IMPULSE®•D+ AC Regenerative System
Instruction Manual

MAGNETEK
MATERIAL HANDLING

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Preface and Safety

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Product Safety Information

Magnetek, Inc. (Magnetek) offers a broad range of radio remote control products, control products and adjustable frequency drives, power delivery systems, and industrial braking systems for material handling applications. This manual has been prepared by Magnetek to provide information and recommendations for the installation, use, operation and service of Magnetek’s material handling products and systems (Magnetek Products). Anyone who uses, operates, maintains, services, installs or owns Magnetek Products should know, understand and follow the instructions and safety recommendations in this manual for Magnetek Products.

The recommendations in this manual do not take precedence over any of the following requirements relating to cranes, hoists, lifting devices or other equipment which use or include Magnetek Products:

• Instructions, manuals, and safety warnings of the manufacturers of the equipment where the Magnetek Products are used,
• Plant safety rules and procedures of the employers and the owners of the facilities where the Magnetek Products are being used,
• Regulations issued by the Occupational Health and Safety Administration (OSHA),
• Applicable local, state, provincial, or federal codes, ordinances, standards and requirements, or
• Safety standards and practices for the industries in which Magnetek Products are used.

This manual does not include or address the specific instructions and safety warnings of these manufacturers or any of the other requirements listed above. It is the responsibility of the owners, users and operators of the Magnetek Products to know, understand and follow all of these requirements. It is the responsibility of the employer to make its employees aware of all of the above listed requirements and to make certain that all operators are properly trained. **No one should use Magnetek Products prior to becoming familiar with and being trained in these requirements and the instructions and safety recommendations for this manual.**

Product Warranty Information

Magnetek, hereafter referred to as Company, assumes no responsibility for improper programming of a device (such as a drive or radio) by untrained personnel. A device should only be programmed by a trained technician who has read and understands the contents of the relevant manual(s). Improper programming of a device can lead to unexpected, undesirable, or unsafe operation or performance of the device. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such programming. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product.

For information on Magnetek’s product warranties by product type, please visit www.magnetek.com.
DANGER, WARNING, CAUTION, and NOTE Statements

Read and understand this manual before installing, operating, or servicing the converter. The converter must be installed according to this manual and local codes.

The following conventions indicate safety messages in this manual. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.

**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION** indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

**NOTICE** indicates a potential equipment damage message.

**NOTE:** A NOTE statement is used to notify installation, operation, programming, or maintenance information that is important, but not hazard-related.

Supplemental Safety Information

**General Precautions**

- The diagrams in this manual may be indicated without covers or safety shields to show details. Replace the covers or shields before operating the converter and run the converter according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering a new copy of the manual due to damage or loss, contact your Magnetek representative or the Magnetek customer service department and provide the manual number shown on the front cover.
- If nameplate becomes worn or damaged, contact Magnetek.
Safety Messages

**DANGER**

Heed the safety messages in this manual.
Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

*Electrical Shock Hazard*

Do not install, wire, maintain, or inspect the product or replace parts while the power supply is turned on.
Failure to comply will result in death or serious injury.

Disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the converter before touching any components.

Do not turn on the power supply or supply power to the input-side AC reactor or to the harmonic filter (harmonic filter module) only.
Voltage will remain in the internal capacitor and will result in death or serious injury. Always connect a converter as shown in the Standard Connection Diagram before you turn on the power supply.

**WARNING**

*Sudden Movement Hazard*

System may start unexpectedly upon application of power, resulting in death or serious injury.
Clear all personnel from the converter, drive, motor and machine area before applying power to the converter. Secure covers, couplings, shaft keys and machine loads.

*Electrical Shock Hazard*

Do not attempt to modify or alter the converter in any way not explained in this manual.
Failure to comply could result in death or serious injury.

Magnetek is not responsible for any modification of the product made by the user. This product must not be modified.

Do not allow unqualified personnel to perform work on the converter.
Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of converters.

Do not remove covers or touch circuit boards while the power is on.
Failure to comply could result in death or serious injury.
WARNING

Electrical Shock Hazard

Always use a ground wire that complies with technical standards on electrical equipment and minimize the length of the ground wire.
Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.

Make sure the protective earthing conductor complies with technical standards and local safety regulations.
Because the leakage current exceeds 3.5 mA in model 41040-D+ IEC/EN 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm² (Cu) or 16 mm² (Al) must be used. Failure to comply may result in death or serious injury.

Use appropriate equipment for Ground Fault Circuit Interrupter (GFCI).
This converter can cause a residual current with a DC component in the protective earthing conductor. Where a residual current operated protective or monitoring device is used for protection in case of direct or indirect contact, always use a GFCI of type B according to IEC/EN60755.

Do not operate equipment with covers removed.
Failure to comply could result in death or serious injury.

Fire Hazard

Do not use an improper voltage source.
Failure to comply could result in death or serious injury by fire.

Verify that the rated voltage of the converter matches the voltage of the incoming power supply before applying power.

When installing an IP00/IP20 converter in a closed panel or cabinet, sufficiently cool the panel or cabinet with a cooling fan or air conditioner so that the air temperature entering the converter is 50°C (122°F) or cooler.
Failure to comply could result in overheating and fire.

Tighten all terminal screws to the specified tightening torque.
Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use improper combustible materials.
Failure to comply could result in death or serious injury by fire.

Do not install the converter to a combustible surface. Never place combustible materials on the converter.

Crush Hazard

Only allow qualified personnel to operate a crane or hoist to transport the converter.
Failure to comply may result in serious injury or death from falling equipment.
CAUTION

Do not carry the converter by the front cover or the terminal cover. Failure to comply may result in minor or moderate injury from the main body of the converter falling.

Hold the specified locations when carrying a harmonic filter module by hand. Holding any other location when carrying the harmonic filter module could cause the module to fall and cause injury.

Carry all standard configuration and peripheral devices in a method suitable for the weight of the device. Incorrectly handling devices could cause them to fall and result in injury or damage to the device.

NOTICE

Do not disconnect the wiring to the converter and harmonic filter module while the converter is outputting a voltage. Improper equipment sequencing could result in damage to the converter.

When connecting a converter, use a power supply with a capacity that is the same or higher than the capacity calculated by the power supply capacity selection formula in Selecting the Power Supply Capacity on page i-vii. Failure to comply could result in damage to the converter.

Observe proper electrostatic discharge procedures (ESD) when handling the converter, circuit boards, and CMOSIC. Failure to comply may result in ESD damage to the converter circuitry.

Do not perform a withstand voltage test on any part of the converter. Failure to comply could result in damage to the sensitive devices within the converter.

Do not operate damaged equipment. Failure to comply could result in further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

Install adequate branch circuit short circuit protection per applicable codes. Failure to comply could result in damage to the converter.

The converter is suitable for circuits capable of delivering not more than 100,000 RMS symmetrical Amperes, 240 VAC maximum (230 V Class) and 480 VAC maximum (460 V Class).

Prevent foreign matter such as metal shavings or wire clippings from falling into the converter during converter installation and project construction. Failure to comply could result in damage to the converter. Place a temporary cover over the top during installation. Be sure to remove the temporary cover before start-up, as the cover will reduce ventilation and cause the converter to overheat.

Never lift the converter up while the cover is removed. This can damage the terminal board and other components.

Do not perform signal checks during operation. Failure to comply could result in damage to the converter.
NOTICE

Check the following items before you turn on the power supply.
Failure to comply could result in damage to the converter and harmonic filter module.

- Is the power supply voltage correct?

230 V Class: 190 to 240 VAC 50/60 Hz
460 V Class: 380 to 480 VAC 50/60 Hz

- Are the converter and the control devices connected properly (e.g., is the phase order correct)?
- Is the phase order correct between the main circuit terminals (R/L1, S/L2, and T/L3) on the converter and the power supply voltage detection terminals (r1/ 11, s1/ 21, t1/ 31)?
- Are the control circuit terminals on the converter connected properly to the control devices?
- Are the Run Commands for the converter and the control devices turned off?

Replace the cooling fan correctly according to instructions in this manual.
Incorrect cooling fan mounting direction will prevent sufficient cooling of the converter and could damage internal circuits.

Do not use unshielded cable for control wiring.
Failure to comply may cause electrical interference resulting in poor system performance.

Magnetek is not responsible for any modification of the product made by the user. This product must not be modified.

Check all the wiring to ensure that all connections are correct after installing the converter and connecting any other devices.
Failure to comply could result in damage to the converter.

To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the converter power supply off and on more than once every 30 minutes.

If a fuse is blown or Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices.
Contact your supplier if the cause cannot be identified after checking the above.

Do not restart the converter or immediately operate the peripheral devices if a fuse is blown or an equipment for RCD is tripped.
Check the wiring and the selection of peripheral devices to identify the cause.
Contact your supplier before restarting the converter or the peripheral devices if the cause cannot be identified.

Do not expose the converter to halogen group disinfectants.
Failure to comply may cause damage to the electrical components in the converter.

Do not pack the converter in wooden materials that have been fumigated or sterilized.
Do not sterilize the entire package after the product is packed.
General Application Precautions

Total Load Capacity

Select a converter with a capacity ($P_{out}$) greater than the value of $P_1$.

\[
P_1 = \frac{\text{Motor 1 output (kW)}}{\text{Motor 1 efficiency} \times \text{Drive 1 efficiency}} + \frac{\text{Motor 2 output (kW)}}{\text{Motor 2 efficiency} \times \text{Drive 2 efficiency}} + \cdots + \frac{\text{Motor N output (kW)}}{\text{Motor N efficiency} \times \text{Drive N efficiency}}
\]

Total drive capacity (or regenerative capacity) ($P_1$) (kW)

<1> The drive capacity is the power capacity during a normal operating condition when energy is applied to the motor. The regenerative capacity is the capacity that is generated when the flow of power is reversed, such as when the drive is decelerated or the load is lowered.

Example:

Draw-out direction: Regeneration
Winding direction: Drive

<2> Use the efficiencies of the motors and drives when known. When they are not known, use a motor efficiency of 0.9 (0.85 for 7.5 kW or less) and a drive efficiency of 0.95 (0.9 for 7.5 kW or less).

NOTE: When the interphase voltage imbalance ratio of the power source exceeds 2%, use a converter with a frame one size larger than is otherwise necessary.

Calculate the interphase voltage imbalance ratio of the power source using the following formula: (Conforms to IEC/EN61800-3 (5.2.3).)

\[
\text{Interphase imbalance ratio (\%)} = \frac{\text{Maximum voltage} - \text{Minimum voltage}}{\text{Three-phase average voltage}} \times 67
\]

Selecting the Power Supply Capacity

Connect a power supply with a capacity (kVA) that is larger than the rated input capacity (kW) of the converter.

Connecting a power supply with a capacity smaller than the rated input capacity may trigger an operating fault. If it is necessary to connect a power supply with a capacity smaller than the rated input capacity, consult your Magnetek representative or the Magnetek service department.

Power supply capacity $\geq \sqrt{3} \times \text{Input power supply rated voltage} \times \text{Rated AC input current} \div 1000$

Installing an Input-side AC Reactor and Harmonic Filter Module

Each converter requires a corresponding input-side AC reactor and harmonic filter module that consider the saturation current and thermal factors. Always install the specified devices.
Regenerative Converter Power Losses and Harmonic Filter Installation

Sequence the power supply for the converter so the circuit opens after the operation is stopped.

Install the specified harmonic filter (harmonic filter module) to reduce the impact of voltage surges on other devices when the circuit opens for any unexpected reason during operation. Refer to Harmonic Filter Module Wiring on page 3-22 for detailed information on the harmonic filter (harmonic filter module).

Installation

Enclosure Panels

Keep the converter in a clean environment by installing the converter in an enclosure panel or selecting an installation area free of airborne dust, lint, and oil mist. Be sure to leave the required space between converters to provide for cooling, and take proper measures so the ambient temperature remains within allowable limits and keep flammable materials away from the converter. Magnetek offers protective designs for converters that must be used in areas subjected to oil mist and excessive vibration. Contact Magnetek for details.

Installation Direction

NOTICE: Install the converter upright as specified in the manual. Refer to Mechanical Installation on page 2-1 for more information on installation. Failure to comply may damage the converter due to improper cooling.

Interlock

An interlock is required between the converter and drive to stop the drive if the converter fails or if a fault occurs in the converter. It is also necessary to provide a suitable time to restart the drive if it will be restarted for momentary power losses.

Restarting can be timed with the “During MC ON” signal output from the converter control circuit terminals. Create a sequence to turn off the output from the drive with an external baseblock input to the drive or by a similar means when the “During MC ON” signal opens. For details, refer to the Standard Connection Diagram on page 3-3.

Example 1: Not Restarting for Momentary Power Losses (Coasting to a Stop for Momentary Power Losses)

Connect the “During MC ON” output from the converter to the external fault input on the drive.

Use an N.C. input for the external fault input on the drive and set the drive to detect external faults only during operation to prevent an external fault from being detected when the power supply is turned on.

Example 2: Restarting the System for Momentary Power Losses

Change the setting for the external baseblock input terminal S8 on the drive from the default setting of an N.O. contact to an N.C. contact.

Connect the “During MC ON” output from the converter to the external baseblock input on the drive and set restarting for momentary power losses in the drive.

NOTE: An external baseblock is not set by default in IMPULSE® G+ Mini or IMPULSE® T. Set an external baseblock (N.C.) for one of the multi-function input terminals.

Example 3: Inputting a Run Command to the drive

Always input Run commands to the drive while the converter is operating. Check converter operating status with a During Run 1 signal on a multi-function output. Refer to Figure 3-1: Standard Connection Diagram for an example of a drive sequence.
General Handling

Wiring Check

NOTICE: Do not connect power supply lines to output terminals. Failure to comply will destroy the converter or the harmonic filter module. Be sure to perform a final check of all sequence wiring and other connections before turning on the power and also check for short circuits on the control terminals, which may damage the converter.

Inspection and Maintenance

WARNING

Electrical Shock Hazard. Capacitors in the converter do not immediately discharge after shutting off the power. Wait for at least the amount of time specified on the converter before touching any components after shutting off the power. Failure to comply may cause injury to personnel from electrical shock.

Burn Hazard. Because the heatsink can get very hot during operation, take proper precautions to prevent burns. When replacing the cooling fan, shut off the power and wait at least 15 minutes to be sure that the heatsink has cooled down. Failure to comply may cause burn injury to personnel.

To connect or perform maintenance for the harmonic filter module, turn off the power supply to the converter, wait for the time that is given on the converter, and then confirm that the temperature of the reactor has sufficiently decreased before you proceed.

Wiring

Magnetek recommends using ring terminals on all models. Converters require the use of ring terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Transporting the Converter

NOTICE: Never steam clean the converter. During transport, keep the converter from coming into contact with salts, fluorine, bromine, phthalate ester, and other such harmful chemicals.

CAUTION

Crush Hazard. Carry all standard configuration and peripheral devices in a method suitable for the weight of the device. Incorrectly handling devices could cause them to fall and result in injury or damage to the device.

Crush Hazard. When standing up and lifting model 41040-D+, move the eye bolts to the top panel and lift the converter from the four eye bolts on the top panel. Failure to comply may cause the converter to fall and cause injury. Refer to Precautions and Instructions for Installation on page 2-6 for details.
Precautions on Using Peripheral Devices

Install a reactor-type noise filter without a capacitor such as a zero phase reactor after the MCCB on the power supply side when installing a noise filter on the power supply.

**NOTICE:** Do not install a filter with a built-in capacitor. The harmonic components may cause the capacitor to overheat or may damage the capacitor. Always install the specified harmonic noise filter.

Selecting a Circuit Breaker or Circuit Interrupter

- Magnetek recommends installing a Ground Fault Circuit Interrupter (GFCI) to the power supply side. The GFCI should be designed for use with AC drives (e.g., Type B according to IEC/EN60755).

- Select a Molded Case Circuit Breaker (MCCB) according to the power factor of the converter power supply. The power factor changes with the power supply voltage, output frequency, and load.

  When using a GFCI that is not recommended, be sure to choose a GFCI with harmonic countermeasures and one with a rated operating current of 30 mA minimum for each connected converter. High-frequency leakage current can cause malfunctions. When a GFCI without countermeasures malfunctions, replace the GFCI with a rated operating current of 200 mA minimum for each connected converter.

- Select a GFCI or MCCB with a rated trip capacity equal to or higher than the power supply short circuit current.

Magnetic Contactor Installation

Magnetek recommends installing a magnetic contactor (MC) between the power supply and the converter to ensure that the power to the converter can be shut off. Create a sequence in which the MC is turned off by the fault output from the converter.

Wire Gauges and Wiring Distances

Use a motor cable gauge large enough to avoid unstable converter phase control from voltage drop caused by a long motor cable.

When using the digital operator remotely, always use the cable specified (option). When controlling the converter remotely using analog signals, limit the length of the control lines between the control signals and converter to 50 m or shorter and separate the control lines from power lines (main circuit and sequence circuits) to prevent induction from peripheral devices.

When using a multi-function analog input, connect the shield wire to the sheath ground terminal E (G) with shielded twisted-pair wires. Refer to Standard Connection Diagram on page 3-3 for details.

Generator Power Supplies

Select a generator with two times the capacity of the converter input power supply. Select the deceleration time, load, and other factors so that the regenerative power from the motor is 10% or less of the capacity of the generator. For details, consult Magnetek.

Connecting an Advanced-phase Capacitor or Thyristor-controlled Device to the Power Supply

An advanced-phase capacitor is not required for the converter. Installing an advanced-phase capacitor will reduce the power factor.

If an advanced-phase capacitor currently exists is in the same power supply system as the converter, install a series reactor on the advanced-phase capacitor to prevent resonance with the converter.
If a device that generates voltage surge or voltage distortion, such as a thyristor-controlled DC drive or electromagnetic mixer is installed in the same power supply system as the converter, consult with your Magnetek representative or the Magnetek service department.

**Countermeasures for EMC and High-frequency (Harmonic) Leakage Current**

Although countermeasures are not required for harmonic currents, the same countermeasures for electrical interference (EMC) and high-frequency (harmonic) leakage current are required as for a normal drive. If there are nearby devices that are easily affected by electrical interference, use a reactor-type noise filter (e.g., zero phase reactor).

When installing an MCCB or GFCI at the power supply, use an MCCB or GFCI that is designed for a drive (i.e., one that has countermeasures for high-frequency leakage current).

**Compliance with Harmonic Suppression Guidelines**

- Guidelines for harmonic suppression measures are applicable to consumers that receive power from a 6.6 kV or higher system. For details, refer to the Harmonics Suppression Technical Guideline JEAG 9702-1995.
- With respect to the harmonic suppression guidelines, the converter is equivalent to a three-phase bridge that does not generate harmonics (K5 =0), but the harmonic component is not completely zero.

**Impact of Power Supply Distortion**

Distorting the power supply voltage and connecting several devices in parallel to the same power supply will cause power supply system harmonics to flow into the converter and increase the harmonic content.
Warranty Information

Restrictions

The converter is not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.

Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic power, electric power, or in underwater applications must first contact their Magnetek representatives or the Magnetek service department.

![WARNING]

Injury to Personnel. This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.
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Chapter 1

Receiving
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Model Numbers

4300-D+K

Voltage
2 = 230 VAC
4 = 460 VAC

Drive Series

Current

Kit Type
None = Inverter Only
K = Component Kit
E = Enclosed and Wired Kit
# Converter Models

Table 1-1: Models

<table>
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<tr>
<th>Voltage Class</th>
<th>Model Number</th>
</tr>
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<tbody>
<tr>
<td>230 V Class Models</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015-D+</td>
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<tr>
<td></td>
<td>2030-D+</td>
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<tr>
<td></td>
<td>2057-D+</td>
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<td></td>
<td>2083-D+</td>
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<td>2140-D+</td>
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<td>2200-D+</td>
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<td>2270-D+</td>
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<td></td>
<td>2400-D+</td>
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<tr>
<td>460 V Class Models</td>
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<td>4008-D+</td>
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<td>4016-D+</td>
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</table>
Chapter 2

Mechanical Installation
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Mechanical Installation

This section outlines specifications, procedures, and the environment for proper mechanical installation of the converter and the harmonic filter module.

Installation Environment

Install the converter in an environment matching the specifications in Table 2-1 to help prolong the optimum performance life of the converter.

**Table 2-1: Installation Environments**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation Area</td>
<td>Indoors</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>-10 °C to +50 °C (14 °F to 122 °F) Converter reliability improves in environments without wide temperature fluctuations. When using the converter in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the converter or the harmonic filter module.</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% RH or less and free of condensation</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 °C to +60 °C (-4 °F to +140 °F)</td>
</tr>
<tr>
<td>Surrounding Area</td>
<td>Install the converter and the harmonic filter module in an area free from:</td>
</tr>
<tr>
<td></td>
<td>• oil mist and dust</td>
</tr>
<tr>
<td></td>
<td>• metal shavings, oil, water, or other foreign materials</td>
</tr>
<tr>
<td></td>
<td>• radioactive materials</td>
</tr>
<tr>
<td></td>
<td>• combustible materials (e.g., wood)</td>
</tr>
<tr>
<td></td>
<td>• harmful gases and liquids</td>
</tr>
<tr>
<td></td>
<td>• excessive vibration</td>
</tr>
<tr>
<td></td>
<td>• chlorides</td>
</tr>
<tr>
<td></td>
<td>• direct sunlight.</td>
</tr>
<tr>
<td>Altitude</td>
<td>1000 m (3281 ft.) or lower, up to 3000 m (9843 ft.) with derating. Refer to Derating Data, starting on page A-7, for details.</td>
</tr>
<tr>
<td>Vibration</td>
<td>10 to 20 Hz at 9.8 m/s², 20 to 55 Hz at 5.9 m/s² (2015-D+ to 2140-D+, 4008-D+ to 4145-D+)</td>
</tr>
<tr>
<td></td>
<td>10 to 20 Hz at 9.8 m/s², 20 to 55 Hz at 2.0 m/s² (2200-D+ to 2400-D+, 4210-D+ to 4560-D+)</td>
</tr>
<tr>
<td></td>
<td>10 to 20 Hz at 5.9 m/s², 20 to 55 Hz at 2.0 m/s² (41040-D+)</td>
</tr>
<tr>
<td>Orientation</td>
<td>Install the converter vertically to maintain maximum cooling effects.</td>
</tr>
</tbody>
</table>

**NOTICE**

Avoid placing converter peripheral devices, transformers, or other electronics near the converter as the noise created can lead to erroneous operation. If such devices must be used in close proximity to the converter, take proper steps to shield the converter from noise.
Installation Orientation and Spacing

Install the converter upright as illustrated in Figure 2-1 to maintain proper cooling.

![Figure 2-1: Correct Installation Orientation](image)

**Single Converter Installation**

Figure 2-2 shows the installation distance required to maintain sufficient space for airflow and wiring. Install the heatsink against a closed surface to avoid diverting cooling air around the heatsink.

![Figure 2-2: Correct Installation Spacing (Single)](image)

**NOTICE**
Prevent foreign matter such as metal shavings and wire clippings from falling into the converter during installation. Failure to comply could result in damage to the converter. Place a temporary cover over the top of the converter during installation. Remove the temporary cover before converter start-up, as the cover will reduce ventilation and cause the converter to overheat.
Parallel Mounting with Drive

When installing the converter beside a drive, mount the devices according to Figure 2-3.

Figure 2-3: Space Between Converter and Drive (Parallel Mounting)

Side-by-Side Installation with Drive

Models 2015-D+ to 2057-D+ and 4008-D+ to 4030-D+ can take advantage of Side-by-Side installation.

When installing the converter beside a drive, mount the devices according to Figure 2-4 and set L8-35, Installation Method Selection, to 1 (Side-by-Side Mounting).

When mounting converters with the minimum clearance of 2 mm according to Figure 2-5, set parameter L8-35 to 1 while considering derating. Refer to Parameter Tables on page B-4 for details.

Figure 2-4: Space Between Converter and Drive (Side-by-Side)
NOTE: Align the tops of the converter and the drives when installing the converter and the drives of different heights in the same enclosure panel. Leave space between the tops and bottoms of stacked converter and drives for easier cooling fan replacement.

Installation Screws

Refer to Exterior and Mounting Dimensions on page 2-8 for the sizes of the installation screws.

Precautions and Instructions for Installation

Read the following precautions and instructions before installing models 4410-D+ to 41040-D+.

**WARNING**

**CRUSH HAZARD.** Observe the following instructions and precautions. Failure to comply could result in serious injury or death from falling equipment:

- Only use vertical suspension to temporarily lift the converter during installation to an enclosure panel.
- Do not use vertical suspension to transport the converter.
- Use screws to securely affix the converter front cover, terminal blocks, and other converter components prior to vertical suspension.
- Do not subject the converter to vibration or impact greater than 1.96 m/s² (0.2 G) while it is suspended by the wires.
- Do not attempt to flip the converter over while it is suspended by the wires.
- Do not leave the converter unattended while it is suspended by the wires.

**Horizontal Suspension of Models 2200-D+ to 2400-D+ and 4210-D+ to 4560-D+**

To make a wire hanger or frame for use when lifting the converter with a crane, lay the converter in a horizontal position and pass a wire through the holes of the four eye bolts.

**NOTICE**

Damage to equipment. When lifting the converter, confirm that the spring washer is fully closed. Failure to comply may deform or damage the converter when lifted.

![Figure 2-5: Details of Spring Washers](image)
Vertical Suspension of Models 2200-D+ to 2400-D+ and 4210-D+ to 4560-D+

Models 2200-D+ to 2400-D+ and 4210-D+ to 4560-D+

When vertical suspension of the converter is required in an enclosure panel, the orientation of the eye bolts for these converter models can be easily changed by turning the eye bolts counterclockwise 90 degrees.

![Figure 2-6: Adjusting Angle of Eye Bolts](image)

Model 41040-D+

When suspending model 41040-D+ with wires, make sure to follow the procedure described below.

WARNING

CRUSH HAZARD. Use an adequate length of wire to ensure a 50° or wider suspension angle as illustrated in Figure 2-9. The maximum allowable load of the eye bolts cannot be guaranteed when the converter is suspended with the wires at angles less than 50°. Failure to comply may result in serious injury or death from falling equipment.

1. Remove the four eye bolts from the converter side panels and fix them securely on the top panel.

![Figure 2-7: Eye Bolt Repositioning](image)
2. Pass wire through the holes of all four eye bolts.

![Figure 2-8: Suspension Wire Angle Example](image)

3. Gradually take up the slack in the wires and hoist the converter after the wires are stretched tight.

4. Lower the converter when ready to install in the enclosure panel. Stop lowering the converter when it is near the floor then begin lowering the converter again very slowly until the converter is placed correctly.

**NOTICE**

Prevent foreign matter such as metal shavings or wire clippings from falling into the drive or converter during installation and project construction. Failure to comply could result in damage to the drive or converter. Place a temporary cover over the top of the drive and converter during installation. Remove the temporary cover before drive and converter start-up, as the cover will reduce ventilation and cause the drive or converter to overheat.

**Exterior and Mounting Dimensions**

Use Table 2-2 to find the converter dimension drawings.

**Table 2-2: Models and Types**

<table>
<thead>
<tr>
<th>Protective Design</th>
<th>Converter Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Three-Phase 230 V Class</strong></td>
<td><strong>Three-Phase 460 V Class</strong></td>
<td></td>
</tr>
<tr>
<td>IP20/Open Type Enclosure</td>
<td>2015-D+</td>
<td>2-9</td>
</tr>
<tr>
<td></td>
<td>2030-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2057-D+</td>
<td></td>
</tr>
<tr>
<td>IP00/Open Type Enclosure</td>
<td>2083-D+</td>
<td>2-9</td>
</tr>
<tr>
<td></td>
<td>2140-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2200-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2270-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2400-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4016-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4030-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4058-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4086-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4145-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4210-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4300-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4410-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4560-D+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41040-D+</td>
<td></td>
</tr>
</tbody>
</table>
### IMPULSE® D+ Dimensions

![Diagram of IMPULSE® D+ models](image)

#### Table 2-3: Dimensions for 230 V Class

<table>
<thead>
<tr>
<th>Model</th>
<th>Figure</th>
<th>Dimensions in (mm)</th>
<th>Wt. (lb (kg))</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+</td>
<td>1</td>
<td>W H D W1 H0 H1 H2 H3 D1 t1 t2 d</td>
<td>11.02 (5)</td>
</tr>
<tr>
<td>2030-D+</td>
<td>1</td>
<td>W H D W1 H0 H1 H2 H3 D1 t1 t2 d</td>
<td>11.02 (5)</td>
</tr>
<tr>
<td>2057-D+</td>
<td>2</td>
<td>W H D W1 H0 H1 H2 H3 D1 t1 t2 d</td>
<td>17.64 (8)</td>
</tr>
</tbody>
</table>

#### Table 2-4: Dimensions for 460 V Class

<table>
<thead>
<tr>
<th>Model</th>
<th>Figure</th>
<th>Dimensions in (mm)</th>
<th>Wt. (lb (kg))</th>
</tr>
</thead>
<tbody>
<tr>
<td>4008-D+</td>
<td>1</td>
<td>W H D W1 H0 H1 H2 H3 D1 t1 t2 d</td>
<td>11.02 (5)</td>
</tr>
<tr>
<td>4016-D+</td>
<td>1</td>
<td>W H D W1 H0 H1 H2 H3 D1 t1 t2 d</td>
<td>11.02 (5)</td>
</tr>
<tr>
<td>4030-D+</td>
<td>2</td>
<td>W H D W1 H0 H1 H2 H3 D1 t1 t2 d</td>
<td>17.64 (8)</td>
</tr>
</tbody>
</table>
Table 2-5: Dimensions for 230 V Class

<table>
<thead>
<tr>
<th>Model</th>
<th>Figure</th>
<th>Dimensions in (mm)</th>
<th>Wt. lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>W</td>
<td>H</td>
</tr>
<tr>
<td>2083-D+</td>
<td>1</td>
<td>10.83</td>
<td>17.72</td>
</tr>
<tr>
<td>2140-D+</td>
<td>1</td>
<td>12.8</td>
<td>21.65</td>
</tr>
<tr>
<td>2200-D+</td>
<td>2</td>
<td>17.72</td>
<td>27.76</td>
</tr>
<tr>
<td>2270-D+</td>
<td>2</td>
<td>17.72</td>
<td>27.76</td>
</tr>
<tr>
<td>2400-D+</td>
<td>3</td>
<td>19.69</td>
<td>31.5</td>
</tr>
<tr>
<td>Model</td>
<td>Figure</td>
<td>Dimensions in (mm)</td>
<td>Wt.</td>
</tr>
<tr>
<td>-------------</td>
<td>--------</td>
<td>--------------------</td>
<td>-----</td>
</tr>
<tr>
<td>4043-D+</td>
<td>1</td>
<td>10.83 (275)</td>
<td>10.16 (258)</td>
</tr>
<tr>
<td>4058-D+</td>
<td>1</td>
<td>10.83 (275)</td>
<td>10.16 (258)</td>
</tr>
<tr>
<td>4086-D+</td>
<td>1</td>
<td>12.8 (325)</td>
<td>11.14 (283)</td>
</tr>
<tr>
<td>4145-D+</td>
<td>1</td>
<td>12.8 (325)</td>
<td>11.14 (283)</td>
</tr>
<tr>
<td>4210-D+</td>
<td>3</td>
<td>19.69 (500)</td>
<td>31.5 (800)</td>
</tr>
<tr>
<td>4300-D+</td>
<td>3</td>
<td>19.69 (500)</td>
<td>31.5 (800)</td>
</tr>
<tr>
<td>4410-D+</td>
<td>3</td>
<td>26.38 (670)</td>
<td>44.88 (1140)</td>
</tr>
<tr>
<td>4560-D+</td>
<td>3</td>
<td>26.38 (670)</td>
<td>44.88 (1140)</td>
</tr>
<tr>
<td>41040-D+</td>
<td>4</td>
<td>49.21 (1250)</td>
<td>54.33 (1380)</td>
</tr>
</tbody>
</table>
Harmonic Filter Module Installation

Installation Environment

Install the harmonic filter module in an environment matching the specifications in Table 2-7 to help prolong the optimum performance life of the harmonic filter module.

Table 2-7: Installation Environment

<table>
<thead>
<tr>
<th>Environment</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation Area</td>
<td>Indoors&lt;br&gt;Install the converter in an environment that does not easily accessible such as control panel.</td>
</tr>
<tr>
<td></td>
<td>IP00/Open Type enclosure: -10°C to +50°C (14 °F to 122 °F)&lt;br&gt;Harmonic filter module reliability improves in environments without wide temperature fluctuations.&lt;br&gt;When using the harmonic filter module in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels.&lt;br&gt;Do not allow ice to develop on the harmonic filter module.</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>Humidity 95% RH or less and free of condensation&lt;br&gt;Storage Temperature -20 °C to +60 °C (-4 °F to +140 °F)</td>
</tr>
<tr>
<td></td>
<td>Surrounding Area&lt;br&gt;Install the converter and the harmonic filter module in an area free from:&lt;br&gt;- oil mist and dust&lt;br&gt;- metal shavings, oil, water, or other foreign materials&lt;br&gt;- radioactive materials&lt;br&gt;- combustible materials (e.g., wood)&lt;br&gt;- harmful gases and liquids&lt;br&gt;- excessive vibration&lt;br&gt;- chlorides&lt;br&gt;- direct sunlight.</td>
</tr>
<tr>
<td>Altitude</td>
<td>3000 m (9843 ft.) or lower</td>
</tr>
<tr>
<td>Vibration</td>
<td>2.0 m/s2 (20 to 55 Hz)</td>
</tr>
</tbody>
</table>

**NOTICE**

Prevent foreign matter such as metal shavings and wire clippings from falling into the converter and harmonic filter module during installation. Failure to comply could result in damage to the converter and the harmonic filter module. Place a temporary cover over the top of the converter and the harmonic filter module during installation. Remove the temporary cover before converter and harmonic filter module start-up, as the cover will reduce ventilation and cause the converter and the harmonic filter module to overheat.
Installation Orientation and Spacing

Installation Orientation

Install the harmonic filter module on the floor with the faceplate facing forward.

Figure 2-9: Correct Installation Orientation

Installation Spacing

Figure 2-10 shows the installation distance required to maintain sufficient space for airflow and wiring.

Figure 2-10: Installation Spacing
Precautions and Instructions for Installation of Harmonic Filter Module

Read the following precautions and instructions before installing a harmonic filter module.

