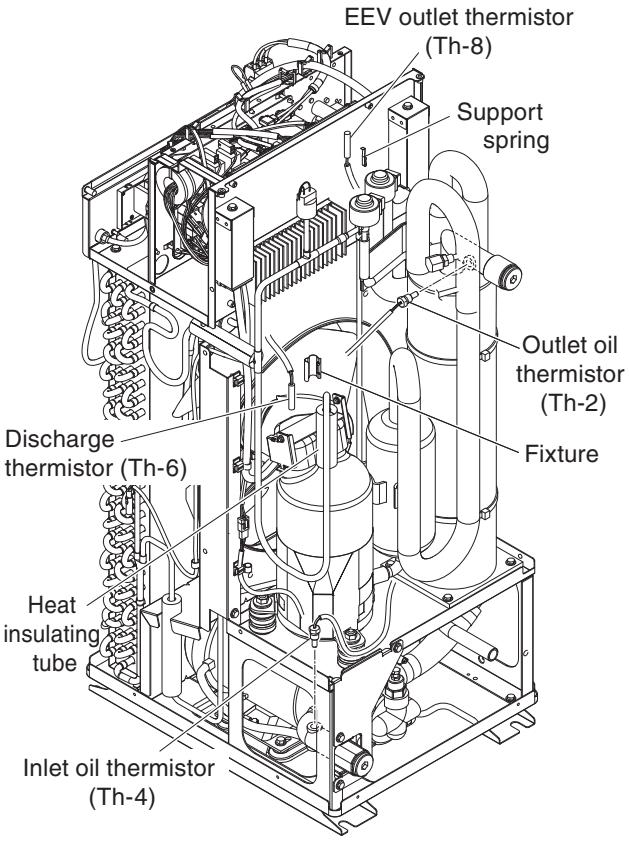
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with “Procedure for Removing Outside Panel Block (P.118)”. **1. Removing high pressure switch (S3PH)** ① Recover refrigerant from the service port. ② Disconnect the brazing section of the high pressure switch (S3PH). ③ Disconnect the connector (63H) on the control board (A1P), and pull out the lead wire of the high pressure switch (S3PH) from the wiring port (see page 98) (*1). Remove the band banding the lead wires of the high pressure switch (S3PH) in the oil cooling unit.		*1 Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded. ⬇ Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Thermistors (1/2) *1

⚠ WARNING

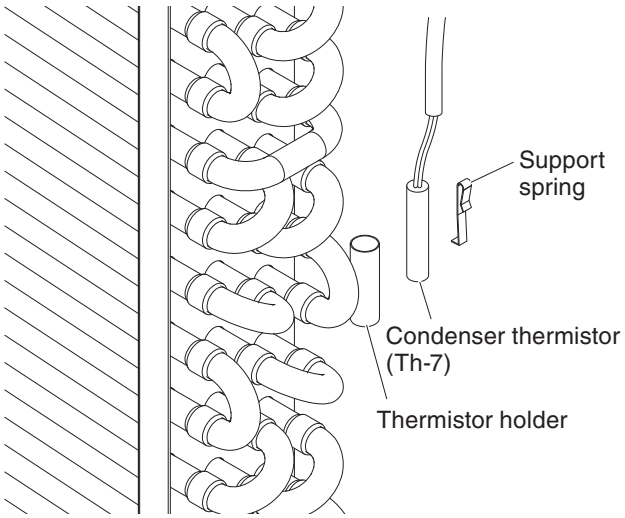
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.118)". **1. Removing outlet oil thermistor (Th-2)** ① Disconnect the relay connector of the outlet oil thermistor. (wire color: blue) Remove the band banding the outlet oil thermistor in the oil cooling unit. ② Remove the outlet oil thermistor with a wrench. **2. Removing inlet oil thermistor (Th-4)** ① Disconnect the relay connector of the inlet oil thermistor. (wire color: yellow) Remove the band banding the inlet oil thermistor in the oil cooling unit. ② Remove the inlet oil thermistor with a wrench. **3. Removing discharge thermistor (Th-6)** ① Disconnect the relay connector of the discharge thermistor. (wire color: black) Remove the band banding the discharge thermistor in the oil cooling unit. ② Remove the heat insulating tube. ③ Detach the fixture, and remove the discharge thermistor. **4. Removing EEV outlet thermistor (Th-8)** ① Disconnect the relay connector of the EEV outlet thermistor. (wire color: white) Remove the band banding the EEV outlet thermistor in the oil cooling unit. ② Remove the dew proofing material. ③ Pull out the EEV outlet thermistor from the thermistor holder.		*1 Disconnect the relay connector in the oil cooling unit before replacing the thermistors.

Procedure for Removing Thermistors (2/2) *1

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
5. Removing condenser thermistor (Th-7) ① Disconnect the relay connector of the condenser thermistor. (wire color: red) Remove the band banding the condenser thermistor in the oil cooling unit. ② Pull out the condenser thermistor from the thermistor holder.		*1 Disconnect the relay connector in the oil cooling unit before replacing the thermistors.

Procedure for Removing Compressor *1, 2, 3

WARNING
Before disassembling work, be sure to turn OFF all power supplies.

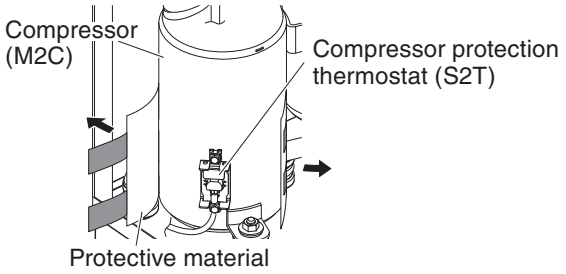
Work Procedure

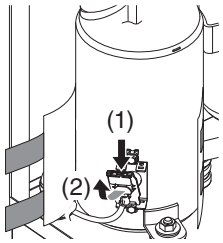
- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with “Procedure for Removing Outside Panel Block (P.118)”.
- Remove discharge thermistor (Th-6) with “Procedure for Removing Thermistors (P.130)”.

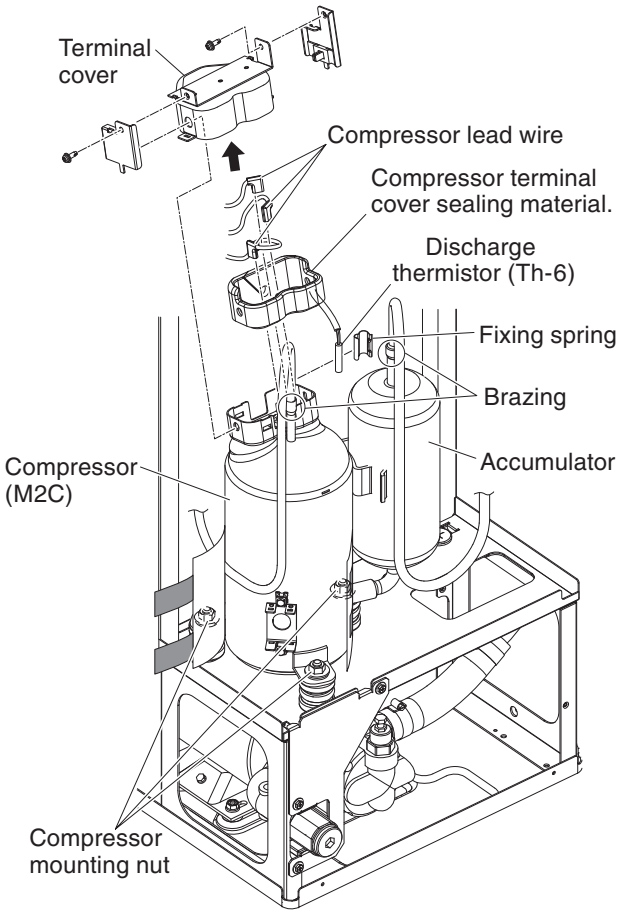
1. Removing compressor (M2C)

① Recover refrigerant from the service port.
② Remove the protective material.
③ Remove the compressor protection thermostat (S2T).

④ Unscrew the two screws to take off the terminal cover.
⑤ Disconnect the lead wire from the compressor terminal section.
⑥ Remove the compressor terminal cover sealing material.
⑦ Unscrew the three mounting nuts of the compressor.
⑧ Disconnect the 2 brazing sections to remove the compressor (M2C).
Roll up the dew proofing tube to expose the brazing sections before brazing the suction pipe.







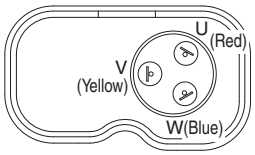
Point

*1
When replacing the compressor (M2C), prepare the accumulator heat insulator (upper and lower) separately, and attach it. Running the unit without the accumulator heat insulator, condensation may occur, causing water to drip outside the unit.

*2
Once the compressor protection thermostat (S2T) is removed, the radiation sheet can no longer be used. In that case, replace with new one.

*3
After the compressor (M2C) is replaced, the cumulative compressor (M2C) running time must be reset. Input “0011” into the parameter n035, and reset the cumulative compressor running time. (refer to page 67)
After input the parameter, turning ON the power supply again.

*4
Compressor terminal signal



2 AKZ56A, 90A

Procedure for Removing Outside Panel Block

⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

1. Removing filter, top panel, and related parts

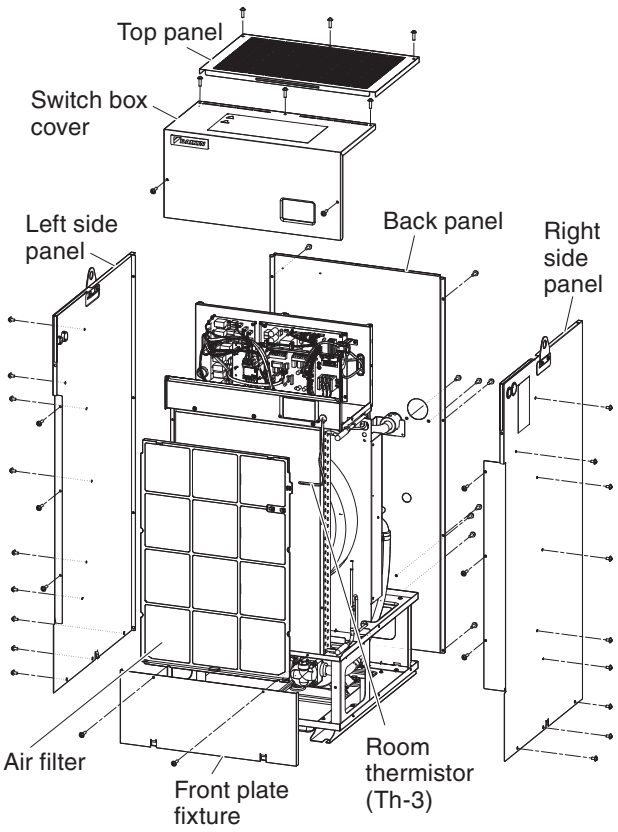
① Remove the room thermistor (Th-3) from the air filter.
② Remove the air filter.
③ Unscrew the screws (no. of pcs.: A) that hold switch box cover.
④ Unscrew the three screws that hold the top panel, and remove it.

2. Removing back panel, side panel, and related parts

① Unscrew the screws (no. of pcs.: B) that hold the back panel.
② Unscrew the screws (no. of pcs.: C) that hold the left side panel, and pull it out upward.
③ Unscrew the screws (no. of pcs.: D) that hold the right side panel, and pull it out upward.
④ Unscrew the two screws that hold the front plate fixture, and remove it.

(pcs.)

	A	B	C	D
AKZ56A	4	11	11	11
AKZ90A	5	12	12	12



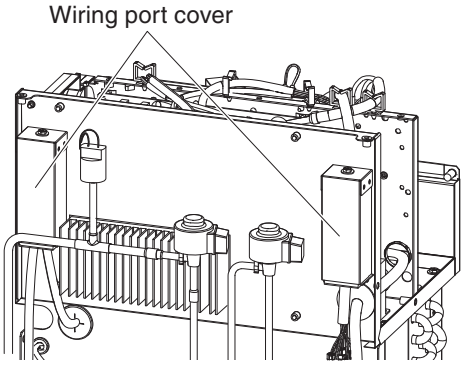
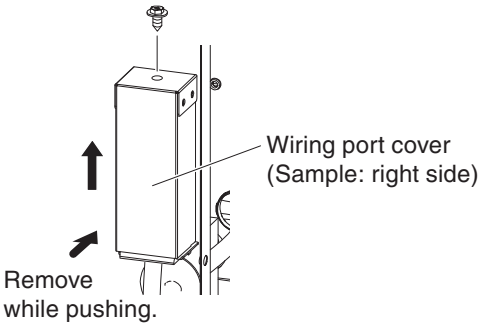
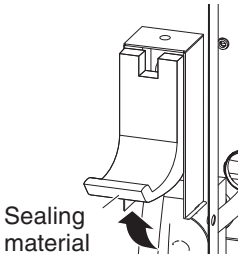
Point

*1
Notes on mounting switch box cover

① Check for any damage on the sealing material on the back of the cover. If any damage is found, replace with new one.
② Adjust the screw tightening torque to 1N-m ±10% during mounting. Use the screws dedicated for the switch box cover. (DO NOT use the tapped screws for plate of cross-recessed hexagon head bolt with flat washer M4 x 12 causing damage to screw hole.)

