



YMAE Air-Cooled Inverter Scroll Chiller and Heat Pump

YMAE 0045, 0050, 0065, 0100, 0130, 0230, 0260, 50 Hz, with Refrigerant R-454B



035-27485-002

Installation, Operation, and Maintenance
Guide

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General safety guidelines

► **Important:** Read before proceeding.

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals might be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled incorrectly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating and service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, operating, and service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks correctly and safely. It is essential that, before performing any task on this equipment, this individual must read and understand the on-product labels, this document and any referenced materials. This individual must also be familiar with and comply with all applicable industry and governmental standards and regulations relating to the task in question.

Safety symbols

The following symbols are used in this document to alert the reader to specific situations:

DANGER

Indicates a possible hazardous situation which will result in death or serious injury if correct care is not taken.

WARNING

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if correct care is not taken.

CAUTION

Identifies a hazard which could lead to damage to the machine, damage to other equipment and environmental pollution if correct care is not taken or instructions are not followed.

① **Note:** Highlights additional information useful to the technician in completing the work being performed correctly.

Wiring warning

 **WARNING**

External wiring, unless specified as an optional connection in the manufacturer’s product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with the published specifications of Johnson Controls and must be performed only by a qualified electrician. Johnson Controls will not be responsible for damage or problems resulting from incorrect connections to the controls or application of incorrect control signals. Failure to follow this warning will void the manufacturer’s warranty and cause serious damage to property or personal injury.

Refrigerant information

- This equipment contains a refrigerant R-454B, a fluorinated greenhouse gas covered by the Kyoto Protocol.
- The global warming potential of refrigerant R-454B is 466.
- R-454B is classified as an A2L refrigerant and must be handled in accordance with all governing regulations.
- See [Physical data](#) for the refrigerant quantity.
- Do not vent the fluorinated greenhouse gases in this equipment to the atmosphere.
- Follow all local safety regulations for fluorinated greenhouse gases.
- This equipment must be serviced by qualified technicians.

A2L refrigerant warning

 **WARNING**

The refrigerant in the unit is classified as an A2L refrigerant and must be handled in accordance with, but not limited to, EN 378 and all local building and safety regulations. Failure to meet this requirement can result in damage to equipment, release of refrigerant into the environment, contamination of the operating space around the equipment and pose a risk of personal injury or death. It is the responsibility of any service technician or operator to adhere to these requirements.

The refrigerant in the unit is classified as PED fluid group 1 and safety class A2L in accordance with Annex E of EN378-1:2016 and PED 2014/68/EU.

The unit is not an ATEX unit and it is intended for use in normal areas. However, the volume around the relief valve piping exhaust opening are zone 2 areas during normal operation.

Under ATEX, areas are classified according to the hazard associated with the flammable gas.

The following classification applies in relation to EN 60079-10:

- Zone 2 - An area in which an explosive gas atmosphere is not likely to occur during normal operation, and if it does occur, it will exist for a short period of time only.

EN standards are typically based on an international standard ISO and IEC standards are international safety-in-use type standards. The following table defines the relationship between International and European Union standards:

Table 1: International and European standards

Standard type	International	European
Refrigerant classification	ISO 817	Follows ISO 817
Safety in use		

Table 1: International and European standards

Standard type	International	European
General	ISO 5149	EN 378
Equipment specific	IEC 60335-2-40	EN 60335-2-40

Check your local regulations and the correct standards such as those listed above to verify the allowable filling charge, new equipment design, and safe handling requirements for the intended application. Where an equipment standard provides guidance for charge limitations, the equipment standard overrules charge limitations in the general safety standard.

The pressure relief valves fitted to units with A2L refrigerant are individually approved in accordance with existing standards under PED from the manufacturer.

You must confirm if any additional rules apply in your country for relief valves with release into free air because this is governed by national and local standards.

Material safety data sheets

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Opteon™ XL41 (R-454B) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 12.03.2024
6.2	03.05.2024	2059543-00028	Date of first issue: 10.10.2017

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name	:	Opteon™ XL41 (R-454B) Refrigerant
SDS-Identcode	:	130000143545
Unique Formula Identifier (UFI)	:	8186-YEN7-0PAD-CG9G

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Sub-stance/Mixture	:	Refrigerant
Recommended restrictions on use	:	For professional and industrial installation and use only., Do not use product for anything outside of the above specified uses

1.3 Details of the supplier of the safety data sheet

Company	:	Chemours Netherlands B.V. Baanhoekweg 22 3313 LA Dordrecht Netherlands
Telephone	:	+31-(0)-78-630-1011
Telefax	:	+31-78-6163737
E-mail address of person responsible for the SDS	:	sds-support@chemours.com

1.4 Emergency telephone number

+(353)-19014670 (CHEMTREC - Recommended) ; +353-(01) 809 2166 (Poison Information Center of Ireland)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Flammable gases, Category 1B	H221: Flammable gas.
Gases under pressure, Liquefied gas	H280: Contains gas under pressure; may explode if heated.

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2.2 Label elements**Labelling (REGULATION (EC) No 1272/2008)**

Hazard pictograms :



Signal word : Danger

Hazard statements : H221 Flammable gas.
H280 Contains gas under pressure; may explode if heated.

Precautionary statements : **Prevention:**
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response:
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 In case of leakage, eliminate all ignition sources.

Storage:
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Additional Labelling

Contains fluorinated greenhouse gases. (HFC-32)

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Ecological information: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Toxicological information: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.

Rapid evaporation of the product may cause frostbite.

May displace oxygen and cause rapid suffocation.

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SECTION 3: Composition/information on ingredients**3.2 Mixtures****Components**

Chemical name	CAS-No. EC-No. Index-No. Registration number	Classification	Concentration (% w/w)
Difluoromethane#	75-10-5 200-839-4 01-2119471312-47	Flam. Gas 1B; H221 Press. Gas Liquefied gas; H280	68.8995
2,3,3,3-Tetrafluoropropene#	754-12-1 468-710-7 01-0000019665-61	Flam. Gas 1B; H221 Press. Gas Liquefied gas; H280	31.1

For explanation of abbreviations see section 16.

Voluntarily-disclosed substance

SECTION 4: First aid measures**4.1 Description of first aid measures**

- General advice : In the case of accident or if you feel unwell, seek medical advice immediately.
When symptoms persist or in all cases of doubt seek medical advice.
- Protection of first-aiders : No special precautions are necessary for first aid responders.
- If inhaled : If inhaled, remove to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
Get medical attention immediately.
- In case of skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area.
Get medical attention immediately.
- In case of eye contact : Get medical attention immediately.
- If swallowed : Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed

- Symptoms : May cause cardiac arrhythmia.
- Other symptoms potentially related to misuse or inhalation abuse are
Cardiac sensitisation
Anaesthetic effects
Light-headedness
Dizziness

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confusion
Lack of coordination
Drowsiness
Unconsciousness

Risks : Gas reduces oxygen available for breathing.
Contact with liquid or refrigerated gas can cause cold burns and frostbite.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

SECTION 5: Firefighting measures**5.1 Extinguishing media**

Suitable extinguishing media : Water spray
Alcohol-resistant foam
Carbon dioxide (CO₂)
Dry chemical

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting : Vapours may form flammable mixture with air
Exposure to combustion products may be a hazard to health.
If the temperature rises there is danger of the vessels bursting due to the high vapor pressure.

Hazardous combustion products : Hydrogen fluoride
carbonyl fluoride
Carbon oxides
Fluorine compounds

5.3 Advice for firefighters

Special protective equipment for firefighters : Wear self-contained breathing apparatus for firefighting if necessary. Use personal protective equipment.

Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Fight fire remotely due to the risk of explosion.
Use water spray to cool unopened containers.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Remove undamaged containers from fire area if it is safe to do so.
Evacuate area.

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SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Personal precautions : Evacuate personnel to safe areas.
Only trained personnel should re-enter the area.
Remove all sources of ignition.
Avoid skin contact with leaking liquid (danger of frostbite).
Ventilate the area.
Follow safe handling advice (see section 7) and personal protective equipment recommendations (see section 8).

6.2 Environmental precautions

Environmental precautions : Avoid release to the environment.
Prevent further leakage or spillage if safe to do so.
Retain and dispose of contaminated wash water.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Ventilate the area.
Non-sparking tools should be used.
Suppress (knock down) gases/vapours/mists with a water spray jet.
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable.
Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

6.4 Reference to other sections

See sections: 7, 8, 11, 12 and 13.

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

Technical measures : Use equipment rated for cylinder pressure. Use a backflow preventative device in piping. Close valve after each use and when empty.

Local/Total ventilation : If sufficient ventilation is unavailable, use with local exhaust ventilation.
If advised by assessment of the local exposure potential, use only in an area equipped with explosion-proof exhaust ventilation.

Advice on safe handling : Avoid breathing gas.
Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure as-

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assessment
Keep container tightly closed.
Wear cold insulating gloves/ face shield/ eye protection.
Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point.
Prevent backflow into the gas tank.
Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.
Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems.
Close valve after each use and when empty. Do NOT change or force fit connections.
Prevent the intrusion of water into the gas tank.
Never attempt to lift cylinder by its cap.
Do not drag, slide or roll cylinders.
Use a suitable hand truck for cylinder movement.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Take precautionary measures against static discharges.
Take care to prevent spills, waste and minimize release to the environment.

Hygiene measures : If exposure to chemical is likely during typical use, provide eye flushing systems and safety showers close to the working place. When using do not eat, drink or smoke. Wash contaminated clothing before re-use.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. Keep in properly labelled containers. Keep tightly closed. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations. Keep away from heat and sources of ignition.

Advice on common storage : Do not store with the following product types:
Self-reactive substances and mixtures
Organic peroxides
Oxidizing agents
Flammable liquids
Flammable solids
Pyrophoric liquids
Pyrophoric solids
Self-heating substances and mixtures
Substances and mixtures, which in contact with water, emit flammable gases
Explosives
Very acutely toxic substances and mixtures
Acutely toxic substances and mixtures

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Substances and mixtures with chronic toxicity

Storage period : > 10 yr

Recommended storage temperature : < 52 °C

Further information on storage stability : The product has an indefinite shelf life when stored properly.

7.3 Specific end use(s)

Specific use(s) : No data available

SECTION 8: Exposure controls/personal protection**8.1 Control parameters****Occupational Exposure Limits**

Contains no substances with occupational exposure limit values.

Derived No Effect Level (DNEL) according to Regulation (EC) No. 1907/2006:

Substance name	End Use	Exposure routes	Potential health effects	Value
Difluoromethane	Workers	Inhalation	Long-term systemic effects	7035 mg/m3
	Consumers	Inhalation	Long-term systemic effects	750 mg/m3
2,3,3,3-Tetrafluoropropene	Workers	Inhalation	Long-term systemic effects	950 mg/m3

Predicted No Effect Concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Substance name	Environmental Compartment	Value
Difluoromethane	Fresh water	0.142 mg/l
	Intermittent use/release	1.42 mg/l
	Fresh water sediment	0.534 mg/kg dry weight (d.w.)
2,3,3,3-Tetrafluoropropene	Fresh water	0.1 mg/l
	Intermittent use/release	1 mg/l
	Fresh water sediment	1.51 mg/kg dry weight (d.w.)
	Soil	1.49 mg/kg dry weight (d.w.)
	Marine water	0.01 mg/l
	Marine sediment	0.151 mg/kg dry weight (d.w.)

8.2 Exposure controls**Engineering measures**

Minimize workplace exposure concentrations.

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If sufficient ventilation is unavailable, use with local exhaust ventilation.
If advised by assessment of the local exposure potential, use only in an area equipped with explosion-proof exhaust ventilation.

Personal protective equipment

Eye/face protection : Wear the following personal protective equipment:
Chemical resistant goggles must be worn.
Face-shield
Equipment should conform to I.S. EN 166

Hand protection
Material : Impervious gloves

Remarks : Choose gloves to protect hands against chemicals depending on the concentration and quantity of the hazardous substance and specific to place of work. For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Wash hands before breaks and at the end of workday. Breakthrough time is not determined for the product. Change gloves often!

Skin and body protection : Wear the following personal protective equipment:
If assessment demonstrates that there is a risk of explosive atmospheres or flash fires, use flame retardant antistatic protective clothing.

Respiratory protection : If adequate local exhaust ventilation is not available or exposure assessment demonstrates exposures outside the recommended guidelines, use respiratory protection.
Equipment should conform to I.S. EN 14387

Filter type : Organic gas and low boiling vapour type (AX)

Protective measures : Wear cold insulating gloves/ face shield/ eye protection.

SECTION 9: Physical and chemical properties**9.1 Information on basic physical and chemical properties**

Physical state : Liquefied gas

Colour : colourless

Odour : slight, ether-like

Odour Threshold : No data available

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Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	-50.9 °C
Flammability (solid, gas)	:	Flammable
Upper explosion limit / Upper flammability limit	:	Upper flammability limit 23.6 %(V) Method: ASTM E681
Lower explosion limit / Lower flammability limit	:	Lower flammability limit 11.3 %(V) Method: ASTM E681
Flash point	:	Not applicable
Auto-ignition temperature	:	496 °C
Decomposition temperature	:	No data available
pH	:	No data available
Viscosity Viscosity, kinematic	:	Not applicable
Solubility(ies) Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Vapour pressure	:	15,856 hPa (25 °C)
Relative density	:	0.98 (25 °C)
Density	:	0.98 g/cm ³ (25 °C) (as liquid)
Relative vapour density	:	2.2 (Air = 1.0)

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Particle characteristics
Particle size : Not applicable

9.2 Other information

Explosives : Not explosive

Oxidizing properties : The substance or mixture is not classified as oxidizing.

Evaporation rate : > 1
(CCL4=1.0)

SECTION 10: Stability and reactivity**10.1 Reactivity**

Not classified as a reactivity hazard.

10.2 Chemical stability

Stable if used as directed. Follow precautionary advice and avoid incompatible materials and conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions : Vapours may form flammable mixture with air
Can react with strong oxidizing agents.
Flammable gas.

10.4 Conditions to avoid

Conditions to avoid : Heat, flames and sparks.

10.5 Incompatible materials

Materials to avoid : Avoid impurities (e.g. rust, dust, ash), risk of decomposition.
Incompatible with acids and bases.
Incompatible with oxidizing agents.
Oxygen
Peroxides
peroxide compounds
Powdered metals

10.6 Hazardous decomposition products

No hazardous decomposition products are known.

SECTION 11: Toxicological information**11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008**

Information on likely routes of exposure : Inhalation
Skin contact

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Eye contact

Acute toxicity

Not classified based on available information.

Components:**Difluoromethane:**

Acute oral toxicity : Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 520000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 350000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitisation

Lowest observed adverse effect concentration (Dog): > 350000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): > 735,000 mg/m3
Test atmosphere: gas
Remarks: Cardiac sensitisation

Acute dermal toxicity : Assessment: The substance or mixture has no acute dermal toxicity

2,3,3,3-Tetrafluoropropene:

Acute inhalation toxicity : LC50 (Rat): > 405800 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 120000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitisation

Lowest observed adverse effect concentration (Dog): > 120000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m3
Test atmosphere: gas
Remarks: Cardiac sensitisation

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Skin corrosion/irritation

Not classified based on available information.

Components:**Difluoromethane:**

Result : No skin irritation

2,3,3,3-Tetrafluoropropene:

Result : No skin irritation

Serious eye damage/eye irritation

Not classified based on available information.

Components:**Difluoromethane:**

Result : No eye irritation

2,3,3,3-Tetrafluoropropene:

Result : No eye irritation

Respiratory or skin sensitisation**Skin sensitisation**

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Components:**Difluoromethane:**

Exposure routes : Skin contact
Result : negative

Exposure routes : Inhalation
Result : negative

2,3,3,3-Tetrafluoropropene:

Exposure routes : Skin contact
Result : negative

Germ cell mutagenicity

Not classified based on available information.

Components:**Difluoromethane:**

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)

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Method: OECD Test Guideline 471
Result: negative

Test Type: Chromosome aberration test in vitro
Method: OECD Test Guideline 473
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Mouse
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative

Germ cell mutagenicity- Assessment : Weight of evidence does not support classification as a germ cell mutagen.

2,3,3,3-Tetrafluoropropene:

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)
Method: OECD Test Guideline 471
Result: positive

Test Type: Chromosome aberration test in vitro
Method: OECD Test Guideline 473
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Mouse
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative

Test Type: In vivo mammalian alkaline comet assay
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 489
Result: negative

Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative

Germ cell mutagenicity- Assessment : Weight of evidence does not support classification as a germ cell mutagen.

Carcinogenicity

Not classified based on available information.

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Components:**Difluoromethane:**

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

2,3,3,3-Tetrafluoropropene:

Result : negative

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

Reproductive toxicity

Not classified based on available information.

Components:**Difluoromethane:**

Effects on fertility : Species: Mouse
Application Route: Inhalation
Result: negative
Remarks: Based on data from similar materials

Effects on foetal development : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 414
Result: negative

Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rabbit
Application Route: inhalation (gas)
Method: OECD Test Guideline 414
Result: negative

Reproductive toxicity - Assessment : Weight of evidence does not support classification for reproductive toxicity

2,3,3,3-Tetrafluoropropene:

Effects on fertility : Test Type: Two-generation reproduction toxicity study
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 416
Result: negative

Effects on foetal development : Test Type: Prenatal development toxicity study (teratogenicity)
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 414

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Result: negative

Reproductive toxicity - Assessment : Weight of evidence does not support classification for reproductive toxicity, No effects on or via lactation

STOT - single exposure

Not classified based on available information.

Components:**Difluoromethane:**

Exposure routes : inhalation (gas)
Assessment : No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less

2,3,3,3-Tetrafluoropropene:

Exposure routes : inhalation (gas)
Assessment : No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less

STOT - repeated exposure

Not classified based on available information.

Components:**Difluoromethane:**

Exposure routes : inhalation (gas)
Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

2,3,3,3-Tetrafluoropropene:

Exposure routes : inhalation (gas)
Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

Repeated dose toxicity**Components:****Difluoromethane:**

Species : Rat, male and female
NOAEL : 49100 ppm
LOAEL : > 49100 ppm
Application Route : inhalation (gas)
Exposure time : 13 Weeks
Method : OECD Test Guideline 413

2,3,3,3-Tetrafluoropropene:

Species : Rat, male and female
NOAEL : 50000 ppm

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LOAEL	:	>50000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	13 Weeks
Method	:	OECD Test Guideline 413

Aspiration toxicity

Not classified based on available information.

Components:**Difluoromethane:**

No aspiration toxicity classification

2,3,3,3-Tetrafluoropropene:

No aspiration toxicity classification

11.2 Information on other hazards**Endocrine disrupting properties****Product:**

Assessment	:	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.
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SECTION 12: Ecological information**12.1 Toxicity****Components:****Difluoromethane:**

Toxicity to fish	:	LC50 (Fish): 1,507 mg/l Exposure time: 96 h Method: ECOSAR (Ecological Structure Activity Relationships)
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 652 mg/l Exposure time: 48 h Method: ECOSAR (Ecological Structure Activity Relationships)
Toxicity to algae/aquatic plants	:	EC50 (green algae): 142 mg/l Exposure time: 96 h Method: ECOSAR (Ecological Structure Activity Relationships)

2,3,3,3-Tetrafluoropropene:

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Toxicity to fish	:	LC50 (Cyprinus carpio (Carp)): > 197 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	EC50 (Selenastrum capricornutum (green algae)): > 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201
		NOEC (Selenastrum capricornutum (green algae)): > 75 mg/l Exposure time: 3 d Method: OECD Test Guideline 201

12.2 Persistence and degradability**Components:****Difluoromethane:**

Biodegradability : Result: Not readily biodegradable.
Method: OECD Test Guideline 301D

2,3,3,3-Tetrafluoropropene:

Biodegradability : Result: Not readily biodegradable.
Method: OECD Test Guideline 301F

12.3 Bioaccumulative potential**Components:****Difluoromethane:**

Partition coefficient: n-octanol/water : log Pow: 0.714

2,3,3,3-Tetrafluoropropene:

Bioaccumulation : Remarks: Bioaccumulation is unlikely.

Partition coefficient: n-octanol/water : log Pow: 2 (25 °C)

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment**Product:**

Assessment : This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of

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0.1% or higher.

12.6 Endocrine disrupting properties**Product:**

Assessment : The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects**Global warming potential**

Regulation (EU) No 517/2014 on fluorinated greenhouse gases

Product:

100-year global warming potential: 466

SECTION 13: Disposal considerations**13.1 Waste treatment methods**

Product	: Dispose of in accordance with local regulations. According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.
Contaminated packaging	: Empty containers should be taken to an approved waste handling site for recycling or disposal. Empty pressure vessels should be returned to the supplier. Empty containers retain residue and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury and/or death. If not otherwise specified: Dispose of as unused product.

SECTION 14: Transport information**14.1 UN number or ID number**

ADN	: UN 3161
ADR	: UN 3161
RID	: UN 3161
IMDG	: UN 3161
IATA (Cargo)	: UN 3161
IATA (Passenger)	: UN 3161

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Not permitted for transport

14.2 UN proper shipping name

ADN	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, 2,3,3,3-Tetrafluoropropene)
ADR	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, 2,3,3,3-Tetrafluoropropene)
RID	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, 2,3,3,3-Tetrafluoropropene)
IMDG	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, 2,3,3,3-Tetrafluoropropene)
IATA (Cargo)	:	Liquefied gas, flammable, n.o.s. (Difluoromethane, 2,3,3,3-Tetrafluoropropene)
IATA (Passenger)	:	Liquefied gas, flammable, n.o.s. Not permitted for transport

14.3 Transport hazard class(es)

	Class	Subsidiary risks
ADN	: 2	2.1
ADR	: 2	2.1
RID	: 2	2.1, (13)
IMDG	: 2.1	
IATA (Cargo)	: 2.1	
IATA (Passenger)	: Not permitted for transport	

14.4 Packing group

ADN	
Packing group	: Not assigned by regulation
Classification Code	: 2F
Hazard Identification Number	: 23
Labels	: 2.1
ADR	
Packing group	: Not assigned by regulation
Classification Code	: 2F
Hazard Identification Number	: 23
Labels	: 2.1
Tunnel restriction code	: (B/D)
RID	
Packing group	: Not assigned by regulation
Classification Code	: 2F
Hazard Identification Number	: 23
Labels	: 2.1 ((13))
IMDG	
Packing group	: Not assigned by regulation

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Labels	:	2.1
EmS Code	:	F-D, S-U
IATA (Cargo)		
Packing instruction (cargo aircraft)	:	200
Packing group	:	Not assigned by regulation
Labels	:	Flammable Gas
IATA (Passenger)	:	Not permitted for transport

14.5 Environmental hazards

ADN	
Environmentally hazardous	: no
ADR	
Environmentally hazardous	: no
RID	
Environmentally hazardous	: no
IMDG	
Marine pollutant	: no

14.6 Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

14.7 Maritime transport in bulk according to IMO instruments

Remarks	:	Not applicable for product as supplied.
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SECTION 15: Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII)	:	Not applicable
REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59).	:	Not applicable
Regulation (EC) No 1005/2009 on substances that deplete the ozone layer	:	Not applicable
Regulation (EU) 2019/1021 on persistent organic pollutants (recast)	:	Not applicable
Regulation (EU) No 649/2012 of the European Parliament and the Council concerning the export and import of dangerous chemicals	:	Not applicable

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REACH - List of substances subject to authorisation : Not applicable
(Annex XIV)

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

		Quantity 1	Quantity 2
18	Liquefied flammable gases (including LPG) and natural gas	50 t	200 t

Other regulations:

Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

15.2 Chemical safety assessment

Chemical Safety Assessments have been carried out for these substances.

SECTION 16: Other information

Other information : Opteon™ and any associated logos are trademarks or copy-rights of The Chemours Company FC, LLC.
Chemours™ and the Chemours Logo are trademarks of The Chemours Company.
Before use read Chemours safety information.
For further information contact the local Chemours office or nominated distributors.

Items where changes have been made to the previous version are highlighted in the body of this document by two vertical lines.

Full text of H-Statements

H221 : Flammable gas.
H280 : Contains gas under pressure; may explode if heated.

Full text of other abbreviations

Flam. Gas : Flammable gases
Press. Gas : Gases under pressure

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air

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Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

Sources of key data used to compile the Safety Data Sheet : Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agency, <http://echa.europa.eu/>

Classification of the mixture:

Flam. Gas 1B	H221
Press. Gas Liquefied gas	H280

Classification procedure:

Based on product data or assessment
Based on product data or assessment

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.

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K)HERMETIC OIL FVC85EA

Version	Revision Date:	SDS Number:	Date of last issue: -
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SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifier**

Trade name	:	K)HERMETIC OIL FVC85EA
Product code	:	32861826

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture	:	Lubricant
Recommended restrictions on use	:	None known.

1.3 Details of the supplier of the safety data sheet

Company	:	Idemitsu Kosan Co., Ltd.
Address	:	2-1, Otemachi 1-chome, Chiyoda-Ku, Tokyo 100-8321, Japan
Telephone	:	+81-3-3213-3143
Telefax	:	+81-3-3211-5343

1.4 Emergency telephone

+44 1235 239670

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****Classification (Commission Regulation (EU) 2020/878)**

Skin sensitization, Category 1	H317: May cause an allergic skin reaction.
Long-term (chronic) aquatic hazard, Category 2	H411: Toxic to aquatic life with long lasting effects.

2.2 Label elements**Labeling (Commission Regulation (EU) 2020/878)**

Hazard pictograms



Signal Word : Warning

Hazard Statements	:	H317	May cause an allergic skin reaction.
	:	H411	Toxic to aquatic life with long lasting effects.

Precautionary Statements	:	Prevention:	
		P261	Avoid breathing mist or vapors.
		P273	Avoid release to the environment.
		P280	Wear protective gloves.
		Response:	
		P333 + P313	If skin irritation or rash occurs: Get medical

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P362 + P364 advice/ attention.
Take off contaminated clothing and wash it before reuse.

P391 Collect spillage.

Hazardous ingredients which must be listed on the label:

[[[2-ethylhexyl]oxy]methyl]oxirane
pin-2(10)-ene

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients**3.2 Mixtures****Hazardous ingredients**

Chemical name	CAS-No. EC-No. Index-No. Registration number	Classification	Concentration (% w/w)
[[[2-ethylhexyl]oxy]methyl]oxirane	2461-15-6 219-553-6 01-2119962196-31	Skin Irrit. 2; H315 Skin Sens. 1A; H317	>= 1 - < 10
pin-2(10)-ene	127-91-3 204-872-5	Skin Irrit. 2; H315 Skin Sens. 1B; H317 Asp. Tox. 1; H304 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	>= 1 - < 2,5
tris(methylphenyl) phosphate	1330-78-5 809-930-9 01-2119531335-46	Repr. 2; H361 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	>= 1 - < 2,5
2,6-di-tert-butyl-p-cresol	128-37-0 204-881-4 01-2119565113-46	Aquatic Acute 1; H400 Aquatic Chronic 1; H410	>= 0,25 - < 1

No hazardous ingredients

Chemical name	CAS-No. EC-No. Registration number	Classification	Concentration (% w/w)
Polyether compound	-	-	>= 90
Lubricating oil additive	-	-	< 0,1

For explanation of abbreviations see section 16.

SECTION 4: First aid measures**4.1 Description of first-aid measures**

General advice : No hazards which require special first aid measures.

If inhaled : Move to fresh air in case of accidental inhalation of dust or fumes from overheating or combustion.
If symptoms persist, call a physician.

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-
- | | |
|-------------------------|--|
| In case of skin contact | : Take off contaminated clothing and shoes immediately.
Wash off with soap and plenty of water. |
| In case of eye contact | : Flush eyes with water as a precaution.
Remove contact lenses.
Protect unharmed eye.
Keep eye wide open while rinsing. |
| If swallowed | : Clean mouth with water and drink afterwards plenty of water.
Do not give milk or alcoholic beverages.
Never give anything by mouth to an unconscious person. |

4.2 Most important symptoms and effects, both acute and delayed

- | | |
|-------|--|
| Risks | : May cause an allergic skin reaction. |
|-------|--|

4.3 Indication of any immediate medical attention and special treatment needed

- | | |
|-----------|--|
| Treatment | : The first aid procedure should be established in consultation with the doctor responsible for industrial medicine. |
|-----------|--|
-

SECTION 5: Firefighting measures**5.1 Extinguishing media**

- | | |
|------------------------------|---|
| Suitable extinguishing media | : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. |
|------------------------------|---|

5.2 Special hazards arising from the substance or mixture

- | | |
|-------------------------------|--|
| Hazardous combustion products | : No hazardous combustion products are known |
|-------------------------------|--|

5.3 Advice for firefighters

- | | |
|--|--|
| Special protective equipment for fire-fighters | : In the event of fire, wear self-contained breathing apparatus. |
| Further information | : Standard procedure for chemical fires. |
-

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures****6.2 Environmental precautions**

- | | |
|---------------------------|--|
| Environmental precautions | : No special environmental precautions required. |
|---------------------------|--|

6.3 Methods and material for containment and cleaning up

- | | |
|-------------------------|--|
| Methods for cleaning up | : Wipe up with absorbent material (e.g. cloth, fleece).
Keep in suitable, closed containers for disposal. |
|-------------------------|--|

6.4 Reference to other sections

- | | |
|--|---|
| | : For personal protection see section 8., For disposal considerations see section 13. |
|--|---|
-

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

- | | |
|------------------------------|--|
| Advice on safe handling | : For personal protection see section 8.
No special handling advice required. |
| Advice on protection against | : Normal measures for preventive fire protection. |
-

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fire and explosion

Hygiene measures : General industrial hygiene practice.

7.2 Conditions for safe storage, including any incompatibilities

Advice on common storage : No special restrictions on storage with other products.

Storage class (TRGS 510) : 10, Combustible liquids

7.3 Specific end use(s)

Specific use(s) : Consult the technical guidelines for the use of this substance/mixture.

SECTION 8: Exposure controls/personal protection**8.1 Control parameters****Occupational Exposure Limits**

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
tris(methylphenyl) phosphate	1330-78-5	AGW (Inhalable fraction)	5 mg/m3	DE TRGS 900
Peak-limit category	2;(II)			
Further information	Skin absorption, When there is compliance with the OEL and biological tolerance values, there is no risk of harming the unborn child			
		MAK (inhalable fraction)	5 mg/m3	DE DFG MAK
Further information	Damage to the embryo or foetus is unlikely when the MAK value or the BAT value is observed			
2,6-di-tert-butyl-p-cresol	128-37-0	AGW (Vapour and aerosols, inhalable fraction)	10 mg/m3	DE TRGS 900
Peak-limit category	4;(II)			
Further information	When there is compliance with the OEL and biological tolerance values, there is no risk of harming the unborn child			
		MAK (inhalable fraction)	10 mg/m3	DE DFG MAK
Further information	Substances that cause cancer in humans or animals or that are considered to be carcinogenic for humans and for which a MAK value can be derived., Damage to the embryo or foetus is unlikely when the MAK value or the BAT value is observed			

8.2 Exposure controls**Personal protective equipment**

Eye protection : Safety glasses

Hand protection

Glove thickness : >= 0,3 m

Remarks

: Polyvinyl alcohol or nitrile- butyl-rubber gloves The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it. Before removing gloves clean them with soap and water.

Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the

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Skin and body protection	: danger of cuts, abrasion, and the contact time.
Respiratory protection	: Protective suit
	: No personal respiratory protective equipment normally required.

SECTION 9: Physical and chemical properties**9.1 Information on basic physical and chemical properties**

Physical state	: transparent
Color	: colorless
Odor	: slight
Odor Threshold	: No data available
Melting point	: No data available
Freezing point	: No data available
Drop point	: No data available
Pour point	: No data available
Boiling point	: No data available
Flammability	: No data available
Upper explosion limit / Upper flammability limit	: No data available
Lower explosion limit / Lower flammability limit	: No data available
Flash point	: 178 °C Method: Cleveland open cup
Autoignition temperature	: No data available
Decomposition temperature	: No data available
pH	: No data available
Viscosity	
Viscosity, kinematic	: 86,39 mm ² /s (40 °C)
Solubility(ies)	
Water solubility	: insoluble
Partition coefficient: n-octanol/water	: No data available
Vapor pressure	: No data available
Density	: 0,9405 g/cm ³
Relative density	: No data available
Relative vapor density	: No data available
Particle characteristics	
Assessment	: No data available

9.2 Other informationNo data available

SECTION 10: Stability and reactivity**10.1 Reactivity**

Stable under recommended storage conditions.

10.2 Chemical stability

No decomposition if stored and applied as directed.

10.3 Possibility of hazardous reactions

Hazardous reactions : No hazards to be specially mentioned.

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10.4 Conditions to avoid

Conditions to avoid : No data available

10.5 Incompatible materials

Materials to avoid : Strong bases

10.6 Hazardous decomposition products

No hazardous decomposition products are known.

No hazardous decomposition products are known.

SECTION 11: Toxicological information**11.1 Information on toxicological effects****Acute toxicity**

Not classified due to lack of data.

Skin corrosion/irritation

Not classified due to lack of data.

Product:

Remarks: According to the classification criteria of the European Union, the product is not considered as being a skin irritant.

Serious eye damage/eye irritation

Not classified due to lack of data.

Product:

Remarks: According to the classification criteria of the European Union, the product is not considered as being an eye irritant.

Respiratory or skin sensitization

Skin sensitization: May cause an allergic skin reaction.

Respiratory sensitization: Not classified due to lack of data.

Product:

Remarks: No data available

Germ cell mutagenicity

Not classified due to lack of data.