**WARNING**

Always observe the following precautions. If handled incorrectly, the harmonic filter module may fall, possibly causing injury. Also, the harmonic filter module may be damaged.

- Suspend the harmonic filter module with wires only temporarily and only when installing them in a control panel. Do not suspend them when transporting them.
- Before you suspend the harmonic filter module, confirm that faceplate, top cover, and other configuration components are securely screwed in place.
- Do not place the harmonic filter module on its side.
- Do not leave the harmonic filter module suspended with wires for a long period of time.

Attach hooks to the specified locations when suspending the harmonic filter module with wires.

**NOTICE**

Do not apply excessive force to the top cover when suspending the harmonic filter. The top cover may be deformed. When lifting the module by hand, always use the holding frames and use two people. Failure to comply may damage the module.

Refer to Figure 2-11 and Figure 2-12 for details.

![Figure 2-11: Suspension Locations for Harmonic Filter Module](image-url)

A – Suspension Holes (Two on Each Side)  

B – Holding Frames (One on Each Side)
Figure 2-12: Holding the Harmonic Filter Module
Harmonic Filter Module Dimensions

Figure 1

Figure 2

Figure 3
### Table 2-8: Dimensions - 230 V Class

<table>
<thead>
<tr>
<th>Model</th>
<th>Figure</th>
<th>Dimensions in (mm)</th>
<th>Wt.</th>
<th>lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF-2015-D+</td>
<td>1</td>
<td>8.23 (209)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.93 (176)</td>
<td></td>
<td>14.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.22 (285)</td>
<td></td>
<td>(6.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.3 (160)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.45 (240)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.54 (39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF-2030-D+</td>
<td>1</td>
<td>8.23 (209)</td>
<td></td>
<td>19.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.24 (184)</td>
<td></td>
<td>(9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.61 (295)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.3 (160)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.84 (250)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.54 (39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF-2057-D+</td>
<td>2</td>
<td>9.13 (232)</td>
<td></td>
<td>30.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.43 (265)</td>
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<td>(14)</td>
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<tr>
<td></td>
<td></td>
<td>11.85 (301)</td>
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<tr>
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<td>7.99 (203)</td>
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<td>9.72 (247)</td>
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<td>1.73 (44)</td>
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<td>M8</td>
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<td></td>
</tr>
<tr>
<td>HF-2083-D+</td>
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<td>10.24 (260)</td>
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<td>35.27</td>
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<td></td>
<td></td>
<td>11.06 (281)</td>
<td></td>
<td>(16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.01 (305)</td>
<td></td>
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</tr>
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<td></td>
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<td>8.66 (220)</td>
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<td>10.08 (256)</td>
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<td>M8</td>
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<td>HF-2140-D+</td>
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<td>11.42 (290)</td>
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<td>59.52</td>
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<td>13.7 (348)</td>
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<td>(27)</td>
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<tr>
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<td>9.84 (250)</td>
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<td></td>
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<td>12.36 (314)</td>
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</tr>
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<td>1.18 (30)</td>
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<td></td>
<td></td>
<td>M10</td>
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<td>HF-2200-D+</td>
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<td>11.42 (290)</td>
<td></td>
<td>83.78</td>
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<td>13.78 (350)</td>
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<td>10 (254)</td>
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<td></td>
<td>12.36 (314)</td>
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### Table 2-9: Dimensions - 460 V Class

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<td>9.45 (240)</td>
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## Standard Configuration Devices

### Input-side AC Reactor 1 - Dimensions

**Table 2-10: Dimensions for Input-side AC Reactor 1**

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<th>Model 460 V</th>
<th>Dimensions in (mm)</th>
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<td>11.40 (290)</td>
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<td>15.00 (382)</td>
<td>8.66 (220)</td>
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<td>2400-D+</td>
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<td>17.20 (436)</td>
<td>9.45 (240)</td>
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### Input-side AC Reactor 2 - Dimensions

**Table 2-11: Dimensions for Input-side AC Reactor 2**

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<td>W</td>
<td>H</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>4410-D+</td>
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<td>12.80 (326)</td>
<td>6.93 (176)</td>
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<tr>
<td>4560-D+</td>
<td>15.20 (385)</td>
<td>15.00 (382)</td>
<td>8.66 (220)</td>
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</tr>
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<td>41040-D+</td>
<td>17.80 (452)</td>
<td>21.5 (545)</td>
<td>14.80 (375)</td>
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### Reactor for Harmonic Filter - Dimensions

**Table 2-12: Dimensions for Harmonic Filter Reactor**

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<td></td>
<td>W</td>
<td>H</td>
<td>D</td>
<td></td>
</tr>
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<td>4410-D+</td>
<td>6.42 (163)</td>
<td>5.31 (135)</td>
<td>4.21 (107)</td>
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<td>7.17 (182)</td>
<td>5.91 (150)</td>
<td>4.02 (102)</td>
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<td>8.27 (210)</td>
<td>7.48 (190)</td>
<td>4.02 (102)</td>
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### Capacitor for Harmonic Filter - Dimensions

**Table 2-13: Dimensions for Harmonic Filter Capacitor**

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</tr>
</thead>
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<td></td>
<td>W</td>
<td>H</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>4410-D+</td>
<td>17.20 (438)</td>
<td>19.80 (502)</td>
<td>5.04 (128)</td>
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<td>17.20 (438)</td>
<td>23.70 (602)</td>
<td>5.04 (128)</td>
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<td>27.40 (695)</td>
<td>22.90 (582)</td>
<td>5.04 (128)</td>
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</tbody>
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Chapter 3

Electrical Installation
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Standard Connection Diagram

Connect the converter and peripheral devices as shown in Figure 3-1 and Figure 3-2. It is possible to set and run the converter via the digital operator without connecting digital I/O wiring. This section does not discuss converter operation.

Refer to Start-Up Programming & Operation on page 4-1 for instructions on operating the converter. Refer to IMPULSE®•G+/VG+ Series 4 Connection Example on page 4-13 for connection with a drive.

**WARNING**

Sudden Movement Hazard. Ensure start/stop and safety circuits are wired properly and in the correct state before energizing the converter. Failure to comply could result in death or serious injury from moving equipment.

**NOTICE**

If unsuitable wiring is performed, the converter could be damaged. Implement protection for branches and short-circuits according to all national and local standards.

**NOTICE**

The minimum load for the relay outputs M1-M2, M3-M4, M5-M6 and MA-MB-MC is 10 mA.
<1> NOTICE: When installing a noise filter on the converter power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.

<2> Do not use a line longer than 10 m (32.8 ft.) to connect the input-side sAC reactor and the converter.

<3> Use the specified AC reactor and harmonic filter module. Non-specified devices may cause erroneous operation.

<4> Do not use a DC bus line that is longer than 5 m (16.4 ft.) to connect the converter and drive.

<5> NOTICE: When installing a breaker or contactor on the converter side for an emergency shutoff, confirm that the CHARGE indicators on the drive and converter are not lit before closing the breaker or contactor on the converter output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the converter output (DC) side is turned on before applying power to the converter.

<6> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.

<7> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).

<8> The connections are shown for sequence connections with no-voltage contacts or NPN transistors for the sequence input signals (S1 to S8). Use jumper S3 to select between Sink mode and Source mode. The default setting is Sink mode.

<9> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

**Figure 3-1: Standard Connection Diagram (example: model 2083-D+, 2400-D+, 4043-D+ to 4300-D+)**
<1> NOTICE: When installing a noise filter on the converter power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.

<2> Do not use a line longer than 10 m (32.8 ft.) to connect the input-side AC reactor and the converter.

<3> Use the specified AC reactor and harmonic filter module. Non-specified devices may cause erroneous operation.

<4> Do not use a DC bus line that is longer than 5 m (16.4 ft.) to connect the converter and drive.

<5> NOTICE: When installing a breaker or contactor on the converter side for an emergency shutoff, confirm that the CHARGE indicators on the drive and converter are not lit before closing the breaker or contactor on the converter output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the converter output (DC) side is turned on before applying power to the converter.

<6> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.

<7> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).

<8> The connections are shown for sequence connections with no-voltage contacts or NPN transistors for the sequence input signals (S1 to S8). Use jumper S3 to select between Sink mode and Source mode. The default setting is Sink mode.

<9> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

**Figure 3-2: Standard Connection Diagram (example: model 4410-D+, 4560-D+)**
<1> NOTICE: When installing a noise filter on the converter power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.

<2> Do not use a line longer than 10 m (32.8 ft.) to connect the input-side AC reactor and the converter.

<3> Use the specified AC reactor and harmonic filter module. Non-specified devices may cause erroneous operation.

<4> Do not use a DC bus line that is longer than 5 m (16.4 ft.) to connect the converter and drive.

<5> NOTICE: When installing a breaker or contactor on the converter side for an emergency shutoff, confirm that the CHARGE indicators on the drive and converter are not lit before closing the breaker or contactor on the converter output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the converter output (DC) side is turned on before applying power to the converter.

<6> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.

<7> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).

<8> The connections are shown for sequence connections with no-voltage contacts or NPN transistors for the sequence input signals (S1 to S8). Use jumper S3 to select between Sink mode and Source mode. The default setting is Sink mode.

<9> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltimeters, and wattmeters. They are not intended for use as a feedback-type signal.

Figure 3-3: Standard Connection Diagram (example: model 41040-D+)
Main Circuit Connection Diagram

Refer to diagrams in this section when wiring the main circuit of the converter. Connections may vary based on converter capacity. The DC power supply for the main circuit also provides power to the control circuit.

**NOTICE**

Do not use the negative DC bus terminal “–” as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the converter.

**2015-D+ to 2057-D+; 4008-D+ to 4030-D+**

![Diagram](image1)

*Figure 3-4: Connecting Main Circuit Terminals*

**2083-D+, 2140-D+; 4043-D+, 4058-D+, 4086-D+**

![Diagram](image2)

*Figure 3-5: Connecting Main Circuit Terminals*
2200-D+, 2270-D+, 2400-D+, 4145-D+, 4210-D+, 4300-D+

Figure 3-6: Connecting Main Circuit Terminals

4410-D+, 4560-D+

Figure 3-7: Connecting Main Circuit Terminals

41040-D+

Figure 3-8: Connecting Main Circuit Terminals
Terminal Block Configuration

Refer to the terminal block configuration diagrams in Table 3-1 for the location of the main circuit terminal block.

Table 3-1: Terminal Block Configuration

<table>
<thead>
<tr>
<th>Model</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+</td>
<td>Figure 3-9</td>
</tr>
<tr>
<td>2030-D+</td>
<td>Figure 3-9</td>
</tr>
<tr>
<td>2057-D+</td>
<td>Figure 3-10</td>
</tr>
<tr>
<td>2083-D+</td>
<td>Figure 3-11</td>
</tr>
<tr>
<td>2140-D+</td>
<td>Figure 3-12</td>
</tr>
<tr>
<td>2200-D+</td>
<td>Figure 3-13</td>
</tr>
<tr>
<td>2270-D+</td>
<td>Figure 3-13</td>
</tr>
<tr>
<td>2400-D+</td>
<td>Figure 3-14</td>
</tr>
<tr>
<td>4008-D+</td>
<td>Figure 3-9</td>
</tr>
<tr>
<td>4016-D+</td>
<td>Figure 3-9</td>
</tr>
<tr>
<td>4030-D+</td>
<td>Figure 3-10</td>
</tr>
<tr>
<td>4043-D+</td>
<td>Figure 3-11</td>
</tr>
<tr>
<td>4058-D+</td>
<td>Figure 3-11</td>
</tr>
<tr>
<td>4086-D+</td>
<td>Figure 3-12</td>
</tr>
<tr>
<td>4145-D+</td>
<td>Figure 3-12</td>
</tr>
<tr>
<td>4210-D+</td>
<td>Figure 3-14</td>
</tr>
<tr>
<td>4300-D+</td>
<td>Figure 3-14</td>
</tr>
<tr>
<td>4410-D+</td>
<td>Figure 3-15</td>
</tr>
<tr>
<td>4560-D+</td>
<td>Figure 3-15</td>
</tr>
<tr>
<td>41040-D+</td>
<td>Figure 3-16</td>
</tr>
</tbody>
</table>

Figure 3-9: Main Circuit Terminal Block Configuration (Models 2015-D+, 2030-D+, 4008-D+, 4016-D+)
Figure 3-10: Main Circuit Terminal Block Configuration (Models 2057-D+, 4030-D+)

Figure 3-11: Main Circuit Terminal Block Configuration (Models 2083-D+, 4043-D+, 4058-D+)

Figure 3-12: Main Circuit Terminal Block Configuration (Models 2140-D+, 4086-D+, 4145-D+)
Figure 3-13: Main Circuit Terminal Block Configuration (Models 2200-D+, 2270-D+)

Figure 3-14: Main Circuit Terminal Block Configuration (Models 2400-D+, 4210-D+ to 4300-D+)

Figure 3-15: Main Circuit Terminal Block Configuration (Models 4410-D+, 4560-D+)
Figure 3-16: Main Circuit Terminal Block Configuration (Model 41040-D+)
Main Circuit Wiring

This section describes the functions, specifications, and procedures required to safely and properly wire the main circuit in the converter.

**NOTICE**

Do not solder the ends of wire connections to the converter. Soldered wiring connections can loosen over time. Improper wiring practices could result in converter malfunction due to loose terminal connections.

Main Circuit Terminal Functions

**Table 3-2: Main Circuit Terminal Functions**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Type</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>230 V Class</strong></td>
<td>Model</td>
<td>2015-D+ to 2400-D+</td>
<td></td>
</tr>
<tr>
<td><strong>460 V Class</strong></td>
<td>Model</td>
<td>4008-D+ to 41040-D+</td>
<td></td>
</tr>
<tr>
<td>R/L1</td>
<td>Main circuit power supply input</td>
<td>These are the power supply input terminals that connect to the input reactor.</td>
<td>3-3</td>
</tr>
<tr>
<td>S/L2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T/L3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r1/ 11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 1/ 21</td>
<td>Power supply voltage detection inputs</td>
<td>These terminals are to detect the power supply voltage order and voltage levels.</td>
<td>3-3</td>
</tr>
<tr>
<td>t1/ 31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>DC voltage output</td>
<td>These terminals output a DC voltage</td>
<td>3-3</td>
</tr>
<tr>
<td>+</td>
<td>For 230 V class: 100 Ω or less For 460 V class: 10 Ω or less</td>
<td>Grounding terminal</td>
<td>3-19</td>
</tr>
</tbody>
</table>

Protecting Main Circuit Terminals

**Insulation Caps or Sleeves**

Use insulation caps or sleeves when wiring the converter with crimp terminals. Take particular care to ensure that the wiring does not touch nearby terminals or the surrounding case.

**Insulation Barrier**

Insulation barriers are packaged with models 4410-D+ to 41040-D+ to provide added protection between terminals.

Magnetek recommends using the provided insulation barriers to ensure proper wiring. Refer to Figure 3-17 and Figure 3-18 for instructions on placement of the insulation barriers.
Wire Gauges and Tightening Torque

Use the tables in this section to select the appropriate wires and crimp terminals.

NOTE: 1. Wire gauge recommendations based on continuous current ratings using 75°C 600 VAC vinyl-sheathed wire assuming ambient temperature within 40°C.
2. Wire gauge recommendations for terminals R/L1, S/L2, T/L3 on 4410-D+ to 41040-D+ based on continuous current ratings using 105°C 600 VAC vinyl-sheathed wire assuming ambient temperature within 40°C.
3. Use terminals + and - when connecting the drive to the converter.

- Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:
  \[
  \text{Line drop voltage (V)} = \sqrt{3} \times \text{wire resistance (Ω/km)} \times \text{wire length (m)} \times \text{current (A)} \times 10^{-3}
  \]
- Refer to UL Standards Compliance on page C-16 for information on UL compliance.

The wire gauges listed in Table 3-3 and Table 3-4 are Magnetek recommendations. Refer to local codes for proper wire gauge selections.
### Three-Phase 230 V Class

Table 3-3: Wire Gauge and Torque Specifications (Three-Phase 230 V Class)

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/11, t1/31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>16 to 10</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>2030-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>8</td>
<td>8 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>8</td>
<td>8 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/11, t1/31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>12 to 10</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>2057-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>4</td>
<td>4 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>4</td>
<td>4 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>r1/11, t1/31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>8 to 6</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>2083-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/11, t1/31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>6 to 4</td>
<td>M8</td>
<td>9.0 to 11 (79.7 to 97.4)</td>
</tr>
<tr>
<td>Model</td>
<td>Terminal</td>
<td>Recomm. Gauge AWG</td>
<td>Applicable Gauge AWG</td>
<td>Screw Size</td>
<td>Tightening Torque N-m (lb-in)</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>-------------------</td>
<td>----------------------</td>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>2140-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3 x 2P</td>
<td>3 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/0 x 2P</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>2200-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3/0 x 2P</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>2270-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3/0 x 2P</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>2400-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>300 x 2P</td>
<td>300 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>300 x 2P</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>Model</td>
<td>Terminal</td>
<td>Recomm. Gauge AWG</td>
<td>Applicable Gauge AWG</td>
<td>Screw Size</td>
<td>Tightening Torque N-m (lb-in)</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
<td>-------------------</td>
<td>----------------------</td>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>4008-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ʃ 11, ∆ʃ 1/ʃ 21, t1/ʃ 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>14 to 12</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>4016-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>12</td>
<td>12 to 16</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ʃ 11, ∆ʃ 1/ʃ 21, t1/ʃ 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>12 to 10</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>4030-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>8</td>
<td>8 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>8</td>
<td>8 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ʃ 11, ∆ʃ 1/ʃ 21, t1/ʃ 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>10 to 8</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>4043-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>6</td>
<td>6 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>6</td>
<td>6 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ʃ 11, ∆ʃ 1/ʃ 21, t1/ʃ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>8 to 6</td>
<td>M8</td>
<td>9.0 to 11 (79.7 to 97.4)</td>
</tr>
<tr>
<td>4058-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>4</td>
<td>4 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>4</td>
<td>4 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ʃ 11, ∆ʃ 1/ʃ 21, t1/ʃ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>(9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>6</td>
<td>M8</td>
<td>9.0 to 11 (79.7 to 97.4)</td>
</tr>
<tr>
<td>Model</td>
<td>Terminal</td>
<td>Recomm. Gauge AWG</td>
<td>Applicable Gauge AWG</td>
<td>Screw Size</td>
<td>Tightening Torque N·m (lb-in)</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>-------------------</td>
<td>----------------------</td>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>4086-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>-,+</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>1/ 11, 1/ 21, t1/ 31</td>
<td>6</td>
<td>6</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>4145-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3 x 2P</td>
<td>3 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>-,+</td>
<td>1/0 x 2P</td>
<td>1/0 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>1/ 11, 1/ 21, t1/ 31</td>
<td>3</td>
<td>3</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>4210-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 600</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td></td>
<td>-,+</td>
<td>3/0 x 2P</td>
<td>3/0 to 600</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td></td>
<td>r1/</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>1/ 11, 1/ 21, t1/ 31</td>
<td>1/0</td>
<td>1/0 to 2/0</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>4300-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 to 2P</td>
<td>3/0 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>-,+</td>
<td>3/0 x 2P</td>
<td>3/0 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>1/ 11, 1/ 21, t1/ 31</td>
<td>1/0</td>
<td>1/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>4410-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>300 x 2P</td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>-,+</td>
<td>300 x 2P</td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>1/ 11, 1/ 21, t1/ 31</td>
<td>2/0</td>
<td>2/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
</tbody>
</table>
Ground Wiring

Follow the precautions below when wiring the ground for one converter or a series of converters.

---

**WARNING**

Electrical Shock Hazard. Always use a ground wire that complies with technical standards on electrical equipment and minimize the length of the ground wire. Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.

---

**WARNING**

Electrical Shock Hazard. Be sure to ground the converter ground terminal (230 V class: ground to 100 Ω or less; 460 V class: ground to 10 Ω or less). Improper equipment grounding could result in death or serious injury by contacting ungrounded electrical equipment.

---

**NOTICE**

Do not share the ground wire with other devices such as welding machines or large-current electrical equipment. Improper equipment grounding could result in converter or equipment malfunction due to electrical interference.
NOTE: Connect the converters to power supply transformers on a 1:1 basis and use independent grounds. Otherwise the converters or the devices may fail to operate.

NOTE: If other devices are installed in the same location, connect them while observing the grounding standards for each device. Otherwise the converters or the devices may fail to operate.

Refer to Figure 3-19 when using a converter with multiple drives. Do not loop the ground wire.

**Figure 3-19: Installation Examples for a Converter and Several Drives**
Wiring the Main Circuit Terminal

WARNING

Electrical Shock Hazard. Shut off the power supply to the converter before wiring the main circuit terminals. Failure to comply may result in death or serious injury.

Wire the main circuit terminals after the terminal board has been properly grounded.

Main Circuit Connection Diagram

Refer to Main Circuit Connection Diagram on page 3-7 when wiring terminals on the main power circuit of the converter.
Harmonic Filter Module Wiring

This section describes the terminal functions, terminal specifications, and wiring methods to correctly and safely wire converters and harmonic filter modules.

**NOTICE**

To comply with the UL compliance, attach crimp terminals to the ends of the cables that connects to the harmonic filter module.

Terminal Configuration

Refer to Figure 3-20 for the terminal arrangements. Refer to Wiring a Harmonic Filter Module on page 3-27 for the procedures to remove the faceplate and top cover.

![Figure 3-20: Harmonic Filter Module Terminal Configuration](image-url)
## Terminal Functions

### Table 3-5: Terminal Functions

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Type</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>R/L1</td>
<td>Main circuit power supply inputs</td>
<td>These terminals are connected to the power supply.</td>
<td>3-3</td>
</tr>
<tr>
<td>S/L2</td>
<td>Power supply voltage detection inputs</td>
<td>These terminals are to detect the power supply voltage order and voltage levels.</td>
<td>3-3</td>
</tr>
<tr>
<td>T/L3</td>
<td>Harmonic filter module outputs</td>
<td>These terminals connect to the input-side AC reactor.</td>
<td>3-3</td>
</tr>
<tr>
<td>r</td>
<td>For 230 V class: 100 Ω or less For 460 V class: 10 Ω or less</td>
<td>Grounding terminal</td>
<td>3-19</td>
</tr>
</tbody>
</table>

### Protecting Circuit Terminals

#### Insulation Caps or Sleeves

Use insulation caps or sleeves when wiring the module with crimp terminals. Take particular care to ensure that the wiring does not touch nearby terminals or the surrounding case.

### Wire Gauges and Tightening Torque

Use the tables in this section to select the appropriate wires and crimp terminals.

**NOTE:**

1. Wire gauge recommendations based on continuous current ratings using 75°C 600 VAC vinyl-sheathed wire assuming ambient temperature within 40°C.
2. Wire gauge recommendations for models 4410-D+ to 41040-D+ based on continuous current ratings using 105°C 600 VAC vinyl-sheathed wire assuming ambient temperature within 40°C.

Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:

\[
\text{Line drop voltage (V)} = \sqrt{3} \times \text{wire resistance (Ω/km)} \times \text{wire length (m)} \times \text{current (A)} \times 10^{-3}
\]
### Three-Phase 230 V Class

#### Table 3-6: Wire Gauge and Torque Specifications (Three-Phase 230 V Class)

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 8</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>12</td>
<td>M4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>16 to 10</td>
<td>M5</td>
<td>2.2 to 2.4 (19.1 to 21.2)</td>
</tr>
<tr>
<td>HF-2015-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>8</td>
<td>8</td>
<td>M5</td>
<td>2.2 to 2.4 (19.1 to 21.2)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>8</td>
<td>M5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14</td>
<td>M6</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>12 to 10</td>
<td>M5</td>
<td>2.2 to 2.4 (19.1 to 21.2)</td>
</tr>
<tr>
<td>HF-2030-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>4</td>
<td>4 to 3/0</td>
<td>M6</td>
<td>4.0 to 4.9 (35.4 to 43.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>4</td>
<td>M6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>8 to 6</td>
<td>M6</td>
<td>4.0 to 4.9 (35.4 to 43.4)</td>
</tr>
<tr>
<td>HF-2057-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>2</td>
<td>2 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>2</td>
<td>M8</td>
<td></td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>6 to 4</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td>HF-2083-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3 x 2P</td>
<td>3 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>3 to 3/0</td>
<td>M8</td>
<td></td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td>HF-2140-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3 x 2P</td>
<td>3 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>3 to 3/0</td>
<td>M8</td>
<td></td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
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<td>r, Δ, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
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<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
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</table>
### Three-Phase 460 V Class

**Table 3-7: Wire Gauge and Torque Specifications (Three-Phase 460 V Class)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF-2200-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td>3/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1 to 1/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>HF-2270-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
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<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td>3/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/0</td>
<td>1/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>HF-2400-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>300 x 2P</td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/0</td>
<td>2/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
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---

HF-4008-D+

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF-4008-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 8</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td>12</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>14 to 12</td>
<td>M5</td>
<td>2.2 to 2.4 (19.1 to 21.2)</td>
</tr>
<tr>
<td>Model</td>
<td>Terminal</td>
<td>Recommm. Gauge AWG</td>
<td>Applicable Gauge AWG</td>
<td>Screw Size</td>
<td>Tightening Torque N-m (lb-in)</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
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<td>----------------------</td>
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<td>-------------------------------</td>
</tr>
<tr>
<td>HF-4016-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 8</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>12</td>
<td>M4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>12 to 10</td>
<td>M5</td>
<td>2.2 to 2.4 (19.1 to 21.2)</td>
</tr>
<tr>
<td>HF-4030-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>8</td>
<td>8 to 3/0</td>
<td>M6</td>
<td>4.0 to 4.9 (35.4 to 43.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>8</td>
<td>8 to 4</td>
<td>M6</td>
<td>4.0 to 4.9 (35.4 to 43.4)</td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>10 to 8</td>
<td>M6</td>
<td>4.0 to 4.9 (35.4 to 43.4)</td>
</tr>
<tr>
<td>HF-4043-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>6</td>
<td>6 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>6</td>
<td>6 to 1</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>8 to 6</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td>HF-4058-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>4</td>
<td>4 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>4</td>
<td>4 to 1</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>6</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td>HF-4086-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>2</td>
<td>2 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>2</td>
<td>2 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>r, Δ, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>6</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
</tbody>
</table>
### Wiring a Harmonic Filter Module

**WARNING**

Electrical Shock Hazard. Shut off the power supply to the converter before wiring the main circuit terminals. Failure to comply may result in death or serious injury.

1. Loosen the screws on the faceplate and top cover and remove the faceplate and top cover.

#### NOTE:

- 1. The face plate and top cover can be removed by loosening these screws; they do not need to be removed.

---

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recom. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF-4145-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3 x 2P</td>
<td>3 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>3 to 3/0</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
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<td></td>
<td>3</td>
<td>3</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td>HF-4210-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>3/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/0</td>
<td>1/0 to 2/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>HF-4300-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td>3/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r, A, t</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/0</td>
<td>1/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
</tbody>
</table>
2. Wire the r, s, and t terminals.

3. Wire the R/L1, S/L2, and T/L3 terminals and then wire the X, Y, and Z terminals. Bundle the cables that are connected to the X, Y, and Z terminals and secure them with cable ties.

NOTE: Wire the ground terminal first and then wire the main circuit terminals.
Figure 3-23: Wiring a Harmonic Filter Module

4. Reverse the previous procedure and connect the faceplate and top cover.
CONTROL CIRCUIT WIRING

**NOTICE**

Do not connect AC control circuit ground to converter enclosure. Improper converter grounding can cause control circuit malfunction.

\<1\> The default setting is for Sinking Mode. Control is possible with no-voltage contacts or NPN transistors. For details, refer to Digital Input Sink/Source/External Power Supply Selection on page 3-38.

\<2\> The maximum output current capacity for the +V and -V terminals on the control circuit is 20 mA. Never short terminals +V, -V, and AC, as it can cause erroneous operation or damage the converter.

\<3\> Set DIP switch S1 to select between a voltage or current input signal to terminal A2. The default setting is for current input. For details, refer to Terminal A2 Input Signal Selection on page 3-38.

\<4\> Set DIP switch S2 to the ON position to enable the termination resistor in a MEMOBUS/Modbus network.

\<5\> Monitor outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

**Figure 3-24: Control Circuit Wiring**
Control Circuit Terminal Block Functions

Parameters determine which functions apply to the multi-function digital inputs (S1 to S8), multi-function relay outputs (M1, M2, M3, M4, M5, M6), and multi-function analog monitor outputs (FM, AM). The default setting is listed next to each terminal name in Table 3-8.

NOTICE

Install an MC on the power supply side of the converter when the drive should not automatically restart after power loss. To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the power supply off and on more than once every 30 minutes. Frequent use can damage the converter.

Input Terminals

Table 3-8 lists the input terminals on the converter. Text in parenthesis indicates the default setting for each multi-function input.

Table 3-8: Control Circuit Input Terminals

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>Terminal Name (Function)</th>
<th>Function (Signal Level) Default Setting</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Function Digital Inputs</td>
<td>S1</td>
<td>Multi-function input 1 (RUN-SB)</td>
<td>Photocoupler</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>Multi-function input 2 (STOP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>Multi-function input 3 (External fault)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>Multi-function input 4 (Fault reset)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S5</td>
<td>Multi-function input 5 (Reserved)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S6</td>
<td>Multi-function input 6 (Reserved)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S7</td>
<td>Multi-function input 7 (Reserved)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S8</td>
<td>Multi-function input 8 (External Baseblock)</td>
<td>24 VDC power supply for digital inputs, 150 mA max (only when not using digital input option DI-A3)</td>
<td>B-11</td>
</tr>
<tr>
<td></td>
<td>SC</td>
<td>Multi-function input common</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>Digital input power supply +24 VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SN</td>
<td>Digital input power supply 0 V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTICE: Do not jumper or short terminals SP and SN. Failure to comply will damage the converter.
Table 3-9 lists the output terminals on the converter. Text in parenthesis indicates the default setting for each multi-function output.

### Table 3-9: Control Circuit Output Terminals

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>Terminal Name (Function)</th>
<th>Function (Signal Level) Default Setting</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td></td>
<td>Multi-function analog input 1</td>
<td>-10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)</td>
<td>B-14</td>
</tr>
<tr>
<td>A1 (Reserved)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A2                        |     | Multi-function analog input 2        | • -10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)  
                                      • 4 to 20 mA, 0 to 20 mA (input impedance: 250 Ω)  
                                      • Voltage or current input must be selected by DIP switch S1 and H3-09. | B-14 |
| A3                        |     | Multi-function analog input 3        | • -10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)  
                                      • Use DIP switch S4 on the terminal board to select between analog and PTC input. | B-14 |
| AC                        |     | Frequency reference common           | 0 V                                     |      |
| E(G)                      |     | Ground for shielded lines and option cards | --                                      |      |
| Output Terminals          |     |                                      |                                        |      |

<1> Refrain from assigning functions to digital relay outputs that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
### Serial Communication Terminals

**Table 3-10: Control Circuit Terminals: Serial Communications**

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>Signal Name</th>
<th>Function (Signal Level)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MEMOBUS/Modbus Communication</strong></td>
<td></td>
<td><strong>R+</strong></td>
<td>Communications input (+)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>R-</strong></td>
<td>Communications input (-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>S+</strong></td>
<td>Communications output (+)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>S-</strong></td>
<td>Communications output (-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>IG</strong></td>
<td>Shield ground</td>
</tr>
</tbody>
</table>

**MEMOBUS/Modbus communication:** Use an RS-422 or RS-485 cable to connect the converter.

**RS-422/RS-485 MEMOBUS/Modbus communication protocol:** 115.2 kbps (max.)

<1> Enable the termination resistor in the last converter in a MEMOBUS/Modbus network by setting DIP switch S2 to the ON position.

### Terminal Configuration

The control circuit terminals are arranged as shown in Figure 3-25.

![Figure 3-25: Control Circuit Terminal Arrangement](image-url)
Wire Size and Torque Specifications

Select appropriate wire type and gauges from Table 3-11.

For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to Table 3-12 for ferrule terminal types and sizes.

Table 3-11: Wire Gauge and Torque Specifications

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in.)</th>
<th>Bare Wire Terminal</th>
<th>Ferrule-Type Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rec mm² (AWG)</td>
<td>Rec mm² (AWG)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>App mm² (AWG)</td>
<td>App mm² (AWG)</td>
</tr>
<tr>
<td>FM, AC, AM, SC, SP, SN, A1, A2, A3, +V, -V, S1 to S8, MA, MB, MC, M1 to M6</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.6)</td>
<td>0.75 (18)</td>
<td>0.5 to 2 (20 to 14)</td>
</tr>
<tr>
<td>E(G)</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.6)</td>
<td>1.25 (12)</td>
<td>0.5 to 2 (20 to 14)</td>
</tr>
<tr>
<td>IG, R+, R-, S+, S-</td>
<td>M2</td>
<td>0.22 to 0.25 (1.9 to 2.2)</td>
<td>0.75 (18)</td>
<td>Stranded wire: 0.25 to 1.0 (24 to 17)</td>
</tr>
</tbody>
</table>

Ferrule-Type Wire Terminals

Magnetek recommends using CRIMPFOX 6, a crimping tool manufactured by PHOENIX CONTACT, to prepare wire ends with insulated sleeves before connecting to the converter. See Table 3-12 for dimensions.

Figure 3-26: Ferrule Dimensions
Table 3-12: Ferrule Terminal Types and Sizes

<table>
<thead>
<tr>
<th>Size mm² (AWG)</th>
<th>Type</th>
<th>L (mm)</th>
<th>d1 (mm)</th>
<th>d2 (mm)</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 (24)</td>
<td>Al 0.25–6YE</td>
<td>10.5</td>
<td>0.8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>0.34 (22)</td>
<td>Al 0.34–6TQ</td>
<td>10.5</td>
<td>0.8</td>
<td>2</td>
<td>PHOENIX CONTACT</td>
</tr>
<tr>
<td>0.5 (20)</td>
<td>Al 0.5–6WH</td>
<td>14</td>
<td>1.1</td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

Wiring the Control Circuit Terminal

This section describes the proper procedures and preparations for wiring the control terminals.

**WARNING**

Electrical Shock Hazard. Do not remove covers or touch the circuit boards while the power is on. Failure to comply could result in death or serious injury.

**NOTICE**

Separate control circuit wiring from main circuit wiring (terminals R/l1, S/l2, T/l3, r1/ 11, 1/ 11, 1/ 11, t1/ 31, –, +) and other high-power lines. Improper wiring practices could result in converter malfunction due to electrical interference.

