TECHNICAL DATA

WF Beverly Hills
DHP-20
IOM

Air2O

an ICT Company

Air2O Intelligent cooling
an ICT Company

Contents

SAFETY PRECAUTIONS

This installation, operation and maintenance manual cannot cover every possibility, situation, or eventuality. Regular service, cleaning and maintenance of the equipment is necessary. If you are not capable of performing these tasks, hire a qualified service specialist. Failure to perform these duties can cause property damage and/or harm to the building occupants and will void the manufacturers' warranty. Please read the following safety precautions carefully. Failure to follow safety precautions could result in death or serious injuries.

Important: *Installation of equipment in corrosive, combustive or explosive environment is strictly prohibited (except some special projects). Do not use Oxygen, Acetylene, poisonous or any other gas that will cause explosion during equipment leak text*.

Warning*: Improper installation, adjustment, alteration, service, or maintenance can cause damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment. This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. Installation and maintenance should be performed by qualified personnel who are familiar with the product, local codes, and regulations. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances. The equipment must be installed according to local rules and regulations. Field-installed wiring must comply with local codes and regulations and must be carried out by qualified personnel. Power supply must comply with unit's name plate specifications. The unit must be GROUNDED to prevent possible hazards due to insulation failure. Disconnect all electric power before servicing job in order to prevent any electric shock or injuries caused by direct contact with moving parts.*

Caution: *Avoid direct contact with sharp edges and coil surfaces which are potential hazards for injuries. Ensure that the drainage piping is connected properly to prevent leakage of condensate water.*

Notice: *This manual should be returned to unit's designated place when installation is complete. This manual should be read carefully before installation. Unit installation and service should be performed by experienced technicians in accordance with manual's procedures to achieve normal and reliable unit operation. This manual does not cover all unit differences and problems that may arise during installation. Please contact our local sales office for further information and assistance. Warning and Caution will appear in proper section throughout this manual, which should be firmly conformed to ensure safety and better operation performance. We claim no liability for unqualified installation or service. The manufacturer reserves the right to revise any of the specifications and designs contained herein at any time without prior notification. Do not step on the top panel to avoid delamination occur during installation.*

CODES & STANDARDS

USA

a. The installation of this unit shall be in accordance with the latest edition of the National Electrical Code (ANSI/NFPA 70), State and Local Codes and in accordance with the local authorities having jurisdiction.
b. This unit shall be electrically grounded in accordance with the latest edition of the National Electrical Code (ANSI/NFPA 70), State and Local Codes and in accordance with the local authorities having jurisdiction.
c. If the unit has not been provided with an electric disconnect switch, one of adequate ampacity shall be installed in accordance with Article 430 of the National Electrical Code (ANSI/NFPA 70).
d. The installation of this unit shall be in accordance with the latest edition of the National Fuel Gas Code ANSI/Z223.1/NFPA 54, State and Local Codes and in accordance with the local authorities having jurisdiction.
e. In accordance with local authorities having jurisdiction or NFPA 54 an accessible approved manual shutoff valve shall be installed within 6 ft (1.8 m) of the valve train (gas manifold).
f. The installation of this unit shall be in accordance with the latest edition of the National Standard Plumbing Code (NSPC), State and Local Codes and in accordance with the local authorities having jurisdiction.
g. The installation of this unit shall be in accordance with all other National, State and Local Codes, and in accordance with the local authorities having jurisdiction.

CANADA

a. The installation of this unit shall be in accordance with the latest edition of the Canadian Electrical Code, Part 1 – C.S.A. Standard C22.1, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.
b. This unit shall be electrically grounded in accordance with the latest edition of the Canadian Electrical Code, Part 1 – C.S.A. Standard C22.1, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.
c. The installation of this unit shall be in accordance with the latest edition of the Canadian Natural Gas and Propane Installation Code, C.S.A. Standard B149.1, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.
d. In accordance with local authorities having jurisdiction or CSA. Standard B149.1 a readily accessible approved manual shut-off valve shall be installed in either the drop or riser as close as possible to the valve train (gas manifold).
e. The installation of this unit shall be in accordance with the latest edition of the National Plumbing Code of Canada, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.
f. The installation of this unit shall be in accordance with all other National, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.

ACCEPTANCE INSTRUCTIONS

Upon receipt of equipment a visual inspection should be made. Inspect protective covers for punctures or other signs that there may be internal damage. Remove protective covers and check for internal damage. Open access doors and check for internal damage. Close access doors when the inspection is complete. Replace covers if the unit is not being assembled or installed at this time. All units are pre-tested at the factory immediately prior to shipping and are ensured to be in good operating condition at that time. Details of any damage or short delivery should be endorsed by the driver delivering the equipment. No responsibility can be held for damage sustained during the unloading from the delivery vehicle or on the site thereafter.

Notice: *All claims for damage or short delivery should be advised to AIR2O COOLING LLC. in writing within five (5) days of receipt.*

Notice: *On receipt of the unit, check electrical characteristics (see rating plate) to make sure the unit voltage is compatible with that available for the unit. All parts for field installation are listed on order form.*

PARTS REPLACEMENTS

Any replacement part must be of equivalent listing or certification and be functionally equivalent. The replacement part must meet the original's specification in terms of functionality including certifications, timing, input and output range, accuracy, and operation.

Motors

a. Motor manufacturers have service centers that will repair or replace motors as required.

Parts Other Than Motors

a. Contact the nearest Engineered Air2O sales office or factory. Be sure to include Model Number, Serial Number, date of installation and nature of failure along with the description of the parts required. Some parts may not be stocked items that must be made or ordered.

Warning: *Failure to replace parts or components with equivalent parts can cause property damage, injury or death.*

STORAGE INSTRUCTIONS

FANS

Into Storage:

a. Record fan condition, fan nameplate and send a copy of record to Air2o.
b. All fan housings exposed to construction, dirty or wet environments should be wrapped in plastic with desiccant enclosed.

Removal From Storage/Preparation For Use:

a. Remove and discard plastic wrapping and desiccant enclosed, insure dryness.
b. Inspect fan structure for cracks or breaks.
c. Inspect and tighten all mounting bolts for fans, adjustable bases and motors.
d. (if applicable) Inspect vortex vanes for wear and ease of operation; lubricate as necessary.
e. (if applicable) Inspect condition of sheaves and belts. Tighten belts to proper tension.
f. Inspect motor bases for freedom of operation – lubrication, etc.
g. (if applicable) Inspect fan base isolation springs for adjustment.
h. Takes vibration readings to determine any out of balance condition. Report readings to Air2o for run approval.
i. Record fan condition, fan nameplate and send a copy of record to Air2o.

MOTORS

Into Storage:

a. Record motor condition, motor tag and send a copy of record to Air2o.
b. Wrap motor in plastic with desiccant enclosed to insure dryness.

Removal From Storage/Preparation For Use:

a. Remove and discard plastic wrapping and desiccant enclosed, insure dryness.
b. Record motor condition, motor tag and send a copy of record to Air2o.
c. Check if the electrical insulation of the motor is within specification. Insulation resistance of motor might be affected when it is not used for long period of time. Measure the resistance reading of motor insulation, the reading should exceed 2MO at 25°C.

PUMPS(If applicable)

Into Storage:

a. Record pump condition, pump tag and send a copy of record to Air2o.
b. Wrap pump in plastic with desiccant enclosed to insure dryness.

Removal From Storage/Preparation For Use:

a. Remove and discard plastic wrapping and desiccant enclosed, insure dryness.
b. Record pump condition, pump tag and send a copy of record to Air2o.

COILS

Into Storage:

a. All coils are pressure tested at Air2o factory, test results are logged.
b. If coils going into storage have been in use prior to storage, make sure coils are completely drained.

Removal From Storage/Preparation For Use:

a. Verify coils are still under pressure.
b. Physically inspect coils before using.
c. Verify vents and drains are closed.

FILTERS

Into Storage:

a. Take filters out of the unit carefully and wrap them in plastic with desiccant enclosed.

Removal From Storage/Preparation For Use:

a. Remove and discard plastic wrapping and desiccant enclosed, insure dryness.
b. Verify filters are still clean enough.

DESICCANT/ENTHALPY WHEEL(If applicable)

Into Storage:

a. Wheel normally comes inside of the unit.
b. Take the motor out and loose the belt around the wheel.
c. Pull the wheel out of the unit and wrap it up with desiccant enclosed to insure dryness.

Removal From Storage/Preparation for Use:

c. Remove and discard plastic wrapping and desiccant enclosed, insure dryness.
d. Inspect the condition of wheel.

RAINHOOD/DAMPER(if applicable)

Into Storage:

a. Rain hood/damper normally shipped with plastic wrapped up, store them in a cool and dry place.
b. Don't place heavy object on top of them.

Removal From Storage/Preparation for Use:

e. Remove and discard plastic wrapping and desiccant enclosed, insure dryness.
f. Verify filters are still clean enough.

ELECTRICAL PANEL

Into Storage:

a. Panel exposed to construction, dirty or wet environments should be wrapped in plastic with desiccant enclosed.

Removal From Storage/Preparation for Use:

a. Remove plastic wrapping.
b. Check contacts for corrosion.
c. Inspection by factory-authorized start-up or service technician is recommended.

WARRANTY

Warranties are void if equipment failures are caused due to owner's neglect and failure to follow these recommended storage procedures or any supplied equipment manufacturers applicable procedures that exceed those outlined here.

INSTALLATION INSTRUCTION

RECEIVING AND HANDLING

The air handling units are packaged for easy handling and storage on the job site. Upon delivery, inspect all components for possible shipping damage. See the Receiving Checklist below for detailedinstructions. Air2O recommends leaving units and accessories in their shipping packages/skids for protection and handling until installation.

Receiving Checklist

Complete the following checklist immediately after receiving unit shipment to detect possible shipping damage.

1. Inspect individual crates before accepting. Check for rattles, bent crates corners, or other visible indications of shipping damage.
2. If a unit appears damaged, inspect it immediately before accepting the shipment. Make specific notations concerning the damage on the freight bill. Do not refuse delivery.
3. Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Report concealed damage toAir2O within 5-days after delivery.
4. Do not move damaged material from the receiving location. It is the receiver's responsibility to provide reasonable evidencethat concealed damage did not occur after delivery.
5. Do not continue unpacking the shipment if it appears damaged. Retain all internal packing, cartons, and crate. Take photos of damaged material if possible.
6. Notify your Air2O representative of the damage and arrange for repair.

Storage

The Air2O unit(s) and its sections are intended for indoor storage. If indoor storage is not possible,Air2O recommends the following provisions for outdoor storage:

- Place the unit(s) on a dry surface; ensure adequate air circulation beneath unit and to assurethat no portion of the unit contacts standing water at any time.
- Cover the entire unit with a canvas tarp only. Do not use clear, black, or plastic tarps which may discolor or mar the surface of the unit.

RIGGING/JOIN/INSTALLATION INSTRUCTION

REQUIRED TOOL LIST TO RIG CUSTOM AIR HANDLING UNITS

a. Pinch bar for rigging
b. Chain for pulling the unit out of the container
c. Electric cords
d. Light for working inside air handling unit
e. Surveyor's level
f. Caulk gun
g. Heavy duty putty knife
h. Tape measure
i. Electric or pneumatic blind rivet tool, heavy duty capacity for pulling stainless steel rivets.
j. Electric or pneumatic impact wrenches
k. Socket for impact wrench (Metric)
l. Electric drivers with socket (Metric)

Important: *Only equipment bearing a CSA C22.2 No. 213 or UL 1604 rating plate (label) with an accompanying CSA Certification mark is suitable for installation in a hazardous location. The hazardous location must conform with the Class, Division, Group and temperature code (if shown) displayed on the rating plate (label). If not marked as noted above, the unit is not rated for hazardous locations and should not be installed in areas requiring any hazardous location rating.*

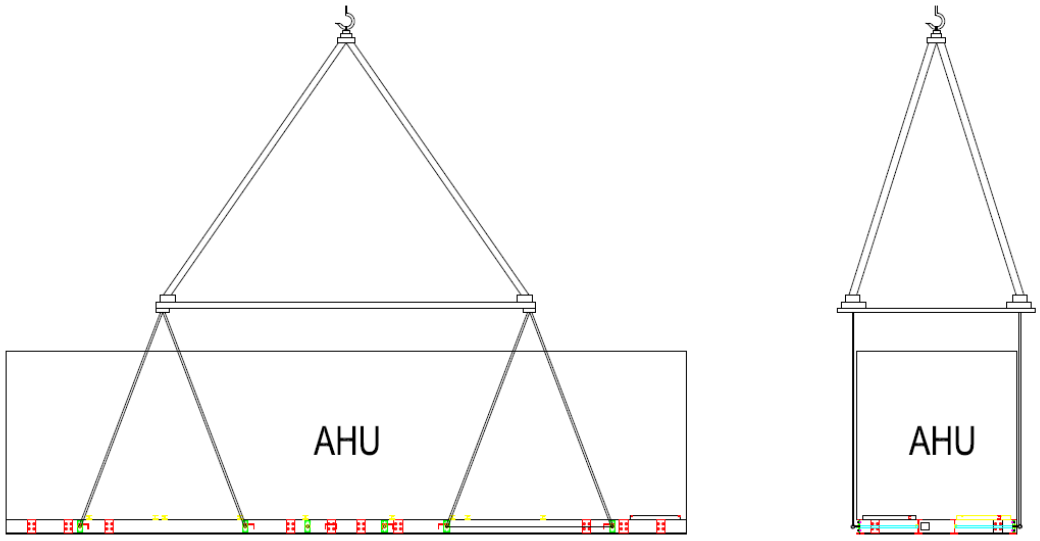
Note: *Installation shall be in accordance with this manual and all other associated component and control Installation, Operation and Maintenance Manuals.*

All wiring, piping and fuel line installation must be completed by qualified persons in accordance with all federal, state, provincial and/or local codes.

As required by the Canadian Electrical Code or the National Electrical Code. For Safety and Service, the minimum clearances must be observed.

UNIT RIGGING

a. Removable lifting lugs (16) are provided with each AHU.
b. Unit may not have equal weight distribution to all lifting points.
c. Care must be taken to adjust lifting sling or chains to avoid out of balance loads.
d. Spreader bars must be equal to or longer than the center distance between lifting points to avoid damage to side and edge of rig-able section.
e. All section doors both interior and exterior must be closed and latched prior to rigging to prevent racking of racking of doorjambs.



LIFTING BARS PROCEDURES

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Given the placement of internal components, the unit weight may be unevenly distributed with more weight in the compressor / coil area. Approximate unit weights are given in the Production Submittals. Prior to hoisting the unit into position, use a proper rigging method such as straps, slings, or spreader bars for protection and safety. Spreader bars must be sized to prevent lateral contact tothe sidewalls and roof cladding of the unit. Caution should be taken that door handles, electrical panels, gauges, hoods, etc. are not in the way of cables which could be broken, bent or damaged. Always test-lift the unit to determine the exact unit balance and stability before hoisting it to the installation location.

Larger Air2O air-handling units may be supplied with single-use lifting bars.

1. Ensure that the lifting lug / bolts and optional locking plate are removed from one-side of the lifting bar.

2. Slide the lifting bar into the opening in the subframe intended for that purpose.
3. After inserting the lifting bar, re-insert the lifting lug / bolts and locking plate in the correct position.

4. Position the lifting cables on the lifting bars. Evenly positioned spreader bars should be used between the lifting cables to prevent damage to the top of the unit and ensure that no excess pressure is applied to the side panels.

Notice: *There may be bottom mounted components, such as drain piping, that can be easily damaged.*

Warning: *Injury or death can result from improper rigging and lifting. Rigging and lifting of equipment must be performed by qualified personnel with proper equipment using appropriate and approved safety precautions.*

SETTING UNIT IN PLACE

a. Unit or unit sections must be set on level flat surfaces with no more than +/- ¼" variance over the length and width of the entire resting surface. If rigging onto steel supports each unit or unit sections must be supported at perimeter.
b. Remove and discard plastic shipping cover.
c. (If applicable) It is recommended for ease of joining to rig and set the heaviest section in to place first then adjust, pull, and set lighter weight sections.
d. (If applicable) On base rail find level adjuster and use it to level the unit sections.

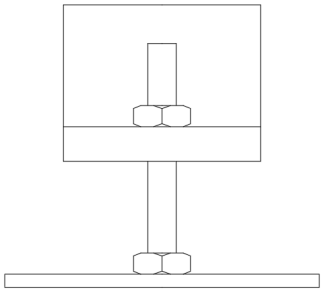


Figure 2 Level Adjuster

e. Shimming between unit and support structure may be required to level unit. Shim and grout perimeter between unit base and support structure every 6 ft and at all door jambs as needed.

JOINING UNIT SECTIONS (If applicable)

a. Pull unit sections together.
b. Check sealing rubber condition along the face of joining surface.
c. Align holes at the joining corner of each unit section.
d. When section base rail is flush and square, use hex head stainless bolt, flat washer locknut to fasten sections.

PREPARATION FOR UNITS WITH SITE ASSEMBLY

The Air2O units shipped in multiple sections shall be placed on a concrete slab, steel base frame or appropriate stiff steelwork for site assembly.

The foundation, steel base frame or steelwork have to be flat and leveled and they should be able to support the weight of the unit. To ensure proper unit operation, the assembled unit must be level (zero tolerance) in both horizontal axes. Failure to level the unit prior to assembly can result in deficient operation of the unit such as:

- Water infiltration and/or accumulation.
- Condensate drainage complications.
- Air infiltration and exfiltration throughout the unit.
- Service doors not sealing (gaskets).
- Higher vibration levels.
- Diminished system performance.
- Premature failure of components such as fans, drive motors and seals.

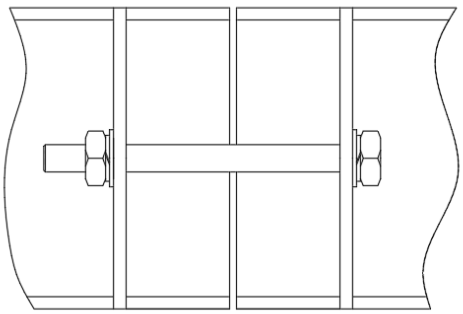


Figure 3 Base Rail Joint

INSTALLING PERIMETER FLASHING (If applicable)

a. Cut insulation to the proper length, set in place.
b. Cover with flashing. The flashing is designed to be a slip and attach fit.
c. Slide the flashing up to the edges around the bottom of the unit then fasten to the perimeter of the unit using rivets.

JOINING UNIT ELECTRICAL CONNECTIONS (If applicable)

a. Unit sections may have been partially wired during manufacturing. This wiring will need completed after unit sections are joined.
b. Ensure conduit passing through unit walls and casing and conduit passing from conditioned to unconditioned areas is sealed to prevent air and water migration.

Caution: *Improper sealing of conduits can cause condensation which can result in serious damage to electrical system through unsealed conduit.*

MOUNTING CONTROL PANEL ON UNIT EXTERIOR (If applicable)

a. Do not mount control panel or cabinet directly to unit panel skin.
b. Control panel or cabinet should be mounted at panel frame joints or strut extending between to panel frame joints.

Important: *Field-installed wirings must comply with local codes and regulations. Voltage tolerance should be kept at rated voltage ±10%. Electrical wiring system should be kept away from transformer system, as it will induce strong interference with electrical wiring system. Check if the main power supply matches the nameplate rating before installation takes place. Each air-conditioning unit should be equipped with independent electric supply furnished with circuit breaker. Unit must be GROUNDED correctly Field-installed wiring must be connected properly according to enclosed wiring diagram.*

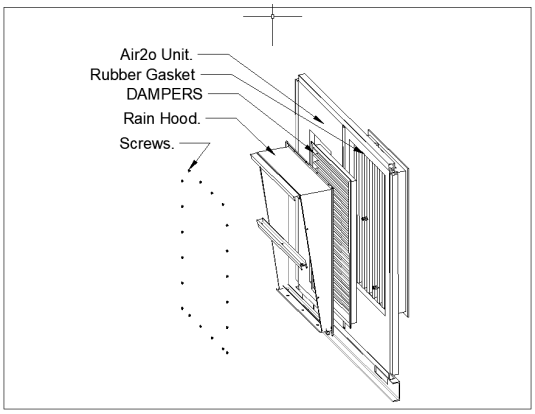
Caution: *DO NOT install anything that will interfere with equipment access or the rating plate. The unit must be electrically grounded, and all wiring must be installed in accordance with the National Electrical Code, ANSI/NFPA 70, and/or the Canadian Electric Code CSA 22-1 and to the approval of the authorities having jurisdiction.*

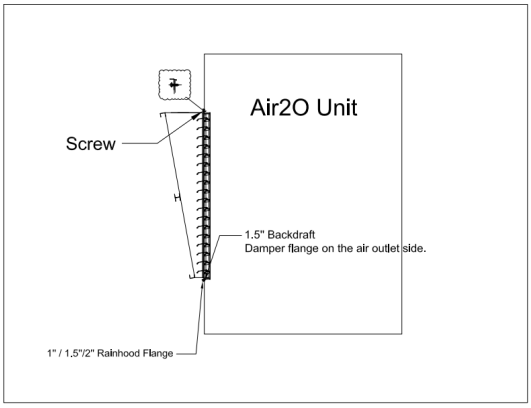
Do not cut or drill holes in the floor or use penetrating fasteners. Internal wiring diagrams are included in the control cabinet. The power requirements are indicated on the rating plate. Where field wiring of control circuits is required, take care to size the field wiring for a maximum 10% voltage drop.

No unspecified external load shall be added to the control transformer circuit(s) or to the main power circuit(s).

INSTALLING DAMPER (If applicable)

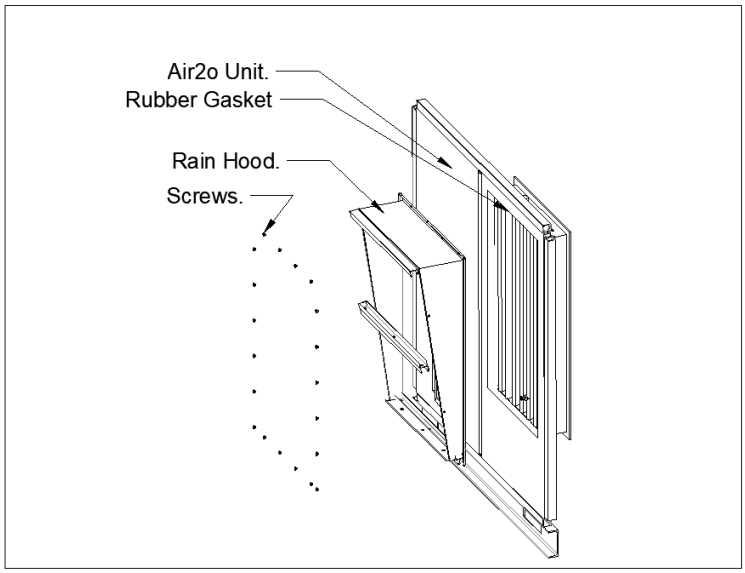
a. Take damper out of crates then remove and discard plastic cover on damper.
b. Mounting the damper on the corresponding opening. When the damper and opening are square, use self-taping screws or bolts to fasten the damper on the panel.
c. (if applicable) Installing damper actuator following the instruction of actuator installation.
d. If there are several dampers for only one opening, mounting them by following top to bottom sequence.





INSTALLING RAINHOOD (If applicable)

a. Take rainhood out of crates then remove and discard plastic cover on rainhood.
b. Mounting the rainhood on the corresponding opening. When the rainhood and opening are square, use self-taping screws or bolts to fasten the damper on the panel.
c. Sliding in the aluminum filters by following top to bottom sequence then use cap screws to lock them inside the rainhood.



INSTALLING RAINPROOF PANEL (If applicable)

a. Take panel sheets and bars out of crates.
b. Mounting each metal sheet piece next to each other correctly on top of the unit, ensure flange at the edge upward.
c. When the metal sheets are flush with the unit top panel, use C-shape bar clip the attached flanges of adjacent metal sheets.
d. Use self-taping screws to fasten them.

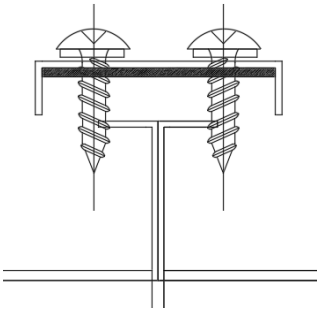


Figure 4 Rainproof panel fixation

INSTALLING WHEEL AND MOTOR (If applicable)

a. Push wheel inside of the unit, inspect and ensure the seal around the wheel.
b. Install the motor at the right place of wheel cassette, use screws fix it with the wheel frame.
c. Tight the drive belt on the wheel and motor. Ensure drive belt gears up with cog belt on the wheel.

INSTALLING WATER PIPE (If applicable)

a. Refer label on the outside panels of the unit to locate coil supply and return pipe connections. A wrench should be firmly held on coil connection when tightening connecting pipes so that the torque is not transmitted to the coil header and damage the coil connections. Tightening torque should not be greater than 250.SN.m (21kgf.m). Excessive torque may cause damage to the header. Unit should be equipped with control valves to regulate water flows when the unit is operating. If possible, provide flexible fitting in all piping connections, particularly adjacent to heating coils, to absorb expansion and contraction strains. Rigid piping connections can cause coil damage. The connecting joints must be sealed properly with no leakage.
b. Keep the water pipes clean and install filtration if necessary.
c. A vent should be installed at the top pipe plug on the highest header. Install a shut-off valve in the supply near the coil for drainage purpose. Strainer should be installed at water inlet.
d. Standard water temperature should not be lower than 5°C during cooling mode, and should not be greater than 80°C during heating mode (60°C is recommended). Coil anti-freeze protection

must be installed when chilled water is subjected to temperature of 0°C or lower. Also, it is recommended to completely drain the water in the coil if it is not in use.

COIL CONDENSATE DRAIN TRAP DETAIL (If applicable)

Cooling coils must be properly trapped. Lack of a proper trap will admit air into the bottom of the condensate drain pan preventing draining of the pan. As water builds up, the entering air will blow water out of the drain pan. The trap must be at least 8" deep with a 4" high drain leg (see figure 5). On units with positive pressure blow-through coils, the trap dimensions must be reversed.

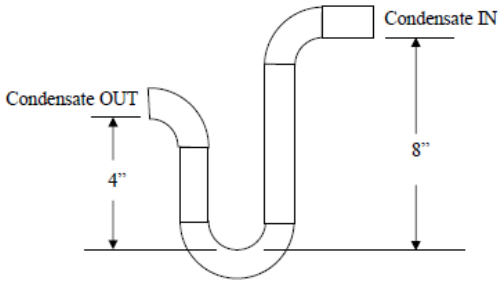
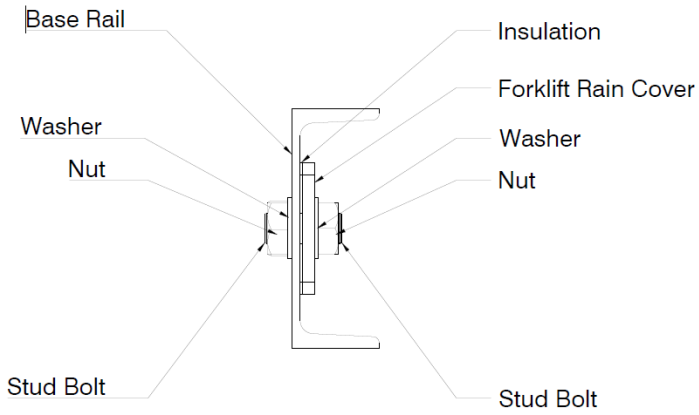
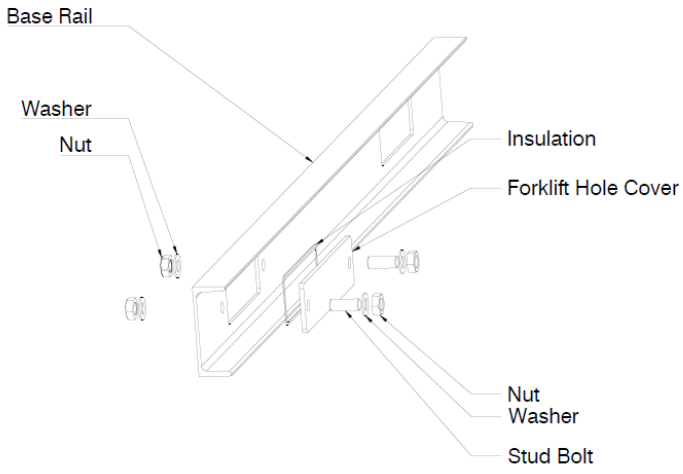


Figure 5 Example of P-Trap

INSTALLING FORKLIFT HOLES COVER (If applicable).

a. Put the forklift holes cover at the designed place
b. Mark the position which you need to make screw holes at the base rail
c. Drill the 2 required holes with the right Dia. for the screws.
d. Put the back nuts inline with the hole and fasten the stud bolt.
e. Fix the forklift hole cover over the 2 bolts and use Silicon insulation between the cover and the base rail.
f. Fasten other 2 washers and nuts over the forklift hole cover tightly.





INSTALLING OF SMOKE DETECTOR (If applicable).

Location Requirements:

This guideline contains general information on duct smoke detector installation, but does not preclude the NFPA and/or ICC documents listed. Air Products and Controls assumes no responsibility for improperly installed duct detectors. To determine the correct installation position for an SL-2000 Series duct smoke detector, the following factors must be considered.

1. A uniform non-turbulent (laminar) airflow between 100 ft/min. to 4,000 ft/min. must be present in the HVAC duct. To determine duct velocities, examine the engineering specifications that define the expected velocities or use an Alnor model 6000AP velocity meter (or equivalent).

2. To minimize the impact of air turbulence and stratification on performance, a duct smoke detector should be located as far as possible downstream from any obstruction (i.e. deflector plates, elbows, dampers, etc.). In all situations, confirmation of velocity and pressure differential within specifications is required.

3. The pressure differential between the input sampling (high pressure) tube and exhaust (low pressure) tube for the SL-2000 Series smoke duct detector should be greater than 0.01 inches of water and less than 1.2 inches of water.

4. Identify a code compliant location (supply or return side, or both) for the installation of the duct unit that will permit easy access for viewing and serviceability.

5. When installing on the return side, install duct units prior to the air being exhausted from the building or diluted with outside “fresh” air.

6. When installing duct smoke units downstream of filters, fires occurring in the filters will be detected, but if the filters become blocked, insufficient air flow through the duct unit will prevent the correct operation of the duct detector. Duct units installed in the supply air side may monitor upstream equipment and/or filters.

7. Where possible, install duct detectors upstream of air humidifiers and downstream of dehumidifiers.

8. To prevent false alarms, the duct detector should not be mounted in areas of extreme high or low temperatures, in areas where high humidity exists, or in areas where the duct may contain gases or excessive dust.

SAMOLING TUBE ASSEMBLY:

The SL-2000 Series duct smoke detectors employ a specially notched sampling tube, which must be ordered separately in one of four standard lengths or packaged as FAST Tubes.

STN-1.0 For duct widths of 6" TO 1.0'

STN-2.5 For duct widths of 1.0' TO 3.0'

STN-5.0 For duct widths of 3.0' TO 5.0'

STN-10.0 For duct widths of 5.0' TO 10.0'

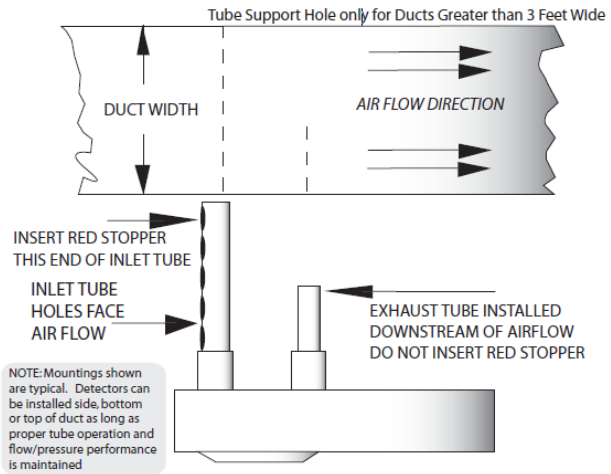
FAST TUBE Sectional tube for duct widths up to 8.0'

Standard sampling tubes are steel tubes with air intake holes drilled the entire length of the tube. FAST Tubes are a recognized plastic with an open slot along the length. These tubes can be cut to length and must span at least 80% of the duct width (spanning the entire width is suggested). Sampling tubes over 3ft must be supported on the opposite side of the duct. To ensure correct operation of the sampling tube, the red end cap (red stopper in installation kit) must be inserted in the end of the air intake. For custom duct widths, always use the next longest standard size and cut down to the exact requirement.

NO-TOOLS TUBE INSTALLATION:

The SL-2000 Series duct smoke detector provides a unique, patented mechanism for installation and/or removal of the sampling and exhaust tubes from either the front or rear of the detector housing.

Once the airflow direction has been determined, insert the inlet and exhaust tubes into the duct smoke detector. If the cover is in place, the tubes may be inserted into the back of the detector via the key-slots provided. Simply push the tube into place against the spring-loaded retainer, and turn into the correct position, allowing the key to "lock" the tube in the desired orientation. For front side installation, simply rotate the tube retainer until the tube may be inserted and oriented properly. Once the tube is installed, rotate the retainer back into place to lock down the tube. Ensure air intake sampling tube is positioned so that the inlet holes (or FAST Tube slot) are directly facing the airflow.



DUCT PREPARATION:

Remove mounting template from the installation kit. Remove paper backing from the mounting template and affix it to the duct at the desired location. Using the template as a guide, drill (2) mounting holes, 3/32" (2.5mm) for the #12 X" sheet metal screws packaged in the installation kit. Drill or punch (2) 1" (32mm) holes for inlet sampling and exhaust tubes, using the template as a guide. Clean all holes.

MOUNTING:

After securing the sampling and exhaust tubes to the duct smoke unit, (or initially placing the tubes through the 1" holes drilled or punched in the HVAC duct to accept the inlet sampling and exhaust tubes and then attaching them to the duct unit), hold the duct unit assembly in position and use (2) # 12 X" sheet metal screws (packaged in the installation kit) to secure the duct smoke detector to the HVAC duct sheet metal.

INSTALL GAS BURNER HIGH LIMIT SWITCH

1. Test the limit switch using a multimeter
2. If the switch has continuity the switch will show zero Ohms
3. If the switch is open or faulty the multimeter will show infinite resistance.
4. Install the new limit switch and secure it into space
5. Connect the wires

Caution: *the switch should be installed 5' away from the heater to have accurate measurement*

AHU START-UP INSTRUCTIONS

AHU START-UP CHECKLISTS

The following are recommended to be completed prior to performing start-up:

g. Unit has been installed according to manufacturer's specifications, local codes and regulations.
h. Duct runs completed and open, not capped off.
i. (if applicable) Terminal boxes cut in and operative.
j. Outside and return air ducts and openings completed.
k. Dampers have been installed and adjusted according to design specifications.
l. Dampers for the above opened and are operable.
m. Wiring completed – motors, filters, lighting and electrical portion of the controls.
n. Power supply is in accordance with the nameplate ratings.
o. Field-installed wiring is according to manufacturer's wiring diagram.
p. Field wiring and protection device are correctly sized and installed.
q. (if applicable) Proper fuses and starter heaters installed.
r. Main power source been connected and checked out.
s. Piping completed to associated water system.
t. Filters and filter clips are properly installed.
u. Air filters installed should be clean and not damaged. Install nylon filters before the prefilter to make sure dust or dirt from the ducting does not contaminate the filter material. Medium and high efficiency filters (HEPA) should only be installed after the unit.
v. commissioning is completed.
w. The condensate drains are properly trapped and piped.
x. (if applicable) Proper mix of heat transfer fluid has been added to prevent freezing in closed system application.
y. (if applicable) Air trapped in water circuit has been released by using air vent.
z. Blowers are free to turn, filters are properly installed.

aa. Unit is serviceable. (Sufficient clearance space has been provided)
bb. The air handling units are cleaned out; cleared of all trades material and equipment.

Air2O recommends the following trades people at the jobsite at the time of start-up: Electrician, Temperature Control Technician, and AHU installation personnel.

Caution: *This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.*

AHU START-UP PROCEDURES

a. Set all associated electrical switches, controls, thermostats and main disconnect switch to "OFF" position.
b. Close all manual valves and field piping valves.
c. Confirm that all shipping materials have been removed. See any supplemental instructions shipped with the unit to help identify possible locations.
d. Inspect all electrical wiring, both field and factory installed, for loose connections. Make sure they are 100% complete before energizing.
e. Turn disconnect switch ON (control is still off) and check the supply voltage. Voltage must be within 10% of rating plate. If not, contact the installing electrical contractor and have the voltage condition corrected before continuing start-up.
f. Check all fan motors and wheel motors for correct rotation. If incorrect, reverse rotation on incoming power only. Check the amperage draw of each motor. Refer to unit or motor rating plate for full load amps. At the unit, check and record the voltage while it is running. For 3 phase power the phase to phase voltage imbalance should be less than 2%. A 2% voltage imbalance can cause up to a 10% current imbalance that will overheat motor windings. If voltage imbalance is greater than two percent (2%), turn off main disconnect and contact the installing electrical contractor to have the voltage condition corrected.
    - (Stop the unit immediately if any unusual vibration or noise occurs)
    - If the vibration continues after all the pre checks above have been re done, lower the unit speed by approximately 10% to determine if a natural frequency is causing the vibration. Unit water coil should be filled with water when this check is carried out(if applicable).
g. Enable heating and/or cooling; refer to unit function for correct sequence and operation.
h. Confirm field wiring voltage drop is less than 10% when equipment is operating.
i. For the unit to operate properly a system air balance must be performed to ensure correct air flow. Failure to do so can damage the equipment and/or building and can be a cause of poor indoor air quality.
j. Take a pressure profile of entire air handling unit at full volume and record on a skeleton drawing of the air handler. Compare total, external, and internal pressures to those noted on the unit notes.

k. Shut down the equipment after 24 hours of satisfactory operation. Re-check all set screws, bolts, etc... and tighten where necessary.
l. Date, compile and send recorded data, pressure profile, start-up checklist, and total volume CFM (if available), to Air2O for our records.

AHU OPERATION

a. This unit may incorporate one or more functions and a variety of controls and options to suit individual requirements. Carefully check your wiring diagram to verify that all remote controls are properly located and correctly field wired.
b. Some equipment may contain programmable unitary controllers or programmable logic controllers (PLC). Additional information can be obtained from the specific programmable control manufacturer. Often this information is available from the control manufacturer's website.

GENERAL UNIT MAINTENANCE

The following is the recommended procedure for general maintenance of an Air2O custom AHU.

AHU GENERAL

a. **Check all casing penetrations** (piping, electrical, etc.) insure they remain properly sealed. This is especially important if any work was done on the piping or electrical system that may have affected the penetration seals. Check for damaged or loose skins that may need repaired or replaced.

b. **Check all doors** to be sure the door handles are not bent, broken or missing and are adjusted so the doors seal tightly and uniformly around the entire frame. Check door hinges and replace them if they are sprung or severely worn. Make sure door restraints (when required) are in place and in good working order. Check the windows (if applicable) for cracks or leaks. Replace broken of fogged windows. Clear the door jamb of any dirt or debris. Check the door gasket for tears, deterioration, looseness and contact integrity. New gasket, windows and handles can be purchased from Air Enterprises. Please specify door thickness when ordering door gasket of door handles - and window size and type when ordering windows.

c. **Pan sections** have auxiliary drains for removal of water that may collect as a result of coil cleaning of housekeeping processes. The drain caps should remain on until such time that draining is required. Make sure all drains are clear of debris. Inspect inside the unit compartments and clean as required. Inspect for mold growth in areas of high humidity. If evidence of molds are present, consult an industrial hygienist for proper clean up methods that fit your application. Painted steel pans may require de-scaling, cleaning and painting.

d. **If maintaining an operating system**, check the following items before turning the system off. Record the filter bank pressure drops, look at the fan operation, the damper positions, the condensate coming off of the chilled water or DX coils, and the unit operations in general. Listen to the sound of the fan, motor and belts as an assembly for any noises. Listen for air leaks. Feel the outside of the air handling unit and the fan assembly, if possible, for unusual of alarming vibrations. Record unusual findings. Check all of these conditions after the maintenance has been completed and compare them to your original findings.

Caution: *Servicing and maintenance works shall only be carried out when power supply is switched off. Label all wires prior to removal when servicing controls or critical components. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.*

Warning: *Maintenance must be carried out by qualified personnel who are fully aware of safety regulation and local codes and regulations.*

FAN SECTION

a. **Before entering the fan compartment**, make sure the fan is de-energized and the fan disconnect is locked out to disable the fan motor from being energized during service. Verify that the fan rotation is correct during coast down. After ensuring that the fan has come to a complete stop, enter the fan compartment and perform initial visual inspection of the entire fan assembly - looking for any signs of abnormality.

b. **Check all structural components**. Check for tightness on all fan assembly bolts and bolts used to fasten components such as the fan, vibration isolators, and motor of devices to the fan base. Check metallic components for corrosion, cracks of signs of fatigue or stress. If an inertia base is supplied, check the concrete for structural integrity.

c. **Inspect the fan shaft (if applicable) and wheel**. Look for signs of corrosion, stress, cracks or fatigue. Check the wheel set screws for tightness. Clean any dirt or water from the fan scroll.

d. **(if applicable) Bearing inspection**. Observe the general condition of the bearing and grease. Make sure the lock ring is tight and a tab for holding the lock ring is in place. Make sure the aluminum seal rings are rotating freely and are not rubbing the cast housing. Make sure one of the bearings has a stabilizer ring installed. If the fan is to be reused, bearings should be replaced if they have more than 5000 operating hours. Check the O&M manual for frequency of lubrication guidelines.

MOTORS

a. **All Motors must be free of oil, dust, dirt, water and chemicals.** Verify that the motor leads have no voltage applied to them. Measure the insulation resistance value with a megaohmeter and log this data for future reference and to use as a base line to evaluate winding insulation condition as part of your inspection. Evaluate the motor life expectancy and efficiency to determine if replacement is warranted.

COILS

a. **Visually inspect coil fins, coil tubes, and return bends** for signs of corrosion and or deterioration. Look for signs of leaks. Check the piping, be sure that it is properly secured so it does not put undue strain on the coil connections. Check the piping where it penetrates the unit casing to see that it is properly sealed. Coil fins must be clean to maximize coil performance and keep the air pressure drop within 110% of the original pressure drop. Dirty or soiled fins can provide an environment for odor and bacteria to grow and be spread throughout the air handling system. Replace coils which have rusted out steel casings, deteriorated fins, excessive internal water pressure drops or excessive air pressure drop.

b. **Cooling coil drain pans** should be cleaned of any foreign matters that may plug the condensate drain. Verify that the condensate drain connections drain connections are open for free water flow. New positive draining coil pans are available. Inspect aluminum drain pans for corrosion or pitting.

c. **If steam coils have been supplied**, make sure the condensate trap is properly installed. Check for steam and condensate leaks. Check the trap to be sure that it is opening properly and that the condensate does not leak through it is closed.

d. **Coil removal** is usually done through a panel, but sometimes is through the access doors. If coils are to be changed out, make sure access is available.

e. **Coils Check List:**
   - Inspect coil fins, tubes and bends
   - Look for leaks
   - Verify piping penetration seals
   - Clean coils, if required
   - Clean drain pan of debris
   - Check coil freeze protection
   - Check steam traps
   - Check control valves, operation and calibration

Caution: *Dirty coils can be a cause of poor air quality. Failure to maintain clean coils can cause injury or death, damage to the equipment, or property or system operational problems. Moisture carry over can result from dirty coils.*

FILTERS

a. **The universal galvanized holding frames** are supplied with filter clips.
b. **Filter clips** must remain in good working condition in the quantity recommended by the manufacturer.
c. **A magnehelic gage** been installed to measure the pressure drop across the filter bank. The magnehelic gage requires minimal maintenance. Occasionally check and zero the pointer by setting the plastic valves to vent and adjusting the zero screw on the bottom of the face plate. Be sure to set plastic valves back to line when completed. Check all tubing connections for tightness. Check the gage cover to be sure it is securely in place and air tight. Check the tubing ends and be sure they are not plugged and remain perpendicular to the air flow. The pressure drop reading on the magnehelic is a pressure made up of the final filter pressure drops.

d. **Filter Check List:**
   - Replace filters, as required
   - Replace missing filter clips
   - Zero magnehelic gage

DESICCANT/ENTHALPY WHEEL(if applicable)

a. **The face of the wheel** should be checked to ensure no apparent dirt or debris, or damage to wheel faces from loose matter within the consumer's air handling unit.
b. **Check the pressure detector** for the pressure drop. If the pressure drop excess the design pressure by 10%, then there might be some dirt and dust buildup inside the corrugated flow channels and need to be cleaned out.
c. **Recoat the face flanges** of the wheel with lubricant.

ELECTRICAL PANEL

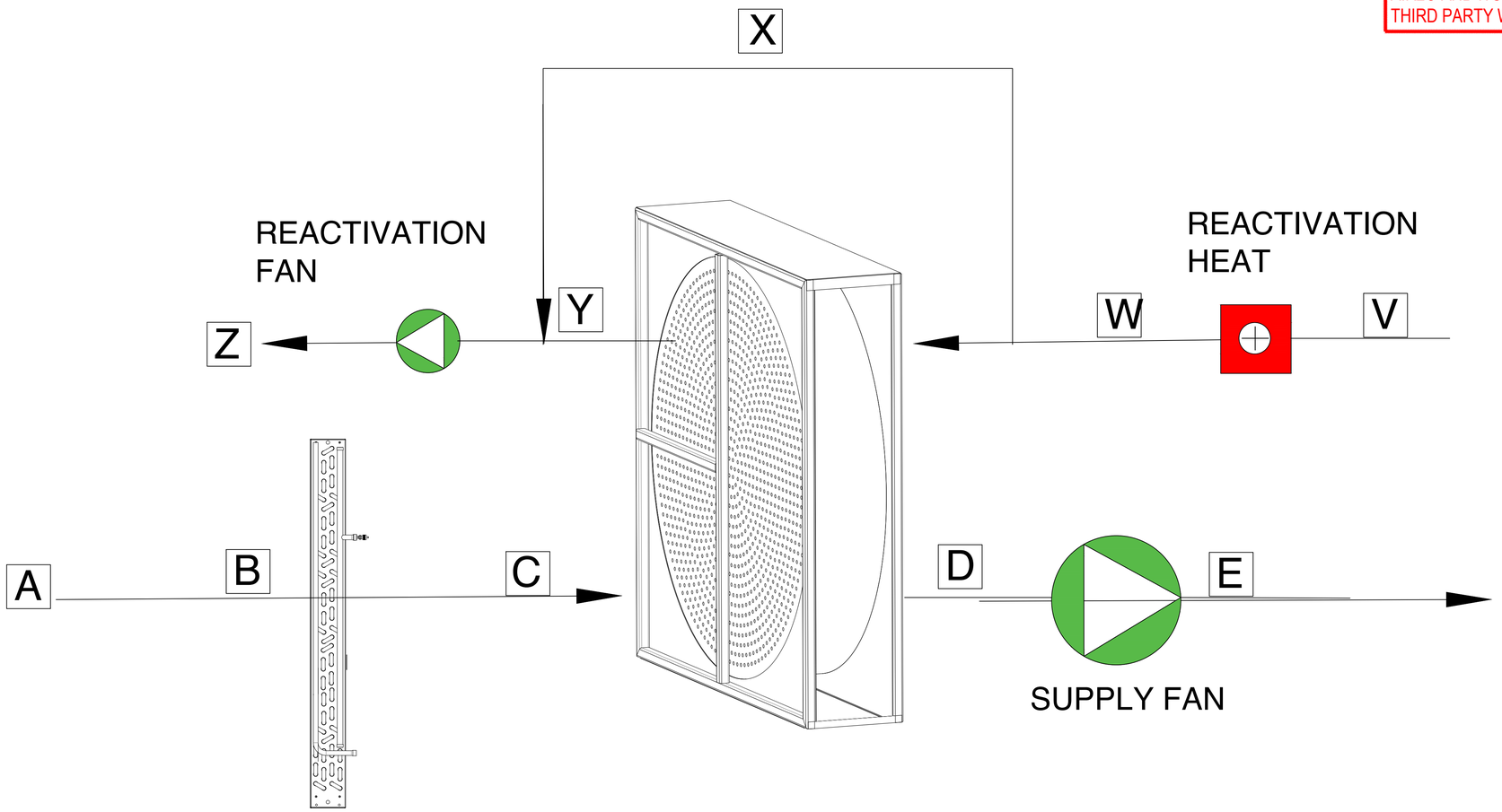
a. **Two weeks after startup**, all electrical connections to contactors, terminals and main power lugs should be checked and tightened. These should be checked monthly for the first four months and twice per season thereafter.
b. **Electrical Panel Check List:**
   - Check all wiring for loose connections.
   - Check voltage at unit (while in operation).
   - Check amperage draw against unit rating plate.
   - Where possible, all contactors should be inspected to ensure that contacts are clean and are making good contact. If contacts are abnormally pitted or burned badly, replace contactor. Single phasing and motor burnouts can result from bad contacts.