Carcinogenicity

Not classified due to lack of data.

Reproductive toxicity

Not classified due to lack of data.

STOT-single exposure

Not classified due to lack of data.

STOT-repeated exposure

Not classified due to lack of data.

Aspiration toxicity

Not classified due to lack of data.

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Further information**Product:**Remarks: No data available

SECTION 12: Ecological information**12.1 Toxicity**

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment**Product:**

Assessment	: This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher..
------------	---

12.6 Other adverse effects**Product:**

Endocrine disrupting potential	: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.
--------------------------------	---

Additional ecological information	: There is no data available for this product.
-----------------------------------	--

SECTION 13: Disposal considerations**13.1 Waste treatment methods**

Product	: Offer surplus and non-recyclable solutions to a licensed disposal company.
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Contaminated packaging	: Empty remaining contents. Empty containers should be taken to an approved waste handling site for recycling or disposal.
------------------------	---

SECTION 14: Transport information**14.1 UN number**

ADN	: UN 3082
ADR	: UN 3082
RID	: UN 3082
IMDG	: UN 3082
IATA	: UN 3082

14.2 UN proper shipping name

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ADN	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (pin-2(10)-ene, (m&p-)Tricresyl phosphate)
ADR	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (pin-2(10)-ene, (m&p-)Tricresyl phosphate)
RID	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (pin-2(10)-ene, (m&p-)Tricresyl phosphate)
IMDG	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (pin-2(10)-ene, (m&p-)Tricresyl phosphate)
IATA	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (pin-2(10)-ene, (m&p-)Tricresyl phosphate)

14.3 Transport hazard class(es)

ADN	: 9
ADR	: 9
RID	: 9
IMDG	: 9
IATA	: 9

14.4 Packing group

ADN	
Packing group	: III
Classification Code	: M6
Hazard Identification Number	: 90
Labels	: 9
ADR	
Packing group	: III
Classification Code	: M6
Hazard Identification Number	: 90
Labels	: 9
Tunnel restriction code	: (E)
RID	
Packing group	: III
Classification Code	: M6
Hazard Identification Number	: 90
Labels	: 9
IMDG	
Packing group	: III
Labels	: 9
EmS Code	: F-A, S-F
IATA	
Packing instruction (cargo aircraft)	: 964
Packing instruction (passenger aircraft)	: 964
Packing instruction (LQ)	: Y964
Packing group	: III
Labels	: Miscellaneous

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14.5 Environmental hazards**ADN**

Environmentally hazardous : yes

ADR

Environmentally hazardous : yes

RID

Environmentally hazardous : yes

IMDG

Marine pollutant : yes

14.6 Special precautions for user

Not applicable

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

SECTION 15: Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

REACH - Candidate List of Substances of Very High Concern for Authorization (Article 59) : Not applicable

REACH - List of substances subject to authorisation (Annex XIV) : Not applicable

Regulation (EC) No 1005/2009 on substances that deplete the ozone layer : Not applicable

Regulation (EU) 2019/1021 on persistent organic pollutants (recast) : Not applicable

Regulation (EU) No 649/2012 of the European Parliament and the Council concerning the export and import of dangerous chemicals : Not applicable

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII) : See Annex XVII to Regulation (EC) no 1907/2006 and amendments for Conditions of restriction

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII) : [[(2-ethylhexyl)oxy]methyl]oxirane pin-2(10)-ene tris(methylphenyl) phosphate (277) See Annex XVII to Regulation (EC) no 1907/2006 and amendments for Conditions of restriction

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

E2	ENVIRONMENTAL HAZARDS	Quantity 1 200 t	Quantity 2 500 t
----	-----------------------	---------------------	---------------------

Water hazard class (Germany)	:	WGK 2 obviously hazardous to water Classification according to AwSV, Annex 1 (5.2)
------------------------------	---	---

TA Luft List (Germany)	:	Total dust: Not applicable Inorganic substances in powdered form: Not applicable Inorganic substances in gaseous form: Not applicable Organic Substances: portion Class 1: 1 %
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	:	Carcinogenic substance: Not applicable
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Quartz fine dust PM4:
Not applicable
Formaldehyde:
Not applicable
fibers:
Not applicable
Germ cell mutagens:
Not applicable
Substances toxic to reproduction:
Not applicable
Poorly degradable, easily enrichable and highly toxic organic
substances:
Not applicable

Volatile organic compounds : Directive 2010/75/EU of 24 November 2010 on industrial
emissions (integrated pollution prevention and control)
Not applicable

Other regulations:

Take note of Directive 94/33/EC on the protection of young people at work or stricter national
regulations, where applicable.

The ingredients of this product are reported in the following inventories:

ENCS : Listed
TSCA : Listed
EINECS : Listed
REACH : For further information, please contact Idemitsu.
DSL : Conditional registration (The annual export quantity is
limited)
AIIIC : Listed
KECI : Listed
PICCS : Not listed
IECSC : Listed
TCSI : Listed
NZIoC : Listed

15.2 Chemical Safety Assessment

A Chemical Safety Assessment is not required for this substance.

SECTION 16: Other information**Full text of H-Statements**

H304 : May be fatal if swallowed and enters airways.
H315 : Causes skin irritation.
H317 : May cause an allergic skin reaction.
H361 : Suspected of damaging fertility or the unborn child.
H400 : Very toxic to aquatic life.
H410 : Very toxic to aquatic life with long lasting effects.

Full text of other abbreviations

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Aquatic Acute	: Short-term (acute) aquatic hazard
Aquatic Chronic	: Long-term (chronic) aquatic hazard
Asp. Tox.	: Aspiration hazard
Repr.	: Reproductive toxicity
Skin Irrit.	: Skin irritation
Skin Sens.	: Skin sensitization

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - substance of very high concern; TCSI - Taiwan Chemical Substance Inventory; TECL - Thailand Existing Chemicals Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

DE / EN

Changeability of this document

In complying with the Johnson Controls® policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls Solution Navigator website at <https://www.solutionnavigator.com/>.

It is the responsibility of rigging, lifting, operating, and service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating and service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment before performing any work on the unit.

Revision notes

Revisions made to this document are indicated in the following table. These revisions are to technical information, and any other changes in spelling, grammar, or formatting are not included.

Table 2: Revision notes

Affected pages	Description
53	Updated Accessories and options
62	Updated Physical data
65	Updated Electrical data
93	Added Installing the y-shaped strainer
98	Added Installing the external HMI
106	Updated 0045/0050/0065/0100/0130/0230/0260 Wiring diagrams

Conditioned based maintenance

Traditional chiller maintenance is based upon assumed and generalized conditions. In lieu of the traditional maintenance program, a Johnson Controls YORK® Conditioned Based Maintenance (CBM) program can be substituted. This CBM service plan is built around the specific needs for the chiller, operating conditions, and annualized impact realized by the chiller. Your local Johnson Controls Branch can propose a customized Planned Service Agreement that leverages real time and historical data, delivering performance reporting, corrective actions required and data enabled guidance for optimal operation and lifecycle assurance. The program will include fault detection diagnostics, operation code statistics, performance based algorithms and advance rules based rationale delivered by the Johnson Controls Connected Equipment Portal.

General chiller information and safety

Note: Before operating the unit, refer to [Refrigerant information](#).

About this guide

The contents of this guide include suggested best working practices and procedures. These are issued for guidance only, and they do not take precedence over the stated individual responsibility or local safety regulations.

This guide and any other document supplied with the unit are the property of Johnson Controls, which reserves all rights. They may not be reproduced, in whole or in part, without prior written authorization from an authorized Johnson Controls representative.

Introduction

YORK YMAE heat pumps are manufactured to the highest design and construction standards to ensure high performance, reliability, and adaptability to all types of air conditioning installations.

The unit provides chilled water, hot water, or glycol solutions for air conditioning applications and industrial processes using central station air handling or terminal units.

The unit combines a variable speed control design with industry-leading DC inverter technology. This enables the unit's compressors and EC fans to operate more efficiently than constant speed units across all capacity-load and ambient-temperature conditions. It is designed for part-load efficiency exceeding the European Ecodesign EN 14825 standard.

Ensure that only a professional rigger does the rigging and lifting, in accordance with a written rigging and lifting plan. The most appropriate rigging and lifting method depends on job specific factors, such as the rigging equipment available and site needs. As a result, a professional rigger must determine an appropriate rigging and lifting method. It is beyond the scope of this guide to specify rigging and lifting details.

Note: The rigger must locate the center of gravity through trial lifts to account for possible variations in unit configurations. Contact your nearest Johnson Controls sales office for weight data. See [Rigging, handling, and storage](#) for more details.

This guide contains all the information required for installing, commissioning, operating, and maintaining the unit. Read the relevant information thoroughly before attempting to operate or service the unit. Ensure that only suitably trained and qualified personnel perform the installation, commissioning, operation, and maintenance procedures.

The manufacturer is not liable for any injury or damage caused by incorrect installation, commissioning, operation, or maintenance resulting from a failure to follow the procedures and instructions detailed in the guide.

Warranty

Johnson Controls warrants YMAE chillers in accordance with the Limited Warranty Engineered Systems Equipment procedure.

Johnson Controls warrants all equipment and materials against defects in workmanship and materials for a period of 18 months from date of shipment or 12 months from date of startup, whichever comes first, unless labor or extended warranty has been purchased as part of the contract. The warranty is limited to parts only replacement and shipping of any faulty part, or sub-assembly, which has failed due to poor quality or manufacturing errors. All claims must be supported by evidence that the failure has occurred within the warranty period, and that the unit has been operated within the designed parameters specified.

All warranty claims must specify the unit model, serial number, order number and run hours/starts. Model, serial number, and order number information is printed on the unit identification plate.

The unit warranty is void if any modification to the unit is carried out without prior written approval from Johnson Controls. For warranty purposes, the following conditions must be satisfied:

- The initial start of the unit must be carried out by trained personnel from an authorized Johnson Controls Center. See [Commissioning](#) for further information.
- Only genuine Johnson Controls approved spare parts, oils, coolants, and refrigerants must be used.
- All the scheduled maintenance operations detailed in this manual must be performed at the specified times by suitably trained and qualified personnel. See [Maintenance](#) for further information.
- Failure to satisfy any of these conditions will automatically void the warranty.

Handling

These units are shipped as completely assembled units containing full operating charge. Take care to avoid damage due to rough handling.

Safety standards

YMAE units are designed and manufactured within an ISO9001 accredited organization and comply with the applicable sections of the following standards and codes:

- Machinery Directive, 2006/42/EC
- EMC Directive, 2014/30/EU
- Pressure Equipment Directive (PED), 2014/68/EU
- Ecodesign Directive, 2009/125/EC
- Ecodesign Label Directive, 2010/125/EU
- Energy Label Directive, 2017/1369
- Safety of Machinery - General principles for design - Risk assessment and risk reduction EN ISO:12100-2010
- Safety Code for Mechanical Refrigeration, EN 378-2
- Safety of Machinery - Electrical Equipment of Machine, EN 60204-1
- Generic Emissions and Immunity Standards for Industrial Environment, EN 61000-6-4:2019 and EN 61000-6-2:2019
- Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection, EN 61000-3-11:2019.
- EMC – Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase, DS/EN 61000-3-12:2012.
- Industrial, scientific and medical equipment, radio-frequency disturbance characteristics- Limits and methods of measurement, EN 55011:2016 and A2:2021
- Determination of sound power levels of noise sources using sound intensity, ISO 9614
- Fluorinated Greenhouse Gases regulation, EU No. 517/2014
- ATEX Standard and Classification of Areas with Presence of Gas, EN 60079-10-1
- Conform to CE testing services for construction of units and provide CE listed mark

Responsibility for safety

Every care has been taken in the design and manufacture of the unit to ensure compliance with the safety requirements. However, the individual rigging, lifting, maintaining, operating, or working on any machinery is primarily responsible for:

- Personal safety, safety of other personnel, and the machinery.
- Correct utilization of the machinery in accordance with the procedures detailed in the guide.

Misuse of equipment

Suitability for application

The unit provides chilled water, hot water, or glycol solutions for air conditioning applications and industrial processes using central station air handling or terminal units. Using any equipment outside its intended use, or operating the equipment contrary to the relevant procedures may result in injury to the operator, or damage to the equipment.

Do not operate the unit outside the design parameters specified in this guide.

Structural support

Ensure the unit has structural support, as indicated in these instructions. Failure to provide the correct support may result in injury to the operator, or damage to the equipment or building.

Mechanical strength

The unit is not designed to withstand loads or stresses from adjacent equipment, pipework, or structures. Do not mount additional components on the unit. Any such extraneous loads may cause structural failure and may result in injury to the operator, or damage to the equipment.

General access

Potentially hazardous areas or features can cause injury when working on the unit, unless personnel take suitable safety precautions. It is important to ensure access to the unit is restricted to suitably qualified personnel who are familiar with the potential hazards and precautions necessary for safe operation and maintenance of equipment containing high temperatures, pressures, and voltages.

Pressure systems

The unit contains refrigerant vapor and liquid under pressure, release of which can be a danger and cause injury. The user must take care during installation, operation and maintenance to avoid damage to the pressure system. Untrained and unqualified personnel must not attempt to gain access to the component parts of the pressure system. Ensure that only suitably trained and qualified personnel access the component parts of the pressure system.

Electrical

Ensure the unit is grounded. Do not attempt installation or maintenance work on the electrical equipment without switching the power off, and isolating and locking-off the power supply. Do not attempt any servicing and maintenance on live equipment. Do not attempt to gain access to the control panel or electrical enclosures during normal operation of the unit.

Heat radiation

Some of the visible components, like the discharge pipe and driver heat sink, may work under high temperatures and radiate high-heat flux. Pay special attention while getting close to the unit. Do not touch the unit during normal operation.

Rotating parts

Ensure fan guards are fitted at all times. Isolate the main power supply before fan guard removal. If you remove the wire fan guards when fitting ductworks, take alternative safety measures to protect against the risk of injury from rotating fans.

Sharp edges

The fins on the air-cooled condenser coils have sharp metal edges. Frame rails, panels, and other components may also have sharp edges. Take reasonable care when working in contact with the coils or any components to avoid the risk of minor abrasions and lacerations, such as wearing appropriate gloves.

Refrigerants and oils



Working with units that are designed to contain contents under pressure must be conducted only by fully qualified technicians.

This equipment is intended only for installation in locations that are not accessible to the general public. Further, this equipment is not intended for use by persons, including children, with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.

Refrigerant R-454B is classified as an A2L refrigerant and must be handled in accordance with all governing regulations. Failure to meet this requirement can result in damage to equipment, release of refrigerant into the environment, contamination of the operating space for the equipment and pose a risk of personal injury or death. It is the responsibility of any service technician or operator to adhere to these requirements. For more information about A2L refrigerants see [A2L refrigerant warning](#).

Refrigerants and oils used in the unit are generally non-toxic and non-corrosive. However, use gloves and safety glasses when working on the unit. The buildup of refrigerant vapor, from a leak for example, poses a risk of asphyxiation in confined or enclosed spaces and attention must be given to good ventilation.

Use only the refrigerant and oil specifically designated for the unit. Any other type of refrigerant or oil may cause damage to the equipment and voids the warranty.

High temperature and pressure cleaning

Do not use high temperature and pressure cleaning methods, for example steam cleaning, on any part of the pressure system as this may cause operation of the pressure relief devices. Also avoid using detergents and solvents, which may cause corrosion.

Emergency shutdown

In case of emergency, the control panel is fitted with an incoming supply circuit breaker switch that acts as the emergency stop device. When operated it removes all the electrical supply, excluding the customer voltage, to the control panel and the unit shuts down. The emergency stop only interrupts control power. Use the main circuit breaker when working in the unit.

Generator operation

The variable speed drive (VSD) can operate on a generator, provided that the generator's output voltage can be maintained within the voltage specifications for the drive. When switching from utility power to generator power, allow a minimum of a 10 s delay. This same delay is required when switching power back from generator power to utility power, unless using a synchronized transfer system.

Safety labels

The following labels are fixed to each unit to give instruction or to indicate potential hazards that may exist.

Table 3: Safety symbols

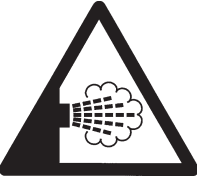
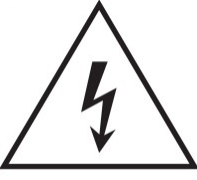
Symbol	Description
	White symbol on nameplate or labels. For safe operation, read the instructions first.
	Black symbol on yellow background. ⚠ WARNING: This machine may start automatically without prior warning.
	Black symbol on yellow background. ⚠ WARNING: Hot surface.
	Black symbol on yellow background. ⚠ WARNING: Safety relief valve may discharge gas or liquid without prior warning.
	Black symbol on yellow background. ⚠ WARNING: Isolate all electrical sources of supply before opening or removing the cover, because lethal voltages may exist.

Table 3: Safety symbols

Symbol	Description
	Black symbol on yellow background. General attention symbol.
	A refrigerant is classified as an A2L refrigerant due in part to its designation as mildly flammable. The A2L symbol can appear as the following: • Black symbol on yellow background • White symbol on nameplate • Black and red symbol on white background Correct precautions are required when handling A2L refrigerants. Ensure that all local building and safety codes, including and not limited to EN 378-2, are reviewed and followed.

Product description

YMAE air-cooled modular chillers and heat pumps provide chilled water or hot water for all air conditioning applications and industrial processes using central station air handling or terminal units. They are completely self-contained and are designed for outside installation, either at roof or ground level. Each complete packaged unit includes the following components mounted on a rugged steel base:

- Hermetic scroll compressors
- Plate heat exchanger
- Air-cooled ambient coils
- R-454B refrigerant charge
- Weather resistant microprocessor control center

The units are completely factory-assembled with all interconnecting refrigerant piping and wiring ready for field installation. The unit is pressure tested, evacuated, and fully factory-charged with refrigerant and oil in each of the independent refrigerant circuits. After assembly, an operational test is performed with water flowing through the heat exchanger to ensure that each refrigerant circuit operates correctly.

The unit structure is manufactured from heavy-gauge, galvanized steel coated with baked-on powder paint.

Optional corrosion-resistant wire mesh grills or special quote offering hail guards protect the condenser coils from external damage and restrict unauthorized access.

Nomenclature

Table 4: YMAE example

1	2	3	4	5-8	9	10	11	12-13
Y	M	A	E	0130	P	J	P	50

Table 5: YMAE nomenclature

Number	Description	Options
1	Brand	Y: YORK
2	System type	M: Variable speed
3	Chiller type	A: Air cooled
4	Design series	E: Scroll
5-8	Nominal capacity, in kW	0045, 0050, 0065, 0100, 0130, 0230, 0260
9	Unit designator	P: Premium efficiency
10	Refrigerant	J: R-454B
11	Unit configuration	P: Two pipe
12-13	Voltage	50: 400 V/3 Ph/50Hz

General system description

Compressors

YMAE is a direct current (DC) inverter scroll compressors that is driven directly by an external driver. An acoustic blanket comes as standard on compressors to improve sound levels. Compressor crankcase heaters are included for extra protection against liquid migration. The inverter scroll compressors is CE certified.

Callout	Component
A	Fan coil
B	Economizer PHE
C	EVI EEV
D	Main EEV
E	BPHE
F	Receiver
G	Compressor
H	Four-way valve
I	Accumulator

① **Note:** This figure is for reference only. It does not reflect the actual PID.

Heat exchanger

The compact, high-efficiency brazed plate heat exchanger (BPHE) is constructed with 316L stainless steel corrugated channel plates with a filler material between each plate.

The refrigerant-side design working pressure of the BPHE heat exchanger is 48 bar and the waterside design working pressure is 10 bar.

BPHE inlet and outlet connections are grooved for compatibility with standard Victaulic connections. A 30-mesh wye-strainer, for the YMAE 0130, and a 20-mesh wye-strainer, for the other YMAE models, are provided as standard for installation upstream of the BPHE. This prevents clogging from liquid system debris, particularly at system start-up when construction debris may be present in the piping system.

The BPHE is equipped with a thermostat-controlled heater for freeze protection within the operational envelope and insulated with 19 mm flexible, closed-cell foam.

The flow switch is a standard offering for each module, installed in a pipe section at the outlet of the BPHE.

Ambient coils

Coils: Fin and tube coils of seamless, internally-enhanced, high-condensing-coefficient, corrosion resistant copper tubes are arranged in staggered rows, mechanically expanded into hydrophilic aluminum fins. The designed working pressure of the coil is 45 bar.

Fans: The ambient fans are composed of corrosion-resistant aluminum blades sprayed with PP plastic and galvanized sheet steel fan housing coated with black plastic. They are designed for maximum efficiency with integrated VSD. All blades are statically and dynamically balanced for vibration-free operation. The fan grilles are constructed of heavy-gauge, rust-resistant, coated steel.

EC motors: The fans are directly driven by electrical commutation (EC) motors or BLDC motors. The fan speed is controlled through Modbus communication.

Control panel and HMI

Each module contains a control panel, and each unit contains a human-machine interface (HMI), the OptiView™ LT HMI, contained an IP 54 cabinet with a hinged, latched, and gasket sealed outer door.

Control panel

- A factory-mounted circuit breaker with external, red lockable handle to enable connection of the unit power supply, except for the YMAE 0045, 0050, and 0065 models. The circuit breaker can be used to isolate the power for servicing, and it can be used as an emergency stop device.

- Factory-mounted filter board with fuses to provide protection for each inverter compressor driver. It converts alternating current into DC to drive the variable-speed compressor.
- Factory-mounted fuses that provides protection for each fan.
- The unit microprocessor control board (IPU3).
- A relay board connected to the control board to extend digital output.
- A factory-mounted fuse to provide protection for the hydro kit of a single module.
- A factory-mounted control transformer is factory wired to the power panel, with input/output fuse protection and emergency stop isolation to supply the 230 V/1 Ph/50 Hz from the unit power supply.

HMI

- Has a password protected interface.
- Access level restrictions for operation and servicing.
- Multi-language LCD controls and keypad display, with English as the default display and multi-language can be selected.

SC-equip (SC-EQ)

A factory-mounted SC-EQ communication card provides BAS network connectivity and communication capability for BACnet (MS/TP), Modbus, and N2 as standard.

The SC-EQ communication card is designed with three active serial ports:

- J3 BAS (RS-485) port
- J5 equipment (RS-485) port
- J1 CS port or remote unit monitoring and diagnostics

CAUTION

Locate the machine in a physically secured area with access only to authorized personnel to prevent unauthorized access to the machine and control panel. To further increase security, ensure that the control panel is mechanically locked. Remove the keys to the control panel and store them in a secure location.

Enclosure panels

Tamperproof enclosure panels prevent unauthorized access to units. Enclosure panels can provide an aesthetically pleasing alternative to fencing.

Operating modes

The unit has a cooling only mode and a heating only mode.

A reversing valve changes the function of the heat exchangers to provide either heated or cooled water as required.

A third operating mode, defrost cycle, is enabled automatically as necessary to remove ice build-up when the unit is in heating operation.

Cooling mode

Low-pressure liquid refrigerant enters the BPHE, it is evaporated, and superheated by the heat energy absorbed from the chilled water. Low-pressure vapor flow enters the compressor through the four-way reversing valve and accumulator, where pressure and superheat are increased.

High-pressure vapor is fed to the ambient coils through the four-way reversing valve, where heat is removed. Then, the refrigerant flows from the condenser coil to the EVI BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's EEV, the refrigerant flow is evaporated and superheated in the EVI's BPHE, then flows to the compressor as a cool gas. Simultaneously, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure causing the cooling effect to occur in the BPHE before returning to compressor through the accumulator starting the refrigerant cycle over.

Heating mode

Low-pressure liquid refrigerant enters the air source coil, it is fully evaporated, and superheated by the energy absorbed from the ambient air. Low-pressure superheated refrigerant vapor passes through the four-way reversing valve through the accumulator and enters the compressor, where pressure and superheat are increased.

High-pressure superheated refrigerant vapor enters the main BPHE where heat is rejected to the water. Then, the refrigerant flows from the main BPHE to the EVI BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's EEV, the refrigerant flow is evaporated and superheated in the EVI's BPHE, then flows to the compressor as a cool gas. Simultaneously, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure for the air source coils to absorb heat from the ambient air before returning to compressor through the accumulator starting the refrigerant cycle over.

Defrost mode

When ice builds up on the ambient coils, an automatic defrost cycle is initiated with the air-source coil working as a condenser. Each of the refrigerant circuits are defrosted separately. When in defrost mode, the circuit operating in heat pump mode is in balance with the circuit operating in defrost (cooling). Heat output is, at worst case, net zero during the defrost period.

Advanced defrost logic is employed to reduce defrost cycle time and system impact. This includes the following capabilities:

- Defrost based on the refrigerant pressure.
- Subcooling circuits are designed to prevent ice block at the bottom of the coil forming from condensate water, and cause less frequent defrosts as a result.
- Defrost staging logic that cycles circuits through defrost sequentially, minimizing deviation from setpoint during defrost. No more than half of the total number of circuits can defrost at the same time. In the most extreme case, the system provides net zero heating output for the defrost period.
- The defrost process generates water, which collects in the unit drain pan under the coils and channels out the bottom of the unit frame through large diameter flexible tubing. The drain pan and tubing are freeze protected by the heat generated inside the unit cabinet. To prevent the pooling of water and slip hazards, field fabricate a drain system for each module to collect and remove condensate water from the working area surrounding the unit.

① **Note:** The capacity including defrost impact is reported on the rating report. Consider the time-averaged capacity during the system design phase to avoid under-sizing.

Figure 2: Ambient heat exchanger

- ① **Note:** The frost-free rows at the bottom of the coil are enabled through specialized circuiting design. This prevents ice build-up from draining condensate, allowing for less frequent defrosts.

Accessories and options

Remote indoor controller

The remote controller is applicable for dual control, together with the standard OptiView LT control panel. The remote indoor controller and the BAS connection use the same port. Both controllers can operate the unit simultaneously, if a BAS connection is not required.

Low sound kit

Lowered sound can be achieved with the following:

Acoustic enclosure

- ① **Note:** Not applicable for 0045 to 0065 units.

This option includes acoustic insulation for the lower panels.

Acoustic enclosure and silent mode

- ① **Note:** Not applicable for 0045 to 0065 units.

This option includes acoustic insulation for lower panels and limits the compressor and fan speed.

Silent mode

- ① **Note:** Only available for 0045 to 0065 units.

This option limits compressor and fan speed.

Modular kit, water temperature sensor

For multiple units in the same control group, an additional outlet water temperature sensor is required for modular control. The sensor is used for compressor sequencing and waterside protection. The additional water sensor is field-mounted.

Neoprene pads isolators

Use neoprene pads isolators for standard installations. Neoprene pads isolators are field-mounted.

25 mm spring isolators

Use level adjustable, spring and cage-type isolators for mounting under the unit base rails. They must be field-mounted.

50 mm spring isolators

Restrained spring isolators incorporate a rugged, welded steel housing with vertical and horizontal limit stops. Housings are designed to withstand a minimum 1.0 G accelerated force in all directions up to 51 m. They are level adjustable and field-mounted.

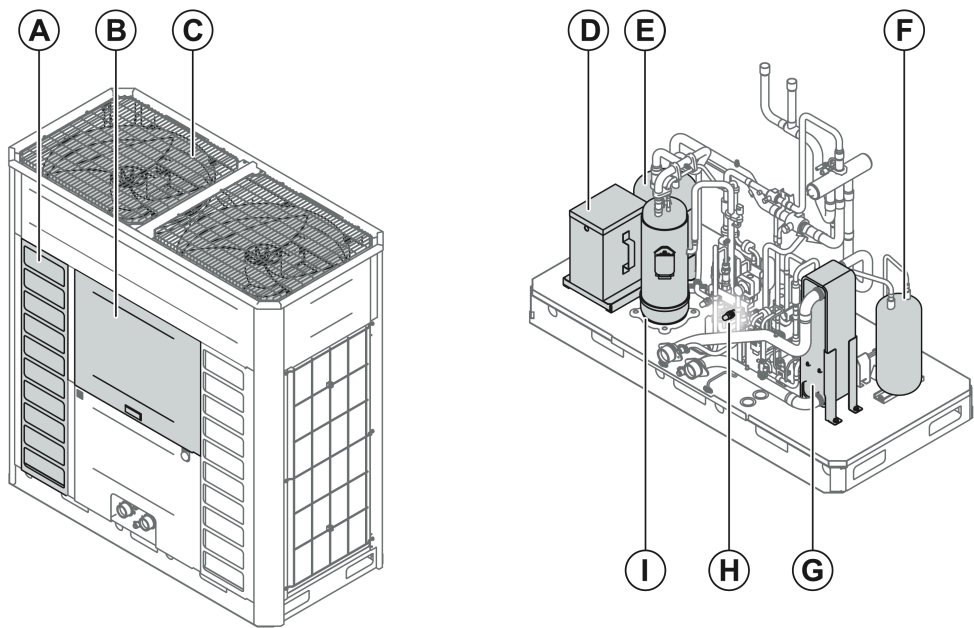
Wire grilles

Note: Not applicable for 0045 to 0065 units.

Welded wire-mesh panels are located on the airside coils section of the unit. The grilles are factory-mounted.

Components

Figure 3: YMAE 0045 to 0065 component locations

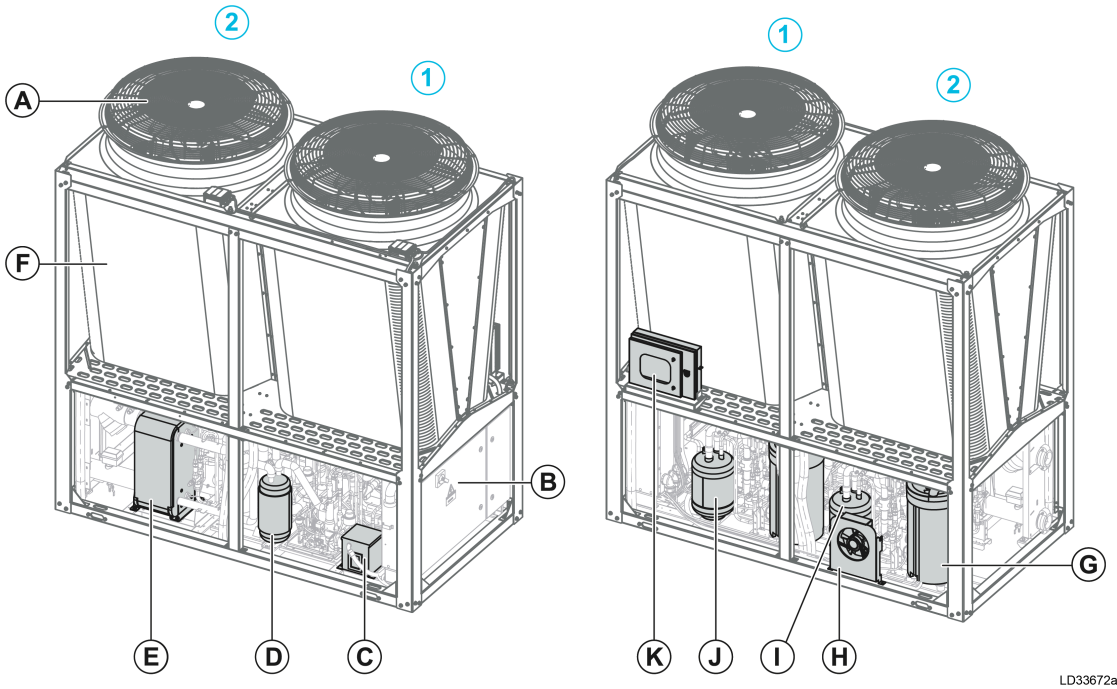


LD34958

Callout	Description
A	Ambient coil
B	Control panel
C	Fans
D	Control circuits transformer
E	Accumulator
F	Receiver
G	BPHE

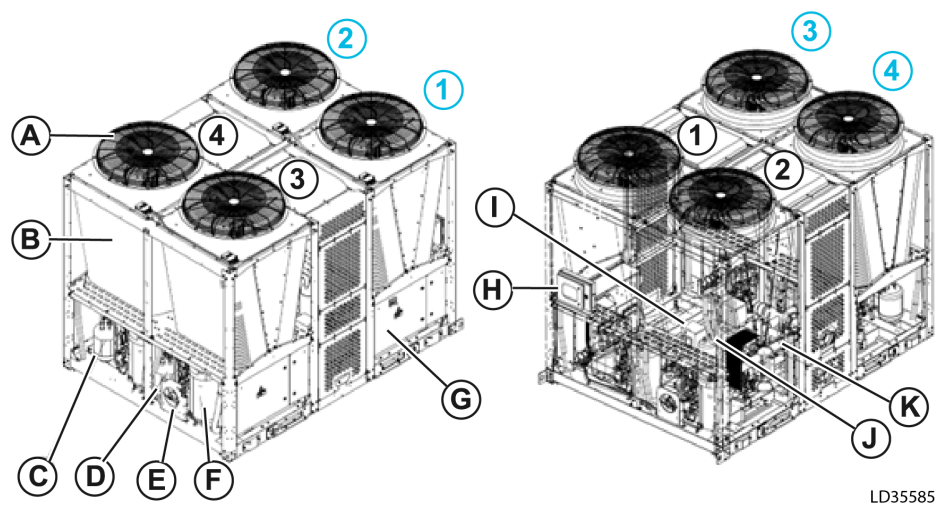
Callout	Description
H	Pressure relief
I	Compressor

Figure 4: YMAE 0100 and 0130 component locations



Callout	Description
1	Circuit one
2	Circuit two
A	Fans
B	Control panel
C	Control circuits transformer
D	Receiver
E	BPHE
F	Ambient coil
G	Compressor
H	Ventilation fan
I	Pressure relief
J	Accumulator
K	HMI

Figure 5: YMAE 0230 and 0260 component locations



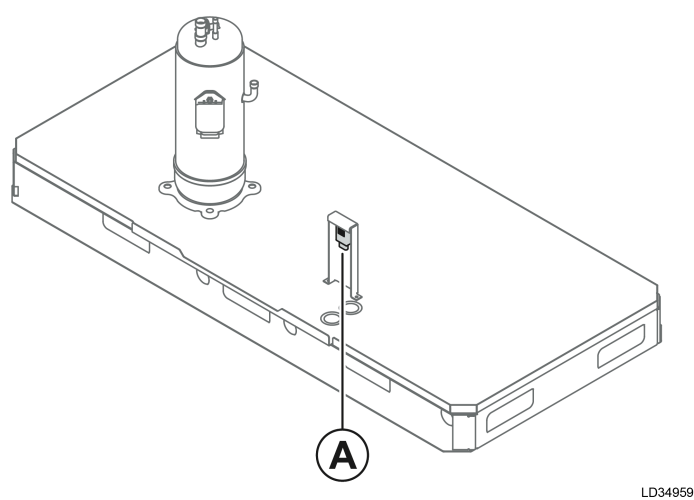
Callout	Description
1	Circuit one
2	Circuit two
3	Circuit three
4	Circuit four
A	Fans
B	Ambient coil
C	Accumulator
D	Pressure relief
E	Ventilation fan
F	Compressor
G	Control Panel
H	HMI
I	Control circuits transformer
J	Receiver
K	BPHE

Refrigerant safety components

A refrigerant gas leakage detection sensor and ventilation fans are installed inside the unit enclosure to avoid potential refrigerant accumulation, if a leak occurs.

