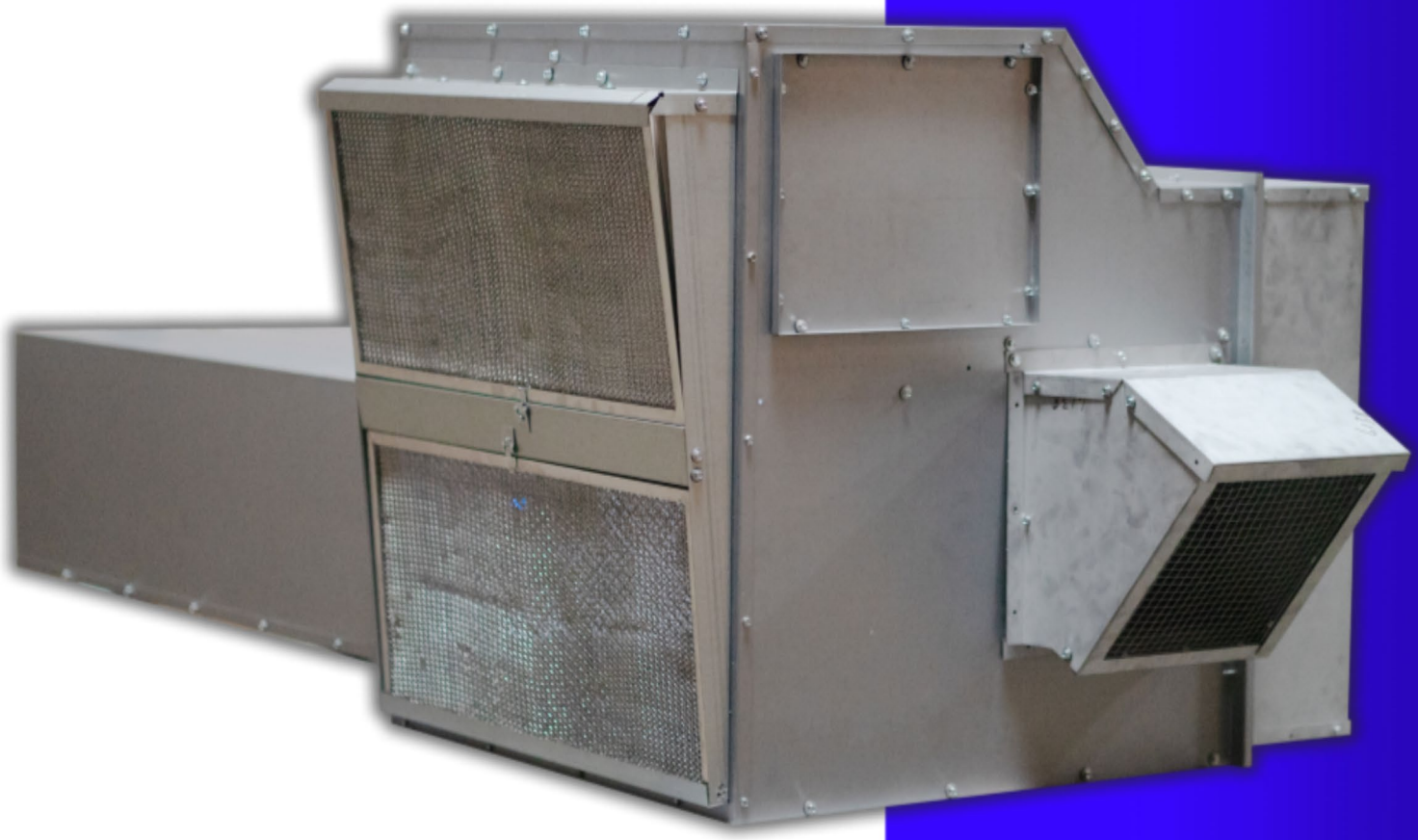
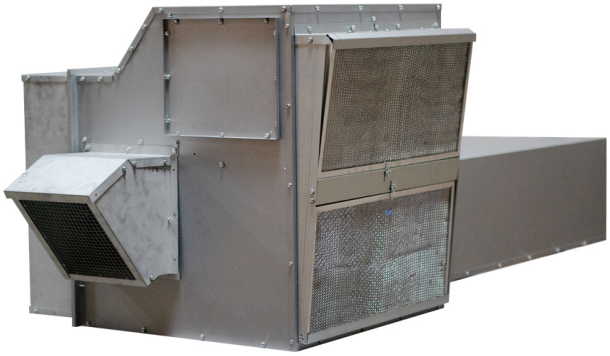
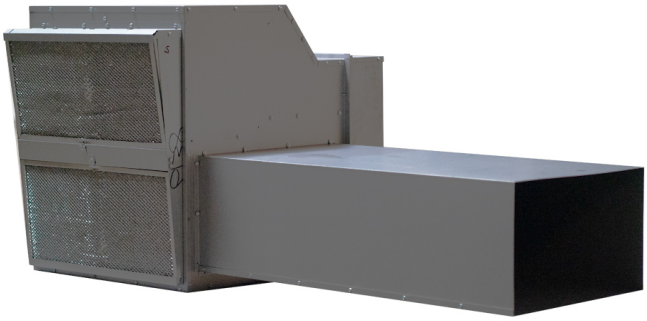
CanFab®



POWER EXHAUST MANUAL

Installation & Maintenance





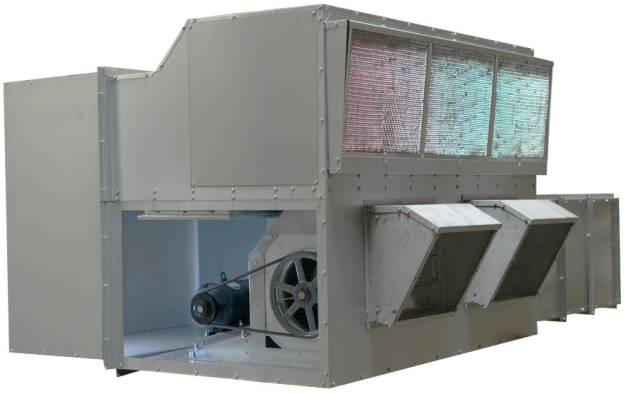


TABLE OF CONTENTS

UNIT INSTALLATION

POWER EXHAUST AND ECONOMIZER INSTALLATION INSTRUCTIONS

⚠ WARNING

EXHAUST FAN CAN CAUSE SEVERE INJURY. ALWAYS DISCONNECT POWER TO HVAC UNIT BEFORE SERVICING.

1 – REMOVE RETURN AIR COMPARTMENT PANEL FROM BACK OF HVAC UNIT. (SEE DETAIL #1)

2 – REMOVE SCREWS ON BACK OF HVAC UNIT HOLDING TOP OF HVAC UNIT DOWN. ALSO REMOVE SCREWS ABOUT HALFWAY DOWN BOTH SIDES OF HVAC UNIT TOP. (SEE DETAIL #1)

3 – LIFT TOP OF THE HVAC UNIT AND PROP UP WITH SUPPORTS, 2" SPACING REQUIRED. (SEE DETAIL #2)

4 – LOCATE EXHAUST HOOD FROM SHIPPING PACKAGE, PLACE GASKET AROUND THE FLANGES OF THE HOOD. THEN SECURE HOOD OVER THE EXHAUST OPENING WITH SCREWS PROVIDED. (SEE DETAIL #2)

5 – WHEN USING THE BELIMO ACTUATOR OPTION, CONSULT CONTROLS CONTRACTOR REGARDING THE ECONOMIZER WIRING REQUIREMENTS.

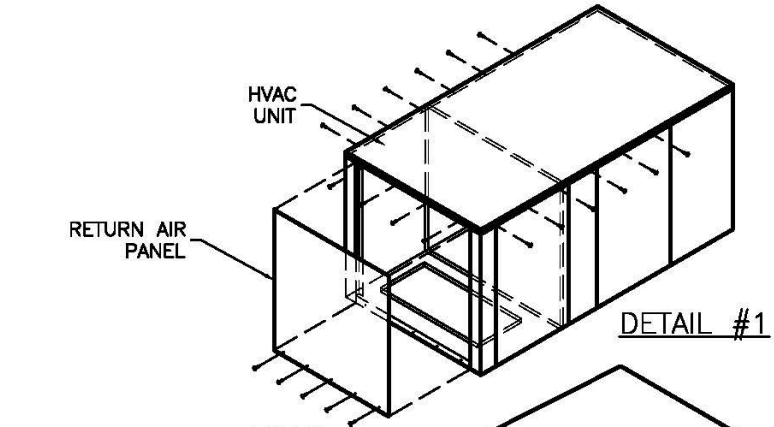
6 – REMOVE THE R/A PAN LOCATED ON THE BOTTOM OF THE R/A HOOD. SLIDE THE R/A HOOD ASSEMBLY INTO THE HVAC UNIT. PUT THE LEFT SIDE IN INTO THE COMPARTMENT FIRST AND SLIDE TO THE LEFT THEN SLIDE THE RIGHT SIDE OF THE ASSEMBLY INTO THE COMPARTMENT. SLIDE POWER EXHAUST ASSEMBLY INTO THE HVAC UNIT UNTIL THE FLANGES ON THE BACK OF THE POWER EXHAUST REST AGAINST THE HVAC UNIT. (SEE DETAIL DRAWING #2 & #3)
NOTE: IF USING HORIZONTAL OPTION, KEEP PROVIDED PAN ON THE R/A HOOD AND TAKE OFF THE HORIZONTAL R/A PANEL OFF OF THE POWER EXHAUST AND RUN DUCT TO THAT.

7 – REMOVE SUPPORTS USED TO PROP THE TOP OF THE HVAC UNIT. SUPPORTS USED FROM STEP #3.
NOTE: THE TOP OF HVAC UNIT HOOKS OVER THE TOP FLANGE OF POWER EXHAUST. (SEE DETAIL #4)

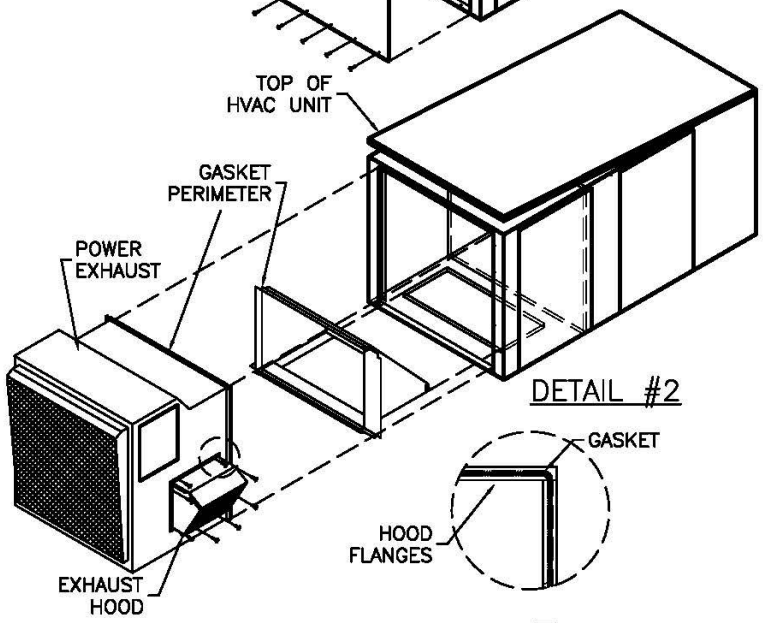
8 – SECURE TOP OF THE POWER EXHAUST TO THE HVAC UNIT BY USING SCREWS REMOVED IN STEP #2. ALSO SCREW ALONG THE SIDE FLANGES OF THE POWER EXHAUST USING #12 X 1 SCREWS PROVIDED WITH POWER EXHAUST PACKAGE. (SEE DETAIL #5)

IMPORTANT

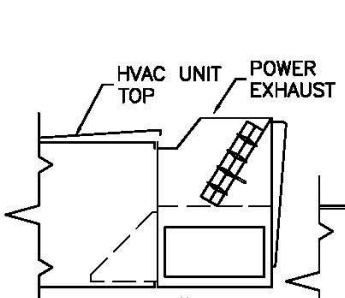
FOLLOW ALL LOCAL AND NATIONAL CODES WHEN WIRING SYSTEM.



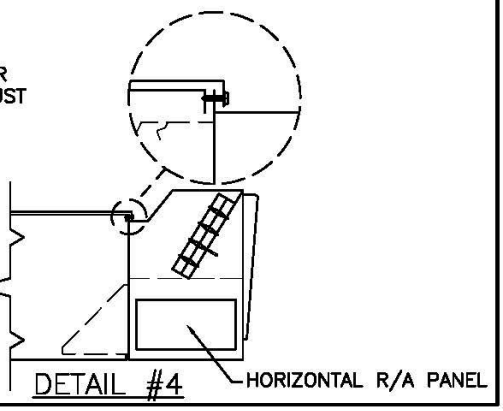
DETAIL #1



DETAIL #2



DETAIL #3



DETAIL #4

POWER EXHAUST AND ECONOMIZER INSTALLATION INSTRUCTIONS CONTINUED

9 – REPLACE ALL SCREWS ALONG THE SIDES OF THE TOP OF THE HVAC UNIT, REMOVED IN STEP #2. (SEE DETAIL #5)

10 – REMOVE RETURN AIR COMPARTMENT PANEL LOCATED ON THE RIGHT SIDE OF HVAC UNIT. (SEE DETAIL #6)

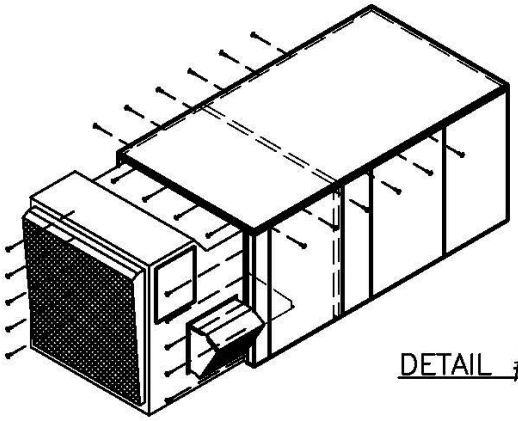
11 – PLUG THE ECONOMIZER HARNESS INTO THE HVAC UNITS ECONOMIZER PLUG. (SEE DETAIL #7)

12 – ROUTE THE 2–GREY MIXED AIR SENSOR WIRES THROUGH THE HVAC UNIT TO THE SUPPLY BLOWER COMPARTMENT.

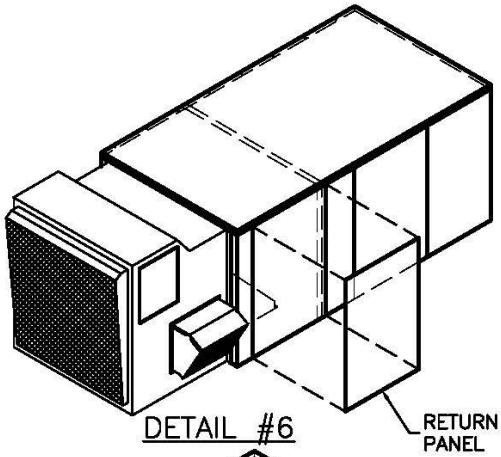
13 – REMOVE THE MIXED AIR TEMPERATURE SENSOR FROM ITS SHIPPING LOCATION. THIS IS LOCATED IN THE OUTSIDE AIR INTAKE HOOD BEHIND THE WATER ENTRAINMENT FILTERS NEXT TO THE DAMPER ACTUATOR.

14 – MOUNT THE MIXED AIR SENSOR ON THE SUPPLY BLOWER SO THE END OF THE SENSOR IS OVER THE INLET OF THE SUPPLY BLOWER. (SEE DETAIL #8)

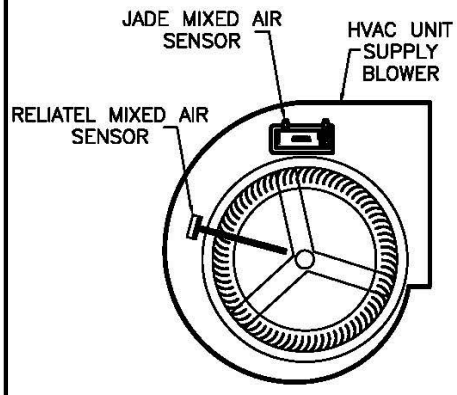
15 – ROUTE THE UL APPROVE LINE VOLTAGE CABLE FROM THE POWER EXHAUST THROUGH THE UNIT TO THE CONTROL COMPARTMENT IN THE HVAC UNIT. SEE THE STANDARD POWER EXHAUST & MODULATION POWER EXHAUST WIRING AND START UP INSTRUCTIONS FOR ELECTRICAL CONNECTIONS AND START UP PROCEDURES.



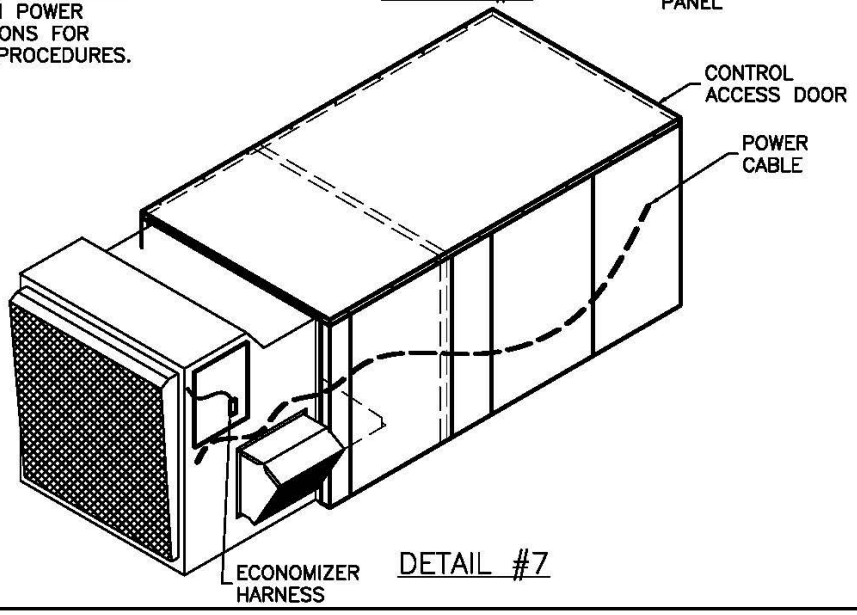
DETAIL #5



DETAIL #6



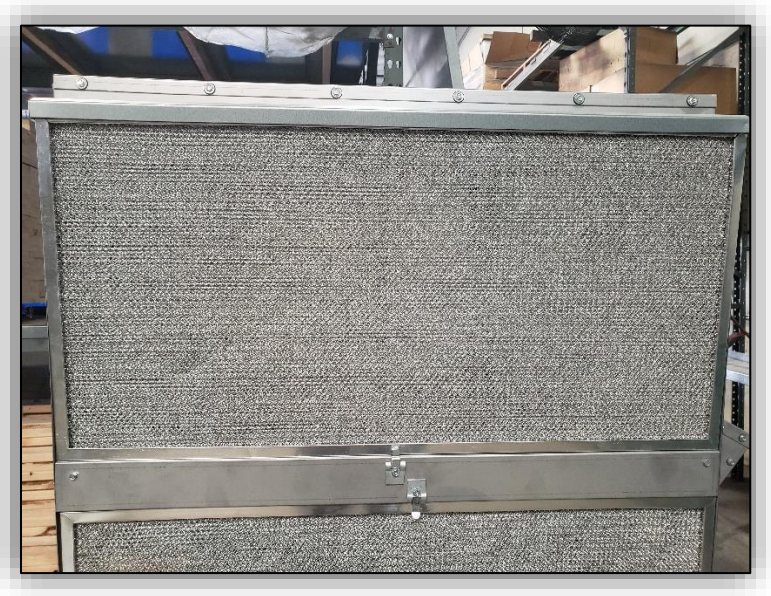
DETAIL #8



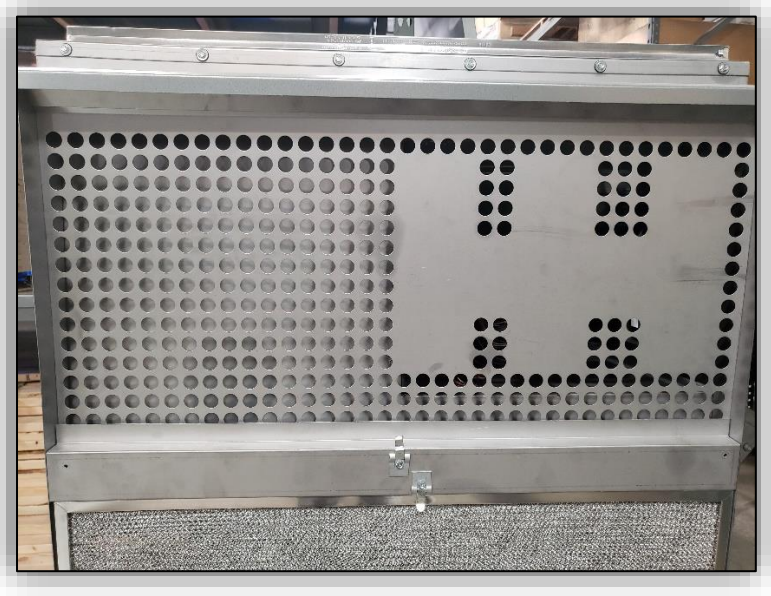
DETAIL #7

1. ACTUATOR REMOVAL

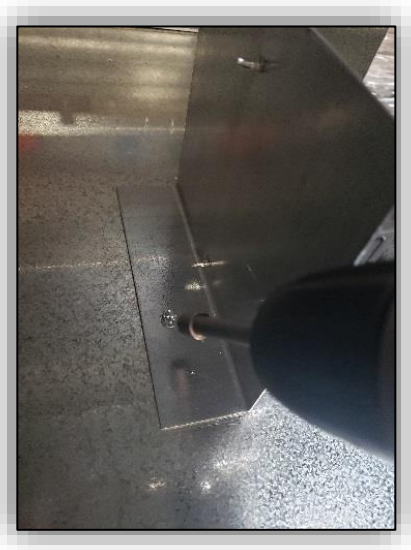
- STEP 1: Remove the filter from the outside air hood by opening the filter clip and sliding the filter back from the bottom.



- STEP 2: Remove the two screws on the horizontal middle part on the corners of the outside air hood to release the perforated plate. Once the perforated plate is released, remove.



- STEP 3: Remove the screw on the logic module bracket to remove the logic module-bracket assembly**.**



- STEP 4: Remove the 2 screws on the bracket holding the actuator linkage and then remove the bracket.

- STEP 5: Remove the spring clip from the damper shaft.

- STEP 6: Remove the bolt on the linkage bracket and damper shaft.

- STEP 7: Remove the retaining clip on the damper linkage to remove the damper shaft bracket.

- STEP 8: Disconnect the damper linkage and remove the damper shaft bracket.

- STEP 9: Remove the bolt on the actuator holding it to the damper shaft.

- STEP 10: Open the access panel door on the left to access the nut attaching the actuator to the divider. Unscrew counterclockwise and slide actuator off from the rod.

- STEP 9: Remove the retaining clip from the back of the actuator.

- STEP 10: Now insert the shaft coupler in the opposite direction and make sure that the position arrow is pointing to zero.

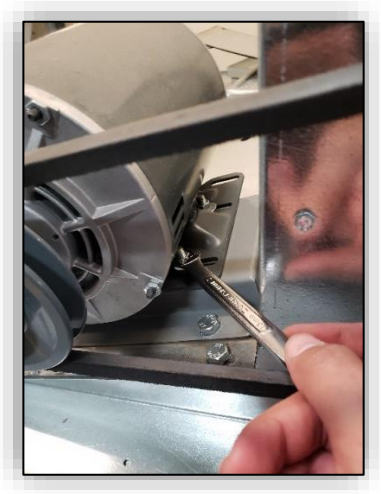
- STEP 11: Reverse steps 9 through 1.
- STEP 12: With the actuator bolted back into place, position the Return Air Damper in the open position and tighten the shaft on the control swivels. During this step, keep in mind which direction the actuator will be rotating. In this case, the actuator will need to rotate in the direction to the damper so that the rod will push the damper blades closed.

- STEP 13: Repeat step 11 with the Outside Air Damper's shaft and secure the rod while the damper is in the closed position.

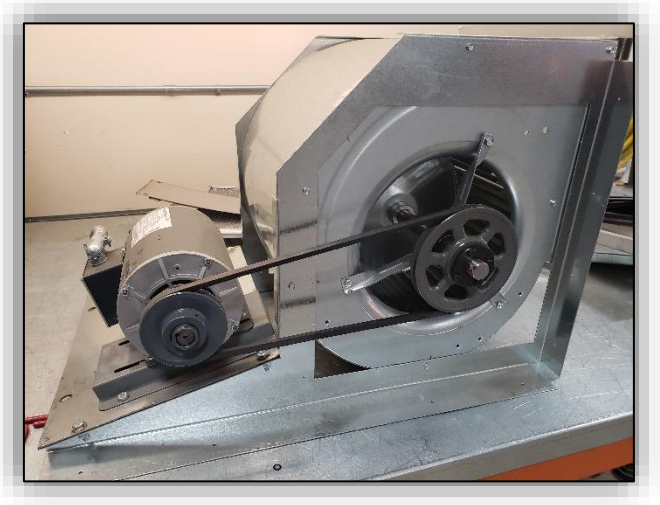
- STEP 14: To ensure the dampers will properly open and close fully, run the Damper Open Procedure in the Checkout Menu of the JADE Logic Module. Adjust rod arms in the control swivels accordingly.

2. PULLEY REMOVAL/ADJUSTMENT

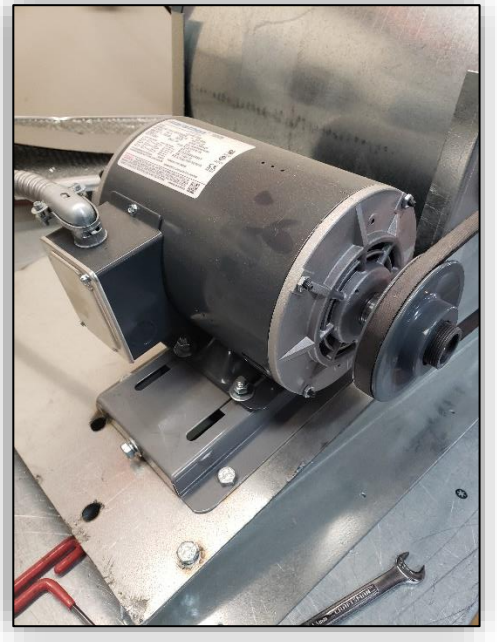
- Note: You will need an 11mm wrench, 13mm wrench, 14mm wrench and a 4mm Allen wrench.
- STEP 1: Locate the sliding base, which the motor is mounted to by 4 bolts. Using a 13mm wrench, loosen the 4 mounting bolts before any belt or motor adjustments begin.



- STEP 2: Located on the back of the sliding base will be the motor adjustment bolt. Rotating the bolt clockwise will tighten the belt, rotating counterclockwise will loosen the belt for removal.
    - If there is no movement in the motor after subsequent rotations of the adjustment bolt, repeat step 1.



- STEP 3: Rotate the adjustment bolt until the tension in the belt is low enough for removal from the pulley. Using a wrench for leverage might be required for belt removal.
    - Be cautious not to pinch hands or fingers while removing or installing the belt.



- STEP 4: Removal of the pulley from the blower shaft will be done with the removal of the two tensioning bolts. Using an 11mm wrench, loosen the two bolts in front of the pulley tensioning bushing.

- STEP 5: Once both tensioning bolts are removed, thread the same bolts in the adjacent holes. Threading the two bolts will cause the pulley to separate from the tensioning bushing. The use of the 11mm wrench will be required.

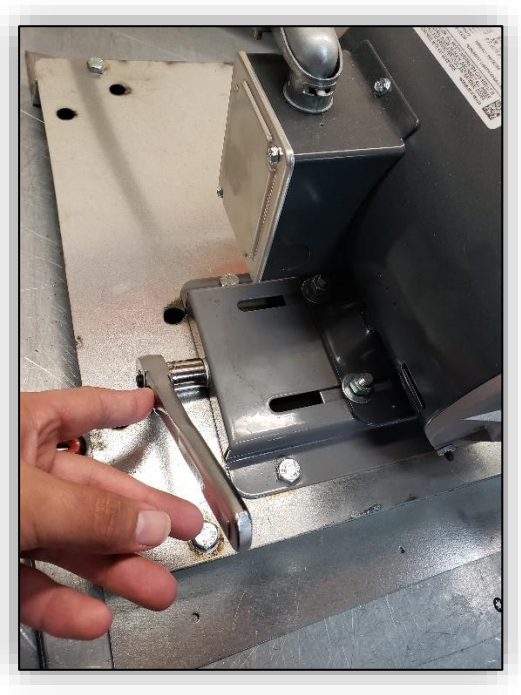
- STEP 6: When reinstalling the pulley on to the blower shaft, ensure the engraved model number is facing away from the blower. Insert the pulley tensioning bushing over the blower shaft and into the pulley. Insert the tensioning bolts through the two non-threaded holes on the tensioning bushing to the threaded holes on the pulley. Before securing the tensioning bushing, ensure that the V groove in the pulley and the sheave are inline. Once the location of the pulley has been adjusted, secure the pulley by tightening the tensioning bolts using an 11mm wrench.

3. SHEAVE REMOVAL/ADJUSTMENT

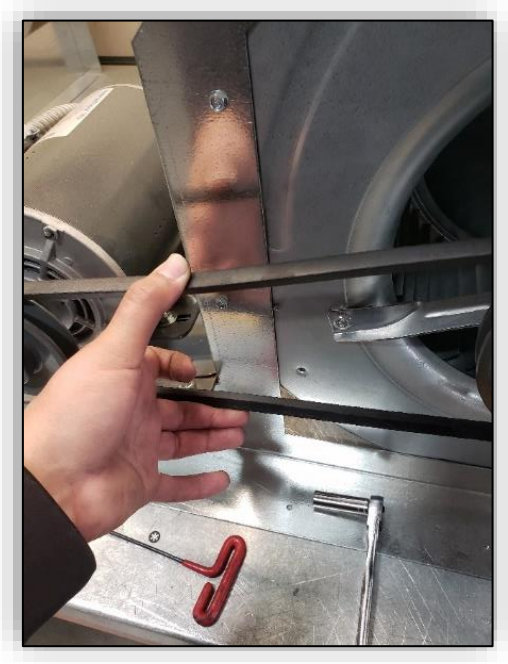
- Note: You will need a 4mm Allen wrench.
- STEP 1: To remove/replace the sheave, use the 4mm Allen wrench to loosen the bolt behind the sheave.

- STEP 2: To adjust the number of turns on the sheave, loosen the bolt on the front of the sheave and turn the front half of the sheave. To tighten the set screw, rotate clockwise and to loosen rotate counterclockwise. Make sure to tighten the set screw on the unthreaded region to prevent the belt from slipping.

- STEP 3: Once the sheave is tightened, reinstall the belt on the sheave & pulley and tighten the bolt on the back of the motor slide base to add tension to the belt.



- STEP 4: Squeeze the belt to make sure that the deflection from equilibrium of the belt is approximately a quarter inch (1/4”). This is the point of optimal efficiency.



4. MAINTENANCE

⚠ WARNING: ELECTRICAL LIVE CIRCUIT HAZARD

Do not touch electrically live parts. Disconnect, lockout and tag out input power supply before installing or servicing motor (includes accessory devices)

⚠ WARNING: ELECTRICAL SHOCK HAZARD

Electrical Connections are to be made by qualified electrical personnel in accordance with all applicable codes, ordinances and sound practices. Failure to follow these instructions could result in serous personal injury, death and/or property damage. Only qualified personnel who are familiar with the applicable national codes, local codes, and sound practices should install or repair electric motor and their accessories.

⚠ WARNING: HAZARDOUS LOCATIONS MOTOR REPAIR HAZARD:

Division 1 Hazard Locations motors can only be modified or repaired by the manufacture or a facility that is listed under UL's category "Motors and Generators, Rebuild for use in Hazardous Locations", failure to follow these instruction could result in serious personal injury, death and/or property damage

4.1 MOTOR MAINTENACE

4.1.1 GENERAL INSPECTION: Inspect the motor approximately every 500 hours of operation or every three months, whichever occurs first. Keep the motor clean and the ventilation and fin openings clear

4.1.2 VENTILATION: Check that the ventilation openings and/or exterior of the motor is fee of dirt, oil, grease, water, etc., which can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.

4.1.3 INSULATION: Use a "Megger" Periodically to ensure that the integrity of the winding insulation has been maintained

4.2 FILTER MAINTENACE

4.2.1 Life span of the filter varies depending on the type of filter and outdoor conditions. For optimum performance, replace filters every 1 – 3 months filters 1"-2" thick and every 6-9 months for filters 4" thick.

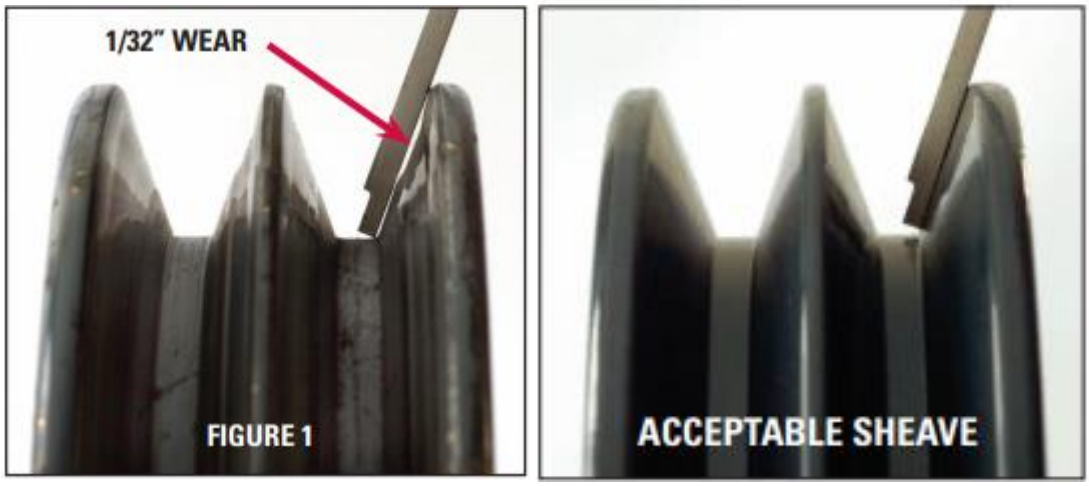
4.3 V-BELT MAINTENACE

4.3.1 GENERAL TENSIONING: Ideal tensioning is the lowest tension at which the belt will not slip under peak load conditions. Over tensioning shortens belt and bearing life. Check tension frequency during the first 24 hours of operation. Checks after jog start

or 1-3 minutes if operation, at 8 hours, 24 hours, 100 hours, and periodically thereafter are recommended. Keep belts free from foreign material that may cause slippage. Make V-Drive inspections on a periodic basis. Under tensioned belt drives often produce audible squeal noise, adjust belt tension when slipping. Never apply belt dressing as this will damage the belt and cause early failure. For proper tensioning values and replacement frequency, refer to manufacture manual.

4.4 SHEAVE MAINTENANCE

4.4.1 GENERAL MAINTENACE: Over time friction between sheave and the belt erodes sheave material lowering the efficiency. In order to maintain sheave efficiency, the sheave should be replaced once the wall erosion reaches 1/32”, as shown in figure 1. (Typically after every 5-7 annual belt change).



5. DAMPER TEST

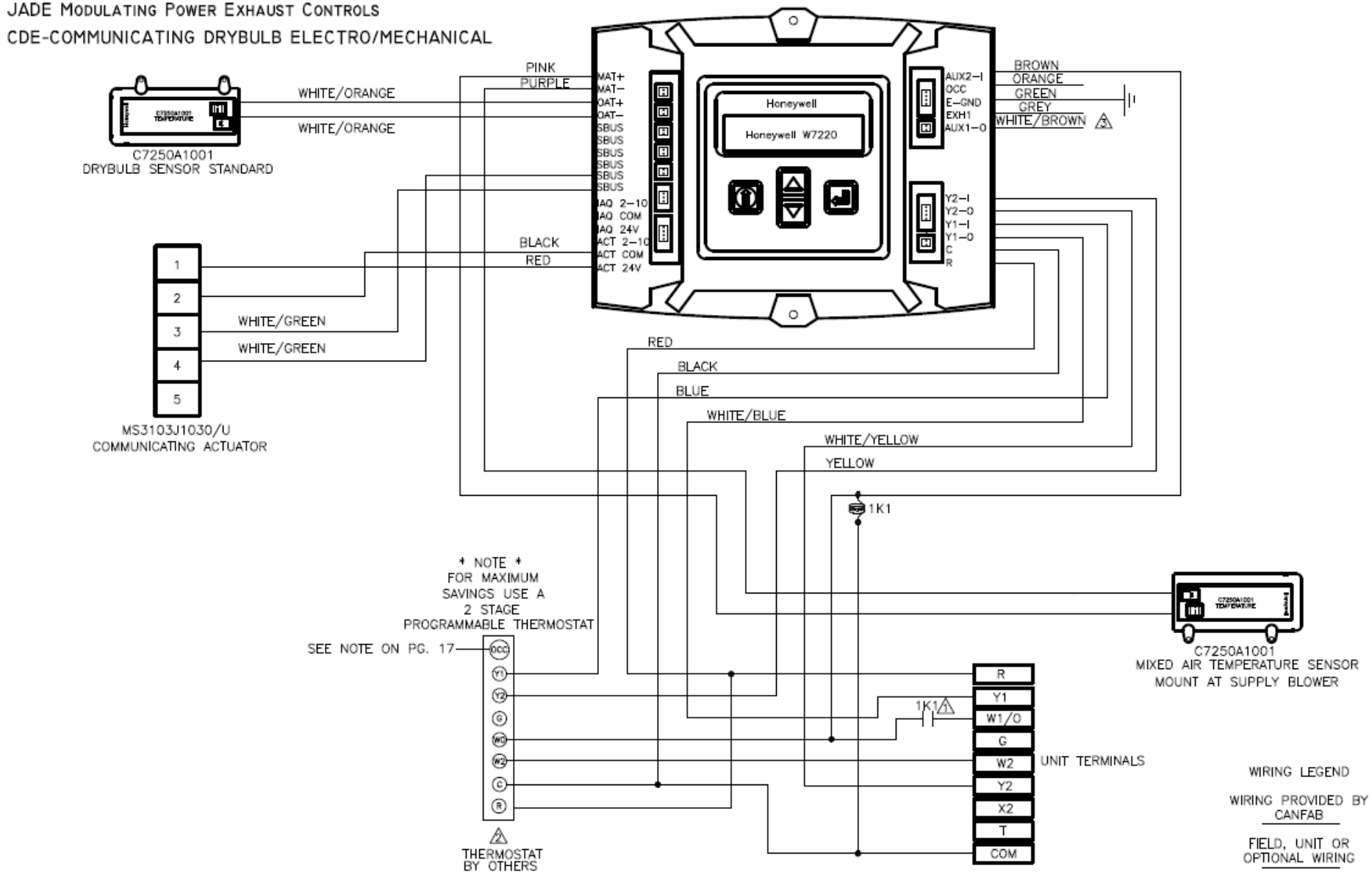
- STEP 1: The Damper Open Procedure can be found by clicking the down button on the JADE controller when I is showing this default screen.

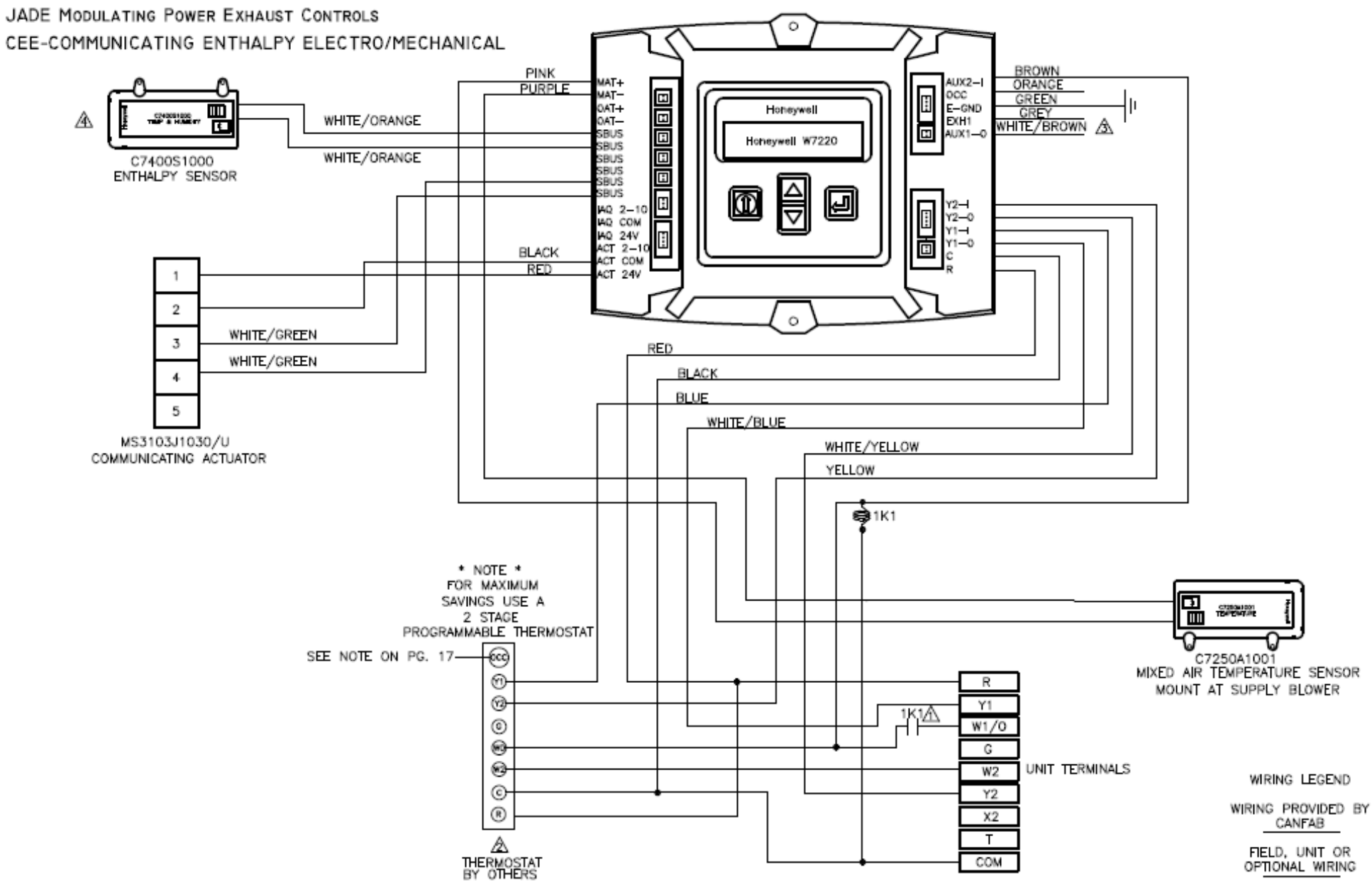
- STEP 2: When the screen CHECKOUT press the ENTER Button. (The ENTER button is the button furthest to the right.)

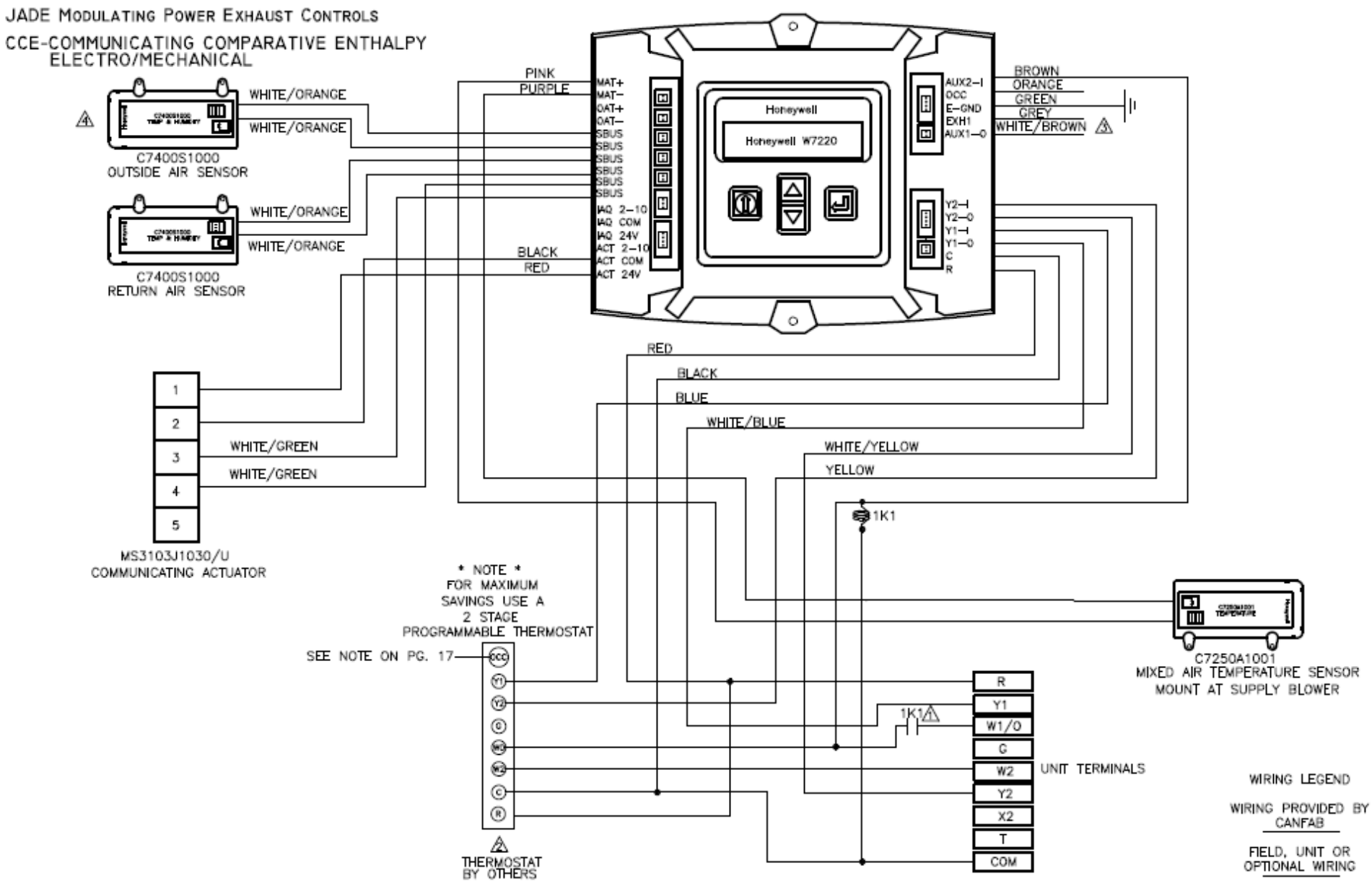
- STEP 3: Scroll down in the Checkout Menu until the screen reads DAMPER OPEN. Press ENTER again.

- STEP 4: The screen will ask if you want to run a test. The test will begin as soon as you click the ENTER button again.

6. WIRING SCHEMATIC




JADE MODULATING POWER EXHAUST CONTROLS
CEE-COMMUNICATING ENTHALPY ELECTRO/MECHANICAL
C7400S1000
ENTHALPY SENSOR
WHITE/ORANGE
WHITE/ORANGE
PINK
PURPLE
BLACK
RED
WHITE/GREEN
WHITE/GREEN
MAT+
MAT–
OAT+
OAT–
SBUS
SBUS
SBUS
SBUS
SBUS
SBUS
IAQ 2–10
IAQ COM
IAQ 24V
ACT 2–10
ACT COM
ACT 24V
Honeywell
Honeywell W7220
AUX2–I
OCC
E–GND
EXH1
AUX1–O
Y2–I
Y2–O
Y1–I
Y1–O
C
R
BROWN
ORANGE
GREEN
GREY
WHITE/BROWN
1
2
3
4
5
MS3103J1030/U
COMMUNICATING ACTUATOR
RED
BLACK
BLUE
WHITE/BLUE
WHITE/YELLOW
YELLOW
1K1
* NOTE *
FOR MAXIMUM
SAVINGS USE A
2 STAGE
PROGRAMMABLE THERMOSTAT
SEE NOTE ON PG. 17
OCC
Y1
Y2
O
W1
W2
C
R
THERMOSTAT
BY OTHERS
C7250A1001
MIXED AIR TEMPERATURE SENSOR
MOUNT AT SUPPLY BLOWER
1K1
R
Y1
W1/O
G
W2
Y2
X2
T
COM
UNIT TERMINALS
WIRING LEGEND
WIRING PROVIDED BY CANFAB
FIELD, UNIT OR OPTIONAL WIRING


JADE MODULATING POWER EXHAUST CONTROLS
CCE-COMMUNICATING COMPARATIVE ENTHALPY
ELECTRO/MECHANICAL
C7400S1000
OUTSIDE AIR SENSOR
C7400S1000
RETURN AIR SENSOR
WHITE/ORANGE
WHITE/ORANGE
WHITE/ORANGE
WHITE/ORANGE
PINK
PURPLE
BLACK
RED
MAT+
MAT–
OAT+
OAT–
SBUS
SBUS
SBUS
SBUS
SBUS
SBUS
IAQ 2–10
IAQ COM
IAQ 24V
ACT 2–10
ACT COM
ACT 24V
Honeywell
Honeywell W7220
AUX2–I
OCC
E–GND
EXH1
AUX1–O
BROWN
ORANGE
GREEN
GREY
WHITE/BROWN
Y2–I
Y2–O
Y1–I
Y1–O
C
R
RED
BLACK
BLUE
WHITE/BLUE
WHITE/YELLOW
YELLOW
WHITE/GREEN
WHITE/GREEN
1
2
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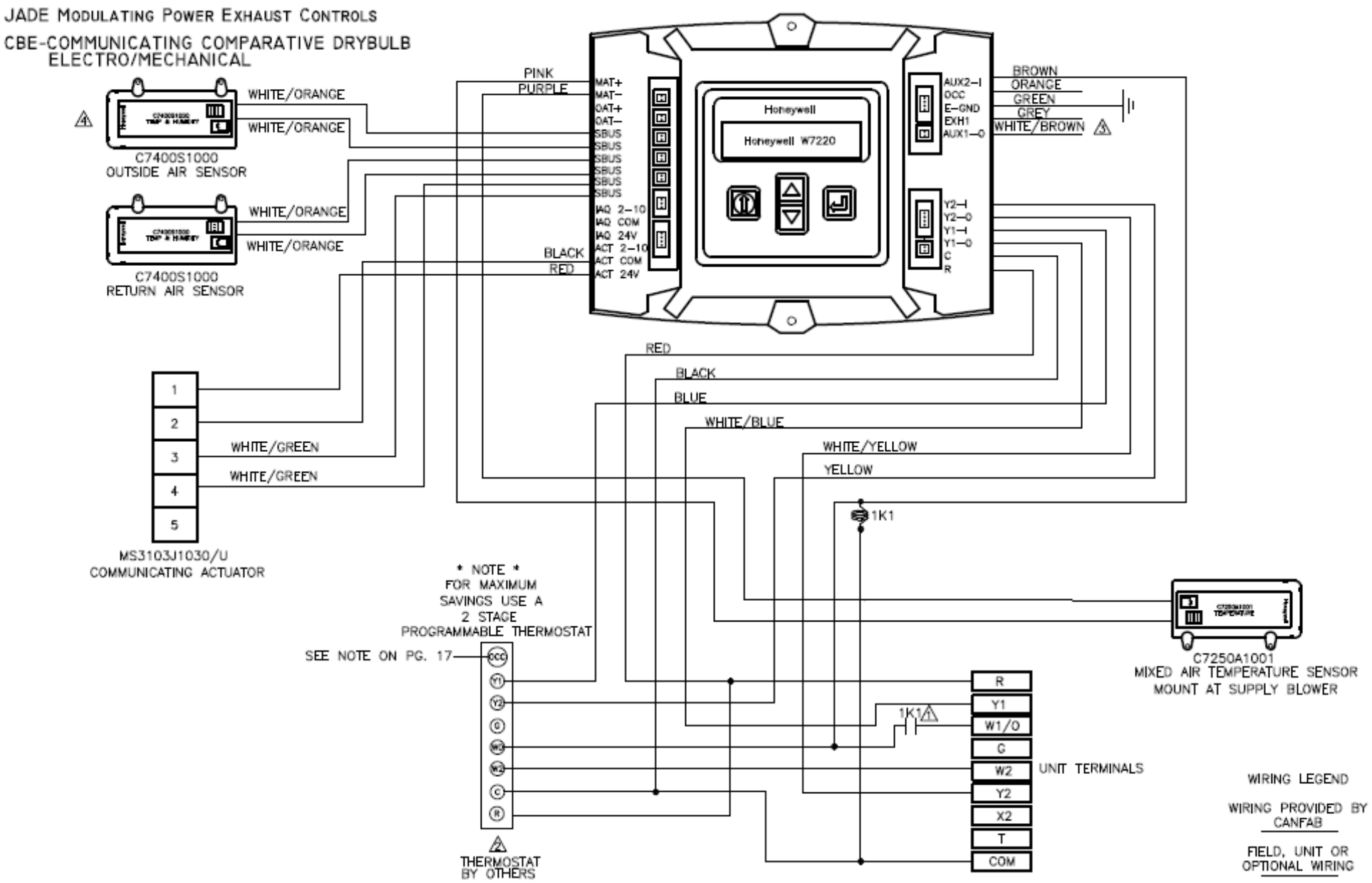
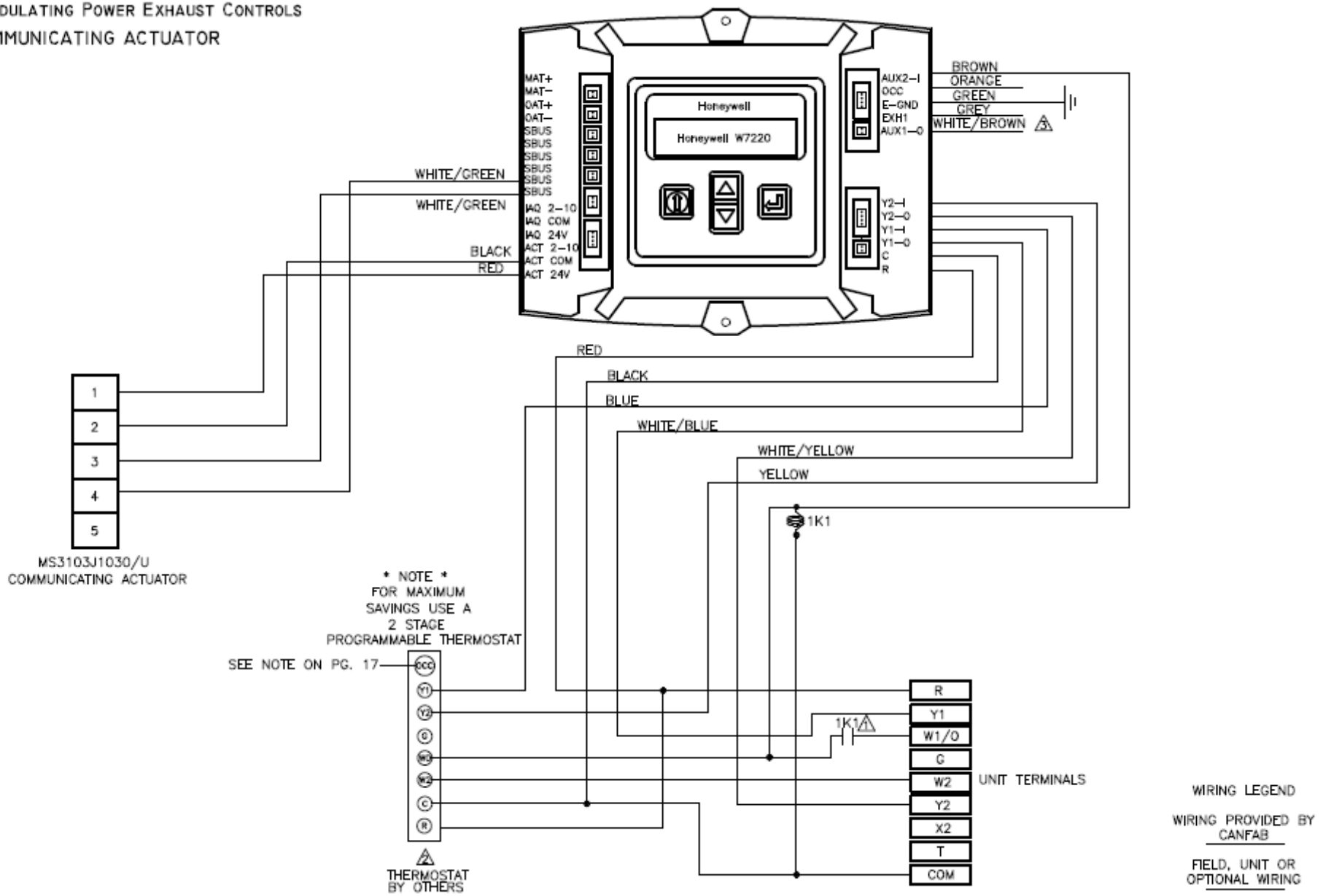
4
5
MS3103J1030/U
COMMUNICATING ACTUATOR
1K1
* NOTE *
FOR MAXIMUM
SAVINGS USE A
2 STAGE
PROGRAMMABLE THERMOSTAT
SEE NOTE ON PG. 17
THERMOSTAT
BY OTHERS
C7250A1001
MIXED AIR TEMPERATURE SENSOR
MOUNT AT SUPPLY BLOWER
1K1
R
Y1
W1/O
G
W2
Y2
X2
T
COM
UNIT TERMINALS
WIRING LEGEND
WIRING PROVIDED BY
CANFAB
FIELD, UNIT OR
OPTIONAL WIRING


JADE MODULATING POWER EXHAUST CONTROLS
CBE-COMMUNICATING COMPARATIVE DRYBULB
ELECTRO/MECHANICAL
C7400S1000
OUTSIDE AIR SENSOR
C7400S1000
RETURN AIR SENSOR
WHITE/ORANGE
WHITE/ORANGE
WHITE/ORANGE
WHITE/ORANGE
PINK
PURPLE
BLACK
RED
MAT+
MAT–
OAT+
OAT–
SBUS
SBUS
SBUS
SBUS
SBUS
SBUS
IAQ 2–10
IAQ COM
IAQ 24V
ACT 2–10
ACT COM
ACT 24V
Honeywell
Honeywell W7220
AUX2–I
OCC
E–GND
EXH1
AUX1–O
BROWN
ORANGE
GREEN
GREY
WHITE/BROWN
Y2–I
Y2–O
Y1–I
Y1–O
C
R
RED
BLACK
BLUE
WHITE/BLUE
WHITE/YELLOW
YELLOW
1K1
1
2
3
4
5
WHITE/GREEN
WHITE/GREEN
MS3103J1030/U
COMMUNICATING ACTUATOR
* NOTE *
FOR MAXIMUM
SAVINGS USE A
2 STAGE
PROGRAMMABLE THERMOSTAT
SEE NOTE ON PG. 17
THERMOSTAT
BY OTHERS
C7250A1001
MIXED AIR TEMPERATURE SENSOR
MOUNT AT SUPPLY BLOWER
1K1
R
Y1
W1/O
G
W2
Y2
X2
T
COM
UNIT TERMINALS
WIRING LEGEND
WIRING PROVIDED BY
CANFAB
FIELD, UNIT OR
OPTIONAL WIRING

JADE MODULATING POWER EXHAUST CONTROLS
CNN-COMMUNICATING ACTUATOR



7. COMPONENT PRODUCT DATA

COMPONENT PRODUCT DATA

Honeywell

JADE™ Economizer Module

(MODEL W7220)

PRODUCT DATA

PRODUCT DESCRIPTION

The JADE™ Economizer System is an expandable economizer control system, which includes a W7220 Economizer Module (controller) with an LCD and keypad. The W7220 can be configured with optional sensors.

The W7220 Economizer Module can be used as a stand-alone economizer module wired directly to a commercial set back space thermostat and sensors to provide Outdoor Air dry-bulb economizer control.

The W7220 Economizer Module can be connected to optional Sylk Bus sensors for single or differential enthalpy control. The W7220 Economizer Module provides power and communications on the Sylk Bus for the Sylk Bus sensors.

The W7220 Economizer Module automatically detects sensors by polling to determine which sensors are present. If a sensor loses communications after it has been detected, the W7220 Economizer indicates a device fail error on its LCD.

System Components

The JADE™ Economizer System includes an Economizer Module, 20k mixed air sensor, damper actuator, an optional CO_2 sensor, and either a 20k outdoor air temperature sensor or Sylk Bus sensors for measuring Outdoor Air and return air enthalpy, temperature, and humidity.

Economizer Module

This is the core of the JADE™ Economizer System and includes the user interface for the system. The W7220 Economizer Module provides the basic inputs and outputs to provide simple economizer control. When used with the optional Sylk Bus sensors, the Economizer Module provides more advanced economizer functionality.

Sylk Bus Sensors (optional)

The Sylk Bus Sensor is a combination temperature and humidity sensor which is powered by and communicates on the Sylk Bus. Up to three sensors may be configured with the JADE™ Economizer Module. See page 2 for details.

CO_2 Sensor (optional)

A CO_2 sensor can be added for Demand Control Ventilation (DCV). Either an analog (2-10 Vdc) or a wall-mount Sylk bus TR40 CO_2 sensor can be used with the Jade economizer.

PC MOD Tool (optional)

The PC MOD tool is connected to a personal computer and communicates with the Jade economizer controller via the Sylk bus. The W7220 PCMOD tool software is free and can be downloaded from the url in the Accessories section.

Some features on the Jade controller can only be enabled or disabled using the W7220 PC MOD tool. See the PC MOD tool options section in Table 5.

Contents

Sylk™ Enabled
Easy 2-wire installation

Certified FDD Product
California Title 24, Part 6
HJW10
www.energy.ca.gov

CE c UL us
E4436

63-2700-10

SPECIFICATIONS

W7220A Economizer Module

The module is designed for use with any Honeywell 2 to 10 Vdc or Honeywell Sylkbus communicating actuator. The module includes terminals for a CO_2 sensor, Mixed Air sensor, and an Outdoor Dry Bulb sensor. Enthalpy and other options are available with Sylk Bus sensors.

User Interface: Provides status for normal operation, setup parameters, checkout tests, and alarms and error conditions with a 2-line 16 character LCD display and a four button keypad.

Electrical

Rated Voltage: 20 to 30 Vac RMS; 50/60 Hz
Transformer: 100 VA maximum system input

Nominal Power Consumption (at 24 Vac, 60 Hz): 11.5 VA without sensors or actuators

Relay Digital Output Rating at 30 Vac (maximum power from Class 2 input only): 1.5A run;
3.5A inrush @ 0.45PF (200,000 cycles) or
7.5A inrush @ 0.45PF (100,000 cycles)

External Sensors Power Output: 21 Vdc +/- 5% @ 48mA

IMPORTANT

All inputs and outputs must be Class 2 wiring.

Inputs

SENSORS:

NOTE: A Mixed Air (MA) analog sensor is required on all W7220 units; either an Outdoor Air (OA) sensor for dry bulb change over or an OA Sylkbus sensor for outdoor enthalpy change over is required in addition to the MA sensor. An additional Return Air (RA) Sylkbus sensor can be added to the system for differential enthalpy or dry bulb changeover. For differential dry bulb changeover a 20k ohm sensor is required in the OA and a Sylkbus sensor in the RA. Dip switch on RA Sylkbus sensor must be set in the RA position.

Dry Bulb Temperature (optional) and Mixed Air (required), C7250A:
2-wire (18 to 22 AWG);
Temperature range -40 to 150 °F (-40 to 65 °C).
Temperature accuracy -0°F/+2°F

Temperature and Humidity, C7400S1000 (optional):
Sylk Bus; 2-wire (18 to 22 AWG)
Temperature: range -40 to 150 °F (-40 to 65 °C)
Temperature accuracy -0°F/+2°F
Humidity: range 0 to 100% RH with 5% accuracy.

NOTE: Up to three (3) SYLK Bus sensors may be connected to the JADE™ Economizer module. For outdoor air (OA), return air (RA) and discharge (supply) air (DA).

DCV (CO_2) Sensor (C7232 or C7632):
2-10 Vdc control signal; minimum impedance >50k ohm.

4 Binary inputs:
1-wire 24 Vac + common GND (see page 6 for wiring details). 24 Vac power supply: 20 to 30 Vac 50/60Hz; 100 VA Class 2 transformer.

Outputs

Actuator signal: 2-10 Vdc; minimum actuator impedance is 2k ohm; Sylkbus two-wire output for Honeywell Sylkbus communicating actuators.

Exhaust fan, Y1, Y2 and AUX1 O:
All Relay Outputs (at 30 Vac):
Running: 1.5A maximum
Inrush: 7.5A maximum

Environmental

Operating Temperature: -40 to 150 °F (-40 to 65 °C).
Exception of display operation down to -4 °F with full recovery at -4 °F from exposure to -40 °F

Storage Temperature: -40 to 150 °F (-40 to 65 °C)

Shipping Temperature: -40 to 150 °F (-40 to 65 °C)

Relative Humidity: 5% to 95% RH non-condensing

Dimensions (See Fig. 1 on page 3):
Height: 4.98 inches (126.4 mm)
Width: 6.3 inches (160 mm)
Depth: 1.34 inches (34 mm)

Weight: 0.58 lb. (0.265 kg)

ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number. If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Environmental and Combustion Controls Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care
   1985 Douglas Drive North
   Minneapolis, Minnesota 55422-4386
3. http://customer.honeywell.com or http://customer.honeywell.ca

International Sales and Service Offices in all principal cities of the world. Manufacturing in Belgium, Canada, China, Czech Republic, Germany, Hungary, Italy, Mexico, Netherlands, United Kingdom, and United States.

