

# Guide Specifications

---

## Guide Specifications for InRow Direct Expansion

*THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTERFORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS IN THE PROJECT MANUAL AND WITH THE DRAWINGS.*

*WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", "INSTALL", "SUBMIT", ETC., UNLESS OTHERWISE INDICATED.*

*THIS SECTION IS WRITTEN TO INCLUDE THE 2004 MASTERFORMAT AND THE 1995 MASTERFORMAT VERSIONS. WHERE APPLICABLE, THESE ITEMS ARE BRACKETED AND, IN EACH CASE, UNLESS OTHERWISE INDICATED, THE FIRST CHOICE APPLIES TO THE 2004 MASTERFORMAT AND THE SECOND CHOICE APPLIES TO THE 1995 MASTERFORMAT.*

### PART 1 — GENERAL

#### 1.1 SUMMARY

- A. The environmental control system shall be designed specifically for precision temperature and humidity control applications. It will automatically monitor and control heating, cooling, humidifying, dehumidifying, and filtering functions for the conditioned space. The system shall be built to the highest quality engineering and manufacturing standards, and shall be floor mounted and configured for horizontal airflow, with draw-through air pattern, to provide uniform air distribution over the entire face of the coil.

#### 1.2 DESIGN REQUIREMENTS

- A. The system shall be as described in the following specification as manufactured by Schneider Electric.
- 1 . Model: \_\_\_\_\_.
  - 2 . Total net cooling capacity: \_\_\_\_\_ MBH (kW).
  - 3 . Sensible net cooling capacity: \_\_\_\_\_ MBH (kW).
  - 4 . Return air dry bulb temperature: \_\_\_\_\_ °F (°C) DB.
  - 5 . Return air wet bulb temperature: \_\_\_\_\_ °F (°C) WB.
  - 6 . Humidity: \_\_\_\_\_ % RH.
  - 7 . Air Volume: \_\_\_\_\_ CFM (l/s).
  - 8 . Humidifier capacity: \_\_\_\_\_ lbs/hr (kg/hr).
  - 9 . Reheat capacity: \_\_\_\_\_ kW (BTU/hr).
  - 10 . Electrical supply: \_\_\_\_\_ V, \_\_\_\_\_ Hz.

#### 1.3 SUBMITTALS

- A. Submittals shall be provided with the proposal and shall include: capacity data, electrical data, physical data, electrical connection drawing, and piping connection drawing.

#### 1.4 QUALITY ASSURANCE

- A. The system shall be completely factory-tested prior to shipment. Testing shall include, but not be limited to: complete pressure and leak testing to ensure system integrity, "Hi-Pot" test, and controls calibration and settings. Each system shall ship with a completed test report to verify completion of

factory testing procedure. The system shall be NTRL listed, MCA, and electrical system shall be UL Listed to UL 1995 and CSA 22.2 No. 236.

## **PART 2 — PRODUCT**

### **2.1 STANDARD COMPONENTS**

#### **A. CABINET CONSTRUCTION**

- 1 . Exterior panels shall be 18 gauge steel with 3.7 lb/ft<sup>3</sup> (60 kg/m<sup>3</sup>) density foam insulation. Insulation complies with UL94. Front and rear exterior panels shall be 18 gauge perforated steel with 80% open free area, and equipped with a keyed lock to provide a means of securing access to the internal components of the unit.
- 2 . The frame shall be constructed of 16 gauge formed steel welded for maximum strength. All units shall provide maintenance from the front and rear, allowing units to be placed within a row of racks.
- 3 . All exterior panels and frame shall be powder coated for durability and attractive finish. Exterior frame and panel color shall have color values: L = 13.44, a = 0.43, b = -2.63.
- 4 . Units shall include casters and leveling feet to allow ease of installation in the row and provide a means to level the equipment with adjacent IT racks.

