SERVICE DOCUMENTATION

MX-420 Packaged Rooftop Air Conditioner

Service Manual · Installation, maintenance and fault diagnosis

Model	Nominal cooling	Power supply
MX-420-07	7.5 TR (26.4 kW)	400 V / 3 ph / 50 Hz
MX-420-10	10 TR (35.2 kW)	400 V / 3 ph / 50 Hz
MX-420-12	12.5 TR (44.0 kW)	400 V / 3 ph / 50 Hz



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Sample manual for product demonstration. The MX-420 is fictional equipment; do not use these procedures on real units.

Contents

1. Safety 2
2. Specifications 3
3. Installation and electrical connection 4
4. Unit controller 5
5. Routine maintenance 6
6. Fault codes and diagnosis 8
7. Refrigerant circuit 10
8. Electrical components 11
9. Service parts and torque values 12

1. Safety

Only qualified HVAC technicians may install, service or repair the MX-420. Read this section before opening any access panel.

WARNING — ELECTRICAL HAZARD

Disconnect the main power supply at the unit isolator and apply a lock and tag before removing the electrical access panel or the compressor compartment cover. The controller remains energised from the 24 V transformer while the isolator is on, even when the unit is switched off at the display.

WARNING — STORED CHARGE

Condenser fan motor run capacitors can hold a dangerous charge after power is removed. After isolating the unit, wait at least 5 minutes, then discharge each capacitor through a 20 kΩ / 5 W bleed resistor and confirm 0 V with a meter before touching the terminals.

CAUTION — REFRIGERANT

The MX-420 uses R-454B, a mildly flammable (A2L) refrigerant. Keep ignition sources at least 3 m from the unit during refrigerant work, use only tools rated for A2L refrigerants, and ventilate the work area. Wear safety glasses and refrigerant-rated gloves.

1.1 Personal protective equipment

- Safety glasses and refrigerant-rated gloves for all refrigerant circuit work.
- Insulated gloves rated to 1,000 V for live electrical measurements.
- Fall-arrest harness when working within 2 m of an unguarded roof edge.
- Hearing protection when the compressor and condenser fans are running with panels removed.

1.2 Hot surfaces

The compressor discharge line can exceed 100 °C during operation. Allow the unit to cool for 15 minutes after shutdown before touching the discharge line or the compressor shell.

2. Specifications

Item	MX-420-07	MX-420-10	MX-420-12
Nominal cooling capacity	26.4 kW	35.2 kW	44.0 kW
Power supply	400 V ±10 % / 3 phase / 50 Hz		
Rated current (full load)	17.8 A	23.6 A	29.4 A
Maximum fuse size (type gG)	25 A	32 A	40 A
Compressor	Hermetic scroll, one per unit		
Refrigerant	R-454B		
Factory refrigerant charge	5.6 kg	7.4 kg	9.1 kg
Supply airflow (nominal)	4,250 m³/h	5,700 m³/h	7,100 m³/h
Maximum external static pressure	250 Pa	250 Pa	300 Pa
Condenser fans	1 × 710 mm	2 × 630 mm	2 × 710 mm
Air filters (G4)	4 × 495 × 495 × 50 mm	6 × 495 × 495 × 50 mm	6 × 595 × 495 × 50 mm
Operating weight	412 kg	486 kg	553 kg
Sound pressure at 3 m	62 dB(A)	64 dB(A)	65 dB(A)

2.1 Operating limits

Condition	Minimum	Maximum
Outdoor air temperature, cooling	10 °C	52 °C
Return air temperature, wet bulb	14 °C	24 °C
Supply voltage	360 V	440 V
Voltage imbalance between phases	—	2 %

Above 52 °C outdoor temperature the controller reduces compressor speed and raises condenser fan speed to protect the compressor. Capacity at 52 °C is approximately 84 % of nominal.

NOTE

Voltage imbalance above 2 % shortens compressor life. Measure all three phase-to-phase voltages at the unit isolator with the compressor running and calculate imbalance as the largest deviation from the average, divided by the average.

3. Installation and electrical connection

3.1 Clearances

Side	Minimum clearance	Reason
Condenser coil side	1,200 mm	Condenser air intake and coil cleaning
Electrical panel side	1,000 mm	Service access
Filter access side	900 mm	Filter removal
Opposite end	600 mm	Airflow
Above unit	2,500 mm, unobstructed	Condenser fan discharge

Do not install the unit where discharge air from another unit can be drawn into the condenser coil. Recirculated hot air is the most common cause of high-pressure faults in summer.