Approvals: UL listed (XAPX) for USA and Canada; California Energy Commission (CEC) FDD ID number HJW10.

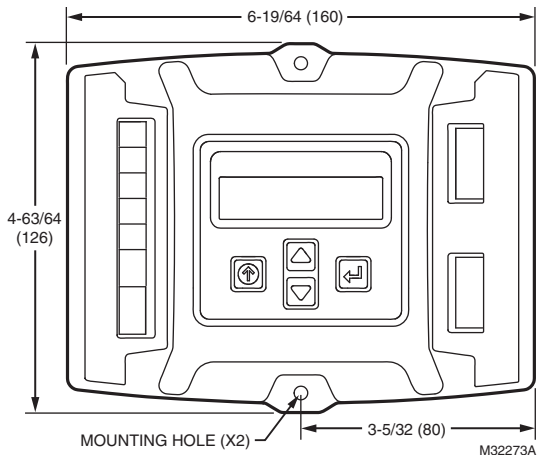


Fig. 1. Dimensions in inches (mm) showing mounting holes.

Accessories

- — 50048926-001 2-pin edge connector for sensors (20 pieces per bag)
- — 50048926-002 6-pin edge connector for field wiring (20 pieces per bag)
- — C7250A 20k sensor for MA or OA (dry bulb changeover)
- — C7400S Sylkbus sensor for enthalpy control in OA and/or RA and RA for differential dry bulb changeover
- — W7220 PCMOD interface tool for JADE controller and Personal Computer. For the software, go to www.customer.honeywell.com/economizertools
- — 50053060-001 Duct mounting kit for sensors
- — C7632 or C7232 CO_2 analog sensors OR one TR40 Sylk bus CO_2 sensor

BEFORE INSTALLATION

Review the “Specifications” on page 2 before installing the The JADE™ Economizer System.

When Installing This Product

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check ratings given in instructions and on the product to ensure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

NOTE: Jade will be in the "set up" mode for the first 60 minutes after powered. If a sensor for OA air or Sylkbus device (sensor, actuator) is disconnected during the set up mode, the Jade will not alarm that failure. The MA sensor is a system "critical" sensor, if the MA sensor is removed during the set up mode, the Jade will alarm. After 60 minutes the Jade controller will change to operation mode and all components removed or failed will alarm in the operation mode.

INSTALLATION AND SETUP

The following installation procedures should be performed in the order listed:

1. Mounting — see page 3.
2. Wiring — see page 4.
3. Interface and Programming overview – see page 18.
4. Setup and Configuration — see page 18
5. Checkout — see page 30.

Troubleshooting and Alarms—see page 31.

MOUNTING

This section describes the mounting procedures for the JADE™ Economizer module and the sensors.

Economizer Module Location and Mounting

IMPORTANT

Avoid mounting in areas where acid fumes or other deteriorating vapors can attack the metal parts of the module’s circuit board, or in areas where escaping gas or other explosive vapors are present.

IMPORTANT

The module must be mounted in a position that allows clearance for wiring, servicing, and removal.

Mount the Economizer module on any convenient interior location using the two mounting holes provided on the enclosure using #6 or #8 screws (screws are not provided and must be obtained separately). Use the dimensions in Fig. 1 on page 3 as a guide.

The Economizer module may be mounted in any orientation. However, mounting in the orientation shown in Fig. 1 on page 3 permits proper viewing of the LCD display and use of the keypad.

Sensor Location and Mounting

The JADE™ Economizer W7220 uses digital and communicating sensors for control. The C7250 temperature sensors (MA[a] and OA[b]) are 20k NTC. A MA sensor is required for all applications and is mounted in the mixed air section of a rooftop unit either directly to the sheet metal using self tapping sheet metal screws or in the air stream using the duct mounting kit. Duct mount kit is part number 50053060-001.

Optional OA, RA[c] and DA[d] Sylkbus sensors communicate with the W7220 on the two-wire communication bus and can either be wired using a two pin header or using a side connector. Each Sylkbus sensor includes a two pin side connector with the packaging. The SKU number of the Sylkbus sensor is C7400S. All OA, RA and DA sensors are the same SKU

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[a] MA = Mixed Air
[b] OA = Outdoor Air
[c] RA = Return Air
[d] DA = Discharge Air

number. The sensor is set for the appropriate type of sensing using the three position DIP switch located on the sensor. OA position is OFF, OFF, OFF; RA is ON, OFF, OFF and DA is OFF, ON, OFF. During installation the sensors are set for the usage desired. See “Sylk Bus Sensor Wiring” on page 7 for DIP switch details.

NOTE: The protective film on the dip switch is only necessary during the factory assembly process. Simply push through the film to set the dip switches; this will not harm the device.

Once installed, a sensor can be changed to a different application by simply changing the DIP switch setting.

Sensor Mounting

The sensors can be mounted directly on to the sheet metal of unit or can be mounted in the air stream using the duct mounting kit (order separately).

The kit contains a rod to hold the sensor in the duct, a flange to secure the sensor rod to the duct wall and fill the hole and a gasket to prevent air from leaking through the duct wall. There are five (5) kits in each bag assembly. See Fig. 2.

The rod has slots for threading the wire to prevent loose or hanging wire in the duct and can be adjusted for 6 to 12 inch length. The flange has extended relief for ease of mounting. See Fig. 3.

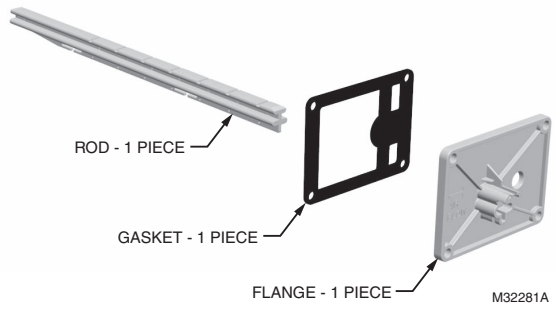


Fig. 2. Duct Mounting Kit (Part No. 50053060-001).

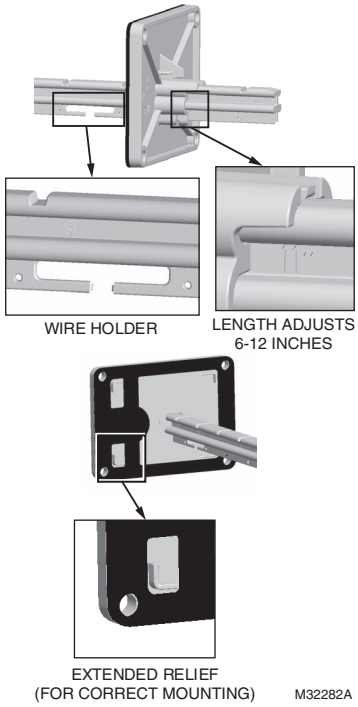


Fig. 3. Duct Mounting Adjustments.

WIRING

All wiring must comply with applicable electrical codes and ordinances, or as specified on installation wiring diagrams. Module wiring in the field is terminated to the four screw terminal blocks located on the left and right sides.

Module wiring at the OEM factory is terminated via the header pin terminals located on the left and right sides. The header terminal pins and the terminal blocks have common terminations for the appropriate input or output. See OEM wiring diagram in Fig. 20.

The remainder of this section describes the wiring for the JADE™ Economizer module, W7220A.

⚠ WARNING

Electrical Shock Hazard.
Can cause severe injury, death or property damage.
Disconnect power supply before beginning wiring, or making wiring connections, to prevent electrical shock or equipment damage.

⚠ CAUTION

Equipment Damage Hazard.
Electrostatic discharge can short equipment circuitry.
Ensure that you are properly grounded before handling the unit.

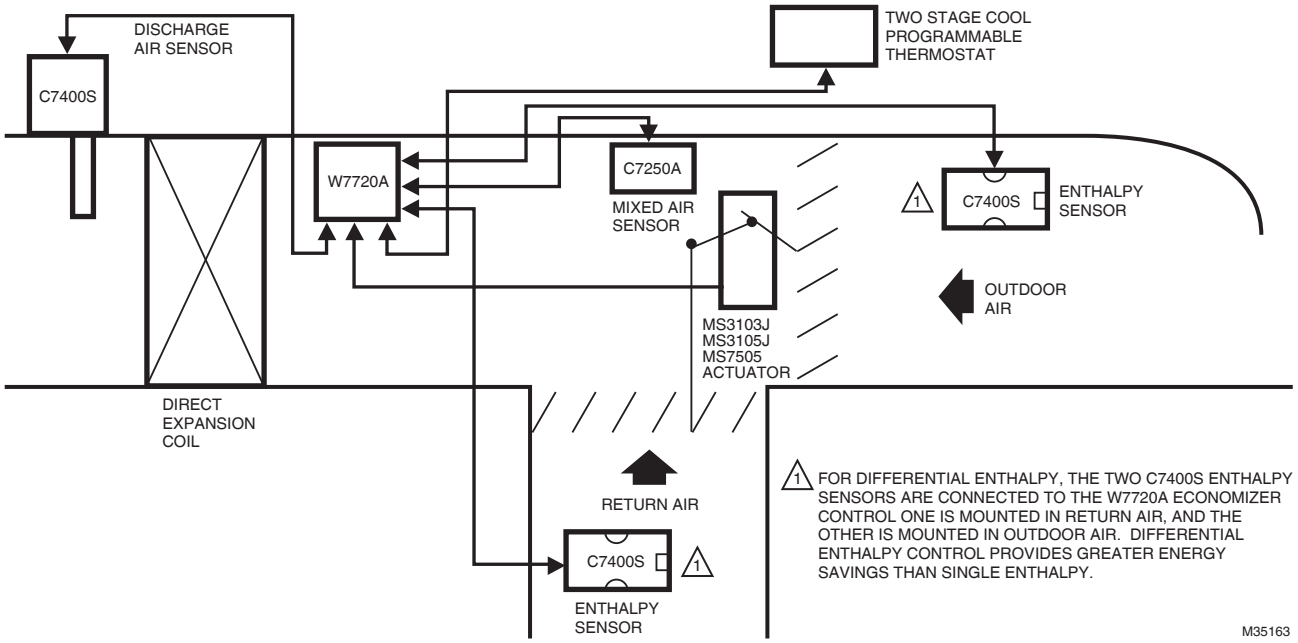


Fig. 4. Location of Outdoor Air, Return Air, Mixed Air, and Discharge Air Sensors in an economizer system.

Economizer Module Wiring Method

Wire the sensors and outputs, then wire the power connection.

Each terminal can accommodate the following gauges of wire:
- Single wire – from 18 AWG to 22 AWG solid or stranded
- Multiple wires – up to two 22 AWG stranded
- For the 24 Vac connections: single wire – from 14 to 18 AWG solid or stranded
- For S-BUS wiring, the sensors may be mounted up to 200 ft. (61 m) from the JADE controller. When the length of wire is over 100 feet use twisted pair shielded wire.
- All sensor wiring to the Sylk bus and analog sensors is polarity insensitive.

Prepare wiring for the terminal blocks, as follows:
1. Remove the plastic tabs from the side of the controller where the connectors will slide onto the PWA.
2. Strip 1/2 in. (13 mm) insulation from the conductor.
3. Cut a single wire to 3/16 in. (5 mm). Insert the wire in the required terminal location and tighten the screw.
4. If two or more wires are being inserted into one terminal location, twist the wires together a minimum of three turns before inserting them to ensure proper electrical contact. See Fig. 5 on page 6.
5. Cut the twisted end of the wires to 3/16 in. (5 mm) before inserting them into the terminal and tightening the screw.
6. Pull on each wire in all terminals to check for good mechanical connection.

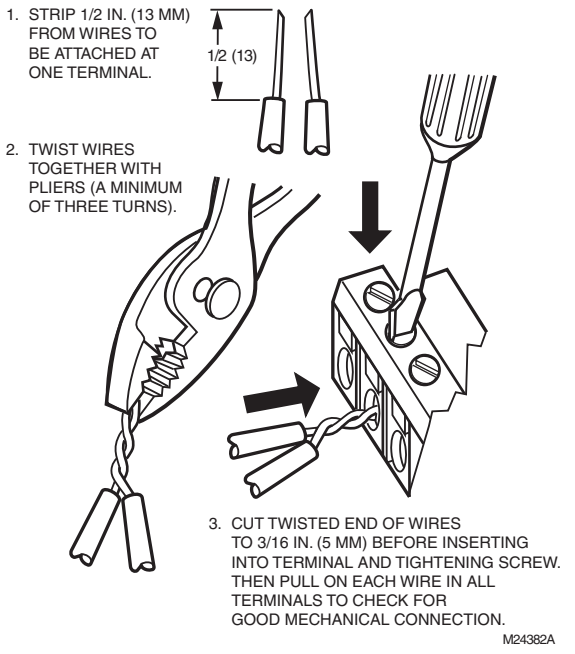


Fig. 5. Attaching two or more wires at terminal blocks.

Economizer Module Wiring Details

The wiring connection terminals for each module/sensor are:
- "JADE™ Economizer Module Wiring" on this page.
- "Sylk Bus Sensor Wiring" on page 7.

JADE™ Economizer Module Wiring

Use Fig. 6 and Tables 1 and 2 to locate the wiring terminals for the Economizer module.

NOTE: The four terminal blocks are removable. You can slide out each terminal block, wire it, and then slide it back into place.

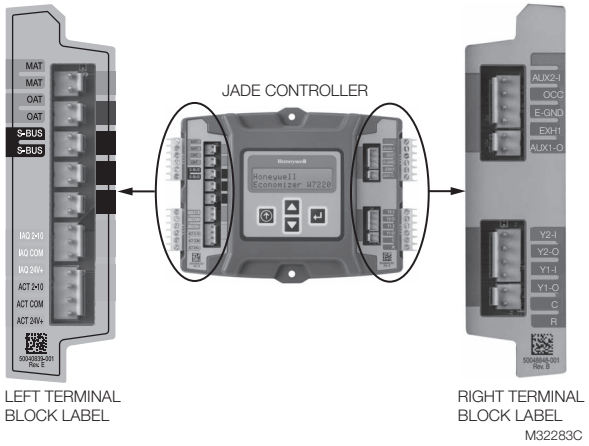


Fig. 6. W7220 Economizer module terminal connection labels.

Table 1. Economizer Module - Left hand terminal blocks.

Label	Type	Description
Top Left Terminal Block		
MAT MAT	20k NTC and COM	Mixed Air Temperature Sensor (polarity insensitive connection)
OAT OAT	20k NTC and COM	Outdoor Air Temperature Sensor (polarity insensitive connection)
S-BUS S-BUS	SYLK Bus	Sylk Bus sensor (polarity insensitive connection)
Bottom Left Terminal Block		
IAQ 2-10	2-10 Vdc	Air Quality Sensor Input (e.g. CO_2 sensor)
IAQ COM	COM	Air Quality Sensor Common
IAQ 24V	24 Vac	Air Quality Sensor 24 Vac Source
ACT 2-10	2-10 Vdc	Damper Actuator Output (2-10 Vdc)
ACT COM	COM	Damper Actuator Output Common
ACT 24V	24 Vac	Damper Actuator 24 Vac Source
	n/a	The bottom pin is not used.

Table 2. Economizer Module - Right hand terminal blocks.

Label	Type	Description
Top Right Terminal Block		
	n/a	The first pin is not used
AUX2 I	24 Vac IN	Shut Down (SD) or Heat (W) Conventional only or Heat Pump Changeover (O/B) in Heat Pump mode.
OCC	24 Vac IN	Occupied / Unoccupied Input
E-GND	EGND	Earth Ground - System Required
EXH1	24 Vac OUT	Exhaust Fan 1 Output
AUX1 O	24 Vac OUT	Programmable: Exhaust fan 2 output or ERV or System Alarm output.
Bottom Right Terminal Block		
Y2-I	24 Vac IN	Y2 in - Cooling Stage 2 Input from space thermostat
Y2-O	24 Vac OUT	Y2 out - Cooling Stage 2 Output to stage 2 mechanical cooling
Y1-I	24 Vac IN	Y1 in - Cooling Stage 1 Input from space thermostat
Y1-O	24 Vac OUT	Y1 out - Cooling Stage 1 Output to stage 1 mechanical cooling
C	COM	24 Vac Common
R	24 Vac	24 Vac Power (Hot)

Sylk Bus Sensor Wiring

The labels on the sensors and controller are color coded for ease of installation. Orange labeled sensors can only be wired to orange terminals on the controller. Brown labeled sensors can only be wired to S-bus (brown) terminals. Use Fig. 7 and Table 3 to locate the wiring terminals for each Sylk Bus sensor.

Use Fig. 7 and Table 4 to set the DIP switches for the desired use of the sensor.

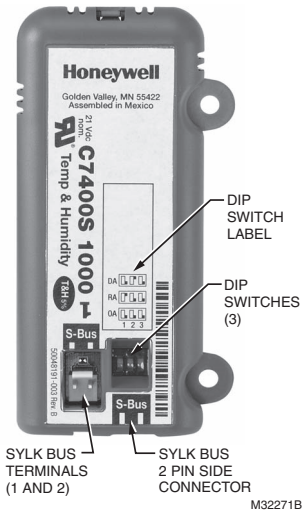


Fig. 7. Sylk Bus sensor DIP switches.

Table 3. SYLK Bus Sensor Wiring Terminations.

Terminal		Type	Description
Nbr	Label		
1	S-BUS	SYLK Bus	Sylk Bus Communications (Sensor Bus) polarity insensitive
2	S-BUS	SYLK Bus	Sylk Bus Communications (Sensor Bus) polarity insensitive

Table 4. SYLK Bus Sensor DIP Switch Settings.

Use	DIP Switch Positions for Switches 1, 2, & 3		
	1	2	3
DA[a]	OFF	ON	OFF
RA[b]	ON	OFF	OFF
OA[c]	OFF	OFF	OFF

[a] DA = Discharge Air
[b] RA = Return Air
[c] OA = Outdoor Air

NOTE: When using the Sylkbus sensors there will be a slight delay while the Jade controller and the sensor communicate. Analog sensors do not communicate on the Sylkbus and output a 20k ohm signal to the Jade controller so the response time is instantaneous.

NOTE: When using the C7400S (Sylk bus enthalpy) sensor there is an operation that will allow test of the operation of the W7220 economizer when the outdoor air conditions (temperature and humidity) are too high for economizing.

1. Remove the C7250A dry bulb sensor from the OAT terminals IF you are using temperature only economizing change over.
2. If you are using enthalpy change over and have a C7400S sensor with a date code prior to 1301, remove the sensor and replace it with one with a date code after 1301.
3. Connect a C7400S Sylk bus sensor to the S-Bus terminals (brown colored) on the W7220A Jade using 18 AWG to 22 AWG solid or stranded wires.
4. Check the STATUS screen for actual outdoor air (OA) temperature and OA humidity readings.
5. Change the 3-position DIP switch on the C7400S sensor from 1 OFF, 2 OFF, 3 OFF to 1 ON, 2 ON, 3 ON position and immediately back to 1 OFF, 2 OFF 3 OFF position.
6. The output of the C7400S sensor to the W7220A will be 40 ºF and 40 %RH which will allow the economizer to go into free cooling mode (economizing available).
7. Make sure you have 24 Vac on terminal Y1 In to simulate a call for cooling.
8. After 15 minutes the C7400S sensor will change back to the actual OA temperature and humidity.

NOTE: If you removed a dry bulb sensor, remove the C7400S from the S-bus terminals and replace the OAT sensor onto the OAT terminals.

Actuator Wiring Options:

1. The JADE economizer controller can only have one (1) communicating actuator connected to it.
2. Up to four (4) non-communicating and two (2) 2-position actuators (1 each on EXH1 and AUX1 O)
3. One (1) communicating and up to four (4) non-communicating and two (2) 2-position actuators (1 each on EXH1 and AUX1 O). When using a 2-position actuator on the AUX1 O, the AUX1 O must be programmed for Exh2 and the % open is the % open of the outdoor damper when the 2-pos actuator opens. Connect 24 V to Exh1 and/or AUX1 O and ground to the Jade "C" terminal.

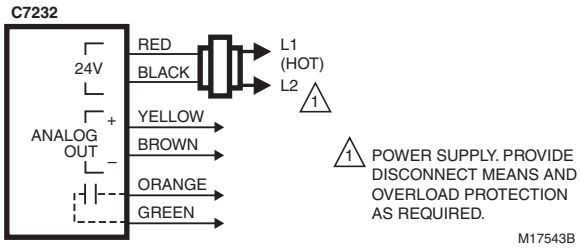


Fig. 8. Wiring for C7232

CO2 Sensor Wiring

When using the C7232 Honeywell CO_2 sensors the black and brown common wires are internally connected and only one is connected to "IAQ COM" on the Jade. Use the power from the Jade to power the CO2 sensor OR make sure the ground for the power supplies are common. See wiring diagram below for the C7232 and C7632 wiring diagrams.

NOTE: When using the C7632 (or any 0-10 Vdc CO_2 sensor) with the Jade you will need to set the CO2ZERO to 400 ppm and the CO2SPAN to 1600 ppm in the ADVANCED SETUP menu.

NOTE: When using the TR40 CO_2 sensor set the address on the TR40-CO2 to 6. Only one TR40 CO_2 sensor can be used with the Jade economizer controller. Address 6 is for a CO_2 sensor, address 11 is for a communicating actuator.

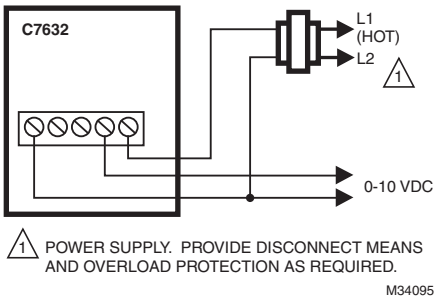


Fig. 9. Wiring for C7632

WIRING APPLICATION EXAMPLES

This section shows the wiring configurations for the JADE™ Economizer system.

Stand-alone Economizer

The most basic configuration is the stand-alone Economizer (see Fig. 10 and Fig. 15).

A stand-alone Economizer is directly wired to sensors, actuators, thermostat, and mechanical cooling controls in the roof top unit. It does not require Sylk Bus communications.

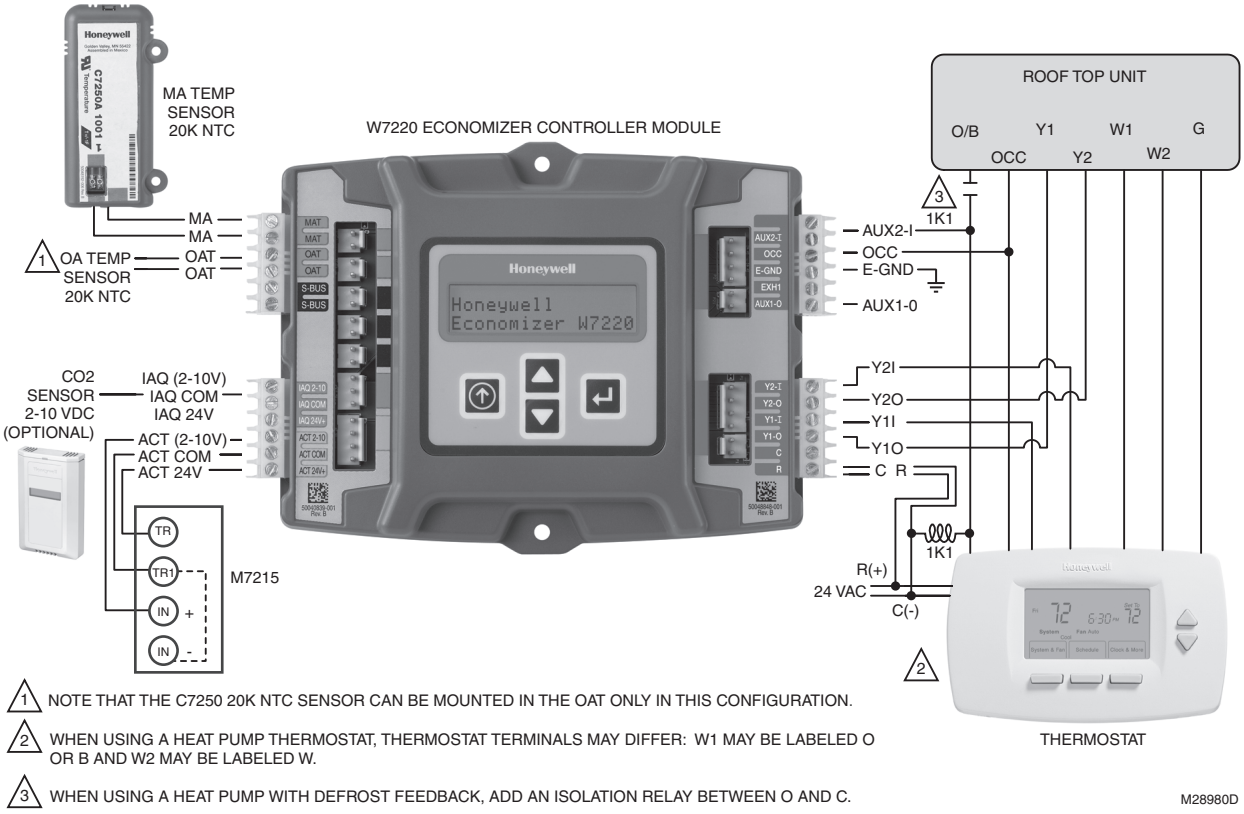
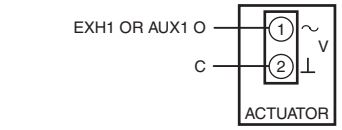


Fig. 10. Stand-alone dry bulb Economizer configuration with black motor M7215.



NOTE: ON/OFF ACTUATORS CAN BE USED ON THE EXH1 OR AUX1 O TERMINAL WITH GROUND TO THE C TERMINAL. WHEN PROGRAMMING THE EXH1 OR AUX1 O, THE % IS THE PERCENT OPEN POSITION OF THE OUTDOOR AIR DAMPER WHEN THE EXH1 OR AUX1 O TERMINAL IS ENERGIZED AND THE 2-POS DAMPER GOES OPEN. IF USING THE AUX1 O TERMINAL PROGRAM AUX1 O FOR EXH2.

M33409

Fig. 11. 2-position actuator.

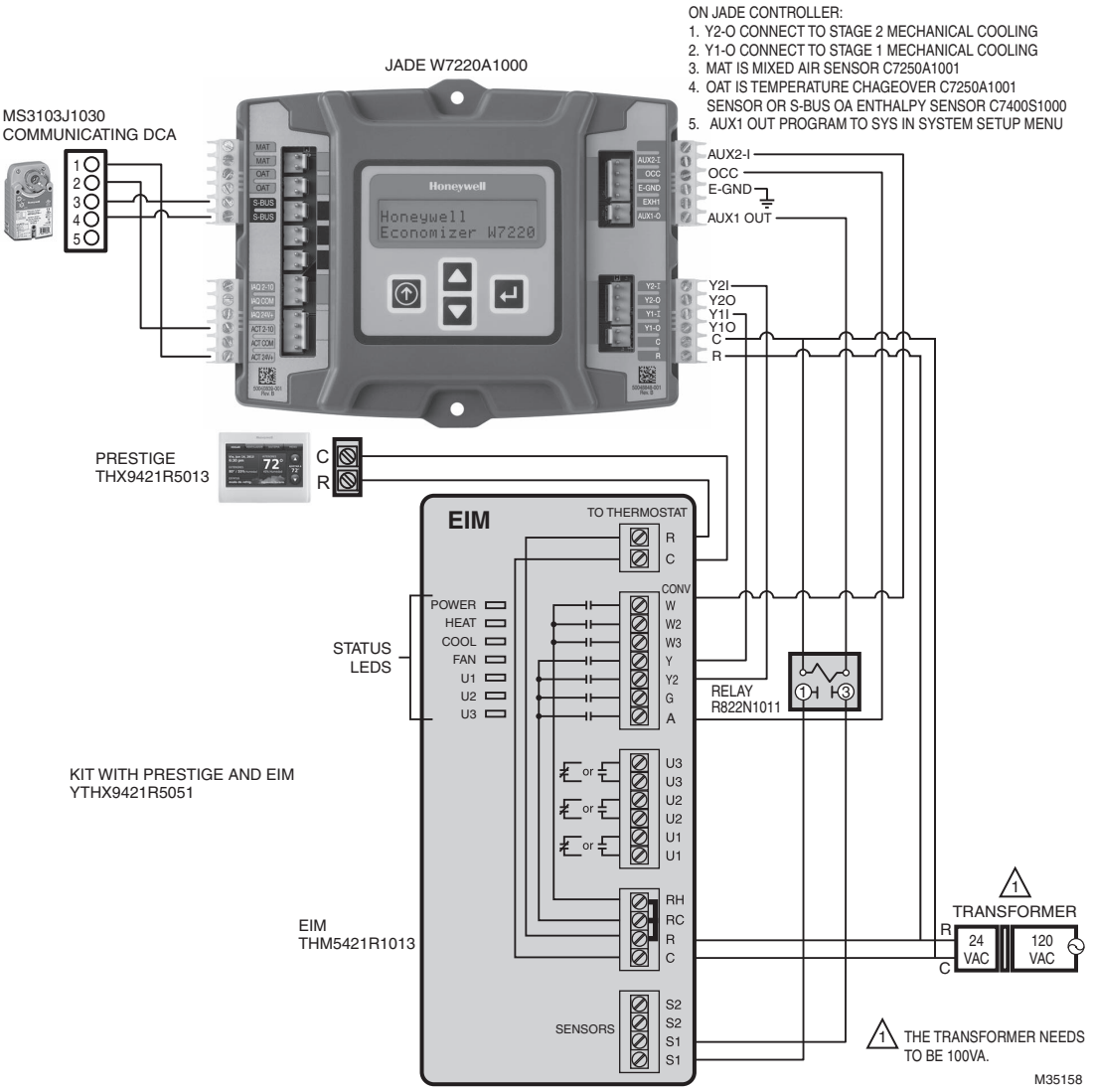
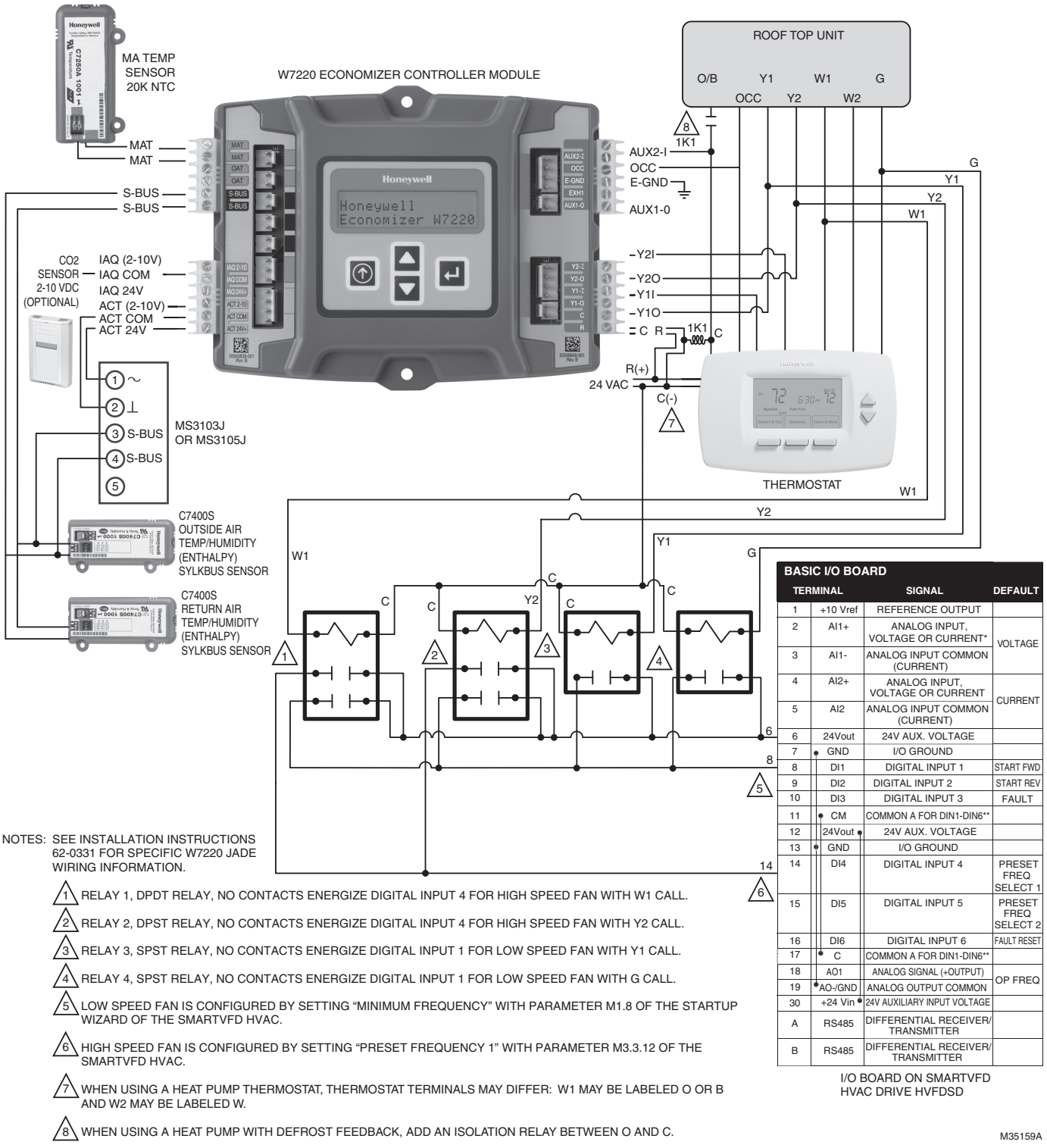


Fig. 12. Prestige and EIM with communicating actuator.



BASIC I/O BOARD			
TERMINAL		SIGNAL	DEFAULT
1	+10 Vref	REFERENCE OUTPUT	
2	AI1+	ANALOG INPUT, VOLTAGE OR CURRENT*	VOLTAGE
3	AI1-	ANALOG INPUT COMMON (CURRENT)	
4	AI2+	ANALOG INPUT, VOLTAGE OR CURRENT	CURRENT
5	AI2	ANALOG INPUT COMMON (CURRENT)	
6	24Vout	24V AUX. VOLTAGE	
7	GND	I/O GROUND	
8	DI1	DIGITAL INPUT 1	START FWD
9	DI2	DIGITAL INPUT 2	START REV
10	DI3	DIGITAL INPUT 3	FAULT
11	CM	COMMON A FOR DIN1-DIN6**	
12	24Vout	24V AUX. VOLTAGE	
13	GND	I/O GROUND	
14	DI4	DIGITAL INPUT 4	PRESET FREQ SELECT 1
15	DI5	DIGITAL INPUT 5	PRESET FREQ SELECT 2
16	DI6	DIGITAL INPUT 6	FAULT RESET
17	C	COMMON A FOR DIN1-DIN6**	
18	AO1	ANALOG SIGNAL (+OUTPUT)	OP FREQ
19	AO-/GND	ANALOG OUTPUT COMMON	
30	+24 Vin	24V AUXILIARY INPUT VOLTAGE	
A	RS485	DIFFERENTIAL RECEIVER/ TRANSMITTER	
B	RS485	DIFFERENTIAL RECEIVER/ TRANSMITTER	

I/O BOARD ON SMARTVFD HVAC DRIVE HVFDSD

NOTES: SEE INSTALLATION INSTRUCTIONS 62-0331 FOR SPECIFIC W7220 JADE WIRING INFORMATION.

1. RELAY 1, DPDT RELAY, NO CONTACTS ENERGIZE DIGITAL INPUT 4 FOR HIGH SPEED FAN WITH W1 CALL.
2. RELAY 2, DPST RELAY, NO CONTACTS ENERGIZE DIGITAL INPUT 4 FOR HIGH SPEED FAN WITH Y2 CALL.
3. RELAY 3, SPST RELAY, NO CONTACTS ENERGIZE DIGITAL INPUT 1 FOR LOW SPEED FAN WITH Y1 CALL.
4. RELAY 4, SPST RELAY, NO CONTACTS ENERGIZE DIGITAL INPUT 1 FOR LOW SPEED FAN WITH G CALL.
5. LOW SPEED FAN IS CONFIGURED BY SETTING “MINIMUM FREQUENCY” WITH PARAMETER M1.8 OF THE STARTUP WIZARD OF THE SMARTVFD HVAC.
6. HIGH SPEED FAN IS CONFIGURED BY SETTING “PRESET FREQUENCY 1” WITH PARAMETER M3.3.12 OF THE SMARTVFD HVAC.
7. WHEN USING A HEAT PUMP THERMOSTAT, THERMOSTAT TERMINALS MAY DIFFER: W1 MAY BE LABELED O OR B AND W2 MAY BE LABELED W.
8. WHEN USING A HEAT PUMP WITH DEFROST FEEDBACK, ADD AN ISOLATION RELAY BETWEEN O AND C.

M35159A

Fig. 13. Jade with Prestige IAQ thermostat, communicating actuator, CO2 and VFD.

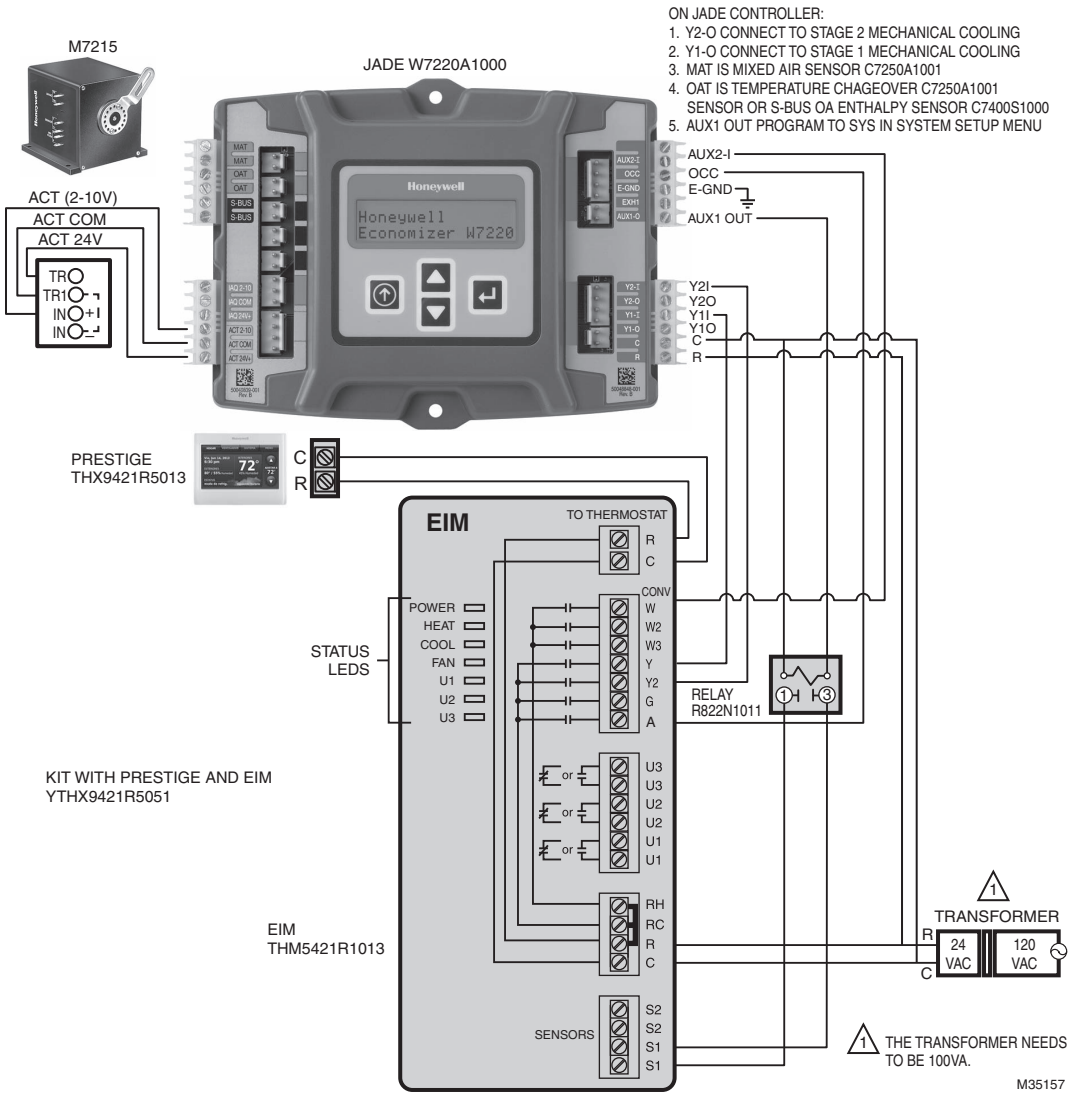


Fig. 14. Jade with Prestige IAQ thermostat and EIM, communicating actuator, CO2 and VFD.

EXH1 and EXH2 wiring:

Relay Digital Output Rating at 30 Vac (maximum powerfrom Class 2 input only): 1.5A run;
3.5A inrush @ 0.45PF (200,000 cycles) or
7.5A inrush @ 0.45PF (100,000 cycles)

If the inrush or FLA amps is above listed limits OR if the fan is a line voltage fan, an external relay will be required.

If no relay is required, the EXH1 or AUX1 out is wired to one side of the fan and the other side is wired to system common "C" on the W7220 or equipment terminal board. (W7220 powered off the system transformer).

If a relay is required, the coil of the relay would be wired between the EXH1 or AUX1 and the C terminal of the W7220.

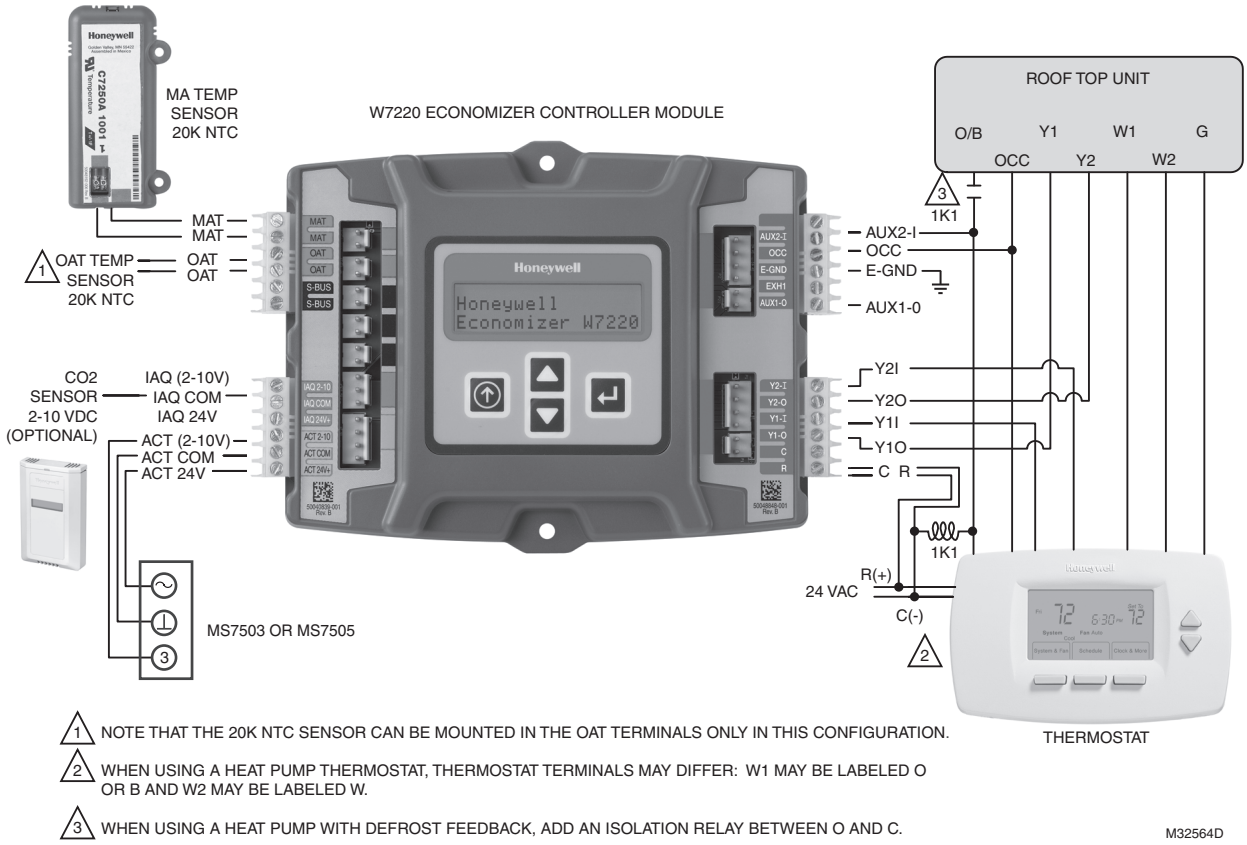


Fig. 15. Stand-alone dry-bulb Economizer configuration with Honeywell MS7503 or MS7505 Direct Coupled Actuator.

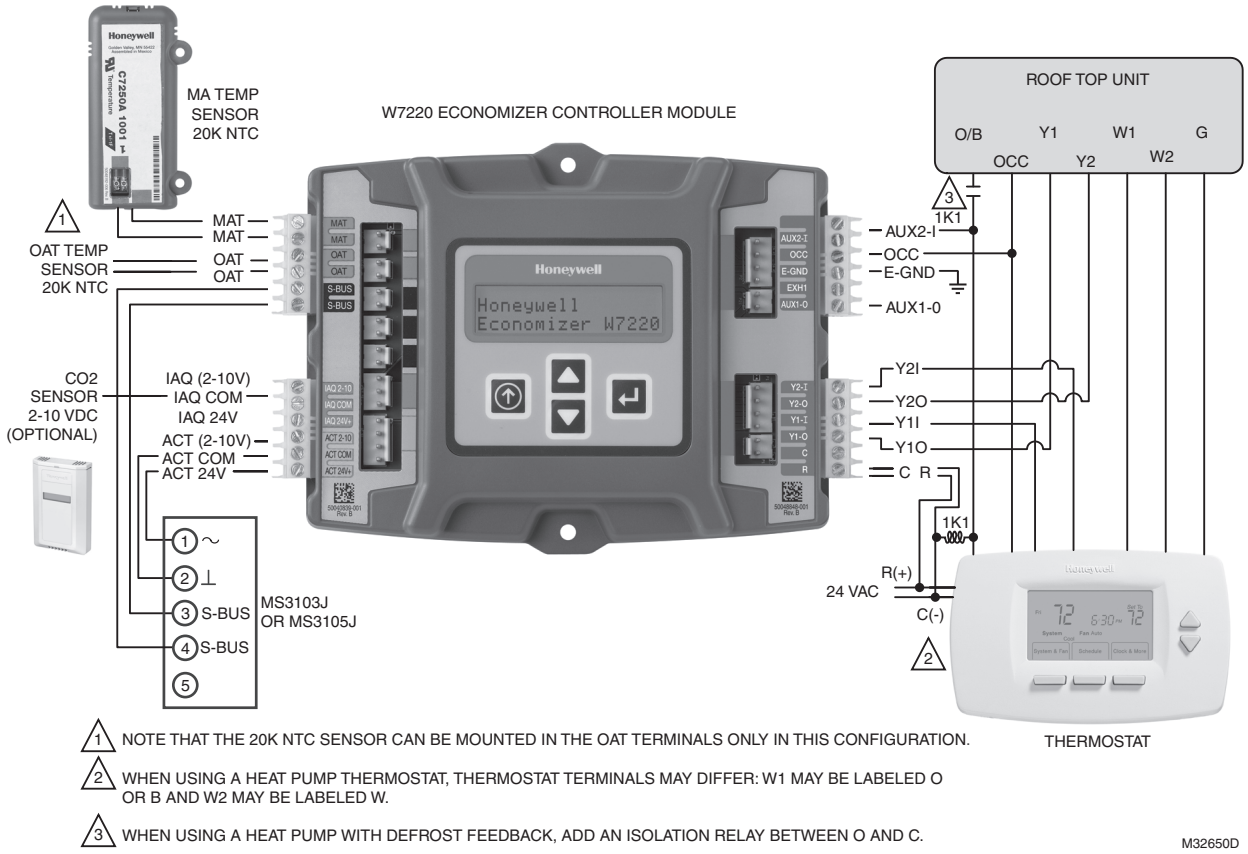


Fig. 16. Stand-alone dry-bulb Economizer configuration with Honeywell MS3103J or MS3105J communicating actuators.

Economizer with Sylk Bus Sensors

A standalone economizer with Sylk Bus sensors uses Sylk Bus communications (see Fig. 17, Fig. 18 and Fig. 19). The Sylk Bus reduces wiring requirements while providing additional functionality.

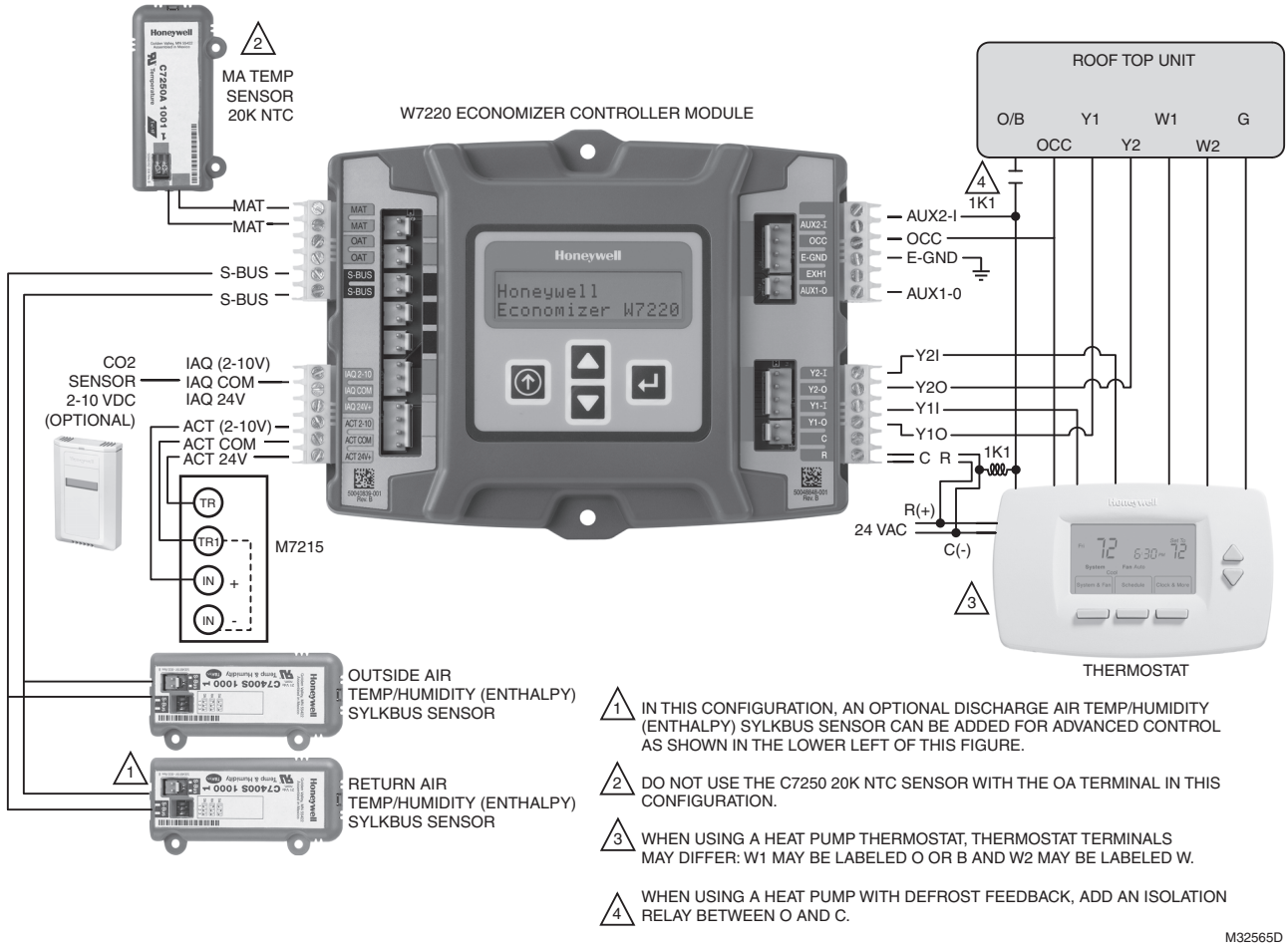


Fig. 17. Economizer with Sylk Bus sensors for enthalpy configuration with Honeywell M7215 black motor.

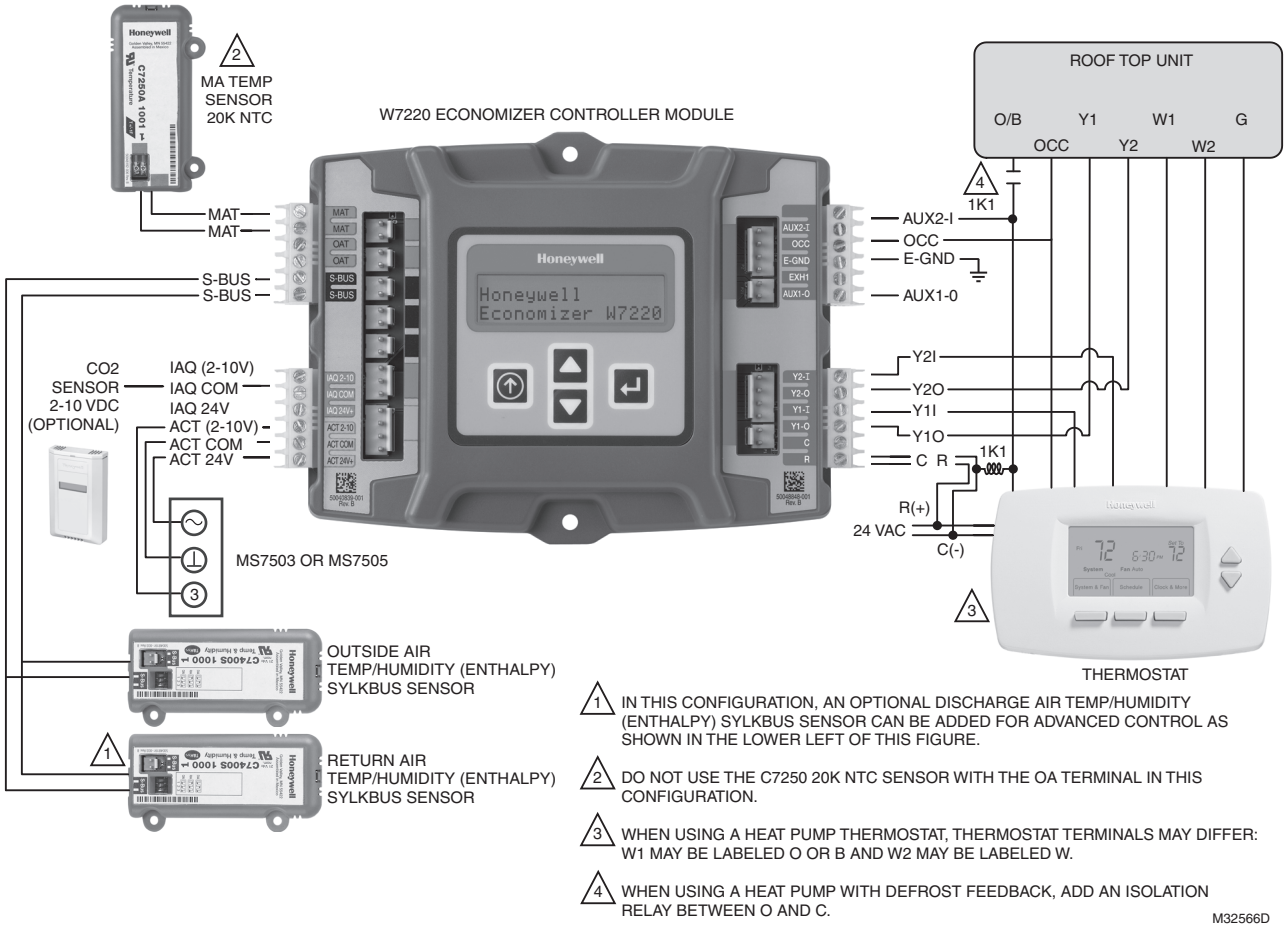


Fig. 18. Economizer with Sylk Bus sensors for enthalpy configuration with a Honeywell MS7503 or MS7505 Direct Coupled Actuator.

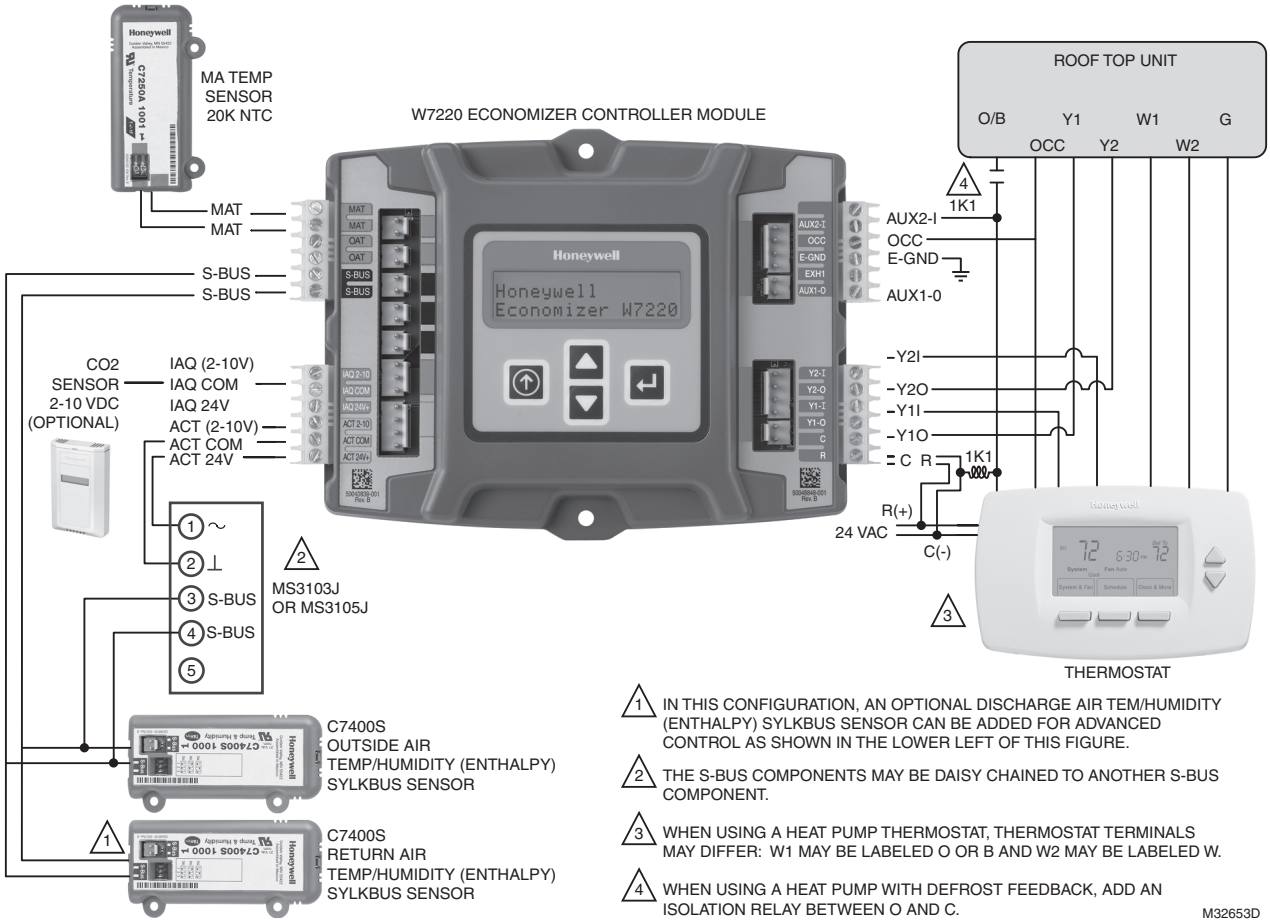
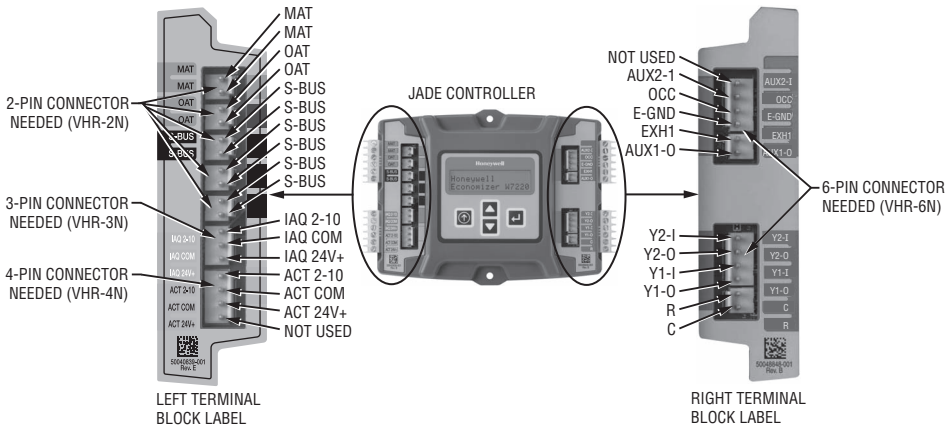


Fig. 19. Economizer with Sylk Bus sensors for enthalpy configuration with a Honeywell MS3103J or MS3105J communicating actuators.



PART NUMBER	PIN COUNT	MANUFACTURER	
JST VH CONNECTOR PLASTIC HOUSING VHR-2N PLUS 2 PIECES SVH-21T-P1.1 METAL CONTACT	2	JST VH	
JST VH CONNECTOR PLASTIC HOUSING VHR-3N PLUS 3 PIECES SVH-21T-P1.1 METAL CONTACT	3	JST VH	
JST VH CONNECTOR PLASTIC HOUSING VHR-4N PLUS 4 PIECES SVH-21T-P1.1 METAL CONTACT	4	JST VH	
JST VH CONNECTOR PLASTIC HOUSING VHR-6N PLUS 6 PIECES SVH-21T-P1.1 METAL CONTACT	6	JST VH	
TYPE 42743-2	1	AMP	1/4 INCH QUICK CONNECT FOR M7215 BLACK MOTOR

NOTE: THOSE ARE NOT HONEYWELL PART NUMBERS. TO PLACE AN ORDER - CONTACT YOUR SALES REPRESENTATIVE.

M31402E

Fig. 20. OEM wiring harness information. Refer to previous wiring diagrams for detailed application wiring.

INTERFACE OVERVIEW

This section describes how to use the Economizer's user interface for:
- Keypad and menu navigation
- Settings and parameter changes
- Menu structure and selection

User Interface

The user interface consists of an LCD display and a 4-button keypad on the front of the Economizer module. The LCD is a 16 character by 2 line dot matrix display.

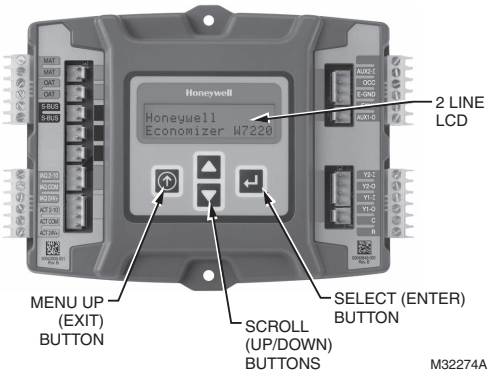


Fig. 21. Economizer LCD and Keypad Layout.

Keypad

The four navigation buttons illustrated in Fig. 21 are used to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

Using the Keypad with Menus

To use the keypad when working with menus:
- Press the ▲ button to move to the previous menu.
- Press the ▼ button to move to the next menu.
- Press the ↵ button (Enter) to display the first item in the currently displayed menu.
- Press the ⓘ button (Menu up) to exit a menu's item and return to the list of menus.

Using the Keypad with Settings and Parameters

To use the keypad when working with Setpoints, System and Advanced Settings, Checkout tests, and Alarms:
- Navigate to the desired menu.
- Press the ↵ button (Enter) to display the first item in the currently displayed menu.
- Use the ▲ and ▼ buttons to scroll to the desired parameter.
- Press the ↵ button (Enter) to display the value of the currently displayed item.
- Press the ▲ button to increase (change) the displayed parameter value.[a]
- Press the ▼ button to decrease (change) the displayed parameter value.[a]
- Press the ↵ button to accept the displayed value and store it in non-volatile RAM.
- CHANGE STORED displays.
- Press the ⓘ button (MenuUp/Exit) to return to the previous menu.

[a] When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

Menu Structure

Table 5 on page 19 illustrates the complete hierarchy of menus and parameters for the JADE™ Economizer system.

The Menus in display order are:
- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

IMPORTANT

Table 5 on page 19 illustrates the complete hierarchy. Your menu parameters will be different depending on your configuration.

For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear and only MIN POS will display. If you have a CO2 sensor, the DCV MIN and DCV MAX will appear AND if you have 2 speed fan DCV MIN (high and low speed) and DCV MAX (high and low speed will appear).

SETUP AND CONFIGURATION

Before being placed into service, the JADE™ Economizer module must be setup and configured for the installed system.

IMPORTANT

During setup, the Economizer module is live at all times.

The setup process uses a hierarchical menu structure that is easy to use. You press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the ↵ button to select and confirm setup item changes.

Time-out and Screensaver

When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each Status items displays in turn and cycles to the next item after 5 seconds.

Table 5. Menu Structure[a].