Caution: *This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.*

ANNEX DOCUMENTATION

Data Sheet	DHP-20		
DESCRIPTION			
General Characteristics	Dehumidification		
VOLUME			
CFM	2400		
DIMENSIONS			
Outer Shell	2'' Double Polyurethane foam	R Value	25.8
Length	127.75		Inches
Width	51		Inches
Height	68		Inches
Weight	3215		Ib
CONNECTIONS			
Electric Conduit	1 ½"		
Drain	1 ¼"		
SUPPLY FAN			
Type	ZA Backward Curved Direct Drive		
Quantity	1		
Airflow Volume	2400		CFM
Actual Power	1.402		kW
Nominal Power	2.5		kW
Speed	EC Motor		
External Static Pressure	0.25		In.Wc
Total Static Pressure	2.83		In.Wc
REACTIVATION FAN			
Type	ZA Backward Curved Direct Drive		
Quantity	2		
Airflow Volume	2 x 3250		CFM
Actual Power	2.924		kW
Nominal Power	3.6		kW
Speed	EC Motor		
External Static Pressure	0		In.Wc
Total Static Pressure	3		In.Wc
PRE-COOLING COIL	Direct Expansion Coil		
Type	Finned and Tube Heat Exchanger	6 Rows	12 FPI
Quantity	1		
Capacity	139.9		MBH
Coating	Baked Phenolic Epoxy		
Air PD	0.75		In.Wc
Split	2 Circuit Intertwined		
PRE-CONDENSER COIL	Condenser		
Type	Finned and Tube Heat Exchanger	6 Rows	12 FPI
Quantity	1		
Capacity	184		MBH
Coating	Baked Phenolic Epoxy		
Air PD	1.05		In.Wc
Split	N/A		

PRE-COMPRESSOR		
Type	Scroll	
Quantity	2	
Capacity	2 x 6.08	TR
Power	2 x 6.37	Kw
DESICCANT WHEEL		
Size	1050	mm
Thickness	200	mm
Power	69	Watt
FILTER		
Process	MERV13	
Reactivation	MERV8	
POWER REQUIREMENT		
RLA	**32**	
Actual Power	**20.99**	**Kw**
Nominal Power	**23.44**	**Kw**
VOLTAGE / PHASE / FREQUENCY	**460 / 3 / 60**	
FLA / MCA / MOCP	**36/38/40**	



PRE COOLING COIL/
CONDENSER COIL (WINTER)

		A	B	C	D	E	V	W	X	Y	Z
Summer	CFM	2400	2400	2400	2400	2400	6500	6500	4100	2400	6500
	DB (°F)	77.1	77.1	51.6	74.4	76.4	77.1	118	118	95	109.47
	GR-LB	100.2	100.2	56.9	30.1	30.1	100.2	100.2	100.2	126	109.73
Winter	CFM	2400	2400	2400	2400	2400					
	DB (°F)	44.9	44.9	115.5	115.5	117					

Rev	Date	Revision	Drawn
			MSH

Air$_2$O Intelligent cooling

PROJECT
DHP-20 : WF BEVERLY ILLS

Engineer AYA H. Date 11/21/2020 Status
Signed
Contract -

Drawn By AYA H. Date 11/21/2020
Title
Air$_2$O__TECH_DRAWING_01

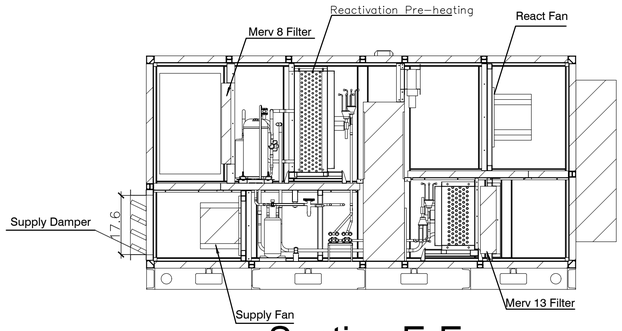
Checked By Date
Signed

Scale @ A1
NTS

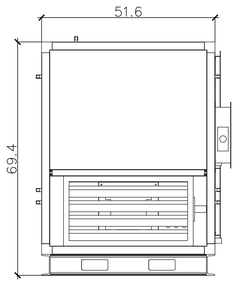
Drawing No.
Revision 01

Rev. -

Drawing No. -



Section E-E



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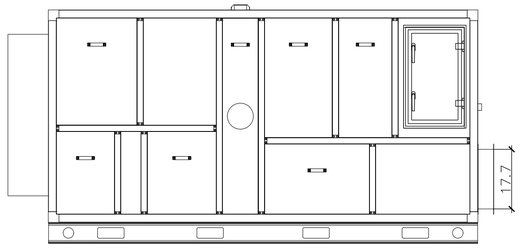
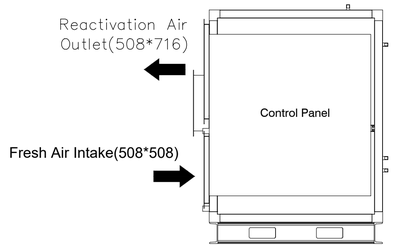
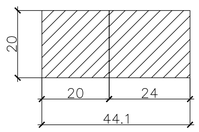


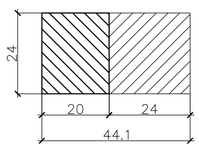
Section C-C



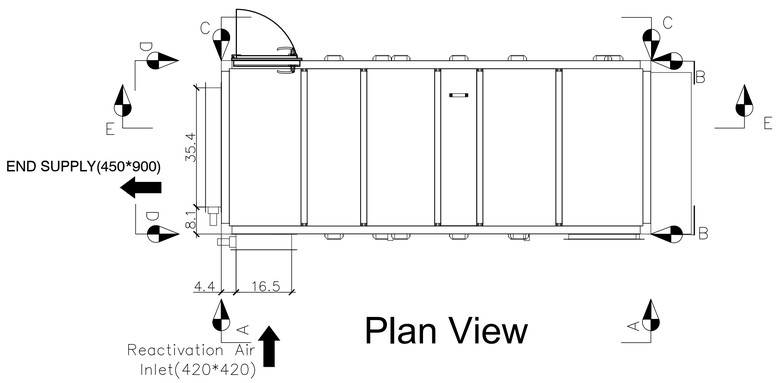
Section B-B



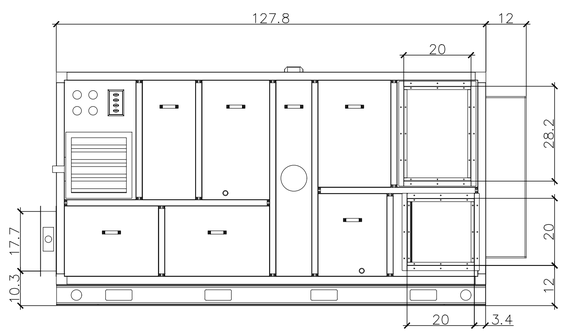
Merv13 Filter



Merv8 Filter



Plan View



Section A-A

Rev	Date	Revision	Drawn	M.SH

Air2O Intelligent cooling

Client
EI Solutions,
4621 Louis B. Mayer Laval, Québec H7P 6G5 Canada

Project
WFM_Beverly Hills-DHP-20

Engineer: M.Shoukry
Date: 04/21/2021

Title
AIR2O-BEVERLY-HILLS-ASBUILT-DRAWING

Checked By: OMAR.Y
Date:

Signed

Scale
NTS

Drawings No.
04212021/M.SH/00

Revision
00

ProFlute
Technology leader

Company:
Project:

26 February 2021

Project Info:

Configuration		
Rotor Media	PPS	
Sector Layout	L180/180	
Rotor Diameter	1050	mm
Rotor Depth	200	mm
Rotor Speed	8	rph
Press/Alt	30	in Hg
Heater kW	30.6	kW

Results		
Moisture Removal	41.2	lb/hr
Moisture Balance	0.9856	
Temperature Balance	0.97934	
Efficiency	0.745	kW/kg
Safety Factor	5	%
RecID: 357911		

Wet Air

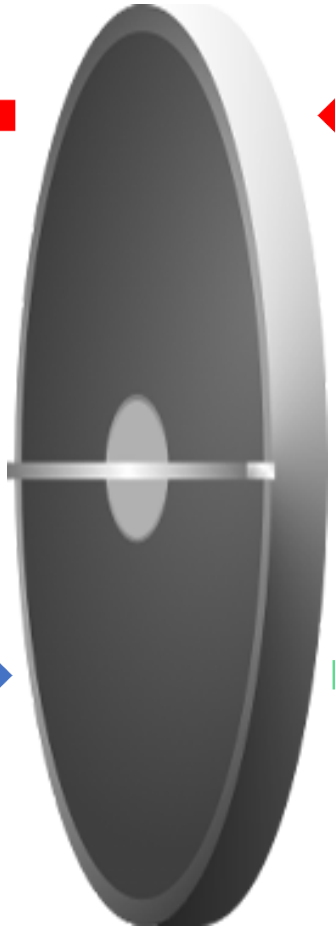
Temp	95 °F
Moist	126 gr/lb
RH	51.1 %
P Loss	0.948 'WC

Reactivation

Temp	118 °F
Moist	100 gr/lb
RH	20.8 %
VFlow	2400 SCFM
MFlow	531 SFPM
Size	180

Reactivation

Temp	77.1 °F
Moist	100 gr/lb
RH	71.3 %
VFlow	2400 SCFM



Process

Temp	51.6 °F
Moist	56.9 gr/lb
RH	100 %
VFlow	2400 SCFM
MFlow	531 SFPM
Size	180

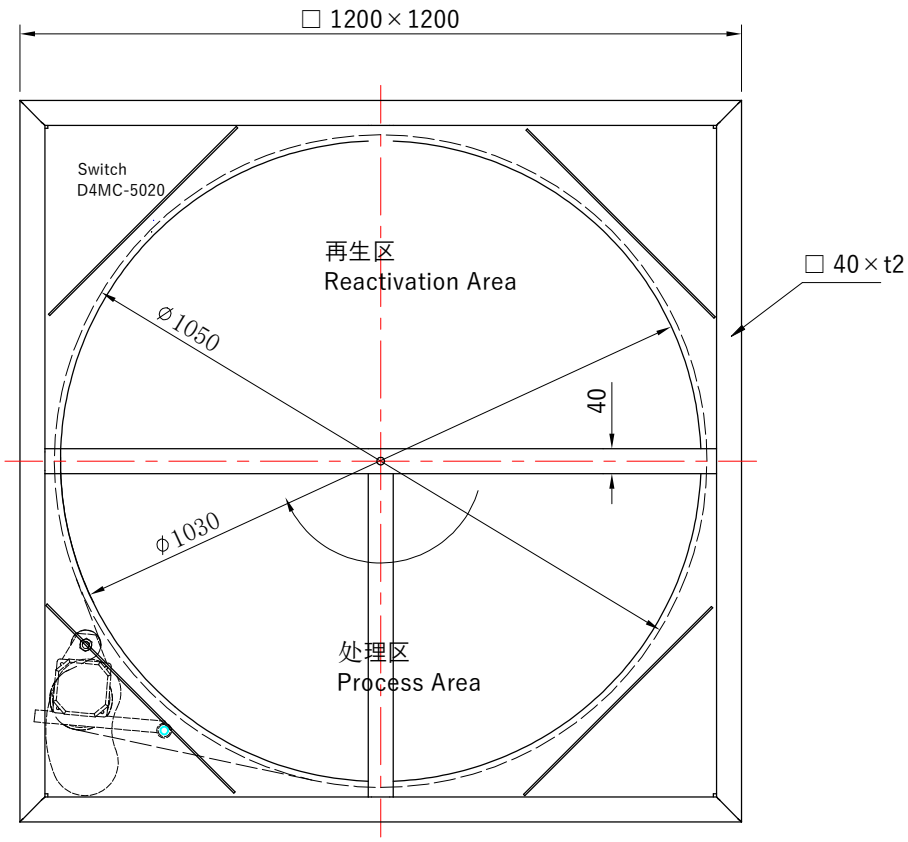
Dry Air

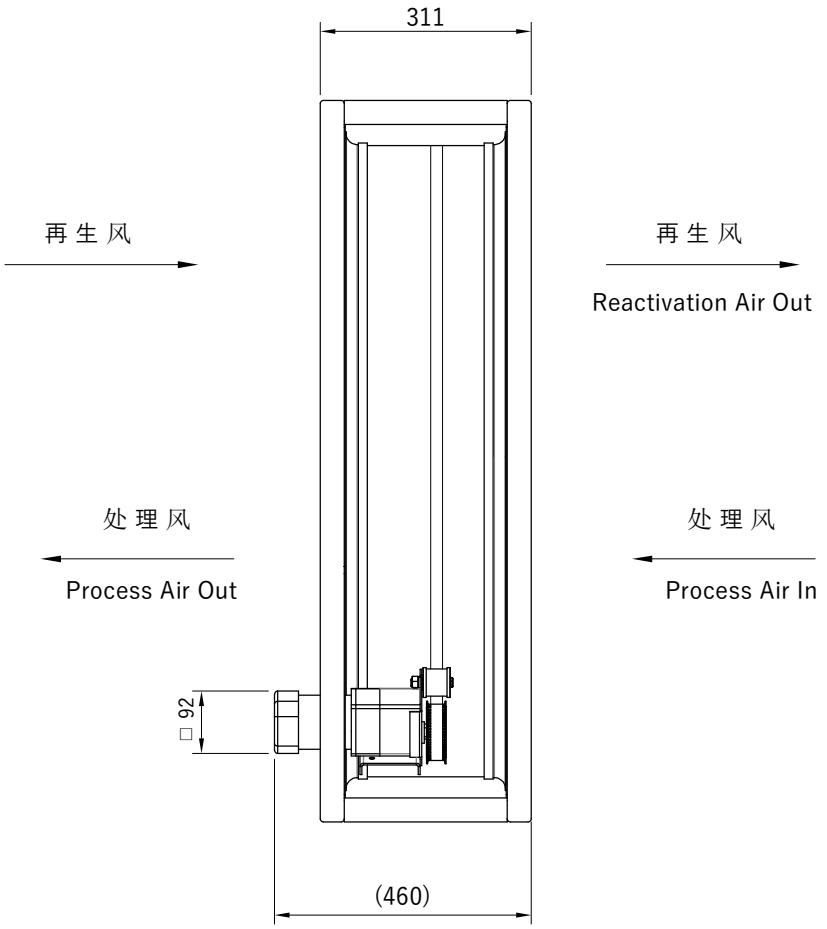
Temp	74.4 °F
Moist	30.1 gr/lb
RH	23.9 %
DPTemp	35.2 °F
P Loss	0.83 'WC

ProCalc performance predictions are for the rotor only.
Apply appropriate safety factors for the construction of the unit and it's application.

ProFlute AB, Box 1155, SE-16426 Kista, Sweden, Tel: +46 73 912 1600, info@proflute.se

其余 25





Part,No	Motor	Rev	Belt	Pulley
B9040073-1050X200	90W 1:750 460V/3/60Hz-UL	8 RPH	20T10-3510	20-T10-25(Φ15/5)

REV NO处数	CHANGE DESCRIPTION更改内容描述	DRAWN制图	CHECKED校对	APPROVED批准
-	-	-	-	-

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
除非特别指明，标示尺寸单位为毫米
TOLERANCES ON 下列通用公差要求

0 < DIM <= 30	± 1.0
30 < DIM <= 120	± 1.5
120 < DIM <= 400	± 2.5
400 < DIM <= 1000	± 4.0
1000 < DIM <= 2000	± 6.0
2000 < DIM <= 4000	± 8.0

ANGLE角度 ±
SURFACE FINISH表面状态
BREAK AND DEBURR ALL SHARP EDGES
去除所有毛刺和锐边
FIRST ANGLE PROJECTION 第一角视图

	APPROVALS批准	DATE日期
DWN制图	Yulei.wang	2020/12/26
CHK校对	—	—
APPD批准	—	—
MATERIAL材料		
FINISH / HEAT TREAT表面处理		

SAT www.sat.net.cn
江阴三特空气处理设备有限公司
Jiangyin SAT Air Treatment Equipment Co.,Ltd

TITLE名称: 1050X200(180+180)
DWG NO图号: B9040073
REV版本: A
SCALE比例: 1:1
SHEET页数: 1 OF 1

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

JOB SUMMARY

DHP-40
, USA

Selection Summary

Tag	Comment	Model	Quantity
Cooling Coil		DX12C06S12-20x40.25-RH	1

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DATA

DHP-40
PrecisionCoils Coil Cooling Coil

Direct Expansion Coil

Tag	Qty	Model	Footnotes	Comment
Cooling Coil	1	DX12C06S12-20x40.25-RH	a,b	

Construction and Performance Details

Tag	Cooling Coil
Air flow (SCFM)	2400
Altitude (ft)	0
Total capacity (MBH)	139.9
Sensible capacity (MBH)	66.8
Entering dry bulb (°F)	77.1
Entering wet bulb (°F)	70.2
Leaving dry bulb (°F)	51.9
Leaving wet bulb (°F)	51.8
Face velocity (ft/min)	429
Air pressure drop (in of water)	0.75
Air fouling factor (h·ft²·°F/Btu)	0.00000
Min. fin surface temp. (°F)	48.3
Refrigerant	R-410A
Suction temp. (°F)	45.0
Superheat (°F)	20.0
Liquid temp. (°F)	125.0
Design condensing temp. (°F)	125.0
Ref. mass flow (lb/h)	2198.9
Ref. velocity (ft/s)	32.52
Ref. pressure drop (psi)	8.97
Coils per bank	1
Coil type	1/2
Fin height (in)	20.0
Fin length (in)	40.3
Face area (ft²)	5.59
Rows	6
Fin spacing (fins/in)	12
Fin material	Al
Fin type	Cor.
Fin thickness (in)	0.006
Tube wall thickness (in)	0.016
Number of feeds	6
Return conn. size (in)	1.125
Weight (lb)	106
Est. internal volume (ft³)	0.47
Entering saturated ref. temp. (°F)	48.5

Footnotes

(a) Coil is NOT certified by AHRI.
(b) Tube OD 0.500, Tube spacing 1.250 x 1.082

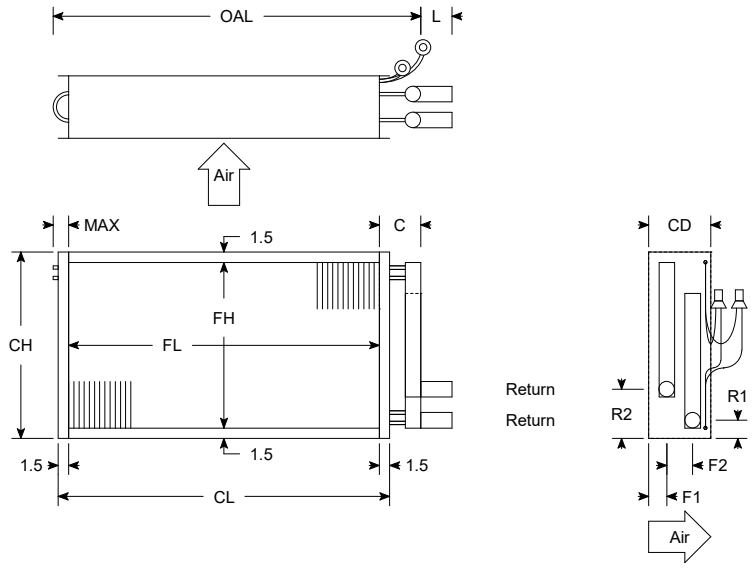
PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DRAWINGS

DHP-40
PrecisionCoils Coil Cooling Coil

Drawings



*Dimensions**

Tag	Cooling Coil
Model	DX12C06S12-20x40.25-RH
Weight	106
Fin material & type	0.006 Aluminum Corrugated
Tube wall	0.016 / Smooth
Casing material / flange	16 ga. galv. steel (std) / Stacking
Intermediate drain pan	None
Coating	Baked phenolic epoxy
Header diameter	1.125
Distributor	0.875-3-5/16-6, 0.875-3-5/16-6
Supply / return conn. size	0.875 / 1.125
Connection type	Sweat Copper
Split ratio	3 feeds outside / 3 feeds inside
Intertwine style	Normal
Number of feeds	6
FH / FL	20 / 40.25
CH / CL	23 / 43.25
OAL / CD	46.75 / 10
C	4.25
F1 / F2	1.55 / 1.5
R1 / R2	1 / 2.625
L / MAX	4 / 2.25

* All distances are measured as inches.

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

JOB SUMMARY

DHP-40
, USA

Selection Summary

Tag	Comment	Model	Quantity
Condenser Coil		CD12C06S12-30x39.5-RH	1

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DATA

DHP-40
PrecisionCoils Coil Condenser Coil

Condenser Coil

Tag	Qty	Model	Footnotes	Comment
Condenser Coil	1	CD12C06S12-30x39.5-RH	a,b	

Construction and Performance Details

Tag	Condenser Coil
Air flow (SCFM)	6500
Altitude (ft)	0
Condenser capacity (MBH)	184.0
Desuperheat capacity (MBH)	0.0
Entering dry bulb (°F)	91.4
Leaving dry bulb (°F)	117.5
Face velocity (ft/min)	790
Air pressure drop (in of water)	1.05
Air fouling factor (h·ft²·°F/Btu)	0.00000
Refrigerant	R-410A
Condensing temp. (°F)	125.0
Vapor temp. (°F)	125.0
Subcooling (°F)	12.0
Suction temp. (°F)	45.0
Ref. mass flow (lb/h)	2855.8
Ref. velocity (ft/s)	16.35
Ref. pressure drop (psi)	12.48
Subcooler circ./face tubes	0 / 0
Subc. capacity (MBH)	0.0
Subc. leaving temp. (°F)	
Subc. pressure drop (psi)	0.00
Coils per bank	1
Coil type	1/2
Fin height (in)	30.0
Fin length (in)	39.5
Face area (ft²)	8.23
Rows	6
Fin spacing (fins/in)	12
Fin material	Al
Fin type	Cor.
Fin thickness (in)	0.006
Tube wall thickness (in)	0.016
Tube interior	Smooth
Number of feeds	4
Supply conn. size (in)	1.125
Return conn. size (in)	1.125
Weight (lb)	145
Est. internal volume (ft³)	0.70

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

Footnotes

(a) Coil is outside of the scope of AHRI Standard-410.
(b) Tube OD 0.500, Tube spacing 1.250 x 1.082

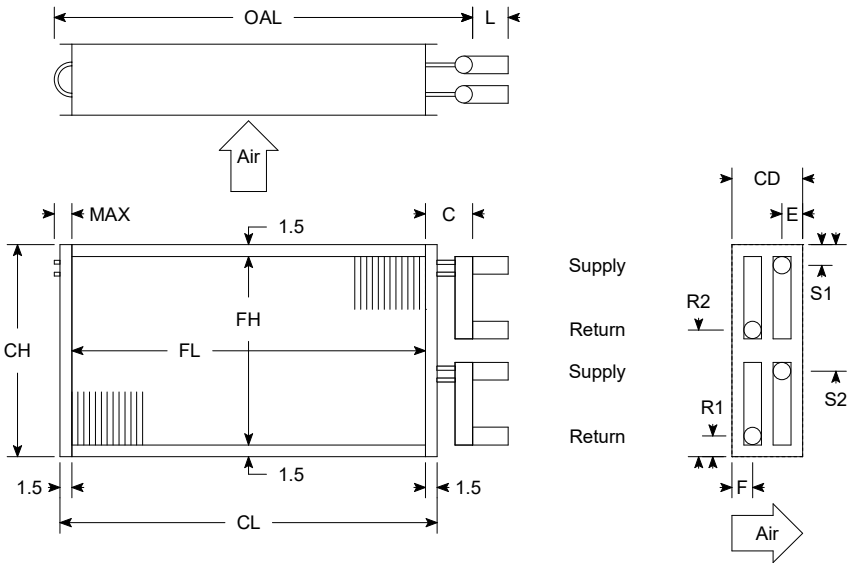
PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DRAWINGS

DHP-40
PrecisionCoils Coil Condenser Coil

Drawings



*Dimensions**

Tag	Condenser Coil
Model	CD12C06S12-30x39.5-RH
Weight	145
Fin material & type	0.006 Aluminum Corrugated
Tube wall	0.016 / Smooth
Casing material / flange	16 ga. galv. steel (std) / Stacking
Coating	Baked phenolic epoxy
Header diameter	1.125
Supply / return conn. size	1.125 / 1.125
Connection type	Sweat Copper
Split ratio	2 feeds top / 2 feeds bottom
Number of feeds	4
Subcooler circ./face tubes	0 / 0
FH / FL	30 / 39.5
CH / CL	33 / 42.5
OAL / CD	46 / 10
C	4.25
E / S1 / S2	2.3 / 1 / 17.125
F / R1 / R2	2.3 / 1 / 17.125
L / MAX	4 / 2.25

* All distances are measured as inches.

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

JOB SUMMARY

DHP-40
, USA

Selection Summary

Tag	Comment	Model	Quantity
Cooling coil in heat pump mode		CD12C06S12-20x40.25-RH	1

PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DATA

DHP-40
PrecisionCoils Coil Cooling coil in heat pump mode

Condenser Coil

Tag	Qty	Model	Footnotes	Comment
Cooling coil in heat pump mode	1	CD12C06S12-20x40.25-RH	a,b	

Construction and Performance Details

Tag	Cooling coil in heat pump mode
Air flow (SCFM)	2400
Altitude (ft)	0
Condenser capacity (MBH)	183.5
Desuperheat capacity (MBH)	0.0
Entering dry bulb (°F)	44.9
Leaving dry bulb (°F)	115.5
Face velocity (ft/min)	429
Air pressure drop (in of water)	0.38
Air fouling factor (h·ft²·°F/Btu)	0.00000
Refrigerant	R-410A
Condensing temp. (°F)	125.0
Vapor temp. (°F)	125.0
Subcooling (°F)	15.0
Suction temp. (°F)	45.0
Ref. mass flow (lb/h)	2808.1
Ref. velocity (ft/s)	10.72
Ref. pressure drop (psi)	2.69
Subcooler circ./face tubes	0 / 0
Subc. capacity (MBH)	0.0
Subc. leaving temp. (°F)	
Subc. pressure drop (psi)	0.00
Coils per bank	1
Coil type	1/2
Fin height (in)	20.0
Fin length (in)	40.3
Face area (ft²)	5.59
Rows	6
Fin spacing (fins/in)	12
Fin material	Al
Fin type	Cor.
Fin thickness (in)	0.006
Tube wall thickness (in)	0.016
Tube interior	Smooth
Number of feeds	6
Supply conn. size (in)	1.625
Return conn. size (in)	1.625
Weight (lb)	109
Est. internal volume (ft³)	0.50

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DATA

DHP-40
PrecisionCoils Coil Cooling coil in heat pump mode

Footnotes

(a) Coil is outside of the scope of AHRI Standard-410.
(b) Tube OD 0.500, Tube spacing 1.250 x 1.082

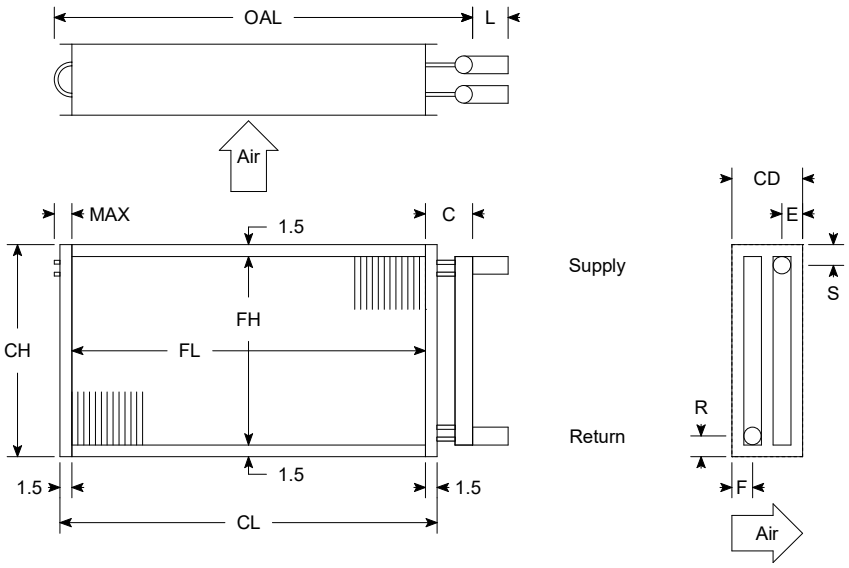
PRECISION COILS
Right Fit. Right Now.

888-921-COIL (2645)
200 Morgan Street
Brownsville, TN 38012

SUBMITTAL DRAWINGS

DHP-40
PrecisionCoils Coil Cooling coil in heat pump mode

Drawings



*Dimensions**

Tag	Cooling coil in heat pump mode
Model	CD12C06S12-20x40.25-RH
Weight	109
Fin material & type	0.006 Aluminum Corrugated
Tube wall	0.016 / Smooth
Casing material / flange	16 ga. galv. steel (std) / Stacking
Coating	Baked phenolic epoxy
Header diameter	1.625
Supply / return conn. size	1.625 / 1.625
Connection type	Sweat Copper
Number of feeds	6
Subcooler circ./face tubes	0 / 0
FH / FL	20 / 40.25
CH / CL	23 / 43.25
OAL / CD	47.25 / 10
C	4.75
S / R	1.25 / 1.25
E / F	2.3 / 2.3
L / MAX	4 / 2.25

* All distances are measured as inches.

Supply Fan

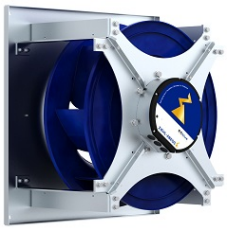
FANselect

general description

1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1



GR31C-ZID.DC.CR | 114535/H01 | Portfolio STD-WW G1 | Cpro ECblue

Standard design with ECblue motor and integrated electronics

Material of impeller:
- ZAmid - high performance composite material

Color Coating:
- Color coating in RAL5002 (Ultra marine-blue)

Mains voltage motor size B_:
- 1~ 200...277 V; 50/60 Hz

Mains voltage motor size D_:
- 1~ 200...277 V; 50/60 Hz
- 3~ 200...240 V; 50/60 Hz
- 3~ 380...480 V; 50/60 Hz

Mains voltage motor size G_:
- 3~ 200...240 V; 50/60 Hz
- 3~ 380...480 V; 50/60 Hz

Thermal class:
- THCL155

Thermal protection:
- Protection with active temperature management

Protection:
- IP54

Coating:
- Motor painted in RAL5002 (Ultra marine-blue)

Controller (only motor size B_):
- Activation via external speed setting 0-10 V / PWM, Communication interface on request
- Standard cable length: 60 cm

Controller (only motor size D_, G_):

FANselect

- **BASIC:**
  Activation via external speed setting 0-10 V / PWMArt. no. ER- and GR-module
  in basic version
- **PREMIUM:**
  Integrated control functionality, Communication interface on request

Cable glands:
- Motor size D: 3 x M16 x 1.5
- Motor size G: 3 x M20 x 1.5

Ambient temperature:
- Minimum permissible ambient temperarture: -20 °C*
- Maximum permissible ambient temperarture: 40 °C or see data sheet

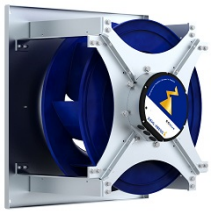
***Continuous operation with occasional starts (S1) according to DIN EN 60034-1: 2011-02. Occasional starting between -35 ° C and -25 ° C is permissible. Permanent operation below -25 ° C only possible with special**
bearings for refrigeration applications on request.

FANselect

fan data

1/16/2021
version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1



type		GR31C-ZID.DC.CR
article no.		114535/H01 | Portfolio STD-WW G1

technical data

motor		ECblue
Efficiency class		IE4
mains supply	-	3~ 460V 60Hz
ambient temperature, max. limit (t_r)	°C	55
efficiency grade η_{statA}	%	66,5
efficiency grade **N_{actual}** | N_{target}		**72,9** | 62
ErP-conformity		2015 | EC controller integrated
grille | influence		no

fan data

SFP-class | SFP-value (P_{SFP})	- | Ws/m³	**3** | 1237
airflow volume (q_V)	ft³/min	2400.0
air velocity	ft/s	38.91
pressure, **stat. (p_{sF})** | tot. (p_F)	in.wg.	**2.830** | 3.159
electrical power input (P_{sys})	W	1402
system eff., **stat. ($\eta_{sF,sys}$)** | tot. ($\eta_{F,sys}$)	%	**57.0** | 63.6
fan speed **(n)** | max. (n_{max})	rpm	**3063** | 3640
fan speed, set value (%n_{max})	%	84
frequency **(f_{BP})** | (f_{max})	Hz	**60** | 60
voltage (U_{DP})	V	460
current (I_{DP})	A	1.89
acoustics, suction side **($L_{w(A),5}$)** | ($L_{w,5}$)	dB	**80** | 83
acoustics, pressure side **($L_{w(A),6}$)** | ($L_{w,6}$)	dB	**88** | 89
dimensions (w x h x d)	in	17.72 x 17.72 x 12.68
product weight (m_{pr})	lb	35.3
k-factor nozzle pres. (k)	-	95
differential pres. nozzle ($p_{sF\ nozzle}$)	Pa	1842

PF:PF_00; Ano:114535/H01; STol:-10 %

FANselect

performance curve / acoustics

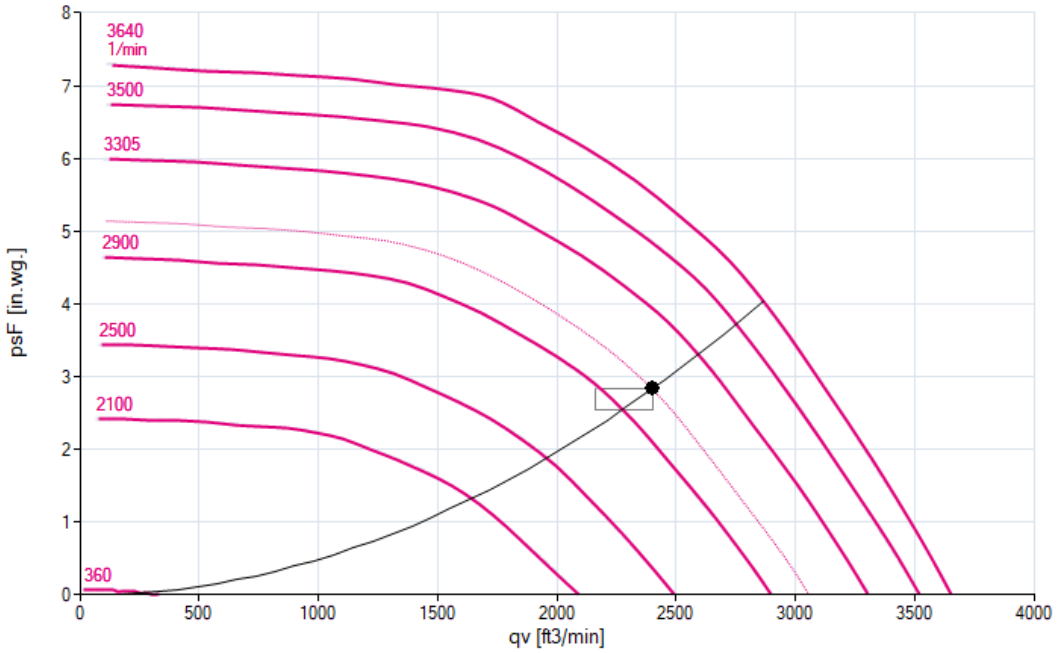
1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

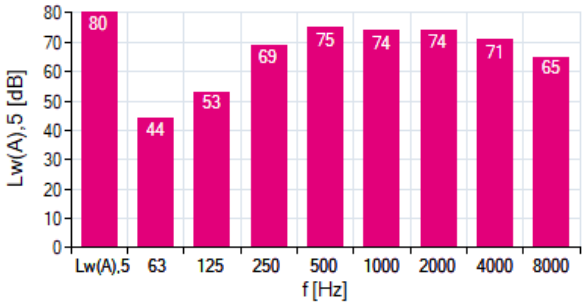
1 GR31C-ZID.DC.CR
114535/H01 | Portfolio STD-WW G1

measured in standard nozzle in installation type A according to ISO 5801
measurement density 0.072 [lbs/ft³]

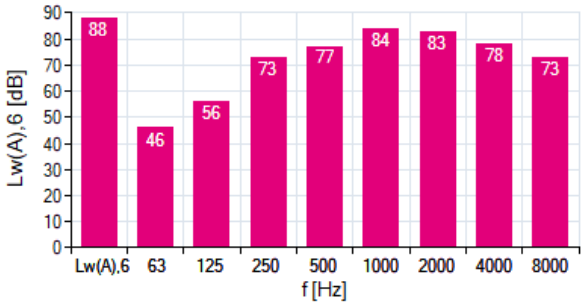
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR31C-ZID.DC.CR

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	80	44	53	69	75	74	74	71	65
$L_{w,5}$	83	71	69	76	78	74	73	70	66

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	88	46	56	73	77	84	83	78	73
$L_{w,6}$	89	72	71	80	81	84	82	77	74

FANselect

efficiency grade / power input

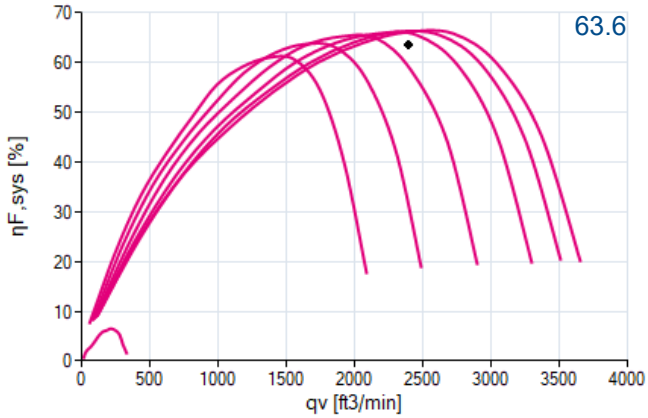
1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

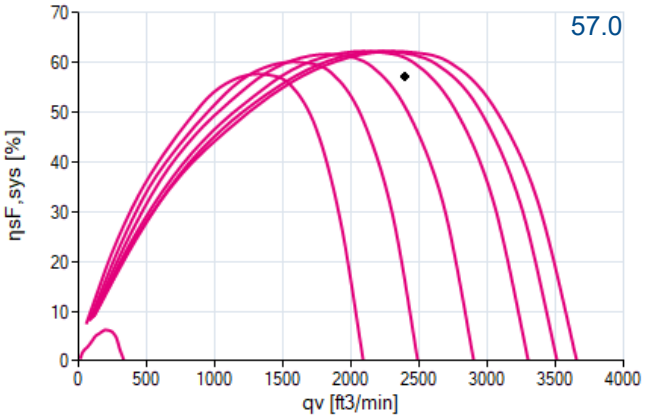
1 GR31C-ZID.DC.CR
114535/H01 | Portfolio
STD-WW G1

measured in standard nozzle in installation type A according to ISO 5801
measurement density 0.072 [lbs/ft³]

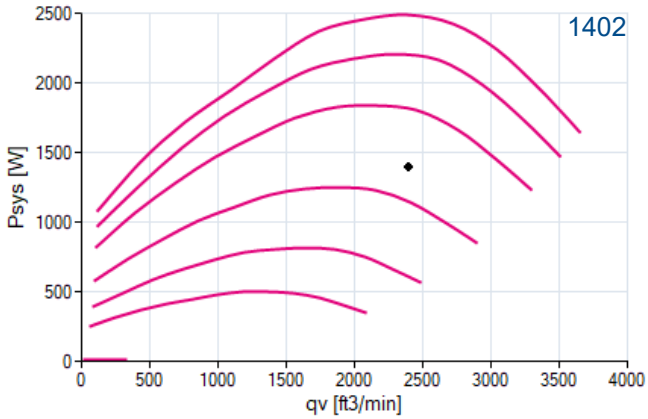
efficiency grade $\eta_{F,sys}$



efficiency grade $\eta_{sF,sys}$



power input P_{sys}



FANselect

nominal values

1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

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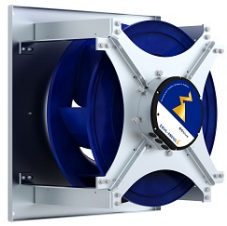

GR31C-ZID.DC.CR

114535/H01

3~ 380-480V 50Hz P1 2.50kW
3.20-4.00A 3640/MIN 55°C
3~ 380-480V 60Hz P1 2.50kW
3.20-4.00A 3640/MIN 55°C
IP54 THCL155

drawing

1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

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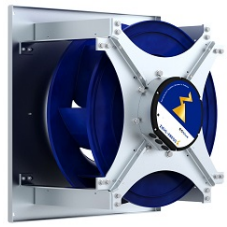
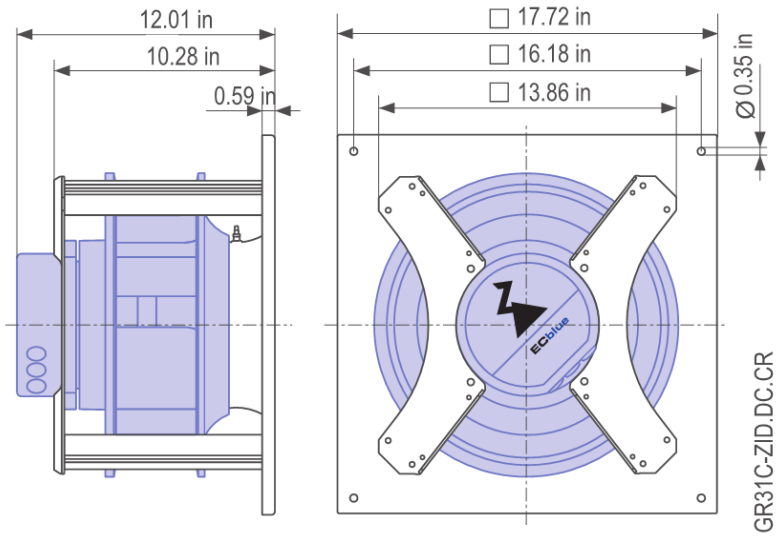


GR31C-ZID.DC.CR

114535/H01

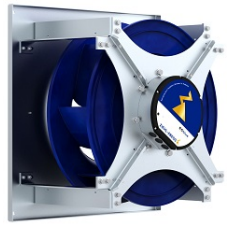


wiring diagram

1/16/2021

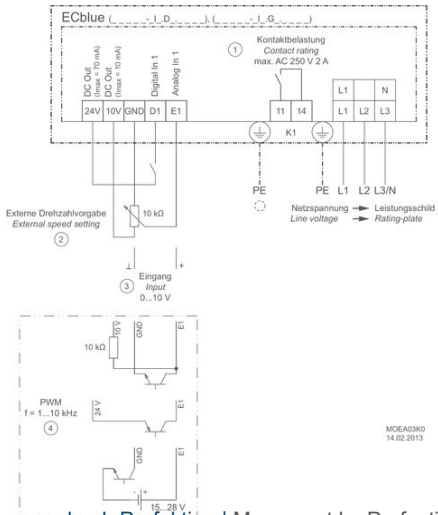
version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1



GR31C-ZID.DC.CR

114535/H01



FANselect

system components

1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1

type	GR31C-ZID.DC.CR
article no.	114535/H01

control component

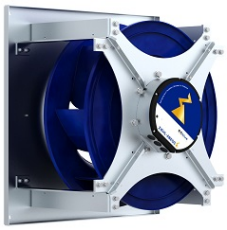
ECblue AM module
type: AM-MODBUS
article no.: 349045

ECblue AM module
type: AM-PREMIUM
article no.: 349046

ECblue AM module
type: AM-MODBUS-W
article no.: 349050

ECblue AM module
type: AM-PREMIUM-W
article no.: 349051

1



GR31C-ZIK.DC.CR | 114910/H01 | Portfolio STD-WW G1 | Cpro ECblue

Standard design with ECblue motor and integrated electronics

Material of impeller:
- ZAmid - high performance composite material

Color Coating:
- Color coating in RAL5002 (Ultra marine-blue)

Mains voltage motor size B_:
- 1~ 200...277 V; 50/60 Hz

Mains voltage motor size D_:
- 1~ 200...277 V; 50/60 Hz
- 3~ 200...240 V; 50/60 Hz
- 3~ 380...480 V; 50/60 Hz

Mains voltage motor size G_:
- 3~ 200...240 V; 50/60 Hz
- 3~ 380...480 V; 50/60 Hz

Thermal class:
- THCL155

Thermal protection:
- Protection with active temperature management

Protection:
- IP54

Coating:
- Motor painted in RAL5002 (Ultra marine-blue)

Controller (only motor size B_):
- Activation via external speed setting 0-10 V / PWM, Communication interface on request
- Standard cable length: 60 cm

Controller (only motor size D_, G_):

FANselect

- **BASIC:**
  Activation via external speed setting 0-10 V / PWMArt. no. ER- and GR-module
  in basic version
- **PREMIUM:**
  Integrated control functionality, Communication interface on request

Cable glands:
- Motor size D: 3 x M16 x 1.5
- Motor size G: 3 x M20 x 1.5

Ambient temperature:
- Minimum permissible ambient temperarture: -20 °C*
- Maximum permissible ambient temperarture: 40 °C or see data sheet

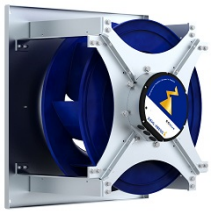
***Continuous operation with occasional starts (S1) according to DIN EN 60034-1: 2011-02. Occasional starting between -35 ° C and -25 ° C is permissible. Permanent operation below -25 ° C only possible with special**
bearings for refrigeration applications on request.

FANselect

fan data

1/16/2021
version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1



type		GR31C-ZIK.DC.CR
article no.		114910/H01 | Portfolio STD-WW G1

technical data

motor		ECblue
Efficiency class		IE4
mains supply	-	3~ 460V 60Hz
ambient temperature, max. limit (t_r)	°C	55
efficiency grade η_{statA}	%	60,6
efficiency grade **N_{actual}** | N_{target}		**65,3** | 62
ErP-conformity		2015 | EC controller integrated
grille | influence		no

fan data

SFP-class | SFP-value (P_{SFP})	- | Ws/m³	**4** | 1907
airflow volume (q_V)	ft³/min	3250.0
air velocity	ft/s	52.69
pressure, **stat. (p_{sF})** | tot. (p_F)	in.wg.	**3.000** | 3.612
electrical power input (P_{sys})	W	2924
system eff., **stat. ($\eta_{sF,sys}$)** | tot. ($\eta_{F,sys}$)	%	**39.2** | 47.2
fan speed **(n)** | max. (n_{max})	rpm	**4001** | 4100
fan speed, set value (%n_{max})	%	98
frequency **(f_{BP})** | (f_{max})	Hz	**60** | 60
voltage (U_{DP})	V	460
current (I_{DP})	A	3.89
acoustics, suction side **($L_{w(A),5}$)** | ($L_{w,5}$)	dB	**92** | 96
acoustics, pressure side **($L_{w(A),6}$)** | ($L_{w,6}$)	dB	**99** | 101
dimensions (w x h x d)	in	17.72 x 17.72 x 11.69
product weight (m_{pr})	lb	37.5
k-factor nozzle pres. (k)	-	95
differential pres. nozzle ($p_{sF\ nozzle}$)	Pa	3378

PF:PF_00; Ano:114910/H01; STol:+10 %

FANselect

performance curve / acoustics

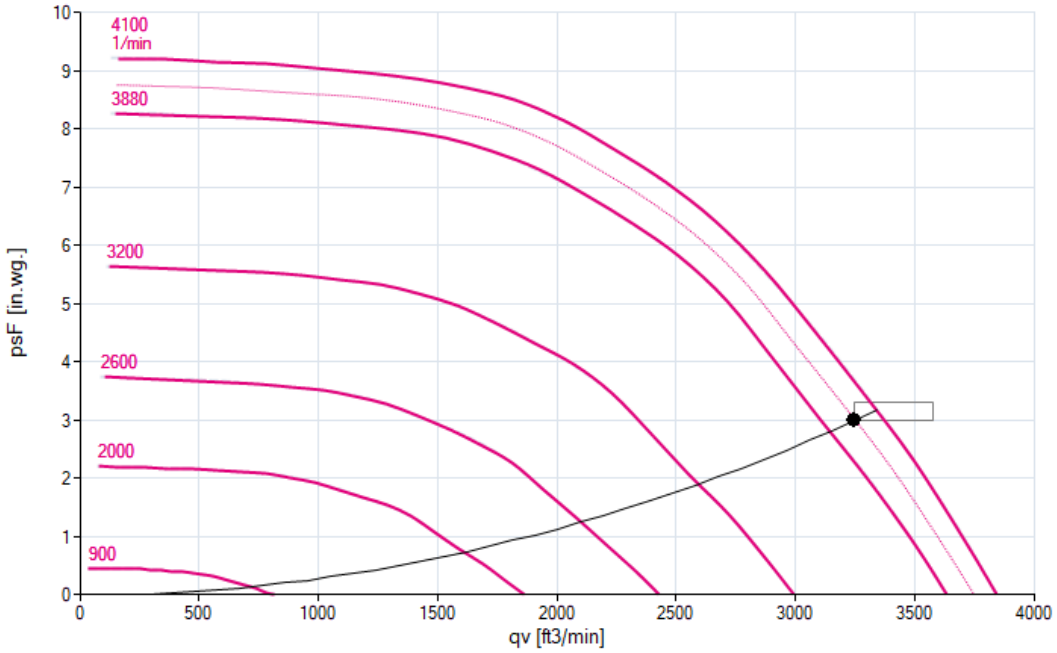
1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

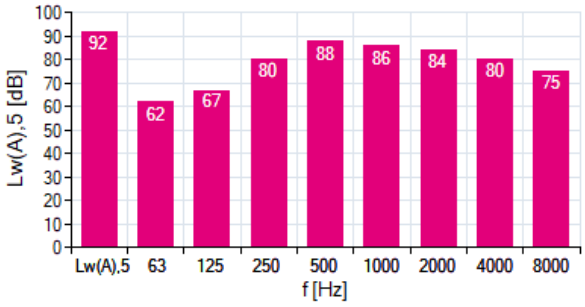
1 GR31C-ZIK.DC.CR
114910/H01 | Portfolio STD-WW G1

measured in standard nozzle in installation type A according to ISO 5801
measurement density 0.072 [lbs/ft³]

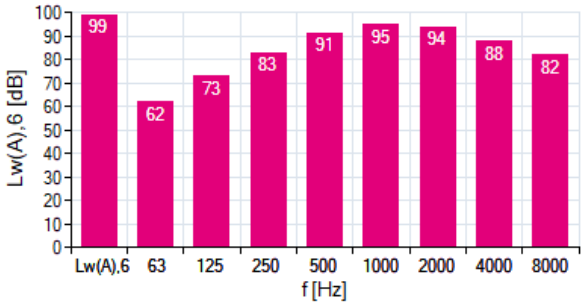
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR31C-ZIK.DC.CR									
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	92	62	67	80	88	86	84	80	75
$L_{w,5}$	96	89	83	88	91	86	83	79	76

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	99	62	73	83	91	95	94	88	82
$L_{w,6}$	101	88	88	91	95	95	93	87	83

FANselect

efficiency grade / power input

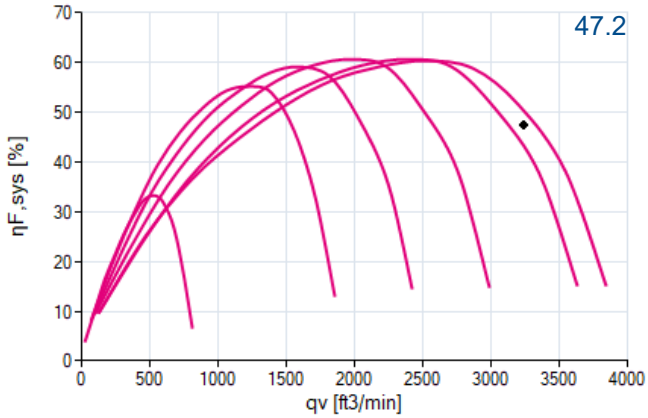
1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

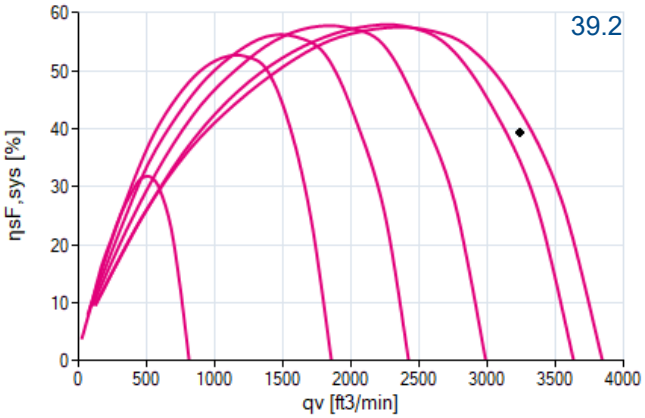
1 GR31C-ZIK.DC.CR
114910/H01 | Portfolio STD-WW G1

measured in standard nozzle in installation type A according to ISO 5801
measurement density 0.072 [lbs/ft³]

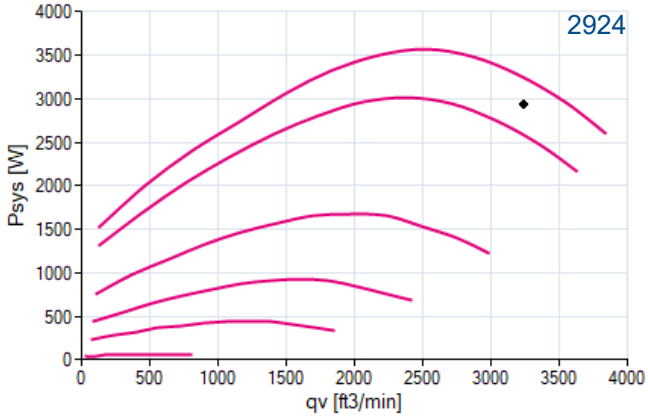
efficiency grade $\eta_{F,sys}$



efficiency grade $\eta_{sF,sys}$



power input P_{sys}



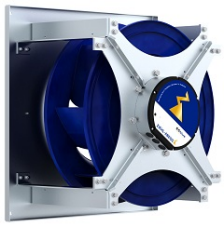
FANselect

nominal values

1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1



GR31C-ZIK.DC.CR

114910/H01

3~ 380-480V 50Hz P1 3.60kW
4.60-5.80A 4100/MIN 55°C
3~ 380-480V 60Hz P1 3.60kW
4.60-5.80A 4100/MIN 55°C
IP54 THCL155

drawing

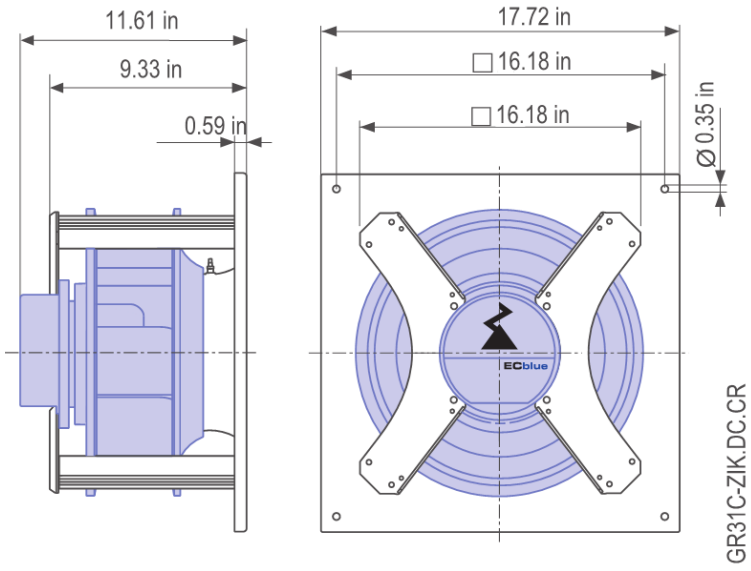
1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1

GR31C-ZIK.DC.CR

114910/H01



wiring diagram

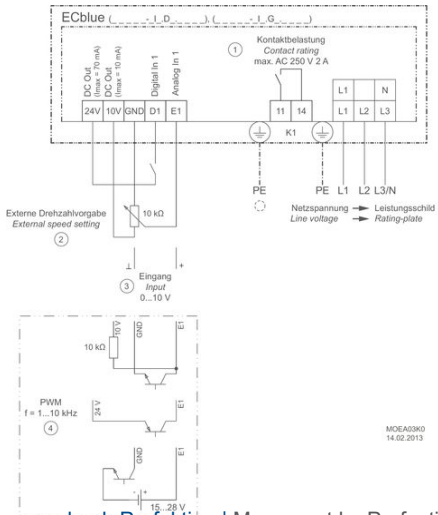
1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1

GR31C-ZIK.DC.CR

114910/H01



FANselect

system components

1/16/2021

version FANselect V 1.01 (201215), AMCA V 1.03 February, 2019 / 1.20.12.15 | 33176 | (user ZAFS23176)

1

type	GR31C-ZIK.DC.CR
article no.	114910/H01

Select 8

Copeland™
brand products

EMERSON

Copeland brand products

EMERSON

Select8

Project Report

Refrigerant	R410A Dew Point
High Side Properties:	
Condensing Temperature, °F	125.00
Abs. Condensing Pressure, psi	460.08
Dew Point, °F	125.00
Bubble Point, °F	125.00
Saturated vapour enthalpy, btu/lb	181.00
Specific volume of saturated vapour, ft³/lb	0.10
Liquid Temperature, °F	110.00
Liquid enthalpy, btu/lb	117.00
Low Side Properties:	
Evaporating Temperature, °F	45.00
Evaporating Abs. Pressure, psi	144.42
Dew Point, °F	45.00
Bubble Point, °F	44.80
With vapour at, °F	65.00
Specific volume, ft³/lb	0.50
Enthalpy, btu/lb	187.00
Operating Conditions:	
Evaporating Temperature, °F	45.00
Condensing Temperature, °F	125.00
Suction Superheat, °F	20.00
Subcooling, °F	15.00
Compressor Selected	ZP72KCE-TFD

PERFORMANCE AT SPECIFIED OPERATING POINT
ZP72KCE-TFD Data at 60 Hz

Cooling Capacity, kBtu/h	73.10
Power, kW	6.37
EER, Btu/h/W	11.48
Current at 460 V, A	9.65
Suction Mass Flow, lb/h	1041.00
Heating Capacity, kBtu/h	93.70
Isentropic Eff., %	69.78

COMPRESSOR MECHANICAL AND PHYSICAL DATA

Displacement @ 60 Hz, m³/h	14.1
Length/Width, mm	246/246
Height, mm	455
Net Weight, kg	45.4
Stub Suction, inch	7/8
Stub Discharge, inch	1/2
Oil Quantity, l	1.66
Oil type (original charge)	POE RL32-3MAF
Oil type (approved oils)	POE RL32-3MAF
Base mounting (hole dia), mm	190 x 190 (19)
Sound Pressure @ 1m (HT), dBA	64
Sound Power (HT), dBA	75
Sound Conditions (HT, Temperatures: Evap./Cond./Suction at freq./speed)	7 / 54 / 18 °C at 60 Hz
PED Category	1
Internal Free Volume, l	3.9
High Side PS gauge, bar	45
Low Side PS gauge, bar	29.5
Low Side TS Min., °C	-35
Refrigerant's GWP	2088
Refrigerant's classification	A1

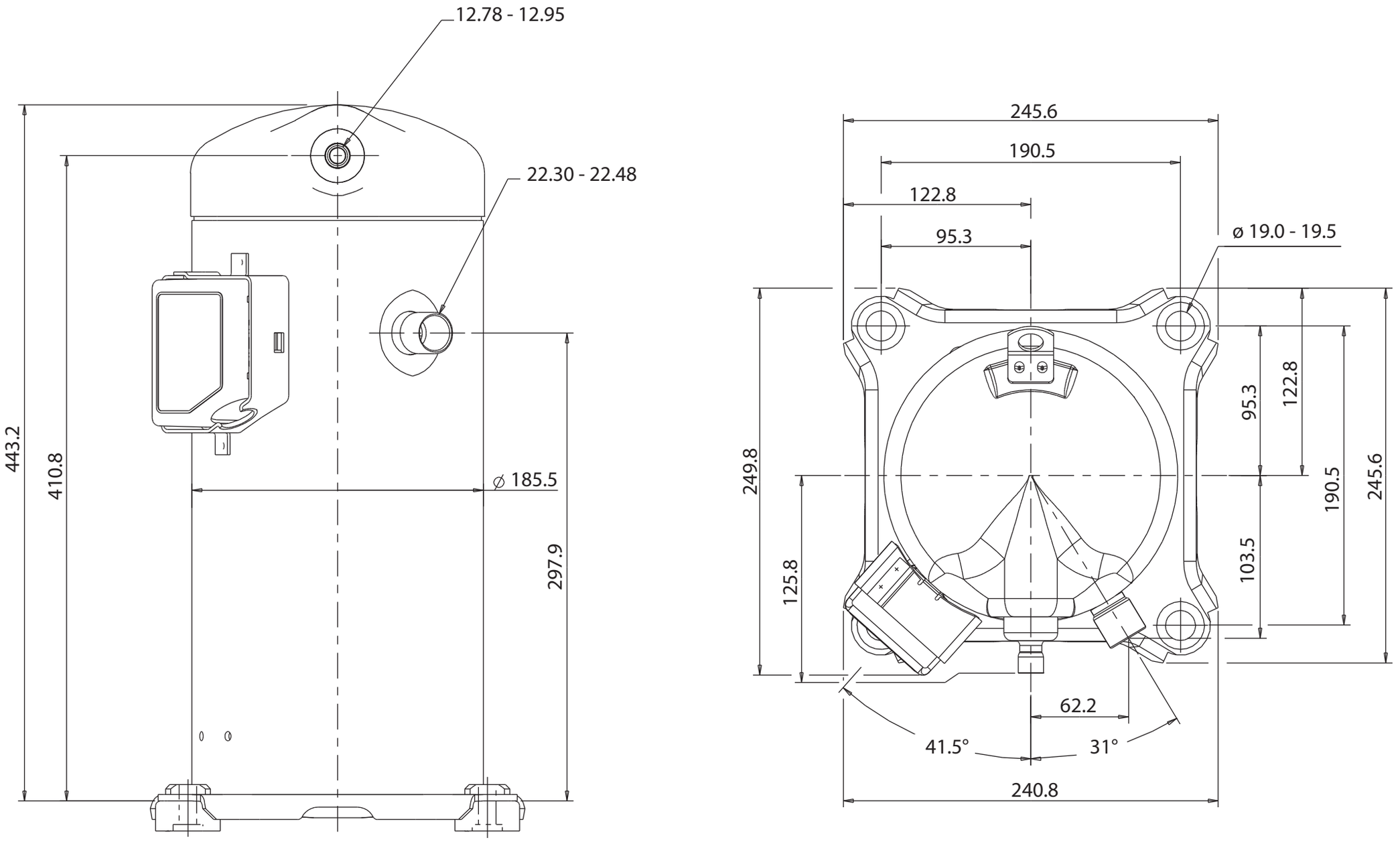
COMPRESSOR ELECTRICAL DATA (460 V / 3~ / 60 Hz)

Maximum Operating Current, A	15
Locked Rotor Current, A	75
Winding Resistance, ohm	2.26
Default Enclosure Class	IP 21 (IEC 34)

ACCESSORIES INCLUDED	
Mounting Grommets	Rubber Grommet For Single

ACCESSORIES OPTIONAL	
Enclosure Class	IP 54

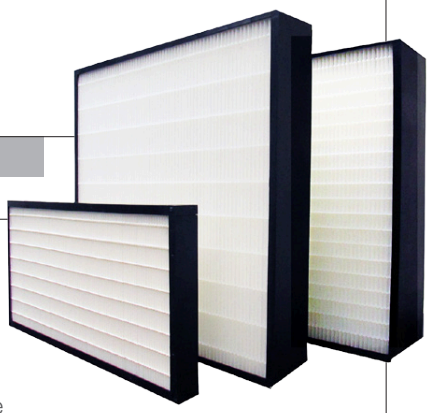
ZP61KCE, ZP72KCE, ZP83KCE



THE WORLD LEADER IN CLEAN AIR SOLUTIONS

PrecisionCell® III

EXTENDED SURFACE MINI-PLEAT FILTERS



- 2″, 4″ & 6″ thickness available
- Rugged plastic frame and synthetic pack for rigidity
- Cartridge design is ideal for Variable Air Volume (VAV) system or turbulent flow conditions
- Lightweight, easy to store and handle
- MERV 14, MERV 13, and MERV 11
- UL Classified

Physical Data

Frame: PVC frame

Media: Synthetic Polypropylene

Media Support: Adhesive-bead pleat separators

Operating Limits: 160° F (71°C) and 100% RH

Construction

PrecisionCell III filters are built with a mini-pleat media pack to achieve a rugged, compact, lightweight, high efficiency filter.