3.2 Power wiring

1. Install a lockable isolator within sight of the unit and no more than 3 m from it.
2. Size supply cables for the rated current in section 2 and the installation method. Use the maximum fuse size in section 2 or smaller.
3. Connect L1, L2, L3 and PE to terminal block X1. Tighten terminals to the torque values in section 9.
4. Connect the room thermostat or building management system to terminals X2-1 to X2-6 using shielded cable.

3.3 Phase rotation

The scroll compressor runs in one direction only. The phase monitor relay K9 prevents start-up if the phase sequence is incorrect and the controller displays `E03`.

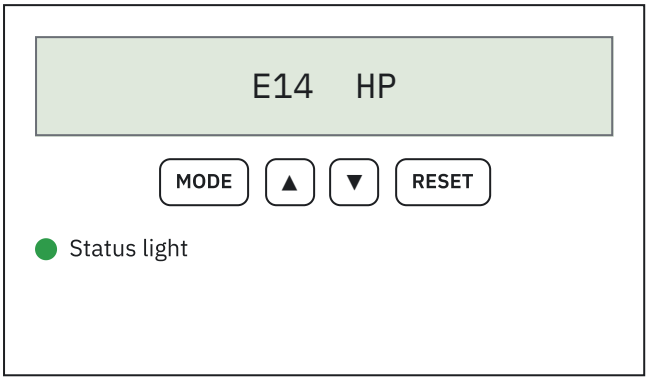
> **CAUTION**
> If `E03` appears on first start-up, isolate the unit and swap any two incoming phases at the isolator. Never swap phases at the compressor terminals, because this reverses the condenser fans as well.

3.4 Condensate drain

Fit a trap to the 32 mm condensate connection. The trap depth must be at least 75 mm because the drain pan is under negative pressure while the supply fan runs. Without a trap, condensate is held in the pan and the float switch shuts the unit down with `E09`.

4. Unit controller

The MX controller is mounted behind the electrical access panel. Its display and keypad are visible through the window in the panel, so normal operation, fault reading and reset do not require removing the panel.



Keys

MODE — cycles between operating mode, setpoint, sensor readings and fault history.

▲ / ▼ — change the selected value or scroll through a list.

RESET — clears an active fault after its cause has been corrected (see 6.4).

4.1 Status light

Status light	Meaning
Green, steady	Normal operation
Green, flashing	Compressor anti-short-cycle delay active (3 minutes after stop)
Amber, flashing	Warning. Unit is running with a limit active, for example high ambient capacity reduction
Red, steady	Fault. Compressor stopped; fault code shown on display
Red, flashing	Lockout. Fault has repeated; manual intervention required (see 6.4)

4.2 Reading fault history

Press MODE until `HIS` appears, then use ▲ / ▼ to scroll through the last 20 faults. Each entry shows the fault code and the compressor running hours when the fault occurred. Fault history is retained when power is removed.

4.3 Sensor readings

Press MODE until `SEN` appears to read live values: outdoor temperature (`OAT`), return air (`RAT`), supply air (`SAT`), suction pressure (`SP`), discharge pressure (`DP`) and suction superheat (`SH`). Pressures are shown in bar gauge.

5. Routine maintenance

Maintenance intervals depend on the site. Sites with sand, dust or construction nearby are classed as **dusty**; all others are **standard**.

Task	Standard site	Dusty site	Section
Inspect and replace air filters	Every 3 months	Every month	5.1
Clean condenser coil	Every 6 months	Every 3 months	5.2
Check supply fan belt tension and wear	Every 6 months	Every 3 months	5.3
Clean drain pan and test float switch	Every 6 months	Every 6 months	3.4
Check electrical terminals for tightness	Every 12 months	Every 12 months	9
Record operating pressures and superheat	Every 12 months	Every 6 months	7.1
Clean evaporator coil	Every 24 months	Every 12 months	—

After a sandstorm, inspect the filters and condenser coil within 48 hours regardless of the schedule.

5.1 Replacing air filters

1. Switch the unit off at the display. The supply fan stops after a 60-second run-on.
2. Remove the filter access panel (six quarter-turn fasteners).
3. Slide out the filters. Note the airflow arrow on each filter frame.
4. Fit new G4 filters of the size listed in section 2, with the arrow pointing towards the evaporator coil.
5. Refit the panel and confirm all six fasteners are locked. An unsealed panel draws unfiltered air into the coil.
6. Reset the filter timer: press MODE until `FIL` appears, then hold RESET for 3 seconds.

> **NOTE**
> Do not wash and reuse G4 filters. Washed filters lose their electrostatic charge and pass fine dust into the evaporator coil.

5.2 Cleaning the condenser coil

WARNING

Isolate and lock off the unit before cleaning. The condenser fans can start without warning while power is connected.