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
STATUS	ECON AVAIL	NO	YES/NO	YES = economizing available; the system can use Outdoor Air for free cooling when required.
	ECONOMIZING	NO	YES/NO	YES = Outdoor Air being used for 1st stage cooling.
	OCCUPIED	NO	YES/NO	YES = OCC signal received from space thermostat or unitary controller. YES = 24 Vac on terminal OCC No = 0 Vac on terminal OCC.
	HEAT PUMP	n/a[c]	COOL HEAT	Displays COOL or HEAT when system is set to heat pump (non-conventional)
	COOL Y1-IN	OFF	ON/OFF	Y1-I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 Vac on term Y1-I OFF = 0 Vac on term Y1-I
	COOL Y1-OUT	OFF	ON/OFF	Cool Stage 1 Relay Output to mechanical cooling (Y1-OUT terminal).
	COOL Y2-IN	OFF	ON/OFF	Y2-I signal from space thermostat or unitary controller for second stage cooling. ON = 24 Vac on term Y2-I OFF = 0 Vac on term Y2-I
	COOL Y2-OUT	OFF	ON/OFF	Cool Stage 2 Relay Output to mechanical cooling (Y2-OUT terminal).
	MA TEMP	_ _._ °F	-40 to 150 °F	Displays value of measured mixed air from MAT sensor. Displays --.- if not connected, short, or out- of-range.
	DA TEMP	_ _._ °F	-40 to 150 °F	Displays when Discharge Air Sylk Bus sensor is connected and displays measured discharge air temperature. Displays --.-°F if sensor sends invalid value, if not connected, short or out-of-range.
	OA TEMP	_ _._ °F	-40 to 140 °F	Displays measured value of outdoor air temperature. Displays --°F if sensor sends invalid value, if not connected, short or out-of-range.
	OA HUM	_ _ %	0 to 100%	Displays measured value of outdoor humidity from OA Sylkbus sensor. Displays --% if not connected, short, or out- of-range.
	RA TEMP	_ _._ °F	0 to 140 °F	Displays measured value of return air temperature from RA Sylkbus sensor. Displays --°F if sensor sends invalid value, if not connected, short or out-of-range.
	RA HUM	_ _ %	0 to 100%	Displays measured value of return air humidity from RA Sylkbus sensor. Displays --% if sensor sends invalid value, if not connected, short or out-of-range.
	IN CO2	_ _ _ ppm	0 to 2000 ppm	Displays value of measured CO2 from CO2 sensor. Invalid if not connected, short or out-of-range. May be adjusted in Advanced menu by Zero offset and Span. See note on page 6 concerning C7632 sensor.
	DCV STATUS	n/a	ON/OFF	Displays ON if above setpoint and OFF if below setpoint, and ONLY if a CO2 sensor is connected.
	DAMPER OUT	2.0V	2.0 to 10.0 V	Displays output voltage or position to the damper actuator.[e]
	ACT POS	n/a	0 to 100%	Displays actual position of actuator.
	ACT COUNT	n/a	1 to 65,535	Displays number of times actuator has cycled. 1 Cycle equals the sum of 180° of movement in any direction.
	ACTUATOR	n/a	OK/Alarm (on Alarm menu)	Displays Error if voltage or torque is below actuator range
	EXH1 OUT	OFF	ON/OFF	Output of EXH1 terminal. Displays ON when damper position reaches programmed percentage setpoint. ON = 24 Vac Output; OFF = No Output.

Table 5. Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
STATUS CONTINUED	EXH2 OUT	OFF	ON/OFF	Output of AUX1 O terminal Displays ON when damper position reaches programmed percentage setpoint ON = 24 Vac Output, OFF = No Output; displays only if AUX1 O = EXH2
	ERV	OFF	ON/OFF	Output of AUX1 O terminal, ON = 24 Vac Output, OFF = No Output; displays only if AUX1 O = ERV
	MECH COOL ON or HEAT STAGES ON	0	0, 1, or 2	Displays number of mechanical cooling stages that are active. Displays the stage of heat pump heating that is active.
	FAN SPEED	n/a	LOW or HIGH	Displays speed of fan on a 2-speed fan unit
	W (HEAT IN)	n/a	ON/OFF	Displays status of heat on a 2-speed fan unit.
SETPOINTS	MAT SET	53ºF	38 to 70 ºF; increment by 1	The economizer will modulate the OA damper to maintain the mixed air temperature at the setpoint.
	LOW T LOCK	32ºF	-45 to 80 ºF; increment by 1	Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout. At or below the setpoint the Y1-O and Y2-O will not be energized on the controller.
	DRYBLB SET	63ºF	48 to 80 ºF; increment by 1	*Dry bulb setpoint will only appear if using dry bulb change over.* Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63 ºF setpoint unit will economizer at 62 ºF and below and not economize at 64 ºF and above. There is a a 2 ºF deadband.
	ENTH CURVE	ES3	ES1, ES2, ES3, ES4, or ES5	*ES curve will only appear if using enthalpy changeover.* Enthalpy boundary “curves” for economizing using single enthalpy. See page 22 for description of enthalpy curves.
	DCV SET	1100ppm	500 to 2000 ppm increment by 100	Displays ONLY if a CO2 sensor is connected. Setpoint for Demand Control Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS	2.8 V	2 to 10 Vdc	Displays ONLY if a CO2 sensor is NOT connected.
				With 2-speed fan units MIN POS L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for MIN POS L is 3.2V and MIN POS H is 2.8V.
	VENTMAX	2.8 V	2 to 10 Vdc	Displays only if a CO2 sensor is connected. Used for Vbz (ventilation max cfm) setpoint. VENTMAX is the same setting as MIN POS would be if you did not have the CO2 sensor.
			100 to 9990 cfm increment by 10	If OA, MA RA and CO2 sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 cfm.
			2 to 10 Vdc	With 2-speed fan units VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V.
	VENTMIN	2.25 V	2 to 10 Vdc	Displays only if CO2 sensor is connected. Used for Va (ventilation min cfm) setpoint. This is the ventilation requirement for less than maximum occupancy of the space.
			100 to 9990 cfm increment by 10	If OA, MA RA and CO2 sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 cfm.
			2 to 10 Vdc	With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) settings are required. Default for VENTMIN L is 2.5V and VENTMIN H is 2.25V.
	ERV OAT SP[d]	32ºF	0 to 50 ºF; increment by 1	Only when AUX1 O = ERV

Table 5. Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
SETPOINTS CONTINUED	EXH1 SET	50%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50%
	EXH2 SET	75%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EHX2. With 2-speed fan units Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required. Default for Exh2 L is 80% and Exh2 H is 75%
SYSTEM SETUP	INSTALL	01/01/11		Display order = MM/DD/YY Setting order = DD, MM, then YY.
	UNITS DEG	ºF	ºF or ºC	Sets economizer controller in degrees Fahrenheit or Celsius.
	EQUIPMENT	CONV	CONV HP	CONV = conventional. HP O/B = Enables Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller.
	AUX2 IN	n/a	Shutdown (SD) Heat (W1) HP(O) HP(B)	In CONV mode: SD = Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. **NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in the two-speed fan mode.** In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on Heat.
	FAN SPEED	1 speed	1 speed/ 2 speed	Sets economizer controller for operation of 1 speed or 2 speed supply fan. The controller does not control the fan but positions the OA and RA dampers to the heating or cooling mode. See page 23 for modes and position. **NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In.**
	FAN CFM	5000cfm	100 to 50000 cfm; increment by 100	This is the capacity of the RTU. The value is found on the label from the RTU manufacturer. The cfm of the fan is only used with DCV CAL ENABLE AUO
	AUX1 OUT	NONE	NONE ERV EXH2 SYS	• NONE = not configured (output is not used) • ERV= Energy Recovery Ventilator[d] • EXH2 = second damper position 24 Vac out for second exhaust fan. • SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	When using a setback thermostat with occupancy out (24 Vac), the 24 Vac is input “INPUT” to the OCC terminal. If no occupancy output from the thermostat then change program to “ALWAYS” OR add a jumper from terminal R to OCC terminal.
	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to factory default values.

Table 5. Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
ADVANCED SETUP	MA LO SET	45 ºF	35 to 65 ºF; increment by 1º	Temp to activate Freeze Protection (close damper or modulate to MIN POS if temp falls below set value)
	FREEZE POS	CLO	CLO MIN	Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; increment by 10	CO2 ppm level to match CO2 sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; increment by 50	CO2 ppm span to match CO2 sensor; e.g.; 500-1500 sensor output would be 500 CO2 zero and 1000 CO2 span. See note on page 6 for C7632 CO2 sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4h or OFF	Delay after stage 2 for cool has been active. Turns on 2nd stage of mechanical cooling when economizer is 1st stage call and mechanical cooling is 2nd stage call. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling.
	SD DMPR POS	CLO	CLO OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 Vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., Y1-O, Y2-O, EXH1, etc. will shut off.
	DA LO ALM	45 ºF	NONE 35ºF to 65ºF in 5ºF increments	Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.
	DA HI ALM	80 ºF	NONE 70 ºF to 180 ºF in 5º F increments	Used for alarm for when the DA air temperature is too high. Set high range of alarm, above this temperature the alarm will show on the display
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA and MA sensor conditions. Requires all sensors (RA, OA, MA and CO2). This operation is not operable with a 2-speed fan unit.
	MAT T CAL	0.0 F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	OAS T CAL	0.0F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	OAS H CAL	0% RH	+/-10% RH	Allows for the operator to adjust for an out of calibration humidity sensor
	RA T CAL	0.0F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	RA H CAL	0% RH	+/-10% RH	Allows for the operator to adjust for an out of calibration humidity sensor
	DA T CAL	0.0 F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments.	When in economizing mode this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.

Table 5. Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
CHECKOUT[f]	DAMPER MINIMUM POSITION	n/a	n/a	The checkout for the damper minimum positions is based on the system. See Table 6.
	DAMPER OPEN	n/a	n/a	Positions damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in this mode to allow for exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	n/a	n/a	Positions damper to the fully closed position.
	CONNECT Y1-O	n/a	n/a	Closes the Y1-O relay (Y1-O). See **CAUTION** on page 30
	CONNECT Y2-O	n/a	n/a	Closes the Y2-O relay (Y2-O). See **CAUTION** on page 30
	CONNECT AUX1-O	n/a	n/a	Energizes the AUX1-O output. If AUX1-O setting is: • NONE – no action taken • ERV – 24 Vac out. Turns on or signals an ERV that the conditions are not good for economizing but are good for ERV operation.[d] • SYS – 24 Vac out. Issues a system alarm.
	CONNECT EXH1	n/a	n/a	Closes the power exhaust fan 1 relay (EXH1)
ALARMS(#)				**Alarms display only when they are active. The menu title "ALARMS (#)" includes the number of active alarms in parenthesis (). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen.**
	MA T SENS ERR	n/a	n/a	Mixed air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	CO2 SENS ERR	n/a	n/a	CO2 sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues
	OA SYLK T ERR	n/a	n/a	Outdoor air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	OA SYLK H ERR	n/a	n/a	
	RA SYLK T ERR	n/a	n/a	Return air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	RA SYLK H ERR	n/a	n/a	
	DA SYLK T ERR	n/a	n/a	Discharge air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	OA SENS T ERR	n/a	n/a	Outdoor air temperature sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	ACT ERROR	n/a	n/a	Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is moveable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu.
	FREEZE ALARM	n/a	n/a	Check if outdoor temperature is below the LOW Temp Lockout on setpoint menu. Check if Mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced setup menu. When conditions are back in normal range then the alarm will go away.
	SHUTDOWN ACTIVE	n/a	n/a	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX 2IN terminal
	DMP CAL RUNNING	n/a	n/a	If DCV Auto enable has been programmed, when the Jade is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up is in the Advanced setup menu
	DA SENS ALM	n/a	n/a	Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.

Table 5. Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
ALARMS(#) CONTINUED	SYS ALARM	n/a	n/a	When AUX1-O is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-O terminal has 24 Vac out.
	ACT UNDER V	n/a	n/a	Voltage received by Actuator is above expected range
	ACT OVER V	n/a	n/a	Voltage received by Actuator is below expected range
	ACT STALLED	n/a	n/a	Actuator stopped before achieving commanded position
FEATURES ADJUSTABLE ONLY BY USE OF THE W7220 PC MOD TOOL				
	ACT STALL ALARM SUPPRESSION	Disabled	Enabled or Disabled	If enabled this feature allows the operator to suppress the stall alarm in a specific range of the actuator stroke.
	SELECT TYPE OF CONTROLLER	W7220	W7220, W7218 or Pre-programmed special	The operator can configure a program for a customer or job and save the program in the file. Found on the configuration page of the Trade version
	ACTUATOR SLIPPAGE ALARM	Enabled	Enabled or Disabled	Alarms if the actuator becomes disconnected from the damper or is slipping on the shaft. If Enabled, the Jade system will complete a system air temperature check. If there is the expected change in system air temperature, then Jade assumes the actuator is connected to the damper. If the expected system air temperature changes do not occur, then an actuator slippage alarm is displayed on the Jade LCD. Found on the configuration page of the Trade version.
	ACTUATOR SLIPPAGE ALARM SENSITIVITY	Low	Low, Standard or High	Sensitivity can be set to HIGH, STANDARD or LOW. High means the system will check 5 times for the damper to move before displaying the alarm. Standard is 10 times before the alarm is displayed. Low is 20 times before the alarm is displayed. Found on the economizer page of the Trade version.
	LOCATION OF ECONOMIZER CONTROL SENSOR	Before the cooling coil	Before coil or AUTO	The operator can choose if the economizer control sensor (normally referred to as the Mixed air sensor) is placed in the mixed air (before the coil) or Auto in the case the sensor is placed after the cooling coil. Found on the configuration page of the Trade version.
	DAMPER AIA THRESHOLD	15 degrees	5 to 40 degrees	Damper threshold feature (Adaptive Integral Action) is the difference in the mixed air temperature reported by the MAT sensor and the MAT setpoint. Lower (2 degrees) transfer rate between the actual MAT sensor reading and the MAT setpoint normally means the damper is closing and opening faster. Larger transfer rate (up to 20 degrees) between the sensor reading and the setpoint normally means the damper is opening and closing slower. Used in applications where there is a large MA space or there is a long duct between the OA and the MA causing a delay. Found on the economizer page of the Trade version.

[a] Table 5 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear.

[b] When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

[c] n/a = not applicable

[d] ERV Operation: When in Cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode the ERV terminal will be energized when the OA is below the ERV OAT setpoint in the setpoint menu.

[e] When used with Honeywell communicating actuator the damper out is reported in XX.X% open versus XX.X Vdc.

[f] After 10 minutes without a command or mode change, the controller will change to normal operation.

Table 6. Damper minimum position settings and readings on checkout menu.

Fan Speed	Demand Control Ventilation (CO2 Sensor)	Setpoints	Checkout
1	NO	MIN POS	VMAX-HS
1	NO	N/A	N/A
2	NO	MIN POS H	VMAX-HS
2	NO	MIN POS L	VMAX-LS
1	YES	VENT MIN	VMIN-HS
1	YES	VENT MAX	VMAX-HS
2	YES	VENT MIN H	VMIN-HS
2	YES	VENT MAX H	VMAX-LS
2	YES	VENT MINL	N/A
2	YES	VENT MAX L	N/A

SEQUENCE OF OPERATION

Table 7. Dry Bulb Operation No DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	MIN POS to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 8. Dry Bulb Operation With DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below CO2 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open
Above CO2 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN to VENTMAX	Closed

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
		On	On	High	24-v/On	24-v/On	VENTMIN to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 9. Enthalpy Operation No DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	MIN POS to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 10. Enthalpy Operation With DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open
Above set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Table 11. Dry Bulb Operation No DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
None	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	MIN POS H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Table 12. Dry Bulb Operation With DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Table 13. Enthalpy Operation No DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
NO CO2 SENSOR	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	MIN POS H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Table 14. Enthalpy Operation With DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

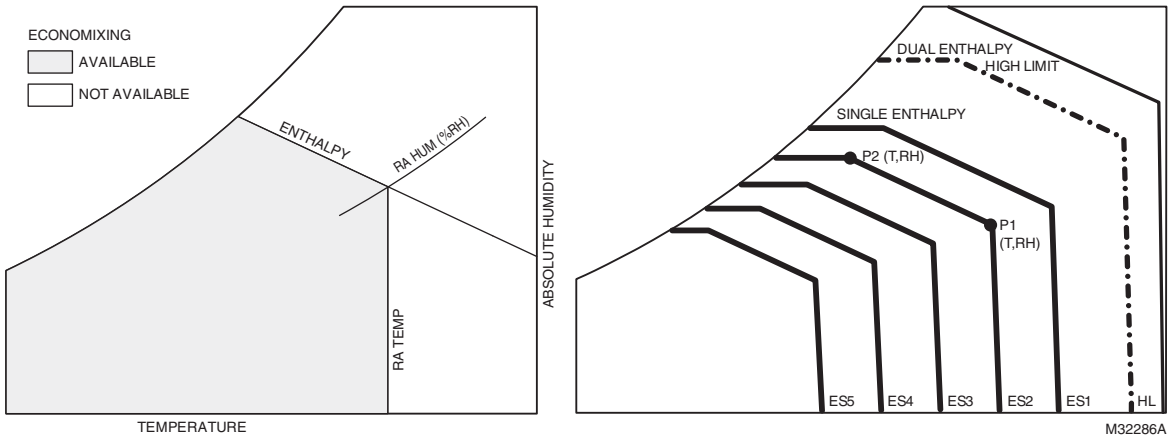


Fig. 22. Single Enthalpy curve and boundaries.

Table 15. Single Enthalpy and Dual Enthalpy High Limit Curves.

Enthalpy Curve	Temp. Dry-Bulb (°F)	Temp. Dewpoint (°F)	Enthalpy (btu/lb/da)	Point P1		Point P2	
				Temp. °F	Humidity %RH	Temp. °F	Humidity %RH
ES1	80.0	60.0	28.0	80.0	36.8	66.3	80.1
ES2	75.0	57.0	26.0	75.0	39.6	63.3	80.0
ES3	70.0	54.0	24.0	70.0	42.3	59.7	81.4
ES4	65.0	51.0	22.0	65.0	44.8	55.7	84.2
ES5	60.0	48.0	20.0	60.0	46.9	51.3	88.5
HL	86.0	66.0	32.4	86.0	38.9	72.4	80.3

Enthalpy Settings

When the OA temperature, enthalpy and dew point are below the respective setpoints, the Outdoor Air can be used for economizing. Fig. 22 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (setpoints ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 15 for the ENTH CURVE setpoint values.

To use enthalpy the W7220 must have a C7400S Sylkbus sensor for OA. The W7220 calculates the enthalpy and dew point using the OA temperature and humidity input from the OA sensor. When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available.

When conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.

Fig. 22 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL when a compressor stage is energized.

Table 15 provides the values for each boundary limit.

Two-Speed Fan Operation

The later versions of the W7220 Jade controller have the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position.

State	Fan Speed
OCC	Low
Y1	Low
Y2	High
W	High

The W (heating mode) is not controlled by the W7220 but it requires the status to know where to position the OA damper for minimum position for the fan speed.

The 2 speed fan delay is available when the system is programmed for 2 speed fan (in the System Setup menu item). The 2 speed fan delay is defaulted to 5 minutes and can be changed in the Advanced Setup menu item. When the unit has a call for Y1 In and in the free cooling mode and there is a call for Y2 In, the 2-speed fan delay starts and the OA damper will modulate 100% open, the supply fan should be set to high speed by the unit controller. After the delay one of two actions will happen:

- The Y2 In call will be satisfied with the damper 100% open and fan on high speed and the call will turn off

OR

- If the call for additional cooling in the space has not been satisfied then the first stage of mechanical cooling will be enabled through Y1 Out or Y2 Out.

CHECKOUT

Inspect all wiring connections at the Economizer module's terminals, and verify compliance with the installation wiring diagrams.

For checkout, review the Status of each configured parameter and perform the Checkout tests.

NOTE: See "Interface Overview" on page 18. for information about menu navigation and use of the keypad.

⚠ WARNING

Electrical Shock Hazard.
Can cause severe injury, death or property damage.
Disconnect power supply before beginning wiring or making wiring connections, to prevent electrical shock or equipment damage.
If any wiring changes are required, first be sure to remove power from the Economizer module before starting work. Pay particular attention to verifying the power connection (24 Vac).

Power Up

After the module is mounted and wired, apply power.

Initial Menu Display

On initial start up, **Honeywell** displays on the first line and **Economizer W7220** on the second line. After a brief pause, the revision of the software appears on the first line and the second line will be blank.

Power Loss (Outage or Brownout)

All setpoints and advanced settings are restored[a] after any power loss or interruption.

[a] All settings are stored in non-volatile flash memory.

Status

Use the Status menu (see Table 5) to check the parameter values for the various devices and sensors configured.

NOTE: See "Interface Overview" on page 18. for information about menu navigation and use of the keypad.

Checkout Tests

Use the Checkout menu (Table 5) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

NOTE: See "Interface Overview" on page 18. for information about menu navigation and use of the keypad.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
2. Press the ↵ button to select the item.
3. RUN? appears on the display.
4. Press the ↵ button to start the test.
5. The unit pauses and then displays IN PROGRESS
6. When all parameters have been tested, press the button (Menu up) to end the test (e.g. turn off the relay).

The checkout tests can all be performed at the time of installation or any time during the operation of the system as a test that the system is operable.

⚠ CAUTION

Equipment damage may result.
Be sure to allow enough time for compressor startup and shutdown between checkout tests so that you do not short-cycle the compressors.

TROUBLESHOOTING

Alarms

The Economizer module provides alarm messages that display on the 2-line LCD.

NOTE: Upon power up, the module waits 60 minutes before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational. The exception is the MA sensor which will alarm immediately.

If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.

You can also navigate to the Alarms menu at any time.

Clearing Alarms

Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor), the alarm can be cleared from the display.

To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the ↵ button.
3. ERASE? displays.
4. Press the ↵ button.
5. ALARM ERASED displays.
6. Press the ⓘ button (MenuUp/Exit) to complete the action and return to the previous menu.

NOTE: If an the alarm still exists after you clear it, it re-displays within 5 seconds.

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Honeywell

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Honeywell

3 Nm, 5 Nm Series Spring Return Direct Coupled Actuators

MS3103, MS3105, MS4103, MS4105, MS7403, MS7405, MS7503, MS7505, MS8103, MS8105

INSTALLATION INSTRUCTIONS

MS3103, MS3105, MS4103, MS4105, MS7403, MS7405, MS7503, MS7505, MS8103, MS8105 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation. *Applications include:*

- *Volume control dampers, mounted directly to the drive shaft or remotely (with the use of accessory hardware).*
- *Quarter-turn rotary valves, such as ball or butterfly valves mounted directly to the drive shaft.*
- *Linear stroke globe or cage valves mounted with linkages to provide linear actuation.*
- *Available with cable on select models*

SPECIFICATIONS

Models:

❑ See Table 1.

Device Weight:

❑ 3.5 lbs (1.60 kg)

Ambient Operating Temperature:

❑ -40° to 150°F (-40° to 65°C)

❑ -22° to 150°F (-30° to 65°C) (Two position only) **Shipping and Storage Temperature:** ❑ -40° to +150°F (-40° to +65°C)

Table 1. Models.

			Power Supply[1]				
Model Number	**Model Number (including 3 ft. whip)**	**Torque**	**Voltage**	**VA Driving 1**	**Drive (sec)**	**Control Input/Output Description**	**SPDT Aux Switch**
MS3103J1030		**27 lb-in (3 Nm)**	**24 Vac/dc @50/60 Hz +/ -20% 24Vdc+/- 10%**	**6/3**	**90**	**Sylk-enabled**	**0**
MS7403A2030						**Floating, Modulating[2],Three-Position, Feedback**	**0**
MS7503A2030						**Floating, Modulating[3], and Feedback**	**0**

[1] Number represents range

[2] 2-10 Vdc

[3] 0/2-10 Vdc

MS7503A2130							**1**
MS8103A1030					**45**	**Two-Position (SPST)**	**0**
MS8103A1130							**1**
MS4103A1030			**100-250 Vac @50/60Hz**	**6/9**	**45**	**Two-Position (SPST)**	**0**
MS4103A1130							**1**
MS3105J3030		**44 lb-in (5 Nm)**	**24 Vac/dc @50/60 Hz +/ -20% 24Vdc+/- 10%**	**6/3**	**90**	**Sylk-enabled (5 addresses & Analog Output)**	**0**
MS3105J3130							**1**
MS7405A2030						**Floating, Modulating[2], Three-Position, Feedback**	**0**
MS7505A2030	**MS7505W2030**					**Floating, Modulating[3], and Feedback**	**0**
MS7505A2130	**MS7505W2130**						**1**
MS8105A1030	**MS8105W1030**				**45**	**Two-Position (SPST)**	**0**
MS8105A1130	**MS8105W1130**						**1**
MS4105A1030			**100-250 Vac @50/60Hz**	**6/9**	**45**	**Two-Position (SPST)**	**0**
MS4105A1130							**1**

Humidity Ratings: ❑ 5% to 95% R.H., Non-Condensing

Electrical Connections:

❑ Field wiring 18 AWG (0.5 mm) to 14 AWG (1.5 mm) conductors (stranded or solid) and up to 2 - 14 AWG (1.5 mm) conductors (stranded) to screw terminals, located under the removable access cover.

Auxiliary Switch (One SPDT):

❑ Switch adjustable from 0-95°

❑ 500 uA Resistive at 5 Vdc (minimum) ❑ 250 Vac, 8 A resistive, 3 A inductive

Mounting: Self-centering shaft adapter (shaft coupling):

❑ Round damper shafts: 3/8 to 5/8 in. (9 to 16 mm) ❑ Square damper shafts: 1/4 to 1/2 in. (6 to 13 mm)

Minimum Damper Shaft Length:

❑ 1 in. (25 mm); 3 in.(76 mm) recommended.

Spring Return Timing (at rated load):

❑ < 25 seconds @ -4°F to 130°F (-20°C to 55°C)
< 60 seconds @ -22°F (-30°C)

Cable Specification:

❑ 300 V, 75° C, Plenum Rated, 3 ft length from end of access cover, 18 AWG

Sylk™ Bus:

❑ Sylk is a two-wire, polarity insensitive bus that provides communications between a Sylk-enabled actuator and a Sylk-enabled controller. For wiring, the Sylk-enabled actuator may be mounted up to 200 ft. (61 m) from the controller; twisted pair wire is recommended for wire runs longer than 100 ft. (30.5 m). Using Sylk-enabled actuators saves I/O on the controller and is faster and cheaper to install since the bus is polarity insensitive.

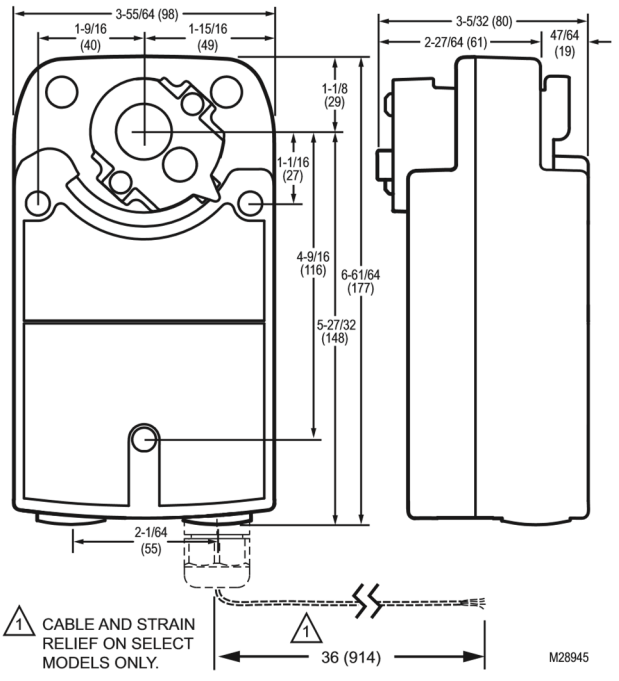


Fig. 1. Dimensional drawing of actuator in in. (mm).

Stroke: 95° ±3°, mechanically limited.

Approvals:
- ❑ UL873
- ❑ IEC 60730-1 and Part 2–14
- ❑ UL1097 for Double Insulation
- ❑ CE Certification Low Voltage Directive 2006/95/EC
- ❑ CE EMC 2004/108/EC ❑ C-Tick N314

Enclosure Ratings:
- ❑ IP54
- ❑ NEMA 2
- ❑ Flame Resistance UL94-5VA

Input Impedance:
- ❑ 95 kOhm minimum.

Feedback Signal:
- ❑ 0(2)-10 Vdc, 3 mA minimum.

Analog Output
Signal: ❑ 0(2)-10 Vdc

Noise Rating at 1m (Maximum):
- ❑ Driving
- ❑ Floating/Modulating/Econ/Sylk-enabled: < 40 dB(A)
- ❑ 2-Position: < 50 dB(A) ❑ Spring Return: < 60 dB(A)

Accessories:
- ❑ 27518 Balljoint (5/16 in.) ❑ 103598 Balljoint (1/4 in.)
- ❑ 27520B, C, E, G, H, K, L, Q Pushrod (5/16 in. diameter)
- ❑ STRN-STRNRLF Water-tight Cable Gland/Strain-relief Fitting (10 pack)
- ❑ STRN-WMK-01 Wall Mount Kit
- ❑ STRN-ECONO-01 Economizer Retrofit Kit
- ❑ STRN-CRK-01 Crank Arm Kit
- ❑ STRN-SCSA Self Centering Shaft Adapter
- ❑ STRN-CA-01 Crank Arm (Non-Self-Centering)
- ❑ STRN-CA-02 Crank Arm (Self-Centering)
- ❑ STRN-BRKT Anti-Rotation Bracket

TYPICAL SPECIFICATION

Spring return actuators shall be direct coupled type requiring neither crankarm nor linkage and be capable of direct mounting to a jackshaft of up to 5/8 in. diameter. The actuator shall connect to the shaft using a removable output hub with a self-centering shaft coupling. This coupling shall provide concentric mounting and include an integral adjustable range-stop mechanism.

The actuator shall provide two-position, floating, proportional, or Sylk bus control. Proportional control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc, or (with addition of a 500 ohm resistor) a 420 mA input signal. Proportional and floating control models shall provide a feedback signal. Sylk-enabled models provide control and feedback via communication between the actuator and Sylkenabled controller. Actuators shall provide wiring terminals located within an integral access cover with conduit connections. Proportional and floating actuators shall have a rotation direction control switch accessible on the cover.

All spring return actuators must be designed for either clockwise or counterclockwise fail-safe operation with a continuously engaged mechanical spring. This spring must return the valve or actuator to a fail-safe position within 25 seconds of power loss.

All actuators shall be designed for a minimum of 60,000 fullstroke cycles at rated torque and temperature, 60,000 spring return cycles and 1,500,000 repositions. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications). All actuators shall be UL60730 and cUL (CSA22.2) listed, have a five year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Honeywell.

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

⚠ CAUTION

Electrical Shock or Equipment Damage Hazard. Low voltage can shock individuals or short equipment circuitry.

Disconnect power supply before installation.

IMPORTANT

All wiring must agree with applicable codes, ordinances and regulations.

Location

These actuators are designed to mount directly to a damper external drive shaft. The shaft coupling fastens to the drive shaft. The actuator housing includes slots which, along with an anti-rotation bracket, secure the actuator to the damper frame or duct work (see Fig. 7).

NOTES:

— When mounted correctly, these slots allow the actuator to *float* without rotating relative to the damper shaft.

— Using other brackets or linkages, the actuator can be foot-mounted or tandem-mounted.

⚠ CAUTION

Motor Damage Hazard.
Corrosive vapors and acid fumes can damage metal and plastic parts.

Install motor in areas free of acid fumes and other deteriorating vapors.

⚠ CAUTION

Equipment Damage Hazard.
Tightly securing actuator to damper housing can damage actuator.

Mount actuator to allow it to float along its vertical axis.

Preparation

Before mounting the actuator onto the damper shaft, determine the:
— Damper/valve opening direction for correct spring return rotation. The actuator can be mounted to provide clockwise or counterclockwise spring return by flipping or turning the unit over.
— Damper shaft size (see the Specifications section).

Determine Appropriate Mounting Orientation

The actuators are designed to open a damper by driving the damper shaft in either a clockwise ↷ or counterclockwise ↶ direction (see Fig. 2).

NOTES:
— Actuators are shipped in the fully closed (spring return) position.
— An arrow on the hub points to a location on the label to indicate the hub rotary position.

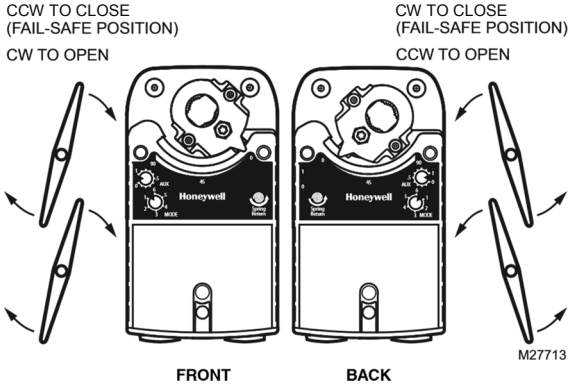


Fig. 2. Spring Return DCA mounting orientation.

Measure Damper/Valve Shaft Length

If the shaft is less than three inches in length, the shaft coupling must be located between the damper/valve and actuator housing. If the shaft length is more than three inches, the shaft coupling may be located on either side of the actuator housing.

If the coupling must be moved from one side of the actuator to the other, reverse the spring return direction and flip the actuator. Follow these instructions (see Fig. 3):

1. Remove the retainer clip from the shaft coupling and set it aside for later use.
2. Remove shaft coupling from one side of the actuator.
3. Replace the shaft coupling on the opposite side of the actuator aligning it based on the stroke labeling.
4. Replace the retainer clip on the shaft coupling using the groove of the coupling.

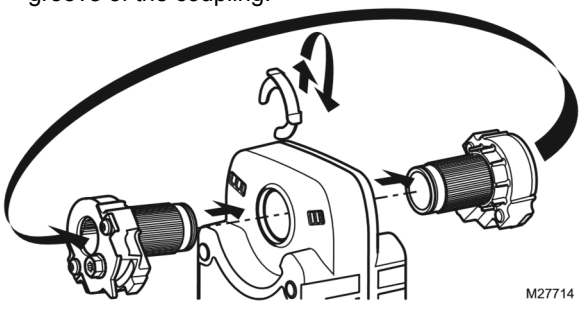


Fig. 3. Mounting shaft coupling to actuator opposite side.

Selecting Actuator Control Signal

Selections are made using a dial that appears on both the front and back of the actuator (see Fig. 4).

To select the control signal simply turn the mode selection dial to the desired mode (as indicated on the device label) without exceeding range indicators.

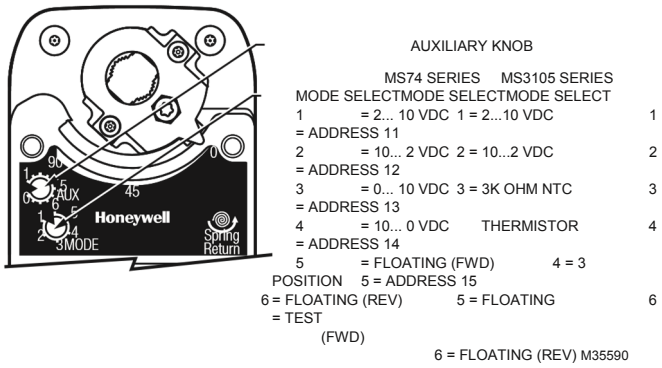


Fig. 4. Dials for control signal and switch or minimum position.

Auxiliary Knob

The auxiliary knob can be used to control minimum position (MS74 Series) or switch position.
with an externally connected 1kOhm potentiometer connected across common (terminal 2) and minimum position (terminal 4); the setting on the AUX dial will be overridden.

SELECT SWITCH POSITION

For switch models, select the degree of rotation you want the switch to activate.

Non-Standard Stroke

Mechanical Stroke Limit Reduction

SELECT MINIMUM POSITION (MS74 SERIES)

To set the actuator minimum position, turn the AUX dial to the desired position. Alternatively, minimum position can be set

For applications requiring a span less than 95 degrees, a simple adjustment can be made. When the rotational mounting of the shaft coupling is changed, the actuator drives less than the full 90 degrees stroke.

The stroke is adjustable in 5 degree increments. Once adjusted, the actuator drives until the shaft coupling reaches the mechanical stop (part of the housing). The stop causes the motor to discontinue driving and the shaft coupling drives no farther. When the actuator returns, it stops at the fail-safe position.

To limit the stroke range, proceed as follows:

1. Remove the retainer clip from the shaft coupling and set it aside for later use.
2. Remove shaft coupling from the actuator.

3. Rotate the coupling to the desired position, aligning it based on the stroke labeling. See Fig. 5.

   NOTE: The shaft coupling location determines the travel span.

   EXAMPLE: Setting shaft coupling to an approximate fail-safe position of 35 degrees (as indicated on the housing) limits stroke to 60 degrees. (See Fig. 5)

4. Install the shaft coupling at this position.
5. Replace the retainer clip on the shaft coupling using the groove of the coupling.

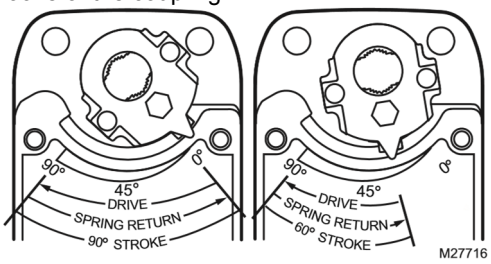


Fig. 5. Stroke reduction.

Mounting

⚠ CAUTION

Device Malfunction Hazard.
Improper shaft coupling tightening causes device malfunction.
Tighten shaft coupling with proper torque to prevent damper shaft slippage.

⚠ CAUTION

Actuator Damage Hazard.
Using actuator as shaft bearing causes device damage.
Use actuator only to supply rotational torque. Avoid any side loads to actuator output coupling bearings.

⚠ CAUTION

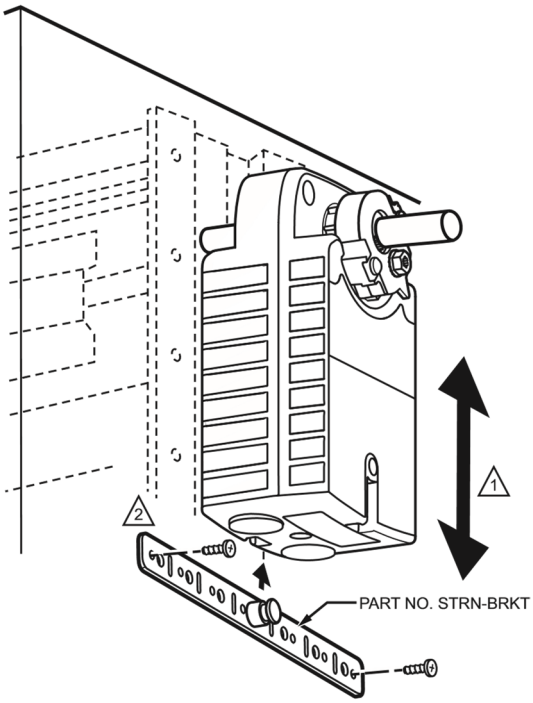
Equipment Damage Hazard.
Can damage the motor beyond repair.
Never turn the motor shaft by hand or with a wrench. Forcibly turning the motor shaft can damage the gear train.

To mount the actuator to an external drive shaft of a damper, proceed as follows:

1. Place actuator over damper shaft; and hold mounting bracket in place. See Fig. 7.
2. Mark screw holes on damper housing.
3. Remove actuator and mounting bracket.
4. Drill or center-punch holes for mounting screws (or use no.10 self-tapping sheet metal screws).
5. Turn damper blades to desired normal (closed) position.
6. Place actuator and mounting bracket back into position and secure bracket to damper box with sheet metal screws.
7. Using 10 mm wrench, tighten shaft coupling securely onto damper shaft using maximum 240 lb-in. (27.1 Nm) torque.

   NOTE: See Fig. 6 for proper mounting to a square damper shaft.

Fig. 6. Proper mounting to square damper shaft.



1 ENSURE THAT MOUNTING ASSEMBLY PREVENTS ACTUATOR ROTATION AND ALLOWS ACTUATOR TO FLOAT ALONG INDICATED AXIS. WHEN TOO TIGHT, THE RESULTING BINDING CAN DAMAGE THE ACTUATOR OR REDUCE TORQUE OUTPUT.

2 THE BRACKET CAN BE BENT TO ALLOW MOUNTING THE ACTUATOR PARALLEL TO THE MOUNTING SURFACE. M27718 **Fig. 7.**

Mounting actuator to damper housing.

WIRING

⚠ CAUTION

Electrical Shock or Equipment Damage Hazard. Disconnect all power supplies before installation. Motors with auxiliary switches can have more than one disconnect.

IMPORTANT

All wiring must comply with local electrical codes, ordinances and regulations.

Access Cover Removal (Fig. 8)

⚠ CAUTION

Equipment Damage Hazard. Improper cover removal can damage electric connections.

Pull the cover along the axis of the actuator.

The cover contains contact sockets that must connect to actuator contact pins.

Bending these pins can permanently damage the device.

NOTE: This cover can be removed before or after mounting actuator to the damper shaft or valve linkage.

In order to wire the device, the access cover must be removed as follows:

1. Remove the screw from the center of the cover, set the screw aside.
2. Pull the cover along the long axis of the actuator.
3. If the actuator is not yet mounted, set it aside.
4. Remove conduit dust covers.
5. Thread wire through conduit holes.
6. Connect wires as appropriate to the terminal block(s). (See Fig. 9 and 11.)

NOTE: Use either 1/2 in. x 14 NPS or M20 x 1.5 strain relief or conduit adapters.

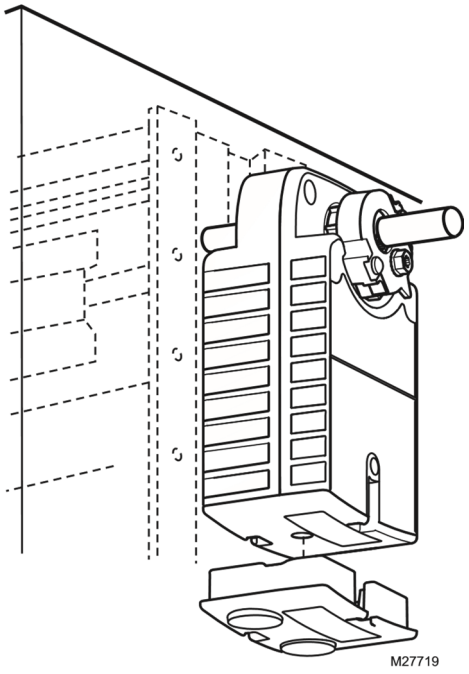


Fig. 8. Removing access cover.

Typical Wiring Without Cables

See Fig. 9 through 23 for typical wiring details for actuators without cables (whips). See Fig. 24 through 26 for wiring actuators with cables (whips).

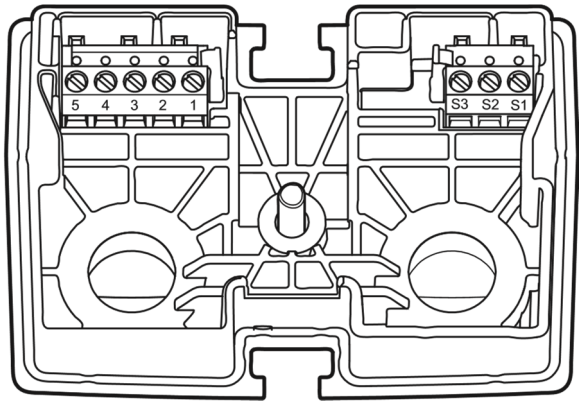
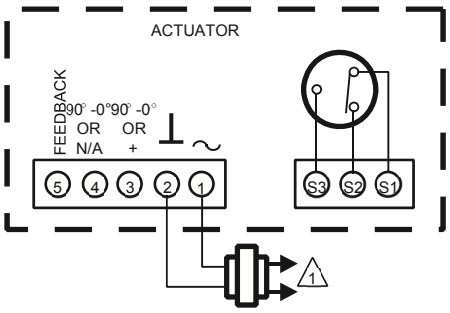


Table 2. Wiring Details.

Terminal	Floating	Modulating	kOhm Economizer	Position Economizer	Two-Position		Sylk-enabled
					24Vac/Vdc	120–250 Vac	
1 ⏡	power	power	power	power	power	power	power
2	common	common	common	common	common	neutral	common
3	0°-90°	control signal	control signal	control signal	—	—	S-BUS
4	90°-0°	—	external minimum position potentiometer	external minimum position potentiometer	—	—	S-BUS
5 ◂ _	feedback	feedback	feedback	feedback	—	—	Analog output

M27720

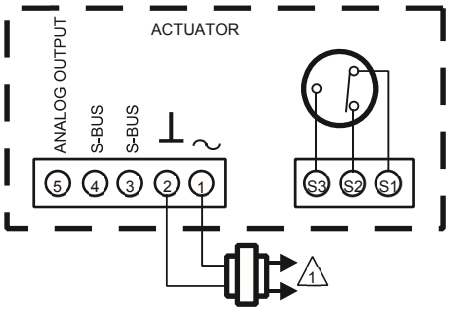
Fig. 9. Terminal block details.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M32677

Fig. 10. Terminal block details.

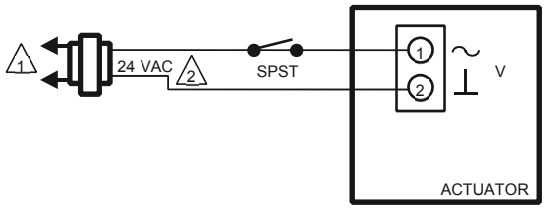


1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M32677

Fig. 11. S-BUS Terminal block details.

Two-Position Models



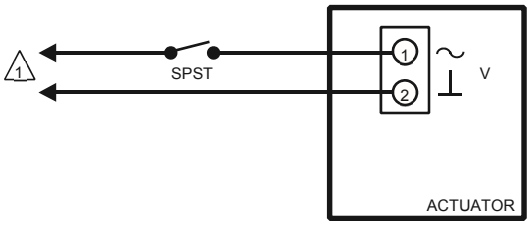
1

2 LINE

1 VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE. M29121

Fig. 12. Wiring for low-voltage two-position control, MS81 series.



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED. M29122

Fig. 13. Wiring for line-voltage two-position control, MS41 series.

Floating, Modulating, and Economizer Models

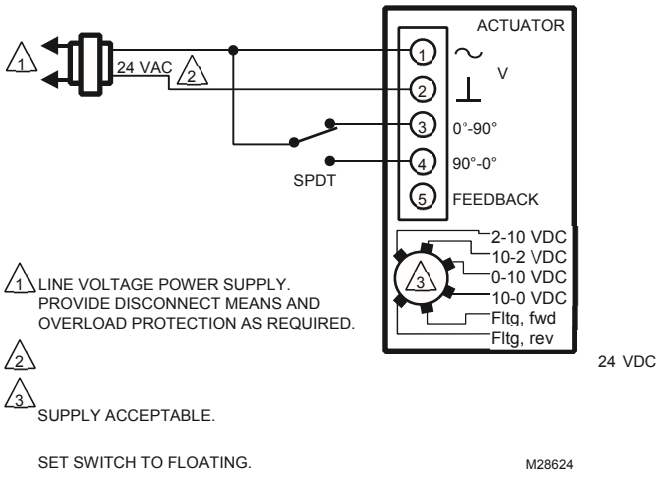


Fig. 14. Wiring for SPDT on/off control, MS75 (shown) and MS74 series.

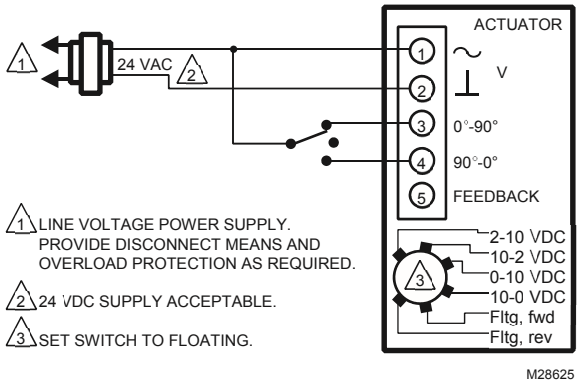


Fig. 15. Wiring for floating control, MS75 (shown) and MS74 series.

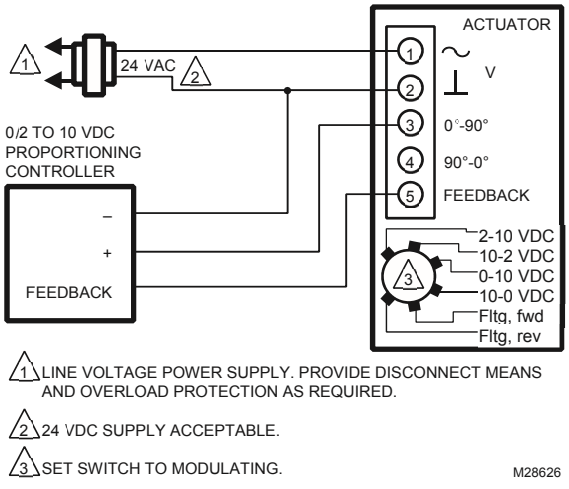


Fig. 16. Wiring for modulating (0/2-10 Vdc) proportioning control, MS75 (shown) and MS74 series.

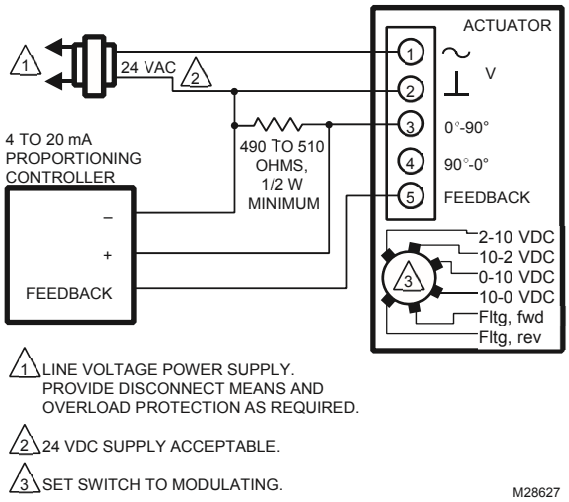


Fig. 17. Wiring for 4-20 mA proportioning controllers, MS75 (shown) and MS74 series.

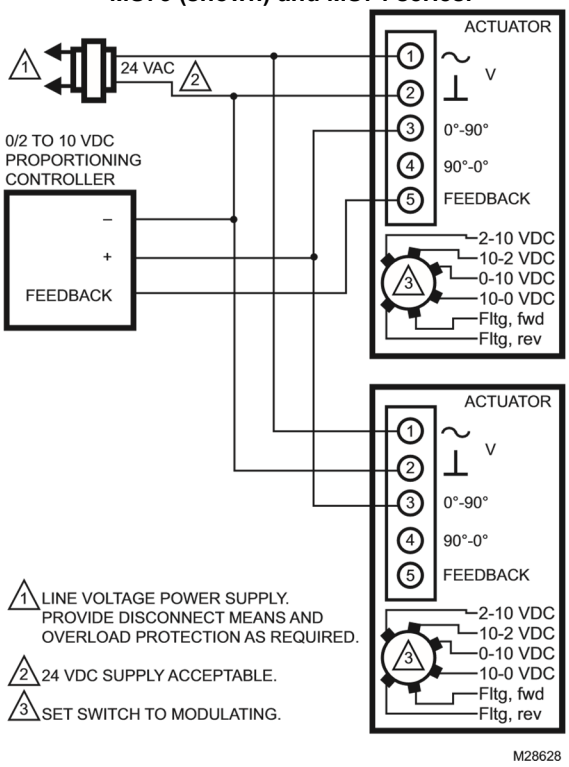


Fig. 18. Wiring for modulating (0/2-10 Vdc) proportioning control operating multiple actuators, MS75 (shown) and MS74 series.

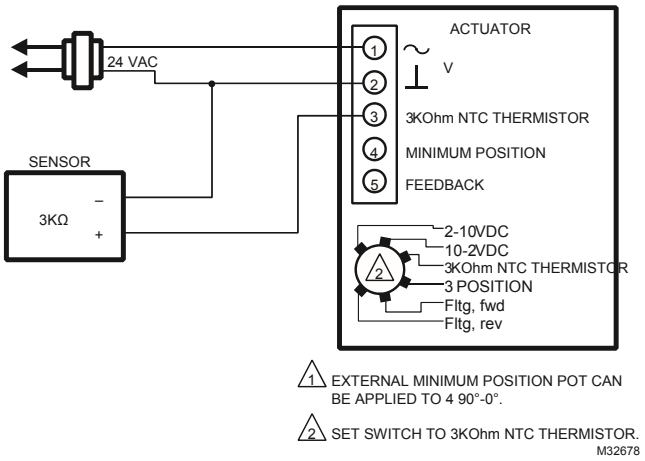


Fig. 19. Wiring for 3kOhm Economizer controllers, MS74 series.

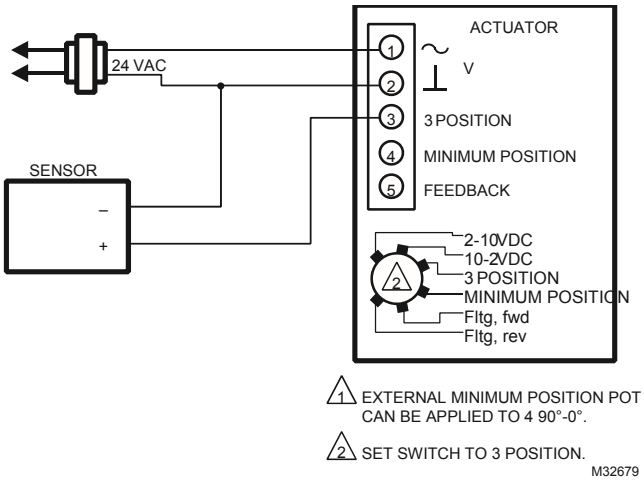


Fig. 20. Wiring for 3 position Economizer controllers, MS74 series.

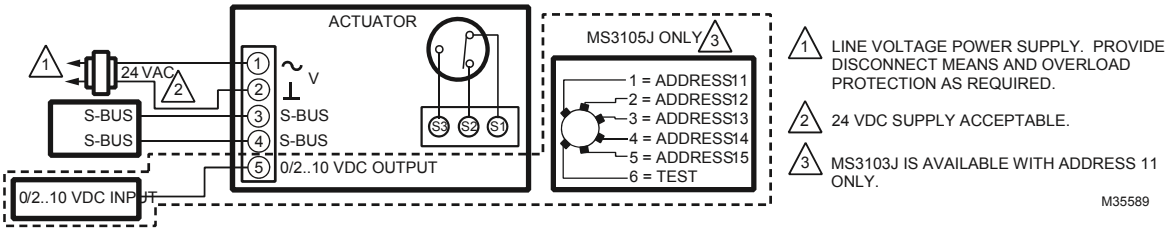


Fig. 21. Wiring for Sylk BUS, MS31 series.

OPERATION

The actuator is designed to be used in ventilating and air conditioning installations to operate valves, dampers, ventilation flaps and louvers. (For ratings, see the Specifications section.) If the power fails, the actuator will spring return to the fail safe position.

When using a proportional controller, the actuator drives toward its fully open position when the input signal increases; the actuator drives toward the fully closed position when the input signal decreases. The actuator stops when the input signal reaches the desired proportional control point. This operates in reverse when set to a 10-2(0) position.

IMPORTANT

The actuator is designed to respond to DDC Controller instantaneous contact closures. Take care not to short cycle the actuator. Unstable damper control can cause premature actuator failure.

Actuator Override

To override the control signal (for freeze protection or similar applications):

1. Override to full open:

a. Disconnect the input signal (from terminal 3).
b. Apply 24 Vac to terminal 3.
c. See Fig. 22.

2. Override to full closed:

a. Disconnect the input signal (from terminal 3).
b. See Fig. 23.

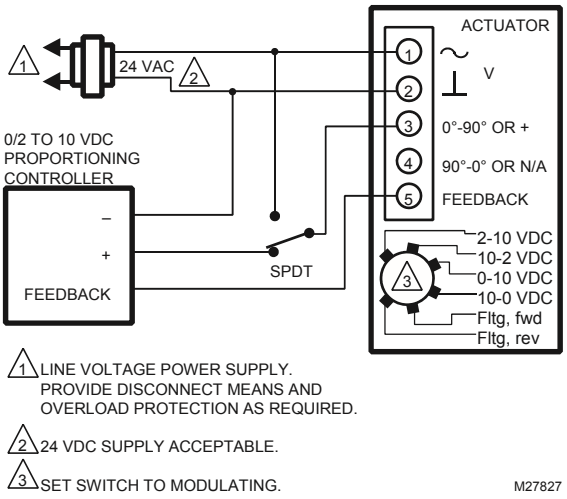


Fig. 22. Override to full open.

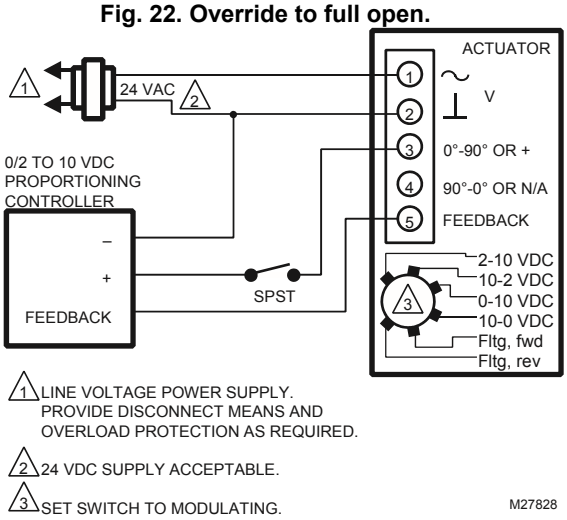


Fig. 23. Override to full close.

Typical Wiring With Cable

See Fig. 24 through 26 for wiring actuators with cables (whips). See Fig. 9 through 23 for typical wiring details for actuators without cables (whips).

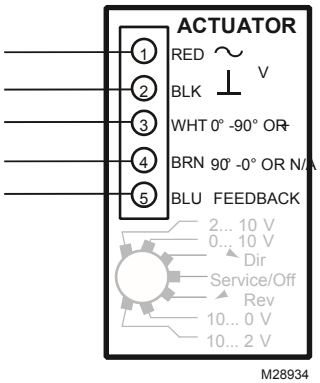


Fig. 24. Cable wiring for floating and modulating (0/2-10 Vdc) control, MS7505W series.

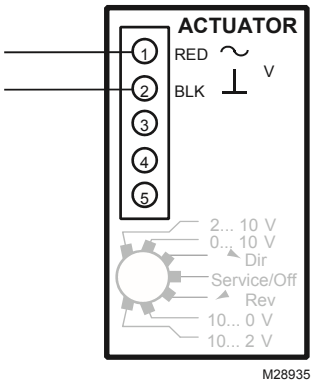


Fig. 25. Cable wiring for low voltage, two-position control, MS8105W series.

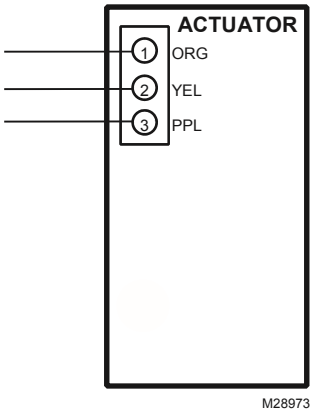


Fig. 26. Switch only models.

End Switches

Some models include an adjustable end switch. For wiring details, see Fig. 11.

CHECKOUT

Modulating/Floating Operation

1. Mount actuator for required application (either clockwise or counterclockwise rotation to open the damper).
2. Connect power to terminals 1 and 2. (See Fig. 11 and Table 2.)
3. Set “Mode Select” dial to desired control signal. (See Fig. 4.)
4. Apply control signal for actuator full open or full closed position. (See Fig. 11 and Table 2.)
   a. (0)2-10 Vdc: apply 10 Vdc signal to terminal 3.
   b. 10-(0)2 Vdc: apply (0)2 Vdc signal to terminal 3.
   c. (0)4-20 mA: apply 20 mA signal to terminal 3.
   d. 20-(0)4mA: apply (0)4 mA signal to terminal 3.
   e. Floating: apply 24 Vac to appropriate 0°-90° (3) or 90°-0° (4) terminal.
5. Actuator drives to full open or full closed position.
6. Apply control signal for actuator 0% position.

(See Fig. 11 and Table 2.)
a. (0)2-10 Vdc: apply (0)2 Vdc signal to terminal 3.
b. 10-(0)2 Vdc: apply 10 Vdc signal to terminal 3.
c. (0)4-20 mA: apply (0)4 mA signal to terminal 3.
d. 20-(0)4mA: apply 20 mA signal to terminal 3.
e. Floating: apply 24 Vac to appropriate 0°-90° (3) or 90°-0° (4) terminal.

7. Actuator drives to full open or full closed position.

Spring Return Operation

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper or valve).
2. Connect power to terminals 1 and 2. (See Fig. 11 and Table 2.)

NOTE: For two-position models skip to step 5.

3. Set "Mode Select" dial to desired control signal. (See Fig. 4.)
4. Apply control signal for actuator 50% position. (See Fig. 11.)
a. Vdc Input Signal: apply 5-6 Vdc signal to terminal 3.
b. mA Input Signal: apply 10-12 mA signal to terminal 3.
c. Floating: apply 24 Vac to appropriate 0°-90° (3) or 90°-0° (4) terminal until device reaches 50%.
5. Allow the actuator to drive to 50% position.
6. Disconnect wire from terminal 1.
7. Actuator spring returns to 0% position.
8. Re-connect wire to terminal 1, actuator drives back toward 50% position.

Feedback Operation

1. Connect a multi-meter, set for Vdc, to terminals 2 and 5.
2. Apply the same signal as in step 4 of Modulating Operation.
3. The multi-meter reading increases to match the input signal as actuator drives towards full open or full closed position.
4. Apply the same signal as in step 6 of Modulating Operation.
5. The multi-meter reading decreases to match the input signal as actuator drives towards 0% position.

Direct Checkout

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper or valve).
2. Check damper position and make sure that 24 Vdc/Vac is present at the appropriate connections. (See Fig. 9.)
3. Apply control signal to the appropriate connections to move the damper to the opposite position. The actuator should drive the damper or valve.
4. If actuator does not run, verify that the actuator is properly installed for either clockwise ↷ or counterclockwise ↶ rotation.
5. If actuator is correctly installed and still does not run, replace the actuator.

Two-Position Checkout

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper or valve).
2. Check damper position and make sure that power is present at terminals 1 and 2.
3. Actuator drives to 100% position.
4. Disconnect power from terminals 1 and 2.
5. Actuator spring-returns to 0% position. If actuator is correctly installed and does not run, replace the actuator.

Sylk-enabled (S-BUS) Checkout

1. Mount actuator for required application (either clockwise or counterclockwise rotation to open the damper).
2. Connect Sylk-enabled (S-BUS) controller to terminals 3 and 4. (See Fig. 20)
3. Connect power to terminals 1 and 2. (See Fig. 20 and Table 2.)
4. Set "Mode Select" dial to desired address (MS3105 series). (See Fig. 4.) This step is not necessary for the MS3103 series. The MS3103 models are only available with Address 11.
5. Apply S-BUS command via the connected Sylk-enabled controller for actuator full open or full closed position. (See Fig. 20 and Table 2.) The MS3105 series has the option for local test by setting "Mode Select" dial to 6. Remember to reset the "Mode Select" dial to the appropriate address after the test has been completed.

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AMCA CLASS 1A LEAKAGE RATED, HIGH PERFORMANCE CONTROL DAMPER

APPLICATION

Ruskin model CD60 incorporates an exclusive one-piece steel frame construction, making it the engineer's preferred frame design with no fasteners required. Frame corners are internally braced and machine staked. Exclusive one-piece aerodynamic dual skin airfoil blades are suitable for medium and high pressure velocity applications. Blade edge seals are mechanically fastened to ensure years of sustainable performance and reliability. Frame and blade construction, in concert with compression type chambered jamb seals, ensures leakage performance on par with requirements of the International Energy Conservation Code (IECC). Factory mounted and commissioned actuators are among the available options.

STANDARD CONSTRUCTION

FRAME
5" x 1" x 16 gauge (127 x 25 x 1.6) hot dipped galvanized steel hat channel reinforced with corner braces.

BLADES
Galvanized steel, one piece airfoil shaped, construction of 14 gauge (2.0) equivalent thickness, typically 6" (152) wide, maximum 8 5/8" wide. Opposed blade action standard, parallel blade action optional.

AXLES
1/2" (13) plated steel hex.

BEARINGS
Oil impregnated, self-lubricating, stainless steel sleeve.

BLADE SEALS
Ruskiprene blade edge seals mechanically fastened to blades.

JAMB SEALS
300 Series stainless steel cambered compression type.

LINKAGE
Shake proof Swedgelock™ plated steel assembly, concealed out of airstream.

CONTROL SHAFT
1/2" (13) dia. x 6" (152) long plated steel shaft on single section units.
1/2" (13) dia. jackshaft on multi-section assemblies up to 12 1/2 ft² (1.16 m²) and 1" (25) dia. jackshaft multi-section assemblies over 12 1/2 ft² (1.16 m²)

MAX PRESSURE
Up to 13 inches w.g. (see Performance Data on page 2).

MAX VELOCITY
Up to 6000 FPM (see Performance Data on page 2).

LEAKAGE
Class 1A (see Performance Data on page 2).

TEMPERATURE LIMITS
-72°F (-58°C) minimum and +275°F (+135°C) maximum.

MINIMUM SIZE
Single blade – 8"w x 6"h (203 x 152).
Two blades, opposed or parallel action: 8"w x 10"h (203 x 254).

MAXIMUM SIZE
Single section – 60"w x 72"h (1524 x 1829).
Multiple section assembly – Unlimited size.
(Units over 60"w or 72"h (1524 x 1829) are built in multiple equal size sections)

ESTIMATED SHIPPING WEIGHT
7 lbs. (3.2kg) per square foot.