The sensor is located near the compressor sets where the piping is most densely arranged.

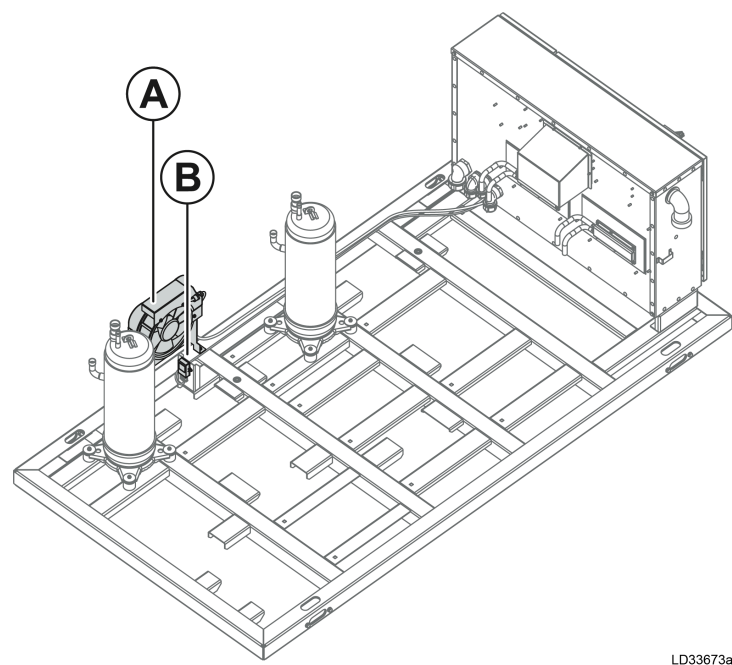
Figure 6: YMAE 0045 to 0065 gas sensor location



LD34959

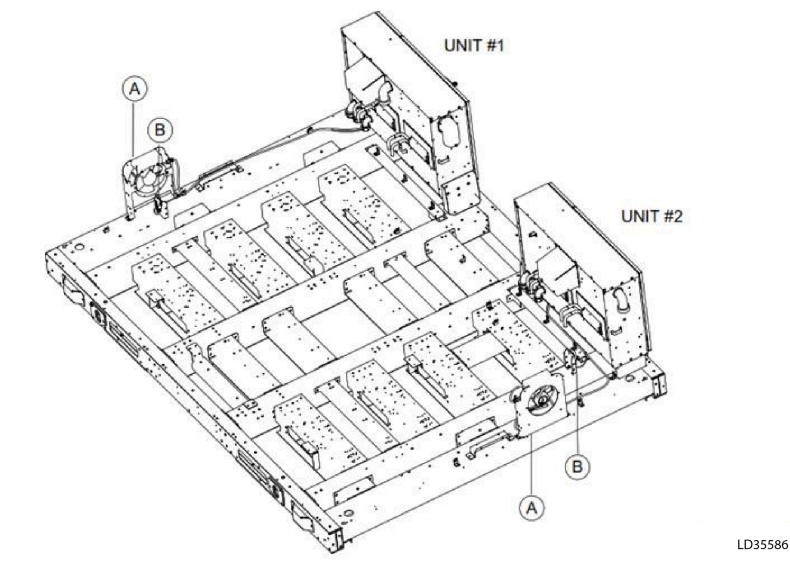
Callout	Component
A	Gas sensor

Figure 7: YMAE 0100 and 0130 gas sensor location



LD33673a

Callout	Component
A	Ventilation fan
B	Gas sensor

Figure 8: YMAE 0230 and 0260 gas sensor location

Callout	Component
A	Ventilation fan
B	Gas sensor

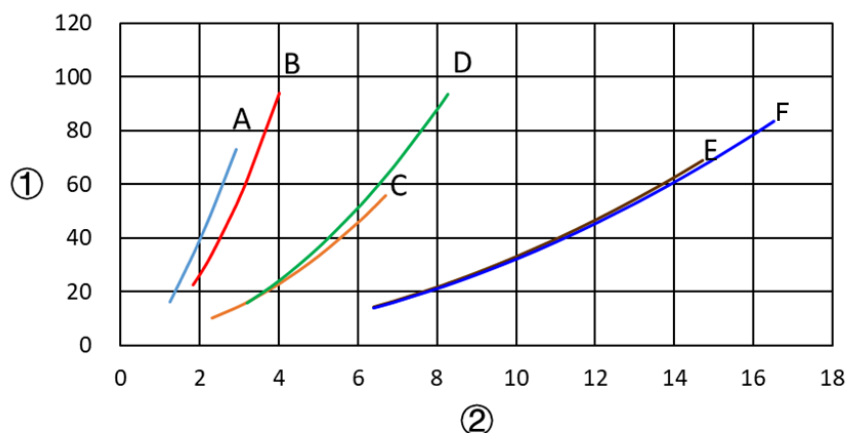
The ventilation fan runs for 60 s when the unit is powered on for the first time, and periodically for 30 s every 24 h. When the refrigerant concentration reaches 25% of low flammable limit (LFL), the fans start to extract the gas mixture from the enclosure. The unit shuts down, with the exception of the ventilation fans if the concentration reaches 50% of LFL.

The leakage sensor is a non-dispersive infrared (NDIR) sensor. The sensor is calibration-free and designed for a lifespan of 15 years.

Technical data

Unit flow

Figure 9: Liquid pressure drop curve



LD35587

Callout	Description
1	Pressure drop, kPa
2	Flow rate, L/s

Table 6: Correlation calculation

Model	Pressure drop curve	Correlation
45	A	$y = 3.463 \cdot x^2 + 19.903 \cdot x - 14.244$
50/65	B	$y = 5.0316 \cdot x^2 + 3.4458 \cdot x - 0.7262$
100	C	$y = 1.073 \cdot x^2 + 0.744 \cdot x + 2.9$
130	D	$y = 1.1725 \cdot x^2 + 1.842 \cdot x - 2.0427$
230	E	$y = 0.288 \cdot x^2 + 0.482 \cdot x - 0.42$
260	F	$y = 0.279 \cdot x^2 + 0.468 \cdot x - 0.41$

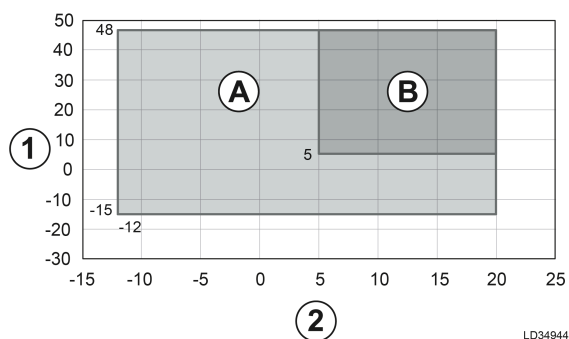
① **Note:** The pressure drop curve is based on using water. If you need other liquid data, contact your Johnson Controls representative.

Operational limitations

Table 7: Operating range

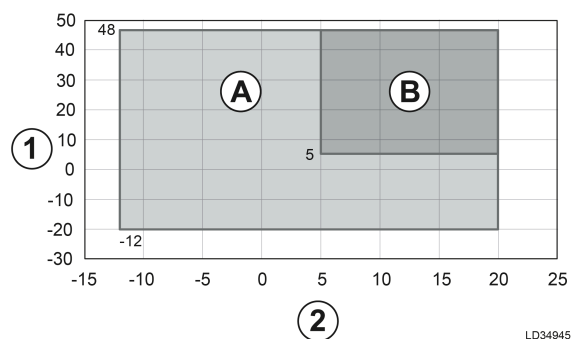
Model	Leaving liquid temperature, °C		Liquid flow, L/s		Working ambient temperature, °C	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Cooling mode, low temperature process chiller						
0045	-12	20	1.25	2.91	-15	48
0050	-12	20	1.83	4.01	-20	48
0065	-12	20	1.83	4.01	-20	48
0100	-12	20	2.36	6.69	-20	48
0130	-12	20	3.45	8.28	-20	48
0230	-12	20	6.67	14.72	-20	48
0260	-12	20	6.67	16.52	-20	48
Cooling mode, water or glycol						
0045	5	20	1.25	2.91	-15	48
0050	5	20	1.83	4.01	-20	48
0065	5	20	1.83	4.01	-20	48
0100	5	20	2.36	6.69	-20	48
0130	5	20	3.45	8.28	-20	48
0230	5	20	6.67	14.72	-20	48
0260	5	20	6.67	16.52	-20	48
Heating mode						
0045	25	55	1.25	2.91	-25	43
0050	25	60	1.83	4.01	-25	43
0065	25	60	1.83	4.01	-25	43
0100	25	60	2.36	6.69	-25	43
0130	25	60	3.45	8.28	-25	43
0230	25	60	6.67	14.72	-25	43
0260	25	60	6.67	16.52	-25	43

Figure 10: Cooling mode operating envelope YMAE 0045, °C



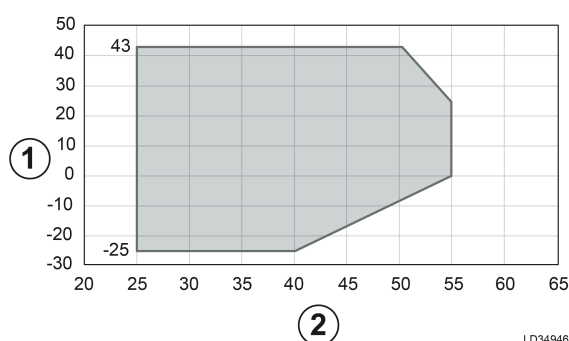
LD34944

Figure 11: Cooling mode operating envelope YMAE 0050/0065/0100/0130/0230/0260, °C



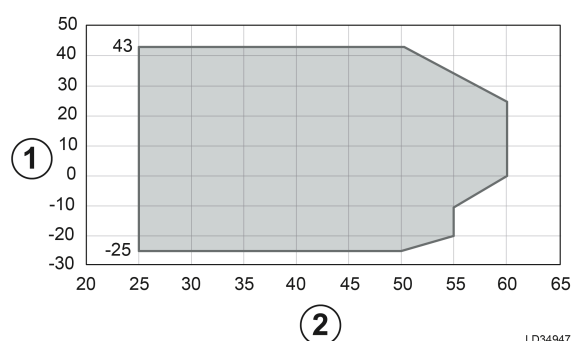
LD34945

Figure 12: Heating mode operating envelope YMAE 0045, °C



LD34946

Figure 13: Heating mode operating envelope YMAE 0050/0065/0100/0130/0230/0260, °C



LD34947

Callout	Description
1	Ambient temperature
2	Leaving liquid temperature
A	Glycol
B	Water or glycol

Note:

- Glycol must be used to prevent freezing in low ambient temperature cooling operation.

Physical data

Table 8: Standard sound unit

Detail	Unit	0045	0050	0065	0100	0130	0230	0260
Cooling mode								
Cooling capacity	kW	43.5	50.0	60.0	100.0	124.0	220.0	247.0
Input power	kW	14.8	15.9	21.3	31.4	42.5	73.3	84.5
EER	kW/kW	2.94	3.15	2.82	3.18	2.92	3.00	2.92
SEER	kW/kW	4.65	4.64	4.50	4.94	4.70	4.76	4.80
Energy ratio $\eta_{s,c}$	%	183.1	182.8	177.2	194.6	185.0	187.4	189.0
Sound power level	dB(A)	80	79	82	82	83	86	87
Heating mode								
Heating capacity	kW	48.0	53.0	60.5	113.1	139.0	242.0	275.0
Input power	kW	15.6	15.6	18.7	34.6	43.4	74.2	88.7
COP	kW/kW	3.08	3.40	3.23	3.26	3.20	3.26	3.10
SCOP	kW/kW	4.10	4.22	4.10	4.12	4.06	4.10	4.06
Energy ratio $\eta_{s,h}$	%	161.0	165.6	161.1	162.0	159.4	161.1	159.4
Refrigerant								
Type		R454B						
Refrigerant circuit	No.	1	1	1	2	2	4	4
Refrigerant charge (R454B)	kg	10.0	10.5	10.5	19.2	23.0	38.4	46.0
Refrigerant charge per circuit (R454B)	kg	10.0	10.5	10.5	9.6	11.5	9.6	11.5
Compressor								
Type		DC inverter EVI scroll						
Capacity step		Stepless with inverter						
Quantity	No.	1	1	1	2	2	4	4
Air side heat exchanger								
Coil type		Copper tube, aluminum plate fin						
Fan type		Axial fan, BLDC motor			Axial fan, EC inverter motor			
Fan quantity	No.	2					4	
Outdoor air temperature range for cooling	°C	-15 to 48	-20 to 48					
Outdoor air temperature range for heating	°C	-25 to 43						
Water side heat exchanger								
Type		Braze plate exchanger						
Water connection		External thread			Victaulic			
Size of water pipe		G2"			DN65		DN100	
Nominal water flow rate for cooling	L/s	2.08	2.39	2.87	4.78	5.92	10.51	11.90
Nominal water flow rate for heating		2.29	2.53	2.89	5.40	6.64	11.56	13.14
Pressure drop for cooling	kPa	42	36	50	29	50	33	43
Pressure drop for heating		50	40	51	35	58	39	51
Leaving water temperature for cooling	°C	-12 to 20						
Leaving water temperature for heating	°C	25 to 55	25 to 60					
Dimensions								
Length	mm	1,650			2,240		2,240	
Width	mm	760			1,200		3,050	
Height	mm	1,700			2,420		2,510	
Weight								
Shipping weight	kg	545	560	560	980	1,075	2,148	2,386
Operation weight	kg	480	502	502	994	1,090	2,181	2,420
Electrical								
Power supply	V/Ph/Hz	400 V - 3Ph - 50 Hz						

① Note:

- Net values at nominal conditions:
 - Cooling capacities are given for 7°C water leaving temperature Δt 5°C and 35°C ambient temperature.
 - Heating capacities are given for 45°C water leaving temperature and 7°C ambient temperature.
 - SEER and SCOP calculated according to EN14511 and EN14825.
 - η_s calculated according to Ecodesign regulation for chillers comfort cooling and heating (813/2013, 2016/2281).
- SEER is calculated base on fixed water flow and variable outlet approach (FW/VO).
- SCOP is calculated based on variable water flow and variable outlet approach (VW/VO).
- For other Ecodesign calculations, contact Johnson Controls.

Table 9: Low sound unit

Detail	Unit	0045	0050	0065	0100	0130	0230	0260
Cooling mode								
Cooling capacity	kW	38.0	45.0	54.0	92.4	118.0	210.0	230.0
Input power	kW	11.4	13.9	18.4	28.8	38.1	71.9	76.1
EER		3.32	3.23	2.93	3.20	3.10	2.92	3.02
SEER		4.70	4.67	4.61	4.90	4.86	4.75	4.86
Energy ratio $\eta_{s,c}$		185.3	184.0	181.4	193.0	191.3	187.0	191.3
Sound power level	dB(A)	75	75	77	76	79	81	82
Heating mode								
Heating capacity	kW	41.5	49.0	54.0	105.0	128.0	231.0	256.0
Input power	kW	12.2	13.9	15.9	30.3	39.1	70.4	78.2
COP		3.41	3.53	3.39	3.46	3.27	3.28	3.27
SCOP		3.97	4.24	4.20	4.10	3.94	4.10	4.06
Energy ratio $\eta_{s,h}$		156.0	166.6	165.1	161.1	154.5	161.1	159.4
Refrigerant								
Type		R454B						
Refrigerant circuit	No.	1	1	1	2	2	4	4
Refrigerant charge (R454B)	kg	10.0	10.5	10.5	19.2	23.0	38.4	46.0
Refrigerant charge per circuit (R454B)	kg	10.0	10.5	10.5	9.6	11.5	9.6	11.5
Compressor								
Type		DC inverter EVI scroll						
Capacity step		Stepless with inverter						
Quantity	No.	1	1	1	2	2	4	4
Air side heat exchanger								
Coil type		Copper tube, aluminum plate fin						
Fan type		Axial fan, BLDC motor			Axial fan, EC inverter motor			
Fan quantity	No.	2					4	
Outdoor air temperature range for cooling	°C	-15 to 48	-20 to 48					
Outdoor air temperature range for heating	°C	-25 to 43						
Water side heat exchanger								
Type		Brazed plate exchanger						
Water connection		External thread			Victaulic			
Size of water pipe		G2"			DN65		DN100	
Nominal water flow rate for cooling	L/s	1.82	2.15	2.58	4.41	5.64	10.03	10.89
Nominal water flow rate for heating		1.98	2.34	2.58	5.02	6.12	11.04	12.23
Pressure drop for cooling	kPa	33	30	42	25	38	30	38
Pressure drop for heating		39	35	42	31	48	36	45
Leaving water temperature for cooling	°C	-12 to 20						
Leaving water temperature for heating	°C	25 to 55	25 to 60					
Dimensions								
Length	mm	1,650			2,240		2,240	
Width	mm	760			1,200		3,050	
Height	mm	1,700			2,420		2,510	

Table 9: Low sound unit

Detail	Unit	0045	0050	0065	0100	0130	0230	0260
Weight								
Shipping weight	kg	545	560	560	983	1,079	2,153	2,391
Operation weight	kg	480	502	502	997	1,093	2,186	2,425
Electrical								
Power supply	V/Ph/Hz	400 V - 3Ph - 50 Hz						

Note:

- Net values at nominal conditions:
 - Cooling capacities are given for 7°C water leaving temperature Δt 5°C and 35°C ambient temperature.
 - Heating capacities are given for 45°C water leaving temperature and 7°C ambient temperature.
 - SEER and SCOP calculated according to EN14511 and EN14825.
 - η_s calculated according to Ecodesign regulation for chillers comfort cooling and heating (813/2013, 2016/2281).
- SEER is calculated base on fixed water flow and variable outlet approach (FW/VO).
- SCOP is calculated based on variable water flow and variable outlet approach (VW/VO).
- For other Ecodesign calculations, contact Johnson Controls.

Table 10: Electrical features data (without pump)

Detail	0045	0050	0065	0100	0130	0230	0260
Nominal voltage/voltage limits	400 V 3 ~ 50 Hz/360 V to 440 V						
Nominal current at 400 V (A)	24	25.1	33.3	49.5	65.2	113.8	130.4
Maximum current at 400 V (A)	28	34	39	69	76	146	152
Maximum current at 360 V (A)	34	42	47	77	85	163	170
Unit short circuit current withstand (kA)	5	5	5	5	5	5	5

Electrical data

Table 11: Electrical data (without pump)

YMAE	No. of modules	Main power supply 3-phase		Control supply 1-phase		Hz	SCCR (kA)	Nomin al current at 400 V (A)	Maxim um current at 400 V (A)	Maxim um current at 360 V (A)	Min. dual elem. fuse/CB, Min. OP (A)	Max. dual elem. fuse/CB, Max. OP (A)	Single module						Notes
													Compressor, 1 PC/sys		Fan, 1~2PC/sys		Control circuit		
		Voltage (V)	Voltage limits	Voltage (V)	Voltage limits								Max power (kW)	RLA (A)	Max power (kW)	MOC (A)	Max power (W)	MOC (A)	
0045PJP50	1	400	360-440	230	207-253	50	5	24	28	34	35	50	15.7	24.2	1.50	3.0	115	0.29	1 compressor and 2 BLDC fans
0050PJP50	1	400	360-440	230	207-253	50	5	25.1	34	42	45	70	19.6	30.2	1.50	3.0	115	0.29	1 compressor and 2 BLDC fans
0065PJP50	1	400	360-440	230	207-253	50	5	33.3	39	47	50	80	22.7	34.9	1.50	3.0	115	0.29	1 compressor and 2 BLDC fans
0100PJP50	1	400	360-440	230	207-253	50	5	49.5	69	77	80	100	20.5	31.5	1.57	2.8	225	0.56	2 compressors and 2 EC fans
0130PJP50	1	400	360-440	230	207-253	50	5	65.2	76	85	90	110	22.7	34.9	1.57	2.8	225	0.56	2 compressors and 2 EC fans
0230PJP50	1	400	360-440	230	207-253	50	5	113.8	146	163	150	200	21.8	33.5	1.57	2.8	450	1.12	4 compressors and 4 EC fans
0260PJP50	1	400	360-440	230	207-253	50	5	130.4	152	170	175	225	22.7	34.9	1.57	2.8	450	1.12	4 compressors and 4 EC fans

Oil charge

Table 12: Total oil charge, in L

Model	0045	0050	0065	0100	0130	0230	0260
System 1	2.5	2.6	2.6	2.9	3.0	2.9	3.0
System 2	—	—	—	2.9	3.0	2.9	3.0
System 3	—	—	—	—	—	2.9	3.0
System 4	—	—	—	—	—	2.9	3.0

① Note:

- Oil type: FVC85EA.
- The systems are charged with additional oil before delivery.
- The oil amount in [Table 12](#) is the total oil volume in individual circuit, which includes the compressor and system.

Water requirements

Table 13: Chilled water requirements

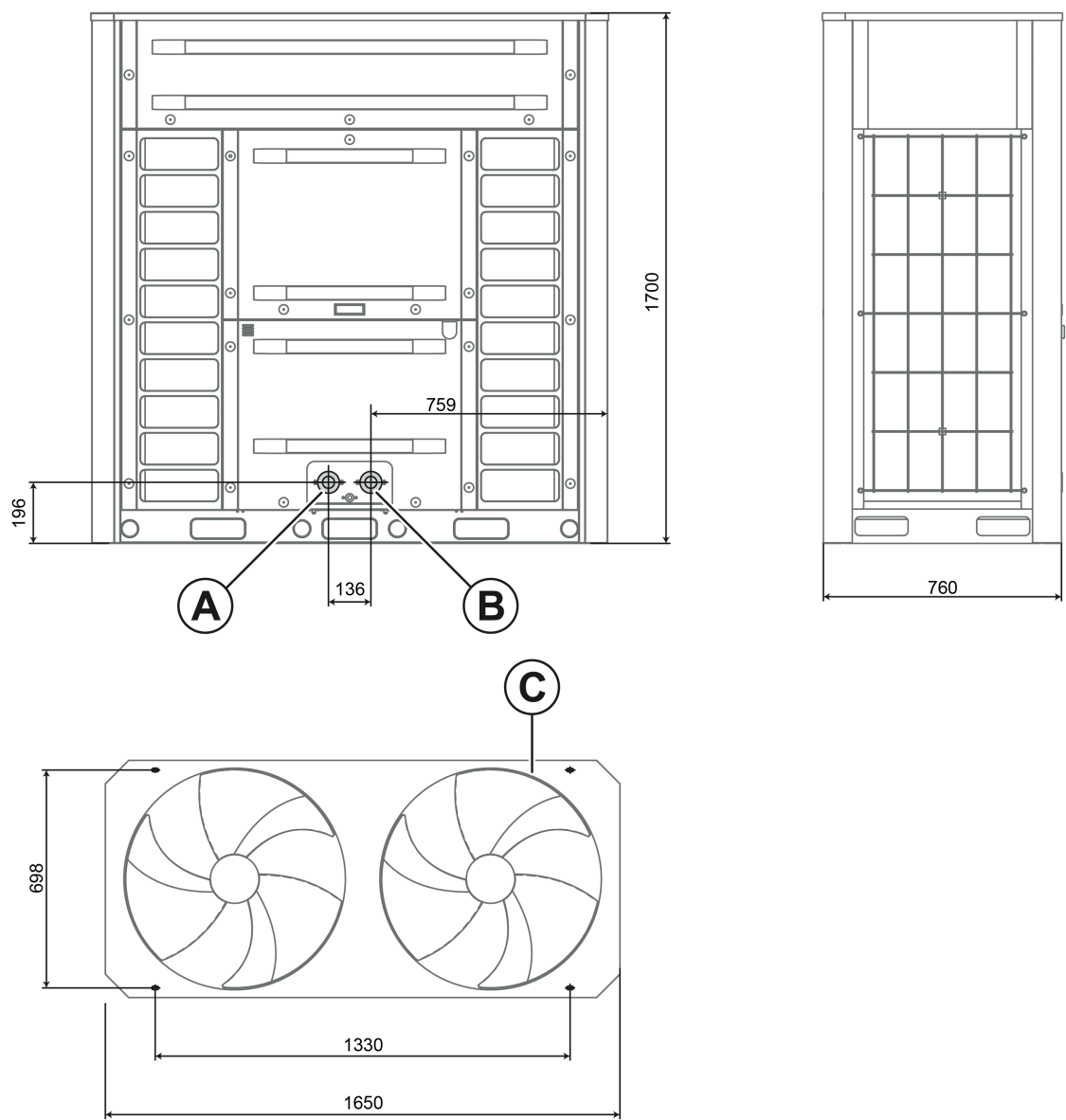
Item	Unit	Allowable value	Tendency	
			Corrosion	Deposition
PH value (25°C)		7.5 to 9.0	X	
SO ₄ ⁻	ppm	<100	X	
HCO ₃ ⁻ / SO ₄ ⁻	ppm	>1.0	X	
Cl ⁻	ppm	<50	X	
PO ₄	ppm	<2.0	X	
NH ₃	ppm	<0.5	X	
Free Chlorine	ppm	<0.5	X	
Fe ⁺⁺⁺	ppm	<0.5	X	
Mn ⁺⁺	ppm	<0.05	X	
CO ₂	ppm	<10	X	
H ₂ S	ppm	<50	X	
Temperature	°C	<65	X	X
Oxygen content	pm	<0.1	X	
Total hardness	pH	4.8 to 8.5		X

① Note:

- Items with corrosion tendency indicate that water quality that exceeds the allowable value for a long time can cause corrosion-related heat exchanger leaks and breakdown.
- Items with deposition tendency indicate that water quality that exceeds the allowable value for a long time can cause serious incrustation of the heat exchanger and affect the heat transfer efficiency, resulting in a low cooling or heating efficiency.

Dimensions

Figure 14: YMAE 0045, 0050, 0065 dimensions, mm

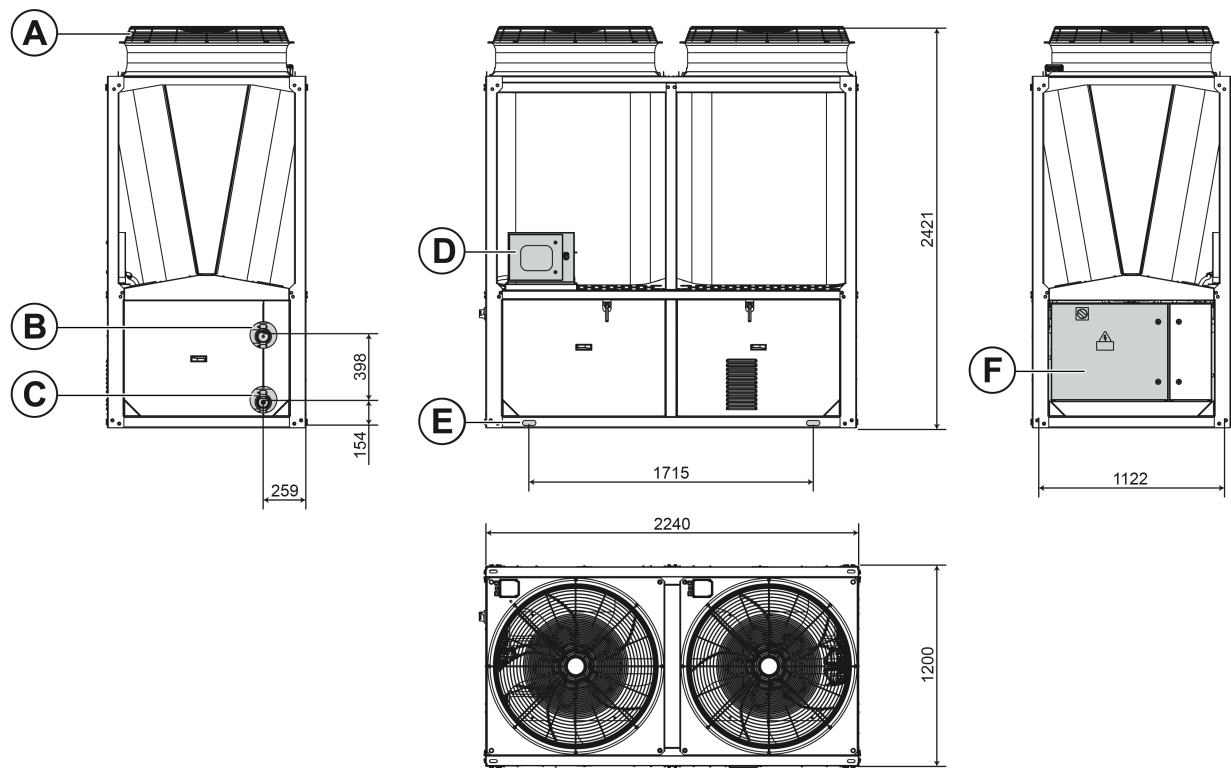


LD34864

① **Note:** YMAE 0045/0050/0065 unit inlet and outlet water tube connections are G2 in. external thread connections. The unit water tube connection OD diameter is 50 mm. A y-shaped strainer must be installed in the field. See [Installing the y-shaped strainer](#).

Callout	Description
A	Water inlet, G2 in. external thread
B	Water outlet, G2 in. external thread
C	Unit installation hole, 11 mm x 22 mm

Figure 15: YMAE 0100 and 0130 dimensions, mm

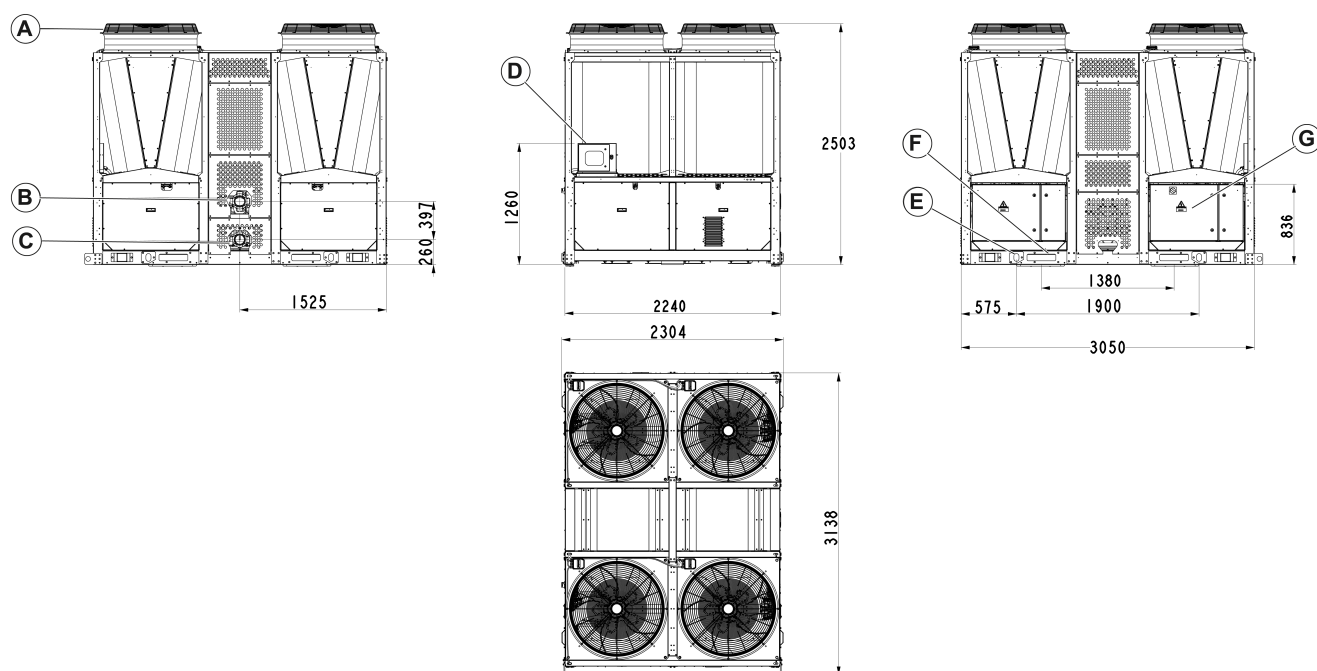


LD33670a

Note: YMAE 0100 and 0130 unit inlet and outlet water tube connections are 63.5 mm (2 1/2 in.) Victaulic grooved coupling. The unit water tube connection OD diameter is 76 mm.