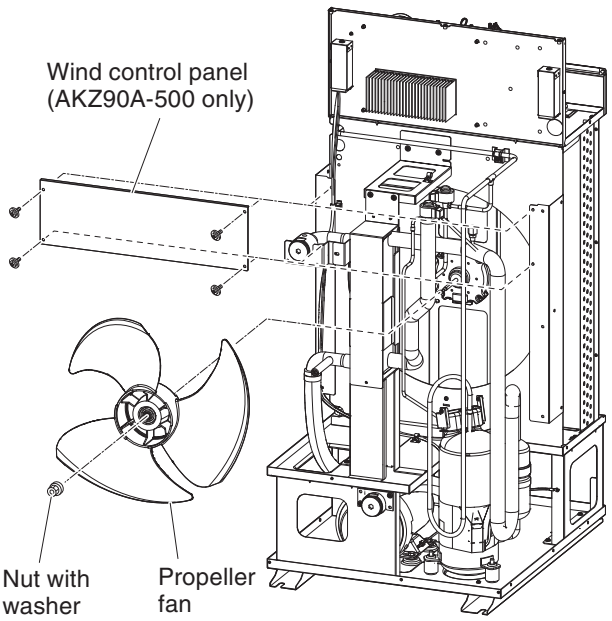
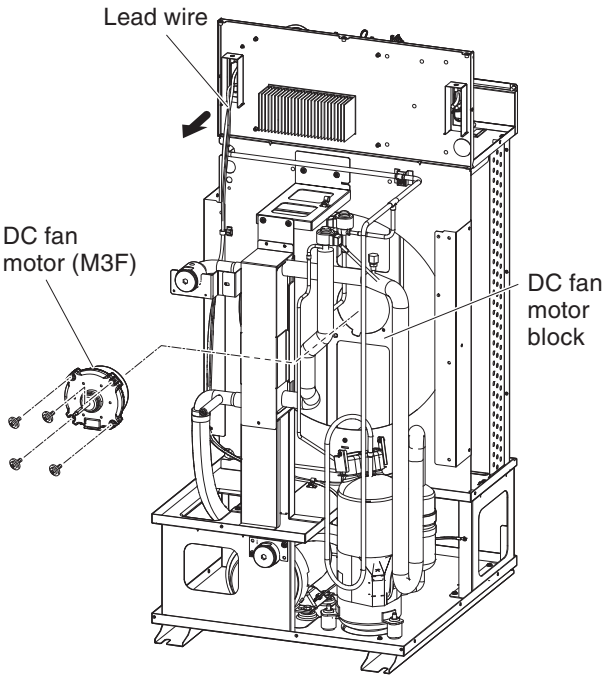
Procedure for Removing Wiring Inside Wiring Port

⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Many of the DC fan motor (M3F), electronic expansion valve for main circuit (Y1E), motor operated valve for hot gas (Y2E), high pressure switch (S3PH), and connection wiring (lead wires) to the other electrical components pass through the left and right wiring ports, instead of the conventional grommet. To remove these wires, follow the procedure below.		
1. Removing the wiring port cover and sealing material.		
① Unscrew one screw and remove the wiring port cover.		
② Peel off the sealing material inside. (*1) ③ Pull out the lead wire of the part to be replaced.		*1 Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded. ⬇ Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Propeller Fan, DC Fan Motor

⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point
● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for removing Outside Panel Block (P.133)".	
1. Removing propeller fan ① Unscrew the four screws the wind control panel, and take it out from the right side when viewed from the front. (AKZ90A-500 only) ② Remove the nut with washer fixing the propeller fan. ③ Remove the propeller fan, and take it out from the right side when viewed from the front.	
2. Removing DC fan motor (M3F) ① Disconnect the relay connector in switch box for DC fan motor. ② Cut the banding band of the lead wires. ③ Take the lead wire off the wiring port cover. (See page 134) (*1) ④ Remove the DC fan motor (M3F) from the DC fan block with four screws and take it out from the right side when viewed from the front.	
	*1 Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded. ⬇ Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Switch Box *1

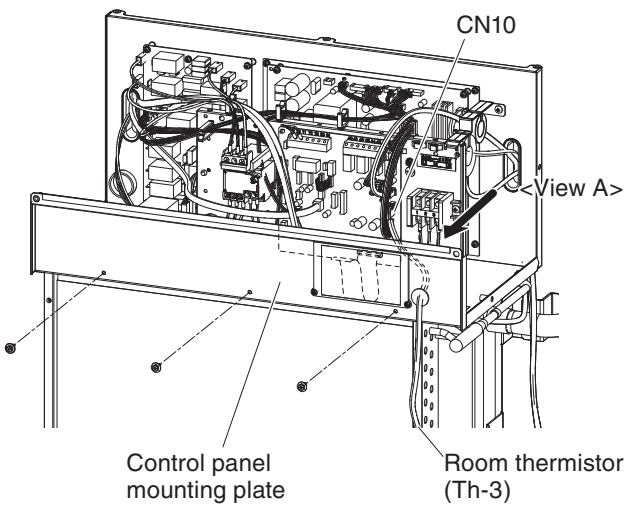
⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with “Procedure for Removing Outside Panel Block (P.133)”.

1. Removing control panel mounting plate

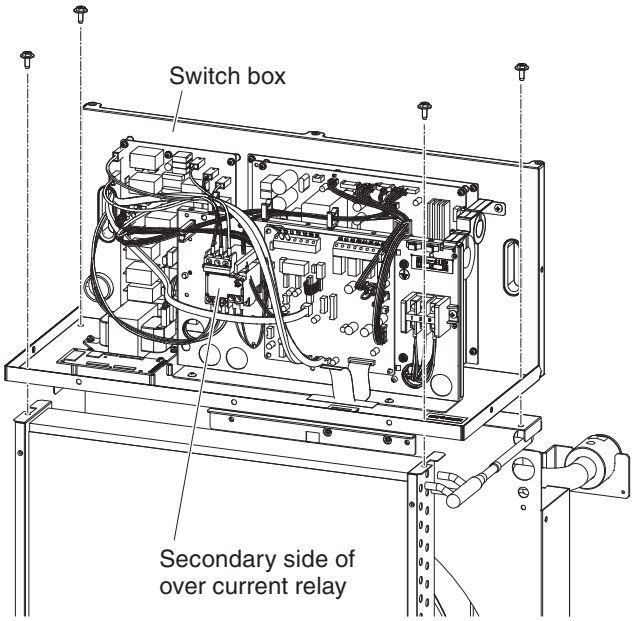
① Disconnect the display board connector located back of the control panel. (*2)
② Disconnect the room thermistor connector (CN10) from the control board (A1P).
③ Unscrew the screws (*3) fixing the control panel mounting plate to take it.



2. Removing connected wiring to switch box

① Disconnect all the connectors and wiring connected from outside into the switch box.
- Primary side of power supply terminal block (to be wired by customer)
- Secondary side of over current relay (*4)
- Control board (A1P)
  1) Thermistor assembly (S9)
  2) Outlet oil temperature thermistor (CN11)
  3) EE valve coil (S90)
  4) MO valve coil (CN7)
  5) High pressure switch (S171)*
     * "-C" models only
  6) Compressor protective thermostat (S172)
  7) Signal terminal block (X2M)
- Inverter board (A2P)
  1) Compressor (relay connector in switch box)
  2) DC fan motor (CN15)

② Take the lead wire off the wiring port cover. (See page 134) (*5)



3. Removing switch box

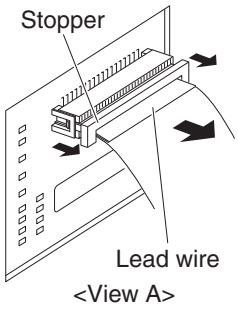
① Unscrew the four screws fixing the switch box.
② Pull up and remove the switch box.

Point

*1
When replacing the switch box, change the setting data referring to “Replacing Control Board” (P.149).

*2
Disconnecting display board

Pull up the stopper of the connector from both sides, and disconnect the lead wire.



*3
The number of screws for the control panel mounting plate varies by model.
AKZ56A: 2 (pcs.)
AKZ90A: 3 (pcs.)

*4
Unless the control panel mounting plate is removed first, wiring of the secondary side of the over current relay cannot be disconnected.

*5
Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded.
⬇
Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing Control Board *1

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

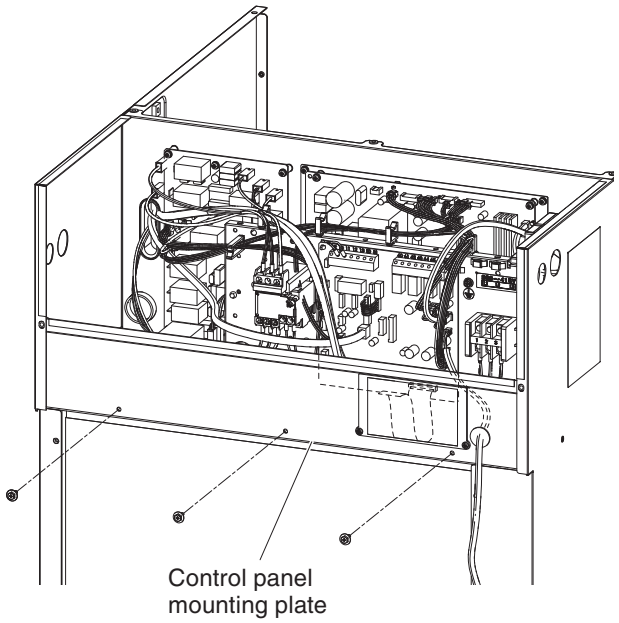
- Remove the switch box cover in accordance with “Procedure for Removing Outside Panel Block (P.133)”.
- Remove the control panel mounting plate in accordance with “Procedure for Removing Switch Box (P.136)”.

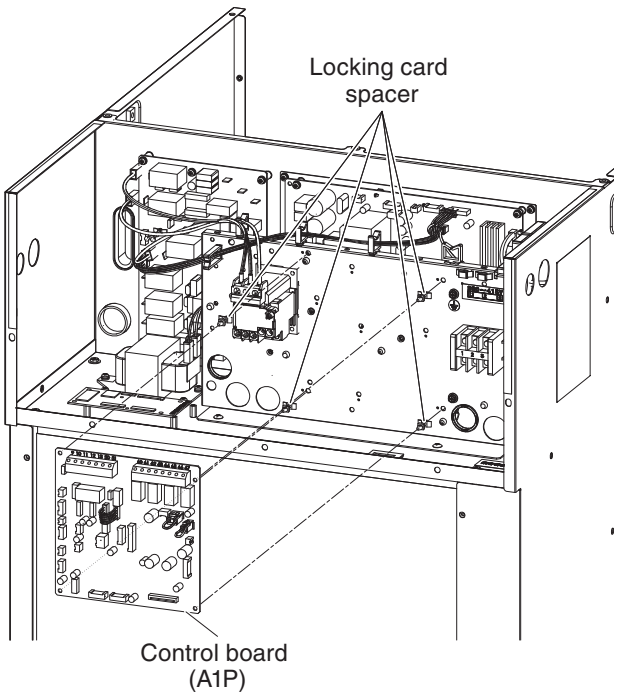
1. Removing control board (A1P)

① Disconnect all the wiring connected on the control board (A1P).
- 1) Thermistor assembly (S9)
- 2) Outlet oil temperature thermistor (CN11)
- 3) EE valve coil (S90)
- 4) MO valve coil (CN7)
- 5) High pressure switch (S171)*2
- 6) Compressor protective thermostat (S172)
- 7) Signal terminal block (X2M)*3
- 8) Inverter board power supply wire (S200)
- 9) Inverter board signal wire 1 (S170)
- 10) Inverter board signal wire 2 (S140)
- 11) Inverter board signal wire 3 (S60)
- 12) Over current relay signal wire (S182)
- 13) Optional board signal wire*3

*2: "-C" models only
*3: connected units only

② Remove the four locking card spacers to take off the control board (A1P).





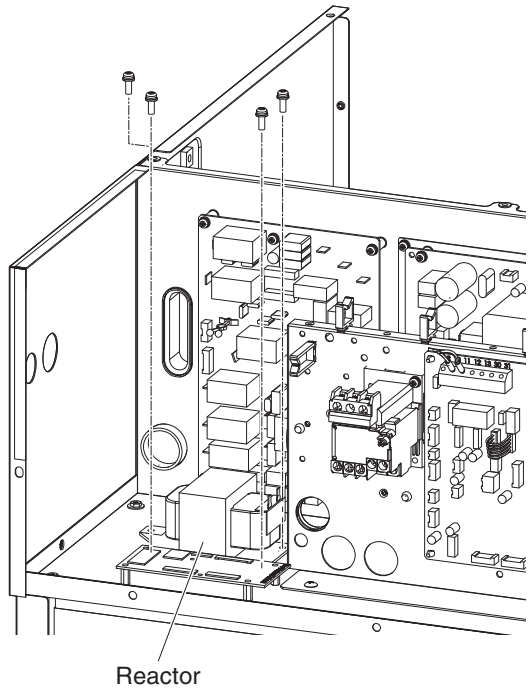
*1
When replacing the control board (A1P), change the setting data referring to the “Replacing Control Board” (P.149).

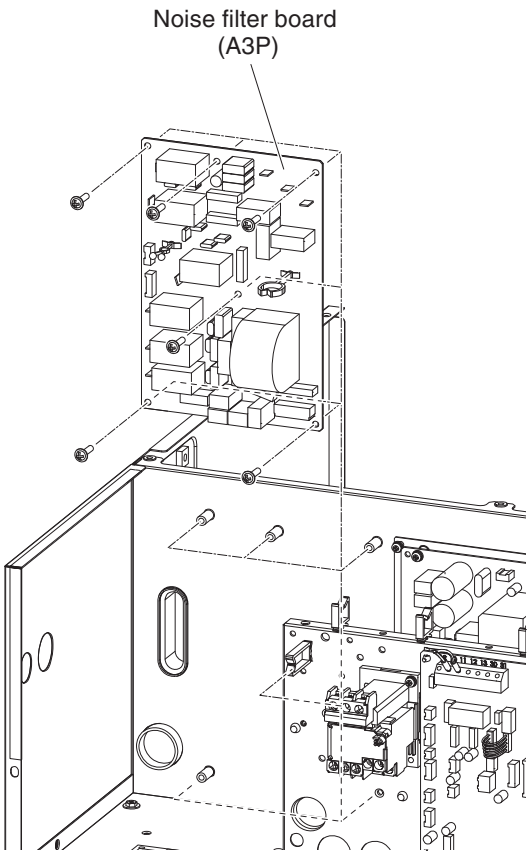
Procedure for Removing Noise Filter Board *1

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

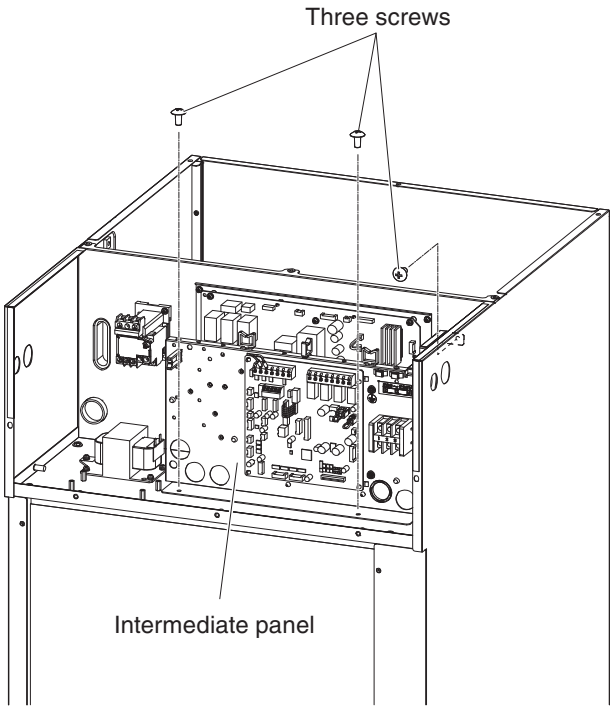
Work Procedure	Point
● Remove the switch box cover in accordance with "Procedure for Removing Outside Panel Block (P.133)". ● Remove the control panel mounting plate in accordance with "Procedure for Removing Switch Box (P.136)".	*1 AKZ90A-500, AKZ56A-500: see page 123.
1. Removing noise filter board (A3P)	
① Unscrew the four screws from the reactor. ② Disconnect all the wiring connected to the noise filter board (A3P). 1) Power supply wire (L1: HS501, L2: HS502, L3: HS503) 2) Control board signal wire (X520) 3) Over current relay (pump power supply wire): (R2: F507, S2: F508, T2: F509) ③ Unscrew the six screws to take out the noise filter board (A3P).	