CERTIFICATE NUMBER AJA07/11923

FEATURES

- One-piece airfoil blade for low pressure drop.
- One-piece interlocking frame design to reduce racking.
- Positive lock axles, noncorrosive bearings and shake proof linkage for low maintenance operation.

VARIATIONS

Ruskin model CD60 is available with the following variations at additional charge.

- Factory mounted and commissioned electric and pneumatic actuators, chain pull devices and manual locking handles.
- Front, rear or double flange frame with or without bolt holes.
- Stainless steel axles and linkage.
- SP100 switch package to remotely indicate damper blade position.
- Factory mounted sleeves with optional round or oval transitions.
- Enamel and epoxy finishes.
- Silicone blade edge seals.

NOTES

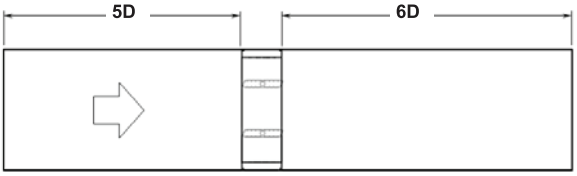
* Value shown in parenthesis ( ) are millimeters unless otherwise indicated.
* Units furnished approximately 1/4" (6) smaller than given opening dimensions.

AMCA LICENSED PERFORMANCE DATA

Pressure Drop Data

CD60 air performance testing is performed in accordance with AMCA Standard 500-D configuration 5.3 as illustrated below. All data are corrected to standard air density of .075 lb/ft³ (1.201 kg/m³).

$$D = \sqrt{\frac{4\,(W)\,(H)}{3.14}}$$



AMCA figure 5.3 was established to represent a fully ducted damper with straight duct upstream and downstream. With entrance and exit losses minimized by this straight duct arrangement, this configuration has the lowest pressure drop of all three configurations.

12" x 12" (305 x 305)		24" x 24" (610 x 610)		36" x 36" (914 x 914)		12" x 48" (305 x 1219)		48" x 12" (1219 x 305)	
Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)
499	0.02	506	0.005	517	0.005	508	0.005	509	0.01
869	0.06	998	0.03	1007	0.02	1002	0.03	1005	0.04
1417	0.17	1514	0.06	1404	0.03	1519	0.06	1523	0.08
1980	0.34	2012	0.11	1949	0.05	2019	0.10	2024	0.16
2986	0.79	2867	0.22	3004	0.12	2883	0.21	2884	0.32

Leakage Data

Air Leakage testing is performed in accordance with ANSI/AMCA Standard 500-D, figure 5.5.

Data are based on a torque of 7 in-lbs/ft² (.56 N.m./m²) applied to close and seat the damper during the test.

Air Leakage is based on operation between 32°F - 120°F (0°C - 49°C).

CD60	LEAKAGE CLASS*			
Maximum Damper Width	1" w.g. (0.25 kPa)	4" w.g. (1 kPa)	8" w.g. (2 kPa)	10" w.g. (2.5 kPa)
60" (1524)	1A	1	NA	NA

*** Leakage Class Definitions**

As defined by AMCA, the maximum allowable leakage is as follows:

Leakage Class 1A (is only defined @ 1" wg)
- 3 cfm/ft² (.92 cmm/m²) @ 1" wg (0.25 kPa)

Leakage Class 1
- 4 cfm/ft² (1.22 cmm/m²) @ 1" wg (0.25 kPa)
- 8 cfm/ft² (2.44 cmm/m²) @ 4" wg (1 kPa)
- 11.3 cfm/ft² (3.45 cmm/m²) @ 8" wg (2 kPa)
- 12.6 cfm/ft² (3.85 cmm/m²) @ 10" wg (2.5 kPa)

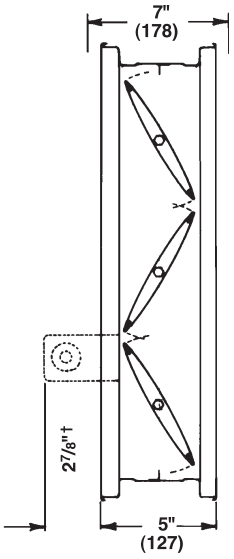
Maximum System Velocity and Pressure

The CD60 may be used in systems with total pressures exceeding 3.5" w.g. (.09 kPA) and velocities exceeding 3000 fpm (15.2 m/s) by reducing damper section width as indicated below:

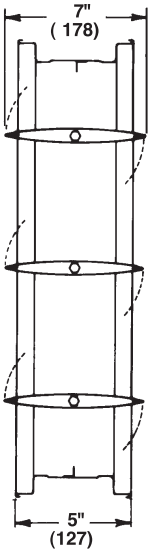
VELOCITY AND PRESSURE DATA		
DAMPER WIDTH INCHES	**MAXIMUM SYSTEM PRESSURE In. wg (kPa)**	**MAXIMUM SYSTEM VELOCITY FPM (m/s)**
60" (1524)	3.5" (0.9)	3000 (15.2)
48" (1219)	6.2" (1.5)	4000 (20.3)
36" (914)	8.5" (2.1)	4000 (20.3)
24" (610)	10.8" (2.7)	5000 (25.4)
12" (305)	13.0" (3.25)	6000 (30.5)

Ruskin Company certifies that model CD60 shown herein is licensed to bear the AMCA seal. The AMCA Certified Ratings Seal applies to Air Leakage and Air Performance ratings. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program.

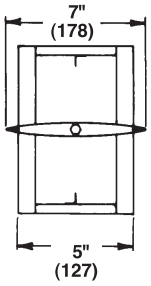
DIMENSIONAL INFORMATION



OPPOSED BLADE



PARALLEL BLADE



Low profile frame illustrated is typical for units under 12" (305) high.

CD60 SUGGESTED SPECIFICATION

Furnish and install, at locations shown on plans, or in accordance with schedules AMCA certified, low leakage airfoil control dampers meeting the following minimum construction standards. Control dampers shall be produced in an ISO9001 certified factory. Frame shall be one-piece uniframe construction of 16 ga. (1.6) galvanized steel roll formed hat channel structurally equivalent to a minimum 13 ga. (2.4) frame. Blades shall be 14 ga. (2.0) equivalent galvanized steel, roll-formed airfoil type for low pressure drop and low noise generation. Blade edge seals shall be Ruskiprene™ TPV type or equivalent mechanically locked into the blade edge. Adhesive or clip-on type seals are unacceptable. Jamb seals shall be stainless steel chambered compression type to prevent leakage between blade end and damper frame. Blade end overlapping frame is unacceptable. Multiple section dampers must have factory installed jackshafts unless clearly eliminated by engineer. Bearings shall be 304 stainless steel, oil impregnated, and self-lubricating sleeve type with a 450 pound (204 kg) minimum radial crush load. Bearings shall turn in extruded holes in the damper frame. Axles shall be hexagonal positively locked into the damper blade. Linkage shall be concealed out of airstream, within the damper frame to reduce pressure drop and noise. Temperature limits shall be -72°(-58°C) to +275°F (+135°C). Submittal must include leakage, maximum air flow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage. Damper widths from 12" to 60" (305 to 1524) wide shall not leak any greater than 3 cfm/sq.ft. at 1" w.g. (15.2 l/s-m^2 at .25 kPa). Dampers shall be equivalent in all respects to Ruskin Model CD60.

marathon® Motors

Nameplate Specifications

Output HP	.5 Hp	Output KW	.37 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	2.2-2.4/1.2 A	Speed	1725 rpm
Service Factor	1.25	Phase	3
Efficiency	68 %	Power Factor	62
Duty	CONTINUOUS	Insulation Class	B
Design Code	B	KVA Code	M
Frame	56	Enclosure	DP
Thermal Protection	AUTOMATIC	Ambient Temperature	40 °C
Drive End Bearing Size	6203	Opp Drive End Bearing Size	6203
UL	Recognized	CSA	Y
CE	Y	IP Code	22

Technical Specifications

Electrical Type	SQ CAGE IND RUN	Starting Method	ACROSS THE LINE
Poles	4	Rotation	REV
Resistance Main	39.2 Ohms	Mounting	RIGID
Motor Orientation	HORIZONTAL	Drive End Bearing	BALL
Opp Drive End Bearing	BALL	Frame Material	ROLLED STEEL
Shaft Type	T	Overall Length	10.44 in
Frame Length	6.56 in	Shaft Diameter	.63 in
Shaft Extension	2.32 in	Assembly/Box Mounting	F1 Only

marathon® Motors

Nameplate Specifications

Output HP	.75 Hp	Output KW	.56 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	2.9-3/1.5 A	Speed	1725 rpm
Service Factor	1.25	Phase	3
Efficiency	75.5 %	Power Factor	66.3
Duty	CONTINUOUS	Insulation Class	B
Design Code	B	KVA Code	L
Frame	56	Enclosure	DP
Thermal Protection	AUTOMATIC	Ambient Temperature	40 °C
Drive End Bearing Size	6203	Opp Drive End Bearing Size	6203
UL	Recognized	CSA	Y
CE	Y	IP Code	22

Technical Specifications

Electrical Type	SQ CAGE IND RUN	Starting Method	ACROSS THE LINE
Poles	4	Rotation	REV
Resistance Main	23 Ohms	Mounting	RIGID
Motor Orientation	HORIZONTAL	Drive End Bearing	BALL
Opp Drive End Bearing	BALL	Frame Material	ROLLED STEEL
Shaft Type	T	Overall Length	10.44 in
Frame Length	6.56 in	Shaft Diameter	.63 in
Shaft Extension	2.32 in	Assembly/Box Mounting	F1 Only

marathon® Motors

Nameplate Specifications

Output HP	1 Hp	Output KW	.75 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	3.4-3.6/1.8 A	Speed	1725 rpm
Service Factor	1.15	Phase	3
Efficiency	77 %	Power Factor	68.4
Duty	CONTINUOUS	Insulation Class	B
Design Code	B	KVA Code	L
Frame	56	Enclosure	DP
Thermal Protection	AUTOMATIC	Ambient Temperature	40 °C
Drive End Bearing Size	6203	Opp Drive End Bearing Size	6203
UL	Recognized	CSA	Y
CE	Y	IP Code	22

Technical Specifications

Electrical Type	SQ CAGE IND RUN	Starting Method	ACROSS THE LINE
Poles	4	Rotation	REV
Resistance Main	17.9 Ohms	Mounting	RIGID
Motor Orientation	HORIZONTAL	Drive End Bearing	BALL
Opp Drive End Bearing	BALL	Frame Material	ROLLED STEEL
Shaft Type	T	Overall Length	10.94 in
Frame Length	7.06 in	Shaft Diameter	.63 in
Shaft Extension	2.32 in	Assembly/Box Mounting	F1 Only

marathon® Motors

Nameplate Specifications

Output HP	1.5 Hp	Output KW	1.12 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	4.8-4.8/2.4 A	Speed	1725 rpm
Service Factor	1.15	Phase	3
Efficiency	80 %	Power Factor	74
Duty	CONTINUOUS	Insulation Class	B
Design Code	B	KVA Code	K
Frame	56H	Enclosure	DP
Thermal Protection	AUTOMATIC	Ambient Temperature	40 °C
Drive End Bearing Size	6203	Opp Drive End Bearing Size	6203
UL	Recognized	CSA	Y
CE	Y	IP Code	22

Technical Specifications

Electrical Type	SQ CAGE IND RUN	Starting Method	ACROSS THE LINE
Poles	4	Rotation	REV
Resistance Main	12.1 Ohms	Mounting	RIGID
Motor Orientation	HORIZONTAL	Drive End Bearing	BALL
Opp Drive End Bearing	BALL	Frame Material	ROLLED STEEL
Shaft Type	T	Overall Length	10.94 in
Frame Length	7.06 in	Shaft Diameter	.63 in
Shaft Extension	2.32 in	Assembly/Box Mounting	F1 Only

Nameplate Specifications

Output HP	**2 Hp**	Output KW	**1.5 kW**
Frequency	**60 Hz**	Voltage	**208-230/460 V**
Current	**6.2-6.2/3.1 A**	Speed	**1725 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**81.5 %**	Duty	**Continous**
Insulation Class	**B**	Design Code	**B**
KVA Code	**K**	Frame	**56HZ**
Enclosure	**Drip Proof**	Overload Protector	**Automatic**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6205**
Opp Drive End Bearing Size	**6205**	UL	**Recognized**
CSA	**Y**	CE	**Y**
IP Code	**22**		

Technical Specifications

Electrical Type	**Squirrel Cage Induction Run**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Reversible**
Mounting	**Rigid base**	Motor Orientation	**Horizontal**
Drive End Bearing	**Ball**	Opp Drive End Bearing	**Ball**
Frame Material	**Rolled Steel**	Shaft Type	**NEMA 145T**
Overall Length	**11.99 in**	Frame Length	**8.06 in**
Shaft Diameter	**0.625 in**	Shaft Extension	**2.28 in**
Assembly/Box Mounting	**F1 Only**		
Outline Drawing	**A-104452-806**	Connection Diagram	**A-EE7335**

Nameplate Specifications

Output HP	**3 Hp**	Output KW	**2.2 kW**
Frequency	**60 Hz**	Voltage	**208-230/460 V**
Current	**9.2-8.6/4.3 A**	Speed	**1725 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**84 %**	Duty	**Continous**
Insulation Class	**B**	Design Code	**B**
KVA Code	**K**	Frame	**56HZ**
Enclosure	**Drip Proof**	Overload Protector	**Automatic**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6205**
Opp Drive End Bearing Size	**6205**	UL	**Recognized**
CSA	**Y**	CE	**Y**
IP Code	**22**		

Technical Specifications

Electrical Type	**Squirrel Cage Induction Run**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Reversible**
Mounting	**Rigid base**	Motor Orientation	**Horizontal**
Drive End Bearing	**Ball**	Opp Drive End Bearing	**Ball**
Frame Material	**Rolled Steel**	Shaft Type	**NEMA 145T**
Overall Length	**13.49 in**	Frame Length	**9.56 in**
Shaft Diameter	**0.625 in**	Shaft Extension	**2.25 in**
Assembly/Box Mounting	**F1 Only**		
Outline Drawing	**A-104452-956**	Connection Diagram	**A-EE7335**

Nameplate Specifications

Output HP	**5 Hp**	Output KW	**3.7 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**12.6/6.3 A**	Speed	**1755 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**89.5 %**	Duty	**Continous**
Insulation Class	**F**	Design Code	**B**
KVA Code	**J**	Frame	**184T**
Enclosure	**Drip Proof**	Overload Protector	**Automatic**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6206**
Opp Drive End Bearing Size	**6205**	UL	**Recognized**
CSA	**Y**	CE	**Y**
IP Code	**22**		

Technical Specifications

Electrical Type	**Squirrel Cage Induction Run**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Reversible**
Mounting	**Rigid base**	Motor Orientation	**Horizontal**
Drive End Bearing	**Ball**	Opp Drive End Bearing	**Ball**
Frame Material	**Rolled Steel**	Shaft Type	**T**
Overall Length	**14.19 in**	Frame Length	**10.00 in**
Shaft Diameter	**1.125 in**	Shaft Extension	**2.81 in**
Assembly/Box Mounting	**F1 Only**		
Outline Drawing	**035658-1000**	Connection Diagram	**005020.02ME**

Nameplate Specifications

Output HP	**7.50 Hp**	Output KW	**5.6 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**19.8/9.9 A**	Speed	**1766 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**91 %**	Duty	**Continous**
Insulation Class	**F**	Design Code	**B**
KVA Code	**H**	Frame	**213T**
Enclosure	**Drip Proof**	Overload Protector	**No**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6307**
Opp Drive End Bearing Size	**6206**	UL	**Recognized**
CSA	**Y**	CE	**Y**
IP Code	**22**		

Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Reversible**
Mounting	**Rigid base**	Motor Orientation	**Horizontal**
Drive End Bearing	**Ball**	Opp Drive End Bearing	**Ball**
Frame Material	**Rolled Steel**	Shaft Type	**T**
Overall Length	**17.52 in**	Shaft Diameter	**1.375 in**
Shaft Extension	**3.38 in**	Assembly/Box Mounting	**F1/F2 Capable**
Outline Drawing	**SS620684**	Connection Diagram	**A-EE7308**

Product Information Packet: Model No: 215TTDBD6026, Catalog No:GT0019A 10,1800,DP,215T,3/60/230/460

Nameplate Specifications

Output HP	**10 Hp**	Output KW	**7.5 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**25.4/12.7 A**	Speed	**1768 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**91.7 %**	Duty	**Continous**
Insulation Class	**F**	Design Code	**B**
KVA Code	**H**	Frame	**215T**
Enclosure	**Drip Proof**	Overload Protector	**No**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6307**
Opp Drive End Bearing Size	**6206**	UL	**Recognized**
CSA	**Y**	CE	**Y**
IP Code	**22**		

Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Reversible**
Mounting	**Rigid Base**	Motor Orientation	**Horizontal**
Drive End Bearing	**Ball**	Opp Drive End Bearing	**Ball**
Frame Material	**Rolled Steel**	Shaft Type	**T**
Overall Length	**17.52 in**	Shaft Diameter	**1.375 in**
Shaft Extension	**3.38 in**	Assembly/Box Mounting	**F1/F2 Capable**
Outline Drawing	**SS620684**	Connection Diagram	**A-EE7308**

Nameplate Specifications

Output HP	**15 Hp**	Output KW	**11.2 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**37.5/18.8 A**	Speed	**1774 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**93 %**	Duty	**Continous**
Insulation Class	**F**	Design Code	**B**
KVA Code	**G**	Frame	**254T**
Enclosure	**Drip Proof**	Overload Protector	**No**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6309**
Opp Drive End Bearing Size	**6208**	UL	**Recognized**
CSA	**Y**	CE	**Y**
IP Code	**12**		

Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Reversible**
Mounting	**Rigid base**	Motor Orientation	**Horizontal**
Drive End Bearing	**Ball**	Opp Drive End Bearing	**Ball**
Frame Material	**Rolled Steel**	Shaft Type	**T**
Overall Length	**22.64 in**	Shaft Diameter	**1.625 in**
Shaft Extension	**4 in**	Assembly/Box Mounting	**F1/F2 Capable**
Outline Drawing	**B-SS620685**	Connection Diagram	**A-EE7308K**

Brochure | GB

i500 inverters

0.25 ... 132 kW

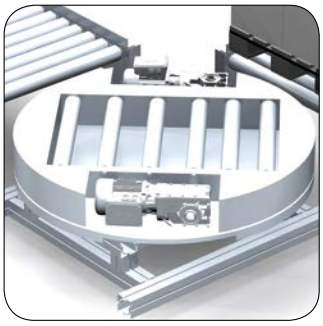
Lenze

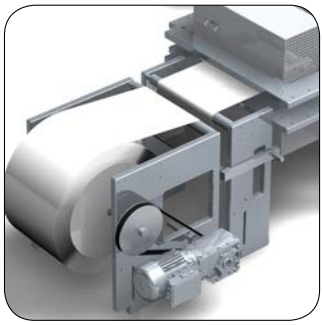
Lenze makes many things easy for you.

With our motivated and committed approach, we work together with you to create the best possible solution and set your ideas in motion - whether you are looking to optimize an existing machine or develop a new one. We always strive to make things easy and seek perfection therein. This is anchored in our thinking, in our services and in every detail of our products. It's as easy as that!

On principle: Always perfect: the new i500

The i500 is ideal for numerous applications:
travelling drives, conveyor drives, shaper drives, pumps and fans, tool drives, hoist drives and winding drives.





Less means more!

Focused on the essentials: the new i500

i500 is the new inverter series - a streamlined design, scalable functionality and exceptional user-friendliness.

Less unnecessary elements ⇢ **More** cost savings

- High scalability in terms of the mains voltage range, rated power and modular structure
- Diagnostics via keypad, USB or WLAN

- Optimised solution for individual customer requirements
- Flexibility

Smaller size ⇢ **More** space in the control cabinet

- Compact size:
  Up to 11 kW just 130mm deep and up to 2.2 kW just 60mm wide
- Side-by-side installation: can be mounted adjacent to each other

- Provides solutions in limited spaces
- Smaller control cabinets reduce costs

Less engineering expenditure ⇢ **More** time for the essentials

- Intuitively logical structure of parameters
- Easy controller integration
- Supports all current networks

- Saves time in engineering
- Reduction in potential error sources

Less installation expense ⇢ **More** productivity

- Keyhole mounting
- Pluggable terminals up to 2.2 kW
- Out of the box operability. Simply connect, start, go!
- Plug-in memory module

- Saves time during installation
- Fewer faults in use
- Lower costs in the event of a service

Less energy consumption ⇢ **More** sustainability

- Fewer inverter losses thanks to the use of cutting-edge technologies
- Energy-efficient

- Best efficiency values, lowest energy costs
- Future-proof thanks to DIN EN 50598

Less downtime ⇢ **Greater** reliability

- Robust single board design
- Entire device produced by Lenze

- Lower quality assurance costs in manufacture
- Reduces
  operational guarantee costs

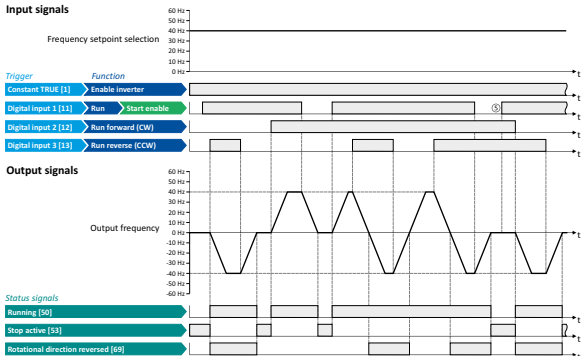
Functionality

i500 provides a high-quality frequency inverter that already conforms to future standard in accordance with the EN 50598-2 efficiency classes (IE). Overall, this provides a reliable and future-proof drive for a wide range of machine applications.

Adjustable motor controls for three-phase AC motors

- V/f characteristic control linear/square-law (VFC plus)
- Sensorless vector control (SLV)
- Energy saving function (VFC-ECO)
- Servo control (SC-ASM) with feedback
- Sensorless vector control for synchronous motors (up to 22 kW)

Motor functions



- Flying restart circuit
- Slip compensation
- Energy saving function (VFC-Eco)
- DC braking
- Oscillation damping
- Skip frequencies
- Automatic identification of the motor data
- Braking energy management
- Holding brake control
- Voltage add-function
- Rational Energy Ride Through (backup operation in case of mains failure)
- Speed feedback (HTL encoder)
- Brake resistor control (brake chopper integrated)
- DC-bus connection (400 V devices)

Application functions

- Process controller (PID)
- Process controller - sleep mode and rinse function
- Freely assignable favorite menu
- Parameter change-over
- S-shaped ramps for smooth acceleration
- Motor potentiometer
- Flexible I/O configuration
- Access protection
- Automatic restart
- OEM parameter set
- Sequence control

Monitoring

off	off	No supply voltage
1 Hz		Safe torque off (STO) active
		Safe torque off (STO) active, warning active
2 Hz		Inverter disabled
		Inverter disabled, no DC-bus voltage
		Inverter disabled, warning active
		Inverter disabled, error available
		Inverter enabled and motor running
		Inverter enabled and motor running, warning pending
		Inverter enabled, quick stop as response to a fault active
Error message	**Cause and remedy (W = warning, T = trouble, F = fault)**	
.2382/.2383	Ixt fault/Ixt warning	
.3210/.3211	Overvoltage DC-bus/warning overvoltage DC-bus	
.3220/.3221	DC-bus voltage too low for switch-on	
.3222	DC-bus voltage too low for switch-on	
.4310	Motor overtemperature error	
.6280	Trigger/functions incorrectly connected. In flexible mode, the controller release or Run/Stop must be allocated to an I/O. Do not use start forward/backward and run forward/backward at the same time.	
.FF37	Automatic start disabled	

- Short circuit
- Earth fault
- Device overload monitoring (i*t)
- Motor overload monitoring (i²*t)
- Mains phase failure
- Stalling protection
- Motor current limit
- Maximum torque
- Ultimate motor current
- Motor speed monitoring
- Load loss detection
- Motor temperature monitoring (PTC and thermal contact)

Diagnostics

- Error history buffer
- Logbook
- LED status displays
- Keypad language selection German, English
- PC tool (EASY Starter)
- Smartphone app (iOS and Android)

App Store

Google Play

Safety functions (optional)

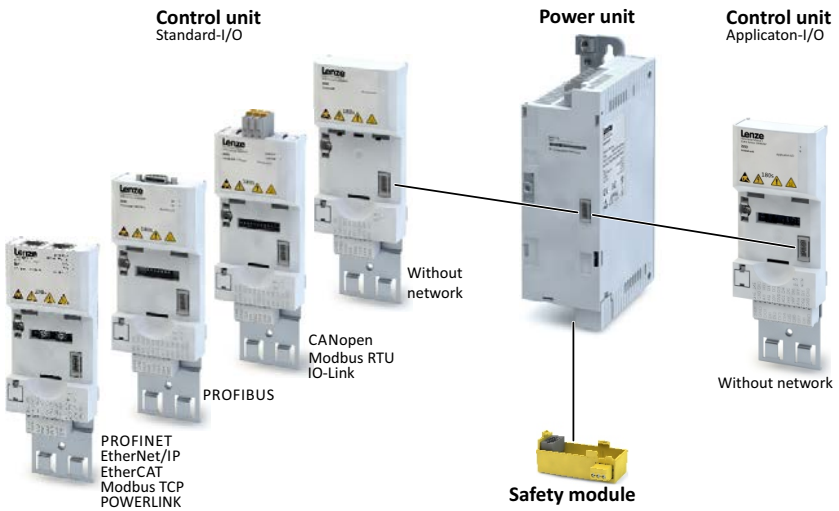
- STO (Safe torque off) with PL “e” and SIL 3

Network (optional)

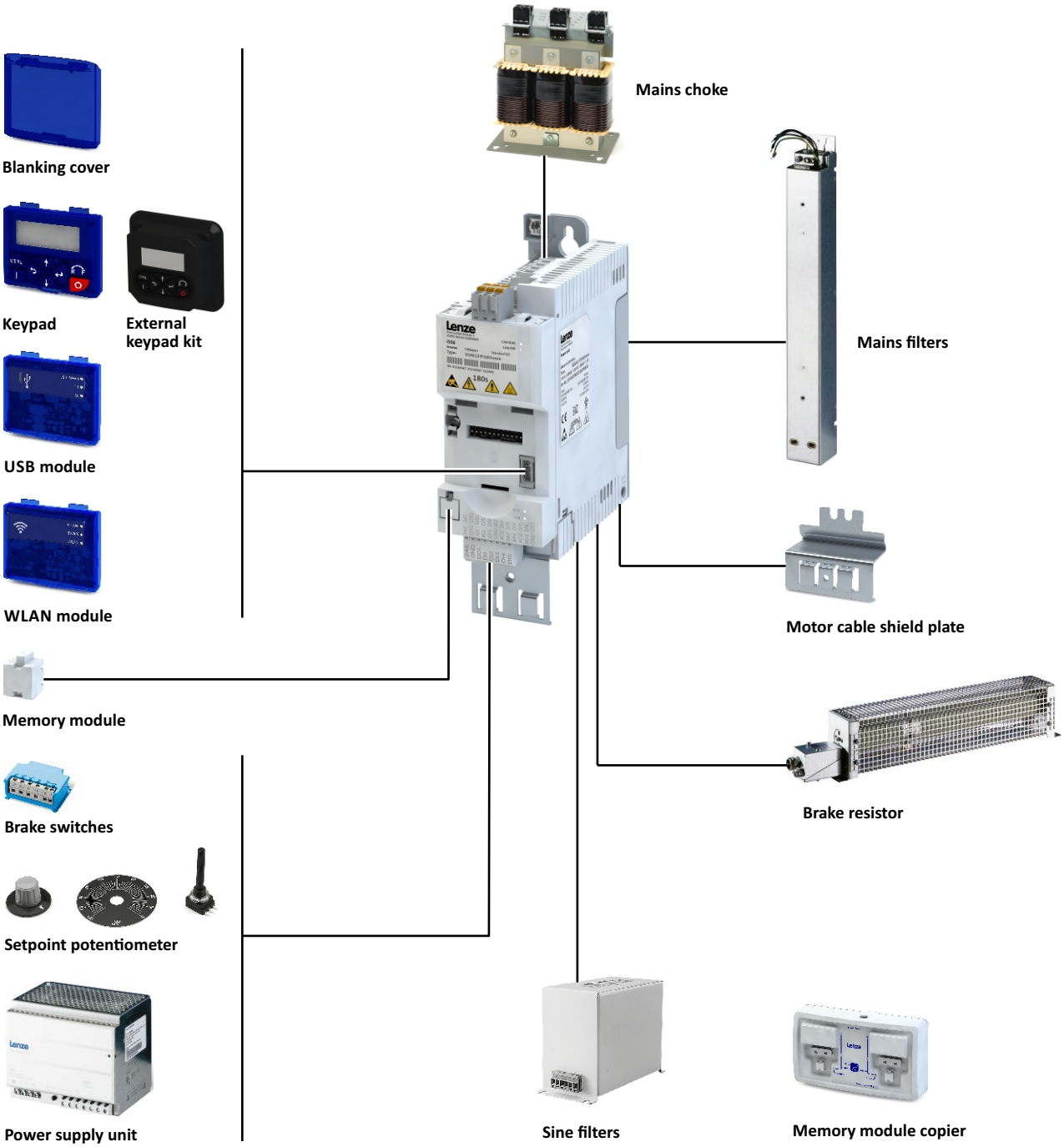
- CANopen
- Modbus RTU
- ModBus TCP
- IO-Link
- EtherCAT
- EtherNet/IP
- PROFIBUS
- PROFINET
- POWERLINK

Scalability

Easily scaled, the right i500 can be customised to suit the application. Here, “scaled” refers to two optimised products: the i510 as the basic design with predefined modes and the high-capacity modular i550 for a variety of applications. Which is the right one for you? See the following table:

	i510	i550
Type of construction and ordering option	Monolithic construction	Modular type of construction
Power range	0.25 kW ... 15 kW	0.25 kW ... 132 kW
Scope	• Memory module • IT network suitability • Integrated RFI filter (apart from i510-Cxxx/230-2) • Can be directly connected • Relay (type C)	• Memory module • IT network suitability • Integrated RFI filter (apart from i550-Cxxx/120-1, i550-Cxxx/230-2, i550-Cxxx/230-3) • Can be directly connected • Relay (type C) • Brake chopper • DC-bus operation is possible • Incremental HTL encoder up to 100 kHz • Temperature monitoring • Functional safety: STO
I/O extension	• Spring terminal, • fixed terminals • Basic I/O - 5 digital inputs - 1 digital output - 2 analog inputs - 1 analog output	• Plug-in spring terminal • External 24-V supply • Choice of negative or positive logic (PNP/NPN) • Standard I/O - 5 digital inputs, 1 digital output - 2 analog inputs, 1 analog output or • Application I/O - 7 digital inputs, 2 digital outputs - 2 analog inputs, 2 analog outputs
Fieldbus network – optional	• CANopen • Modbus RTU	• CANopen • Modbus RTU • Modbus TCP • IO-Link • EtherCAT • EtherNet/IP • PROFIBUS • PROFINET • POWERLINK
Motor controls	• V/f characteristic control (VFC open loop, linear, quadratic or FVC Eco) • Sensorless vector control (SLVC) • Sensorless control (SL PSM)	• V/f characteristic control (VFC open loop, linear, quadratic or FVC Eco) • V/f characteristic control (VFC closed loop) with feedback • Sensorless vector control (SLVC) • Sensorless control (SL PSM) • Servo control (SC-ASM) with feedback (up to 22 kW)
i510	**i550**	
 Two versions: with Basic I/O with Basic I/O and CANopen / Modbus RTU		

The scalable inverter is completed by an accessory kit. Simply select all the necessary components oriented to your application.



Technical data

Inverter i510; connection to 230-V mains

Conformities	CE	2014/35/EU, 2014/30/EU
	EAC	TR TC 004/2011, TP TC 020/2011
	RoHS 2	2011/65/EU
Approvals	$_{c}UL_{us}$	UL 61800-5-1, CSA 22.2 No. 274
Energy efficiency	Class IE2	EN 50598-2
Protection type	IP20	EN 60529 (except in wire range of terminals)
		NEMA 250 (type 1 protection against accidental contact only)
	Open type	Only in UL-approved systems
Power systems	TT, TN	Voltage to earth: max. 300 V
	IT	Apply the measures described for IT systems!
Mains switching		3 x within one minute possible
Operation with residual current circuit breaker		Up to 2.2 kW 30 mA
Cable length for EMC	Category C2	20 m (≤0.37 kW max. 15 m)
	Category C3	≥ 35 m (≤0.37 kW max. 15 m)
Switching frequencies		2, 4, 8, 16 kHz, The rated output currents listed below apply at 45 °C and switching frequencies of 2 and 4 kHz, and at 40 °C and switching frequencies of 8 and 16 kHz
Ambient temperature		55 °C (derating of 2.5 %/ °C above 45 °C)
Max. output frequency		0 Hz ... 599 Hz
Overload capacity		200 % for 3s; 150 % for 60 s

	Rated power	**Mains voltage range**	**Rated output current**	**Weight**	**Dimensions (h x w x d)**
	[kW]	**[V]**	**[A]**	**[kg]**	**[mm]**
	1-phase inverter with integrated RFI filter				
i510-C0.25/230-1	0.25	1/N/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	1.7	0.75	155 x 60 x 130
i510-C0.37/230-1	0.37		2.4	0.75	155 x 60 x 130
i510-C0.55/230-1	0.55		3.2	0.95	180 x 60 x 130
i510-C0.75/230-1	0.75		4.2	0.95	180 x 60 x 130
i510-C1.1/230-1	1.1		6	1.35	250 x 60 x 130
i510-C1.5/230-1	1.5		7	1.35	250 x 60 x 130
i510-C2.2/230-1	2.2		9.6	1.35	250 x 60 x 130
	1/3-phase inverter without integrated RFI filter				
i510-C0.25/230-2	0.25	1/N/PE AC or 3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	1.7	0.75	155 x 60 x 130
i510-C0.37/230-2	0.37		2.4	0.75	155 x 60 x 130
i510-C0.55/230-2	0.55		3.2	0.95	180 x 60 x 130
i510-C0.75/230-2	0.75		4.2	0.95	180 x 60 x 130
i510-C1.1/230-2	1.1		6	1.35	250 x 60 x 130
i510-C1.5/230-2	1.5		7	1.35	250 x 60 x 130
i510-C2.2/230-2	2.2		9.6	1.35	250 x 60 x 130
	3-phase inverter without integrated RFI filter				
i510-C4.0/230-3	4	3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	16.5	2.1	250 x 90 x 130
i510-C5.5/230-3	5.5		23	2.1	250 x 90 x 130

Inverter i510; connection to 400-V mains

Conformities	CE	2014/35/EU, 2014/30/EU
	EAC	TR TC 004/2011, TP TC 020/2011
	RoHS 2	2011/65/EU
Approvals	$_{c}UL_{US}$	UL 61800-5-1, CSA 22.2 No. 274
Energy efficiency	Class IE2	EN 50598-2
Protection type	IP20	EN 60529 (except in wire range of terminals)
		NEMA 250 (type 1 protection against accidental contact only)
	Open type	Only in UL-approved systems
Power systems	TT, TN	Voltage to earth: max. 300 V
	IT	Apply the measures described for IT systems!
Mains switching		3 x within one minute possible
Operation with residual current circuit breaker		Up to 2.2 kW 30 mA
Cable length for EMC	Category C2	20 m (≤0.37 kW max. 15 m)
	Category C3	35 m (≤0.37 kW max. 15 m)
Switching frequencies		2, 4, 8, 16 kHz, The rated output currents listed below apply at 45 °C and switching frequencies of 2 and 4 kHz, and at 40 °C and switching frequencies of 8 and 16 kHz
Ambient temperature		55 °C (derating of 2.5 %/ °C above 45 °C)
Max. output frequency		0 Hz ... 599 Hz
Overload capacity		200 % for 3s; 150 % for 60 s

	Rated power	**Mains voltage range**	**Rated output current**	**Weight**	**Dimensions (h x w x d)**
	[kW]	**[V]**	**[A]**	**[kg]**	**[mm]**
	3-phase inverter with integrated RFI filter				
i510-C0.37/400-3	0.37	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	1.3	0.75	155 x 60 x 130
i510-C0.55/400-3	0.55		1.8	0.95	180 x 60 x 130
i510-C0.75/400-3	0.75		2.4	0.95	180 x 60 x 130
i510-C1.1/400-3	1.1		3.2	1.35	250 x 60 x 130
i510-C1.5/400-3	1.5		3.9	1.35	250 x 60 x 130
i510-C2.2/400-3	2.2		5.6	1.35	250 x 60 x 130
i510-C3.0/400-3	3		7.3	1.35	250 x 60 x 130
i510-C4.0/400-3	4		9.5	1.35	250 x 60 x 130
i510-C5.5/400-3	5.5		13	2.3	250 x 90 x 130
i510-C7.5/400-3	7.5		16.5	3.7	276 x 120 x 130
i510-C11/400-3	11		23.5	3.7	276 x 120 x 130
	3-phase mains connection 400 V - Light duty; with integrated RFI filter				
i510-C3.0/400-3	4	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	8.8	1.35	250 x 60 x 130
i510-C4.0/400-3	5.5		11.9	1.35	250 x 60 x 130
i510-C5.5/400-3	7.5		15.6	2.3	250 x 90 x 130
i510-C7.5/400-3	11		23	3.7	276 x 120 x 130
i510-C11/400-3	15		28.2	3.7	276 x 120 x 130

i510-C3.0/400-3 and i510-C4.0/400-3 of the generation “A” are 90 mm wide.
As stated, the devices of the generation “B” with a width of 60 mm are 33% smaller.

Inverter i550; connection to 120 V mains and 230 V mains

Conformities	CE	2014/35/EU, 2014/30/EU
	EAC	TR TC 004/2011, TP TC 020/2011
	RoHS 2	2011/65/EU
Approvals	$_{c}UL_{US}$	UL 61800-5-1, CSA 22.2 No. 274
Energy efficiency	Class IE2	EN 50598-2
Protection type	IP20	EN 60529 (except in wire range of terminals)
		NEMA 250 (type 1 protection against accidental contact only)
	Open type	Only in UL-approved systems
Power systems	TT, TN	Voltage to earth: max. 300 V
	IT	Apply the measures described for IT systems!
Mains switching		3 x within one minute possible
Operation with residual current circuit breaker		up to 2.2 kW 30 mA, above this 300 mA
Cable length for EMC	Category C2	20 m (≤0.37 kW max. 15 m)
	Category C3	≥ 35 m (≤0.37 kW max. 15 m)
Switching frequencies		2, 4, 8, 16 kHz, The rated output currents listed below apply at 45 °C and switching frequencies of 2 and 4 kHz, and at 40 °C and switching frequencies of 8 and 16 kHz
Max. ambient temperature		55 °C (derating of 2.5 %/ °C above 45 °C)
Max. output frequency		0 Hz ... 599 Hz
Overload capacity		200 % for 3s; 150 % for 60 s

	Rated power	**Mains voltage range**	**Rated output current**	**Weight**	**Dimensions (h x w x d)**
	[kW]	**[V]**	**[A]**	**[kg]**	**[mm]**
	1-phase mains connection 120 V; without integrated RFI filter				
i550-C0.25/120-1	0.25	1/N/PE AC 90 V ... 132 V 45 Hz ... 65 Hz	1.7	1	180 x 60 x 130
i550-C0.37/120-1	0.37		2.4	1	180 x 60 x 130
i550-C0.75/120-1	0.75		4.2	1.35	250 x 60 x 130
i550-C1.1/120-1	1.1		6	1.35	250 x 60 x 130
	1-phase mains connection 230/240 V; with integrated RFI filter				
i550-C0.25/230-1	0.25	1/N/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	1.7	0.8	155 x 60 x 130
i550-C0.37/230-1	0.37		2.4	0.8	155 x 60 x 130
i550-C0.55/230-1	0.55		3.2	1	180 x 60 x 130
i550-C0.75/230-1	0.75		4.2	1	180 x 60 x 130
i550-C1.1/230-1	1.1		6	1.35	250 x 60 x 130
i550-C1.5/230-1	1.5		7	1.35	250 x 60 x 130
i550-C2.2/230-1	2.2		9.6	1.35	250 x 60 x 130
	1-phase mains connection 230/240 V; without integrated RFI filter				
i550-C0.25/230-2	0.25	1/N/PE A 170 V ... 264 V 45 Hz ... 65 Hz	1.7	0.8	155 x 60 x 130
i550-C0.37/230-2	0.37		2.4	0.8	155 x 60 x 130
i550-C0.55/230-2	0.55		3.2	1	180 x 60 x 130
i550-C0.75/230-2	0.75		4.2	1	180 x 60 x 130
i550-C1.1/230-2	1.1		6	1.35	250 x 60 x 130
i550-C1.5/230-2	1.5		7	1.35	250 x 60 x 130
i550-C2.2/230-2	2.2		9.6	1.35	250 x 60 x 130
	3-phase mains connection 230/240 V; without integrated RFI filter				
i550-C0.25/230-2	0.25	3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	1.7	0.8	155 x 60 x 130
i550-C0.37/230-2	0.37		2.4	0.8	155 x 60 x 130
i550-C0.55/230-2	0.55		3.2	1	180 x 60 x 130
i550-C0.75/230-2	0.75		4.2	1	180 x 60 x 130
i550-C1.1/230-2	1.1		6	1.35	250 x 60 x 130
i550-C1.5/230-2	1.5		7	1.35	250 x 60 x 130
i550-C2.2/230-2	2.2		9.6	1.35	250 x 60 x 130
i550-C4.0/230-3	4		16.5	2.1	250 x 90 x 130
i550-C5.5/230-3	5.5		23	2.1	250 x 90 x 130

Inverter i550; connection to 400 V mains

Certain i550 400 V inverters can be operated with two load characteristics.
Heavy Duty: For requirements with high overload behaviour.
Light Duty: For requirements with low-level overload behaviour.

Conformities	CE	2014/35/EU, 2014/30/EU
	EAC	TR TC 004/2011, TP TC 020/2011
	RoHS 2	2011/65/EU
Approvals	$_{c}UL_{us}$	UL 61800-5-1, CSA 22.2 No. 274
Energy efficiency	Class IE2	EN 50598-2
Protection type	IP20	EN 60529 (except in wire range of terminals)
		NEMA 250 (type 1 protection against accidental contact only)
	Open type	Only in UL-approved systems
Power systems	TT, TN	Voltage to earth: max. 300 V
	IT	Apply the measures described for IT systems!
Mains switching		3 x within one minute possible
Operation with residual current circuit breaker		Up to 2.2 kW 30 mA
Cable length for EMC	Category C2	20 m (≤0.37 kW max. 15 m)
	Category C3	35 m (≤0.37 kW max. 15 m)
Switching frequencies		2, 4, 8, 16 kHz, The rated output currents listed below apply at 45 °C and switching frequencies of 2 and 4 kHz, and at 40 °C and switching frequencies of 8 and 16 kHz
Ambient temperature		55 °C (derating of 2.5 %/ °C above 45 °C)
Max. output frequency		0 Hz ... 599 Hz
Overload capacity		200 % for 3s; Heavy Duty: 150 % for 60s; Light Duty: 120 % for 60 s

	Rated power	**Mains voltage range**	**Rated output current**	**Weight**	**Dimensions (h x w x d)**
	[kW]	**[V]**	**[A]**	**[kg]**	**[mm]**
	3-phase mains connection 400 V – heavy duty; with integrated RFI filter				
i550-C0.37/400-3	0.37	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	1.3	0.8	155 x 60 x 130
i550-C0.55/400-3	0.55		1.8	1	180 x 60 x 130
i550-C0.75/400-3	0.75		2.4	1	180 x 60 x 130
i550-C1.1/400-3	1.1		3.2	1.35	250 x 60 x 130
i550-C1.5/400-3	1.5		3.9	1.35	250 x 60 x 130
i550-C2.2/400-3	2.2		5.6	1.35	250 x 60 x 130
i550-C3.0/400-3	3		7.3	1.35	250 x 60 x 130
i550-C4.0/400-3	4		9.5	1.35	250 x 60 x 130
i550-C5.5/400-3	5.5		13	2.3	250 x 90 x 130
i550-C7.5/400-3	7.5		16.5	3.7	276 x 120 x 130
i550-C11/400-3	11		23.5	3.7	276 x 120 x 130
i550-C15/400-3	15		32	10.3	347 x 204.5 x 222
i550-C18/400-3	18.5		40	10.3	347 x 204.5 x 222
i550-C22/400-3	22		47	10.3	347 x 204.5 x 222
i550-C30/400-3	30		61	17.2	450 x 250 x 230
i550-C.37/400-3	37		76	17.2	450 x 250 x 230
i550-C45/400-3	45		89	17.2	450 x 250 x 230
i550-C55/400-3	55		110	24	536 x 250 x 265
i550-C75/400-3	75		150	24	536 x 250 x 265
i550-C90/400-3	90		180	35.6	685 x 258 x 304
i550-C110/400-3	110		212	35.6	685 x 258 x 304
	3-phase mains connection 400 V - Light duty; with integrated RFI filter				
i550-C3.0/400-3	4	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	8.8	1.35	250 x 60 x 130
i550-C4.0/400-3	5.5		11.9	1.35	250 x 60 x 130
i550-C5.5/400-3	7.5		15.6	2.3	250 x 90 x 130
i550-C7.5/400-3	11		23	3.7	276 x 120 x 130
i550-C11/400-3	15		28.2	3.7	276 x 120 x 130
i550-C15/400-3	18.5		38.4	10.3	347 x 204.5 x 222
i550-C18/400-3	22		48	10.3	347 x 204.5 x 222
i550-C22/400-3	30		56.4	10.3	347 x 204.5 x 222
i550-C30/400-3	37		73.2	17.2	450 x 250 x 230
i550-C37/400-3	45		91.2	17.2	450 x 250 x 230
i550-C45/400-3	55		107	17.2	450 x 250 x 230
i550-C55/400-3	75		132	24	536 x 250 x 265
i550-C75/400-3	90		180	24	536 x 250 x 265
i550-C90/400-3	110		216	35.6	685 x 258 x 304
i550-C110/400-3	132		254	35.6	685 x 258 x 304

i550-C3.0/400-3 and i550-C4.0/400-3 of the generation “A” are 90 mm wide.
As stated, the devices of the generation “B” with a width of 60 mm are 33% smaller.

Order codes i500

i510 or i550:
Delivery as complete inverter

If the same inverter is always inserted into the machine, the inverter can be ordered “out of the box”. i5x0 is the designation for both products; these products can be ordered in the power range of up to 11 kW.

Ordering information for complete devices
Example for inverter i550-C2.2/400-3:

Inverter	Order code				
• 3-phase mains connection 400 V • Power 2.2 kW • Safety function STO • Standard I/O with CANopen	i55AE222F1	A	V1	0	002S

Inverter	Order code				
i5x0-C0.25/120-1	i5xAE125A1				
i5x0-C0.37/120-1	i5xAE137A1		V0		
i5x0-C0.75/120-1	i5xAE175A1				
i5x0-C1.1/120-1	i5xAE211A1				
i5x0-C0.25/230-1	i5xAE125B1				
i5x0-C0.37/230-1	i5xAE137B1				
i5x0-C0.55/230-1	i5xAE155B1				
i5x0-C0.75/230-1	i5xAE175B1		V1		
i5x0-C1.1/230-1	i5xAE211B1				
i5x0-C1.5/230-1	i5xAE215B1				
i5x0-C2.2/230-1	i5xAE222B1				
i5x0-C0.25/230-2	i5xAE125D1				
i5x0-C0.37/230-2	i5xAE137D1				
i5x0-C0.55/230-2	i5xAE155D1				
i5x0-C0.75/230-2	i5xAE175D1		V0		
i5x0-C1.1/230-2	i5xAE211D1				
i5x0-C1.5/230-2	i5xAE215D1				
i5x0-C2.2/230-2	i5xAE222D1				
i5x0-C4.0/230-3	i5xAE240C1				
i5x0-C5.5/230-3	i5xAE255C1				
i5x0-C0.37/400-3	i5xAE137F1				
i5x0-C0.55/400-3	i5xAE155F1				
i5x0-C0.75/400-3	i5xAE175F1				
i5x0-C1.1/400-3	i5xAE211F1				
i5x0-C1.5/400-3	i5xAE215F1				
i5x0-C2.2/400-3	i5xAE222F1				
i5x0-C3.0/400-3	i5xAE230F1				
i5x0-C4.0/400-3	i5xAE240F1		V1		
i5x0-C5.5/400-3	i5xAE255F1				
i5x0-C7.5/400-3	i5xAE275F1				
i5x0-C11/400-3	i5xAE311F1				
i550-C15/400-3	i55AE315F1				
i550-C18.5/400-3	i55AE318F1				
i550-C22/400-3	i55AE322F1				
i550-C30/400-3	i55AE330F1				
i550-C37/400-3	i55AE337F1				
i550-C45/400-3	i55AE345F1				
i550-C55/400-3	i55AE355F1				
i550-C75/400-3	i55AE375F1				
i550-C90/400-3	i55AE390F1				
i550-C110/400-3	i55AE411F1				
Safety engineering					
Without safety function		0			
Safety function STO		A			
Control code					
Type					
Global type, mains frequency 50 Hz				0	
USA type, mains frequency 60 Hz				1	
Compact device types i510					
Basic I/O					000S
Basic I/O with CANopen/Modbus					001S
Mounted control unit in the case of the i550					
Standard I/O without network					000S
Application I/O without network					001S
Standard I/O with CANopen					002S
Standard I/O with Modbus RTU					003S
Standard I/O with IO-Link					016S
Standard I/O with PROFIBUS					004S
Standard I/O with EtherCAT					00KS
Standard I/O with PROFINET					00LS
Standard I/O with EtherNet/IP					00MS
Standard I/O with Modbus TCP					00WS
Standard I/O with POWERLINK					012S

i550:
delivery as components

If different product versions are required in the machine, the various components can be ordered individually. Depending on the application, the components can be plugged together easily an without any further tools.

Ordering information for components
Example for inverter i550-C2.2/400-3:

Components	Order code
• 3-phase mains connection 400 V • Power 2.2 kW	I5DAE222F10V10000S
Safety function STO	I5MASAV000000S
Standard I/O with CANopen	I5CA5C02000VA0000S

Power Unit inverter	Order code
i550-C0.25/120-1	i5DAE125A10V00000S
i550-C0.37/120-1	i5DAE137A10V00000S
i550-C0.75/120-1	i5DAE175A10V00000S
i550-C1.1/120-1	i5DAE211A10V00000S
i550-C0.25/230-1	i5DAE125B10V10000S
i550-C0.37/230-1	i5DAE137B10V10000S
i550-C0.55/230-1	i5DAE155B10V10000S
i550-C0.75/230-1	i5DAE175B10V10000S
i550-C1.1/230-1	i5DAE211B10V10000S
i550-C1.5/230-1	i5DAE215B10V10000S
i550-C2.2/230-1	i5DAE222B10V10000S
i550-C0.25/230-2	i5DAE125D10V00000S
i550-C0.37/230-2	i5DAE137D10V00000S
i550-C0.55/230-2	i5DAE155D10V00000S
i550-C0.75/230-2	i5DAE175D10V00000S
i550-C1.1/230-2	i5DAE211D10V00000S
i550-C1.5/230-2	i5DAE215D10V00000S
i550-C2.2/230-2	i5DAE222D10V00000S
i550-C4.0/230-3	i5DAE240C10V00000S
i550-C5.5/230-3	i5DAE255C10V00000S
i550-C0.37/400-3	i5DAE137F10V10000S
i550-C0.55/400-3	i5DAE155F10V10000S
i550-C0.75/400-3	i5DAE175F10V10000S
i550-C1.1/400-3	i5DAE211F10V10000S
i550-C1.5/400-3	i5DAE215F10V10000S
i550-C2.2/400-3	i5DAE222F10V10000S
i550-C3.0/400-3	i5DAE230F10V10000S
i550-C4.0/400-3	i5DAE240F10V10000S
i550-C5.5/400-3	i5DAE255F10V10000S
i550-C7.5/400-3	i5DAE275F10V10000S
i550-C11/400-3	i5DAE311F10V10000S
i550-C15/400-3	i5DAE315F10V10000S
i550-C18.5/400-3	i5DAE318F10V10000S
i550-C22/400-3	i5DAE322F10V10000S
i550-C30/400-3	i5DAE330F10V10000S
i550-C37/400-3	i5DAE337F10V10000S
i550-C45/400-3	i5DAE345F10V10000S
i550-C55/400-3	i5DAE355F10V10000S
i550-C75/400-3	i5DAE375F10V10000S
i550-C90/400-3	i5DAE390F10V10000S
i550-C110/400-3	i5DAE411F10V10000S

Control unit	Order code	
	50 Hz	60 Hz
Standard I/O without network	I5CA5002000VA0000S	I5CA5002000VA1000S
Application I/O without network	I5CA5003000VA0000S	I5CA5003000VA1000S
Standard I/O with CANopen	I5CA5C02000VA0000S	I5CA5C02000VA1000S
Standard I/O with Modbus RTU	I5CA5W02000VA0000S	I5CA5W02000VA1000S
Standard I/O with Modbus TCP	I5CA5V02000VA0000S	I5CA5V02000VA1000S
Standard I/O with IO-Link	I5CA5K02000VA0000S	I5CA5K02000VA1000S
Standard I/O with PROFIBUS	I5CA5P02000VA0000S	I5CA5P02000VA1000S
Standard I/O with EtherCAT	I5CA5T02000VA0000S	I5CA5T02000VA1000S
Standard I/O with PROFINET	I5CA5R02000VA0000S	I5CA5R02000VA1000S
Standard I/O with EtherNet/IP	I5CA5G02000VA0000S	I5CA5G02000VA1000S
Standard I/O with POWERLINK	I5CA5N02000VA0000S	I5CA5N02000VA1000S

Product extensions

Diagnostics and operation of the i510 and i550

For diagnostics and parameterisation, the keypad, the Lenze SMART Keypad app (iOS and Android) or the EASY Starter can be used.

Inverter	External keypad	Keypad	WLAN	USB
				
i550-Cxxx/120-1 **i5x0-Cxxx/230-1** **i5x0-Cxxx/230-2** **i550-Cxxx/230-3** **i5x0-Cxxx/400-3**	I5MADR0000000S	I5MADK0000000S	I5MADW0000000S	I5MADU0000000S
	3 m cable			3 m cable
	I5MADR0000001S			EWL0085/S
	5 m cable			5 m cable
	I5MADR0000002S			EWL0086/S

Functional safety i550

The safety function STO can also be ordered at a later date and retrofitted.

Inverter	Safety function STO (Safe torque off)
	
i550-Cxxx/120-1 **i550-Cxxx/230-1** **i550-Cxxx/230-2** **i550-Cxxx/230-3** **i550-Cxxx/400-3**	I5MASAV000000S

Shield plate for i510 and i550

Accessories to safeguard the EMC if the motor shield is not installed on an earthing bus-bar in the control cabinet.
From 15 kW onwards, the shield plate is included with the inverter on delivery.

Inverter	Shield mounting kit	
Inverter i510 and i550 0.25 ... 2.2 kW	EZAMBHXM014/S	1x motor shield plate
		2 x fixing clips
	EZAMBHXM014/M	5 x motor shield plates
		10 x fixing clips
Inverter i510 and i550 3.0 kW ... 5.5 kW	IEZAMBHXM015/S	1 x motor shield plate
		2 x fixing clips
		1 x clamps (cable diameter 4 mm ... 15 mm)
	IEZAMBHXM015/M	5 x motor shield plates
		5 x fixing clips
		5 x clamps (cable diameter 4 mm ... 15 mm)
Inverter i510 and i550 7.5 kW ... 11 kW	EZAMBHXM016/S	1 x motor shield plate
		1 x fixing clip
		1 x clamp (cable diameter 10 mm ... 20 mm)
	EZAMBHXM016/M	5 x motor shield plates
		5 x fixing clips
		5 x clamps (cable diameter 10 mm ... 20 mm)
Inverter i550 15 kW ... 45 kW	EZAMBHXM004/M	5 x clamps (cable diameter 15 mm ... 28 mm)
	EZAMBHXM005/M	5 x clamps (cable diameter 20 mm ... 37 mm)
Inverter i550 55 kW ... 75 kW	EZAMBHXM005/M	5 x clamps (cable diameter 20 mm ... 37 mm)

Accessories

Accessories for i510; connection to 230-V mains

Inverter	Rated power	Mains voltage range	Brake resistor		
	[kW]	[V]			
					
			Order codes	Dimensions (h x w x d)	
				[mm]	
i510-C0.25/230-1	0.25	1/N/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	–	–	
i510-C0.37/230-1	0.37		–	–	
i510-C0.55/230-1	0.55		–	–	
i510-C0.75/230-1	0.75		–	–	
i510-C1.1/230-1	1.1		–	–	
i510-C1.5/230-1	1.5		–	–	
i510-C2.2/230-1	2.2		–	–	
i510-C0.25/230-2	0.25	1/N/PE AC or 3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	–	–	
i510-C0.37/230-2	0.37		–	–	
i510-C0.55/230-2	0.55		–	–	
i510-C0.75/230-2	0.75		–	–	
i510-C1.1/230-2	1.1		–	–	
i510-C1.5/230-2	1.5		–	–	
i510-C2.2/230-2	2.2		–	–	
i510-C4.0/230-3	4	3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	–	–	
i510-C5.5/230-3	5.5		–	–	
	Heavy Duty				
i510-C0.37/400-3	0.37	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	–	–	
i510-C0.55/400-3	0.55		–	–	
i510-C0.75/400-3	0.75		–	–	
i510-C1.1/400-3	1.1		–	–	
i510-C1.5/400-3	1.5		–	–	
i510-C2.2/400-3	2.2		–	–	
i510-C3.0/400-3	3.0		–	–	
i510-C4.0/400-3	4.0		–	–	
i510-C5.5/400-3	5.5		–	–	
i510-C7.5/400-3	7.5		–	–	
i510-C11/400-3	11		–	–	
	Light Duty				
i510-C3.0/400-3	4	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	–	–	
i510-C4.0/400-3	5.5		–	–	
i510-C5.5/400-3	7.5		–	–	
i510-C7.5/400-3	11		–	–	
i510-C11/400-3	15		–	–	

There are also additional accessory components available for the i510 inverter.
You can find the complete range in the configuration document for the i510.

	Mains choke		RFI filter			
			Short Distance		Long Distance	
	• Optional • Reduction of the effective mains current • Fewer current harmonics		• C1 up to 25 m (≤ 0.37 kW up to max. 15 m) • C2 up to 50 m (≤ 0.37 kW up to max. 15 m) • Operation with 30 mA residual-current circuit breaker		• C1 up to 50 m (≤ 0.37 kW up to max. 15 m) • C2 up to 100 m (≤ 0.37 kW up to max. 15 m); ≤ 2.2 kW up to max. 50 m) • Operation with 300 mA residual-current circuit breaker	
	Order codes	**Dimensions (h x w x d)**	**Order codes**	**Dimensions (h x w x d)**	**Order codes**	**Dimensions (h x w x d)**
		[mm]		**[mm]**		**[mm]**
	ELN1-0900H005	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0900H005	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0500H009	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0500H009	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0250H018	96 x 96 x 90	I0FAE222B100S0000S	346 x 60 x 50	I0FAE222B100D0000S	346 x 60 x 50
	ELN1-0250H018	96 x 96 x 90	I0FAE222B100S0000S	346 x 60 x 50	I0FAE222B100D0000S	346 x 60 x 50
	ELN1-0250H018	96 x 96 x 90	I0FAE222B100S0000S	346 x 60 x 50	I0FAE222B100D0000S	346 x 60 x 50
	EZAELN3002B153	56 x 77 x 100	–	–	–	–
	EZAELN3004B742	60 x 95 x 115	–	–	–	–
	EZAELN3004B742	60 x 95 x 115	–	–	–	–
	EZAELN3006B492	69 x 95 x 117	–	–	–	–
	EZAELN3006B492	69 x 95 x 117	–	–	–	–
	EZAELN3008B372	85 x 120 x 140	–	–	–	–
	EZAELN3010B292	85 x 120 x 140	–	–	–	–
	EZAELN3016B18	95 x 120 x 140	–	–	–	–
	EZAELN3025B12	110 x 155 x 170	–	–	–	–
	EZAELN3002B203	56 x 77 x 100	I0FAE175F100S0000S	276 x 60 x 50	I0FAE175F100D0000S	276 x 60 x 50
	EZAELN3002B153	56 x 77 x 100	I0FAE175F100S0000S	276 x 60 x 50	I0FAE175F100D0000S	276 x 60 x 50
	EZAELN3004B742	60 x 95 x 114	I0FAE175F100S0000S	276 x 60 x 50	I0FAE175F100D0000S	276 x 60 x 50
	EZAELN3004B742	60 x 95 x 114	I0FAE222F100S0000S	346 x 60 x 50	I0FAE222F100D0000S	346 x 60 x 50
	EZAELN3004B742	60 x 95 x 114	I0FAE222F100S0000S	346 x 60 x 50	I0FAE222F100D0000S	346 x 60 x 50
	EZAELN3006B492	69 x 95 x 120	I0FAE222F100S0000S	346 x 60 x 50	I0FAE222F100D0000S	346 x 60 x 50
	EZAELN3008B372	85 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE240F100D0000S	346 x 60 x 50
	EZAELN3010B292	85 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE240F100D0000S	346 x 60 x 50
	EZAELN3016B182	95 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE255F100D0001S	346 x 90 x 50
	EZAELN3016B182	95 x 120 x 140	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3025B122	110 x 155 x 170	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3010B292	85 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 50	I0FAE240F100D0000S	346 x 60 x 50
	EZAELN3016B182	95 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 50	I0FAE255F100D0001S	346 x 90 x 60
	EZAELN3016B182	95 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 50	I0FAE255F100D0001S	346 x 90 x 60
	EZAELN3025B122	110 x 155 x 170	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3030B981	110 x 155 x 170	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60

Accessories

Accessories for i550; connection to 120 V mains and 230 V mains

Inverter	Rated power	Mains voltage range	Brake resistor		
	[kW]	[V]			
					
			Order codes	Dimensions (h x w x d)	
				[mm]	
i550-C0.25/120-1	0.25	1/N/PE AC 90 V ... 132 V 45 Hz ... 65 Hz	ERBM180R050W	175 x 21 x 40	
i550-C0.37/120-1	0.37		ERBM180R050W	175 x 21 x 40	
i550-C0.75/120-1	0.75		ERBP047R200W	320 x 41 x 122	
i550-C1.1/120-1	1.1		ERBP047R200W	320 x 41 x 122	
i550-C0.25/230-1	0.25	1/N/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	ERBM180R050W	175 x 21 x 40	
i550-C0.37/230-1	0.37		ERBM180R050W	175 x 21 x 40	
i550-C0.55/230-1	0.55		ERBM100R100W	240 x 80 x 95	
i550-C0.75/230-1	0.75		ERBM100R100W	240 x 80 x 95	
i550-C1.1/230-1	1.1		ERBP033R200W	240 x 41 x 122	
i550-C1.5/230-1	1.5		ERBP033R200W	240 x 41 x 122	
i550-C2.2/230-1	2.2		ERBP033R200W	240 x 41 x 122	
i550-C0.25/230-2	0.25	1/N/PE AC or 3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	ERBM180R050W	175 x 21 x 40	
i550-C0.37/230-2	0.37		ERBM180R050W	175 x 21 x 40	
i550-C0.55/230-2	0.55		ERBM100R100W	240 x 80 x 95	
i550-C0.75/230-2	0.75		ERBM100R100W	240 x 80 x 95	
i550-C1.1/230-2	1.1		ERBP033R200W	240 x 41 x 122	
i550-C1.5/230-2	1.5		ERBP033R200W	240 x 41 x 122	
i550-C2.2/230-2	2.2		ERBP033R200W	240 x 41 x 122	
i550-C4.0/230-3	4	3/PE AC 170 V ... 264 V 45 Hz ... 65 Hz	ERBS015R800W	710 x 110 x 105	
i550-C5.5/230-3	5.5		ERBS015R800W	710 x 110 x 105	

There are also additional accessory components available for the i550 inverter.
You can find the complete range in the configuration document for the i550.