**NOTICE**

Separate wiring for digital output terminals MA, MB, MC, M1 to M6 from wiring to other control circuit lines. Improper wiring practices could result in converter or equipment malfunction or nuisance trips.

**NOTICE**

Use a class 2 power supply (UL standard) when connecting to the control terminals. Improper application of peripheral devices could result in converter performance degradation due to improper power supply.

**NOTICE**

Insulate shields with tape or shrink tubing to prevent contact with other signal lines and equipment. Improper wiring practices could result in converter or equipment malfunction due to short circuit.
Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete.

Prepare the ends of the control circuit wiring as shown in Figure 3-27. Refer to Figure 3-21 for the treatment of the ends of the shield wire.

**NOTICE**

Connect the shield of shielded cable to the appropriate ground terminal. Improper equipment grounding could result in converter or equipment malfunction or nuisance trips.

**NOTICE**

Do not tighten screws beyond the specified tightening torque. Failure to comply may result in erroneous operation, damage to the terminal block, or cause a fire.

**NOTICE**

Use shielded twisted-pair cables as indicated to prevent operating faults. Improper wiring practices could result in converter or equipment malfunction due to electrical interference.

Connect control wires as shown in Figure 3-27 and Figure 3-28.

**Figure 3-27: Terminal Board Wiring Guide**
Figure 3-28: Terminal Board Location Inside the Converter

NOTICE

The analog signal wiring between the converter and the operator station or peripheral equipment should not exceed 50 meters when using an analog signal from a remote source. Failure to comply could result in poor system performance.
Control I/O Connections

Use the wire jumper between terminals SC and SP or SC and SN to select between Sink mode, Source mode or external power supply for the digital inputs S1 to S8 as shown in Table 3-13 (Default: Sink mode, internal power supply).

NOTE: Never short terminals SP and SN as doing so will damage the converter.

Table 3-13: Digital Input Sink / Source / External Power Supply Selection

<table>
<thead>
<tr>
<th>Converter Internal Power Supply</th>
<th>External 24 VDC Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Sinking Mode (NPN) diagram" /></td>
<td><img src="image" alt="Sourcing Mode (PNP) diagram" /></td>
</tr>
</tbody>
</table>

Terminal A2 Input Signal Selection

Terminal A2 can be used to input either a voltage or a current signal. Select the signal type using switch S1 as explained in Table 3-14. Set parameter H3-09 accordingly as shown in Table 3-15. Refer to Figure 3-29 for locating switch S1.

To set the DIP switch, use tweezers or a tool with a tip width of approximately 0.8 mm.
Figure 3-29: DIP Switch S1

Table 3-14: DIP Switch S1 Settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V (left position)</td>
<td>Voltage input (-10 to +10 V or 0 to 10 V)</td>
</tr>
<tr>
<td>I (right position)</td>
<td>Current input (4 to 20 mA or 0 to 20 mA); default setting</td>
</tr>
</tbody>
</table>

Table 3-15: Parameter H3-09 Details

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3-09</td>
<td>Terminal A2 signal level selection</td>
<td>Selects the signal level for terminal A2.</td>
<td>0–3</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>0 to 10 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-10 to 10 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4 to 20 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0 to 20 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using the Contact Outputs

Figure 3-30 illustrates the use of multi-function relay outputs and the fault relay outputs.

<1> Minimum load: 5 VDC, 10 mA

Figure 3-30: Contact Outputs
## Wiring Checklist

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>➡️</td>
<td><strong>Converter, Peripherals, Option Cards</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Check converter model number to ensure receipt of correct model.</td>
<td>1-2</td>
</tr>
<tr>
<td>2</td>
<td>Make sure you have the correct peripheral devices.</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>Check the option card model number.</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td><strong>Installation Area and Physical Setup</strong></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ensure that the area surrounding the converter complies with</td>
<td>2-3</td>
</tr>
<tr>
<td></td>
<td>specifications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Power Supply Voltage, Output Voltage</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The voltage from the power supply should be within the input voltage</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>specification range of the converter.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The total load must be within the output specifications of the</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>converter.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>A power supply with a capacity (kVA) that is larger than the rated</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>input capacity of the converter must be used.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>The ratings must be correct.</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td><strong>Main Circuit Wiring</strong></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Confirm proper branch circuit protection as specified by national</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>and local codes.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Properly wire the converter.</td>
<td>3-9</td>
</tr>
<tr>
<td>11</td>
<td>Suitable wires must be used to wire the power supply and converter.</td>
<td>3-14</td>
</tr>
<tr>
<td>12</td>
<td>Properly ground the converter. Review page 3-19.</td>
<td>3-19</td>
</tr>
<tr>
<td>13</td>
<td>Tighten control circuit and grounding terminal screws. Refer to</td>
<td>3-14</td>
</tr>
<tr>
<td></td>
<td>Wire Gauges and Tightening Torque on page 3-14.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Control Circuit Wiring</strong></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Use twisted-pair line for all converter control circuit wiring.</td>
<td>3-35</td>
</tr>
<tr>
<td>15</td>
<td>Ground the shields of shielded wiring to the GND ( \text{terminal} )</td>
<td>3-4</td>
</tr>
<tr>
<td>16</td>
<td>Properly wire any option cards.</td>
<td>--</td>
</tr>
<tr>
<td>17</td>
<td>Check for any other wiring mistakes. Only use a multimeter to check</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>wiring.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Properly fasten converter control circuit terminal screws. Refer to</td>
<td>3-34</td>
</tr>
<tr>
<td></td>
<td>Wire Size and Torque Specifications on page 3-34.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Pick up all wire clippings.</td>
<td>--</td>
</tr>
<tr>
<td>20</td>
<td>Ensure that no frayed wires on the terminal block are touching</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>other terminals or connections.</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Properly separate control circuit wiring and main circuit wiring.</td>
<td>--</td>
</tr>
<tr>
<td>22</td>
<td>The line between the input-side AC reactor and converter must be</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>10 m or shorter and the DC bus line between the converter and drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>must be 5 m or shorter.</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 4

Start-Up Programming & Operation
This page intentionally left blank.
Using the Digital Operator

Use the digital operator to enter Run and Stop commands, edit parameters, and display data including fault and alarm information.

LCD Display

![LCD Display Image]

**Figure 4-1: LCD Display**

**Table 4-1: Display and Contents**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Display</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operation Mode Menus</td>
<td>MODE</td>
<td>Displayed when in Mode Selection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MONITR</td>
<td>Displayed when in Monitor Mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VERIFY</td>
<td>Indicates the Verify Menu.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRMSET</td>
<td>Displayed when in Parameter Setting Mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SETUP</td>
<td>Displayed when in Setup Mode.</td>
</tr>
<tr>
<td>2</td>
<td>Mode Display Area</td>
<td>DRV</td>
<td>Displayed when in Drive Mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRG</td>
<td>Displayed when in Programming Mode.</td>
</tr>
<tr>
<td>3</td>
<td>Ready</td>
<td>Rdy</td>
<td>Indicates the converter is ready to run.</td>
</tr>
<tr>
<td>4</td>
<td>Data Display</td>
<td>--</td>
<td>Displays specific data and operation data.</td>
</tr>
<tr>
<td>5</td>
<td>DC Bus Voltage Reference Assignment &lt;1&gt;</td>
<td>OPR</td>
<td>Displayed when the DC Bus Voltage Reference is assigned to the LCD Operator Option.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AI</td>
<td>Displayed when the DC Bus Voltage Reference is assigned to the Analog Input.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COM</td>
<td>Displayed when the DC Bus Voltage Reference is assigned to the MEMOBUS/Modbus Communication Inputs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OP</td>
<td>Displayed when the DC Bus Voltage Reference is assigned to a Option converter.</td>
</tr>
</tbody>
</table>

<1> Displayed when in DC Bus Voltage Reference Mode.
<2> Displayed when in DC Bus Voltage Reference Mode and Monitor Mode.
### ALARM (ALM) LED Displays

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Display</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>LO/RE Display &lt;2&gt;</td>
<td>RSEQ</td>
<td>Displayed when the reference is supplied from a remote source.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LSEQ</td>
<td>Displayed when the reference is supplied from the operator keypad.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RREF</td>
<td>Displayed when the frequency reference is supplied from a remote source.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LREF</td>
<td>Displayed when the frequency reference is supplied from the operator keypad.</td>
</tr>
<tr>
<td>7</td>
<td>Function Key 1 (F2)</td>
<td>HELP</td>
<td>Pressing displays the Help menu.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>←</td>
<td>Pressing scrolls the cursor to the left.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HOME</td>
<td>Pressing returns to the top menu (DC Bus Voltage Reference).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ESC</td>
<td>Pressing returns to the previous display.</td>
</tr>
<tr>
<td>8</td>
<td>Function Key 2 (F1)</td>
<td>DATA</td>
<td>Pressing scrolls to the next display.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>→</td>
<td>Pressing scrolls the cursor to the right.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RESET</td>
<td>Pressing resets the existing converter fault or error.</td>
</tr>
</tbody>
</table>

<1> Displayed when in DC Bus Voltage Reference Mode.
<2> Displayed when in DC Bus Voltage Reference Mode and Monitor Mode.

### ALARM (ALM) LED Status and Contents

<table>
<thead>
<tr>
<th>State</th>
<th>Content</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illuminated</td>
<td>When the converter detects a fault.</td>
<td><img src="image" alt="ALM" /></td>
</tr>
</tbody>
</table>
| Flashing   | • When an alarm occurs.  
            | • When oPE is detected.     | ![ALM](image) |
| Off       | Normal operation (no fault or alarm).       | ![ALM](image) |
### LO/RE LED and RUN LED Indications

**Table 4-3: LO/RE LED and RUN LED Indications**

<table>
<thead>
<tr>
<th>LED</th>
<th>Lit</th>
<th>Flashing</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="LO/RE LED" /></td>
<td>When source of the Run command is assigned to the digital operator (LOCAL)</td>
<td>--</td>
<td>When a device other than the operator is selected for Run command control (REMOTE)</td>
</tr>
<tr>
<td><img src="image" alt="RUN LED" /></td>
<td>During run</td>
<td>Stopped for an operation interlock. &lt;1&gt;</td>
<td>During stop</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td><img src="image" alt="RUN LED" /></td>
<td><img src="image" alt="RUN LED" /></td>
<td><img src="image" alt="RUN LED" /></td>
</tr>
</tbody>
</table>

<1> The indicator flashes in the following cases:
- When REMOTE operation is restored after inputting a Run command from an external terminal during LOCAL operation.
- A Run command was input from an external terminal in any mode other than Drive Mode.
- The STOP key on the digital operator was pressed during REMOTE operation.
Menu Structure for Digital Operator

1. Pressing \[ \text{RUN} \] will start the converter operation.

2. Flashing characters are shown as \[ \text{X} \].

3. "X" characters are used as examples in this manual. The LCD Operator will display the actual setting values.

4. The DC Bus Voltage Reference appears after the initial display that shows the product name.

5. The information that appears on the display will vary depending on the converter.

Figure 4-2: Digital Operator Menu and Screen Structure
The Drive and Programming Modes

The converter has a Drive Mode and a Programming Mode.

**Drive Mode:** In Drive Mode the user can operate the converter, monitor operating status (DC bus voltage, DC current reference, etc.), and change the setting of d8-01. For details, refer to Parameter Tables on page B-4.

**Programming Mode:** In Programming Mode the user can edit and verify parameter settings. When the converter is in Programming Mode it will not accept a Run command unless b1-08 is set to 1.

Navigating the Drive and Programming Modes (Default Setting)

**NOTICE**

Check the following items before you turn on the power supply.

- Is the power supply voltage correct?
  230 V Class: 190 to 240 VAC 50/60 Hz
  460 V Class: 380 to 480 VAC 50/60 Hz
- Are the converter and the control devices connected properly (e.g., is the phase order correct)?
- Is the phase order correct between the main circuit terminals (R/L1, S/L2, and T/L3) on the converter and the power supply voltage detection terminals (r1/11, 1/21, t1/31).
- Are the control circuit terminals on the converter connected properly to the control devices?
- Are the Run Commands for the converter and the control devices turned off?

The converter is set to operate in Drive Mode when it is first powered up. Switch between display screens by using the ▲ and ▼ keys.

**Drive Mode Details**

The following actions are possible in the Drive Mode:

- Run and stop the converter
- Monitor the operation status of the converter (DC bus voltage feedback, Power supply side voltage, Power supply side current, etc.)
- View information on an alarm
- View a history of alarms that have occurred

**NOTE:** The converter must be in Drive Mode to operate. Change to another mode when the converter is stopped.

Figure 4-3 illustrates how to change the Output Voltage Reference from 600 (600 V) to 700 (700 V) while in the Drive Mode.

This example assumes the converter is set to LOCAL.
NOTE: The converter will not accept a change to the value of DC bus voltage reference until the ENTER key is pressed after the value of DC bus voltage reference is entered. This feature prevents accidental setting of the value of DC bus voltage reference.

Programming Mode Details

The following actions are possible in the Programming Mode:

- **Verify Mode:** View a list of parameters that have been changed from the default values.
- **Setup Mode:** Access a list of commonly used parameters to simplify setup. Refer to Setup Group Parameters on page 4-8.
- **Parameter Setting Mode:** Access and edit all parameter settings.

Setup Group Parameters

Parameters most likely to be changed are assigned to the group of User Parameters, A2-01 through A2-32. User Parameters are part of the Setup Group, which provides quicker access by eliminating the need to scroll through multiple menus.

Table 4-4 lists the default settings of the A2-xx parameters.

**NOTE:** Parameter b1-02 is displayed in Setup Mode regardless of A2-xx parameter settings.

<table>
<thead>
<tr>
<th>A2-xx</th>
<th>Default</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2-01</td>
<td>b1-18</td>
<td>Voltage Reference Source</td>
</tr>
<tr>
<td>A2-02</td>
<td>b1-02</td>
<td>Run Command Selection</td>
</tr>
<tr>
<td>A2-03</td>
<td>d8-01</td>
<td>DC Bus Voltage Reference</td>
</tr>
</tbody>
</table>

Changing Parameter Settings or Values

This example explains changing b1-02 (Run Command Selection) from 01 to 00.
<table>
<thead>
<tr>
<th>Step</th>
<th>Display/Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn on the power to the converter. The initial display appears.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>2. Press the ▲ or ▼ key until the Parameter Setting Mode screen appears.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>3. Press the ENTER key to enter the parameter menu tree.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>4. Press the ▲ or ▼ key to select the B parameter group.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>5. Press ENTER two times.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>6. Press ENTER to view the current setting value (1). “1” flashes.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>7. Press the ▼ key and enter 0.</td>
<td>![Display/Result Image]</td>
</tr>
<tr>
<td>8. Press ENTER and the converter will confirm the change.</td>
<td>![Display/Result Image]</td>
</tr>
</tbody>
</table>
Verifying Parameter Changes: Verify Mode

The Verify Mode lists edited parameters from the Programming Mode. The Verify Mode helps determine which settings have been changed, and is particularly useful when replacing a converter. If no settings have been changed, the Verify Mode will read “None”. The Verify Mode also allows users to quickly access and re-edit any parameter settings that have been changed.

<table>
<thead>
<tr>
<th>Step</th>
<th>Display/Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Turn on the power to the converter. The initial display appears. ➔</td>
</tr>
<tr>
<td>2.</td>
<td>Press ▲ or ▼ until the display shows the top of the Verify Menu. ➔</td>
</tr>
<tr>
<td>3.</td>
<td>Press to enter the list of parameters that have been edited from their original default settings. If parameters other than b1-02 have been changed, use the ▲ or ▼ key to scroll until b1-02 appears. ➔</td>
</tr>
<tr>
<td>4.</td>
<td>Press the key to access the setting value. ➔</td>
</tr>
</tbody>
</table>
Switching Between LOCAL and REMOTE

LOCAL mode is when the converter is set to accept the Run command from the digital operator RUN key. REMOTE mode is when the converter is set to accept the Run command from an external device.

Switch the operation between LOCAL and REMOTE using the \[ \text{LO/RE} \] key on the digital operator or via a digital input.

**NOTE:**
1. After selecting LOCAL, the LO/RE light will remain lit.
2. The converter will not allow the user to switch between LOCAL and REMOTE during run.

Using the LO/RE Key on the Digital Operator

<table>
<thead>
<tr>
<th>Step</th>
<th>Display/Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn on the power to the converter. The initial display appears.</td>
<td>➞</td>
</tr>
<tr>
<td>2. Press [ \text{LO/RE} ]. The LO/RE light will light up. The converter is now in LOCAL. To set the converter for REMOTE operation, press the key again.</td>
<td>➞</td>
</tr>
</tbody>
</table>

Using Input Terminals S1 through S8 to Switch between LOCAL and REMOTE

It is possible to switch between LOCAL and REMOTE modes using one of the digital input terminals S1 through S8 (set the corresponding parameter H1-xx to “1”).

Setting H1-xx to 1 disables the LO/RE key on the digital operator.
Powering Up the Converter

Powering Up the Converter and Operation Status Display

Review the following checklist before turning the power on.

<table>
<thead>
<tr>
<th>Item to Check</th>
<th>Description</th>
</tr>
</thead>
</table>
| Power supply voltage                              | Check the power supply voltage.  
230 V class: Three-phase 200 to 240 VAC 50/60 Hz  
460 V class: Three-phase 380 to 480 VAC 50/60 Hz  
Properly wire the power supply input terminals (R/L1, S/L2, T/L3).  
Properly wire the phase order of the power supply input terminals (R/ L1, S/L2, and T/L3) and the power supply voltage detection terminals (1/ 11, Δ 1/ 21, t1/ 31).  
Check for proper grounding of converter. |
| Converter output terminals and drive terminals    | Properly connect the DC voltage output terminals (+/–) on the converter to the DC power supply input terminals (+/–) on the drive. Be particularly careful to correctly connect the + and – terminals. |
| Control circuit terminals                         | Properly connect the control circuit terminals on the converter to other control devices.                                                   |
| Converter control terminal status                 | Turn off the Run Commands for the converter and the peripheral control devices.                                                            |
| Input-side AC reactor and harmonic filter (harmonic filter module) connections to converter | Properly connect the AC reactor and harmonic filter (harmonic filter module) to converter as shown in the Standard Connection Diagram. |

Status Display

When the power supply to the converter is turned on, the digital operator lights will appear as follows:

<table>
<thead>
<tr>
<th>Status</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Operation</td>
<td>![Normal Operation Image]</td>
<td>The data display area displays the DC bus voltage reference DC voltage feedback. <strong>DRV</strong> is lit.</td>
</tr>
<tr>
<td>Fault</td>
<td>![Fault Image]</td>
<td>Data displayed varies by the type of fault. Refer to Troubleshooting on page 5-1 for more information. <strong>DRV</strong> and <strong>ALM</strong> are lit.</td>
</tr>
</tbody>
</table>

Example: External Fault
**Operation with the Drive Connected**

**IMPULSE®•G+/VG+ Series 4 Connection Example**

<1> **NOTICE:** When installing a noise filter on the converter power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.

<2> Do not use a line longer than 10 m (32.8 ft.) to connect the input-side AC reactor and the converter.

<3> Use the specified AC reactor and harmonic filter module. Non-specified devices may cause erroneous operation.

<4> Do not use a DC bus line that is longer than 5 m (16.4 ft.) to connect the converter and drive.

<5> **NOTICE:** When installing a breaker or contactor on the converter side for an emergency shutoff, confirm that the CHARGE indicators on the drive and converter are not lit before closing the breaker or contactor on the converter output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the converter output (DC) side is turned on before applying power to the converter.

<6> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.

<7> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).

<8> The connections are shown for sequence connections with no-voltage contacts or NPN transistors for the sequence input signals (S1 to S8). Use jumper S3 to select between Sink mode and Source mode. The default setting is Sink mode.

<9> For information on an interlock with the drive, refer to Interlock with the Drive on page 4-15.

**Figure 4-4: Standard Connection Diagram with G+/VG+ Series 4 (Example for 2083-D+, 2400-D+, and 4043-D+ to 4300-D+)**

**NOTE:** For information on connecting other control circuit I/O terminals, refer to the Quick Start Guide for the drive that is connected to the converter.
Timing Chart for Turning the Power Supply On and Off

Figure 4-5 is a timing chart for turning the power supply on and off.

![Timing Chart](image)

**WARNING**

Sudden Movement Hazard. Suitably wire the circuits to start and stop operation and the safety circuits to ensure a suitable status when the power supply to the converter is turned on.

Failure to comply could result in sudden machine operation, which could result in death or serious injury.

Observe the following precautions when you perform operation with the converter connected to the drive.

- After turning on the power supply to the converter, wait for the converter ready signal on the multi-function contact output to turn on and then input the Run Command for the converter.
- Confirm that the converter is operating (i.e., confirm that During Run 1 is on) and then turn on the Run Command for the drive.
- To stop the converter, turn off the Run Command to the drive, confirm that the motor has stopped, and then input the Stop Command.
- Wait for the converter to stop and the During Run 1 multi-function contact output to turn off, then turn off the power supply.
Interlocks

Interlock with the Drive

An interlock is required between the converter and the drive to stop the drive with a fault signal from the converter. It is also necessary to provide a suitable time to restart the drive if it will be restarted for momentary power losses.

Restarting can be timed with the “During MC on” signal that is output from a control terminal of the converter. Create a sequence to turn off the output from the drive with an external base block input to the drive or by a similar means when the terminal that is set for the “During MC on” signal opens.

The drive should be operated only when the converter is operating. The M1-M2 terminals (During Run 1) will confirm that the converter is operating, and the drive should be operated only when the During Run 1 signal is on. Stop the drive if the During Run 1 signal turns off.

Not Restarting Operation for Momentary Power Loss (Stopping Operation When a Momentary Power Loss Is Detected)

Connect the “During MC on” signal from the converter to a multi-function contact input terminal on the drive that is assigned to an external fault.

Use an N.C. input for the external fault input on the drive and set the drive to detect external faults only during operation to prevent an external fault from being detected when the power supply is turned on.

Restarting the System for Momentary Power Losses

- **G/VG+ Series 4**
  Connect the “During MC on” signal from the converter to a multi-function contact input terminal on the drive that is assigned to a Baseblock Command (N.C.).

- **Control Devices Other Than the G+/VG+ Series 4**
  Connect the “During MC on” signal from the converter to a multi-function contact input terminal on the drive that is assigned to External Search Command 2.

(Contact your Magnetek representative if you are using a Magnetek drive that does not have External Search Command 2.)

Stopping the Converter for Faults in Peripheral Devices

If an external device fails or a fault occurs, the fault contact output on the converter is activated to stop operation. To use an external fault, set H1-xx (terminal S1 to S8 function selection) to one of the values from Table 4-5.

When an external fault is input, EFx is displayed on the digital operator. The x in EFs is the number of the terminal where the external fault signal was input.

Example: If an external fault signal is input to the S3 terminal, EF3 is displayed.

Select the number to set for H1-xx according to the combination of the following three conditions:

- Use an input contact for a signal from the peripheral device.
- Use detection of an external fault.
- Stop operation (as the operation selection when an external fault is detected).

Table 4-5 shows the relationship between the combination of conditions and the set value of H1-xx.
Table 4-5: Combination of Conditions

<table>
<thead>
<tr>
<th>Setting Value</th>
<th>Input contact &lt;1&gt;</th>
<th>Detection &lt;2&gt;</th>
<th>Operation selection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N.O. Contact</td>
<td>N.C. Contact</td>
<td>Always detect</td>
</tr>
<tr>
<td>24</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>25</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>26</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>27</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2C</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2D</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2E</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2F</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<1> When using an input contact, set whether to detect a fault when the signal opens or closes. (N.O.: External fault when closed, N.C.: External fault when open)

<2> When using detection of a fault, set whether to always detect faults or to detect them only during operation.
Verifying Parameter Settings and Backing Up Changes

Use the Verify Mode to check all changes to parameter settings. Refer to Verifying Parameter Changes: Verify Mode on page 4-10.

Save the verified parameter settings. Change the access level or set a password to the converter to prevent accidental modification of parameter settings.

Backing Up Parameter Values: o2-03

Setting o2-03 to 1 saves all parameter settings to the converter internal memory. The converter can now recall all the saved parameters by performing a User Initialization (A1-03 = 1110).

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>o2-03</td>
<td>User Defaults</td>
<td>Lets the user create a set of default settings for a User Initialization.</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Saved/Not Set</td>
<td>Saves current parameter settings as the default values for a User Initialization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Set Defaults</td>
<td>Clear All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Clear All</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1-03</td>
<td>Initialize Parameters</td>
<td>Selects a method to initialize the parameters.</td>
<td>0, 1110, 2220, 5550</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>No Initialize</td>
<td>1110User Initialization</td>
<td>The user must first program and store desired settings using parameter o2-03.</td>
<td></td>
</tr>
<tr>
<td>22202-Wire Initialization</td>
<td>Parameter initialized prior to shipment</td>
<td>oPE4 Fault reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5550oPE4 Fault Reset</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameter Access Level: A1-01

Setting the Access Level for “Operation only” (A1-01 = 0) allows the user to access parameters A1-xx and Ux-xx only.

Other parameters are not displayed.

Setting the Access Level for “User Parameters” (A1-01 = 1) allows the user to access only the parameters that have been previously saved as User Parameters. This is helpful when displaying only the relevant parameters for a specific application.
**Password Settings: A1-04, A1-05**

The user can set a password in parameter A1-05 to restrict access to the converter. The password must be entered to A1-04 to unlock parameter access (i.e., parameter setting A1-04 must match the value programmed into A1-05). The following parameters cannot be viewed or edited until the value entered to A1-04 correctly matches the value set to A1-05: A1-01, A1-03, and A2-01 through A2-33.


**Copy Function**

Parameter settings can be copied to another converter to simplify parameter restoration or multiple converter setup. The converter supports the following copy options:

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1-01</td>
<td>Access Level Selection</td>
<td>Selects which parameters are accessible via the digital operator.</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Operation only. A1-01, A1-04, and A1-06 can be set and monitored, and UX-XX parameters can also be viewed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>User Parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only recently changed parameters from application parameters A2-01 to A2-16 and A2-17 to A2-32 can be set and monitored.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Advanced Access Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>All parameters can be set and monitored.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2-01 to A2-32</td>
<td>User Parameters 1 to 32</td>
<td>Parameters selected by the user are saved as User Parameters, including recently viewed parameters and parameters specifically selected for quick access. Parameters A2-01 through A2-16 must be manually selected by the user. If A2-33 is set to 1, recently viewed parameters will be listed between A2-17 and A2-32. Parameters A2-01 through A2-32 can be set and monitored. If A2-33 is set to 0, recently viewed parameters will not be saved to the group of User Parameters. A2-XX parameters are now available for manual programming.</td>
<td>A1-00 to o4-19</td>
<td>--</td>
</tr>
<tr>
<td>A2-33</td>
<td>User Parameter Automatic Selection</td>
<td>Parameters A2-01 through A2-32 are reserved for the user to create a group of User Parameters. Save history of recently viewed parameters. Recently edited parameters will be saved to A2-17 through A2-32 for quick access. The most recently changed parameter is saved to A2-17. The second most recently changed parameter is saved to A2-18, etc.</td>
<td>0, 1</td>
<td>0</td>
</tr>
</tbody>
</table>
• **LCD Operator (standard in all models)**
  The LCD operator used to operate the converter supports copying, importing, and verifying parameter settings. Refer to o3: Copy Function on page B-22 for details.

• **LED Operator**
  The optional LED operator also supports copying, importing, and verifying parameter settings. Refer to the manual supplied with the LED operator for instructions.

• **USB Copy Unit and CopyUnitManager**
  The copy unit is an external option connected to the converter to copy parameter settings from one converter and save those settings to another converter. Refer to the manual supplied with the USB Copy Unit for instructions.

  **NOTE:** Connect the USB Copy Unit to the RS-422/RS-485 communication port on the converter.

  CopyUnitManager is a PC software tool. It allows the user to load parameter settings from the Copy Unit onto a PC, or from the PC onto a Copy Unit. This is useful when managing parameters for various converters or applications. Refer to the manual supplied with CopyUnitManager for instructions.

**Copying Procedure for the LCD Operator**

The LCD operator can perform the following operations by changing the o3-01(Copy Function Selection) parameter in the converter.

**Read (o3-01 = 1)**

Copies all parameters from the converter to the LCD operator.

**NOTE:** There is a limit to the number of read operations that you can perform from the LCD operator. As a guide, do not perform more than 100,000 read operations.

**Copy (o3-01 = 2)**

Copies all parameters from the LCD operator to the converter.

**Verify (o3-01 = 3)**

Compares the parameters in the converter with the parameter settings saved on the LCD operator for matches.
Test Run Checklist

Review the checklist before performing a test run. Check each item that applies.

<table>
<thead>
<tr>
<th>No.</th>
<th>Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thoroughly read the manual before performing a test run.</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Check the Wiring Checklist on page 3-40.</td>
<td>3-40</td>
</tr>
<tr>
<td>3</td>
<td>Set the correct power supply voltage.</td>
<td>4-12</td>
</tr>
<tr>
<td>4</td>
<td>Turn on the power supply to the converter and drive.</td>
<td>4-12</td>
</tr>
<tr>
<td>5</td>
<td>Correctly sequence the Run commands.</td>
<td>4-14</td>
</tr>
<tr>
<td>6</td>
<td>The [D] should light after giving a Run command.</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>To give Run command and DC bus voltage reference from the digital operator, press [] key to set to LOCAL.</td>
<td>4-3, 4-11</td>
</tr>
<tr>
<td>8</td>
<td>To give Run command and DC bus voltage reference from the control circuit terminals, press the [] key to set REMOTE. (The LO/RE indicator is lit off while REMOTE is set.)</td>
<td>4-11</td>
</tr>
</tbody>
</table>
Chapter 5

Troubleshooting
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Alarms, Faults, and Errors

Types of Alarms, Faults, and Errors

Check the digital operator for information about possible faults if the converter fails to operate.

If problems occur that are not covered in this manual, contact the nearest Magnetek representative with the following information:

- Converter model
- Software version
- Date of purchase
- Description of the problem

Table 5-1 contains descriptions of the various types of alarms, faults, and errors that may occur while operating the converter.

If the converter fails, contact your Magnetek representative or the Magnetek service department.

Table 5-1: Types of Alarms, Faults, and Errors

<table>
<thead>
<tr>
<th>Type</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faults</strong></td>
<td>When the converter detects a fault:</td>
</tr>
<tr>
<td></td>
<td>- The digital operator displays text indicating the specific fault and the ALM indicator LED remains lit until the fault is reset.</td>
</tr>
<tr>
<td></td>
<td>- The fault interrupts converter output.</td>
</tr>
<tr>
<td></td>
<td>- Some faults allow the user to select the stopping method when the fault occurs.</td>
</tr>
<tr>
<td></td>
<td>- Fault output terminals MA-MC will close, and MB-MC will open.</td>
</tr>
<tr>
<td></td>
<td>- The converter will remain inoperable until the fault is cleared. Refer to Fault Reset Methods on page 5-31.</td>
</tr>
<tr>
<td><strong>Minor Faults and Alarms</strong></td>
<td>When the converter detects an alarm or a minor fault:</td>
</tr>
<tr>
<td></td>
<td>- The digital operator displays text indicating the specific alarm or minor fault, and the ALM indicator LED flashes.</td>
</tr>
<tr>
<td></td>
<td>- A multi-function contact output set to be tripped by a minor fault ($H2-XX = 10$) closes. If the output is set to be tripped by an alarm, the contact will not close.</td>
</tr>
<tr>
<td></td>
<td>Remove the cause of the problem to reset a minor fault or alarm.</td>
</tr>
<tr>
<td><strong>Operation Errors</strong></td>
<td>An operation error occurs when parameter settings conflict or do not match hardware settings (such as with an option card). When the converter detects an operation error:</td>
</tr>
<tr>
<td></td>
<td>- The digital operator displays text indicating the specific error.</td>
</tr>
<tr>
<td></td>
<td>- Multi-function contact outputs do not operate.</td>
</tr>
<tr>
<td></td>
<td>The converter will not operate until the error has been reset. Correct the settings that caused the operation error to clear the error.</td>
</tr>
<tr>
<td><strong>Copy Function Errors</strong></td>
<td>Copy Function Errors occur when using the digital operator or the USB Copy Unit to copy, read, or verify parameter settings.</td>
</tr>
<tr>
<td></td>
<td>- The digital operator displays text indicating the specific error.</td>
</tr>
<tr>
<td></td>
<td>- Multi-function contact outputs do not operate.</td>
</tr>
<tr>
<td></td>
<td>Pressing any key on the digital operator will clear the fault. Investigate the cause of the problem (such as model incompatibility) and try again.</td>
</tr>
</tbody>
</table>
Alarm and Error Displays

Faults

Table 5-2 gives an overview of possible fault codes. Conditions such as overvoltages can trip faults and alarms. It is important to distinguish between faults and alarms to determine the proper corrective actions. When the converter detects a fault, the ALM indicator LED lights, the fault code appears on the digital operator, and the fault contact MA-MB-MC triggers. An alarm is present if the ALM LED blinks and the fault code on the digital operator flashes. Refer to Minor Faults and Alarms on page 5-6 for a list of alarm codes.