Procedure for Removing Inverter Board (AKZ56A, 90A) (1/2)

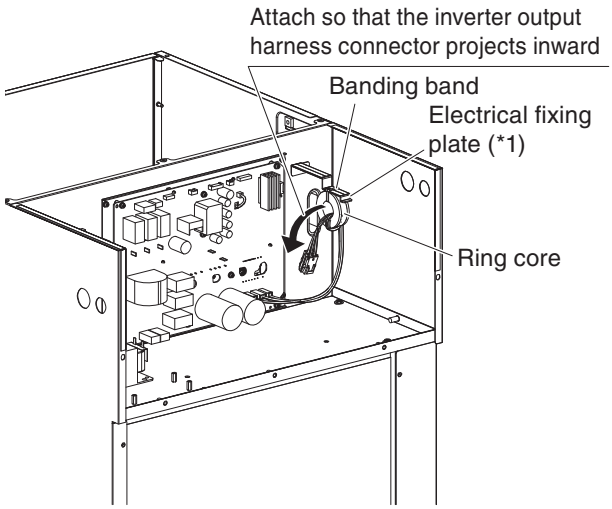
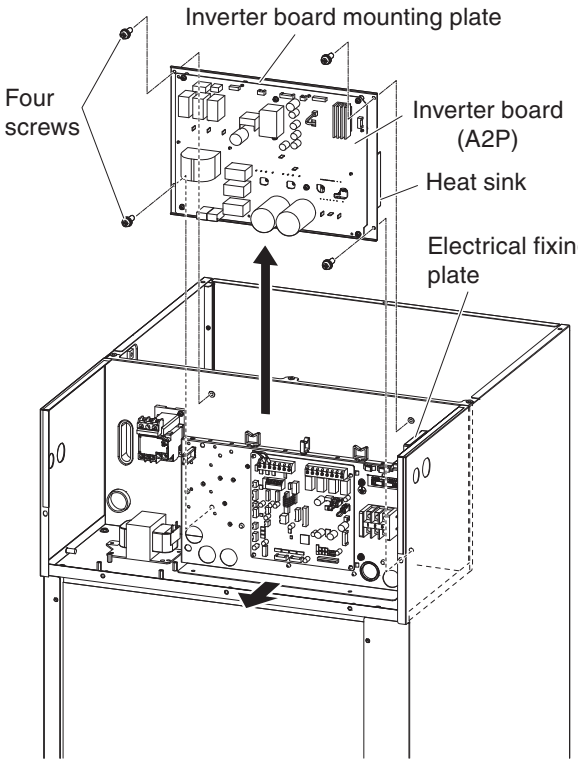
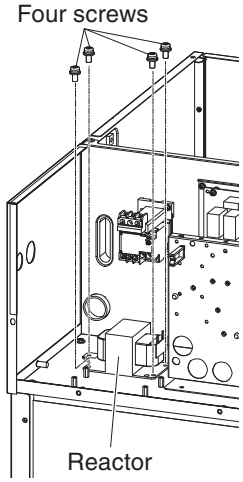
⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Remove the switch box cover in accordance with "Procedure for Removing Outside Panel Block (P.133)". ● Remove the control panel mounting plate in accordance with "Procedure for Removing Switch Box (P.136)".		
1. Removing inverter board (A2P) ① Unscrew the three screws fixing the intermediate panel. ② Disconnect all the wiring connected to the inverter board (A2P). 1) Compressor (relay connector in switch box) 2) DC fan motor (CN15) 3) Inverter board signal wire 1 (CN6) 4) Inverter board signal wire 2 (CN110) 5) Inverter board power supply wire (X501) 6) Inverter board signal wire 3 (X520) 7) Main circuit power supply wire (R1: HS501, S1: HS502, T1: HS503) 8) Reactor (DCL1, DCL2) 9) Pump power supply harness (X510)		

Procedure for Removing Inverter Board (AKZ56A, 90A) (2/2)

⚠ WARNING

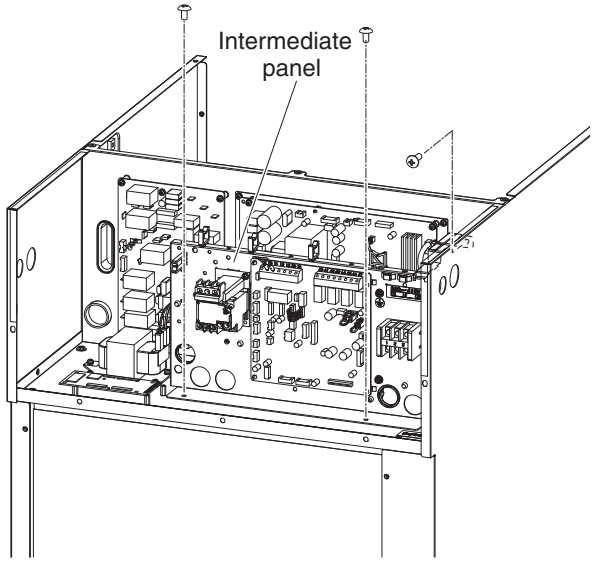
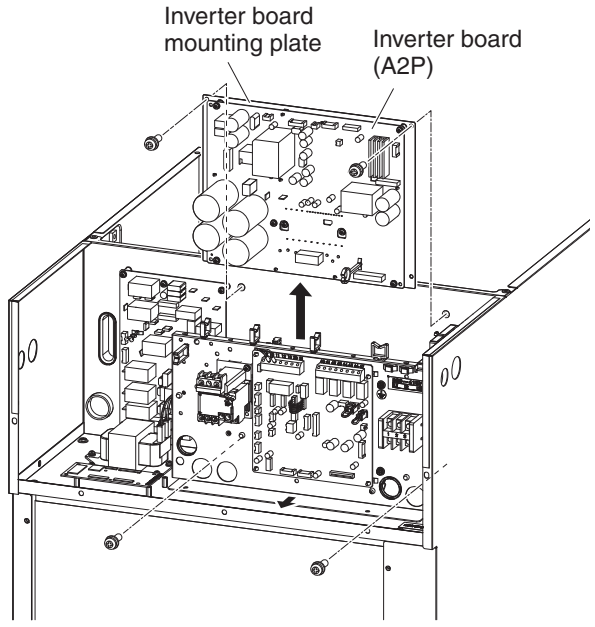
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
③ Remove the ring core fixed to the electrical fixing plate by cutting the cable tie.		*1 When installing the inverter board assembly, a cable tie (Part number: NE43027-4, Model: T-30R, Quantity: 1) is required to attach the ring core to the electrical fixing plate.
④ Slide the intermediate panel forward. ⑤ When removing the inverter board (A2P), unscrew the four screws on the inverter board mounting plate, and remove the inverter board with heat sink attached to the inverter board mounting plate. (*2) (*3)		*2 When replacing the inverter board, handle it as the “inverter board assembly”, i.e., inverter board integrated with heat sink. Never replace the inverter Board only. Replacement of the inverter board only may cause degradation of the radiation performance of the heat sink, leading to smoke or ignition. *3 (AKZ56A only) In order to remove the screws on the inverter board mounting plate, it is necessary to remove the reactor. 

Procedure for Removing Inverter Board (AKZ56A, 90A-500)

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Remove the switch box cover in accordance with "Procedure for Removing Outside Panel Block (P.133)". ● Remove the control panel mounting plate in accordance with "Procedure for Removing Switch Box (P.136)".		
1. Removing inverter board (A2P) ① Unscrew the three screws fixing the intermediate panel. ② Disconnect all the wiring connected to the inverter board (A2P). 1) Compressor (relay connector in switch box) 2) DC fan motor (CN15) 3) Control board signal wire 1 (CN6) 4) Control board signal wire 2 (CN110) 5) Noise filter board signal wire 1 (CN650) 6) Noise filter board signal wire 2 (CN103) 7) Main circuit power supply wire (R1: F504, S1: F505, T1: F506)* 8) Reactor (DCL1, DCL2) *Connector is located on the noise filter board (A3P) side. ③ Slide the intermediate panel forward. ④ When removing the inverter board (A2P), unscrew the four screws on the inverter board mounting plate, and remove the inverter board with heat sink attached to the inverter board mounting plate. (*1)	 	*1 When replacing the inverter board, handle it as the "inverter board assembly", i.e., inverter board integrated with heat sink. Never replace the inverter board only. Replacement of the inverter board only may cause degradation of the radiation performance of the heat sink, leading to smoke or ignition.

Procedure for Removing Oil Pump *1

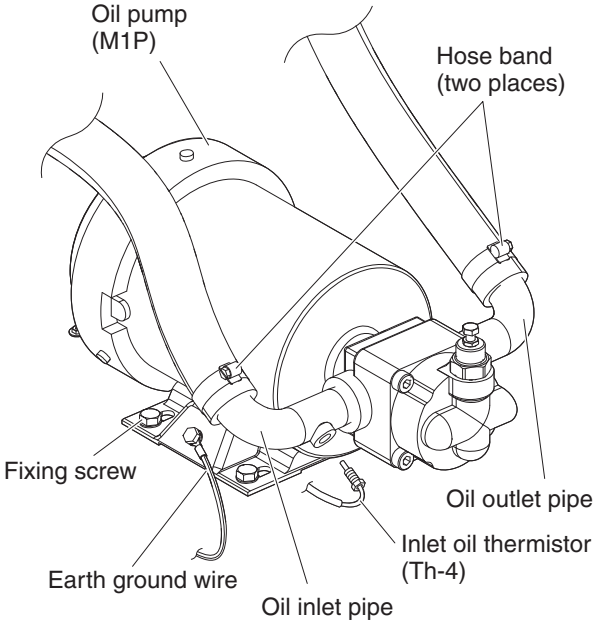
⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with “Procedure for Removing Outside Panel Block (P.133)”.
- Remove the control panel mounting plate in accordance with “Procedure for Removing Switch Box (P.136)”.
- Place a receptacle to receive oil under the evaporator.

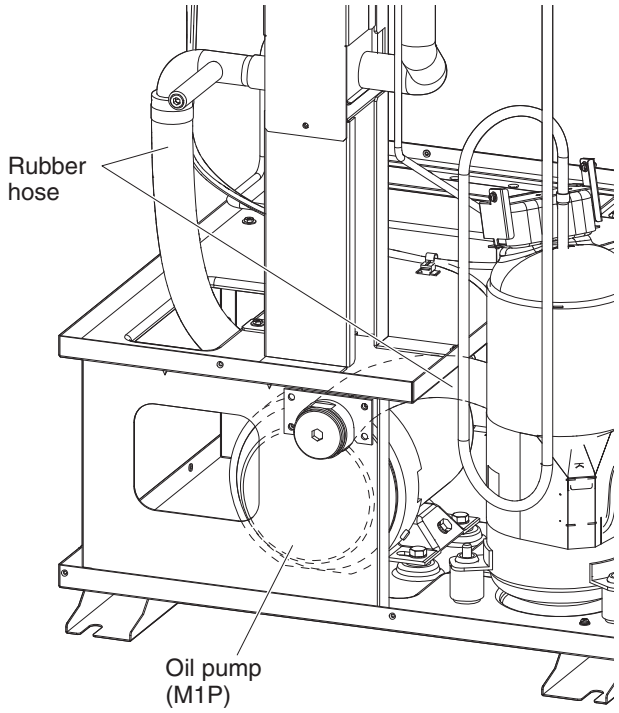
1. Discharging oil

① Loosen two hose bands (oil outlet/inlet pipe), and discharge oil.
② Remove the inlet oil thermistor (Th-4).



2. Removing oil pump (M1P)

① Disconnect the earth ground wire.
② Disconnect the oil pump lead wire connected to the secondary side of the overcurrent relay in the switch box and pull it out from the grommet (*2) of the switch box. Remove the band banding the oil pump lead wires in the oil cooling unit.
③ Unscrew the four fixing screws from the pump.
④ Remove the two front hose bands that are connected to the oil pump (M1P).
⑤ Pull the rubber hose and remove the oil pump (M1P).



Point

*1
After the oil pump (M1P) is replaced, the cumulative oil pump (M1P) running time must be reset.

Input “0012” into the parameter n035, and reset the cumulative pump running time.
(refer to page 67)

*2
Removing grommet

Grommet is used to maintain dust preventive performance in the switch box.

⬇

If any lead wire is taken out from the grommet hole, be sure to replace the grommet.

Procedure for Removing EEV (for main circuit) and MOV (for hot gas) *1

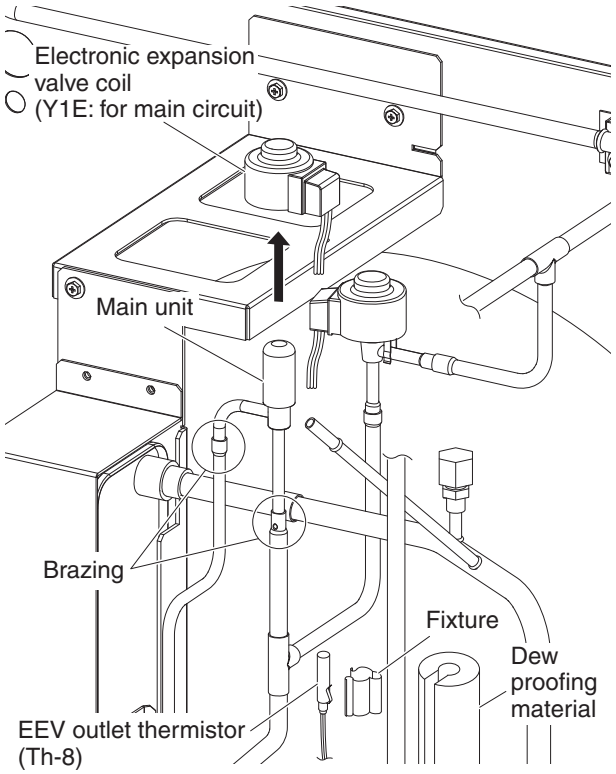
⚠ WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure

- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.133)".

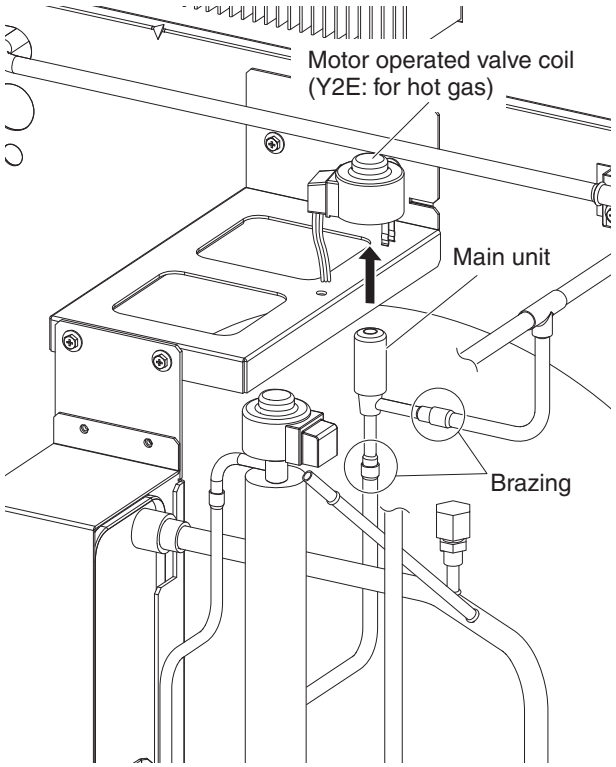
1. Removing EE valve (for main circuit) (Y1E)

① Remove the dew proofing material.
② Recover refrigerant from the service port.
③ Detach the EEV (Y1E) coil by pulling out it upward. When replacing the coil, disconnect the connector (S90) on the control board, and pull out the coil lead wire from the wiring port (see page 134) (*2). Remove the band banding the coil lead wires in the oil cooling unit.
④ Remove the EEV outlet thermistor (Th-8) from the thermistor holder.
⑤ Disconnect the two brazing sections to remove the EE valve (for main circuit) (Y1E) main unit.