	Mains choke		RFI filter			
			Short Distance		Long Distance	
	• Optional up to 18.5 kW; mandatory from 22 kW upwards • Reduction of the effective mains current • Fewer current harmonics		• C1 up to 25 m (≤ 0.37 kW up to max. 15 m) • C2 up to 50 m (≤ 0.37 kW up to max. 15 m) • Operation with 30 mA residual-current circuit breaker		• C1 up to 50 m (≤ 0.37 kW up to max. 15 m) • C2 up to 100 m (≤ 0.37 kW up to max. 15 m); ≤ 2.2 kW up to max. 50 m) • Operation with 300 mA residual-current circuit breaker	
	Order codes	Dimensions (h x w x d)	Order codes	Dimensions (h x w x d)	Order codes	Dimensions (h x w x d)
		[mm]		[mm]		[mm]
	ELN1-0500H009	75 x 66 x 82	–	–	–	–
	ELN1-0500H009	75 x 66 x 82	–	–	–	–
	ELN1-0250H018	96 x 96 x 90	–	–	–	–
	ELN1-0250H018	96 x 96 x 90	–	–	–	–
	ELN1-0900H005	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0900H005	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0500H009	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0500H009	75 x 66 x 82	I0FAE175B100S0000S	276 x 60 x 50	I0FAE175B100D0000S	276 x 60 x 50
	ELN1-0250H018	96 x 96 x 90	I0FAE222B100S0000S	346 x 60 x 50	I0FAE222B100D0000S	346 x 60 x 50
	ELN1-0250H018	96 x 96 x 90	I0FAE222B100S0000S	346 x 60 x 50	I0FAE222B100D0000S	346 x 60 x 50
	ELN1-0250H018	96 x 96 x 90	I0FAE222B100S0000S	346 x 60 x 50	I0FAE222B100D0000S	346 x 60 x 50
	EZAELN3002B153	56 x 77 x 100	–	–	–	–
	EZAELN3004B742	60 x 95 x 115	–	–	–	–
	EZAELN3004B742	60 x 95 x 115	–	–	–	–
	EZAELN3006B492	69 x 95 x 120	–	–	–	–
	EZAELN3006B492	69 x 95 x 120	–	–	–	–
	EZAELN3008B372	85 x 120 x 140	–	–	–	–
	EZAELN3010B292	85 x 120 x 140	–	–	–	–
	EZAELN3016B182	95 x 120 x 140	–	–	–	–
	EZAELN3025B122	110 x 155 x 170	–	–	–	–

Accessories

Accessories for i550; connection to 400 V mains

Inverter	Rated power	Mains voltage range	Brake resistor		
	[kW]	[V]			
			Order codes	Dimensions (h x w x d)	
				[mm]	
	Heavy Duty				
i550-C0.37/400-3	0.37	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	ERBM390R100W	235 x 21 x 40	
i550-C0.55/400-3	0.55		ERBM390R100W	235 x 21 x 40	
i550-C0.75/400-3	0.75		ERBM390R100W	235 x 21 x 40	
i550-C1.1/400-3	1.1		ERBP180R200W	240 x 41 x 122	
i550-C1.5/400-3	1.5		ERBP180R200W	240 x 41 x 122	
i550-C2.2/400-3	2.2		ERBP180R200W	240 x 41 x 122	
i550-C3.0/400-3	3		ERBP082R200W	320 x 41 x 122	
i550-C4.0/400-3	4		ERBP047R200W	320 x 41 x 122	
i550-C5.5/400-3	5.5		ERBP047R200W	320 x 41 x 122	
i550-C7.5/400-3	7.5		ERBP027R200W	320 x 41 x 122	
i550-C11/400-3	11		ERBP027R200W	320 x 41 x 122	
i550-C15/400-3	15		ERBS018R800W	710 x 110 x 105	
i550-C18/400-3	18.5		ERBS015R800W	710 x 110 x 105	
i550-C22/400-3	22		ERBS015R800W	710 x 110 x 105	
i550-C30/400-3	30		ERBG075D01K9	486 x 236 x 302	
i550-C37/400-3	37		ERBG075D01K9	486 x 236 x 302	
i550-C45/400-3	45		ERBG075D01K9	486 x 236 x 302	
i550-C55/400-3	55		ERBG005R02K6	486 x 326 x 302	
i550-C75/400-3	75		ERBG005R02K6	486 x 326 x 302	
i550-C90/400-3	90		ERBG028D04K1	486 x 426 x 302	
i550-C110/400-3	110		ERBG028D04K1	486 x 426 x 302	
	Light Duty				
i550-C3.0/400-3	4	3/PE AC 340 V ... 528 V 45 Hz ... 65 Hz	ERBP082R200W	320 x 41 x 122	
i550-C4.0/400-3	5.5		ERBP047R200W	320 x 41 x 122	
i550-C5.5/400-3	7.5		ERBP047R200W	320 x 41 x 122	
i550-C7.5/400-3	11		ERBP027R200W	320 x 41 x 122	
i550-C11/400-3	15		ERBP027R200W	320 x 41 x 122	
i550-C15/400-3	18.5		ERBS018R800W	710 x 110 x 105	
i550-C18/400-3	22		ERBS015R800W	710 x 110 x 105	
i550-C22/400-3	30		ERBS015R800W	710 x 110 x 105	
i550-C30/400-3	37		ERBG075D01K9	486 x 236 x 302	
i550-C37/400-3	45		ERBG075D01K9	486 x 236 x 302	
i550-C45/400-3	55		ERBG075D01K9	486 x 236 x 302	
i550-C55/400-3	75		ERBG005R02K6	486 x 326 x 302	
i550-C75/400-3	90		ERBG005R02K6	486 x 326 x 302	
i550-C90/400-3	110		ERBG028D04K1	486 x 426 x 302	
i550-C110/400-3	132		ERBG028D04K1	486 x 426 x 302	

There are also additional accessory components available for the i550 inverter.
You can find the complete range in the configuration document for the i550.

	Mains choke		RFI filter			
			Short Distance		Long Distance	
	• Heavy Duty: optional up to 18.5 kW, mandatory from 22 kW upwards • Light Duty: always mandatory • Reduction of the effective mains current • Fewer current harmonics		• C1 up to 25 m (≤ 0.37 kW up to max. 15 m) • C2 up to 50 m (≤ 0.37 kW up to max. 15 m) • Operation with 30 mA residual-current circuit breaker		• C1 up to 50 m (≤ 0.37 kW up to max. 15 m) • C2 up to 100 m (≤ 0.37 kW up to max. 15 m); ≤ 2.2 kW up to max. 50 m) • Mains filter from 22 kW (mains choke and Long Distance filter) integrated. • Operation with 300 mA residual-current circuit breaker	
	Order codes	**Dimensions (h x w x d)**	**Order codes**	**Dimensions (h x w x d)**	**Order codes**	**Dimensions (h x w x d)**
		[mm]		**[mm]**		**[mm]**
	EZAELN3002B203	56 x 77 x 100	I0FAE175F100S0000S	276 x 60 x 50	I0FAE175F100D0000S	276 x 60 x 50
	EZAELN3002B153	56 x 77 x 100	I0FAE175F100S0000S	276 x 60 x 50	I0FAE175F100D0000S	276 x 60 x 50
	EZAELN3004B742	60 x 95 x 115	I0FAE175F100S0000S	276 x 60 x 50	I0FAE175F100D0000S	276 x 60 x 50
	EZAELN3004B742	60 x 95 x 115	I0FAE222F100S0000S	346 x 60 x 50	I0FAE222F100D0000S	346 x 60 x 50
	EZAELN3004B742	60 x 95 x 115	I0FAE222F100S0000S	346 x 60 x 50	I0FAE222F100D0000S	346 x 60 x 50
	EZAELN3006B492	69 x 95 x 120	I0FAE222F100S0000S	346 x 60 x 50	I0FAE222F100D0000S	346 x 60 x 50
	EZAELN3008B372	85 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE240F100D0000S	346 x 60 x 50
	EZAELN3010B292	85 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE240F100D0000S	346 x 60 x 50
	EZAELN3016B182	95 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE255F100D0001S	346 x 90 x 60
	EZAELN3016B182	95 x 120 x 140	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3025B122	110 x 155 x 170	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3030B981	110 x 155 x 170	–	–	I0FAE318F100D0000S	436 x 205 x 90
	EZAELN3040B741	112 x 185 x 200	–	–	I0FAE318F100D0000S	436 x 205 x 90
	EZAELN3045B651	112 x 185 x 200	–	–	I0FAE322F100D0000S	436 x 205 x 90
	EZAELN3063B471	122 x 185 x 210	–	–	I0FAE330F100D0000S	590 x 250 x 105
	EZAELN3080B371	125 x 210 x 240	–	–	I0FAE337F100D0000S	590 x 250 x 105
	EZAELN3080B371	125 x 210 x 240	–	–	I0FAE345F100D0001S	590 x 250 x 105
	EZAELN3100B301	139 x 267 x 205	–	–	I0FAE355F100D0001S	700 x 250 x 105
	EZAELN3160B191	149 x 291 x 215	–	–	I0FAE375F100D0001S	700 x 250 x 105
	EZAELN3180B171	164 x 316 x 235	–	–	I0FAE411F100D0001S	855 x 250 x 130
	EZAELN3200B151	144 x 352 x 265	–	–	I0FAE411F100D0001S	855 x 250 x 130
	EZAELN3010B292	85 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE240F100D0000S	346 x 60 x 50
	EZAELN3016B182	95 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE255F100D0001S	346 x 90 x 60
	EZAELN3016B182	95 x 120 x 140	I0FAE255F100S0001S	346 x 90 x 60	I0FAE255F100D0001S	346 x 90 x 60
	EZAELN3025B122	110 x 155 x 170	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3030B981	110 x 155 x 170	I0FAE311F100S0000S	371 x 120 x 60	I0FAE311F100D0000S	371 x 120 x 60
	EZAELN3040B741	112 x 185 x 200	–	–	I0FAE318F100D0000S	436 x 205 x 90
	EZAELN3045B651	112 x 185 x 200	–	–	I0FAE322F100D0000S	436 x 205 x 90
	EZAELN3063B471	122 x 185 x 210	–	–	I0FAE322F100D0000S	436 x 205 x 90
	EZAELN3080B371	125 x 210 x 240	–	–	I0FAE337F100D0000S	590 x 250 x 105
	EZAELN3090B331	115 x 267 x 205	–	–	I0FAE345F100D0001S	590 x 250 x 105
	EZAELN3100B301	139 x 267 x 205	–	–	I0FAE345F100D0001S	590 x 250 x 105
	EZAELN3125B241	139 x 291 x 215	–	–	I0FAE355F100D0001S	700 x 250 x 105
	EZAELN3160B191	149 x 291 x 215	–	–	I0FAE375F100D0001S	700 x 250 x 105
	EZAELN3200B151	144 x 352 x 265	–	–	I0FAE411F100D0001S	855 x 250 x 130
	EZAELN3250B121	207 x 352 x 260	–	–	I0FAE411F100D0001S	855 x 250 x 130

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HITACHI
Inspire the Next

Pursuing the Ideal Compact Inverter

WJ200 Series

Designed for excellent performance and user friendliness

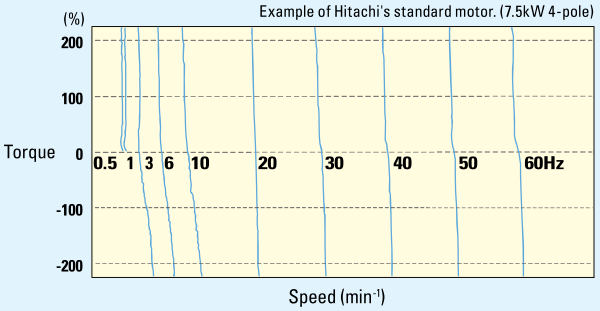
Hitachi Industrial Equipment Systems Co., Ltd.

Industry-leading Levels of Performance

1 High starting torque of 200% or greater achieved by sensorless vector control (when sized for heavy duty).

Integrated auto-tuning function for easy sensorless vector control realizes high torque suitable for applications requiring it such as crane hoists, lifts, elevators, etc.

Example of Torque Characteristics

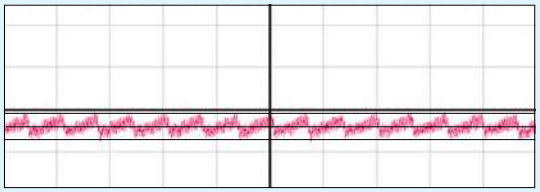


Auto-tuning to perform sensorless vector control can now be easily done.

2 Speed regulation at low-speed is greatly improved. – Fluctuation is 1/2* compared with the previous model. –

Speed regulation at low speed has been drastically improved to enhance process stability and precision.

(Example of WJ200-055LF)



- Frequency commanded by the inverter: 0.5Hz.
- Motor: Hitachi's standard 3-phase 5.5kW 4-pole totally enclosed type motor.

* WJ200: 5min^{-1}, Previous model: 13min^{-1}

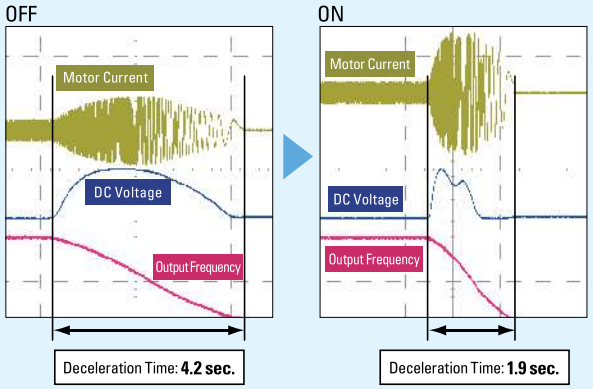
3 Trip avoidance functions

NEW

Minimum time deceleration function, over-current suppress function and DC bus AVR function are incorporated. The functions reduce nuisance tripping. Improved torque limiting/current limiting function enables a load limit to protect machine and equipment.

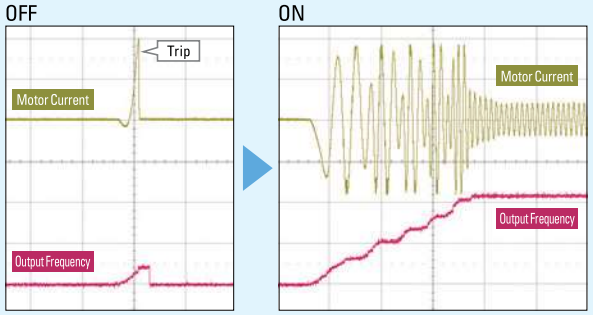
(Example of WJ200-075LF)

Minimum time deceleration Function



2.3 sec. reduction of deceleration time without a braking resistor is achieved when the function is active.

Over-current Suppress Function*



*Turn off this function for lifting equipment.

Model Name Indication

WJ200 – 001 L F

- Series Name
- Applied Motor Capacity: 001: 0.1kW – 150: 15kW
- Power Source: M:1-phase 100V class; S:1-phase 200V class; L:3-phase 200V class; H:3-phase 400V class
- with Digital Operator

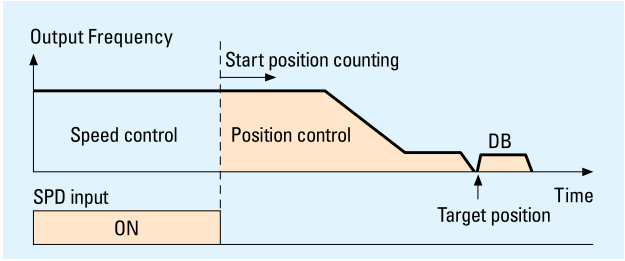
Model Configuration

Model Name WJ200-xxx	1-phase 100V class	1-phase 200V class		3-phase 200V class		3-phase 400V class	
	CT	VT	CT	VT	CT	VT	CT
001		0.2	0.1	0.2	0.1		
002		0.4	0.2	0.4	0.2		
004	0.4	0.55	0.4	0.75	0.4	0.75	0.4
007	0.75	1.1	0.75	1.1	0.75	1.5	0.75
015		2.2	1.5	2.2	1.5	2.2	1.5
022		3.0	2.2	3.0	2.2	3.0	2.2
030						4.0	3.0
037				5.5	3.7		
040						5.5	4.0
055				7.5	5.5	7.5	5.5
075				11	7.5	11	7.5
110				15	11	15	11
150				18.5	15	18.5	15

4 Simple positioning control
(when feedback signal is used.)

NEW

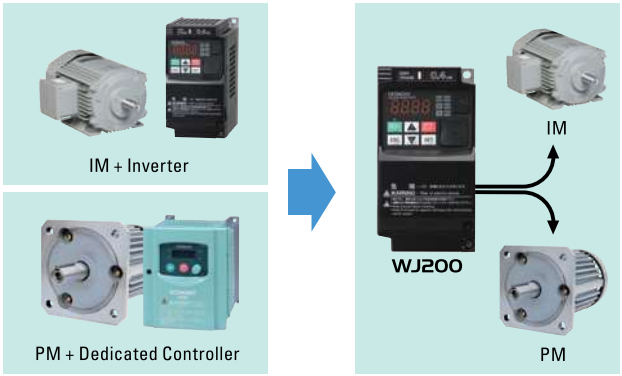
When simple positioning function is activated, speed control operation or positioning control operation is selectable via intellient input. While the [SPD] input is ON, the current position counter is held at 0. When [SPD] is OFF, the inverter enters positioning control operation and the position counter is active.



5 Induction motor & Permanent magnetic motor* control with one inverter (corresponds more than Ver.2.0)

NEW

The WJ200 inverter can drive both induction motors (IM) and permanent magnetic motors (PM). Energy conservation and miniaturization can be achieved using PM motors. Moreover, one inverter used for two types of motor.



*Permanent magnet motor control function of WJ200 is for variable torque application such as fan and pump.

Global standards

1 Conformity to global standards

CE, UL, c-UL, c-Tick approvals.
(1-phase 100V class is for CE, UL and c-UL only)

2 Sink / source logic is standard

Logic input and output terminal can be configured for sink or source logic.

3 Wide input power voltage range

Input voltage 240V for 200V class and 480V for 400V class as standard.

Index

Pursuing the Ideal Compact Inverter

WJ200

Designed for excellent performance and user friendliness

Pursuit of Ease of Use

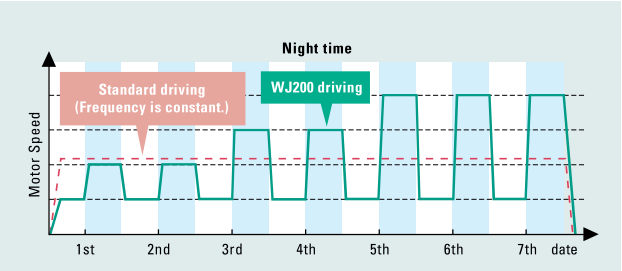
1 Easy sequence [EzSQ] programming function

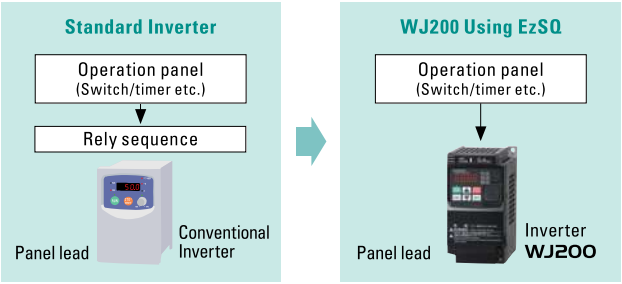
NEW

Sequence operation is realized by downloading to an inverter a program created with Hitachi's EzSQ software. User program can be compiled on EzSQ software on a PC. External components can be simplified or eliminated, resulting in cost-savings.

- EzSQ Example: Energy cost saving by speed reduction.
  - ■Daytime: Motor speed is automatically reduced to reduce demand during peak hours.
  - ■Nighttime: Motor speed is increased to take a advantage of off-peak power rates.

Example of driving program



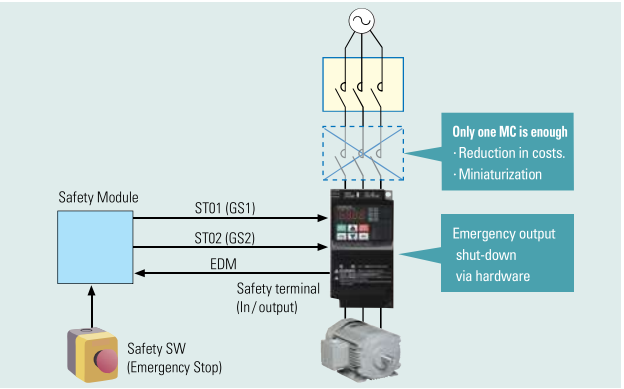


2 Safe stop function

NEW

WJ200 conforms to the applicable safety standards and corresponds to Machinery Directive of Europe. Shuts down the inverter by hardware, bypassing the CPU, to achieve reliable safe stop function. The safety standard can be met at a low cost.
(ISO13849-1 Category 3 / IEC60204-1 Stop Category 0)

*1-phase 100V class and C versions (SFC, LFU, HFC) are not certified.



3 Password function

NEW

The WJ200 inverter has a password function to prevent changing parameters or to hide some or all parameters.

Ease of Maintenance

1 Long life time components (Design life time 10 years or more*)

NEW

Design lifetime 10 Years or more for DC bus capacitors and cooling fan.
Cooling fan ON / OFF control function for longer fan life.

*Ambient temperature : Average 40°C (no corrosive gases, oil mist or dust)
Design lifetime is calculated, and not guaranteed.

2 Life time warning function

NEW

WJ200 diagnoses lifetime of DC bus capacitors and cooling fan(s).

3 Easy-removable cooling fan

The cooler fan can be exchanged without special tools.

Top cover can be removed with fingertips.

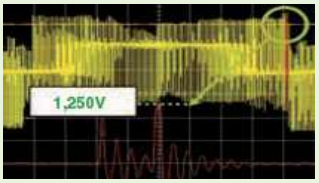
Remove cooling fan after disconnecting power plug.

Environmental Friendliness

1 Micro surge voltage suppress function

Hitachi original PWM control method limits motor terminal voltage to less than twice inverter DC bus voltage.
Lower than Hitachi motor max. insulation voltage (1,250V)
(During regeneration, the motor terminal voltage may exceed the motor maximum insulation voltage (1,250V))

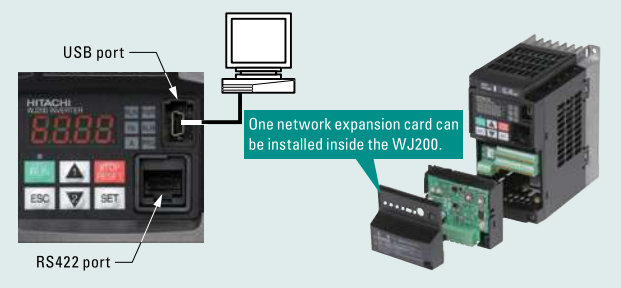
Motor terminal voltage



E=625V cable:100m

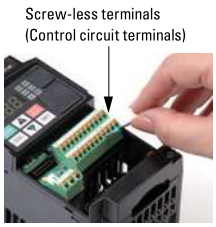
4 Network compatibility & External ports NEW

A serial RS485 Modbus/RTU port is standard. The WJ200 can communicate via DeviceNet and CCLink with optional expansion card (ordered items). USB (Mini-B connector) port and RS422 (RJ45 connector) port are standard.



5 Ease of wiring NEW

Screw-less terminals (control circuit terminals) spring-loaded, for use with solid or stranded wire with ferrules.



6 Easy to maintain NEW

Easy selection of displayed parameters

- Data comparison function
  Display parameters changed from default setting.
- Basic display
  Display most frequently used parameters.
- Quick display
  Display 32 user-selected parameters.
- User-changed parameter display
  Store automatically and display the parameters changed by the user (Up to 32 sets); can also be used as change history.
- Active parameter display
  Display those parameters which are enabled.

7 Side-by-side installation

Inverters can be installed with no space between them to save space in the panel.
*Ambient temperature 40°C max., individual mounting.

8 Easy adjustment of frequency

Pot for frequency adjustiment is available as option kit.

Various Versatile Functions

2 EU RoHS compliant

Environment-friendly inverter meets RoHS requirements (ordered items).

3 Improvement of environment

Varnish coating of internal PC board is standard.
(Logic PCB and I/F PCB are excluded.)

1 Dual rating NEW

WJ200 can be used for both heavy and normal duty. One-frame-size smaller WJ200 can be applicable to certain applications.
*1-phase 100V class is only with CT.

2 Watt-hour monitor NEW

Energy consumption is displayed in kwh.

3 Output monitoring (2 terminals) NEW

Two monitor output terminals (Analog 0–10VDC (10-bit), pulse train (0–10VDC, max 32kHz)).

4 Built-in BRD circuit

Built-in BRD circuit for all models (Optional resistor).

5 EzCOM (Peer-to-Peer communication) NEW

WJ200 supports Peer-to-Peer communication between multiple inverters. One administrator inverter is necessary in the network, and the other inverters act as master or slave.

6 Flexible display functions NEW

Automatic return to the initial display: 10 min. after the last key operation, display returns to the initial parameter set.
Display limitation: Show only the contents of display parameter.
Dual monitor: Two arbitrary monitor items can be set. Parameters are switched by up/down keys.

Standard Specifications

1-phase 100V class (only with CT)

Models WJ200-			004MF	007MF
Applicable motor size *1		kW	0.4	0.75
		HP	1/2	1
Rated capacity (kVA)		100V	1.0	1.7
		120V	1.2	2.0
Input Rating	Rated input voltage (V)		1-phase: 100V-10% to 120V +10%, 50/60Hz ±5%	
	Rated input current (A)		14	24
Output Rating	Rated output voltage (V) *2		3-phase: 200 to 240V (proportional to input voltage)	
	Rated output current (A)		3.5	5.0
Minimum value of resistor (Ω)			100	50
Cooling method			Self-cooling	
Weight		kg	1.1	1.6
		lb	2.4	3.5

1-phase 200V class

Models WJ200-			001SF	002SF	004SF	007SF	015SF	022SF
Applicable motor size *1	kW	VT	0.2	0.4	0.55	1.1	2.2	3.0
		CT	0.1	0.2	0.4	0.75	1.5	2.2
	HP	VT	1/4	1/2	3/4	1.5	3	4
		CT	1/8	1/4	1/2	1	2	3
Rated capacity (kVA)	200V	VT	0.4	0.6	1.2	2.0	3.3	4.1
		CT	0.2	0.5	1.0	1.7	2.7	3.8
	240V	VT	0.4	0.7	1.4	2.4	3.9	4.9
		CT	0.3	0.6	1.2	2.0	3.3	4.5
Input Rating	Rated input voltage (V)		1-phase: 200V-15% to 240V +10%, 50/60Hz ±5%					
	Rated input current (A)	VT	2.0	3.6	7.3	13.8	20.2	24.0
		CT	1.3	3.0	6.3	11.5	16.8	22.0
Output Rating	Rated output voltage (V) *2		3-phase: 200 to 240V (proportional to input voltage)					
	Rated output current (A)	VT	1.2	1.9	3.5	6.0	9.6	12.0
		CT	1.0	1.6	3.0	5.0	8.0	11.0
Minimum value of resistor (Ω)			100	100	100	50	50	35
Cooling method			Self-cooling				Force ventilation	
Weight		kg	1.0	1.0	1.1	1.6	1.8	1.8
		lb	2.2	2.2	2.4	3.5	4.0	4.0

3-phase 200V class

Models WJ200-			001LF	002LF	004LF	007LF	015LF	022LF	037LF	055LF	075LF	110LF	150LF
Applicable motor size *1	kW	VT	0.2	0.4	0.75	1.1	2.2	3.0	5.5	7.5	11	15	18.5
		CT	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	HP	VT	1/4	1/2	1	1.5	3	4	7.5	10	15	20	25
		CT	1/8	1/4	1/2	1	2	3	5	7.5	10	15	20
Rated capacity (kVA)	200V	VT	0.4	0.6	1.2	2.0	3.3	4.1	6.7	10.3	13.8	19.3	23.9
		CT	0.2	0.5	1.0	1.7	2.7	3.8	6.0	8.6	11.4	16.2	20.7
	240V	VT	0.4	0.7	1.4	2.4	3.9	4.9	8.1	12.4	16.6	23.2	28.6
		CT	0.3	0.6	1.2	2.0	3.3	4.5	7.2	10.3	13.7	19.5	24.9
Input Rating	Rated input voltage (V)		3-phase: 200V-15% to 240V +10%, 50/60Hz ±5%										
	Rated input current (A)	VT	1.2	1.9	3.9	7.2	10.8	13.9	23.0	37.0	48.0	68.0	72.0
		CT	1.0	1.6	3.3	6.0	9.0	12.7	20.5	30.8	39.6	57.1	62.6
Output Rating	Rated output voltage (V) *2		3-phase: 200 to 240V (proportional to input voltage)										
	Rated output current (A)	VT	1.2	1.9	3.5	6.0	9.6	12.0	19.6	30.0	40.0	56.0	69.0
		CT	1.0	1.6	3.0	5.0	8.0	11.0	17.5	25.0	33.0	47.0	60.0
Minimum value of resistor (Ω)			100	100	100	50	50	35	35	20	17	17	10
Cooling method			Self-cooling			Force ventilation							
Weight		kg	1.0	1.0	1.1	1.2	1.6	1.8	2.0	3.3	3.4	5.1	7.4
		lb	2.2	2.2	2.4	2.6	3.5	4.0	4.4	7.3	7.5	11.2	16.3

3-phase 400V class

Models WJ200-			004HF	007HF	015HF	022HF	030HF	040HF	055HF	075HF	110HF	150HF
Applicable motor size *1	kW	VT	0.75	1.5	2.2	3.0	4.0	5.5	7.5	11	15	18.5
		CT	0.4	0.75	1.5	2.2	3.0	4.0	5.5	7.5	11	15
	HP	VT	1	2	3	4	5	7.5	10	15	20	25
		CT	1/2	1	2	3	4	5	7.5	10	15	20
Rated capacity (kVA)	200V	VT	1.3	2.6	3.5	4.5	5.7	7.3	11.5	15.1	20.4	25.0
		CT	1.1	2.2	3.1	3.6	4.7	6.0	9.7	11.8	15.7	20.4
	240V	VT	1.7	3.4	4.4	5.7	7.3	9.2	14.5	19.1	25.7	31.5
		CT	1.4	2.8	3.9	4.5	5.9	7.6	12.3	14.9	19.9	25.7
Input Rating	Rated input voltage (V)		3-phase: 380V-15% to 480V +10%, 50/60Hz ±5%									
	Rated input current (A)	VT	2.1	4.3	5.9	8.1	9.4	13.3	20.0	24.0	38.0	44.0
		CT	1.8	3.6	5.2	6.5	7.7	11.0	16.9	18.8	29.4	35.9
Output Rating	Rated output voltage (V) *2		3-phase: 380 to 480V (proportional to input voltage)									
	Rated output current (A)	VT	2.1	4.1	5.4	6.9	8.8	11.1	17.5	23.0	31.0	38.0
		CT	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18.0	24.0	31.0
Minimum value of resistor (Ω)			180	180	180	100	100	100	70	70	70	35
Cooling method			Self-cooling		Force ventilation							
Weight		kg	1.5	1.6	1.8	1.9	1.9	2.1	3.5	3.5	4.7	5.2
		lb	3.3	3.5	4.0	4.2	4.2	4.6	7.7	7.7	10.4	11.5

*1: The applicable motor refers to Hitachi standard 3-phase motor (4p). When using other motors, care must be taken to prevent the rated motor current (50/60Hz) from exceeding the rated output current of the inverter.
*2: The output voltage varies as the main supply voltage varies (except when using the AVR function). In any case, the output voltage cannot exceed the input power supply voltage.

General Specifications

Item			General Specifications
Protective housing *3			IP20
Control method			Sinusoidal Pulse Width Modulation (PWM) control
Carrier frequency			2kHz to 15kHz (derating required depending on the model)
Output frequency range *4			0.1 to 400Hz
Frequency accuracy			Digital command: ±0.01% of the maximum frequency Analog command: ±0.2% of the maximum frequency (25°C ±10°C)
Frequency setting resolution			Digital: 0.01Hz; Analog: max. frequency / 1000
Volt. / Freq. characteristic			V/f control (constant torque, reduced torque, free-V/F): base freq. 30Hz – 400Hz adjustable, Sensorless vector control, Closed loop control with motor encoder feedback (only V/f control).
Overload capacity			Dual rating*6: CT (Heavy duty): 60 sec. @150% VT (Normal duty): 60 sec. @120%
Acceleration / deceleration time			0.01 to 3600 seconds, linear and S-curve accel / decel, second accel / decel setting available
Starting torque			200% @0.5Hz (sensorless vector control)
DC braking			Variable operating frequency, time, and braking force
Input signal	Freq. setting	Operator panel	△▽ keys / Value settings
		External signal *7	0 to 10 VDC (input impedance 10kΩ), 4 to 20mA (input impedance 100Ω), Potentiometer (1k to 2kΩ, 2W)
		Via network	RS485 ModBus RTU, other network option
	FWD / REV run	Operator panel	Run / Stop (Forward / Reverse run change by command)
		External signal *7	Forward run / stop, Reverse run / stop
		Via network	RS485 ModBus RTU, other network option
	Intelligent input terminal 68 functions assignable	Terminals	7 terminals, sink / source changeable by a short bar
		Functions	FW (forward run command), RV (reverse run command), CF1 – CF4 (multi-stage speed setting), JG (jog command), DB (external braking), SET (set second motor), 2CH (2-stage accel. / decel. command), FRS (free run stop command), EXT (external trip), USP (startup function), CS (commercial power switchover), SFT (soft lock), AT (analog input selection), RS (reset), PTC (thermistor thermal protection), STA (start), STP (stop), F / R (forward / reverse), PID (PID disable), PIDC (PID reset), UP (remote control up function), DWN (remote control down function), UDC (remote control data clear), OPE (operator control), SF1 – SF7 (multi-stage speed setting; bit operation), OLR (overload restriction), TL (torque limit enable), TRQ1 (torque limit changeover1), TRQ2 (torque limit changeover2), BOK (Braking confirmation), LAC (LAD cancellation), PCLR (position deviation clear), ADD (add frequency enable), F-TM (force terminal mode), ATR (permission of torque command input), KHC (Cumulative power clear), MI1 – MI7 (general purpose inputs for EzSQ), AHD (analog command hold), CP1 – CP3 (multistage-position switches), ORL (limit signal of zero-return), ORG (trigger signal of zero-return), SPD (speed/position changeover), GS1,GS2 (STO inputs, safety related signals), 485 (Starting communication signal), PRG (executing EzSQ program), HLD (retain output frequency), ROK (permission of run command), EB (rotation direction detection of B-phase), DISP (display limitation), NO (no function)
Output signal	Intelligent output terminal 48 functions assignable	Functions	RUN (run signal), FA1 – FA5 (frequency arrival signal), OL,OL2 (overload advance notice signal), OD (PID deviation error signal), AL (alarm signal), OTQ (over / under torque threshold), UV (under-voltage), TRQ (torque limit signal), RNT (run time expired), ONT (power ON time expired), THM (thermal warning), BRK (brake release), BER (brake error), ZS (0Hz detection), DSE (speed deviation excessive), POK (positioning completion), ODc (analog voltage input disconnection), OIDc (analog current input disconnection), FBV (PID second stage output), NDc (network disconnect detection), LOG1 – LOG3 (Logic output signals), WAC (capacitor life warning), WAF (cooling fan warning), FR (starting contact), OHF (heat sink overheat warning), LOC (Low load), MO1 – MO3 (general outputs for EzSQ), IRDY (inverter ready), FWR (forward operation), RVR (reverse operation), MJA (major failure), WCO (window comparator O), WCOI (window comparator OI), FREF (frequency command source), REF (run command source), SETM (second motor in operation), EDM (STO (safe torque off) performance monitor), OP (option control signal), NO (no function)
	Monitor output (analog)		Output freq., output current, output torque, output voltage, input power, thermal load ratio, LAD freq., heat sink temperature, general output (EzSQ)
	Pulse train output (0 – 10VDC, 32kHz max.)		[PWM output] Output freq., output current, output torque, output voltage, input power, thermal load ratio, LAD freq., heat sink temperature, general output (EzSQ) [Pulse train output] Output frequency, output current, pulse train input monitor
Alarm output contact			ON for inverter alarm (1c contacts, both normally open or closed available.)
Other functions			Free-V/f, manual / automatic torque boost, output voltage gain adjustment, AVR function, reduced voltage start, motor data selection, auto-tuning, motor stabilization control, reverse running protection, simple position control, simple torque control, torque limiting, automatic carrier frequency reduction, energy saving operation, PID function, non-stop operation at instantaneous power failure, brake control, DC injection braking, dynamic braking (BRD), frequency upper and lower limiters, jump frequencies, curve accel and decel (S, U, inversed U,EL-S), 16-stage speed profile, fine adjustment of start frequency, accel and decel stop, process jogging, frequency calculation, frequency addition, 2-stage accel / decel, stop mode selection, start / end freq., analog input filter, window comparators, input terminal response time, output signal delay / hold function, rotation direction restriction, stop key selection, software lock, safe stop function, scaling function, display restriction, password function, user parameter, initialization, initial display selection, cooling fan control, warning, trip retry, frequency pull-in restart, frequency matching, overload restriction, over current restriction, DC bus voltage AVR
Protective function			Over-current, over-voltage, under-voltage, overload, brake resistor overload, CPU error, memory error, external trip, USP error, ground fault detection at power on, temperature error, internal communication error, driver error, thermistor error, brake error, safe stop, overload at low speed, modbus communication error, option error, encoder disconnection, speed excessive, EzSQ command error, EzSQ nesting error, EzSQ execution error, EzSQ user trip
Operating environment		Temperature	Operating (ambient): -10 to 50°C / Storage: -20 to 65°C *8
		Humidity	20 to 90% humidity (non-condensing)
		Vibration *9	5.9m/s^2 (0.6G), 10 to 55 Hz
		Location	Altitude 1,000m or less, indoors (no corrosive gasses or dust)
Coating color			Black
Options			Remote operator unit, cables for the units, braking unit, braking resistor, AC reactor, DC reactor, EMC filter

*3: The protection method conforms to JIS C 0920 (IEC 60529).

*4: To operate the motor beyond 50 / 60Hz, consult the motor manufacturer for the maximum allowable rotation speed.

*5: The braking torque via capacitive feedback is the average deceleration torque at the shortest deceleration (stopping from 50 / 60Hz as indicated). It is not continuous regenerative braking torque. The average deceleration torque varies with motor loss. This value decreases when operating beyond 50Hz. If a large regenerative torque is required, the optional regenerative braking unit and a resistor should be used.

*6: 1-phase 100V class is only with CT.

*7: The frequency command is the maximum frequency at 9.8V for input voltage 0 to 10VDC, or at 19.8mA for input current 4 to 20mA. If this characteristic is not satisfactory for your application, contact your Hitachi representative.

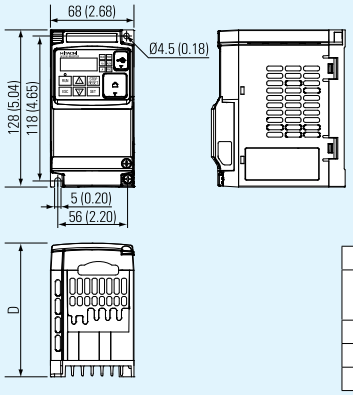
*8: The storage temperature refers to the short-term temperature during transportation.

*9: Conforms to the test method specified in JIS C 60068-2-6:2010 (IEC 60068-2-6:2007). For the model types excluded in the standard specifications, contact your Hitachi sales representative.

Dimensions

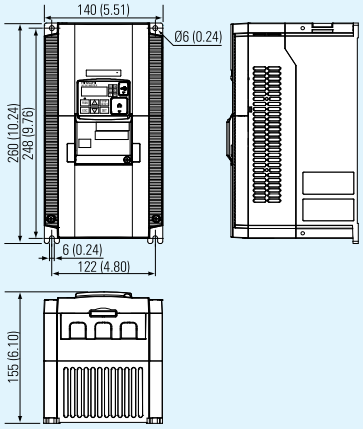
[Unit: mm(inch)]
Inches for reference only

- **WJ200-004MF**
- **WJ200-001SF – 004SF**
- **WJ200-001LF – 007LF**

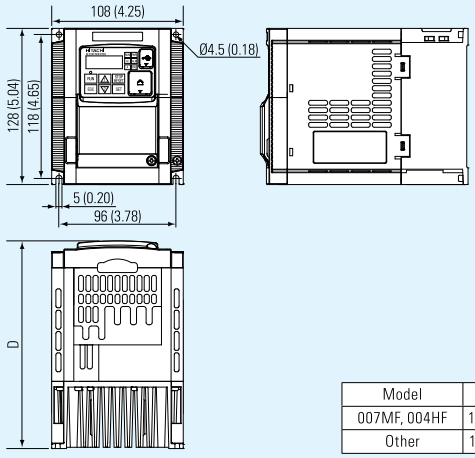


Model	D
001SF, 002SF 001LF, 002LF	109 (4.29)
004SF, 004LF	122.5 (4.82)
004MF	132.5 (5.22)
007LF	145.5 (5.73)

- **WJ200-055LF**
- **WJ200-075LF**
- **WJ200-055HF**
- **WJ200-075HF**

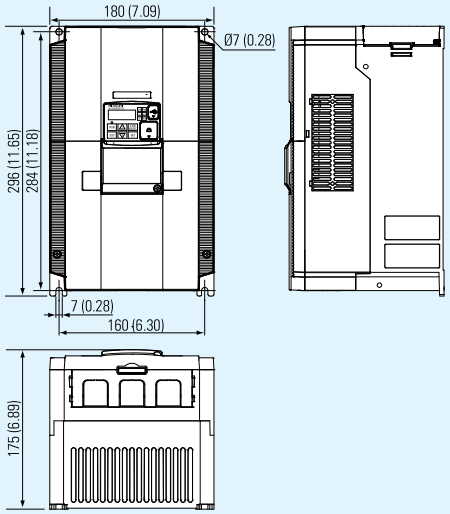


- **WJ200-007MF**
- **WJ200-007SF – 022SF**
- **WJ200-015LF, 022LF**
- **WJ200-004HF – 030HF**

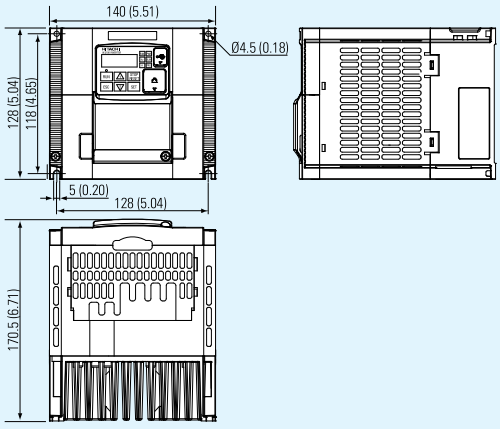


Model	D
007MF, 004HF	143.5 (5.65)
Other	170.5 (6.71)

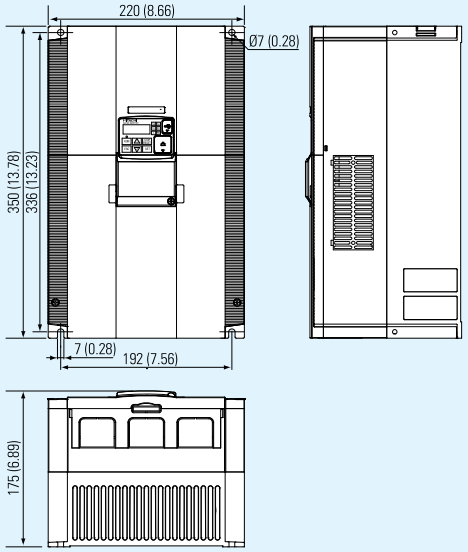
- **WJ200-110LF**
- **WJ200-110HF**
- **WJ200-150HF**



- **WJ200-037LF**
- **WJ200-040HF**



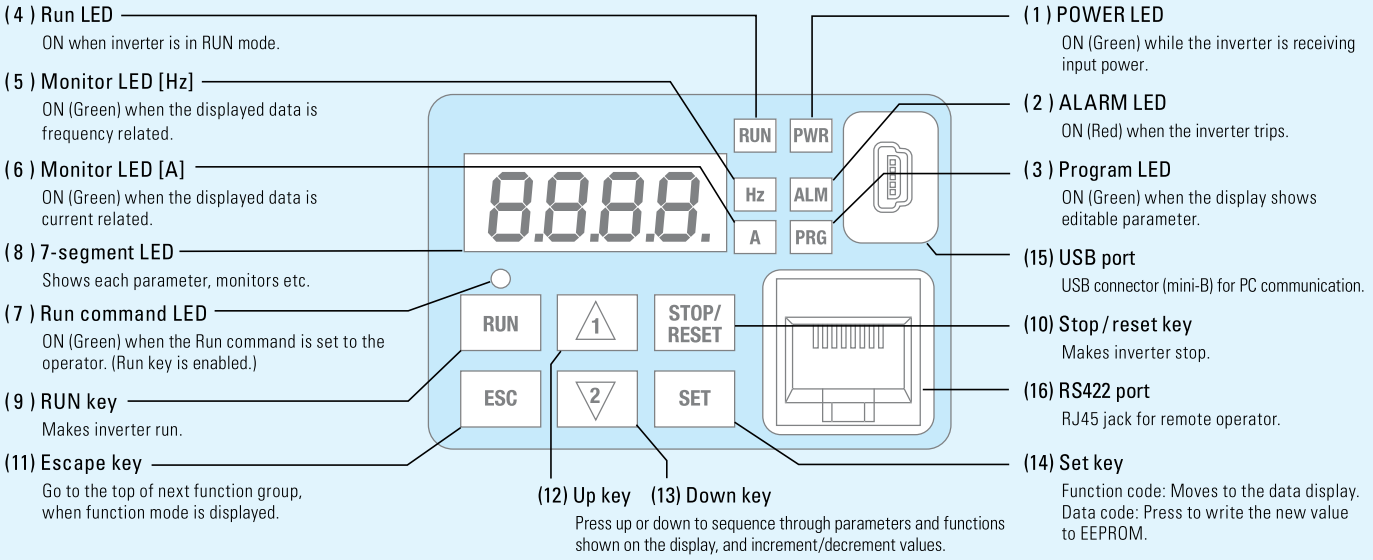
- **WJ200-150LF**



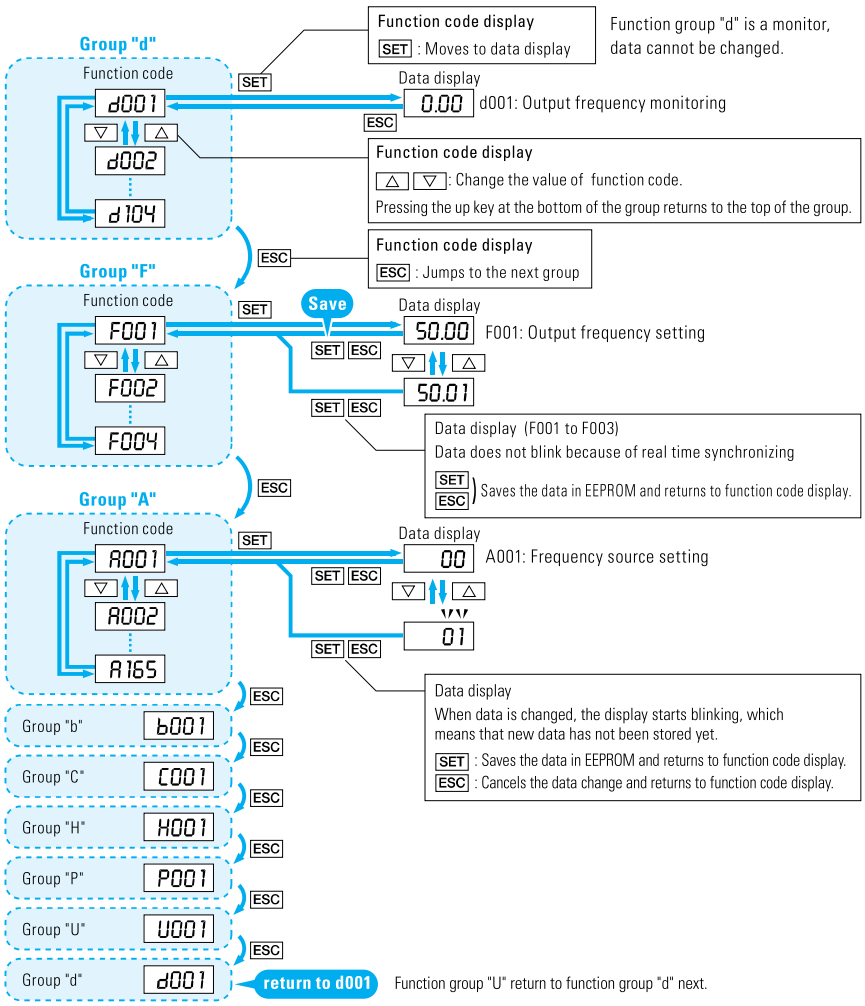
Operation and Programming

Operation Panel

WJ200 Series can be easily operated with the digital operator provided as standard.



Keypad Navigation Map



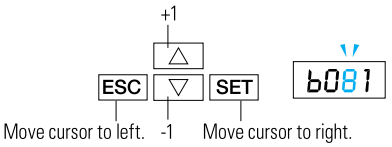
Single-Digit Edit Mode

If a target function code or data is far from current position, using the single-digit edit mode makes it quicker to navigate there. Pressing the up key and down key at the same time brings you into the digit-by-digit navigation mode.

Step1: Press both up key and down key at the same.

1st digit will be blinking.

Step2: The blinking digit is moved by the ESC and SET key right and left. Use up/down keys to change the value of the digit.



Step3: When the least significant digit is blinking, the SET key selects that parameter.

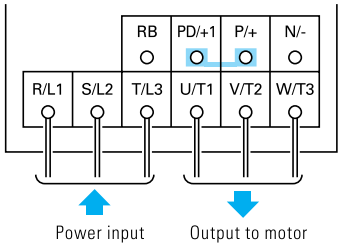
Terminal (Arrangements / Functions)

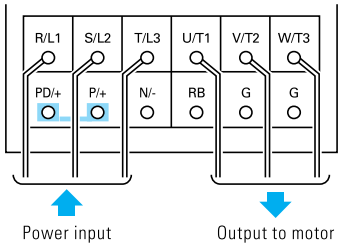
Terminal Description

Symbol	Terminal Name
R/L1, S/L2, T/L3	Main power supply input terminals
U/T1, V/T2, W/T3	Inverter output terminals
PD/+1, P/+	DC reactor connection terminals

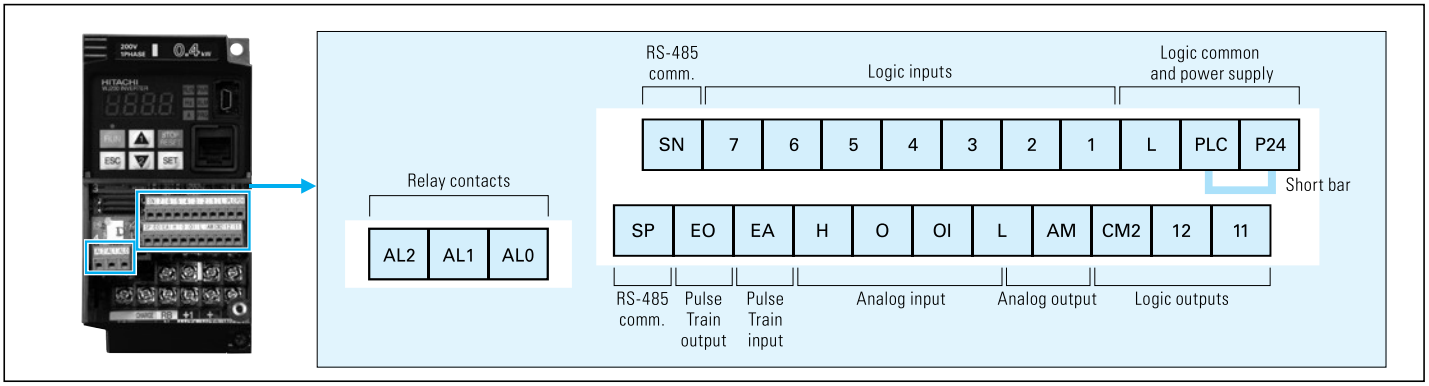
Symbol	Terminal Name
P/+, RB	External braking resistor connection terminals
P/+, N/-	External braking unit connection terminals
G	Ground connection terminal

Terminal Arrangement and Screw Diameter

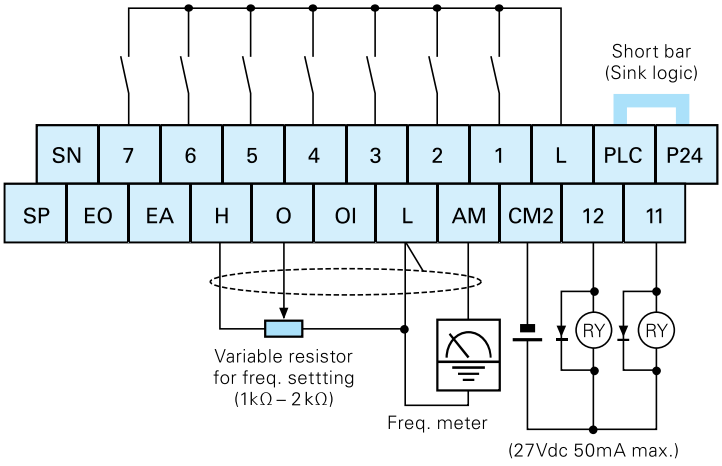
Terminal	Model	Screw Diameter
	004MF 001 – 004SF 001 – 007LF	M3.5
	007MF 007 – 022SF 015 – 037LF 004 – 040HF	M4

Terminal	Model	Screw Diameter
	055 – 075LF 055 – 075HF	M5
	110LF 110 – 150HF	M6
	150LF	M8

Terminal Arrangement of Control Circuit Terminals



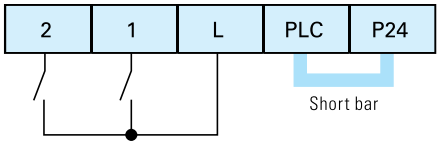
Wiring sample of control logic terminal (Sink logic)



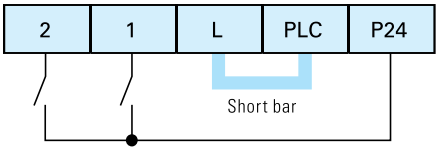
Sink / source logic of intelligent input terminals

Sink or source logic is switched by a short bar as below.

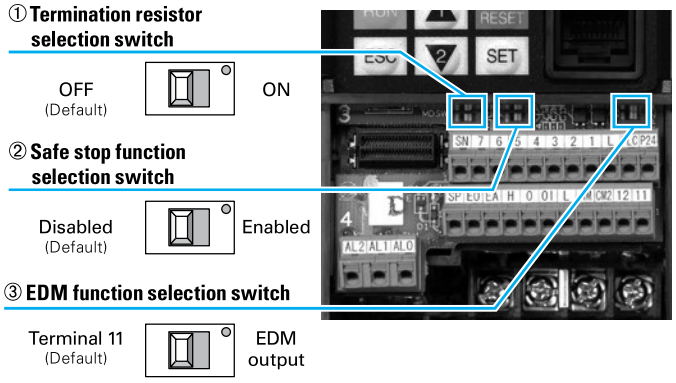
Sink logic



Source logic



Hardware Switches



Switch Name	Switch Name Description
① Termination resistor selection switch	Termination resistor for the RS485 communication port. WJ200 has a built-in 200Ω resistor activated by a DIP switch.
② Safe stop function selection switch	To enable the Safe stop function, set the DIP switch ON. Before operating switch, make sure that the input power supply is off.
③ EDM function selection switch	To enable the EDM function, set the DIP switch ON. Before operating switch, make sure that the input power supply is off.

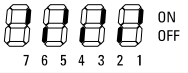
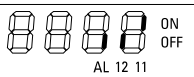
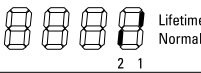
Terminal Functions

			Symbol	Terminal Name	Description / Ratings
Analog	Power supply		L	GND for analog signals	Sum of [OI], [O], and [H] currents (return)
			H	+10V analog reference	10VDC nominal, 10mA max.
	Frequency setting		O	Analog voltage input	0 to 9.8 VDC range, 10 VDC nominal,input impedance 10 kΩ
			OI	Analog current input	4 to 19.6 mA range, 20 mA nominal, input impedance 100 Ω
	Sensor input		5/PTC	Motor thermistor input	Connect motor thermistor between PTC and L terminal to detect the motor temperature. Set 19 in C005
	Monitor Output		AM	Analog voltage output	0 to 10VDC 2mA max.
Digital	Power supply		L	GND for logic inputs	Sum of input [1] – [7] currents (return)
			P24	+24V for logic inputs	24VDC, 30mA. (do not short to terminal L)
			PLC	Intelligent input common	Source type (connecting [P24] to [1] – [7] turns each input ON). Sink type (connecting [L] to [1] – [7] makes each input ON.)
	Input	Contact	7 6 5 4 3 2 1	Discrete logic inputs (Terminal [3],[4],[5] and [7] have dual function. See following description and related pages for the details.)	[Input ON condition] Voltage between each terminal and PLC: 18VDC min. [Input OFF condition] Voltage between each terminal and PLC: 3VDC max. Allowable voltage between each terminal and PLC: 27VDC max. (use PLC or an external supply referenced to terminal L)
			3/GS1	Safe stop input GS1	Functionality is based on ISO13849-1 See appendix for the details.
			4/GS2	Safe stop input GS2	
		Pulse	EA	Pulse train input A	32kHz max. Common is [L]
			7/EB	Pulse train input B	2kHz max. Common is [PLC]
	Output	Open collector	11/EDM	Discrete logic outputs [11] (Terminal [11] has dual function. See following description and related pages for the details.)	50mA max. ON state current, 27 VDC max. OFF state voltage Common is CM2 In case the EDM is selected, the functionality is based on ISO13849-1 4VDC max. ON state voltage depression
			11 12	Discrete logic outputs [12]	50mA max. ON state current, 27 VDC max. OFF state voltage Common is CM2.
			CM2	GND for logic output	100 mA: [11], [12] current return
		Relay	AL0	Relay common contact	Maximum capacity of relays AL1 – AL0: 250VAC, 2A (R load)/ 0.2A (L load) 30VDC, 3A (R load)/ 0.6A (L load) AL2 – AL0: 250VAC, 1A (R load)/ 0.2A (L load) 30VDC, 1A (R load)/ 0.2A (L load) Minimum capacity of relays AL1 – AL0, AL2 – AL0: 100VAC, 10mA / 5VDC, 100mA
			AL1	Relay contact, normally open	
			AL2	Relay contact, normally closed	
		Pulse	EO	Pulse train output	10VDC 2mA max. 32kHz max.
Serial communication port			SP, SN	Serial communication terminal	For RS485 Modbus communication.

Function List

If a desired parameter is not displayed, check the setting of function "b037"(function code display restriction). To display all parameters, specify "00" for "b037".