Table 5-2: Fault Displays

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aov</td>
<td>Power Supply Overvoltage</td>
<td>5-9</td>
</tr>
<tr>
<td>AUv</td>
<td>Power Supply Undervoltage</td>
<td>5-9</td>
</tr>
<tr>
<td>bUS</td>
<td>Option Communication Error</td>
<td>5-9</td>
</tr>
<tr>
<td>CE</td>
<td>MEMOBUS/Modbus Communication Error</td>
<td>5-10</td>
</tr>
<tr>
<td>CoF</td>
<td>Current Offset Fault</td>
<td>5-10</td>
</tr>
<tr>
<td>CPF00, CPF01</td>
<td>Control Circuit Error</td>
<td>5-10</td>
</tr>
<tr>
<td>CPF02</td>
<td>A/D Conversion Error</td>
<td>5-10</td>
</tr>
<tr>
<td>CPF03</td>
<td>Control Board Connection Error</td>
<td>5-11</td>
</tr>
<tr>
<td>CPF06</td>
<td>EEPROM Memory Data Error</td>
<td>5-11</td>
</tr>
<tr>
<td>CPF07</td>
<td>Terminal Board Connection Error</td>
<td>5-11</td>
</tr>
<tr>
<td>CPF08</td>
<td>Terminal Board Connection Error</td>
<td>5-11</td>
</tr>
<tr>
<td>CPF11, CPF22</td>
<td>Control Circuit Error</td>
<td>5-10</td>
</tr>
<tr>
<td>CPF23</td>
<td>Control Board Connection Error</td>
<td>5-11</td>
</tr>
<tr>
<td>CPF24</td>
<td>Converter Unit Signal Fault</td>
<td>5-11</td>
</tr>
<tr>
<td>CPF26 to CPF35</td>
<td>Control Circuit Error</td>
<td>5-10</td>
</tr>
<tr>
<td>E5</td>
<td>MECHATROLINK-II Watchdog Timer Error</td>
<td>5-12</td>
</tr>
<tr>
<td>EF0</td>
<td>Option Card External Fault</td>
<td>5-12</td>
</tr>
</tbody>
</table>

<1> Displayed as CPF00 when occurring at converter power up. When one of the faults occurs after successfully starting the converter, the display will show CPF01. Displayed as CPF20 when occurring at converter power up. When one of the faults occurs after successfully starting the converter, the display will show CPF21.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF1 to EF8</td>
<td>External Fault (input terminal S1 to S8)</td>
<td>5-12</td>
</tr>
<tr>
<td>Err</td>
<td>EEPROM Write Error</td>
<td>5-12</td>
</tr>
<tr>
<td>FAn</td>
<td>Internal Fan Fault</td>
<td>5-13</td>
</tr>
<tr>
<td>Fdv</td>
<td>Power Supply Frequency Fault</td>
<td>5-13</td>
</tr>
</tbody>
</table>

<1> Displayed as CPF00 when occurring at converter power up. When one of the faults occurs after successfully starting the converter, the display will show CPF01. Displayed as CPF20 when occurring at converter power up. When one of the faults occurs after successfully starting the converter, the display will show CPF21.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uv1</td>
<td>Main Circuit Undervoltage</td>
<td>5-19</td>
</tr>
<tr>
<td>Uv2</td>
<td>Control Power Supply Undervoltage</td>
<td>5-19</td>
</tr>
<tr>
<td>Uv3</td>
<td>Soft Charge Circuit Fault</td>
<td>5-19</td>
</tr>
<tr>
<td>vrE</td>
<td>Resonance Detection</td>
<td>5-20</td>
</tr>
</tbody>
</table>
Minor Faults and Alarms

Refer to Table 5-3 for an overview of possible alarm codes. Conditions such as overvoltages can trip faults and alarms. It is important to distinguish between faults and alarms to determine the proper corrective actions. When the converter detects an alarm, the ALM indicator LED blinks and the alarm code display flashes. Most alarms trigger a digital output programmed for alarm output (H2-xx = 10). A fault (not an alarm) is present if the ALM LED lights without blinking.

Refer to Faults on page 5-4 for information on fault codes.

Table 5-3: Minor Fault and Alarm Displays

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Name</th>
<th>Minor Fault Output (H2-xx = 10)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>0Er</td>
<td>AEr Station Number Setting Error</td>
<td>YES</td>
<td>5-21</td>
</tr>
<tr>
<td>0ov</td>
<td>Aov Power Supply Overvoltage</td>
<td>YES</td>
<td>5-21</td>
</tr>
<tr>
<td>0uv</td>
<td>AUv Power Supply Undervoltage</td>
<td>YES</td>
<td>5-21</td>
</tr>
<tr>
<td>bb</td>
<td>bb Converter Baseblock</td>
<td>No output</td>
<td>5-21</td>
</tr>
<tr>
<td>bUS</td>
<td>bUS Option Card Communications Error</td>
<td>YES</td>
<td>5-22</td>
</tr>
<tr>
<td>CALL</td>
<td>CALL Serial Communication Transmission Error</td>
<td>YES</td>
<td>5-22</td>
</tr>
<tr>
<td>CE</td>
<td>CE MEMOBUS/Modbus Communication Error</td>
<td>YES</td>
<td>5-23</td>
</tr>
<tr>
<td>CoF</td>
<td>CoF Current Offset Fault</td>
<td>YES</td>
<td>5-23</td>
</tr>
<tr>
<td>CrST</td>
<td>CrST Cannot Reset</td>
<td>YES</td>
<td>5-23</td>
</tr>
<tr>
<td>EF0</td>
<td>EF0 Option Card External Fault</td>
<td>YES</td>
<td>5-23</td>
</tr>
<tr>
<td>EF1/F1</td>
<td>EF1 to EF8 External Fault (input terminal S1 to S8)</td>
<td>YES</td>
<td>5-24</td>
</tr>
<tr>
<td>FAn</td>
<td>FAn Converter Internal Fan Fault</td>
<td>YES</td>
<td>5-24</td>
</tr>
<tr>
<td>Fdv</td>
<td>Fdv Power Supply Frequency Fault</td>
<td>YES</td>
<td>5-24</td>
</tr>
<tr>
<td>HCA</td>
<td>HCA Current Alarm</td>
<td>YES</td>
<td>5-25</td>
</tr>
<tr>
<td>LT-1</td>
<td>LT-1 Cooling Fan Maintenance Time</td>
<td>No output &lt;1&gt;</td>
<td>5-25</td>
</tr>
<tr>
<td>LT-2</td>
<td>LT-2 Capacitor Maintenance Time</td>
<td>No output &lt;1&gt;</td>
<td>5-25</td>
</tr>
<tr>
<td>LT-3</td>
<td>LT-3 Capacitor Maintenance Time</td>
<td>No output &lt;1&gt;</td>
<td>5-25</td>
</tr>
<tr>
<td>oH</td>
<td>oH Heatsink Overheat</td>
<td>YES</td>
<td>5-25</td>
</tr>
<tr>
<td>oL2</td>
<td>oL2 Converter Overheat</td>
<td>YES</td>
<td>5-25</td>
</tr>
<tr>
<td>ov</td>
<td>ov Overvoltage</td>
<td>YES</td>
<td>5-26</td>
</tr>
<tr>
<td>PAuv</td>
<td>PAuv Power Supply Undervoltage Pre-alarm</td>
<td>YES</td>
<td>5-26</td>
</tr>
<tr>
<td>PF3</td>
<td>PF3 Input Phase Loss Detection</td>
<td>YES</td>
<td>5-26</td>
</tr>
<tr>
<td>SE</td>
<td>SE MEMOBUS/Modbus Test Mode Fault</td>
<td>YES</td>
<td>5-26</td>
</tr>
</tbody>
</table>

* Output when H2-xx = 2F.
### Table 5-4: Operation Error Displays

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Name</th>
<th>Minor Fault Output (H2-xx = 10)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>$SrC$</td>
<td>SfC Phase Order Fault</td>
<td>YES</td>
<td>5-27</td>
</tr>
<tr>
<td>$Uv$</td>
<td>Undervoltage</td>
<td>YES</td>
<td>5-27</td>
</tr>
<tr>
<td>$v_{rE}$</td>
<td>Resonance Detection</td>
<td>YES</td>
<td>5-27</td>
</tr>
</tbody>
</table>

* Output when H2-xx = 2F.

### Operation Errors

### Table 5-5: Copy Errors

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy</td>
<td>Writing parameter settings (flashing)</td>
<td>5-30</td>
</tr>
<tr>
<td>CPyE</td>
<td>Error writing data</td>
<td>5-30</td>
</tr>
<tr>
<td>CSEr</td>
<td>Copy unit error</td>
<td>5-30</td>
</tr>
<tr>
<td>dFPS</td>
<td>Converter model mismatch</td>
<td>5-30</td>
</tr>
<tr>
<td>End</td>
<td>Task complete</td>
<td>5-30</td>
</tr>
<tr>
<td>iFEr</td>
<td>Communication error</td>
<td>5-30</td>
</tr>
<tr>
<td>ndAT</td>
<td>Model, voltage class, capacity mismatch</td>
<td>5-30</td>
</tr>
<tr>
<td>rdEr</td>
<td>Error reading data</td>
<td>5-30</td>
</tr>
<tr>
<td>rEAd</td>
<td>Reading parameter settings (flashing)</td>
<td>5-30</td>
</tr>
<tr>
<td>vAEr</td>
<td>Voltage class, capacity mismatch</td>
<td>5-30</td>
</tr>
<tr>
<td>vFyE</td>
<td>Parameter setting mismatch</td>
<td>5-30</td>
</tr>
<tr>
<td>Digital Operator Display</td>
<td>Name</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>LED  vrFy</td>
<td>vrFy</td>
<td>5-30</td>
</tr>
<tr>
<td>LCD  Comparing parameter settings (flashing)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Fault Detection

### Fault Displays, Causes, and Possible Solutions

Table 5-6: Detailed Fault Displays, Causes, and Possible Solutions

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aov</td>
<td>Power Supply Overvoltage</td>
<td>The input power supply voltage became equal to or higher than the Input Power Supply Overvoltage Detection Level (L8-36). 230 V Class: Approx. 277 VAC 460 V Class: Approx. 554 VAC</td>
</tr>
<tr>
<td>AUv</td>
<td>Power Supply Undervoltage</td>
<td>The input power supply voltage became equal to or lower than the Input Power Supply Undervoltage Detection Level. 230 V Class: Approx. 150 VAC 460 V Class: Approx. 300 VAC</td>
</tr>
<tr>
<td>bUS</td>
<td>Option Communication Error</td>
<td>The connection was lost after establishing initial communication. Only detected when the run command frequency reference is assigned to an option card.</td>
</tr>
</tbody>
</table>

**Cause**

| The input power supply voltage is too high. | Reduce the voltage to within the range in the power supply specifications. |
| The capacity of the power supply is too small. | Increase the capacity of the power supply. |
| The AC fuse burned out. | A transistor inside the converter was destroyed. Or, the drive output is ground-faulted or short-circuited, which destroyed the output transistor. * Consult with your Magnetek representative or the Magnetek service department. |
| The distortion in the power supply is too large. | Lower the impedance of the input power supply wiring. |
| A phase loss occurred in the input power supply. | Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and then reset the fault. |

**Possible Solution**

| No signal was received from the PLC. | Check for faulty wiring. |
| Faulty communications wiring or an existing short circuit. | Check for disconnected cables and short circuits and repair as needed. |
| Communication data error occurred due to noise. | Check the various options available to minimize the effects of noise. Countertact noise in the control circuit, main circuit, and ground wiring. Ensure that other equipment such as switches or relays do not cause noise. Use surge absorbers if necessary. Use only recommended cables or other shielded line. Ground the shield on the controller side or the converter input power side. Separate all communication wiring from drive power lines. Install an EMC noise filter to the converter power supply input. |
| The option card is damaged. | Replace the option card if there are no problems with the wiring and the error continues to occur. |
| The option card is not properly connected to the converter. | The connector pins on the option card do not line up properly with the connector pins on the converter. Reinstall the option card. |

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.  
<2> Detected in model 41040-D+.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>CE</td>
<td>MEMOBUS/Modbus Communication Error</td>
</tr>
</tbody>
</table>

**Possible Solution**

- Check for faulty wiring.
  - Correct the wiring.
  - Check for disconnected cables and short circuits and repair as needed.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoF</td>
<td>CoF</td>
<td>Current Offset Fault</td>
</tr>
</tbody>
</table>

**Possible Solution**

- Cycle the power supply and check operation.
- If the fault occurs again, replace the board or converter. For information on board replacement, consult with your Magnetek representative or the Magnetek service department.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF00, CPF01 &lt;1&gt;</td>
<td>CPF00, CPF01 &lt;1&gt;</td>
<td>Control Circuit Error</td>
</tr>
</tbody>
</table>

**Possible Solution**

- Cycle power to the converter.
- If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF02</td>
<td>CPF02</td>
<td>A/D Conversion Error</td>
</tr>
</tbody>
</table>

**Possible Solution**

- Cycle power to the converter.
- If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

---

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

<2> Detected in model 41040-D+.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF03</td>
<td>Control Board Connection Error</td>
<td>Connection error between the control board and the converter.</td>
</tr>
</tbody>
</table>

**Cause**
- There is a connection error.

**Possible Solution**
- Turn off the power and check the connection between the control board and the converter.
- *If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.*

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF06</td>
<td>EEPROM Memory Data Error</td>
<td>Error in the data saved to EEPROM</td>
</tr>
</tbody>
</table>

**Cause**
- There is an error in EEPROM control circuit.

**Possible Solution**
- Turn off the power and check the connection between the control board and the converter.
- *If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.*

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF07</td>
<td>Terminal Board Connection Error</td>
<td>There is a faulty connection in the removable terminal block.</td>
</tr>
</tbody>
</table>

**Cause**
- There is a faulty connection between the terminal board and the control board.

**Possible Solution**
- Turn off the power and reconnect the terminal board.
- *If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.*

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF23</td>
<td>Control Board Connection Error</td>
<td>Connection error between the control board and the converter.</td>
</tr>
</tbody>
</table>

**Cause**
- Hardware is damaged.

**Possible Solution**
- Turn off the power and check the connection between the control board and the converter.
- *If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.*

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPF24</td>
<td>Converter Signal Fault</td>
<td>The converter capacity cannot be detected correctly (converter capacity is checked when the converter is powered up).</td>
</tr>
</tbody>
</table>

**Cause**
- Hardware is damaged.

**Possible Solution**
- If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

---

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

<2> Detected in model 41040-D+.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5</td>
<td>E5 MECHATROLINK-II Watchdog Timer Error</td>
<td>The watchdog timed out.</td>
</tr>
</tbody>
</table>

**Possible Solution**

Data has not been received from the PLC.

- Execute DISCONNECT or ALM_CLR, then issue a CONNECT command or SYNC_SET command and proceed to phase 3. Refer to the SI-T3 Option Technical Manual for more details on troubleshooting.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF0</td>
<td>EF0 Option Card External Fault</td>
<td>An external fault condition is present.</td>
</tr>
</tbody>
</table>

**Possible Solution**

An external fault was received from the PLC and F6-03 is set to a value other than 3.

- Remove the cause of the external fault.
- Remove the external fault input from the PLC.

**Problem with the PLC program**

- Check the PLC program and correct problems.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF1</td>
<td>EF1</td>
<td>External Fault (input terminal S1)</td>
</tr>
<tr>
<td>EF2</td>
<td>EF2</td>
<td>External Fault (input terminal S2)</td>
</tr>
<tr>
<td>EF3</td>
<td>EF3</td>
<td>External Fault (input terminal S3)</td>
</tr>
<tr>
<td>EF4</td>
<td>EF4</td>
<td>External Fault (input terminal S4)</td>
</tr>
<tr>
<td>EF5</td>
<td>EF5</td>
<td>External Fault (input terminal S5)</td>
</tr>
<tr>
<td>EF6</td>
<td>EF6</td>
<td>External Fault (input terminal S6)</td>
</tr>
<tr>
<td>EF7</td>
<td>EF7</td>
<td>External Fault (input terminal S7)</td>
</tr>
<tr>
<td>EF8</td>
<td>EF8</td>
<td>External Fault (input terminal S8)</td>
</tr>
</tbody>
</table>

**Possible Solution**

An external device tripped an alarm function.

- Remove the cause of the external fault and reset the fault.

- Wiring is incorrect.
  - Properly connect the signal lines to the terminals assigned for external fault detection (H1-xx = 20 to 2B).
  - Reconnect the signal line.

- Multi-function contact input setting is incorrect.
  - Check for unused terminals set for H1-xx = 20 to 2B (External Fault).
  - Change the terminal settings.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err</td>
<td>Err EEPROM Write Error</td>
<td>Data cannot be written to the EEPROM.</td>
</tr>
</tbody>
</table>

**Possible Solution**

Electrical noise has corrupted data while writing to the EEPROM.

- Press "ENTER" on the digital operator.
- Correct the parameter setting.
- Cycle power to the converter.

Hardware problem.

If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
<2> Detected in model 41040-D+.
### Digital Operator Display | Fault Name | Details
---|---|---
\(F_{\text{An}}\) | FAn | Internal Fan Fault
Fan or magnetic contactor failure.

**Cause**
- Internal cooling fan has malfunctioned.
- Fault detected in the internal cooling fan or magnetic contactor to the power supply.

**Possible Solution**
- Cycle power to the converter.
- Check fan operation.
- Verify the cumulative operation time of the fan with monitor U4-03, and verify the cumulative operation time of the fan maintenance timer with U4-04.
- If the cooling fan has exceeded its expected performance life or is damaged in any other way, replace the cooling fan.

### Digital Operator Display | Fault Name | Details
---|---|---
\(F_{\text{dv}}\) | Fdv | Power Supply Frequency Fault
The input power supply frequency exceeded the allowable frequency fluctuation.

**Cause**
- A momentary power loss occurred.
- An input power supply wiring terminal is loose.
- The fluctuation in the voltage of the input power supply is too large.
- The AC power supply fuse burned out.

**Possible Solution**
- Investigate and correct the cause and then reset the fault. Refer to Diagnosing and Resetting Faults on page 5-31.
- A transistor inside the converter was destroyed.
- The input wiring or drive output has ground faulted or short circuited.
- Contact your Magnetek representative or the Magnetek service department.

### Digital Operator Display | Fault Name | Details
---|---|---
\(F_{\text{UA}}\) | FUA | AC Fuse Blowout
The power supply fuse burned out.

**Cause**
- The power supply fuse burned out.
- A transistor inside the converter was destroyed.
- The input wiring or drive output has ground faulted or short circuited.
- Contact your Magnetek representative or the Magnetek service department.

**Possible Solution**
- Replace the converter.

### Digital Operator Display | Fault Name | Details
---|---|---
\(F_{\text{UD}}\) | FUd | DC Fuse Blowout
The DC converter output fuse burned out.

**Cause**
- The main transistor failed.
- The DC circuit fuse burned out.
- The drive failed.

**Possible Solution**
- Replace the drive.
- For information on drive replacement, consult with your Magnetek representative or the Magnetek service department.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

<2> Detected in model 41040-D+.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>GF</td>
<td>Ground Fault</td>
<td>A current that exceeded the Ground Short Detection Level was detected at the power supply side of the converter.</td>
</tr>
</tbody>
</table>

### Cause
- A damaged cable is creating a short circuit.

#### Possible Solution
- Check the cable.
- Remove the short circuit and reapply power to the converter.
- Check the resistance between the cable and the ground terminal.
- Replace the cable.

- Excessive leakage current at the drive output.

#### Possible Solution
- Reduce the amount of stray capacitance.

- Hardware problem.

#### Possible Solution
- If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>nSE</td>
<td>Node Setup Error</td>
<td>A terminal assigned to the node setup function closed during run.</td>
</tr>
</tbody>
</table>

### Cause
- The node setup terminal closed during run.

#### Possible Solution
- A Run command was issued while the node setup function was active. Stop the converter when using the node setup function.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oC</td>
<td>Overcurrent</td>
<td>Converter sensors detected an output current greater than the specified overcurrent level.</td>
</tr>
</tbody>
</table>

### Cause
- One of the cables has shorted out or there is a grounding problem.

#### Possible Solution
- Check the motor cables.
- Remove the short circuit and reapply power to the converter.
- Check the resistance between the motor cables and the ground terminal.
- Replace damaged cables.

- The load is too heavy.

#### Possible Solution
- Measure the current flowing into the converter.
- Replace the converter with a larger capacity converter if the current value exceeds the rated current.
- Determine if there is sudden fluctuation in the current level.
- Reduce the load to avoid sudden changes in the current level or switch to a larger converter.

- Converter fails to operate properly due to noise interference.

#### Possible Solution
- Review the possible solutions provided for handling noise interference.
- Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oC</td>
<td>Overcurrent</td>
<td>Converter sensors detected an output current greater than the specified overcurrent level.</td>
</tr>
</tbody>
</table>

### Cause
- The wiring of the power supply voltage detection circuits (R/L1, S/L2, T/L3) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.

#### Possible Solution
- Correct the wiring.

- The voltage on the power supply side is very low.

#### Possible Solution
- Check the wiring.
- Correct the wiring.
- Check the load on the power supply of peripheral devices that are connected to the same power supply line.
- Reduce the load.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

<2> Detected in model 41040-D+. 
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFA00</td>
<td>Option Card Connection Error at Option Port CN5-A</td>
<td>Option compatibility error.</td>
</tr>
</tbody>
</table>

**Cause** Possible Solution

The option card installed into port CN5-A is incompatible with the converter. Check if the converter supports the option card to be installed. Contact Magnetek for assistance.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFA01</td>
<td>Option Card Fault at Option Port CN5-A</td>
<td>Option not properly connected.</td>
</tr>
</tbody>
</table>

**Cause** Possible Solution

The option card connection to port CN5-A is faulty. Turn off the power and reconnect the option card.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFA02</td>
<td>Same Type of Option Card Already Connected</td>
<td>The combination of the option cards that are connected is not correct.</td>
</tr>
</tbody>
</table>

**Cause** Possible Solution

The same option cards or the same type of option cards are connected to CN5-A, CN5-B, and CN5-C. Connect the option cards correctly.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFA05 to oFA06</td>
<td>Option Card Error Occurred at Option Port CN5-A</td>
<td>There is a fault in the option card.</td>
</tr>
<tr>
<td>oFA10, oFA11</td>
<td>Option Card Connection Error (CN5-A)</td>
<td>Cycle power to the converter.</td>
</tr>
<tr>
<td>oFA12 to oFA17</td>
<td>Communication Option Card Connection Error (CN5-A)</td>
<td>If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.</td>
</tr>
</tbody>
</table>

**Digital Operator Display**

<table>
<thead>
<tr>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFb00</td>
<td>Option Card Fault at Option Port CN5-B</td>
</tr>
</tbody>
</table>

**Cause** Possible Solution

The option card installed into port CN5-B is incompatible with the converter. Make sure the converter supports the option card to be installed. Contact Magnetek for assistance.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFb01</td>
<td>Option Card Fault at Option Port CN5-B</td>
<td>Option not properly connected.</td>
</tr>
</tbody>
</table>

**Cause** Possible Solution

The option card connection to port CN5-B is faulty. Turn off the power and reconnect the option card.

1. If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
2. Detected in model 41040-D+.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFb02</td>
<td>Option Card Fault at Option Port CN5-B</td>
<td>Same type of option card is currently connected.</td>
</tr>
</tbody>
</table>

**Cause**

An option card of the same type is already installed in option port CN5-A.

**Possible Solution**

Only one of each option card type can only be installed simultaneously. Make sure only one type of option card is connected.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFb03 to oFb11</td>
<td>Option card error occurred at Option Port CN5-B</td>
<td>There is a fault in the option card.</td>
</tr>
<tr>
<td>oFb12 to oFb17</td>
<td>Option card error occurred at Option Port CN5-B</td>
<td></td>
</tr>
</tbody>
</table>

**Cause**

Option card or hardware is damaged.

**Possible Solution**

- Cycle power to the converter.
- If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFC00</td>
<td>Option Card Connection Error at Option Port CN5-C</td>
<td>Option compatibility error</td>
</tr>
</tbody>
</table>

**Cause**

The option card installed into port CN5-C is incompatible with the converter.

**Possible Solution**

Confirm that the converter supports the option card to be installed. Contact Magnetek for assistance.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFC01</td>
<td>Option Card Fault at Option Port CN5-C</td>
<td>Option not properly connected.</td>
</tr>
</tbody>
</table>

**Cause**

The option card connection to port CN5-C is faulty.

**Possible Solution**

Turn the power off and reconnect the option card.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFC02</td>
<td>Option Card Fault at Option Port CN5-C</td>
<td>Same type of option card is currently connected.</td>
</tr>
</tbody>
</table>

**Cause**

An option card of the same type is already installed in option port CN5-A or CN5-B.

**Possible Solution**

Only one of each option card type can only be installed simultaneously. Make sure only one type of option card is connected.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFC03 to oFcll</td>
<td>Option Card Error Occurred at Option Port CN5-C</td>
<td>There is a fault in the option card.</td>
</tr>
<tr>
<td>oFcl2 to oFcl7</td>
<td>Option Card Error Occurred at Option Port CN5-C</td>
<td></td>
</tr>
</tbody>
</table>

**Cause**

Option card or hardware is damaged.

**Possible Solution**

- Cycle power to the converter.
- If the problem continues, replace the control board or the entire converter. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

<2> Detected in model 41040-D+. 
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oFC50 to oFC55</td>
<td>Option Card Error Occurred at Option Port CN5-C</td>
<td>Option card is damaged.</td>
</tr>
</tbody>
</table>

**Cause**
Option card or hardware is damaged. Refer to the option manual for details.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oH</td>
<td>Heatsink Overheat</td>
<td>The heatsink temperature exceeded the overheat pre-alarm level set to L8-02. The default value for L8-02 is determined by o2-04 (drive model selection).</td>
</tr>
</tbody>
</table>

**Possible Solution**
- Check the temperature surrounding the converter. Verify temperature is within converter specifications.
- Improve the air circulation within the enclosure panel.
- Install a fan or air conditioner to cool the surrounding area.
- Remove anything near the converter that might be producing excessive heat.

**Cause**
Surrounding temperature is too high.

**Possible Solution**
- Check the temperature surrounding the converter.
- Improve the air circulation within the enclosure panel.
- Install a fan or air conditioner to cool the surrounding area.
- Remove anything near the converter that might be producing excessive heat.

**Cause**
Load is too heavy.

**Possible Solution**
- Check the temperature surrounding the converter.
- Improve the air circulation within the enclosure panel.
- Install a fan or air conditioner to cool the surrounding area.
- Remove anything near the converter that might be producing excessive heat.

**Possible Solution**
- Measure the output current.
- Decrease the load.

**Cause**
Internal cooling fan is stopped.

**Possible Solution**
- Replace the cooling fan.
- After replacing the cooling fan, set parameter o4-03 to 0 to reset the cooling fan maintenance.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oH</td>
<td>Overheat 1 (Heatsink Overheat)</td>
<td>The heatsink temperature exceeded the converter overheat level. Overheat level is determined by o2-04 (drive model selection).</td>
</tr>
</tbody>
</table>

**Possible Solution**
- Replace the cooling fan.
- After replacing the cooling fan, set parameter o4-03 to 0 to reset the cooling fan maintenance.

**Cause**
Load is too heavy.

**Possible Solution**
- Replace the converter with a larger model.
- Start converter operation first, and then start converter operation.

**Cause**
The converter does not operate.

**Possible Solution**
- Replace the converter with a larger model.
- Start converter operation first, and then start converter operation.

**Cause**
External operator is not properly connected to the converter.

**Possible Solution**
- Check the connection between the operator and the converter.
- Replace the cable if damaged.
- Turn off the input power and disconnect the operator. Reconnect the operator and reapply converter input power.

*<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.*

*<2> Detected in model 41040-D+.*
## Digital Operator Display

### Fault Name

<table>
<thead>
<tr>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>OV</em></td>
<td>Overvoltage</td>
</tr>
</tbody>
</table>

**Details**

Voltage in the DC bus has exceeded the overvoltage detection level. For 230 V class models: approximately 410 V. For 460 V class models: approximately 820 V.

### Cause

The regenerative load is too large.

### Possible Solution

- Reduce the regenerative load.

### Cause

Input power voltage is too high.

### Possible Solution

- Check the voltage.
- Lower input power voltage within the limits listed in the specifications.

### Cause

Converter fails to operate properly due to noise interference.

### Possible Solution

- Review the list of possible solutions provided for controlling noise.
- Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring.

### Cause

The wiring of the power supply voltage detection circuits (r1/ô 11, ô 1/ô 21, ô 1/ô 31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.

### Possible Solution

Correct the wiring.

### Digital Operator Display

<table>
<thead>
<tr>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>PF2</em></td>
<td>Input Power Supply Fault</td>
</tr>
</tbody>
</table>

**Details**

Abnormal oscillation in the main circuit DC bus continued. (Applies when L8-65 is set to 1 or 2.)

### Cause

The fluctuation in the voltage of the input power supply is too large.

### Possible Solution

- Investigate and correct the cause and then reset the fault.
- Refer to Diagnosing and Resetting Faults on page 5-31.

### Cause

A phase loss occurred in the input power supply.

### Possible Solution

- The capacity of the power supply is too small.
- The wiring is too long.
- The phase imbalance is too large.

### Digital Operator Display

<table>
<thead>
<tr>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>PF3</em></td>
<td>Input Phase Loss Detection</td>
</tr>
</tbody>
</table>

**Details**

The voltage balance in the three-phase power supply has broken down. (Detected when L8-69 = 1.)

### Cause

The fluctuation in the voltage of the input power supply is too large.

### Possible Solution

- Investigate and correct the cause and then reset the fault.
- Refer to Diagnosing and Resetting Faults on page 5-31.

### Cause

A phase loss occurred in the input power supply.

### Possible Solution

- The capacity of the power supply is too small.
- The wiring is too long.
- The phase imbalance is too large.

### Digital Operator Display

<table>
<thead>
<tr>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>SC</em></td>
<td>Input Short-circuit/Main Transistor Failure</td>
</tr>
</tbody>
</table>

**Details**

Short circuit or ground fault is detected.

### Cause

IGBT fault.

### Possible Solution

- Check the wiring to the drive.
- Turn the power supply off and then on again to check operation.
- If the problem continues, contact your Magnetek representative or the Magnetek service department.

### Cause

IGBT short circuit detection circuit fault.

### Digital Operator Display

<table>
<thead>
<tr>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>SrC</em></td>
<td>Phase Order Fault</td>
</tr>
</tbody>
</table>

**Details**

The phase order detection direction for the input power supply changed after the power supply was turned on.

### Cause

The power supply phase order changed during operation.

### Possible Solution

- Investigate and correct the cause and then reset the fault.
- Refer to Diagnosing and Resetting Faults on page 5-31.

### Cause

A momentary power loss occurred.

### Possible Solution

- An input power supply wiring terminal is loose.
- The fluctuation in the voltage of the input power supply is too large.

---

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

<2> Detected in model 41040-D+.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uv1</td>
<td>Main Circuit Undervoltage</td>
<td>The following condition occurred in the converter when a Run Command was not being input. The main circuit DC voltage became equal to or lower than the set value of L2-05 (Undervoltage Detection Level). 230 V Class: Approx. 190 V 460 V Class: Approx. 380 V</td>
</tr>
</tbody>
</table>

**Cause**

A phase loss occurred in the input power supply.

Check the wiring of the main circuit power supply for broken wires and wiring mistakes.

- Correct the wiring.

An input power supply wiring terminal is loose.

Check the terminals for looseness.

- Tighten the terminals to the tightening torque that is given in this manual. (See page 3-14.)

Fluctuation occurred in the power supply voltage.

Check the voltage.

- Correct the voltage so that it is within the range given in the power supply specifications of the converter.
- If there is no problem with the main circuit power supply, check the magnetic contactor in the main circuit for faults.

A power loss occurred.

Improve the power supply.

The main circuit capacitor circuit in the converter has deteriorated.

Check the maintenance period for the capacitor in U4-05 (Capacitor Maintenance).

- If the value of U4-05 has exceeded 90%, replace the board or the converter. For information on board replacement, consult with your Magnetek representative or the Magnetek service department.

The operation of the relay or contactor in the inrush current protection circuit in the converter failed.

Cycle the power supply and see if the fault occurs again.

- If the fault occurs repeatedly, replace the board or the converter. For information on board replacement, consult with your Magnetek representative or the Magnetek service department.
- Check the maintenance period for the inrush prevention relay in U4-06 (Soft Charge Bypass Relay Maintenance).
- If the value of U4-06 has exceeded 90%, replace the board or the converter. For information on board replacement, consult with your Magnetek representative or the Magnetek service department.

A fault occurred in the power supply device.

Check the wiring.

- Correct the wiring.

A fault occurred in the power supply.

A fault occurred in the power supply.

A fault occurred in power supply voltage detection.

Check the wiring.

- Correct the wiring.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uv2</td>
<td>Control Power Supply Voltage Fault</td>
<td>Voltage is too low for the control converter input power.</td>
</tr>
</tbody>
</table>

**Cause**

Internal circuitry is damaged.

- Cycle power to the converter. Check if the fault reoccurs.
- If the problem continues, replace either the control board or the entire converter. For instructions on replacing the control board, contact Magnetek or a Magnetek representative.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Fault Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uv3</td>
<td>Undervoltage 3 (Soft-Charge Bypass Circuit Fault)</td>
<td>The soft-charge bypass circuit failed.</td>
</tr>
<tr>
<td>Digital Operator Display</td>
<td>Fault Name</td>
<td>Details</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>$I_g v_4$</td>
<td>UV4</td>
<td>Gate Drive Board Undervoltage</td>
</tr>
<tr>
<td>$u_r E$</td>
<td>vRE</td>
<td>Resonance Detection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause</th>
<th>Possible Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enough power is being supplied to the gate drive board.</td>
<td>• Cycle power to the converter and see if the fault reoccurs.</td>
</tr>
<tr>
<td></td>
<td>• Refer to Diagnosing and Resetting Faults on page 5-31 for details.</td>
</tr>
<tr>
<td></td>
<td>• If the problem continues, replace either the gate drive board or the entire</td>
</tr>
<tr>
<td></td>
<td>converter. For instructions on replacing the gate drive board, contact Magnetek</td>
</tr>
<tr>
<td></td>
<td>or a Magnetek representative.</td>
</tr>
<tr>
<td>The power supply was turned off during operation.</td>
<td>Stop the operation of the converter and turn off the power supply.</td>
</tr>
<tr>
<td>There is noise on the power supply line.</td>
<td>Investigate the source of the noise and implement countermeasures.</td>
</tr>
<tr>
<td>A phase was lost for an input terminal during operation.</td>
<td>Check the wiring of the power supply system and remove the cause of the phase</td>
</tr>
<tr>
<td></td>
<td>loss.</td>
</tr>
</tbody>
</table>

*1*<sup>1</sup> If the fault occurs when starting the converter, CPP00 or CPP20 is displayed. If it occurs during operation, CPP01 or CPP21 is displayed.

*2* Detected in model 41040-D+.
Alarm Detection

Alarm Codes, Causes, and Possible Solutions

Alarms are converter protection functions that do not necessarily cause the converter to stop. After removing the cause of an alarm, the converter will return to the same status it was before the alarm occurred.

When an alarm has been triggered, the ALM light on the digital operator display blinks and the alarm code display flashes. If a multi-function output is set for an alarm (H2-xx = 10), that output terminal will be triggered.

**NOTE:** If a multi-function output is set to close when an alarm occurs (H2-xx = 10), it will also close when maintenance periods are reached, triggering alarms LT-1 through LT-4 (triggered only if H2-xx = 2F).