2. Removing MO valve for hot gas (Y2E)

① Recover refrigerant from the service port.
② Pull out the MOV (Y2E) coil. When replacing the coil, disconnect the connector (CN7) on the inverter board, and pull out the coil lead wire from the wiring port (see page 111) (*2). Remove the band banding the coil lead wires in the oil cooling unit.
③ Disconnect the two brazing sections to remove the MO valve for hot gas (Y2E) main unit.



Point

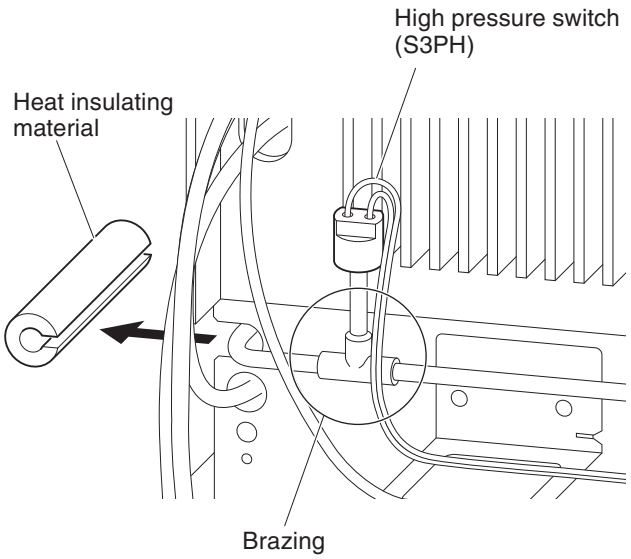
*1
After the motor operated valve (for main circuit and hot gas) main unit is replaced, the fully closed pulse must be set up for each valve. Be sure to perform the pulse detection operation with EEV (MOV) fully closed. (refer to page 150)

*2
Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded.
⬇
Change the removed sealing material with a new one before taking in lead wire again.

Procedure for Removing High Pressure Switch

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure		Point
● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with “Procedure for Removing Outside Panel Block (P.133)”. **1. Removing high pressure switch (S3PH)** ① Remove the heat insulating material. ② Recover refrigerant from the service port. ③ Disconnect the brazing section of the high pressure switch (S3PH). ④ Disconnect the connector (63H) on the control board, and pull out the lead wire of the high pressure switch (S3PH) from the wiring port (*1). Remove the band banding the lead wires of the high pressure switch (S3PH) in the oil cooling unit.		*1 Once the sealing material of the wiring port is removed, its dust-preventive performance is degraded. ⬇ Change the removed sealing material with a new one before taking in lead wire again.

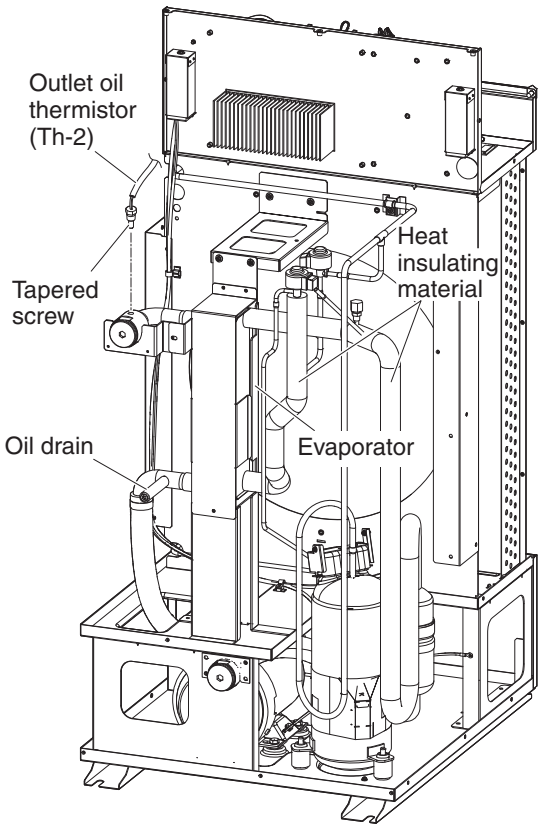
Procedure for Removing Evaporator

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.133)".

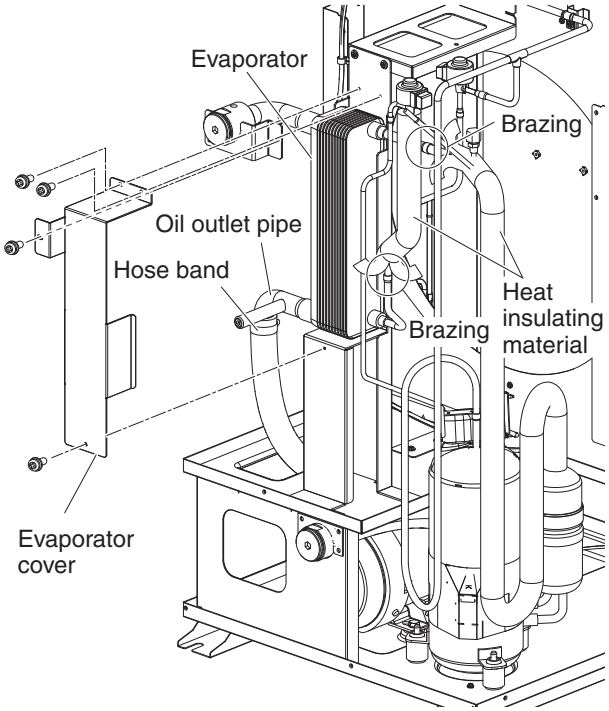


1. Discharging oil

① Remove the tapered screw and take out the outlet oil thermistor (Th-2).
② Discharge oil from oil drain.

2. Removing evaporator

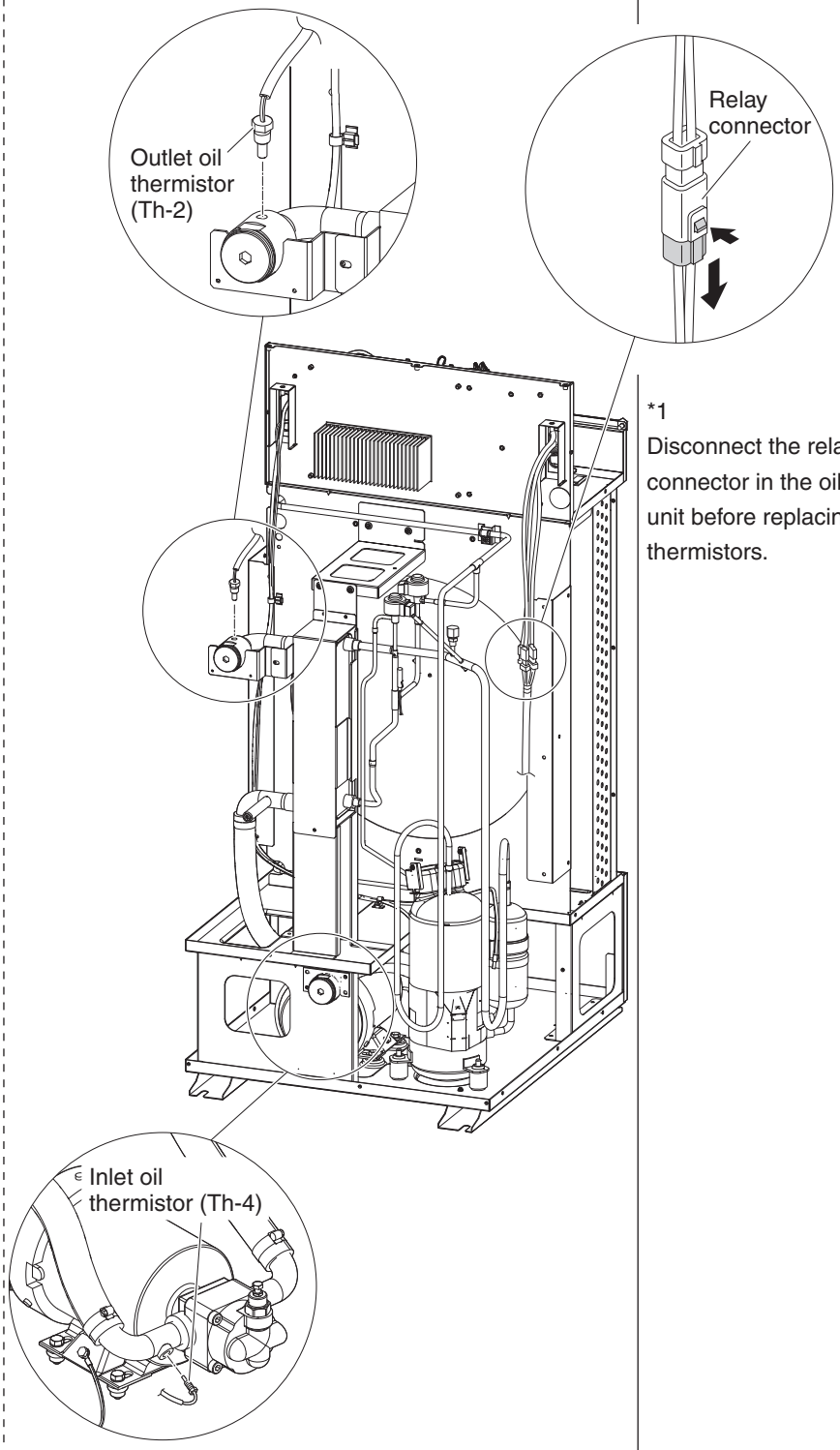
① Unscrew the four screws from the evaporator cover.
② Loosen the oil outlet pipe and remove the hose.
③ Remove the heat insulating material and remove the two brazing points.



Procedure for Removing Thermistors (1/2) *1

WARNING
Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point
● Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.133)".	
1. Removing outlet oil thermistor (Th-2)	
① Disconnect the relay connector of the outlet oil thermistor. (wire color: blue) Remove the band banding the outlet oil thermistor in the oil cooling unit. ② Remove the outlet oil thermistor with a wrench.	
2. Removing inlet oil thermistor (Th-4)	
① Disconnect the relay connector of the inlet oil thermistor. (wire color: yellow) Remove the band banding the inlet oil thermistor in the oil cooling unit. ② Remove the inlet oil thermistor with a wrench.	



*1
Disconnect the relay connector in the oil cooling unit before replacing the thermistors.

Procedure for Removing Thermistors (2/2) *1

⚠ WARNING

Before disassembling work, be sure to turn OFF all power supplies.

Work Procedure	Point

3. Removing discharge thermistor (Th-6)

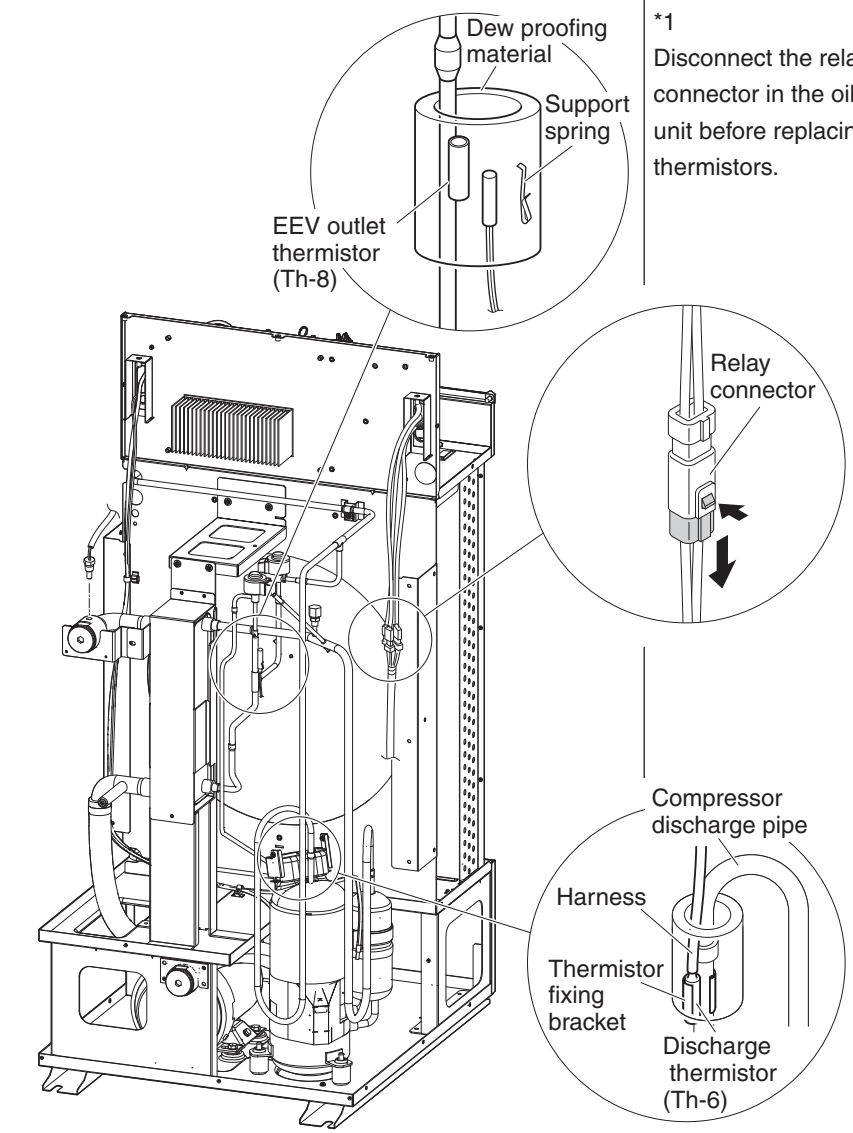
① Disconnect the relay connector of the discharge thermistor. (wire color: black) Remove the band banding the discharge thermistor in the oil cooling unit.
② Remove the heat insulating tube.
③ Detach the fixture, and remove the discharge thermistor.