[○ = Allowed × = Not parmitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Monitor mode	d001	Output frequency monitoring	0.00 to 99.99 / 100.0 to 400.0 [Hz]	○	○	—
	d002	Output current monitoring	0.0 to 655.3 [A]	—	—	—
	d003	Rotation direction minitoring	F (Forward) / o (Stop) / r (Reverce)	—	—	—
	d004	Process variable (PV), PID feedback monitoring	0.00 to 99.99 in steps of 0.01/100.0 to 999.9 in steps of 0.1/1000. to 9999. in steps of 1/1000 to 9999 in steps of 10/Γ100 to Γ999 in units of 1000	—	—	—
	d005	Intelligent input terminal status	(Example) 7, 5, 3, 1 : ON 6, 4, 2 : OFF 	—	—	—
	d006	Intelligent output terminal status	(Example) 11 : ON AL, 12 : OFF 	—	—	—
	d007	Scaled output frequency monitoring	0.00 to 99.99 / 100.0 to 999.9 / 1000. to 9999. / 1000 to 3999	○	○	—
	d008	Actual-frequency monitoring	-400. to -100. / -99.9 to -10.0 / -9.99 to -0.00 / 0.00 to 99.99 / 100.0 to 400.0 [Hz]	—	—	—
	d009	Torque command monitoring	-200 to +200 [%]	—	—	—
	d010	Torque bias monitoring	-200 to +200 [%]	—	—	—
	d012	Torque monitoring	-200 to +200 [%]	—	—	—
	d013	Output voltage monitoring	0.0 to 600.0 [V]	—	—	—
	d014	Power monitoring	0.0 to 999.9 [kW]	—	—	—
	d015	Cumulative power monitoring	0.0 to 999.9 in steps of 1 kW/h, or the unit set for function "b079" / 1000 to 9999 in units of 10 kW/h, or the unit set for function "b079" / Γ100 to Γ999 in units of 1000 kW/h, or the unit set for function "b079"	—	—	—
	d016	Cumulative operation RUN time monitoring	0. to 9999. in units of 1 hour / 1000 to 9999 in units of 10 hours / Γ100 to Γ999 in units of 1,000 hours	—	—	—
	d017	Cumulative power-on time monitoring	0. to 9999. in units of 1 hour / 1000 to 9999 in units of 10 hours / Γ100 to Γ999 in units of 1,000 hours	—	—	—
	d018	Heat sink temperature monitoring	-20.0 to 150.0 [°C]	—	—	—
	d022	Life-check monitoring	1: Capacitor on main circuit board 2: cooling-fan 	—	—	—
	d023	EzSQ program counter	0 to 1024	—	—	—
	d024	EzSQ program number	0000 to 9999	—	—	—
	d025	User monitor 1	-2147483647 to 2147483647	—	—	—
	d026	User monitor 2	-2147483647 to 2147483647	—	—	—
	d027	User monitor 3	-2147483647 to 2147483647	—	—	—
	d029	Position setting monitor	-268435455 to 268435455	—	—	—
	d030	Position feedback monitor	-268435455 to 268435455	—	—	—
	d050	Dual monitor	Displays two different data configured in b160 and b161.	—	—	—
	d060	Inverter mode monitor	Displays currently selected inverter mode : I-C / I-V	—	—	—
	d080	Trip Counter	0. to 9999. in units of 1 trip / 1000 to 6553 in units of 10 trips	—	—	—
	d081 – d086	Trip info. 1–6 (factor)	Factor code	—	—	—
	d090	Warning monitor	Warning code	—	—	—
	d102	DC voltage monitoring (across P and N)	0.0 to 999.9 / 1000. [V]	—	—	—
	d103	BRD load factor monitoring	0.0 to 100.0 [%]	—	—	—
	d104	Electronic thermal overload monitoring	0.0 to 100.0 [%]	—	—	—
Setting mode	F001	Output frequency setting	0 / "start frequency" to "maximum frequency" [Hz]	○	○	0.00
	F002	Acceleration (1) time setting	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	F202	Acceleration (1) time setting, 2nd motor	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	F003	Deceleration (1) time setting	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	F203	Deceleration (1) time setting, 2nd motor	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	F004	Keypad Run key routing	00 (Foward) / 01 (Reverce)	×	×	00
Basic settings	A001	Frequency source setting	00 (keypad potentiometer) / 01 (control circuit terminal block) / 02 (digital operator) / 03 (Modbus) / 04 (option) / 06 (pulse train input) / 07 (easy sequence) / 10 (operation function result)	×	×	02
	A201	Frequency source setting, 2nd motor		×	×	02
	A002	Run command source setting	01 (control circuit terminal block) / 02 (digital operator) / 03 (Modbus) / 04 (option)	×	×	02
	A202	Run command source setting, 2nd motor		×	×	02
	A003	Base frequency setting	30.0 to "maximum frequency (1st)" [Hz]	×	×	60
	A203	Base frequency setting, 2nd motor	30.0 to "maximum frequency (2nd)" [Hz]	×	×	60
	A004	Maximum frequency setting	"Base frequency (1st)" to 400.0 [Hz]	×	×	60
	A204	Maximum frequency setting, 2nd motor		×	×	60
Analog input setting	A005	[AT] selection	00 (switching between O and OI terminals) / 02 (switching between O terminal and keypad potentiometer) / 03 (switching between OI terminal and keypad potentiometer)	×	×	00
	A011	Pot./O-L input active range start frequency	0.00 to 99.99/100.0 to 400.0 [Hz]	×	○	0.00
	A012	Pot./O-L input active range end frequency	0.00 to 99.99/100.0 to 400.0 [Hz]	×	○	0.00
	A013	Pot./O-L input active range start voltage	0 to 100 [%]	×	○	0
	A014	Pot./O-L input active range end voltage	0 to 100 [%]	×	○	100
	A015	Pot./O-L input start frequency enable	00 (A011) / 01 (0Hz)	×	○	01
	A016	External frequency filter time constant	1 to 30 / 31	×	○	8
	A017	Easy sequence function selection	00 (disabled) / 01 (PRG terminal) / 02 (Always)	○	○	00

[○ = Allowed × = Not permitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Multispeed and Jogging frequency setting	A019	Multi-speed operation selection	00 (Binary mode) / 01 (Bit mode)	×	×	00
	A020	Multi-speed 0 setting	0.00 / "start frequency" to "maximum frequency (1st)" [Hz]	○	○	0.00
	A220	Multi-speed 0 setting, 2nd motor	0.00 / "start frequency" to "maximum frequency (2nd)" [Hz]	○	○	0.00
	A021 – A035	Multi-speed 1 – 15 setting	0.00 / "start frequency" to "maximum frequency" [Hz]	○	○	0.00
	A038	Jog frequency setting	"start frequency" to 9.99 [Hz]	○	○	6.00
	A039	Jog stop mode	00 (Free-run stop [invalid during run]) / 01 (Controlled deceleration [invalid during run]) / 02 (DC braking to stop [invalid during run]) / 03 (Free-run stop [valid during run]) 04 (Controlled deceleration [valid during run]) 05 (DC braking to stop [valid during run])	×	○	04
V/f Characteristic	A041	Torque boost select	00 (manual torque boost) / 01 (automatic torque boost)	×	×	00
	A241	Torque boost select, 2nd motor		×	×	00
	A042	Manual torque boost value	0.0 to 20.0 [%]	○	○	1.0
	A242	Manual torque boost value, 2nd motor	0.0 to 20.0 [%]	○	○	1.0
	A043	Manual torque boost frequency adjustment	0.0 to 50.0 [%]	○	○	5.0
	A243	Manual torque boost frequency adjustment, 2nd motor	0.0 to 50.0 [%]	○	○	5.0
	A044	V/f characteristic curve selection	00 (VC) / 01 (VP) / 02 (free V/f) / 03 (SLV)	×	×	00
	A244	V/f characteristic curve selection, 2nd motor	00 (VC) / 01 (VP) / 02 (free V/f) / 03 (SLV)	×	×	00
	A045	V/f gain setting	20 to 100 [%]	○	○	100
	A245	V/f gain setting, 2nd motor	20 to 100 [%]	○	○	100
	A046	Voltage compensation gain for automatic torque boost	0 to 255	○	○	100
	A246	Voltage compensation gain for automatic torque boost, 2nd motor	0 to 255	○	○	100
	A047	Slip compensation gain for automatic torque boost	0 to 255	○	○	100
	A247	Slip compensation gain for automatic torque boost, 2nd motor	0 to 255	○	○	100
DC braking	A051	DC braking enable	00 (disabled) / 01 (enabled) / 02 (output freq < [A052])	×	○	00
	A052	DC braking frequency setting	0.00 to 60.00 [Hz]	×	○	0.50
	A053	DC braking wait time	0.0 to 5.0 [s]	×	○	0.0
	A054	DC braking force for deceleration	0 to 100 / 70 [%] (CT / VT)	×	○	50
	A055	DC braking time for deceleration	0.0 to 60.0 [s]	×	○	0.5
	A056	DC braking / edge or level detection for [DB] input	00 (edge operation) / 01 (level operation)	×	○	01
	A057	DC braking force at start	0 to 100 / 70 [%] (CT / VT)	×	○	0
	A058	DC braking time at start	0.0 to 60.0 [s]	×	○	0.0
	A059	Carrier frequency during DC braking	2.0 to 15.0 / 10.0 [kHz] (CT / VT)	×	○	5.0
Frequency upper/lower limit and Jump frequency	A061	Frequency upper limit setting	0.00 / A062 to A004 [Hz]	×	○	0.00
	A261	Frequency upper limit setting, 2nd motor	0.00 / A262 to A204 [Hz]	×	○	0.00
	A062	Frequency lower limit setting	0.00 / b082 to A061 [Hz]	×	○	0.00
	A262	Frequency lower limit setting, 2nd motor	0.00 / b082 to A261 [Hz]	×	○	0.00
	A063	Jump (center) frequency setting 1	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A064	Jump (hysteresis) frequency width setting 1	0.00 to 10.00 [Hz]	×	○	0.50
	A065	Jump (center) frequency setting 2	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A066	Jump (hysteresis) frequency width setting 2	0.00 to 10.00 [Hz]	×	○	0.50
	A067	Jump (center) frequency setting 3	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A068	Jump (hysteresis) frequency width setting 3	0.00 to 10.00 [Hz]	×	○	0.50
	A069	Acceleration stop frequency setting	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A070	Acceleration stop time setting	0.0 to 60.0 [s]	×	○	0.0
PID control	A071	PID enable	00 (disabled) / 01 (enabled) / 02 (enabled inverted-data output)	×	○	00
	A072	PID proportional gain	0.00 to 25.00	○	○	1.00
	A073	PID integral time constant	0.0 to 999.9 / 1000. to 3600. [s]	○	○	1.0
	A074	PID derivative time constant	0.00 to 99.99 / 100.0 [s]	○	○	0.00
	A075	PV scale conversion	0.01 to 99.99	×	○	1.00
	A076	PV source setting	00 (input via OI) / 01 (input via O) / 02 (external communication) / 03 (pulse train frequency input) / 10 (operation result output)	×	○	00
	A077	Reverse PID action	00 (OFF) / 01 (ON)	×	○	00
	A078	PID output limit	0.0 to 100.0 [%]	×	○	0.0
	A079	PID feed forward selection	00 (disabled) / 01 (O input) / 02 (OI input)	×	○	00
AVR function	A081	AVR function select	00 (always on) / 01 (always off) / 02 (off during deceleration)	×	×	02
	A281	AVR function select, 2nd motor	00 (always on) / 01 (always off) / 02 (off during deceleration)	×	×	02
	A082	AVR voltage select	200 V class : 200 / 215 / 220 / 230 / 240 (V) 400 V class : 380 / 400 / 415 / 440 / 460 / 480 (V)	×	×	200 / 400
	A282	AVR voltage select, 2nd motor	200 V class : 200 / 215 / 220 / 230 / 240 (V) 400 V class : 380 / 400 / 415 / 440 / 460 / 480 (V)	×	×	200 / 400
	A083	AVR filter time constant	0.000 to 9.999 / 10.00 [s]	×	○	0.300
	A084	AVR deceleration gain	50 to 200 [%]	×	○	100

Function List

[○ = Allowed × = Not parmitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Operation mode and Accel. / Decel. function	A085	Operation mode selection	00 (normal operation), / 01 (energy-saving operation)	×	×	00
	A086	Energy saving mode tuning	0.0 to 100.0 [%]	○	○	50.0
	A092	Acceleration (2) time setting	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	A292	Acceleration (2) time setting, 2nd motor	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	A093	Deceleration (2) time setting	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	A293	Deceleration (2) time setting, 2nd motor	0.01 to 99.99 / 100.0 to 999.9 / 1000. to 3600. [s]	○	○	10.00
	A094	Select method to switch to Acc2 / Dec2 profile	00 (switching by 2CH terminal) / 01 (switching by setting) / 02 (Forward and reverse)	×	×	00
	A294	Select method to switch to Acc2 / Dec2 profile, 2nd motor		×	×	00
	A095	Acc1 to Acc2 frequency transition point	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	×	0.00
	A295	Acc1 to Acc2 frequency transition point, 2nd motor	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	×	0.00
	A096	Dec1 to Dec2 frequency transition point	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	×	0.00
	A296	Dec1 to Dec2 frequency transition point, 2nd motor	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	×	0.00
	A097	Acceleration curve selection	00 (linear) / 01 (S curve) / 02 (U curve) / 03 (inverted-U curve) / 04 (EL-S curve)	×	×	01
	A098	Deceleration curve selection		×	×	01
External frequency tuning	A101	[OI]-[L] input active range start frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A102	[OI]-[L] input active range end frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A103	[OI]-[L] input active range start current	0 to 100 [%]	×	○	20
	A104	[OI]-[L] input active range end voltage	0 to 100 [%]	×	○	100
	A105	[OI]-[L] input start frequency enable	00 (A101) / 01 (0Hz)	×	○	00
Accel./ Decel. curve	A131	Acceleration curve constant setting (for S, U, Inverse U)	01 to 10	×	○	02
	A132	Deceleration curve constant setting (for S, U, Inverse U)	01 to 10	×	○	02
Operation target frequency	A141	A input select for calculate function	00 (digital operator) / 01 (keypad potentiometer) / 02 (input via O) / 03 (input via OI) / 04 (external communication) / 05 (option) / 07 (pulse train frequency input)	×	○	02
	A142	B input select for calculate function		×	○	03
	A143	Calculation symbol	00 (A141 + A142) / 01 (A141 - A142) / 02 (A141 × A142)	×	○	00
	A145	ADD frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A146	ADD direction select	00 (frequency command + A145) / 01 (frequency command - A145)	×	○	00
Acceleration and deceleration	A150	Curvature of EL-S-curve at the start of acceleration	0 to 50 [%]	×	×	10
	A151	Curvature of EL-S-curve at the end of acceleration	0 to 50 [%]	×	×	10
	A152	Curvature of EL-S-curve at the start of deceleration	0 to 50 [%]	×	×	10
	A153	Curvature of EL-S-curve at the end of deceleration	0 to 50 [%]	×	×	10
Others	A154	Deceleration stop frequency setting	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A155	Deceleration stop time setting	0.0 to 60.0 [s]	×	○	0.0
PID control	A156	PID sleep function action threshold	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A157	PID sleep function action delay time	0.0 to 25.5 [s]	×	○	0.0
Frequency trimming	A161	[VR] input active range start frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A162	[VR] input active range end frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	A163	[VR] input active range start current	0 to 100 [%]	×	○	0
	A164	[VR] input active range end voltage	0 to 100 [%]	×	○	100
	A165	[VR] input start frequency enable	00 (A161) / 01 (0Hz)	×	○	01
Restart after instantaneous power failure	b001	Selection of automatic restart mode	00 (tripping) / 01 (starting with 0 Hz) / 02 (starting with matching frequency) / 03 (tripping after deceleration and stopping with matching frequency) / 04 (restarting with active matching frequency)	×	○	00
	b002	Allowable under-voltage power failure time	0.3 to 25.0 [s]	×	○	1.0
	b003	Retry wait time before motor restart	0.3 to 100.0 [s]	×	○	1.0
	b004	Instantaneous power failure / under-voltage trip alarm enable	00 (disabled) / 01 (enabled) / 02 (disabled during stopping and decelerating to stop)	×	○	00
	b005	Number of restarts on power failure / under-voltage trip events	00 (16 times) / 01 (unlimited)	×	○	00
	b007	Restart frequency threshold	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	b008	Selection of retry after tripping	00 (tripping) / 01 (starting with 0 Hz) / 02 (starting with matching frequency) / 03 (tripping after deceleration and stopping with matching frequency) / 04 (restarting with active matching frequency)	×	○	00
	b010	Selection of retry count after undervoltage	1 to 3 [times]	×	○	3
	b011	Start freq. to be used in case of freq. matching restart	0.3 to 100.0 [s]	×	○	1.0
Electronic Thermal	b012	Level of electronic thermal setting	Set a level between 20% and 100% for the rated inverter current [A]	×	○	Rated current of inverter
	b212	Level of electronic thermal setting, 2nd motor	Set a level between 20% and 100% for the rated inverter current [A]	×	○	Rated current of inverter
	b013	Electronic thermal characteristic	00 (reduced-torque characteristic) / 01 (constant-torque characteristic) / 02 (free setting)	×	○	01
	b213	Electronic thermal characteristic, 2nd motor		×	○	01
	b015	Free setting, electronic thermal frequency (1)	0 to "electronic thermal frequency (2)" [Hz]	×	○	0
	b016	Free setting, electronic thermal current (1)	Range is 0 to inverter rated current Amps [A]	×	○	0.00
	b017	Free setting, electronic thermal frequency (2)	"electronic thermal frequency (1)" to "electronic thermal frequency (3)" [Hz]	×	○	0
	b018	Free setting, electronic thermal current (2)	Range is 0 to inverter rated current Amps [A]	×	○	0.00
	b019	Free setting, electronic thermal frequency (3)	"electronic thermal frequency (2)" to 400 [Hz]	×	○	0
	b020	Free setting, electronic thermal current (3)	Range is 0 to inverter rated current Amps [A]	×	○	0.00

[○ = Allowed × = Not permitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Overload restriction	b021	Overload restriction operation mode	00 (disabled) / 01 (enabled during acceleration and constant-speed operation) / 02 (enabled during constant-speed operation) / 03 (enabled during acceleration and constant-speed operation [speed increase at regeneration])	×	○	01
	b221	Overload restriction operation mode, 2nd motor		×	○	01
	b022	Overload restriction level setting	Set a level between 20% and 200% / 150% for the rated inverter current [A] (CT / VT)	×	○	150% of Rated current
	b222	Overload restriction level setting, 2nd motor		×	○	
	b023	Deceleration rate at overload restriction	0.1 to 999.9 / 1000. to 3000. [s]	×	○	1.0
	b223	Overload restriction operation mode, 2nd motor	0.1 to 999.9 / 1000. to 3000. [s]	×	○	1.0
	b024	Overload restriction operation mode 2	00 (disabled) / 01 (enabled during acceleration and constant-speed operation) / 02 (enabled during constant-speed operation) / 03 (enabled during acceleration and constant-speed operation [speed increase at regeneration])	×	○	01
	b025	Overload restriction level 2 setting	Set a level between 20% and 200% / 150% for the rated inverter current [A] (CT / VT)	×	○	150% of Rated current
	b026	Deceleration rate 2 at overload restriction	0.1 to 999.9 / 1000. to 3000. [s]	×	○	1.0
	b027	OC suppression selection	00 (disabled) / 01 (enabled)	×	○	01
	b028	Current level of active freq. matching restart setting	Set a level between 20% and 200% / 150% for the rated inverter current [A] (CT / VT)	×	○	Rated current of inverter
	b029	Deceleration rate of frequency matching restart setting	0.1 to 999.9 / 1000. to 3000. [s]	×	○	0.5
	b030	Start freq. to be used in case of active freq. Matching restart	00 (frequency at the last shutoff) / 01 (maximum frequency) / 02 (set frequency)	×	○	00
Lock	b031	Software lock mode selection	00 (all parameters except b031 are locked when [SFT] terminal is ON) / 01 (all parameters except b031 and output frequency F001 are locked when [SFT] terminal is ON) / 02 (all parameters except b031 are locked) / 03 (all parameters except b031 and output frequency F001 are locked) / 10 (High level access including b031)	×	○	01
Others	b033	Motor cable length parameter	5 to 20	○	○	10
	b034	Run / power ON warning time	0. (Warning disabled) / 1. to 9999. in units of 10 hours / 1000 to 6553 in units of 100 hours	×	○	0
	b035	Rotation direction restriction	00 (Enable for both dir) / 01 (Enable for forward only) / 02 (Enable for reverse only)	×	×	00
	b036	Reduced voltage start selection	0 (minimum reduced voltage start time) to 255 (maximum reduced voltage start time)	×	○	2
	b037	Function code display restriction	0 (full display) / 1 (function-specific display) / 2 (user setting) / 3 (data comparison display) / 4 (basic display) / 5 (monitor display)	×	○	04
	b038	Initial-screen selection	000 (Func. code that SET key pressed last displayed) / 001 to 060 (d001 to d060) / 201 (F001) / 202 (Screen displayed when the STR key was pressed last)	×	○	001
	b039	Automatic user parameter setting	00 (disabled) / 01 (enabled)	×	○	00
Torque limit	b040	Torque limit selection	00 (quadrant-specific setting) / 01 (switching by terminal) / 02 (O input)	×	○	00
	b041 – b044	Torque limit (1) – (4)	0 to 200 [%] / no	×	○	200
	b045	Torque LAD STOP selection	00 (disabled) / 01 (enabled)	×	○	00
	b046	Reverse run protection	00 (disabled) / 01 (enabled)	×	○	01
Others	b049	Dual Rating Selection	00 (CT mode) / 01 (VT mode) [1-phase 100V class is only with CT]	×	×	00
Nonstop operation at momentary power failure	b050	Selection of the nonstop operation	00 (disabled) / 01 (enabled) / 02 (nonstop operation at momentary power failure [no restoration]) / 03 (nonstop operation at momentary power failure [restoration to be done])	×	×	00
	b051	Nonstop operation start voltage setting	0.0 to 999.9 / 1000. [V]	×	×	220 / 440
	b052	OV-LAD Stop level of nonstop operation setting	0.0 to 999.9 / 1000. [V]	×	×	360 / 720
	b053	Deceleration time of nonstop operation setting	0.1 to 999.9 / 1000. to 3600. [s]	×	×	1.00
	b054	Frequency width of quick deceleration setting	0.00 to 10.00 [Hz]	×	×	0.00
Window comparator	b060	Maximum-limit level of window comparators O	0 to 100 [%]	○	○	100
	b061	Minimum-limit level of window comparators O	0 to 100 [%]	○	○	0
	b062	Hysteresis width of window comparators O	0 to 10 [%]	○	○	0
	b063	Maximum-limit level of window comparators OI	0 to 100 [%]	○	○	100
	b064	Minimum-limit level of window comparators OI	0 to 100 [%]	○	○	0
	b065	Hysteresis width of window comparator (OI)	0 to 10 [%]	○	○	0
Others	b070	Operation level at O disconnection	0 to 100 [%] / no	×	○	no
	b071	Operation level at OI disconnection	0 to 100 [%] / no	×	○	no
	b075	Ambient temperature	-10 to 50 [°C]	○	○	40
	b078	Watt-hour reset	00 (OFF) / 01 (ON)	○	○	00
	b079	Watt-hour display gain setting	1 to 1000	○	○	1
	b082	Start frequency adjustment	0.10 to 9.99 [Hz] (to 200Hz)	×	○	0.50
	b083	Carrier frequency setting	2.0 to 15.0 [kHz]	×	○	2.0
	b084	Initialization mode (parameters or trip history)	00 (disabled) / 01 (clearing the trip history) / 02 (initializing the data) / 03 (clearing the trip history and initializing the data) / 04 (clearing the trip history and initializing the data and EzSQ program)	×	×	00
	b085	Country for initialization	00 / 01	×	×	00
	b086	Frequency scaling conversion factor	0.01 to 99.99	○	○	1.00
	b087	STOP key enable	00 (enabled) / 01 (disabled) / 02 (disabled only stop)	×	○	00

Function List

[○ = Allowed × = Not parmitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Others	b088	Restart mode after FRS	00 (starting with 0 Hz) / 01 (starting with matching frequency) / 02 (starting with active matching frequency)	×	○	00
	b089	Automatic carrier frequency reduction	00 (disabled) / 01 (enabled [output current controlled]) / 02 (enabled [fin temperature controlled])	×	×	01
	b090	Dynamic braking usage ratio	0.0 to 100.0 [%]	×	○	0.0
	b091	Stop mode selection	00 (deceleration until stop) / 01 (free-run stop)	×	○	00
	b092	Cooling fan control	00 (fan always ON) / 01 (ON fan only during inverter operation [including 5 minutes after power-on and power-off]) / 02 (fin temperature controlled)	×	○	01
	b093	Accumulated time clear of the cooling fan	00 (count) / 01 (clear)	×	×	00
	b094	Initialization target data setting	00 (All parameters) / 01 (All parameters except in/output terminals and communication) / 02 (Uxxx) / 03 (expect Uxxx)	×	×	00
	b095	Dynamic braking control (BRD) selection	00 (disabled) / 01 (enabled [disabled while the inverter is stopped]) / 02 (enabled [enabled also while the inverter is stopped])	×	○	01
	b096	BRD activation level	330 to 380 / 660 to 760 [V]	×	○	360 / 720
	b097	BRD register	Set range : minimum connectable register Rbmin to 600.0 [Ω]	×	○	Min. resistance
Free-setting V/f pattern	b100	Free-setting V/F freq. (1)	0. to b102 [Hz]	×	×	0.
	b101	Free-setting V/F volt. (1)	0.0 to 800.0 [V]	×	×	0.0
	b102	Free-setting V/F freq. (2)	0. to b104 [Hz]	×	×	0.
	b103	Free-setting V/F volt. (2)	0.0 to 800.0 [V]	×	×	0.0
	b104	Free-setting V/F freq. (3)	0. to b106 [Hz]	×	×	0.
	b105	Free-setting V/F volt. (3)	0.0 to 800.0 [V]	×	×	0.0
	b106	Free-setting V/F freq. (4)	0. to b108 [Hz]	×	×	0.
	b107	Free-setting V/F volt. (4)	0.0 to 800.0 [V]	×	×	0.0
	b108	Free-setting V/F freq. (5)	0. to b110 [Hz]	×	×	0.
	b109	Free-setting V/F volt. (5)	0.0 to 800.0 [V]	×	×	0.0
	b110	Free-setting V/F freq. (6)	0. to b112 [Hz]	×	×	0.
	b111	Free-setting V/F volt. (6)	0.0 to 800.0 [V]	×	×	0.0
	b112	Free-setting V/F freq. (7)	0. to 400 (to 1000) [Hz]	×	×	0.
	b113	Free-setting V/F volt. (7)	0.0 to 800.0 [V]	×	×	0.0
Others	b120	Brake control enable	00 (disabled) / 01 (enabled)	×	○	00
	b121	Brake Wait Time for Release	0.00 to 5.00 [s]	×	○	0.00
	b122	Brake Wait Time for Acceleration	0.00 to 5.00 [s]	×	○	0.00
	b123	Brake Wait Time for Stopping	0.00 to 5.00 [s]	×	○	0.00
	b124	Brake Wait Time for Confirmation	0.00 to 5.00 [s]	×	○	0.00
	b125	Brake release freq. setting	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	b126	Brake release current setting	Set range: 0 to 200% of inverter rated current [A]	×	○	Rated current of inverter
	b127	Braking frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	b130	Over-voltage LADSTOP enable	00 (disabled) / 01 (enabled) / 02 (enabled with acceleration)	×	○	00
	b131	Over-voltage LADSTOP level	330 to 395 / 660 to 790 [V]	×	○	380 / 760
	b132	DC bus AVR constant setting	0.10 to 30.00 (s)	×	○	1.00
	b133	DC bus AVR for decel. Proportional-gain	0.00 to 5.00	○	○	0.20
	b134	DC bus AVR for decel. Integral-time	0.0 to 150.0 [s]	○	○	1.0
	b145	GS input performance selection	00 (non Trip) / 01 (Trip)	×	○	00
	b150	Panel Display selection	d001 to d060	○	○	001
	b160	1st parameter of Double Monitor	d001 to d030	○	○	001
	b161	2nd parameter of Double Monitor	d001 to d030	○	○	002
	b163	Data change mode selection of d001 and d007	00 (disabled) / 01 (enabled)	○	○	00
	b164	Automatic return to the initial display	00 (disabled) / 01 (enabled)	○	○	00
	b165	Action selection in case of external operator disconnection	00 (tripping) / 01 (tripping after decelerating and stopping the motor) / 02 (ignoring errors) / 03 (stopping the motor after free-running) / 04 (decelerating and stopping the motor)	○	○	02
	b166	Data Read / Write selection	00 (read / write enable) / 01 (both read, write disable)	×	○	00
	b171	Inverter mode selection	00 (disabled) / 01 (IM enabled)	×	×	00
	b180	Initialization trigger	00 (disabled) / 01 (enabled)	×	×	00
Password	b190	Password A setting	0 (disabled) / 0001 to FFFF (enabled)	×	×	0000
	b191	Password A for authentication	0000 to FFFF	×	×	0000
	b192	Password B setting	0 (disabled) / 0001 to FFFF (enabled)	×	×	0000
	b193	Password B for authentication	0000 to FFFF	×	×	0000

[○ = Allowed × = Not permitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Intelligent input terminal setting	C001	Terminal [1] function	00 (FW: Forward Run) / 01 (RV: Reverse RUN) / 02 (CF1: Multispeed 1setting) / 03 (CF2: Multispeed 2 setting) / 04 (CF3: Multispeed 3 setting) / 05 (CF4: Multispeed 4 setting) / 06 (JG: Jogging) / 07 (DB: external DC braking) / 08 (SET: Set 2nd motor data) / 09 (2CH: 2-stage acceleration/deceleration) / 11 (FRS: free-run stop) / 12 (EXT: external trip) / 13 (USP: unattended startprotection) / 14 (CS: commercial power source enable) / 15 (SFT: software lock) / 16 (AT: analoginput voltage/current select) / 18 (RS: reset) / 19 (PTC (only C005): Thermistor input) / 20 (STA: starting by 3-wire input) / 21 (STP: stopping by 3-wire input) / 22 (F/R: forward/reverse switching by 3-wire input) / 23 (PID: PID disable) / 24 (PIDC: PID reset) / 27 (UP: remote control UP function) / 28 (DWN: remote control DOWN function) / 29 (UDC: remote control data clearing) / 31 (OPE: forcible operation) / 32 (SF1: multispeed bit 1) / 33 (SF2: multispeed bit 2) / 34 (SF3: multispeed bit 3) / 35 (SF4: multispeed bit 4) / 36 (SF5: multispeed bit 5) / 37 (SF6: multispeed bit 6) / 38 (SF7: multispeed bit 7) / 39 (OLR: overload restriction selection) / 40 (TL:torque limit enable) / 41 (TRQ1: torque limit selectionbit 1) / 42 (TRQ2: torque limit selection bit 2) / 44 (BOK: braking confirmation) / 46 (LAC: LAD cancellation) / 47 (PCLR: clearance of position deviation) / 50 (ADD: trigger for frequency addition[A145]) / 51 (F-TM: forcible-terminal operation) / 52 (ATR: permission of torque command input) / 53 (KHC: cumulative power clearance) / 56 (MI1: general-purpose input 1) / 57 (MI2: general-purpose input 2) / 58 (MI3: general-purpose input 3) / 59 (MI4: general-purpose input 4) / 60 (MI5: general-purpose input 5) / 61 (MI6: general-purpose input 6) / 62 (MI7: general-purpose input 7) / 65 (AHD: analog command holding) / 66 (CP1: multistage position settings selection 1) / 67 (CP2: multistage position settings selection 2) / 68 (CP3: multistage position settings selection 3) / 69 (ORL: Zero-return limit function) / 70 (ORG: Zero-return trigger function) / 73 (SPD: speed / position switching) / 77 (GS1: safety input 1) / 78 (GS2: safety input 2) / 81 (485: EzCOM) / 82 (PRG: executing EzSQ program) / 83 (HLD: retain output frequency) / 84 (ROK: permission of run command) / 85 (EB: Rotation direction detection for V/f with ENC) / 86 (DISP: Display limitation) / 255 (no: no assignment)	×	○	00 (FW)
	C002	Terminal [2] function		×	○	01 (RV)
	C003	Terminal [3] function		×	○	02 (CF1)
	C004	Terminal [4] function		×	○	03 (CF2)
	C005	Terminal [5] function		×	○	09 (2CH)
	C006	Terminal [6] function		×	○	18 (RS)
	C007	Terminal [7] function		×	○	13 (USP)
	C011 – C017	Terminal [1] – [7] active state	00 (NO) / 01 (NC)	×	○	00
Intelligent output terminal setting	C021	Terminal [11] function	00 (RUN: running) / 01 (FA1: constant-speed reached) / 02 (FA2: set frequency overreached) / 03 (OL: overload notice advance signal [1]) / 04 (OD: output deviation for PID control) / 05 (AL: alarm signal) / 06 (FA3: set frequency reached) / 07 (OTQ: over-torque) / 09 (UV: undervoltage) / 10 (TRQ: torque limited) / 11 (RNT: operation time over) / 12 (ONT: plug-in time over) / 13 (THM: thermal alarm signal) / 19 (BRK: brake release) / 20 (BER: braking error) / 21 (ZS: 0 Hz detection signal) / 22 (DSE: speed deviation maximum) / 23 (POK: positioning completed) / 24 (FA4: set frequency overreached 2) / 25 (FA5: set frequency reached 2) / 26 (OL2: overload notice advance signal [2]) / 27 (ODC: analog O input disconnection) / 28 (OIDC: analog OI input disconnection) / 31 (FBV: PID feedback comparison) / 32 (NDc:communication line disconnection) / 33 (LOG1: logicaloperation result 1) / 34 (LOG2: logical operation result 2) / 35 (LOG3: logical operation result 3) / 39 (WAC: capacitor life warning) / 40 (WAF: cooling-fan) / 41 (FR: starting contact signal) / 42 (OHF: heat sink overheat warning) / 43 (LOC: low-current indication signal) / 44 (M01:general-purpose output 1) / 45 (M02: general-purpose output 2) / 46 (M03: general-purpose output 3) / 50 (IRDY: inverter ready) / 51 (FWR: forward rotation) / 52 (RVR: reverse rotation) / 53 (MJA: major failur) / 54 (WCO: window comparator O) / 55 (WCOI: window comparator OI) / 58 (FREF) / 59 (REF) / 60 (SETM) / 62 (EDM) / 63 (OPO: Option) / 255 (no: no assignment)	×	○	01 (FA1)
	C022	Terminal [12] function		×	○	00 (RUN)
	C026	Alarm relay terminal function		×	○	05 (AL)
Analog monitorring	C027	EO signal selection (Pulse / PWM output)	00 (output frequency) / 01 (output current) / 02 (output torque) / 03 (digital output frequency) / 04 (output voltage) / 05 (input power) / 06 (electronic thermal overload) / 07 (LAD frequency) / 08 (digital current monitoring) / 10 (heat sink temperature) / 12 (general-purpose output YA0) / 15 (Pulse train input monitor) / 16 (option)	×	○	07
	C028	[AM] signal selection	00 (output frequency) / 01 (output current) / 02 (output torque) / 04 (output voltage) / 05 (input power) / 06 (electronic thermal overload) / 07 (LAD frequency) / 10 (heat sink temperature) / 11 (output torque [signed value]) / 13 (general-purpose output YA1) / 16 (option)	×	○	07
	C030	Digital current monitor reference value	Set a level between 20% and 200% for the rated inverter current [A]	○	○	Rated current of inverter
Intelligent output terminal setting	C031	Terminal [11] active state	00 (NO) / 01 (NC)	×	○	00
	C032	Terminal [12] active state	00 (NO) / 01 (NC)	×	○	00
	C036	Alarm relay active state	00 (NO) / 01 (NC)	×	○	01
Levels and output terminal status	C038	Output mode of low load detection signal	00 (output during acceleration/deceleration and constant-speed operation) / 01 (output only during constant-speed operation)	×	○	01
	C039	Low load detection level	Set range: 0 to 200% of inverter rated current [A]	○	○	Rated current of inverter
	C040	Output mode of overload warning	00 (output during acceleration / deceleration and constant-speed operation) / 01 (output only during constant-speed operation)	×	○	01

Function List

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Levels and output terminal status	C041	Overload level setting	Set range: 0 to 200% of inverter rated current [A]	○	○	115% of Rated current
	C241	Overload level setting, 2nd motor	Set range: 0 to 200% of inverter rated current [A]	○	○	115% of Rated current
	C042	Frequency arrival setting for acceleration	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	C043	Frequency arrival setting for deceleration	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	C044	PID deviation level setting	0.0 to 100.0 [%]	×	○	3.0
	C045	Frequency arrival signal for acceleration (2)	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	C046	Frequency arrival signal for deceleration (2)	0.00 to 99.99 / 100.0 to 400.0 [Hz]	×	○	0.00
	C047	Pulse train input scale conversion for EO output	0.01 to 99.99	○	○	1.00
	C052	PID FBV function high limit	0.0 to 100.0 [%]	×	○	100.0
	C053	PID FBV function variable low limit	0.0 to 100.0 [%]	×	○	0.0
	C054	Over-torque / under-torque selection	00 (Over torque) / 01 (under torque)	×	○	00
	C055	Over / under-torque level (Forward powering mode)	0 to 200 [%]	×	○	100
	C056	Over / under-torque (Reverse regen. mode)	0 to 200 [%]	×	○	100
	C057	Over / under-torque (Reverse powering mode)	0 to 200 [%]	×	○	100
	C058	Over / under-torque level (Forward regen. mode)	0 to 200 [%]	×	○	100
	C059	Signal output mode of Over / under torque	00 (output during acceleration / deceleration and constant-speed operation) / 01 (output only during constant-speed operation)	×	○	01
	C061	Electronic thermal warning level setting	0 to 100 [%]	×	○	90
	C063	Zero speed detection level setting	0.00 to 99.99 / 100.0 [Hz]	×	○	0.00
	C064	Heat sink overheat warning	0. to 110. [°C]	×	○	100
Communication function	C071	Communication speed selection	03 (2400bps) / 04 (4800bps) / 05 (9600bps) / 06 (19200bps) / 07 (38400bps) / 08 (57600bps) / 09 (76800bps) / 10 (115200bps)	×	○	05
	C072	Node allocation	1 to 247	×	○	1
	C074	Communication parity selection	00 (no parity) / 01 (even parity) / 02 (odd parity)	×	○	00
	C075	Communication stop bit selection	1 (1bit) / 2 (2bit)	×	○	1
	C076	Communication error select	00 (tripping) / 01 (tripping after decelerating and stopping the motor) / 02 (ignoring errors) / 03 (stopping the motor after free-running) / 04 (decelerating and stopping the motor)	×	○	02
	C077	Communication error time-out	0.00 to 99.99 [s]	×	○	0.00
	C078	Communication wait time	0 to 1000 [ms]	×	○	0
Adjustment	C081	O input span calibration	0. to 200.0 [%]	○	○	100.0
	C082	OI input span calibration	0. to 200.0 [%]	○	○	100.0
	C085	Thermistor input (PTC) span calibration	0. to 200.0 [%]	○	○	100.0
	C091	00 (Disable) / 01 (Enable)	00	○	○	00
Communication function	C096	Communication selection	00 (Modbus-RTU) / 01 (EzCOM) / 02 (EzCOM [administrator])	×	×	00
	C098	EzCOM start adr. of master	01 to 08	×	×	01
	C099	EzCOM end adr. of master	01 to 08	×	×	01
	C100	EzCOM starting trigger	00 (Input terminal) / 01 (Always)	×	×	00
Others	C101	UP / DWN memory mode selection	00 (not storing the frequency data) / 01 (storing the frequency data)	×	○	00
	C102	Reset selection	00 (resetting the trip when RS is on) / 01 (resetting the trip when RS is off) / 02 (enabled resetting only upon tripping [resetting when RS is on]) / 03 (resetting only trip)	○	○	00
	C103	Restart mode after reset	00 (starting with 0 Hz) / 01 (starting with matching frequency) / 02 (restarting with active matching frequency)	×	○	00
	C104	UP / DWN clear: terminal input mode selection	00 (0Hz) / 01 (EEPROM data when power supply is turned on)	×	○	00
	C105	EO gain adjustment	50 to 200 [%]	○	○	100
	C106	AM gain adjustment	50 to 200 [%]	○	○	100
	C109	AM bias adjustment	0 to 100 [%]	○	○	0
	C111	Overload setting (2)	Set range: 0 to 200% of inverter rated current [A]	○	○	115% of Rated current
Input / Output terminal operation function	C130	Output 11 on-delay time	0.0 to 100.0 [s]	×	○	0.0
	C131	Output 11 off-delay time	0.0 to 100.0 [s]	×	○	0.0
	C132	Output 12 on-delay time	0.0 to 100.0 [s]	×	○	0.0
	C133	Output 12 off-delay time	0.0 to 100.0 [s]	×	○	0.0
	C140	Output RY on-delay time	0.0 to 100.0 [s]	×	○	0.0
	C141	Output RY off-delay time	0.0 to 100.0 [s]	×	○	0.0
	C142	Logical output signal 1 selection 1	Same as the settings of C021 to C026 (except those of LOG1 to LOG3 & OPO, no)	×	○	00
	C143	Logical output signal 1 selection 2		×	○	00
	C144	Logical output signal 1 operator selection	00 (AND) / 01 (OR) / 02 (XOR)	×	○	00
	C145	Logical output signal 2 selection 1	Same as the settings of C021 to C026 (except those of LOG1 to LOG3 & OPO, no)	×	○	00
	C146	Logical output signal 2 selection 2		×	○	00
	C147	Logical output signal 2 operator selection	00 (AND) / 01 (OR) / 02 (XOR)	×	○	00
	C148	Logical output signal 3 selection 1	Same as the settings of C021 to C026 (except those of LOG1 to LOG3 & OPO, no)	×	○	00
	C149	Logical output signal 3 selection 2		×	○	00
	C150	Logical output signal 3 operator selection	00 (AND) / 01 (OR) / 02 (XOR)	×	○	00
	C160 – C166	Response time of intelligent input terminal 1 – 7	0 to 200 (× 2ms)	×	○	1.
	C169	Multistage speed / position determination time	0. to 200. (× 10ms)	×	○	0.

[○ = Allowed × = Not permitted]

Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Motor constants and gain setting	H001	Auto-tuning Setting	00 (disabled auto-tuning) / 01 (auto-tuning without rotation) / 02 (auto-tuning with rotation)	×	×	00
	H002	Motor data selection	00 (Hitachi standard data) / 02 (auto-tuned data)	×	×	00
	H202	Motor data selection, 2nd motor		×	×	00
	H003	Motor capacity	0.1 / 0.2 / 0.4 / 0.55 / 0.75 / 1.1 / 1.5 / 2.2 / 3.0 / 3.7 / 4.0 / 5.5 / 7.5 / 11.0 / 15.0 / 18.5 [kW]	×	×	Factory set
	H203	Motor capacity, 2nd motor		×	×	Factory set
	H004	Motor poles setting	2 / 4 / 6 / 8 / 10 [pole]	×	×	4
	H204	Motor poles settingg, 2nd motor		×	×	4
	H005	Motor speed response constant	1 to 1000	○	○	100.
	H205	Motor speed response constant, 2nd motor	1 to 1000	○	○	100.
	H006	Motor stabilization constant	0 to 255	○	○	100.
	H206	Motor stabilization constant, 2nd motor	0 to 255	○	○	100.
	H020	Motor constant R1	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	Depending on motor capacity
	H220	Motor constant R1, 2nd motor	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H021	Motor constant R2	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H221	Motor constant R2, 2nd motor	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H022	Motor constant L	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H222	Motor constant L, 2nd motor	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H023	Motor constant I0	0.01 to 99.99 / 100.0 to 655.3 [A]	×	×	
	H223	Motor constant I0, 2nd motor	0.01 to 99.99 / 100.0 to 655.3 [A]	×	×	
	H024	Motor constant J	0.001 to 9.999 / 10.00 to 99.99 / 100.0 to 999.9 / 1000. to 9999. [kgm^2]	×	×	
	H224	Motor constant J, 2nd motor	0.001 to 9.999 / 10.00 to 99.99 / 100.0 to 999.9 / 1000. to 9999. [kgm^2]	×	×	
	H030	Auto constant R1	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H230	Auto constant R1, 2nd motor	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H031	Auto constant R2	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H231	Auto constant R2, 2nd motor	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H032	Auto constant R1	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H232	Auto constant R1, 2nd motor	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H033	Auto constant R1	0.01 to 99.99 / 100.0 to 655.3 [A]	×	×	
	H233	Auto constant R1, 2nd motor	0.01 to 99.99 / 100.0 to 655.3 [A]	×	×	
	H034	Auto constant R1	0.001 to 9.999 / 10.00 to 99.99 / 100.0 to 999.9 / 1000. to 9999. [kgm^2]	×	×	
	H234	Auto constant R1, 2nd motor	0.001 to 9.999 / 10.00 to 99.99 / 100.0 to 999.9 / 1000. to 9999. [kgm^2]	×	×	
	H050	ASR P-Gain for FB control	0.00 to 10.00	○	○	0.20
	H051	ASR I-Gain for FB control	0 to 1000	○	○	2
PM motor control	H102	PM motor code setting	00 (Hitachi standard data) / 01 (auto-tuned data)	×	×	00
	H103	PM motor capacity	0.1 / 0.2 / 0.4 / 0.55 / 0.75 / 1.1 / 1.5 / 2.2 / 3.0 / 3.7 / 4.0 / 5.5 / 7.5 / 11.0 / 15.0 / 18.5 [kW]	×	×	Depending on motor capacity
	H104	PM motor poles setting	2/4/6/8/10/12/14/16/18/20/22/24/26/28/30/32/34/36/38/40/42/44/46/48 [pole]	×	×	
	H105	PM rated current	Range is 0 to inverter rated current Amps [A]	×	×	
	H106	PM const R (resistance)	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H107	PM const Ld (d-axis inductance)	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H108	PM const Lq (q-axis inductance)	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H109	PM const Ke (induction voltage constant)	0.0001 to 6.5535 [V/(rad/s)]	×	×	
	H110	Pm const J (moment of inertia)	0.001 to 9.999 / 10.00 to 99.99 / 100.0 to 999.9 / 1000. to 9999. [kgm^2]	×	×	
	H111	Auto PM const R (resistance)	0.001 to 9.999 / 10.00 to 65.53 [Ω]	×	×	
	H112	Auto PM const Ld (d-axis inductance)	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H113	Auto PM const Lq (q-axis inductance)	0.01 to 99.99 / 100.0 to 655.3 [mH]	×	×	
	H116	PM speed response	1 to 1000	○	○	100
	H117	PM starting current	20.0 to 100.0 [%]	×	×	70.00
	H118	PM starting time	0.01 to 60.00 [s]	×	×	1.00
	H119	PM stabilization constant	0.0 to 120.0 [%]	×	×	100
	H121	PM minimum frequency	0.0 to 25.5 [%]	○	○	8.0
	H122	PM No-Load current	0.00 to 100.0 [%]	×	×	10.00
	H123	PM starting method	00 (disabling) / 01 (enabling)	×	×	00
	H131	PM initial magnet position estimation 0V wait times	0 to 255	×	×	10
	H132	PM initial magnet position estimation detect wait times	0 to 255	×	×	10
	H133	PM initial magnet position estimation detect times	0 to 255	×	×	30
	H134	PM initial magnet position estimation voltage gain	0 to 200	×	×	100
Others	P001	Operation mode on expansion card 1 error	00 (tripping) / 01 (continuing operation)	×	○	00
	P003	Pulse train input terminal [EA] mode determination	00 (Speed reference, incl. PID) / 01 (control for encoder feedback [1st only]) / 02 (Extended terminal for EzSQ)	×	×	00
Control with FB	P004	Pulse train input mode selection for simple Positioning	00 (Single-phase pulse input) / 01 (2-phase pulse [90° difference] input 1 with EB input) / 02 (2-phase pulse [90° difference] input 2 with EB input) / 03 (Single-phase pulse and direction signal with EB input)	×	×	00
	P011	Encoder pulse-per-revolution (PPR) setting	32 to 1024 [pulse]	×	×	512
	P012	Control pulse setting	00 (simple positioning deactivated) / 02 (simple positioning activated)	×	×	00
	P015	Creep speed setting	"start frequency" to 10.00Hz	×	○	5.00
	P026	Over-speed error detection level setting	0.0 to 150.0 [%]	×	○	115.0
	P027	Speed deviation error detection level setting	0.00 to 99.99 / 100.0 to 120.0 [Hz]	×	○	10.00

Function List

[○ = Allowed × = Not parmitted]

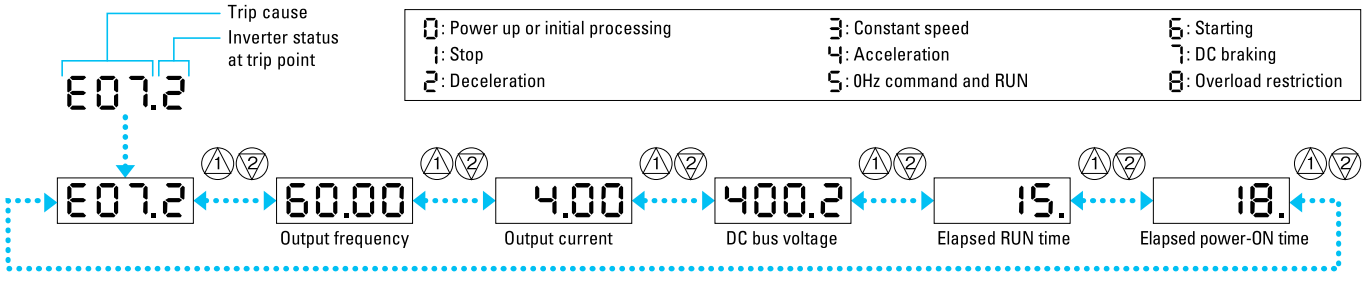
Code		Function Name	Setting Range	Setting During Operation (allowed or not)	Change During Operation (allowed or not)	Default Setting
Others	P031	Accel / decel time input selection	00 (digital operator) / 03 (easy sequence)	×	×	00
Torque control	P033	Torque command input selection	00 (O terminal) / 01 (OI terminal) / 03 (digital operator) / 06 (Option)	×	×	00
	P034	Torque command setting	0 to 200 [%]	○	○	0
	P036	Torque bias mode	00 (disabled the mode) / 01 (digital operator) / 05 (Option)	×	×	00
	P037	Torque bias value	-200 to 200 [%]	○	○	0
	P038	Torque bias polarity selection	00 (as indicated by the sign) / 01 (depending on the operation direction)	×	×	00
	P039	Speed limit for torque-controlled operation (forward rotation)	0.00 to 99.99 / 100.0 to 120.0 [Hz]	×	×	0.00
	P040	Speed limit for torque-controlled operation (reverse rotation)	0.00 to 99.99 / 100.0 to 120.0 [Hz]	×	×	0.00
	P041	Speed / torque change time	0. to 1000. [ms]	×	×	0.
Option	P044	Network comm. Watchdog timer	0.00 to 99.99 [s]	×	×	1.00
Communication option setting	P045	Inverter action on network comm error	00 (tripping) / 01 (tripping after decelerating and stopping the motor) / 02 (ignoring errors) / 03 (stopping the motor after free-running) / 04 (decelerating and stopping the motor)	×	×	01
	P046	Polled I/O output instance number	00 to 20	×	×	00
	P048	Inverter action on network idle mode	00 (tripping) / 01 (tripping after decelerating and stopping the motor) / 02 (ignoring errors) / 03 (stopping the motor after free-running) / 04 (decelerating and stopping the motor)	×	×	01
	P049	Network motor poles setting for RPM	0 / 2 / 4 / 6 / 8 / 10 / 12 / 14 / 16 / 18 / 20 / 22 / 24 / 26 / 28 / 30 / 32 / 34 / 36 / 38	×	×	0
Pulse train input	P055	Pulse train frequency scale	1.0 to 32.0 [kHz]	×	○	25.0
	P056	Time constant of pulse train frequency filter	0.01 to 2.00 [s]	×	○	0.10
	P057	Pulse train frequency bias	-100 to 100 [%]	×	○	0
	P058	Pulse train frequency limit	0 to 100 [%]	×	○	100
Simple positional control	P060 – P067	Multistage position setting 0 – 7	"Position range specification (reverse)" to "Position range specification (forward)"	○	○	0
	P068	Zero-return mode selection	00 (Low) / 01 (High)	○	○	00
	P069	Zero-return direction selection	00 (FW) / 01 (RV)	○	○	01
	P070	Low-speed zero-return frequency	0.00 to 10.00 [Hz]	○	○	5.00
	P071	High-speed zero-return frequency	0.00 to 99.99 / 100.0 to 400.0 [Hz]	○	○	5.00
	P072	Position range specification (forward)	0 to +268435455	○	○	268435455
	P073	Position range specification (reverse)	-268435455 to 0	○	○	-268435455
	P075	Positioning mode selection	00 (With limitation) / 01 (No limitation)	×	×	00
	P077	Encoder disconnection timeout	0.0 to 10.0 [s]	○	○	1.0
Easy sequence programming function	P100 – P131	Easy sequence user parameter U (00) – (31)	0. to 9999. in units of 1 / 1000 to 6553 in units of 10	○	○	0.
Peer-to-Peer communication	P140	EzCOM number of data	1 to 5	○	○	5
	P141	EzCOM destination 1 address	1 to 247	○	○	1
	P142	EzCOM destination 1 register	0000h to FFFFh	○	○	0000
	P143	EzCOM source 1 register	0000h to FFFFh	○	○	0000
	P144	EzCOM destination 2 address	1 to 247	○	○	2
	P145	EzCOM destination 2 register	0000h to FFFFh	○	○	0000
	P146	EzCOM source 2 register	0000h to FFFFh	○	○	0000
	P147	EzCOM destination 3 address	1 to 247	○	○	3
	P148	EzCOM destination 3 register	0000h to FFFFh	○	○	0000
	P149	EzCOM source 3 register	0000h to FFFFh	○	○	0000
	P150	EzCOM destination 4 address	1 to 247	○	○	4
	P151	EzCOM destination 4 register	0000h to FFFFh	○	○	0000
	P152	EzCOM source 4 register	0000h to FFFFh	○	○	0000
	P153	EzCOM destination 5 address	1 to 247	○	○	5
	P154	EzCOM destination 5 register	0000h to FFFFh	○	○	0000
	P155	EzCOM source 5 register	0000h to FFFFh	○	○	0000
Communication option setting	P160 – P169	Option I / F command register to write 1 – 10	0000h to FFFFh	○	○	0000
	P170 – P179	Option I / F command register to read 1 – 10	0000h to FFFFh	○	○	0000
	P180	Profibus Node address	0 to 125	×	×	0.
	P181	Profibus Clear Node address	00 (clear) / 01 (not clear)	×	×	00
	P182	Profibus Map selection	00 (PPO) / 01 (Comvertional)	×	×	00
	P185	CANOpen Node address	0 to 127	×	×	0
	P186	CANOpen speed selection	00 to 08	×	×	06
	P190	CompoNet Node address	00 to 63	×	×	0
	P192	DeviceNet MAC ID	00 to 63	×	×	63
	P195	ML2 frame length	0 (32bytes) / 1 (17bytes)	×	×	00
	P196	ML2 Node address	21h to 3Eh	×	×	21h
User parameter	U001 – U032	User-selected function 1 – 32	no / d001 to P186	○	○	no

Protective Functions

Name	Cause(s)	Error Code
Over-current event while at constant speed	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current for the inverter, so the inverter output is turned OFF. The dual-voltage motor is wired incorrectly.	E01
Over-current event during deceleration		E02
Over-current event during acceleration		E03
Over-current event during other conditions		E04
Overload protection *1	When a motor overload is detected by the electronic thermal function, the inverter trips and turns OFF its output.	E05
Braking resistor overload protection	When the BRD operation rate exceeds the setting of "b090", this protective function shuts off the inverter output and displays the error code.	E06
Over-voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor.	E07
EEPROM error *2	When the built-in EEPROM memory has problems due to noise or excessive temperature, the inverter trips and turns OFF its output to the motor.	E08
Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault. This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns OFF its output.	E09
Current detection error	If an error occurs in the internal current detection system, the inverter will shut off its output and display the error code.	E10
CPU error *2	A malfunction in the built-in CPU has occurred, so the inverter trips and turns OFF its output to the motor.	E11
External trip	A signal on an intelligent input terminal configured as EXT has occurred. The inverter trips and turns OFF the output to the motor.	E12
USP	When the Unattended Start Protection (USP) is enabled, an error occurred when power is applied while a Run signal is present. The inverter trips and does not go into Run Mode until the error is cleared.	E13
Ground fault *2	The inverter is protected by the detection of ground faults between the inverter output and the motor upon during powerup tests. This feature protects the inverter, and does not protect humans.	E14
Input over-voltage	The inverter tests for input over-voltage after the inverter has been in Stop Mode for 100 seconds. If an over-voltage condition exists, the inverter enters a fault state. After the fault is cleared, the inverter can enter Run Mode again.	E15
Inverter thermal trip	When the inverter internal temperature is above the threshold, the thermal sensor in the inverter module detects the excessive temperature of the power devices and trips, turning the inverter output OFF.	E21
CPU communication error	When communication between two CPU fails, inverter trips and displays the error code.	E22
Main circuit error *3	The inverter will trip if the power supply establishment is not recognized because of a malfunction due to noise or damage to the main circuit element.	E25
Driver error *2	An internal inverter error has occurred at the safety protection circuit between the CPU and main driver unit. Excessive electrical noise may be the cause. The inverter has turned OFF the IGBT module output.	E30
Thermistor	When a thermistor is connected to terminals [5] and [L] and the inverter has sensed the temperature is too high, the inverter trips and turns OFF the output.	E35
Braking error	When "01" has been specified for the Brake Control Enable (b120), the inverter will trip if it cannot receive the braking confirmation signal within the Brake Wait Time for Confirmation (b124) after the output of the brake release signal.	E36
Safe stop	Safe stop signal is given.	E37
Low-speed overload protection	If overload occurs during the motor operation at a very low speed, the inverter will detect the overload and shut off the inverter output.	E38
Operator connection	When the connection between inverter and operator keypad failed, inverter trips and displays the error code.	E40
Modbus communication error	When "trip" is selected (C076=00) as a behavior in case of communication error, inverter trips when timeout happens.	E41
EzSQ invalid instruction	The program stored in inverter memory has been destroyed, or the PRG terminal was turned on without a program downloaded to the inverter.	E43
EzSQ nesting count error	Subroutines, if-statement, or for-next loop are nested in more than eight layers	E44
EzSQ instruction error	Inverter found the command which cannot be executed.	E45
EzSQ user trip (0 to 9)	When user –defined trip happens, inverter trips and displays the error code.	E50 to E59
Option error	The inverter detects errors in the option board mounted in the optional slot. For details, refer to the instruction manual for the mounted option board.	E60 to E69
Encoder disconnection	If the encoder wiring is disconnected, an encoder connection error is detected, the encoder fails, or an encoder that does not support line driver output is used, the inverter will shut off its output and display the error code shown on the right.	E80
Excessive speed	If the motor speed rises to "maximum frequency (A004) x over-speed error detection level (P026)" or more, the inverter will shut off its output and display the error code shown on the right.	E81
Positioning range error	If current position exceeds the position range (P072-P073), the inverter will shut off its output and display the error code.	E83

*1: Reset operations acceptable 10 seconds after the trip.
*2: The inverter will not accept any reset command after an EEPROM error (E08), CPU error (E11), Ground fault (E14) or Driver error (E30) occurs with error code displayed. Turn off the inverter power once. If error is displayed when the inverter power is turned on subsequently, the internal memory device may have failed or parameters may have not been stored correctly. In such cases, initialize the inverter, and then re-set the parameters.
*3: Reset cannot be released with the STOP/RESET key. Please reset it with the inverter power or reset terminal (18:RS).

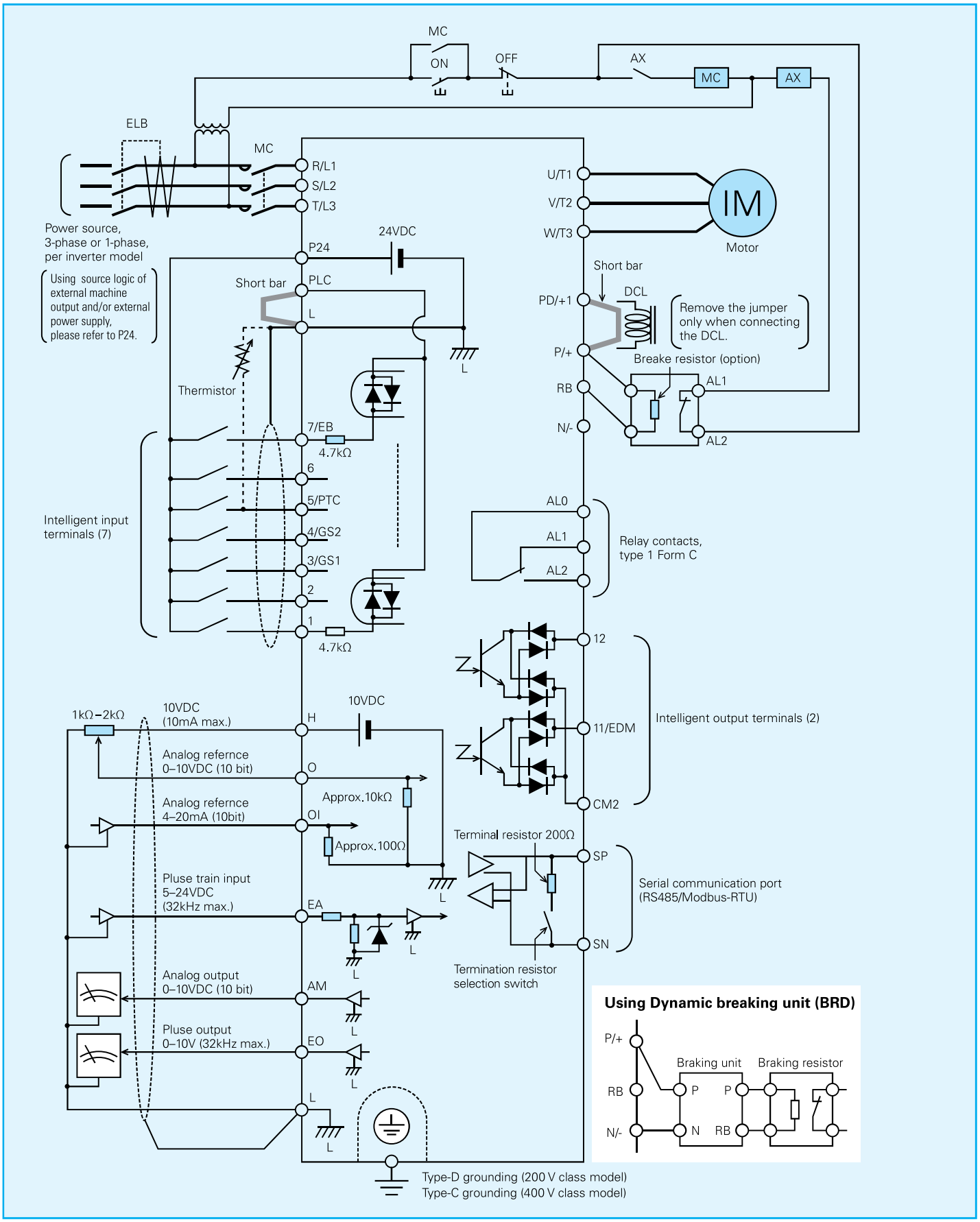
How to access the details about the present fault



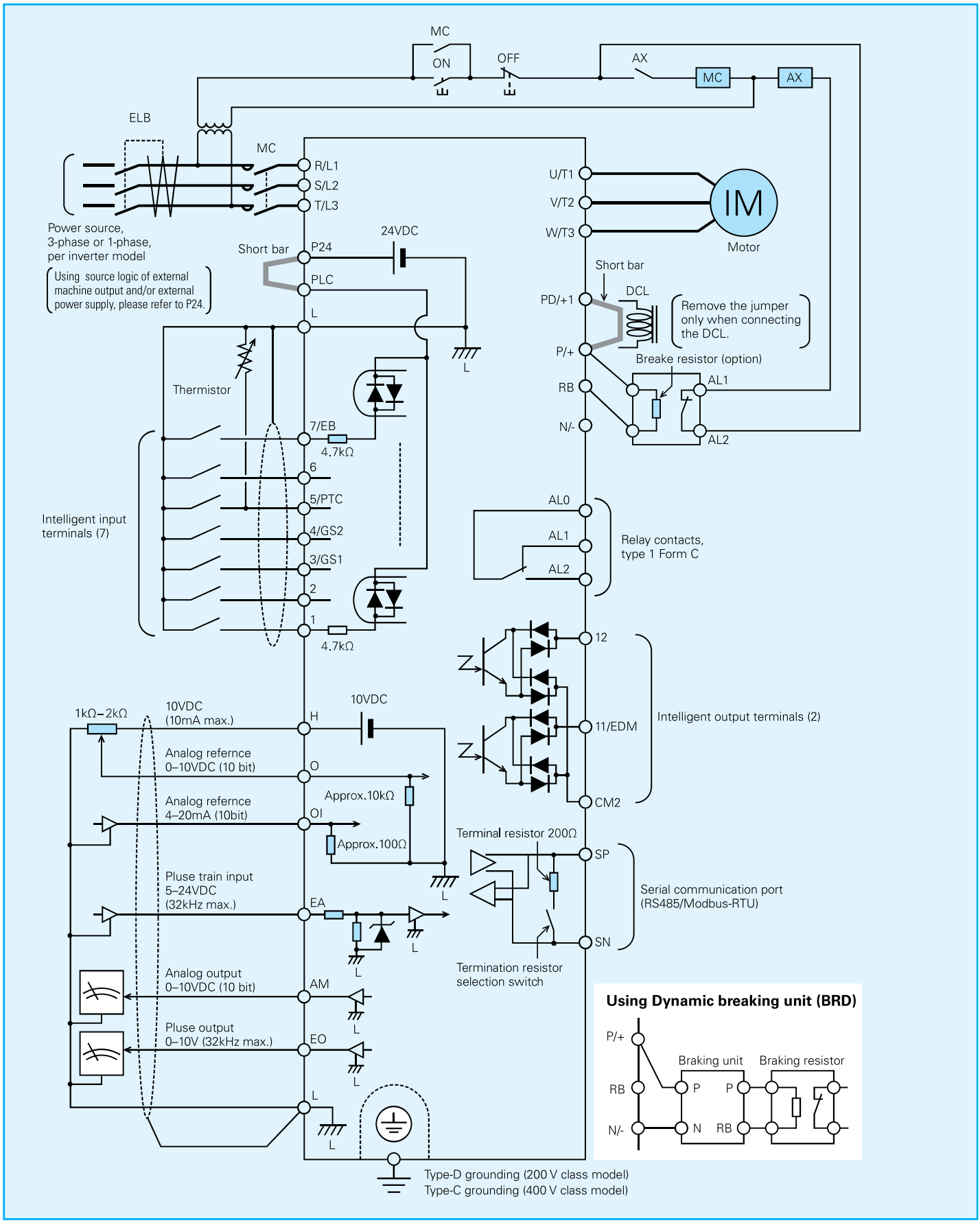
Note: Indicated inverter status could be different from actual inverter behavior. (e.g. When PID operation or frequency given by analog signal, although it seems constant speed, acceleration and deceleration could be repeated in very short cycle.)

Connecting Diagram

Source Type Logic

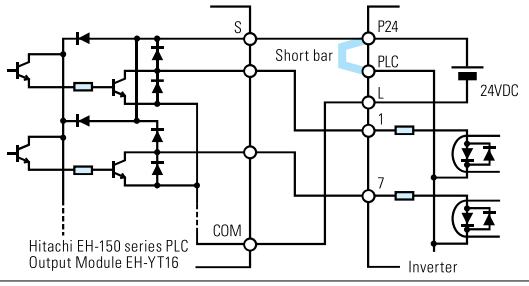
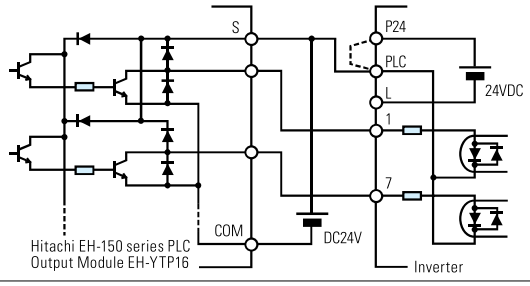
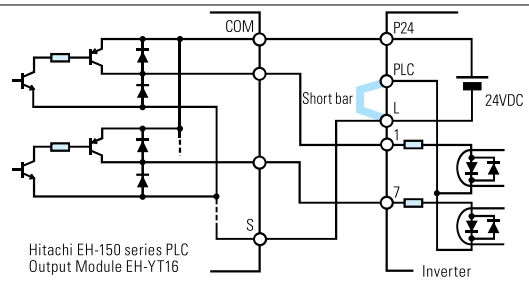
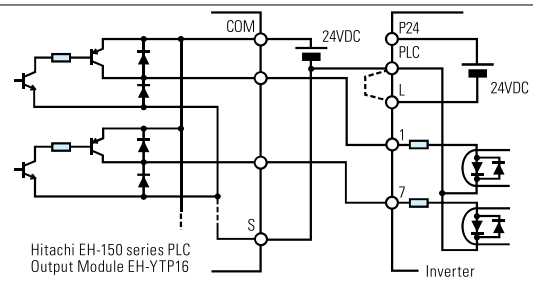
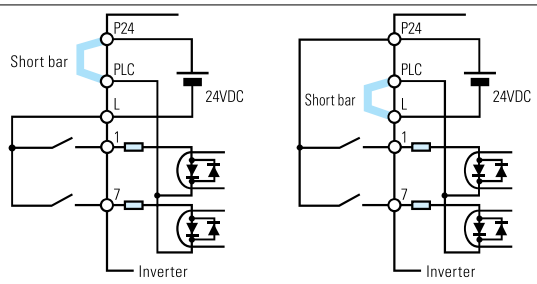
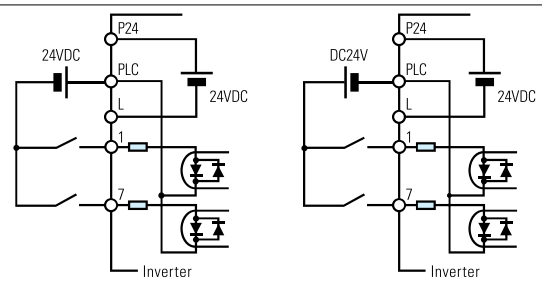


Sink Type Logic

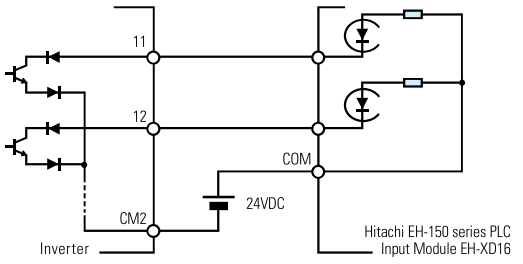
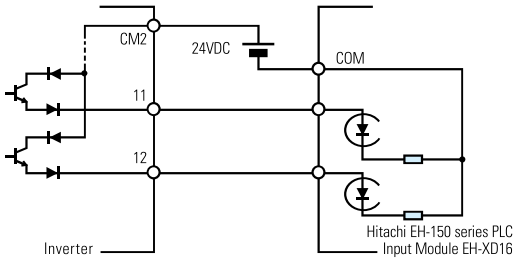


Connecting to PLC

Connection with Input Terminals

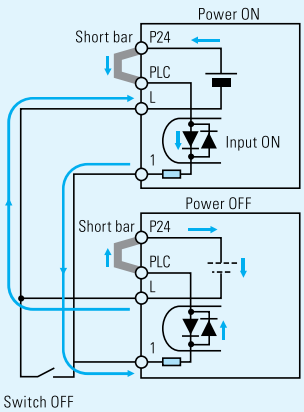
	Using Internal Power Supply of the Inverter	Using External Power Supply (Please remove the short bar.)
Sink type logic		
Source type logic		
Non-voltage switch		

Connection with Output Terminals

Sink type logic	
Source type logic	

Attention when inverter plurals is used

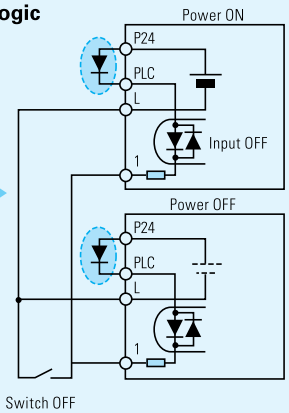
When two or more inverters connected to common I/O wiring as shown in the figure at the right are turned on at a different timing, unwanted current flows, establishing a closed circuit, and the inverter is judged to be ON, even though its switch is set to OFF.
To prevent the unwanted current flow, install diodes rated at 50 V/0.1 A at the specified locations.



Example of sink logic

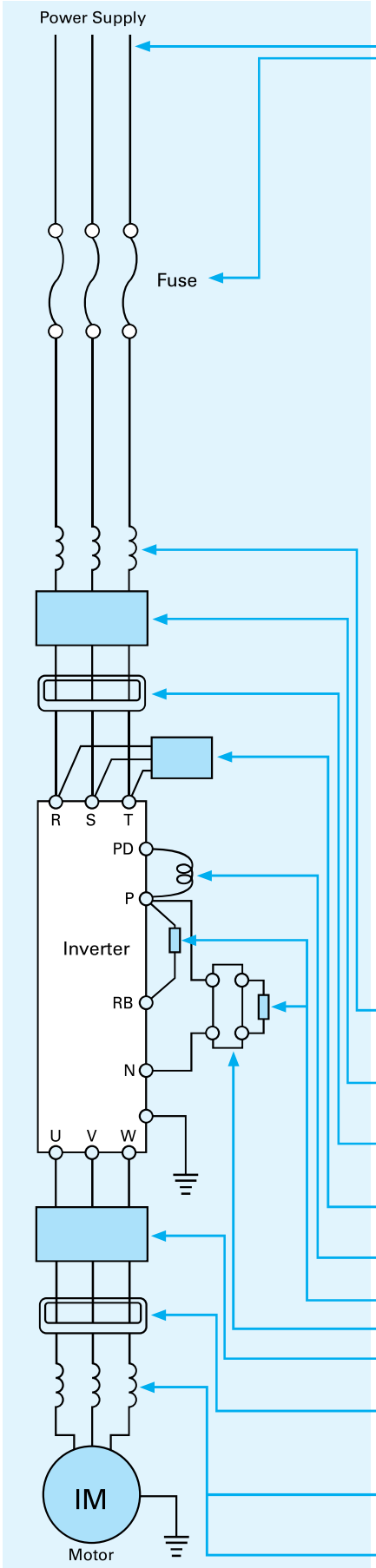
Add diode

Without a diode, unwanted current flows, turning the input on even when the switch is set to off.