Callout	Description
A	Fan
B	PHE inlet, DN65 Victaulic connection
C	PHE outlet, DN65 Victaulic connection
D	HMI
E	Rigging holes
F	Control panel

Figure 16: YMAE 0230 and 0260 dimensions, mm



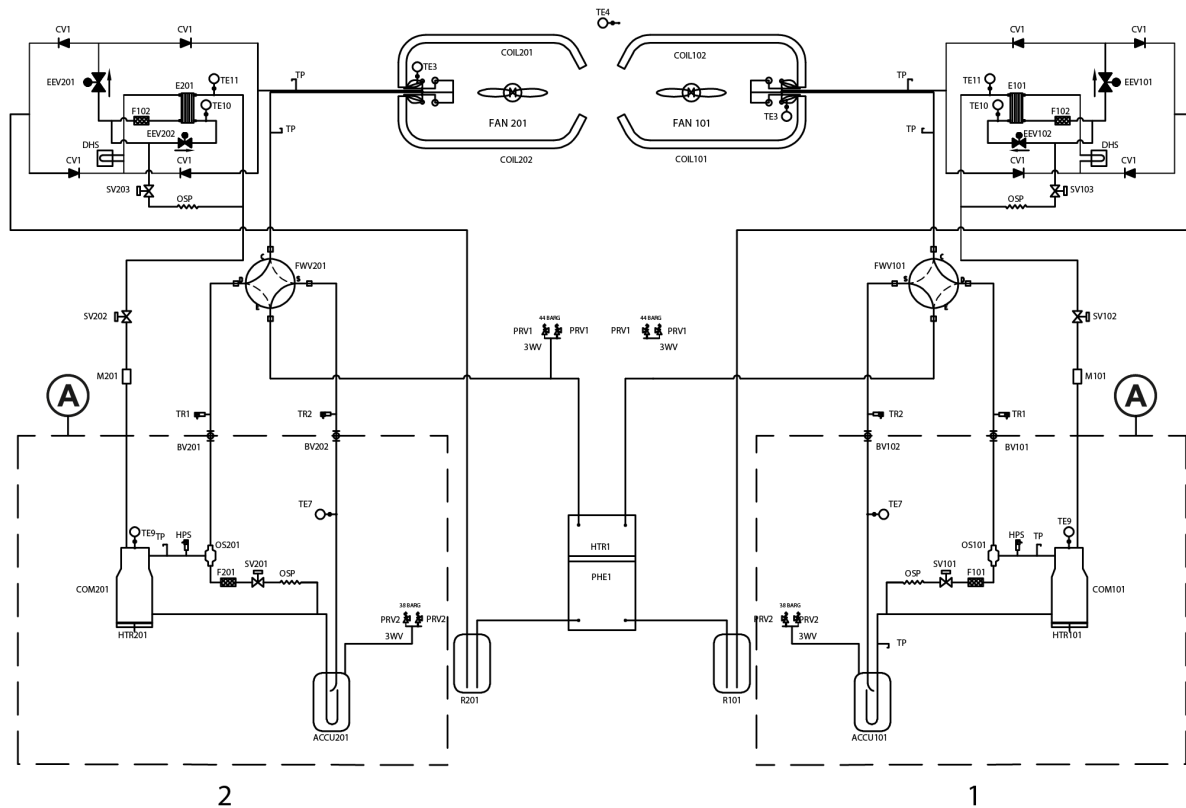
LD35588

- ① **Note:** The YMAE 0230 and 0260 unit inlet and outlet water tube connections are 101.6 mm (4 in.) Victaulic grooved coupling. The unit water tube connection OD diameter is 114 mm (4.5 in.).

Callout	Description
A	Fan
B	PHE inlet, DN100 Victaulic connection
C	PHE outlet, DN100 Victaulic connection
D	HMI
E	Rigging holes
F	Forklift holes
G	Control panel

Piping and instrumentation diagrams

Figure 17: System PID

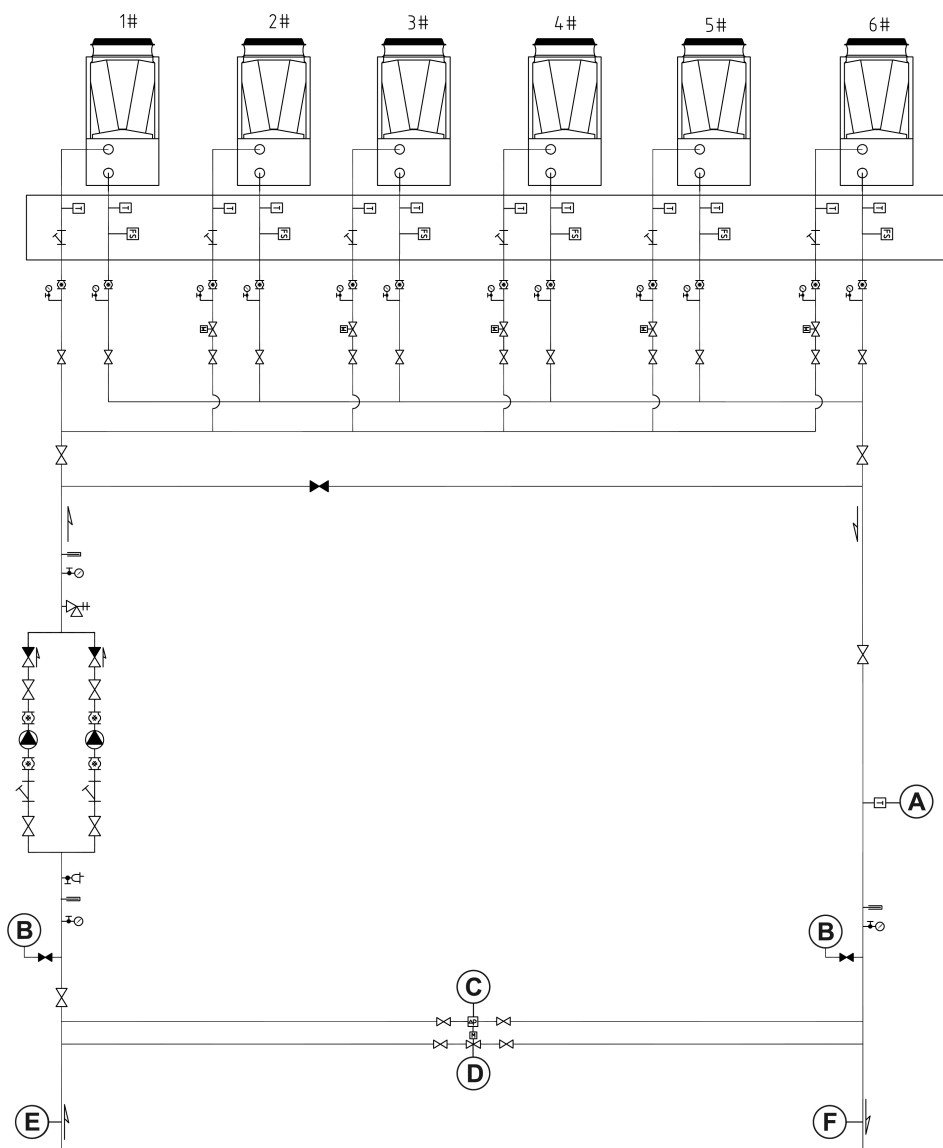


LD33671

Note: The YMAE 0045, 0050, and 0065 has one circuit, the YMAE 0100 and 0130 has two circuits, and the YMAE 0230 and 0260 has four circuits.

Callout	Description
A	Low pressure test side
COM	Compressor
Fan	Air side fan
ACCU	Accumulator
R	Receiver
FWV	Four-way valve
PHE	Blazed plate heat exchanger
E	Economizer
EEV	Electronic expansion valve
SV	Solenoid valve
BV	Ball valve
F	Filter
PRV	Dual relief valve
M	Muffler
3WV	Three-way valve
TR	Pressure transducer
HPS	High pressure switch
HTR	Heater
DHS	Driver heat sink
TE	Temperature sensor

Figure 18: Modular connections diagram



LD33010a

Callout	Description
A	System LWT
B	Drain valve
C	ΔP meter
D	Proportional valve
E	Return pipe
F	Supply pipe

Note:

- The system LWT sensor is shipped loose and must be field-installed for modular application.
- The EWT, LWT sensors, entering strainer, and flow switch in solid box for individual two-pipe modules are factory-installed, except for the YMAE 0045 to 0065 entering strainer, which requires field installation.

Table 14: Modular connections legend

Symbol	Definition	Symbol	Definition
	Isolating valve - normal open		Temperature sensor
	Pressure gauge		Flow switch
	Thermometer		Safety valve
	Vent valve		Check valve
	Water pump		Isolating valve - normal closed
	Metal flexible joint		Electrical water valve
	Water strainer		Pressure differential controller

Rigging, handling, and storage

WARNING

Rigging and lifting must only be done by a professional rigger in accordance with a written rigging and lifting plan.

The most appropriate rigging and lifting method depends on job specific factors, such as the rigging equipment available and site needs.

A professional rigger must determine the rigging and lifting method to be used, and it is beyond the scope of this manual to specify rigging and lifting details.

Failure to follow these instructions could result in death, serious injury or equipment damage.

Other considerations while rigging and lifting the unit include:

- Follow all applicable regulations and safety practices during rigging and lifting.
- Prepare and follow a written rigging and lifting plan.
- Use spread bars that are long enough to prevent the rigging from contacting the unit.
- Use all the designated lifting points according to the unit manual.
- Only use the designated lifting points.
- Locate the center of gravity through trial lifts to account for possible variations in unit configuration.
- Keep the unit stable and level during rigging and lifting.
- Keep clear of the unit when lifting.

Delivery

To ensure consistent quality and maximum reliability, all units are tested and inspected before leaving the factory.

Units are shipped completely assembled and containing refrigerant under pressure.

Units are shipped without export crating unless crating has been specified on the sales order.

Inspecting the delivery

1. Remove any transit packing and inspect the unit to ensure that all components have been delivered and that no damage has occurred during transit.
2. If there is any evident damage, note the damage on the carrier's freight bill and enter a claim in accordance with the instructions given on the advice note.
3. Report any major damage immediately to your local Johnson Controls representative.

Storage

If the unit is being put into storage before installation, follow these guidelines:

- Block the chiller so that the base cannot sag or bow.
- Securely cap all openings, such as water connections.
- Do not store the chiller where it is exposed to high ambient air temperatures that can exceed relief valve settings.
- Cover the condensers to protect the coils and fins from potential damage and corrosion, particularly where building work is in progress.
- To limit the risk of accidental physical damage, store the unit in a location where there is minimal activity.

- To prevent inadvertent operation of the pressure relief devices, do not steam clean the unit.
- Inspect the unit periodically during storage.
- Store the unit in a location with ambient temperature -30°C to 55°C.

Moving the unit

ⓘ Note: Refer to the unit nameplate for unit shipping weight. The weight and center of gravity may vary slightly depending on unit configuration at the time of lifting.

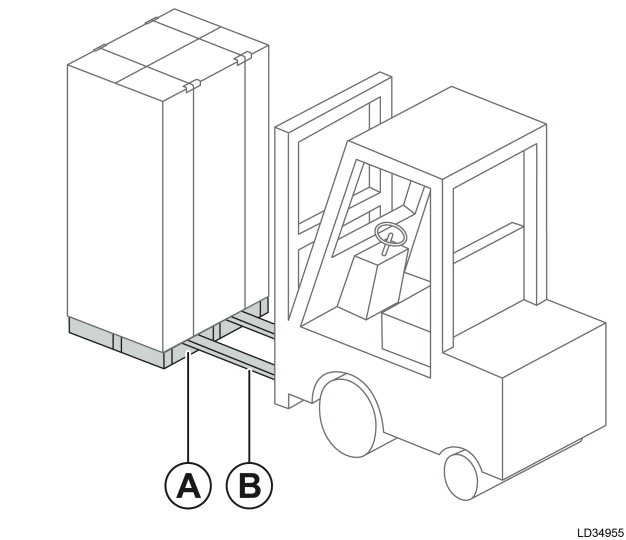
Before moving the unit, ensure that the installation site is suitable for installing the unit and is appropriate to support the weight of the unit and all associated services.

Avoid damaging the condenser coil fins when moving the unit.

 **CAUTION**

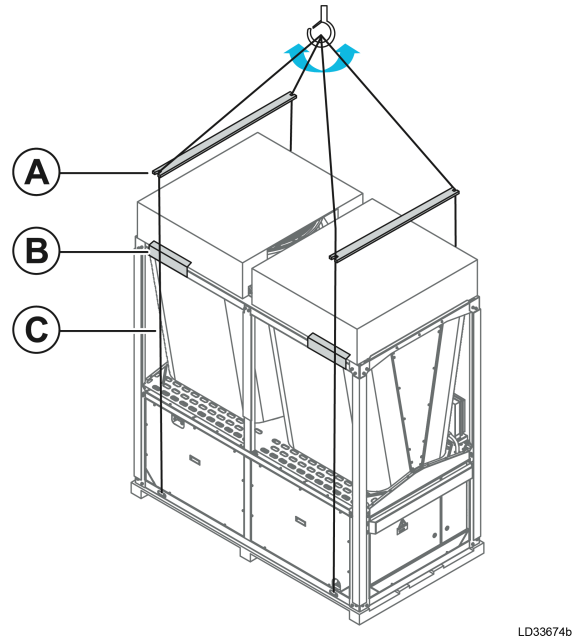
YMAE 0100, 0130, 0230, and 0260 units must only be lifted at the rigging plates fitted to the base frame, and you must use a spreader bar or a frame of sufficient width.

Figure 19: Lifting the YMAE 0045, 0050, and 0065



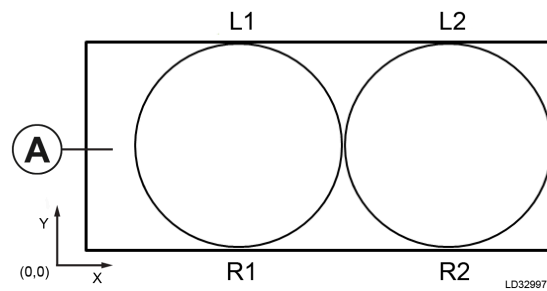
Callout	Description
A	Wooden pallet opening
B	Lifting fork

Figure 20: Lifting the YMAE 0100 and 0130



Callout	Description
A	Spreader bar
B	Protective pads
C	Lifting ropes

Figure 21: Lifting locations YMAE 0100 and 0130



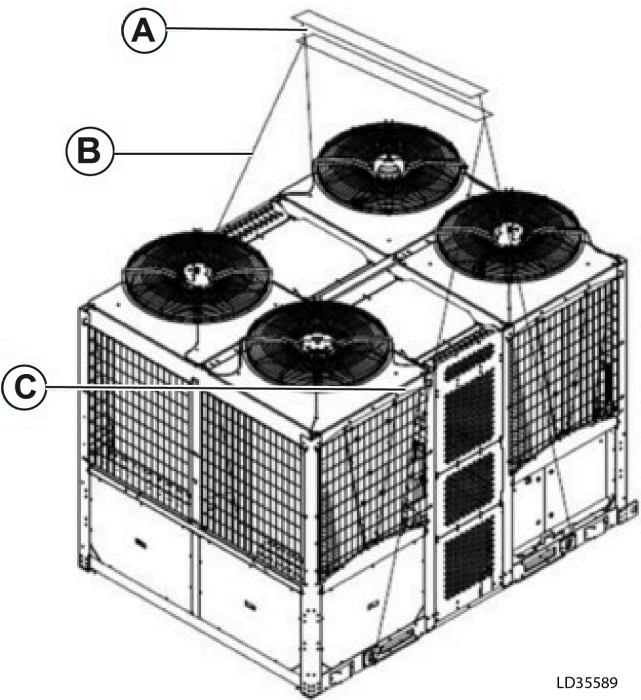
Callout	Description
A	Control panel

Table 15: YMAE 0100 and 0130 unit lifting locations (X,Y), mm

Distance	R1	L1	R2	L2
X	263	263	1978	1978
Y	39	1161	39	1161

① **Note:** Coordinates are measured from X and Y axis shown on the image.

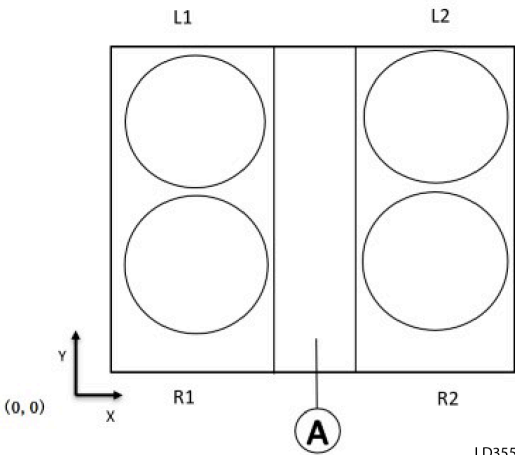
Figure 22: Lifting the YMAE 0230 and 0260



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Callout	Description
A	Spreader bar
B	Protective pads
C	Lifting ropes

Figure 23: YMAE 0230 and 0260 lifting locations



LD35590

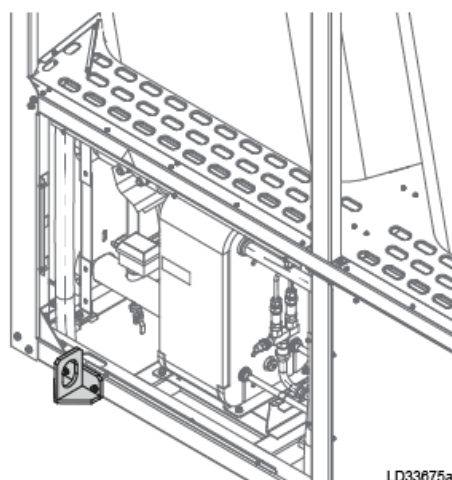
Callout	Description
A	Control panel

Table 16: YMAE 0230 and 0260 unit lifting locations in mm (X,Y)

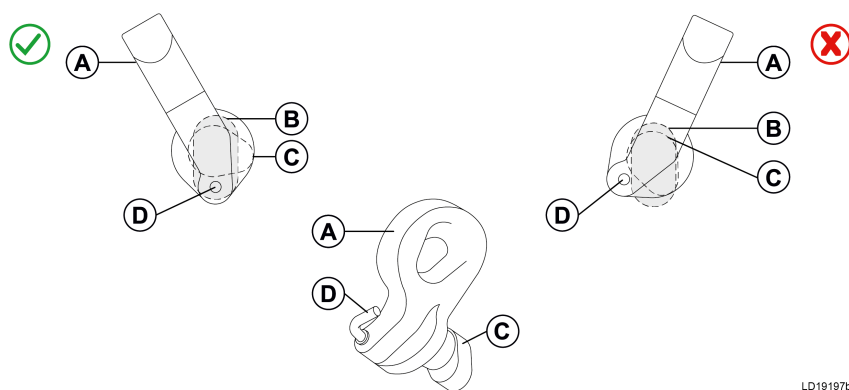
Distance	R1	L1	R2	L2
X	575	575	2475	2475
Y	53	2187	53	2187

Using lifting lugs

Units are provided with rigging plates fitted to the unit base frame, which accept the accessory lifting lug set as shown in the following figures.

Figure 24: Correct lifting lug position

1. Insert the RH and LH lugs into the respective holes in the rigging plates.
2. Turn the lugs so that the spring loaded pin engages into the hole and the flanges on the lug lock behind the hole.
3. Attach the lugs to the cables and chains using shackles or safety hooks.

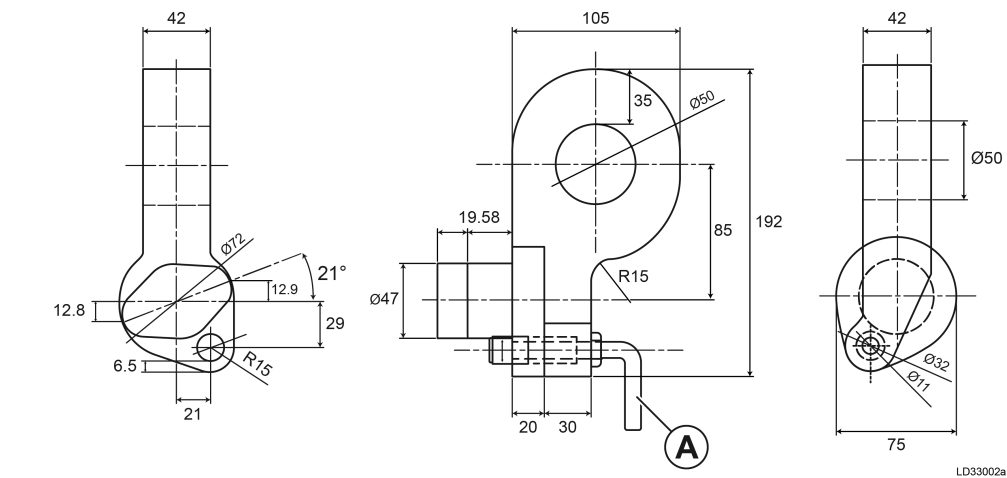
Figure 25: Lifting lug

Callout	Component
A	Lug
B	Lifting hole in the base frame
C	Flange
D	Locking pin

- ⓘ

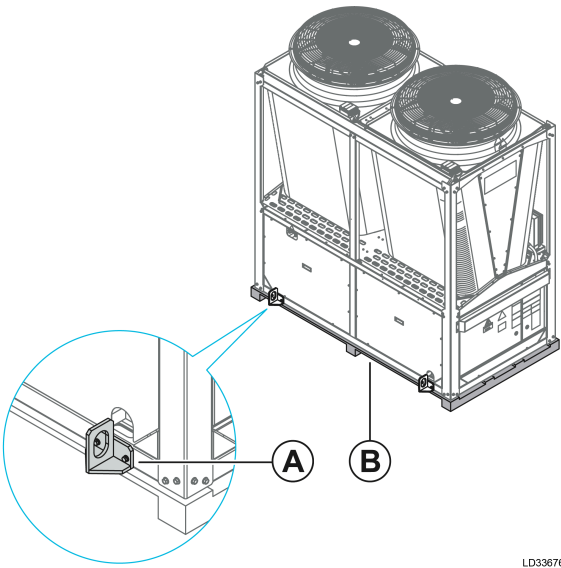
Note:
 - The lugs are not included with the unit.
 - Do not use the dragging plates as lifting lugs when lifting the units. Refer to the lifting instructions on each unit before you lift units.

Figure 26: Lifting lug dimensions, mm



Callout	Description
A	Locking pin

Figure 27: YMAE 0100 and 0130 rigging holes and fork lifting slots



Callout	Component
A	Rigging holes
B	Fork lifting slots

Note:

- Rigging holes are located at the four-corner of the unit.
- The rigging hole and fork lifting slots can be used when dragging the unit from container.

Figure 28: YMAE 0230 and 0260 rigging holes and fork lifting slots



Note:

- Only use dragging plates and anti-collision plates during container transport. Fork lift holes are for in-plant transfer.
- The factory installs the four rigging plates before delivery.

Callout	Description
A	Rigging holes
C	Dragging plate
B	Fork lifting slots
D	Anticollision plate

Installation

To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized YORK service engineer. Installation must comply with all applicable local codes.



The control and power panels can deliver lethal voltages. Before servicing, open and tag all disconnect switches.

Installation site

For optimum performance and trouble-free service, it is essential that the installation site meets the location and space requirements for the model being installed.

Ensure that the minimum service access space is maintained for cleaning and maintenance purposes. Local health and safety regulations, or practical considerations for service replacement of large components, may require larger clearances than those given in this guide.

Outside installations

The units can be installed on rail bracket, at least 150 mm above ground, at ground level on a suitable, level foundation easily capable of supporting the weight of the unit, or on a suitable rooftop location. In both cases an adequate supply of air is required. Avoid locations where the sound output and air discharge from the unit may be a problem.

Select a location away from boiler flues and other sources of airborne chemicals that could damage the condenser coils and steel parts of the unit.

If located in an area accessible to unauthorized persons, take steps to prevent access to the unit by means of a protective fence. This helps to prevent the possibility of vandalism, accidental damage, or possible harm caused by unauthorized removal of protective guards or opening panels to expose rotating or high-voltage components.

For ground level locations, install the unit on a suitable flat concrete base or rails that extends to fully support the two side channels of the unit base frame. Use a one-piece concrete slab, with footings extending below the frost line. To avoid noise and vibration transmission, do not secure the unit to the building foundation. Use neoprene isolators.

On rooftop locations, choose a place with adequate structural strength to safely support the entire operating weight of the unit and service personnel. Mount the unit on a concrete slab, similar to ground floor locations, or on steel channels of suitable strength.

Space the channels with the same centers as the unit side and front base rails. This allows vibration isolators to be fitted if required. Use isolators for rooftop locations.

Ensure that the place of installation and operation can support the weight of the unit and any extra operation and maintenance weights that may occur.

Noise sensitive locations

Ensure that the unit is not located next to occupied spaces or noise sensitive areas where unit noise levels would be a problem. Unit noise is a result of compressor and fan operation. Use published noise level information as part of your considerations.

Corrosion locations

The unit is designed to withstand most climate conditions. If the unit is installed near the seashore where high levels of salt may shorten the life of the unit, make sure it is not exposed to sea winds directly.

Installations close to environmental, chemical, or corrosive effects require special consideration. For example, contact Johnson Controls with regards to units being installed near the seashore, or near chlorine-treated swimming pools.

Operating in low ambient conditions

If the unit is operating in low ambient temperature, consider the following precautions:

- Install a baffle plate on the airside of the unit to prevent exposure to snow.
- Use a canopy to prevent snowfall affecting the coil and fan. Refer to [Figure 29](#) and [Figure 30](#) for the minimum clearance from the unit if applicable.
- De-ice the fan blades before operation if the fan blades fail to rotate after a long period of standby in low ambient temperature.
- Install flexible hoses to ensure effective condensation water drainage during operation.

Clearances

Adequate clearances around the units are required for the unrestricted airflow for the air-cooled condenser coils and to prevent re-circulation of warm discharge air back onto the coils. If the appropriate clearances are not maintained, airflow restriction or re-circulation can cause a loss of unit performance, an increase in power consumption, and may cause the unit to malfunction. Consider the possibility of down drafts, caused by adjacent buildings, which may cause re-circulation or uneven unit airflow.

For locations where significant cross winds can occur, such as exposed rooftops, use a louver enclosure to prevent wind turbulence interfering with the unit airflow.

When units are installed in an enclosure, ensure the enclosure height does not exceed the height of the unit on more than one side. If the enclosure is of louvered construction, the same requirement of static pressure loss applies as for ducts and attenuators. If the surrounding enclosures or wall exceed the height of the unit on more than one side, see [Figure 29](#) for the minimum necessary clearances.

Where accumulation of snow is likely, ensure there is additional height clearance under the unit to ensure normal airflow to the unit.

- Placement on a level surface free of obstructions, including snow for winter operation, or air recirculation ensures rated performance, reliable operation and ease of maintenance.
- Site restrictions may compromise minimum clearances, resulting in unpredictable air flow patterns and possible reduced performance.
- The distances between the walls and peripheral units must employ the same rules as shown in location clearances if the units are surrounded by walls.
- No more than one adjacent wall may be higher than the unit.
- The installing contractor must include vent and drain connections in the water piping near the heat exchanger.
- Balancing valves must be installed at the inlet of each unit to balance chilled liquid distribution.
- A minimum space of 1,220 mm for R-454B units must be reserved for field wiring, commissioning and maintenance in case of control panel face to face installation.
- Refer to the single module and modular array drawings for detailed dimensions.

Figure 29: Location clearances, top view

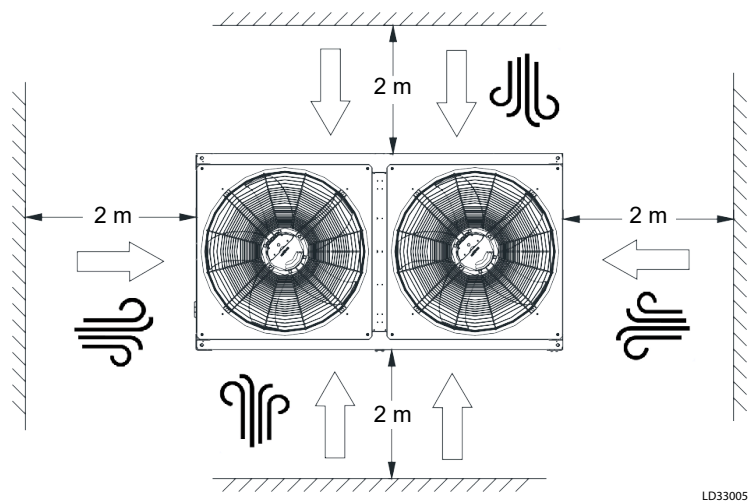


Figure 30: Location clearances, side view

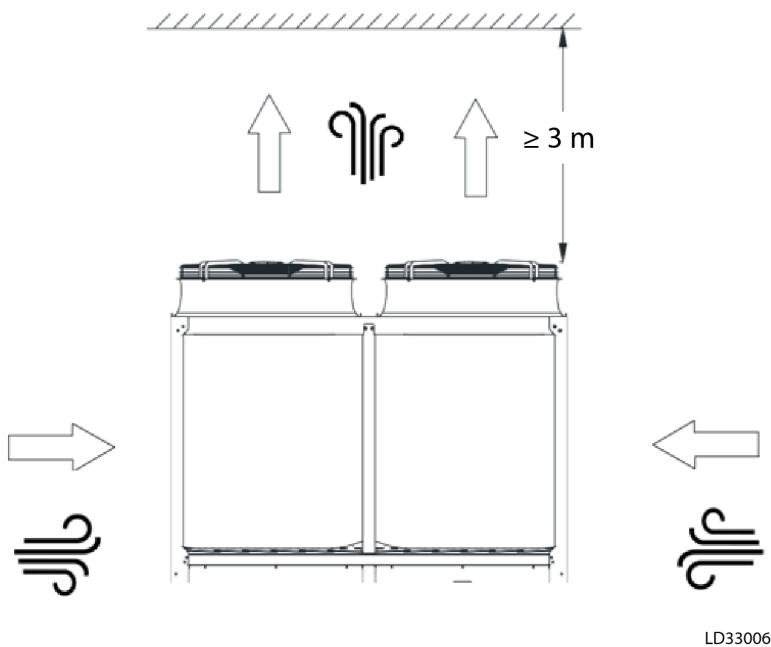
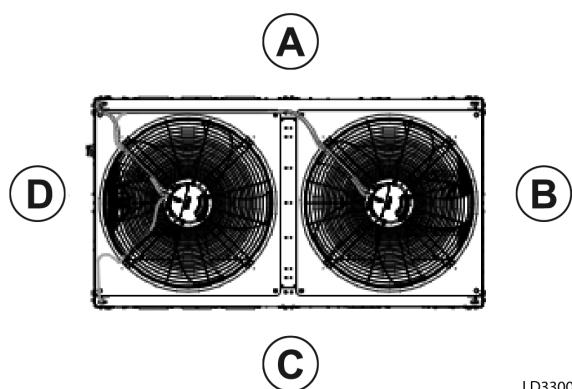
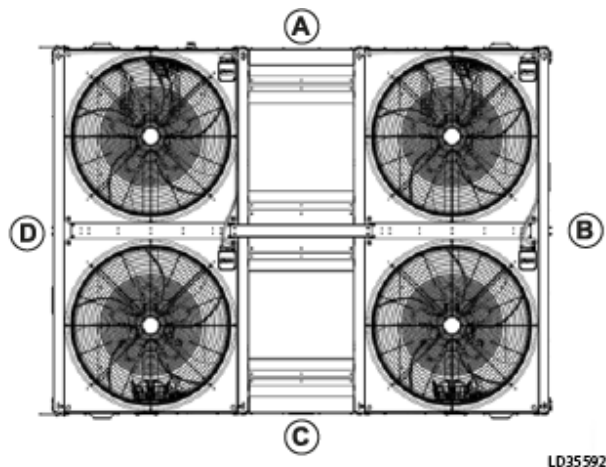


Figure 31: Array clearances



YMAE 0045, 0050, and 0065		YMAE 0100 and 0130	
Callout	Description	Callout	Description
A	≥ 500 mm clearance, service airflow	A	≥ 650 mm clearance, service airflow
B	≥ 500 mm clearance, service airflow	B	≥ 500 mm clearance, piping side
C	≥ 900 mm clearance, panel and piping side	C	≥ 650 mm clearance, HMI side
D	≥ 500 mm clearance, service airflow	D	≥ 900 mm clearance, panel door side

Figure 32: YMAE 0230 and 0260 unit clearances



Callout	Description
A	Minimum 500 mm clearance, piping side. Need consider additional clearance service access to pipework.
B	Minimum 650 mm clearance, HMI side
C	Minimum 900 mm clearance, panel side
D	Minimum 650 mm clearance, service airflow

Installation of vibration isolators

An optional set of vibration isolators can be supplied loose with each unit. The correct number of isolators are supplied to suit the unit model.