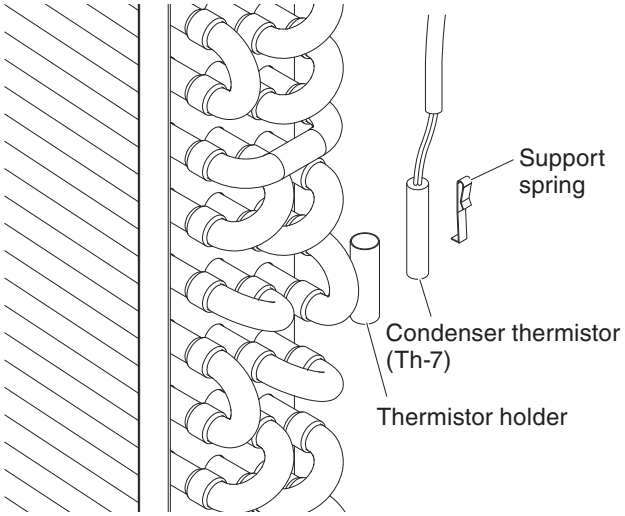
4. Removing EEV outlet thermistor (Th-8)

① Disconnect the relay connector of the EEV outlet thermistor. (wire color: white) Remove the band banding the EEV outlet thermistor in the oil cooling unit.
② Remove the dew proofing material.
③ Pull out the EEV outlet thermistor from the thermistor holder.

5. Removing condenser thermistor (Th-7)

① Disconnect the relay connector of the condenser thermistor. (wire color: red) Remove the band banding the condenser thermistor in the oil cooling unit.
② Pull out the condenser thermistor from the thermistor holder.





*1
Disconnect the relay connector in the oil cooling unit before replacing the thermistors.

Procedure for Removing Compressor *1, 2, 3

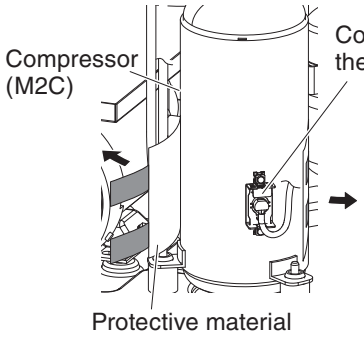
WARNING
Before disassembling work, be sure to turn OFF all power supplies.

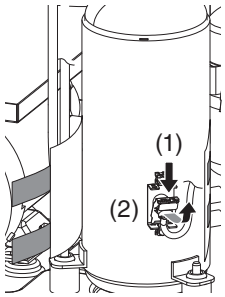
Work Procedure

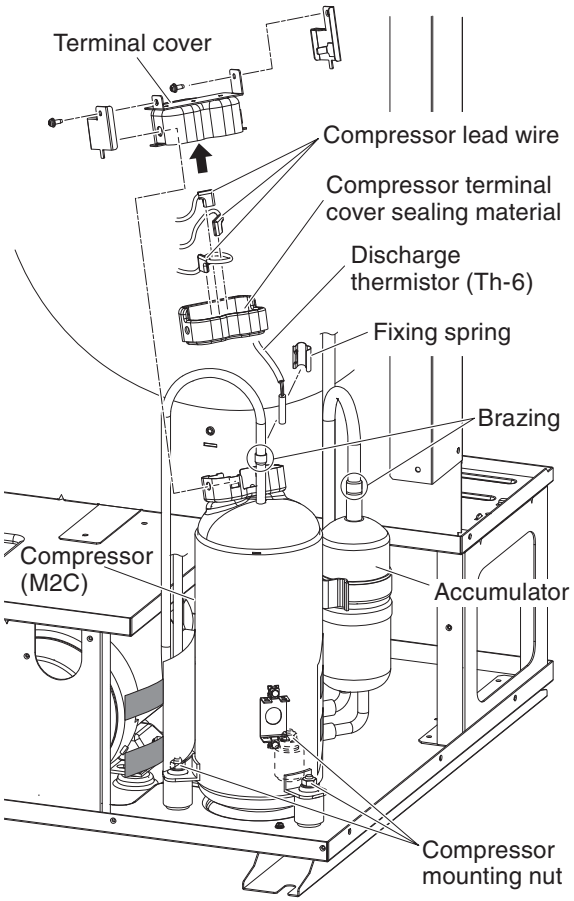
- Remove the switch box cover, top panel, back panel, left side panel, and right side panel in accordance with "Procedure for Removing Outside Panel Block (P.133)".
- Remove discharge thermistor (Th-6) with "Procedure for Removing Thermistors (P.147)".

1. Removing compressor (M2C)

① Recover refrigerant from the service port.
② Remove the protective material.
③ Remove the compressor protection thermostat (S2T).
④ Unscrew the two screws to take off the terminal cover.
⑤ Disconnect the lead wire from the compressor terminal section.
⑥ Remove the compressor terminal cover sealing material.
⑦ Unscrew the three mounting nuts of the compressor.
⑧ Disconnect the 2 brazing sections to remove the compressor (M2C).
Roll up the dew proofing tube to expose the brazing sections before brazing the suction pipe.







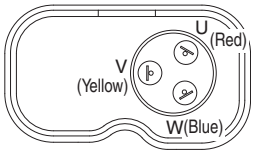
Point

*1
When replacing the compressor (M2C), prepare the accumulator heat insulator (upper and lower) separately, and attach it. Running the unit without the accumulator heat insulator, condensation may occur, causing water to drip outside the unit.

*2
Once the compressor protection thermostat (S2T) is removed, the radiation sheet can no longer be used. In that case, replace with new one.

*3
After the compressor (M2C) is replaced, the cumulative compressor (M2C) running time must be reset. Input "0011" into the parameter n035, and reset the cumulative compressor running time. (refer to page 67)
After input the parameter, turning ON the power supply again.

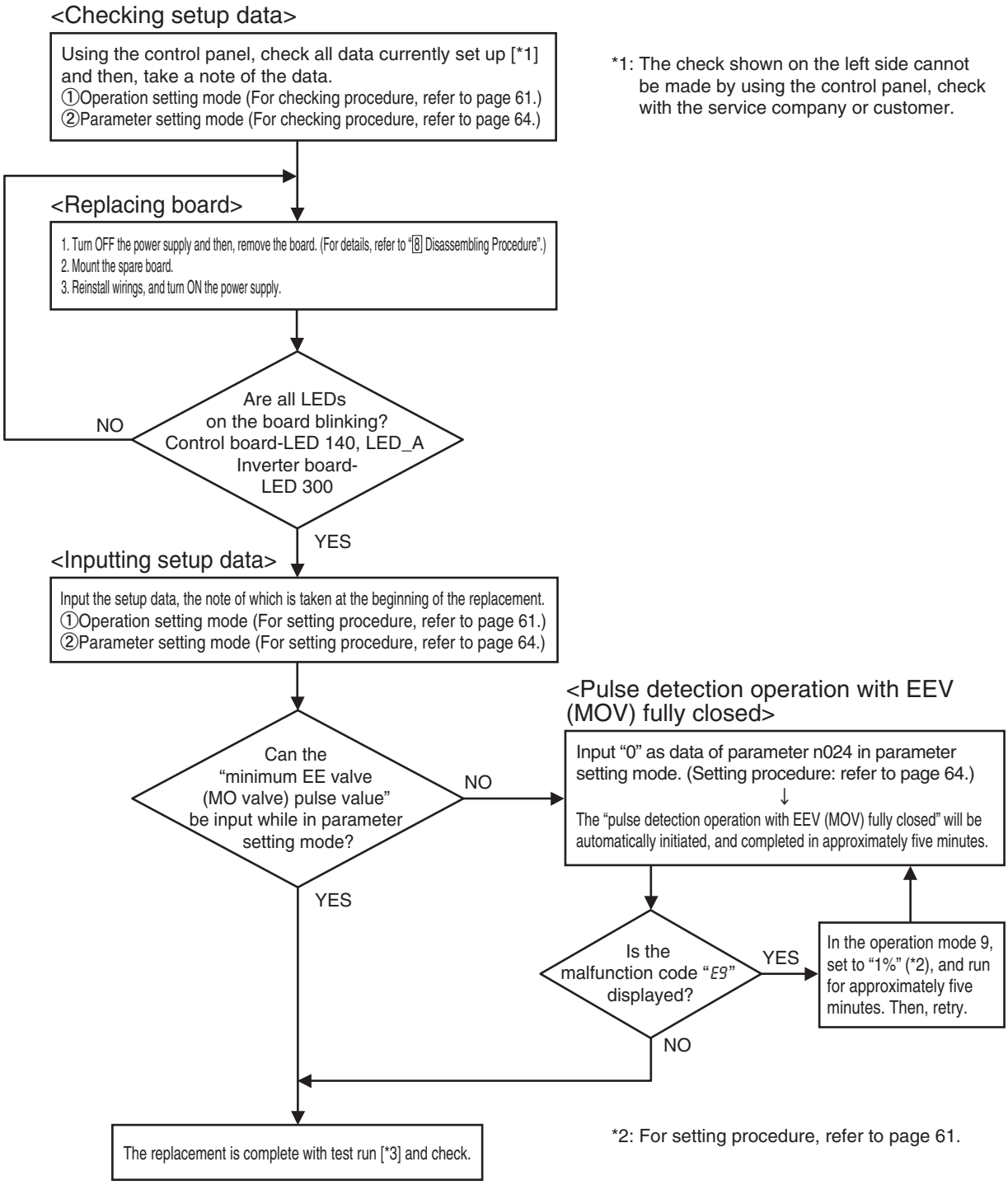
*4
Compressor terminal signal



1 Replacing Control Board

For the replacement of the control board, check to be sure the model name of Oil Cooling Unit corresponds to the applicable model of the board*, and then, follow the procedure shown below.

*Models AKZ14A, 32A and 43A, and models AKZ14A-500, 32A-500 and 43A-500 use the same inverter board, so even if a non-applicable board is used, the compressor will still operate. In such a case, however, the revolutions may be unstable (reduced compressor operation), or step-out may occur. Thus, when replacing the control board, be sure to confirm the rom seal on the board and execute test running.



*1: The check shown on the left side cannot be made by using the control panel, check with the service company or customer.

*2: For setting procedure, refer to page 61.

*3: Make sure that the board is applied to the proper model.

<Procedure>

①Mode 9: Set to 100% (setting procedure: refer to page 61.)

②Check to be sure the compressor rpm is increased to the levels shown in the table below in the monitor mode No. 7. (Monitor mode checking procedure: refer to page 63.)

	AKZ				
	14A	32A	43A	56A	90A
Compressor (rpm)	43	70	88	71	75

It will take 90 seconds from the supply of power to running of the compressor.

2 Procedure for Replacing EEV (for main circuit) and MOV (for hot gas)

In order to replace the electronic expansion valve for main circuit (EEV) or motor operated valve for hot gas (MOV) main unit, be sure to perform the fully closed pulse detection operation. (The reason is that the pulse to fully close the EEV and MOV varies.)
Replace the EEV and MOV main units in accordance with the following procedures.

<Removing the main unit and coil of the EE valve (for main circuit) and MO valve (for hot gas)>

1. Recover the refrigerant (R410A).
2. Remove the heat insulating materials and thermistor related to the EEV (or MOV).
3. Disconnect the brazed sections from the inlet and outlet pipes of the EEV (or MOV).
4. Remove the strainer from the inlet pipe.

↓

<Installing the main unit and coil of the EE valve (for main circuit) and MO valve (for hot gas)>

1. Install the spare EEV (or MOV).
2. Attach the strainer to the inlet pipe. (*1)
3. Wrap the EEV (or MOV) main unit with wet cloth (in order to prevent rise in temperature during brazing).
4. Braze the inlet pipe and outlet pipe while injecting nitrogen gas.
5. Mount the EEV (or MOV) coil. (*2)
6. After vacuuming, charge the normal quantity of refrigerant (R410A).

↓

<Check the motor operated valve>

Refer to page 116 "Check 2" to check the motor operated valve.

↓

<Pulse detection operation with EEV (MOV) fully closed>

Input “0” as data of parameter n024 in parameter setting mode. (For setting procedure, refer to page 64.)
↓
The “Pulse detection operation with EEV (MOV) fully closed” will be automatically initiated, and completed in approximately five minutes.
* Automatically detects fully closed pulses of EEV and MOV.

↓

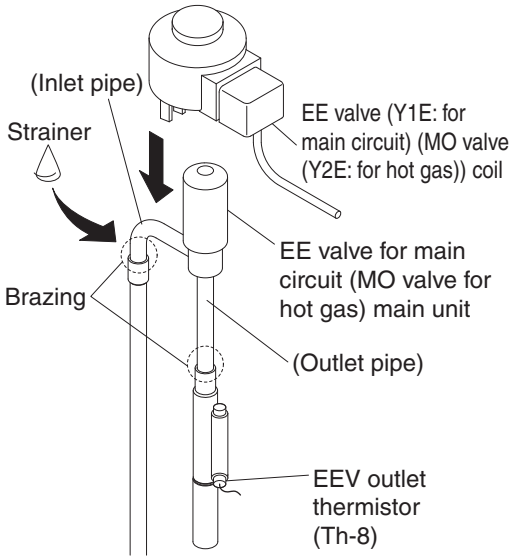
Is the malfunction code “E9” displayed?

YES → Set to “1%” (*3), and run for approx. five minutes. Then, retry. → (back to pulse detection operation)

NO ↓

The replacement is complete with test run and check.

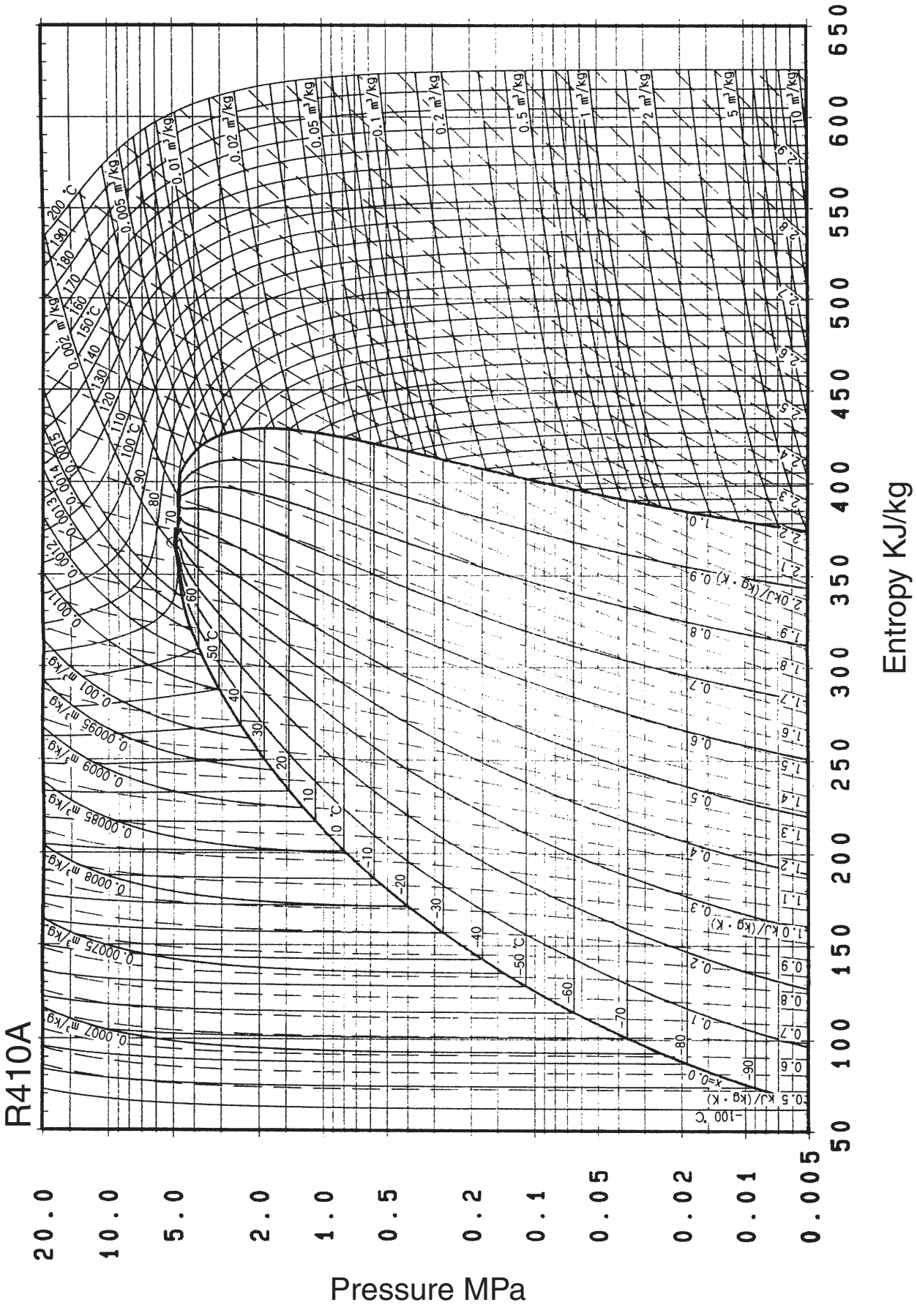
<EE valve for main circuit (MO valve for hot gas)>



*1: For the mounting direction, refer to figure shown above.
*2: Securely insert the coil until you hear it click.