Table 5-7: Alarm Codes, Causes, and Possible Solutions

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE&lt;sub&gt;r&lt;/sub&gt;</td>
<td>Communication Option Station Number Setting Error (CC-Link, CANopen, MECHATROLINK-II)</td>
<td>Option card node address is outside of the acceptable setting range.</td>
<td>YES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station number is set outside the possible setting range.</td>
<td>Set the station number of the option card correctly.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO&lt;sub&gt;v&lt;/sub&gt;</td>
<td>Power Supply Overvoltage</td>
<td>The input power supply voltage became equal to or higher than the Input Power Supply Overvoltage Detection Level (L8-36). 230 V Class: Approx. 277 VAC 460 V Class: Approx. 554 VAC</td>
<td>YES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The input power supply voltage is too high.</td>
<td>Reduce the voltage to within the range in the power supply specifications.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU&lt;sub&gt;v&lt;/sub&gt;</td>
<td>Power Supply Undervoltage</td>
<td>The input power supply voltage became equal to or lower than the Input Power Supply Undervoltage Detection Level. 230 V Class: Approx. 150 VAC 460 V Class: Approx. 300 VAC</td>
<td>YES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The power supply voltage is low.</td>
<td>Increase the power supply voltage.</td>
</tr>
<tr>
<td>A phase loss occurred in the input power supply.</td>
<td>Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and then reset the fault.</td>
</tr>
<tr>
<td>Voltage detection failed.</td>
<td>Correctly wire r1/ 11, l1/ 21, and t1/ 31.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>Baseblock</td>
<td>Converter output interrupted as indicated by an external baseblock signal.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>External baseblock signal was entered via one of the multi-function input terminals (S1 to S8).</td>
<td>Check external sequence and baseblock signal input timing.</td>
</tr>
</tbody>
</table>

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bUS</td>
<td>Option Card Communication Error</td>
<td>The connection was lost after initial communication was established. Assign a Run command frequency reference to the option card.</td>
<td>YES</td>
</tr>
</tbody>
</table>

**Cause**
- Check for faulty wiring.
- Correct the wiring.
- Check for disconnected cables and short circuits. Repair as needed.

**Possible Solutions**
- If there are no problems with the wiring and the fault continues to occur, replace the option card.
- The connector pins on the option card are not properly lined up with the connector pins on the converter.
- Reinstall the option card.
- Check options available to minimize the effects of noise.
- Take steps to counteract noise in the control circuit wiring, main circuit lines and ground wiring.
- Try to reduce noise on the controller side.
- Use surge absorbers on magnetic contactors or other equipment causing the disturbance.
- Use recommended cables or some other type of shielded line. Ground the shield to the converter side or on the input power side.
- Separate the wiring for communication devices from the converter input power lines. Install an EMC noise filter to the converter input power.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALL</td>
<td>CALL</td>
<td>Serial Communication Transmission Error</td>
<td>Communication has not yet been established.</td>
</tr>
</tbody>
</table>

**Cause**
- Check for wiring errors.
- Correct the wiring.
- Check for disconnected cables and short circuits. Repair as needed.

**Possible Solutions**
- Check communications at start-up and correct programming errors.
- Perform a self-diagnostics check.
- If the problem continues, replace either the control board or the entire converter. For instructions on replacing the control board, contact Magnetek.
- Install a termination resistor at both ends of a communication line. Set the internal termination resistor switch correctly on slave converters. Place DIP switch S2 to the ON position.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>CE</td>
<td>MEMOBUS/Modbus Communication Error</td>
<td>Control data was not received correctly for two seconds.</td>
</tr>
</tbody>
</table>

**Cause** | **Possible Solutions**
--- | ---
A data error occurred due to noise. | - Check options available to minimize the effects of noise.
- Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring.
- Reduce noise on the controller side.
- Use surge absorbers for the magnetic contactors or other components that may be causing the disturbance.
- Use only recommended shielded line. Ground the shield on the controller side or on the converter input power side.
- Separate all wiring for communication devices from converter input power lines. Install an EMC noise filter to the converter input power supply.

Communication protocol is incompatible. | - Check the H5 parameter settings and the protocol setting in the controller.
- Ensure settings are compatible.

The CE detection time (H5-09) is set shorter than the time required for a communication cycle to take place. | - Check the PLC.
- Change the software settings in the PLC.
- Set a longer CE detection time using parameter H5-09.

Incompatible PLC software settings or there is a hardware problem. | - Check the PLC.
- Remove the cause of the error on the controller side.

Communications cable is disconnected or damaged. | - Check the connector to make sure the cable has a signal.
- Replace the communications cable.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoF</td>
<td>CoF</td>
<td>Current Offset Fault</td>
<td>A fault occurred in adjustment of the automatic current offset when the power supply was turned on.</td>
</tr>
</tbody>
</table>

**Cause** | **Possible Solutions**
--- | ---
A fault occurred in the current detection circuit. | Cycle the power supply and check operation.
*If the fault occurs again, replace the board or converter. For information on board replacement, consult with your Magnetek representative or the Magnetek service department.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CrST</td>
<td>CrST</td>
<td>Cannot Reset</td>
<td>A fault reset command was entered while the Run command was still present.</td>
</tr>
</tbody>
</table>

**Cause** | **Possible Solutions**
--- | ---
Fault reset was being executed when a Run command was entered. | - Ensure that a Run command cannot be entered from the external terminals or option during fault reset.
- Turn off the Run command.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF0</td>
<td>EF0</td>
<td>Option Card External Fault</td>
<td>An external fault condition is present.</td>
</tr>
</tbody>
</table>

**Cause** | **Possible Solutions**
--- | ---
An external fault was received from the PLC with F6-03 set to 3, which allows the converter to continue running after an external fault occurs. | - Remove the cause of the external fault.
- Remove the external fault input from the PLC.

There is a problem with the PLC program. | Check the PLC program and correct problems.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
### Digital Operator Display

<table>
<thead>
<tr>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF1</td>
<td>External Fault (Input Terminal S1)</td>
<td>YES</td>
</tr>
<tr>
<td>EF2</td>
<td>External Fault (Input Terminal S2)</td>
<td>YES</td>
</tr>
<tr>
<td>EF3</td>
<td>External Fault (Input Terminal S3)</td>
<td>YES</td>
</tr>
<tr>
<td>EF4</td>
<td>External Fault (Input Terminal S4)</td>
<td>YES</td>
</tr>
<tr>
<td>EF5</td>
<td>External Fault (Input Terminal S5)</td>
<td>YES</td>
</tr>
<tr>
<td>EF6</td>
<td>External Fault (Input Terminal S6)</td>
<td>YES</td>
</tr>
<tr>
<td>EF7</td>
<td>External Fault (Input Terminal S7)</td>
<td>YES</td>
</tr>
<tr>
<td>EF8</td>
<td>External Fault (Input Terminal S8)</td>
<td>YES</td>
</tr>
</tbody>
</table>

### Cause
- An external device has tripped an alarm function.

### Possible Solutions
- Remove the cause of the external fault and reset the multi-function input value. Refer to Stopping the Converter for Faults in Peripheral Devices on page 4-15 for details.
- Wiring is incorrect.
  - Ensure the signal lines have been connected properly to the terminals assigned for external fault detection (H1-xx=24 to 27, 2C to 2F).
  - Reconnect the signal line. Refer to Stopping the Converter for Faults in Peripheral Devices on page 4-15 for details.
- Multi-function contact inputs are set incorrectly.
  - Check if the unused terminals have been set for H1-xx = 24 to 27, 2C to 2F (External Fault).
  - Change the terminal settings. Refer to Stopping the Converter for Faults in Peripheral Devices on page 4-15 for details.

### Digital Operator Display

<table>
<thead>
<tr>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAn</td>
<td>Converter Internal Circulation Fan Fault</td>
<td>YES</td>
</tr>
</tbody>
</table>

### Cause
- An internal circulation fan in the converter is faulty.

### Possible Solutions
- Cycle the power supply and see if the fault occurs again.
- Check the operation of the internal circulation fans.
- Check U4-03 (Cooling Fan Operation Time) and U4-04 (Cooling Fan Maintenance Display).
  - If the life of the internal circulation fans has expired or if a fan is faulty, perform fan replacement according to instructions in this manual.
- An internal circulation fan or MC power supply is faulty (2400-D+ or 4210-D+ to 4560-D+).
  - Cycle the power supply and see if the fault occurs again.
  - If the fault occurs repeatedly, replace the board or the converter. For information on board replacement, consult with your Magnetek representative or the Magnetek service department.

### Digital Operator Display

<table>
<thead>
<tr>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fdv</td>
<td>Power Supply Frequency Fault</td>
<td>YES</td>
</tr>
</tbody>
</table>

### Cause
- A momentary power loss occurred.
- An input power supply wiring terminal is loose.
- The fluctuation in the voltage of the input power supply is too large.
- The AC power supply fuse burned out.
- The AC phase rotation direction has changed in the input power supply.
- The detected power supply frequency exceeded the allowable value.

### Possible Solutions
- Investigate and correct the cause and then reset the fault. Refer to Diagnosing and Resetting Faults on page 5-31.
- A transistor inside the converter was destroyed.
- The input wiring or drive output has ground faulted or short circuited.
- Contact your Magnetek representative or the Magnetek service department.
- Correct the wiring.
- Improve the power supply.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCA</td>
<td>Current Alarm</td>
<td>Converter current exceeded overcurrent warning level (150% of the rated current).</td>
<td>YES</td>
</tr>
<tr>
<td>LT-1</td>
<td>Cooling Fan Maintenance Time</td>
<td>The cooling fan has reached its expected maintenance period and may need to be replaced.</td>
<td>YES</td>
</tr>
<tr>
<td>LT-2</td>
<td>Capacitor Maintenance Time</td>
<td>The main circuit and control circuit capacitors are nearing the end of their expected performance life.</td>
<td>YES</td>
</tr>
<tr>
<td>LT-3</td>
<td>Soft Charge Bypass Relay Maintenance Time</td>
<td>The DC bus soft charge relay is nearing the end of its expected performance life.</td>
<td>YES</td>
</tr>
<tr>
<td>oH</td>
<td>Heatsink Overheat</td>
<td>The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02 (90-100 °C). Default value for L8-02 is determined by o2-04 (drive model selection).</td>
<td>YES</td>
</tr>
</tbody>
</table>

**Cause**

Reduce the load for applications with repetitive operations (i.e., stops and starts), or replace the converter.

Replace the cooling fan and set o4-03 to 0 to reset the Maintenance Monitor.

Replace either the control board or the entire converter. For instructions on replacing the control board, contact Magnetek.

Replace either the control board or the entire converter. For instructions on replacing the control board, contact Magnetek.

Check the surrounding temperature.

- Improve the air circulation within the enclosure panel.
- Install a fan or air conditioner to cool surrounding area.
- Remove anything near converter that may cause extra heat.

Check the ambient temperature.

- Improve ventilation in the control panel.
- Install a cooling device (e.g., a cooling fan or air conditioner) and lower the ambient temperature.
- If there are heat-generating objects nearby, remove them.

Measure the output current.

- Lower the load.

Replace the cooling fan.

- After replacing the converter, set parameter o4-03 to 0 to reset the cooling fan operation time.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
**Digital Operator Display**  | **Minor Fault Name**  | **Details**  | **Alarm Output (H2-xx=10)**  
--- | --- | --- | ---

| **oL<sup>2</sup>**  | **oL2**  | Converter Overload  | YES  

**Cause**  
Load is too heavy.  
The converter does not operate.

**Possible Solutions**  
Reduce the load.  
Start converter operation first, and then start converter operation.

| **ov**  | **DC Bus Overvoltage**  | The DC bus voltage exceeded the trip point.  
For 230 V class models: approximately 410 V  
For 460 V class models: approximately 820 V  | YES  

**Cause**  
Electrical noise interference causes the converter to operate incorrectly.

**Possible Solutions**  
- Review possible solutions for handling noise interference.  
- Review section on handling noise interference and check control circuit lines, main circuit lines and ground wiring.  
- If the magnetic contactor is identified as a source of noise, install a surge protector to the MC coil.

Set number of fault restarts (L5-01) to a value other than 0.

There was a regenerative load while the converter is stopped.  
The power supply voltage is too high.

**Possible Solutions**  
Operate the converter.  
Lower the voltage so that it is within the power supply specifications of the converter.

There is a regenerative load while the converter is stopped.  
The wiring of the power supply voltage detection circuits (r1/ 11, t1/ 21, t1/ 31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.

**Possible Solutions**  
- Check the wiring.  
- Correct the wiring.

| **PAUv**  | **Power Supply Undervoltage Pre-Alarm**  | The input power supply voltage became equal to or lower than the Input Power Supply Undervoltage Detection Level.  
230 V Class: Approx. 150 VAC  
460 V Class: Approx. 300 VAC  | YES  

**Cause**  
The power supply voltage is low.  
A phase loss occurred in the input power supply.  
Voltage detection failed.

**Possible Solutions**  
Increase the power supply voltage.  
Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and then reset the fault.  
Check r1/ 11, t1/ 21, t1/ 31 to see if they are wired correctly.

| **PF3**  | **Input Phase Loss Detection**  | Abnormal oscillation continued in the input power supply voltage.  
(Detected when L8-69 = 1.)  | YES  

**Cause**  
The fluctuation in the voltage of the input power supply is too large.  
A phase loss occurred in the input power supply.  
The interphase voltage balance is bad.

**Possible Solutions**  
Investigate the cause and implement countermeasures. Refer to Diagnosing and Resetting Faults on page 5-31 for details.

| **SE**  | **MEMOBUS/Modbus Test Mode Fault**  | A MEMOBUS/Modbus communications test was performed during operation.  | YES  

**Cause**  
A fault occurred during MEMOBUS/Modbus Communications Test Mode.

**Possible Solutions**  
Always stop the operation of the converter before you perform MEMOBUS/Modbus communications tests.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SrC</td>
<td>Phase Order Fault</td>
<td>The phase order detection direction for the input power supply changed after the power supply was turned on.</td>
<td>YES</td>
</tr>
</tbody>
</table>

### Cause
A momentary power loss occurred.
An input power supply wiring terminal is loose.
The fluctuation in the voltage of the input power supply is too large.

### Possible Solutions
- Investigate and correct the cause and then reset the fault. Refer to Diagnosing and Resetting Faults on page 5-31 for details.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
</table>
| UU                      | Undervoltage    | One of the following conditions was true when the converter was stopped and a Run command was entered:
  - DC bus voltage dropped below the level specified in L2-05.
  - Contactor to suppress inrush current in the converter was opened.
  - Low voltage in the control converter input power. This alarm outputs only if L2-01 is not 0 and DC bus voltage is under L2-05. | YES |

### Cause
- Phase loss in the converter input power. Check for wiring errors in the main circuit input power. Correct the wiring.
- Loose wiring in the converter input power terminals.
  - Ensure the terminals have been properly tightened.
  - Apply the tightening torque to the terminals as specified. Refer to Wire Gauges and Tightening Torque on page 3-14.
- There is a problem with the converter input power voltage.
  - Check the voltage.
  - Lower the voltage of the converter input power so that it is within the limits listed in the specifications.
- A power loss occurred. Improve the power supply.
- Internal circuitry is worn.
  - Check the maintenance time for the capacitors (U4-05).
  - Replace either the control board or the entire converter if U4-05 exceeds 90%. For instructions on replacing the control board, contact Magnetek.
- The converter input power transformer is too small and voltage drops when the power is switched on.
  - Check for an alarm when the magnetic contactor, line breaker, and leakage breaker are closed.
  - Check the capacity of the converter input power transformer.
- Air inside the converter is too hot. Check the temperature inside the converter.
- The CHARGE light is broken or disconnected. Replace either the control board or the entire converter. For instructions on replacing the control board, contact Magnetek.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Minor Fault Name</th>
<th>Details</th>
<th>Alarm Output (H2-xx=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>vEE</td>
<td>Resonance Detection</td>
<td>A filter resonance fault was detected or there is a harmonic component on the power supply side.</td>
<td>YES</td>
</tr>
</tbody>
</table>

### Cause
There is noise on the power supply line.

### Possible Solutions
- Investigate the source of the noise and implement countermeasures.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.
Operator Programming Errors

Operator Programming Error Codes, Causes, and Possible Solutions

An Operator Programming Error (oPE) occurs when a contradictory parameter is set or an individual parameter is set to an inappropriate value.

The converter will not operate until the parameter or parameters causing the problem are set correctly. An oPE, however, does not trigger an alarm or fault output. If an oPE occurs, investigate the cause and refer to Table 5-8 for the appropriate action. When an oPE appears on the operator display, press the ENTER button to view U1-18 and see which parameter is causing the oPE.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err</td>
<td>EEPROM Write Error</td>
<td>A verification mismatch occurred when writing data to the EEPROM.</td>
</tr>
</tbody>
</table>

**Cause**

The data was corrupted by noise when writing data to the EEPROM.

**Possible Solution**

- Press ENTER
- Set the parameters again.
- Cycle the power supply. Refer to Diagnosing and Resetting Faults on page 5-31 for details.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE01</td>
<td>Converter Capacity Setting Fault</td>
<td>Converter capacity and the value set to o2-04 do not match.</td>
</tr>
</tbody>
</table>

**Cause**

The drive model selection (o2-04) and the actual capacity of the converter are not the same.

**Possible Solution**

Correct the value set to o2-04.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE02</td>
<td>Parameter Range Setting Error</td>
<td>Set parameters to the proper values.</td>
</tr>
</tbody>
</table>

**Possible Solution**

Parameters were set outside the possible setting range.

**NOTE:** When multiple errors occur simultaneously, other errors are given precedence over oPE02.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE03</td>
<td>Multi-Function Input Selection Error</td>
<td>A contradictory setting is assigned to multi-function contact inputs H1-01 to H1-08.</td>
</tr>
</tbody>
</table>

**Cause**

The same function is assigned to two multi-function inputs. Excludes “Not used” and “External Fault.”

**Possible Solution**

- Ensure all multi-function inputs are assigned to different functions.
- Re-enter the multi-function settings to ensure this does not occur.
<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE04</td>
<td>Terminal Board Mismatch Error</td>
<td>The converter or the removable terminal block with parameter backup was replaced.</td>
</tr>
</tbody>
</table>

**Cause**

The converter was replaced (but the removable terminal block with parameter backup was not replaced). The removable terminal block with parameter backup was replaced.

**Possible Solution**

Set A1-03 to 5550 to load the parameter settings stored in the terminal board to the converter. Initialize parameters after converter replacement by setting A1-03 to 2220.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE05</td>
<td>Run Command Selection Error</td>
<td>The settings for the Run Command or Bus Voltage Command are not correct.</td>
</tr>
</tbody>
</table>

**Cause**

The Run command is assigned to an option card (b1-18 = 3) and an input option card is not connected to the converter. The Run command is assigned to an option card (b1-02 = 3) and an input option card is not connected to the converter.

**Possible Solution**

Reconnect the input option card to the converter.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE07</td>
<td>Multi-Function Analog Input Selection Error</td>
<td>A contradictory setting is assigned to multi-function analog inputs H3-02, H3-10, or H3-06.</td>
</tr>
</tbody>
</table>

**Cause**

At least two of these parameters have the same setting: H3-02, H3-10, or H3-06.

**Possible Solution**

Change the settings to H3-02, H3-10, and H3-06 so that functions no longer conflict. **NOTE:** Both 1F (Through mode) and F (Through mode) can be set to H3-02, H3-10, or H3-06 simultaneously.

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>Error Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPE30</td>
<td>Incorrect Input Voltage Adjustment</td>
<td>The input voltage offset adjustment has not been performed.</td>
</tr>
</tbody>
</table>

**Cause**

- The setting of o2-04 (Drive Model Selection) changed.
- ERPROM failed for the input voltage offset.

**Possible Solution**

For information on clearing the fault, consult with your Magnetek representative or the Magnetek service department.
Copy Function Related Displays

Tasks, Errors, and Troubleshooting

The table below lists the messages and errors that may appear when using the Copy function. When executing the tasks offered by the Copy function, the operator will indicate the task being performed. When an error occurs, a code appears on the operator to indicate the error. Note that errors related to the Copy function do not trigger a multifunction output terminal that has been set up to close when a fault or alarm occurs. To clear an error, simply press any key on the operator and the error display will disappear.

Table 5-9 lists the corrective action that can be taken when an error occurs.

NOTE: 1. Whenever using the copy function, the converter should be fully stopped.
2. The converter will not accept a Run command while the Copy function is being executed.
3. Parameters can only be saved to a converter when the voltage class, capacity, control mode, and software version match.

Table 5-9: Copy Function Task and Error Displays

<table>
<thead>
<tr>
<th>Digital Operator Display</th>
<th>LED</th>
<th>LCD</th>
<th>Error Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy</td>
<td>CoPy</td>
<td>LCD</td>
<td>Writing Parameter Settings (flashing)</td>
</tr>
<tr>
<td>CPyE</td>
<td>CPyE</td>
<td>CSEr</td>
<td>Error Writing Data</td>
</tr>
<tr>
<td>CSEr</td>
<td>CSEr</td>
<td></td>
<td>Copy Unit Error</td>
</tr>
<tr>
<td>dFPS</td>
<td>dFPS</td>
<td></td>
<td>Converter Model Mismatch</td>
</tr>
<tr>
<td>End</td>
<td>End</td>
<td></td>
<td>Task Complete</td>
</tr>
<tr>
<td>iFeR</td>
<td>iFeR</td>
<td></td>
<td>Communication Error</td>
</tr>
<tr>
<td>ndAT</td>
<td>ndAT</td>
<td></td>
<td>Model, Voltage Class, Capacity Mismatch</td>
</tr>
<tr>
<td>rdEr</td>
<td>rdEr</td>
<td></td>
<td>Error Reading Data</td>
</tr>
<tr>
<td>rEAd</td>
<td>rEAd</td>
<td></td>
<td>Reading Parameter Settings (flashing)</td>
</tr>
<tr>
<td>vAEr</td>
<td>vAEr</td>
<td></td>
<td>Voltage Class, Capacity Mismatch</td>
</tr>
<tr>
<td>vFyE</td>
<td>vFyE</td>
<td></td>
<td>Parameter settings in the converter and those saved to the copy function are not the same</td>
</tr>
<tr>
<td>vrFy</td>
<td>vrFy</td>
<td></td>
<td>Comparing parameter settings (flashing)</td>
</tr>
</tbody>
</table>
Diagnosing and Resetting Faults

When a fault occurs and the converter stops, follow the instructions below to remove whatever conditions triggered the fault, then restart the converter.

Fault Reset Methods

When a fault occurs, the cause of the fault must be removed and the converter must be restarted. The table below lists the different ways to restart the converter.

<table>
<thead>
<tr>
<th>After the Fault Occurs</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fix the cause of the fault, restart the converter, and reset the fault</td>
<td>Press  on the digital operator when the error code is displayed.</td>
</tr>
<tr>
<td>Resetting via Fault Reset Digital Input S4</td>
<td>Close then open the fault signal digital input via terminal S4. S4 is set for “Fault Reset” as default (H1-04 = 14).</td>
</tr>
<tr>
<td>Turn off the main power supply if the above methods do not reset the fault. Reapply power after the digital operator display has turned off.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** If the Run command is present, the converter will disregard any attempts to reset the fault. Remove the Run command before attempting to clear a fault situation.
Chapter 6

Standard Configuration
Devices, Peripheral Devices,
and Options
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Converter Options and Peripheral Devices

Table 6-1 lists the names of the various peripheral devices, accessories, and options available for Magnetek converters. Contact Magnetek or your Magnetek sales representative to order these peripheral devices.

- Peripheral Device Selection: Contact Magnetek for selection and part numbers.
- Peripheral Device Installation: Refer to the corresponding option manual for installation instructions.

### Table 6-1: Available Peripheral Devices

<table>
<thead>
<tr>
<th>Option</th>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Options</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V Power Supply</td>
<td>PS-A10L (230 V class)</td>
<td>Provides power supply for the control circuit and option boards.</td>
</tr>
<tr>
<td></td>
<td>PS-A10H (460 V class)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> Parameter settings cannot be changed when the drive is operating solely from this power supply.</td>
<td></td>
</tr>
<tr>
<td><strong>Interface Options</strong></td>
<td>COPY-STICK</td>
<td></td>
</tr>
<tr>
<td>USB Copy Unit (RJ-45/USB compatible plug)</td>
<td><strong>COPY-STICK</strong></td>
<td>- Can copy parameter settings easily and quickly to be later transferred to another converter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Adapter for connecting converter to the USB port of a PC.</td>
</tr>
<tr>
<td><strong>Monitor Option Cards</strong></td>
<td>AO-A3</td>
<td>Outputs analog signal for monitoring the output state (input frequency, output voltage etc.) of the converter.</td>
</tr>
<tr>
<td></td>
<td>Output resolution: 11 bit signed (1/2048)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output voltage: 0 to 10 VDC (non-isolated)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminals: 2 analog outputs</td>
<td></td>
</tr>
<tr>
<td>Digital Output</td>
<td>DO-A3</td>
<td>Outputs isolated type digital signal for monitoring the run state of the converter (alarm signal, during run, etc.)</td>
</tr>
<tr>
<td></td>
<td>Terminals: 6 photocoupler outputs (48 V, 50 mA or less)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 relay contact outputs (250 VAC, 1 A or less 30 VDC, 1 A or less)</td>
<td></td>
</tr>
</tbody>
</table>
Standard Configuration Devices Wiring

Install the standard configuration devices according to Table 6-2 and Table 6-3 when installing the converter.

For more information, refer to Standard Connection Diagram on page 3-3. Refer to the product catalog for selection of standard configuration devices.

Table 6-2: Standard Configuration Devices (230 V Class)

<table>
<thead>
<tr>
<th>Voltage Class</th>
<th>Model</th>
<th>2015-D+</th>
<th>2030-D+</th>
<th>2057-D+</th>
<th>2083-D+</th>
<th>2140-D+</th>
<th>2200-D+</th>
<th>2270-D+</th>
<th>2400-D+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmonic Filter Module</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Input-side AC Reactor 1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Input-side AC Reactor 2</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Reactor for Harmonic Filter</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Capacitor for Harmonic Filter</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 6-3: Standard Configuration Devices (460 V Class)

<table>
<thead>
<tr>
<th>Voltage Class</th>
<th>Model</th>
<th>4008-D+</th>
<th>4016-D+</th>
<th>4030-D+</th>
<th>4043-D+</th>
<th>4058-D+</th>
<th>4086-D+</th>
<th>4145-D+</th>
<th>4210-D+</th>
<th>4300-D+</th>
<th>4410-D+</th>
<th>4560-D+</th>
<th>41040-D+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmonic Filter Module</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Input-side AC Reactor 1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Input-side AC Reactor 2</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Reactor for Harmonic Filter</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Capacitor for Harmonic Filter</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Wire Gauges and Tightening Torque

Use the tables in this section to select the appropriate wires and crimp terminals.

**NOTE:**
1. Wire gauge recommendations based on continuous current ratings using 75°C 600 VAC vinyl-sheathed wire assuming ambient temperature within 40°C.
2. Wire gauge recommendations for models 4410-D+ to 41040-D+ based on continuous current ratings using 105°C 600 VAC vinyl sheathed wire assuming ambient temperature within 40°C.

Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:

\[
\text{Line drop voltage (V)} = \sqrt{3} \times \text{wire resistance (Ω/km)} \times \text{wire length (m)} \times \text{current (A)} \times 10^{-3}
\]

**Harmonic Filter Module**

Refer to Wire Gauges and Tightening Torque on page 3-14 when wiring of the harmonic filter module.
## Input-side AC Reactor 1

### Table 6-4: Wire Gauge and Torque Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>230 V Class</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 2015-D+ | U, V, W  
X, Y, Z   | 12      | 12 to 10          | M4       | 1.0 to 1.3 (8.9 to 11.5) |
| 2030-D+ | U, V, W  
X, Y, X   | 8       | 8 to 6            | M5       | 2.0 to 2.5 (17.7 to 22.1) |
| 2057-D+ | U, V, W  
X, Y, Z   | 4       | 4                 | M6       | 4.0 to 4.9 (35.4 to 43.4) |
| 2083-D+ | U, V, W  
X, Y, Z   | 2       | 2 to 1            | M8       | 8.9 to 10.7 (79.7 to 97.4) |
| 2140-D+ | U, V, W  
X, Y, Z   | 3       | 3 to 2/0          | M8       | 8.9 to 10.7 (79.7 to 97.4) |
| 2200-D+ | U, V, W  
X, Y, Z   | 3/0 x 2P  
3/0       | 3/0     | M12     | 31.4 to 39.2 (283 to 354) |
| 2270-D+ | U, V, W  
X, Y, Z   | 3/0 x 2P  
3/0 to 4/0 | M12 | 32 to 40 (283 to 354) |
| 2400-D+ | U, V, W  
X, Y, Z   | 300 x 2P  
300 to 400 | M12 | 32 to 40 (283 to 354) |
| **460 V Class** | | | | | |
| 4008-D+ | U, V, W  
X, Y, Z   | 12      | 12 to 10          | M4       | 1.0 to 1.3 (8.9 to 11.5) |
| 4016-D+ | U, V, W  
X, Y, Z   | 12      | 12 to 10          | M4       | 1.0 to 1.3 (8.9 to 11.5) |
| 4030-D+ | U, V, W  
X, Y, Z   | 8       | 8                 | M6       | 4.0 to 4.9 (35.4 to 43.4) |
| 4043-D+ | U, V, W  
X, Y, Z   | 6       | 6                 | M8       | 8.9 to 10.7 (79.7 to 97.4) |
| 4058-D+ | U, V, W  
X, Y, Z   | 4       | 4                 | M8       | 8.9 to 10.7 (79.7 to 97.4) |
| 4086-D+ | U, V, W  
X, Y, Z   | 2       | 2 to 1            | M8       | 8.9 to 10.7 (79.7 to 97.4) |
| 4145-D+ | U, V, W  
X, Y, Z   | 3 x 2P   
3 x 2P     | 3 to 2/0  | M8       | 8.9 to 10.7 (79.7 to 97.4) |
| 4210-D+ | U, V, W  
X, Y, Z   | 3/0 x 2P  
3/0 x 2P   | 3/0 x 2P  | M12     | 32 to 40 (283 to 354) |
| 4300-D+ | U, V, W  
X, Y, Z   | 3/0 x 2P  
3/0 to 4/0 | M12 | 32 to 40 (283 to 354) |
| 4410-D+ | U, V, W  
X, Y, Z   | 300 x 2P  
300 to 400 | M12 | 32 to 40 (283 to 354) |
| 4560-D+ | U, V, W  
X, Y, Z   | 4/0 x 4P  
4/0 to 300 | M12 | 32 to 40 (283 to 354) |
| 41040-D+ | U, V, W  
X, Y, Z   | 4/0 x 8P  
4/0 to 300 | M12 | 32 to 40 (283 to 354) |
## Input-side AC Reactor 2

### Table 6-5: Wire Gauge and Torque Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4410-D+</td>
<td>U, V, W</td>
<td>300 x 2P</td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4560-D+</td>
<td>U, V, W</td>
<td>4/0 x 4P</td>
<td>4/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41040-D+</td>
<td>U, V, W</td>
<td>4/0 x 8P</td>
<td>4/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Reactor for Harmonic Filter

### Table 6-6: Wire Gauge and Torque Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4410-D+</td>
<td>R/L1, S/L2, T/L3</td>
<td>4</td>
<td>4</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4560-D+</td>
<td>R/L1, S/L2, T/L3</td>
<td>1</td>
<td>1</td>
<td>M8</td>
<td>8.9 to 10.7 (79.7 to 97.4)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41040-D+</td>
<td>R/L1, S/L2, T/L3</td>
<td>1 x 2P</td>
<td>1 to 2/0</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td></td>
<td>X, Y, Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Capacitor for Harmonic Filter

### Table 6-7: Wire Gauge and Torque Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG</th>
<th>Applicable Gauge AWG</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4410-D+</td>
<td>U, V, W</td>
<td>4</td>
<td>4</td>
<td>M12</td>
<td>18.0 to 22.0 (159.3 to 194.7)</td>
</tr>
<tr>
<td>4560-D+</td>
<td>U, V, W</td>
<td>1</td>
<td>1</td>
<td>M12</td>
<td>18.0 to 22.0 (159.3 to 194.7)</td>
</tr>
<tr>
<td>41040-D+</td>
<td>U, V, W</td>
<td>1 x 2P</td>
<td>1 to 2/0</td>
<td>M12</td>
<td>18.0 to 22.0 (159.3 to 194.7)</td>
</tr>
</tbody>
</table>
Installing Peripheral Devices

This section describes the proper steps and precautions to take when installing or connecting various peripheral devices to the converter.

### Installing a Molded Case Circuit Breaker (MCCB) or Ground Fault Circuit Interrupter (GFCI)

Install an MCCB or GFCI for line protection between the power supply and the main circuit power supply input terminals R/L1, S/L2, and T/L3. This protects the main circuit and devices wired to the main circuit while also providing overload protection.

#### NOTICE

Use a class 2 power supply when connecting to the control terminals. Improper application of peripheral devices could result in converter performance degradation due to improper power supply. Refer to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits for requirements concerning class 2 power supplies.

#### NOTICE

Prevent Equipment Damage. Install a fuse and a GFCI to model 41040-D+. Failure to comply may result in damage to the power supply in the event of a short circuit.

Consider the following when selecting and installing an MCCB or a GFCI:

- The capacity of the MCCB or GFCI should be 1.5 to 2 times the rated output current of the converter. Use an MCCB or GFCI to keep the converter from faulting out instead of using overheat protection (150% for one minute at the rated output current).
- If several converters are connected to one MCCB or GFCI that is shared with other equipment, use a sequence that shuts the power OFF when errors are output by using magnetic contactor (MC) as shown in Figure 6-1.

#### Figure 6-1: Power Supply Interrupt Wiring (Example)

![Power Supply Interrupt Wiring](image_url)

#### WARNING

Electrical Shock Hazard. Disconnect the MCCB (or GFCI) and MC before wiring terminals. Failure to comply may result in serious injury or death.
Application Precautions when Installing a GFCI

Converter outputs generate high-frequency leakage current as a result of high-speed switching. Install a GFCI on the input side of the converter to switch off potentially harmful leakage current.

Use a GFCI with harmonic countermeasures and with a rated operating current of 30 mA minimum for each connected converter at the power supply side to eliminate harmonic leakage current and suppress any potentially harmful frequencies.