#### **B. FANS**

- 1 . Variable speed direct drive mixed flow DC fan assembly (ACRD100 and ACRD200 series):
  - a. The unit shall be configured for draw-through air pattern to provide uniform air flow over the entire face of the coil. Each unit shall include six 200 mm mixed flow direct drive DC axial fans. Each fan assembly should be designed to provide 180.1 l/s (381.7 CFM) for total unit airflow of 1080.76 l/s (2290 CFM). The ACRD600/P series includes two fans. Each fan provides 1075 l/s (2000 CFM) for a total unit airflow of 2350 l/s (4000 CFM).
  - b. Variable speed fans: Fans shall be variable speed capable of modulating from 30-100%. Fans shall soft start to minimize in-rush current.
  - c. Fan protection: Each fan assembly shall consist of a plastic injection molded bezel with integral fan discharge finger guard. Inlet of the fan should include a cage type finger guard.
  - d. Operation and service: The unit should be capable of operation in the event of a fan failure. Fans shall be replaceable while the unit is in operation.
- 2 . Variable speed fan assembly (ACRD600/P series):
  - a. Variable speed fans: The unit is equipped with two variable speed, electronically commutated, 400-mm backward incline fans complete with inlet volute.
  - b. Fan protection: discharge finger guard. Outlet of the fan should include a cage type finger guard.

#### **C. MAIN DISCONNECT SWITCH (ACRD600/P series)**

- 1 . Unit shall be provided with Thermal-Magnetic circuit breakers with interrupt capacity ratings per UL489/CSA C22.2/IEC-947.
  - a. Voltage: 200–240V 50/60Hz /kAIC 50
  - c. Voltage: 460–480V 60Hz /kAIC 22
  - b. Voltage: 380–415V 50/60Hz /kAIC 36
- 2 . Air-cooled: Units shall include a main disconnect switch located on the E-panel in order to disconnect power input (600 mm models only).
- 3 . A condenser disconnect shall be field supplied.

#### D. MICROPROCESSOR CONTROLLER

- 1 . Monitoring and Configuration: The master display shall allow monitoring and configuration of the air conditioning unit through a menu-based control. Functions include status reporting, set-up, and temperature set points. Three LEDs report the operational status of the connected air conditioning unit.
- 2 . Controls: The microprocessor controller shall come equipped with control keys to allow the user to navigate between menus, select items, and input alpha numeric information.
- 3 . Alarms: The microprocessor controller shall activate a visible and audible alarm in the occurrence of the following events:
  - a. All series:
    - 1 . Cool Fail
    - 2 . Air filter clogged
    - 3 . Return air sensor fault
    - 4 . Supply air sensor fault
    - 5 . Rack temperature sensor fault
    - 6 . High discharge pressure
    - 7 . Low suction pressure
    - 8 . Fan fault
    - 9 . Water detected (if optional leak detector used)
    - 10 . Check condensate management system
    - 11 . Air filter run hours violation
    - 12 . Group communication fault
    - 13 . Supply air high temperature violation
    - 14 . Return air high temperature violation
    - 15 . Filter DP sensor failure
    - 16 . Suction pressure sensor failure
    - 17 . Discharge pressure sensor failure
    - 18 . Persistent high discharge pressure fault
    - 19 . Rack inlet temperature high violation
    - 20 . External communication fault
    - 21 . Internal communication fault
    - 22 . On standby input contact fault
    - 23 . A-link isolation relay fault
  - b. ACRD100 series and ACRD200 series only:
    - 1 . Condensate pan full
    - 2 . Upper fan power supply fault
    - 3 . Lower fan power supply fault
    - 4 . Suction temperature sensor failure
    - 5 . Persistent low suction pressure fault
    - 6 . Factory configuration not completed
    - 7 . Liquid refrigerant sensor failure
  - c. ACRD200 series only:
    - 1 . Condenser fluid valve actuator fault
    - 2 . Outdoor heat exchanger (OHE) fault
  - d. ACRD600/P series only:
    - 1 . Compressor drive communication fault
    - 2 . Compressor drive fault
    - 3 . Compressor drive warning
    - 4 . Compressor run hours violation