PrecisionCell III extended surface mini-pleat rigid filters are available in nominal depths of 2″, 4″, and 6″. They are designed for use in most commercial and industrial HVAC systems where medium to high efficiency filtration is required. They are available in MERV 14, MERV 13, and MERV 11 efficiencies.

PrecisionCell III filters are especially suitable for VAV systems and are designed to operate at face velocities up to 625 FPM. Two styles are available: standard box style and an optional headered version that is manufactured with a header for use with existing front or side access housings.

In-Line Space-Saving Design

PrecisionCell III filters dramatically reduce in-line space requirements when compared to 12″ – 36″ deep filters. Their nominal 2″, 4″, and 6″ depths make a convenient “fit” for most installations. High efficiency filtration, which is often required for acceptable Indoor Air Quality, may now be selected by the design engineer without having to compromise space.

Installation Considerations

PrecisionCell III filters may be installed in AAF Flanders PF-1 holding frames or Surepleat side access housings. PF-1 holding frames are riveted together to form a bank and may be installed for upstream or downstream service. Smaller systems and systems with minimum upstream access space are best served using Surepleat side access housings.

AAF | Flanders®

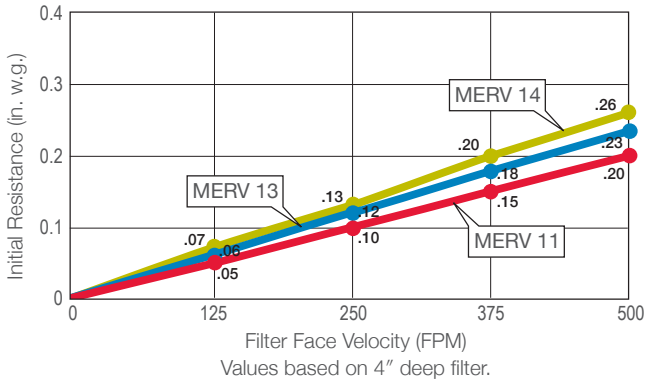
PrecisionCell® III Filters

Product Information – Standard Sizes & Performance Data

Rated Airflow (500 FPM)	Nominal Size (inches) (W x H x D)	125 FPM			250 FPM			375 FPM			500 FPM			Media Area (sq. ft.)			Weight Each (lbs.)		
		2″	4″	6″	2″	4″	6″	2″	4″	6″	2″	4″	6″	2″	4″	6″	2″	4″	6″
MERV 11																			
2000 CFM	24 x 24	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	50	120	125	3.4	4.5	7.0
1000 CFM	12 x 24	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	25	60	61	1.9	2.5	3.5
1400 CFM	20 x 20	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	35	84	86	2.3	3.0	4.9
1100 CFM	16 x 20	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	28	66	68	1.9	2.5	3.9
1850 CFM	20 x 24	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	44	105	104	2.6	3.5	5.8
1500 CFM	18 x 24	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	39	93	93	2.3	3.0	5.3
1750 CFM	20 x 25	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	44	105	108	3.0	4.0	6.1
1400 CFM	16 x 25	0.06	0.05	0.03	0.11	0.10	0.09	0.17	0.15	0.14	0.23	0.20	0.19	35	84	86	2.3	3.0	4.9
MERV 13																			
2000 CFM	24 x 24	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	50	120	125	3.4	4.5	7.0
1000 CFM	12 x 24	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	25	60	61	1.9	2.5	3.5
1400 CFM	20 x 20	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	35	84	86	2.3	3.0	4.9
1100 CFM	16 x 20	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	28	66	68	1.9	2.5	3.9
1850 CFM	20 x 24	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	44	105	104	2.6	3.5	5.8
1500 CFM	18 x 24	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	39	93	93	2.3	3.0	5.3
1750 CFM	20 x 25	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	44	105	108	3.0	4.0	6.1
1400 CFM	16 x 25	0.07	0.06	0.04	0.14	0.12	0.11	0.20	0.18	0.17	0.27	0.23	0.22	35	84	86	2.3	3.0	4.9
MERV 14																			
2000 CFM	24 x 24	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	50	120	125	3.4	4.5	7.0
1000 CFM	12 x 24	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	25	60	61	1.9	2.5	3.5
1400 CFM	20 x 20	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	35	84	86	2.3	3.0	4.9
1100 CFM	16 x 20	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	28	66	68	1.9	2.5	3.9
1850 CFM	20 x 24	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	44	105	104	2.6	3.5	5.8
1500 CFM	18 x 24	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	39	93	93	2.3	3.0	5.3
1750 CFM	20 x 25	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	44	105	108	3.0	4.0	6.1
1400 CFM	16 x 25	0.08	0.07	0.06	0.15	0.13	0.12	0.23	0.20	0.19	0.30	0.26	0.25	35	84	86	2.3	3.0	4.9

Performance Data

Initial Resistance vs. Filter Face Velocity



Values based on 4″ deep filter.

All performance data based on ASHRAE Standard 52.2. Performance tolerance conforms to Section 6.4 of ANSI/AHRI Standard 850-2013.

***Underwriters Laboratories Classification** – PrecisionCell filters are UL Classified. Testing was performed according to UL Standard 900.*

AAF Flanders®

9920 Corporate Campus Drive, Suite 2200, Louisville, KY 40223-5690
888.223.2003 Fax 888.223.6500 | aafintl.com

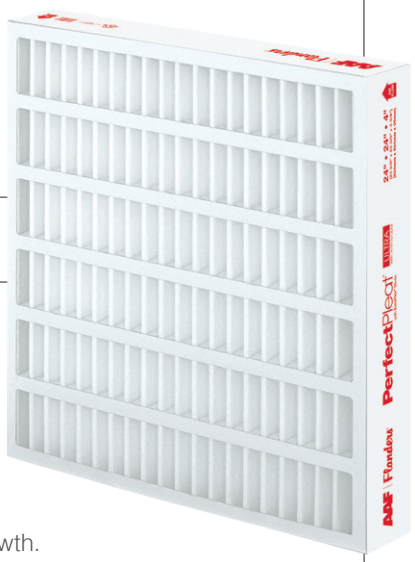
ISO Certified Firm AFP-1-353 01/17

THE WORLD LEADER IN CLEAN AIR SOLUTIONS

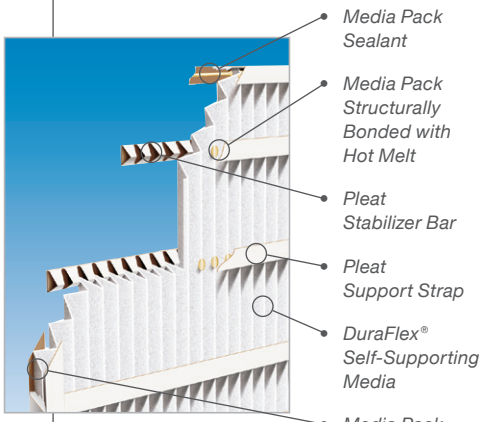
PerfectPleat® ULTRA

(MERV 8 with Antimicrobial)

EXTENDED SURFACE PLEATED PANEL FILTERS



- Highest performing self-supported pleated filter in the world
- Mechanical efficiency – does not rely on electret charge technology
- Self-supporting DuraFlex® media made from virgin fiber – no wire support needed
- Consistent media with controlled fiber size and blend
- Incorporates antimicrobial
- Available in 1″, 2″ and 4″ models
- Environmentally friendly – no dies, no metal, fully incinerable
- Patented media, filter design, and manufacturing process. Covered under one or more of the following patents: US 6398839 B2; US 6254653 B1; US 6159318; US 6165242; US 6387140 B1 (1″ model only)



PerfectPleat® ULTRA 2″ Filter Construction

The PerfectPleat ULTRA filter is designed to consistently increase efficiency throughout the service life of the filter. The PerfectPleat ULTRA filter has approximately 25% more media than our standard capacity filter and also incorporates an antimicrobial. The antimicrobial is applied to the media to preserve the integrity of the media throughout the filter's useful life by inhibiting microbial growth. PerfectPleat ULTRA filters have an initial MERV 8 rating respectively, but the efficiency increases significantly when dust holding begins. PerfectPleat ULTRA filters have distinctive self-supporting characteristics that allow a pleating pattern, which promotes airflow and maximizes Dust Holding Capacity (DHC). The PerfectPleat ULTRA filter is ideal for applications where pleated filters are currently in use and higher efficiencies are desired or required. It is also suited to high moisture conditions where bacterial growth may be likely to occur on air filters.

Superior Design and Construction

The perimeter frame is constructed from the highest wet-strength 28 pt. beverage carrier board, securely bonded to the media pack. The 1″ model employs three supporting straps on the air entering and air leaving sides of the filter to control pleat spacing and support the media pack in the perimeter frame.

Support straps on the air entering side are used in combination with uniquely designed pleat stabilizers on the air-leaving side of the 2″ model to provide additional strength. The support straps and pleat stabilizers ensure integrity against turbulent airflow. The 2″ filter resists crushing and abuse and provides excellent lateral stability for installation in side-access systems.

The 4″ model utilizes a two piece die cut frame with integral pleat spacers on the air leaving side. Pleat spacing is controlled by straps bonded to the air entering side and the multiple rows of pleat spacers on the air leaving side. The pleat spacers also ensure the pleats remain open during use, maximizing filter life.

DuraFlex® Media—Patented Media Design

Uniform size virgin fibers are assembled in closely controlled blends to create a media that is both self-supporting and consistent in performance. When pleated, DuraFlex media will hold its shape without the wire support characteristic of conventional pleated filters. That means no potential for the formation of rust and safer handling. With the superior resiliency of DuraFlex media and no need for wire support, PerfectPleat ULTRA filters can sustain significant abuse and maintain their shape and pleat spacing. The absence of wire also makes the filter totally incinerable, which can simplify disposal.

AAF | Flanders®

PerfectPleat® ULTRA Filters

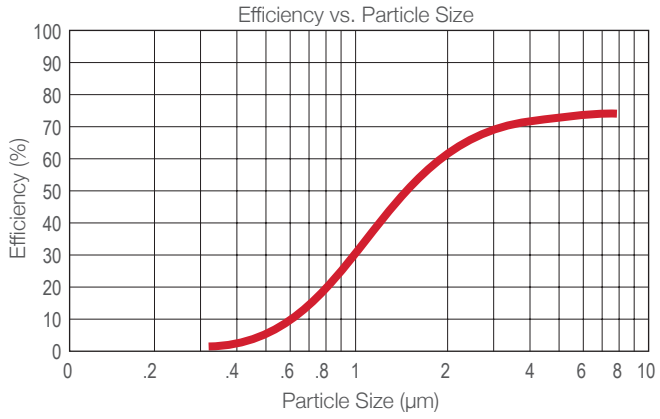
Performance Data

Filter	Pleats Per Linear Foot	Rated Initial Resistance (in. w.g.)			Recommended Final Resistance (in. w.g.)	ASHRAE 52.2 MERV	Continuous Operating Temperature Limits
		300 FPM	500 FPM	625 FPM			
1″ PerfectPleat ULTRA	15	.23	.42	–	1.0	8	150°F (66°C)
2″ PerfectPleat ULTRA	15	.12	.23	.34	1.0	8	150°F (66°C)
4″ PerfectPleat ULTRA	11	.12	.25	.38	1.0	8	200°F (93°C)

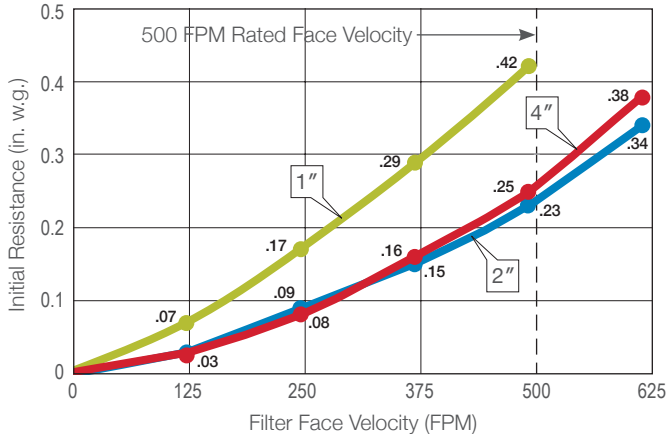
All performance data based on ASHRAE Standard 52.2. Performance tolerance conforms to Section 6.4 of ANSI/AHRI Standard 850-2013.

***Underwriters Laboratories Classification** – PerfectPleat ULTRA filters are UL Classified. Testing was performed according to UL Standard 900.*

Composite Minimum Efficiency Curve



Initial Resistance vs. Filter Face Velocity



Energy savings may be realized by operating the PerfectPleat ULTRA filters to a lower final resistance. Contact your local AAF Flanders representative for a Total Cost of Ownership analysis for your specific application.

Product Information – Standard Sizes

Nominal Sizes (Inches) (W x H x D)	Actual Sizes (Inches) (W x H x D)	Rated Airflow (SCFM)			Pleats Per Filter
		300 FPM	500 FPM	625 FPM	
10 x 10 x 1	9½ x 9½ x ¾	200	350	–	11
10 x 20 x 1	9½ x 19½ x ¾	400	700	–	11
12 x 12 x 1	11½ x 11½ x ¾	300	500	–	14
12 x 20 x 1	11½ x 19½ x ¾	500	850	–	14
12 x 24 x 1	11⅜ x 23⅜ x ¾	600	1000	–	14
14 x 20 x 1	13½ x 19½ x ¾	600	1000	–	16
14 x 25 x 1	13½ x 24½ x ¾	750	1200	–	16
15 x 20 x 1	14½ x 19½ x ¾	650	1050	–	17
16 x 16 x 1	15½ x 15½ x ¾	550	900	–	19
16 x 20 x 1	15½ x 19½ x ¾	650	1100	–	19
16 x 25 x 1	15½ x 24½ x ¾	850	1400	–	19
18 x 20 x 1	17½ x 19½ x ¾	750	1250	–	21
18 x 24 x 1	17⅜ x 23⅜ x ¾	900	1500	–	21
18 x 25 x 1	17½ x 24½ x ¾	950	1550	–	21
20 x 20 x 1	19½ x 19½ x ¾	850	1400	–	24
20 x 25 x 1	19½ x 24½ x ¾	1050	1750	–	24
24 x 24 x 1	23⅜ x 23⅜ x ¾	1200	2000	–	29
25 x 25 x 1	24½ x 24½ x ¾	1300	2200	–	30
10 x 20 x 2	9½ x 19½ x 1¾	400	700	850	11
12 x 20 x 2	11½ x 19½ x 1¾	500	850	1050	14
12 x 24 x 2	11⅜ x 23⅜ x 1¾	600	1000	1250	14
14 x 25 x 2	13½ x 24½ x 1¾	750	1200	1500	16
15 x 20 x 2	14½ x 19½ x 1¾	650	1050	1300	17
15 x 25 x 2	14½ x 24½ x 1¾	800	1300	1650	17
16 x 16 x 2	15½ x 15½ x 1¾	550	900	1100	19
16 x 20 x 2	15½ x 19½ x 1¾	650	1100	1400	19
16 x 24 x 2	15⅜ x 23⅜ x 1¾	800	1350	1650	19
16 x 25 x 2	15½ x 24½ x 1¾	850	1400	1750	19
18 x 24 x 2	17⅜ x 23⅜ x 1¾	900	1500	1900	21
18 x 25 x 2	17½ x 24½ x 1¾	950	1550	1950	21
20 x 20 x 2	19½ x 19½ x 1¾	850	1400	1750	24
20 x 24 x 2	19⅜ x 23⅜ x 1¾	1000	1650	2100	24
20 x 25 x 2	19½ x 24½ x 1¾	1050	1750	2150	24
24 x 24 x 2	23⅜ x 23⅜ x 1¾	1200	2000	2500	29
25 x 25 x 2	24½ x 24½ x 1¾	1300	2150	2700	30
12 x 24 x 4	11⅜ x 23⅜ x 3¾	600	1000	1250	10
16 x 20 x 4	15⅜ x 19⅜ x 3¾	650	1100	1400	13
16 x 25 x 4	15⅜ x 24⅜ x 3¾	850	1400	1750	13
18 x 24 x 4	17⅜ x 23⅜ x 3¾	900	1500	1875	15
20 x 20 x 4	19⅜ x 19⅜ x 3¾	850	1400	1750	17
20 x 25 x 4	19⅜ x 24⅜ x 3¾	1050	1750	2150	17
24 x 20 x 4	23⅜ x 19⅜ x 3¾	1000	1650	2100	17
24 x 24 x 4	23⅜ x 23⅜ x 3¾	1200	2000	2500	21
25 x 29 x 4	24⅜ x 28⅜ x 3¾	1500	2500	3150	26

AAF Flanders®

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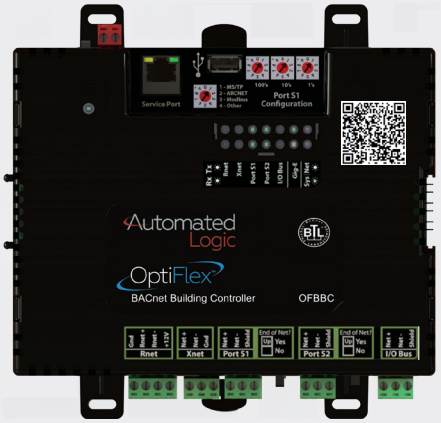
AAF Flanders has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

ISO Certified Firm AFP-1-203K 01/17

OptiFlex™ OFBBC

BACnet Building Controller and Router

Automated Logic



Part# OFBBC

The Automated Logic® OptiFlex™ BACnet Building Controller model OFBBC is a high-performance, BACnet native direct digital controller and BACnet router. As a component of the WebCTRL® building automation system, this controller provides comprehensive control of connected equipment.

The OFBBC provides the speed, power, memory, and I/O flexibility needed for the most demanding control applications in the industry. Capable of controlling multiple pieces of HVAC equipment simultaneously, this robust BACnet controller can support complex control strategies.

Key Features and Benefits

BACnet Features

- *BACnet Device Types*
  - BACnet Building Controller (B-BC)
  - BACnet BBMD (B-BBMD)
  - BACnet Router (B-RTR)
- Supports BACnet Foreign Device Registration (FDR)
- Supports BACnet interoperability and routing with and between BACnet IP, BACnet MS/TP and BACnet over ARC156

Application Features

- Designed to address HVAC applications including complex central plants
- Graphically programmed through the EIKON® programming software, an object oriented tool that provides complete flexibility for any custom control sequence
- Supports Automated Logic's ZS communicating sensors, available in a variety of zone and equipment sensing options
- Enables live, visual displays of control logic, which uses real time operational data and aids in optimizing and troubleshooting system operations

Hardware Features

- Supports Gig-E, 1000 Mbps, BACnet IP and DHCP IP addressing
- Local Access Ethernet port at 100 Mbps for system start-up and troubleshooting
- Supports up to 9 FIO expanders in panel configuration or remotely mounted for scalable solutions (180 I/O total)
- Provides direct connect for power and communication for up to 7 FIO expansion modules when using a DC power supply
- All programs and historical data stored in non-volatile memory, eliminating the need for batteries
- Capacitor-backed real-time clock keeps time in the event of power failure or network interruption for up to three days
- Communications expansion port for future communication option cards
- Supports 200 Modbus points for system integrations
- USB port for local device updates
- DIN rail or screw mounting

System Benefits

- Connects seamlessly to the WebCTRL building automation system
- Multiple serial comunication ports to simultaneously route and share data across a wide range of building subsystems

WebCTRL®

The WebCTRL® system gives you the ability to understand your building operations and analyze the results. Integrate environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations.

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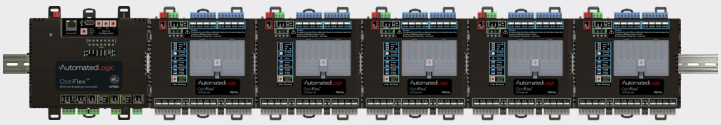
WE MAKE BUILDINGS BETTER.
Next level building automation engineered to help you make smart decisions.

OptiFlex™ OFBBC

BACnet Building Controller and Router

Part# OFBBC
05052020

BACnet Conformance	Conforms to the BACnet Building Controller (B-BC) Standard Device and BACnet BBMD (B-BBMD) Device as defined in BACnet 135-2001 2012 Annex L and tested to Protocol Revision 14.
Control Program Execution	Maximum number of control programs: 999 depending upon available memory.
BACnet Objects	Maximum number of BACnet objects: 12,000 depending upon available memory.
Third-party integration	Supports up to 1,500 third-party BACnet points, and 200 Modbus points depending upon available memory.
Power	24 Vac ±10%, 50–60 Hz, 50 VA | 26 Vdc ±10%, 15 W
Gig-E port	10/100/1000 BaseT Ethernet port for BACnet/IP and/or BACnet/Ethernet and/or Modbus TCP/IP communication on the Ethernet at 10, 100, or 1000 Mbps, full duplex
Serial port 1	For communication with either of the following: • A BACnet ARCNET network at 156,000 bps • A BACnet MS/TP network at 9,600 to 115,200 bps • A Modbus network at 1,200 to 115,200 bps
Serial port 2	For communication with a BACnet MS/TP network at 9,600 to 115,200 bps or Modbus network at 1,200 to 115,200 bps
Service port	Ethernet port at 10 or 100 Mbps for system start-up and troubleshooting
Rnet Port	Supports Rnet Communicating ZS Sensors, OptiFlex™ and OptiPoint™ devices
XNet Port	Supports MEx series expanders
Expanders	Supports up to 9 FIO expanders or 6 MEx expanders, but no more than 9 expanders total
Microprocessor	32-bit ARM Cortex-A8, 600 MHz, processor with multi-level cache memory, two Ethernet controllers, and USB 2.0 host port
Memory	16 GBs eMMC Flash memory and 256 MB DDR3 DRAM. User data is archived to non-volatile Flash memory when parameters are changed, every 90 seconds, and when the firmware is deliberately shutdown or restarted
Real-time Clock	Real-time clock keeps track of time in the event of a power failure for up to 3 days
Protection:	Device is protected by 2 replaceable, fast acting, 250 Vac, 2A, 5 mm x 20 mm glass fuses The power and network ports comply with the EMC requirements EN50491-5-2
Physical	Fire-retardant plastic ABS, UL94-5VA



Mounting	DIN rail mounting or screw mounting
Weight	1 lb. 1 oz. (0.482kg)
Recommended Panel Depth	2 3/4" (7cm)

Compliance

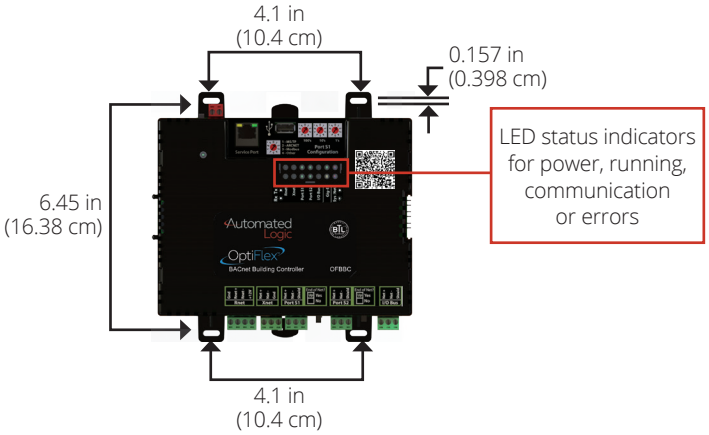
United States of America: FCC compliant to Title CFR47, Chapter 1, Subchapter A, Part 15, Subpart B, Class A;
UL Listed to UL 916, PAZX, Energy Management Equipment

Europe: Mark EN50491-5-2:2009; Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment; EN50491-3:2009, Part 3: Electrical safety requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS); Low Voltage Directive: 2014/35/EU

RoHS Compliant: 2011/65/EU

ANZ: C-Tick Mark AS/NZS 61000-6-3

Canada: Industry Canada Compliant, ICES-003, Class A cUL Listed UL 916, PAZX, Energy Management Equipment



Automated Logic

WE MAKE BUILDINGS BETTER.

Next level building automation engineered to help you make smart decisions.

OptiPoint™ Interfaces

Graphical Touchscreen Displays

The Automated Logic® OptiPoint™ interfaces provide building operators and technicians with visibility and control over a single piece of HVAC equipment in a building. Available in three sizes, they feature an illuminated color pixel touchscreen display and connect to a single WebCTRL® controller, making management of the connected HVAC equipment both intuitive and simple.

OptiPoint 10 Interface
10" Display
part# EQT2-10

OptiPoint 7 Interface
7" Display
part# EQT2-7

OptiPoint 4 Interface
4.3" Display
part# EQT2-4

Key Features and Benefits

- Available in three sizes
- Capacitive touch screen with best-in-class resolution
- Rugged, industrial grade display
- Can be panel or wall-mounted
- Connects to a single WebCTRL controller
- Easily programmable using ViewBuilder
- Supports standard Equipment Touch files
- Touch files can be uploaded from connected controller or stored on OptiPoint interface
- Support for graphics and animations
- Support for international languages
- Multi-level password protection for security
- Built-in PDF viewer
- View and edit BACnet time schedules
- Change setpoints easily
- View all alarms in controller
- Visual alarm indicator
- View trends, with added support for pinch/zoom and swiping to move along timeline
- Supports screen capture to USB flash drive
- Access virtually any point in the controller
- Can be used as a technician tool or user interface

WebCTRL®

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.

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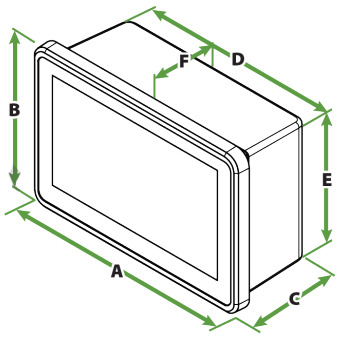
OptiPoint™ Interfaces

Specifications

		OptiPoint 4 Interface	OptiPoint 7 Interface	OptiPoint 10 Interface
Power:		24Vdc, .375A	24Vdc, .375A	24Vdc, .417A
Display:	TFT (Widescreen):	4.3" (11.0 cm)	7" (17.8 cm)	10.1" (25.7 cm)
	Resolution:	480 x 272 pixels (128 ppi)	1024 x 600 pixels (170 ppi)	1280 x 800 pixels (149 ppi)
	Brightness:	400 cd/m (typ.)	320 cd/m (typ.)	350 cd/m (typ.)
	Contrast ratio:	1000:1 (typ.)	1000:1 (typ.)	800:1 (typ.)
	Viewing angle:	-75~50(H); -75~75(V)	-75~50(H); -75~75(V)	-85~85(H); -85~85(V)
	Max colors:	16.7M (8-bit)	16.7M (8-bit)	16.7M (8-bit)
	Touch:	Capacitive Multi-Touch (P-CAP)	Capacitive Multi-Touch (P-CAP)	Capacitive Multi-Touch (P-CAP)
Operating Conditions:		-4°F to 140°F (-20°C to 60°C), 10% to 90% RH (non-condensing) Front IP65 Water and Dust Proof (Rear: IP20); Vibration tested to IEC60068-2-64		
Storage Temperatures:		-13°F to 158°F (-25°C to 70°C)		
Communication:				
	Comm Input:	EIA-485 based serial port for connection to the Rnet network (115kbps)		
	USB:	For upgrades, screen captures, and file transfers		
	USB OTG:	Micro-USB "On the Go" port for firmware upgrades		
	LAN:	Disabled for future use		
System:		OS: Android 6.0		
	Processor:	Freescale Cortex A9 i.MX6 Dual Core 1 GHz		
	System Memory:	1GB LPDDR3 RAM to store variable data and LCD data		
	Storage:	8 GB on-board eMMC flash memory to store program code and screen file		
Mounting:		Wall or panel mounting within the building interior		
Listed by:		CE (Class B), FCC (Class B), UL 60950, Vibration tested to EN60068-2-6, IP65 rated (front) IP20 rated (rear)		
Real-time clock:		A 365-day real time clock/calendar chip. The time and date will be maintained for a minimum of 72 hours after loss of power (at room temperature).		
Device identification:		A serial number label is on the back of the device.		

Physical Dimensions



OptiPoint 4 Interface

A: 121 mm (4.76")
B: 82 mm (3.23")
C: 49 mm (1.93")
D:110 mm (4.33")
E: 74 mm (2.91")
F: 42 mm (1.65")

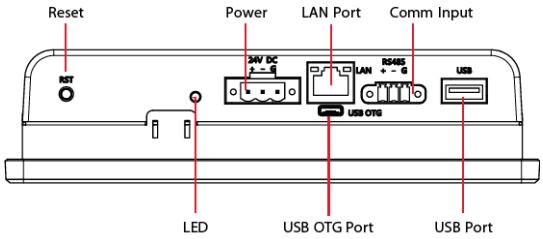
OptiPoint 7 Interface

A: 185 mm (7.28")
B: 128 mm (5.04")
C: 46 mm (1.81")
D:175 mm (6.89")
E: 118 mm (4.65")
F: 39 mm (1.52")

OptiPoint 10 Interface

A: 267 mm (10.5")
B: 182 mm (7.17")
C: 47 mm (1.85")
D: 244 mm (9.61")
E: 159 mm (6.26")
F: 39 mm (1.52")

Ports



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AUTOMATEDLOGIC
United Technologies

ReV0120

COMMERCIAL CONTROL DAMPER

AIR2O INTELLIGENT COOLING

BY RYAN ZHOU

AIR2O CONTROL DAMPER™

Air₂O is an industry leader in designing and manufacturing hybrid evaporative cooling solutions. Air₂O also provide damper solutions with high performance and sustainable energy efficiency. The material used on damper can be galvanized, stainless, or aluminum for any solutions.

CONTROL SOLUTIONS

AIR2O CONTROL DAMPER™ is a solution that regulates the flow of air inside an air handler. Its operation can be manual or automatic. Manual dampers are controlled by a handle on the outside of a duct. Automatic dampers are used to regulate airflow constantly and operated by actuator., which is controlled by a thermostat or building automation system.

CONSTRUCTION

Leakage

The leakage rate of the whole machine is not more than 0.5%, and the test pressure is according to the standard of JB/T7228-1994 air volume control damper.

Axles

The flatness of the axles surface shall not be greater than 0.2;

The axles must be less resistance while rotation after assembly, and there must be no jamming.

Blade Seals

The size of the extrude on the blade meets the design requirements, the deviation is less than ±2mm, and the diagonal difference is less than 2mm;

One side of the blade is glued with a rubber strip.

Strength

The shaft material is featured with PA6 GF-30: Glass fiber reinforced 30% rockwell hardness at 23 degrees Celsius: 87.M-Scale, compression strength 80 Degrees Celsius: 990kg/cm2 when the shear strength is 80 degrees Celsius: 684cm.

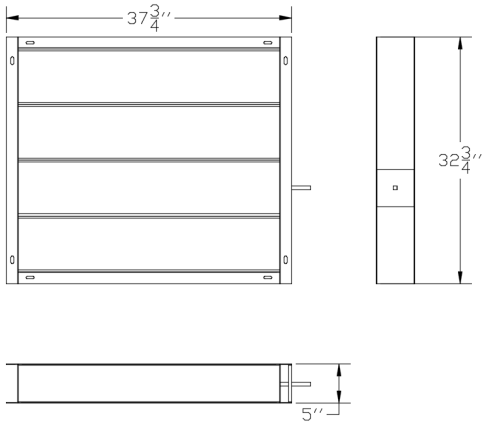
FEATURES

- Positive lock axle, noncorrosive bearings and shake proof linkage for low maintence operation.
- Aluminum alloy salt spray test according to GB/T6461 corrosion results rating; protection level R≥9.5. The damper meets the red rust on the surface after the 150-hour salt spray test.
- When the height of the damper is ≥ 1400mm, the length is <1500mm, the damper is divided into upper and lower bins; the length is ≥1500mm, the upper and lower dampers are assembled, and the length directionis divided into 2 bins; the length ≥2800mm is divided into 3 bins; the length is ≥3600mm, the length the direction is divided into two dampers of the same size.
- When the height of the damper is less than 1400mm, the length is ≥1500mm divided into 2 bins, ≥2800mm is divided into 3 bins; when the damper size is ≥ 3600mm, two dampers of the same size are rquired to be assembled.

OPTIONS

- Factory-installed, pneumatic and electric actuators.
- SP100 Switch Package to remotely indicate damper blade position
- Front, rear or double flange frame with or without bolt holes

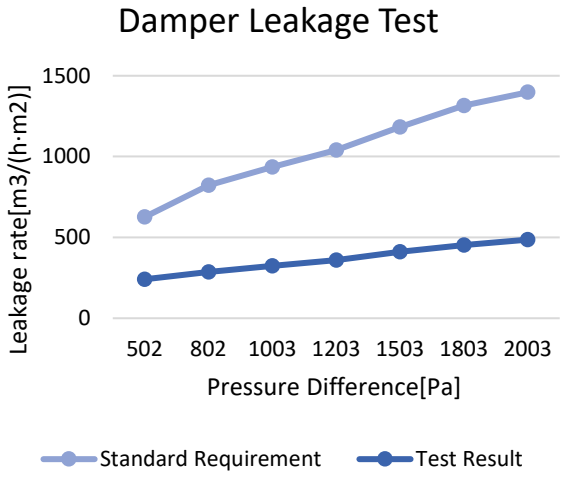
DIMENSIONAL INFORMATION

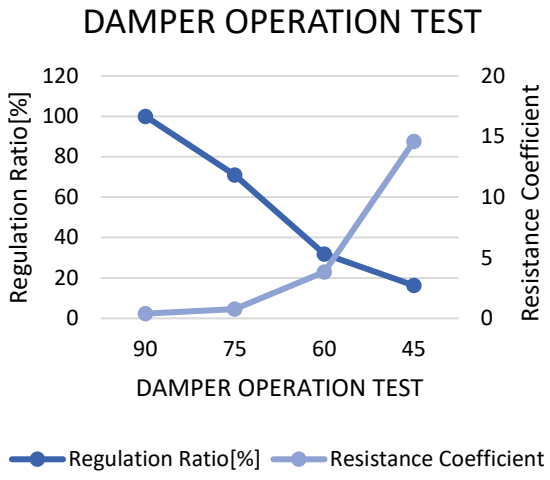


TEST REPORT

DAMPER LEAKAGE TEST								
Pressure Difference[Pa]		502	802	1003	1203	1503	1803	2003
Leakage rate[$m^3/(h \cdot m^2)$]	Standard Requirement	626.3	822.0	935.6	1040.0	1183.0	1314.9	1397.87
	Test Result	241.1	285.8	324.6	359.2	410.7	452.2	486.2

DAMPER OPERATION TEST				
Damper Opening Angle	90	75	60	45
Resistance Coefficient	0.39	0.77	3.83	14.60
Regulation Ratio[%]	100	71.0	31.9	16.3
Max. Pressure Difference[Pa]	2003			





ZG-JSL, ZG-JSLA Jackshaft Retrofit Linkage

For Use with Belimo Rotary Actuators

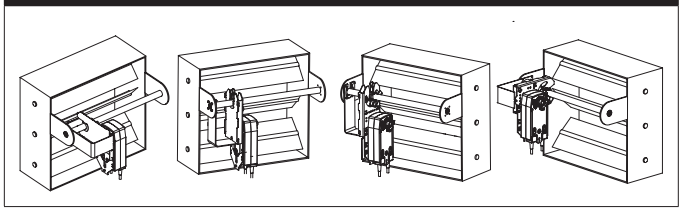
5 YEAR WARRANTY

Technical Data

Stem	steel
Frame, plate, base	galanized steel
Housing material	galvanized steel
Bearing	GF Delrin
Mounting Position	90° to 180°
Ambient temperature	-22...122°F [-30...50°C]
Storage temperature	-40...176°F [-40...80°C]
Weight	5.2 lb [2.4 kg]

* ZG-121 adapter must be used with EF. ** GM/GK not for use with 1/2" shafts. *** K6-1 clamp must be used with LF. For close-off pressure reference Select Pro or Retrofit Technical Documentation.
For close-off pressure reference Select Pro or retrofit technical documentation.

Flow Pattern



Application

The ZG-JSL jackshaft linkage is designed to easily attach to any part of a jackshaft and allow easy installation of select Belimo actuators. The unique open ended design and clamp insert allows the ZG-JSL to be used with any jackshaft from ½" to ¾" in diameter. Removal of the insert will allow the linkage to attach to a maximum shaft diameter of 1.05". Changing the antirotation plate will allow various actuators to be mounted.

Operation

The ¾" diameter built-in steel shaft allows direct coupling to the Belimo series actuators in the chart below. There is a torque reduction when using the ZG-JSL linkage. Verify application requirements before use.

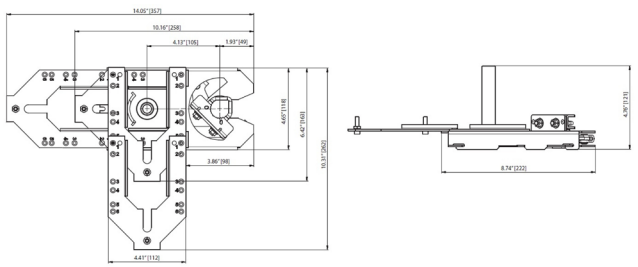
Default/Configuration

The ZG-JSL linkage can also be configured by moving the anti-rotation plate 90° for space-saving applications. See mounting configurations below. The ZG-JSLA will have a factory mounted actuator on the linkage in the vertical position only.

Suitable Actuators

	Non-Spring	Spring	Electronic fail-safe
ZG-JSL	AMB(X), GMB(X), NMB(X)	AF, EFB(X), LF, NF	NKQB(X)

Dimensions (Inches [mm])



AFX24 Damper Actuator Technical Data Sheet
On/Off, Spring Return, AC/DC 24 V

Torque min. 180 in-lb, for control of air dampers.

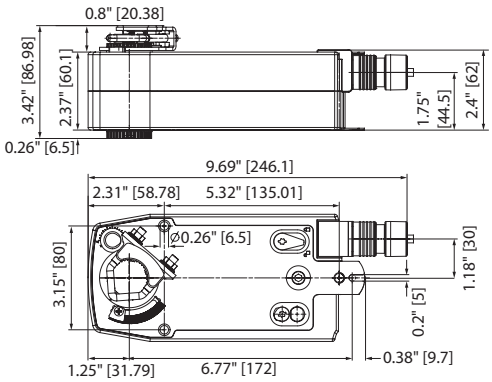
Application
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two AF's can be piggybacked for torque loads of up to 266 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

Operation
The AF..24 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The AF..24 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The AF..24 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	5 W
Power consumption in rest position	2.5 W
Transformer sizing	7.5 VA (class 2 power source)
Shaft Diameter	1/2...1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	18 GA appliance or plenum cables, 3 ft [1 m], 10 ft [3 m] or 16ft [5 m], with or without 1/2" conduit connector
Overload Protection	electronic throughout 0...95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°, adjustable with mechanical end stop, 35...95°
Torque motor	180 in-lb [20 Nm]
Direction of rotation motor	reversible with CW/CCW mounting
Direction of motion fail-safe	reversible with cw/ccw mounting
Position indication	Mechanical
Manual override	5 mm hex crank (3/16" Allen), supplied
Running Time (Motor)	<75 s
Running time fail-safe	<20 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
Ambient humidity	max. 95% r.H., non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Storage temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Galvanized steel and plastic housing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	50 dB(A)
Noise level, fail-safe	62 dB(A)
Maintenance	maintenance-free
Quality Standard	ISO 9001
Weight	4.0 lb [1.8 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

Dimensions (Inches[mm])

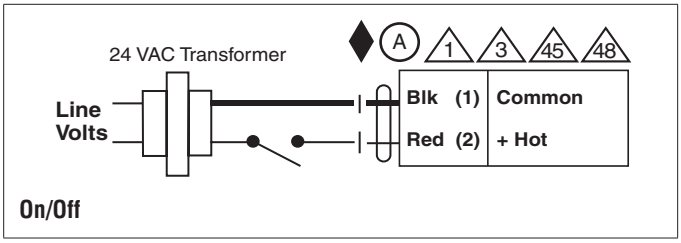


Safety Notes
WARNING: For Belimo products sold in California: these products do or may contain chemicals which are known to the State of California to cause cancer and or birth defects or other reproductive harms. For more information see www.p65warnings.ca.gov.

AFX24 Damper Actuator Technical Data Sheet

On/Off, Spring Return, AC/DC 24 V

Accessories	
AF-P	Anti-rotation bracket AF/NF.
AV8-25	Shaft extension
IND-AFB	End stop indicator
K7-2	Shaft clamp reversible
KG10A	Ball joint
KG8	Ball joint
KH10	Damper crank arm
KH8	Damper crank arm
KH-AFB	Actuator arm
SH10	Push rod for KG10A ball joint (36” L, 3/8” diameter).
SH8	Push rod for KG6 & KG8 ball joints (36” L, 5/16” diameter).
TOOL-06	8 mm and 10 mm wrench.
ZG-100	Univ. right angle bracket 17”x11-1/8”x6” (HxWxbase).
ZG-101	Univ. right angle bracket 13x11x7-7/16” (HxWxbase).
ZG-102	Dual actuator mounting bracket.
ZG-109	Right angle bracket for ZS-260.
ZG-110	Stand-off bracket for ZS-260.
ZG-118	AFB(X)/NFB(X) U bracket 5-7/8x5-1/2x2-19/32” (HxWxD).
ZG-120	Jackshaft mounting bracket.
ZG-AFB	Mounting and linkage kit
ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
ZG-DC1	Damper clip for damper blade, 3.5” width.
ZG-DC2	Damper clip for damper blade, 6” width.
ZG-JSA-1	1” diameter jackshaft adaptor (11” L).
ZG-JSA-2	1-5/16” diameter jackshaft adaptor (12” L).
ZG-JSA-3	1.05” diameter jackshaft adaptor (12” L).
ZS-100	Weather shield - galvaneal 13x8x6” (LxWxD).
ZS-101	Base plate for ZS-100.
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4” (LxWxD).
ZS-260	Explosion proof housing.
ZS-300	NEMA 4X, 304 stainless steel enclosure.
ZS-300-5	NEMA 4X, 316L stainless steel enclosure.
ZS-300-C1	1/2” shaft adaptor, standard wtih ZS-300(-5).
ZS-300-C2	3/4” shaft adaptor for ZS-300(-5).
ZS-300-C3	1” shaft adaptor for ZS-300(-5).
Z-SF	Base plate extension
P475	Shaft mount, non-Mercury aux. switch for 1/2” dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1” dia. shafts.
PS-100	Actuator power supply and control simulator.
TF-CC US	Cable conduit connector, 1/2”.
ZG-X40	120 to 24 VAC, 40 VA transformer.



Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05” diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

WARNING! LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Meets cULus requirements without the need of an electrical ground connection.

A Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

45 Actuators may be powered in parallel. Power consumption must be observed.

48 Parallel wiring required for piggy-back applications.

Unit Casing

Construction

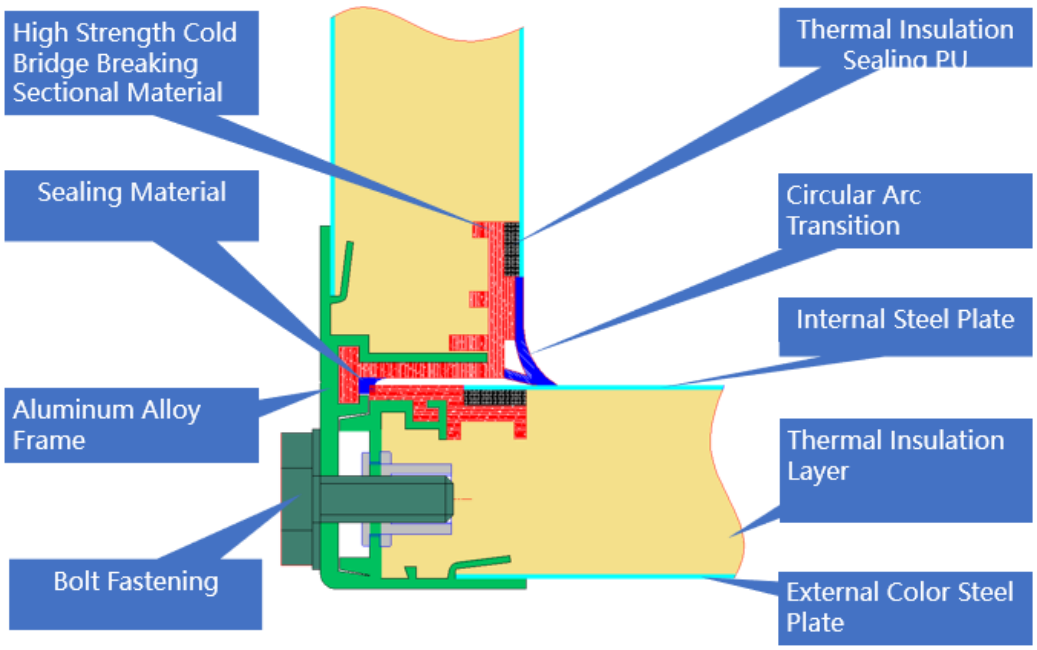
Outer Shell	2” Double Skin
Material	
Skin	1/32’’ thickness painted steel plate
Thermal insulation layer	2’’ Polyurethane foam
Frame	Aluminium alloy frame
Condensate drain pan	5/64’’ thickness stainless steel sheet

Performance

	Value	Unit	AHRI 1351(SI)	EN 1886
Air Leakage Rate	0.11%	%	CL1 (Highest)	L1 (Highest)
R-Value	25.8	$(Ft^2 F^o)/BTU$	CT1 (Highest)	T1 (Highest)
Thermal Bridging Factor K_b	0.8	N/A	CB1 (Highest)	TB1 (Highest)
Casing Deflection Rating Class	0.64	mm / m	CD1 (Highest)	D1 (Highest)

Board Connection Type

2’’ / 50 mm



ACCESS DOOR

- The surface is flat and the door frame is in close contact with the casing.
- The whole door is made of high-pressure foaming, with high strength and no air leakage; it adopts composite structure with no thermal bridge, no condensation.
- Hinge, handle, observation window and other components are black ABS plastic, simple design.

When the positive pressure section access door is opened, the internal locking device acts at the same time, the door can only open a small amount, and the handle must be turned again to completely open the door (to avoid personal injury caused by accidental opening of the positive pressure door during operation).