Leakage current can cause unprotected components to operate incorrectly. If this is a problem, lower the carrier frequency, replace the components in question with parts protected against harmonic current, or increase the sensitivity amperage of the circuit interrupter to at least 200 mA per converter.

Factors in determining leakage current:
- Size of the converter
- EMI/RFI filter
- Carrier frequency
- Motor cable type and length

Select an interrupter that senses all types of current (AC and DC) and high frequency currents to safely protect the system.

Installing a Magnetic Contactor at the Power Supply Side

Disconnecting the Power Supply

Instead of an MCCB, you can also use an MC in the sequence to turn off the power supply for the main circuits when protection functions in the converter are activated or for emergency stop operations. However, if an MC at the input (primary side) to the converter is used to force the converter to stop, it will stop without performing regenerative operation. Create the sequence carefully.

**NOTICE**

Do not connect electromagnetic switches or MCs to the output motor circuits without proper sequencing. Improper sequencing of output motor circuits could result in damage to the converter.

**NOTICE**

Install an MC on the input side of the drive when the converter should not automatically restart after power loss. To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the converter power supply off and on more than once every 30 minutes. Frequent use can damage the converter. Use the converter to stop and start the motor.

**NOTICE**

Use a magnetic contactor (MC) to ensure that power to the converter can be completely shut off when necessary. The MC should be wired so that it opens when a fault output terminal is triggered.
NOTE: Set up a delay that prevents the MC from opening prematurely to continue operating the converter through a momentary power loss.

Connecting a Surge Absorber

A surge absorber suppresses surge voltage generated from switching an inductive load near the converter. Inductive loads include magnetic contactors, relays, valves, solenoids, and brakes. Always use a surge absorber or diode when operating with an inductive load.

WARNING

Fire Hazard. Do not connect surge absorbers to the converter output power terminals. Failure to comply may result in serious injury or death by fire or flying debris.

Attachment for External Heatsink Mounting

An external attachment can be used to project the heatsink outside of an enclosure to ensure that there is sufficient air circulation around the heatsink.

Contact a Magnetek sales representative or Magnetek directly for more information on this attachment.
Appendix A

Specifications
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# Power Ratings

**Table A-1: Power Ratings (Three-Phase 230 V Class)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>2015-D+</td>
</tr>
<tr>
<td>Maximum Applicable Motor Capacity [HP]</td>
<td>5.0</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Output Capacity [HP] &lt;1&gt;</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Output Capacity [kW] &lt;2&gt;</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Input Current (DC) [A]</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Input Current (AC) [A]</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Output Voltage [V]</td>
</tr>
</tbody>
</table>

<1> Rated output capacity is calculated with a rated input voltage of 230 V.

<2> Rated output capacity is calculated with an input voltage of 220V.

**Table A-2: Power Ratings (Three-Phase 460 V Class)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>4008-D+</td>
</tr>
<tr>
<td>Maximum Applicable Motor Capacity [HP]</td>
<td>5</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Output Capacity [HP] &lt;1&gt;</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Output Capacity [kW] &lt;2&gt;</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Input Current (DC) [A]</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Input Current (AC) [A]</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Output Voltage [V]</td>
</tr>
</tbody>
</table>

<1> Rated output capacity is calculated with a rated input voltage of 460 V.

<2> Rated output capacity is calculated with an input voltage of 440V.
# Converter Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td></td>
</tr>
<tr>
<td>Rated Voltage Rated Frequency</td>
<td>230 V Class: 200 to 240 VAC 50/60 Hz&lt;br&gt;460 V Class: 380 to 480 VAC 50/60 Hz</td>
</tr>
<tr>
<td>Allowable Voltage Fluctuation</td>
<td>-15 to +10%</td>
</tr>
<tr>
<td>Allowable Frequency Fluctuation</td>
<td>±2%</td>
</tr>
<tr>
<td><strong>Control Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Control Method</td>
<td>Sine-wave PWM control</td>
</tr>
<tr>
<td>Input Power Factor</td>
<td>Input power factor of 0.99 min. (for rated operation)</td>
</tr>
<tr>
<td>Output Voltage Accuracy</td>
<td>±5%</td>
</tr>
<tr>
<td>Overload Protection</td>
<td>Converter stops after 60 s at 150% of rated output current or after 3 s at 200% of rated output current.</td>
</tr>
<tr>
<td>Voltage Reference Range</td>
<td>230 V Class: 300 to 360 VDC&lt;br&gt;460 V Class: 600 to 730 VDC</td>
</tr>
<tr>
<td><strong>Carrier Frequency</strong></td>
<td>Depends on the converter capacity&lt;br&gt;6 kHz&lt;br&gt;2015-D+ to 2083-D+&lt;br&gt;4008-D+ to 4086-D+&lt;br&gt;4 kHz&lt;br&gt;2140-D+ to 2400-D+&lt;br&gt;4145-D+ to 4300-D+&lt;br&gt;2 kHz&lt;br&gt;4410-D+ to 41040-D+</td>
</tr>
<tr>
<td><strong>Main Control Functions</strong></td>
<td>Torque Limit, Cooling Fan on/off Switch, Removable Terminal Block with Parameter Backup Function, MEMOBUS/Modbus Comm. (RS-422/RS-485 max, 115.2 kbps)</td>
</tr>
<tr>
<td>Momentary Overcurrent Protection</td>
<td>Converter stops when input current exceeds 200%.</td>
</tr>
<tr>
<td>Fuse burnout</td>
<td>Operation stops if the fuse burns out.</td>
</tr>
<tr>
<td><strong>Overloads</strong></td>
<td>Operation stops after 60 s at 150% of rated output current. Operation stops after 3 s at 200% of rated output current. (power supply and regeneration)</td>
</tr>
<tr>
<td><strong>Overvoltage Protection</strong></td>
<td>230 V class: Stops when DC bus voltage exceeds approx. 410 VDC&lt;br&gt;460 V class: Stops when DC bus voltage exceeds approx. 820 VDC</td>
</tr>
<tr>
<td>(Output)</td>
<td></td>
</tr>
<tr>
<td><strong>Overvoltage Protection</strong></td>
<td>230 V class: Stops when input voltage exceeds approx. 227 VAC&lt;br&gt;460 V class: Stops when input voltage exceeds approx. 554 VAC</td>
</tr>
<tr>
<td>(Input)</td>
<td></td>
</tr>
<tr>
<td>Undervoltage Protection</td>
<td>230 V class: Stops when DC bus voltage falls below approx. 190 VDC&lt;br&gt;460 V class: Stops when DC bus voltage falls below approx. 380 VDC</td>
</tr>
<tr>
<td>(Output)</td>
<td></td>
</tr>
<tr>
<td><strong>Undervoltage Protection</strong></td>
<td>230 V class: Stops when input voltage falls below approx. 150 VAC&lt;br&gt;460 V class: Stops when input voltage falls below approx. 300 VAC</td>
</tr>
<tr>
<td>(Input)</td>
<td></td>
</tr>
<tr>
<td>Momentary Power Loss</td>
<td>Immediately stop after Momentary Power Loss is detected.</td>
</tr>
<tr>
<td>Ride-Thru</td>
<td></td>
</tr>
<tr>
<td>Power Supply Frequency Fault</td>
<td>Operation stops for a deviation of ±6 Hz or more from the rated input frequency.</td>
</tr>
<tr>
<td>Heatsink Overheat Protection</td>
<td>Thermistor</td>
</tr>
<tr>
<td>Ground Protection</td>
<td>Electronic circuit protection&lt;br&gt;&lt;1&gt;</td>
</tr>
<tr>
<td>DC Bus Charge LED</td>
<td>Remains lit until DC bus voltage falls below 50 V</td>
</tr>
</tbody>
</table>

<1> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the converter is powered up while a ground fault is present at the output.
### Environment

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area of Use</strong></td>
<td>Indoors</td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>IP00/Open Type enclosure: -10°C to +50°C (14°F to 122°F)</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>95 RH% or less (no condensation)</td>
</tr>
<tr>
<td><strong>Vibration/Shock</strong></td>
<td>10 to 20 Hz at 9.8 m/s², 20 to 55 Hz at 5.9 m/s² (2015-D+ to 2140-D+, 4008-D+ to 4145-D+)</td>
</tr>
<tr>
<td></td>
<td>10 to 20 Hz at 9.8 m/s², 20 to 55 Hz at 2.0 m/s² (2200-D+ to 2400-D+, 4210-D+ to 4560-D+)</td>
</tr>
<tr>
<td></td>
<td>10 to 20 Hz at 5.9 m/s², 20 to 55 Hz at 2.0 m/s² (41040-D+)</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-20°C to +60°C (-4°F to +140°F)</td>
</tr>
<tr>
<td><strong>Altitude</strong></td>
<td>1000 m (3281 ft.) or lower, up to 3000 m (9843 ft.) with derating.</td>
</tr>
</tbody>
</table>

### Protection Design

- IP00/Open Type enclosure
- IP20/Open Type enclosure

### Safety Standard

- UL508C, IEC/EN61800-5-1, IEC/EN61800-3, CSA

---

*<1> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the converter is powered up while a ground fault is present at the output.*
## Heat Loss Data

### Table A-3: Heat Loss

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated Amps (A)</th>
<th>Heatsink Loss (W)</th>
<th>Interior Unit Loss (W)</th>
<th>Total Loss (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>230 V Class</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015-D+</td>
<td>15</td>
<td>93</td>
<td>38</td>
<td>131</td>
</tr>
<tr>
<td>2030-D+</td>
<td>30</td>
<td>167</td>
<td>57</td>
<td>224</td>
</tr>
<tr>
<td>2057-D+</td>
<td>61</td>
<td>319</td>
<td>101</td>
<td>420</td>
</tr>
<tr>
<td>2083-D+</td>
<td>91</td>
<td>380</td>
<td>134</td>
<td>514</td>
</tr>
<tr>
<td>2140-D+</td>
<td>152</td>
<td>666</td>
<td>245</td>
<td>911</td>
</tr>
<tr>
<td>2200-D+</td>
<td>197</td>
<td>1193</td>
<td>464</td>
<td>1657</td>
</tr>
<tr>
<td>2270-D+</td>
<td>273</td>
<td>1616</td>
<td>619</td>
<td>2235</td>
</tr>
<tr>
<td>2400-D+</td>
<td>394</td>
<td>1918</td>
<td>776</td>
<td>2694</td>
</tr>
<tr>
<td><strong>460 V Class</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4008-D+</td>
<td>8</td>
<td>83</td>
<td>37</td>
<td>120</td>
</tr>
<tr>
<td>4016-D+</td>
<td>15</td>
<td>158</td>
<td>58</td>
<td>216</td>
</tr>
<tr>
<td>4030-D+</td>
<td>30</td>
<td>314</td>
<td>103</td>
<td>417</td>
</tr>
<tr>
<td>4043-D+</td>
<td>45</td>
<td>263</td>
<td>109</td>
<td>372</td>
</tr>
<tr>
<td>4058-D+</td>
<td>61</td>
<td>647</td>
<td>201</td>
<td>848</td>
</tr>
<tr>
<td>4086-D+</td>
<td>91</td>
<td>1092</td>
<td>334</td>
<td>1426</td>
</tr>
<tr>
<td>4145-D+</td>
<td>152</td>
<td>1303</td>
<td>467</td>
<td>1770</td>
</tr>
<tr>
<td>4210-D+</td>
<td>197</td>
<td>1969</td>
<td>695</td>
<td>2664</td>
</tr>
<tr>
<td>4300-D+</td>
<td>280</td>
<td>2864</td>
<td>997</td>
<td>3861</td>
</tr>
<tr>
<td>4410-D+</td>
<td>409</td>
<td>2477</td>
<td>1323</td>
<td>3799</td>
</tr>
<tr>
<td>4560-D+</td>
<td>561</td>
<td>3705</td>
<td>1852</td>
<td>5557</td>
</tr>
<tr>
<td>41040-D+</td>
<td>955</td>
<td>6103</td>
<td>3098</td>
<td>9201</td>
</tr>
</tbody>
</table>
Derating Data

The converter can be operated at above the rated temperature, altitude, and default carrier frequency by derating the converter capacity.

Temperature Derating

To ensure the maximum performance life, the converter output current must be derated as shown in Figure A-1 when the converter is installed in areas with high ambient temperature or if converters are mounted side-by-side in a cabinet. In order to ensure reliable converter overload protection, set parameters L8-35 according to the installation conditions.

Parameter Settings

If the ambient temperature is higher than the rating or if converters are installed side by side in the control panel, you must set the L8-12 and L8-35 parameters according to the installation conditions. Derate the output current according to Figure A-1.

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L8-12</td>
<td>Ambient Temperature Setting</td>
<td>Lets the user create a set of default settings for a User Initialization.</td>
<td>-10°C – +50°C</td>
<td>40</td>
</tr>
<tr>
<td>L8-35</td>
<td>Installation Method Selection</td>
<td></td>
<td>0, 1, 3</td>
<td>Set by o2-04</td>
</tr>
<tr>
<td></td>
<td>0 IP00/IP20/Open-Chassis Enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Side-by-Side Mounting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Finless converter or External Heatsink Installation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Setting 0: IP00/IP20/Open-Chassis Enclosure

Converter operation between -10°C and +50°C allows 100% continuous current without derating.

Setting 1: Side-by-Side Mounting

Converter operation between -10°C and +30°C allows 100% continuous current without derating. Operation between +30°C and +50°C requires output current derating.

Setting 3: External Heatsink Installation

Converter operation between -10°C and +40°C allows 100% continuous current without derating. Operation between +40°C and +50°C requires output current derating.
Altitude Derating

Standard ratings are valid for installation altitudes up to 1000 m. For installations from 1000 m to 3000 m, the converter rated voltage and the rated output current must be derated for 1% per 100 m.
Appendix B

Parameter List
This page intentionally left blank.
## Parameter Groups

<table>
<thead>
<tr>
<th>Parameter Group</th>
<th>Name</th>
<th>Page</th>
<th>Parameter Group</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Initialization Parameters</td>
<td>B-4</td>
<td>H4</td>
<td>Multi-Function Analog Outputs</td>
<td>B-15</td>
</tr>
<tr>
<td>A2</td>
<td>User Parameters</td>
<td>B-5</td>
<td>L2</td>
<td>Momentary Power Loss Ride-Thru</td>
<td>B-16</td>
</tr>
<tr>
<td>b1</td>
<td>Operation Mode Selection</td>
<td>B-5</td>
<td>L5</td>
<td>Fault Restart</td>
<td>B-17</td>
</tr>
<tr>
<td>b4</td>
<td>Timer Function</td>
<td>B-6</td>
<td>L8</td>
<td>Drive Protection</td>
<td>B-18</td>
</tr>
<tr>
<td>C1</td>
<td>Acceleration and Deceleration Times</td>
<td>B-7</td>
<td>o1</td>
<td>Digital Operator Display Selection</td>
<td>B-20</td>
</tr>
<tr>
<td>C6</td>
<td>Carrier Frequency</td>
<td>B-7</td>
<td>o2</td>
<td>Digital Operator Keypad Functions</td>
<td>B-21</td>
</tr>
<tr>
<td>C7</td>
<td>DC Bus Voltage Control</td>
<td>B-8</td>
<td>o3</td>
<td>Copy Function</td>
<td>B-22</td>
</tr>
<tr>
<td>d8</td>
<td>DC Bus Voltage Reference</td>
<td>B-9</td>
<td>o4</td>
<td>Maintenance Monitor Settings</td>
<td>B-22</td>
</tr>
<tr>
<td>F4</td>
<td>Analog Monitor Card (AO-A3)</td>
<td>B-9</td>
<td>U1</td>
<td>Operation Status Monitors</td>
<td>B-24</td>
</tr>
<tr>
<td>F5</td>
<td>Digital Monitor Card (DO-A3)</td>
<td>B-10</td>
<td>U2</td>
<td>Fault Trace</td>
<td>B-27</td>
</tr>
<tr>
<td>H1</td>
<td>Multi-Function Digital Inputs</td>
<td>B-11</td>
<td>U3</td>
<td>Fault History</td>
<td>B-29</td>
</tr>
<tr>
<td>H2</td>
<td>Multi-Function Relay Outputs</td>
<td>B-12</td>
<td>U4</td>
<td>Maintenance Monitors</td>
<td>B-30</td>
</tr>
<tr>
<td>H3</td>
<td>Multi-Function Analog Inputs</td>
<td>B-14</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Parameter Tables

A: Initialization Parameters

The A parameter group creates the operating environment for the converter. This includes the parameter Access Level, Control Method, Password, User Parameters and more.

- Indicates that the parameter setting can be changed while the converter is operating.

A1: Initialization

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1-00 &lt;1&gt;</td>
<td>Select Language</td>
<td>Language Selection</td>
<td>0, 1, 7</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 English</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Japanese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Chinese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1-01</td>
<td>Access Level</td>
<td>Access Level Selection</td>
<td>0–2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>0 Operation Only</td>
<td>View and set A1-01 and A1-04. UX-XX parameters can also be viewed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 User Parameters</td>
<td>User Parameters (access to a set of parameters selected by the user, A2-01 to A2-32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Advanced Level</td>
<td>Advanced Access (access to view and set all parameters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1-03</td>
<td>Init Parameters</td>
<td>Selects a method to initialize the parameters.</td>
<td>0, 1110, 2220, 3330, 5550</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 No Initialize</td>
<td>No initialization</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1110 User Initial</td>
<td>User Initialize (parameter values must be stored using parameter A2-03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2220 2-Wire Initial</td>
<td>2-Wire initialization</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3330 3-Wire Initial</td>
<td>3-Wire initialization</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5550 oPE4 error reset</td>
<td>oPE04 error reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1-04</td>
<td>Enter Password</td>
<td>When the value set into A1-04 does not match the value set into A1-05, parameters A1-01 through A1-03, A1-06, and A2-01 through A2-33 cannot be changed.</td>
<td>0–9999</td>
<td>0</td>
</tr>
<tr>
<td>A1-05</td>
<td>Select Password</td>
<td>When the value set into A1-04 does not match the value set into A1-05, parameters A1-01 through A1-03, A1-06, and A2-01 through A2-33 cannot be changed.</td>
<td>0–9999</td>
<td>0</td>
</tr>
</tbody>
</table>

<1> Parameter setting value is not reset to the default value when the converter is initialized.

A2: User Parameters

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2-01</td>
<td>User Param 1</td>
<td>Recently edited parameters are listed here. The user can also select parameters to appear here for quicker access.</td>
<td>A1-00 to A4-19</td>
<td>b1-18</td>
</tr>
</tbody>
</table>
b: Application

Application parameters configure the source of the operation mode selection.

b1: Operation Mode Selection

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1-02</td>
<td>Run Source 1</td>
<td>Run Command Selection 1</td>
<td>0–3</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>Digital operator</td>
<td>Digital operator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Digital Inputs</td>
<td>Digital input terminals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Communication</td>
<td>MEMOBUS/Modbus communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Option PCB</td>
<td>Option PCB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b1-06</td>
<td>Cntl Input Scans</td>
<td>Digital Input Reading - Defines how the digital inputs are read. The inputs are acted upon every 1 ms or 2 ms depending upon the setting.</td>
<td>0, 1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Scan</td>
<td>Input status is read once and processed immediately (for quicker response)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Scans</td>
<td>Input is read twice and processed only if the status is the same in both readings (robust against noisy signals)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### b4: Timer Function

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>b4-01</td>
<td>Delay-ON Timer</td>
<td>Timer Function On-Delay Time Sets the on-delay times for a digital timer output (H2-xx=12). The output is triggered by a digital input programmed to H1-xx=18.</td>
<td>0.0–3000.0 sec</td>
<td>0.0</td>
</tr>
<tr>
<td>b4-02</td>
<td>Delay-OFF Timer</td>
<td>Timer Function Off-Delay Time Sets the off-delay times for a digital timer output (H2-xx=12). The output is triggered by a digital input programmed to H1-xx=18.</td>
<td>0.0–3000.0 sec</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Table 1: Parameter Selection

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1-08</td>
<td>RUN dur PRG Mode</td>
<td>Allow the converter to run while in Programming Mode. Run command is not accepted while in Programming Mode. Run command is accepted while in Programming Mode. Prohibit entering Programming Mode during run.</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td>b1-17</td>
<td>Run Cmd @ Pwr On</td>
<td>Run Command at Power Up - Determines whether an external Run command that is active during power up will start the converter. Disregarded. A new Run Command must be issued. Allowed. Converter will start immediately if Run Command is present at power up.</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td>b1-18</td>
<td>Reference Sel</td>
<td>Voltage Reference Source - Sets the input source for the voltage reference. Digital operator Control circuit terminal (analog input) MEMOBUS/Modbus communications Option card Input voltage based control 1 Input voltage based control 2</td>
<td>0–3, 7, 8</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 2: Timer Function Details

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>b4-01</td>
<td>Delay-ON Timer</td>
<td>Timer Function On-Delay Time Sets the on-delay times for a digital timer output (H2-xx=12). The output is triggered by a digital input programmed to H1-xx=18.</td>
<td>0.0–3000.0 sec</td>
<td>0.0</td>
</tr>
<tr>
<td>b4-02</td>
<td>Delay-OFF Timer</td>
<td>Timer Function Off-Delay Time Sets the off-delay times for a digital timer output (H2-xx=12). The output is triggered by a digital input programmed to H1-xx=18.</td>
<td>0.0–3000.0 sec</td>
<td>0.0</td>
</tr>
</tbody>
</table>
C: Tuning

Tuning parameters set the voltage increase time, voltage decrease time, carrier frequency, and DC bus voltage control.

**C1: Voltage Increase and Decrease Times**

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1-20</td>
<td>Vref Inc Ramp t</td>
<td>Voltage Increase Time</td>
<td>0.0–100.0 sec</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the output voltage increase time in seconds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set the time to increase from 0% to 100%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>460 V Class: 800 V/C1-20 (V/s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>230 V Class: 400 V/C1-20 (V/s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1-21</td>
<td>Vref Dec Ramp t</td>
<td>Voltage Decrease Time</td>
<td>0.0–100.0 sec</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the output voltage decrease time in seconds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set the time to decrease from 100% to 0%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>460 V Class: 800 V/C1-21 (V/s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>230 V Class: 400 V/C1-21 (V/s)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**C6: Carrier Frequency**

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C6-02</td>
<td>CarrierFreq Sel</td>
<td>Carrier Frequency Selection</td>
<td>1–3, F</td>
<td>&lt;2&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is normally no need to change this parameter from the default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you change this setting carelessly, the converter may be damaged.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Fc = 2.0 kHz</td>
<td>2 kHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Fc = 4.0 kHz</td>
<td>4 kHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Fc = 6.0 kHz</td>
<td>6 kHz &lt;1&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F Program</td>
<td>User-defined &lt;1&gt;</td>
<td></td>
</tr>
<tr>
<td>C6-03</td>
<td>CarrierFreq Max</td>
<td>Carrier Frequency Upper Limit</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is normally no need to change this parameter from the default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set the carrier frequency that is specified by the manufacturer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you change this setting carelessly, the converter may be damaged.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<1> This parameter is not available in model 41040-D+.
<2> Default setting is dependent on parameter o2-04, Drive Model Selection.
## C7: DC Bus Voltage Control

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C7-01</td>
<td>AVR P Gain</td>
<td>DC Bus Voltage Control (Avr) Proportional Gain</td>
<td>1.0–300.00</td>
<td>20.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the proportional gain for DC bus voltage control (Avr).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-02</td>
<td>AVR I Time</td>
<td>DC Bus Voltage Control (Avr) Integral Time</td>
<td>0.000–10.000 sec</td>
<td>0.500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the integral time for DC bus voltage control (Avr).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-03</td>
<td>AVR Delay Time</td>
<td>DC Bus Voltage Control (Avr) Primary Delay Time Constant</td>
<td>0.000–0.5000 sec</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the primary delay time constant for DC bus voltage control (Avr).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-12</td>
<td>React I Bias Sel</td>
<td>Reactive Current Reference Bias Automatic Calculation Selection</td>
<td>0, 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is normally no need to change this parameter from the default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets whether to automatically calculate the leading current compensation for the control process to compensate the leading current in the reactive current reference so that the leading current becomes 0.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 Disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatically calculate the reactive current reference bias.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-41</td>
<td>Damp Gain 2</td>
<td>Gain for Active Damping 2</td>
<td>0.000–10.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is normally no need to change this parameter from the default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-42</td>
<td>Id Bias Gain</td>
<td>Gain for Automatic Compensation of Leading Current</td>
<td>0.0–1000.0%</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is normally no need to change this parameter from the default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is used to make fine adjustments to the power factor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-43</td>
<td>Vac Bias Adj Sel</td>
<td>Input Voltage Offset Adjustment</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is normally no need to change this parameter from the default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>This parameter is for factory setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the setting is not correct, the converter may be damaged.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 Standard</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Start offset adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Offset adjustment not required</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The parameter returns to 0 after it is set.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The parameter returns to 0 after it is set.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7-44</td>
<td>Damping Gain 3</td>
<td>There is normally no need to change this parameter from the default value.</td>
<td>0.00–1.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<1> This parameter is not available in model 41040-D+.

<2> Default setting is dependent on parameter o2-04, Drive Model Selection.
d: References

Reference parameters set the value of the DC bus voltage reference.

**d8: DC Bus Voltage Reference**

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
</table>

F: Options

F parameters program the converter for communication options and to function with option cards.

**F4: Analog Monitor Card (AO-A3)**

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4-01</td>
<td>AO Ch1 Select</td>
<td>Terminal V1 Monitor Selection</td>
<td>000–408</td>
<td>0</td>
</tr>
<tr>
<td>F4-02</td>
<td>AO Ch1 Gain</td>
<td>Terminal V1 Monitor Gain</td>
<td>-999.9–999.9%</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The digital output card parameters set the function for contact output terminals M1-M2, M3-M4, and photocoupler output terminals P1 through P6.
H: Multi-Function Terminals

H parameters assign functions to the multi-function input and output terminals.

H1: Multi-Function Digital Inputs

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1-01</td>
<td>Term S1 Func Sel</td>
<td>Multi-Function Digital Input Terminal S1 Function Selection</td>
<td>1–67</td>
<td>4B</td>
</tr>
<tr>
<td>H1-02</td>
<td>Term S2 Func Sel</td>
<td>Multi-Function Digital Input Terminal S2 Function Selection</td>
<td>1–67</td>
<td>4C</td>
</tr>
<tr>
<td>H1-03</td>
<td>Term S3 Func Sel</td>
<td>Multi-Function Digital Input Terminal S3 Function Selection</td>
<td>0–67</td>
<td>24H</td>
</tr>
<tr>
<td>H1-04</td>
<td>Term S4 Func Sel</td>
<td>Multi-Function Digital Input Terminal S4 Function Selection</td>
<td>0–67</td>
<td>14H</td>
</tr>
<tr>
<td>H1-05</td>
<td>Term S5 Func Sel</td>
<td>Multi-Function Digital Input Terminal S5 Function Selection</td>
<td>0–67</td>
<td>F</td>
</tr>
<tr>
<td>H1-06</td>
<td>Term S6 Func Sel</td>
<td>Multi-Function Digital Input Terminal S6 Function Selection</td>
<td>0–67</td>
<td>F</td>
</tr>
<tr>
<td>H1-07</td>
<td>Term S7 Func Sel</td>
<td>Multi-Function Digital Input Terminal S7 Function Selection</td>
<td>0–67</td>
<td>F</td>
</tr>
<tr>
<td>H1-08</td>
<td>Term S8 Func Sel</td>
<td>Multi-Function Digital Input Terminal S8 Function Selection</td>
<td>0–67</td>
<td>8H</td>
</tr>
</tbody>
</table>

The H1 parameters assign a function to the multi-function digital inputs S1 to S8.

NOTE: Set unused terminals to F.

H1 Multi-Function Digital Input Selections

<table>
<thead>
<tr>
<th>H1-xx Setting</th>
<th>Function</th>
<th>LCD Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOCAL/REMOTE selection</td>
<td>Local/Remote Sel</td>
<td>Open: REMOTE (parameter settings determine the source of the frequency Reference 1 or 2 (b1-01, b1-02 or b1-15, b1-16) Closed: LOCAL, Frequency reference and Run command are input from the digital operator</td>
</tr>
<tr>
<td>8</td>
<td>Baseblock command (N.O.)</td>
<td>Ext BaseBlk N.O.</td>
<td>Closed: No converter output</td>
</tr>
<tr>
<td>9</td>
<td>Baseblock command (N.C.)</td>
<td>Ext BaseBlk N.C.</td>
<td>Open: No converter output</td>
</tr>
<tr>
<td>C</td>
<td>Analog terminal input selection</td>
<td>Term A2 Enable</td>
<td>Open: Function assigned by H3-14 is disabled. Closed: Function assigned by H3-14 is enabled.</td>
</tr>
<tr>
<td>F</td>
<td>Through mode</td>
<td>Term Not Used</td>
<td>Select this setting when using the terminal in a pass-through mode.</td>
</tr>
<tr>
<td>14</td>
<td>Fault reset</td>
<td>Fault Reset</td>
<td>Closed: Resets faults if the cause is cleared and the Run command is removed.</td>
</tr>
<tr>
<td>18</td>
<td>Timer function input</td>
<td>Timer function</td>
<td>Triggers the timer set up by parameters b4-01 and b4-02. Must be set in conjunction with the timer function output (H2-xx = 12).</td>
</tr>
<tr>
<td>1B</td>
<td>Program Lockout</td>
<td>Program Lockout</td>
<td>Open: Parameters cannot be edited (except for U1-01 if the reference source is assigned to the digital operator). Closed: Parameters can be edited and saved.</td>
</tr>
</tbody>
</table>
H2: Multi-Function Relay Outputs

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2-01</td>
<td>M1-M2 Func Sel</td>
<td>Terminal M1-M2 function selection (relay)</td>
<td>0–160</td>
<td>25H</td>
</tr>
<tr>
<td>H2-02</td>
<td>P1/PC Func Sel</td>
<td>Terminal M3-M4 Function Selection (Relay)</td>
<td>0–160</td>
<td>26H</td>
</tr>
<tr>
<td>H2-03</td>
<td>P2/PC Func Sel</td>
<td>Terminal M5-M6 Function Selection (Relay)</td>
<td>0–160</td>
<td>6H</td>
</tr>
</tbody>
</table>

Refer to H2: Multi-Function Relay Output Settings on page B-12 for a description of setting values.

NOTE: Set unused terminals to F.