*3: For the setting procedure, refer to page 61.

1 Characteristics of Refrigerant R410A



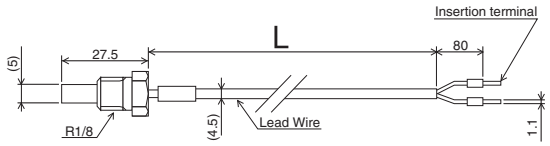
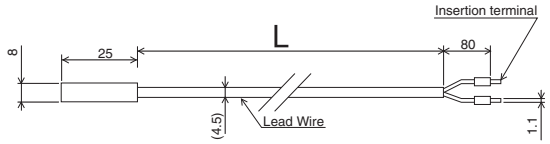
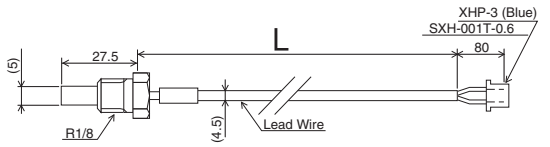
Pressure MPaG	Temperature ℃	Pressure MPaG	Temperature ℃	Pressure MPaG	Temperature ℃
0.00	-51.58	0.90	7	3.49	57
0.06	-42	0.93	8	3.57	58
0.07	-41	0.97	9	3.65	59
0.08	-40	1.00	10	3.73	60
0.085	-39	1.03	11	3.82	61
0.09	-38	1.06	12	3.90	62
0.10	-37	1.09	13	3.99	63
0.11	-36	1.12	14	4.08	64
0.12	-35	1.16	15		
0.13	-34	1.20	16		
0.14	-33	1.24	17		
0.15	-32	1.27	18		
0.16	-31	1.31	19		
0.17	-30	1.35	20		
0.18	-29	1.39	21		
0.19	-28	1.43	22		
0.21	-27	1.48	23		
0.22	-26	1.52	24		
0.23	-25	1.56	25		
0.24	-24	1.60	26		
0.26	-23	1.65	27		
0.27	-22	1.70	28		
0.29	-21	1.75	29		
0.30	-20	1.79	30		
0.32	-19	1.84	31		
0.33	-18	1.89	32		
0.35	-17	1.92	33		
0.36	-16	1.94	34		
0.38	-15	2.02	35		
0.40	-14	2.10	36		
0.42	-13	2.16	37		
0.43	-12	2.21	38		
0.45	-11	2.27	39		
0.47	-10	2.33	40		
0.49	-9	2.39	41		
0.51	-8	2.45	42		
0.54	-7	2.51	43		
0.56	-6	2.57	44		
0.58	-5	2.64	45		
0.60	-4	2.70	46		
0.63	-3	2.77	47		
0.65	-2	2.83	48		
0.68	-1	2.90	49		
0.70	0	2.97	50		
0.73	1	3.04	51		
0.75	2	3.11	52		
0.78	3	3.19	53		
0.81	4	3.26	54		
0.84	5	3.34	55		
0.87	6	3.41	56		

2 Procedure for Mounting Optional Parts

2-1. Machine Body Thermistor/Returned Oil Thermistor (Optional)

①Symbol and intended use by type

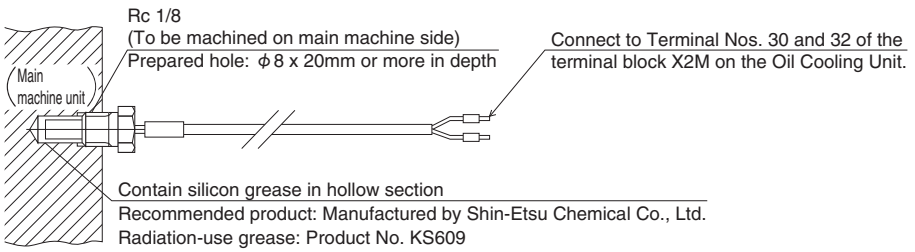
Mounting this optional part to the oil piping of the main machine makes it possible to detect and control the temperature.

Name	Type	Lead wire length L (m)	Shape	Intended use (To be mounted by customer)
Machine body thermistor	**AKZ-OP-K5**	5m		Machine body control (To be recessed in the main machine unit)
	AKZ-OP-K10	10m		
	AKZ-OP-K15	15m		
	AKZ-OP-A5	5m		Machine body control (To be affixed to the surface of the main machine unit)
	AKZ-OP-A10	10m		
Returned oil thermistor (optional)	**AKZ-OP-Y5**	5m		Returned oil temperature control (To be mounted to the oil piping of the main machine)
	AKZ-OP-Y10	10m		

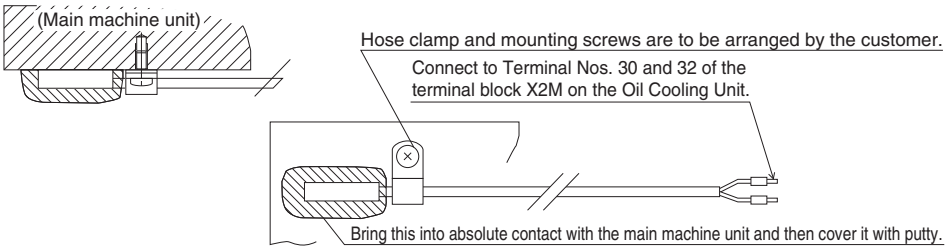
Thermistor characteristics: Resistance···R25 (Resistance at 25℃) ＝20kΩ Tolerance: ±3%

②Mounting procedure

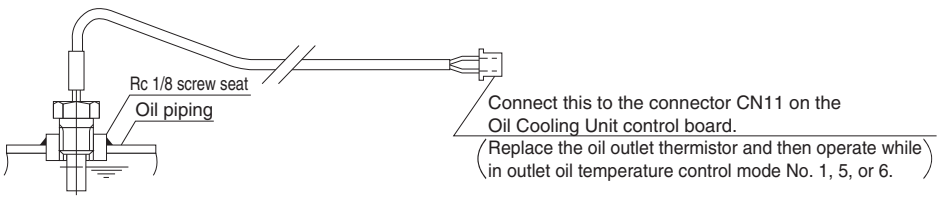
For AKZ-OP-K



For AKZ-OP-A



For AKZ-OP-Y



2-2. Communication Board (Optional)

When this optional board is mounted to the Oil Cooling Unit to connect this unit to the main machine:

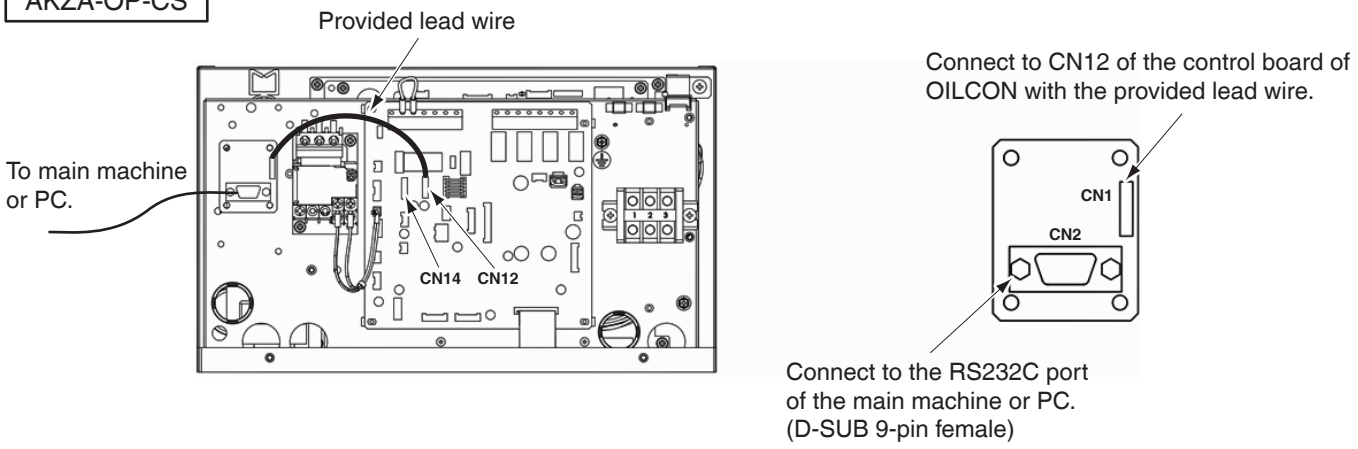
1. You can change the operation mode and operation setting from the main machine.
2. You can read the Oil Cooling Unit alarm code and temperature data (machine temperature, room temperature, inlet oil temperature, outlet oil temperature, temperature difference between inlet and outlet, and inverter frequency data) from the main machine.

Optional parts

Communication method	Type	Mounting position	Compatible model	Specification No.
Serial communication	AKZA–OP–CS	Inside switch box	AKZ**A (10 series)	PSP07465
Serial / Parallel communication	AKZA-OP-CSP	Inside switch box	AKZ**A (10 series)	PSP07466

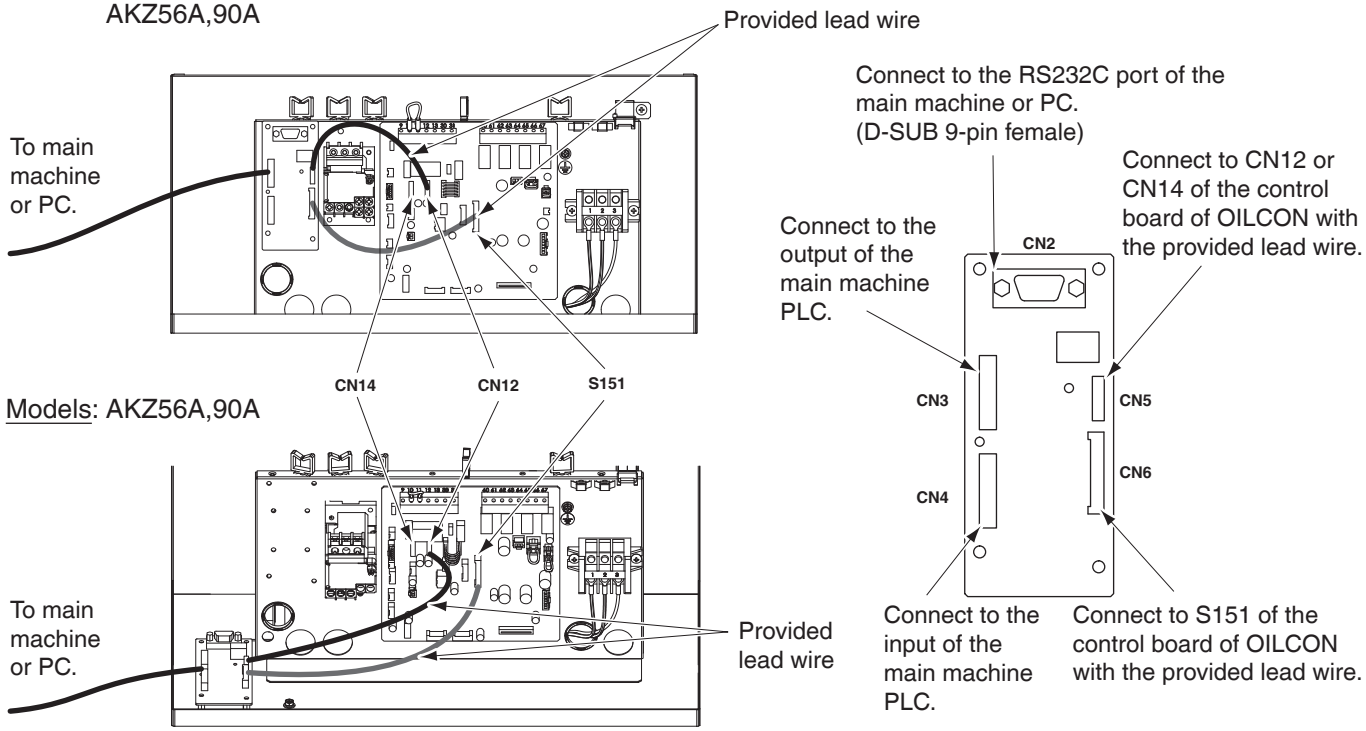
Mounting procedure

AKZA-OP-CS



AKZA-OP-CSP The position at which mounting is possible varies depending on the model.