- 5 . Condensate pump run hours violation
  - 6 . Fan run hours violation
  - 7 . VFD inverter overheat
  - 8 . Compressor drive locked
  - 9 . High pressure switch active
  - 10 . Compressor high pressure
  - 11 . Supply humidity sensor fault
  - 12 . High suction pressure
  - 13 . Excessive compressor cycling
- e. ACRD600P series only:
- 1 . Humidifier water conductivity high violation
  - 2 . Humidifier fault tolerance exceeded
  - 3 . Humidifier low water
  - 4 . Humidifier excessive output reduction
  - 5 . Humidifier drain fault
  - 6 . Humidifier cylinder full
  - 7 . Heater run hours exceeded
  - 8 . Humidifier RS485 communication fault
  - 9 . Humidifier run hours violation
  - 10 . Humidity high/low violation
  - 11 . Return humidity sensor fault
  - 12 . Heater fault
- 4 . Logging: The microprocessor controller shall log and display all available events. Each alarm log shall contain time/date stamp as well as operating conditions at the time of occurrence. Controller shall display the run time hours for major components.

#### E. NETWORK MANAGEMENT CARD

- 1 . The unit shall include a network management card to provide management through a computer network through TCP/IP. Management through the network should include the ability to change set points as well as view and clear alarms.
- 2 . Modbus TCP/IP and RTU: ACRD602/P series units shall support Modbus TCP/IP and RTU.

#### F. COOLING COIL AND CONDENSATE PAN

- 1 . ACRD100 and ACRD200 series Direct Expansion: The cooling coil shall use corrugated aluminum fin and copper tube coils. The coil header is equipped with a drip plate in the bottom to capture and direct the condensation accumulating on the suction header tube to the drain pan.
- 2 . ACRD600P Direct Expansion: Cooling coil shall use raised lance type corrugated aluminum fin and 1/2 inch OD (12.7 mm) copper tube coils. Fin shall be a minimum of 0.006 inch thick. Tube wall shall be a minimum of 0.039 inch thick wall. Coil end supports shall be a minimum 17 gauge G90 galvanized steel. Coil shall be rated for a maximum pressure of 600 psig (4200 kPa), and the coils are certified in accordance with UL207. Coil header is equipped with a drip plate in the bottom to capture and direct the condensation accumulating on the suction header tube to the drain pan. Coil has 6 circuits complete with brass distributor and copper distribution tubes.

#### G. COMPRESSORS

- 1 . Variable Speed Compressor/VFD Assembly (ACRD600/P series)
  - a. Compressor: The unit shall be configured with a variable speed scroll compressor using a matched VFD. As a result, the VFD can be varied through a range between 25 and 78 Hz to accommodate varying load conditions. VFD firmware is written to include oil return protection in cases where pipe velocities may drop to low speeds during low loading periods.

- b. Compressor is electrically protected through the VFD.
  - c. Compressor utilizes a noise cap for noise reduction.
  - d. Sight glass provided.
  - d. Compressor shall soft start to minimize in-rush current.
- 2 . Scroll Compressor (ACRD100 series and ACRD200 series only)
- a. The high EER and few moving parts of scroll compressors shall provide efficient and reliable operation. Scroll technology has unparalleled ability to withstand liquid refrigerant “slugging,” which is a major cause of compressor failure.

H. CONDENSATE PUMP

- 1 . ACRD100 series and ACRD200 series: factory installed and wired condensate pumps shall pump at 34 l/h (9 g/hr) at 4.9 m (16 ft) of head. Each pump shall have dual internal floats.
- 2 . ACRD600/P series: A single factory installed and wired condensate pump shall pump at 32 l/h (8.45 g/hr) at 3.5 m (11.5 ft) of head. The pump shall have dual internal floats.

I. CONDENSATE RESERVOIR

- 1 . Each pump shall have a condensate reservoir made of polymeric materials to prevent corrosion.

J. FILTERS

- 1 . ACRD100 series and ACRD200 series:
  - a. The standard filters shall be 20% efficient per ASHRAE 52.1, MERV 1 per ASHRAE 52.2, 1/2 in. washable mesh filter.
  - b. The optional filter shall be high capacity 2 in. pleated, UL 900 Class 2, moisture resistant, with average atmospheric dust spot efficiency of 30%, per AHRAE Standard 52.1, MERV 8 per ASHRAE 52.2.
- 2 . ACRD600/P
  - a. The standard filters shall be 30% efficient per ASHRAE Standard 52.1, UL Class 2 (MERV 8 per ASHRAE 52.2). Filters shall be EN779 G4 efficient. The 3.75 in. (96 mm) deep, pleated filters shall be replaceable from the rear of the unit.
  - b. The optional filter shall be 85% efficient per ASHRAE Standard 52.1 (MERV 13 per ASHRAE 52.2, EN779 F7).