H2 Multi-Function Relay Output Settings

<table>
<thead>
<tr>
<th>H2-xx Setting</th>
<th>Function</th>
<th>LCD Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>During run</td>
<td>During RUN 1</td>
<td>Closed: A Run command is active or voltage is output.</td>
</tr>
<tr>
<td>6</td>
<td>Ready</td>
<td>Drive Ready</td>
<td>Closed: Power up is complete and the converter is ready to accept a Run command.</td>
</tr>
<tr>
<td>H2-xx Setting</td>
<td>Function</td>
<td>LCD Display</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------</td>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>DC bus undervoltage</td>
<td>DC Bus Undervolt</td>
<td>Closed: DC bus voltage is below the Uv trip level set in L2-05.</td>
</tr>
<tr>
<td>8</td>
<td>During baseblock (N.O.)</td>
<td>BaseBlk 1</td>
<td>Closed: Converter has entered the baseblock state (no output voltage).</td>
</tr>
<tr>
<td>E</td>
<td>Fault</td>
<td>Fault</td>
<td>Closed: Fault occurred.</td>
</tr>
<tr>
<td>F</td>
<td>Through mode</td>
<td>Not Used</td>
<td>Set this value when using the terminal in the pass-through mode.</td>
</tr>
<tr>
<td>10</td>
<td>Minor fault</td>
<td>Minor Fault</td>
<td>Closed: An alarm has been triggered.</td>
</tr>
<tr>
<td>11</td>
<td>Fault reset command active</td>
<td>Reset Cmd Active</td>
<td>Closed: A command has been entered to clear a fault via the input terminals or from the serial network.</td>
</tr>
<tr>
<td>12</td>
<td>Timer output</td>
<td>Timer Output</td>
<td>Closed: Timer output.</td>
</tr>
<tr>
<td>1B</td>
<td>During baseblock (N.C.)</td>
<td>BaseBlk 2</td>
<td>Open: Converter has entered the baseblock state (no output voltage).</td>
</tr>
<tr>
<td>1D</td>
<td>During Regeneration</td>
<td>Regenerating</td>
<td>Closed: Motor is regenerating energy into the converter.</td>
</tr>
<tr>
<td>1E</td>
<td>Restart enabled</td>
<td>Dur Flt Restart</td>
<td>Closed: An automatic restart is performed.</td>
</tr>
<tr>
<td>20</td>
<td>Drive overheat pre-alarm (oH)</td>
<td>OH Prealarm</td>
<td>Closed: Heatsink temperature exceeds the parameter L8-02 value.</td>
</tr>
<tr>
<td>24</td>
<td>Fuse Blowout Detection</td>
<td>FUA/FUD Detect</td>
<td>Closed: Fuse burnout detected.</td>
</tr>
<tr>
<td>25</td>
<td>During Run 1</td>
<td>During RUN 1</td>
<td>Closed: The drive is ready to operate.</td>
</tr>
<tr>
<td>26</td>
<td>During MC ON</td>
<td>MC On</td>
<td>Closed: The magnetic contactor is closed.</td>
</tr>
<tr>
<td>27</td>
<td>Converter Overload Warning (oL2)</td>
<td>OL2 Pre-alarm</td>
<td>Closed: There is an overload warning.</td>
</tr>
<tr>
<td>2F</td>
<td>Maintenance Period</td>
<td>Maintenance</td>
<td>Closed: It is time to perform maintenance on the cooling fan, electrolytic capacitor, and inrash prevention relay.</td>
</tr>
<tr>
<td>30</td>
<td>During torque limit</td>
<td>Torque Limit</td>
<td>Closed: When the torque limit has been reached.</td>
</tr>
<tr>
<td>3B</td>
<td>Alarm 2</td>
<td>Minor Fault 2</td>
<td>Closed: Alarm occurred (excluding Uv, AUv, Fdv, SrC, and PAUv).</td>
</tr>
<tr>
<td>3C</td>
<td>LOCAL/REMOTE status</td>
<td>Local</td>
<td>Open: REMOTE</td>
</tr>
<tr>
<td>4D</td>
<td>oH Pre-alarm time limit</td>
<td>OH Pre-Alarm</td>
<td>Closed: oH pre-alarm time limit has passed.</td>
</tr>
<tr>
<td>60</td>
<td>Internal cooling fan alarm</td>
<td>Fan Alrm Det</td>
<td>Closed: Internal cooling fan alarm</td>
</tr>
<tr>
<td>100 to 160</td>
<td>Function 0 to 60 with inverse output</td>
<td>--</td>
<td>Inverts the output switching of the multi-function output functions. Set the last two digits of 1XX to reverse the output signal of that specific function.</td>
</tr>
</tbody>
</table>
### H3: Multi-Function Analog Inputs

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3-01</td>
<td>Term A1 Level</td>
<td>Terminal A1 Signal Level Selection</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 0-10V, (LowLim=0)</td>
<td>0 to 10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 0-10V, (BipolRef)</td>
<td>-10 to 10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-02</td>
<td>Term A1 FuncSel</td>
<td>Terminal A1 Function Selection</td>
<td></td>
<td>F–19</td>
</tr>
<tr>
<td></td>
<td>Sets the function of terminal A1.</td>
<td></td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>H3-03</td>
<td>Terminal A1 Gain</td>
<td>Terminal A1 Gain Setting</td>
<td>-999.9–999.9%</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Sets the level of the input value selected in H3-02 when 10 V is input at terminal A1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-04</td>
<td>Terminal A1 Bias</td>
<td>Terminal A1 Bias Setting</td>
<td>-999.9–999.9%</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Sets the level of the input value selected in H3-02 when 0 V is input at terminal A1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-05</td>
<td>Term A3 Signal</td>
<td>Terminal V1 Signal Level</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 0-10V (LowLim=0)</td>
<td>0 to 10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 0-10V (BipolRef)</td>
<td>-10 to 10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-06</td>
<td>Terminal A3 Sel</td>
<td>Terminal A3 Function Selection</td>
<td></td>
<td>F–19</td>
</tr>
<tr>
<td></td>
<td>Sets the function of terminal A3.</td>
<td></td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>H3-07</td>
<td>Terminal A3 Gain</td>
<td>Terminal A3 Gain Setting</td>
<td>-999.9–999.9%</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Sets the level of the input value selected in H3-06 when 10 V is input at terminal A3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-08</td>
<td>Terminal A3 Bias</td>
<td>Terminal A3 Bias Setting</td>
<td>-999.9–999.9%</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Sets the level of the input value selected in H3-06 when 0 V is input at terminal A3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-09</td>
<td>Term A2 Level</td>
<td>Terminal A2 Signal Level Selection</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 0-10V, (LowLim=0)</td>
<td>0 to 10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 0-10V, (BipolRef)</td>
<td>-10 to 10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 4-20 mA</td>
<td>4 to 20 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 0-20 mA</td>
<td>0 to 20 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> Use DIP switch S1 to set input terminal A2 for a current or a voltage input signal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-10</td>
<td>Term A2 FuncSel</td>
<td>Terminal A2 Function Selection</td>
<td></td>
<td>F–19</td>
</tr>
<tr>
<td></td>
<td>Sets the function of terminal A2.</td>
<td></td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>H3-11</td>
<td>Terminal A2 Gain</td>
<td>Terminal A2 Gain Setting</td>
<td>-999.9–999.9%</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Sets the level of the input value selected in H3-10 when 10 V (20 mA) is input at terminal A2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-12</td>
<td>Terminal A2 Bias</td>
<td>Terminal A2 Bias Setting</td>
<td>-999.9–999.9%</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Sets the level of the input value selected in H3-10 when 0 V (0 or 4 mA) is input at terminal A2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3-13</td>
<td>A1/A2 Filter T</td>
<td>Analog Input Filter Time Constant</td>
<td>0.00–2.00 sec</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Sets a primary delay filter time constant for terminals A1, A2, and A3. Used for electrical noise filtering.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### H3 Analog Output Settings

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3-14</td>
<td>A1/A2 Sel</td>
<td>Analog Input Terminal Enable Selection</td>
<td>1–7</td>
<td>7</td>
</tr>
</tbody>
</table>

- **A1 Available**: Terminal A1 only
- **A2 Available**: Terminal A2 only
- **A1/A2 Available**: Terminals A1 and A2 only
- **A3 Available**: Terminal A3 only
- **A1/A3 Available**: Terminals A1 and A3
- **A2/A3 Available**: Terminals A2 and A3
- **All Available**: All terminals enabled

### H3 Analog Output Settings

<table>
<thead>
<tr>
<th>H3-xx Setting</th>
<th>Function</th>
<th>LCD Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Through mode</td>
<td>Through mode</td>
<td>Set this value when using the terminal in the pass-through mode.</td>
</tr>
<tr>
<td>10</td>
<td>Power Supply Side Active Current Limit</td>
<td>Motoring I Limit</td>
<td>10 V = Converter rated current</td>
</tr>
<tr>
<td>12</td>
<td>Regeneration side Active Current Limit</td>
<td>Regen I limit</td>
<td>10 V = Converter rated current</td>
</tr>
<tr>
<td>19</td>
<td>Voltage Reference</td>
<td>DC V Reference</td>
<td>10 V = Maximum value in d8-01</td>
</tr>
</tbody>
</table>

### H4: Analog Outputs

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4-01</td>
<td>Term FM FuncSel</td>
<td>Terminal FM Monitor Selection</td>
<td>000–408</td>
<td>157</td>
</tr>
</tbody>
</table>

- Selects the data to be output through terminal FM. Set the desired monitor parameter to the digits available in Ux-xx. For example, enter “153” for U1-53.

| H4-02          | Terminal FM Gain| Terminal FM Monitor Gain                      | -999.9–999.9% | 100.0         |

- Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.

| H4-03          | Terminal FM Bias| Terminal FM Monitor Bias                      | -999.9–999.9% | 0.0           |

- Sets the signal level at terminal FM that is equal to 0% of the selected monitor value.

| H4-04          | Terminal AM Sel | Terminal AM Monitor Selection                 | 000–408   | 155           |

- Selects the data to be output through terminal AM. Set the desired monitor parameter to the digits available in Ux-xx. For example, enter “153” for U1-53.
<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4-05</td>
<td>Terminal AM Gain</td>
<td>Terminal AM Monitor Gain Sets the signal level at terminal AM that is equal to 100% of the selected monitor value.</td>
<td>-999.9–999.9%</td>
<td>50.0</td>
</tr>
<tr>
<td>H4-06</td>
<td>Terminal AM Bias</td>
<td>Terminal AM Monitor Bias Sets the signal level at terminal AM that is equal to 0% of the selected monitor value.</td>
<td>-999.9–999.9%</td>
<td>0.0</td>
</tr>
<tr>
<td>H4-07</td>
<td>Level Select1</td>
<td>Terminal FM Signal Level Selection Sets the signal level at terminal FM.</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td>H4-08</td>
<td>AO Level Select2</td>
<td>Terminal AM Signal Level Selection Sets the signal level at terminal AM.</td>
<td>0–2</td>
<td>0</td>
</tr>
</tbody>
</table>

**L: Protection Function**

Protection function parameters set momentary power loss processing, fault retries, and hardware protection.

**L2: Momentary Power Loss Ride-Thru**

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-01</td>
<td>PwrL Selection</td>
<td>Momentary Power Loss Operation Selection Disabled. Converter trips on Uv1 fault when power is lost. Recover within the time set in L2-02. Uv1 will be detected if power loss is longer than L2-02. Recover as long as CPU has power. Uv1 is not detected.</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td>L2-02</td>
<td>PwrL Ridethru t</td>
<td>Momentary Power Loss Ride-Thru Time Sets the Power Loss Ride-Thru time. Enabled only when L2-01 = 1 or 3.</td>
<td>0.0–25.5 sec</td>
<td>&lt;2&gt;</td>
</tr>
<tr>
<td>L2-05</td>
<td>PUV Det Level</td>
<td>Undervoltage Detection Level (Uv) There is normally no need to change this parameter from the default value.</td>
<td>230 V: 150–210 V 460 V: 300–420 V</td>
<td>230 V: 190 460 V: 380</td>
</tr>
<tr>
<td>L2-21</td>
<td>AC UV Level</td>
<td>AUv Detection Level Sets the undervoltage detection level for power supply voltage (AC) in volts.</td>
<td>230 V: 100–200 V 460 V: 200–400 V</td>
<td>230 V: 150 460 V: 300</td>
</tr>
</tbody>
</table>

<2> Default setting is dependent on parameter o2-04, Drive Model Selection.
### L5: Fault Restart

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L5-01</td>
<td>Num of Restarts</td>
<td>Number of Auto Restart Attempts</td>
<td>0–10 times</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the number of times the converter may attempt to restart after the following faults occur: GF, oC, oL2, ov, Uv1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L5-02</td>
<td>Restart Sel</td>
<td>Auto Restart Fault Output Operation Selection</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fault output not active. Fault output active during restart attempt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0       Flt Outp Disabld</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1       Flt Outp Enabled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L5-04</td>
<td>Flt Reset Wait T</td>
<td>Fault Reset Interval Time</td>
<td>0.5–600.0 sec</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the amount of time to wait between performing fault restarts.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<2> Default setting is dependent on parameter o2-04, Drive Model Selection.
### L5-05 Fault Reset Sel

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
</table>
| L5-05          | Fault Reset Sel      | Fault Reset Operation Selection  
0  Continuous  
1  Use L5-04 Time  
Continuously attempt to restart while incrementing restart counter only at a successful restart.  
Attempt to restart with the interval time set in L5-04 and increment the restart counter with each attempt. | 0, 1       | 0              |

### L7: Torque Limit

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
</table>
| L7-25          | Motoring I Limit     | Active Current Limit at Power Supply Side  
Sets the limit for the active current at the power supply side. | 0–200%    | 200           |
| L7-26          | Regen I Limit        | Active Current Limit at Regeneration Side  
Sets the limit for the active current at the regeneration side. | 0–200%    | 200           |

### L8: Drive Protection

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
</table>
| L8-02          | OH Pre-Alarm Lvl     | Overheat Alarm Level  
An overheat alarm occurs when heatsink temperature exceeds the L8-02 level. | 50–150°C   | <2>           |
| L8-03          | OH Pre-Alarm Sel     | Overheat Pre-Alarm Operation Selection  
Ramp to stop. A fault is triggered.  
Continue operation. An alarm is triggered. | 0, 3       | 3             |
| L8-09          | Gnd Flt Det Sel      | Output Ground Fault Detection Selection | 0, 1       | <2>           |
| L8-10          | Fan On/Off Sel       | Heatsink Cooling Fan Operation Selection  
During run only. Fan operates only during run for L8-11 seconds after stop.  
Fan always on. Cooling fan operates whenever the converter is powered up. | 0, 1       | 0             |
| L8-11          | Fan Delay Time       | Heatsink Cooling Fan Off Delay Time  
Sets a delay time to shut off the cooling fan after the Run command is removed when L8-10 = 0. | 0–300 sec | 60            |

<1> Default setting is dependent on parameter o2-04, Drive Model Selection.
### Parameter Code | Parameter Name | Function | Range | Initial Value
--- | --- | --- | --- | ---
L8-12 | Ambient Temp | Ambient Temperature Setting | -10–50°C | 40

L8-35 | Installation Sel | Installation Method Selection | 0, 1, 3 | <2>

0 | IP00/OpenChassis Enclosure |
1 | Side-by-Side mounting |
3 | External Heatsink Installation |

L8-41 | High Cur Alm Sel | High Current Alarm Selection | 0, 1 | 0

0 | Disabled |
1 | Enabled |

Enabled. An alarm is triggered at output currents above 150% of converter rated current.

L8-65 | Vpn Ripple Sel | Power Supply Fault Detection Selection | 0–2 | 0

0 | Disabled |
1 | Coast to Stop |
2 | Alarm Only |


L8-67 | Vpn Ripple Cnt | Number of Times of Power Supply Fault for Detection | 1–10 | 5

<1> Default setting is dependent on parameter o2-04, Drive Model Selection.
o: Operator-Related Settings

The o parameters set up the digital operator displays.

### o1: Digital Operator Display Selection

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L8-69</td>
<td>AC Phase Imb Det</td>
<td>Input Phase Loss Protection Selection 3</td>
<td>0, 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets whether to enable or disable the protective function for the converter when there is an input phase loss.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 Disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L8-78</td>
<td>LF3 Det Sel</td>
<td>Module Phase Loss (LF3) Protection</td>
<td>0, 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enables phase loss protection for the input terminals R/L1, S/L2, T/L3 or R1/L11, S1/L21, T1/L31.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 Disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE:</strong> This parameter is available in model 41040-D+.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<1> Default setting is dependent on parameter o2-04, Drive Model Selection.

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>o1-01</td>
<td>User Monitor Sel</td>
<td>Drive Mode Converter Monitor Selection</td>
<td>110–914</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When the power supply is turned on, the operator will display the following in order: DC Bus Voltage Reference, DC Bus Voltage Feedback, DC Current Reference, Power Supply Voltage, Power Supply Frequency, and U1-xx.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The o1-01 parameter sets the item to display instead of the output voltage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The o1-02 parameter sets the item to display at power up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o1-02</td>
<td>Power-On Monitor</td>
<td>User Monitor Selection after Power Up</td>
<td>1–5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selects the information displayed on the digital operator when the power is turned on.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency Ref</td>
<td>Output Voltage Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FWD/REV</td>
<td>Output Voltage Feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output Freq</td>
<td>Output Current</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output Current</td>
<td>Input Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Monitor</td>
<td>User monitor item set in o1-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o1-05 &lt;7&gt;</td>
<td>LCD Contrast</td>
<td>LCD Contrast Control</td>
<td>0–5</td>
<td>3</td>
</tr>
</tbody>
</table>

<7> Parameter is available in software versions PRG: 2003 and later (PRG: 3010 and later in 41040-D+).
### o2: Digital Operator Keypad Functions

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>o2-01</td>
<td>LO/RE Key</td>
<td>LO/RE Key Function Selection</td>
<td>0, 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0 Disabled</td>
<td>LO/RE key switches between LOCAL and REMOTE operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Enabled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o2-02</td>
<td>Oper STOP Key</td>
<td>STOP Key Function Selection</td>
<td>0, 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0 Disabled</td>
<td>STOP key is disabled in REMOTE operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Enabled</td>
<td>STOP key is always enabled.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o2-03</td>
<td>User Default Sel</td>
<td>User Parameter Default Value</td>
<td>0–2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 No Change</td>
<td>No change.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Save User Init</td>
<td>Set defaults. Saves parameter settings as default values for a User Initialization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Clear User Init</td>
<td>Clear all. Clears the default settings that have been saved for a User Initialization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o2-04</td>
<td>Inverter Model #</td>
<td>Drive Model Selection</td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter the converter model. Setting required only if installing a new control board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o2-06</td>
<td>Oper Discon Det</td>
<td>Operation Selection when Digital Operator is Disconnected Determines the operation when the digital operator is disconnected.</td>
<td>0, 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0 Disabled</td>
<td>The converter continues operating if the digital operator is disconnected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Enabled</td>
<td>A fault is triggered (oPr) and the motor coasts to stop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o2-09</td>
<td>--</td>
<td>Reserved</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>o2-21</td>
<td>US signal check</td>
<td>Converter Check Sets the operation for Converter Capacity Setting Fault (oPE01). Set this parameter to 1 to reset an oPE01 fault without cycling the power supply.</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 Normal</td>
<td>Standard, recheck converter (The parameter returns to 0 after it is set.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Start</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### o3: Copy Function

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>o3-01</td>
<td>COPY SELECT</td>
<td>Copy Function Select</td>
<td>0–3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0 COPY SELECT</td>
<td>No action</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 INV→OP READ</td>
<td>Read parameters from the converter, saving them onto the digital operator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 OP→INV WRITE</td>
<td>Copy parameters from the digital operator, writing them to the converter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 OP←→INV VERIFY</td>
<td>Verify parameter settings on the converter to check if they match the data saved on the operator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o3-02</td>
<td>Read Allowable</td>
<td>Copy Allowed Selection</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 Disabled</td>
<td>Read operation prohibited</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Enabled</td>
<td>Read operation allowed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### o4: Maintenance Monitor Settings

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Range</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>o4-01</td>
<td>DrvElapsTimeCnt</td>
<td>Cumulative Operation Time Setting</td>
<td>0–9999 H</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the value for the cumulative operation time of the converter in units of 10 h.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-02</td>
<td>ElapsTimeCntSet</td>
<td>Cumulative Operation Time Selection</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Logs power-on time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Logs operation time when the converter output is active (output operation time).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-03</td>
<td>FanElapsTimeCn</td>
<td>Cooling Fan Operation Time Setting</td>
<td>0–9999 H</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the value of the fan operation time monitor U4-03 in units of 10 h.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-05</td>
<td>BusCap Maint Set</td>
<td>Capacitor Maintenance Setting</td>
<td>0–150%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the value of the Maintenance Monitor for the capacitors. See U4-05 to check when the capacitors may need to be replaced.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-07</td>
<td>ChrgCircMaintSet</td>
<td>DC Bus Pre-Charge Relay Maintenance Setting</td>
<td>0–150%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sets the value of the Maintenance Monitor for the soft charge bypass relay. See U4-06 to check when the bypass relay may need to be replaced.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameter Code</td>
<td>Parameter Name</td>
<td>Function</td>
<td>Range</td>
<td>Initial Value</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------------</td>
</tr>
<tr>
<td>o4-11</td>
<td>Fault Data Init</td>
<td>U2, U3 Initialization U2-xx and U3-xx monitor data is not reset when the converter is initialized (A1-03).</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U4-10 and U4-11 monitor data is reset when the converter is initialized (A1-03).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 No Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-12</td>
<td>kWh Monitor Init</td>
<td>kWh Monitor Initialization U4-10 and U4-11 monitor data is not reset when the converter is initialized (A1-03).</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled. An alarm is triggered at output currents above 150% of converter rated current.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 No Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-13</td>
<td>Run Counter Init</td>
<td>Number of Run Commands Counter Initialization Number of Run commands counter is not reset when the converter is initialized (A1-03).</td>
<td>0, 1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of Run commands counter is reset when the converter is initialized (A1-03).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 No Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o4-19</td>
<td>Cost per 1 kWh</td>
<td>Power Unit Price This parameter is used to calculate the power rate that is displayed for User Monitors U9-07 through U9-14. Set the price per 1 kWh.</td>
<td>000.00–650.00</td>
<td>000.00</td>
</tr>
</tbody>
</table>
U: Monitors

Monitor parameters allow the user to view converter status, fault information, and other data concerning converter operation.

**U1: Operation Status Monitors**

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1-10</td>
<td>Input Term Sts</td>
<td>Input Terminal Status</td>
<td>No signal output</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the input terminal status.</td>
<td>available</td>
<td></td>
</tr>
<tr>
<td>U1-11</td>
<td>Output Term Sts</td>
<td>Output Terminal Status</td>
<td>No signal output</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the output terminal status.</td>
<td>available</td>
<td></td>
</tr>
</tbody>
</table>

**Diagram for U1-10**

```
U1-10=00000000
1: ON  D: OFF
• Digital input 1 (terminal S1 enabled)
• Digital input 2 (terminal S2 enabled)
• Digital input 3 (terminal S3 enabled)
• Digital input 4 (terminal S4 enabled)
• Digital input 5 (terminal S5 enabled)
• Digital input 6 (terminal S6 enabled)
• Digital input 7 (terminal S7 enabled)
• Digital input 8 (terminal S8 enabled)
```

**Diagram for U1-11**

```
U1-11=00000000
1: ON  D: OFF
• Multi-Function Relay Output (terminal M1-M2)
• Multi-Function Relay Output (terminal M3-M4)
• Multi-Function Relay Output (terminal M5-M6)
• Reserved
• Fault Relay (terminal MA/MB-MC closed MA/MB-MC open)
```
<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1-12</td>
<td>Int Ctl Sts 1</td>
<td>Drive Status</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verifies the converter operation status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1-13</td>
<td>Term A1 Level</td>
<td>Terminal A1 Input Level</td>
<td>10 V: 100%</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the signal level to analog input terminal A1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1-14</td>
<td>Term A2 Level</td>
<td>Terminal A2 Input Level</td>
<td>10 V: 100%</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the signal level to analog input terminal A2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1-15</td>
<td>Term A3 Level</td>
<td>Terminal A3 Input Level</td>
<td>10 V: 100%</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the signal level to analog input terminal A3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1-18</td>
<td>OPE Error Code</td>
<td>oPE Fault Parameter</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the parameter number that caused the oPE02 or oPE08 operation error.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1-19</td>
<td>Transmit Err</td>
<td>MEMOBUS/Modbus Error Code</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displays the contents of a MEMOBUS/Modbus error.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**U1-12**

- Bit 0: AUv reset: (0: Not completed, 1: Reset)
- Bit 1: PF3 reset: (0: Not completed, 1: Reset)
- Bit 2: Rated frequency detection
  - (0: Not completed, 1: Completed)
- Bit 3: Phase order detection
  - (0: Not completed, 1: Completed)
- Bit 4: Power supply established
  - (0: Not completed, 1: Completed)
- Bit 5: Fdv detection: (0: Not detected, 1: Detected)
- Bit 6: PF3 detection: (0: Not detected, 1: Detected)
- Bit 7: Reserved.

**U1-19**

- 1 CRC Error
- 1 Data Length Error
- 0 Not Used
- 1 Parity Error
- 1 Overrun Error
- 1 Framing Error
- 1 Timed Out
- 0 Not Used

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1-25</td>
<td>CPU 1 SW Number</td>
<td>Software Number (Flash) FLASH ID</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U1-26</td>
<td>CPU 2 SW Number</td>
<td>Software No. (ROM) ROM ID</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U1-27</td>
<td>MessageID (OPR)</td>
<td>Message ID (OPR)</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>Parameter Code</td>
<td>Parameter Name</td>
<td>Function</td>
<td>Analog Output Level</td>
<td>Unit</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>------</td>
</tr>
<tr>
<td>U1-28</td>
<td>MessageID (INV)</td>
<td>Message ID (INV) Shows the message ID number for INV.</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U1-29</td>
<td>CPU 3 SW Number</td>
<td>Software No. (PWM) PWM ID NOTE: This parameter is available in 41040-D+</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U1-51</td>
<td>DC V Command</td>
<td>DC Bus Voltage Reference (Before SFS) Shows the DC bus voltage reference.</td>
<td>230 V 10 V: 400 V 460 V 10 V: 800 V</td>
<td>1 V</td>
</tr>
<tr>
<td>U1-52</td>
<td>DC V Feedback</td>
<td>DC Bus Voltage Feedback Shows the DC bus voltage feedback value.</td>
<td>230 V 10 V: 400 V 460 V 10 V: 800 V</td>
<td>1 V</td>
</tr>
<tr>
<td>U1-53</td>
<td>DC Current</td>
<td>DC Bus Side Current Shows an estimated value of the bus current on the DC side.</td>
<td>10 V: Rated Output Current</td>
<td>1 A</td>
</tr>
<tr>
<td>U1-54</td>
<td>AC Voltage</td>
<td>Power Supply Voltage Shows the power supply voltage.</td>
<td>230 V 10 V: 400 V 460 V 10 V: 800 V</td>
<td>1 V</td>
</tr>
<tr>
<td>U1-55</td>
<td>AC Current</td>
<td>Power Supply Current Shows the current on the power supply side.</td>
<td>10 V: Rated Input Current</td>
<td>1 A</td>
</tr>
<tr>
<td>U1-56</td>
<td>DC Power</td>
<td>DC Bus Side Power Shows the power on the DC side.</td>
<td>10 V: Rated power (output side)</td>
<td>1 kW</td>
</tr>
<tr>
<td>U1-57</td>
<td>AC Power</td>
<td>Power Supply Side Power Shows the power on the power supply side.</td>
<td>10 V: Rated power (input side)</td>
<td>1 kW</td>
</tr>
<tr>
<td>U1-58</td>
<td>AC Frequency</td>
<td>Power Supply Frequency Shows the frequency on the power supply side.</td>
<td>10 V: Rated Frequency</td>
<td>0.1 Hz</td>
</tr>
<tr>
<td>U1-59</td>
<td>AC Current Ref</td>
<td>Power Supply Current Reference Shows the current reference on the power supply side.</td>
<td>10 V: Rated Input Current</td>
<td>1 A</td>
</tr>
<tr>
<td>U1-60</td>
<td>Power Factor</td>
<td>Power Factor Shows the power factor.</td>
<td>10 V: 100%</td>
<td>1%</td>
</tr>
<tr>
<td>U1-61</td>
<td>Active Current</td>
<td>Active Current Shows the active current.</td>
<td>10 V: 100.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>U1-62</td>
<td>Reactive Current</td>
<td>Reactive Current Shows the reactive current.</td>
<td>10 V: 100.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>U1-63</td>
<td>DC Volt SFS Out</td>
<td>DC Bus Voltage Reference (After SFS) Shows the DC bus voltage reference after the soft starter.</td>
<td>230 V 10 V: 400 V 460 V 10 V: 800 V</td>
<td>1 V</td>
</tr>
</tbody>
</table>
### U2: Fault Trace

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U2-01</td>
<td>Current Fault</td>
<td>Displays the current fault.</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U2-02</td>
<td>Last Fault</td>
<td>Shows the previous fault.</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U2-11</td>
<td>Input Term Sts</td>
<td>Displays the input terminal status at the previous fault. Displayed as in U1-10.</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U2-12</td>
<td>Output Term Sts</td>
<td>Displays the output status at the previous fault. Displays the same status displayed in U1-11.</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>Parameter Code</td>
<td>Parameter Name</td>
<td>Function</td>
<td>Analog Output Level</td>
<td>Unit</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>U2-13</td>
<td>Inverter Status</td>
<td>Drive Operation Status at Previous Fault Displays the operation status of</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the converter at the previous fault. Displays the same status displayed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>in U1-12.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-14</td>
<td>Elapsed time</td>
<td>Cumulative Operation Time at Previous Fault Displays the cumulative</td>
<td>No signal output available</td>
<td>1 H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>operation time at the previous fault.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-20</td>
<td>Actual Fin Temp</td>
<td>Heatsink Temperature at Previous Fault Displays the temperature of the</td>
<td>No signal output available</td>
<td>1°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>heatsink when the most recent fault occurred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-28</td>
<td>Fault Axis</td>
<td>Malfunctioned Module Displays the module where the previous fault</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>occurred as a decimal number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: This parameter is only available in 41040-D+.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-51</td>
<td>DC V Command</td>
<td>DC Bus Voltage Reference at Previous Fault (Before SFS) Shows the DC</td>
<td>No signal output available</td>
<td>1 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bus Voltage Reference.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-52</td>
<td>DC V Feedback</td>
<td>DC Bus Voltage Feedback at Previous Fault Shows the DC bus voltage</td>
<td>No signal output available</td>
<td>1 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>feedback value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-53</td>
<td>DC Current</td>
<td>DC Side Current at Previous Fault Shows the estimated current on</td>
<td>No signal output available</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the bus on the DC side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-54</td>
<td>AC Voltage</td>
<td>Power Supply Voltage at Previous Fault Shows the power supply voltage.</td>
<td>No signal output available</td>
<td>1 V</td>
</tr>
<tr>
<td>U2-55</td>
<td>AC Current</td>
<td>Power Supply Side Current at Previous Fault Shows the current on the</td>
<td>No signal output available</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>power supply side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-56</td>
<td>DC Power</td>
<td>DC Side Power at Previous Fault Shows the power on the DC side.</td>
<td>No signal output available</td>
<td>1 kW</td>
</tr>
<tr>
<td>U2-57</td>
<td>AC Power</td>
<td>Power Supply Side Power at Previous Fault Shows the power on the power</td>
<td>No signal output available</td>
<td>1 kW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>supply side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-58</td>
<td>AC Frequency</td>
<td>Power Supply Frequency at Previous Fault Shows the frequency on the</td>
<td>No signal output available</td>
<td>0.1 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>power supply side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2-59</td>
<td>AC Current Ref</td>
<td>Power Supply Side Current Reference at Previous Fault Shows the current</td>
<td>No signal output available</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reference on the power supply side when the most recent fault occurred.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Parameter Code | Parameter Name | Function | Analog Output Level | Unit
--- | --- | --- | --- | ---
U2-60 | Power Factor | Power Factor at Previous Fault Shows the power factor when the most recent fault occurred. | No signal output available | 1% |
U2-61 | Active Current | Active Current Reference at Previous Fault Shows the active current when the most recent fault occurred. | No signal output available | 0.1% |
U2-62 | Reactive Current | Reactive Current Reference at Previous Fault Shows the reactive current when the most recent fault occurred. | No signal output available | 0.1% |
U2-63 | DC V SFS Level | DC Bus Voltage Reference at Previous Fault (After SFS) Shows the DC bus voltage reference after the soft starter. | No signal output available | 1 V |
U2-64 | AVR Input | Avr Input (Voltage Deviation) at Previous Fault Shows the Avr input. | No signal output available | 1 V |
U2-65 | Voltage Ref (Vq) | Control Voltage Reference (Vq) at Previous Fault Shows the control voltage reference (Vq) when the most recent fault occurred. | No signal output available | 1 V |
U2-66 | Voltage Ref (Vd) | Control Voltage Reference (Vd) at Previous Fault Shows the control voltage reference (Vd) when the most recent fault occurred. | No signal output available | 1 V |

### U3: Fault History

| Parameter Code | Parameter Name | Function | Analog Output Level | Unit |
--- | --- | --- | --- | ---
U3-01 to U3-04 | Fault Message | First to 4th Most Recent Fault Displays the first to the fourth most recent faults. | No signal output available | -- |
U3-05 to U3-10 | Fault Message | 5th to 10th Most Recent Fault Displays the fifth to the tenth most recent faults. After ten faults, data for the oldest fault is deleted. The most recent fault appears in U3-01, with the next most recent fault appearing in U3-02. The data is moved to the next monitor parameter each time a fault occurs. | No signal output available | -- |
U3-11 to U3-14 | Elapsed Time | Cumulative Operation Time at 1st to 4th Most Recent Fault Displays the cumulative operation time when the first to the fourth most recent faults occurred. | No signal output available | 1 h |
U3-15 to U3-20 | Elapsed Time | Cumulative Operation Time at 5th to 10th Most Recent Fault Displays the cumulative operation time when the fifth to the tenth most recent faults occurred. | No signal output available | 1 h |
# U4: Maintenance Monitors

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U4-01 &lt;4&gt;</td>
<td>Drv Elapsed Time</td>
<td>Displays the cumulative operation time of the converter. The value for the cumulative operation time counter can be reset in parameter o4-01. Use parameter o4-02 to determine if the operation time should start as soon as the power is switched on or only while the Run command is present. The maximum number displayed is 99999, after which the value is reset to 0.</td>
<td>No signal output available</td>
<td>1 h</td>
</tr>
<tr>
<td>U4-02</td>
<td>RUN Cmd Counter</td>
<td>Number of Run Commands Displays the number of times the Run command is entered. Reset the number of Run commands using parameter o4-13. This value will reset to 0 and start counting again after reaching 65535.</td>
<td>No signal output available</td>
<td>1 time</td>
</tr>
<tr>
<td>U4-03 &lt;5&gt;</td>
<td>Fan Elapsed Time</td>
<td>Cooling Fan Operation Time Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter o4-03. This value will reset to 0 and start counting again after reaching 99999.</td>
<td>No signal output available</td>
<td>1 h</td>
</tr>
<tr>
<td>U4-04</td>
<td>Fan Life Mon</td>
<td>Cooling Fan Maintenance Displays main cooling fan usage time as a percentage of its expected performance life. Parameter o4-03 can be used to reset this monitor. Replace the fan when this monitor reaches 90%.</td>
<td>No signal output available</td>
<td>1%</td>
</tr>
<tr>
<td>U4-05</td>
<td>Cap Life Mon</td>
<td>Capacitor Maintenance Displays main circuit capacitor usage time as a percentage of their expected performance life. Parameter o4-05 can be used to reset this monitor. Replace the capacitor when this monitor reaches 90%.</td>
<td>No signal output available</td>
<td>1%</td>
</tr>
<tr>
<td>U4-06</td>
<td>ChgCirc Life Mon</td>
<td>Soft Charge Bypass Relay Maintenance Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. Parameter o4-07 can be used to reset this monitor. Replace the soft charge bypass relay when this monitor reaches 90%.</td>
<td>No signal output available</td>
<td>1%</td>
</tr>
<tr>
<td>U4-08</td>
<td>Heatsink Temp</td>
<td>Heatsink Temperature Displays the heatsink temperature.</td>
<td>10 V: 100°C</td>
<td>1°C</td>
</tr>
<tr>
<td>U4-09</td>
<td>LED Oper Check</td>
<td>LED Check Lights all segments of the LED to verify that the display is working properly.</td>
<td>No signal output available</td>
<td>--</td>
</tr>
</tbody>
</table>

<4> The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 0099H.

<5> The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 009BH.
<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U4-13</td>
<td>Current PeakHold</td>
<td>Displays the highest current value that occurred during run.</td>
<td>No signal output available</td>
<td>1 A</td>
</tr>
<tr>
<td>U4-18</td>
<td>Reference Source</td>
<td>DC BUS Voltage Reference Source Selection. Displays the source for the DC BUS voltage reference as XY-nn. X: indicates which reference is used: 1 = Reference 1 (b1-01) Y-nn: indicates the reference source 0-01 = Digital operator 1-01 = Analog (terminal A1) 1-02 = Analog (terminal A2) 1-03 = Analog (terminal A3) 3-01 = MEMOBUS/Modbus communications 4-01 = Communication option card 8-01 = Depends on b1-18</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U4-20</td>
<td>Option Freq Ref</td>
<td>Option DC voltage Reference Displays the DC bus voltage reference input by an option card (decimal).</td>
<td>0.01%</td>
<td>--</td>
</tr>
<tr>
<td>U4-35</td>
<td>UV Alarm Axis</td>
<td>Power Supply Module Undervoltage (Uv). Displays the module where power supply Undervoltage (Uv) occurred in binary. &lt;NOTE: This setting is available only in model 41040-D+.&gt;</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U4-36</td>
<td>OV Alarm Axis</td>
<td>Power Supply Module Overvoltage (ov). Displays the module where power supply Overvoltage (ov) occurred in binary. &lt;NOTE: This setting is available only in model 41040-D+.&gt;</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U4-37</td>
<td>OH Alarm Axis</td>
<td>Heatsink Overheat (oH) Module Displays the module where Heatsink Overheat (oH) occurred in binary. &lt;NOTE: This setting is available only in model 41040-D+.&gt;</td>
<td>No signal output available</td>
<td>--</td>
</tr>
<tr>
<td>U4-38</td>
<td>FAN Alarm Axis</td>
<td>Cooling Fan Error (FAn) Module Displays the module where Cooling Fan Error (FAn) occurred in binary. &lt;NOTE: This setting is available only in model 41040-D+.&gt;</td>
<td>No signal output available</td>
<td>--</td>
</tr>
</tbody>
</table>

<4> The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 0099H.