Figure 33: Anti-vibration mounts (AVM) locations, YMAE 0045/0050/0065

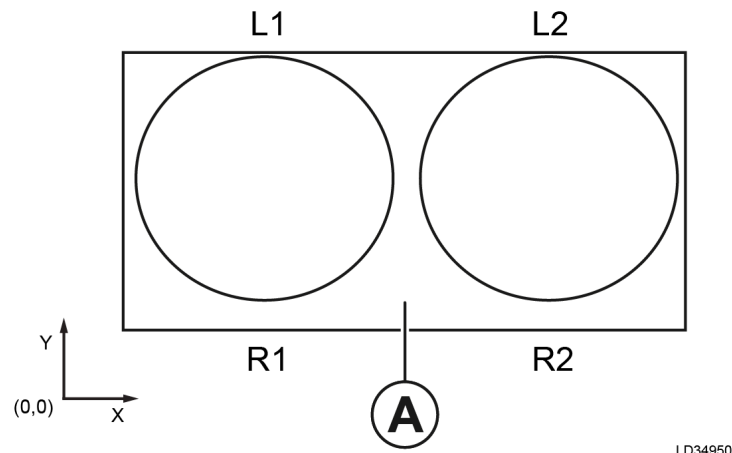


Figure 34: Anti-vibration mounts (AVM) locations, YMAE 0100 and 0130

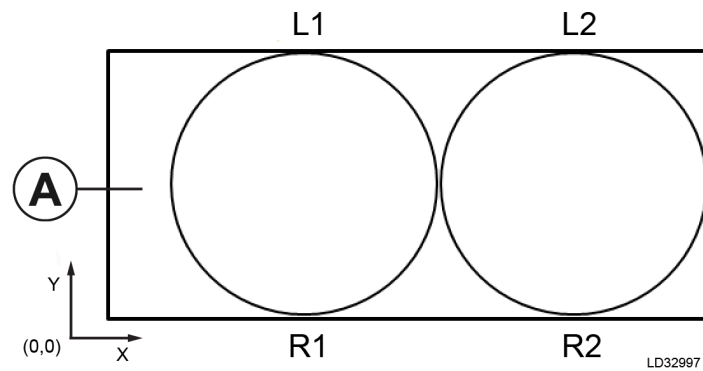
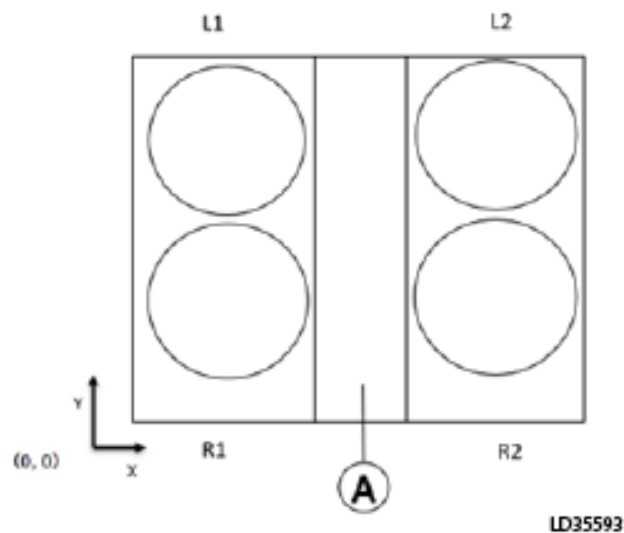


Figure 35: Anti-vibration mounts (AVM) locations, YMAE 0230 and 0260



Callout	Description
A	Control panel

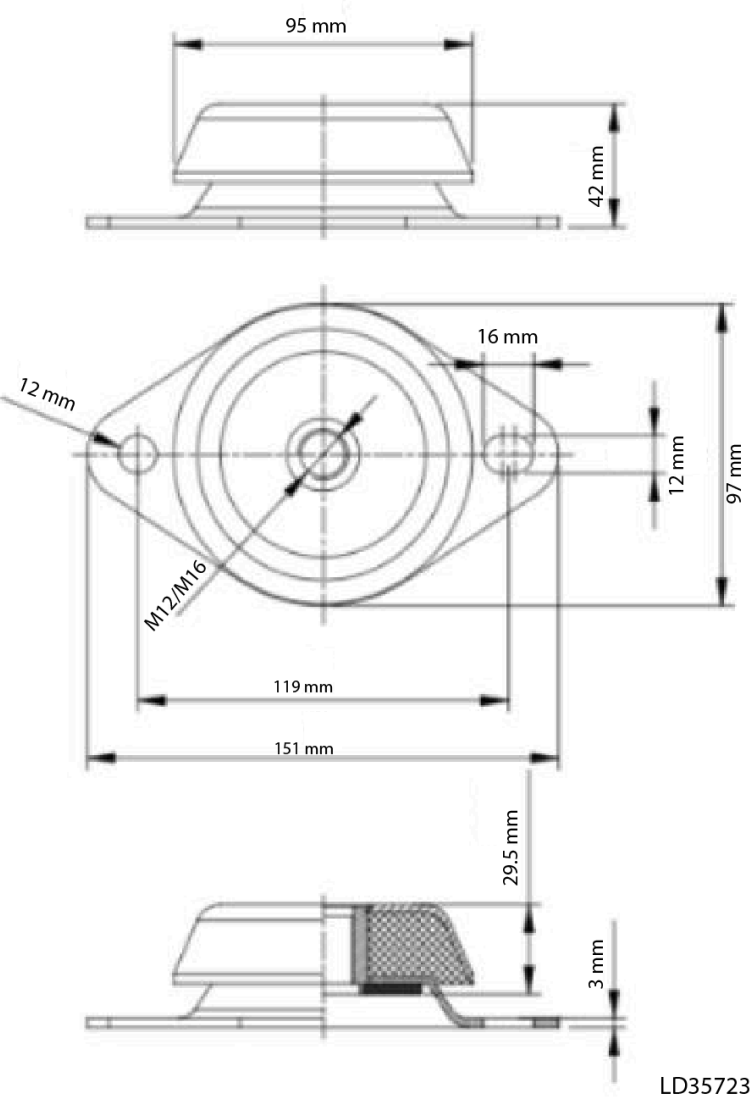
Table 17: Unit AVM coordinate locations (X,Y), in mm

Model	Distance	R1	L1	R2	L2
YMAE 0045/0050/0065	X	194	194	1424	1424
	Y	34	732	34	732
YMAE 0100/0130	X	263	263	1978	1978
	Y	39	1161	39	1161
YMAE 0230/0260	X	575	575	2475	2475
	Y	53	2187	53	2187

① **Note:** Coordinates are measured from X and Y axis shown on the image.

AVM isolator dimensions

Figure 36: JR anti-vibration pad



LD35723

Figure 37: JD anti-vibration pad 029-28746-002-007

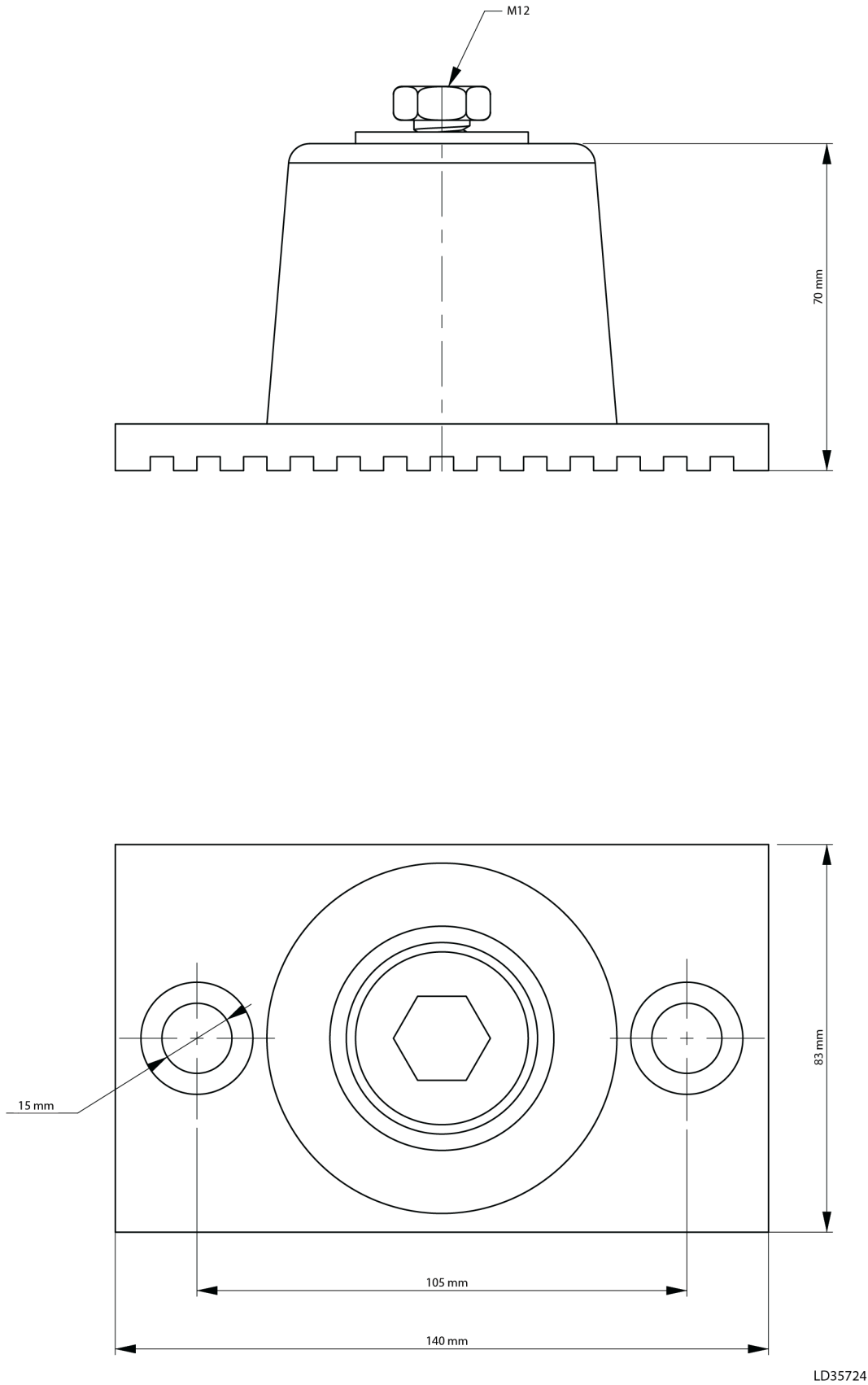
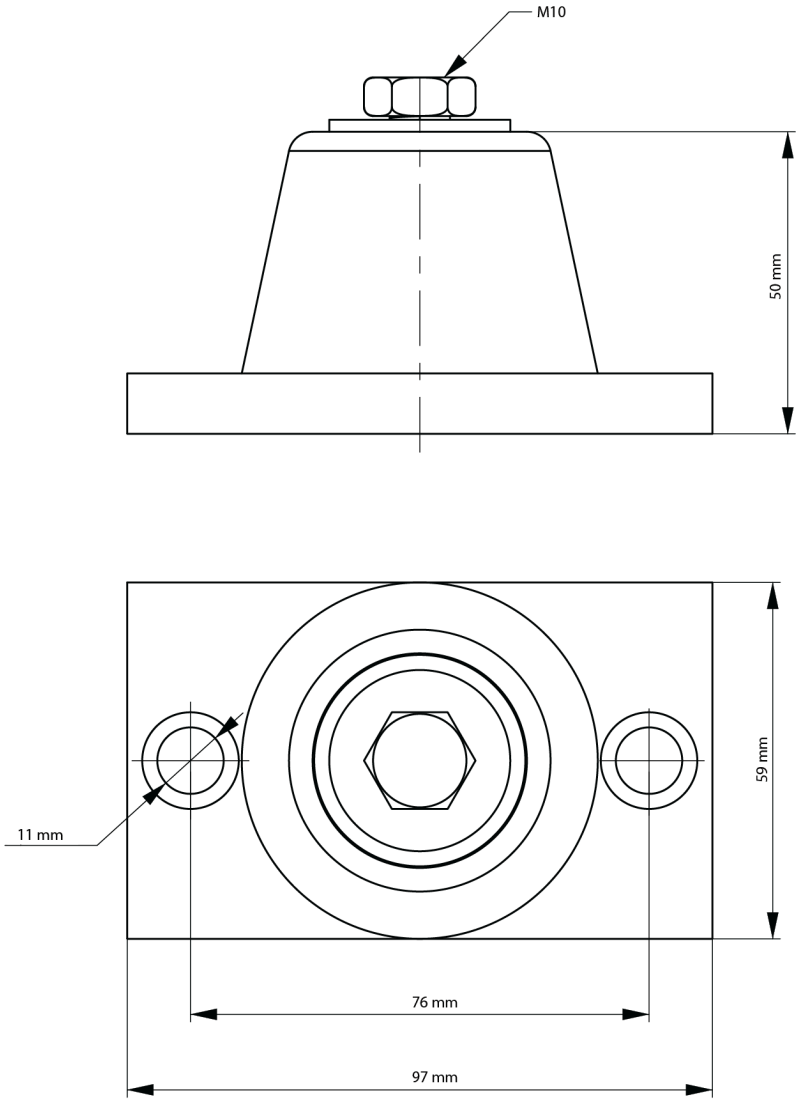


Figure 38: JD anti-vibration pad 029-28746-002-001



LD35725

Figure 39: JD anti-vibration pad 029-28746-002-008

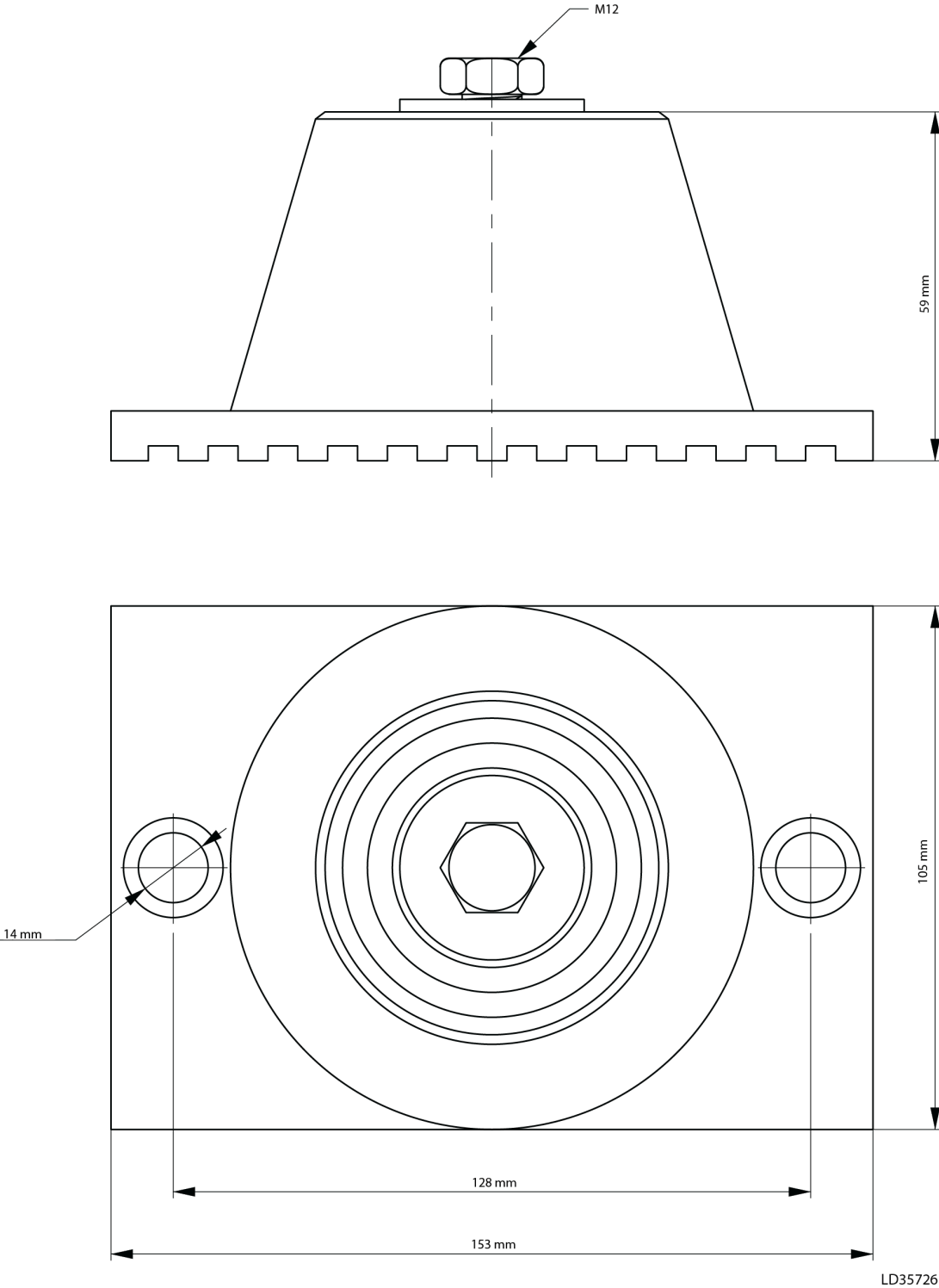


Table 18: AVM isolator types and dimensions

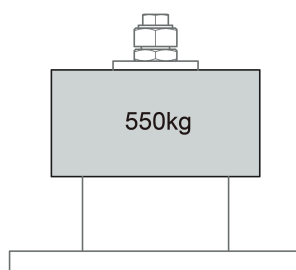
Feature Code	Feature description	Type	SAP	Isolator model	Color	Min Value	Max Value	Height
						AVM (kg)	AVM (kg)	
N	Neoprene Isolators	JD	6471094	JD-100-LA	Black	65	85	50
N	Neoprene Isolators	JD	6471093	JD-120-LA	Black	85	100	70
N	Neoprene Isolators	JD	6471092	JD-140-LA	Black	100	115	70
N	Neoprene Isolators	JD	6471091	JD-160-LA	Black	115	138	70
N	Neoprene Isolators	JD	6471090	JD-200-LA	Black	138	169	70
N	Neoprene Isolators	JD	6471089	JD-240-LA	Black	169	208	70
N	Neoprene Isolators	JD	6471088	JD-300-LA	Black	208	269	70
N	Neoprene Isolators	JR	6492264	JR-500 M12	Black	269	462	42
N	Neoprene Isolators	JR	5465055	JR-700	Black	462	577	42
N	Neoprene Isolators	JR	5465054	JR-800	Black	577	692	42
N	Neoprene Isolators	JD	6471087	JD-1000-LA	Black	692	808	70
1	1" Deflection Isolators	MHS	6471119	MHS-100-LA	Gray	65	85	150
1	1 in. Deflection Isolators	MHS	6471118	MHS-120-LA	Gray	85	100	150
1	1 in. Deflection Isolators	MHS	6471117	MHS-140-LA	Gray	100	115	150
1	1 in. Deflection Isolators	MHS	6471116	MHS-160-LA	Gray	115	138	150
1	1 in. Deflection Isolators	MHS	6471115	MHS-200-LA	Gray	138	169	150
1	1 in. Deflection Isolators	MHS	6471114	MHS-230-LA	Gray	169	185	150
1	1 in. Deflection Isolators	MHS	6471113	MHS-250-LA	Gray	185	215	150
1	1 in. Deflection Isolators	MHS	6471112	MHS-300-LA	Gray	215	238	150
1	1 in. Deflection Isolators	MHS	6471111	MHS-330-LA	Gray	238	269	150
1	1 in. Deflection Isolators	MHS	6471110	MHS-360-LA	Gray	269	292	150
1	1 in. Deflection Isolators	MHS	5494941	MHS-400S	Gray	292	462	150
1	1 in. Deflection Isolators	MHD	6471095	MHD-810-LA	Gray	462	631	172
1	1 in. Deflection Isolators	MHD	223531	MHD-850	Gray	631	677	183
1	1 in. Deflection Isolators	MHD	333372	MHD-920	Gray	677	808	183
S	2 in. Restrained Spring Isolators	LAT	6471109	LAT-100-LA	Gray	65	85	170
S	2 in. Restrained Spring Isolators	LAT	6471108	LAT-120-LA	Gray	85	100	170
S	2 in. Restrained Spring Isolators	LAT	6471107	LAT-140-LA	Gray	100	115	170
S	2 in. Restrained Spring Isolators	LAT	6471106	LAT-160-LA	Gray	115	138	170
S	2 in. Restrained Spring Isolators	LAT	6471105	LAT-200-LA	Gray	138	169	170
S	2 in. Restrained Spring Isolators	LAT	6471104	LAT-230-LA	Gray	169	185	170
S	2 in. Restrained Spring Isolators	LAT	6471103	LAT-250-LA	Gray	185	215	170
S	2 in. Restrained Spring Isolators	LAT	6471102	LAT-300-LA	Gray	215	238	170
S	2 in. Restrained Spring Isolators	LAT2	6471101	LAT2-320-LA	Gray	238	269	189
S	2 in. Restrained Spring Isolators	LAT2	6471100	LAT2-360-LA	Gray	269	292	189
S	2 in. Restrained Spring Isolators	LAT3-E	6471098	LAT3-400E-LA	Gray	292	462	195
S	2 in. Restrained Spring Isolators	LAT2	6471099	LAT2-800-LA	Gray	462	631	189
S	2 in. Restrained Spring Isolators	LAT3-E	6471097	LAT3-850E-LA	Gray	631	677	195
S	2 in. Restrained Spring Isolators	LAT3-E	6471096	LAT3-920E-LA	Gray	677	808	195

Installing the deflection spring isolators

① Note:

- Read the instructions fully before beginning the installation.
 - Isolators are shipped fully assembled.
1. Check the printed code and adhesive label on the anti-vibration mounts (AVM).

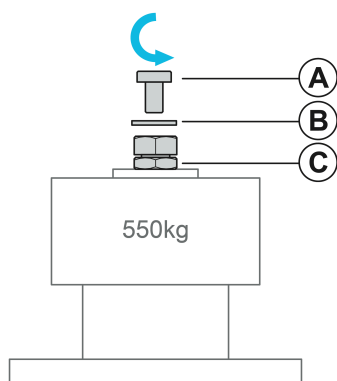
Figure 40: AVM load label



LD33038a

2. Match each load point with the corresponding isolators.
3. Use a spanner to twist off the fixing bolt and washer on the isolator.

Figure 41: Fixing bolt, washer, and adjusting bolt



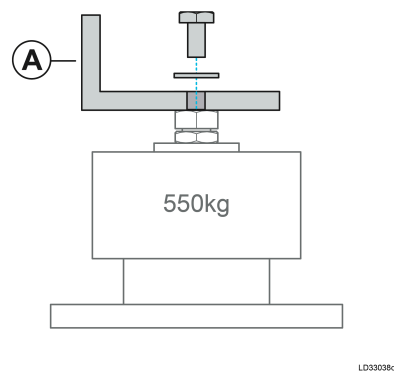
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Callout	Description
A	Fixing bolt
B	Washer
C	Adjusting bolt

4. Set the isolators on a level floor.
 - ① **Note:** Make sure that all isolator centerlines are aligned with the unit mounting holes.
5. Level all isolator bases to the same height.
 - ① **Note:** A maximum difference of 1/4 in. can be tolerated.
6. Place the unit on top of the isolators.

① **Note:** Make sure that the mounting holes on the unit align with the isolator installation holes.

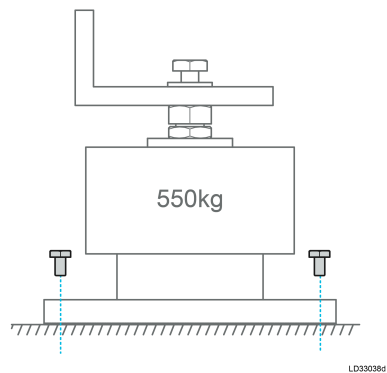
Figure 42: Aligning the unit and isolator



Callout	Description
A	Unit base

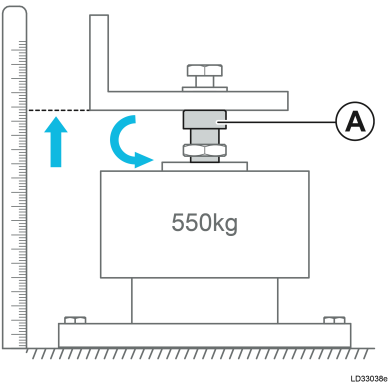
- 7. Loosely attach the fixing bolt and washer.
- 8. Tighten the bolts at the base of the isolator. Use the same torque on all bolts.

Figure 43: Bolting the isolator to the floor



- 9. Bring the unit to the full operating weight.
- 10. Measure the height of the housing.
- 11. Adjust each isolator in sequence by turning the adjusting bolt.

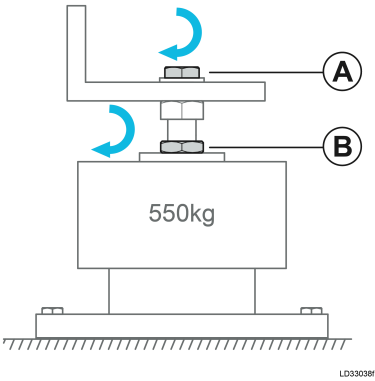
Figure 44: Adjusting the height



Callout	Description
A	Adjusting bolt

12. Fasten the fixing bolt and M20 nut.

Figure 45: Fixing bolt and M20 thin nut

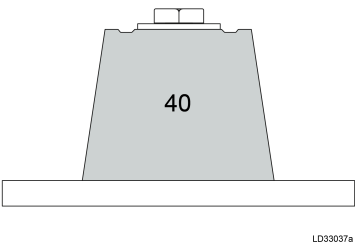


Callout	Description
A	Fixing bolt
B	M20 thin nut

Installing the neoprene isolators

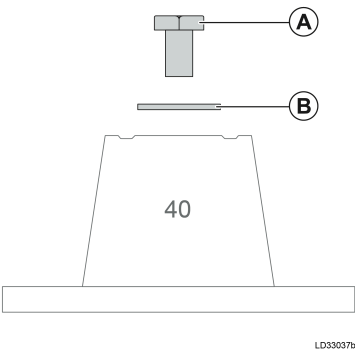
- Note:**
- Read the instructions fully before beginning the installation.
 - Isolators are shipped fully assembled.
1. Check the printed code and adhesive label on the anti-vibration mounts (AVM).

Figure 46: AVM code



- 2. Match each load point with the corresponding isolators.
- 3. Use a spanner to twist off the fixing bolt and washer on the isolator.

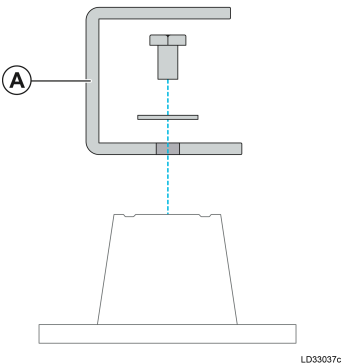
Figure 47: Fixing bolt and washer



Callout	Description
A	Fixing bolt
B	Washer

- 4. Set the isolators on a level floor.
 - ⓘ **Note:** Make sure that all isolator centerlines are aligned with the unit mounting holes.
- 5. Level all isolator bases to the same height.
- 6. Place the unit on top of the isolators.
 - ⓘ **Note:** Make sure that the mounting holes on the unit align with the isolator installation holes.

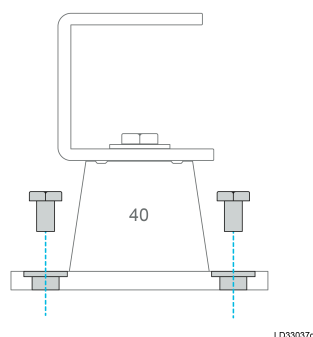
Figure 48: Aligning the unit and isolator



Callout	Description
A	Unit base

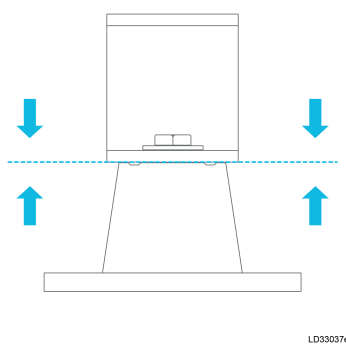
7. Tighten the fixing bolt and ensure that the isolators are level.
8. Tighten the bolts at the base of the isolator.

Figure 49: Securing the base



9. Ensure the base of the unit covers the surface of isolator without a gap.

Figure 50: Final position



Pipework arrangement

The following pre-installed features are intended to ensure satisfactory operation of the unit.

- A flow switch is included as standard on each module. It is factory-wired and installed in the extension pipe between heat exchanger outlet and edge of chiller.
- For the YMAE 0100 and 0130, a 30-mesh wye-strainer is provided as standard to protect each heat exchanger. For all other models, a 20-mesh strainer is provided. Strainers must be fitted as close as possible to the liquid inlet connection of the PHE, and provided with a means of local isolation. For more information on wye-strainer sizes, see [Heat exchanger](#).
- Heat tape is provided as a standard offering on the water pipe and the plate heat exchanger. The heat tape is powered and controlled by the unit based on ambient temperature.
- The heat exchanger is protected by a heater placed under the insulation, which is powered from the unit control system power supply.

To further protect the pipework and ensure satisfactory operation of the unit, perform these actions during installation. Failure to follow these actions can cause damage to the unit, or loss of performance, and may invalidate the warranty.

- Support pipework and fittings separately, to prevent any loading on the heat exchangers.
 - Some movement of the unit can be expected in normal operation. Use flexible connections to minimize the transmission of vibrations to the building. On units with AVM you must use flexible connections.
 - Ensure that pipework and fittings immediately next to the heat exchangers are readily demountable to enable cleaning before operation, and to facilitate visual inspection of the exchanger nozzles.
 - Do not expose the heat exchangers to flushing velocities or debris released during flushing. Use a suitably sized bypass and valve arrangement be installed to allow flushing of the pipework system. The bypass can be used during maintenance to isolate the heat exchangers without disrupting flow to other units.
 - Install a thermometer and pressure gauge on the inlet and outlet connections of each heat exchanger.
 - Provide drain and air vent connections at all low and high points in the pipework to permit draining the system, and to vent any air in the pipes.
 - Use insulation and heater tape, or a suitable glycol solution, to protect liquid systems at risk of freezing.
 - Install insulation around the heat exchanger nozzles.
 - You must use liquid pumps to ensure liquid is circulated when the ambient temperature approaches freezing point.
 - The water piping system requires site installation to ensure that the water temperature is 3°C to 5°C above freezing point at all times. Heater tape of appropriate heating capacity based on the location's conditions is required for the water piping system outside of the units. This is supplied independently and controlled by the customer.
- **Important:** During cold weather when there is a risk of freezing, leave the unit powered on and controlling the pumps to prevent automatic freezing during low ambient standby periods, unless the liquid systems have been drained.

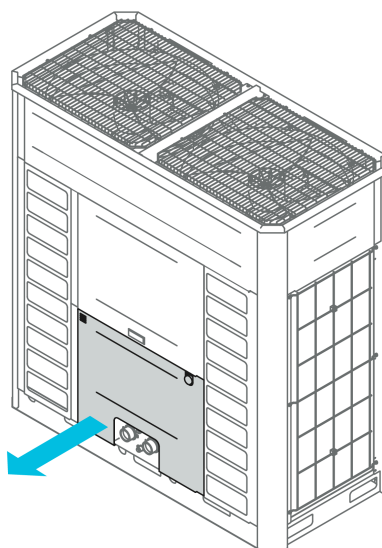
Installing the y-shaped strainer

For the YMAE 0100/0130/0230/0260, a y-shaped strainer is factory-installed. For the YMAE 0045/0050/0065 models, the strainer is shipped with the unit and must be field installed.

① **Note:** Install the strainer before connecting the pipes.

1. Remove the side lower panel of the unit.

Figure 51: Removing the lower panel



LD34990

2. Locate the strainer inside the unit.

Figure 52: Strainer shipping location



LD34991

3. Connect the strainer.
4. Continue with other pipe connections.

Connection types and sizes

Standard pipework connections are Victaulic-groove type. For connection sizes for each models see [Physical data](#).

R-454B pipework

DANGER

Ensure there is no potential ignition sources within 1.2 m in all directions from the outlet of the relief valve piping.

Dual pressure relief valves are installed in each circuit on both the high and low pressure sides. There are two external vent pipes in each refrigerant system. The pipes are shipped loose and the connection is 7/8-14UNF. The pipes must be field installed before commissioning.

Remove the panels to connect the vent pipes that are shipped loose with the unit.

CAUTION

Check that all vent pipes are correctly connected after the chiller is in its final location.

Water treatment

The unit performance is based on a standard fouling factor of 0.0180 m²K/kW. Dirt, scale, grease and certain types of water treatment adversely affect the heat exchanger surfaces and unit performance.

① **Note:** Foreign matter in the water systems can increase the pressure drop, reducing the flow rate and causing potential damage.

Do not use aerated, brackish, or salt water in the water systems. Johnson Controls suggests consulting a water treatment specialist to determine whether the proposed water composition could affect the heat exchanger materials of carbon steel and copper. Keep the pH value of the water flowing through the unit between 7 pH and 8.5 pH.

Refrigerant relief valve piping

The unit is protected against internal refrigerant overpressure by refrigerant relief valves. The discharge line from the pressure relief device leads to a safe place of discharge, if any extended discharge line is installed in the field.

① **Note:** Only install R-454B units in outside or unenclosed areas.