OMRON
AUTOMATION & SAFETY

New WL-N Series Limit Switches

Easy to use and models focus on the most popular features to make stocking easier

Features & Benefits

- Gold clad contacts cover a wide range of loads from micro-load to general load.
- Reduced part numbers
- Easy wiring
- Improved visibility of indicators (for WL-□LE/LD /LR-N types)

Roller lever type (Standard, R=38 mm)

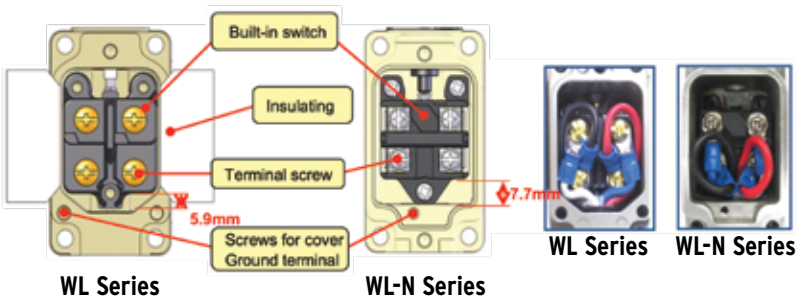
8 part numbers ➡ 3 part numbers

Operating characteristics		Head type		Contact type
PT	TT	One-way operation	Mounting	
15	45	Yes	4-direction	For General load
15	45	Yes	4-direction	For Micro load
15	80	No	4-direction	For General load
15	80	No	4-direction	For Micro load
20	90	Yes	4-direction	For General load
20	90	Yes	4-direction	For Micro load
25	90	No	2-direction	For General load
25	90	No	2-direction	For Micro load

➡

Type	Standard	Operating characteristics		Head type		Contact type
	Part No.	PT	TT	One-way operation	Mounting	
Overtravel 90° type	WLCA2-N	15	90	Yes	4-direction	For General and Micro loads
	WLCA2-2N-N	20				
	WLCA2-2-N	25				

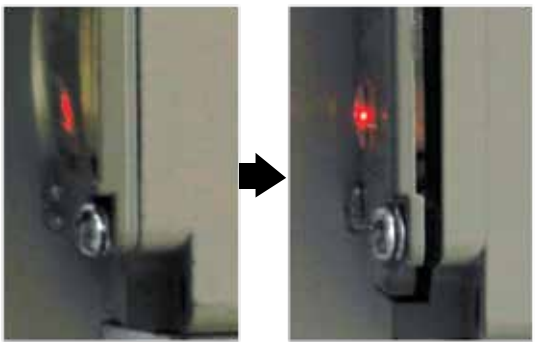
Easy Wiring



WL Series WL-N Series

WL Series WL-N Series

Improved visibility of indicators (for WL-□LE/LD/LR- N series)



WL Series WL-N Series

WL-N Series Nomenclature

Operating Characteristics/Lever Type

Code	Operating Characteristics	Lever
RCA2	PT 15±5°	Without Lever
CA2		Standard Lever
CL		Adjustable Rod Lever (25 mm to 140 mm)
CA12		Adjustable Lever
CA2-7		Roller R – 50 mm
CA2-8		Roller R – 63 mm
HAL4		Adjustable Rod Lever (350 to 380 mm)
HAL5		Spring Rod lever
RG2	PT 10°(+2/-1)	Without Lever
G2		Standard Lever
G12		Adjustable Lever
GL		Adjustable Rod Lever
RCA2-2	PT 25±5°	Without Lever
CA2-2		Standard Lever
CA12-2		Adjustable Lever
CL-2		Adjustable Rod Lever
RCA2-2N	PT 20°Max.	Without Lever
CA2-2N		Standard Lever
CA12-2N		Adjustable Lever
CL-2N		Adjustable Rod Lever

Environment-resistant

Code	Specifications
Blank	Standard type
P1	Weather-resistant type
TH	Heat-resistant type
TC	Low temperature type

Sensor I/O connector

Same connectors as the current WL are available

Screw

Code	Specifications
Blank	Standard type (Steel)
E2	Stainless steel screw

Indicator

Code	Type of Indicator
Blank	Without Indicator
LE	Neon lamp
LD	LED
LR	LED (special wiring)

Lamp wiring (with cable type)

Code	Wiring
2	NC side wiring. Light when operating
3	NO side wiring. Light when not operating

Actuator

Code	Actuator mounting screw
Blank	Standard(Allen-head bolt)
A	Double nuts
F	Allen-head hexagon nut

Spatter-prevention

Code	Specifications
Blank	Without Spatter-prevention
S	Spatter-prevention type

Conduit size / Ground terminal

Code	Conduit size	Ground terminal
Blank	G1/2	Without ground terminal
G1	G1/2	With ground terminal
G	Pg13.5	With ground terminal
Y	M20	With ground terminal

Specifications

Approved standards		UL508,CSA C22.2 No.14, EN60947-5-1,GB14048.5
Electrical Rating		A600, 1A at 125 VDC
Insulation Resistance		100 MΩ Minimum (at 500 VDC)
Contact Resistance		25 mΩ Maximum (at initial)
Dielectric strength	Between same polarity	1,000 VAC 50/60Hz 1 minute
	Between terminals and ground	2,200 VAC 50/60Hz 1 minute
	Between terminals and non-live metal parts	2,200 VAC 50/60Hz 1 minute
Permissible operating speed		1 mm to 1 m/second

Permissible operating frequency	Mechanical	120 operations/minute
	Electrical	30 operations/minute
Protective code		IP67
Minimum applicable load		1 mA at 5VDC, Resistive load, P-level
Ambient temperature		-10°C to +80°C (with no icing)
Ambient humidity		35 to 95%RH
Mechanical durability		15,000,000 operations minimum
Electrical durability		750,000 operations minimum (3A at 250VAC, Resistive load)

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C22I-E-01 Note: Specifications are subject to change. Printed in U.S.A.

Dwyer

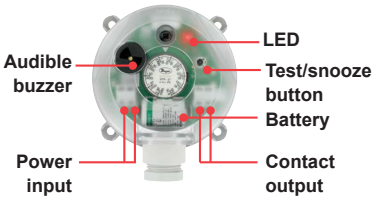
SERIES ADPS/EDPS/BDPA

HVAC DIFFERENTIAL PRESSURE SWITCHES

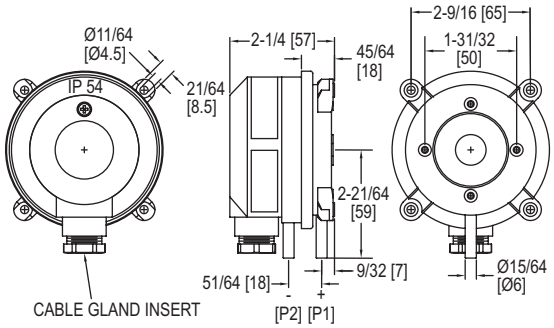
With Dual Scale Field Adjustable Set Point Knob

ADPS

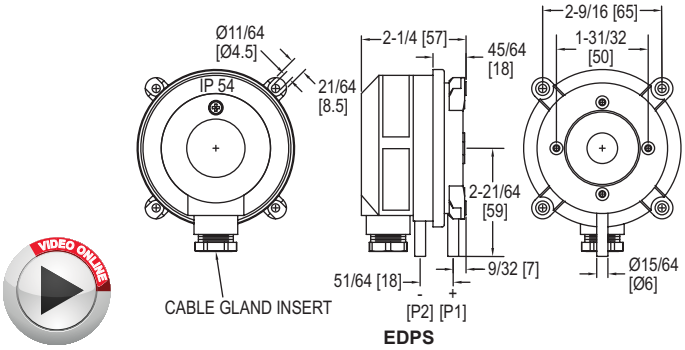
EDPS



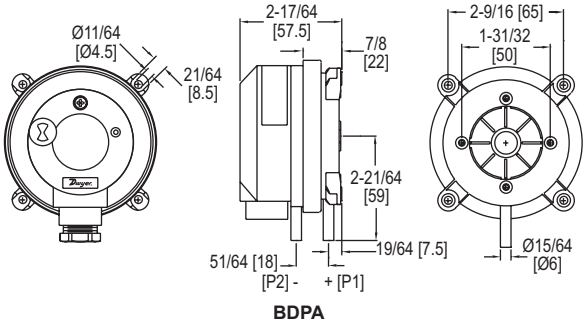
BDPA



ADPS



EDPS



BDPA

The **Series ADPS/EDPS/BDPA HVAC Differential Pressure Switches** are designed for pressure, vacuum, and differential pressures. The dual scaled adjustment knob in inches water column and pascals allows changes to the switching pressure to be made without a pressure gage. The ADPS/EDPS/BDPA are available with settings from 0.08 in w.c. (20 Pa) up to 20 in w.c. (5000 Pa). The silicone diaphragm and PA 6.6 body make the series ADPS ideal for use with air and other noncombustible gases. Series EDPS models meet UL508 and are constructed of plenum rated plastics. The series BDPA Adjustable Differential Pressure Alarms offer a versatile range of configurations allowing utilization of their many features including buzzer and LED notification, and battery or line powered. The compact size, adjustment knob and low cost make the ADPS/EDPS/BDPA the perfect choice for HVAC applications.

FEATURES/BENEFITS

- Adjustment knob changes switching pressure easily with a pressure gage reducing components for application
- Low cost device makes it an excellent solution in BAS and HVAC applications requiring duct control and monitoring
- Relay contact allows simple integration with DDC or building systems

APPLICATIONS

- Air filter and ventilator monitoring
- Industrial cooling circuits
- Fire-protection damper control
- Ventilation duct monitoring
- Fan heater overheating protection
- Heat exchanger frost protection

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: ADPS: Diaphragm material: Silicone; Housing material: POM; Switch body: PA 6.6; Cover: Polystyrene; EDPS: Diaphragm material: Silicone; Housing material: Switch body: PA 6.6; Cover: Polystyrene; Materials UL 94 V-0 rated.
Temperature Limits: Process and ambient temperature from -4 to 185°F (-20 to 85°C).
Storage: -40 to 185°F (-40 to 85°C).
Pressure Limits: Max. operating pressure: 40 in w.c. (10 kPa) for all pressure ranges.
Switch Type: Single-pole double-throw (SPDT).
Electrical Rating: Max. 1.5 A res./0.4 A ind./250 VAC, 50/60 Hz; Max. switching rate: 6 cycles/min.
Electrical Connections: Push-on screw terminals. M20x1.5 with cable strain relief or optional 1/2″ NPT.
Process Connections: 5/16″ (7.94 mm) outside diameter tubing, 1/4″ (6.0 mm) inside diameter tubing.
Enclosure Rating: NEMA 13 (IP54).
Mounting Orientation: Vertically, with pressure connections pointing downwards.
Mechanical Working Life: Over 10^6 switching operations.
Weight: 4.4 oz (125 g).
Agency Approvals: ETL approved to UL508 and CSA C22.2#14 (EDPS only).

MODEL CHART - ADPS

Model	Set Point Range in w.c. (Pa)	Approx. Dead Band @ Min Set Point in w.c. (Pa)	Approx. Deadband @ Max Set Point in w.c. (Pa)
ADPS-08-2-N	0.08 to 1.20 (20-300)	0.04 (10)	0.05 (12)
ADPS-04-2-N	0.12 to 1.60 (30-400)	0.06 (15)	0.09 (23)
ADPS-03-2-N	0.20 to 2.00 (50-500)	0.08 (20)	0.09 (23)
ADPS-05-2-N	0.80 to 4.00 (200-1000)	0.4 (100)	0.5 (130)
ADPS-06-2-N	2.00 to 10.00 (500-2500)	0.6 (150)	0.8 (200)
ADPS-07-2-N	4.00 to 20.00 (1000-5000)	1.0 (250)	1.4 (350)

Note: For optional 1/2″ NPT conduit connection, change -2-N to-1-N. Models that include installer kit add -C to the end of the model number (-2-N cable gland models only). Installer kit includes two static tips and 7 ft of PVC tubing. Order installer kit separately with 1/2″ NPT conduit connection models. See A-481 in the accessories list. Consult factory for bulk packaging option.

MODEL CHART - EDPS

Model	Set Point Range in w.c. (Pa)	Approx. Dead Band @ Min Set Point in w.c. (Pa)	Approx. Dead Band @ Max Set Point in w.c. (Pa)
EDPS-08-1-N	0.08 to 1.20 (20-300)	0.04 (10)	0.05 (12)
EDPS-04-1-N	0.12 to 1.60 (30-400)	0.06 (15)	0.09 (23)
EDPS-03-1-N	0.20 to 2.00 (50-500)	0.08 (20)	0.09 (23)
EDPS-05-1-N	0.80 to 4.00 (200-1000)	0.4 (100)	0.5 (130)
EDPS-06-1-N	2.00 to 10.00 (500-2500)	0.6 (150)	0.8 (200)
EDPS-07-1-N	4.00 to 20.00 (1000-5000)	1.0 (250)	1.4 (350)

Note: For optional M20 cable gland connection, change -1-N to-2-N.

MODEL CHART - BDPA

Model	Set Point Range in w.c. (Pa)	Approx. Dead Band @ Min Set Point in w.c. (Pa)	Approx. Dead Band @ Max Set Point in w.c. (Pa)
BDPA-08-2-N	0.08 to 1.20 (20 to 300)	0.04 (10)	0.05 (12)
BDPA-04-2-N	0.12 to 1.60 (30 to 400)	0.06 (15)	0.09 (23)
BDPA-03-2-N	0.20 to 2.00 (50 to 500)	0.08 (20)	0.09 (23)
BDPA-05-2-N	0.80 to 4.00 (200 to 1000)	0.4 (100)	0.5 (130)
BDPA-06-2-N	2.00 to 10.00 (500 to 2500)	0.6 (150)	0.8 (200)
BDPA-07-2-N	4.00 to 20.00 (1000 to 5000)	1.0 (250)	1.4 (350)

ACCESSORIES

Model	Description
A-288	"L" type metal mounting bracket with screws
A-289	"S" type metal mounting bracket with screws
A-480	Plastic static pressure tip
A-481	Installer kit, includes 2 plastic static pressure tips & 7′ (2.1 m) of PVC tubing
A-489	4″ straight static pressure tip with flange

A-480

Process Tubing Options: See page 455 (Gage Tubing Accessories)

RH DUCT

Relative Humidity, Duct, Thermistor

The ACI Relative Humidity with Thermistor Duct Series utilizes a thermoset polymer capacitive sensing element with a factory fitted hydrophobic filter to improve its moisture resistance. The sensing elements multilayer construction also provides excellent resistance in applications where dust, dirt, oils and common environmental chemicals are found. The RH duct sensors include on board DIP switches which allow the user to select the desired output signal and can be powered by AC or DC power sources. Each unit also contains 0%, 50%, and 100% test options to verify that the transmitter is both working and wired properly. Field calibration can be performed by using the increment and decrement calibration DIP switches without the need to replace the sensing element. These enhancements provide increased flexibility and outstanding long-term reliability without the need to replace the sensors in the field. Duct configurations feature a weatherproof Euro style enclosure with a gasketed cover and conformally coated circuit boards for increased moisture resistance in high humidity environments. The sensor is protected by a stainless-steel sintered filter. Three and Five-point NIST Calibration Certificates are available and must be ordered separately when placing your order.

Applications: Humidification, Dehumidification, Supply / Discharge / Return Air, Economizers, Clean Rooms, Data Centers, Process Control, Schools, Hospitals, Office Buildings

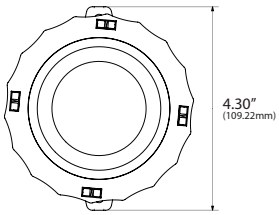
The ACI RH Thermistor Duct is covered by ACI's Five (5) Year Limited Warranty. The warranty can be found in the front of ACI's Sensors & Transmitters catalog, as well as on ACI's website, www.workaci.com.

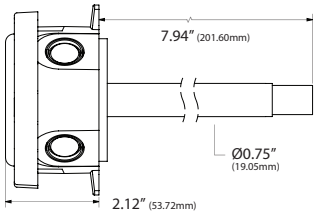
PRODUCT SPECIFICATIONS

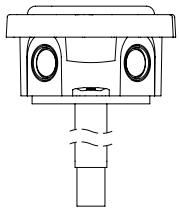
RH Supply Voltage	**4-20 mA:** 250 Ohm Load: 15 - 40 VDC / 18 - 28 VAC | **500 Ohm Load:** 18 - 40 VDC / 18 - 28 VAC	
(Reverse Polarity Protected):	**0-5 VDC:** 12 - 40 VDC / 18 - 28 VAC | **0-10 VDC:** 18 - 40 VDC / 18 - 28 VAC	
RH Supply Current (VA):	**Voltage Output:** 8 mA maximum (0.32 VA) | **Current Output:** 24 mA maximum (0.83 VA)	
RH Output Load Resistance:	**4-20 mA:** 700 Ohms maximum | **0-5 VDC or 0-10 VDC:** 4K Ohms Minimum	
RH Output Signal:	**2-wire:** 4 - 20 mA (Factory Default) | **3-wire:** 0-5 or 0-10 VDC and 4 - 20 mA (Field Selectable)	
RH Accuracy @ 77°F (25°C):	+/- 1% over 20% RH Range between 20 to 90% | +/- 2%, 3%, or 5% from 10 to 95%	
RH Measurement Range	0-100%	
Operating RH Range:	0 to 95% RH, non-condensing (Conformally Coated PCB's)	
Operating Temperature Range:	-40 to 140°F (-40 to 60°C)	
Storage Temperature Range:	-40 to 149°F (-40 to 65°C)	
RH Stability | Repeatability | Sensitivity:	Less than 2% drift / 5 years | 0.5% RH | 0.1% RH	
RH Response Time (T63):	20 Seconds Typical	
RH Sensor Type:	Capacitive with Hydrophobic Filter	
RH Transmitter Stabilization Time:	30 Minutes (Recommended time before doing accuracy verification)	
RH Connections | Wire Size:	Screw Terminal Blocks (Polarity Sensitive) | 16 (1.31 mm^2) to 26 AWG (0.129 mm^2)	
RH Terminal Block Torque Rating:	4.43 to 5.31 lb-in (0.5 to 0.6 Nm)	
RH NIST Test Points:	**Default Test Points:** 3 Points (20%, 50% & 80%) or 5 Points (20%, 35%, 50%, 65% & 80%)	
	1% NIST Test Points: 5 Points within selected 20% Range (ie. 30%-50% are 30, 35, 40, 45 & 50)	
Nominal Thermistor Resistive Output @ 77°F (25°C)	**RHx-1.8K Series:** 1.8KΩ (Red/Yellow)	**RHx-CSI Series:** 10KΩ (Green/Yellow)
(Lead Wire Colors) Non-Linear NTC (Negative	**RHx-3K Series:** 3KΩ (White/Brown)	**RHx-10KS Series:** 10KΩ (White/Blue)
Temperature Coefficient):	**RHx-AN Series (Type III):** 10KΩ (White/White)	**RHx-10K-E1 Series:** 10KΩ (Gray/Orange)
	RHx-AN-BC Series: 5.238KΩ (White/Yellow)	**RHx-20K Series:** 20KΩ (Brown/Blue)
	RHx-CP Series (Type II): 10KΩ (White/Green)	**RHx-100KS Series:** 100KΩ (Black/Yellow)
Thermistor Accuracy 32-158°F (0-70°C):	+/- 0.36°F (0.2°C) except 10K-E1 Series: +/- 0.54°F (0.3°C)	
	1.8K Series: +/- 0.9°F (0.5°C) @ 77°F (25°C) & +/- 1.8°F (1.0°C) from 32 to 158°F (0 to 70°C)	
Thermistor Power Dissipation Constant:	3 mW/°C except 1.8K Series: 1 mW/°C; 10K-E1 Series: 2 mW/°C	
Thermistor Sensor Response Time (T63):	10 Seconds nominal	
Lead Wire Length | Conductor Size:	14" (35.6 cm) | 22 AWG (0.65 mm)	
Insulation | Rating:	Etched Teflon (PTFE) Colored Leads | Mil Spec 16878/4 Type E	
Enclosure Specifications (Material, Flammability,	**"-EH" Enclosure:** ABS Plastic; UL94-V0; -40 to 140°F (-40 to 60°C)	
Temperature, NEMA/IP Rating):	**"-4X" Enclosure:** Polystyrene Plastic; UL94-V2; -40 to 158°F (-40 to 70°C); NEMA 4X (IP 66)	
Sensing Tube Material | Filter Material:	**"EH" Enclosure:** 304 Series Stainless Steel | 304 Series Stainless Steel	
	"-4X" Enclosure: Schedule 40 PVC (White) | Slotted PVC without filter	
Sensing Tube Dimensions (Length x Diameter):	**"-EH" Models with Sintered Filters:** 7.75" (196.85 mm) x 0.75" (19.05 mm)	
	"-4X" Models: 7.20" (182.88 mm) x 0.84" (21.34 mm)	
Product Dimensions (L x W x D):	See drawings on back of data sheet	
Product Weight:	**A/RHx-xx-D Series:** 1.22 lbs. (0.55 kg) | **A/RHx-xx-D-4X Series:** 0.50 lbs. (0.227 kg)	
Agency Approvals:	CE, RoHS2, WEEE	

DIMENSIONAL DRAWING

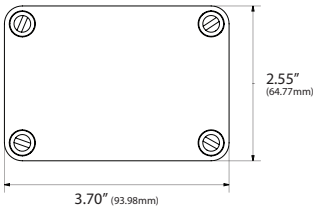
Euro Enclosure [EH]

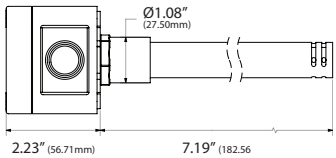


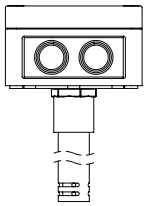




NEMA 4X Enclosure [4X]







Front View | **Right View** | **Top View**

CUSTOM ORDERING

Model # Example: A/ - RH2 - CP - D - 010 - NIST (A. B. C. D. E. F.)

		MODEL #
A. Sensor Series *No Selection Required*	**A/** →	**A/**
B. Accuracy *Select One (1)*	**RH1** = +/-1% (Specify a 20% Range between 20 to 90% RH) **RH2** = +/-2% | **RH3** = +/-3% | **RH5** = +/-5%	
C. Temperature Sensor *Select One (1)*	**1.8K** | **3K** | **10KS** | **AN** (Type III) | **AN-BC** | **CP** (Type II) | **CSI** | **10K-E1** | **20K** | **100KS**	
D. Configuration *Select One (1)*	**D** = Duct (Euro Enclosure) | **D-4X** (NEMA 4X Enclosure)	
E. Output Signal *Select One (1)*	**----** = 4 to 20 mA (Default) | **010** = 0 to 10 VDC | **05** = 0 to 5 VDC	
F. NIST (Temperature) *Select One (1)*	**----** = No NIST Certificate | **NIST** = NIST Certificate (Must Specify 1, 3 or 5 Points)	

Note: Outputs are field selectable between 4-20 mA, 0-5 VDC & 0-10 VDC

ACCESSORIES ORDERING

Model # Example: A/SINTERED FILTER

Model #	Item #	Description
A/SINTERED FILTER	143433	3/8″ Sintered Filter for RH Duct/Stainless Plate/Remote Probe

ACCESSORIES ORDERING [NIST]

Model # Example: NIST RH CERT

Model #	Description
NIST RH CERT	RH Calibration Certificate (Specify 3 Point or 5 Point NIST)

Note: When ordering NIST certificates, please add an additional line item under the corresponding A/RHx-xx-D Model Number

A19 Series Remote Bulb Control

Description

The A1 Series Controls are single-stage temperature controls that incorporate environmentally friendly li uid-filled sensing elements.

Refer to the *A19 Series Hot Water Heating Controls Well Immersion Product Bulletin (LIT-125025)* for important product application information.

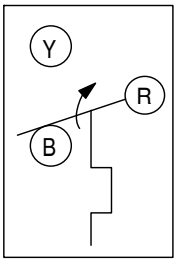
Features

- wide temperature ranges available
- constant differential throughout the entire range
- compact enclosure
- fixed or adjustable differential available
- variety of sensing element styles
- unaffected by cross-ambient conditions

Applications

The A1 is suitable for temperature control in HVAC/R applications.

A19 Series



Action on Increase of Temperature

a1 .eps

A19 Series Terminal Arrangement for Single-Pole, Double-Throw (SPDT)

A19ABC-24 Remote Bulb Control

Wheel Air High Temp Switch
Reactivation High Temp Switch
Reactivation Low Temp Switch

Selection Charts

A19 Series Remote Bulb Control[1]

Product Code Number	Switch Action	Range °F (°C)	Differential F° (C°)	Bulb and Capillary	Bulb Well No. (Order Separately)	Range Adjuster	Max. Bulb Temp. °F (°C)
Adjustable Differential (Wide Range)							
A19ABA-40C[2]	Single-Pole, Single-Throw SPST Open low	-30 to 100 -3 to 38	3 to 12 1. to .	3/8 in. x in., ft. capillary	WEL1 A- 02R	Screwdriver Slot	1 0 0
A19ABC-4C	SPDT	50 to 130 10 to 55	3-1/2 to 1 1. to 8	3/8 in. x 5 in., 8 ft. capillary	WEL1 A- 03R	nob	1 0
A19ABC-24C[3]	SPDT	-30 to 100 -3 to 38	3 to 12 1. to .	3/8 in. x in., 8 ft. capillary	WEL1 A- 02R	Convertible	1 0 0
A19ABC-36C	SPDT	-30 to 100 -3 to 38	3 to 12 1. to .	3/8 in. x in., 20 ft. capillary	WEL1 A- 02R	Convertible	1 0 0
A19ABC-37C	SPDT	-30 to 100 -3 to 38	3 to 12 1. to .	3/8 in. x in., 10 ft. capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
A19ABC-74C	SPDT	-30 to 100 -3 to 38	3 to 12 1. to .	3/8 in. x in., ft. capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
Fixed Differential							
A19AAF-12C	SPDT	25 to 225 - to 10	3-1/2 1.	3/8 in. x 3 in., 10 ft. capillary	WEL1 A- 02R	Screwdriver slot	2 5 135
Fixed Differential (Case Compensated)							
A19AAC-4C	SPDT	0 to 80 -18 to 2	5 2.8	3/8 in. x in., ft. capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
A19AAD-12C	SPST Open low	-30 to 50 -3 to 10	2-1/2 1.	3/8 in. x in., ft. capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
Fixed Differential (Close)							
A19AAD-5C[4]	SPST Open low	30 to 50 -1 to 10 (Bulk Milk Cooler)	2-1/2 1.	3/8 in. x 2-5/8 in., ft. capillary	WEL1 A- 01R	Screwdriver slot	1 0 88
A19AAF-20C	SPDT	-30 to 100 -3 to 38	2-1/2 1.	3/8 in. x in., ft. capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
A19AAF-21C	SPDT	0 to 0 to 32	1-1/2 0.8	3/8 in. x 5-3/ in., ft. capillary	WEL1 A- 03R	Screwdriver slot	1 0 0
Manual Reset							
A19ACA-14C	SPST Open low	-30 to 100 -3 to 38	Manual reset	3/8 in. x in. ft capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
A19ACA-15C	SPST Open low	-30 to 100 -3 to 38	Manual reset	3/8 in. x in. 10 ft capillary	WEL1 A- 02R	Screwdriver slot	1 0 0
A19ADB-1C	SPST Open high	100 to 2 0 38 to 11	Manual reset	3/8 in. x 3-1/2 in. ft capillary	WEL1 A- 02R	nob	2 0 1 3
A19ADB-38C	SPST Open high	100 to 2 0 38 to 11	Manual reset	3/8 in. x in. ft capillary	WEL1 A- 02R	Screwdriver slot	2 0 1 3

1. Specify the control model code number, packing nut code number if re uired , and bulb well code number if re uired .
2. Replaces White-Rodgers 1 0 -101
3. Replaces White-Rodgers 1 0 -12, -13 Ranco 010-1 08, -1 0 , - 1 10, -1 0, 0 0-110 Honeywell L 018C-100 , L 021A-1005, T 5A-1011, -1508, -151 , -1821, T 301A-1008, T 031A-1011, T 031A-102
. Case-Compensated

A19 Series Remote Bulb Control (Continued)

Replacement Parts

Product Code Number	Description
CVR28A-617R	Concealed adjustment cover
CVR28A-618R	Visible scale cover
KNB20A-602R	Replacement nob it

Accessories

A packing nut is available for closed tank application.
Specify the code number **FTG13A-600R**.

Bulb wells WEL1 A Series are available for li uid immersion applications.
See the selection chart or the *Bulb Wells Catalog Page (LIT-1922135)*.

Technical Specifications

Electrical Ratings

Motor Ratings VAC	120	208	240
Wide Range – Adjustable Differential			
AC Full Load A	1 .0	.2	8.0
AC Locked Rotor A	.0	55.2	8.0
Non-Inductive A[1]	22 A, 120 to 2 VAC		
Pilot Duty	125 VA, 2 to 00 VAC		
Fixed Differential and Close Differential			
AC Full Load A	.0	3.	3.0
AC Locked Rotor A	3 .0	20.	18.0
Non-Inductive A	10 A, 2 to 2 VAC		
Pilot Duty	125 VA, 2 to 2 VAC		
Case Compensated – Fixed Differential A19AAC-4			
AC Full Load A	1 .0	.2	8.0
AC Locked Rotor A	.0	55.2	8.0
Non-Inductive A[1]	22 A, 120 to 2 VAC		
Pilot Duty	125 VA, 2 to 00 VAC		
A19AAD-12			
AC Full Load A	.0	3.	3.0
AC Locked Rotor A	3 .0	20.	18.0
Non-Inductive A	10 A, 2 to 2 VAC		
Pilot Duty	125 VA, 2 to 2 VAC		
Manual Reset			
AC Full Load A	1 .0	.2	8.0
AC Locked Rotor A	.0	55.2	8.0
Non-Inductive A	1 .0	.2	8.0
Pilot Duty	125 VA, 2 to 00 VAC		

1. SPST and N.O. contact of SPDT control
   SPDT N.C. contact- 1 amperes 120 to 2 VAC

Enclosed Switch

D4MC

CSM_D4MC_DS_E_2_1

Economical, High Utility Enclosed Switch

- Enclosed Switches with Built-in Basic Switches for High Repeatability and Durability of 10 Million Operations Minimum.
- Panel mount versions have the same operating position as Z Basic Switch.
- Suitable for applications demanding higher mechanical strength, dustproof and drip-proof properties than those on basic switches.
- Resin molded terminal versions are available.
- Approved by UL, CSA, and CCC (Chinese standard). (Ask your OMRON representative for information on approved models.)

⚠ Be sure to read *Safety Precautions* on page 5 and *Safety Precautions for All Limit Switches*.

Model Number Structure

Model Number Legend

D4MC- □ **(1)**

(1) Actuator

5000: Panel mount plunger
5020: Panel mount roller plunger
5040: Panel mount crossroller plunger
1000: Hinge lever
1020: Short hinge lever
2000: Hinge roller lever
2020: Short hinge roller lever
3030: One-way action short hinge roller lever

Desiccant Wheel
Moving Limit Switch

Ordering Information

Actuator	Model
Panel mount plunger	D4MC-5000
Panel mount roller plunger	D4MC-5020
Panel mount crossroller plunger	D4MC-5040
Hinge lever	D4MC-1000
Short hinge lever	D4MC-1020
Hinge roller lever	D4MC-2000
Short hinge roller lever	D4MC-2020
One-way action short hinge roller lever	D4MC-3030

Note: 1. Use Switches with molded terminals in locations subject to dirt, dust, oil drops, or high humidity. Models are available with lead wires on the right, on the left, and from the bottom.
2. Contact your OMRON representative for information on models certified for international standards.

Specifications

Approved Standards

Agency	Standard	File No.
UL *	UL508, CSA C22.2 No.14	E76675
CCC(CQC)	GB14048.5	2003010303077627

Note: Ask your OMRON representative for information on approved models.
* UL certified for CSA C22.2 No. 14.

Ratings

Rated voltage	Non-inductive load (A)				Inductive load (A)			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10		3	1.5	10		5	2.5
250 VAC	10		2.5	1.25	10		3	1.5
480 VAC	3		1.5	0.75	2.5		1.5	0.75
8 VDC	10		3	1.5	6		5	2.5
14 VDC	10		3	1.5	6		5	2.5
30 VDC	6		3	1.5	5		5	2.5
125 VDC	0.5		0.4	0.4	0.05		0.05	0.05
250 VDC	0.25		0.2	0.2	0.03		0.03	0.03

Inrush current	NC	30 A max.
	NO	15 A max.

Note: 1. The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.
5. The above ratings were tested under the following conditions.
(1) Ambient temperature: +20±2°C
(2) Ambient humidity: 65±5%RH
(3) Operating frequency: 20 operations/min

Characteristics

Degree of protection		IP67
Durability	Mechanical	10,000,000 operations min.
	Electrical	500,000 operations min.
Operating speed		0.05 mm/s to 0.5 m/s *1
Operating frequency	Mechanical	120 operations/min
	Electrical	20 operations/min
Rated frequency		50/60 Hz
Insulation resistance		100 MΩ min. (at 500 VDC)
Contact resistance		15 mΩ max. (initial value for the built-in switch when tested alone)
Dielectric strength	Between terminals of the same polarity	1,000 VAC, 50/60 Hz for 1 min
	Between each terminal and non-current-carrying part	2,000 VAC, 50/60 Hz for 1 min
Rated insulation voltage (Ui)		1,000 VAC
Pollution degree (operating environment)		3 (IEC947-5-1)
Protection against electric shock		Class II
PTI (tracking characteristics)		175
Switch category		D (IEC335)
Rated operating current (Ie)		10 A
Rated operating voltage (Ue)		250 VAC
Vibration resistance	Malfunction	10 to 55 Hz, 1.5-mm double amplitude *2
Shock resistance	Destruction	1,000 m/s² min.
	Malfunction	100 m/s² min. *1 *2
Ambient operating temperature		−10°C to +80°C (with no icing)
Ambient operating humidity		35% to 95%RH
Weight		Approx. 71 g (in case of panel mount plunger)

*1. Only for models with plungers. (Contact your OMRON representative for information on other models.)
*2. Less than 1 ms under a free state at the operating limits.

Approved Standard Ratings

UL/CSA

A300

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC	10A	60	6	7,200	720
240 VAC		30	3		

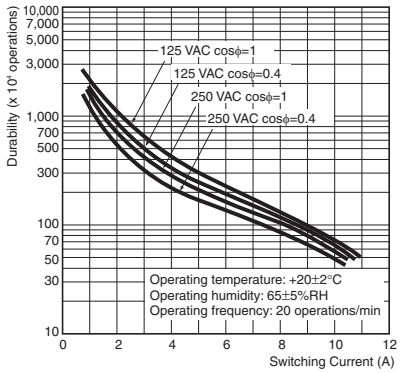
EN60947-5-1

CCC (GB14048.5)

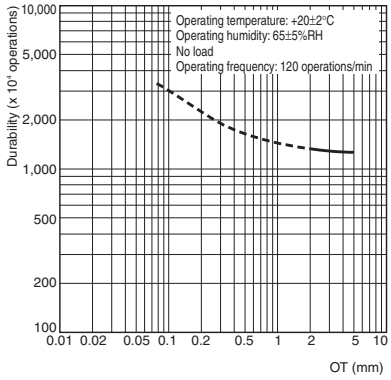
Applicable category and ratings
AC-12 10 A/250 VAC

Engineering Data

Electrical Durability



Mechanical Durability (D4MC-5000)

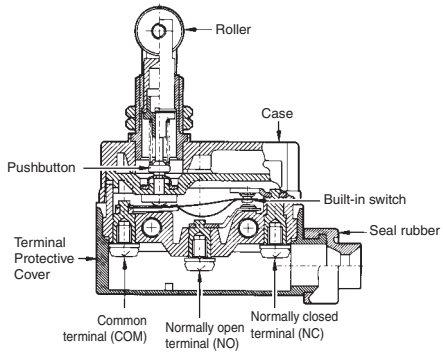


Structure and Nomenclature

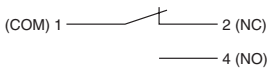
Structure

Changing the Terminal Protective Cover around allows the cable to be pulled out from either the right or the left.

M4 binding head screws (with toothed washers) are used as the terminal screws.



Contact Form

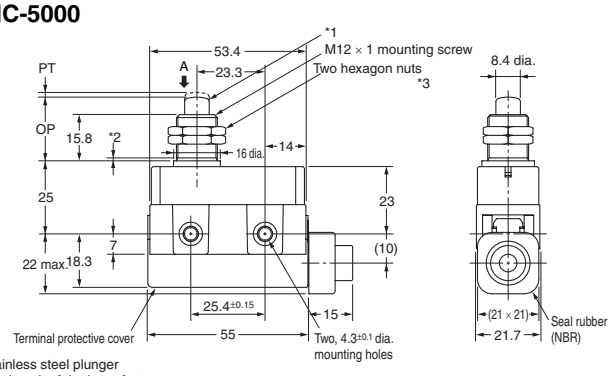


Dimensions and Operating Characteristics

(Unit: mm)

Panel Mount Plunger

D4MC-5000

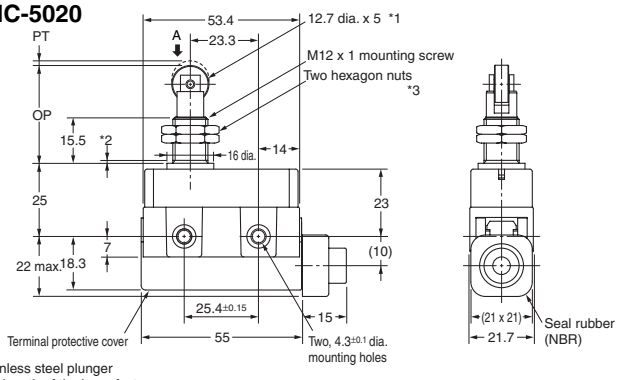


*1. Stainless steel plunger
*2. The length of the imperfect threads is 1.5 mm maximum.
*3. Thickness: 3 width: 17

Note: Do not use the M12 mounting screw and the case mounting hole at the same time.

Panel Mount Roller Plunger

D4MC-5020

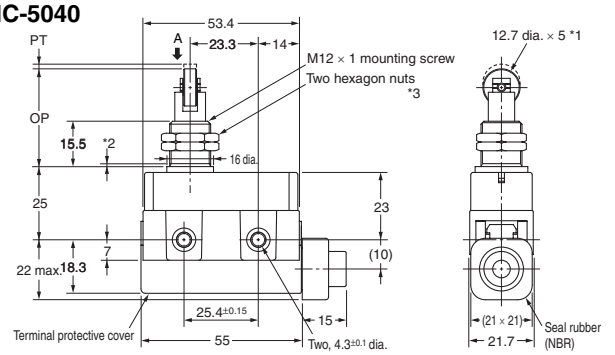


*1. Stainless steel plunger
*2. The length of the imperfect threads is 1.5 mm maximum.
*3. Thickness: 3 width: 17

Note: Do not use the M12 mounting screw and the case mounting hole at the same time.

Panel Mount Crossroller Plunger

D4MC-5040

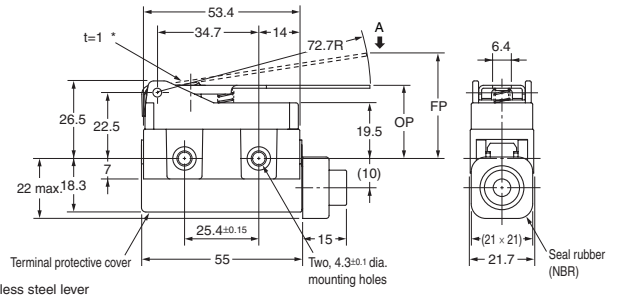


*1. Stainless steel plunger
*2. The length of the imperfect threads is 1.5 mm maximum.
*3. Thickness: 3 width: 17

Note: Do not use the M12 mounting screw and the case mounting hole at the same time.

Hinge Lever

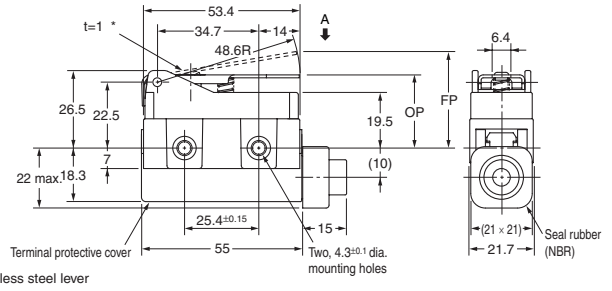
D4MC-1000



* Stainless steel lever

Short Hinge Lever

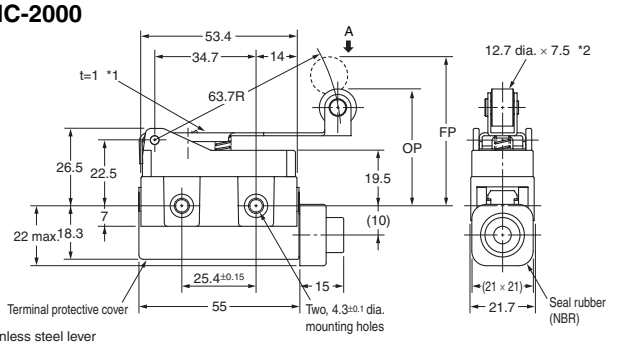
D4MC-1020



* Stainless steel lever

Hinge Roller Lever

D4MC-2000

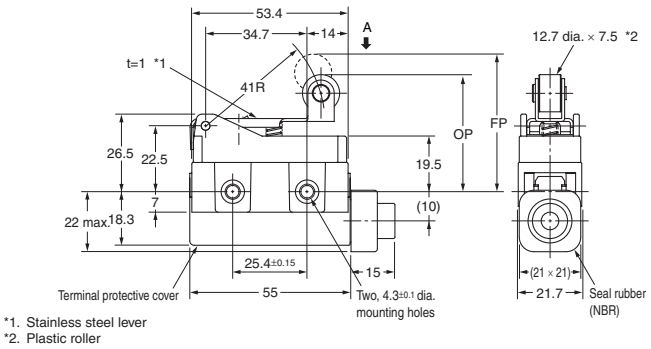


*1. Stainless steel lever
*2. Plastic roller

Note: 1. Unless otherwise specified, a tolerance of±0.4 mm applies to all dimensions.
2. Operating characteristics are for when the Switch is operated from direction A.
3. Make sure that the permissible OT position is not exceeded.

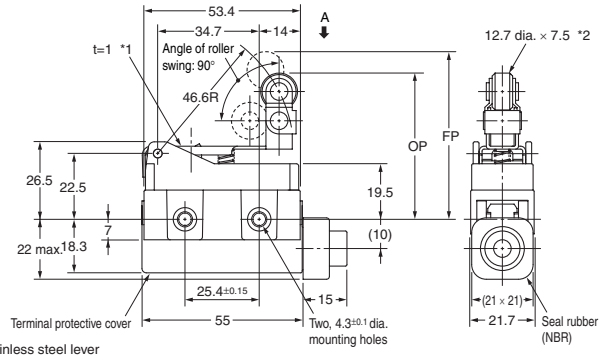
Operating Characteristics		Model	D4MC-5000	D4MC-5020	D4MC-5040	D4MC-1000	D4MC-1020	D4MC-2000
Operating force	OF	max.	5.88 N	5.88 N	5.88 N	1.67 N	2.55 N	1.96 N
Release force	RF	min.	0.98 N	0.98 N	0.98 N	0.25 N	0.34 N	0.39 N
Pretravel	PT	max.	1.6 mm	1.6 mm	1.6 mm	---	---	---
Overtravel	OT	min.	5 mm	5 mm	5 mm	4 mm	2.5 mm	5 mm
Movement Differential	MD	max.	0.2 mm	0.2 mm	0.2 mm	3 mm	1.7 mm	3 mm
Free Position	FP	max.	---	---	---	36 mm	33 mm	51 mm
Operating Position	OP		21.8±1.2 mm	33.4±1.2 mm	33.4±1.2 mm	25±1 mm	25±1mm	40±1 mm

Short Hinge Roller Lever
D4MC-2020



*1. Stainless steel lever
*2. Plastic roller

One-way Action Short Hinge Roller Lever
D4MC-3030



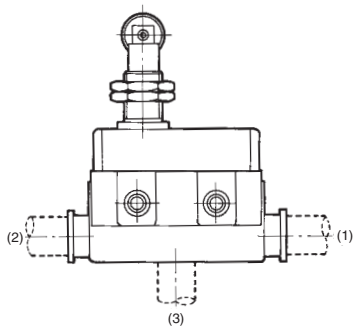
*1. Stainless steel lever
*2. Plastic roller

Note: 1. Unless otherwise specified, a tolerance of±0.4 mm applies to all dimensions.
2. Operating characteristics are for when the Switch is operated from direction A.
3. Make sure that the permissible OT position is not exceeded.

Operating characteristics	Model	D4MC-2020	D4MC-3030
Operating force	OF max.	2.94 N	2.94 N
Release force	RF mim.	0.39 N	0.39 N
Pretravel	PT max.	---	---
Overtravel	OT min.	2 mm	2 mm
Movement Differential	MD max.	1.5 mm	1.5 mm
Free Position	FP max.	47 mm	57.2 mm
Operating position	OP	40±1 mm	50±1 mm

Molded Terminal Models (Not Approved by UL, CSA, or EN)

Use Switches with molded terminals in locations subject to dirt, dust, oil drops, or high humidity. Molded terminals are available with all D4MC models. Dimensions and operating characteristics are the same as the basic models.



Suffix by Location of Lead Outlet

Location of lead outlet (Refer to left figure)	Model
	COM, NC, and NO
(1) Right-hand	D4MC-□□□1
(2) Left-hand	D4MC-□□□2
(3) Underside	D4MC-□□□3

Note: To form the model numbers for molded terminals models, add the numbers 1 to 3 in the table above to the end of the model number in Ordering Information on page 1.

Leads Supplied

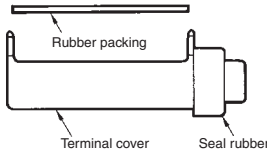
Specifications / Leads	Nominal cross-sectional area mm²	External diameter mm	Terminal connections	Cable length m
V.C.T. (Vinyl cabtire cable)	1.25	3 conductor 10.5 dia.	Black: COM White: NO Red: NC	1, 3

Note: Add the VCT length to the end of the model number when ordering. Consult with your OMRON representative for other types of lead wires and for lead wires longer than 3 m.

How to Order

Example:
Standard type: D4MC-5020
Location of lead outlet: Underside
Length of lead: 1 m (V.C.T. lead)
When placing your order for the above Switch specify the model number as D4MC-5023 VCT 1M

Terminal Protective Cover, Seal Rubber, and Rubber Packing (The Switch is equipped with these 3 items as a standard.)



- ZC Terminal Cover (Product code: ZC55-0002H)
- ZC Seal Rubber (Product code: SC-1404C)
- ZC Rubber Packing (Product code: ZC55-0003F)

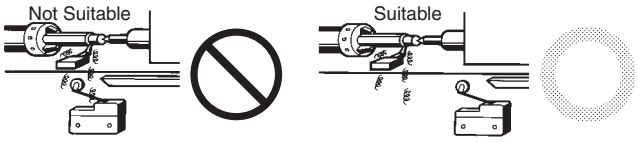
Safety Precautions

Refer to *Safety Precautions for All Limit Switches*.

Precautions for Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



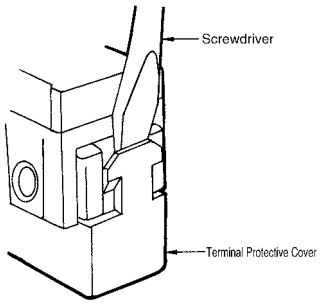
- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Operating

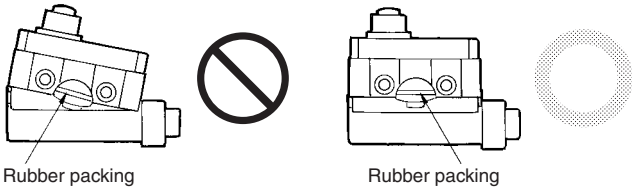
Excessive dog angle, operating speed, or overtravel (OT) may damage the actuator. Check that OT has a sufficient margin. The actual OT should be rated OT × 0.7 to 1.

Handling

- Do not expose the Switch to water exceeding +60°C or use it in steam.
- Do not use the Switch in oil or water.
- An 8.5-dia. to 10.5-dia. cable can be applied as seal rubber for the lead wire outlet. (Use two- or three-core cable of VCT1.25 mm^2.)
- When detaching the Terminal Protective Cover, insert a screwdriver and apply a force in the opening direction. Do not use excess force to remove the cover. Doing so may cause deformation in the fitting section and reduce the holding force.



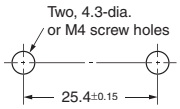
- When mounting the Terminal Protective Cover to the case, align the cover on the case and then press the cover down to mount it firmly. If the cover is pressed down in an inclined position, rubber packing will deform and thus affect the sealing capability.



Mounting

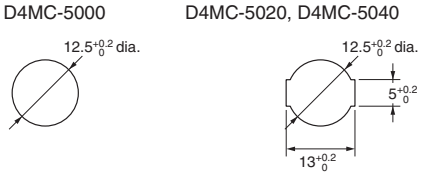
- When mounting the Switch with screws on a side surface, fasten the Switch with M4 screws and use washers, spring washers, etc., to ensure secure mounting.

Mounting Holes



- When mounting the Panel Mount-type Switch (D4MC-5000, D4MC-5020, or D4MC-5040) with screws on a side surface, remove the hexagonal nuts from the actuator.
- When mounting the panel mount type on a panel, be careful not to tighten to an excessive torque. Tightening the screws to a torque exceeding 4.91 N·m will cause the plunger to fail.

Mounting Hole Dimensions



Tightening Torque

A loose screw may cause malfunctions. Be sure to tighten each screw to the proper tightening torque as shown in the table.

No.	Type	Appropriate tightening torque
(1)	Terminal screw	0.78 to 1.18 N·m
(2)	Panel mounting screw	2.94 to 4.92 N·m
(3)	Side mounting screw	1.18 to 1.47 N·m

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CSM_D4MC_DS_E_2_1 11/08

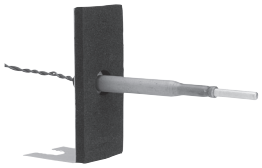
Note: Specifications are subject to change.

Reactivation Outlet Heater Sensor

Duct Temperature Sensors — Various Outputs

Duct Sensor with Rigid Probe

Duct Sensor with Flexible Probe



536-811 Bracket Mounted Duct Sensor

Energy & Atmosphere

Indoor Environmental Quality

Description

The Duct Temperature Sensors monitor and transmit changes in temperature to the building control system. Specific devices within the range are compatible with most North American building automation systems.. They install directly into the duct and are equipped with necessary mounting hardware. All sensors incorporate precision temperature sensing elements to accurately and reliably measure temperature.

Features

- Variety of sensing elements
- Responsive to temperature change
- Accurate and reliable indication of duct temperature
- Simple installation requires no special tools

Applications

Duct temperature sensors are used throughout forced air HVAC systems to monitor air temperature within the ductwork. Single point sensors include one sensing element. Averaging sensors incorporate multiple sensing elements and are typically used in larger ducts where some temperature stratification may occur.