Install a diode instead of a short bar to prevent the unwanted current flow.

Wiring and Accessories



Input Voltage	Motor Output kW VT	Motor Output kW CT	Motor Output HP VT	Motor Output HP CT	Inverter Model	Wiring: Power Lines	Wiring: Signal Lines	Fuse (UL-rated, class J, 600V)	Circuit Breaker (Inverse Time)
1-phase 100V	–	0.4	–	1/2	WJ200-004MF	AWG12/3.3mm² (75°C only)	18 to 28 AWG / 0.14 to 0.75 mm² shielded wire (see Note 4)	50A	30A
	–	0.75	–	1	WJ200-007MF	AWG10/5.3mm² (75°C only)			
1-phase 200V	0.2	0.1	1/4	1/8	WJ200-001SF	AWG16 / 1.3mm² (75°C only)		10A	30A
	0.4	0.2	1/2	1/4	WJ200-002SF				
	0.55	0.4	3/4	1/2	WJ200-004SF				
	1.1	0.75	1.5	1	WJ200-007SF	AWG12 / 3.3mm² (75°C only)		20A	
	2.2	1.5	3	2	WJ200-015SF	AWG10 / 5.3mm²		30A	
	3.0	2.2	4	3	WJ200-022SF				
3-phase 200V	0.2	0.1	1/4	1/8	WJ200-001LF	AWG16 / 1.3mm²		10A	30A
	0.4	0.2	1/2	1/4	WJ200-002LF				
	0.75	0.4	1	1/2	WJ200-004LF				
	1.1	0.75	1.5	1	WJ200-007LF			15A	
	2.2	1.5	3	2	WJ200-015LF	AWG14 / 2.1mm² (75°C only)			
	3.0	2.2	4	3	WJ200-022LF	AWG12 / 3.3mm² (75°C only)		20A	
	5.5	3.7	7.5	5	WJ200-037LF	AWG10 / 5.3mm² (75°C only)		30A	
	7.5	5.5	10	7.5	WJ200-055LF	AWG6 / 13mm² (75°C only)		60A	100A
	11	7.5	15	10	WJ200-075LF				
	15	11	20	15	WJ200-110LF	AWG4 / 21mm² (75°C only)		80A	
	18.5	15	25	20	WJ200-150LF	AWG2 / 34mm² (75°C only)			
3-phase 400V	0.75	0.4	1	1/2	WJ200-004HF	AWG16 / 1.3mm²		10A	20A
	1.5	0.75	2	1	WJ200-007HF				
	2.2	1.5	3	2	WJ200-015HF				
	3.0	2.2	4	3	WJ200-022HF	AWG14 / 2.1mm²			
	4.0	3.0	5	4	WJ200-030HF			15A	
	5.5	4.0	7.5	5	WJ200-040HF	AWG12 / 3.3mm² (75°C only)			
	7.5	5.5	10	7.5	WJ200-055HF	AWG10 / 5.3mm² (75°C only)		30A	40A
	11	7.5	15	10	WJ200-075HF				
	15	11	20	15	WJ200-110HF	AWG6 / 13mm² (75°C only)		50A	
	18.5	15	25	20	WJ200-150HF	AWG6 / 13mm² (75°C only)			

Note 1: Field wiring must be made by a UL-Listed and CSA-certified closed-loop terminal connector sized for the wire gauge involved. Connector must be fixed by using the crimping tool specified by the connector manufacturer.
Note 2: Be sure to consider the capacity of the circuit breaker to be used.
Note 3: Be sure to use a larger wire gauge if power line length exceeds 66ft. (20 m).
Note 4: Use 18 AWG / 0.75mm² wire for the alarm signal wire ([AL0], [AL1], [AL2] terminals).

Name	Function
Input-side AC Reactor	This is useful in suppressing harmonics induced on the power supply lines and for improving the power factor. WARNING: Some applications must use an input-side AC Reactor to prevent inverter damage. See Warning on next page.
EMC filter (for CE applications, see Appendix D)	Reduces the conducted noise on the power supply wiring between the inverter and the power distribution system. Connect to the inverter primary (input) side.
Radio noise filter	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise (can also be used on output).
Radio noise filter (use in non-CE applications)	This capacitive filter reduces radiated noise from the main power wires in the inverter (input) side.
DC link choke	Suppress harmonics generated by the inverter. However, it will not protect the input diode bridge rectifier.
Braking register	This is useful for increasing the inverter's control torque for high duty-cycle (on-off) applications, and improving the decelerating capability.
Braking unit	
Output side nose filter	Reduces radiated noise from wiring in the inverter output side.
Radio noise filter	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise (can also be used on input).
Output-side AC Reactor	This reactor reduces the vibration in the motor caused by the inverter's switching waveforms, by smoothing the waveform to approximate commercial power quality. It is also useful to reduce harmonics when wiring from the inverter to the motor is more than 10 m in length.
LCR filter	Sine wave shaping filter for output side.

Wiring and Accessories

Recommended Reactor & Filter Selection*1

Input Power	Capacity (kW)	Inverter Model	DC reactor	Input side AC reactor	Input side noise filter *2	Radio noise filter <Zero-phase reactor>	Radio noise filter <Capacitor filter>
1-phase 100V	0.4	WJ200-004MF	—	—	—	ZCL-B40 ZCL-A	—
	0.75	WJ200-007MF					
1-phase 200V	0.1	WJ200-001SF	DCL-L-0.2	—	—	ZCL-B40 ZCL-A	—
	0.2	WJ200-002SF					
	0.4	WJ200-004SF	DCL-L-0.4				
	0.75	WJ200-007SF	DCL-L-0.7				
	1.5	WJ200-015SF	DCL-L-1.5				
	2.2	WJ200-022SF	DCL-L-2.2				
3-phase 200V	0.1	WJ200-001LF	DCL-L-0.2	ALI-2.5L2	NF-L6	ZCL-B40 ZCL-A	CFI-L
	0.2	WJ200-002LF					
	0.4	WJ200-004LF	DCL-L-0.4				
	0.75	WJ200-007LF	DCL-L-0.7				
	1.5	WJ200-015LF	DCL-L-1.5		NF-L10		
	2.2	WJ200-022LF	DCL-L-2.2	ALI-5.5L2	NF-L20		
	3.7	WJ200-037LF	DCL-L-3.7				
	5.5	WJ200-055LF	DCL-L-5.5	ALI-11L2	NF-L30	ZCL-A	
	7.5	WJ200-075LF	DCL-L-7.5		NF-L40		
	11	WJ200-110LF	DCL-L-11	ALI-22L2	NF-L60		
	15	WJ200-150LF	DCL-L-15		NF-L80		
3-phase 400V	0.4	WJ200-004HF	DCL-H-0.4	ALI-2.5H2	NF-H7	ZCL-B40 ZCL-A	CFI-H
	0.75	WJ200-007HF	DCL-H-0.7				
	1.5	WJ200-015HF	DCL-H-1.5				
	2.2	WJ200-022HF	DCL-H-2.2	ALI-5.5H2			
	3.0	WJ200-030HF	DCL-H-3.7		NF-H10		
	4.0	WJ200-040HF					
	5.5	WJ200-055HF	DCL-H-5.5	ALI-11H2	NF-H20		
	7.5	WJ200-075HF	DCL-H-7.5				
	11	WJ200-110HF	DCL-H-11	ALI-22H2	NF-H30	ZCL-A	
	15	WJ200-150HF	DCL-H-15		NF-H40		

*1: The above table is a selection example for the case of heavy duty (CT) model.
*2: These NF filter is not applied for oversea markings such as CE etc.
Please contact your nearest sales office for selection EMC filter.

Recommended Regenerative Braking Unit & Resistance Selection*5

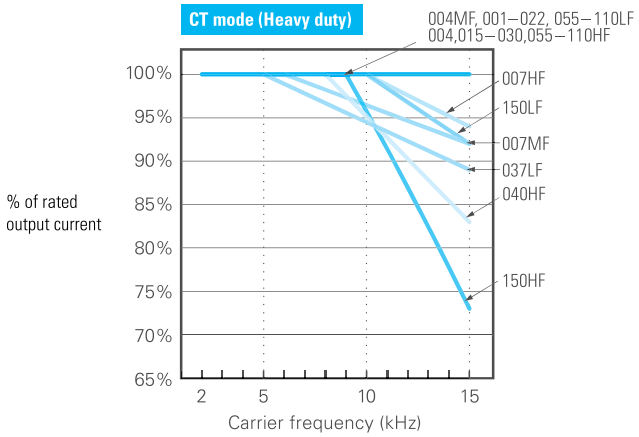
Input Power	Required torque for brake	Capacity (kW)	Selection of dynamic brake unit	Allowable resistance value (Ω)	Resistance selection (Ω)	Braking resistor	Dynamic braking usage ratio (=b090setting) *4	Specification of resistor
100V	150%	0.4	Built-in	100	180	SRB200-1	10	180Ω 200W
		0.75		50	100	SRB200-2	7.5	100Ω 200W
				50	50	RB1	10	50Ω 400W
200V	150%	0.1	Built-in	100	180	SRB200-1	10	180Ω 200W
		0.2		100	180	SRB200-1	10	180Ω 200W
		0.4		100	180	SRB200-1	10	180Ω 200W
		0.75		50	100	SRB200-2	7.5	100Ω 200W
				50	50	RB1	10	50Ω 400W
		1.5		50	50	SRB300-1	7.5	50Ω 300W
				50	50	RB1	10	50Ω 400W
		2.2		35	35	SRB400-1	7.5	35Ω 400W
				35	35	RB2	10	35Ω 600W
		3.7	BRD-E3	17	17	RB3	—	17Ω 1200W
		5.5		17	17	RB3	—	17Ω 1200W
		7.5	BRD-E3-30K	4	8.5	2parallel RB3	—	17Ω 1200W
		11		4	8.5	2parallel RB3	—	17Ω 1200W
		15		4	5.7	3parallel RB3	—	17Ω 1200W
	100%	0.1	Built-in	100	180	SRB200-1	10	180Ω 200W
		0.2		100	180	SRB200-1	10	180Ω 200W
		0.4		100	180	SRB200-1	10	180Ω 200W
		0.75		50	180	SRB200-1	10	180Ω 200W
		1.5		50	100	SRB200-2	7.5	100Ω 200W
				50	50	RB1	10	50Ω 400W
		2.2		35	50	SRB300-1	7.5	50Ω 300W
				35	50	RB1	10	50Ω 400W
		3.7		35	35	SRB400-1	7.5	35Ω 400W
				35	35	RB2	10	35Ω 600W
		5.5		20	25	2parallel RB1	10	35Ω 400W
		7.5		17	17	RB3	10	17Ω 1200W
		11 *1		17	17	RB3	10	17Ω 1200W
		15 *2		10	11.7	3parallel RB2	10	35Ω 600W
400V	150%	0.4	Built-in	180	360	2direct SRB200-1	10	180Ω 200W
		0.75		180	360	2direct SRB200-1	10	180Ω 200W
		1.5		180	360	2direct SRB200-1	10	180Ω 200W
		2.2		100	100	2direct SRB300-1	7.5	50Ω 300W
				100	100	2direct RB1	10	50Ω 400W
		3.7		100	100	2direct SRB300-1	7.5	50Ω 300W
				100	100	2direct RB1	10	50Ω 400W
		5.5		70	70	2direct RB2	10	35Ω 600W
		7.5	BRD-EZ3	34	50	2direct 2parallel RB1	—	50Ω 400W
		11		34	35	2direct 2parallel RB2	—	35Ω 600W
		15	BRD-EZ3-30K	10	25	2direct 4parallel RB1	—	50Ω 400W
	100%	0.4	Built-in	180	360	2direct SRB200-1	10	180Ω 200W
		0.75		180	360	2direct SRB200-1	10	180Ω 200W
		1.5		180	360	2direct SRB200-1	10	180Ω 200W
		2.2		100	100	2direct SRB300-1	7.5	50Ω 300W
				100	100	2direct RB1	10	50Ω 400W
		3.7		100	100	2direct SRB300-1	7.5	50Ω 300W
				100	100	2direct RB1	10	50Ω 400W
		5.5		70	100	2direct RB1	10	50Ω 400W
		7.5		70	70	2direct RB2	10	35Ω 600W
		11 *3		70	70	2direct RB2	10	35Ω 600W
		15		35	35	2direct 2parallel RB2	10	35Ω 600W

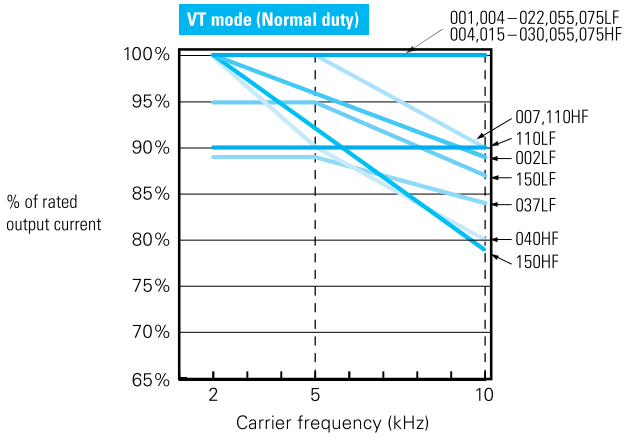
*1: Braking torque is set as 76%.
*2: Braking torque is set as 80%.
*3: Braking torque is set as 74%.
*4: Above examples are based on rotating condition with Hitachi three phase induction motors (4poles) under frequency condition of 60Hz.
%ED = T1/T0 T1: Breaking time, T0: Repeating time.
*5: The above table is a selection example for the case of heavy duty (CT) model.

De-rating Curves

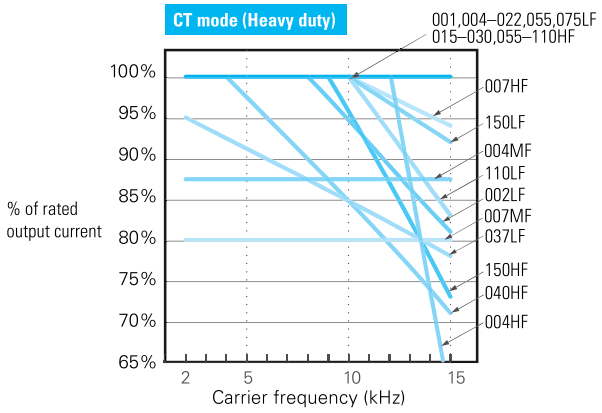
The maximum available inverter current output is limited by the carrier frequency and ambient temperature as shown below.
Choosing a higher carrier frequency tends to decrease audible noise, but it also increases the internal heating of the inverter, thus decreasing the maximum current output capability.
WJ200 Series may be mounted side-by-side with other inverter(s). It is necessary to De-rating also in this case.

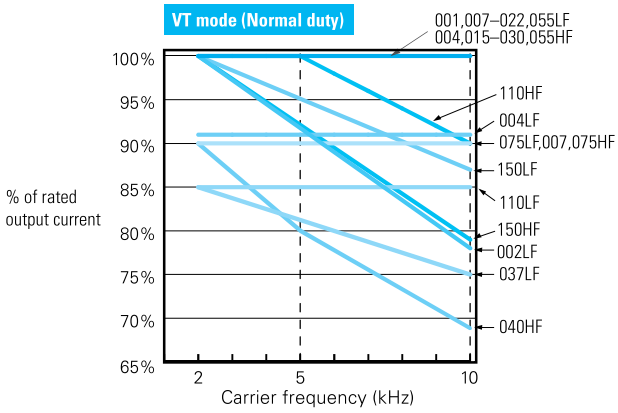
Side-by-side mounting, ambient temperature 40°C max.



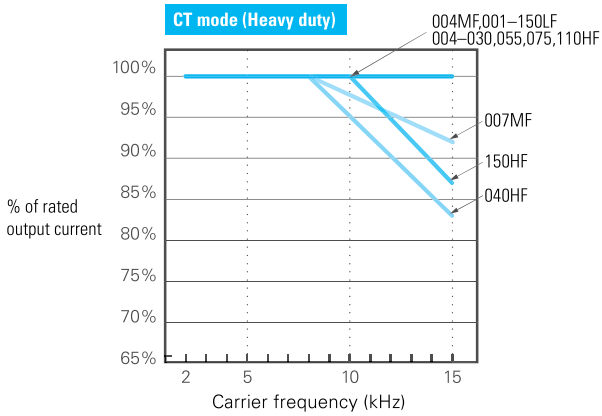


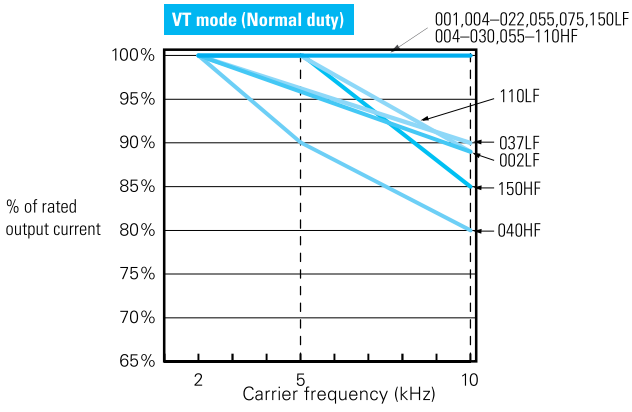
Ambient temperature 50°C max.





Ambient temperature 40°C max.





For Correct Operation

Precaution for Correct Usage

- Before use, be sure to read through the Instruction Manual to insure proper use of the inverter.
- Note that the inverter requires electrical wiring; a trained specialist should carry out the wiring.
- The inverter in this catalog is designed for general industrial applications. For special applications in fields such as aircraft, outer space, nuclear power, electrical power, transport vehicles, clinics, and underwater equipment, please consult with us in advance.
- For application in a facility where human life is involved or serious losses may occur, make sure to provide safety devices to avoid a serious accident.
- The inverter is intended for use with a three-phase AC motor. For use with a load other than this, please consult with us.

Application to Motors

[Application to general-purpose motors]

Operating frequency	The overspeed endurance of a general-purpose motor is 120% of the rated speed for 2 minutes (JIS C4,004). For operation at higher than 60Hz, it is required to examine the allowable torque of the motor, useful life of bearings, noise, vibration, etc. In this case, be sure to consult the motor manufacturer as the maximum allowable rpm differs depending on the motor capacity, etc.
Torque characteristics	The torque characteristics of driving a general-purpose motor with an inverter differ from those of driving it using commercial power (starting torque decreases in particular). Carefully check the load torque characteristic of a connected machine and the driving torque characteristic of the motor.
Motor loss and temperature increase	An inverter-driven general-purpose motor heats up quickly at lower speeds. Consequently, the continuous torque level (output) will decrease at lower motor speeds. Carefully check the torque characteristics vs speed range requirements.
Noise	When run by an inverter, a general-purpose motor generates noise slightly greater than with commercial power.
Vibration	When run by an inverter at variable speeds, the motor may generate vibration, especially because of (a) unbalance of the rotor including a connected machine, or (b) resonance caused by the natural vibration frequency of a mechanical system. Particularly, be careful of (b) when operating at variable speeds a machine previously fitted with a constant speed motor. Vibration can be minimized by (1) avoiding resonance points using the frequency jump function of the inverter, (2) using a tire-shaped coupling, or (3) placing a rubber shock absorber beneath the motor base.
Power transmission mechanism	Under continued, low-speed operation, oil lubrication can deteriorate in a power transmission mechanism with an oil-type gear box (gear motor) or reducer. Check with the motor manufacturer for the permissible range of continuous speed. To operate at more than 60 Hz, confirm the machine's ability to withstand the centrifugal force generated.

[Application to special motors]

Gear motor	The allowable rotation range of continuous drive varies depending on the lubrication method or motor manufacturer. (Particularly in case of oil lubrication, pay attention to the low frequency range.)
Brake-equipped motor	For use of a brake-equipped motor, be sure to connect the braking power supply from the primary side of the inverter.
Pole-change motor	There are different kinds of pole-change motors (constant output characteristic type, constant torque characteristic type, etc.), with different rated current values. In motor selection, check the maximum allowable current for each motor of a different pole count. At the time of pole changing, be sure to stop the motor. Also see: Application to the 400V-class motor.
Submersible motor	The rated current of a submersible motor is significantly larger than that of the general-purpose motor. In inverter selection, be sure to check the rated current of the motor.
Explosion-proof motor	Inverter drive is not suitable for a safety-enhanced explosion-proof type motor. The inverter should be used in combination with a pressure-proof explosion-proof type of motor. *Explosion-proof verification is not available for WJ200 Series.
Synchronous (MS) motor High-speed (HFM) motor	In most cases, the synchronous (MS) motor and the high-speed (HFM) motor are designed and manufactured to meet the specifications suitable for a connected machine. As to proper inverter selection, consult the manufacturer.
Single-phase motor	A single-phase motor is not suitable for variable-speed operation by an inverter drive. Therefore, use a three-phase motor.

[Application to the 400V-class motor]

A system applying a voltage-type PWM inverter with IGBT may have surge voltage at the motor terminals resulting from the cable constants including the cable length and the cable laying method. Depending on the surge current magnification, the motor coil insulation may be degraded. In particular, when a 400V-class motor is used, a longer cable is used, and critical loss can occur, take the following countermeasures: (1) install the LCR filter between the inverter and the motor, (2) install the AC reactor between the inverter and the motor, or (3) enhance the insulation of the motor coil.

Notes on Use

[Drive]

Run / Stop	Run or stop of the inverter must be done with the keys on the operator panel or through the control circuit terminals. Do not operate by installing a electromagnetic contactor (Mg) in the main circuit.
Emergency motor stop	When the protective function is operating or the power supply stops, the motor enters the free run stop state. When an emergency stop is required or when the motor should be kept stopped, use of a mechanical brake should be considered.
High-frequency run	A max. 400 Hz can be selected on the WJ200 Series. However, a two-pole motor can attain up to approx. 24,000 rpm, which is extremely dangerous. Therefore, carefully make selection and settings by checking the mechanical strength of the motor and connected machines. Consult the motor manufacturer when it is necessary to drive a standard (general-purpose) motor above 60 Hz. A full line of high-speed motors is available from Hitachi.

[Installation location and operating environment]

Avoid installation in areas of high temperature, excessive humidity, or where moisture can easily collect, as well as areas that are dusty, subject to corrosive gasses, mist of liquid for grinding, or salt. Install the inverter away from direct sunlight in a well-ventilated room that is free of vibration. The inverter can be operated in the ambient temperature range from –10 to 50°C. (Carrier frequency and output current must be reduced in the range of 40 to 50°C.)

[About the load of frequent repetition use]

About frequent repetition use (crane, elevator, press, washing machine), a power semiconductor (IGBT, a repetition diode, thyristor) in the inverter may come to remarkably have a short life by heat exhaustion, The life can be prolonged by lower a bad electric current. Lengthen acceleration / deceleration time. Lower carrier frequency. or increasing capacity the inverter.

For Correct Operation

[About the use in highlands beyond l,000m above sea level]

When the standard inverter is used at a place beyond l,000m above sea level because it cool heating element with air, please be careful as follows, But please inquire for the highlands more than 2,500m separately.

1 . Reduction of the inverter rating current
The density of air decreases by 1% whenever rising by 100m when the altitude exceeds 1,000m. For example, in the case of 2,000m above sea level, it is {2,000(m)- because it becomes 1,000(m)}/100(m)X{-1(%)}=-10(%), please use with 10(%) reduction (0.9 inverter rating electric current) of a rating current of the inverter.

2. Reduction of the breakdown voltage
When using inverter at a place beyond 1,000m, the breakdown voltage decreases as follows.
1,000m or less: 1.00 / 1,500m: 0.95 / 2,000m: 0.90 / 2,500m: 0.85
But please do not perform the withstand pressure test as mention of the instruction manual.

[Main power supply]

Installation of an AC reactor on the input side	In the following examples involving a general-purpose inverter, a large peak current flows on the main power supply side, and is able to destroy the converter module. Where such situations are foreseen or the connected equipment must be highly reliable, install an AC reactor between the power supply and the inverter. Also, where influence of indirect lightning strike is possible, install a lightning conductor. (A) The unbalance factor of the power supply is 3% or higher. (Note) (B) The power supply capacity is at least 10 times greater than the inverter capacity (the power supply capacity is 500 kVA or more). (C) Abrupt power supply changes are expected. Examples: (1) Several inverters are interconnected with a short bus. (2) A thyristor converter and an inverter are interconnected with a short bus. (3) An installed phase advance capacitor opens and closes. In cases (A), (B) and (C), it is recommended to install an AC reactor on the main power supply side. Note: Example calculation with V_{RS} = 205V, V_{ST} = 201V, V_{TR} = 200V (V_{RS} : R-S line voltage, V_{ST} : S-T line voltage, V_{TR} : T-R line voltage) Unbalance factor of voltage = $\frac{\text{Max. line voltage (min.)} - \text{Mean line voltage}}{\text{Mean line voltage}} \times 100$ $= \frac{V_{RS} - (V_{RS}+V_{ST}+V_{TR})/3}{(V_{RS}+V_{ST}+V_{TR})/3} \times 100 = \frac{205-202}{202} \times 100 = 1.5\ (\%)$
Using a private power generator	An inverter run by a private power generator may overheat the generator or suffer from a deformed output voltage waveform of the generator. Generally, the generator capacity should be five times that of the inverter (kVA) in a PWM control system, or six times greater in a PAM control system.

Notes on Peripheral Equipment Selection

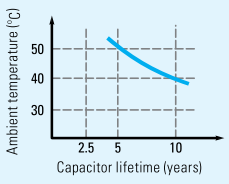
Wiring connections		(1) Be sure to connect main power wires with R (L1), S (L2), and T (L3) terminals (input) and motor wires to U (T1), V (T2), and W (T3) terminals (output). (Incorrect connection will cause an immediate failure.) (2) Be sure to provide a grounding connection with the ground terminal (⏚).
Wiring between inverter and motor	Electro-magnetic contactor	When an electromagnetic contactor is installed between the inverter and the motor, do not perform on-off switching during running operation.
	Thermal relay	When used with standard applicable output motors (standard three-phase squirrel-cage four-pole motors), the WJ200 Series does not need a thermal relay for motor protection due to the internal electronic protective circuit. A thermal relay, however, should be used: • during continuous running outside a range of 30 to 60 Hz. • for motors exceeding the range of electronic thermal adjustment (rated current). • when several motors are driven by the same inverter; install a thermal relay for each motor. • The RC value of the thermal relay should be more than 1.1 times the rated current of the motor. Where the wiring length is 10 m or more, the thermal relay tends to turn off readily. In this case, provide an AC reactor on the output side or use a current sensor.
Installing a circuit breaker		Install a circuit breaker on the main power input side to protect inverter wiring and ensure personal safety. Choose an inverter-compatible circuit breaker. The conventional type may malfunction due to harmonics from the inverter. For more information, consult the circuit breaker manufacturer.
Wiring distance		The wiring distance between the inverter and the remote operator panel should be 20 meters or less. Shielded cable should be used on the wiring. Beware of voltage drops on main circuit wires. (A large voltage drop reduces torque.)
Earth leakage relay		If the earth leakage relay (or earth leakage breaker) is used, it should have a sensitivity level of 15 mA or more (per inverter).
Phase advance capacitor		Do not use a capacitor for power factor improvement between the inverter and the motor because the high-frequency components of the inverter output may overheat or damage the capacitor.

High-frequency Noise and Leakage Current

(1) High-frequency components are included in the input / output of the inverter main circuit, and they may cause interference in a transmitter, radio, or sensor if used near the inverter. The interference can be minimized by attaching noise filters (option) in the inverter circuitry.
(2) The switching action of an inverter causes an increase in leakage current. Be sure to ground the inverter and the motor.

Lifetime of Primary Parts

Because a DC bus capacitor deteriorates as it undergoes internal chemical reaction, it should normally be replaced every 10 years. (10 years is not the guaranteed lifespan but rather, the expected design lifeplan.) Be aware, however, that its life expectancy is considerably shorter when the inverter is subjected to such adverse factors as high temperatures or heavy loads exceeding the rated current of the inverter.
JEMA standard is the 5 years at ambient temperature 40°C used in 12 hours daily. (according to the "Instructions for Periodic Inspection of General-Purpose Inverter" (JEMA))
Also, such moving parts as a cooling fan should be replaced. Maintenance inspection and parts replacement must be performed by only specified trained personnel.
Please plan to replace new INV depends on the load, ambient condition in advance.



Information in this brochure is subject to change without notice.

HITACHI
Inspire the Next

Economical inverter with simple operation

NE-S1 Series

Hitachi Industrial Equipment Systems Co.,Ltd.

What's "NES"?

New Inverter Small, Simple

N Next&New

NEXT generation
inverter opens the door
to NEW market segments

E Ecological& Economical

ECOLOGICAL - saves energy
ECONOMICAL - simple to
install and easy to use

1 Space Saving

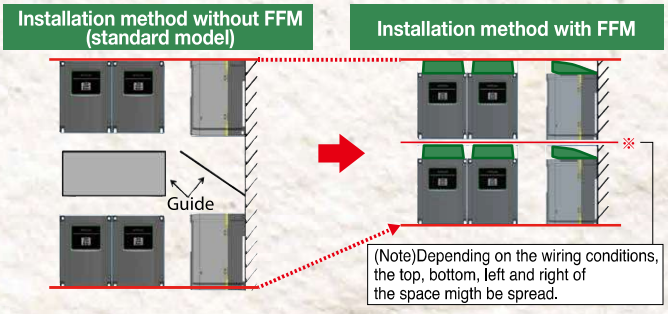
* Side-by-side installation: derating for carrier frequency and output current required

●Among the smallest form-factors in their category:
-43% smaller than equivalent X200 (0.2 kW)
-Side-by-side installation to save panel space

●FFM: The top cover for NE-S1 series.
Optional top cover NES1-FFM-M (Afterward FFM) for exclusive use to improve usability of the inverter.Applicable model：NES1-015～022SB/LB,007～040HB

Effect to reduce installation space

Generally, in the inverter installation, so as not to disturb the ventilation, space of the top and bottom of inverter requires more than 10cm. By attaching FFM, ventilation is exhausted to the front. Therefore, the space of the top and bottom of inverter may by reduced to 2cm, saving panel space and cost to the overall installation.



Effect to improve derating properties

Derating properties are improved by attaching FFM at the NES1-015SB、NES1-022SB and NES1-040HB.
Derating of carrier frequency and current at ambient temperature 50°C is not required for some models.
Please refer "Derating Curves" page for more detail.

Effect to improve Capacitor life

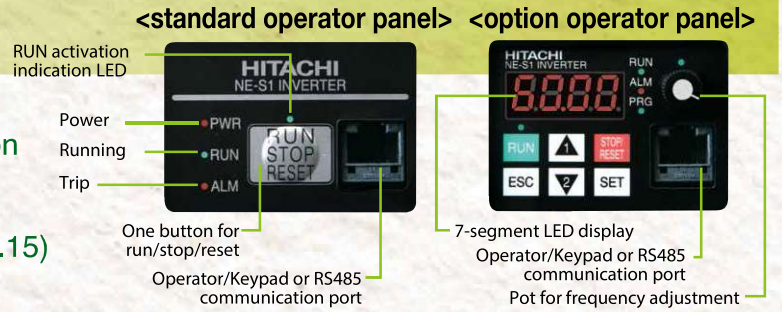
By attaching FFM to applicable model, the expected life of the aluminum electrolytic capacitors is approximately doubled, adding longevity to the inverter.

Reduce invasion of dust into product

Since upper apertuer of NE-S1 series is blind structure, dust from the top is hard to invasion into the products directly.
Furthermore, by attaching FFM, falling dust intrusion is reduced significantly, further enhancing service life.

2 Simple Operation

Two types of operator is available.
●Run/Stop/Reset is integrated in one button for simple operation.
●Full-function field attachable operator available as an option.(refer to P.5 and P.15)



3 Global Standards

<CE> <UL, c-UL> <c-Tick>

●Conformity to global standards
Conforms to CE/UL/c-UL/c-Tick

●Compatible to both sink and source logic as standard
(Configurable with a provided Jumper.)

Developed by Hitachi and Economical

S Small&Simple

SIMPLE functions in a SMALL package

4 For Network

- RS485 Modbus-RTU Communication port is standard

5 Optional Customization

Customization for specific applications is available. (contact Hitachi)

6 Inherent Functions to achieve energy savings

Automatic energy saving function is implemented to minimize energy consumption.

- **Arithmetic and Delay Functions**
  Arithmetic operation and delay functions simplify external circuit.
- **Keypad / Terminal Switching**
  Source of frequency and run commands can be selected via intelligent terminal.
- **2nd Motor Function**
  Settings for 1st and 2nd motor can be selected via intelligent input.
- **Three-wire Operation Function**
  Momentary contact for RUN and STOP can be utilized.
- **Analog Input Disconnection Detect Function**
  Upon the loss of analog signal, a preconfigured signal can be activated.

*Parameter change and setting by keypad etc.

7 Application

Optimal performance for energy saving applications such as fans and pumps

Fan and air conditioners
- air conditioning systems
- fans and blowers
- clean rooms

Pumps
- water and wastewater pump systems
- tank-less water supply and drainage systems

Food Processing Machines
- slicers • mixers
- confectionery machines
- Fruit Sorters

Model Configuration

Applicable motor kW(HP)		0.2(1/4)	0.4(1/2)	0.75(1)	1.5(2)	2.2(3)	4.0(5)
Three Phase 200V	LB	●	●	●	●	●	
Single Phase 200V	SB	●	●	●	●	●	
Three Phase 400V	HB		●	●	●	●	●

Model Name Indication

NES1-002 S B E

- Series Name
- Applicable Motor Capacity
  - 002: 0.2kW(1/4HP)
  - 040: 4.0kW(3HP)
- Power Source
  - S : 1-phase 200V class
  - L : 3-phase 200V class
  - H : 3-phase 400V class
- B : Without keypad
- E : European version

CONTENTS

ISO 14001
JQA-EM6974

ISO 9001
JQA-1153

Hitachi variable frequency drives (inverters) in this brochure are produced at the factory registered under the ISO 14001 standard for environmental manegement system and the ISO 9001 standard for inverter quality management system.

Standard Specifications

● 1-/3-phase 200V class

Model NES1-			002SB(E)	004SB(E)	007SB(E)	015SB(E)	022SB(E)
			002LB	004LB	007LB	015LB	022LB
Output Ratings	Applicable motor size, 4-pole kW(HP) *1		0.2(1/4)	0.4(1/2)	0.75(1)	1.5(2)	2.2(3)
	Rated capacity	200V	0.4	0.9	1.3	2.4	3.4
		240V	0.5	1.0	1.6	2.9	4.1
	Rated output current (A) *2		1.4	2.6	4.0	7.1	10.0
	Overload capacity(output current)		150% for 60 sec.				
	Rated output voltage (V)		3-phase (3-wire) 200 to 240V (corresponding to input voltage)				
Input Rating	Rated input voltage (V)		SB: 1-phase 200 to 240V+10%, -15%, 50/60Hz ±5% LB: 3-phase 200 to 240V+10%, -15%, 50/60Hz ±5%				
	Rated input current (A)	SB	3.1	5.8	9.0	16.0	22.5
		LB	1.8	3.4	5.0	9.3	13.0
Enclosure *4			IP20				
Cooling method			Self-cooling			Force ventilation	
Weight (kg)		SB	0.7	0.8	1.0	1.2	1.3
		LB	0.7	0.8	0.9	1.2	1.3

● 3-phase 400V class

Model NES1-			004HB(E)	007HB(E)	015HB(E)	022HB(E)	040HB(E)
Output Ratings	Applicable motor size, 4-pole kW(HP) *1		0.4(1/2)	0.75(1)	1.5(2)	2.2(3)	4.0(5)
	Rated capacity (kVA)	380V	0.9	1.6	2.6	3.6	6.0
		480V	1.2	2.0	3.4	4.5	7.6
	Rated output current (A) *2		1.5	2.5	4.1	5.5	9.2
	Overload capacity(output current)		150% for 60 sec.				
	Rated output voltage (V)		3-phase (3-wire) 380 to 480V (corresponding to input voltage)				
Input Rating	Rated input voltage (V)		3-phase 380 to 480V +10%, -15%, 50/60Hz ±5%				
	Rated input current (A)		2	3.3	5.2	7	11.7
Enclosure *4			IP20				
Cooling Method			Self-cooling	Force ventilation			
Weight (kg)			0.9		1.0	1.1	1.2

General Specifications

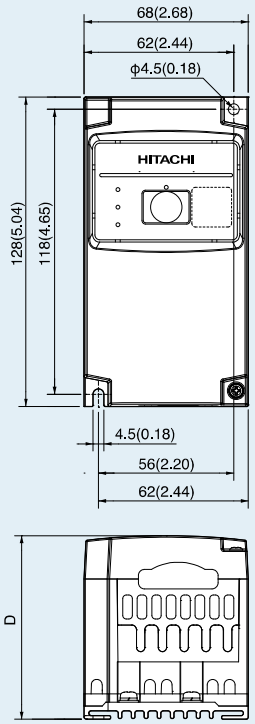
Item			General Specifications
Control	Control method		Line-to-line sine wave pulse-width modulation (PWM) control
	Output frequency range *5		0.01 to 400Hz
	Frequency accuracy *6		Digital command :±0.01%, Analog command±0.4% (25±10˚C)
	Frequency setting resolution		Digital: 0.01Hz, Analog: (max frequency)/1000
	Voltage/Frequency Characteristic		V/f control,V/f variable (constant torque, reduced torque)
	Acceleration/deceleration time		0.00 to 3000 sec. (linear, sigmoid), two-stage accel./decel.
	Starting torque *7		100%/6Hz
	Carrier frequency range		2.0 to 15kHz
	Protective functions		Over-current, Over-voltage, Under-voltage, Overload, Overheat, Ground fault at power-on, Input over-voltage, External trip, Memory error, CPU error, USP error, Driver error, Output phase loss protection
Input terminal	Specification		10kohm input impedance, sink/source logic selectable
	Functions		FW(Forward), RV(Reverse), CF1-CF3(Multispeed command), JG(Jogging), DB(External DC braking), SET(Second motor constants setting), 2CH(Second accel./decel.), FRS(Free-run stop), EXT(External trip), USP(Unattended start protection), SFT(Software lock), AT(Analog input selection), RS(Reset), STA(3-wire start), STP(3-wire stop), F/R(3-wire fwd./rev.), PID(PID On/Off), PIDC(PID reset), UP/DWN(Remote-controlled accel./decel.) , UDC(Remote-controlled data clearing), OPE(Operator control), SF1-SF3(multispeed bit), OLR(overload restriction selection), LAC(LAD cancellation, ADD(ADD frequency enable), F-TM(force terminal mode), KHC(cumulative power clearance), AHD(analog command holding), HLD(retain output frequency), ROK(permission of run command), DISP (display limitation), NO(Not selected)
Output signal	Intelligent output terminal	Specification	27V DC 50mA max open collector output, 1 terminals 1c output relay (AL0, AL1, AL2 terminals)
		Function	RUN(run signal), FA1(Frequency arrival type 1 - constant speed), FA2(Frequency arrival type 2 - over-frequency), OL(overload advance notice signal), OD(Output deviation for PID control), AL(alarm signal), DC(Wire brake detect on analog input), FBV(PID Second Stage Output), NDC(ModBus Network Detection Signal), LOG(Logic Output Function), ODC(analog voltage input disconnection), LOC(Low load), FA3(Set frequency reached), UV(Under voltage), RNT(Operation time over), ONT(Plug-in time over), THM(Thermal alarm signal), ZS(0 Hz detection signal), IRDY(Inverter ready), FWR(Forward rotation),RVR(Reverse rotation), MJA(Major failure)
	Moniter output terminal	Function	PWM output; Select analog output frequency monitor, analog output current monitor or digital output frequency monitor
Operator	Operation key		1 unified key for RUN/STOP/RESET ON : this key has function of "RUN"(regardless run command source setting (A002/A201).) OFF : this key has function of "STOP/RESET When optional operator is connected, operation from key is disabled.
	Status LED Interface		Control power supply LED (Red),LED during operation (yellow-green),Operation button operation LED (yellow-green),LED during tripping (Red), 4LED in total
Operation	Frequency setting	Operator keypad(Option)	Up and Down keys / Value settings or analog setting via potentiometer on operator keypad
		External signal *8	0 to 10 V DC or 4 to 20 mA
		Serial port	RS485 interface (Modbus RTU)
	FW/RV Run	Operator Keypad(Option)	Run key / Stop key (change FW/RV by function command)
		External signal	FW Run/Stop (NO contact), RV set by terminal assignment (NC/NO), 3-wire input available
		Serial port	RS485 interface (Modbus RTU)
Environment	Operating temperature		−10 to 50°C(carrier derating required for aambient temperature higher than 40°C(022SB:temperature higher than 30°C)), no freezing When attach option FFM, in 015/022SB the derating becomes needless.
	Storage temperature		−20 to 60˚C
	Humidity		20 to 90% RH
	Vibration		5.9mm/s² (0.6G) 10 to 55Hz
	Location		Altitude 1,000 m or less, indoors (no corrosive gasses or dust)
Other functions			AVR (Automatic Voltage Regulation), V/f characteristic selection, accel./decel. curve selection, frequency upper/lower limit, 8 stage multispeed, PID control, frequency jump, external frequency input bias start/end, jogging, trip history etc.
Options			Remote operator with copy function (WOP), Remote operator (OPE-SRmini, OPE-SR), Operator (NES1-OP), input/output reactors, DC reactors, radio noise filters, LCR filter, communication cables (ICS-1, 3)

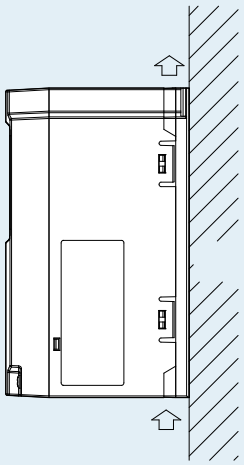
Note 1: The applicable motor refers to Hitachi standard 3-phase motor (4-pole). When using other motors, care must be taken to prevent the rated motor current (50/60 Hz) from exceeding the rated output current of the inverter.
Note 2: The output voltage decreases as the main supply voltage decreases (except when using the AVR function). In any case, the output voltage cannot exceed the input power supply voltage.
Note 3: The braking torque via capacitive feedback is the average deceleration torque at the shortest deceleration (stopping from 50/60 Hz as indicated). It is not continuous regenerative braking torque. The average decel torque varies with motor loss. This value decreases when operating beyond 50 Hz.
Note 4: The protection method conforms to JIS C 0920(IEC60529).
Note 5: To operate the motor beyond 50/60 Hz, consult the motor manufacturer for the maximum allowable rotation speed.
Note 6: The output frequency may exceed the maximum frequency setting (A004 or A204) for automatic stabilization control.
Note 7: At the rated voltage when using a Hitachi standard 3-phase, 4pole motor.
Note 8: DC 4 to 20 mA Input, need parameter setting by Keypad etc. Analog input voltage or current can be switched by switch as individually and not use them in the same time.

Dimensions

NES1-002SB(E), 004SB(E), 002LB, 004LB, 007LB

[Unit: mm(inch)]
Inches for reference only

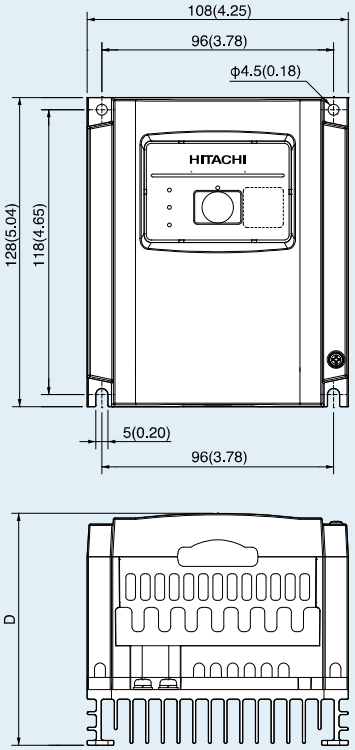


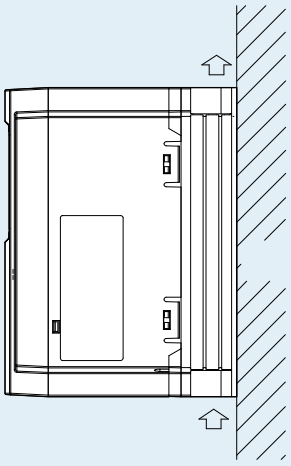


Model	D
002LB, 002SB(E)	76 (2.99)
004LB, 004SB(E)	91 (3.58)
007LB	115 (4.53)

*002 to 007LB/002,004SB(E):without cooling fan.

NES1-007SB(E), 015SB(E), 022SB(E), 015LB, 022LB, 004HB(E), 007HB(E), 015HB(E), 022HB(E), 040HB(E)





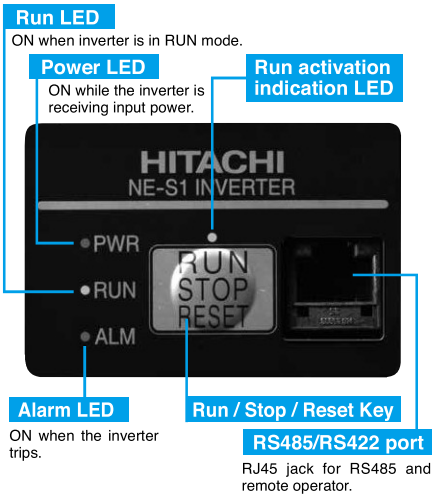
Model	D
007SB(E), 004HB(E), 007HB(E)	96 (3.78)
015LB, 015SB(E)	107 (4.21)
015HB(E)	111 (4.37)
022LB, 022SB(E), 022HB(E)	125 (4.92)
040HB(E)	135 (5.31)

*007SB(E)/004HB(E):without cooling fan.

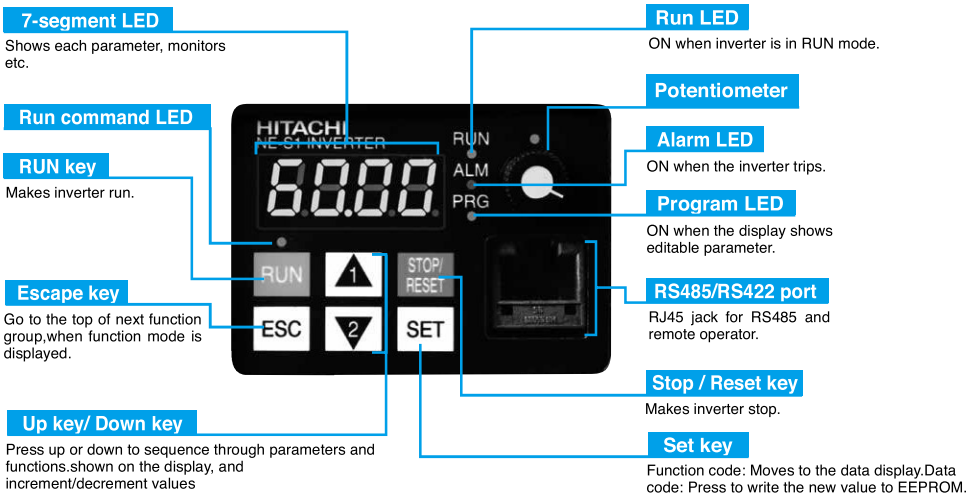
Operation and Programming

The NE-S1 series can be easily operated with the digital operator provided as standard. Change and setting parameter by Keypad (NES1-OP). The digital operator can also be detached and used for remote-control. An operator with copy function is also available as an option.

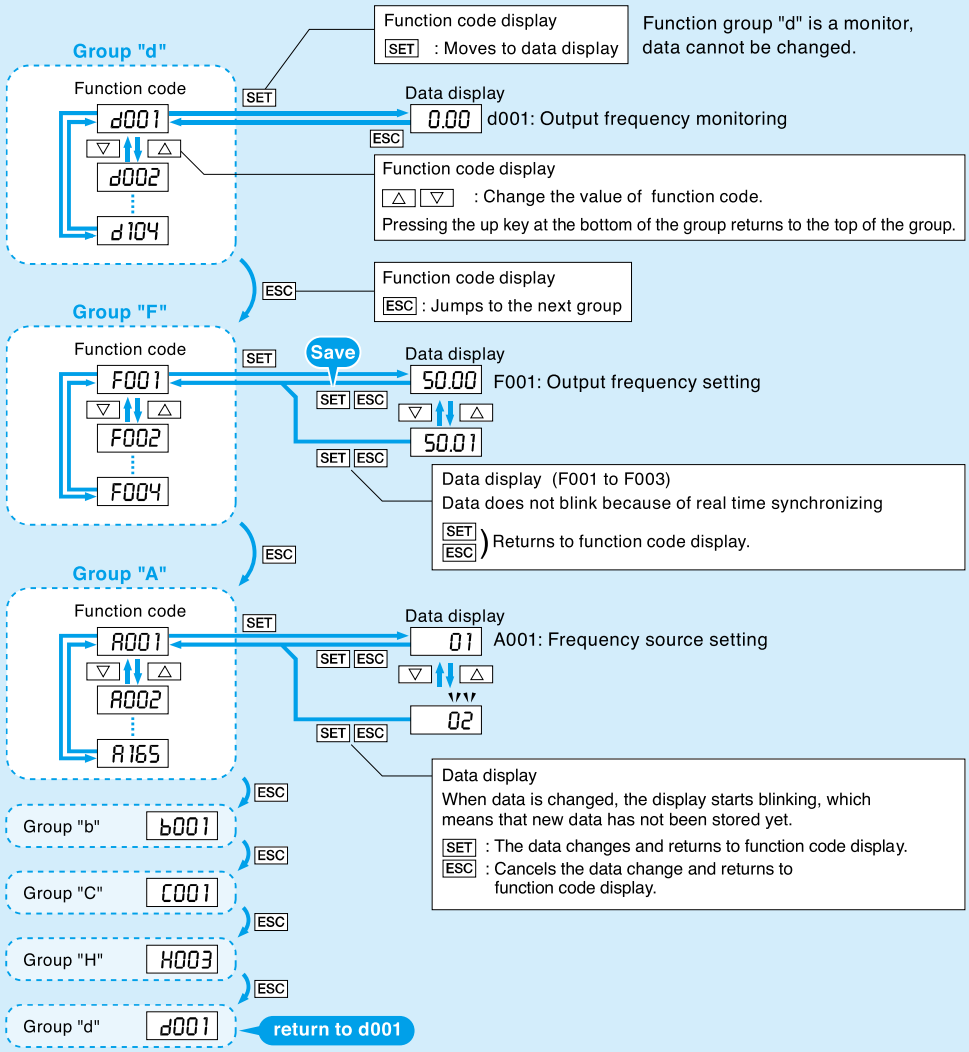
<NE-S1 Standard Operator Panel>



<Option Operator Panel>

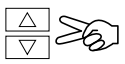


●Keypad Navigation Map Single-Digit Edit Mode (At the time of operator use.)



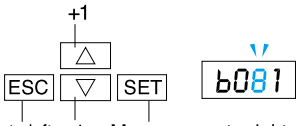
If a target function code or data is far from current position, using the single-digit edit mode makes it quicker to navigate there. Pressing the up key and down key at the same time brings you into the digit-by-digit navigation mode.

Step1: Press both up key and down key at the same.



1st digit will be blinking.

Step2: The blinking digit is moved by the ESC and SET key right and left. Use up/down keys to change the value of the digit.



Move cursor to left. -1 Move cursor to right.

Step3: When the least significant digit is blinking, the SET key selects that parameter.

Terminal Description

Terminal Symbol

Terminal Symbol	Terminal Name
L1,L2,N/L3	Main power supply input terminals
U/T1,V/T2,W/T3	Inverter output terminals
+1,+	DC reactor connection terminals
⏚	Ground connection terminal

Screw Diameter and Terminal Width

Model	Screw diameter (mm)	Terminal width W (mm)	
002-004SB(E)	M3.5	7.1	
002-007LB			
007-022SB(E)	M4	9.2	
015-022LB			
004-040HB(E)			

Terminal Arrangement

- **NES1-002-007LB**

R(L1)	S(L2)	T(L3)	P(+)
U(T1)	V(T2)	W(T3)	PD(+1)

- **NES1-002,004SB(E)**

L1		N	P(+)
U(T1)	V(T2)	W(T3)	PD(+1)

- **NES1-015,022LB,004-040HB(E)**

R(L1)	S(L2)	T(L3)	PD(+1)	P(+)	U(T1)	V(T2)	W(T3)

- **NES1-007-022SB(E)**

L1		N	PD(+1)	P(+)	U(T1)	V(T2)	W(T3)

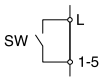
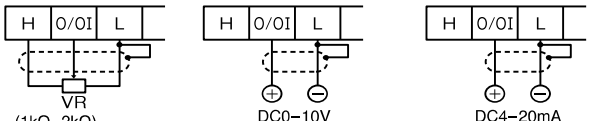
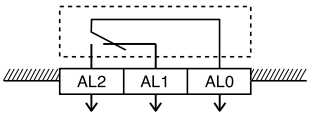
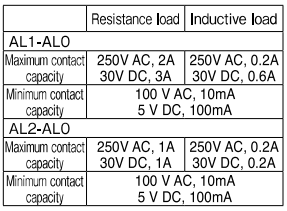
Control Circuit Terminals

Terminal Arrangement

			5	4	3	2	1	CM2	11
AL2	AL1	AL0	H	O/OI	L	FM	L	PLC	P24

Short bar:default position (Source logic)

Terminal Function

	Terminal name			
Input/monitor signals	FM	Monitor terminal (frequency, current, etc.)		PWM out put(0 to10V DC, 1mA max.)
	L	Common for inputs		–
	P24	+24V for logic inputs		24V DC, 30mA (do not short to terminal L)
	PLC	Intelligent input common		–
	5	Intelligent (programable) input terminals, selection from: FW(Forward), RV(Reverse), CF1-CF3(Multispeed command), JG(Jogging), DB(External DC braking), SF1-SF3(multispeed bit), SET(Second motor constants setting), 2CH(Second accel./decel.), FRS(Free-run stop), EXT(External trip), USP(Unattended start protection), SFT(Software lock), RS(Reset), STA(3-wire start), STP(3-wire stop), F/R(3-wire fwd./rev.), PID(PID On/Off), PIDC(PID reset), OLR(overload restriction selection), UP/DWN(Remote-controlled accel./decel.), UDC(Remote-controlled data clearing), OPE(Operator control), ADD(Frequency setpoint), F-TM(Force terminal enable),KHC(cumulative power clearance), AHD(analog command holding), HLD(retain output frequency), ROK(permission of run command), DISP (display limitation) or NO(Not selected).		 Operated by closing switch. (Input logic is selectable)
	4			
	3			
	2			
	1			
Freqency setting	H	+10V analog reference		10V DC, 10mA max
	O/OI	Analog input, voltage/ Analog input, current Switch able by switch but not use them in the same time.		0 to 10V DC, input impedance10kohm 4 to 20mA DC, input impedance 250ohm
	L	Common for inputs		–
Output signals	11	Intelligent (programable) output terminals, selection from: RUN(run signal), FA1(Frequency arrival type 1 -constant speed), FA2(Frequency arrival type 2 -over-frequency), OL(overload advance notice signal), OD(Output deviation for PID control), AL(alarm signal), FA3(Set frequency reached), UV(Under voltage), RNT(Operation time over), ONT(Plug-in time over), DC(Wire brake detect on analog input), FBV(Feedback voltage comparison), NDc(analog voltage input disconnection), LOG1(Logic operation result), LOC(Low Load Detection).		Open collector output L level at operation (ON) 27V DC, 50mA max.
	CM2	Common for intelligent output terminals		–
Relay output	AL2	Relay contact (alarm output) terminals (programable, function is selectable same as intelligent output terminals).	 <Initial setting> Normal: AL0-AL1 closed Trip/Power OFF: AL0-AL2 closed	
	AL1			
	AL0			

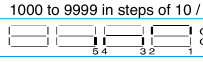
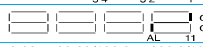
	Resistance load	Inductive load
AL1-AL0		
Maximum contact capacity	250V AC, 2A 30V DC, 3A	250V AC, 0.2A 30V DC, 0.6A
Minimum contact capacity	100 V AC, 10mA 5 V DC, 100mA	
AL2-AL0		
Maximum contact capacity	250V AC, 1A 30V DC, 1A	250V AC, 0.2A 30V DC, 0.2A
Minimum contact capacity	100 V AC, 10mA 5 V DC, 100mA	

Function List

The parameter tables in this chapter have a column titled "Run Mode Edit." An Ex mark x means the parameter cannot be edited; a Check mark ✓ means the parameter can be edited. The table example to the right contains two adjacent marks "x ✓ ". These two marks (that can also be "xx" or "✓ ✓ ") correspond to low-access or high-access levels to Run Mode edits (note Lo and Hi in column heading).Parameter shown in case "b037" is "00" (Full display).