1. Isolate the unit at the isolator and apply a lock and tag.
2. Remove the condenser fan guards to reach the coil from the inside.
3. Brush loose debris off the outer face with a soft brush, working along the fins, never across them.
4. Spray an approved non-acid coil cleaner on the coil and leave it for the time the cleaner's label states, normally 5 to 10 minutes.
5. Rinse from the inside of the coil outwards with low-pressure water at no more than 5 bar. Hold the nozzle at least 300 mm from the coil and keep the spray at right angles to the fins.
6. Straighten any bent fins with a fin comb of the correct pitch (2.1 mm).
7. Refit the fan guards, remove the lock and restore power.

CAUTION

Pressure washers above 5 bar flatten the aluminium fins and permanently reduce airflow. Acid-based cleaners corrode the fins and void the coil coating.

5.3 Supply fan belt

Check belt deflection midway between the pulleys with a force of 25 N. Correct deflection is 12 to 15 mm. Replace the belt if it is cracked, glazed, or if deflection cannot be brought within range with the motor slide adjuster.

1. Isolate and lock off the unit.
2. Loosen the four motor base bolts and turn the adjuster screw to move the motor.
3. Check pulley alignment with a straightedge. Misalignment must not exceed 1 mm per 100 mm of centre distance.
4. Tighten the motor base bolts to 24 N·m.
5. Run the fan for 30 minutes, isolate again, and recheck the tension. New belts stretch in the first hours of use.

5.4 Recording a maintenance visit

Record the date, filter change, coil condition, belt deflection and the operating values from the `SEN` menu on the service log inside the electrical panel door.

6. Fault codes and diagnosis

6.1 Fault code table

Code	Fault	Most likely causes	Action
E01	Return air sensor fault	Sensor open or short circuit; loose connector J4	Check sensor resistance: 10 kΩ at 25 °C
E03	Phase sequence or phase loss	Phases reversed; blown fuse; supply voltage outside 360–440 V	See 3.3. Check all three phases
E05	Supply fan overload	Belt too tight; seized bearing; motor fault	See 5.3. Check motor current
E07	Low suction pressure	Dirty filters; low refrigerant charge; frozen evaporator	See 5.1 and 7.2
E09	Condensate overflow	Blocked drain; missing trap; float switch fault	See 3.4. Clean drain pan
E11	Compressor overload	Low voltage; voltage imbalance above 2 %; high discharge pressure	See 2.1 and 8.3
E14	High discharge pressure	Dirty condenser coil; condenser fan failure; hot air recirculation; overcharge	See 6.3, then reset (6.4)
E16	High discharge temperature	Low charge; high superheat; restricted filter drier	See 7.1 and 7.2
E18	Condenser fan fault	Fan motor failure; failed fan capacitor; blocked fan	See 8.2
E22	Communication fault	Display cable disconnected; controller fault	Reseat cable J1; replace controller if fault persists

6.2 General approach

1. Read the active code and the fault history (4.2) before resetting anything. A repeating pattern points to the cause.
2. Read the live values in the SEN menu (4.3) with the unit running, if it can run.
3. Correct the cause before resetting. Resetting without correcting the cause leads to lockout.

> **NOTE**
> Switching the isolator off and on does not clear an active fault or a lockout. The fault is stored in the controller and reappears when power returns.

6.3 Diagnosing E14 — high discharge pressure

The controller stops the compressor and shows E14 when discharge pressure exceeds 41.5 bar. The mechanical high-pressure switch S2 opens at 43.0 bar as a second safety.

1. Check that every condenser fan runs when the compressor starts. A stopped fan also raises E18 in the fault history.
2. Inspect the condenser coil. A coil blocked by dust or sand is the most common cause. Clean it as described in 5.2.
3. Check for hot air recirculation from nearby units or walls (see 3.1).
4. If the coil is clean and the fans run, measure subcooling (7.1). Subcooling above 9 K indicates overcharge.

6.4 Controller reset

Reset the controller only after the cause of the fault has been corrected.

1. Keep the unit powered on. The controller cannot be reset with the isolator off.
2. Press and hold RESET for 5 seconds.
3. Release RESET when the status light turns green. The display returns to the operating mode.
4. The compressor restarts after the 3-minute anti-short-cycle delay (status light flashes green).
5. Watch the discharge pressure in the SEN menu for 15 minutes. It should remain below 36 bar at 46 °C outdoor temperature.

Lockout after repeated faults

If E14 occurs three times within 24 hours, the controller enters lockout (status light flashes red) and RESET on the keypad has no effect. To clear a lockout:

1. Isolate and lock off the unit.
2. Open the compressor compartment and press the red manual reset button on high-pressure switch S2 until it clicks.
3. Restore power, then hold RESET on the keypad for 10 seconds.