Models: AKZ14A,32A,43A
AKZ56A,90A



3 Notes on Installation

3-1. Installing Location and Oil Piping

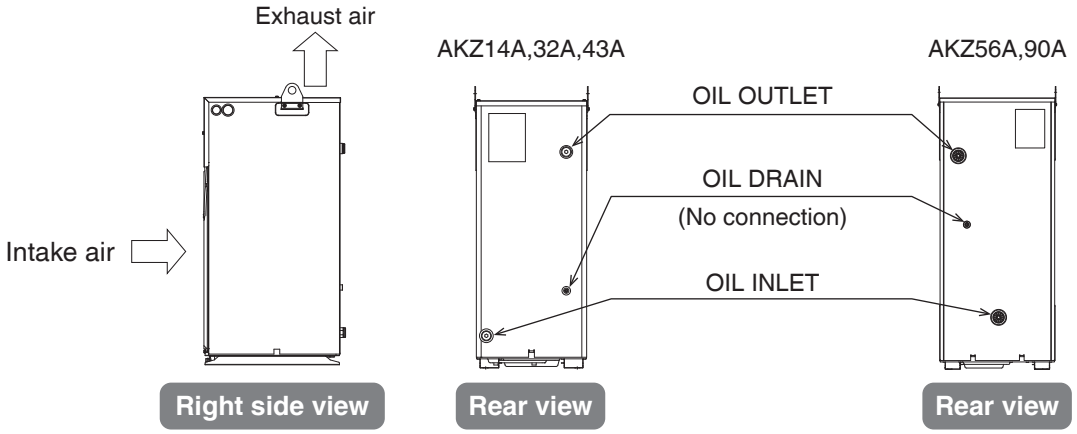
■ **For an installation place, observe the following.**

1. Horizontal and rugged floor face (vertical interval 5 mm or less) When you install the product, fix it with a bolt (M10×20 hexagonal bolt is recommended).
2. A place where the unit is not exposed to direct sunlight or heat
3. A place with proper ventilation and little humidity
4. A place where exhaust air does not circulate (exhaust air will not be taken into the unit)
5. A place that allows easy access to piping and wiring
6. A place with little contaminant, waste, dust particles or oil mist
   (Ensure that no foreign matter enters the electric component box.)
7. A place free from explosive atmosphere (evolution, inflow, retention or leak of inflammable gas)
8. Do not install the unit outdoors.
9. Install the unit within 1 m of the tank level. (Otherwise, it will affect the sucking capability of the pump.)
10. Keep any electrical noise generating devices away from the unit. If it is difficult to do so, implement appropriate measures on the noise generating devices.
11. Leave safe, sufficient space around the unit to ensure proper, trouble-free operations of the control panel.
12. Do not install at an altitude of 2,000m or more.

■ **Do not place an object that may block air flow within 500 mm from the air intake/exhaust port.**

■ **Oil piping: Locations of the oil inlet, oil outlet and oil drain are shown below.**

Oil may remain inside the OILCON, so prepare something to catch the oil, such as an oil tray.



1. Make sure that the pressure loss at the oil inlet/outlet is within the following range:
   • Suction pressure (at oil inlet) ..... –30.7 to 0 kPa
   • Discharge pressure (at oil outlet) ..... 0.5 MPa or less
   However, if the atmospheric pressure drops, use thorough caution about suction pressure.
   In case atmospheric pressure drops, be careful of the decrease of inlet suction pressure.
   (Reference) Reduction of the pressure at altitude:–1kPa/100m
2. Use piping that can withstand a pressure of more than 1MPa and with oil resistance characteristics, and avoid using a valve in the middle of the piping as much as possible.
   If a valve is used, it causes a large pressure loss even when it is fully opened.
3. If the oil viscosity is high, or if there is a large pressure loss in external piping (other than the piping for the Oil Cooling Unit), use a pipe with a larger diameter to reduce the pressure loss.
   If the operating condition exceeds the specified range, it causes noise or fault of the unit. Use thorough caution about the operating condition. Keep the oil viscosity at 1.4 to 200 mm^2/s.
4. To prevent air entry or oil leak, wrap the pipe joints with sealing tape, etc.
5. Make sure that the oil piping of the main machine is not blocked (fully closed).

3-2. Suction Strainer (Line Filter)

Attach a strainer (mesh size: 100 to 150) with a small pressure loss to the oil piping system.

- If the evaporator (cooler) in the Oil Cooling Unit is clogged with dust, it causes not only cooling capacity deterioration, but also a fault of the compressor or oil pump.
- During adjustment at trial run, the strainer gathers much dust from the oil piping system. Clean or replace the strainer before starting actual operation. Check the strainer periodically.
- The oil pollution level must not exceed NAS class 10.

3-3. Oil Tank

- To receive oil from the main machine oil piping system, provide an oil tank that can accept an increase/decrease in oil quantity.
- Consider the tank structure so that inside of the tank can be easily cleaned. (For example, the tank has a cleaning hole or the tank top plate is detachable.)
- Before the start of operation, make sure that the tank is filled with oil to an appropriate level.

4 Electric Wiring Work

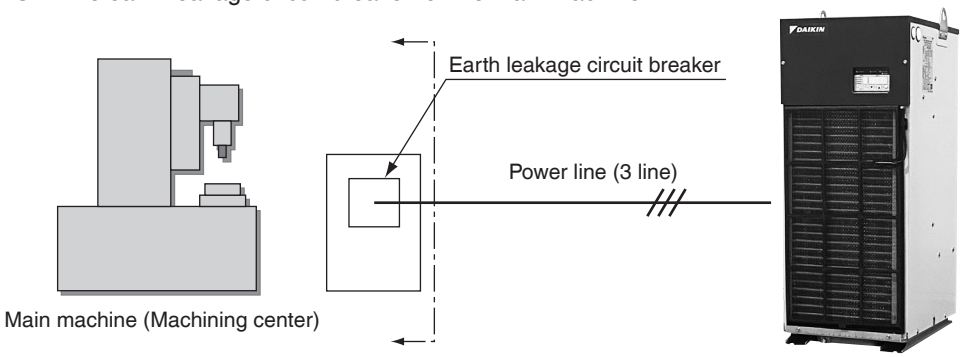
- Conduct electric wiring according to the local wiring standard.
- For the power supply, be sure to use the commercial power source. If you use the inverter power source or other power source, the product may cause burnout.
- The Oil Cooling Unit is not equipped with an earth leakage circuit breaker. An earth leakage circuit breaker exclusively for the unit should be mounted to the main machine.
- For electric wiring, refer to the electric wiring diagram on the nameplate attached to the rear of the switch box cover.
- Do not change the wiring in the Oil Cooling Unit. Do not touch the protection devices.

4-1. Starting/stopping the Oil Cooling Unit

To turn ON the power supply for the Oil Cooling Unit, the following three methods are available:

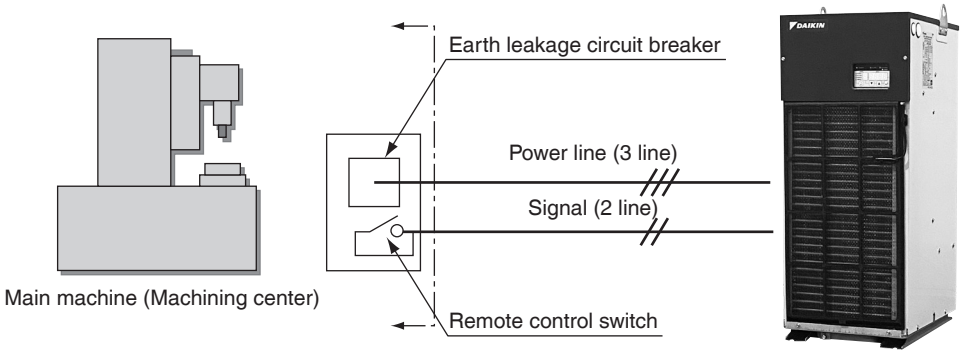
1 Directly starting/stopping the Oil Cooling Unit with the main machine power supply

When the earth leakage circuit breaker for the main machine is turned ON, the Oil Cooling Unit starts operation. To stop the unit, turn OFF the earth leakage circuit breaker for the main machine.



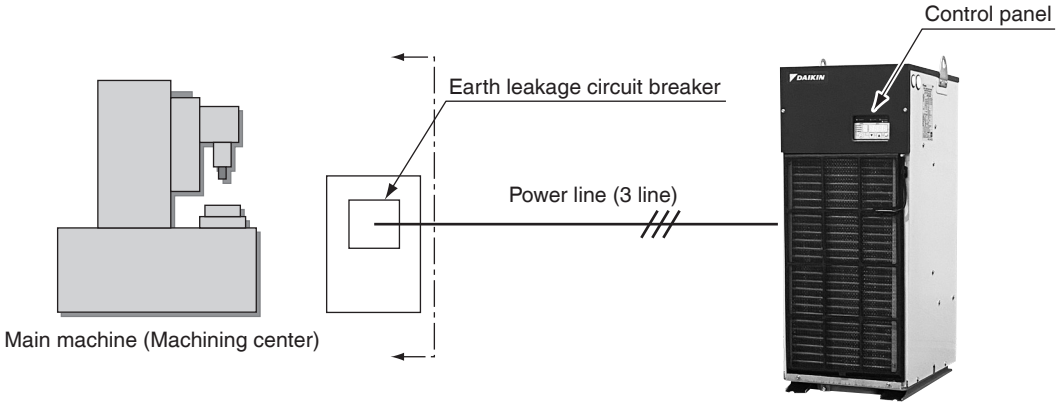
2 Starting/stopping the Oil Cooling Unit with the remote control contact

When the remote control switch is turned ON, the Oil Cooling Unit starts operation. To stop the unit, turn OFF the remote control switch.



3 Starting/stopping the Oil Cooling Unit with the control panel

If you keep pressing the ▼ and ▲ keys for at least 5 seconds in the “operation lock” mode, the Oil Cooling Unit starts operation according to preset conditions. If you keep pressing the ▼ and ▲ keys for at least 5 seconds during operation, “Loc” blinks on the data display, and the Oil Cooling Unit will be stopped (locked).



4-2. Mounting a Ground Leakage Circuit Breaker

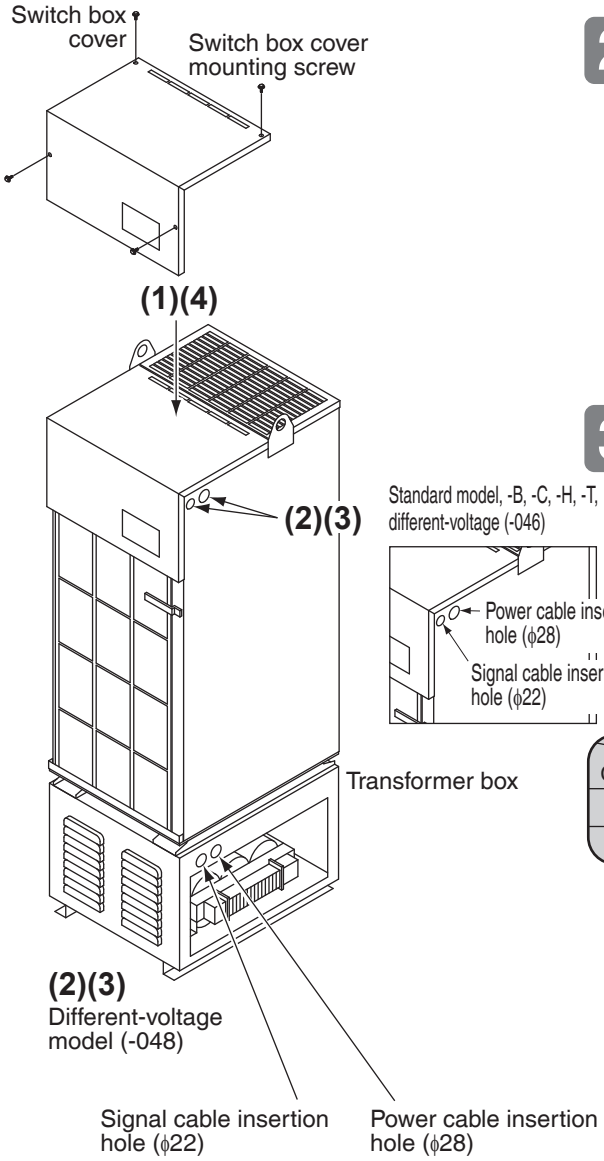
The Oil Cooling Unit is not equipped with a ground leakage circuit breaker. Be sure to mount a 3-pole ground leakage circuit breaker (∗) exclusively for the Oil Cooling Unit to the main machine. For the breaker capacity, refer to the specifications of each model (from page 10).
(Recommended product: Rated sensitivity current 15 mA or 20 mA)

∗ The ground leakage circuit breaker must conform to IEC 60947-2, and the distance between the contacts must be more than 3 mm.

⚠ CAUTION

To use a ground leakage breaker, select an inverter-compatible type.
If the ground leakage breaker is not inverter-compatible, it may malfunction due to high-frequency noise of the inverter.

4-3. Wiring procedure



1 **Remove the switch box cover mounting screws, and remove the switch box cover.**

2
1. **Insert the power cable into the power cable insertion hole (ϕ28) in the side plate of the unit.**
2. **Insert the remote control signal cable and external output signal cable into the signal cable insertion hole (ϕ22) in the side plate of the unit. When using the different-voltage model (-048), insert the power cable into the transformer box.**

∗ Use conduits with IP54 or higher for wiring intake to allow the electric component box to have a protective structure equivalent to IP54. If the electric component box is affected by electrical noise, use conduits or shielded cables. Allow a proper distance from the potential noise source.

3
1. **Connect the ground cable to the ⏚(ground) terminal.**
   Use green/yellow ground cable.
2. **Connect the power cable to the power supply terminal block.**
   Connect the power cable to the breaker if OILCON is supplied with breaker.

■ When you remove the power cables, follow the instructions above in reverse. (Default setting is breaker OFF.)
■ The cable size should conform to those listed below, or a larger size.

Model/Series name / Cable type	AKZ14A/32A/43A/56A series	AKZ90A series
UL cable	UL1015 AWG#14 (equivalent to 2.0 mm²)	UL1015 AWG#12 (equivalent to 3.5 mm²)
IEC/CENELEC cable	2.5 mm² (60245 IEC53/H05RR-F)	4.0 mm² (60245 IEC53/H05RR-F)

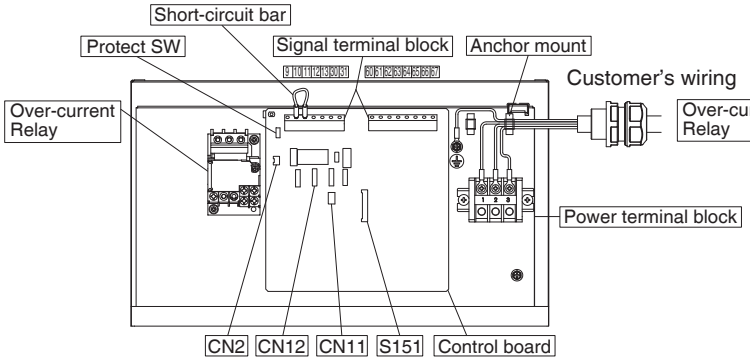
■ For each wiring, use M4 or M5 coated round crimp-style terminal. (For the crimp tool, use the specified tool.
Carry out the processing of the crimp-style terminal to prevent short- circuits between phases.)
■ The tightening torque of the screw to the terminal block should be 0.98 to 1.47N·m.
■ Carry out the processing of the wiring careful not to damage the electric wire coating.
■ Fix the electric wire and the signal wire to the anchor mount with tie wrap.