The size of any extended pipework attached to a relief valve must be of sufficient diameter so as not to cause resistance to the operation of the valve.

Unless otherwise specified by local regulations, the internal diameter depends on the length of pipe required. Use the following formula to estimate the internal diameter:

$$D^5 = 1.447 \times L$$

Where:

D = minimum pipe internal diameter (cm)

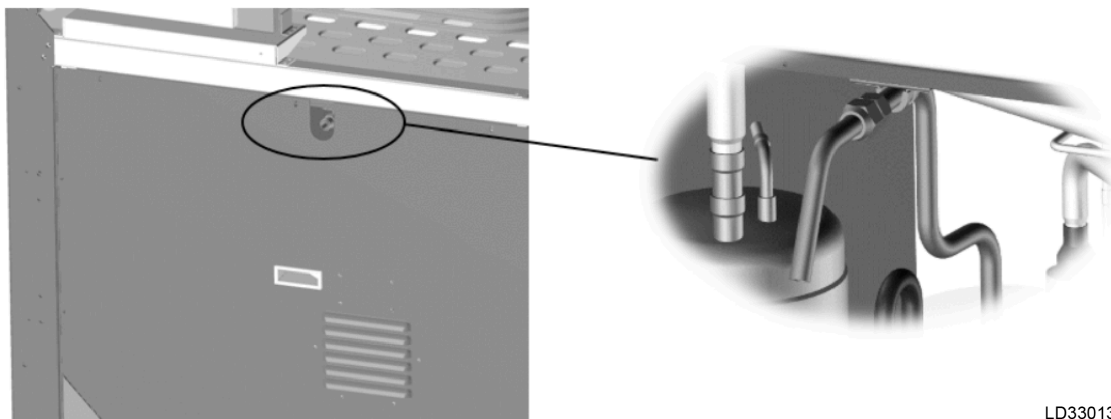
L = length of pipe (m)

If relief pipework is common to more than one valve, its cross sectional area must be at least the total required by each individual valve.

⚠ CAUTION

Do not mix high-pressure and low-pressure relief valves on a common pipe. Take precautions to ensure that the exit of relief valves and vent piping remain clear of obstructions at all times.

Figure 53: PRV exhausting piping connection



LD33013

Electrical connection

The following connection recommendations are intended to ensure safe and satisfactory operation of the unit. Failure to follow these recommendations could cause harm to persons, or damage to the unit, and may invalidate the warranty.

⚠ WARNING

Do not mount any additional controls, such as relays, in the power panel. Do not run power and control wiring through the power panel that is not connected to the power panel. If these precautions are not followed it could lead to a risk of electrocution. In addition, electrical noise could cause malfunctions or damage the unit and its controls.

Power wiring

⚠ CAUTION

These units are suitable for 400 V, 3-phase, 50 Hz nominal supplies only.

Conduct all electrical wiring in accordance with local regulations. Route correctly sized cables to the cable entries in the power panel.

In accordance with EN 60204, it is the responsibility of the user to install overcurrent protection devices between the supply conductors and the power supply terminals on the unit.

To ensure that no eddy currents are set up in the power panel, the cables forming each 3-phase power supply must enter through the same cable entry.

WARNING

All sources of supply to the unit must be taken through a common point of isolation, which is not supplied by Johnson Controls.

Single-point power supply wiring

All models require one field-provided 400 V, 3-phase, 50 Hz and protected earth (PE) supply to the unit with circuit protection.

Connect the 3-phase supply to the circuit breaker or the power supply terminal in the power panel.

Connect the earth wire to the main protective earth terminal located in the power panel. The PE is printed on the steel metal by steel seal.

Control wiring

Remote mode selection: SC/H

For remote mode selection, either for cooling or heating, connect a contact between terminals 86 and 80F. You can also select the remote mode control function in the system parameters setup in the HMI interface if necessary.

Remote interlock: SEI

Connect a remote switch to terminals 88 and 80H to provide remote interlock, if required. Connect a jumper to terminals 88 and 80H if no remote interlock switch is connected by customer.

 **Note:** Changing operation mode requires the user to stop the unit.

Cold-water flow switch: SFM1

Connect the cold-water flow switch SFM1 for each module to terminals 82 and 80A for YMAE 0045 to 0065, or terminals 92 and 80K of XT2 for YMAE 0100 to 0260. For all PJP models, SFM1 is installed and wired in the factory by default.

Liquid pump starter contacts

Use terminals 51 and 52 of XT2 to control the cold-water pump for YMAE 0045 to 0065. The capacity of the free contact is 250 V/12A.

Use terminals TB1:1-2 (DO1-E) of the relay board (ARB) to control the cold-water pump for YMAE 0100 and 0130. The capacity of the free contact is 230 V/2A.

Use terminals 71A and 71B of XT3 to control the cold-water pump for YMAE 0230/260. The capacity of the free contact is 250 V/2A.

Water valve control contacts

Use terminals 48B and 2E of XT2 to control the cold-water valve for YMAE 0045 to 0065. The capacity of the active contact is 230V/1A.

Use terminals TB2:1-2 (DO2-E) of the ARB to control the cold-water valve for YMAE 0100 and 0130. The capacity of the free contact is 230 V/2A.

Use terminals 72A and 72B of XT3 to control the cold-water valve for YMAE 0230 and 260. The capacity of the free contact is 230V/2A.

Inlet and outlet pipe heater of cold water BPHE: EPH11 and EPH12

The active contact for the inlet and outlet pipe heater of the cold-water BPHE is on terminals 43B and 2B of XT2 for YMAE 0045 to 0065, and the wiring for the heater in the control panel is completed in the factory.

The active contact for the inlet and outlet pipe heater of the cold-water BPHE is on terminals 76B-2B for YMAE 0100 to 0260, and the wiring for the heater in the control panel is completed in the factory.

Alarm contacts

The free contact for the alarm signal is on terminals 65 and 66 of XT3 for YMAE 0100 to 0260. The capacity of the free contact is 250V/12A.

The active contact for the alarm signal is on terminals 47 and 2E of XT2 for YMAE 0045 to 0065. The capacity of the active contact is 230V/1A.

Run status contacts

The free contact for the run status signal is on terminals 67 and 68 of XT3 for YMAE 0100 to 0260. The capacity of the free contact is 250V/12A.

The active contact for the run status signal is on terminals 45 and 2D of XT2 for YMAE 0045 to 0065. The capacity of the active contact is 230V/1A.

System leaving liquid temperature sensor: BLST

Connect the system leaving temperature sensor for cold water (BLST1) to AI6 on the control board of the leader module.

Emergency stop switch

For YMAE 0100 to 0260, you can connect an emergency stop switch to terminals 3 and 4 of XT1. When the switch is open, the entire control power is cut off and the unit can be stopped. The jumper needs to be removed before connecting the emergency stop switch.

SC-EQ communication board

The SC-EQ communication board can provide a BACnet communication port for BAS connectivity. Refer to *SC-EQ Communication Card, Form 450.50-N1* and *YMAE Quick Start Guide, Form 150.89-QSG1* for more information.

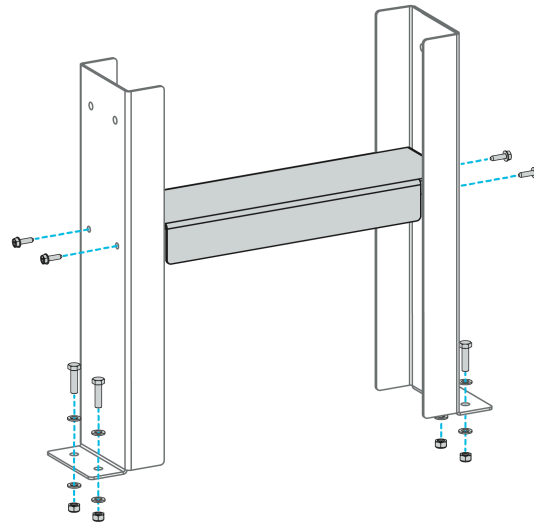
Installing the external HMI

The HMI is not mounted on the machine, and can be field-mounted on the provided stand.

① **Note:** Johnson Controls does not supply cables or bolts for the external HMI installation.

1. Attach the support bar to the legs, and bolt the legs to the floor.

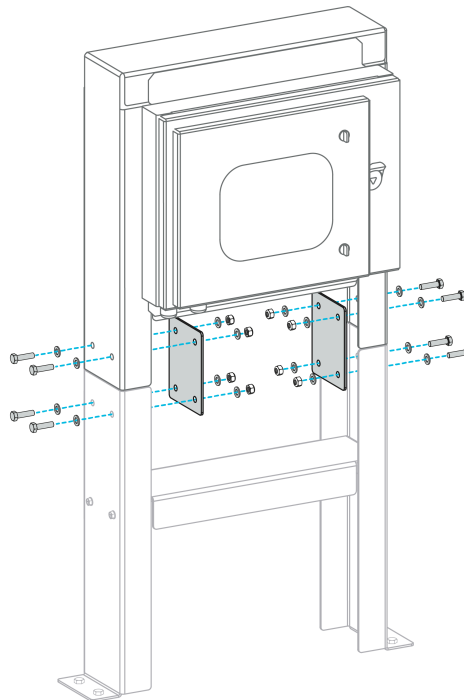
Figure 54: Leg assembly



LD34981

2. Use the junction plates to bolt the HMI base to the legs.

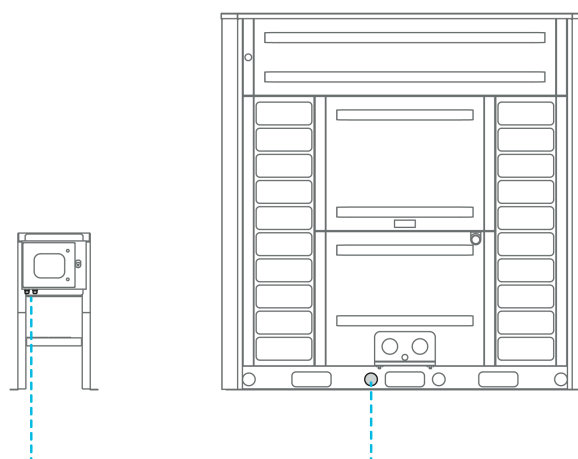
Figure 55: Attaching the HMI base



LD34982

3. Run cables from the HMI to the unit.

Figure 56: HMI to unit connection



LD34987

Table 19: Connection cable sizes

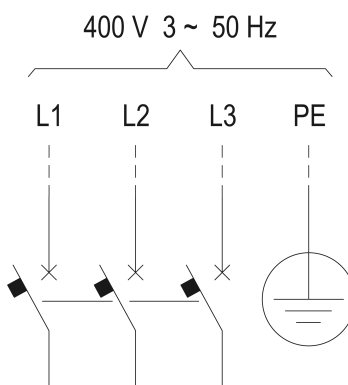
Cable length	Power cable, 24 VDC	Shielded communication cable
0 m to 100 m	0.75 mm ² x 2	0.75 mm ² x 2
100 m to 500 m	1 mm ² x 2	1 mm ² x 2

Modular communications

For the modular communications PID, see [Figure 18](#).

- **Important:** The maximum number of modules for connected within one control group must not exceed 32. The maximum number of YMAE 0230 and 0260 modules connected within one control group must not exceed 16. Each module must have a unique address set using the module address switch. Set all addresses before applying power to avoid damage.

Figure 57: Power supply connection



LD33661

① Note:

- For the appropriate power supply, refer to the voltage and current on the nameplate.
- Connect the customer power to the control panel. The control panel connection to the individual module is completed in the factory.
- For YMAE 0045, 0050, and 0065 the circuit breaker is customer supplied.

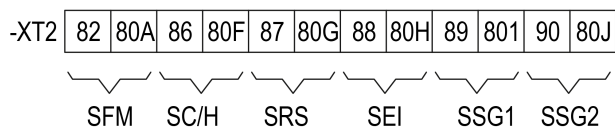
- Deploy a leakage current protector in the customer circuit breaker, and ensure there is a reliable ground connection on site.
- For any discrepancy on site, such as capacitance decreases, refer to EN standards and requirements by cable manufacturers.
- Only use copper conductors for the power supply cable.
- For YMAE 0045, 0050, and 0065, when connecting the power supply to the terminal, use the magnetic ring provided in the attachment to insert two loops.

Table 20: Power supply cable specifications

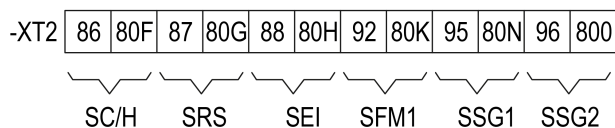
YMAE model	0045	0050	0065	0100	0130	0230	0260
Power supply	400 V 3 ~ 50 Hz/360 V to 440 V						
Maximum current at 400 V	28 A	34 A	39 A	69 A	76 A	146 A	152 A
Maximum current at 360 V	34 A	42 A	47 A	77 A	85 A	163 A	170 A
Circuit breaker in the panel				NSX100F TM100D 3P	NSX160H TM125D 3P	NSX250F TM250D 3P	NSX250F TM250D 3P
Circuit breaker setting value				100 A	113 A	200 A	225 A

① Note:

- The breaker must have an earth leak protector.
- The circuit breakers mentioned in [Table 20](#) refer to those installed inside the panel. Select the customer circuit breakers based on the maximum current at which the unit operates under the minimum voltage.

Figure 58: External customer input control connections, YMAE 0045 to 0065

LD34960

Figure 59: External customer input control connections, YMAE 0100 to 0260

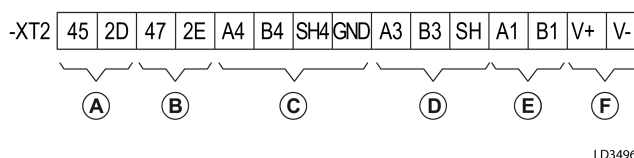
LD33662

Callout	Description
SC/H	Cooling/heating switch
SRS	Remote start switch
SEI	External interlock switch
SFM/SFM1	Module cold water flow switch
SSG1	Smart grid DI1
SSG2	Smart grid DI2

Note:

- The contact resistance of external switches cannot be greater than 1kΩ. The loop voltage is 12 VDC when the external switch is open.
- SFM/SFM1 is installed and wired in the factory.

Figure 60: Alarm output and running status connections, YMAE 0045 to 0065

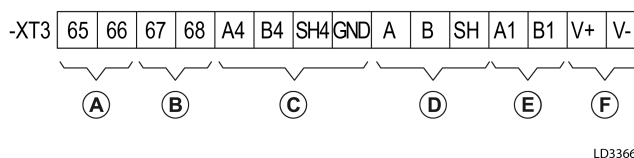


Callout	Description
A	Alarm output
B	Running status
C	RS485 module
D	FCU
E	RS485 HMI
F	HMI power

Note:

- Alarm output on terminals 47 and 2E and running status on terminals 45 and 2D are active contacts, and the rating capacity is 1 A/230 V.
- If the customer needs a dry contact, it is possible to connect a relay. For the specific connection method, refer to the schematic in the control panel.

Figure 61: Alarm output and running status connections, YMAE 0100 to 0260

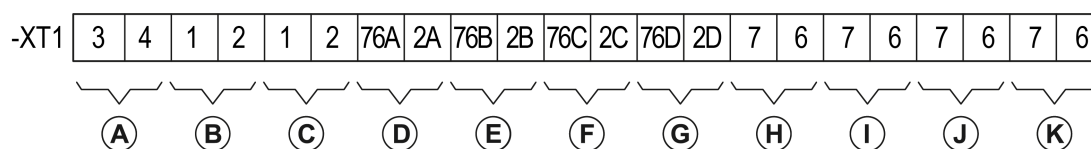


Callout	Description
A	Alarm output
B	Running status
C	RS485 module
D	Reserved

Callout	Description
E	RS485 HMI
F	HMI power

① Note:

- Alarm output on terminals 65 and 66 and running status on terminals 67 and 68 are free contacts, and the rating capacity is 12 A / 250 V.

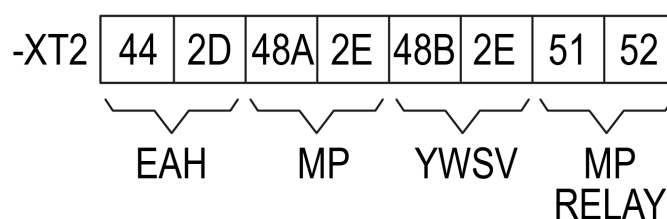
Figure 62: Emergency stop switch and pipe heater connections, YMAE 0100 and 0260

LD33665

Callout	Description
A	Emergency stop switch
B	Secondary of transformer
C	Reserved
D	EEH 1
E	EPH 11 and EPH 12
F	Reserved
G	Reserved
H	Control power
I	Control power
J	Control power
K	Cooling fan power

① Note:

- The customer must wire these connections.
- The F and G connections are specially reserved according to customer requirements. They connect the inlet and outlet pipes of the heating strips for individual module pump kits. For the single-module units 0230 and 0260, configure the contactors if the inlet and outlet water pipes are equipped with heating elements..

Figure 63: Pump control and water valve connections, YMAE 0045 to 0065

LD34962

Callout	Description
EAH	Heating auxiliary heater
MP	Cold water pump control
YWSV	Module cold water valve
MP relay	Cold water pump relay out

① **Note:** The customer must wire these connections. Terminals 44-2D, 48A-2E and 48B-2E are active contacts, and the rating capacity is 1 A/230 V. The terminal 51 and 52 are free contact and the rating capacity is 12 A/250 V.

Figure 64: Pump control and water valve connections, YMAE 0100 and 0130

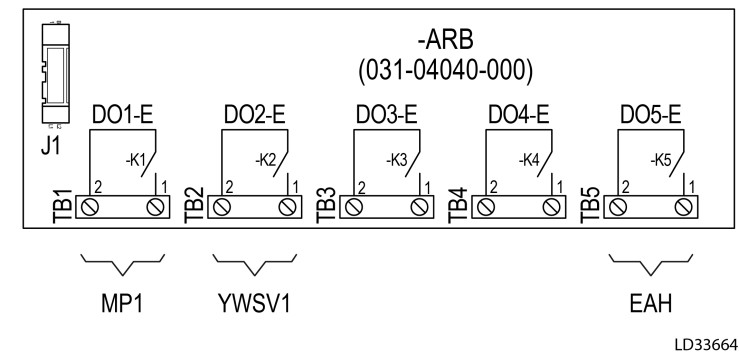
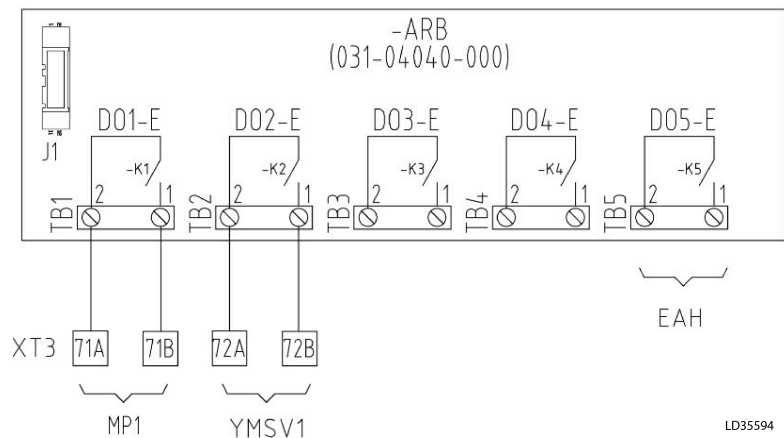


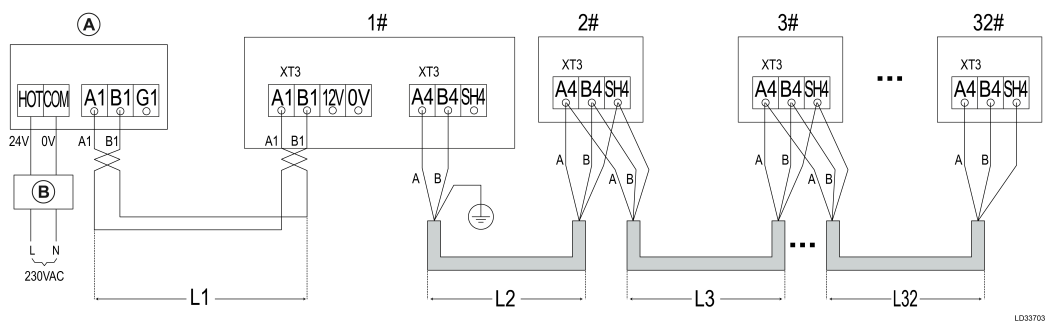
Figure 65: Pump control and water valve connections, YMAE 0230 and 0260



Callout	Description
MP1	Cold water pump control
YWSV1	Module cold water valve
EAH	Heating auxiliary heater

① **Note:** The customer must wire these connections. The relay outputs are free contacts and the rating capacity is 2 A/230 V.

Figure 66: Communication connections, modular array



Callout	Description
A	25.4 mm (7 in.) touch screen
B	DC power

Note:

- Modular communication connections for other multi-unit applications are completed in the field.
- The HMI is installed and wired in the field as a standalone component. Connect the HMI to the primary unit. Use a wire with a diameter of 0.75 mm² or above.

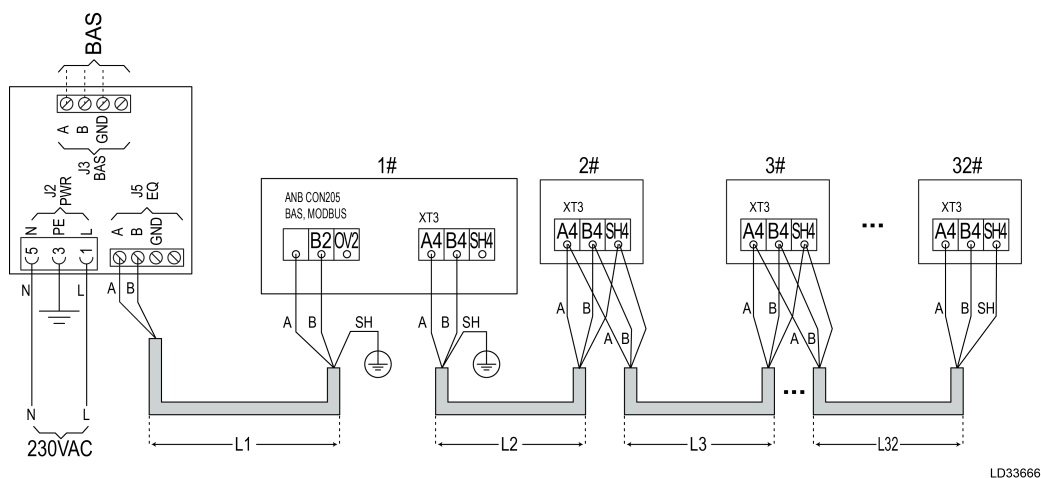
Table 21: Communication cable length and type

Total length	L = L1 + L2 + L3 + ... + Ln (n ≤ 32, m)		
	L < 100 m	100 m < L < 500 m	L > 500 m
Cable type	Recommend shield twisted pair cable 2 x 0.75 mm ²	Recommend shield twisted pair cable 2 x 1.0 mm ²	Contact Johnson Controls

Note:

- The total length of the communication cable is L = L2 + L3... + Ln.
- Ensure the communication cable is shielded twisted pair (STP).
- Every control board of each individual module is assigned one ID address. The ID address can be set using the DIP switch in the control panel of each module.
- For other multi-module combination applications, you need to set the ID addresses in the field.
- Connect the HMI to the leader module.

Figure 67: Communication connections, SC-EQ and BAS



LD33666

- Note:** For the BAS connection, see the SC-EQ manual. The SC-EQ on the leader module provides the BACnet communication port for the BAS.

Table 22: Electrical cable connections

Detail	YMAE 0045	YMAE 0050	YMAE 0065	YMAE 0100	YMAE 0130	YMAE 0230	YMAE 0260
Voltage	400 V 3 ~ 50 Hz / 360 V - 440 V						
Maximum current @ 360 V	34 A	42 A	47 A	77 A	85 A	163 A	170 A

Table 22: Electrical cable connections

Detail	YMAE 0045	YMAE 0050	YMAE 0065	YMAE 0100	YMAE 0130	YMAE 0230	YMAE 0260
Guidance breaker (leakage protection) / In	63 A	63 A	63 A	125 A	125 A	250 A	250 A
Guidance cable sizing	10 mm ²	16 mm ²	16 mm ²	25 mm ²	35 mm ²	70 mm ²	95 mm ²
Phase, recommended torque	M6, 2.5 N·m	M6, 2.5 N·m	M6, 2.5 N·m	M6, 10 N·m	M8, 15 N·m	M8, 15 N·m	M8, 15 N·m
PE, recommended torque	M6, 3 N·m	M6, 3 N·m	M6, 3 N·m	M8, 18 N·m	M8, 18 N·m	M8, 18 N·m	M8, 18 N·m

① Note:

- The maximum current in the table does not include the water pump current. When setting the protection value of the client's circuit breaker, the customer needs to take the water pump current into account.
- Install an earth leakage protector in the client's circuit breaker and ensure there is a reliable grounding connection on site.
- Use only copper wires for the power lines.

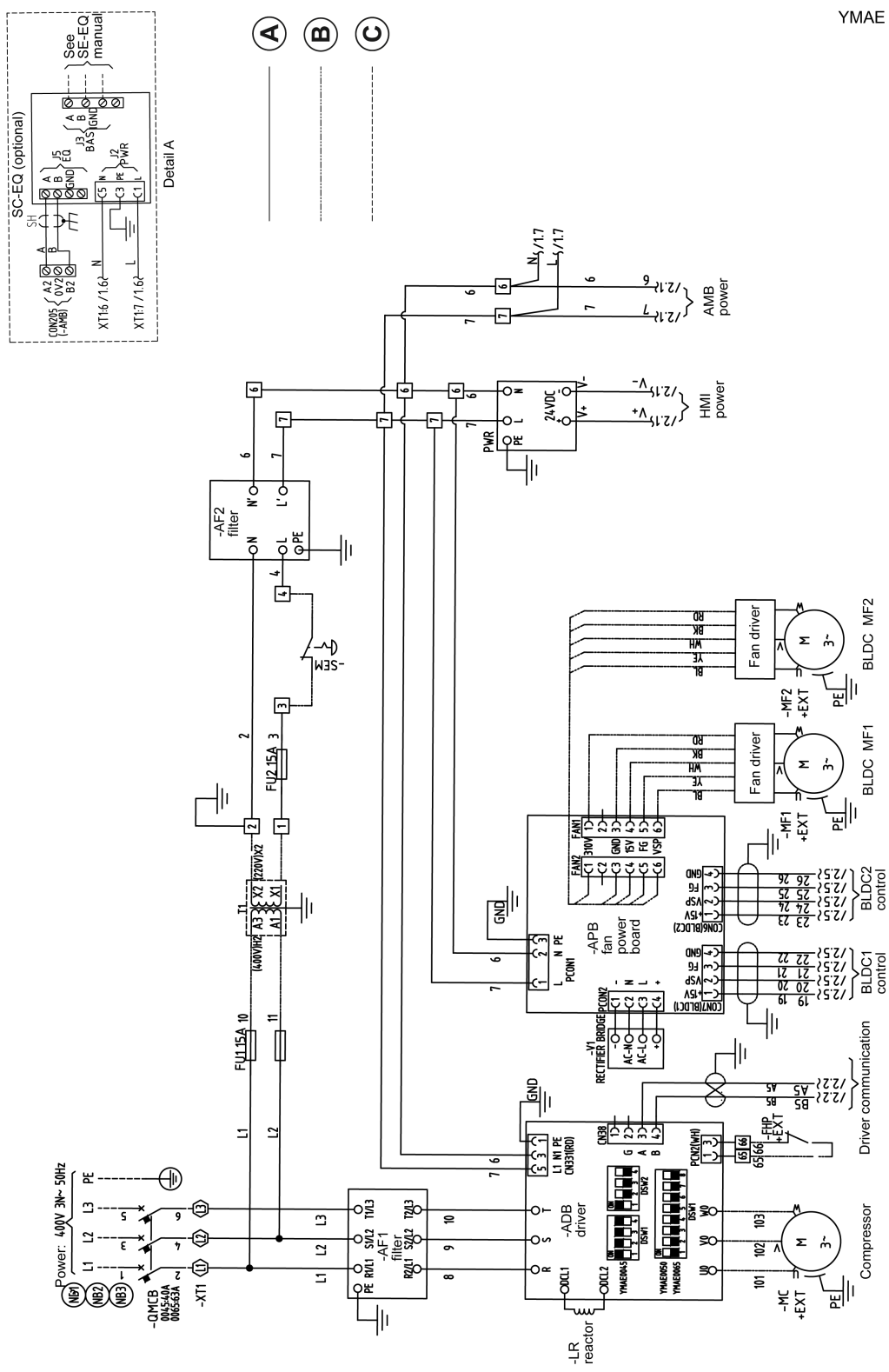
⚠ WARNING

Refer to the dimensions of any power cable connectors to ensure that the fitting to the specified power cables and circuit breaker is correct. Due to the high risk of electrical shock and in compliance with electrical regulations, cable and power terminals must be protected. Any accessories to adapt allowable cable connections can be sourced at electrical suppliers.

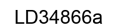
Wiring diagrams

Figure 68: YMAE 0045, 0050, and 0065 electrical schematic 1

YMAE 0045/0050/0065 PJP50
035W28433-200-1



LD34865a



① Note:

- HMI2 is optional and can be used for a remote HMI, if a BAS connection is not required.
- Refer to ICOM for customer connections and notes. Non-compliance with these instructions will invalidate the unit warranty.
- Provide power according to the voltage and current on the unit nameplate.
- Power supply circuit breaker QMCB is provided by the customer.
- For auxiliary heater applications, install KAH. The YMAE 0045, 0050, and 0065 only provides an active contact. If the auxiliary heater exceeds the contact capacity, add a relay. For detail, refer to the schematic in the cabinet.
- YLISV is only for YMAE 0050 and YMAE 0065 PJP units.
- AMB DO is an active signal.
- The voltage at both ends of the DI switch is 12 VDC when the DI switch or signal is open.
- KP is a relay. AMB provides dry contact output control of pump for customers by KP.
- BLST are only connected to the primary unit in multi-unit applications.