Monitoring and Main Profile Parameters

[✓: Allowed ✗: Not allowed]

Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
Monitor	d001	Output frequency monitoring	0.00 to 99.99/100.0 to 400.0	–	Hz	✓	✓
	d002	Output current monitor	0.0 to 6553.5	–	A	–	–
	d003	Rotation direction monitor	F(Forward)/o(Stop)/r(Reverse)	–	–	–	–
	d004	PID feedback monitoring	0.00 to 99.99 in steps of 0.01 / 100.0 to 999.9 in steps of 0.1 1000. to 9999. in steps of 1 1000 to 9999 in steps of 10 / 100 to 999 in units of 1000	–	–	–	–
	d005	Intelligent input terminal status		–	–	–	–
	d006	Intelligent output terminal status		–	–	–	–
	d007	Scaled output frequency monitoring	0.00 to 99.99/100.0 to 999.9/1000. to 9999./1000 to 3999	–	–	✓	✓
	d013	Output voltage monitor	0.0 to 600.0	–	V	–	–
	d014	Power monitoring	0 to 999.9	–	kW	–	–
	d015	Cumulative power monitoring	0.0 to 999.9 in steps of 1 kW/h, or the unit set for function "b079" 1000 to 9999 in units of 10 kW/h, or the unit set for function "b079" 100 to 999 in units of 1000 kW/h, or the unit set for function "b079"	–	–	–	–
	d016	Cumulative operation RUN time monitoring	0. to 9999. in units of 1 hour 1000 to 9999 in units of 10 hours 100 to 999 in units of 1,000 hours	–	hr	–	–
	d017	Cumulative power-on time monitoring	0. to 9999. in units of 1 hour 1000 to 9999 in units of 10 hours 100 to 999 in units of 1,000 hours	–	hr	–	–
	d018	Heat sink temperature monitoring	-020. to 120.0	–	˚C	–	–
	d050	Dual Monitoring	display the monitoring data selected by b160, b161	–	–	–	–
	d080	Trip counter	0. to 9999. in units of 1 trip 1000 to 6553 in units of 10 trips	–	time	–	–
	d081	Trip monitor 1	Displays trip event information	–	–	–	–
	d082	Trip monitor 2		–	–	–	–
	d083	Trip monitor 3		–	–	–	–
	d084	Trip monitor 4		–	–	–	–
	d085	Trip monitor 5		–	–	–	–
	d086	Trip monitor 6		–	–	–	–
	d090	Warning monitoring	Warning code	–	–	✗	✗
	d102	DC voltage monitoring	0.0 to 999.9/1000.	–	V	✗	✗
	d104	Electronic thermal overload monitoring	0.0 to 100.0	–	%	✗	✗
Main Profile Parameters	F001	Output frequency setting	0.0,start frequency to Maximum frequency(1st/2st) 0.0 to 100.0(%)(PID function on time)	0.00	Hz	✓	✓
	F002	Acceleration time (1)	0.00 to 99.99/100.0 to 999.9/1000. to 3600.	10.00	s	✓	✓
	F202	Acceleration time (1),2nd motor		10.00	s	✓	✓
	F003	Deceleration time (1)	0.00 to 99.99/100.0 to 999.9/1000. to 3600.	10.00	s	✓	✓
	F203	Deceleration time (1),2nd motor		10.00	s	✓	✓
	F004	Keypad Run key routing	00(Forward)/01(Reverse)	00	–	✗	✗

A Group: Standard Functions

[✓: Allowed ✗: Not allowed]

Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
Basic setting	A001	Frequency source setting	00(Keypad potentiometer)/01 (control circuit terminal block)/02 (digital operator)/03 (Modbus)/10 (operation function result)	01	–	✗	✗
	A201	Frequency source setting, 2nd motor		01	–	✗	✗
	A002	Run command source setting	01(control circuit terminal block)/02 (digital operator)/03 (Modbus)	01	–	✗	✗
	A202	Run command source setting, 2nd motor		01	–	✗	✗
	A003	Base frequency setting	30.0 to "maximum frequency(1st)"	60.0	Hz	✗	✗
	A203	Base frequency setting, 2nd motor	30.0 to "maximum frequency(2st)"	60.0	Hz	✗	✗
	A004	Maximum frequency setting	"Base frequency(1st)" to 400.0	60.0	Hz	✗	✗
	A204	Maximum frequency setting, 2nd motor	"Base frequency(2st)" to 400.0	60.0	Hz	✗	✗
Analog input setting	A011	[O/OI] input active range start frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A012	[O/OI] input active range end frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A013	Aanalog input active range start voltage	0 to 100	0.	%	✗	✓
	A014	Aanalog input active range end voltage	0 to 100	100.	%	✗	✓
	A015	Aanalog input start frequency enable	00(use set value)/01(use 0 Hz)	01	–	✗	✓
	A016	Analog input filter	1 to 30 or 31 (500 ms filter ±0.1 Hz with hysteresis)	31.	Spl	✗	✓
Multi-speed and jogging	A019	Multi-speed operation selection	00(Binary mode)/01(Bit mode)	00	–	✗	✗
	A020	Multi-speed frequency setting (0)	0.0/start freq. to maximum freq.	0.00	Hz	✓	✓
	A220	Multi-speed frequency (2nd), setting 2nd motor		0.00	Hz	✓	✓
	A021	Multi-speed frequency setting (1)		60.00	Hz	✓	✓
	A022	Multi-speed frequency setting (2)		40.00	Hz	✓	✓
	A023	Multi-speed frequency setting (3)		20.00	Hz	✓	✓
	A024	Multi-speed frequency setting (4)		0.00	Hz	✓	✓
	A025	Multi-speed frequency setting (5)		0.00	Hz	✓	✓
	A026	Multi-speed frequency setting (6)		0.00	Hz	✓	✓
	A027	Multi-speed frequency setting (7)		0.00	Hz	✓	✓
	A038	Jog frequency	Start frequency to 9.99	6.00	Hz	✓	✓
	A039	Jog stop mode	00 (free-running after jogging stops [disabled during operation])/01 (deceleration and stop after jogging stops [disabled during operation])/02 (DC braking after jogging stops [disabled during operation])/03 (free-running after jogging stops [enabled during operation])/04 (deceleration and stop after jogging stops [enabled during operation])/05 (DC braking after jogging stops [enabled during operation])	04	–	✗	✓
V/f Characteristic	A041	Torque boost select	00(Manual)/01(Automatic)	00	–	✗	✗
	A241	Torque boost select 2nd motor	00(Manual)/01(Automatic)	00	–	✗	✗
	A042	Manual torque boost value	0.0 to 20.0	1.0	%	✓	✓
	A242	Manual torque boost value, 2nd motor	0.0 to 20.0	1.0	%	✓	✓
	A043	Manual torque boost frequency adjustment	0.0 to 50.0	5.0	%	✓	✓
	A243	Manual torque boost frequency adjustment, 2nd motor	0.0 to 50.0	5.0	%	✓	✓

Function List

A Group: Standard Functions

[✓: Allowed ✗: Not allowed]

Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
V/f Characteristic	A044	V/f characteristic curve selection	00(VC)/01(VP)/02(free V/ f)	00	-	✗	✗
	A244	V/f characteristic curve selection, 2nd motor	00(VC)/0(VP)/02(free V/ f)	00	-	✗	✗
	A045	V/f gain	20. to 100.	100.	%	✓	✓
	A245	V/f gain, 2nd motor		100.	%	✓	✓
	A046	Voltage compensation gain for automatic torque boost	0. to 255.	100.	–	✓	✓
	A246	Voltage compensation gain for automatic torque boost, 2nd motor		100.	–	✓	✓
	A047	Slip compensation gain for automatic torque boost	0. to 255.	100.	–	✓	✓
	A247	Slip compensation gain for automatic torque boost, 2nd motor		100.	–	✓	✓
DC braking	A051	DC braking enable	00(Disable)/01(Enable)/02(output freq < [A052])	00	–	✗	✓
	A052	DC braking frequency setting	0.00 to 60.00	0.50	Hz	✗	✓
	A053	DC braking wait time	0.0 to 5.0	0.00	s	✗	✓
	A054	DC braking force during deceleration	0 to 100	50	%	✗	✓
	A055	DC braking time for deceleration	0.0 to 10.0	0.5	s	✗	✓
	A056	DC braking / edge or level detection for [DB] input	00(Edge)/01(Level)	01	–	✗	✓
	A057	DC braking force at start	0. to 100.	0.	%	✗	✓
	A058	DC braking time at start	0.0 to 10.0	0.0	s	✗	✓
	A059	Carrier frequency during DC braking	2.0 to 15.0	2.0	kHz	✗	✓
Frequency Upper/Lower Limit and Jump Frequency	A061	Frequency upper limit setting	0.00/Freq. lower limit setting to maximum freq.	0.00	Hz	✗	✓
	A261	Frequency upper limit setting, 2nd motor	0.00/Freq. lower limit setting (2nd) to maximum freq. (2nd)	0.00	Hz	✗	✓
	A062	Frequency lower limit setting	0.00/Start freq. to freq. upper limit setting	0.00	Hz	✗	✓
	A262	Frequency lower limit setting, 2nd motor	0.00/Start freq. (2nd) to freq. upper limit setting (2nd)	0.00	Hz	✗	✓
	A063	Jump freq. (center) 1	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A064	Jump (hysteresis) frequency setting 1	0.00 to 10.00	0.50	Hz	✗	✓
	A065	Jump freq. (center) 2	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A066	Jump (hysteresis) frequency setting 2	0.00 to 10.00	0.50	Hz	✗	✓
	A067	Jump freq. (center) 3	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A068	Jump (hysteresis) frequency setting 3PID Enable	0.00 to 10.00	0.50	Hz	✗	✓
	A069	Acceleration hold frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✓	✓
	A070	Acceleration hold time setting	0.0 to 60.0	0.0	s	✗	✓
PID Control	A071	PID Enable	00(Disable)/01(Enable)/02(Enabling inverted data output)	00	–	✗	✓
	A072	PID proportional gain	0.00 to 25.00	1.00	–	✓	✓
	A073	PID integral time constant	0.0 to 999.9/1000. to 3600.	1.0	s	✓	✓
	A074	PID derivative time constant	0.00 to 99.99/100.0	0.00	s	✓	✓
	A075	PV scale conversion	0.01 to 99.99	1.00	–	✗	✓
	A076	PV source setting	01 (Analog1)/02(Modbus)/10 (operation result output)	01	–	✗	✓
	A077	Reverse PID action	00(OFF)/01(ON)	00	–	✗	✓
	A078	PID output limit	0.0 to 100.0	0.0	%	✗	✓
AVR function	A081	AVR function select	00 (always on)/ 01 (always off)/ 02 (off during deceleration)	02	–	✗	✗
	A281	AVR function select, 2nd motor		02	–	✗	✗
	A082	AVR voltage select	200V class: 200/215/220/230/240, 400V class:380/400/415/440/480	200/400	V	✗	✗
	A282	AVR voltage select, 2nd motor		200/400	V	✗	✗
	A083	AVR filter time constant	0.000 to 1.000	0.030	s	✗	✓
	A084	AVR deceleration gain	50. to 200.	100.	%	✓	✓
Automatic Energy Saving	A085	Operation mode selection	00(Normal)/01(Energy-saver)	00	–	✗	✗
	A086	Energy saving mode tuning	0.0 to 100.0	50.0	%	✓	✓
Operation mode and acc./dec. function	A092	Acceleration time (2)	0.00 to 99.99/100.0 to 999.9/1000. to 3600.	10.00	s	✓	✓
	A292	Acceleration time (2),2nd motor		10.00	s	✓	✓
	A093	Deceleration time (2)	0.00 to 99.99/100.0 to 999.9/1000. to 3600.	10.00	s	✓	✓
	A293	Deceleration time (2),2nd motor		10.00	s	✓	✓
	A094	Select method to switch to Acc2/Dec2 profile	00 (switching by 2CH terminal)/ 01 (switching by setting)/ 02 (Forward and reverse)	00	–	✗	✗
	A294	Select method to switch to Acc2/Dec2 profile, 2nd motor	00 (switching by 2CH terminal)/ 01 (switching by setting)/ 02 (Forward and reverse)	00	–	✗	✗
	A095	Acc1 to Acc2 frequency transition point	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✗
	A295	Acc1 to Acc2 frequency transition point, 2nd motor		0.00	Hz	✗	✗
	A096	Dec1 to Dec2 frequency transition point	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✗
	A296	Dec1 to Dec2 frequency transition point, 2nd motor		0.00	Hz	✗	✗
	A097	Acceleration curve selection	00(Linear)/01(S-curve)/ 02 (U curve)/ 03 (inverted-U curve)	00	–	✗	✗
	A098	Deceleration curve selection	00(Linear)/01(S-curve)/ 02 (U curve)/ 03 (inverted-U curve)	00	–	✗	✗
	A131	Acceleration curve constant setting (for S, U, Inverse U)	1 to 10	2	–	✗	✓
	A132	Deceleration curve constant setting (for S, U, Inverse U)	1 to 10	2	–	✗	✓
Frequency caluculation	A141	A input select for calculate function	00(Digital operator)/01(Keypad potentiometer) 02(input via Analog1)/04 (external communication)	00	–	✗	✓
	A142	B input select for calculate function		02	–	✗	✓
	A143	Calculation symbol	00(A141+A142)/01(A141-A142)/02(A141× A142)	00	–	✗	✓
	A145	ADD frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A146	ADD direction select	00 (frequency command + A145)/ 01(frequency command - A145)	00	–	✗	✓
	A154	Deceleration hold frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A155	Deceleration hold time setting	0.0 to 60.0	0	s	✗	✓
	A156	PID sleep function action threshold	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A157	PID sleep function action delay time	0.0 to 25.5	0.0	s	✗	✓
	A158	PID sleep function return threshhold	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✗	✓
	A161	[VR] input active range start frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✓	✓
	A162	[VR] input active range end frequency	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✓	✓
	A163	[VR] input active range start %	0. to [VR] input active range end	0.	%	✓	✓
	A164	[VR] input active range end %	[VR] input active range start to 100.	100.	%	✓	✓
	A165	Option operator input start frequency enable	00(A161)/01(0Hz)	01	–	✗	✓

b Group: Fine-tuning Functions

[✓: Allowed ✗: Not allowed]

Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
Restart after instantaneous power failure	b001	Selection of automatic restart mode	00 (tripping)/ 01 (starting with 0 Hz)/ 02 (starting with matching frequency)/ 03 (tripping after deceleration and stopping with matching frequency)	00	–	✗	✓
	b002	Allowable under-voltage power failure time	0.3 to 25.0	1.0	s	✗	✓
	b003	Retry wait time before motor restart	0.3 to 100.0	1.0	s	✗	✓
	b004	Under-voltage trip alarm enable	00 (OFF)/ 01 (ON)/ 02 (disabling during stopping and decelerating to stop)	00	–	✗	✓
	b005	Under-voltage trip events	00 (16 times)/ 01 (No limit)	00	–	✗	✓
	b007	Restart frequency threshold	0.00 to 400.00	0.50	Hz	✗	✓
	b008	Selection of retry after tripping	00 (tripping)/ 01 (starting with 0 Hz)/ 02 (starting with matching frequency)/ 03 (tripping after deceleration and stopping with matching frequency)	00	–	✗	✓
	b010	Selection of retry count after undervoltage	1 to 3	3	times	✗	✓
	b011	Start frequency to be used in case of frequency pull-in restart	0.3 to 100.0	1.0	s	✗	✓

Function List

b Group: Fine-tuning Functions

✓: Allowed
✗: Not allowed

Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
Electronic thermal	b012	Electronic thermal setting	0.20 × Rated current to 1.00 × Rated current	Rated current	A	✗	✓
	b212	Electronic thermal setting, 2nd motor		Rated current	A	✗	✓
	b013	Electronic thermal characteristic	00 (reduced-torque characteristic)/ 01 (constant-torque characteristic)/ 02 (free setting)	01	–	✗	✓
	b213	Electronic thermal characteristic, 2nd motor		01	–	✗	✓
	b015	Free setting, electronic thermal frequency (1)	0 to Free setting, electronic thermal frequency (2)	0.	Hz	✗	✓
	b016	Free setting electronic thermal ~current1	0.00 to inverter rated current Amps	0.0	A	✗	✓
	b017	Free setting, electronic thermal frequency (2)	Free setting, electronic thermal frequency (1) to Free setting, electronic thermal frequency (3)	0.	Hz	✗	✓
	b018	Free setting electronic thermal ~current2	0.00 to inverter rated current Amps	0.0	A	✗	✓
	b019	Free setting electronic thermal ~freq.3	Free setting, electronic thermal frequency (2) to 400.0	0.	Hz	✗	✓
	b020	Free setting electronic thermal ~current3	0.00 to inverter rated current Amps	0.0	A	✗	✓
Overload restriction	b021	Overload restriction operation mode	00(Disable)/01(Enable)/02(Enable for during acceleration)	01	–	✗	✓
	b221	Overload restriction operation mode, 2nd motor		01	–	✗	✓
	b022	Overload restriction setting	0.20 × Rated current to 2.00 × Rated current	150% of Rated current	A	✗	✓
	b222	Overload restriction setting, 2nd motor			A	✗	✓
	b023	Deceleration rate at overload restriction	0.1 to 999.9/1000. to 3000.	1.0	s	✗	✓
	b223	Deceleration rate at overload restriction, 2nd motor		1.0	s	✗	✓
	b024	Overload restriction operation mode 2	00 (disabling)/ 01 (enabling during acceleration and constant-speed operation)/ 02 (enabling during constant-speed operation)	01	–	✗	✓
	b025	Overload restriction level 2 setting	0.20 × rated current to 2.00×rated current	150% of Rated current	A	✗	✓
	b026	Deceleration rate 2 at overload restriction	0.1 to 999.9/1000. to 3000.	1.0	s	✗	✓
	b027	OC suppression selection	00 (OFF)/ 01 (ON)	01	–	✗	✓
	b028	Current level of active freq. matching restart setting	0.20 × rated current to 2.00 × rated current	Rated current	A	✗	✓
	b029	Deceleration rate of active freq. matching	0.1 to 999.9/1000. to 3000.	0.5	s	✗	✓
	b030	Start freq to be used in case of active freq. Matching restart	00 (frequency at the last shutoff)/ 01 (maximum frequency)/ 02 (set frequency)	00	–	✗	✓
Lock	b031	Software lock mode selection	00([SFT] input blocks all edits)/01([SFT] input blocks edits except F001 and Multispeed parameters/02(No access to edits)/03(No access to edits except F001 and Multi-speed parameters)/10(High-level access,including b031)	01	–	✗	✓
Others	b034	Run/power ON warning time	0. (Disabling the signal output) /1. to 9999. in units of 10 hours 1000 to 6553 in units of 100 hours	0.	Hrs	✗	✓
	b035	Rotation direction restriction	00(Enable for both dir)/ 01 (Enable for forward only)/ 02 (Enable for reverse only)	00	–	✗	✗
	b036	Reduced voltage start selection	0 (minimum reduced voltage start time) to 255 (maximum reduced voltage start time)	3	–	✗	✓
	b037	Function code display restriction	0 (full display), 1 (function-specific display) , 3 (data comparison display), 4 (basicdisplay), 5(monitor display)	00	–	✗	✓
	b038	Initial display selection	000(Func. code that SET key pressed last displayed.) / 001 to 060(d001 to d060 displayed) / 201(F001displayed) / 202(B display of LCD operator (In case of Digital operator, same 000 setting)	001	–	✗	✓
	b050	Selection of the non stop operation	00(Disabled)/ 01 (enabling)/ 02 (nonstop operation at momentary power failure (no restoration))/03 (nonstop operation at momentary power failure (restoration to be done))	00	–	✗	✗
	b051	DC bus voltage trigger level of ctrl. decel.	200V class:0.0 to 400.0, 400V class:0.0 to 800.0	220.0/440.0	V	✗	✗
	b052	Over-voltage threshold of ctrl. decel.	200V class:0.0 to 400.0, 400V class:0.0 to 800.0	360.0/720.0	V	✗	✗
	b053	Deceleration time of ctrl. decel.	0.01 to 300.0	1.00	s	✗	✗
	b054	Frequency width of quick deceleration setting	0.00 to 10.00	0.00	Hz	✗	✗
	b060	Maximum-limit level of window comparators	0 to 100	100.	%	✓	✓
	b061	Minimum-limit level of window comparators	0 to 100	0.	%	✓	✓
	b062	Hysteresis width of window comparators	0 to 10	0.	%	✓	✓
	b070	Operation level at O/OI disconnection	0. to 100., or “no” (ignore)	no	–	✗	✓
	b078	Watt-hour clearance	00(OFF)/01(CLR)(press STR then clear)	00	–	✓	✓
	b079	Watt-hour display gain	1.to1000.	1.	–	✓	✓
	b082	Start frequency adjustment	0.01 to 9.99	0.50	Hz	✗	✓
	b083	Carrier frequency setting	2.0 to 15.0 *1	2.0	kHz	✗	✓
	b084	Initialization mode (parameters or trip history)	00(disabling)/ 01 (clearing the trip history)/ 02 (initializing the data)/ 03 (clearing the trip history and initializing the data)	00	–	✗	✗
	b085	Country code for initialization	00 (Mode1)/ 01(Mode2)	00	–	✗	✗
	b086	Frequency scaling conversion factor	0.01 to 99.99	1.00	–	✓	✓
	b087	STOP key enable	00:ON(Enable)/01:OFF(Disable)/02:Only RESET(Disable for stop)	00	–	✗	✓
	b088	Restart mode after FRS	00(Restart from 0Hz)/01(Restart with frequency detection)	00	–	✗	✓
	b089	Automatic carrier frequency reduction	00(disabling)/ 01(enabling(output current controlled))/ 02(enabling(fin temperature controlled))	00	–	✗	✗
	b091	Stop mode selection	00(Deceleration and stop)/01(Free-run stop)	00	–	✗	✓
	b094	Initialization target data setting	00(All parameters)/01(All parameters except in/output terminals and communication)	00	–	✗	✗
	b100	Free-setting V/F freq. (1)	0. to b102	0.	Hz	✗	✗
	b101	Free-setting V/F volt. (1)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0.0	V	✗	✗
	b102	Free-setting V/F freq. (2)	b100 to b104	0.	Hz	✗	✗
	b103	Free-setting V/F volt. (2)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0.0	V	✗	✗
	b104	Free-setting V/F freq. (3)	b102 to b106	0.	Hz	✗	✗
	b105	Free-setting V/F volt. (3)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0.0	V	✗	✗
	b106	Free-setting V/F freq. (4)	b104 to b108	0.	Hz	✗	✗
	b107	Free-setting V/F volt. (4)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0.0	V	✗	✗
	b108	Free-setting V/F freq. (5)	b106 to b110	0.0	Hz	✗	✗
	b109	Free-setting V/F volt. (5)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0	V	✗	✗
	b110	Free-setting V/F freq. (6)	b108 to b112	0.	Hz	✗	✗
	b111	Free-setting V/F volt. (6)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0.0	V	✗	✗
	b112	Free-setting V/F freq. (7)	b110 to 400	0.	Hz	✗	✗
	b113	Free-setting V/F volt. (7)	200V class:0.0 to 300.0, 400V class:0.0 to 600.0	0.0	V	✗	✗
	b130	Over-voltage LADSTOP enable	00 (OFF)/ 01 (V-count)/ 02 (Accel)/ 03(Acc/Dcc)	00	–	✗	✓
	b131	Decel. overvolt. suppress level	200V class:330. to 390. , 400V class:660. to 780.	360/720	V	✗	✓
	b132	DC bus AVR constant setting	0.10 to 30.00	1.00	s	✗	✓
	b133	DC bus AVR for decel. Proportional-gain	0.00 to 5.00	0.20	–	✓	✓
	b134	DC bus AVR for decel. Integral-time	0.0 to 150.0	1.0	s	✓	✓
	b150	Panel Display selection	001 to 050	001	–	✓	✓
	b160	1st data of d050	001 to 018	001	–	✓	✓
	b161	2nd parameter of Double Monitor	001 to 018	002	–	✓	✓
	b163	Data change mode selection of d001 and d007	00 (OFF)/ 01 (ON)	01	–	✓	✓
	b164	Automatic return to the initial display	00 (OFF)/ 01 (ON)	00	–	✓	✓
	b165	Ex. operator com. loss action	00 (trip)/01 (trip after deceleration to a stop)/02 (Ignore)/03 (coasting (FRS))/ 04 (decelerates to a stop)	02	–	✓	✓
	b166	Data Read/Write select	00 (Read/Write OK)/01 (Protected)	00	–	✗	✓
	b180	Initialization trigger	00 (initialization disable)/01 (perform initialization)	00	–	✗	✗

Note 1: Carrier derating required for aambient temperature higher than 40°C(022SB:temperature higher than 30°C), no freezing.
When attach option FFM, in 015/022SB the derating becomes needless.

Function List

C Group: Intelligent Terminal Functions

[✓: Allowed ✕: Not allowed]

Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
Intelligent input terminal	C001	Terminal [1] function	00(FW:Forward), 01(RV:Reverse), 02-04(CF1-CF3:Multispeed command), 06(JG:Jogging), 07(DB:External DC braking), 08(SET:Second motor constants setting), 09(2CH:Second accel./decel.), 11(FRS:Free-run stop), 12(EXT:External trip), 13(USP:Unattended start protection), 15(SFT:Software lock), 18(RS:Reset), 20(STA:3-wire start), 21(STP:3-wire stop), 22(F/R:3-wire fwd./rev.), 23(PID:PID On/Off), 24(PIDC:PID reset), 27(UP:Remote-controlled accel.), 28(DWN:Remote-controlled decel.), 29(UDC:Remote-controlled data clearing), 31(OPE:Operator control), 32 -34(SF1-SF3: multispeed bit1, 39 (OLR: overload restriction selection), 50(ADD: Frequency setpoint), 51(F-TM: Force terminal enable), 53(S-ST: Special-Set (select) 2nd Motor Data), 65 (AHD: analog command holding), 83 (HLD: retain output frequency), 84 (ROK: permission of run command), 86 (DISP: display limitation),255(NO:Not selected),	00	–	✕	✓
	C002	Terminal [2] function		01	–	✕	✓
	C003	Terminal [3] function		02	–	✕	✓
	C004	Terminal [4] function		03	–	✕	✓
	C005	Terminal [5] function		18	–	✕	✓
	C011- C015	Terminal [1] to [5] active state	00(NO)/01(NC)	00	–	✕	✓
Intelligent input terminal	C021	Terminal [11] function	00(RUN:run signal), 01(FA1:Frequency arrival type 1 - constant speed), 02(FA2:Frequency arrival type 2 - over-frequency), 03(OL:overload advance notice signal), 04(OD:Output deviation for PID control), 05(AL:alarm signal), 06(DC:Wire brake detect on analog input), 09(LOG: Logic operation result),11 (RNT: run time expired), 12 (ONT: power ON time expired), 13 (THM: thermal warning), 21 (ZS: 0Hz detection), 27 (ODc: Analog input disconnect detection),31 (FBV: PID second stage output), 32 (NDc: Network disconnect detection), 33 (LOG1: Logic output function 1), 41 (FR: Starting contact signal), 42 (OHF: Heat sink overheat warning), 50 (IRDY:Inverter ready), 51 (FWR:Forward rotation), 52 (RVR:Reverse rotation), 53 (MJA:Major failure), 54 (WCO: Window comparator), 58(FREF: Frequency command source), 59(REF: Run command source), 60(SETM:Second motor in operation),255(NO: Not selected)	01	–	✕	✓
	C026	Alarm relay function		05	–	✕	✓
	C027	FM signal selection (Pulse/PWM output)	00 (output frequency), 01 (output current), 03 (digital output frequency), 04 (output voltage), 05 (input power), 06 (electronic thermal overload), 07 (LAD frequency), 08 (digital current monitoring), 10 (heat sink temperature)	07	–	✕	✓
	C030	Digital current monitor reference value	0.20 × rated current to 2.00 × rated current	Rated current	A	✓	✓
	C031	Terminal [11] active state	00(NO)/01(NC)	00	–	✕	✓
	C036	Alarm relay active state	00(NO)/01(NC)	01	–	✕	✓
	C038	Output mode of low load detection signal	00 (output during acceleration/deceleration and constant-speed operation)/ 01 (output only during constant-speed operation)	01	–	✕	✓
	C039	Low load detection level	0.00 to 2.00 × Rated current to 2.00 × rated current	Rated current	A	✓	✓
	C040	Output mode of overload warning	00 (output during acceleration/deceleration and constant-speed operation)/ 01 (output only during constant-speed operation)	01	–	✕	✓
	C041	Overload level setting	0.00 × Rated current to 2.00 × Rated current	115% of Rated current	A	✓	✓
	C241	Overload level setting, 2nd motor				✓	✓
	C042	Frequency arrival setting for acceleration	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✕	✓
	C043	Frequency arrival setting for deceleration	0.00 to 99.99/100.0 to 400.0	0.00	Hz	✕	✓
	C044	PID deviation level setting	0.0 to 100.0	3.0	%	✕	✓
	C052	Feedback comparison upper level	0.0 to 100.0	100.0	%	✕	✓
	C053	Feedback comparison lower level	0.0 to 100.0	0.0	%	✕	✓
	C061	Electronic thermal warning level	0. to 100.	90.	%	✕	✓
	C063	Zero speed detection level	0.00 to 99.99/100.0	0.00	Hz	✕	✓
	C064	Heat sink overheat warning	0. to 110.	100.	°C	✕	✓
Serial communication	C070	SELECTION OF OPE/MODBUS	00(OPE)/01(Modbus)	00	–	✕	✓
	C071	Communication speed	04(4800bps)/ 05(9600bps)/ 06(19.2kbps)/07(38.4kbps)	05	bps	✕	✓
	C072	Node allocation	1 to 247	1.	–	✕	✓
	C074	Communication parity selection	00(No parity)/01(Even parity)/02(Odd parity)	00	–	✕	✓
	C075	Communication stop bit selection	01(1-bit)/02(2-bit)	01	bit	✕	✓
	C076	Communication error mode	00(Trip)/01(Tripping after decelerating and stopping the motor)/02(Disable)/ 03(FRS)/04(Deceleration stop)	02	–	✕	✓
	C077	Communication error time-out	0.00(disabled)/0.01 to 99.99	0.00	s	✕	✓
	C078	Communication wait time	0. to 1000.	0.	ms	✕	✓
Analog meter setting	C081	O/OI input span calibration	0.0 to 200.0	100.0	%	✓	✓
Others	C091	Debug mode enable	00(MD0)/01(MD1)	00	–	–	–
	C101	Up/Down memory mode selection	00 (not storing the frequency data)/ 01 (storing the frequency data)	00	–	✕	✓
	C102	Reset mode selection	00(Cancel trip state at input signal ON transition)/ 01(Cancel trip state at signal OFF transition)/02(Cancel trip state at input signal ON transition)	00	–	✓	✓
	C103	Restart mode after reset	00 (starting with 0 Hz)/ 01 (restarting with active matching frequency)	00	–	✕	✓
	C104	UP/DWN clear: terminal input mode selection	00(0Hz)/01(Flash data when power supply is turned on)	00	–	✕	✓
	C105	FM gain adjustment	50. to 200.	100.	%	✓	✓
	C130	Output 11 on-delay time	0.0 to 100.0	0.0	s	✕	✓
	C131	Output 11 off-delay time	0.0 to 100.0	0.0	s	✕	✓
	C140	Output RY on-delay time	0.0 to 100.0	0.0	s	✕	✓
	C141	Output RY off-delay time	0.0 to 100.0	0.0	s	✕	✓
	C142	Logical output signal 1 selection 1	Same as the settings of C021 to C026 (except those of LOG1 to LOG3 & OPO , no)	00	–	✕	✕
	C143	Logical output signal 1 selection 2	Same as the settings of C021 to C026 (except those of LOG1 to LOG3 & OPO , no)	00	–	✕	✕
	C144	Logical output signal 1 operator selection	00(AND)/01(OR)/02(XOR)	00	–	✕	✓
	C151	Button sensitivity selection	0 to 250 / no	10	–	✕	✓
	C152	Scroll sensitivity selection	1 to 20	10	–	✕	✓
	C155	Ground fault set	00(OFF) / 01(ON)	01	–	✕	✓
	C157	Out phase-loss set	00(OFF) / 01(ON)	00	–	✕	✓
	C160	Response time of intelligent input terminal 1	0. to 200. (×2ms)	1.	–	✕	✓
	C161	Response time of intelligent input terminal 2	0. to 200. (×2ms)	1.	–	✕	✓
	C162	Response time of intelligent input terminal 3	0. to 200. (×2ms)	1.	–	✕	✓
	C163	Response time of intelligent input terminal 4	0. to 200. (×2ms)	1.	–	✕	✓
	C164	Response time of intelligent input terminal 5	0. to 200. (×2ms)	1.	–	✕	✓
	C169	Multistage speed determination time	0. to 200. (×10ms)	0.	ms	✓	✓

H Group: Motor Constants Functions

[✓: Allowed ✕: Not allowed]

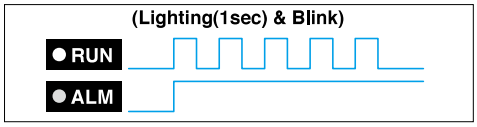
Function Code		Name	Range	Default	Unit	Run mode edit	
						Lo	Hi
Motor constants and gain	H003	Motor capacity, 1st motor	0.1/0.2/0.4/0.55/0.75/1.1/1.5/2.2/3.0/3.7/4.0/5.5	Factory set	kW	✕	✕
	H203	Motor capacity, 2nd motor			kW	✕	✕
	H004	Motor poles setting, 1st motor	2/4/6/8	4	poles	✕	✕
	H204	Motor poles setting, 2nd motor		4	poles	✕	✕
	H006	Motor stabilization constant	0. to 255.	100.	–	✓	✓
	H206	Motor stabilization constant, 2nd motor		100.	–	✓	✓

Protective Functions

Error Codes (Standard)

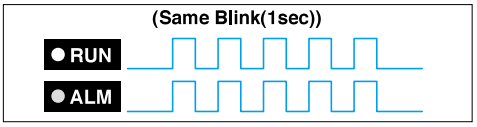
Over Current Trip

(Lighting(1sec) & Blink)



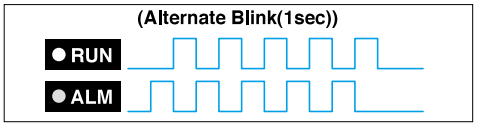
Over Voltage Trip

(Same Blink(1sec))



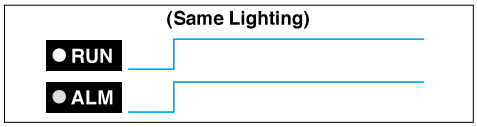
Under Voltage Trip

(Alternate Blink(1sec))



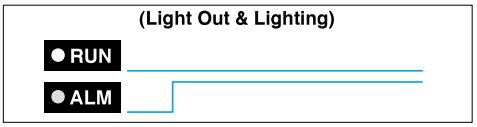
Over Load Trip

(Same Lighting)



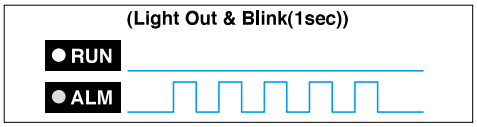
Major Failures *1

(Light Out & Lighting)



Other Failures

(Light Out & Blink(1sec))



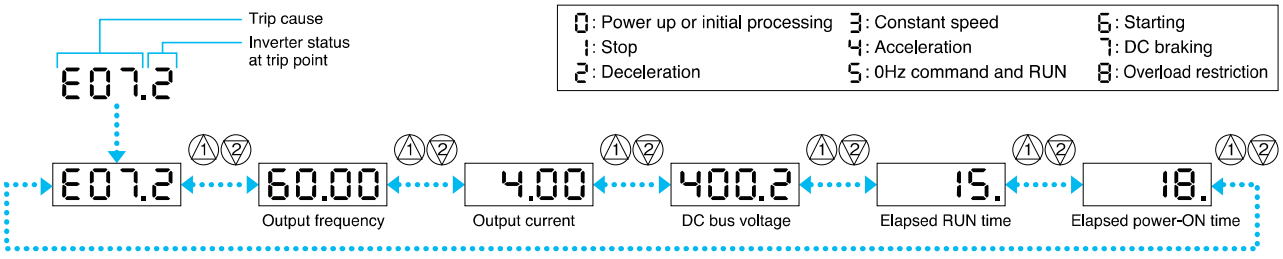
*1 The Major fault: When a memory error, CPU error and Ground fault.

Error Codes (Operator)

Name	Cause(s)		Display on digital operator
Over current	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current for the inverter, so the inverter output is turned OFF.	While at constant speed	E01
		During deceleration	E02
		During acceleration	E03
		Others	E04
Overload protection *1	When a motor overload is detected by the electronic thermal function, the inverter trips and turns OFF its output.		E05
Over voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor.		E07
Memory error *2,3	When the built-in memory has problems due to noise or excessive temperature, the inverter trips and turns OFF its output to the motor.		E08
Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault. This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns OFF its output.		E09
Current detection error	If an error occurs in the internal current detection system, the inverter will shut off its output and display the error code.		E10
CPU error	A malfunction in the built-in CPU has occurred, so the inverter trips and turns OFF its output to the motor.		E11
External trip	A signal on an intelligent input terminal configured as EXT has occurred. The inverter trips and turns OFF the output to the motor.		E12
USP *4	When the Unattended Start Protection (USP) is enabled, an error occurred when power is applied while a Run signal is present. The inverter trips and does not go into Run Mode until the error is cleared.		E13
Ground fault *5	The inverter is protected by the detection of ground faults between the inverter output and the motor during powerup tests. This feature protects the inverter, and does not protect humans.		E14
Input over-voltage	When the input voltage is higher than the specified value, it is detected 100 seconds after powerup and the inverter trips and turns OFF its output.		E15
Inverter thermal detection system error	When the cooling fin thermal sensor in the inverter detect disconnection etc, inverter trips.		E19
Inverter thermal trip	When the inverter internal temperature is above the threshold, the thermal sensor in the inverter module detects the excessive temperature of the power devices and trips, turning the inverter output OFF.		E21
Driver error	An internal inverter error has occurred at the safety protection circuit between the CPU and main driver unit. Excessive electrical noise may be the cause. The inverter has turned OFF the IGBT module output.		E30
Output phase loss protection	Output Phase Loss Logic Detection (There are undetectable terms of use.)		E34
Low-speed overload protection	If overload occurs during the motor operation at a very low speed, the inverter will detect the overload and shut off the inverter output.		E38
Operator connection failure	When the connection between inverter and operator keypad failed, inverter trips and displays the error code.		E40
Communications error	The inverter's watchdog timer for the communications network has timed out.		E41

Note 1: Reset operations acceptable 10 seconds after the trip. Note 2: If an memory error (E08) occurs, be sure to confirm the parameter data values are still correct.
Note 3: Memory error may occer at power-on after shutting down the power while copying data with remote operator or initializing data. Shut down the power after completing copy or initialization.
Note 4: USP error occures at reseting trip after under-voltage error (E09) if USP is enabled. Reset once more to recover.
Note 5: Ground fault error (E14) cannot be released with resetting. Shut the power and check wiring.
Note 6: When error E08 error, it may be required to perform initialization.

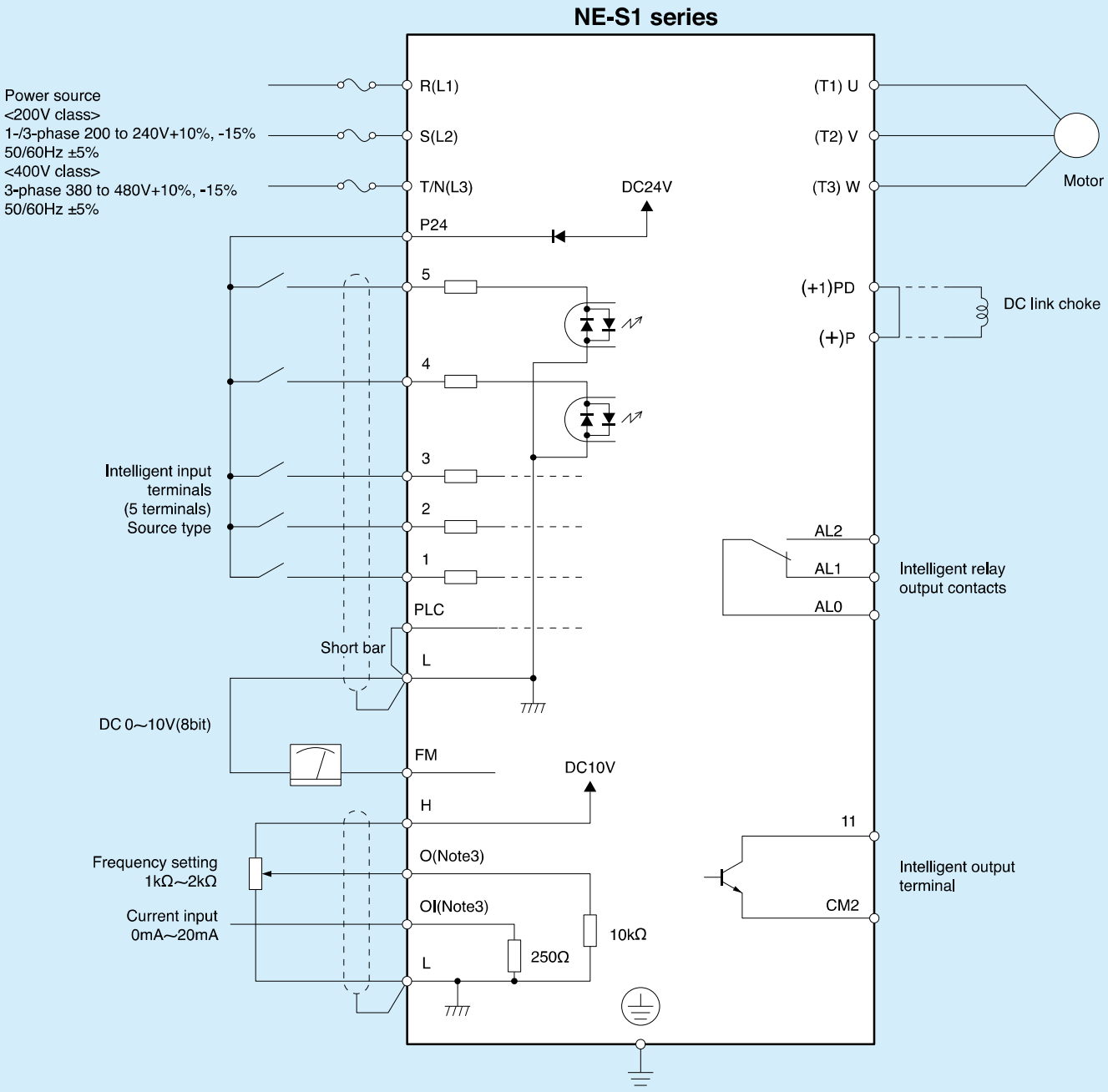
How to access the details about the present fault



Note: Indicated inverter status could be different from actual inverter behavior. (e.g. When PID operation or frequency given by analog signal, although it seems constant speed, acceleration and deceleration could be repeated in very short cycle.)

Connecting Diagram

Source type logic



Note 1: Common terminals are depend on logic.

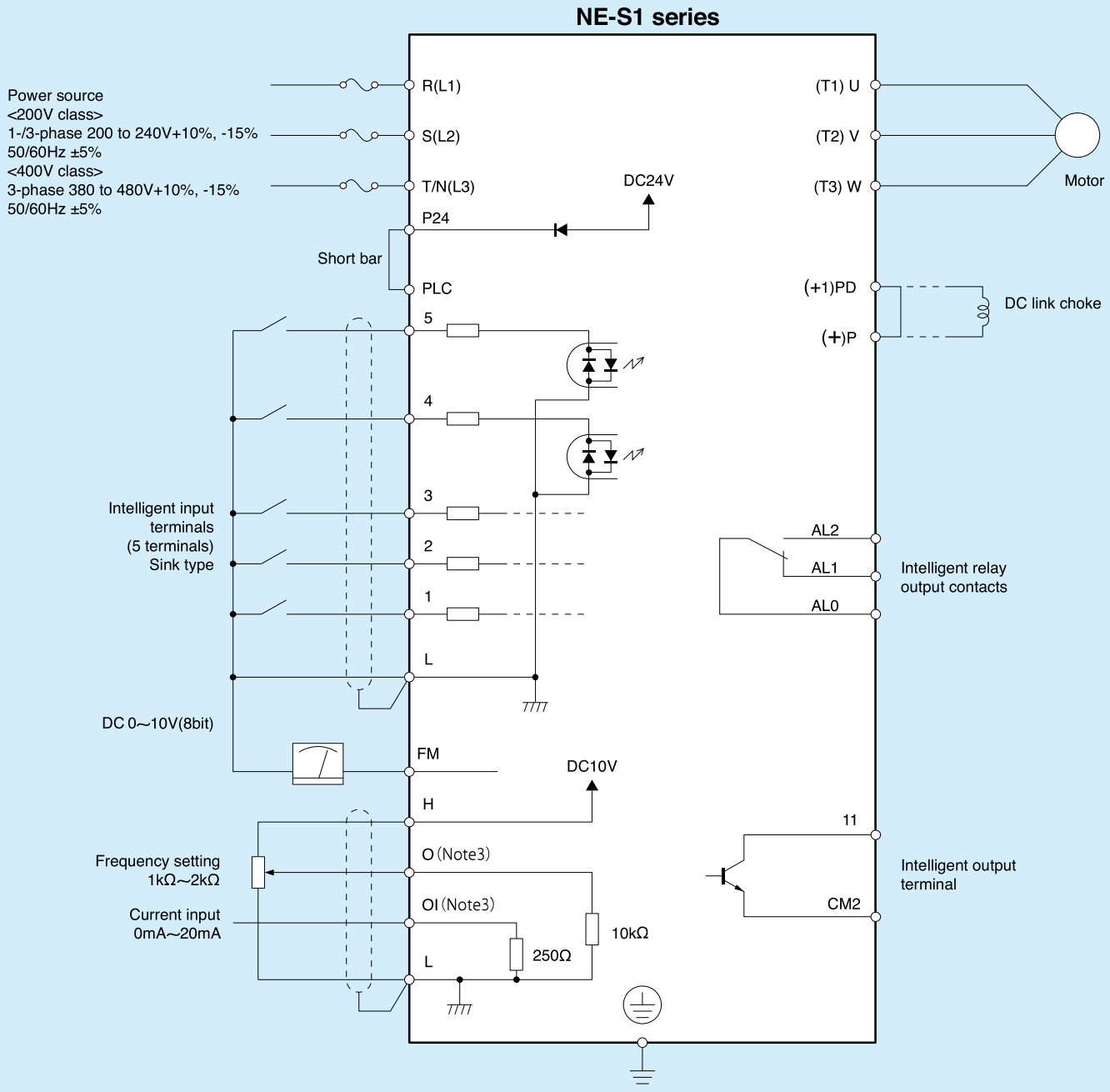
Terminal	1,2,3,4,5	H,O/OI	11
Common	P24	L	CM2

Note 2: Please choose proper inverter input voltage rating.

Note 3: Voltage input: 0 to 10V and current input: 0 to 20mA
(change parameter to move 4 to 20mA current input).
O and OI is common input terminal (O / OI terminal) change voltage / current input by switch.

Connecting Diagram

Sink type logic (default)



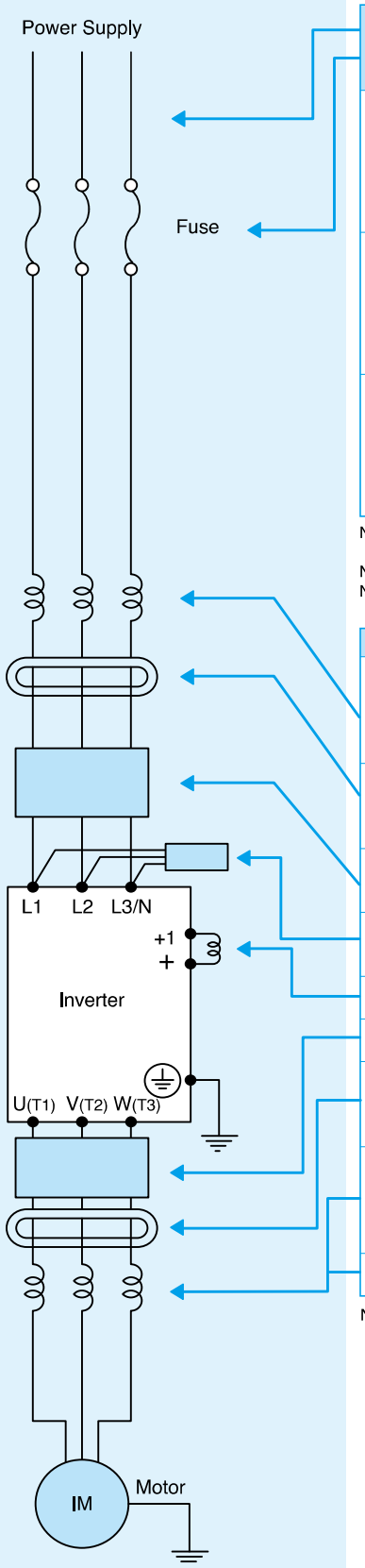
Note 1: Common terminals are depend on logic.

Terminal	1,2,3,4,5,H,O/OI	11
Common	L	CM2

Note 2: Please choose proper inverter input voltage rating.

Note 3: Voltage input: 0 to 10V and current input: 0 to 20mA
(change parameter to move 4 to 20mA current input).
O and OI is common input terminal (O / OI terminal) change voltage / current input by switch.

Wiring and Accessories



Input Voltage	Motor Output (kW(HP))	Model	Wiring			Fuse		Circuit Breaker	
			Power Lines		Signal Lines	Type	Rated	Type	Rated
			AWG	mm²					
1-phase 200V	0.2(1/4)	NES1-002SB(E)	AWG14	2.0	0.75mm² shielded wire	Class □, CC,G or T	10A	Inverse Time	15A
	0.4(1/2)	NES1-004SB(E)	AWG14	2.0					
	0.75(1)	NES1-007SB(E)	AWG14	2.0			20A		
	1.5(2)	NES1-015SB(E)	AWG10	5.5			30A		30A
	2.2(3)	NES1-022SB(E)	AWG10	5.5					
3-phase 200V	0.2(1/4)	NES1-002LB	AWG16	1.25			10A		15A
	0.4(1/2)	NES1-004LB	AWG16	1.25					
	0.75(1)	NES1-007LB	AWG16	1.25			15A		
	1.5(2)	NES1-015LB	AWG14	2.0					
	2.2(3)	NES1-022LB	AWG14	2.0			20A		20A
3-phase 400V	0.4 (1/2)	NES1-004HB(E)	AWG16	1.25			15A	–	–
	0.75(1)	NES1-007HB(E)	AWG16	1.25					
	1.5(2)	NES1-015HB(E)	AWG16	1.25					
	2.2(3)	NES1-022HB(E)	AWG14	2					
	4.0(5)	NES1-040HB(E)	AWG14	2					

Note 1: Field wiring connection must be made by a UL and c-UL listed closed-loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimping tool specified by the connector manufacturer.
Note 2: Be sure to use large wire gauges for power wiring if the distance exceeds 20m (66ft).
Note 3: Use 0.75mm² /18 AWG wire for the relay terminals (AL0, AL1 and AL2) signal wire.

Name	Function
Input side AC reactor (Note 4)	This is useful in suppressing harmonics induced on the power supplylines, or when the main power voltage imbalance exceeds 3% (and power source capacity is more than 500kVA), or to smooth out line fluctuations. It also improves the power factor.
Radio noise filter	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiation noise (can also be used on output).
EMC filter (Note 4)	Reduces the conducted noise on the power supply wiring generated by the inverter. Connect to the inverter input side.
Radio noise filter (Capacitor filter)	This capacitor filter reduces radiated noise from the main power wires in the inverter input side.
DC link choke	Suppresses harmonics generated by the inverter.
Output side noise filter	Reduces radiated noise from wiring in the inverter output side.
Radio noise filter	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise (can also be used on input).
AC reactor	This reactor reduces the vibration in the motor caused by the inverter's switching waveforms, by smoothing the waveforms to approximate commercial power quality. It is also useful when wiring from the inverter to the motor is more than 10m in length, to reduce harmonics.
LCR filter	Sine wave shaping filter for the output side.

Note 4: If there are any thyristor equipments belonging to the same net, and a possibility that the surge voltage is given to the net, change the connecting order of above Input side AC reactor and EMC filter. (Connecting order: Net -> Fuse(Circuit Breaker -> EMC filter -> Input side AC reactor -> Inverter)
Otherwise, there is a danger of damaging inverter and/or fire.

Accessories

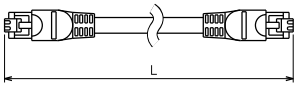
Operator, Cable

Operator

Model	Potentiometer	Remote Control	Copy function
NES1-OP	○		
OPE-SR mini	○	○	
OPE-SBK		○	
OPE-SR	○	○	
WOP		○	○

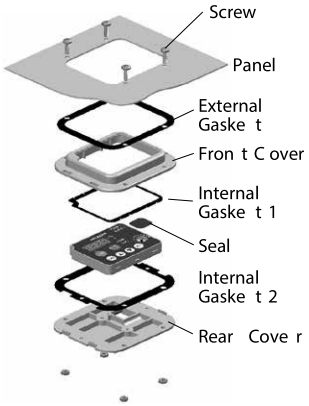
Cable

Cable <ICS-1、3>



Model	Cable Length
ICS-1	1m(3.3ft)
ICS-3	3m(9.8ft)

4X-KITmini (For installation with OPE-SR mini)



You can mount the keypad with the potentiometer for a NEMA1 rated installation. The kit also provides for removing the potentiometer knob to meet NEMA 4X requirements,as shown (part no.4X-KITmini).

Operator

<NES1-OP>

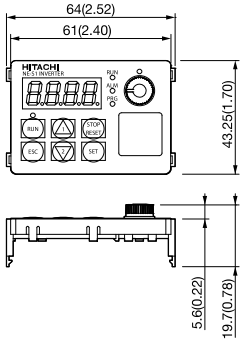
<OPE-SR mini>

<OPE-SBK (SR)>

<WOP>

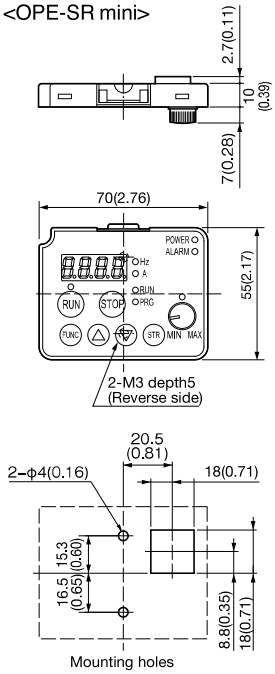
Dimentions (Unit:mm (inch)) Inches for reference only)

<NES1-OP>

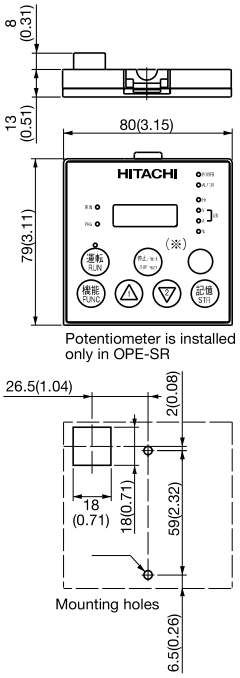


*Built-in keypad for NES1,so,this is not expandable with remote cable.

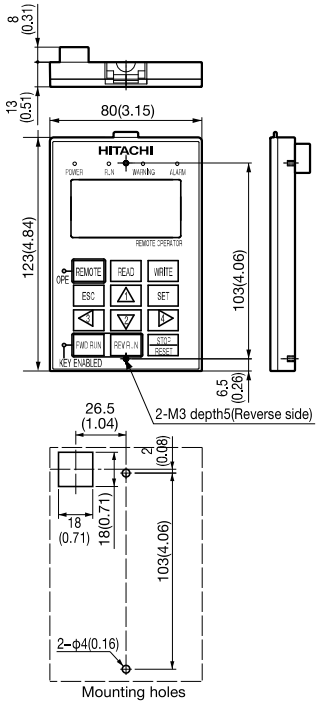
<OPE-SR mini>



<OPE-SBK (SR)>



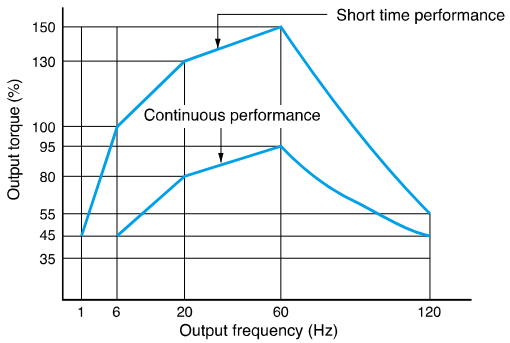
<WOP>



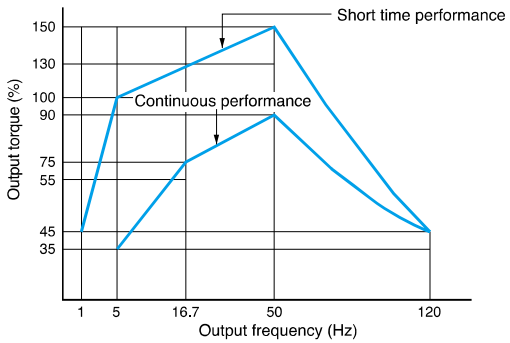
Torque characteristics & De-rating curves

Torque characteristics

Base frequency = 60Hz

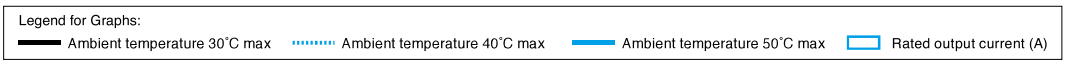


Base frequency = 50Hz

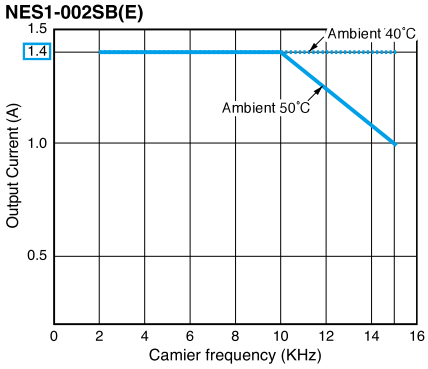


De-rating Curves

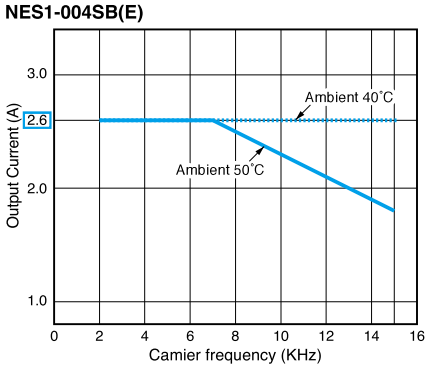
The maximum available inverter current output is limited by the carrier frequency and ambient temperature as shown below.
Choosing a higher carrier frequency tends to decrease audible noise, but it also increases the internal heating of the inverter, thus decreasing the maximum current output capability.
007SB,015LB,022LB,007H,015HB and 022HB is not require derating at ambient temperature 50°C,
And Derating properties are improved by attaching FFM at the NES1-015SB,NES1-022SB and NES1-040HB.
(Note: The figure below applied in the product since August 2012.)



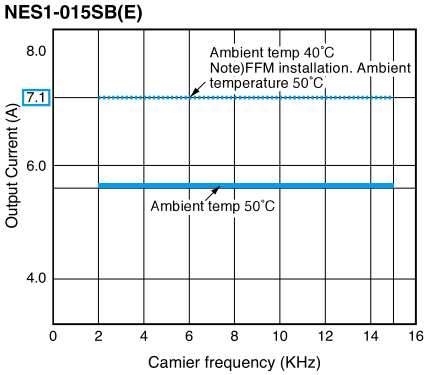
NES1-002SB(E)



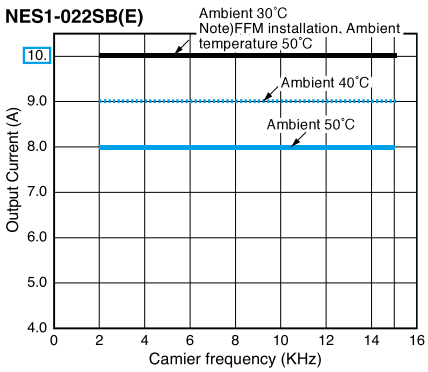
NES1-004SB(E)



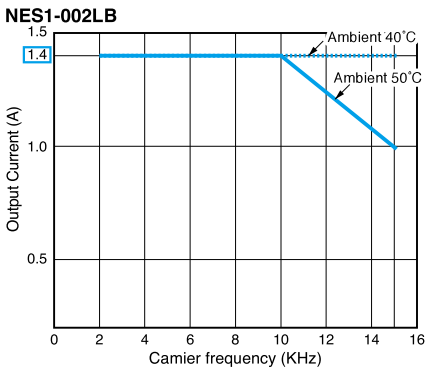
NES1-015SB(E)



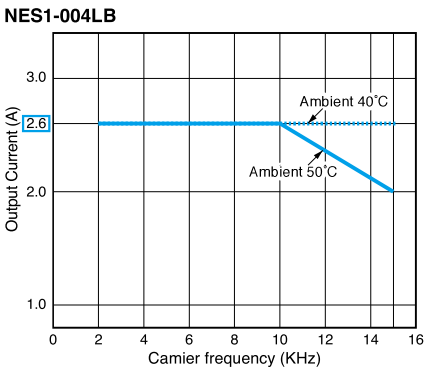
NES1-022SB(E)



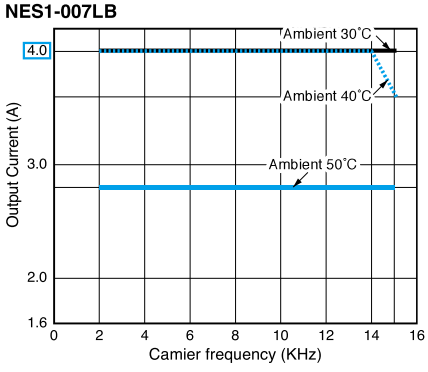
NES1-002LB



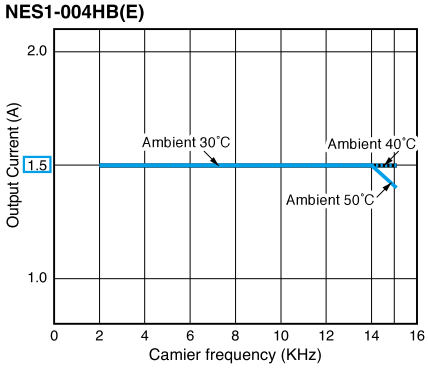
NES1-004LB



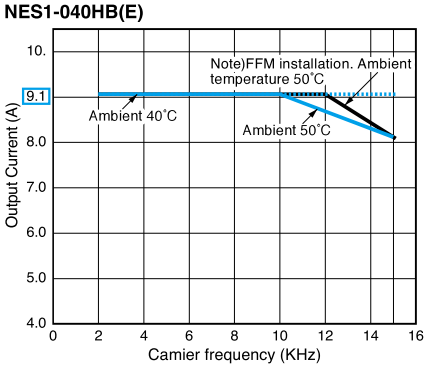
NES1-007LB



NES1-004HB(E)



NES1-040HB(E)



Application to Motors

Application to general-purpose motors

Operating frequency	The overspeed endurance of a general-purpose motor is 120% of the rated speed for 2 minutes (JIS C4,004). For operation at higher than 60Hz, it is required to examine the allowable torque of the motor, useful life of bearings, noise, vibration, etc. In this case, be sure to consult the motor manufacturer as the maximum allowable rpm differs depending on the motor capacity, etc.
Torque characteristics	The torque characteristics of driving a general-purpose motor with an inverter differ from those of driving it using commercial power (starting torque decreases in particular). Carefully check the load torque characteristic of a connected machine and the driving torque characteristic of the motor.
Motor loss and temperature increase	The torque characteristics of driving a general-purpose motor with an inverter differ from those of driving it using commercial power
Noise	When run by an inverter, a general-purpose motor generates noise slightly greater than with commercial power.
Vibration	When run by an inverter at variable speeds, the motor may generate vibration, especially because of (a) unbalance of the rotor including a connected machine, or (b) resonance caused by the natural vibration frequency of a mechanical system. Particularly, be careful of (b) when operating at variable speeds a machine previously fitted with a constant speed motor. Vibration can be minimized by (1) avoiding resonance points using the frequency jump function of the inverter, (2) using a tireshaped coupling, or (3) placing a rubber shock absorber beneath the motor base.
Power transmission mechanism	Under continued, low-speed operation, oil lubrication can deteriorate in a power transmission mechanism with an oil-type gear box (gear motor) or reducer. Check with the motor manufacturer for the permissible range of continuous speed. To operate at more than 60 Hz, confirm the machine's ability to withstand the centrifugal force generated.

Application to special motors

Gear motor	The allowable rotation range of continuous drive varies depending on the lubrication method or motor manufacturer. (Particularly in case of oil lubrication, pay attention to the low frequency range.)
Brake-equipped motor	For use of a brake-equipped motor, be sure to connect the braking power supply from the primary side of the inverter.
Pole-change motor	There are different kinds of pole-change motors (constant output characteristic type, constant torque characteristic type, etc.), with different rated current values. In motor selection, check the maximum allowable current for each motor of a different pole count. At the time of pole changing, be sure to stop the motor. Also see: Application to the 400V-class motor.
Submersible motor	The rated current of a submersible motor is significantly larger than that of the general-purpose motor. In inverter selection, be sure to check the rated current of the motor.
Explosion-proof motor	Inverter drive is not suitable for a safety-enhanced explosion-proof type motor. The inverter should be used in combination with a pressure-proof explosion-proof type of motor. *Explosion-proof verification is not available for NE-S1 Series.
Synchronous (MS) motor High-speed (HFM) motor	In most cases, the synchronous (MS) motor and the high-speed (HFM) motor are designed and manufactured to meet the specifications suitable for a connected machine. As to proper inverter selection, consult the manufacturer.
Single-phase motor	A single-phase motor is not suitable for variable-speed operation by an inverter drive. Therefore, use a three-phase motor.

Application to the 400V-class motor

A system applying a voltage-type PWM inverter with IGBT may have surge voltage at the motor terminals resulting from the cable constants including the cable length and the cable laying method. Depending on the surge current magnification, the motor coil insulation may be degraded. In particular, when a 400V-class motor is used, a longer cable is used, and critical loss can occur, take the following countermeasures:
(1) install the LCR filter between the inverter and the motor,
(2) install the AC reactor between the inverter and the motor, or
(3) enhance the insulation of the motor coil.

Notes on Use

Drive

Run/Stop	Run or stop of the inverter must be done with the keys on the operator panel or through the control circuit terminal. Do not operate by installing a electromagnetic contactor (MC) in the main circuit.
Emergency motor stop	When the protective function is operating or the power supply stops, the motor enters the free run stop state. When an emergency stop is required or when the motor should be kept stopped, use of a mechanical brake should be considered.
High-frequency run	A max. 400Hz can be selected on the NE-S1 Series. However, a two-pole motor can attain up to approx. 24,000 rpm, which is extremely dangerous. Therefore, carefully make selection and settings by checking the mechanical strength of the motor and connected machines. Consult the motor manufacturer when it is necessary to drive a standard (general-purpose) motor above 60 Hz. A full line of high-speed motors is available from Hitachi.

About the load of a frequent repetition use

About frequent repetition use (crane, elevator, press, washing machine) , a power semiconductor (IGBT, a rectification diode, thyristor) in the inverter may come to remarkably have a short life by thermal fatigue.
The life can be prolonged by lower a load electric current. Lengthen acceleration / deceleration time. Lower carrier frequency. or increasing capacity of the inverter.

About the use in highlands beyond 1,000m above sea level

Due to the air density decreasing, whenever standard inverters are used for altitudes above 1,000m, the following conditions are additionally required for proper operation. In application for operation over 2,500m, kindly contact your nearest sales office for assistance.

1. Reduction of inverter rated current
   Current rating has to be reduced 1% for every 100m that exceeds from an altitude of 1,000m.
   For example, for inverters placed at an altitude of 2,000m, the rated current has to be reduced 10%(Rated current x0.9) from its original amount. {(2,000m-1,000m)/100m*-1%=-10%}
2. Reduction of breakdown voltage
   Whenever an inverter is used at altitudes beyond 1,000m, the breakdown voltage decreases as follows:
   1,000m or less: 1.00 / 1,500m: 0.95 / 2,000m: 0.90 / 2,500m: 0.85.
   As mentioned in the instruction manual, please avoid any pressure test.

Installation location and operating environment

Avoid installation in areas of high temperature, excessive humidity, or where moisture can easily collect, as well as areas that are dusty, subject to corrosive gasses, mist of liquid for grinding, or salt. Install the inverter away from direct sunlight in a well-ventilated room that is free of vibration. The inverter can be operated in the ambient temperature range from -10 to 50˚C.(Carrier frequency and output current must be reduced in the range of 40 to 50˚C.)

Main power supply

Installation of an AC reactor on the input side	In the following examples involving a general-purpose inverter, a large peak current flows on the main power supply side, and is able to destroy the converter module. Where such situations are foreseen or the connected equipment must be highly reliable, install an AC reactor between the power supply and the inverter. Also, where influence of indirect lightning strike is possible, install a lightning conductor. (A) The unbalance factor of the power supply is 3% or higher. (Note) (B) The power supply capacity is at least 10 times greater than the inverter capacity (the power supply capacity is 500 kVA or more). (C) Abrupt power supply changes are expected. Examples: (1) Several inverters are interconnected with a short bus. (2) A thyristor converter and an inverter are interconnected with a short bus. (3) An installed phase advance capacitor opens and closes. In cases (A), (B) and (C), it is recommended to install an AC reactor on the main power supply side. Note: Example calculation with V_{RS} = 205V, V_{ST} = 201V, V_{TR} = 200V V_{RS} : R-S line voltage, V_{ST} : S-T line voltage, V_{TR} : T-R line voltage Unbalance factor of voltage = $\frac{\text{Max. line voltage (min.) - Mean line voltage}}{\text{Mean line voltage}} \times 100$ $= \frac{V_{RS}-(V_{RS}+V_{ST}+V_{TR})/3}{(V_{RS}+V_{ST}+V_{TR})/3} \times 100 = \frac{205-202}{202} \times 100 = 1.5(\%)$
Using a private power generator	An inverter run by a private power generator may overheat the generator or suffer from a deformed output voltage waveform of the generator. Generally, the generator capacity should be five times that of the inverter (kVA) in a PWM control system, or six times greater in a PAM control system.

Notes on Peripheral Equipment Selection

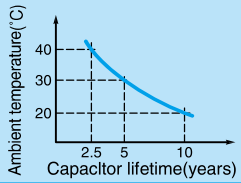
Wiring connections		(1) Be sure to connect main power wires with R(L1), S(L2), and T(L3) terminals (input) and motor wires to U(T1), V(T2), and W(T3) terminals (output). (Incorrect connection will cause an immediate failure.) (2) Be sure to provide a grounding connection with the ground terminal (⏚).
Wiring between inverter and motor	Electromagnetic contactor	When an electromagnetic contactor is installed between the inverter and the motor, do not perform on-off switching during running operation.
	Thermal relay	When used with standard applicable output motors (standard three-phase squirrel-cage four-pole motors), the NE-S1 Series does not need a thermal relay for motor protection due to the internal electronic protective circuit. A thermal relay, however, should be used: • during continuous running outside a range of 30 to 60 Hz. • for motors exceeding the range of electronic thermal adjustment (rated current). • when several motors are driven by the same inverter; install a thermal relay for each motor. • The RC value of the thermal relay should be more than 1.1 times the rated current of the motor. Where the wiring length is 10 m or more, the thermal relay tends to turn off readily. In this case, provide an AC reactor on the output side or use a current sensor.
Installing a circuit breaker		Install a circuit breaker on the main power input side to protect inverter wiring and ensure personal safety. Choose an inverter-compatible circuit breaker. The conventional type may malfunction due to harmonics from the inverter. For more information, consult the circuit breaker manufacturer.
Wiring distance		The wiring distance between the inverter and the remote operator panel should be 20 meters or less. Shielded cable should be used on thewiring. Beware of voltage drops on main circuit wires. (A large voltage drop reduces torque.)
Earth leakage relay		If the earth leakage relay (or earth leakage breaker) is used, it should have a sensitivity level of 15 mA or more (per inverter).
Phase advance capacitor		Do not use a capacitor for power factor improvement between the inverter and the motor because the high-frequency components of the inverter output may overheat or damage the capacitor.

High-frequency Noise and Leakage Current

(1) High-frequency components are included in the input/output of the inverter main circuit, and they may cause interference in a transmitter, radio, or sensor if used near the inverter. The interference can be minimized by attaching noise filters (option) in the inverter circuitry.
(2) The switching action of an inverter causes an increase in leakage current. Be sure to ground the inverter and the motor.

Lifetime of Primary Parts

Because a DC bus capacitor deteriorates as it undergoes internal chemical reaction, it should normally be replaced every five years. Be aware, however, that its life expectancy is considerably shorter when the inverter is subjected to such adverse factors as high temperatures or heavy loads exceeding the rated current of the inverter. The approximate lifetime of the capacitor is as shown in the figure at the right when it is used 12 hours daily (according to the " Instructions for Periodic Inspection of General-Purpose Inverter " (JEMA).) Also, such moving parts as a cooling fan should be replaced. Maintenance inspection and parts replacement must beperformed by only specified trained personnel. Please plan to replace new INV depends on the load, ambient condition in advance.



Precaution for Correct Usage

- Before use, be sure to read through the Instruction Manual and QRG(http://www.hitachi-ies.co.jp/english/products/inv/nes1/index.htm) to insure proper use of the inverter.
- Note that the inverter requires electrical wiring; a trained specialist should carry out the wiring.
- The inverter in this catalog is designed for general industrial applications. For special applications in fields such as aircraft, outer space, nuclear power, electrical power, transport vehicles, clinics, and underwater equipment, please consult with us in advance.
- For application in a facility where human life is involved or serious losses may occur, make sure to provide safety devices to avoid a serious accident.
- The inverter is intended for use with a three-phase AC motor. For use with a load other than this, please consult with us.

Information in this brochure is subject to change without notice.