4 **Re-mount the switch box cover, and fasten it with the screws.**

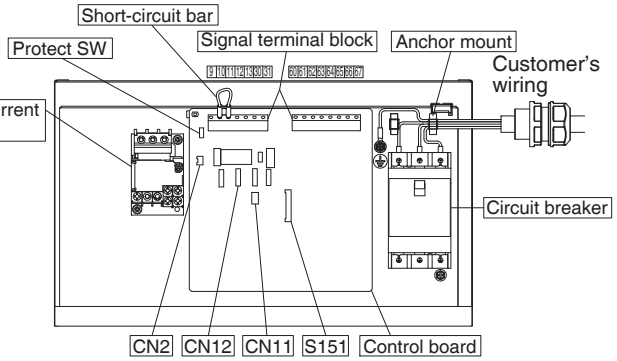
■ Secure the switch box cover mounting screws with 1N·m to maintain the protection structure of the switch box.

4-4. Switch Box Outline

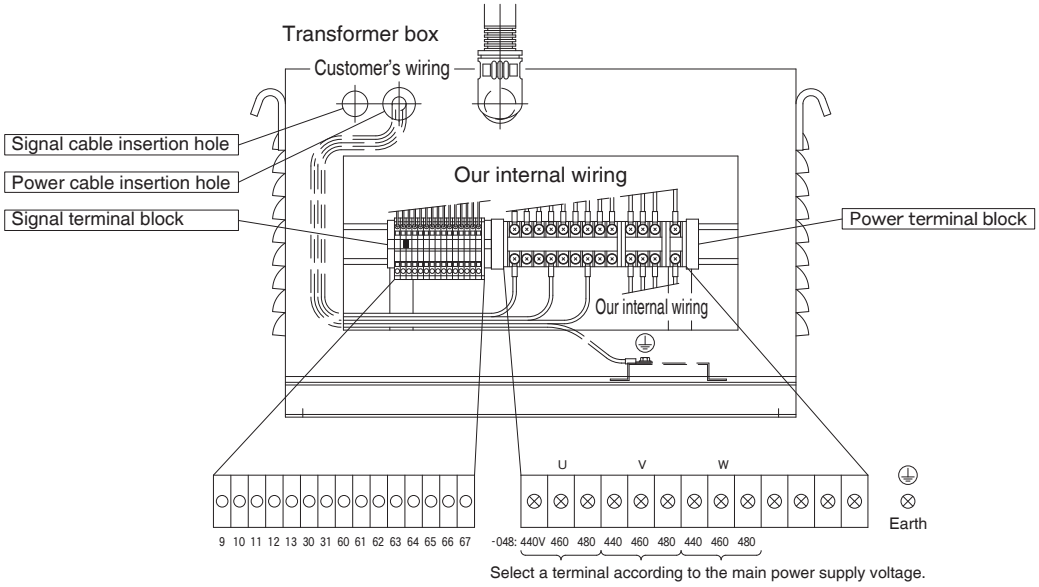
Terminal block for standard model (Including -C, -H and -T)



Built-in breaker model (B)



For different-voltage model (-048)* (* Wiring connection example when the voltage is 440V)



Terminal screw size and tightening torque

(N·m)

Terminal block for standard model (Including -C, -H, and -T)	M4, M5	0.98–1.47
Breaker terminals (-B)	M5	2–3
Transformer terminals (-048)	M4	1.2–2.0

- Protect switch (erroneous operation prevention)
  The factory setting of this switch is OFF but some nonstandard units are set to ON.
  Pay attention when you attempt to change any of the operation setting, parameter setting or timer setting.
- Connector CN2 (Option OP2 terminal)
  Alarm will be generated on malfunction by connecting an external protecting device and setting the parameter (n003)
- Connector CN11
  Replace this connector with the outlet oil thermistor when you attempt returned oil temperature control.
- Connector CN12
  Connect the lead provided in the unit to the optional communication board.
- Connector S151
  Connect the lead provided in the unit to the optional communication board.

4-5. Connecting Remote-control Operation Input

To execute remote control, connect the cable according to the procedure below.

1 Local procurement items

Component	Single-pole, single-throw remote control switch, or "a" contact that enables operation command output Note) Select a switch whose minimum allowable load is 12 VDC and 5 mA.
Wiring material	Single-core cable: ϕ1.2 (AWG16), or twisted cable: 1.25 mm^2 (AWG16), Bar-type crimp terminal (∗)

∗ Recommended Model (Manufacturer): TGN TC-1.25-9T (Nichifu)
APA-1.25N (Daido Solderless Terminal Mfg.)

2 Remove the short-circuit bar (between terminals [10]-[11]) on the terminal block in the switch box.

3 Connect the cable specified in 1 above between terminals [10]-[11]. (For the crimp tool, use the specified tool.)

∗12 VDC is applied across these terminals (Terminal [10]: negative polarity, [11]: positive polarity).

4-6. Connecting External Output Contact

To output the Oil Cooling Unit operation status signal to the main machine, connect the required signal cable to the signal terminal block according to the procedure below.
To use an output contact, change the parameter setting, and make sure that the output contact normally operates.

1. Bar-type Terminal and cable size

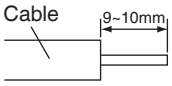
Bar-type Terminal	Cable size	
	IEC cable	UL cable
∗	0.3 mm^2 – 1.5 mm^2	AWG#22 – #16

∗ Recommended Model (Manufacturer): TGN TC-1.25-9T (Nichifu)
APA-1.25N (Daido Solderless Terminal Mfg.)

2. Connect each cable by using a bar-type crimp terminal.

3. Use a twisted cable.

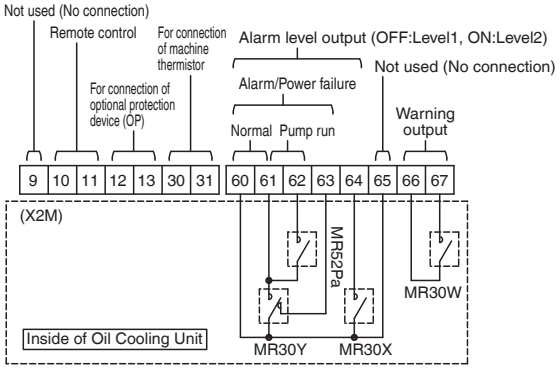
4. When a 2-core IEC cable is used, the cable size should be 0.5 to 1.5 mm^2. When you use a stripped wire, strip the sheath 9 to 10mm from the end of the wire.



⚠ CAUTION

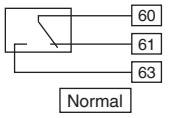
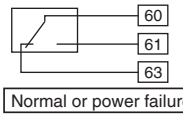
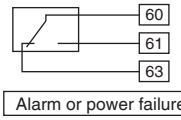
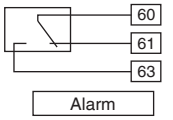
- The contact capacity is as follows:
  Resistance load: 30 VDC, 2 A
- The minimum allowable load is as follows:
  12 mVDC, 10 μA
- To connect an inductive load, be sure to use a surge absorber.

1 External input and output circuit



2 Alarm and warning output logic

The alarm and warning output logic can be changed depending on the parameter setting.

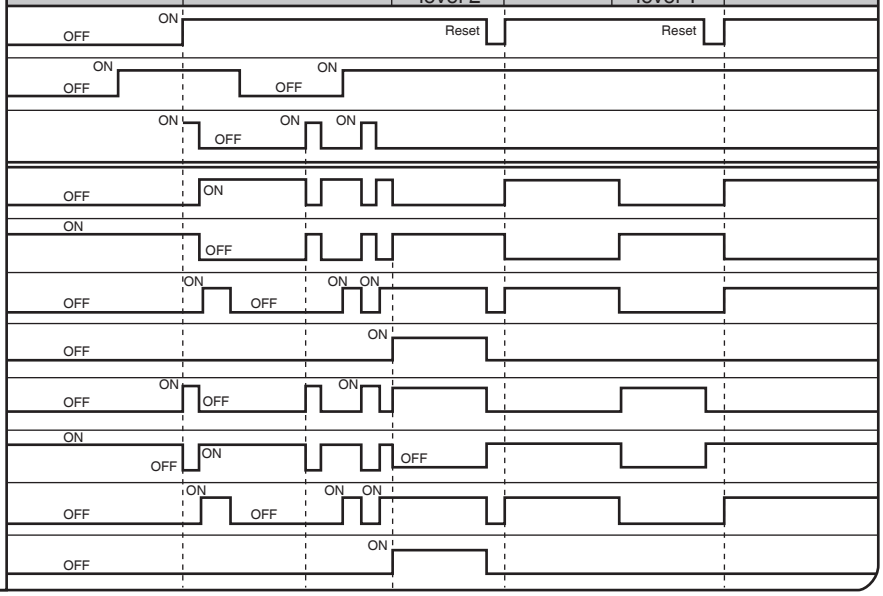
Value of the first digit in alarm and warning output logic parameter (n001)	
0 (Factory setting) [Positive action]	1 [“b” contact]
 Normal	 Normal or power failure
 Alarm or power failure	 Alarm

3 When the power supply is turned ON, external output becomes unstable.

Set up the main machine sequence program so that the external output signal is ignored for one second after power-ON.

External output timing chart

Operation status			Power OFF (including power failure)	Power ON: Run	Power ON: Alarm level 2	Power ON: Run	Power ON: Alarm level 1	Power ON: Run
Preset condition	Power supply							
	Remote control contact	Between terminals [10]-[11]						
	Operation panel	Operation lock mode						
Mode and terminal symbol of external output contact: Output logic parameter setting: “0”	Normal (“a” contact)	Between terminals [60]-[61]						
	Alarm/Stop (Power OFF) (“b” contact)	Between terminals [60]-[63]						
	Agitator operation/ Pump run (“a” contact)	Between terminals [61]-[62]						
	Alarm level	Between terminals [60]-[64]						
Mode and terminal symbol of external output contact: Output logic parameter setting: “1”	Alarm (“a” contact)	Between terminals [60]-[61]						
	Normal/Stop (Power OFF) (“b” contact)	Between terminals [60]-[63]						
	Agitator operation/ Pump run (“a” contact)	Between terminals [61]-[62]						
	Alarm level	Between terminals [60]-[64]						



Signal output \ Operation status				No warning status: Normal	No warning status: Alarm level 1 or LOCK	No warning status: Alarm level 2	No warning status: Power failure (Power OFF)	Warning status: Normal	Warning status: Alarm level 1 or LOCK	Warning status: Alarm level 2	Warning status: Power failure (Power OFF)
Warning output (“a” contact)	Output logic parameter setting: “0”	[66]-[67]	ON OFF								
	Output logic parameter setting: “1”	[66]-[67]	ON OFF								

5 Maintenance and Inspection

5-1. Daily Maintenance and Inspection

- Oil pollution causes a fault or shortened service life of the pump. The oil pollution level must not exceed NAS class 10.
- Keep a normal oil level in the oil tank (Between the yellow line and red line of the oil level gauge). Make sure that the oil does not contain air bubbles.
- Clean inside of the oil tank periodically.
- Make sure that the main machine oil piping is not blocked (fully closed).
- Make sure that the oil piping has no oil leak.
- Make sure that the power supply voltage is within the range specified in the specifications.
- Make sure that the compressor, fan and oil pump do not abnormally sound during operation.
- Make sure that the OILCON does not abnormally shake during operation.
- Check whether the sheath of the OILCON power lead is not broken.

5-2. Periodic Maintenance and Inspection

Suction strainer

- Clean the suction strainer every six months to prevent the pump flow rate from being reduced due to blockages built-up, and to prevent abnormal sound caused by cavitation.

Air filter

NOTE: Wear gloves when working as the fins of the condenser may cause injury while replacing the air filter.

- Be sure to wash the air filter with water at 40℃ or lower temperature every two weeks.
  If the air filter is clogged with dust, the intake air volume reduces, resulting in capacity deterioration. Also, the compressor's protection device is activated, hindering smooth operation. Furthermore, it causes power consumption increase.
- Operating the unit without the air filter causes a fault.
- To remove the air filter, first remove the room thermistor, then lift the air fiter up and pull it forward and out.

If the air filter is clogged, the cooling capacity deteriorates, resulting in excess power consumption. Clean the air filter periodically to improve efficiency.

Condenser

- Check whether there are any substances in the condenser by removing the air filter (You do not need to remove the external plate).
- If the condenser becomes extremely dirty, clean it with a brush, air blower, etc.
- However, do not use water or cleaning agents for cleaning. The fan motor or pump motor may cause a ground leakage.

Exterior

- Wipe the exterior surface with a dry cloth.
  Never splash water over it.
- To clean the exterior, do not use a brush, polish powder, acid, solvent (benzine etc.) or hot water. Using such substances causes the paint to peel off.

Evaporator

- Perform inspect the evaporator regularly as the piping becomes blocked (fully closed) because the internal gaps are clogged with dirt. The inside of the evaporator cannot be checked as it is sealed. Check the oil flow rate at the customer's oil piping from the OILCON output (You do not need to remove the external plate).

Heater

- The dust clogging in the heater causes the same status as heating without water. Carry out the inspection periodically.

Oil drain (drain pan)

- Inspect the bottom of OILCON (drain pan) every six months and if oil has accumulated, discharge it from the oil drain port. The tightening torque of the hexagonal bolt for the drain is 2N·m.
  If it is tightened with excessive torque, the bottom frame may be damaged.

Sealing material of the switch box cover

- If the sealing material of the switch box cover is seriously damaged, consult Nearby Service Network. If you use the product without an addressing the damage, the protection structure of IP54 cannot be maintained and the electric component may break down.

5-3. To leave the unit unused for a long period

・Mount a cover to the Oil Cooling Unit to prevent dust or water from entering inside of the unit.
・Be sure to turn OFF the main power supply.
・Be careful to keep oily dust off the condenser surface of the Oil Cooling Unit.

MEMO

MEMO

Warning

- Ask a qualified installer or contractor to install this product. Do not try to install the product yourself. Improper installation can result in water or refrigerant leakage, electrical shock, fire or explosion.
- Use only those parts and accessories supplied or specified by Daikin. Ask a qualified installer or contractor to install those parts and accessories. Use of unauthorized parts and accessories or improper installation of parts and accessories can result in water or refrigerant leakage, electrical shock, fire or explosion.
- Read the User's Manual carefully before using this product. The User's Manual provides important safety instructions and warnings. Be sure to follow these instructions and warnings.

For any inquiries, contact your local distributor.

Cautions on product corrosion

1. Air conditioners should not be installed in areas where corrosive gases, such as acid gas or alkaline gas, are produced.
2. If the outdoor unit is to be installed close to the sea shore, direct exposure to the sea breeze should be avoided and choose an outdoor unit with anti-corrosion treatment.

The air conditioners manufactured by Daikin Industries have received **ISO 9000 series** certification for quality assurance.

Certificate Number.
(ISO9001) **JMI-0107** (ISO9002) **JQA-1452**
JQA-0495

All Daikin Industries locations and subsidiaries in Japan have received environmental management system standard **ISO 14001** certification.

Daikin Industries, Ltd.
Domestic Group
Certificate Number. EC99J2044

About ISO 14001

ISO 14001 is the standard defined by the International Organization for Standardization (ISO) relating to environmental management systems. Our group has been acknowledged by an internationally accredited compliance organisation as having an appropriate programme of environmental protection procedures and activities to meet the requirements of ISO 14001.

Dealer

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•The specifications, designs, and information in this brochure are subject to change without notice.