K. HUMIDIFIER (ACRD600P only)

- 1 . Humidifier shall be able to modulate capacity. The humidifier shall be self-contained, steam-generating type, factory piped and wired, with disposable cylinder and automatic solid-state control circuit. Humidifier canisters shall be replaceable. The humidifier controller shall communicate directly to the microprocessor controller and provide complete status and control at the operator interface. Humidifier shall control flush cycling and conductivity via automated controls. Humidifier shall be capable of producing up to 6.6 lbs (3 kg) of steam per hour.

L. ELECTRIC REHEAT (ACRD600P only)

- 1 . Reheat elements shall be low watt density, wired for three-phase, loaded equally on all three phases and shall be electrically and thermally protected by both automatic and manual reset cutouts. Reheat capacity shall be 6 kW.
- 2 . Reheat coils shall be stainless steel, fin tubular construction. Heater casing shall be 20 gauge G90 galvanized steel.
- 3 . Heater shall be provided with self-engaging electrical connectors upon installation. Heater with manually connected conductors are not acceptable.

M. TEMPERATURE AND HUMIDITY SENSORS

1. Internal Temperature Sensors: Thermistor temperature sensors shall be mounted behind the front and rear doors to provide control inputs based on supply and return air temperature. Sensor accuracy shall be within  $\pm 1$  degree F accuracy.
2. Remote Temperature Sensors
  - a. ACRD600/P series: Three remote rack inlet temperature sensors shall be shipped with the unit to provide control input based on rack inlet temperature.
  - b. ACRD100 and ACRD200 series: One remote rack inlet temperature sensor shall be shipped with the unit to provide control input based on rack inlet temperature.
3. Internal Humidity Sensors
  - a. Humidity sensors shall be mounted behind the front door and shall provide control input based on humidity in supply air. Humidifier sensor shall be  $\pm 3\%$  RH accuracy full scale. (ACRD600 series only)
  - b. Humidity sensors shall be mounted behind both the front and rear doors and shall provide control input based on humidity in supply air. Humidifier sensor shall be  $\pm 3\%$  RH accuracy full scale. (ACRD600P series only)

N. COOLING FLUIDS (ACRD200 Series)

1. Water and solutions of propylene or ethylene glycol up to 50% may be used. Solutions of brine or other aqueous salt are NOT permitted.

O. AMBIENT PROTECTION

1. InRow DX (ACRD10x and ACRD60x/P) systems shall be equipped with a recommended outdoor flooded receiver package suitable for ambient temperatures down to -40C/-40F.
2. (ACRD200 Series) Per ASHRAE Handbook Fundamentals 2001 21.5, a maximum of 30% ethylene glycol and 35% propylene glycol are needed for freeze protection. See the ASHRAE handbook for more details.

P. CABLE WATER DETECTOR (OPTIONAL)

1. A leak detection sensing cable shall be shipped loose with the unit. If water or other conductive liquids contact the cable anywhere along its length, the main controller visually and audibly annunciates the leak.
2. The detector shall be provided with a 20 ft (6.1 m) of cable. Cable may be cascaded up to 80 ft (24.4 m).

Q. BRIDGE POWER CABLE TROUGH

1. An overhead power distribution bridge, that sits between adjacent NetShelter racks and allows for removal of the unit without disrupting the overhead power cabling, is available as an accessory.
2. Cable trough shall be constructed of 16 gauge cold rolled steel with a black powder finish.

R. BRIDGE DATA PARTITION

1. An overhead cable distribution, that sits between adjacent NetShelter racks and allows for removal of the unit without disrupting overhead cabling, is available as an accessory.
2. Data partition shall be constructed of 16-gauge cold rolled steel with a black powder finish.