Specifications

Output Signals

Active 4-20mA

Passive ..... Pt 1k Ω (375 alpha)
Pt 1k Ω (385 alpha)
Ni 1k Ω @32F
Ni 1k Ω @70F
NTC 100k Ω
NTC 10k Ω Type II
NTC 10k Ω Type III

Accuracy

NTC Thermistors, mid-range ..... ±1.0°F (±0.5°C)
Pt RTD and Ni RTD, mid-range ..... ±0.75°F (±0.4°C)

Conduit Connection Threads ..... 1/2-inch – 14 NPSMI

Housing ..... Standard NEC approved 2 × 4 inch (5 × 10 cm) utility box with 1/2 inch (13 mm) knockouts

Probe Material ..... 0.028 Wall SAE J526 ZTEW or Galfan steel tubing

Standard Duct Temperature Sensor Ordering

Application	Description	Output Signal	Part Number	Range	Data Sheet
Duct Averaging	Duct Averaging Sensor with 16 ft. Probe	Platinum 1k Ω 375 alpha	**544-342-16**	Controller Dependent	149-261P25
	Duct Averaging Sensor with 18 in. Probe		**544-343-18**		149-261P25
	Duct Averaging Sensor with 24 ft. Probe		**544-342-24**		149-261P25
	Duct Averaging Sensor with 24 in. Probe		**544-343-24**		149-261P25
	Duct Averaging Sensor with 36 in. Probe		**544-343-36**		149-261P25
	Duct Averaging Sensor with 48 in. Probe		**544-343-48**		149-261P25
	Duct Averaging Sensor with 8 ft. Probe		**544-342-8**		149-261P25
	Duct Averaging Sensor with 16 ft. Probe	4-20 mA	**533-380-16**	20 to 120F	149-263P25
	Duct Averaging Sensor with 18 in. Probe		**535-490-18**		149-263P25
	Duct Averaging Sensor with 24 ft. Probe		**533-380-24**		149-263P25
	Duct Averaging Sensor with 24 in. Probe		**535-490-24**		149-263P25
	Duct Averaging Sensor with 36 in. Probe		**535-490-36**		149-263P25
	Duct Averaging Sensor with 48 in. Probe		**535-490-48**		149-263P25
	Duct Averaging Sensor with 8 ft. Probe		**533-380-8**		149-263P25
	Duct Averaging Sensor with 16 ft. Probe	Nickel 1k Ω @ 32F	**QAM2020.500**	Controller Dependent	149-916
	Duct Averaging Sensor with 24 ft. Probe		**QAM2020.750**		149-916
	Duct Averaging Sensor with 24 ft. Probe	Nickel 1k Ω @ 70F	**QAM2021.750**		149-916
	Duct Averaging Sensor with 18 in. Probe	NTC 100k Ω Type 2	**540-244-18**		149-916
	Duct Averaging Sensor with 36 in. Probe		**540-245-36**		149-916
	Duct Averaging Sensor with 72 in. Probe		**540-246-72**		149-916
	Duct Averaging Sensor with 16 ft. Probe	NTC 10k Ω Type 2	**QAM2030.500**		149-916
	Duct Averaging Sensor with 16 ft. Probe	NTC 10k Ω Type 3	**QAM2032.500**		149-916
	Duct Averaging Sensor with 24 ft. Probe	NTC 10k Ω Type 2	**QAM2030.750**		149-916
	Duct Averaging Sensor with 24 ft. Probe	NTC 10k Ω Type 3	**QAM2032.750**		149-916
	Duct Averaging Sensor with 8 ft. Probe	NTC 10k Ω Type 2	**QAM2030.250**		149-916
	Duct Averaging Sensor with 8 ft. Probe	NTC 10k Ω Type 3	**QAM2032.250**		149-916
	Duct Averaging Sensor with 16 ft. Probe	Platinum 1k Ω 385 alpha	**QAM2012.500**		149-916
	Duct Averaging Sensor with 24 ft. Probe		**QAM2012.750**		149-916
	Duct Averaging Sensor with 8 ft. Probe		**QAM2012.250**		149-916
Duct Point	Duct Temp Sensor with 18" Probe	Platinum 1k Ω 375 alpha	**544-339-18**		149-916
	Duct Temp Sensor with 4" Probe		**544-339-4**		149-916
	Duct Temp Sensor with 8" Probe		**544-339-8**		149-916
	Duct Temp Sensor with 18" Probe	4-20 mA	**533-376-18**	20 to 120F	149-263P25
	Duct Temp Sensor with 18" Probe		**533-377-18**	70 to 220F	149-263P25
	Duct Temp Sensor with 18" Probe		**544-560-18**	4 to 122F	149-263P25
	Duct Temp Sensor with 4" Probe		**533-376-4**	20 to 120F	149-263P25
	Duct Temp Sensor with 4" Probe		**533-377-4**	70 to 220F	149-263P25
	Duct Temp Sensor with 4" Probe		**544-560-4**	4 to 122F	149-263P25
	Duct Temp Sensor with 8" Probe		**533-376-8**	20 to 120F	149-263P25
	Duct Temp Sensor with 8" Probe		**533-377-8**	70 to 220F	149-263P25
	Duct Temp Sensor with 8" Probe		**544-560-8**	4 to 122F	149-263P25
	Duct Temp Sensor with 18" Probe	Nickel 1k Ω @ 32F	**QAM2020.045**	Controller Dependent	149-915
	Duct Temp Sensor with 4" Probe		**QAM2020.010**		149-915
	Duct Temp Sensor with 8" Probe		**QAM2020.020**		149-915
	Duct Temp Sensor with 18" Probe	Nickel 1k Ω @ 70F	**QAM2021.045**		149-915
	Duct Temp Sensor with 8" Probe		**QAM2021.020**		149-915
	Duct Temp Sensor with 18" Probe	NTC 100k Ω Type2	**535-741-18**		149-262P25
	Duct Temp Sensor with 4" Probe (2" x 4" box)		**535-741-4**		149-262P25
	Duct Temp Sensor with 4" Probe (bracket mount)		**536-811**		149-134P25
	Duct Temp Sensor with 8" Probe		**535-741-8**		149-262P25
	Duct Temp Sensor with 18" Probe	NTC 10k Ω Type 2	**QAM2030.045**		149-915
	Duct Temp Sensor with 18" Probe	NTC 10k Ω Type 3	**QAM2032.045**		149-915
	Duct Temp Sensor with 4" Probe	NTC 10k Ω Type 2	**QAM2030.010**		149-915
	Duct Temp Sensor with 4" Probe	NTC 10k Ω Type 3	**QAM2032.010**		149-915
	Duct Temp Sensor with 8" Probe	NTC 10k Ω Type 2	**QAM2030.020**		149-915
	Duct Temp Sensor with 8" Probe	NTC 10k Ω Type 3	**QAM2032.020**		149-915
	Duct Temp Sensor with 18" Probe	Platinum 1k Ω 385 alpha	**QAM2012.045**		149-915
	Duct Temp Sensor with 4" Probe		**QAM2012.010**		149-915
	Duct Temp Sensor with 8" Probe		**QAM2012.020**		149-915

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AS BUILT

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DRAWING NOT TO SCALE UNLESS SCALE BAR IS PRESENT

SUPERIOR

Air$_2$O Intelligent cooling

CUSTOMER: AIR2O
LOCATION: WHOLE FOODS BEVERLY HILLS
DESCRIPTION: DHP-20
JOB NUMBER: 11772

SUPERIOR CONTROL SYSTEMS, INC.
2406 S. 24TH STREET
BUILDING C SUITE 120
PHOENIX, AZ 85034

O: 480-966-1400
F: 480-966-1422
WWW.SUPERIORCONTROL.COM

Air$_2$O Intelligent cooling

WHOLE FOODS BEVERLY HILLS DHP-20
COVER

REVISIONS

NO.	BY	DATE	CKD	REMARKS
0	AS	4/16/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

COVER

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

SUPERIOR

AS BUILT

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DRAWING INDEX

SHEET #	DESCRIPTION
COVER	COVER
INDEX	DRAWING INDEX
DETAILS	DRAWING DETAILS
BOM	BILL OF MATERIALS
E01	ELEVATION (INSIDE) - PANEL LAYOUT
E02	ELEVATION (INSIDE) - PANEL DETAILS
E03	ELEVATION (INSIDE) - TERMINAL BLOCK/RELAY LAYOUT
LEGEND	SCHEMATIC - LEGEND
S01	SCHEMATIC - 480VAC POWER DISTRIBUTION 1
S02	SCHEMATIC - 480VAC POWER DISTRIBUTION 2
S03	SCHEMATIC - SPARE SHEET
S04	SCHEMATIC - 120VAC POWER DISTRIBUTION
S05	SCHEMATIC - 24VDC CONTROL POWER
S06	SCHEMATIC - 24VAC CONTROL POWER
S07	SCHEMATIC - PLC CONNECTIONS 1
S08	SCHEMATIC - PLC CONNECTIONS 2
S09	SCHEMATIC - PLC CONNECTIONS 3
S10	SCHEMATIC - PLC CONNECTIONS 4
S11	SCHEMATIC - PLC CONNECTIONS 5
F01	CUSTOMER FIELD CONNECTIONS

SUPERIOR CONTROL SYSTEMS, INC.
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PHOENIX, AZ 85034

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Air$_2$O Intelligent cooling

WHOLE FOODS BEVERLY HILLS DHP-20
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DATE: 8/30/2021

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DRAWING# 11772 AIR20-WF-BEVERLYHILLS-DHP20

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WIRE COLOR		
BROWN	12AWG OR BIGGER	480Y/277VAC PHASE A
ORANGE	12AWG OR BIGGER	480Y/277VAC PHASE B
YELLOW	12AWG OR BIGGER	480Y/277VAC PHASE C
GREY	ALL	277VAC NEUTRAL
BLACK	12AWG OR BIGGER	208Y/240Y/120VAC PHASE A
RED	12AWG OR BIGGER	208Y/240Y/120VAC PHASE B
BLUE	12AWG OR BIGGER	208Y/240Y/120VAC PHASE C
BLACK	14AWG OR SMALLER	120VAC SUPPLY POWER
RED	14AWG OR SMALLER	120VAC CONTROL
ORANGE	ALL	+24VAC SUPPLY POWER
WHITE W/ ORANGE	ALL	24VAC NEUTRAL
BLUE W/ WHITE	ALL	+24VAC CONTROL
WHITE	ALL	120 TO 240VAC NEUTRAL
VIOLET	ALL	+24VDC SUPPLY POWER
BLUE	14AWG OR SMALLER	+24VDC CONTROL
WHITE W/ BLUE	ALL	-24VDC
YELLOW	16AWG OR SMALLER	FOREIGN VOLTAGE
GREEN	ALL	GROUND

CIRCUIT BREAKER SCHEDULE					
CB NO.	RATING	CURVE	BRANCH	POLES	DESCRIPTION
CB1	2A	C	BRANCH	3	VOLTAGE MONITORING RELAY
CB2	2A	D	BRANCH	2	PS1 DC SUPPLY PRIMARY
CB3	3A	D	BRANCH	2	CPT1 TRANSFORMER PRIMARY
CB4	15A	D	BRANCH	1	GFCI RECEPTACLE
CB5	5A	D	BRANCH	1	PS1 DC SUPPLY OUTPUT
CB6	30A	D	BRANCH	1	CPT1 TRANSFORMER SECONDARY
CB7	10A	D	SUPPLEMENTARY	1	MOTOR STARTER COILS
CB8	5A	D	SUPPLEMENTARY	1	CONTROL POWER

UL INFORMATION CIRCUIT A	
MAX VOLTAGE	480VAC
PHASE	3PH
CABINET TYPE	OPEN
TOTAL FLA	40.5A
LARGEST FLA	8.4A
SCCR	10kA

FABRICATION DETAILS	
DOOR LABELS	DECALS
WIRE LABELS	SHRINK
WIRE FERRULES	SHOP STANDARD
HARDWARE	STANDARD / PLASTIC
SPECIAL INSTRUCTIONS: DIN RAIL, WIREWAY LABELS, ETC	

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WHOLE FOODS BEVERLY HILLS DHP-20
DRAWING DETAILS

REVISIONS

NO.	BY	DATE	CKD	REMARKS
0	AS	4/16/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

DETAILS

DRAWING# 11772 AIR20-WF-BEVERLYHILLS-DHP20

SUPERIOR

AS BUILT

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ITEM	QTY	P/N	MANUF.	DESC.	NOTES
1	110	3.21179e+06	PHOENIX CONTACT	DOUBLE-LEVEL TERMINAL BLOCK, CONNECTION METHOD: PUSH-IN CONNECTION	
2	15	3.03046e+06	PHOENIX CONTACT	D-STT B 4 END COVER	
3	14	0828746	PHOENIX CONTACT	MARKER FOR TERMINAL BLOCKS - UCT-TMF 6 (60 PER SHEET)	
4	18	3030271	PHOENIX CONTACT	10-POLE JUMPER FOR 30A STANDARD	
5	15	3022276	PHOENIX CONTACT	CLIPFIX QUICK MOUNTING END BRACKET L 48.5 X W 5.5 X H 35MM GRAY	
6					
7	1	FAZ-D5-1-SP	EATON	5A SUPPLEMENTARY CIRCUIT BREAKER 1 POLE D-CURVE	FIELD (AC)
8	1	FAZ-D15-1-NA-SP	EATON	15A BRANCH CIRCUIT BREAKER 1 POLE D-CURVE	MOTOR STARTERS & GFCI RECEPTACLE
9	1	FAZ-D30-1-NA-SP	EATON	30A BRANCH CIRCUIT BREAKER 1 POLE D-CURVE	CPT1 SECONDARY
10	1	FAZ-D5-1-NA-SP	EATON	5A BRANCH CIRCUIT BREAKER 1 POLE D-CURVE	PS1 SECONDARY
11	1	FAZ-D2-2-NA	EATON	2A BRANCH CIRCUIT BREAKER 2 POLE D-CURVE	PS1 PRIMARY
12	1	FAZ-D3-2-NA	EATON	3A BRANCH CIRCUIT BREAKER 2 POLE D-CURVE	CPT1 PRIMARY
13	1	FAZ-C2-3-NA	EATON	2A BRANCH CIRCUIT BREAKER 3 POLE C-CURVE	VMR
14	1	FAZ-D10-1-SP	EATON	10A BRANCH CIRCUIT BREAKER 1 POLE D-CURVE	
15					
16	1	ANKPS-301	ANKO	DUPLEX GFCI 20A W/ INDOOR COVER	
17	1	5320-0	BELL	BOX OUTDOOR SINGLE GANG Q3 1/2IN HOLES	
18	1	SCE-48P48	SAGINAW	44X44 BACK PANEL W PANEL SUPPORT KIT	
19	1	PB1043	EDISON	OPEN POWER DISTRIBUTION BLOCK, 175A, 3-POLE	
20	1	PBC23	EDISON	3-POLE POWER D-BLOCK COVER 175	
21	1	SR2P-06	IDEC	8-PIN SOCKET 300V 10A	
22	1	PMPU	MACROMATIC	UNIVERSAL PHASE MONITOR 480V MAX 8P	
23	3	2903370	PHOENIX CONTACT	RELAY MODULE SPDT 24VDC COIL	
24					
25	1	MT0500B	SIEMENS	500VA CONTROL TRANSFORMER 240/480-24VAC	**OR EQUIVALENT**
26	1	WDR-120-24	MEAN WELL	120W 5A POWER SUPPLY, 1PH 200-550VAC INPUT, 24VDC OUT	
27					
28	1	3RV20111AA10	SIEMENS	S00 MOTOR PROTECTOR, 1.1-1.6 A, CLASS 10	DESICCANT WHEEL
29	2	3RV20111GA10	SIEMENS	S00 MOTOR PROTECTOR, 4.5-6.3A, CLASS 10	REACT FANS
30	1	3RV20111FA10	SIEMENS	S00 MOTOR PROTECTOR, 3.5-5A, CLASS 10	SUPPLY FANS & EXHAUST FAN
31	2	3RV20114AA10	SIEMENS	S00 MOTOR PROTECTOR, 11-16A, CLASS 10	CONDENSER FAN & ENTHALPY WHEEL
32					
33	3	3RV29011E	SIEMENS	AUXILIARY SWITCH TRANSVERSE 1 NO+1 NC SCREW TERMINAL FOR BREAKER 3RV2	
34	1	3RT20231AC20	SIEMENS	9A STARTER 1NO1NC AUX 24 VAC COIL	
35	2	3RT20271AC20	SIEMENS	32A STARTER 1NO1NC AUX 24 VAC COIL	
36	3	3RA29211AA00	SIEMENS	LINK MODULE SCREW AC S0	
37	2	3RV29255AB	SIEMENS	BUSBAR 63A FEEDER TERMINAL	
38	1	3RV19151AB	SIEMENS	45-2-STARTERS 63A BUSBAR W/OUT AUX SPACING	
39	1	3RV19151CB	SIEMENS	45-4-STARTERS 63A BUSBAR W/OUT AUX SPACING	
40					
41	2	H800	VERIS HAWKEYE	AC CURRENT SWITCH SOLID CORE 0.25-200A 1NO CONTACT	
42					
43	1	LS-1628u	OEMCTRL	CPU CONTROLLER WITH 16 OUTPUTS & 28 INPUTS	**PROVIDED BY AIR2O**
44	2	LS-XP812u	OEMCTRL	EXPANSION MODULE WITH 8 OUTPUTS & 12 INPUTS	**PROVIDED BY AIR2O**
45	1	3.24020e+06	PHOENIX CONTACT	CABLE DUCT 100MM X 100MM GRAY	
46	1	0801733	PHOENIX CONTACT	DIN RAIL	
47	1	5.60419e+06	PHOENIX CONTACT	RAISED DIN RAIL	
48	1	ADR11	SQUARE D	1/0-14AWG GROUNDING LUG 1WIRE	
49	3	PK15GTA	SQUARE D	15PT GROUND BAR	
50	1	3240263	PHOENIX CONTACT	CABLE DUCT 60MM X 100MM GRAY	
51					
52	1	HW1S-2TF10	IDEC	22MM 2 POSITION SWITCH 1NO	
53	1	M22IVS	EATON	22MM 2 POSITION SWITCH 1NO DIN RAIL ADAPTER	
54					
55	1	SCE-TEMNO	SAGINAW	24VDC TEMPERATURE SWITCH 1NO	
56					
57					
58					
59					
60					
61					
62					
63		**PARTS SHIPPED LOOSE TO FACTORY**			
64	4	A/1K-2W-A-24'-GD	ACI	24FT. PLATINUM 1K OHM RTD FLEXIBLE AVERAGING DUCT TEMPERATURE SENSOR	TEMPERATURE SENSOR
65	2	P499VCP-107K	JOHNSON CONTROLS	ELECTRONIC PRESSURE TRANSDUCER, 0 TO 10 VDC RATIOMETRIC OUTPUT SIGNAL, 1/8" 27 NPT EXTERNAL THREAD (STYLE 49) WITH DEPRESSOR, PACKARD, 0 TO 750PSI, 6.6' WIRE HARNESS	HIGHSIDE PRESSURE SW
66	2	P100AP-3C	JOHNSON CONTROLS	ENCAPSULATED PRESSURE SWITCH, 150 TO 225 PSI, SPST, OPEN CONSTRUCTION	LOWSIDE PRESSURE SW
67	4	ADPS-03-2-N	DWYER	ADJUSTABLE DIFFERENTIAL PRESSURE SWITCH, SET POINT RANGE 0.20 TO 2.00" W.C., M20 CONNECTION	DIRTY FILTER SW & AIR PROVING SW
68	3	A/RH3-CP-O	ACI	HUMIDITY, DUCT, ± 3% ACCURACY, RH/ RESISTIVE TEMP, 10K-E1, EURO, 0 TO 10 VDC (RH)	TEMPERATURE & RH SENSOR
69	2	SM-501-P	ACI	PHOTOELECTRIC SMOKE DETECTOR 24VAC/VDC/115VAC 2 ALARM RELAYS, 1 TROUBLE RELAY	SMOKE DETECTOR
70	2	STN-5.0'	ACI	SMOKE DETECTOR SAMPLING TUBE 2.5FT-5FT DUCT WIDTH	SMOKE DETECTOR
71	1	F6-HPS-31	W.F. ANDERSON	PRE-COOLING COIL CONDENSATE PAN OVERFLOW SWITCH	LEVEL SWITCH
72					
73	1	EQT2-4	OEMCTRL	4IN COLOR TOUCHSCREEN HMI	**PROVIDED BY AIR2O**

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WHOLE FOODS BEVERLY HILLS DHP-20
BILL OF MATERIALS

REVISIONS

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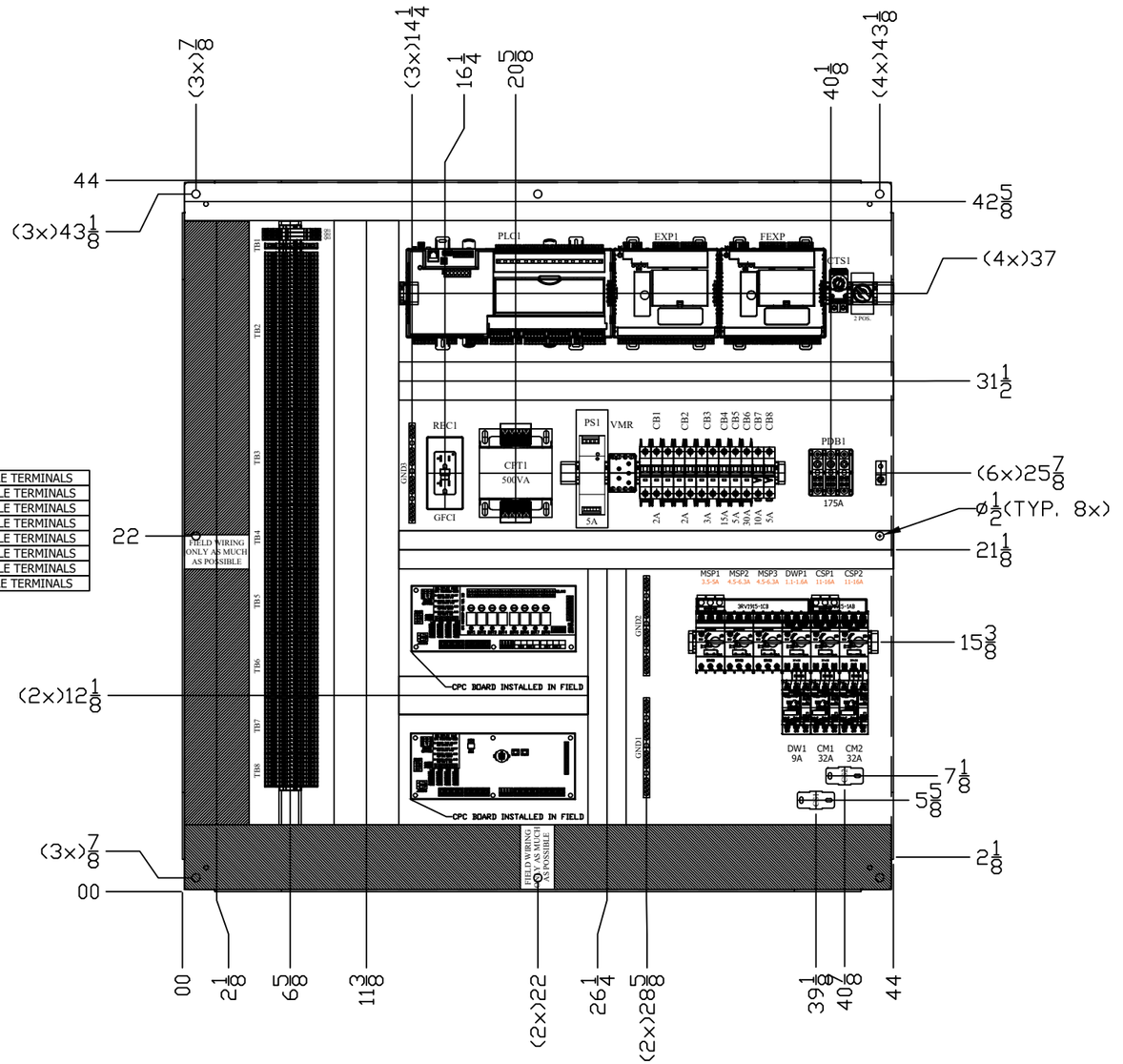
TB1	5 DOUBLE TERMINALS
TB2	42 DOUBLE TERMINALS
TB3	16 DOUBLE TERMINALS
TB4	16 DOUBLE TERMINALS
TB5	16 DOUBLE TERMINALS
TB6	16 DOUBLE TERMINALS
TB7	14 DOUBLE TERMINALS
TB8	8 DOUBLE TERMINALS



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WHOLE FOODS BEVERLY HILLS DHP-20
FABRICATION 1 - PANEL

REVISIONS

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FAB01 OF FAB01

DRAWING# 11772 AIR20-WF-BEVERLYHILLS-DHP20

SUPERIOR

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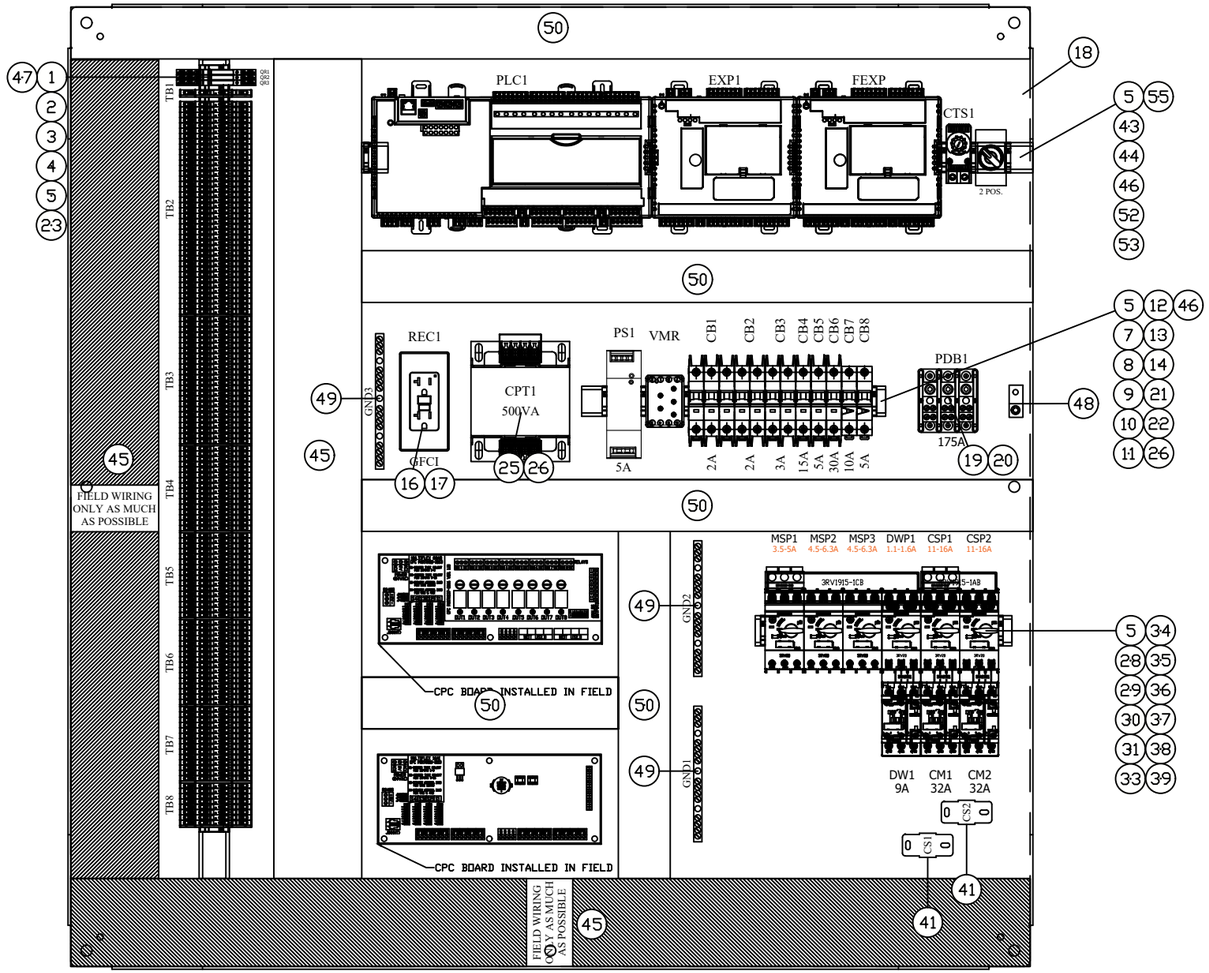

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WHOLE FOODS BEVERLY HILLS DHP-20
ELEVATION (INSIDE) - PANEL LAYOUT

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E01 OF E03

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SUPERIOR

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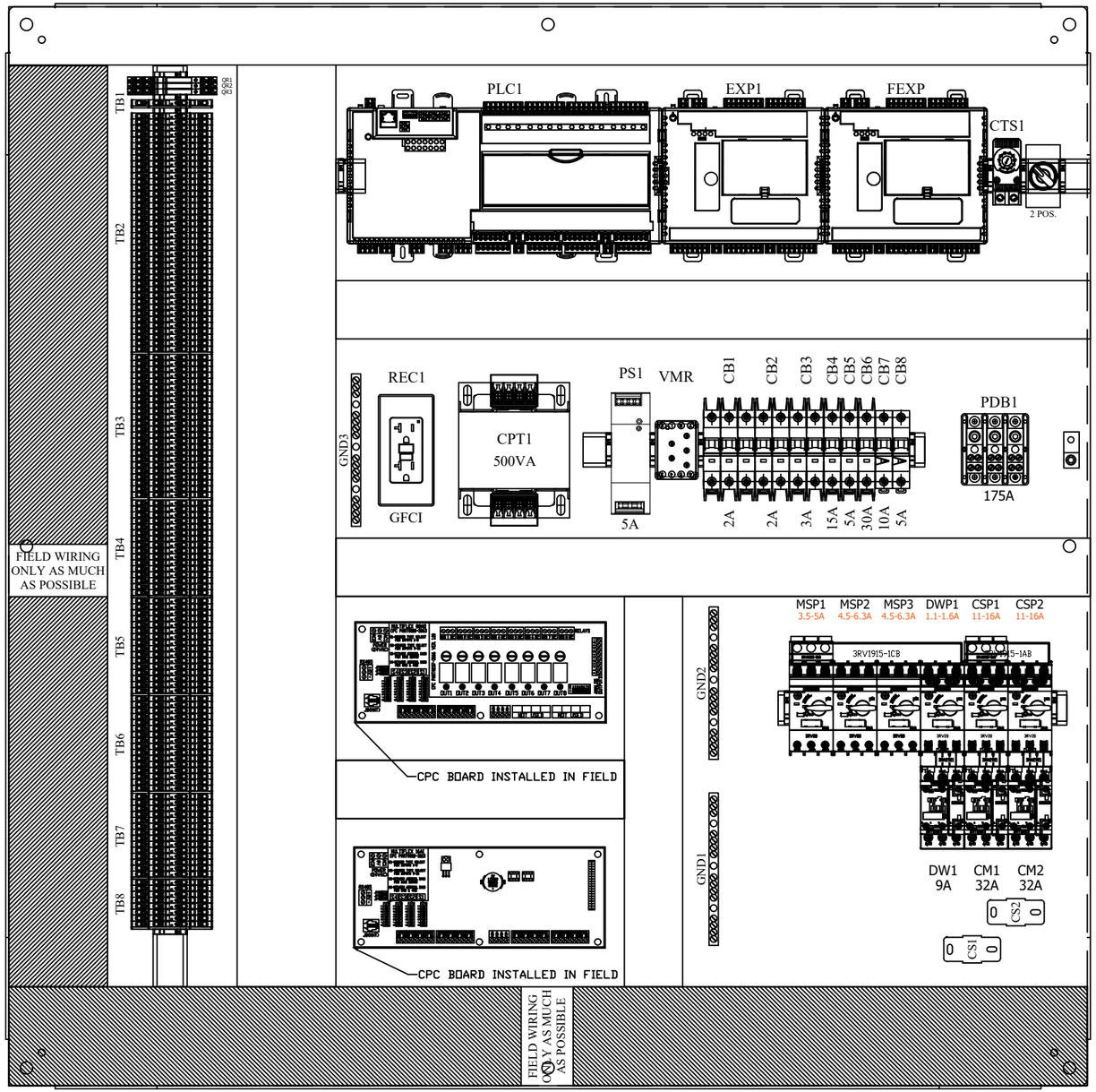

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WHOLE FOODS BEVERLY HILLS DHP-20
ELEVATION (INSIDE) - PANEL DETAILS

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JOB# 11772

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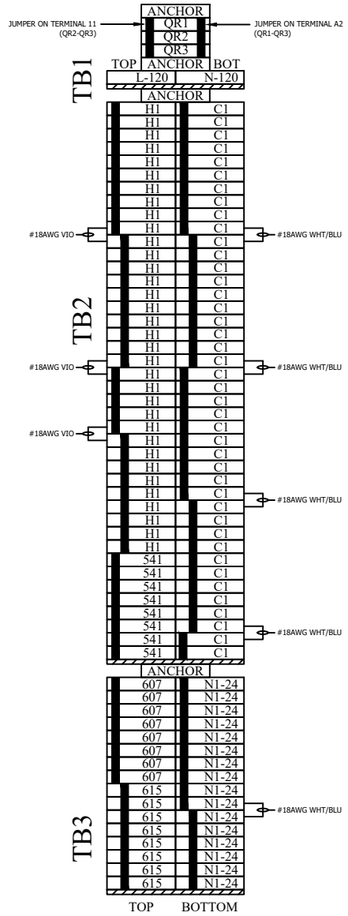
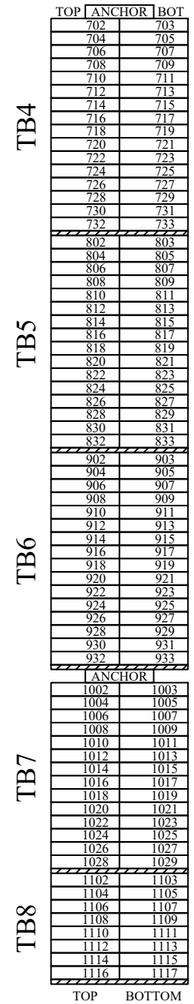
DRAWING# 11772 AIR20-WF-BEVERLYHILLS-DHP20

TERMINAL BLOCK & RELAY LAYOUT





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WHOLE FOODS BEVERLY HILLS DHP-20
ELEVATION (INSIDE) - TERMINAL BLOCK/RELAY LAYOUT

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E03 OF E03

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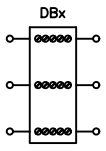
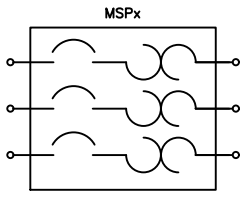
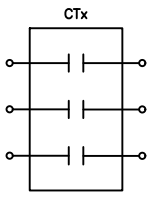
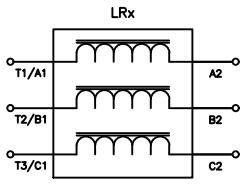
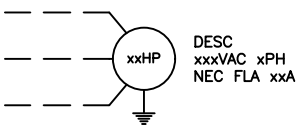
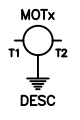
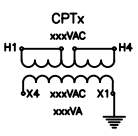
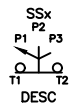
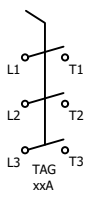
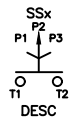
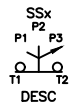
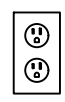
WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – LEGEND

	DISTRIBUTION BLOCK		COIL CONTACTOR (CTx) CONTROL RELAY (CRx) SAFETY RELAY (SRx)		AUDIBLE
	GROUND LUG		CONTACT NORMALLY OPEN (NO)		LEVEL SENSOR NORMALLY OPEN CONTACT
	MOTOR STARTER PROTECTION		CONTACT NORMALLY CLOSED (NC)		LEVEL SENSOR NORMALLY CLOSED CONTACT
	CONTACTOR		PUSH BUTTON NORMALLY OPEN CONTACT		LEVEL SENSOR NORMALLY OPEN CONTACT
	LINE REACTOR		PUSH BUTTON NORMALLY CLOSED CONTACT		LEVEL SENSOR NORMALLY CLOSED CONTACT
	3 PHASE MOTOR		EMERGENCY STOP NORMALLY OPEN CONTACT		LIMIT SWITCH NORMALLY OPEN CONTACT
	SINGLE PHASE MOTOR		EMERGENCY STOP NORMALLY CLOSED CONTACT		LIMIT SWITCH NORMALLY CLOSED CONTACT
	CONTROL POWER TRANSFORMER		SELECTOR SWITCH 2-POSITION (P1)		GENERIC SWITCH NORMALLY OPEN CONTACT
	TERMINAL BLOCK		SELECTOR SWITCH 2-POSITION (P2)		TEMPERATURE SWITCH NORMALLY OPEN CONTACT
	CIRCUIT BREAKER		SELECTOR SWITCH 3-POSITION (P1)		SOLENOID
	NON FUSIBLE DISCONNECT		SELECTOR SWITCH 3-POSITION (P2)		PRESSURE SENSOR
	FUSE		SELECTOR SWITCH 3-POSITION (P3)		SIMPLEX RECEPTACLE
	FUSE W/DISCONNECT		PANEL INDICATOR		DUPLEX RECEPTACLE

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REVISIONS

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LEGEND

DRAWING# 11772 AIR20-WF-BEVERLYHILLS-DHP20

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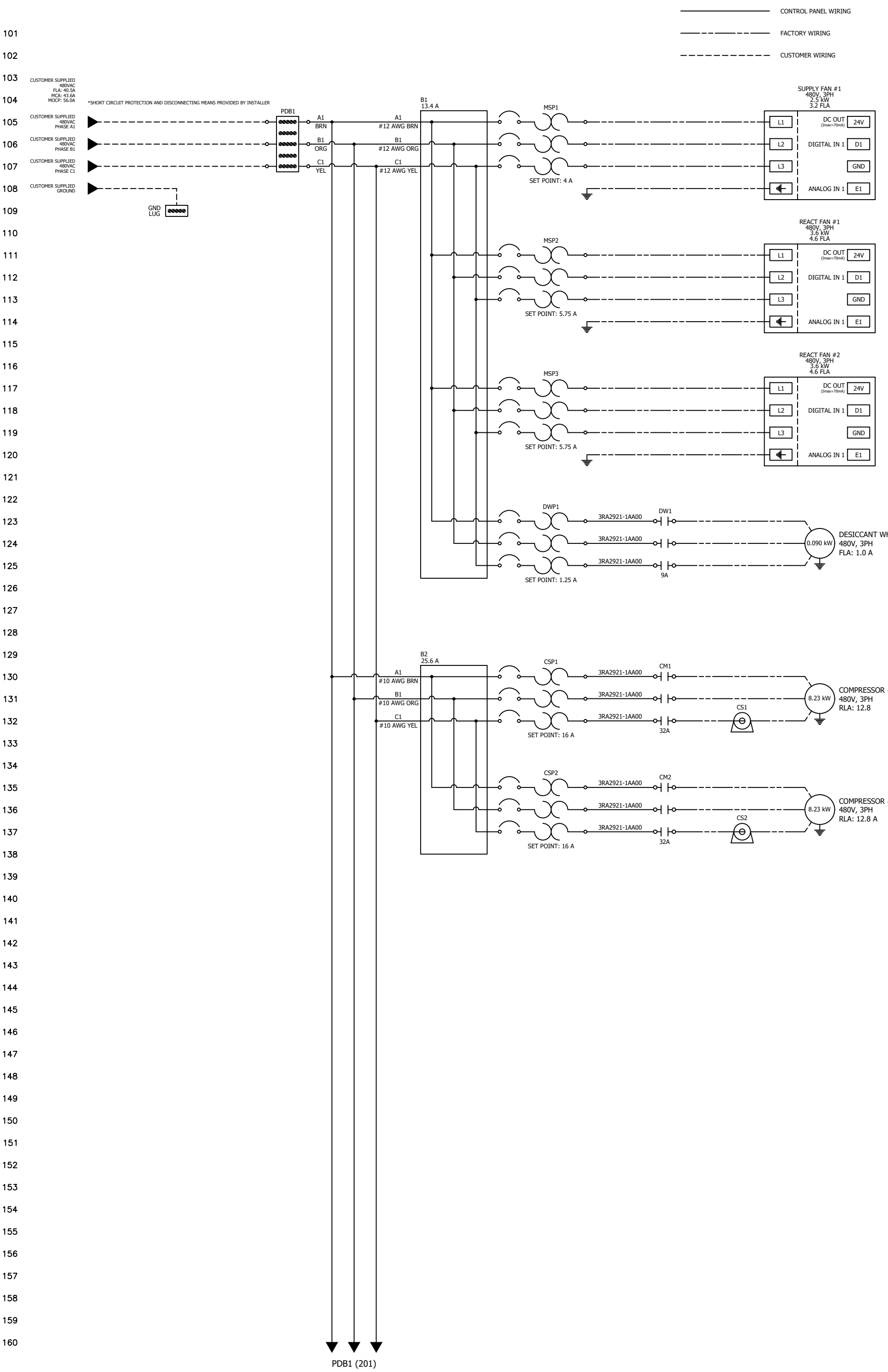
WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC - 480VAC POWER DISTRIBUTION 1

480VAC POWER DISTRIBUTION



NO.	BY	DATE	CKD	REMARKS
0	AS	4/19/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	09/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	09/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S01 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

SUPERIOR CONTROL SYSTEMS, INC.
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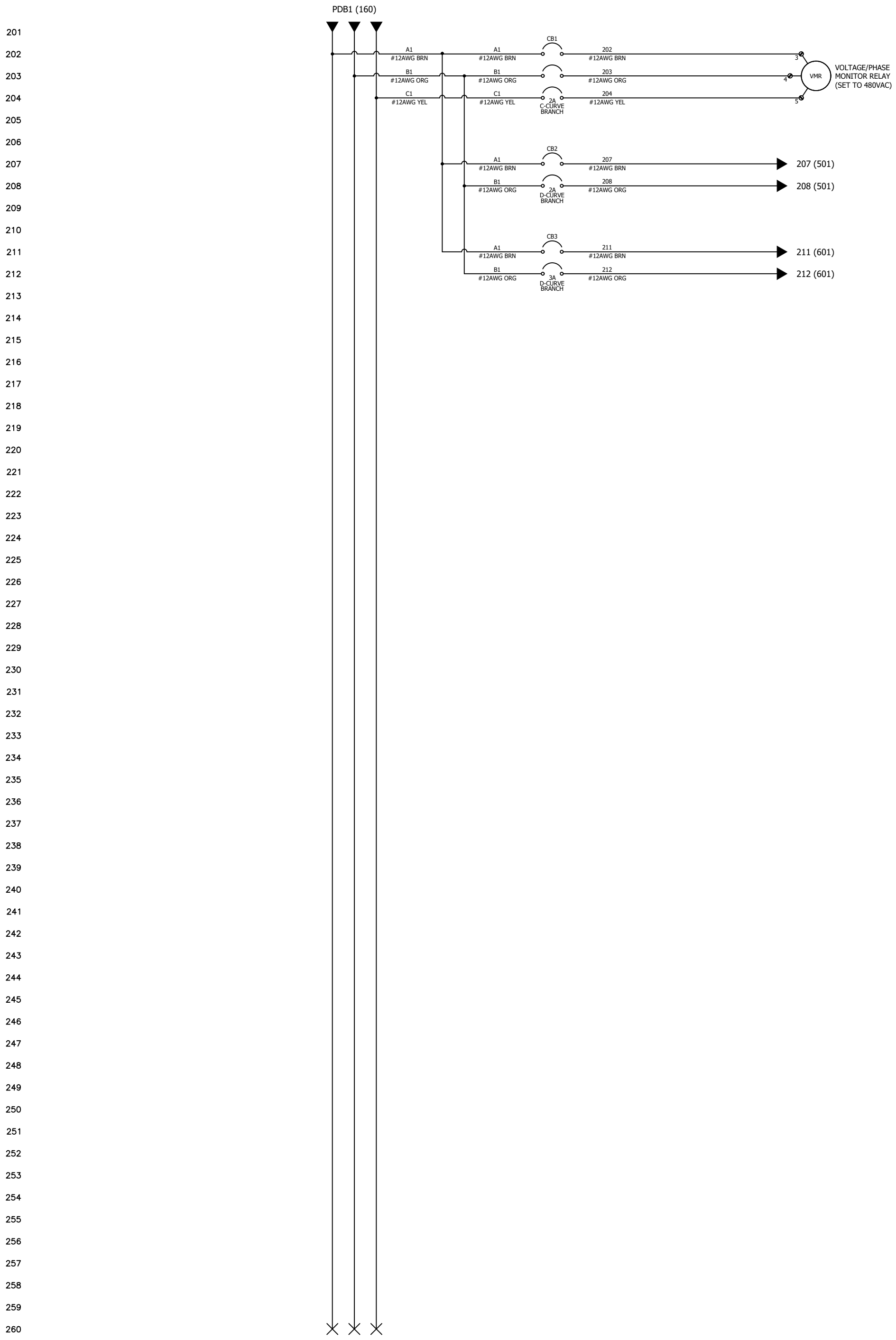

WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC - 480VAC POWER DISTRIBUTION 2

NO.	BY	DATE	CKD	REMARKS
0	AS	4/19/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FE.XP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S02 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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RUNGS INTENTIONALLY LEFT BLANK

WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – SPARE SHEET

NO.	BY	DATE	CKD	REMARKS
0	AS	4/19/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FE,XP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S03 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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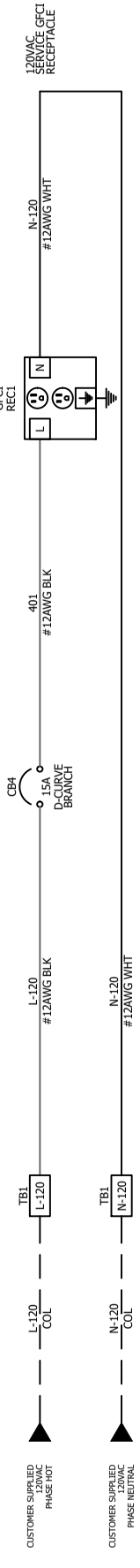
CIRCUIT B 120VAC CONTROL POWER



120VAC CONTROL POWER

SPACE RESERVED FOR
ADDITIONAL 120VAC
CONTROL POWER

401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460

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WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC - 120VAC POWER DISTRIBUTION

REVISIONS

NO.	BY	DATE	CKD	REMARKS
0	AS	4/16/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

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WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC — 24VDC CONTROL POWER

NO.	BY	DATE	CKD	REMARKS
0	AS	4/16/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

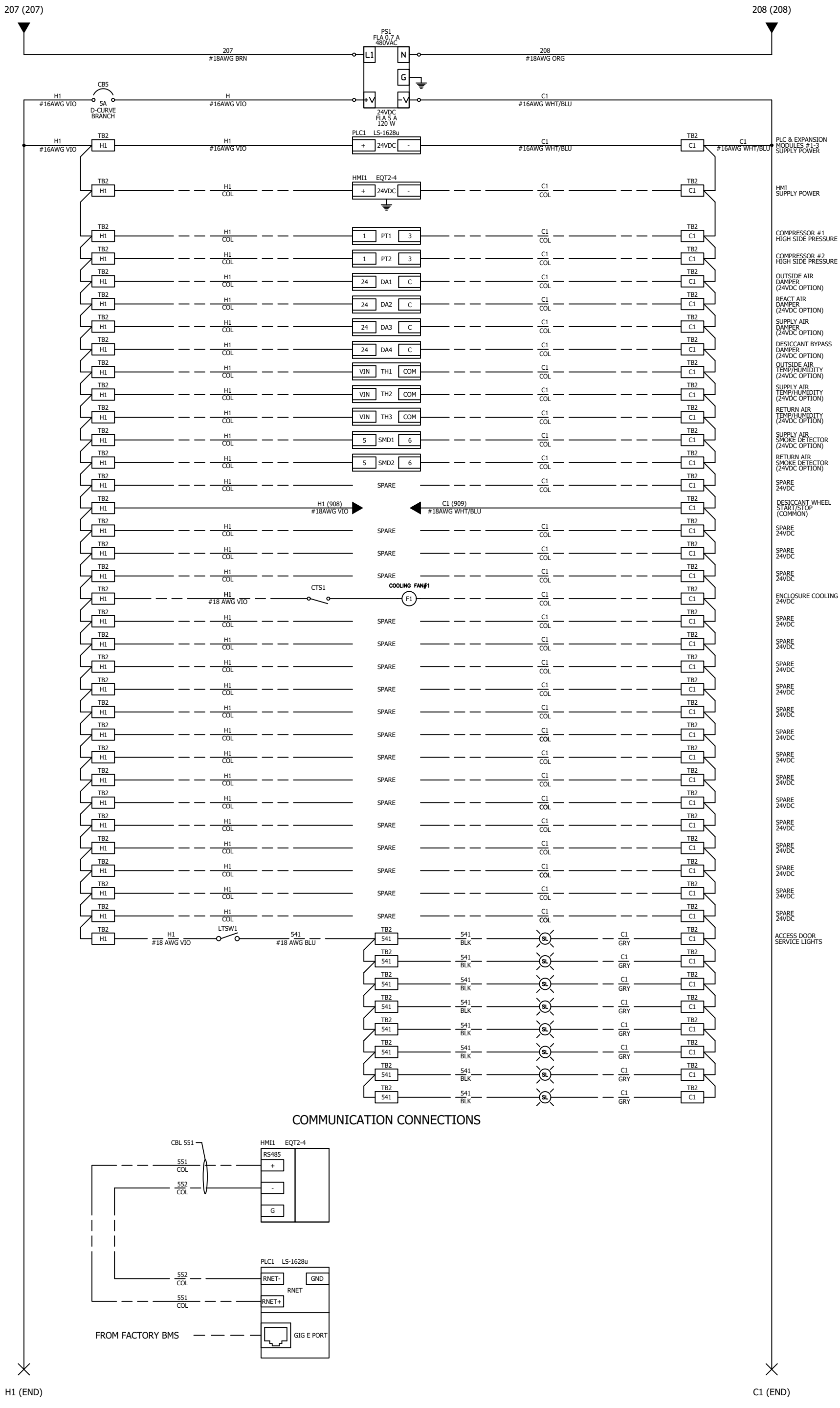
JOB# 11772

DATE: 8/30/2021

S05 OF S11

DRAWING# 11772 AIR20-WF-BEVERLYHILLS-DHP20

24VDC CONTROL POWER



COMMUNICATION CONNECTIONS

SUPERIOR CONTROL SYSTEMS, INC.
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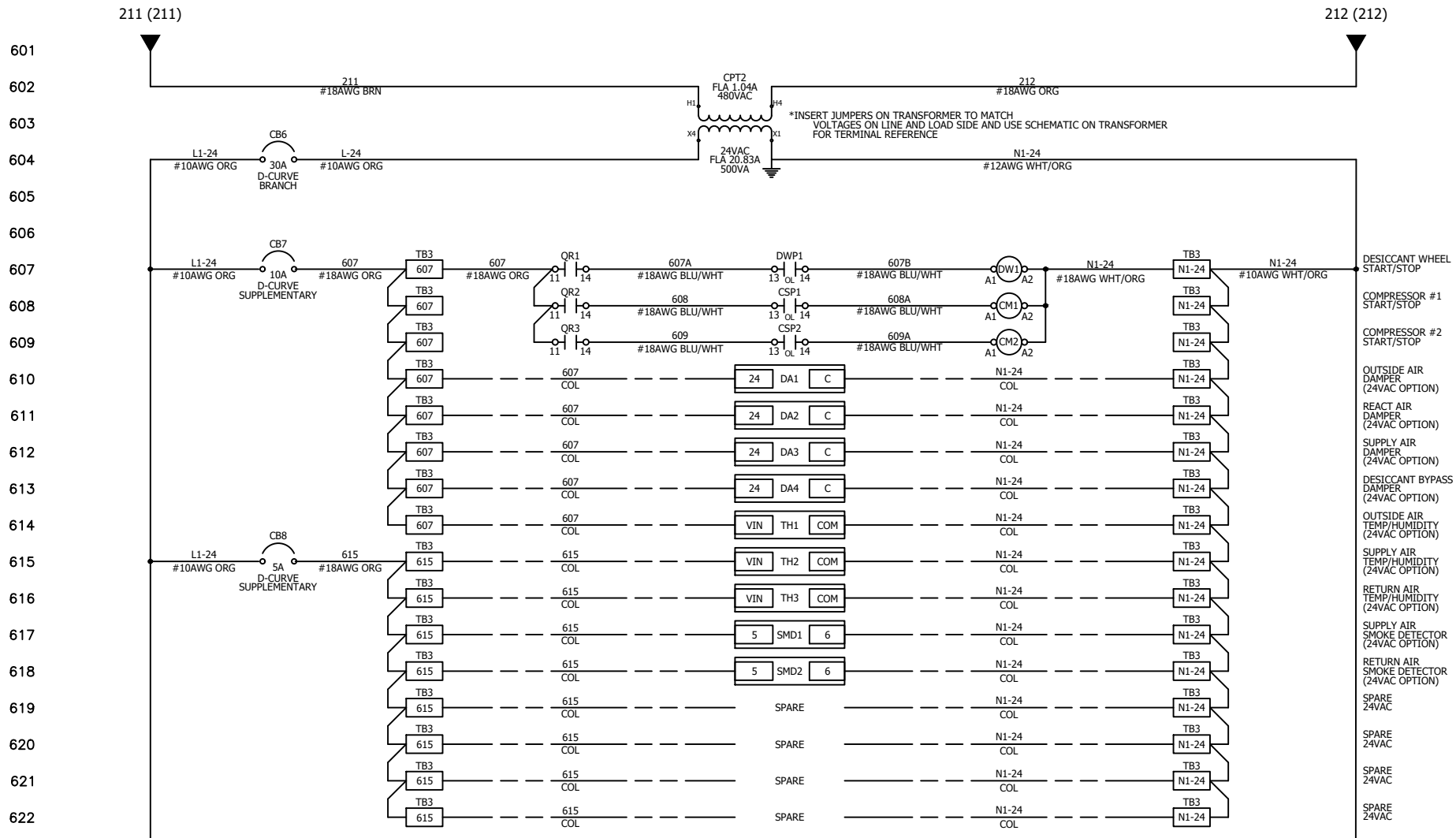
24VAC CONTROL POWER



WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – 24VAC CONTROL POWER

NO.	BY	DATE	CKD	REMARKS
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1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S06 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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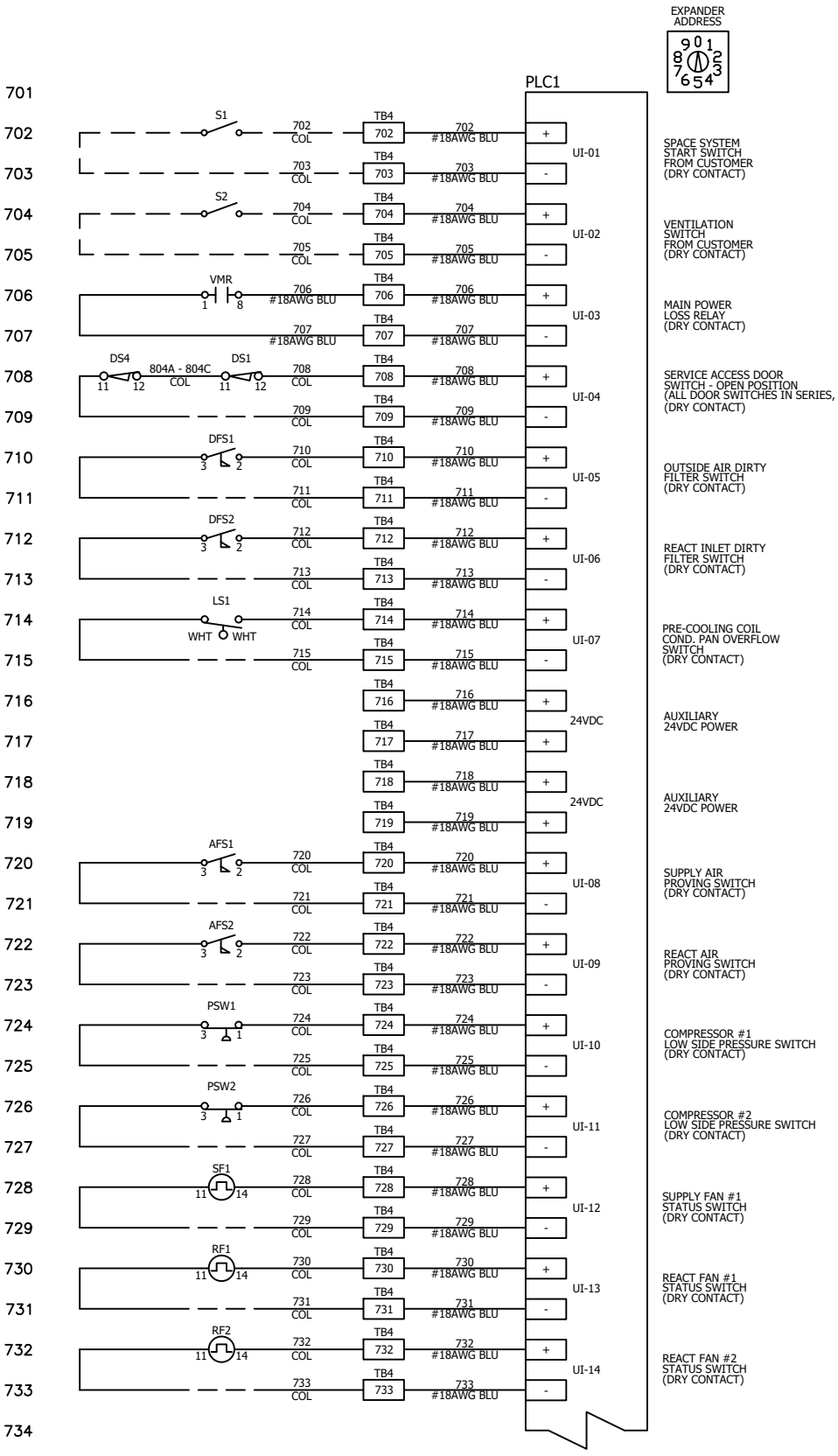
WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – PLC CONNECTIONS 1