Callout	Description	Callout	Description	Callout	Description	Callout	Description
A	Vendor wired	SFM	Module cold water SF	KRS	Running status relay	BRLD	Refrigerant leak detector
B	Factory wired	SEI	External interlock switch	EEH	BPHE heater	BECOT	ECO outlet temperature
C	Customer wired	SC/H	Cooling/heating mode switch	KAH	Auxiliary heater contact	BECIT	ECO inlet temperature
YWSV	Module hot water valve	RC	RC absorber	HA	Alarm light	BDT	Discharge temperature
YOSV	Oil return SOL valve	QMCB	Main circuit breaker	FHP	High pressure switch	BAMB	Ambient temperature
YMSV	Mode SOL valve	QCB	Circuit breaker	ECH	Crank case heater	BACDT	Air coil defrost temperature
YLISV	Liquid inject SOL valve	MP	Pump motor	EXT	External part	BAIT	Accumulator inlet temperature
YESV	EVI SOL valve	MF	Fan motor	BSP	Suction pressure	APB	Fan diver power board
YEEV	EVI EEV	YMEV	Main EEV	BDP	Discharge pressure transducer	AF2	Control circuit filter
XT	Terminal block	MC	Compressor motor	BLMT	Leaving module temperature	AF1	Driver board filter
V1	Rectifier bridge	LR	Reactor	BLST	Leaving system temperature	ADB	Driver board
SRS	Remote start switch	EPH	In/out pipe heater of BPHE	BEST	Entering system temperature	AMB	Main control board
SEM	Emergency button	KP	Pump relay	BEMT	Entering module temperature		

Figure 70: YMAE 0100 and 0130 electrical schematic 1

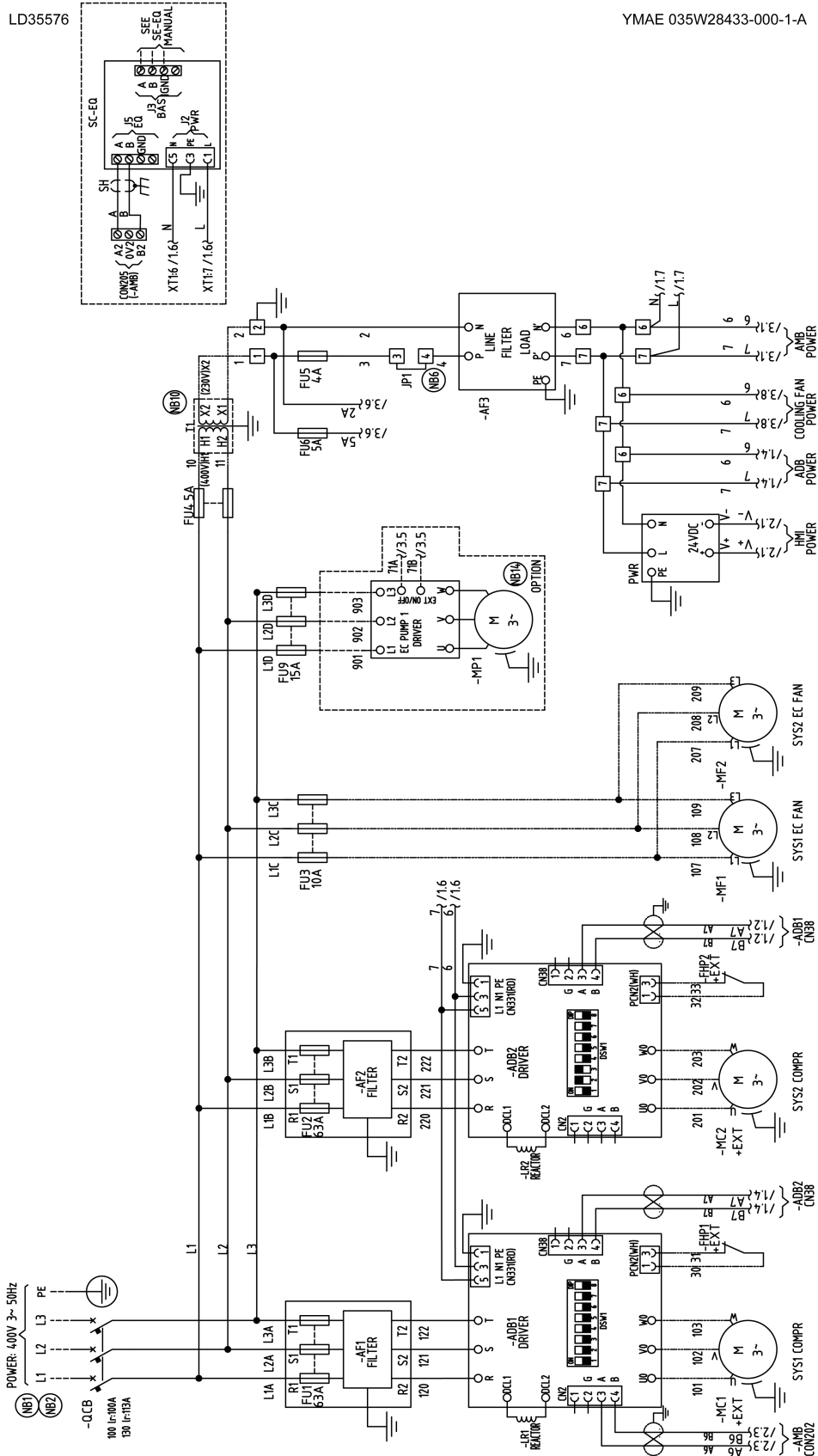
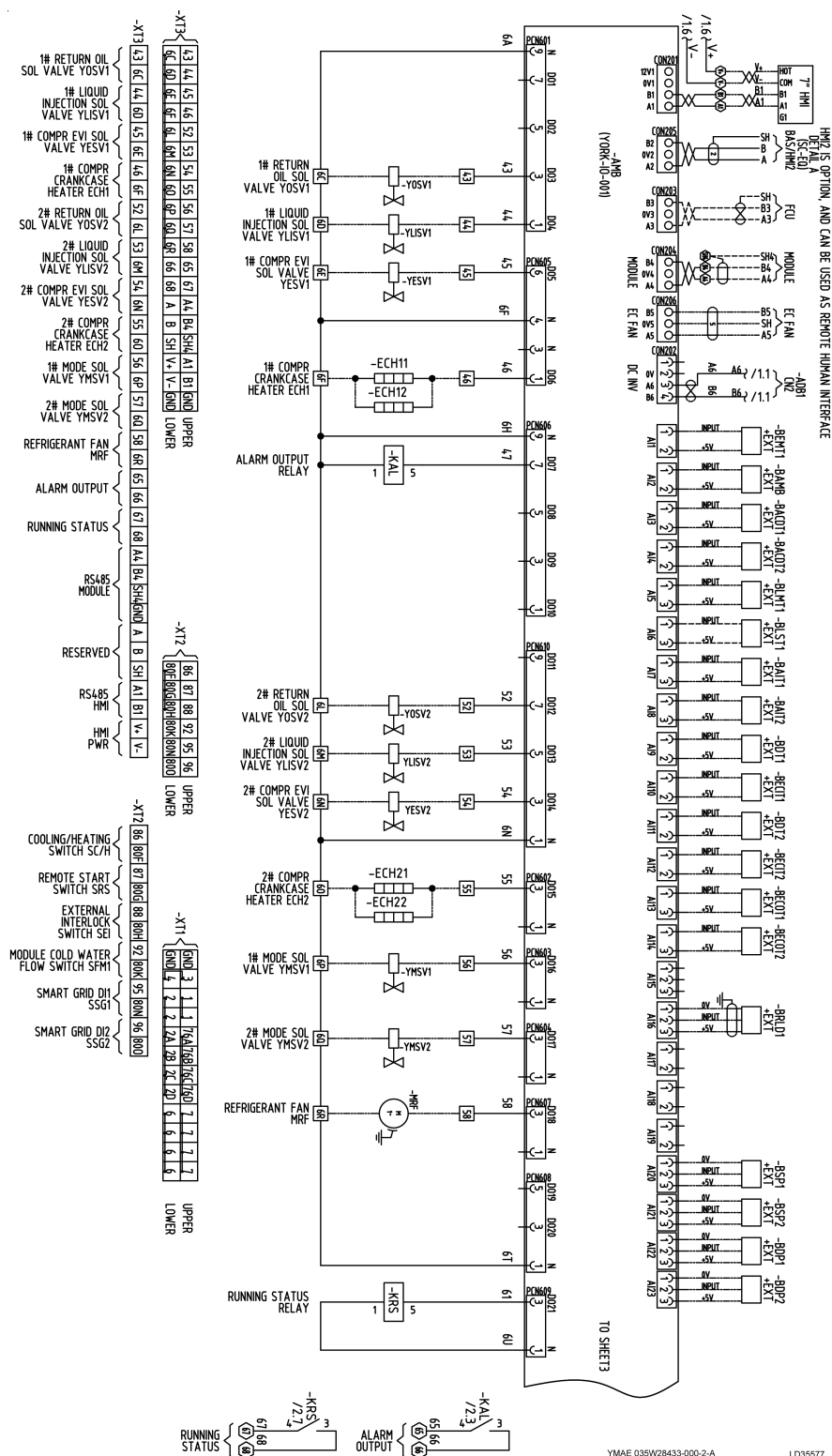
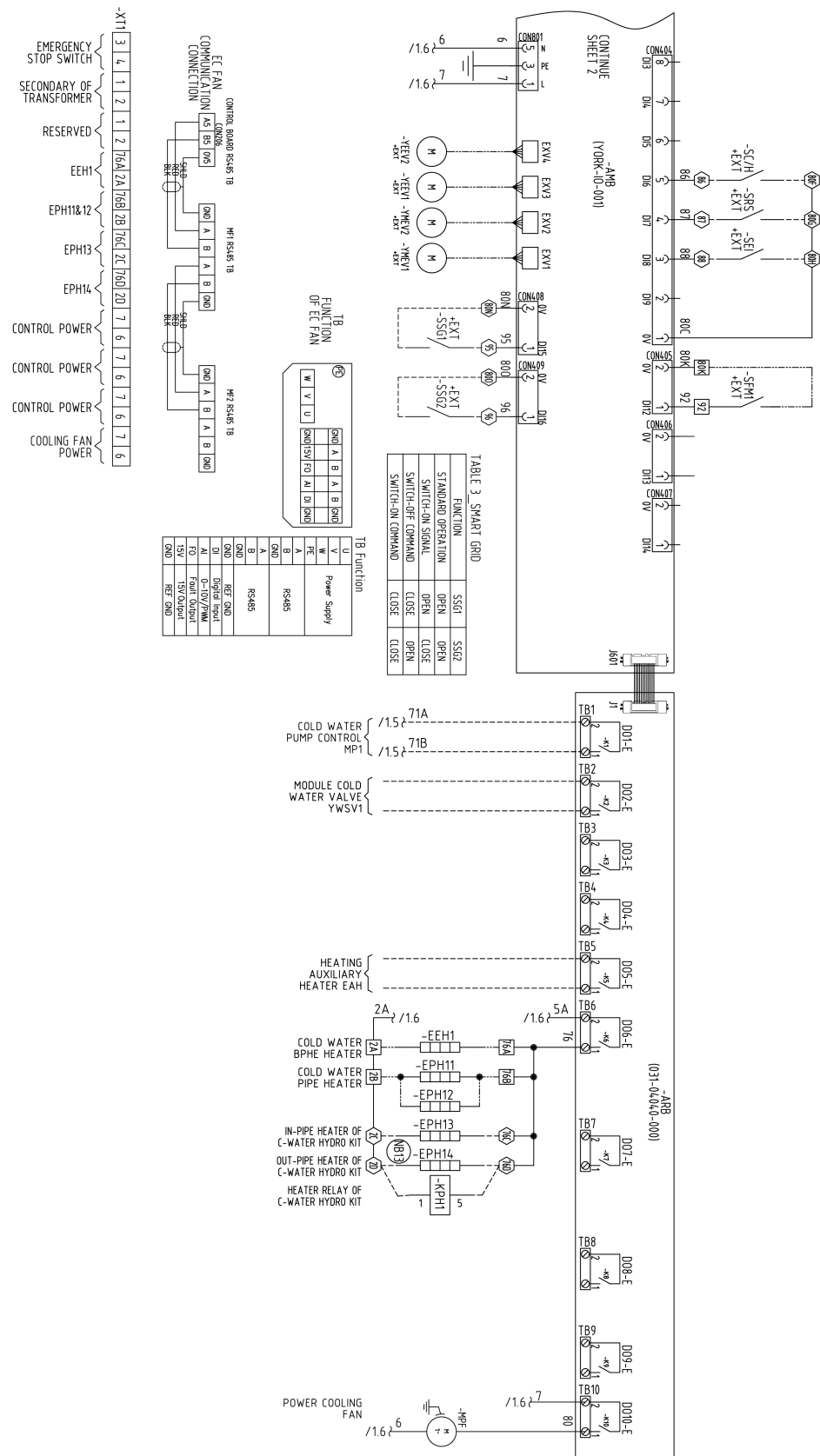


Figure 71: YMAE 0100 and 0130 electrical schematic 2

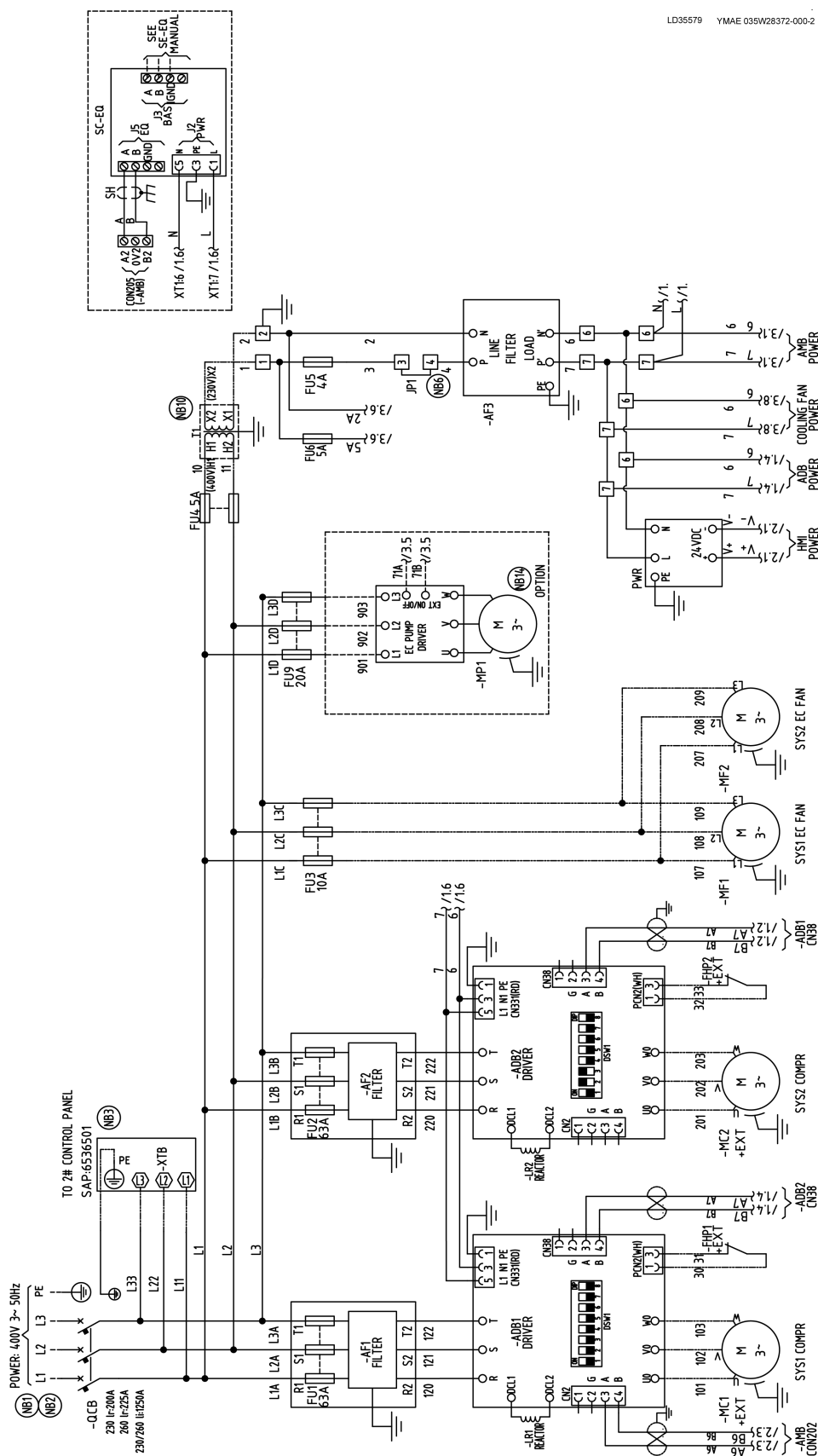


Note: HMI2 is optional and can be used for a remote HMI.

Figure 72: YMAE 0100 and 0130 electrical schematic 3



YMAE 035W28433-000-3-A LD35578



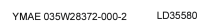


Figure 75: YMAE 0230 and 0260 one panel electrical schematic 3

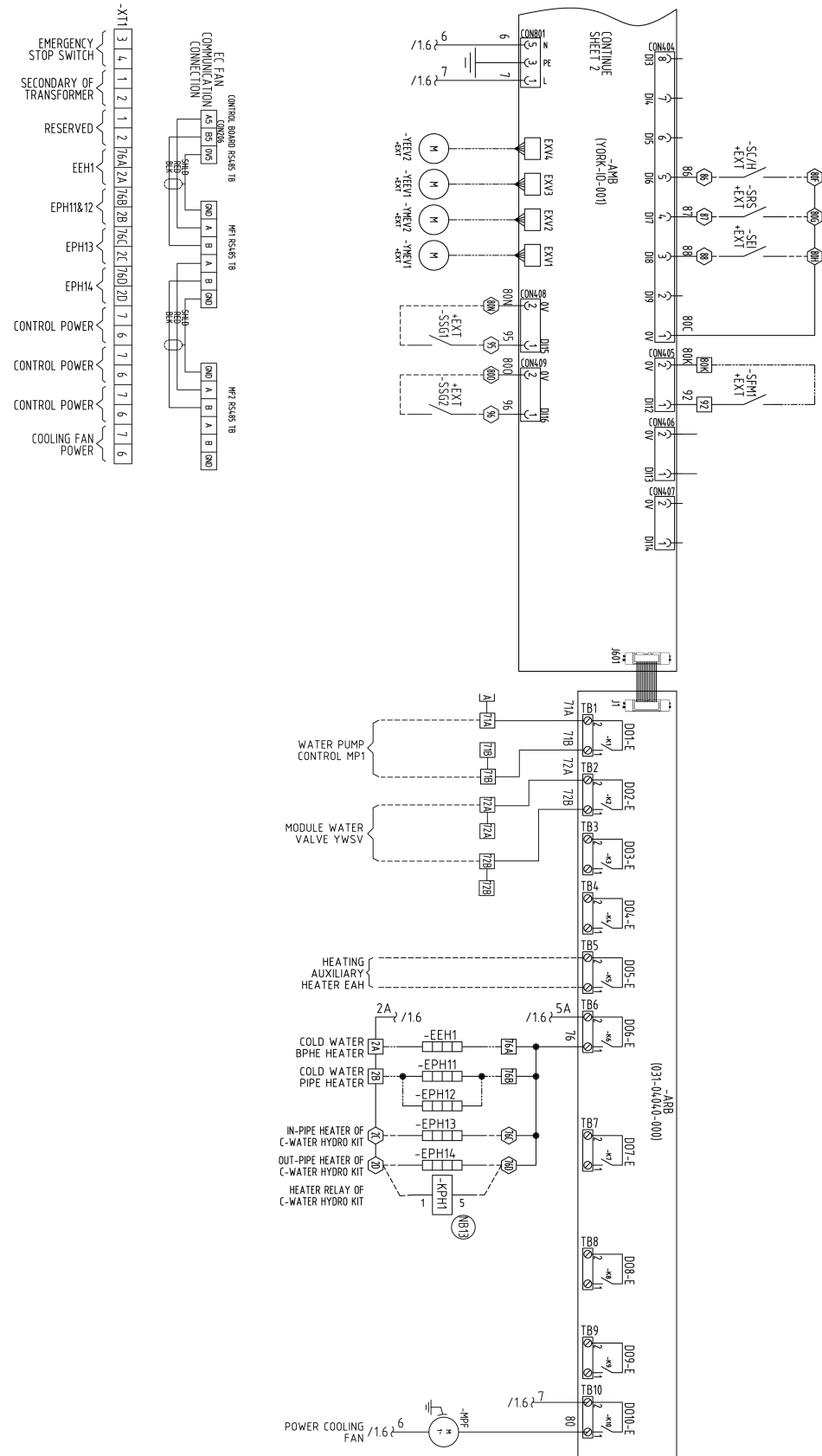
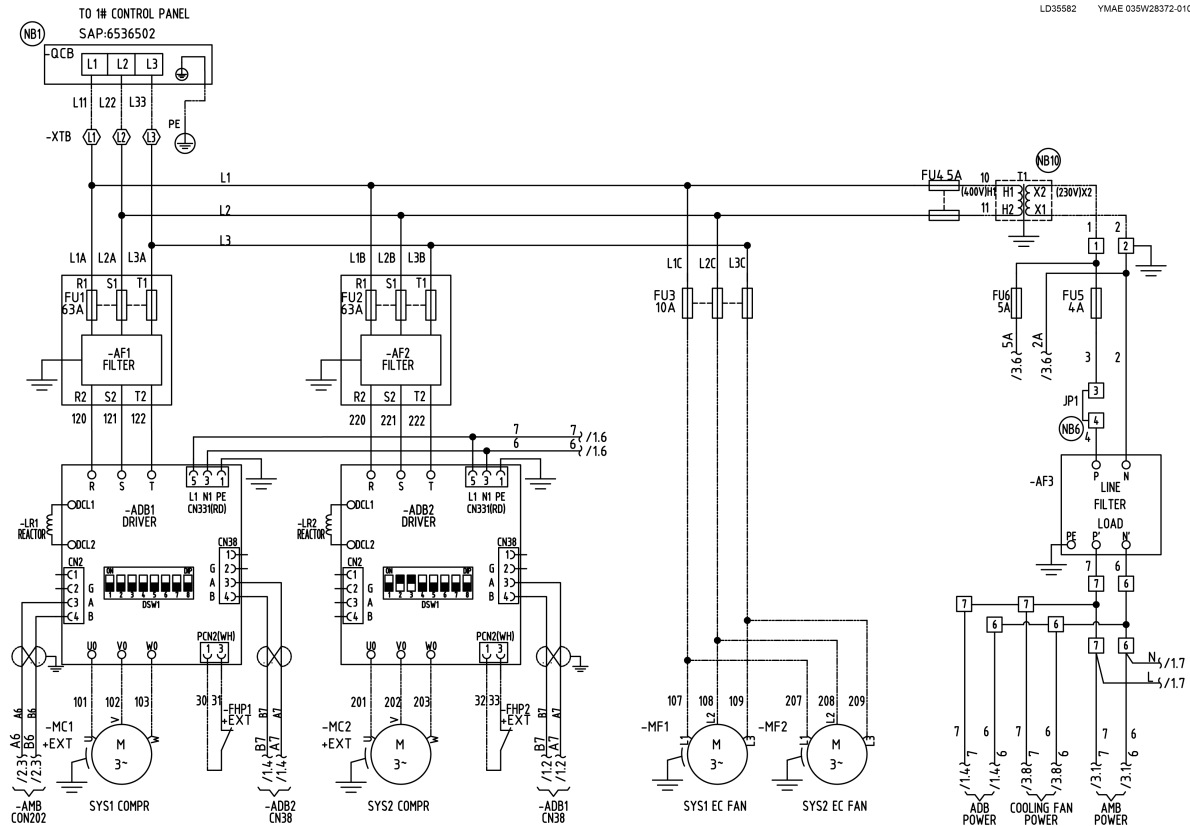
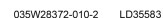
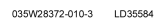


Figure 76: YMAE 0230 and 0260 two panel electrical schematic 1







Callout	Description	Callout	Description	Callout	Description	Callout	Description
A	Vendor wired	SFM1	Module cold water SF	FU	Fuse	BEMT1	Enter module cold water temperature
B	Factory wired	SEI	External interlock switch	FHP	High pressure switch	BECOT	ECO outlet temperature
C	Customer wired	SC/H	Cooling/heating mode switch	EXT	External part	BECIT	ECO inlet temperature
YWSV1	Module hot water valve	SC-EQ	BACnet gateway BD	EPH14	Reserved	BDT	Discharge temperature
YOSV	Oil return SOL valve	QCB	Circuit breaker	EPH13	Reserved	BAMB	Ambient temperature
YMSV	Mode SOLB valve	MRF	Refrigerant fan	EPH11/12	In/Out-pipe heater of cold water BPHE	BACDT	Air coil defrost temperature
YMEV	Main EEV	MP1	Cold water pump/water pump	EEH1	Cold water BPHE heater	BAIT	Accumulator inlet temperature
YLISV	Liquid inject SOL valve	MF	EC fan	ECH	Crank case heater	AF	Filter/filter board
YESV	EVI SOL valve	MPF	Power cooling fan	BSP	Suction pressure transducer	ARB	Relay board
YEEV	EVI EEV	MC	Compressor motor	BRLD	Refrigerant leak detector	ADB	Driver board
XT	Terminal block	LR	Reactor	BDP	Discharge pressure transducer	AMB	Main control board
SRS	Remote start switch	KRS	Running status relay	BLST1	Leaving system cold water temperature		
SSG2	Smart grid ready 2	KPH	Pump kit heater relay	BLMT1	Leaving module cold water temperature		
SSG1	Smart grid ready 2	KAL	Alarm output relay	BPHE	Brazed plate heat exchanger		

① Note:

1. Refer to the ICOM for the external wiring. Non-compliance with these instructions invalidate the warranty.
2. Provide power according to the voltage and current on the unit nameplate.
3. Reserved.
4. Reserved.
5. For single-module units, do not install BLST1.
6. Remove jump JP1 between XT1 3 and 4 if the emergency stop button is required.
7. The YMAE 0100 to 0260 units only provides the control signal for the heating auxiliary heater.
8. You can install YWSV for modular array applications.
9. The voltage at both ends of the DI switch is 12 VDC when the DI switch or signal is open. AMB DO is the active signal.
10. T1 is outside of the panel.
11. Set the DIP switch on the control board according to the DIP switch label.
12. Reserved.

Table 23: Smart grid status

Function	SSG1	SSG2
Standard operation	Open	Open
Switched on signal	Open	Closed
Switch off command	Closed	Open
Switch on command	Closed	Closed

Commissioning

Preparation with the power off

CAUTION

Ensure only authorized personnel perform commissioning of this unit.

WARNING

Complete the following checks with the customer supply to the unit switched OFF.

Inspection: Inspect the unit for installation damage. If found, take action or repair as appropriate. Inspect the wiring and ensure connection terminals are correctly tightened.

Refrigerant charge: Units are normally shipped as standard with a full refrigerant operating charge. Check that refrigerant pressure is present in both systems and that there are no leaks. If there is no pressure in the system, complete a leak test, locate the leak, and repair the problem. Evacuate any repaired systems with a suitable vacuum pump or recovery unit as appropriate to below 1,000 microns before charging.

CAUTION

Do not charge liquid refrigerant with static water in the heat exchanger. Care must also be taken to charge liquid refrigerant slowly to avoid excessive thermal stress at the charging point.

After the vacuum is broken, charge with the full operating charge. See [Oil charge](#).

Valves: Ensure that the compressor discharge and suction service valves are set correctly, that is they are open.

Fans: Check that all fans are free to rotate and are not damaged. Ensure blades are at the same height when rotated. Ensure the fan guard is securely fixed.

Isolation/protection: Verify that all sources of electrical supply are taken from a point of isolation.

Power panel: Check the panel to see that it is free of foreign materials, for example wire or metal chips, and clean out if required. Vacuum clean only. Do not pressure clean.

Power connections: Check the customer power cables are connected correctly. Ensure that connections of power cables within the power panel to the circuit breaker are tight. See [Table 22](#).

Earthing: Verify that the unit earth terminal is correctly connected to a suitable earthing point. Ensure that all unit internal earth connections are tight.

Supply voltage: Verify that the site voltage supply corresponds to the unit requirements and is within the limits given in [Electrical data](#). The phase imbalance must be less than 2% of the average voltage.

Switch settings: Set the circuit breaker to ON, then set the customers disconnection devices to ON. Close all doors on the electrical panel with engage the handle, if present.

 WARNING

The machine is now live.

Preparation with the power on

Complete the steps in [Preparation with the power off](#).

Crankcase heaters: Verify the heaters are energized.

 CAUTION

Depending on the ambient temperature, the crankcase heaters must be on for 8 h before the first start-up.

Water system: Verify that the liquid system has been correctly installed and has been commissioned with the correct direction of water flow through the heat exchanger. Follow the installation indicated by the arrows on the pipework. Purge air from the heat exchanger using the air vent mounted in the pipework.

 CAUTION

See [Technical data](#) for flow rate and pressure drop limits. Do not operate outside of these limits because it could damage the unit.

Temperature sensor BLST: Ensure the leaving liquid temperature sensors are coated with heat conductive compound, part number 013-00898-000, and are inserted in the water outlet sensor pockets of the system. This is applicable for modular systems only, such as modular arrays or multi-module combination applications.

Programmed settings: Ensure the system cut-out and operational settings are in accordance with operational requirements. See [Operation](#).

Date and time: Set the date and time. See [Setting the date and time](#).

Start or stop schedule: Program the daily and holiday start/stop. See [Setting a schedule](#) and [Setting a holiday](#).

Setpoints: Set the required leaving chilled or hot liquid temperature setpoint and control range. See [Setting the cooling and heating setpoints](#).

First time start-up

- ① **Note:** During the commissioning period, ensure there is sufficient heat load to run the unit under stable full load operation to enable the unit controls and system operation to be set up correctly and a commissioning log taken. Refer to the Start-Up Checklist, *Form 150.89-CL2*, for more information.

Read the following section in conjunction with [Operation](#), and complete the following steps:

1. **Emergency stop:** Remove the protective plate from the control panel before commissioning.
2. **Interlocks:** Verify that liquid is flowing through the heat exchanger and that heat load is present. Ensure that any remotely run interlocks are in the run position and that the run schedule requires the unit to run or is overridden.
3. **Start-up:** On the HMI, set the unit switch to the ON position to start the unit. There may be a few minutes delay before the first compressor starts because of the anti-recycle timer. If any unusual noises or other adverse conditions develop when each compressor starts, be ready to switch the unit off immediately. Refer to [Unit operating sequence](#) for the normal operating sequence from start-up.
4. **System operation:** Check the system pressures and temperatures.
5. **General operation:** After completing the above checks for System 1, repeat the process for all other systems. In addition, check that loading occurs as specified in [Technical data](#) and that general operation is correct.

Special items required for vacuuming and refrigerant charging

As standard, the refrigerant for these units is charged in the factory. If the units are delivered without R-454B and charged with nitrogen instead, the following items are necessary to complete an onsite refrigerant charge:

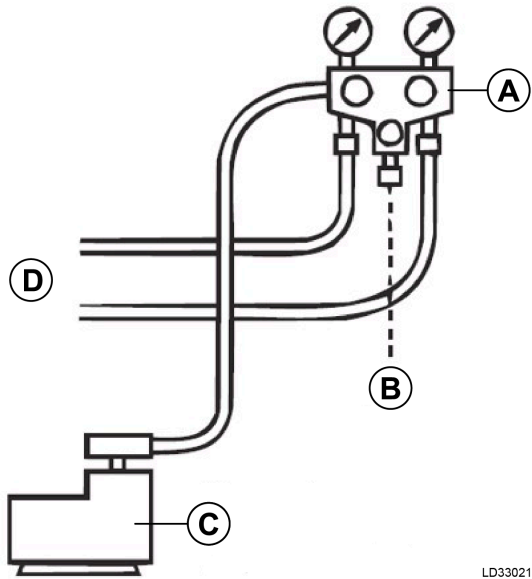
- Nitrogen chart
- Leak detector
- ATEX vacuum pump
- ATEX ventilation fan
- Antistatic gloves
- Warning sign to indicate no ignition sources in the area

Vacuumping procedure

If you need to charge the refrigerant, it is necessary to first obtain a sufficiently dry system. Perform a vacuuming in the high and low side service access valves, which are in the discharge line and suction line.

1. Connect a manifold valve, a vacuum pump, and a vacuum gauge suitable for R-454B refrigerant.
2. Operate the vacuuming pump for at least 1 h to 2 h until the vacuum grade is below 130 Pa (1,000 microns).
 - ① **Note:** If the vacuum grade has not decreased to 130 Pa (1,000 microns) after 2 h, ensure that there is no leakage and no water in the system, and then continue to vacuum for another 1 h.

Figure 79: Vacuuming procedure



LD33021

Callout	Description
A	Manifold valve for vacuuming
B	Refrigerant tank for R-454B
C	Vacuumping pump
D	Connection to the unit

Confirming a vacuum

Use a vacuum gauge to measure a target vacuum. However, it is not possible to read the vacuum gauge installed in the manifold accurately. Use a digital vacuum measuring device.

Water evaporation

In atmospheric pressure, water boils at 100°C. However, each time the pressure in the pipes reaches a vacuum state, water boils at a lower temperature than 100°C. The lower this temperature is, the easier the water evaporators and vacuum drying occurs.

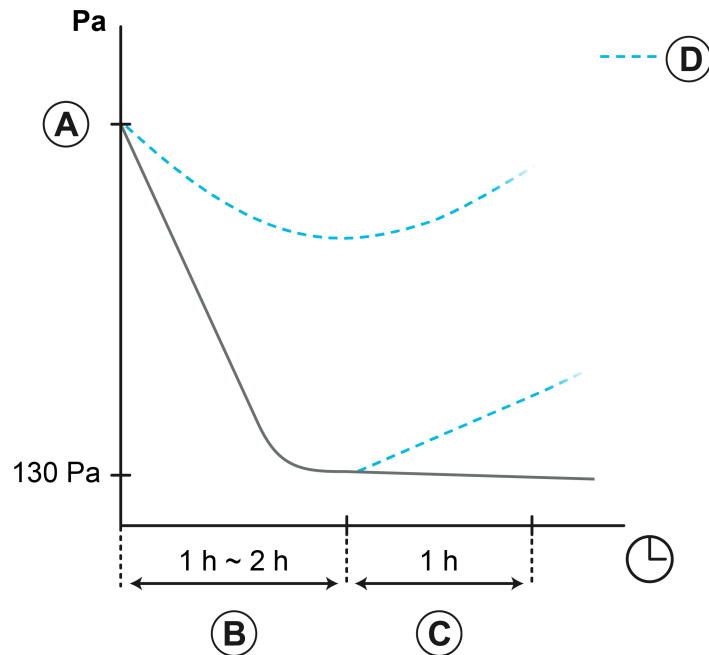
If there is a possibility of dew condensation, the vacuuming time must be controlled more strictly because water does not evaporate easily and it is difficult to know the degree of dew condensation. 130 Pa (1,000 microns) is a guideline to control the vacuum grade.

After finishing vacuuming, close the manifold valve and stop the vacuum pump. Leave the unit for 1 h to confirm that the pressure measured by a vacuum gauge has not increased.

This process is necessary because the ambient air can leak into the system due to negative pressure in the system after the vacuum process. Additionally, an air leak may not be confirmed in the air tightness test alone.

In the case of pressure increasing significantly, it can indicate that there may be a leakage somewhere in the system. Complete an air tightness check and the vacuum drying process again after fixing the leakage.

Figure 80: Graph of pressure over time



LD33022a

Callout	Description
A	Atmospheric pressure
B	Perform a vacuum
C	Close the valves and leave the unit
D	Abnormal pressure

Note: An abnormal pressure indicates an air leak, or water in the pipes.

Refrigerant charging for R-454B

CAUTION

Do not charge liquid refrigerant with static water in the heat exchanger. Take care to charge liquid refrigerant slowly to avoid excessive thermal stress at the charging point.

Due to refrigerant characteristics, ensure the following points:

- Refrigerant must be added in a liquid state and not in gas state.
- Confirm if the tanks are specialized for R-454B.
- The valves or hose for charge must be specialized for R-454B.

Refrigerants are classified as A2L refrigerant and must be handled in accordance with all governing regulations. Failure to meet this requirement can result in damage to equipment, release of refrigerant into the environment, contamination of the operating space for the equipment, and pose a risk of personal injury. It is the responsibility of any service technician or operator to adhere to these requirements. For more details see [Refrigerant information](#).

Confirming the correct refrigerant tank

The color of the cylinder tank differs depending on the type of refrigerant. It is also possible to confirm the refrigerant by the engraved text on the container.