> **WARNING**
> Never bypass or bridge the high-pressure switch S2 to keep a unit running. Doing so can rupture the refrigerant circuit.

7. Refrigerant circuit

7.1 Normal operating values

Values apply with clean filters and coils, nominal airflow, and return air at 27 °C dry bulb / 19 °C wet bulb, measured after 15 minutes of stable operation. Pressures are bar gauge.

Outdoor temperature	Suction pressure	Discharge pressure	Superheat	Subcooling
35 °C	8.6 – 9.4 bar	27.5 – 29.5 bar	5 – 8 K	5 – 7 K
40 °C	8.9 – 9.7 bar	30.0 – 32.0 bar	5 – 8 K	5 – 7 K
46 °C	9.3 – 10.1 bar	33.5 – 35.5 bar	6 – 9 K	4 – 7 K
52 °C	9.8 – 10.6 bar	37.0 – 39.0 bar	6 – 9 K	4 – 6 K

7.2 Checking the charge

The MX-420 has a fixed factory charge (section 2). Do not adjust the charge based on pressures alone. Use superheat and subcooling together:

Superheat	Subcooling	Likely condition
High	Low	Undercharge or leak. Leak test before adding refrigerant
Low	High	Overcharge. Recover refrigerant to the correct charge
High	High	Restriction, for example a blocked filter drier
Low	Low	Low airflow across the evaporator. Check filters and belt

7.3 Charging

1. Repair any leak and pressure test with dry nitrogen at 30 bar for 30 minutes.
2. Evacuate the system to below 500 microns and confirm it holds for 10 minutes with the pump isolated.
3. Weigh in the full factory charge as liquid through the liquid line service valve. R-454B must always be charged as liquid.

CAUTION

R-454B is a zeotropic blend. Charging as vapour changes the blend composition and reduces capacity.

8. Electrical components

8.1 Component locations

Ref.	Component	Location
K1	Compressor contactor	Electrical panel, top row
K2, K3	Condenser fan contactors	Electrical panel, top row
K9	Phase monitor relay	Electrical panel, DIN rail
C2, C3	Condenser fan run capacitors	Fan deck junction box
S2	High-pressure switch, manual reset	Compressor compartment, discharge line
T1	Control transformer 400 / 24 V	Electrical panel, bottom

8.2 Testing and replacing a fan run capacitor

1. Isolate and lock off the unit. Wait at least 5 minutes.
2. Discharge the capacitor through a 20 kΩ / 5 W bleed resistor and confirm 0 V across the terminals with a meter.
3. Label and disconnect the wires.
4. Measure capacitance with a capacitance meter. Replace the capacitor if the reading is more than 6 % below the rated value printed on it.
5. Fit a replacement with the same capacitance and an equal or higher voltage rating. Capacitors C2 and C3 are 6 µF / 450 V (part MX-C0645).

8.3 Motor currents

Motor	MX-420-07	MX-420-10	MX-420-12
Compressor, rated load amps	13.2 A	17.6 A	22.1 A
Compressor, locked rotor amps	88 A	118 A	142 A
Condenser fan, each	1.6 A	1.3 A	1.6 A
Supply fan motor	3.4 A	4.6 A	5.8 A

A compressor drawing more than 110 % of rated load amps at stable conditions indicates high discharge pressure, low voltage or a mechanical fault.

9. Service parts and torque values

9.1 Torque values

Connection	Torque
Main terminal block X1, L1 / L2 / L3 / PE	4.0 N·m
Compressor contactor K1, power terminals	2.5 N·m
Compressor terminal box	3.0 N·m
Control terminals X2	0.5 N·m
Supply fan motor base bolts	24 N·m
Service valve caps	12 N·m

9.2 Common service parts

Part	Part number	Models
G4 filter 495 × 495 × 50 mm	MX-F4955	-07, -10
G4 filter 595 × 495 × 50 mm	MX-F5955	-12
Supply fan belt	MX-B1320	All
High-pressure switch S2	MX-S2430	All
Condenser fan capacitor 6 µF / 450 V	MX-C0645	All
Return air sensor 10 kΩ	MX-T1010	All
Filter drier	MX-D0516	All
MX controller	MX-CTL42	All

9.3 Replacing the controller

Before replacing the controller, record the setpoints from the SET menu. The replacement controller is supplied with factory defaults. After fitting, select the model under SET > MOD so the controller applies the correct current limits for that model.

> **NOTE**
> Fault history is stored in the controller and is lost when the controller is replaced. Photograph the HIS list before removal.