NO.	BY	DATE	CKD	REMARKS
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1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S07 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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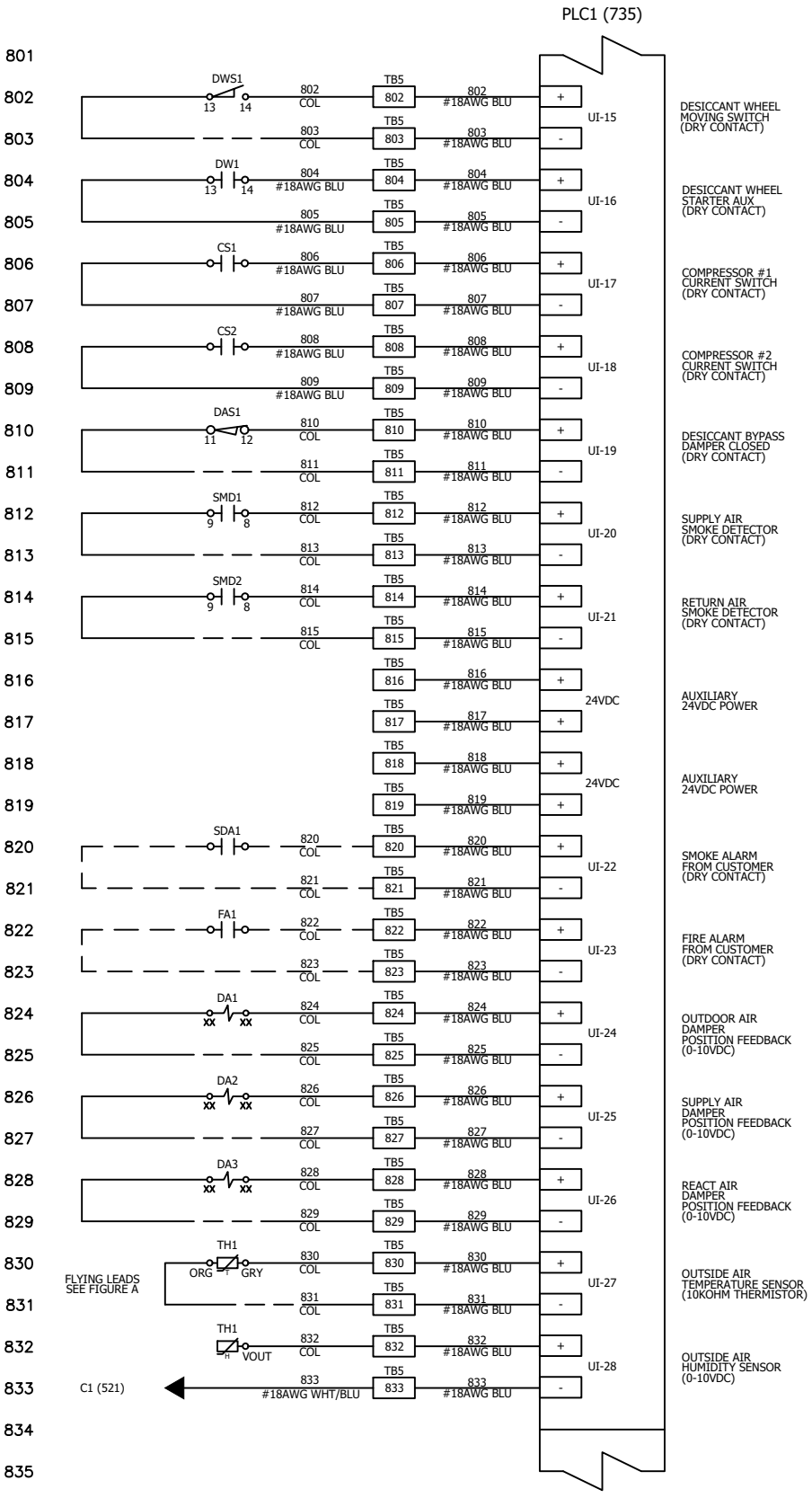
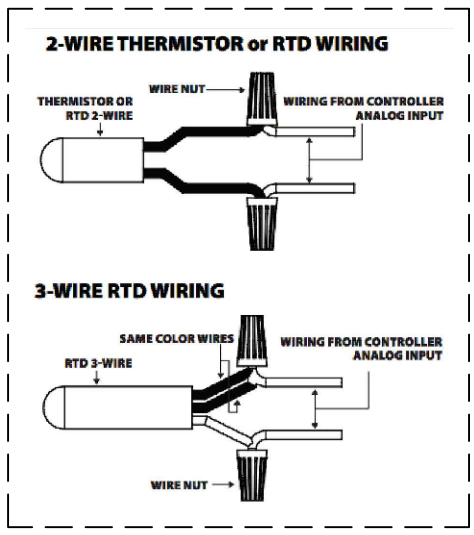


FIGURE A: TEMPERATURE SENSOR FLYING LEAD CONNECTIONS



WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – PLC CONNECTIONS 2

NO.	BY	DATE	CKD	REMARKS
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1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FE,XP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S08 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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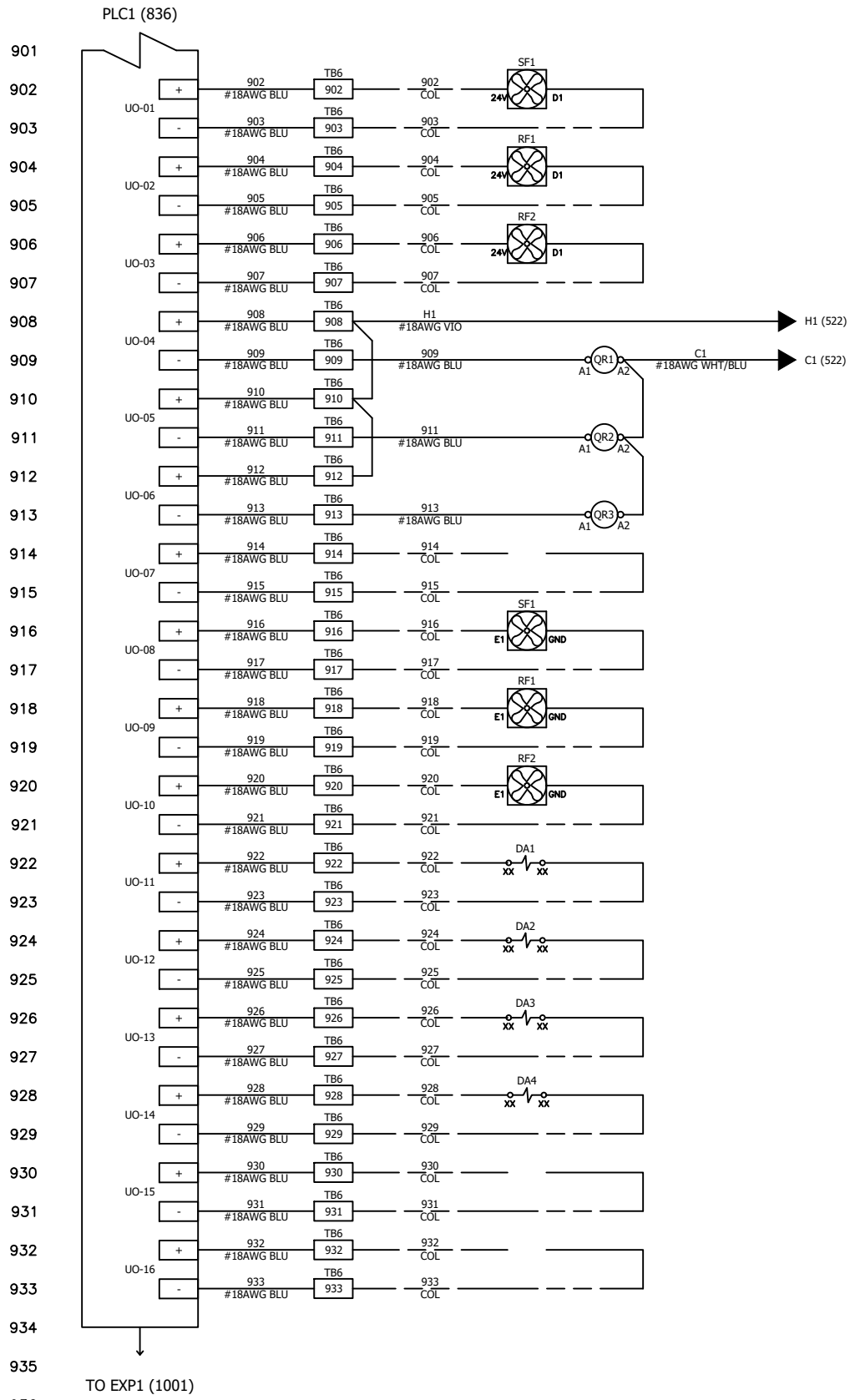
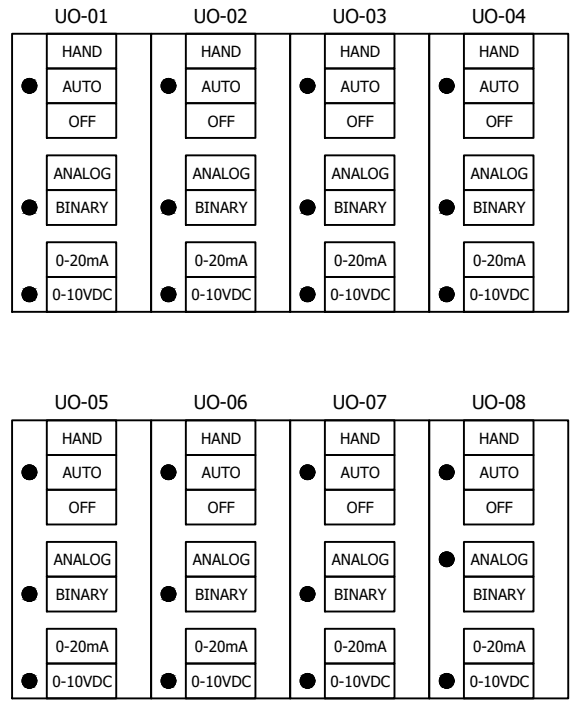
WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – PLC CONNECTIONS 3



SUPPLY FAN #1 START/STOP (RELAY)
REACT FAN #1 START/STOP (RELAY)
REACT FAN #2 START/STOP (RELAY)
DESICCANT WHEEL START/STOP (RELAY)
COMPRESSOR #1 START/STOP (RELAY)
COMPRESSOR #2 START/STOP (RELAY)
SPARE UNIVERSAL OUTPUT (SELECTABLE)
SUPPLY FAN #1 SPEED (0-10VDC)
REACT FAN #1 SPEED (0-10VDC)
REACT FAN #2 SPEED (0-10VDC)
OUTDOOR AIR DAMPER POSITION (0-10VDC)
SUPPLY AIR DAMPER POSITION (0-10VDC)
REACT AIR DAMPER POSITION (0-10VDC)
DESICCANT WHEEL BYPASS DAMPER OPEN/CLOSE (0-10VDC)
SPARE UNIVERSAL OUTPUT (SELECTABLE)
SPARE UNIVERSAL OUTPUT (SELECTABLE)



REVISIONS				
NO.	BY	DATE	CKD	REMARKS
0	AS	4/19/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
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2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S09 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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EXPANDER ADDRESS

FROM PLC1 (935)

EXP1

1001								
1002		1002 COL	TB7 1002	1002 #18AWG BLU	+	UI-01	SPARE UNIVERSAL INPUT (PROGRAMMABLE)	
1003		1003 COL	TB7 1003	1003 #18AWG BLU	-			
1004		1004 COL	TB7 1004	1004 #18AWG BLU	+	UI-02	SPARE UNIVERSAL INPUT (PROGRAMMABLE)	
1005		1005 COL	TB7 1005	1005 #18AWG BLU	-			
1006	FLYING LEADS SEE FIGURE A	TT1 WHT RED 1006 COL	TB7 1006	1006 #18AWG BLU	+	UI-03	PRE-COOLING COIL LEAVING AIR TEMPERATURE SENSOR (1KOHM RTD)	
1007		1007 COL	TB7 1007	1007 #18AWG BLU	-			
1008	FLYING LEADS SEE FIGURE A	TT2 WHT RED 1008 COL	TB7 1008	1008 #18AWG BLU	+	UI-04	PROCESS AIR DESICCANT LEAVING AIR TEMPERATURE SENSOR (1KOHM RTD)	
1009		1009 COL	TB7 1009	1009 #18AWG BLU	-			
1010	FLYING LEADS SEE FIGURE A	TT3 WHT RED 1010 COL	TB7 1010	1010 #18AWG BLU	+	UI-05	REACT AIR DESICCANT ENTERING TEMPERATURE SENSOR (1KOHM RTD)	
1011		1011 COL	TB7 1011	1011 #18AWG BLU	-			
1012	FLYING LEADS SEE FIGURE A	TT4 WHT RED 1012	TB7 1012	1012 #18AWG BLU	+	UI-06	REACT AIR DESICCANT LEAVING TEMPERATURE SENSOR (1KOHM RTD)	
1013		1013	TB7 1013	1013 #18AWG BLU	-			
1014		PT1 P 2 1014	TB7 1014	1014 #18AWG BLU	+	UI-07	COMPRESSOR #1 HIGH SIDE PRESSURE SENSOR (0-10VDC)	
1015	C1 (524)	1015 #18AWG WHT/BLU	TB7 1015	1015 #18AWG BLU	-			
1016			TB7 1016	1016 #18AWG BLU	+	24VDC	AUXILIARY 24VDC POWER	
1017			TB7 1017	1017 #18AWG BLU	+			
1018			TB7 1018	1018 #18AWG BLU	+			
1019			TB7 1019	1019 #18AWG BLU	+			
1020		PT2 P 2 1020	TB7 1020	1020 #18AWG BLU	+	UI-08	COMPRESSOR #2 HIGH SIDE PRESSURE SENSOR (0-10VDC)	
1021	C1 (525)	1021 #18AWG WHT/BLU	TB7 1021	1021 #18AWG BLU	-			
1022		1022 COL	TB7 1022	1022 #18AWG BLU	+	UI-09	SPARE UNIVERSAL INPUT (PROGRAMMABLE)	
1023		1023 COL	TB7 1023	1023 #18AWG BLU	-			
1024		1024 COL	TB7 1024	1024 #18AWG BLU	+	UI-10	SPARE UNIVERSAL INPUT (PROGRAMMABLE)	
1025		1025 COL	TB7 1025	1025 #18AWG BLU	-			
1026		1026 COL	TB7 1026	1026 #18AWG BLU	+	UI-11	SPARE UNIVERSAL INPUT (PROGRAMMABLE)	
1027		1027 COL	TB7 1027	1027 #18AWG BLU	-			
1028		1028 COL	TB7 1028	1028 #18AWG BLU	+	UI-12	SPARE UNIVERSAL INPUT (PROGRAMMABLE)	
1029		1029 COL	TB7 1029	1029 #18AWG BLU	-			
1030								
1031								
1032	EXP1 CONTINUED (1101)							
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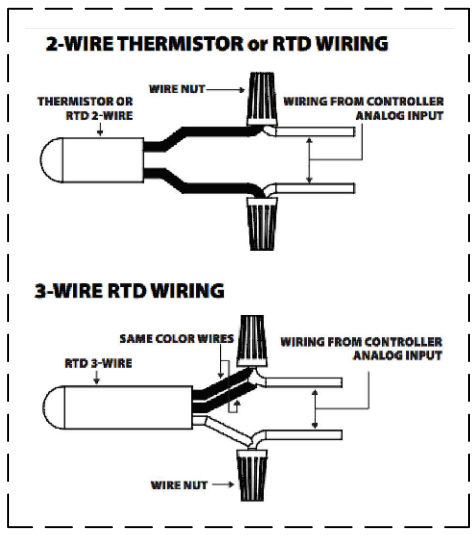
FIGURE A: TEMPERATURE SENSOR FLYING LEAD CONNECTIONS



WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – PLC CONNECTIONS 4

NO.	BY	DATE	CKD	REMARKS
0	AS	4/19/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S10 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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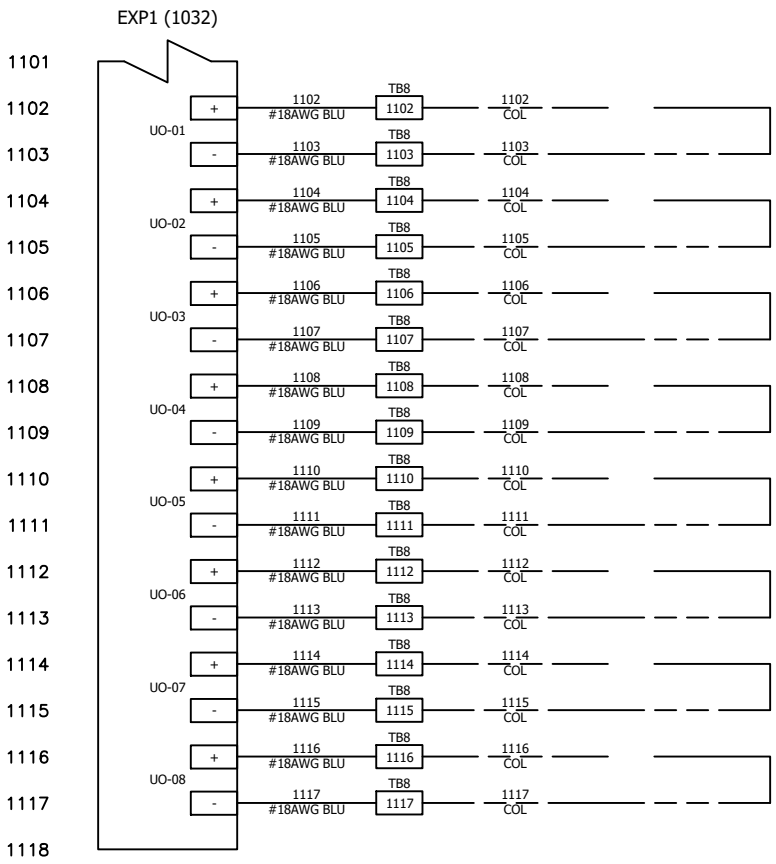
WHOLE FOODS BEVERLY HILLS DHP-20
SCHEMATIC – PLC CONNECTIONS 5



SPARE UNIVERSAL OUTPUT (SELECTABLE)
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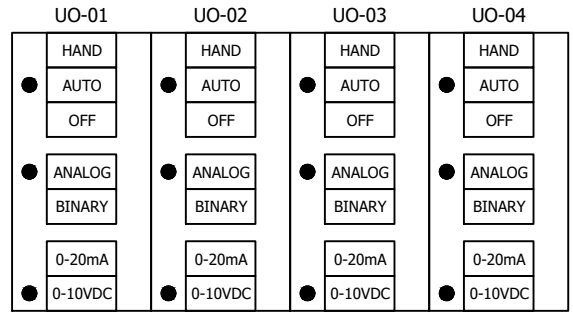

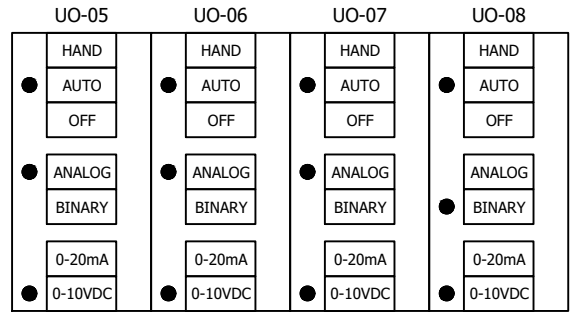

NO.	BY	DATE	CKD	REMARKS
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2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

S11 OF S11

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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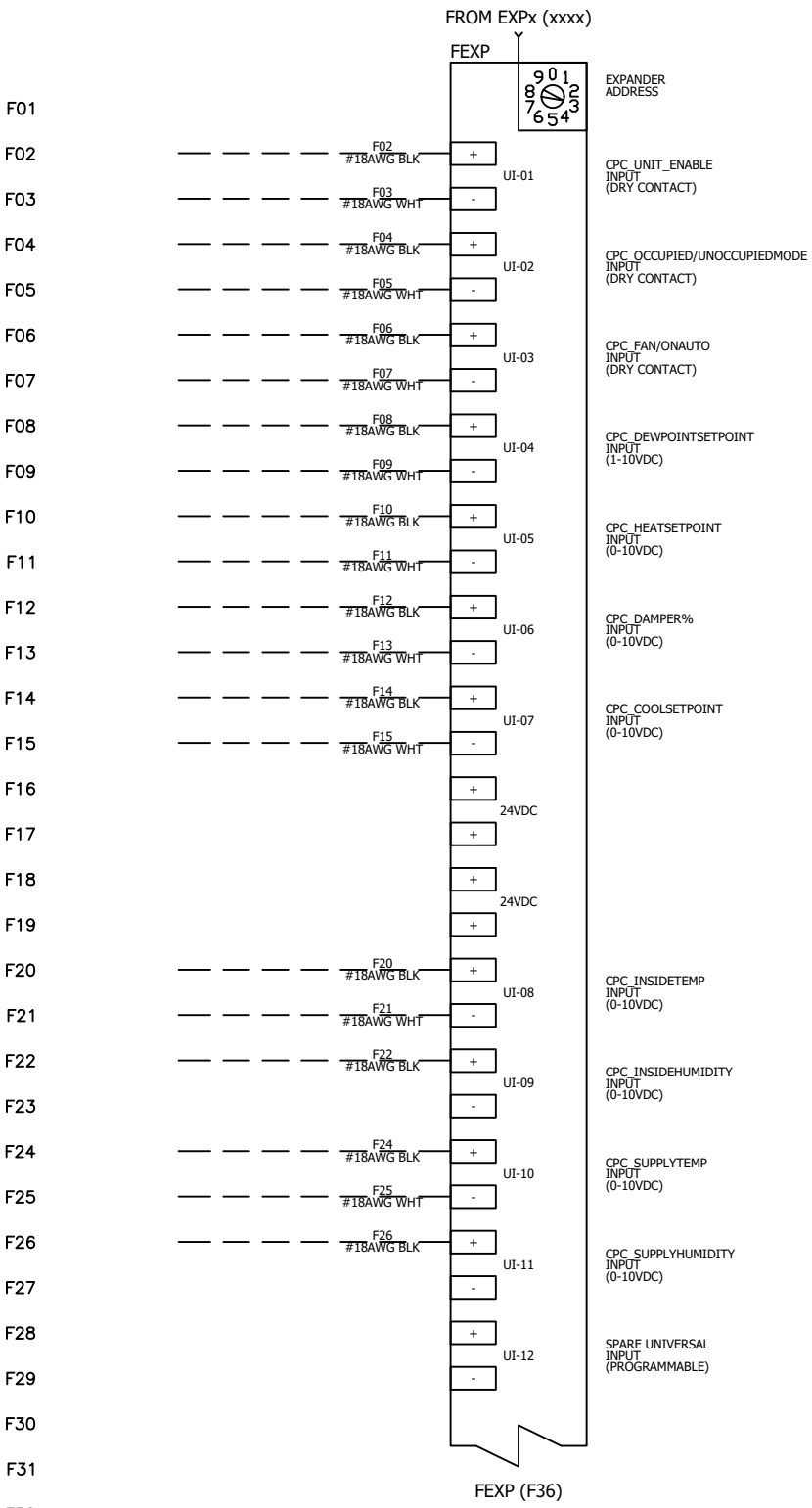
WHOLE FOODS BEVERLY HILLS DHP-20
CUSTOMER FIELD CONNECTIONS



NO.	BY	DATE	CKD	REMARKS
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1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOOP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

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F01 OF F01

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

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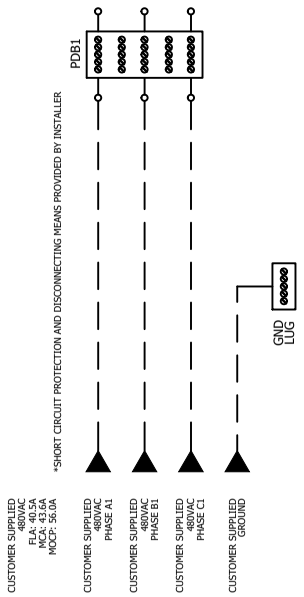
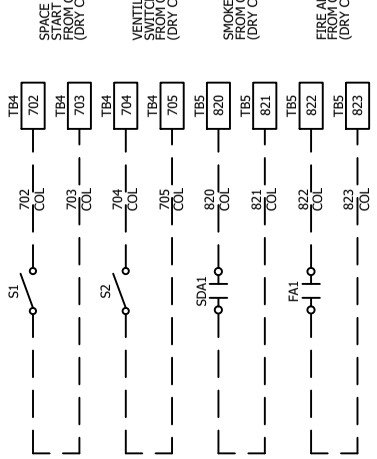
CUSTOMER FIELD CONNECTIONS

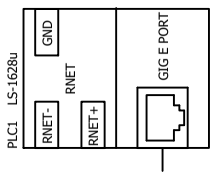
480VAC CONNECTIONS



I/O CONNECTIONS



COMMUNICATION CONNECTIONS



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Air$_2$O Intelligent cooling

WHOLE FOODS BEVERLY HILLS DHP-20
CUSTOMER FIELD CONNECTIONS

REVISIONS

NO.	BY	DATE	CKD	REMARKS
0	AS	4/16/2021	AH	SUBMITTAL
1	FN	4/27/2021	RJK	CONSTRUCTION
1.1	RJK	06/04/2021	XX	CONSTRUCTION W/ CHANGES
1.2	MT	08/05/2021	XX	FEXP AND FLA, MOP, MOCP
2.0	RJK	08/30/2021	XX	AS BUILT

JOB# 11772

DATE: 8/30/2021

F01 OF F01

DRAWING# 11772 AIR2O-WF-BEVERLYHILLS-DHP20

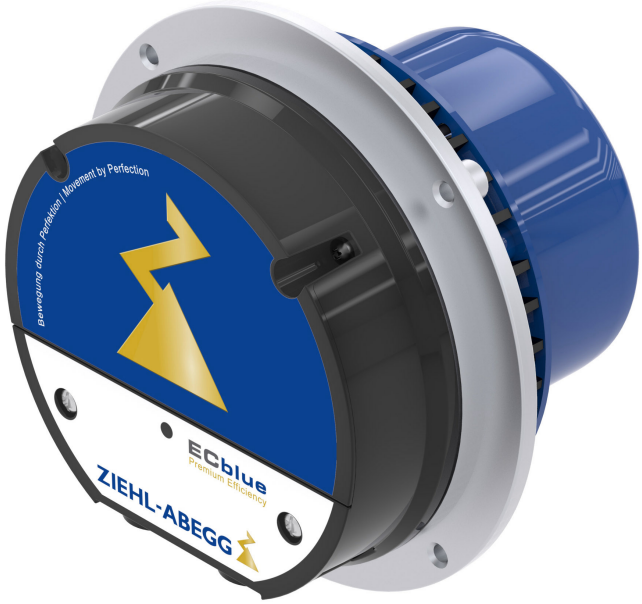
english

ECblue

Motor size B (IP54)

EC-fans and motors with highest efficiency

Assembly instructions



Keep for reference!

ZIEHL-ABEGG

Content

1 General notes

Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, start-up, maintenance, repair, cleaning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and limb of users and third parties.
Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications.

1.1 Validity

This document is valid for motors and fans of the ECblue series.
Motor size: B (90), protection class of motor IP54.
The used motor size is recognisable from the type designation (☞ rating plate).

Examples for type designations with motor size **B** = 90		
Motors Type	**Axial fans type**	**Centrifugal fans type**
MK090 -_ I _ . _ _ . _ _	F _ _ _ _-_ I _. **B** _._ _ _ _	RH _ _ _-_ I _. **B** _._ _ GR _ _ _-_ I _. **B** _._ _ ER _ _ _-_ I _. **B** _._ _

In the case of fans with the quality mark (see rating plate), please note the related specifications depending on the application location!

1.2 Structure of the assembly instructions

Before installation and start-up, read this assembly instructions carefully to ensure correct use!
We emphasize that these assembly instructions apply to specific units only, and are in no way valid for the complete system!
Use these assembly instructions to work safely with and on the device. They contain safety instructions that must be complied with as well as information that is required for failure-free operation of the device.
Keep these assembly instructions together with the device. It must be ensured that all persons that are to work on the device can refer to the assembly instructions at any time.
Keep the assembly instructions for continued use. They must be passed-on to all successive owners, users and final customers.

1.3 Target group

The assembly instructions address persons entrusted with planning, installation, commissioning and maintenance and servicing and who have the corresponding qualifications and skills for their job.

1.4 Exclusion of liability

Concurrence between the contents of these assembly instructions and the described hardware and software in the device has been examined. It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. To allow for future developments, construction methods and technical data given are subject to alteration. We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.
ZIEHL-ABEGG SE is not liable for damage due to misuse, improper use or as a consequence of unauthorized repairs or modifications.

1.5 Copyright

2 Safety instructions

2.1 Intended use

Attention!

- The fans are only intended for the conveyance of air or mixtures similar to air.
- Any other use above and beyond this is considered not for the intended purpose unless agreed otherwise by contract. The manufacturer will not be liable for any damage resulting from this. The individual or company using it bears the sole risk.
- Built-in fans with VDE approval (see rating plate) are designed to be installed inside devices and are not suitable for the direct mains connection.
- Reading these document and complying with all contained instructions -especially the safety notifications contained therein -are considered part of intended use.
- To consider is also the documentation of attached components.

2.2 Improper use

Improper use / reasonably foreseeable misuse

- Conveyance of aggressive and explosive gaseous media.
- Use in areas at risk of explosion for conveying gas, mist, vapours or mixtures of the above.
- Transfer of solids or solids content in the transfer medium.
- Operation with iced up impellers.
- Conveyance of abrasive or adhesive media.
- Conveyance of liquid media.
- Operation of plug fans outside devices.
- Connect built-in fans to open flue pipes of gas and other firing devices.
- Use of the fan and add-on parts (e.g. guard grille) as a resting surface or climbing aid.
  - Fans are not designed for walking on even with an additive diffusor attachment (retrofit kit)! Do not climb onto fans without suitable aids.
- Unauthorised constructional modifications to the fan.
- Operation of the fan as a safety component or for the performance of safety-relevant functions in the sense of EN ISO 13849-1.
- Blocking or braking of the fan by inserting objects.
- Use with direct contact with foodstuffs or cosmetic and pharmaceutical products.
- Use of the fan as an independent household appliance.
- Use as a fire gas or smoke extraction fan (special application according to DIN EN 12101-3).
- Loosening of fan blade, impeller and balancing weight.
- All applications not listed in the intended use.

Attention!
Not the manufacturer, rather the operator of the device is liable for any personal harm or material damage arising from non-intended use.

2.3 Explanations of symbols

Safety instructions are highlighted with warning triangles and are depicted according to the degree of hazard as follows.

	**Attention!** General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!
	**Danger due to electric current** Danger by dangerous, electric voltage! Death or severe injury can occur if the corresponding precautions are not taken!
	**Information** Important additional information and advice for user.

2.4 Product safety

The device conforms to the state of the art at the time of delivery and is fundamentally considered to be reliable. The device and its accessories must only be used in a flawless condition and installed and operated in compliance with the assembly instructions and/or operating instructions. Operating outside the device's technical specifications (see name plate and attachment / technical data) can lead to a defect in the device and additional damage!

Information
A separate fault and performance monitoring-system with an alarm signal function is necessary in order to prevent personal injuries and material damages during malfunctions and in case the device fails. Substitute operation must be taken into consideration! The design and installation of the system must comply with local regulations and directives.

2.5 Requirements placed on the personnel / due diligence

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the frequency inverter must have the corresponding qualifications and skills for these jobs.
In addition, they must be knowledgeable about the safety regulations, EU/EC directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations.
Personnel to be trained or instructed and apprentices are only permitted to work on the device under the supervision of an experienced person. This also applies to personnel undergoing general training.
Comply with the legal minimum age.

2.6 Work on the device

Information
Mounting, electrical connection, and start-up operation may only be carried out by an electrical specialist in accordance with electrotechnical regulations (e.g. EN 50110 or EN 60204)!

Danger due to electric current

- It is generally forbidden to carry out work on electrical live parts!
- Only remove the lid from the terminal compartment (available depending on the model) with the line voltage switched off!
- Opening of the base lid is prohibited. Loosening the safety screws will void the guarantee!
  - Protection class of the device when complete open is IP00! It is possible to touch hazardous voltages directly.
  - Through use of capacitors, danger of death exists even after switching off the device!
- The rotor is not protected against indirect contact neither by supplementary or reinforced insulation nor by connection to safety-earth in accordance with EN 60204-1, therefore the motor/fan must be installed so that it is not touchable.
- When the motor runs independently due to air flowing through or if it continues to run down after being turned off, dangerous voltages of over 50 V can arise on the motor internal connections through operation of the generator.
- The safe isolation from the supply must be checked using a **two-pole** voltage detector.

- Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground “PE” and the mains connection.
- The protective earth is conducting high discharge currents (dependent on the switching frequency, current-source voltage and motor capacity). Earthing in compliance with EN specifications shall therefore be observed even for testing and trial conditions (EN 50 178, Art. 5.2.11). Without earthing, dangerous voltages can be present on the motor housing.
- Maintenance work may only be carried out by suitably qualified personnel.

Attention, automatic restart!
- The motor may switch on and off automatically for functional reasons.
- Automatically restart after a power failure or mains disconnection!
- Wait for the motor to come to a complete standstill before approaching it!
- The exterior rotor turns during operation of the external rotor motor!

Danger of being sucked in!
Do not wear loose or hanging clothing, jewellery, etc., tie together long hair and cover it.

Attention, hot surface!
- Temperatures of above 85 °C can occur on the motor surfaces, especially on the controller housing!

2.7 Modifications / interventions in the device

Attention!
For reasons of safety, no unauthorized interventions or modifications may be made on the device. All planned modifications must be authorized by the manufacturer in writing.

Use only genuine spare parts / genuine wearing parts / genuine accessories from ZIEHL-ABEGG.These parts were specifically designed for the device. There is no guarantee that parts from non-original sources are designed and manufactured in correspondence with load and safety requirements.
Parts and optional equipment not supplied by ZIEHL-ABEGG are not approved by ZIEHL-ABEGG for use.

2.8 Operator’s obligation of diligence

- The contractor or owner must also ensure that the electric systems and equipment are operated and maintained in accordance with electro-technical regulations.
- The owner is obliged to ensure that the device is operated in perfect working order only.
- The device may only be used as intended.
- You must periodically examine the safety equipment for their properly functioning condition.
- The assembly instructions and/or operating instructions are always readily available at the location where the device is being used, are complete and are in legible condition.
- These persons are regularly instructed in all applicable questions regarding occupational safety and environmental protection and are knowledgeable regarding the assembly instructions and/or operating instructions and, especially, are familiar with the safety instructions contained therein.
- All safety and warning notices attached to the device are never removed and remain legible.

2.9 Employment of external personnel

Maintenance and service work are frequently carried out by external employees who often do not recognize the specific situations and the thus resulting dangers.These persons must be comprehensively informed about the hazards in their area of activity.
You must monitor their working methods in order to intervene in good time if necessary.

3 Product overview

3.1 Area of application/Notes on use

The fans / motors are not ready-for-use products, but conceived as components for ventilation systems (type designation see rating plate).
The fans may not be operated until they are installed in line with their intended use. The supplied and certified guard grille of ZIEHL-ABEGG SE fans is designed in accordance with DIN EN ISO 13857 Table 4 (from the age of 14 up). In the event of deviations, further structural protective measures must be taken for safe operation.

- Any use below -10 °C is dependent on not being subjected to unusual, sudden or mechanical loads or stresses on the material (see minimal permissible ambient temperature).
- Corrosion is possible at the cutting edges on sendzimir galvanised parts.

Attention!
If the motor/fan is used in applications where a ignitable atmosphere can form in the event of a fault, e.g. due to leakage, the user must assess the risks of ignition and take appropriate precautions to prevent ignition.

3.2 Functional description

ECblue stands for EC fans and motors with maximum efficiency. Highly efficient, electronically commutated motors with permanent magnets are used the speed of which is controlled by the integrated controller.
The devices are constructed in accordance with the general requirement in EN 61800-2 for adjustable speed electrical power systems and is intended for one-quadrant drives.

3.3 Temperature management

The service life of devices with power electronics is decisively dependent on the ambient temperatures. The longer electronic components are exposed to high ambient temperatures, the faster the deterioration and the more probable the failures.
The power electronics protects itself against excessive temperatures by active temperature management (power reduction).
However, this cannot provide complete protection in all circumstances. Observe the rated data - particularly the maximum permitted ambient temperature - on the rating plate.

3.4 Note on the ErP directive

ZIEHL-ABEGG SE wishes to point out that, based on the directive (EU) no. 327/2011 of the Commission of 30th of March 2011 for enforcing directive 2009/125/EC (hereinafter referred to as ErP directive), the operational area of certain fans within the EU is bound by certain prerequisites.
The fan may only be used within the EU when it meets the requirements of the ErP directive.
If the said fan does not have a CE mark (cf. especially the rating plate), use of this product within the EU is not admissible.
All ErP-relevant information comprises measurements which are determined using a standardised measurement set-up. More details can be obtained from the manufacturer.
Further information about the ErP directive (Energy related Products-Directive) can be found on www.ziehl-abegg.de search key: "ErP".

3.5 Transport, storage

Attention!
- Observe the weight specifications (see rating plate) and the permissible carrying loads of the means of transport.
- Wear safety clothing / shoes and cut-resistant safety gloves when handling.
- Do not transport the fan by the connecting cable!
- Avoid shocks and impacts to the device during the transport.
- Avoid extreme humidity, heat or exposure to cold (see technical data).
- Watch out for possible damage to the packaging or fan.
- Fix pallets during transport.
- Do not stack pallets.
- Only handle with suitable hoisting gear.

- Position the lifting beam transversely to the motor axis. Pay attention to adequate width of the lifting beam.
- Never stand underneath the suspended fan because defective transport equipment could cause death.

- Store the fan / motor in the original packaging in a dry area protected from the weather and protect it from dirt and weather until final installation.
- Avoid prolonged storage; we recommend a maximum of one year (consult the manufacturer before starting if stored for longer).
- Inspect the bearing for proper operation prior to installation.
  – Recommendation: Turn the impeller evenly by hand to avoid jamming and damaging the bearing.
- Transport the fan(s) either in the original packaging or, in the case of larger fans, on the dedicated transportation fixtures.
  – axial fans: holes drilled in support arms, wall ring plates and motor block
  – centrifugal fans depending on type: holes drilled in the housing flange, motor block, fastening brackets and support plates,
- Radial impellers, fans with scroll RG.., RD.. or built-in fans type ER../GR.., WR.. are generally delivered on europallets, and can be transported using lift trucks.
- **Design RG.. / RD.. / ER.. / GR../ WR../HR..** : Fan unit may only be lifted and transported when using a suitable hoisting device (load spreader). Ensure sufficient cable or chain length.
- **Design FV.. / DN..** : The fan must be fastened to 4 points during transport so the flanges do not warp.
- Design WR: maximum permissible number for lifting fan units mounted on top of one another

Size	External dimensions [mm]	Permissible number
1	607 x 607	5
2	760 x 760	4
3	912 x 912	3

Attention!
Lifting several fan units next to one another is prohibited!

3.6 Disposal / recycling

Disposal must be carried out professionally and in an environmentally friendly way in accordance with the respective national legal stipulations.
▷ Separate the materials by type and in an environmentally friendly way.
▷ If necessary, commission a specialist company with the waste disposal.

4 Mounting

4.1 General notes

Attention!

- Mounting is only to be undertaken by trained service personnel. The system manufacturer or the machine builder and/or the user is responsible that the inherent installation and security information are harmonized with the valid standard and guidelines (EN ISO12100 / 13857).
- Check the fan for damage, e.g. cracks, dents or damage to the electric cables, before assembly. Start-up is not allowed in the case of transport damage!
- Wear safety clothing / shoes and cut-resistant safety gloves when handling.
- At a weight greater than 25 kg for men / 10 kg for women, the fan should be lifted out by two persons (according to REFA). The values may differ from country to country.
- Lift the fan out of the packaging with a lifting gear (lifting beam). Attachment points are solely the holes on the housing flange, motor bed, support plate, motor suspensions, fastening brackets and any crane eyes of the fan (depending on the design of the fan).
- The chain/rope may not touch the impeller and the possibly mounted frequency inverter when lifting with the lifting beam, otherwise damage is possible.
- The custom designs must suit the prevailing conditions.
- Take into account easy access for cleaning and maintaining the fan.
- Before installing the fan, make sure the safety distances are maintained compliant with EN ISO 13857 or in household equipment according to EN 60335.
  - If the mounting height (danger area) above the reference plane is greater than or equal to 2700 mm and is not reduced by auxiliary means such as chairs, ladders, working platforms or floor space on vehicles, a guard grille is not necessary on the fan.
  - If the fan is located in danger zone, then the manufacturer or operator shall ensure that hazards shall be prevented by appropriare protective constuctions which meet the requirements to EN ISO 13857.
- Protective measures must be taken against falling parts when mounting with a hanging rotor.
- Tighten the fastenings with the specified torques.
- Drilling chips, screws and other foreign bodies must not be located inside the device! Before the first switch-on, remove any items that may be present (drilling chips, screws and other foreign objects) from the intake area - risk of injury from any objects that may fly out!
- For fans, the alignment must be adhered to during operation, e.g. if this is indicated by “Oben/Top”.

4.2 Connecting lead, position terminal compartment

Information

In demanding environments (wet areas, open air installation) all connections must incorporate water drainage curves. To ensure that water cannot penetrate through to the controller housing from the connections install a terminal box lower than the fan.
In vertical mounting (installation position “H” = motor shaft horizontal), install the fan for protection ahainst penetrating moisture with the terminal compartment vertically downwards (up to max. 30° lateral inclination).
Optimum heat dissipation of the power loss resulting in the device is achieved in this position (☞ Diagnostic/ Faults / Temperature Management).

4.3 Version with separate junction box

For products supplied by ZIEHL-ABEGG with a separate junction box, note the following information.

1	Separate junction box made of plastic or metal
2	Lid screws Tightening torque: Plastic box 1.3 Nm/12 Lb In, metal box 2.6 Nm/23 Lb In
3	Cable glands (see table below)
4	Screw plugs, plastic/brass Tightening torque: 2,5 Nm/22 Lb In

Cable glands

Thread size	Material	Tightening torques M_A	
M12	Synthetic material	1.5 Nm	13 Lb In
	Brass	4 Nm	35 Lb In
M16	Synthetic material	2,5 Nm	22 Lb In
	Brass	5 Nm	44 Lb In
M20	Synthetic material	4 Nm	35 Lb In
	Brass	6.5 Nm	58 Lb In
M25	Synthetic material	6.5 Nm	58 Lb In
	Brass	6.5 Nm	58 Lb In
M32	Synthetic material	6.5 Nm	58 Lb In

4.4 Assembly in a humid atmosphere

Information

If the device is not in use for longer periods in a humid atmosphere, it is recommended to operate the motor/fan for at least two hours every month at 80 - 100 % of maximum speed to remove any moisture that has penetrated inside.

4.5 Motorheating

A continuous power supply is required for safe operation down to the minimum permitted ambient temperature (see technical data).
If the motor is not switched on with an existing power supply (no setting signal, switch off by enable), the motorheating switches back off automatically at a controller inside temperature of -19 °C and heating up to -15 °C.
Heating takes place via the motor winding whereby a current is induced which cannot cause rotation.

4.6 Installation of axial fans

4.6.1 Fans design A, D, K, S and W (without nozzles)

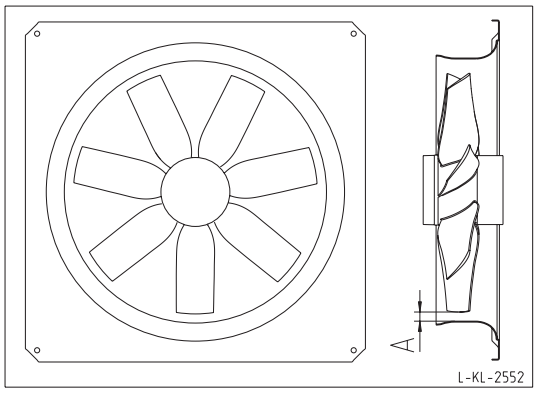
For attachment to fixed motor flange use screws with property class 8.8 or A2-70 (stainless steel) to EN ISO 4014 and provide with suitable screw locking.

Permissible tightening torques M_A		
Thread size	M6	M8
Property class 8.8, friction coefcient µges = 0.12	9.5 Nm	23 Nm
Stainless steel A2-70, friction coefcient µges = 0.12	7 Nm	17 Nm
Screw penetration	≥ 1.5 x d	≥ 1.5 x d

When using screws with different friction values or strength classes, different tightening torques may be necessary.

Information

- Pay attention to a sufficient screw-in length in the motor flange.
- An excess screw length of max. 3 mm is permissible.
- Every screwing case is different. The tightening torque adapted to it must be determined by the appropriate screw tests.
- In the case of a vertical motor axis, the respective lower drain hole must be open.
- Secure fan connection cable with cable fasteners or cable clips.



A minimum head gap “A” of 2.5 mm in all installation positions but especially in installation position “H” (horizontal motor shaft) is necessary. Distortion due to uneven surface may lead to fan failure due to brushing against the fan wheel.

Attention!

Avoid structural damage or stress with installation. Make sure the surface is flat and even.

4.6.2 ZAplus fans

When mounting ZAplus fans, ensure plastic-compliant connectors.

Recommended tightening torques M_A when using flat fastening discs according to EN ISO 7089 or DIN125			
ZAplus size ((tye: ZC.., ZN.., ZF..)	040	045 - 063	> 071
Thread size	M8	M10	M12
Property class 8.8, friction coefcient µges = 0.12	12 Nm	24 Nm	40 Nm

Tightening torque guard grille fitting: 6 Nm

Information

- Since the concrete bolt or screw varies by customer unit, these recommendations must be checked for each respective situation.
- Secure the cable covering against loss after connecting the motor by securing with 2 cable ties.
- For a version with a square rear wall (design Q), removal of this square plastic plate is prohibited.

4.7 Mounting of centrifugal fans

4.7.1 Mounting of centrifugal fans design RE, RH, RZ

For attachment to fixed motor flange use screws with property class 8.8 to EN ISO 4014 and provide with suitable screw locking.

Permissible tightening torques M_A	
Thread size	M6
Property class 8.8, friction coefcient µges = 0.12	9.5 Nm
Screw penetration	≥ 1.5 x d

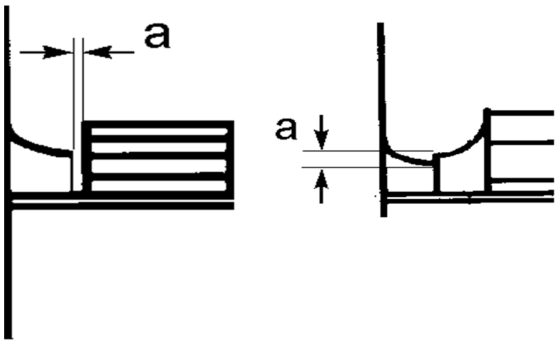
When using screws with different friction values or strength classes, different tightening torques may be necessary.

Mounting of centrifugal fans, RZ design

Attachment to motor fan wheel mounting according to device manufacturer's specifications.

Information

- Pay attention to a sufficient screw-in length in the motor flange.
- An excess screw length of max. 3 mm is permissible.
- Every screwing case is different. The tightening torque adapted to it must be determined by the appropriate screw tests.
- In the case of a vertical motor axis, the respective lower drain hole must be open.



Ensure that the clearance (gap) “a” see fig. between the fan impeller and the stationary housing section is constant. Distortion due to uneven surface may lead to fan failure.

Attention!

- Avoid structural damage or stress with installation. Flange and mounting bracket must be fixed flat on a level surface.
- The fan must be securely mounted, with vibration dampers if necessary.

4.7.2 Mounting of centrifugal fans design RG.. / RD..

Fastening depending on housing design on flange or fastening brackets.

Information

An additional bracket is required for fastening to the flange. This is available as an accessory.

Attention!

- Avoid structural damage or stress with installation. Flange and mounting bracket must be fixed flat on a level surface.
- Provide screwed connections with suitable screw locking.

4.7.3 Erecting the equipment: Design ER.. / GR.. / WR..

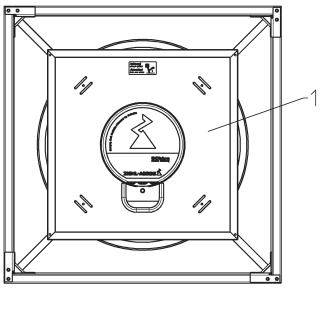
- To avoid the transference of disruptive vibrations, we recommend de-coupling the entire plug fan to avoid sounds transmitted through solids. (Spring and/or attenuation units are not a constituent part of the standard scope of delivery). Look at our catalogue for positioning the decoupling elements or request a dimensions sheet stating the type designation and Part.-No.
- Erect in the open air only if this is expressly mentioned and confirmed in the ordering information. There is a risk of damage to the bearings if the fan remains stopped in a moist environment. Avoid corrosion by suitable protective measures. Roofing is required.
- In the case of a vertical motor axis, the respective lower drain hole (if available) must be open.
- The GR design in position “H” (horizontal shaft) should be installed in the preferred direction. The cable guides should point downwards (angled sideways by approx. 30°). This is indicated by the “OBEN/TOP” warning sign on the device.
- Design ER.. / WR.. is only permissible with horizontal motor shaft.

Attention!

- All contact points must be fixed securely. If the fixing is inadequate there is a risk of the fan overturning.
- Making your own alterations/conversions on the fan module is unacceptable - safety risk.

Design WR: maximum permissible number for installing several fan units on top of one another		
Size	**External dimensions [mm]**	**Permissible number**
1	607 x 607	5
2	760 x 760	5
3	912 x 912	5

Version with Optimizer



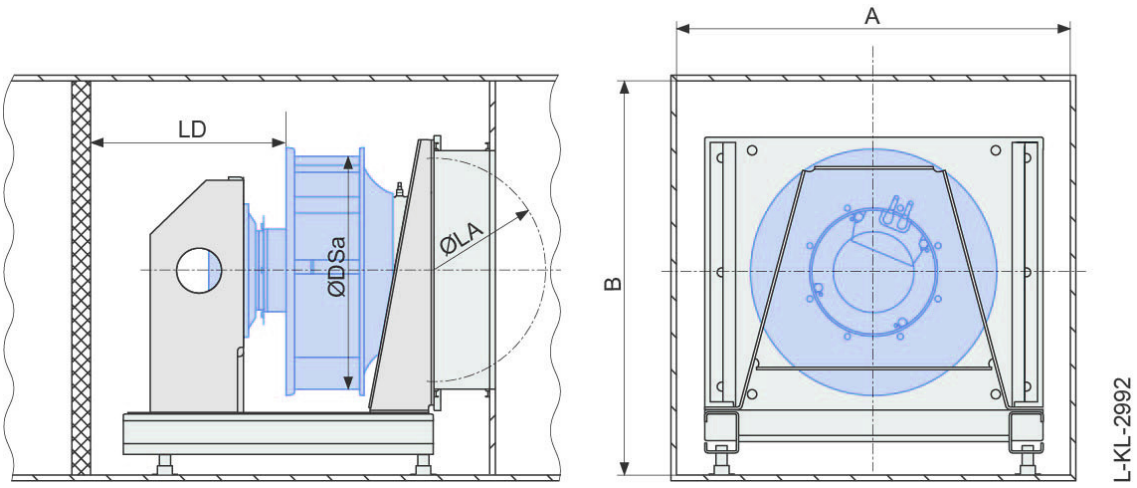
The optimizer can be removed temporarily for better accessibility (e.g. for laying of cables or cleaning).

1 Optimizer

Attention!

The optimizer is only engaged. External mechanical stress (e.g. securing or fastening of installation elements) is prohibited.

4.7.4 Optimal installation distances according to for RH../ ER../ GR.. fans



- Distance on suction side: LA ≥ 0.5 x DSa *
- Distance on the pressure side: LD ≥ 1 x DSa
- Impeller blade external-diameter : Ø DSa
- Housing wall distances: A = 1.8 x DSa (A = B)

* In the case of disturbance flow (per example curved pipe at the suction side, flaps etc.) LA ≥ 1 x DSa

4.8 Mounting the motor

Motors design MK

Fastening to fixed motor flange☞ (assembly of axial fans / fans of design A, D ..) and (assembly of radial fans of design RH).

- If the motor is used to drive fan impellers or other components, please note the maximum permissible speeds of the impeller or the component to be driven.
- The max. permissible mass of the impeller ort he component to be driven must be inquired from and confirmed in writing by ZIEHL-ABEGG.
- Motors are not balanced as standard, a complete balancing with mounted fan impeller is necessary. The balancing must be done on the fan impeller. The pertinent regulations must be observed.

Design K (with rotor flange) or D (with offset rotor flange) as a drive for fans:

- During assembly of the fan impellers or other components, no inadmissible force may be applied to the motor bearing.
- Centre the fan impeller accurately and mount without tension on the rotor flange, the fan wheel must lie flat.
- Use suitable screws for fastening the fan impeller on the rotor flange and fit as suitable screw lock.
- Every screwing case must be tested for suitability.
- The permissible area pressing of the rotor flange may never be exceeded (depending on the contact surface).
- Too great a screw overhang is not permitted and can lead to scraping or blocking of the rotor on the fixed motor flange.
- Motors are not balanced as standard, a complete balancing with mounted fan impeller is necessary. The balancing must be done on the fan impeller. The pertinent regulations must be observed.

Permissible tightening torques M_A	
Thread size	M6
Property class 8.8, friction coefcient µges = 0.12	9.5 Nm
Screw penetration	≥ 1.0 x d
Max. permissible screw overhang	1.0 mm

5 Electrical installation

5.1 Safety precautions

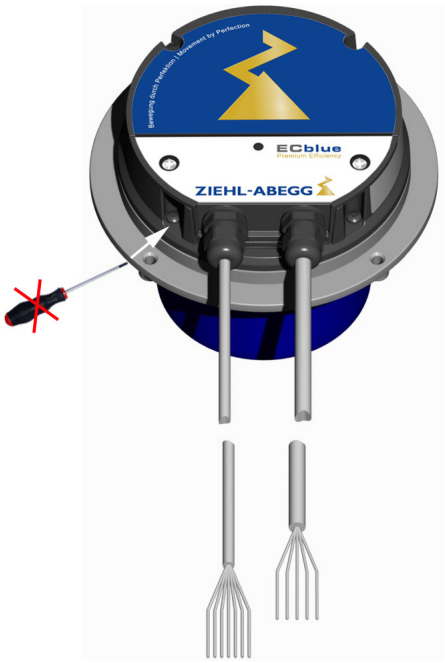
Danger due to electric current

- Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.
- The 5 electrical safety rules must be observed!
- It is forbidden to carry out work on electrically live parts! Even after disconnection, the dc-link is still live. Always wait at least 3 minutes.
- Cover neighbouring electrical equipment during installation work.
- Cable glands made out of metal are not allowed in plastic terminal boxes due to lack of potential equalisation.
- Other measures may be necessary to achieve safe electrical isolation.
- Connect fan only to electrical circuits that can be disconnected with an all-pole isolating switch.
- Operating the device with the housing cover removed is prohibited because energized, exposed parts are present inside the device. Disregarding this regulation can lead to severe personal injury.
- The final application must ensure that the fundamental health and safety requirements are met.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- Electrical equipment must be checked regularly: Loose connections are to be re-tightened and damaged cables must be replaced immediately.

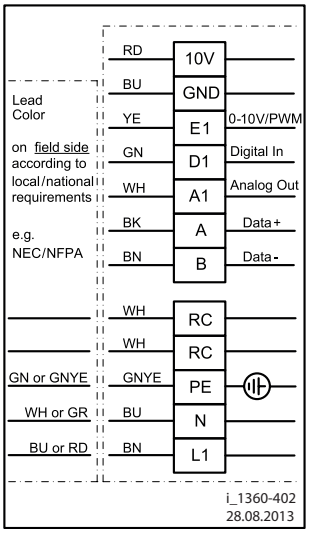
5.2 Version with connection cables

Information

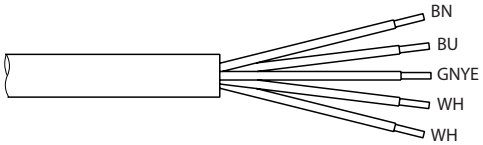
- In versions with connecting leads the connection is made to the colour coded wires. Note the cable bands on the connecting leads and the respective connection diagram.
- The type, length, colour coding and connection assignment of the connecting leads may vary depending on the version.
- Read the following chapter “Version without connection cables” for a new connection to the terminals in the terminal compartment.