① **Note:** The specification of the connection screw for R-454B is usually UNF1/2.

Charging the refrigerant

Complete the refrigerant charge using the charging valve located in the liquid line between the air source coil and the small economizer PHE. The refrigerant is charged in liquid form:

1. Confirm the measurement with a scale for refrigerant charge. See [Oil charge](#) for more information.
2. If it is not possible to charge the defined amount due to low outdoor temperature or other reasons, complete the following steps:
 - a. Operate the compressor in cooling mode.
 - b. Gradually charge the refrigerant from the service access valve in the suction line before the accumulator.
 - c. Adjust the stop valve opening of the liquid from fully closed to slightly open, and charge the remaining defined amount on the low-pressure side.

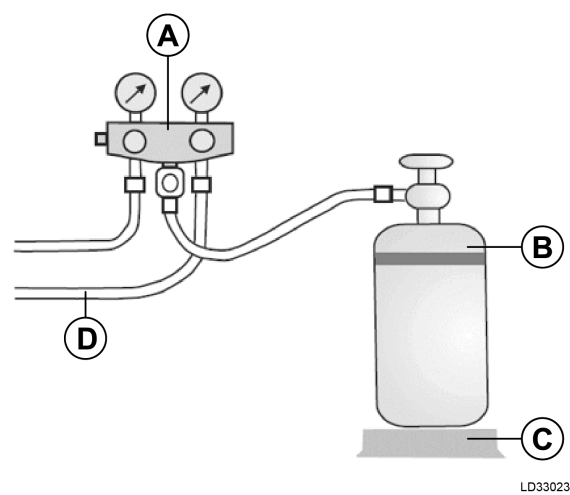
WARNING

Checks for refrigerant leakage must be performed steadily. The refrigerant used in this unit is flammable, non-toxic, and odorless. Ensure air ventilation to avoid potential refrigerant accumulation risk. Any ignition sources are strictly prohibited during vacuuming, refrigerant charging, and commissioning.

CAUTION

Over-charging and insufficient refrigerant charge may cause damage to the compressor. Always weigh the refrigerant to ensure that the correct amount of refrigerant is used. Refer to the nameplate and [Technical data](#) for more information.

Figure 81: Charging R-454B



Callout	Component	Callout	Component
A	Manifold valve specialized for R-454B	C	Scale
B	Refrigerant tank with siphon pipe, specialized for R-454B	D	Hose for charge specialized for R-454B

Operation

① Note: Before operating the unit, see [Refrigerant information](#).

Units are designed to work independently, or in conjunction with other equipment through the Modbus building management systems (BMS) or other automated control systems.

Control system

The microprocessor control system is capable of refrigerant circuit control to maintain liquid temperature within programmed limits, and system safeties, displaying status, and daily schedules.

Remote starting and flow and equipment interlock can be accomplished by field supplied contacts.

Remote indications of alarms and pump control are available as outputs.

Compressor starting/stopping and loading/unloading decisions are performed by the microprocessor to maintain leaving liquid temperature.

Unit operating sequence

The following sequence describes the start-up process after unit power up. When a compressor starts, internal timers limit the minimum time before another compressor can start.

1. After starting the system, the microprocessor performs a pre-check to ensure that the daily or holiday schedule and any remote interlocks allow the unit to run, all safety cut-outs are satisfied, and no faults are unsettled. Any problems identified during the pre-check are shown on the HMI display.
2. The unit can start automatically based on an internal schedule function, without user or BMS input. When the unit is on, the water pump starts working instantly and the water valves open. The unit then detects the status of the flow switch to ensure sufficient liquid flow is supplied. Ensure the water pump is controlled by the leader chiller unit.
3. If there are no problems, the control system adjusts the unit load depending on the liquid temperature and temperature change rate. If operating at a high load demand, the controller increases the speed of the inverter compressor or turns on more compressors. If there is a low load demand, the inverter compressor may continue to operate at low speed or may stop. If the latter is the case, one compressor restarts automatically when needed.
4. When a compressor is running, the controller monitors discharge and suction pressure and various other system parameters such as liquid temperature, ambient temperature, and heat exchanger temperature. If any problems are detected, the control system takes appropriate action and displays the related fault message on the HMI display.
5. The corresponding EC fans cycle on when the compressor starts in cooling and heating mode. Fan speed is automatically adjusted based on system pressure, ambient temperature, and other key parameters.
6. Each system is configured with a main EEV in the liquid line between the condenser and the evaporator. The device automatically adjusts opening steps to satisfy refrigerant flow demand, mainly based on the difference between the actual and target suction superheat.
7. If demand requires, more compressors start up, either from another system for dual circuit units or another unit in a modular control system. The priority is as follows:
 - Increase the running speed for the compressor that meets the hertz increase criteria before loading more compressors. The maximum load limit is 85 Hz for one compressor, 75 Hz for two compressors, and 65 Hz for more than two compressors.
 - To start up a compressor in other standby modules.
 - To start up the standby compressor from the module in which one compressor has been already running.

- If the compressors have the same loading conditions, the priority is the compressor with less running hours and without operation limits.
- 8. As the load decreases below the setpoint, the compressors shut down in sequence. This normally occurs at intervals of between approximately 20 s and 40 s based on water temperature as compared to the setpoint and the rate of temperature change.
- 9. When the compressor in a system unloads to shut off, the system switches off its fan and EEV shortly afterwards.
- 10. The compressor heaters energize based on ambient temperature and discharge temperature, to prevent liquid refrigerant condensing from being accumulated in the compressor housing, and to prevent liquid flooding and oil lubrication risk.
- 11. For simultaneous cooling and heating mode, the following sequence and priorities occur:
 - If both cooling and heating require loading, priority is to upload systems running in heat recovery. After heating load meets requirement, continue loading systems running in cooling mode.
 - If both cooling and heating require unloading, priority is to unload systems running in heat recovery. If the heating load meets the requirement, continue unloading systems running in cooling mode.
- 12. When multiple modules are packaged together, the capacity of each circuit is $1/2n$ of the total capacity, where n is the number of modules. When the unit is running, the following processes can occur:
 - If only cooling or heating is required, the unit loads step by step and operates in cooling only or heating only mode until it meets the required capacity.
 - If cooling and heating are both required simultaneously, the unit starts up with the cooling and heat recovery mode. The unit loads the circuits step by step until it meets the required capacity for cooling or heating, whichever is lower. Then, for the remaining cooling or heating capacity, the unit continues to load other circuits and operate in cooling only or heating only mode until the remaining capacity is met.
 - If the cooling and heating recovery mode has been loaded into the last circuit, this last circuit switches between the cooling and heat recovery mode and cooling only or heating only mode.
- 13. To mitigate adverse effects on system performance due to air-source heat exchanger frosting, the module intermittently activates defrost mode when one of the following conditions are met:
 - If the coil temperature is less than or equal to the target temperature for 3 min and the cumulative heating duration is greater than or equal to 40 min. The default target temperature in this criteria is equal to the current ambient temperature in °C minus 7°C. For example, the target temp is -7°C if current ambient is 0°C.
 - If the saturated suction temperature is less than or equal to the target temperature for 3 min and the cumulative heating duration is greater than or equal to 40 min. The default target temperature in this criteria is equal to the current ambient temperature in °C minus 13°C. For example, the target temperature is -13°C if current ambient is 0°C.
 - The systems cumulative heating duration is greater than or equal to 180 min when ambient temperature is below -10°C.
- 14. In defrost mode, the module runs a reversed refrigeration cycle and air-to-water heat pump heating capacity diminishes as a result.
- 15. When ice builds up on the ambient coils, the unit operates in defrost mode to remove ice. The number of defrosting circuits does not exceed half of the total number of circuits. When in defrost mode, the circuit operating in heat pump mode is in balance with the circuit operating in defrost. Heat energy is not removed from the hot water system because the controller minimizes the quantity of circuits that can defrost at any one time. Less than half of total circuits can enter defrost at any time, which reduces heating capacity loss and helps minimize the temperature impact on the system.

Human machine interface (HMI)

The HMI enables the user to control the unit operation either manually or automatically, or through remote communications. In addition, it provides access to view, change, and program parameters and system commands and view faults using a 7 in. touchscreen.

The 7 in. resistive touch screen is used to configure unit parameters and view operating data. The touch screen is protected by an IP54 rated enclosure and is connected to the main board with an RS-485 communication port. Different access levels are available through the button in the upper-right corner.

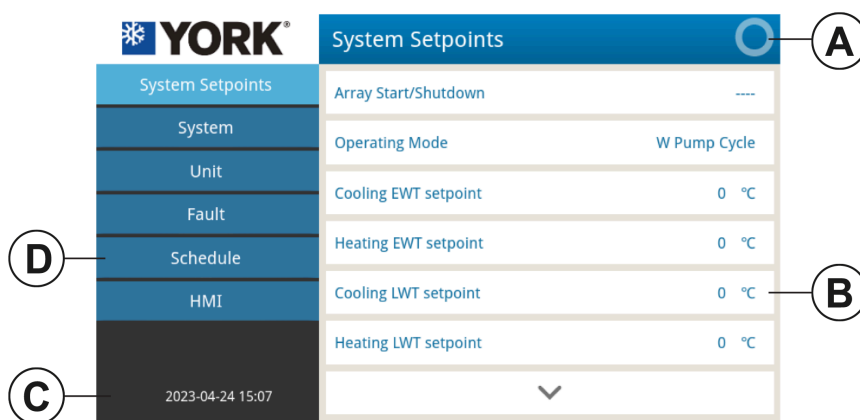
All the data is displayed in metric values as default, in English or a number of European languages. The following sections give an overview of the operation of the unit and the use of the HMI.

- ① **Note:** The default access is **Viewer**. To access **Operator**, enter the password 9017. After 5 min of inactivity, the screen dims and the access level returns to **Viewer**. You can adjust the standby duration within a range from 2 min to 60 min in the **HMI** menu.

Main interface

The screen takes about 1 min to display after powering on. The default access level for operation is **Viewer** at first startup. The interface is divided into the following areas:

Figure 82: Main interface



LD33040

Callout	Description
A	Privilege access level
B	System operating status
C	Date and time
D	Menu

System

Select **System** to view and interact with the following parameters:

Table 24: System page items

Menu	No.	Parameter items
System	1	Array status
	2	Running mode
	3	Array cooling EWT
	4	Array cooling LWT
	7	Ambient temperature
	8	Array loading
	9	Available mode
	10	Total run hours
	11	Cooling anti-freezing
	12	Defrosting
	13	Low noise
	14	Cooling pump status

When logged in at Operator or Service levels, you can view and set the following system setpoints and modes:

Table 25: System setpoints viewable in operator and service level

Array start/shutdown	Array LWT offset	Clear running time
Operating mode	EWT pulldown rate	EXV cooling initial steps
Cooling EWT setpoint	Heater on water temperature differential	EXV heating initial steps
Heating EWT setpoint	Heater off water temperature differential	EXV cooling minimum steps
Cooling LWT setpoint	Heater on ambient temperature	EXV heating minimum steps
Heating LWT setpoint	Low LWT alarm	Defrost initial steps
Noise reduction mode	High LWT alarm	Cooling target suction superheat
Default setting	Defrost temperature, with ambient temperature <0°C	Heating target suction superheat
Cooling control select	Defrost temperature, with ambient temperature ≥0°C	Pump periodic dun
Heating control select	Defrost time limit	Water valve opening time
Temperature control cycle	Defrost interval	Manual defrost unit
Water temperature control differential	Coil temperature after defrost	Limited hours

Unit

Select **Unit** to view the operating status of different modules in the network:

Table 26: Unit parameter items

No.	Parameter
1	Unit selection
2	Unit network status
3	Unit fault status
4	Circuit 1 oil preheating
5	Circuit 2 oil preheating
6	Software version A
7	Software name A
8	Unit cooling EWT
9	Ambient temperature
10	Circuit 1 coil temperature
11	Circuit 2 coil temperature
12	Unit cooling LWT
13	Circuit 1 suction temperature
14	Circuit 2 suction temperature
15	Circuit 1 compressor discharge temperature
16	Circuit 1 economizer entering temperature
17	Circuit 2 compressor discharge temperature
18	Circuit 2 economizer entering temperature
19	Circuit 1 economizer leaving temperature
20	Circuit 2 economizer leaving temperature
21	Refrigerant concentration, lower flammability limit percentage (LFL%)
24	Circuit 1 suction pressure
25	Circuit 2 suction pressure
26	Circuit 1 discharge pressure
27	Circuit 2 discharge pressure
29	Cooling and heating switch
30	On and off switch
31	External lock
32	Unit cooling WFS
34	Exhaust fan
35	Circuit 1 variable frequency driver fan
36	Circuit 2 variable frequency driver fan
37	Unit operation status
38	Fault output
39	Cooling loop pump
40	Unit cooling water valve
43	Water auxiliary heater

Table 26: Unit parameter items

No.	Parameter
44	Cooling side freeze protection heater
48	Circuit 1 oil valve
49	Circuit 1 liquid injection valve
50	Circuit 1 EVI valve
51	Circuit 1 compressor oil heater
56	Circuit 2 oil valve
57	Circuit 2 liquid injection valve
58	Circuit 2 EVI valve
59	Circuit 2 compressor oil heater
60	Circuit 1 FWV
61	Circuit 2 FWV
62	Circuit 1 EEV
63	Circuit 2 EEV
64	Circuit 1 EVI EEV
65	Circuit 2 EVI EEV
66	Circuit 1 fan speed
67	Circuit 2 fan speed
68	Circuit 1 compressor speed
69	Circuit 2 compressor speed

Fault

Select **Fault** to view fault readouts and resets. The warning symbol in the upper-right corner indicates that there is a fault present.

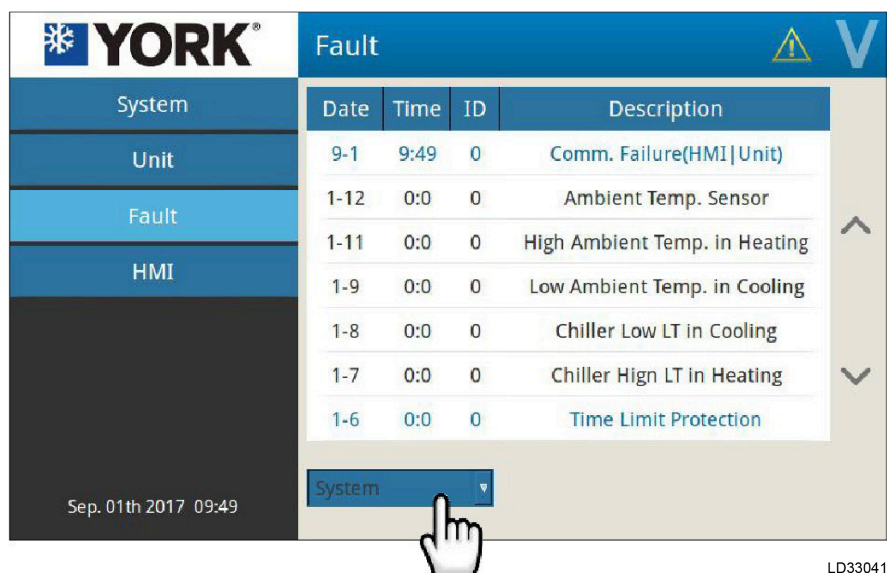
Use the network fault list on the lower part of the screen to filter the faults by different parts of the network. See [Figure 83](#).

1. To see the system faults, select **System**.
2. To view units in modular systems, select **Unit 1**, **Unit 2**, or any other available unit.

The faults are listed sequentially on the screen, with details of date, time, ID, and a description of the fault. Current faults are displayed in blue and historical faults in black.

The unit number is displayed as 0 if the fault is systemic.

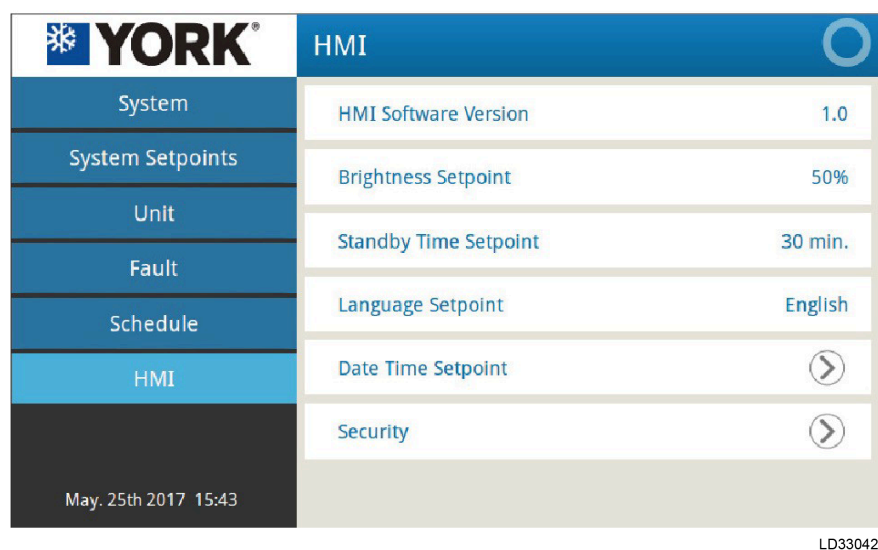
Figure 83: Fault screen



HMI

Select **HMI** to view display settings and software information. When logged in at the operator level, you can view the HMI software version, adjust the display, set the standby time, set the language, set the system date and time, and change the operator password.

Figure 84: HMI screen



Changing the system setpoints

1. Press the system setpoint that you want to change. A pop-up called **Operating Mode** appears with the different available setpoint options.
2. Select an option and press the **Tick icon**.
3. Press **Confirm** or **Cancel**.
4. For setpoints that require a specific unit input, such as **Cool EWT Setpoint**, enter the appropriate number and press the tick icon.

Changing the access level

There are three access levels in the HMI control:

- V: Viewer
- O: Operator
- S: Service

To change the access level, complete the following steps:

1. Press the access letter in the upper-right corner of the screen.
2. Press **Change Access Level**.
3. Enter the password and press **Enter**. The operator password is 9017.
The letter indicating the access level in the upper-right corner changes accordingly.

Starting or stopping the chiller

1. In the operator access level, press **System Setpoints** and select **Array Start/Shutdown**.
2. Select **ON/OFF** to either start or stop the chiller.

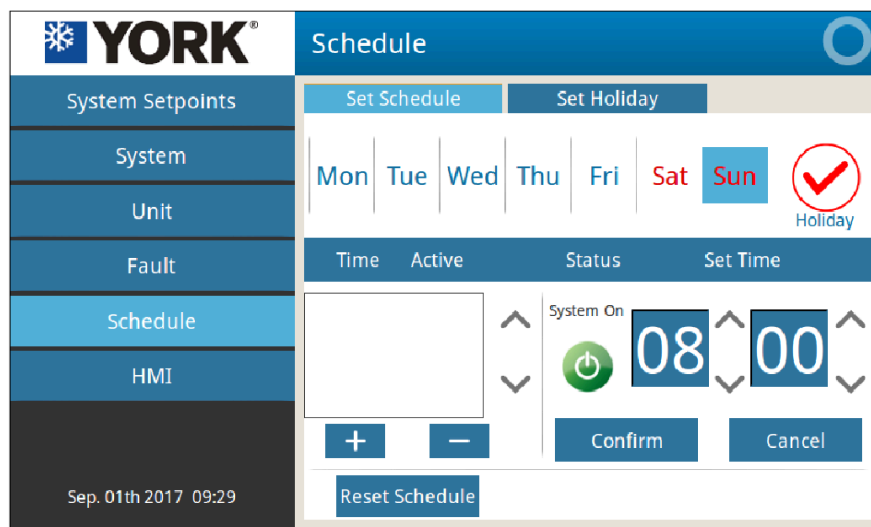
Setting the date and time

1. In the operator access level, press **HMI** and select **Date Time Setpoint**.
2. Set the date and time and press **Confirm**.

Setting a schedule

1. In the operator or service access level O or S, press **Schedule**.
2. Press **Set Schedule**.
3. Press the **plus** icon to add a new item.
4. Configure the settings using the icons on the right and press **Confirm**
 - Press the **minus** icon to delete an item.

Figure 85: Setting a schedule



LD33043

Setting a holiday

Use the holiday setting to set specified dates as holidays. You can enter a maximum of 30 days in the holiday setting.

1. In the operator access level, press **Schedule**.
2. Press **Set Holiday**
3. Choose the dates in the calendar and press **Confirm**.

Setting the water temperature control using return (RT) or leaving (LT)

1. In the operator access level, press **System Setpoints**.
2. Select **Cooling/Heating Control Select**.

Setting the cooling and heating setpoints

1. In the operator access level, press **System Setpoints**.
2. Configure the setpoints in **Cooling/Heating EWT Setpoint** or **Cooling/ Heating LWT Setpoint**.
3. Set according to cooling or heating control selection.

Setting the low temperature leaving alarm

- ① **Note:** For the target cooling LWT setpoints between 4.4°C and -10°C, configure the micro DIP switches to glycol mode.
1. In the operator access level, press **System Setpoints**, and select **Low LWT Alarm**.
 2. Set this parameter to between or 3°C to 5°C degrees above the liquid freeze temperature setpoint. For example, if the glycol liquid freeze setpoint is -10°C, you can set the alarm to -5°C.

Maintenance

The units have been designed to operate continuously, provided they are regularly maintained and operated within the limitations given in this guide. Each unit must be included in a routine schedule of daily maintenance checks by the operator or customer, backed up by regular service inspection and maintenance visits by a suitably qualified service engineer.

It is the sole responsibility of the owner to provide these regular maintenance requirements or enter into a maintenance agreement with a Johnson Controls service organization to protect the operation of the unit. If damage or a system failure occurs due to incorrect maintenance during the warranty period, Johnson Controls is not liable for costs incurred to return the unit to satisfactory condition.

- ① **Note:** This maintenance section applies to the basic unit only and may, on individual contracts, be supplemented by additional requirements to cover any modifications or ancillary equipment as applicable.

CAUTION

You must carefully read [General chiller information and safety](#) and [Operation](#) before attempting any maintenance operations on the unit.

Daily maintenance

The operator or customer must carry out the following maintenance checks daily. Note that the units are not generally user serviceable. Do not attempt to rectify faults or problems found during daily checks unless competent and equipped to do so. If in any doubt, contact your local Johnson Controls service center.

Refrigerant leaks: Visually check the cooler, air-cooled condensers, compressors, and pipework for damage and gas leaks.

Condenser fan motors: The fan motors are permanently lubricated and require no maintenance.

Airflow obstructions: Check the air-cooled condenser coil intakes and adjacent areas are clear of foreign materials or obstructions for example paper or leaves.

CAUTION

See [Technical data](#) for the inverter compressor oil information.

Scheduled maintenance

Table 27: Scheduled maintenance

Procedure	Weekly	Quarterly	Semi-annually	Yearly	Every hour ¹
Check the unit operation for optimal function. Report any faults or leaks.	X				
Overall inspection of unit structure and components condition.		X			
Check system operating pressures, temperatures, compressor/fan speeds, EEV steps. Record the results and report if anything abnormal is detected.		X			
Check programmable operating setpoints and ensure they are correct for the particular application.		X			
Check condenser coils and water pans for dirt/debris and clean if necessary.		X			
Check compressor superheat on evaporator and condenser subcooling ² .		X			
Measure and record compressor/fan running currents		X			
Check compressor heaters, evaporator heaters, and piping heaters for operation.		X			
Check for leaks ² .		X			
Disconnect the power source and lock out. Check tightness of power wiring connections ² .				X	
Others	Refer to the manufacturer's recommendations.				

① Note:

1. Reserved for customer use for any special site-determined requirements.
2. This procedure must be performed by an industry-certified technician who has been trained and qualified to work on this type of Johnson Controls equipment. Maintain a record on file of this procedure being successfully carried out by the equipment owner if proof of adequate maintenance is required at a later date for warranty validation purposes.

Pressure relief valves

The dual pressure relief valves are standard for each system. A shutoff valve is installed to enable removal of individual relief valves for testing or calibrating as required by local regulations.

Overall unit inspection

Conduct periodic inspections of the unit to ensure correct equipment operation. Inspect items such as loose equipment, component operation, unusual noises, and other similar issues and correct if necessary.

Heat exchanger in-service inspection

It is not necessary to perform an in-service inspection on the refrigerant side because there is no corrosion on the refrigerant side.

For the water side, if the water used is treated in accordance with [Water treatment](#), an in-service inspection is not necessary.

Ensure the system has adequate water or glycol treatment. Adhere to any local standards for closed-loop heating and cooling circuits.

While periodic in-service proof testing, for example hydro tests, may not be required, Johnson Controls recognizes that national regulations may require such testing to be conducted.

Maintenance alerts

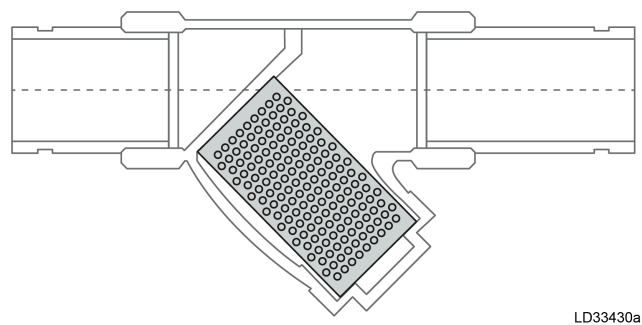
Scheduled maintenance alerts display on the fault screen. See [Fault](#) for information.

Table 28: Maintenance alerts

Alert	Access level	Description
Strainer cleaning	Service	A warning appears on the HMI fault interface when the 4,000 h service is due. You must manually reset this fault after cleaning the filter screen of the strainer. You can remove the filter screen of the strainer for cleaning without removing the whole strainer from the piping. Refer to Figure 86 .

The unit keeps running when any of the alerts occur. The counter resets if the warning is cleared.

Figure 86: Filter screen



Service and troubleshooting

Table 29: Troubleshooting guide

Problem	Cause	Solution
No display on the HMI. Unit does not operate.	24 VDC ON/OFF switch for HMI power supply is defective.	Check input and output power supply firstly. If input power is abnormal, need to check the 230 V control circuit. If output power is abnormal, need to check or replace the 24 V ON/OFF switch.
	Not appropriate voltage (230 VAC) for the control circuit.	Check wiring and power supply. Check wiring emergency stop contacts of terminal block.
	Not appropriate voltage (230 VAC) for the microboard.	Check the wiring control transformer to the microboard.
	Control transformer is defective.	Replace the control transformer.
	Defective IPU3 and I/O board or display board.	Replace the IPU3 control board and I/O board or the display board.
	HMI is defective.	Replace with a new HMI.
Chiller water flow fault.	No chilled liquid flow.	Check field site chilled liquid flow.
	Too much air in piping system.	Purge the air through a gas release valve.
	Flow switch incorrectly installed.	Check that the flow switch is installed according to manufacturer's instructions.
	Defective flow switch.	Replace flow switch.
	Remote cycling device (pump) not working.	Check cycling devices (pump) ON/OFF control wiring to ensure they are connected to terminals of the terminal block, as shown in the electrical wiring schematics.

Table 29: Troubleshooting guide

Problem	Cause	Solution
Low suction pressure fault.	Suction side isolation valve not open or isolation ball valve defective.	Open or replace suction service ball valve.
	Low refrigerant charge.	Repair leak if necessary and add refrigerant.
	Fouled or clogged BPHE.	Clean BPHE and ensure strainer is correctly installed on the upstream tube of BPHE.
	EEV defective.	Check the EEV valve wiring or replace EEV.
	Reduced flow of chilled.	Check liquid flow rate. Check operation of pump, clean pump strainer, purge chilled liquid system of air.
	Defective suction pressure transducer, low pressure switch, or wiring.	Replace transducer/low pressure switch or faulty wiring.
	Fouled chilled BPHE surface in cooling mode. Low suction pressure observed.	Contact your local Johnson Controls representative.
	Fouled coil surface in heating mode. Low suction pressure observed.	
	Incorrect flow through the evaporator.	Adjust flow to within chiller design specs. See Operational limitations .
	Low refrigerant charge. Low suction pressure observed.	Check subcooling and add charge if necessary.
	Fans not operating, in heating mode.	Check fan wiring and communication.
High discharge pressure or compressor overload fault.	Discharge side isolation ball valve not open or valve defective.	Open or replace discharge side isolation ball valve.
	Condenser fans not operating or operating backwards.	Check fan motor. Ensure the fan blows air.
	Too much refrigerant.	Remove refrigerant.
	Air in refrigerant system.	Evacuate, vacuum, and recharge system with new refrigerant.
	Defective discharge pressure transducer.	Replace discharge pressure transducer.
	Compressor motor locked.	Check if there is any phase loss at compressor level due to defective contacts. Replace compressor, and oil if necessary.
	Compressor internal motor protector (MP) open.	Verify refrigerant charge is not low. Verify superheat setting. The default superheat setting is 5°C for cooling, and 4°C for heating. 3°C to 5°C is the reasonable superheat setting range. Verify correct compressor rotation. Verify compressor is not overloaded.
	Inverter compressor overload system tripped.	Determine cause and reset.
	Defective high-pressure cutout switch.	Replace switch.

Table 29: Troubleshooting guide

Problem	Cause	Solution
Low liquid leaving temperature fault.	Incorrectly adjusted leaving chilled liquid temperature cutout (glycol only).	Ensure the leaving chilled liquid temperature cutout is correct.
	Micropanel setpoint or range values incorrectly programmed.	Re-adjust setpoint or range.
	Chilled liquid flow too low.	Increase chilled liquid flow. See Operational limitations .
	Defective LWT or RWT sensor.	Compare sensor against a known good temperature sensing device. Ensure the sensor is correctly installed in the bottom of the well with a generous amount of heat conductive compound.
Compressors do not start.	Defective water temperature sensor.	Compare the display with a thermometer. Ensure it is within $\pm 2^{\circ}\text{C}$.
	Overload failure.	Replace defective part.
	Compressor driver failure.	Check driver running status and the flicker of LEDs.
	Unit is in oil preheat time.	When first powering up the unit, this is normal. Wait for a maximum of 120 min.
	Compressor failure.	Diagnose cause of failure and replace.
Fan stop.	Circuit failure.	Contact your local Johnson Controls representative.
	Internal overheat protection is in operation.	
Unit turns off, the leakage alarm sounds and stops.	A potential refrigerant leak.	The unit automatically resets the alarm and restarts when the error is detected after refrigerant leakage concentration is low. Contact your local Johnson Controls representative.
Unit turns off, the leakage alarm sounds.	A potential refrigerant leak.	Contact your local Johnson Controls representative.

Table 29: Troubleshooting guide

Problem	Cause	Solution
Individual module failure in modular array or in modular combination group.	Follower module failure.	Turn off the unit power switch for the modules with failure issue, the other modules can still operate.
	HMI failure, on the leader module.	Turn off SPC main power switch, to replace HMI. Or, if controlling through BACnet, the unit can operate before HMI replacement.
	Leader module failure.	1. Turn off the main power switch. 2. Set the DIP-switch of control panel on follower modules to make one follower modules the new leader, then install the HMI on this new leader. 3. Connect the modular system leaving temp sensor to the new leader module control panel. 4. Wire pump control connections to the new leader. 5. Supply power to the SPC.
Other	Contact your local Johnson Controls representative.	

Decommissioning, dismantling, and disposal

WARNING

Never release refrigerant to the atmosphere when emptying the refrigerating circuits. Use suitable retrieval equipment. If reclaimed refrigerant cannot be reused, return it to the manufacturer.

WARNING

Never discard used compressor oil, as it contains refrigerant in solution. Return used oil to the oil manufacturer.

WARNING

Refer to local codes and specialized recycling companies. Contact Johnson Controls for more information.

Unless otherwise indicated, any suitably trained maintenance technician can complete the operations described in [General](#).

General

- ① **Note:** Carry out an inspection to determine the safest means of removal for the unit. Special care must be taken regarding the weight and handling of each component. Where possible, dismantle units in the reverse order of installation. See [Installation](#).
1. Isolate all sources of electrical supply to the unit including any control system supplies switched by the unit. Ensure that all points of isolation are secured in the OFF position. The supply cables can then be disconnected and removed.
 2. Remove all refrigerant from each system of the unit into a suitable container using a refrigerant reclaim or recovery unit. This refrigerant can then be re-used, if appropriate, or returned to the manufacturer for disposal. Never vent refrigerant to the atmosphere.
 3. Drain the refrigerant oil from each system into a suitable container and dispose of according to local laws and regulations governing the disposal of oily wastes. Clean and dispose of any spilled oil.
 4. Isolate the unit heat exchanger from the external water systems and drain the heat exchanger section of the system. If no isolation valves are installed it may be necessary to drain the entire system.

WARNING

If glycol or similar solutions have been used in the water system, or chemical additives are contained, the solution must be disposed of in a suitable and safe manner. Never drain any system containing glycol or similar solutions directly into domestic waste or natural water systems.

 WARNING

Water used in the system can also be contaminated. Do not dispose of water systems without prior checks. Refer to local codes.

5. Disconnect and remove the water pipework.
6. **Optional:** For units that cannot be removed in one piece, dismantle the unit in position.
7. Remove the fixing bolts and lift the unit from position following all the provided steps.

 WARNING

Only use lifting equipment of adequate capacity.

8. Remove the remaining components, ensuring that they are supported in a safe manner.
9. Clean up any residual liquids on the site and in any components.

 WARNING

Residual refrigerant oil and glycol or similar solutions may remain in some parts of the system. Mop up and dispose of this residue as described above.

10. Dispose of the unit parts according to local laws and regulations.