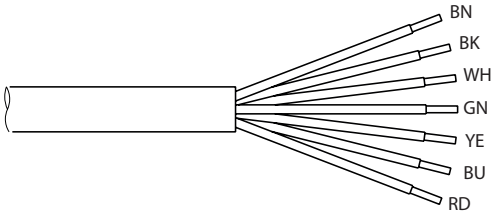


Do not loosen the safety screws from the housing!



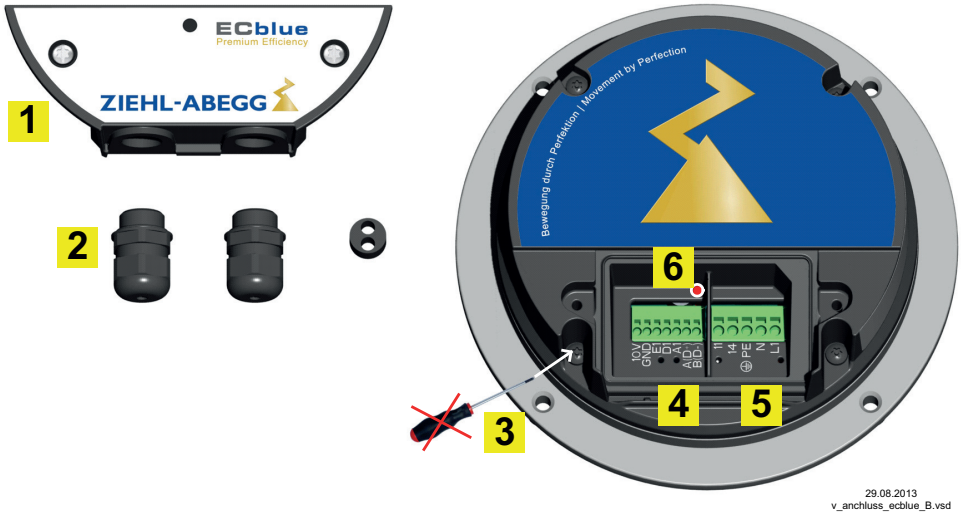
The bands around the cables show national colour codes which may be available on the field side.

For line and relay: hose cable 5 x 1.0 mm² (18 AWG) comparable LiYY-JB			
 length approx. 0.6 m *	brown	L1	Voltage supply
	blue	N	
	green-yellow	PE	
	white	11	Relay
	white	14	K1

For control: hose cable 7 x 0.34 mm² (22 AWG) comparable LiYY-OB			
 length approx. 0.6 m *	brown	B (D-)	MODBUS (RS-485)
	black	A (D+)	MODBUS (RS-485)
	white	A1	OC Out Status (Tacho)
	green	D1	Digital In 1
	yellow	E1	Analog In 1
	blue	GND	
	red	10V	DC Out

* *The lead length can vary according to the version.*

5.3 Version without connection cables



1 Cover for terminal compartment
2 Cable glands (2 x M16x1.5)
seal insert with two holes 5 mm for two cables applicable if necessary
3 Do not loosen the safety screws from the housing!
4 Connection control system
5 Connection alarm relay and voltage supply
6 Status LED

Procedure:

1. Remove the cover from the terminal compartment for the connection.
2. Both cable entry points are in a sealed condition at delivery.
   – Turn in cable gland until seal breaks.
   – Unused entry points must be sealed!
3. Insert and connect cables properly and ensure tightness of the cable glands.
4. Attach connection cover again carefully in correct position before start-up.

Information
The seal of the end cap can adopt the contour of the housing in time.
Therefore mount the cover on the same motor that it was removed from to achieve maximum tightness.

Attention!

- Temperatures up to 80 °C can be present on the controller housing.
- To connect, always use heat resistant wires or, as an alternative, silicon tubes.
- Only use lines which can guarantee a permanent seal around the cable glands (pressure-resistant, dimensionally-stable, round-centred jacket; e.g. by means of gusset filling)! Lines with filling fleece are not permissible because moisture can penetrate due to the capillary effect!
- Two lines may only be fed through one cable gland with the sealing insert for two lines.
- When using the seal insert for two cables it is not permissible to use the corresponding cable gland with only one cable.
- Make absolutely sure that different connections do not come into contact (e.g. by splaying or loose connecting wires).
- Remants from installation and foreign object may not remain on the inside!

Connection data of terminals

Terminal	Line, relay	Brake control
Stripping length	10 mm	10 mm
Conductor cross-section rigid min.	0.2 mm^2	0.2 mm^2
Conductor cross-section rigid max.	4 mm^2	1.5 mm^2
Conductor cross-section flexible min.	0.2 mm^2	0.2 mm^2
Conductor cross-section flexible max.	2.5 mm^2	1.5 mm^2
Conductor cross section flexible with wire end ferrule without plastic sleeve min.	0.25 mm^2 (stripping length 8 mm)	0.25 mm^2 (stripping length 8 mm)
Conductor cross section flexible with wire end ferrule without plastic sleeve max.	2.5 mm^2 (stripping length 8 mm)	1.5 mm^2 (stripping length 8 mm)
Conductor cross section flexible with wire end ferrule with plastic sleeve min.	0.25 mm^2 (stripping length 8 mm)	0.25 mm^2 (stripping length 8 mm)
Conductor cross section flexible with wire end ferrule with plastic sleeve max.	1.5 mm^2 (stripping length 8 mm)	0.75 mm^2 (stripping length 8 mm)
Conductor cross-section AWG/kcmil min.	24	24
Conductor cross-section AWG/kcmil max.	12	16
The data refer to the connection possibilities of the terminals. The necessary conductor cross section must be dimensioned according to the respective prevailing conditions.		

Push-In Terminals

Rigid conductors and conductors with wire end ferrules can be plugged directly into the terminal without tools.

Permissible tightening torques M_A

	Thread size	**Tightening torque M_A**		**Remarks**
		[Nm]	[Lb In]	
Cable gland	M16x1.5	2.5	22	Sealing area: cable diameter 4…10 mm
Cover for terminal compartment *	4.0	2.5	22	

* *Recommended tightening speed maximum 400 min^{-1}*

5.4 EMC-compatible installation of control lines

Pay attention to sufficient distance from powerlines and motor wires to prevent interferences. The control cable may not be longer than 30 m. Screened control cables must be used when the cable length is longer than 20 m. When using a shielded cable connect the shielding to one side only, i.e. only to the signal source with the protective earth (keep cable short and with as little inductance as possible!).

5.5 Voltage supply

5.5.1 Line voltage

Danger due to electric current
- It must be strictly observed that the line voltage complies with specified on the rating plate and lies within the allowable tolerance specifications (see technical data).
- Between the voltage supply of the device and the protective earth “PE” is in no case a higher voltage permissible than the indicated line voltage of the device!

- Mains connection to: PE, L1 and N.
- **Attention!**
  – To activate the on current limitation, you must wait at least 90 seconds after switching off the line voltage before switching back on!

5.5.2 Required quality attributes for the mains voltage

Danger due to electric current
The mains voltage must comply with the EN 50160 quality characteristics and the defined standard voltages in IEC 60038!

5.5.3 Line protection fuse

The connection must be fused depending on the used cable, the type of routing, the operating conditions and according to the standards applicable on site. The specification for the maximum admissible line fuse of the device must be observed (see technical data).

Possible components for the line protection (recommendation):
- Safety fuses of operating class “gG” (whole range fuse cartridges for general applications according to EN 60269-1).
- Line protection switch with characteristic “C” (according to EN 60898-1).

5.5.4 Operating in IT-System

Danger due to electric current
- In the IT-System the neutral point of voltage supply is not grounded; in the case of a short-circuit between a phase (e.g. “L1”) and protective earth “PE” becomes the protective earth potential = phase.
- Between the connection of the voltage supply of the device and the protective earth “PE” is in no case a higher voltage permissible than the indicated line voltage of the device!

1 ~ types can be used in IT-System in standard version. These may only be used in 3 ~ IT-Systems if no higher voltage to the “PE” can occur than the specified mains voltage of the device even in case of a fault to earth of a mains phase which is not used by the device (of none of the two power supplies).
In order to ensure a trouble free operation in IT-System the “GND” potential of the control ports have to be connected with the protective earth potential.
As a consequence of these connection must be considered for the control ports (exception floating relay contacts):
1. Connection only with wires, suitable for mains voltage and surrounding area.
2. Connection with suitable isolated amplifiers only.

5.6 Systems with residual current protective devices

Whether the use of a residual current protective device (RCD) is necessary or allowed depends on the design of the low-voltage system on which the device is to be operated.
The assessment whether or which residual current protective device should be used is the responsibility of the system operator or electrician commissioned by it.

Danger due to electric current
When selecting the tripping characteristics of the residual current protective device, the possible residual current form of the power electronics (system with semiconductors) must be observed in conjunction with the standards and regulations applicable at the place of use.

Design of the power electronics

- The design of the power electronics corresponds to a frequency inverter with two-pulse bridge circuit and PFC (power factor correction).

Information
To prevent false tripping due to pulse-like charging currents of the integrated EMC filter, we recommend a rated differential current of 300 mA for reasons of operational reliability in the case of fixed connection and use of a residual current protective device.

5.7 Motor protection

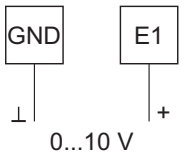
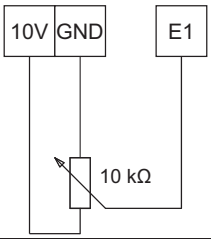
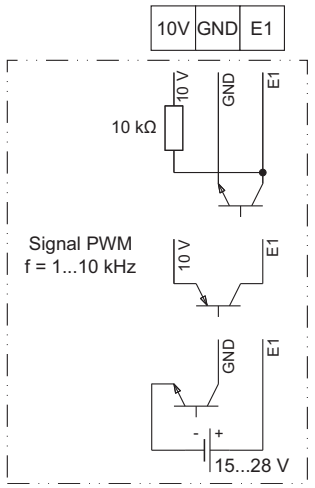
Integrated overload protection, preceding motor protection device unnecessary (max. line fuse see Technical data).

5.8 Analog input “E1” for setting speed

The device has an analog input for setting the motor speed. Connection “E1” / “GND” (R☞ Technical data).
If the analogue input “E1” is not required for specifying the speed, this can reprogrammed as a digital input.

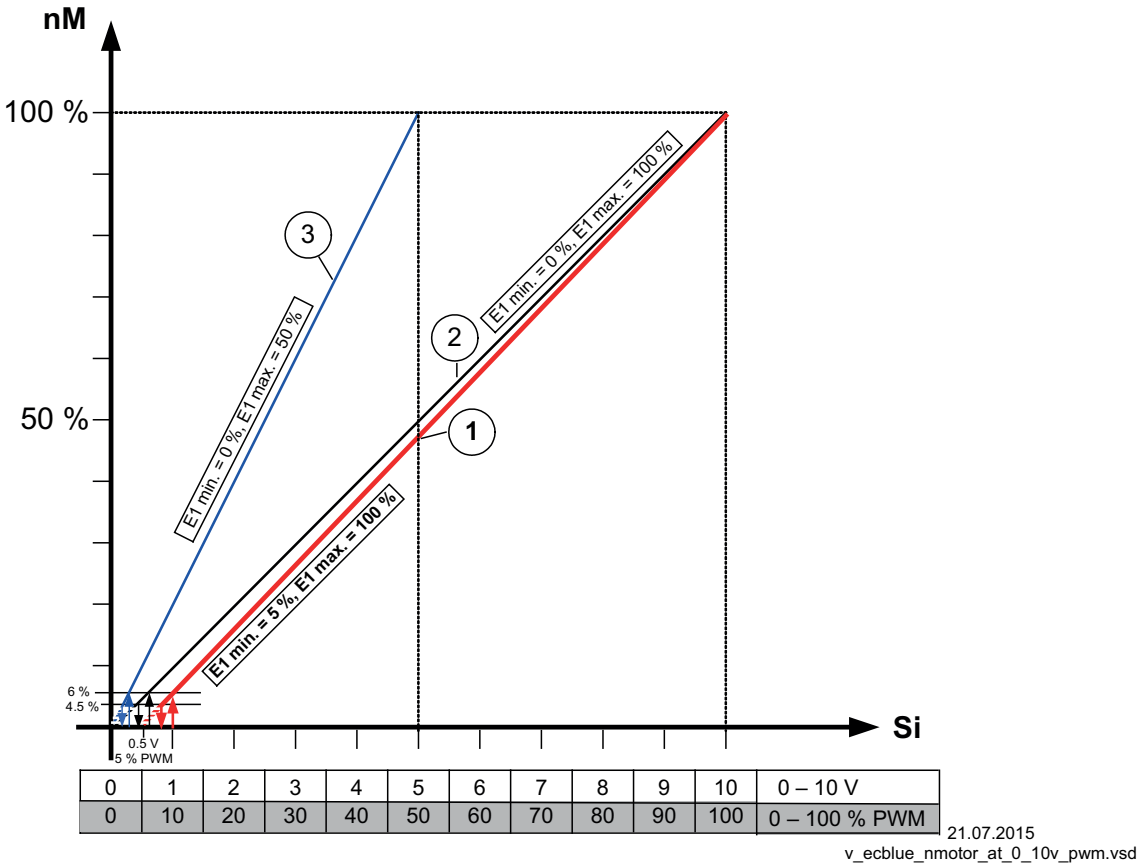
Danger due to electric current

- Ensure correct polarity!
- Never apply line voltage to analog inputs!

Possibilities for speed setting	
	• Control via external setting signal **0...10 V**. • Control by inverted setting signal **10...0 V** (reprogramming necessary). • By external wiring with a resistor (499 Ω / 0,25 W) between the terminals “E1” and “GND” parallel to the input signal, activation with a **0...20 mA** signal is possible.
	• Speed setting by 10 kΩ potentiometer at terminals “+10 V” and “GND” pick-off at terminals “E1”.
	• Control via external setting signal PWM.

The motor always starts with at least 6 % of the rated speed and stops below 4.5 % of the rated speed (providing that the “Min. Speed” setting is “0”).
With the settings “E1 min.” and “E1 max.” it is possible to adapt the setting signal / speed characteristic, e.g. for setting signal: 0...5 V, 2...10 V.

Diagram setting signal and motor speed



nM Motor speed
100 % Rated speed
6 % Height of start speed
4.5 % Height of stop speed
0.5 V / 5 % PWM Value start analog input (factory setting)
Si Speed setting signal 0...10 V / 0...100 % PWM

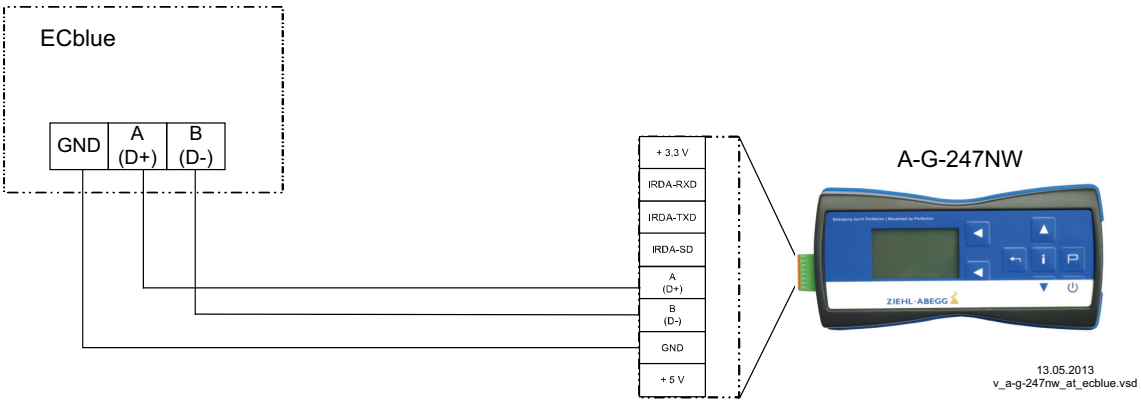
1	**Factory setting**: E1 min. = 5 %, E1 max. = 100 % 0.5...10 V ≙ 0...100 % speed setting I.e. the motor starts with 6 % of the rated speed at a setting signal of approx. 1 V.
2	Example: E1 min. = 0 %, E1 max. = 100 % 0....10 V ≙ 0...100 % speed setting
3	Example: E1 min. = 0 %, E1 max. = 50 % 0....5 V ≙ 0...100 % speed setting

5.9 Voltage supply “10 V DC”

Voltage supply for activation of the digital input and external components, e.g. for a potentiometer for speed setting (PELV current source according to EN 60204-1).
Connection: “10 V” - “GND” (max. load ☞ Technical data und connection diagram).
During an overload or short-circuit (10 V - GND), the control voltage (and thus the device) is disconnected . Automatic start after elimination of the cause of error.
It is not permissible to connect outputs of several devices to each other!

5.10 Connection terminal type A-G-247NW for service

If necessary an external terminal can be connected. This can be e.g. necessary to adapt the pre-setting during start-up.
The connection is made by a 4-wire cable at the terminals: A (D+), B (D-) and GND. E. g. telephone cable type: J-Y (St) Y 2x2x0.6 (or similar), maximum cable length approx. 250 m.
The voltage supply of the terminal is made by the accumulators inserted there or the plug power supply unit.



5.11 Digital input “D1” for enable (device ON / OFF)

Electronic ON / OFF control via floating contact at terminals “+10V” - “D1” (input resistance and voltage range ☞ Technical data).
Function factory setting for “D1”:

- Device “ON” for closed contact.
- Device “OFF” with opened contact.
  Relay “K1” remains energized, connections 11 - 14 bridged.
  Status Out with flash code: 1 (☞ Diagnostics / Faults).

Danger due to electric current

- No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
- Never apply line voltage to the digital input!

5.12 Relay output “K1” for fault indication

An external fault indicator is available over the potential-free contact of the built-in relay (max. contact rating see Technical data and connection diagram).
Function factory setting for “K1”:

- For operation the relay is energized, connections “11” and “14” are bridged. For fault the relay is de-energized (see Diagnostics / Faults).
- When switching off via enable (D1 = Digital In 1), the relay remains energized.

Information

After switching on the line voltage, an initialisation time of a maximum 7.5 seconds is required for the device's electronics to be operational. Subsequently, a reliable status message will be possible. If no malfunction is detected, the relay will be energised after the initialisation time.
Since both line voltage fluctuations and ambient conditions affect the initialisation time, a different delay might occur in individual cases.

5.13 Communication

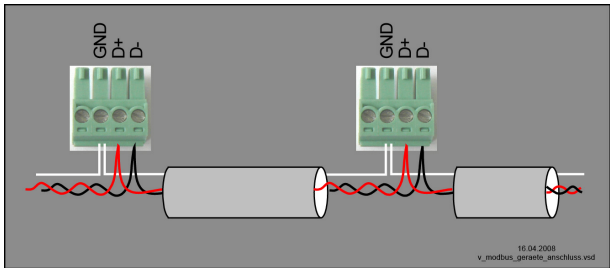
5.13.1 Networking via MODBUS-RTU

The device comes equipped with a RS-485 interface for networking via MODBUS. Conntection at: “A (D+)”, “B (D-)” and “GND”.
The address must be set in the “IO Setup”menu.

Information
A maximum of 64 participants can be directly connected to one another, and another 64 participants via a repeater.

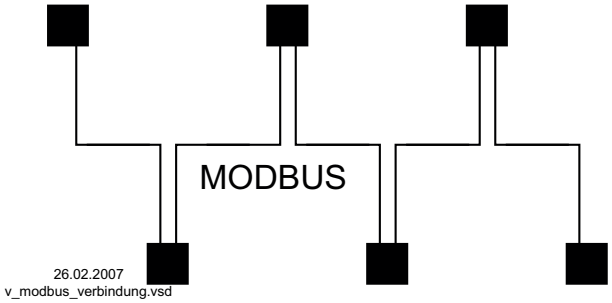
5.13.2 RS-485 - network design and interface parameter

Please ensure the correct connection; i.e. "A (D+)" must always be connected to "A (D+)" of the next devices. The same applies to "B (D-)" .
In addition, a "GND" connection must be established, as dissimilar potential (over 10 V!) will lead to the destruction of the RS-485 interface (e.g. lightning).



general example for MODBUS device connection

The data line must be connected from one device to the next. No other type of wiring is allowed! Always use only two wires of one lead (twisted pair) for the connection.



Example for MODBUS connection

Recommended wire types

1. CAT5 / CAT7 cables
2. J-Y (St) 2x2x0.6 (telephone cable)
3. AWG22 (2x2 twisted pair)

When using telephone cable with four cable cores, we recommend the following allocation:
“A (D+)” = red, “B (D-)” = black, “GND” = white

Information

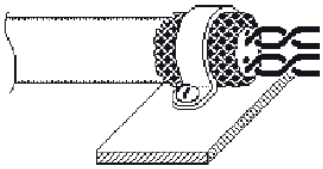
- Pay attention to sufficient distance from powerlines and motor wires (min. 20 cm).
- Except the data link "A (D+)", "B (D-)" and "GND"- connection may no further cable cores of the data line be used.
- Max allowed wire length 1000 m (CAT5/7 500 m).

Shielding

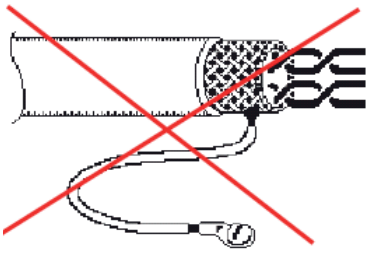
The use of shielded cables is normally not needed but offers high protection against electromagnetic interferences, especially high frequencies. However, the effectiveness of the shield depends on careful installation of the line.

If shielded cables are used, the shield should be placed at “PE” on at least one side (preferably on the master connection). The occurrence of compensating currents may have to be considered if the shield is contacted on both sides.

Shield connection correct



Shield connection incorrect



Default interface parameter

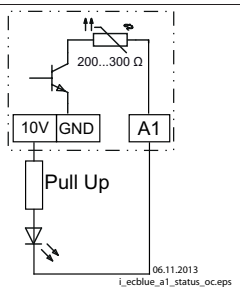
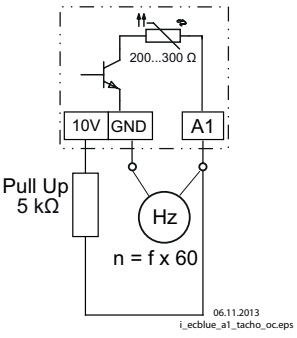
Baudrate	=	19200
Bits	=	8
Parity	=	Even (None, exception of devices agriculture)
Stop bits	=	1
Handshake	=	none

Information

If any matters are unclear, please contact our V-STE support department for control systems - ventilation technology. The information sheet "Network structure of MODBUS" R-TIL08_01 contains detailed information about "MODBUS".

5.14 Open-Collector output “A1” (status / tacho)

Open-Collector pulse output for status display or speed display.

Status display (function for factory setting) Depending on the operating state of the device, the output “A1” is switched to GND potential for a certain number of pulses. The status of the device can be displayed by this digitally coded signal. With the output voltage “+10 V” a standard LED / low-power LED can be controlled by using a pull-up resistor. This lights when the output “A1 Status Out OC” (OC = Open-Collector) is on GND potential. The details of which pull-up resistor needs to be used depend on the specification on the LED that is used. Explanation of flash codes ☞ Diagnostic / Status Out with flash code.	
Tacho out Alternatively, via output “A1”, the current motor speed can be output. The frequency (duty cycle 50 : 50) that can be measured by a pull-up resistor at the output “A1” corresponds to the motor speed. Example: 10 Hz x 60 = 600 rpm	

A1 more specifications ☞ Technical data!

5.15 Potential at control voltage connections

The connections for the control voltage (< 30 V) relate to the common GND potential (exception: relay contacts are potential-free). There is a potential isolation between the connections for the control voltage and the PE conductor. It must be ensured that the maximum external voltage at the connections for the control voltage cannot exceed 30 V (between the “GND” and “PE” conductor terminals). A connection to the PE conductor potential can be made if required; fit a bridge between the “GND” terminal and the “PE” connection (terminal for shield).

6 Start-up

6.1 Prerequisites for commissioning

Attention!

- During commissioning, unexpected and hazardous conditions can arise in the entire installation due to defective adjustments, defective components or incorrect electrical connections. Remove all persons and objects from the hazardous area.
- Do not start the fan until all safety instructions (DIN EN 50110, IEC 364) have been checked, the fan is out of range (DIN EN ISO 13857) and danger can be ruled out.
- A-rated sound power levels of over 80 dB(A) are possible, see product catalogue.

Before first-time start-up, check the following:

1. Installation and electrical connection have been properly completed?
2. Has any leftover installation material and other foreign material been removed from the fan area?
3. That safety devices -if necessary- are mounted (EN ISO 13857)?
4. The impeller is out of reach?
5. Are the drain holes (as far as available) open or respectively closed according to the suitable installation position?
6. Connection data complies with the specifications on the rating plate?

During start-up check the following:

1. Check the direction of rotation (see rotation direction arrow on the fan blade, impeller base plate or support plates on suction side or rating plate).
2. Check for quiet, low vibration operation. Strong vibrations due to erratic operation (unbalanced), e.g. caused by transportation damage or improper use, can lead to failure.
3. If resonance vibrations occur, it is possible to hide certain speed ranges (see Motor Setup).
4. Fans from ZIEHL-ABEGG SE are delivered balanced in accordance with DIN ISO 21940-11 for the appropriate fan category in accordance with ISO 14694 Check the fan for mechanical vibrations after installation. If the limit values of the corresponding fan category are exceeded in start-up, you must have the motor/impeller unit checked by an expert and rebalanced if necessary before continuous operation is permitted.

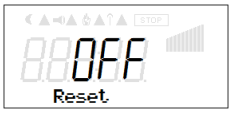
7 Operating hand held terminal A-G-247NW

7.1 Menu operation

▷ Switch over between actual value* and “Start” with Esc arrow key.
▷ Switch over between “Start” and actual value* with i key.

* *Actual value depending on device type: "Speed" / rpm, "Frequency" / Hz, "Modulation" / %*

P↓



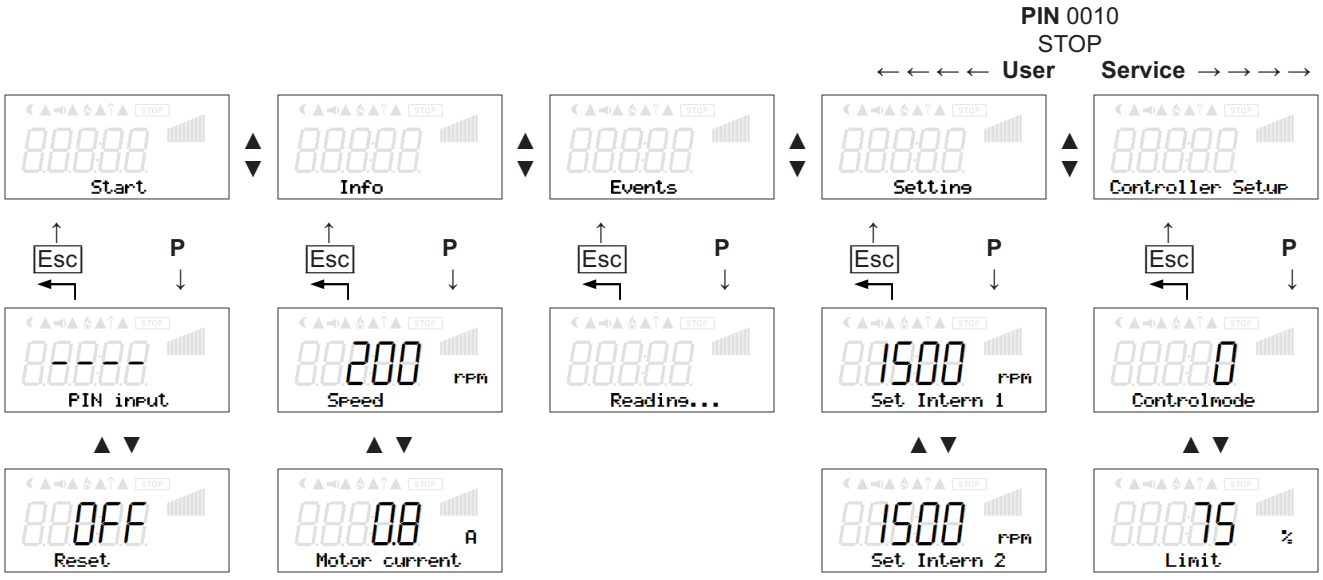
▲ ▼

▷ By pushing the **P**- key one reaches the menu item “Start”.
▷ Return to the menu group “Start” using arrow key Esc.

▷ One moves up and down within the menu group using the arrow keys.

Display for english menu language = “GB ”

7.2 Menu structure



Display for english menu language = “GB ”

Selection of the menu group (e.g. “Setting”) to the right through the ▼-key, to the left through the ▲-key.
You can go to the menu items in the menu groups (e.g. “Set Intern1”) by using the **P**-key. Use the arrow keys to move up and down within the menu group.
The menu groups consist of one area for the user (user menu) and one area for installation (service). The service area can be protected against unauthorized access by using a PIN.
To make adjustments, press the **P**-key after selecting the menu item. If the previously set value starts to flash, it can be adjusted with the ▼ + ▲ keys and then saved with the **P**-key. To exit the menu without making any changes, use the “Esc” key, i.e., the originally set values remain.

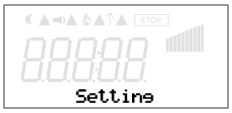
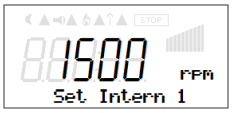
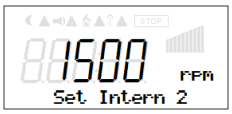
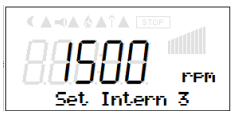
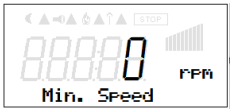
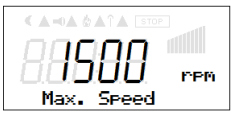
8 Programming by hand held terminal A-G-247NW

8.1 Information

The menu language can be set on the hand held terminal type A-G-247NW (see operating instructions). The text in the graphic display (left column) is shown in the factory-set menu language English.

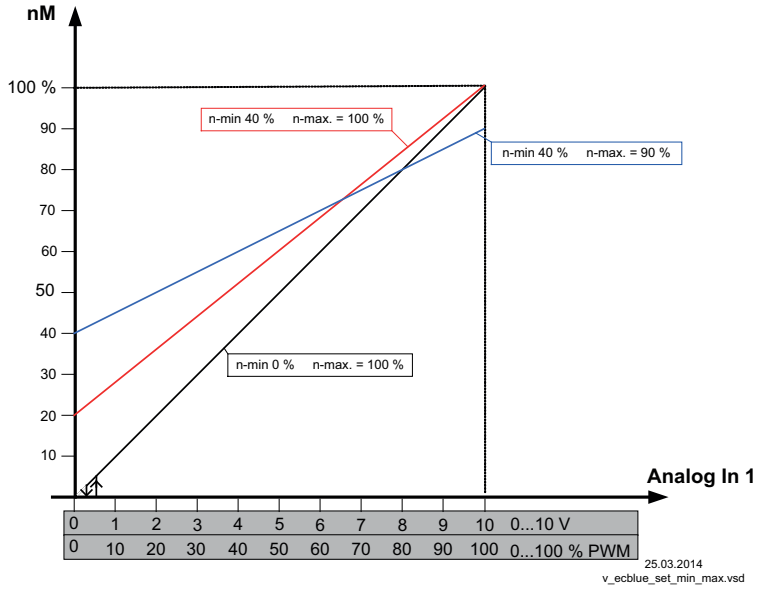
8.2 Menu group Setting

Information
Factory setting: Activation by external signal (0 - 10 V / PWM) at input “E1” (control mode = 0 ☞ Controller Setup). I.e. the following settings “Set Internal1”, “Set Internal2”, “Set Internal3” are not active!

	**Setting**
	**Set Internal1** Setting only in Controlmode 4 active (☞ Controller Setup). Via the inputs “D1” / “E1” it is possible to switch to “Default Internal2” or “Default Internal3” (☞ IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	**Set Internal2** Setting only in control mode 5 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	**Set Internal3** Setting only in control mode 6 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	**Min. Speed** The basic speed is active in every control mode. Setting range: 0...100 % (Rated speed) Factory setting*: 0 %
	**Max. Speed** The speed limiting is active in every control mode. Setting range: 100 % (Rated speed)... “Min.Speed” Factory setting*: 100 % (Rated speed)

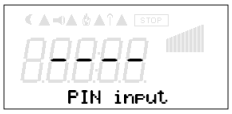
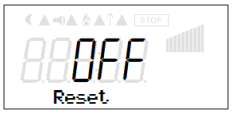
* *Specifications not binding, these values can differe depending on the software version and customer-specific pre-setting.*

Diagram setting signal and speed

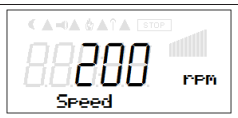
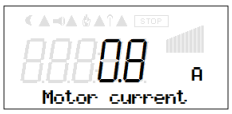
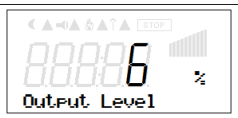
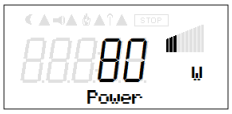


nM: Motor speed
Analog In 1: Speed setting signal
n-min: Min. Speed
n-max: Max. Speed
100 % Rated speed

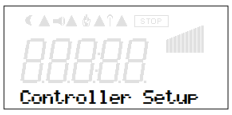
8.3 Menu group Start

	**Start**
	**PIN input** The service menu for the installation can be protected against unintentional changes by a pin code. With further pin codes putting back to pre-setting is possible.
	PIN 0010 Release of the service settings with programmed PIN-Accesslevel [0] (see “Controller Setup”). Menu groups Service: “Controller Setup”, “IO Setup”, “Motor Setup”
	PIN 1234 Freischalten Menu group “Setting”. Release of the menu group for the user “setting” with programmed PIN-Accesslevel [0] (see “Controller Setup”).
	PIN 3698 Communications parameters take-over.
	PIN 9095 Loading the factory settings. Only the parameters which are released by the currently set PIN-Accesslevel are loaded.
	**Reset** Complete re-start of the device
	**Software version**
	Parameter sets can be saved by the module in the terminal type A-G-247NW and transferred to other devices (see Operating Instructions Terminal Type A-G-247NW). Name parameterset with the keys ▼, ▲ + **P** and load in the terminal with the **P**-key.

8.4 Menu group Info

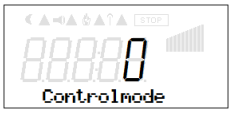
	**Info**
	**Speed** Motor speed
	**Motor current** Display of internal motor current (metering precision approx. +/-10 %)
	**Brake control** Display of modulation 0...100 % (metering precision approx. +/- 10 %)
	**Motor input power** Display of input power (metering precision approx. +/-10 %)

8.5 Menu group Controller Setup

	**Controller Setup**

Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

8.5.1 ControlMode

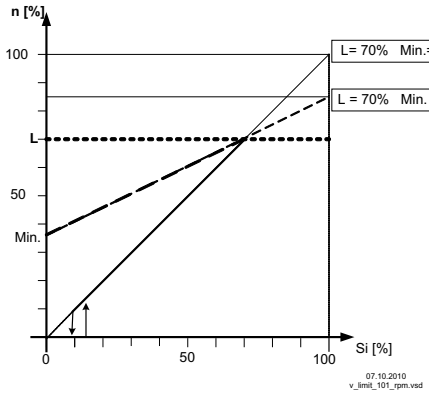
	Type of device modulation.
0	**Factory setting** Control by external signal (0 - 10 V / PWM) at the input “E1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
1	no function
2	no function
3	no function
4	constant speed “Set Internal1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
5	Fixed speed “Default Internal2” (without switching possibility to other default).
6	Fixed speed “Default Internal3” (without switching possibility to other default).

8.5.2 Limit

	After allocation of a digital input (☞ IO Setup) an adjustable limitation of the modulation can be activated via a digital input.

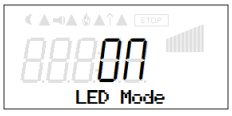
“Limit value” = max. possible modulation (e.g. speed reduction during night operation by time switch).
Setting range: 0 - 100 %
Factory setting: 75 % ≙ max. modulation, i. e. no limit.

Limit (idealized principle diagram)



n [%] Motor speed
L Limit
Si Speed setting signal

8.5.3 LED Mode

	**LED Mode** Only for versions with integrated status LED!

Setting	Function
ON	Status LED in ECblue active i.e. operating conditions are indicated by flash code (factory setting).
OFF	Status LED not active, i.e. always OFF.

8.5.4 PIN-Accesslevel

	**PIN-Accesslevel** The PIN-Accesslevel determines for which setting ranges a PIN must be entered.

Setting	Function
2	**Factory setting** All menu groups are visible, settings are possible without a PIN.
1	• The menu group “Setting” is free, i.e. changes are possible without a PIN. • **PIN 0010**: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).
0	**All settings are only possible after entering a PIN.** • **PIN 1234** for changes in the menu group: “Setting” • **PIN 0010**: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).

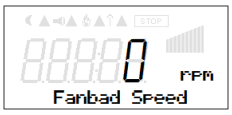
Information
ChangesforthePINprotection“which”effect a reduced access right only become active after switching off the device or executing the Reset (see Start menu group) function.

8.5.5 Tacho output f_{out}

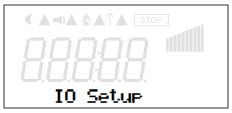
	**Tacho out** See the function description Electrical installation / Open-Collector output “A1”

Setting	Function
OFF	A1 = Status output
ON	A1 = Tacho output (n = f x 60)

8.5.6 Message at speed deviation “Fan Bad”

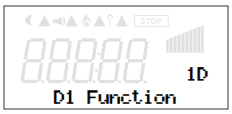
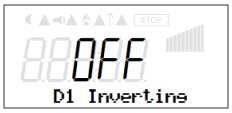
	**Fanbad Speed** Speed deviation Factory setting: 0 rpm Setting range: 0 - 255 rpm
	**Fanbad Time** Time delay Factory setting: 0 sec Setting range: 0 - 255 sec.

8.6 Menu group IO Setup

	**IO Setup**

Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

8.6.1 Digital inputs “D1” (“E1” *)

	**D1 Function** Different functions can be assigned to the digital inputs “D1” and “E1”*. Activation via floating contacts (a low voltage of approx. 10/24 V DC is connected). “D1” is programmed for the “Enable” function at the factory.
	**D1 Inverting** For inverting switch to “ON”. The input inversion is set at the factory to “OFF” (when a function is programming).

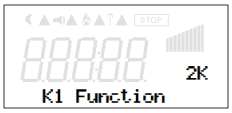
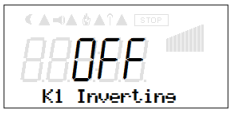
* *If the analogue input “E1” is not required for specifying the fan speed, this can be used as a digital input (see E1 function). The same functions can be assigned for “E1” as for “D1”.*

Attention!
Never apply line voltage to the digital input!

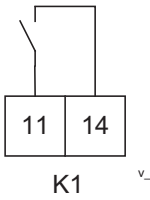
Function	Designation
OFF	No function
1D	**Enable ON / OFF (factory setting)** Remote ON/OFF (electronic switch-off) by potential-free contact. The power unit is switched off electronically, the device can still be operated in the switched-off state after pressing the “Esc” key combination. Signal inputs and outputs remain active. A programmed alarm relay (factory set “K1 function” = 2K) does not report the switch-off. **Attention!** No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
3D	**Limit ON / OFF** see Controller Setup / Limit
5D	**Set Internal2** Fixed speed “Default Internal2” active. Function with selected “control mode”: 0, 1, 2 , 3 (see “Controller Setup”). With simultaneous activation of “Default Internal3” with function 6D, 5D has priority).
6D	**Set Internal3** Constant speed “Set Internal3”, also with selected “control mode”: 0 (see “Controller Setup”).
13D	**Switch over direction of rotation** Switch over between direction of rotation “RIGHT” = CW and direction of rotation “LEFT” CCW. When“switching”over via a digital input, the device works with the opposite direction of rotation than the one set in Motor Setup. If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.

15D	**Bypass temperature management (operation at max. speed)** To make the ECblue as durable as possible, the devices have active temperature management. The modulation is reduced when internal temperature limits are exceeded. In ventilation systems in which the fan has to continue operating at maximum speed despite overtemperature, temperature management can be deactivated using a digital input. At the same time, the fan is operated at maximum speed regardless of the specified speed for regular operation. The function is active at the digital input when the contact is open (in factory setting D1/E1 Inverting = OFF), so that the maximum fan speed is still possible even when the line to the digital input is interrupted. **Attention!** • This function is implemented by switching to “Set Intern3”. A setting of 100 % (= rated speed) of “Set Intern3” is a prerequisite for operation at maximum speed. • The device and its internal components are no longer protected against overtemperature when this function is activated (this affects the life installation instructions ECblue).
19D	**Bypass temperature management (operation with variable speed)** This function differs from 15D due to operation at variable speed. When temperature management is switched off by a digital input, speed setting by an external signal is still possible. The speed set in “Set Intern3 ” is the maximum speed at 100 % setting signal (limitation).

8.6.2 Relay outputs “K1”

	**Function K1** Various functions can be allocated to the relay outputs “K1”. This is preset at the factory for fault indication.
	**K1 Inverting** For switching inversion to “ON” (switching behaviour dependent on assigned function). The relays can only pull up basically when the voltage supply of the electronics is working. Three-phase current devices must have at least 2 line phases! The relay inversion “K1” is set at the factory to “OFF” (when a function is programming).

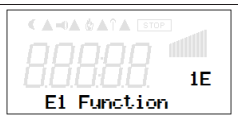
Function	Designation
OFF	**No function** Relays remain always de-energized .
1K	**Operating indication** Operation without fault, reports enable “OFF”.
2K	**Fault indication (factory setting)** Pulled up in operation without fault, with release “OFF” not dropped out. Drops out at: line fault, motor fault, etc. ☞ Events / Fault indications
4K	**Limit** Alarm when the speed exceeds the value set under “Set Internal3” (☞ menu group “Setting”) (output power > 0 %). The function is active in every Controlmode (☞ menu group: “Controller Setup”).
17K	**Bus control** The relay output can be controlled by bus if networked.
20K	**Fault indication or message for active temperature management** In addition to the fault indication, a message will appear in the case of active temperature management, i.e. if the specified temperature limits are exceeded resulting in a reduction in modulation (function from software version 13.31 and upwards).

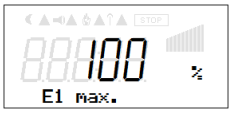


K1
1 = energized, terminals 11 - 14 bridged
0 = de-energized 11 - 14 not bridged

Function	**State controller**	**K1** 1 = energized 0 = de-energized	
		Inverting	
		OFF	ON
1K	Operation without fault, line supply okay	**1**	0
2K	Fault with indication by relay	**0**	1
4K	Exceed Frequency / Speed > setting “Set Internal3”	**1**	0
20K	Fault indication or message for active temperature management	**0**	1

8.6.3 Input “E1”

	**E1 Function** 1E (factory setting) = speed setting by external signal (0 - 10 V / PWM). For settings via 1E “E1” operates like “D1” as a digital input (see digital inputs / function).
	**E1 Inverting** Factory setting inverting to “OFF”. For control with inverted setting signal switch to “ON” (setting signal: 10 - 0 V).

	**E1 min.** Value of the input signal at which the controller starts at minimum modulation. Setting range: 0 - 100 % Factory setting: 5 %
	**E1 max** Value of the input signal at which the maximum modulation of the controller is reached. Setting range: 0 - 100 % Factory setting: 100 %

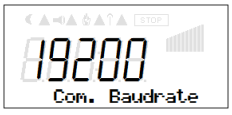
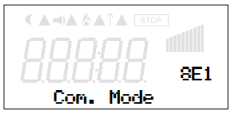
8.6.4 MODBUS communication watchdog

The MODBUS communication watchdog defines the behaviour in case of a communication fault.

	**Watchdog Time** If the device receives no message in the time window, a definable function is executed. Watchdog time in seconds. Setting range: 0 - 255 sec. Factory setting: 0 sec. = off
	**Watchdog Mode** Watchdog Mode: 0: No function (default) = OFF from FW 13 1: Fault (K1 function, h15) in case of communication fault (WDT) 2: Constant speed 1 * in case of communication fault (WDT) 3: Fault + constant speed 1 * in case of communication fault (WDT) 4: Fault by E1 Fault ** (only ECblue) 5: Constant speed 1 by E1 Fault (only ECblue) 6: Fault constant speed 1 in case of E1 fault (only ECblue)
	* in this condition it is possible by digital input function 5, 6 or digital control function to change between the constant speeds (Holding register h4). ** E1 fault is triggered when E1 falls below E1 min x 0.5. E1 fault is cancelled when E1 rises above E1 min x 0.9.

8.6.5 Networking via MODBUS

It is possible to network several devices with each other. The device uses the MODBUS-RTU as the protocol for the RS-485 interface.

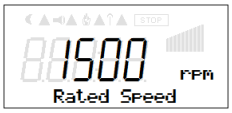
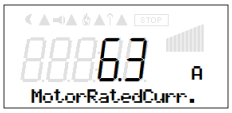
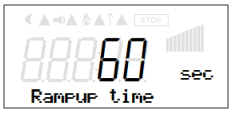
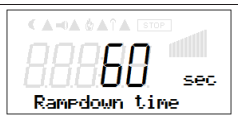
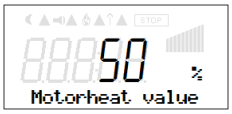
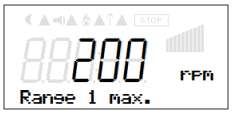
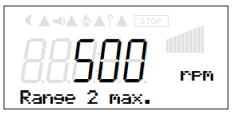
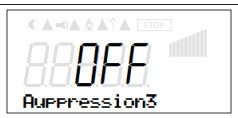
	**Bus Address** The device address is factory set to the highest available MODBUS address: 247. Setting range MODBUS Address: 1 - 247.
	**UART Baudrate** Setting transfer rate Valid values: 4800, 9600, 19200, 38400 Factory setting: 19200 Illegal value: 115200
	**UART Mode** Setting transfer format Valid values: 8O1, 8N1, 8E1 Factory setting: 8E1

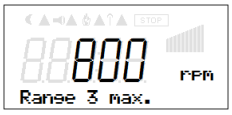
Information

If it is attempted to change the baud rate to an impermissible value (e.g. 115200), the following exception code will be sent back: [Exception Code 3: Illegal Data Value].

8.7 Menu group “Motor Setup”

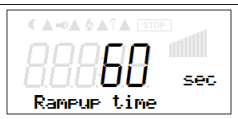
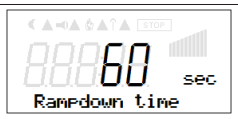
	**Motor Setup**

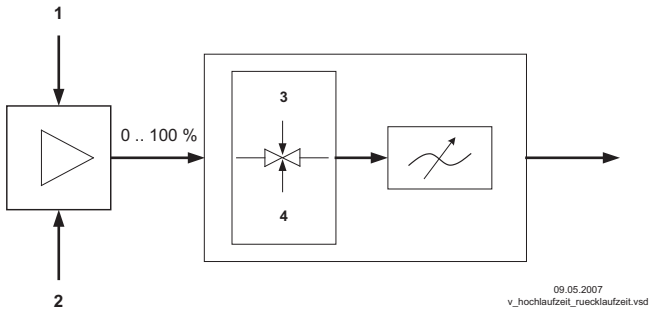
	**Rated speed**	
	**MotorRatedCurr.**	* The following controller presettings are dependent on the respective motor design and are only shown for information. • Rated speed • MotorRatedCurr. • Rotat. Direction • Value motorheating
	**Rampup time**	
	**Rampdown time**	
	**Rotat. Direction**	
	**Value motorheating**	
	**Suppression1**	
	**Range1 min.**	
	**Range1 max.**	
	**Suppression2**	
	**Range2 min.**	
	**Range2 max.**	
	**Suppression3**	

	**Range3 max.**	
	**Range3 max.**	

8.7.1 Setting for Rampup time and Rampdown time

By separate menus for Rampup time and Rampdown time an adjustment is possible to individual system conditions.
This function is switched behind the actual controller function.

	**Rampup time** Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 0...250 sec. Factory setting depending on motor
	**Rampdown time** Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 0...250 sec. Factory setting depending on motor

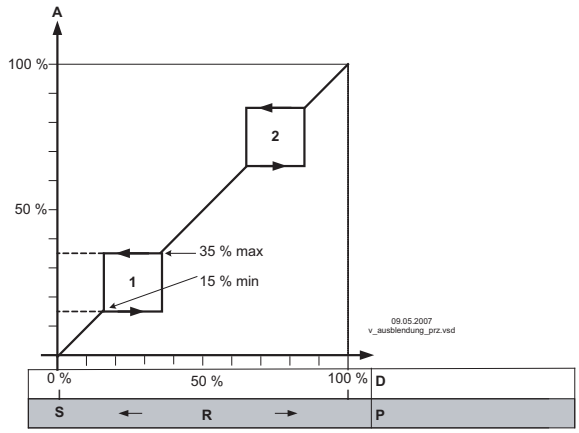


1 external Signal
2 Setting
3 Rampup time
4 Rampdown time

8.7.2 Suppression of speeds

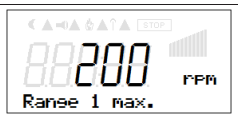
Suppression of up to three speed ranges.
Under certain circumstances, it is possible to prevent disturbing noises that can arise at certain speeds due to resonances.

Example for suppression of 2 ranges (Idealized principle diagram)



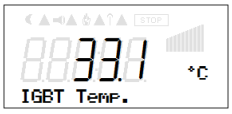
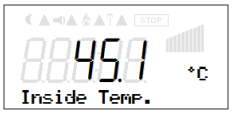
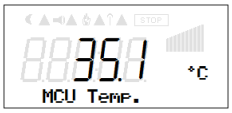
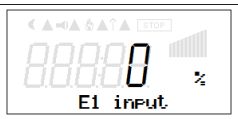
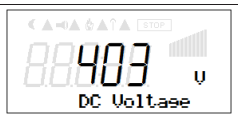
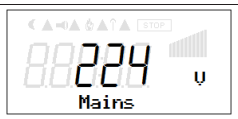
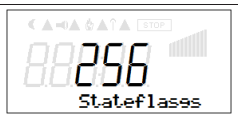
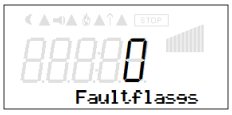
Setting depending on device type
in: %, Hz, rpm

A Brake control
S Setpoint
R Pband
D Speed controller: setting signal
P P-controller: control deviation

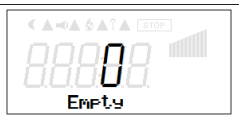
	Suppression active = “ON”
	Setting for “Range1 min.” Setting range: “0” - “Range 1 max.”
	Setting for “Range1 max.” Setting range: “Range 1 max.” - “Rated speed”
	Identical procedures for Suppression2 and Suppression3, as far as desired

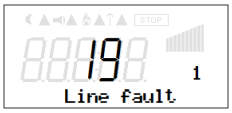
8.8 Diagnostics menu

The diagnostics menu supplies information about the momentary operating condition of the device.

	**Diagnostic**
	**IGBT temp.** Display of the internal temperature of the power semiconductor.
	**Inside Temp.** Display of electronics internal temperature.
	**MCU Temp.** Display of the internal temperature of the microcontroller.
	**E1 Input** no function
	**DC-Voltage** DC-link voltage constant approx. 400 V.
	**Line voltage**
	**Stateflags**
	**Faultflags**
	**PIN-Accesslevel** Momentarily adjusted PIN-Accesslevel (☞ Controller Setup).

8.9 Display and query of events and malfunctions

	**Events**
	The event memory is read out after pressing the **P** key. Reading »»»
	Beispiel: keine vorliegenden Störungen Empty = no entry = no event in the memory

	Example line fault Position 1 = latest event The last 10 (1 - 10) events are saved. The desired position can be selected with the ▼+ ▲ keys. 19 = number of all previous faults

An error message appears alternately with the actual value display (☞ Diagnostic faults).

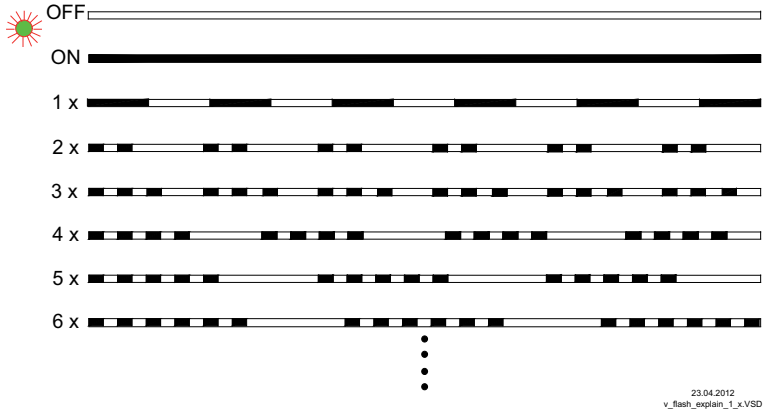
9 Diagnostics / Faults

9.1 Trouble shooting

Type of error	Possible cause	Adjustment
Fan does not run (anymore)	No line voltage Line failure Under - or overvoltage	Check line voltage
	Earth fault	Check motor connection and line voltage
	Short circuit winding	Replace fan
	Thermal motor protection has triggered (motor is overheated)	Check for free air passages; remove foreign bodies if necessary see "Impeller blocked or dirty" Check temperature of supply air Check voltage
	Impeller blocked or dirty	- Switch off power to the motor and secure against switching back on - Check safe isolation from supply - Remove safety grille - Remove foreign bodies or soiling - Remount the safety grille - Further procedure as in the chapter “Start-up”
Fan will not start	Temperature too low for bearing grease	Insert bearing with cold greasing
	Air stream wrong direction (Motor turns in wrong direction at high speed)	Check air stream (see behaviour in rotation by air current in reverse direction)
	see "Fan does not run"	
Fan turns too slowly	Impeller / blade scrapes / brushes	When indicated, clear foreign bodies/dirt from the fan
	Active temperature management effective (Motor or electronics overheated)	Check for free air passages; remove foreign bodies if necessary see "Impeller blocked or dirty" Check temperature of supply air Check installation space (air speed over heat sink)
Air flow to low	Fan turns too slowly	see "Fan turns too slowly"
	Airways blocked	Check for free air passages (supply/exhaust air vents, filters) see "Impeller blocked or dirty"
	Pressure loss different to planned	Check fan selection
Vibrations	Imbalance	Check blades for damage, soiling or ice (see "Impeller blocked or dirty")
	No or wrong vibration dampers (only in radial)	Install correct vibration dampers
Unusual noises	Bearing damaged / worn	Change bearings In motor size 055“(Z” / “B” at cross flow) and 072 (O) change the fan.
	Impeller / blade scrapes / brushes	When indicated clear foreign bodies / dirt from the fan (see "Impeller blocked or dirty")
	Operation beyond stall point (for axial fans)	Check for free air passages (supply/exhaust air vents, filters)
	Wrong overlap on nozzle (for centrifugal fans)	Observe the installation instructions

9.2 Status output with flashing code

Status LED in the lid of the terminal compartment.
Output A1 Status Out OC ☞ Electrical installation.



LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
OFF	de-energized, 11 - 14 interrupted	No line voltage	Line voltage available? Unit switch OFF and automatically ON when the voltage has been restored
ON	energized, 11 - 14 bridged	Normal operation without fault	
1 x	energized, 11 - 14 bridged	**No enable = OFF** Terminals “D1” - “10 V” (Digital In 1) not bridged or switch off by Bus.	Switch-off ☞digital input or Bus
2 x	energized, 11 - 14 bridged	**Temperature management active** The device has an active temperature management to protect it from damage due to too high inside temperatures. In case of a temperature rise above the fixed limits, the modulation is reduced linearly. To prevent the complete system being switched off externally (in this operation permissible for the controller) in case of reduced operation due to too high an internal temperature, no fault message is sent via the relay.	With a drop in temperature the modulation rises again llinear. Check installation of the device and cooling of the controller.
3 x	de-energized, 11 - 14 interrupted	**HALL-IC** Incorrect signal from the Hall-ICs, error in the commutation. Internal plug connection faulty.	The controller switches the motor off. Automatic restart if no faults are recognised. Replace fan / motor
5 x	de-energized, 11 - 14 interrupted	**Motor blocked** If after 8 seconds of commutation no speed is measured > 0, the fault “Motor blocked” is released.	EC-Controller switches off, renewed attempt to start after about 2.5 sec. Final shutoff, when fourth starting test fails. It is then necessary to have a reset by disconnecting the line voltage. Check if motor is freely rotatable.
6 x	de-energized, 11 - 14 interrupted	**IGBT Fault** Short circuit to earth or short circuit of the motor winding.	EC-Controller switches off, renewed attempt to start after about 60 sec. ☞ Code 9. Final shutoff, if - following a second starting test – a second fault detection is detected within a period of 60 seconds. It is then necessary to have a reset by disconnecting the line voltage.
7 x	de-energized, 11 - 14 interrupted	**Intermediate undervoltage** If the DC-link voltage drops below a specified limit the device will switch off.	If the DC-link voltage rises above the limit within 75 seconds, then the cotroller will attempt to start. Should the DC-link voltage stay for more than 75 seconds below the limit, the device will switch off with a fault message.

LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
8 x	de-energized, 11 - 14 interrupted	**Intermediate overvoltage** If the DC-link voltage increases above a specified limit, the motor will switch off. Reason for excessively high input voltage or alternator motor operation.	If the DC-link voltage drops below the limit within 75 seconds, then the cotroller will attempt to start. Should the DC-link voltage stay above the limit for more than 75 seconds, the device will switch off with a fault message.
9 x	energized, 11 - 14 bridged	**IGBT cooling down period** IGBT cooling down period for approx. 60 sec. Final shutoff after 2 cooling-off intervals ☞ Code 6	IGBT cooling down period for approx. 60 sec. Final shutoff after 2 cooling-off intervals ☞ Code 6.
11 x	de-energized, 11 - 14 interrupted	**Error motor start** If a starting command is given (enable available and Setpoint > 0) and the motor does not start to turn in the correct direction within 5 minutes, then an error message will appear.	If it is possible to start the motor in the target direction of rotation after the error message, the error message will disappear Should a voltage interruption occur in the meantime, the time taken up to the switch off will begin again. Check if motor is freely rotatable. Check if the fan is driven in reverse direction by an air stream (☞ Behaviour in rotation by air current in reverse direction).
12 x	de-energized, 11 - 14 interrupted	**Line voltage too low** If the DC-link voltage drops below a specified limit the device will switch off.	If the line voltage rises above a specified limit within 75 seconds, then the controller will attempt to start. Should the line voltage stay below the specified limit for more than 75 seconds, the device will switch off with an error message.
13 x	de-energized, 11 - 14 interrupted	**Line voltage too high** Cause to high input voltage If the line voltage increases above a specified limit, the motor will switch off.	If the line voltage drops below the specified limit within 75 seconds, then the controller will attempt to start. Should the line voltage stay above the specified limit for more than 75 seconds, the device will switch off with an error message.
14 x	de-energized, 11 - 14 interrupted	**Error peak current** If the motor current increases above the specified limit (even in a short time-frame) the device will switch-off.	After a switch off the controller waits for 5 seconds then the controller attempt a start. Arises within 60 sec. in series 5 further disconnections a final switch off with fault indication follows. Should no further switch off be exceeded in 60 sec. the counter will be reset.
17 x	de-energized, 11 - 14 interrupted	**Temperature alarm** Excess of the max. permissible inside temperature.	Controller switches off motor. Automatic restarting after cooling down. Check installation of the device and cooling of the controller.

* *K1: programmed function at factory: Fault indication not inverted*

9.3 Brake function and behaviour in rotation by air current

At applied line voltage, enable and a setting signal above "0", the speed control is active and the speed is stable even under load fluctuations.

If the motor is not controlled with line voltage applied, i.e. without enable or with enable with setting signal "0", the brake function becomes active to hold the motor until start (holding brake).

- If the line voltage is switched on whilst the fan is rotating in reverse (wrong turning direction), this is decelerated and started in the correct turning direction at a setting signal above "0". To protect the electronics against too high braking current, this function is partly (fan-dependent) only possible up to a certain speed value.
- The braking function also becomes active to bring the fan to a standstill when this is driven with a speed below 100 min^{-1} (without control). At speeds above 100 min^{-1} the motor control does not intervene.
- When driven in correct direction of rotation and with enable with a setting signal above "0", the motor is started whilst the fan is rotating.

Behaviour in strong drive in reverse direction (e.g. suction)
The braking effect with applied line voltage is limited, strong reverse acting forces can lead to rotational movement despite the holding brake.
From a certain level (fan-dependent) it is no longer possible to start the fan in the correct turning direction (=> message: Fault motor start). Further start attempts follow; the error message disappears if start is successful.

Information
- Do not switch off the line voltage so that the braking function can prevent rotation of the fan in reverse (wrong) direction and safe starting is possible.
- If the application requires safe starting after switching on the line voltage, too strong an air current (suction effect) in reverse direction must be prevented by suitable measures.
- Special settings are possible which can lead to deviations from the above functional description.

10 Service work

10.1 Repairs / maintenance

Attention!
- Please read the Safety instructions chapter before working on the fan!
- Before working on the fan, this must be disconnected from the power supply and secured against switching back on!
- No maintenance work at running fan!
- Allow maintenance work to be carried out by trained specialists only.
- Any faults detected in the electric system/modules/operating equipment must be corrected immediately. If these faults are not corrected, the device/system is potentially very dangerous. The device/system must therefore not be operated when it is faulty.
- Wear safety clothing / shoes and cut-resistant safety gloves when handling.
- Please observe the safety regulations and the worker´s protection rules by all maintenance and service work (EN 50 110, IEC 364).
- Fuses must always be only replaced; never repaired or bridged. The specifications for the maximum series fuse must always be adhered to (see Technical data). Only fuses cited in the electrical circuit diagram may be used.
- Generator operation can produce dangerous voltages (see safety instructions)!
- Keep the airways of the fan free - danger because of objects dropping out!
- Watch out for vibration free motion!
- The impeller is subject to natural wear depending on the area of application and the conveying medium. Deposits on the impeller can lead to imbalance and damage (danger of permanent fracture). The impeller can burst!
- If highly aggressive media for which the product is not suited are conveyed, the severe corrosion may result in the impeller breaking. Any impellers corroded in this way must be replaced immediately.

- Deposits on the motor, particularly on the cooling vanes and in recesses on the rotor, can lead to reduced cooling performance and the motor switching off prematurely. For this reason, remove deposits quickly (see chapter: Cleaning).
- Maintenance interval in accordance with the degree of contamination of the impeller!
- Check the fan at regular intervals (recommendation: every 6 months) for mechanical oscillations. Observe the limits specified in ISO 14694 and, if they are exceeded, implement remedial measures (e.g. rebalancing by specialist staff).
- Check the impeller, in particular the weld-seams, for possible cracks.
- Repair, e.g. by welding is prohibited!
- Bolted-on impellers and/or wings may only be replaced by authorised ZIEHL-ABEGG SE staff. The manufacturer shall not be liable for damage caused through improper repair work.
- Please consult our service department with regard to changing the bearing as for all other damage (e.g. to the coil).
- Regular inspection and possibly cleaning is necessary to prevent imbalance and blockage of the drain holes due to ingress of dirt.
- When opening cable glands on the fan / motor, check the condition of the threaded connections and seals. Always replace defective or brittle threaded connections and seals.

Information
Confirmation number for inquiries or in service cases see rating plate.
State the additionally engraved confirmation number (available depending on the motor build) if the rating plate is no longer legible. This can be found under the affixed rating plate or on the stator flange (in external rotor motors) depending on the motor size.

10.2 Cleaning

Danger due to electric current
Voltage supply for motor must be interrupted and secured against restoration!

Clean the fans`s flow area.

Attention!

- Do not use any aggressive, paint solvent cleaning agents when cleaning.
- Make sure that no water gets inside the motor and the electronics (e.g. by direct contact with seals or motor openings), observe protection class (IP).
- The drain holes (if available) corresponding to the installation position must be checked for free passage.
- In case of improper cleaning work, no warranty is assumed regarding corrosion formation / paint adhesion for unpainted / painted fans.
- To avoid accumulation of moisture in the motor, the fan must be operated for at least 1 hour at 80% to 100 % of the maximum speed before the cleaning process!
- After the cleaning process, the fan must be operated for at least 2 hours at 80 to 100 % of the maximum speed for drying purposes!

11 Enclosure

11.1 Technical data

Line voltage* (see rating plate)	1 ~ 200...277 V, 50/60 Hz
	1 ~ 100...130 V, 50/60 Hz
	DC 110 V, voltage range 110...400 V (+/- 2 %)
Maximal line fuse**	16 A
Max. load limit integral of cut-in current approx.	2.0 A^2s
Switching Freq.	16 kHz
Analogue input “E1”	Input resistance: R_i > 100 kΩ Specification speed setting signal PWM Voltage: 15...28 VDC Switching Frequency: 1...10 kHz On-off ratio: 0...100 %
Voltage supply for external devices	+10 V (-2 %), I_{max} 50 mA (short-circuit-proof)
Digital input “D1”	Input resistance: R_i approx. 2 kΩ Voltage range high level: 7.1...19 V DC Voltage range low level: 0....2.7 V DC
Open-Collector output “A1”	I_{max}: 20 mA $U_{CE\ max}$: 30 V DC
Duty type of motor/fan	Continuous operation with occasional starts (S1) according to DIN EN 60034-1:2011-02. Occasional starting between -35 °C and -25 °C is permissible. Continuous operation below -25 °C only with special bearings for refrigeration applications on request.
Permissible minimal and maximal ambient temperature for operation	Please refer to the technical documentation of the product for the minimum and maximum ambient temperature valid for the respective fan. Operation below -25 °C as well as partial load operation for refrigeration applications is only possible with special bearings for refrigeration applications on request. If special bearings for refrigeration applications are installed in the fan, please observe the permissible maximum temperatures in the technical documentation of the product. To avoid condensation the drive must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.
Permissible temperature range for storage and transport	-40...+80 °C
Permissible installation height	0...4000 m amsl ≤ 1000 m: no limitation > 1000 m: max. permissible input current = current indication rating plate minus 5 % / 1000 m > 2000 m: max. permissible line voltage = max. voltage indication rating plate minus 1.29 % / 100 m
Permissible rel. humidity	The motor is released for a relative humidity of 100 % at continental climate without other ambient influences. Other ambient conditions on request.
Ball-bearings service life	The according to standard calculation methods determined bearing service life expectation of the motor-integrated ball bearings is mainly determined by the grease service life F10h and amounts for standard application to approx. 30.000 - 40.000 operating hours. The fan or motor is maintenance-free due to the use of ball bearings with "lifetime lubrication". Once the grease operating life F10h has been reached, it may be necessary to replace the bearing. The bearing service life expectation may change compared to the specified value, if operating conditions such as increased vibrations or shocks, increased or too low temperatures, humidity, dirt in the ball bearing or unfavourable control modes are present. A service life calculation for special applications can be provided on request.
Electromagnetic compatibility for the standard voltage 230 / 400 V according to IEC 60038	Interference emission EN 61000-6-3 (domestic household applications)
	Interference immunity EN 61000-6-2 (industrial applications)

Harmonics current	Active power factor adjustment for sinusoidal input current (PFC = Power - Factor - controller), harmonic current in accordance with EN 61000-3-2 are guaranteed.
Contact rating of the internal relay “K1”	AC 250 V 2 A
Max. leakage current according to the defined networks of EN 60990	< 3.5 mA
dB(A) values	see product catalog
Protection class of motor according to EN 60529	IP54

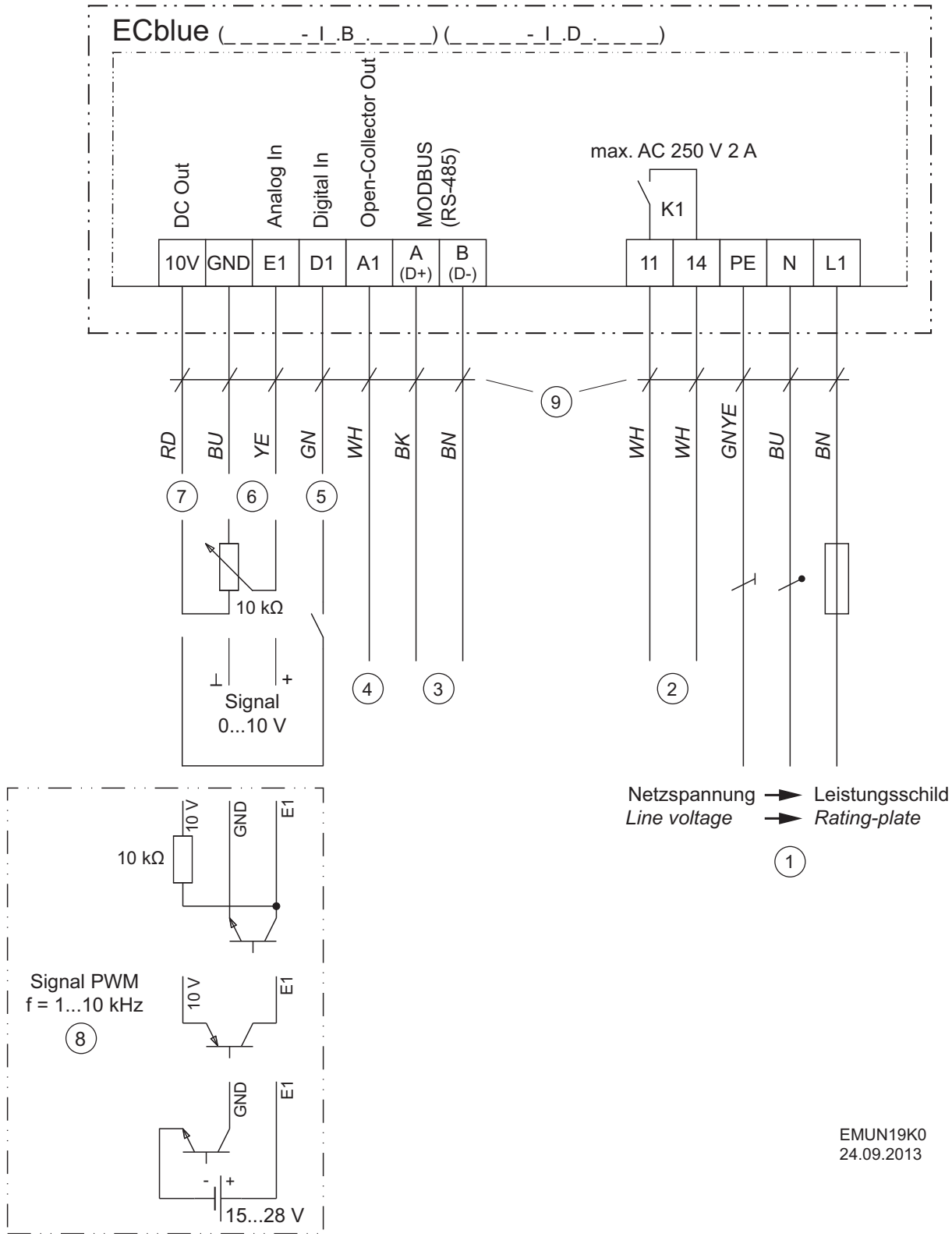
* *Regarding the mains connection, these devices are to be classified as category “C2” devices according to the relevant DIN EN 61800-3. The increased requirements placed on electrical interference > 2 kHz for category “C1” devices are complied with in addition.*

** *Max. line fuse on site (line protection fuse) according to EN 60204-1 Classification VDE0113 Part 1 (see also Assembly instructions / Electrical installation / Voltage supply / Line protection fuse).*

For motors with the corresponding quality mark (☞ rating plate)		
Authorization:	FILE No. E347018	UL 1004-1, 1004-3, UL 1004-7; CAN CSA C22.2 No. 100, No. 77
	c UL us	Electronically Protected Motors

For motors with the corresponding quality mark (☞ rating plate) Rated voltage 200 - 250 V, 50/60 Hz		
Zulassung	REG.-Nr. E418 Certificate number 40039441	DIN EN 60335-1 (VDE-0700-1): 2012-10; EC 60335-1: 2012
	VDE REG E418	Einbaumotor (Built-in-motor)

11.2 Connection diagram



1 Line voltage ☞ rating plate
2 Relay output for fault indication (contact rating max. AC 250 V 2 A)
3 MODBUS (RS-485) interface
4 Open-Collector output status / tacho (I_{max} 20 mA)
5 Digital input for enable (R_i approx. 2 kΩ)
6 Input for speed setting by 0...10 V signal / potentiometer (R_i > 100 kΩ)
7 Voltage supply 10 V DC (I_{max} 50 mA)
8 Speed setting by PWM signal (f = 1...10 kHz)
9 Version with connection cables

11.3 EC Declaration of Incorporation

- Translation -
(english)

ZA87-GB 2044 Index 009

as defined by the EC Machinery Directive 2006/42/EC, Annex II B

The design of the incomplete machine:

Axial fan DN.., FA.., FB.., FC.., FE.., FF.., FG.., FH.., FL.., FN.., FS.., FT.., FV.., VN.., VR.., ZC.., ZF.., ZG.., ZN..Centrifugal fan ER.., GR.., HR.., RA.., RD.., RE.., RF.., RG.., RH.., RK.., RM.., RR.., RZ.., WR..Cross-flow fan QD.., QG.., QK.., QR.., QT..,

Motor type:

Asynchronous internal or external rotor motor (also with integrated frequency inverter)Electronically commutated internal or external rotor motor (also with integrated EC controller)

complies with the requirements in Appendix I, Articles 1.1.2, 1.1.5, 1.4.1, 1.5.1 in EG Machinery Directive 2006/42/EG.

The manufacturer is

ZIEHL-ABEGG SE
Heinz-Ziehl-Strasse
D-74653 Künzelsau

The following harmonised standards have been used:

EN 60204-1:2006 + A1:2009 + AC:2010	Safety of machinery; electrical equipment of machines; Part 1: General requirements
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13857:2008	Safety of machinery; safety distances to prevent danger zones being reached by the upper limbs
Note:	The maintenance of the EN ISO 13857:2008 relates only to the installed accidental contact protection, provided that it is part of the scope of delivery.

The specific technical documentation in accordance with Appendix VII B has been written and is available in its entirety.

The person authorised for compiling the specific technical documentation is: Dr. W. Angelis, address see above.

The specific documentation will be transmitted to the official authorities on justified request. The transmission can be electronic, on data carriers or on paper. All industrial property rights remain with the above-mentioned manufacturer.

It is prohibited to commission this incomplete machine until it has been secured that the machine into which it was incorporated complies with the stipulations of the EC Machinery Directive.

Künzelsau, 28.10.2020
(location, date of issue)

ZIEHL-ABEGG SE	ZIEHL-ABEGG SE
Dr. W. Angelis	Dr. D. Kappel
Head of Technics Ventilation Technology	Head of Electrical Systems
(name, function)	(name, function)
i.V. W. Angelis	i. V. Daniel Kappel
(signature)	(signature)

11.4 Index

11.5 Manufacturer reference CE

Our products are manufactured in accordance with the relevant international regulations. If you have any questions concerning the use of our products or plan special uses, please contact:

ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
phone: +49 (0) 7940 16-0
info@ziehl-abegg.de
http://www.ziehl-abegg.com

11.6 Service information

If you have any technical questions while commissioning or regarding malfunctions, please contact our technical support for control systems - ventilation technology.
phone: +49 (0) 7940 16-800
Email: fan-controls-service@ziehl-abegg.de

Our worldwide contacts are available in our subsidiaries for deliveries outside of Germany, see www.ziehl-abegg.com.

Copeland Scroll

Assembly Instructions

for Copeland Scroll™ compressors

EMERSON

Climate Technologies

Safety Instructions for Copeland® brand compressors

Read these safety instructions thoroughly before installation. Failure to comply can result in personal injury. These instructions should be retained throughout the lifetime of the compressor.

Copeland® brand compressors are intended for installation in systems according to the EC Machines directive. They may be put to service only if they have been installed in these systems according to instructions and conform to the corresponding provisions of legislation.

Safety statements

- Refrigerant compressors must be employed only for their intended use.
- Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission and maintain this equipment.
- Electrical connections must be made by qualified electrical personnel.
- All valid safety standards for connecting electrical and refrigeration equipment must be observed.

Use personal safety equipment. Safety goggles, gloves, protective clothing, safety boots and hard hats should be worn where necessary.

General instructions

WARNING
Risk of collapse! Personal injuries! Move compressors only with appropriate mechanical or handling equipment according to weight. Keep in the upright position. Stack pallets on top of each other when not exceeding 300 kg, max. 3 high for storage and 2 high for transport. Do not stack single boxes on top of each other. Keep the packaging dry at all times.
Rapid release of pressurised gas! Personal injuries! Compressors are factory charged with pressurised dry air to between 1.35 and 1.5 bar to ensure no ingress of air or moisture during transit. Pressure must be safely reduced prior to fully opening connections or removing blanking components.
System breakdown! Personal injuries! Systems without a full charge or with the service valves closed should be electrically locked/tagged if left unattended. Only approved refrigerants and refrigeration oils must be used.
High pressure! Injury to skin and eyes possible! Be careful when opening connections on a pressurized item.
High pressure! Personal injuries! Use of safety relief valves according to EN 378 is mandatory. Consider personal safety requirements and refer to test pressures prior to test.

WARNING
Conductor cables! Electrical shock! Shut off the power supply and remove all of the fuses before working on the electrics.

WARNING
Diesel effect! Compressor destruction! The mixture of air and oil at high temperature can lead to an explosion. Avoid operating with air.
System explosion! Personal injuries! Do not use other industrial gases.
Explosive flame! Burning! Oil-refrigerant mixtures are highly flammable. Remove all refrigerant before opening the system. Avoid working with an unshielded flame in a refrigerant charged system.

WARNING
High surface temperature! Burning! Do not touch the compressor or pipe-work until it has cooled down. Ensure that other materials in the area of the compressor do not get in touch with it.
Low surface temperatures! Frostbite! Do not touch any surface or pipe-work of the compressor until they are at room temperature.

Assembly Instructions for Copeland Scroll™ compressors

These Assembly Instructions deal with all single Copeland Scroll™ compressors. These instructions are intended to enable users to ensure the safe installation, starting, operation and maintenance of Copeland Scroll™ compressors. They are not intended to replace the system expertise available from system manufacturers.

1 Product description

1.1 Qualified refrigerants and oils

Models	Refrigerants	Copeland® Brand Standard oils	Servicing oils
ZP, ZPD	R410A	Emkarate RL32 3MAF	Emkarate RL32 3MAF
ZR, ZH	R407C, R134a		Emkarate RL32 3MAF Mobil Arctic 22CC
ZRD, ZH...KVE	R407C		
ZB, ZS, ZF	R404A, R507, R407A/C/F, R134a		
ZBD, ZFD	R404A, R407F		
ZO, ZOD	R744	Emkarate RL68 HB	Emkarate RL68 HB

Table 1: Qualified refrigerants and oils

1.2 Application limits

For the application envelopes please refer to Copeland® Brand Products Selection Software on **www.emersonclimate.eu**.

2 Installation

2.1 Compressor handling

2.1.1 Transport and storage

WARNING
Risk of collapse! Personal injuries! Move compressors only with appropriate mechanical or handling equipment according to weight. Keep in the upright position. Stack pallets on top of each other when not exceeding 300 kg. Do not stack single boxes on top of each other. Keep the packaging dry at all times.

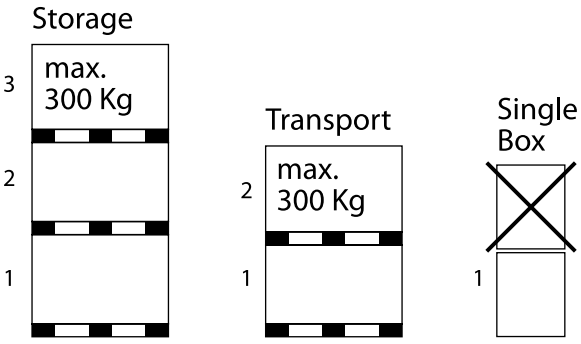
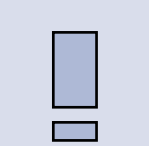


Figure 1

2.1.2 Positioning and securing



IMPORTANT
Handling damage! Compressor malfunction! Only use the lifting eyes whenever the compressor requires positioning. Using discharge or suction connections for lifting may cause damage or leaks.

If possible, the compressor should be kept vertical during handling. The discharge connection plug should be removed first before pulling the suction connection plug to allow the dry air pressure inside the compressor to escape. Pulling the plugs in this sequence prevents oil mist from coating the suction tube making brazing difficult. The copper-coated steel suction tube should be cleaned before brazing. No object, eg, a swaging tool should be inserted deeper than 51 mm into the suction tube or it might damage the suction screen and motor.

2.1.3 Installation location

Ensure the compressors are installed on a solid level base.

2.1.4 Mounting parts

Four vibration absorber grommets are usually supplied with each compressor. They dampen the start-up surge of the compressor and minimise sound and vibration transmission to the compressor base during operation. The metal sleeve inside is a guide designed to hold the grommet in place. It is not designed as a load-bearing member, and application of excessive torque to the bolts can crush the sleeve. Its inner diameter is approximately 8.5 mm to fit, eg, an M8 screw. The mounting torque should be 13 ± 1 Nm. It is critically important that the grommet is not compressed.

***NOTE:* For information about the mounting parts, please refer to Technical Information C7.11.2 "Scroll Mounting Parts" available on www.emersonclimate.eu.**

2.2 Brazing procedure

IMPORTANT
Blockage! Compressor breakdown! Maintain a flow of oxygen-free nitrogen through the system at very low pressure during brazing. Nitrogen displaces the air and prevents the formation of copper oxides in the system. If allowed to form, the copper oxide material can later be swept through the system and block screens such as those protecting capillary tubes, thermal expansion valves, and accumulator oil return holes.

Contamination or moisture! Bearing failure! Do not remove the plugs until the compressor is set into the unit. This minimises any entry of contaminants and moisture.

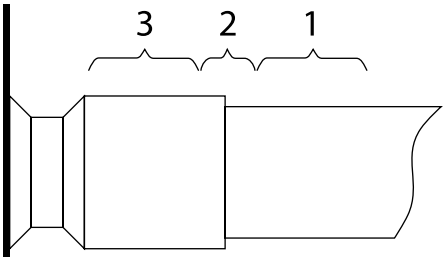


Figure 2: Suction tube brazing

Copeland Scroll™ compressors have copper-plated steel suction and discharge tubes. These tubes are far more robust and less prone to leaks than copper tubes. Due to the different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used.

Figure 2 shows the proper procedures for brazing the suction and discharge lines to a Scroll compressor.

- The copper-coated steel tubes on Scroll compressors can be brazed in approximately the same manner as any copper tube. Recommended brazing materials: any silfos material is recommended, preferably with a minimum of 5% silver. However, 0% silver is acceptable.
- Be sure tube fitting inner diameter and tube outer diameter are clean prior to assembly.
- Using a double-tipped torch, apply heat in area 1.
- As the tube approaches brazing temperature, move the torch flame to area 2.
- Heat area 2 until braze temperature is attained, moving the torch up and down and rotating around the tube as necessary to heat the tube evenly. Add braze material to the joint while moving the torch around the joint to flow braze material around the circumference.
- After the braze material flows around the joint, move the torch to heat area 3. This will draw the braze material down into the joint.
- The time spent heating area 3 should be minimal. As with any brazed joint, overheating may be detrimental to the final result.

To disconnect:
- Heat joint areas 2 and 3 slowly and uniformly until the braze material softens and the tube can be pulled out of the fitting.

To reconnect:
- Recommended brazing materials: Silfos with minimum 5% silver or silver braze used on other compressors. Due to the different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used.

***NOTE:* Since the discharge stub contains a check valve, care must be taken not to overheat it to prevent brazing material to flow into it.**

2.3 Shut-off valves and adaptors

CAUTION
Leaking system! System breakdown! It is strongly recommended to periodically re-torque all pipe and fixing connections to the original setting after the system has been put into operation.

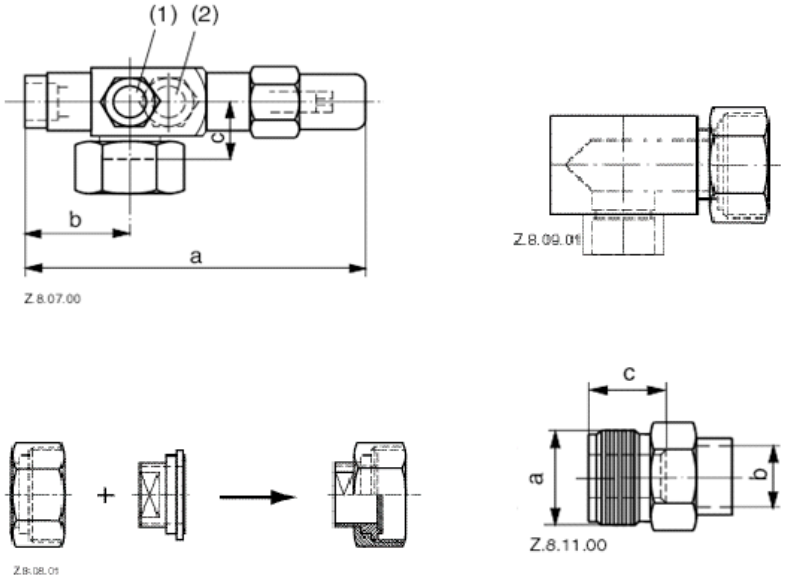


Figure 3

Copeland Scroll™ compressors are delivered with brazing or Rotalock connections. There are options to fit either Rotalock valves, Rotalock adaptors or just make brazing connections.

	Torque [Nm]
Rotalock 3/4"-16UNF	40-50
Rotalock 1"-14UNF	70-80
Rotalock 1"1/4-12UNF	110-135
Rotalock 1"3/4-12UNF	135-160
Rotalock 2"1/4-12UNF	165-190

Table 2

***NOTE:* More information concerning adaptors and shut-off valves can be found in the "Spare parts list".**

3 Electrical connection

3.1 General recommendations

The compressor terminal box has a wiring diagram on the inside of its cover. Before connecting the compressor, ensure the supply voltage, the phases and the frequency match the nameplate data.

3.2 Electrical installation

Recommended wiring diagrams (power circuit and control circuit) are shown on pages 11 and 12.

***NOTE:* For AC and HP applications, we recommend using a K2 contactor for the safety chain in order to comply with EN 60335.**

	Single-phase PF*	Three-phase TF*	Three-phase TW*	
			with INT69SC2	with INT69SCY2
Power circuit	Figure 5	Figure 6		Figure 7
Control circuit	Figures 9/10		Figure 11	Figure 12

Table 3

Single-phase compressors are connected to the Common (C), Start (S) and Run (R) connections. Three-phase compressors are connected to the T1, T2 and T3 connections (see **Figure 8**).

3.3 Crankcase heater

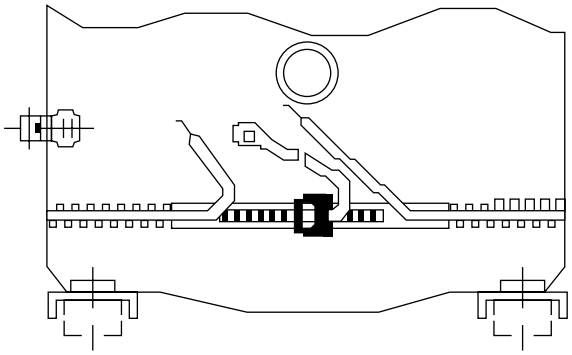
IMPORTANT
Oil dilution! Bearing malfunction! Turn the crankcase heater on 12 hours before starting the compressor.

A crankcase heater is used to prevent refrigerant migrating into the shell during standstill periods. Due to the Copeland scroll's inherent ability to handle liquid refrigerant in flooded conditions a crankcase heater is not required when the system charge does not exceed the charge limits shown in **Table 4.**

A crankcase heater is always required with **ZO compressors**.

Model				Refrigerant Charge Limit
Medium Temperature	**Low Temperature**	**A/C**	**Heat Pump**	
		ZR18K*		2.7 kg
ZB15K* to ZB26K* ZS21K* to ZS26K*	ZF06K* to ZF11K*		ZH15K* to ZH26K* ZH09KVE	3.6 kg
ZB30K* to ZB45K* ZS30K* to ZS45K*	ZF13K* & ZF18K*	ZR22K* to ZR81K* ZP24K* to ZP83K*	ZH30K* to ZH45K* ZH13KVE to ZH18KVE	4.5 kg
		ZR94K* to ZR190K* ZP24K* to ZP91K*		7.0 kg
ZB56K* to ZB11M* ZB50K* to ZB114K* ZS56K* to ZS11M*	ZF24K* to ZF48K*		ZH56K* to ZH11M* ZH24KVE to ZH48KVE	7.5 kg
ZB220K*		ZR250K* & ZP235K*		11.3 kg
		ZR310K* to ZR380K* ZP295K* to ZP385K*		13.6 kg
		ZP485K*		16.0 kg

Table 4



If a crankcase heater is fitted it is recommended that the heater be turned on for a minimum of **12 hours** prior to starting the compressor. This will prevent oil dilution and bearing stress on initial start up. The crankcase heater must remain energised during compressor off cycles.

The crankcase heater must be mounted below the oil schraeder valve located on the bottom shell.

Figure 4

3.4 Pressure safety controls

High-pressure and low-pressure cut-outs with a manual reset feature for the highest level of system protection are recommended. Required setting points are given in **Table 5** below:

	HP bar(g)	LP bar(g)
ZB, ZBD	28	2.6
ZS		
ZF		0.3 (R404A), 0.0 (R22), 1.5 (R134a)
ZFD		0.3 (R404A)
ZH		0.5 (R407C), 0.0 (R134a)
ZR	28.8	2 - 0.5*(R407C), 2.3 (R134a), 2.8 (R22)
ZRD		2 - 0.5*
ZP, ZPD	43	4.4 - 2*
ZO, ZOD		5.8

* Recommendation for use in heat pump system

Table 5

3.5 Motor protection

The motor protection system is identified by the centre letter in the motor code:
- **"F"** for conventional inherent internal line break motor protection
- **"W"** for electronic motor protection system.

3.6 Discharge temperature protection

Internal discharge temperatures reached under some extreme operating conditions (such as loss of refrigerant injection charge or extremely high compression ratio) could cause compressor damage.

Table 6 hereunder describes the various discharge temperature protection devices available on Scroll compressors.

Additionnal information about discharge temperature protection is avaible in the Application Guidelines.

	ZR	ZP	ZB	ZF	ZS	ZH	ZO
Internal thermo-protection "Klixon"	ZR18K* to ZR81K*	ZP24K* to ZP83K*	ZB15K* to ZB45K*				
Internal thermo-protection "ASTP"	ZR94K* to ZR190K*	ZP90K* to ZP182K*	ZB50K* to ZB114K*				
Internal thermistor + Electronic module	Only motor version TW..						
External Thermostat	ZRD / ZRH	ZPD	ZBD / ZBH	Only TF.. or PF..			All
NTC Sensor	ZRD	ZPD	ZBD	ZFD			All

Table 6: Discharge temperature protection devices

3.7 High-potential testing

WARNING
Conductor cables! Electrical shock! Shut off power supply before highpotential testing.

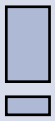
CAUTION
Internal arcing! Motor destruction! Do not carry out high-voltage or insulation tests if the compressor housing is under vacuum.

Emerson Climate Technologies subjects all Scroll compressors to a high-voltage test after final assembly. Each motor phase winding is tested, according to EN 0530 or VDE 0530 part 1, at a differential voltage of 1000V plus twice the nominal voltage. Since high-voltage tests lead to premature ageing of the winding insulation further additional tests of that nature are not recommended.

If it has to be done for any reason, a lower voltage must be used. Disconnect all electronic devices, eg, motor protection module, fan speed control, etc prior to testing.

4 Starting up & operation

WARNING
Diesel effect! Compressor destruction! The mixture of air and oil at high temperature can lead to an explosion. Avoid operating with air.



IMPORTANT
Oil dilution! Bearing malfunction! Turn the crankcase heater on 12 hours before starting the compressor.

4.1 Strength pressure test

The compressor has been strength-tested in the factory. It is not necessary for the customer to strength- or leak-test the compressor again although the compressor will normally be exposed to the testing made as part of system testing.

4.2 Tightness/pressure test

WARNING
High pressure! Personal injuries! Consider personal safety requirements and refer to test pressures prior to test.

WARNING
System explosion! Personal injuries! DO NOT USE other industrial gases.

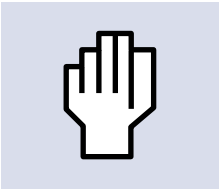
CAUTION
System contamination! Bearing malfunction! Use only dry nitrogen or dried air for pressure testing.

If using dry air do not include the compressor in the pressure test – isolate it first. Never add refrigerant to the test gas (as leak indicator).

4.3 System evacuation

Before the installation is put into commission, it has to be evacuated with a vacuum pump. Proper evacuation reduces residual moisture to 50 ppm. During the initial procedure, suction and discharge shut-off valves on the compressor remain closed. The installation of adequately sized access valves at the furthest point from the compressor in the suction and liquid lines is advisable.

4.4 Charging procedure



CAUTION
Low suction pressure operation! Compressor damage! Do not operate with a restricted suction. Do not operate with the low-pressure cut-out bridged. Do not operate compressor without enough system charge to maintain at least 0.5 bar suction pressure. Allowing pressure to drop below 0.5 bar for more than a few seconds may overheat scrolls and cause early drive bearing damage.

The system should be liquid-charged through the liquid-receiver shut-off valve or through a valve in the liquid line. The use of a filter drier in the charging line is highly recommended. Because scrolls have discharge check valves, systems should be liquid-charged on both the high and low sides simultaneously to ensure a positive refrigerant pressure is present in the compressor before it runs. The majority of the charge should be placed in the high side of the system to prevent bearing washout during first-time start on the assembly line.

4.5 Preliminary checks – Pre-starting

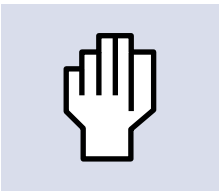
Discuss details of the installation with the installer. If possible, obtain drawings, wiring diagrams, etc. It is ideal to use a check-list but always check the following:

- Visual check of the electrics, wiring, fuses etc
- Visual check of the plant for leaks, loose fittings such as TXV bulbs etc
- Compressor oil level
- Calibration of HP & LP switches and any pressure actuated valves
- Check setting and operation of all safety features and protection devices
- All valves in the correct running position
- Pressure and compound gauges fitted
- Correctly charged with refrigerant
- Compressor electrical isolator location & position

4.6 Rotation direction

Scroll compressors, like several other types of compressors, will only compress in one rotational direction. Direction of rotation is not an issue with single-phase compressors since they will always start and run in the proper direction. Three-phase compressors will rotate in either direction depending upon phasing of the power to L1, L2 and L3. Since there is a 50/50 chance of connecting power in such a way as to cause rotation in the reverse direction, **it is important to include notices and instructions in appropriate locations on the equipment to ensure proper rotation direction is achieved when the system is installed and operated.**

4.7 Deep vacuum operation



CAUTION
Vacuum operation! Compressor damage! Copeland Scroll™ compressors should never be used to evacuate a refrigeration or air-conditioning system.

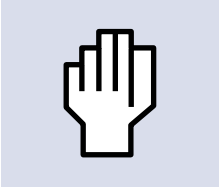
The Scroll compressor can be used to pump down refrigerant in a unit as long as the pressures remain within the operating envelope. Low suction pressures will result in overheating of the scrolls and permanent damage to the compressor drive bearing. Scroll compressors incorporate internal low vacuum protection; the floating seal unloads when the pressure ratio exceeds approximately 20:1 for ZS and ZF and 10:1 for ZB, ZH, ZO, ZP and ZR.

5 Maintenance & repair

5.1 Rotalock valves

Rotalock valves should be periodically re-torqued to ensure that leak prevention tightness is maintained.

5.2 Replacing a compressor



CAUTION
Inadequate lubrication! Bearing destruction! Exchange the accumulator after replacing a compressor with a burned out motor. The accumulator oil return orifice or screen may be plugged with debris or may become plugged. This will result in starvation of oil to the new compressor and a second failure.

5.3 Unbrazing system components

WARNING
Explosive flame! Burning! Oil-refrigerant mixtures are highly flammable. Remove all refrigerant before opening the system. Avoid working with an unshielded flame in a refrigerant charged system.

6 Dismantling & disposal

Removing oil and refrigerant:
- Do not disperse in the environment.
- Use the correct equipment and method of removal.
- Dispose of oil and refrigerant properly.
- Dispose of compressor properly.

7 Wiring diagrams

7.1 Wiring diagram legend

B1 ..... Room thermostat
B3 ..... Discharge gas thermostat
C2 ..... Run capacitor
F1, F6 ... Fuses
F3 ..... HP switch
F4 ..... LP switch
K1 ..... Contactor
K2..... Recommended contactor compliant w/ EN 60335 AC/HP
K35 .... Current relay (if needed)
Q1 ..... Main switch
R2 ..... Crankcase heater
S1..... Auxiliary switch
Y5..... Solenoid valve for injection (if available)

7.2 Wiring diagrams

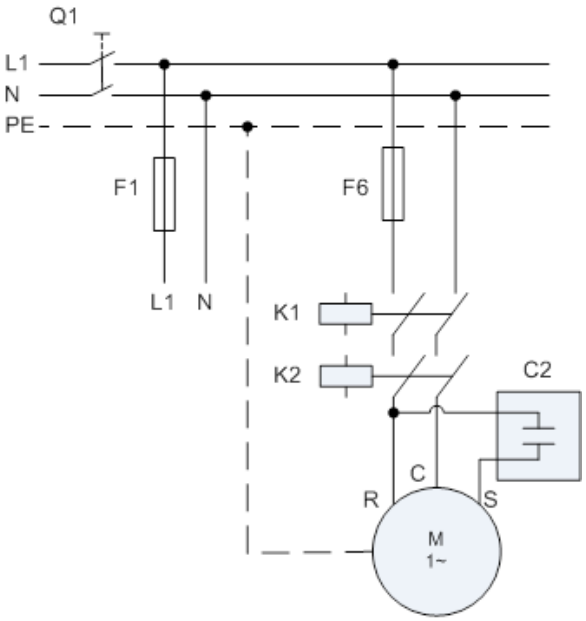


Figure 5

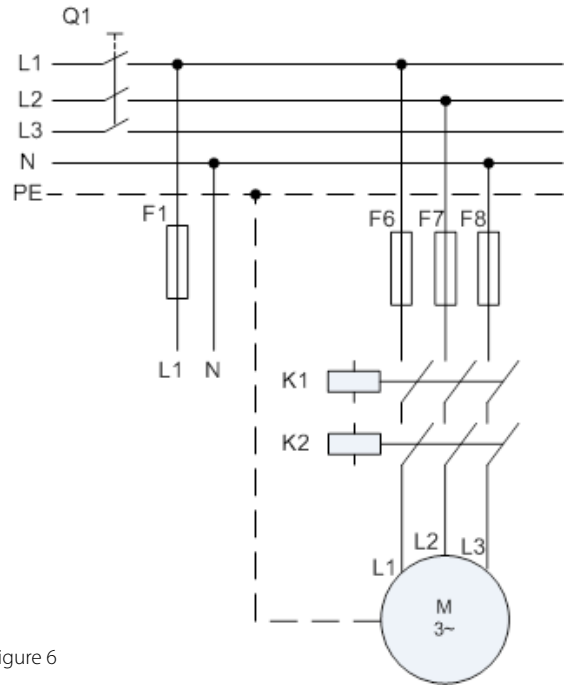


Figure 6

TW* - INT69SCY2

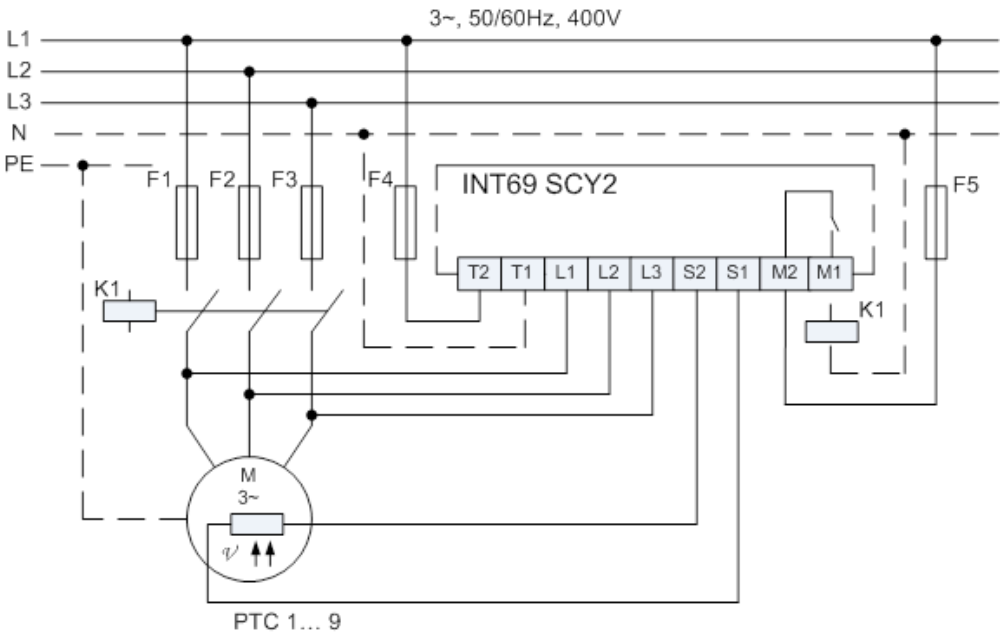


Figure 7

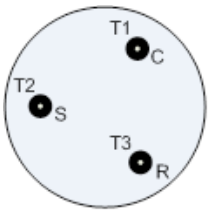


Figure 8

PF*, TF* **ZR, ZP, ZH**

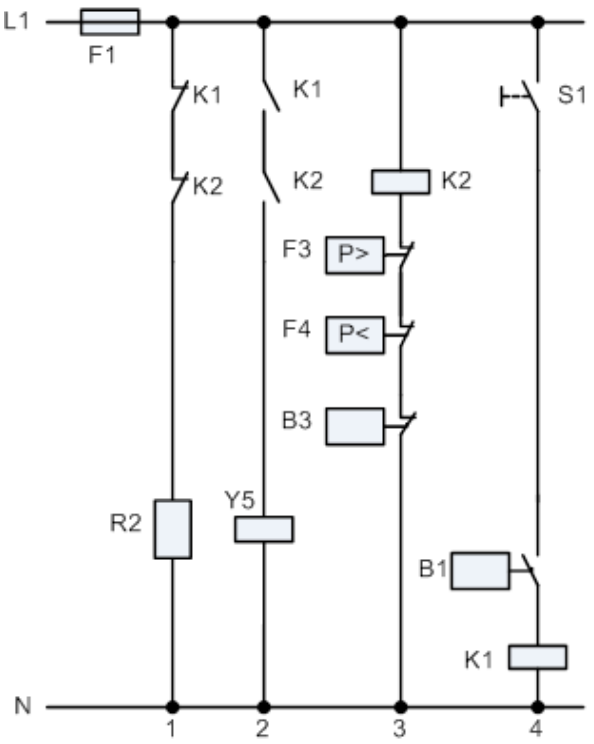


Figure 9

PF*, TF* **ZB, ZF, ZO, ZS**

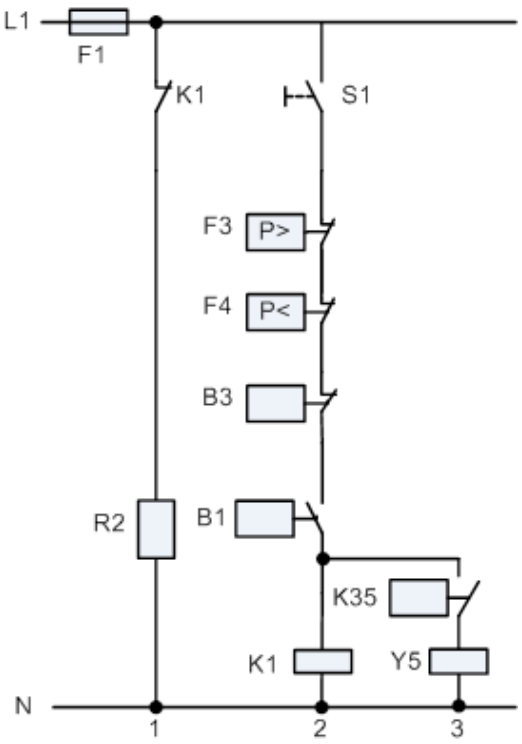


Figure 10

TW* **ZR, ZP, ZH**

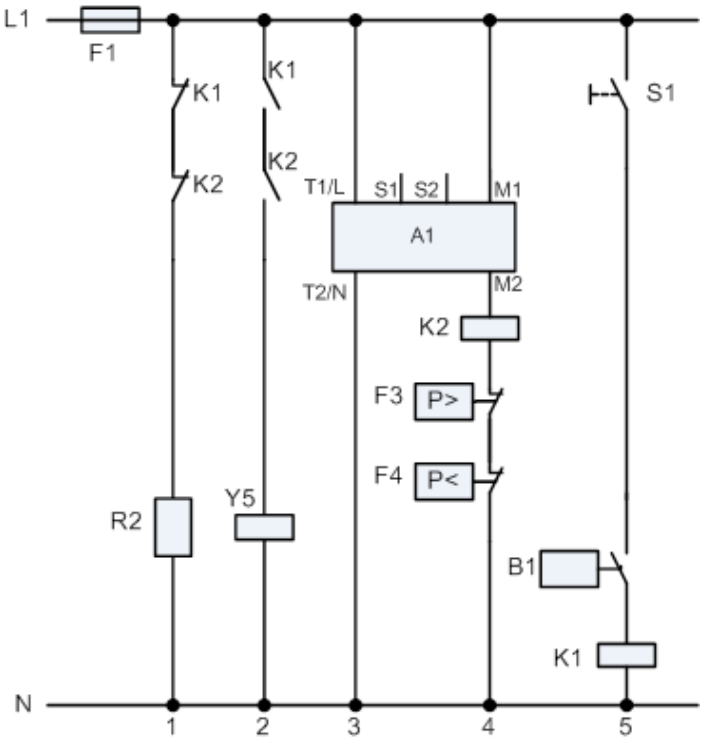


Figure 11

TW* **ZB, ZF, ZS**

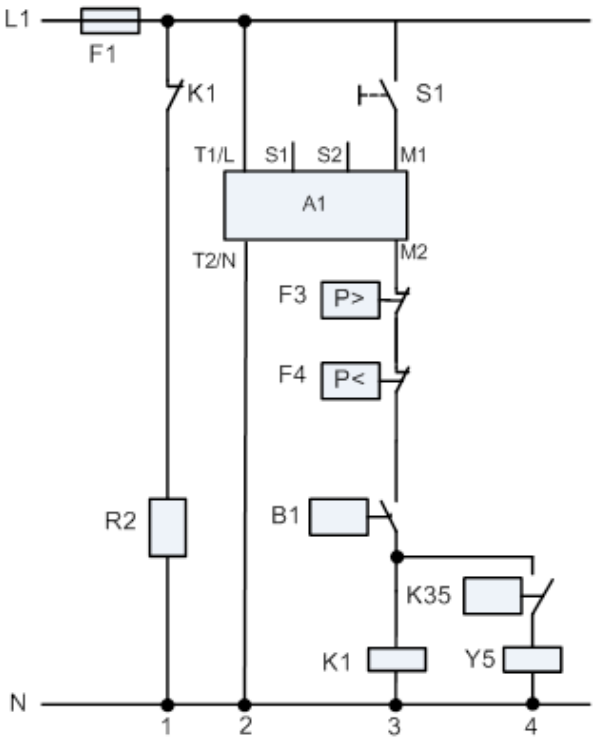


Figure 12

North America

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