<5> The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 009BH.
### U6: Operation Status Monitors

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U6-80 to U6-99</td>
<td>–</td>
<td>Option Monitors 1 to 20 option cards are connected.</td>
<td>No signal output available</td>
<td>–</td>
</tr>
</tbody>
</table>

- **U6-80 to U6-99**
  - Option Monitors 1 to 20
  - Shows the monitor information for Option Monitor 1 (876 hex) to 20 (6FF hex).
  - This information is displayed when option cards are connected.
  - 230 V Class: 100% = 400 VDC
  - 460 V Class: 100% = 800 VDC

### U9: Operation Status Monitor

<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U9-01</td>
<td>GWh Consumed</td>
<td>Electric Power (GWh)</td>
<td>0 to 999</td>
<td>1GWh</td>
</tr>
<tr>
<td>U9-02</td>
<td>MWh Consumed</td>
<td>Electric Power (MWh)</td>
<td>0 to 999</td>
<td>1MWh</td>
</tr>
<tr>
<td>U9-03</td>
<td>kWh Consumed</td>
<td>Electric Power (kWh)</td>
<td>0 to 999</td>
<td>1kWh</td>
</tr>
<tr>
<td>U9-04</td>
<td>Regenerative Power (GWh)</td>
<td>GWh Produced</td>
<td>0 to 999</td>
<td>1GWh</td>
</tr>
<tr>
<td>U9-05</td>
<td>Regenerative Power (MWh)</td>
<td>MWh Produced</td>
<td>0 to 999</td>
<td>1MWh</td>
</tr>
<tr>
<td>U9-06</td>
<td>Regenerative Power (kWh)</td>
<td>kWh Produced</td>
<td>0 to 999</td>
<td>1kWh</td>
</tr>
</tbody>
</table>

**Diagram:**

```
  000 000 000 kW
  |     |
U9-03 - U9-02 - U9-01
```

```
  000 000 000 kW
  |     |
U9-06 - U9-05 - U9-04
```
<table>
<thead>
<tr>
<th>Parameter Code</th>
<th>Parameter Name</th>
<th>Function</th>
<th>Analog Output Level</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U9-07 to U9-10</td>
<td>Consumed [ ] ($)</td>
<td>Electric Power Rates 1 to 4 These parameters show the electric power rate in Power Unit Price (o4-19) that is calculated from the total electrical power consumptions in U9-01 to U9-03. U9-10: Digit 1 to digit 3 U9-09: Digit 4 to digit 6 U9-08: Digit 7 to digit 9 U9-07: Digit 10 to digit 12</td>
<td>0 to 999</td>
<td>--</td>
</tr>
<tr>
<td>U9-11 to U9-14</td>
<td>Produced [ ] ($)</td>
<td>Regenerative Power Rates 1 to 4 These parameters show the regenerative power rate in Power Unit Price (o4-19) that is calculated from the total electrical power consumptions in U9-04 to U9-06. U9-14: Digit 1 to digit 3 U9-13: Digit 4 to digit 6 U9-12: Digit 7 to digit 9 U9-11: Digit 10 to digit 12</td>
<td>0 to 999</td>
<td>--</td>
</tr>
</tbody>
</table>
Defaults by Converter Model

The following tables show parameters and default settings that change with o2-04 (drive model selection).

**Table B-1: 230 V Class Model Default Settings by Converter Model Selection**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Unit</th>
<th>2015-D+</th>
<th>2030-D+</th>
<th>2057-D+</th>
<th>2083-D+</th>
<th>2140-D+</th>
<th>2200-D+</th>
<th>2270-D+</th>
<th>2400-D+</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-02</td>
<td>Momentary Power Loss Ride-Thru Time</td>
<td>s</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>L2-05</td>
<td>Undervoltage Detection Level (Uv)</td>
<td>V</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
</tr>
<tr>
<td>L2-21</td>
<td>AUv Detection Level</td>
<td>V</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>L8-02</td>
<td>Overheat Alarm Level</td>
<td>°C</td>
<td>110</td>
<td>125</td>
<td>115</td>
<td>125</td>
<td>130</td>
<td>135</td>
<td>135</td>
<td>130</td>
</tr>
<tr>
<td>L8-09</td>
<td>Output Ground Fault Detection Selection</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
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<td>L8-66</td>
<td>Power Supply Fault Detection Voltage Level</td>
<td>%</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
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<td>50</td>
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<tr>
<td>C7-47</td>
<td>Adjustment Reactor 1</td>
<td>mH</td>
<td>2.450</td>
<td>1.267</td>
<td>0.645</td>
<td>0.443</td>
<td>0.263</td>
<td>0.184</td>
<td>0.136</td>
<td>0.092</td>
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<td>C7-51</td>
<td>Adjustment Reactor 2</td>
<td>mH</td>
<td>0.809</td>
<td>0.418</td>
<td>0.213</td>
<td>0.146</td>
<td>0.087</td>
<td>0.061</td>
<td>0.045</td>
<td>0.030</td>
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<td>3</td>
<td>3</td>
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<tr>
<td>L8-35</td>
<td>Installation Method Selection</td>
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<td>0</td>
<td>0</td>
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**Table B-2: 460 V Class Model Default Settings by Converter Model Selection**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Unit</th>
<th>4008-D+</th>
<th>4016-D+</th>
<th>4030-D+</th>
<th>4043-D+</th>
<th>4058-D+</th>
<th>4086-D+</th>
<th>4145-D+</th>
<th>4210-D+</th>
<th>4300-D+</th>
<th>4410-D+</th>
<th>4560-D+</th>
<th>41040-D+</th>
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<tbody>
<tr>
<td>d8-01</td>
<td>DC Bus Voltage Reference</td>
<td>V</td>
<td>660</td>
<td>660</td>
<td>660</td>
<td>660</td>
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<td>660</td>
<td>660</td>
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<td>660</td>
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<tr>
<td>L2-02</td>
<td>Momentary Power Loss Ride-Thru Time</td>
<td>s</td>
<td>0.5</td>
<td>1.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
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<td>L2-05</td>
<td>Undervoltage Detection Level (Uv)</td>
<td>V</td>
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<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
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<td>380</td>
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<td>L2-21</td>
<td>AUv Detection Level</td>
<td>V</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
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<td>L8-02</td>
<td>Overheat Alarm Level</td>
<td>°C</td>
<td>110</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>130</td>
<td>145</td>
<td>140</td>
<td>140</td>
<td>130</td>
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<tr>
<td>L8-09</td>
<td>Output Ground Fault Detection Selection</td>
<td></td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>L8-66</td>
<td>Power Supply Fault Detection Voltage Level</td>
<td>%</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
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<td>50</td>
<td>50</td>
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<td>50</td>
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<tr>
<td>C7-47</td>
<td>Adjustment Reactor 1</td>
<td>mH</td>
<td>9.189</td>
<td>4.594</td>
<td>2.450</td>
<td>1.710</td>
<td>1.267</td>
<td>0.855</td>
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<td>0.350</td>
<td>0.245</td>
<td>0.179</td>
<td>0.131</td>
<td>0.064</td>
</tr>
<tr>
<td>C7-51</td>
<td>Adjustment Reactor 2</td>
<td>mH</td>
<td>3.308</td>
<td>1.654</td>
<td>0.882</td>
<td>0.615</td>
<td>0.456</td>
<td>0.308</td>
<td>0.183</td>
<td>0.126</td>
<td>0.088</td>
<td>0.065</td>
<td>0.047</td>
<td>0.023</td>
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<td>C6-02</td>
<td>Carrier Frequency Selection</td>
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<tr>
<td>L8-35</td>
<td>Installation Method Selection</td>
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</tr>
</tbody>
</table>
Appendix C

Standards Compliance
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Section Safety

WARNING

ELECTRICAL SHOCK HAZARD

Do not operate equipment with covers removed. Failure to comply could result in death or serious injury.

The diagrams in this section may show converters without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the converters and run the converters according to the instructions described in this manual.

Do not connect or disconnect wiring while the power is on. Failure to comply will result in death or serious injury.

Always ground the motor-side grounding terminal. Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not touch any terminals before the capacitors have fully discharged. Failure to comply could result in death or serious injury.

Before wiring terminals, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the converter before touching any components.

Do not allow unqualified personnel to perform work on the converter. Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of AC converters.

Do not perform work on the converter while wearing loose clothing, jewelry, or lack of eye protection. Failure to comply could result in death or serious injury.

Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the converter.

Do not remove covers or touch circuit boards while the power is on. Failure to comply could result in death or serious injury.

FIRE HAZARD

Tighten all terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use an improper voltage source. Failure to comply could result in death or serious injury by fire.

Verify that the rated voltage of the converter matches the voltage of the incoming power supply before applying power.

Do not use improper combustible materials. Failure to comply could result in death or serious injury by fire.

Attach the converter to metal or other noncombustible material.
NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the converter and circuit boards.
Failure to comply may result in ESD damage to the converter circuitry.

Never connect or disconnect the motor from the converter while the converter is outputting voltage.
Improper equipment sequencing could result in damage to the converter.

Do not use unshielded cable for control wiring.
Failure to comply may cause electrical interference resulting in poor system performance. Use shielded twisted-pair wires and ground the shield to the ground terminal of the converter.

Do not allow unqualified personnel to use the product.
Failure to comply could result in damage to the converter.

Do not modify the converter circuitry.
Failure to comply could result in damage to the converter and will void warranty.

Magnetek is not responsible for any modification of the product made by the user. This product must not be modified.

Check all the wiring to ensure that all connections are correct after installing the converter and connecting any other devices.
Failure to comply could result in damage to the converter.

If a fuse is blown or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices.
Contact your supplier if the cause cannot be identified after checking the above.

Do not restart the converter immediately operate the peripheral devices if a fuse is blown or a GFCI is tripped.
Check the wiring and the selection of peripheral devices to identify the cause. Contact your supplier before restarting the converter or the peripheral devices if the cause cannot be identified.
European Standards

**CE Mark**

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling electrical noise.

This converter displays the CE mark based on the EMC guidelines and the Low Voltage Directive.

- Low Voltage Directive: 2006/95/EC
- EMC Guidelines: 2004/108/EC

Devices used in combination with this converter must also be CE certified and display the CE mark. When using converter displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

**CE Low Voltage Directive Compliance**

This converter has been tested according to European standard IEC61800-5-1, and it fully complies with the Low Voltage Directive.

To comply with the Low Voltage Directive, be sure to meet the following conditions when combining this converter with other devices:

**Area of Use**

Do not use converter in areas with pollution higher than severity 2 and overvoltage category 3 in accordance with IEC664.

**Factory Recommended Branch Circuit Protection**

Install appropriate harmonic filter module that has built-in input fuses to the input side to protect converter wiring and prevent other secondary damage. Select harmonic filter module according to Table C-1.

Refer to Power Ratings on page A-3 for details on the converter Input Current and Rated Output Current.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If a fuse is blown or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of peripheral devices to identify the cause. Contact Magnetek before restarting the converter or the peripheral devices if the cause cannot be identified.</td>
</tr>
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</table>
Table C-1: Harmonic Filter Module and Recommended Fuses

<table>
<thead>
<tr>
<th>Model</th>
<th>Harmonic Filter Module</th>
<th>Fuse</th>
<th>Manufacturer</th>
<th>Fuse Ampere Rating (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+</td>
<td>HF-2015-D+</td>
<td>350GH-32ULTC</td>
<td>HINODE</td>
<td>32</td>
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<tr>
<td>2030-D+</td>
<td>HF-2030-D+</td>
<td>350GH-50ULTC</td>
<td>HINODE</td>
<td>50</td>
</tr>
<tr>
<td>2057-D+</td>
<td>HF-2057-D+</td>
<td>350GH-125ULTC</td>
<td>HINODE</td>
<td>125</td>
</tr>
<tr>
<td>2083-D+</td>
<td>HF-2083-D+</td>
<td>170M1371</td>
<td>BUSSMANN</td>
<td>250</td>
</tr>
<tr>
<td>2140-D+</td>
<td>HF-2140-D+</td>
<td>350GH-250ULTC</td>
<td>HINODE</td>
<td>250</td>
</tr>
<tr>
<td>2200-D+</td>
<td>HF-2200-D+</td>
<td>170M4015</td>
<td>BUSSMANN</td>
<td>550</td>
</tr>
<tr>
<td>2270-D+</td>
<td>HF-2270-D+</td>
<td>170M4016</td>
<td>BUSSMANN</td>
<td>630</td>
</tr>
<tr>
<td>2400-D+</td>
<td>HF-2400-D+</td>
<td>170M4019</td>
<td>BUSSMANN</td>
<td>900</td>
</tr>
</tbody>
</table>

230 V Class

<table>
<thead>
<tr>
<th>Model</th>
<th>Harmonic Filter Module</th>
<th>Fuse</th>
<th>Manufacturer</th>
<th>Fuse Ampere Rating (A)</th>
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</thead>
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<tr>
<td>4008-D+</td>
<td>HF-4008-D+</td>
<td>660GH-16ULTC</td>
<td>HINODE</td>
<td>16</td>
</tr>
<tr>
<td>4016-D+</td>
<td>HF-4016-D+</td>
<td>660GH-40ULTC</td>
<td>HINODE</td>
<td>40</td>
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<tr>
<td>4030-D+</td>
<td>HF-4030-D+</td>
<td>660GH-63ULTC</td>
<td>HINODE</td>
<td>63</td>
</tr>
<tr>
<td>4043-D+</td>
<td>HF-4043-D+</td>
<td>170M1369</td>
<td>BUSSMANN</td>
<td>160</td>
</tr>
<tr>
<td>4058-D+</td>
<td>HF-4058-D+</td>
<td>170M1370</td>
<td>BUSSMANN</td>
<td>200</td>
</tr>
<tr>
<td>4086-D+</td>
<td>HF-4086-D+</td>
<td>660GH-200ULTC</td>
<td>HINODE</td>
<td>200</td>
</tr>
<tr>
<td>4145-D+</td>
<td>HF-4145-D+</td>
<td>660GH-315ULTC</td>
<td>HINODE</td>
<td>315</td>
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<tr>
<td>4210-D+</td>
<td>HF-4210-D+</td>
<td>170M4016</td>
<td>BUSSMANN</td>
<td>630</td>
</tr>
<tr>
<td>4300-D+</td>
<td>HF-4300-D+</td>
<td>170M4018</td>
<td>BUSSMANN</td>
<td>800</td>
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<tr>
<td>4410-D+</td>
<td>--</td>
<td>170M6014</td>
<td>BUSSMANN</td>
<td>1000</td>
</tr>
<tr>
<td>4560-D+</td>
<td>--</td>
<td>170M6016</td>
<td>BUSSMANN</td>
<td>1250</td>
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<tr>
<td>41040-D+</td>
<td>--</td>
<td>170M6016</td>
<td>BUSSMANN</td>
<td>1250</td>
</tr>
</tbody>
</table>

460 V Class

**Grounding**

The converter is designed to be used in T-N (grounded neutral point) networks. If installing the converter in other types of grounded systems, contact your Magnetek representative for instructions.

**Guarding Against Harmful Materials**

When installing IP00 enclosure converters, use an enclosure that prevents foreign material from entering the converter from above or below.

**EMC Guidelines Compliance**

This converter is tested according to European standards IEC/EN61800-3: 2004, and complies with the European standards IEC/EN12015 (requires an optional AC reactor) and IEC/EN12016.

**EMC Filter Installation**

The following conditions must be met to ensure continued compliance with guidelines. Refer to EMC Filters on page C-8 for EMC filter selection.
Installation Method

Verify the following installation conditions to ensure that other devices and machinery used in combination with this converter also comply with EMC guidelines.

1. Install an EMC noise filter to the input side specified by Magnetek for compliance with European standards.
2. Place the converter and EMC noise filter in the same enclosure.
3. Use braided shield cable for the converter and motor wiring, or run the wiring through a metal conduit.
4. Keep wiring as short as possible. Ground the shield on both the converter side and the motor side.
5. Make sure the protective earthing conductor complies with technical standards and local safety regulations.

Figure C-2: Ground Area

A – Braided shield cable
B – Metal panel
C – Cable clamp (conductive)

Figure C-3: Wiring Diagram for EMC (Models 2015-D+ to 2400-D+, 4008-D+ to 4300-D+)
EMC Filters

The converter should be installed with the EMC filters listed in Table C-2 in order to comply with the IEC/EN61800-3 requirements.

Table C-2: IEC/EN61800-3 Filters

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Rated Current (A)</th>
<th>Weight kg (lb)</th>
<th>Dimensions [W x H x D] mm (in)</th>
<th>Y x X mm (in)</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 V Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015-D+</td>
<td>RTEN-2030D6E2-00</td>
<td>TDK-Lambda</td>
<td>30</td>
<td>0.56 (1.2)</td>
<td>146 × 42 × 70 (5.7 × 1.7 × 2.8)</td>
<td>60 × 130 (2.4 × 5.1)</td>
<td>C-5</td>
</tr>
<tr>
<td>2030-D+</td>
<td>RTEN-2030D6E2-00</td>
<td>TDK-Lambda</td>
<td>30</td>
<td>0.56 (1.2)</td>
<td>146 × 42 × 70 (5.7 × 1.7 × 2.8)</td>
<td>60 × 130 (2.4 × 5.1)</td>
<td>C-5</td>
</tr>
<tr>
<td>2057-D+</td>
<td>RTEN-2060G6E2-00</td>
<td>TDK-Lambda</td>
<td>60</td>
<td>3.9 (8.6)</td>
<td>267 × 85 × 161 (10.5 × 3.3 × 6.3)</td>
<td>135 × 247 (5.3 × 9.7)</td>
<td>C-6</td>
</tr>
<tr>
<td>2083-D+</td>
<td>RTEN-2100G6E2-00</td>
<td>TDK-Lambda</td>
<td>100</td>
<td>4.2 (9.3)</td>
<td>267 × 85 × 161 (10.5 × 3.3 × 6.3)</td>
<td>135 × 247 (5.3 × 9.7)</td>
<td>C-7</td>
</tr>
<tr>
<td>2140-D+</td>
<td>RTEN-2150G6E2-00</td>
<td>TDK-Lambda</td>
<td>150</td>
<td>6.5 (14.3)</td>
<td>290 × 88 × 190 (11.4 × 3.5 × 7.5)</td>
<td>164 × 270 (6.5 × 10.6)</td>
<td>C-8</td>
</tr>
</tbody>
</table>

<p>| 460 V Class |
| 4008-D+ | B84143A0020R106 | EPCOS | 20 | 0.6 (1.3) | 150 × 58 × 57.5 (5.9 × 2.3 × 2.3) | 28 × 132.5 (1.1 × 5.2) | C-10 |
| 4016-D+ | B84143A0020R106 | EPCOS | 20 | 0.6 (1.3) | 150 × 58 × 57.5 (5.9 × 2.3 × 2.3) | 28 × 132.5 (1.1 × 5.2) | C-10 |</p>
<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Rated Current (A)</th>
<th>Weight [kg (lb)]</th>
<th>Dimensions [W x H x D] mm (in)</th>
<th>Y x X mm (in)</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4030-D+</td>
<td>B84143A0035R106</td>
<td>EPCOS</td>
<td>35</td>
<td>0.9 (2.0)</td>
<td>200 × 71 × 72.5 (7.9 × 2.8 × 2.8)</td>
<td>50 × 142.5 (2 × 5.6)</td>
<td>C-11</td>
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<tr>
<td>4043-D+</td>
<td>B84143A0065R106</td>
<td>EPCOS</td>
<td>65</td>
<td>1.9 (4.2)</td>
<td>217 × 80 × 84.5 (8.5 × 3.1 × 3.3)</td>
<td>65 × 152.5 (2.6 × 6)</td>
<td>C-12</td>
</tr>
<tr>
<td>4058-D+</td>
<td>B84143A0065R106</td>
<td>EPCOS</td>
<td>65</td>
<td>1.9 (4.2)</td>
<td>217 × 80 × 84.5 (8.5 × 3.1 × 3.3)</td>
<td>65 × 152.5 (2.6 × 6)</td>
<td>C-12</td>
</tr>
<tr>
<td>4086-D+</td>
<td>B84143B0180S080</td>
<td>EPCOS</td>
<td>180</td>
<td>5 (11.0)</td>
<td>270 × 114 × 170 (10.6 × 4.5 × 6.7)</td>
<td>155 × 145 (6.1 × 5.7)</td>
<td>C-13</td>
</tr>
<tr>
<td>4145-D+</td>
<td>B84143B0180S080</td>
<td>EPCOS</td>
<td>180</td>
<td>5 (11.0)</td>
<td>270 × 114 × 170 (10.6 × 4.5 × 6.7)</td>
<td>155 × 145 (6.1 × 5.7)</td>
<td>C-13</td>
</tr>
<tr>
<td>4210-D+</td>
<td>B84143B0400S080</td>
<td>EPCOS</td>
<td>400</td>
<td>7.5 (16.5)</td>
<td>320 × 120 × 190 (12.6 × 4.7 × 7.5)</td>
<td>165 × 170 (6.5 × 6.7)</td>
<td>C-14</td>
</tr>
<tr>
<td>4300-D+</td>
<td>B84143B0400S080</td>
<td>EPCOS</td>
<td>400</td>
<td>7.5 (16.5)</td>
<td>320 × 20 × 190 (12.6 × 4.7 × 7.5)</td>
<td>165 × 170 (6.5 × 6.7)</td>
<td>C-14</td>
</tr>
<tr>
<td>4410-D+</td>
<td>B84143B1000S080</td>
<td>EPCOS</td>
<td>1000</td>
<td>18.5 (41)</td>
<td>410 × 140 × 260 (16.1 × 5.5 × 10.2)</td>
<td>235 × 240 (9.3 × 9.4)</td>
<td>C-15</td>
</tr>
<tr>
<td>4560-D+</td>
<td>B84143B1000S080</td>
<td>EPCOS</td>
<td>1000</td>
<td>18.5 (41)</td>
<td>410 × 140 × 260 (16.1 × 5.5 × 10.2)</td>
<td>235 × 240 (9.3 × 9.4)</td>
<td>C-15</td>
</tr>
<tr>
<td>41040-D+</td>
<td>B84143B1600S080</td>
<td>EPCOS</td>
<td>1000</td>
<td>24.5 (54)</td>
<td>490 × 140 × 260 (19.3 × 5.5 × 10.2)</td>
<td>235 × 240 (9.3 × 9.4)</td>
<td>C-16</td>
</tr>
</tbody>
</table>

![Figure C-5: EMC Filter Dimensions (2015-D+, 2030-D+)](image-url)
Figure C-6: EMC Filter Dimensions (2057-D+)

Figure C-7: EMC Filter Dimensions (2083-D+)
Figure C-8: EMC Filter Dimensions (2140-D+)

Figure C-9: EMC Filter Dimensions (2200-D+ to 2400-D+)
Figure C-10: EMC Filter Dimensions (4008-D+, 4016-D+)

Figure C-11: EMC Filter Dimensions (4030-D+)
**Figure C-12: EMC Filter Dimensions (4043-D+, 4058-D+)***

![EMC Filter Dimensions (4043-D+, 4058-D+)](image1)

**Figure C-13: EMC Filter Dimensions (4086-D+, 4145-D+)***

![EMC Filter Dimensions (4086-D+, 4145-D+)](image2)
Figure C-14: EMC Filter Dimensions (4210-D+, 4300-D+)

Figure C-15: EMC Filter Dimensions (4410-D+, 4560-D+)
Figure C-16: EMC Filter Dimensions (41040-D+)
UL Standards

The RU mark applies to products in the United States and Canada and it means that UL has performed product testing and evaluation and determined that their stringent standards for product safety have been met. For a product to receive UL certification, all components inside that product must also receive UL certification.

UL Standards Compliance

This converter is tested in accordance with UL standard UL508C and complies with UL requirements. To ensure continued compliance when using this converter in combination with other equipment, meet the following conditions:

Installation Area

Do not install the converter to an area greater than pollution severity 2 (UL standard).

Ambient Temperature

IP00/ Open Type Enclosure: -10°C to +50°C
IP20/ Open Type Enclosure: -10°C to +40°C

Main Circuit Terminal Wiring

Magnetek recommends using closed-loop crimp terminals on all converter models. To maintain UL/cUL approval, UL-Listed closed-loop crimp terminals are specifically required when wiring the converter main circuit terminals on models 2083-D+ to 2400-D+, 4043-D+ to 41040-D+. Use only the tools recommended by the terminal manufacturer for crimping. Refer to Closed-Loop Crimp Terminal Recommendations on page C-21 for closed-loop crimp terminal recommendations. The wire gauges listed in the following tables are Magnetek recommendations. Refer to local codes for proper wire gauge selections.

NOTE: The mark indicates the terminals for protective ground connection as defined in IEC/ EN60417-5019.
Grounding impedance:
230 V: 100 Ω or less
460 V: 10 Ω or less
## Wire Gauges and Tightening Torques

### Table C-3: Wire Gauge and Torque Specifications (Three-Phase 230 V Class)

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recomm. Gauge AWG, kcmil</th>
<th>Wire Range AWG, kcmil</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ 21, t1/ 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>16 to 10</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>2030-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>8</td>
<td>8 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>8</td>
<td>8 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ 21, t1/ 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>12 to 10</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>2057-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>4</td>
<td>4 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>4</td>
<td>4 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ 21, t1/ 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>8 to 6</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>2083-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ 21, t1/ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>6 to 4</td>
<td>M8</td>
<td>9.0 to 11 (79.7 to 97.4)</td>
</tr>
<tr>
<td>2140-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3 x 2P</td>
<td>3 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>1/0 x 2P</td>
<td>1/0 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ 21, t1/ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
</tbody>
</table>
### Table C-4: Wire Gauge and Torque Specifications (Three-Phase 460 V Class)

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal</th>
<th>Recommen. Gauge AWG, kcmil</th>
<th>Wire Range AWG, kcmil</th>
<th>Screw Size</th>
<th>Tightening Torque N-m (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>–, +</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/ ø 11, Δ 1/ ø 21, t1/ ø 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1 to 1/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>2270-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>–, +</td>
<td>3/0 x 2P</td>
<td>3/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/ ø 11, Δ 1/ ø 21, t1/ ø 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/0</td>
<td>1/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>2400-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>300 x 2P</td>
<td>300 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>–, +</td>
<td>300 x 2P</td>
<td>300 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/ ø 11, Δ 1/ ø 21, t1/ ø 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/0</td>
<td>2/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>4008-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>–, +</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ ø 11, Δ 1/ ø 21, t1/ ø 31</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>14 to 12</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>Model</td>
<td>Terminal</td>
<td>Recomm. Gauge AWG, kcmil</td>
<td>Wire Range AWG, kcmil</td>
<td>Screw Size</td>
<td>Tightening Torque N-m (lb-in)</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
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<td>----------------------</td>
<td>------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>4016-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>12</td>
<td>12 to 6</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>12</td>
<td>12 to 16</td>
<td>M4</td>
<td>2.1 to 2.3 (18.6 to 20.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ ( \frac{\text{t/}}{31} )</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td>( \downarrow )</td>
<td>10</td>
<td>12 to 10</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>4030-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>8</td>
<td>8 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>8</td>
<td>8 to 1</td>
<td>M6</td>
<td>3.6 to 4.0 (31.9 to 35.4)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ ( \frac{\text{t/}}{31} )</td>
<td>14</td>
<td>14</td>
<td>M3.5</td>
<td>0.8 to 1.0 (7.1 to 8.9)</td>
</tr>
<tr>
<td></td>
<td>( \downarrow )</td>
<td>8</td>
<td>10 to 8</td>
<td>M6</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td>4043-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>6</td>
<td>6 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>6</td>
<td>6 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ ( \frac{\text{t/}}{31} )</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>( \downarrow )</td>
<td>6</td>
<td>8 to 6</td>
<td>M8</td>
<td>9.0 to 11 (79.7 to 97.4)</td>
</tr>
<tr>
<td>4058-D+</td>
<td>R/L1,S/L2,T/L3</td>
<td>4</td>
<td>4 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>4</td>
<td>4 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ ( \frac{\text{t/}}{31} )</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>( \downarrow )</td>
<td>6</td>
<td>6</td>
<td>M8</td>
<td>9.0 to 11 (79.7 to 97.4)</td>
</tr>
<tr>
<td>4086-D+</td>
<td>R/L1,S/L2,T/L3</td>
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<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
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<td>−, +</td>
<td>2</td>
<td>2 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ 11, Δ 1/ ( \frac{\text{t/}}{31} )</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td>( \downarrow )</td>
<td>6</td>
<td>6</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>Model</td>
<td>Terminal</td>
<td>Recomm. Gauge AWG, kcmil</td>
<td>Wire Range AWG, kcmil</td>
<td>Screw Size</td>
<td>Tightening Torque N·m (lb-in)</td>
</tr>
<tr>
<td>---------</td>
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<td>-----------------------</td>
<td>------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>4145-D+</td>
<td>R/L1,S/L2,T/L3 3 x 2P</td>
<td>3 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>1/0 x 2P</td>
<td>1/0 to 2/0</td>
<td>M8</td>
<td>5.4 to 6.0 (47.8 to 53.1)</td>
</tr>
<tr>
<td></td>
<td>r1/ ‖ 11, Δ 1/ ‖ 21, t1/ ‖ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>4210-D+</td>
<td>R/L1,S/L2,T/L3 3/0 x 2P</td>
<td>3/0 to 600</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>3/0 x 2P</td>
<td>3/0 to 600</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td></td>
<td>r1/ ‖ 11, Δ 1/ ‖ 21, t1/ ‖ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/0</td>
<td>1/0 to 2/0</td>
<td>M10</td>
<td>18 to 23 (159 to 204)</td>
</tr>
<tr>
<td>4300-D+</td>
<td>R/L1,S/L2,T/L3 3/0 to 2P</td>
<td>3/0 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>3/0 x 2P</td>
<td>3/0 to 600</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/ ‖ 11, Δ 1/ ‖ 21, t1/ ‖ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/0</td>
<td>1/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>4410-D+</td>
<td>R/L1,S/L2,T/L3 300 x 2P</td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>300 x 2P</td>
<td>300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/ ‖ 11, Δ 1/ ‖ 21, t1/ ‖ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/0</td>
<td>2/0 to 4/0</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td>4560-D+</td>
<td>R/L1,S/L2,T/L3 4/0 x 4P</td>
<td>4/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>−, +</td>
<td>4/0 x 4P</td>
<td>4/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
</tr>
<tr>
<td></td>
<td>r1/ ‖ 11, Δ 1/ ‖ 21, t1/ ‖ 31</td>
<td>14</td>
<td>14 to 10</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
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<tr>
<td></td>
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<td>4/0</td>
<td>2/0 to 300</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
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</tbody>
</table>
Closed-Loop Crimp Terminal Recommendations

Magnetek recommends UL-listed crimp terminals made by JST and Tokyo DIP (or equivalent) for the insulation cap. Table C-5 matches the wire gauges and terminal screw sizes with Magnetek-recommended crimp terminals, tools, and insulation caps. Refer to the appropriate Wire Gauge and Torque Specifications table for the wire gauge and screw size for your converter model. Place orders with a Magnetek representative or the Magnetek sales department. The closed-loop crimp terminal sizes and values listed in Table C-5 are Magnetek recommendations. Wire gauge values shown in Table C-5 are the recommended values. Refer to local codes for proper selections.

Table C-5: Closed-Loop Crimp Terminal Size

<table>
<thead>
<tr>
<th>Model</th>
<th>Wire Gauge (AWG, kcmil)</th>
<th>Screw Size</th>
<th>Crimp Terminal Model Number</th>
<th>Tool Machine No.</th>
<th>Die Jaw</th>
<th>Insulation Cap Model No.</th>
<th>Code &lt;1&gt;</th>
</tr>
</thead>
<tbody>
<tr>
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<td>4/0 x 8P</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
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<tr>
<td></td>
<td>4/0 x 8P</td>
<td>M12</td>
<td>32 to 40 (283 to 354)</td>
<td></td>
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<tr>
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<td>14</td>
<td>M4</td>
<td>1.1 to 1.2 (9.7 to 10.6)</td>
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<td>M12</td>
<td>32 to 40 (283 to 354)</td>
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</table>

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.

Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-561].

Example 2: Models with 4/0 AWG × 4P for both input and output require four sets for input terminals and four sets for output terminals, so the user should order eight sets of [100-051-559].
## Table: IMPULSE®•D+ Instruction Manual - April 2016

**Model** | **Wire Gauge (AWG, kcmil)** | **Screw Size** | **Crimp Terminal Model Number** | **Tool Model No.** | **Insulation Cap Model No.** | **Code <1>** |
---|---|---|---|---|---|---|
2140-D+ | R/L1, S/L2, T/L3 | U/T1, V/T2, W/T3 | M8 | R38-8 | YA-5 | AD-954 | TP-038 | 100-051-264 |
 | 3 × 2P |  |  |  |  |  |  |  |  |
 | 2 × 2P |  |  | R38-8 | YA-5 | AD-954 | TP-038 | 100-051-264 |
 | 1 × 2P |  |  | R60-8 | YA-5 | AD-955 | TP-060 | 100-051-265 |
 | 1/0 × 2P | 1/0 × 2P |  | R60-8 | YA-5 | AD-955 | TP-060 | 100-051-265 |
 | 2/0 × 2P | 2/0 × 2P |  | 80-8 | YF-1, YET-300-1 | TD-323, TD-312 | TP-080 | 100-092-579 |
2200-D+ |  | 3/0 × 2P | M12 | 80-L12 | YF-1, YET-300-1 | TD-323, TD-312 | TP-080 | 100-051-558 |
 |  | 4/0 × 2P |  | 100-L12 | YF-1, YET-300-1 | TD-324, TD-312 | TP-100 | 100-051-560 |
 |  | 250 |  | 150-L12 | YF-1, YET-300-1 | TD-325, TD-313 | TP-150 | 100-051-562 |
 |  | 300 |  | 150-L12 | YF-1, YET-300-1 | TD-325, TD-313 | TP-150 | 100-051-562 |
2270-D+ |  | 3/0 × 2P | M12 | 80-L12 | YF-1, YET-300-1 | TD-323, TD-312 | TP-080 | 100-051-558 |
 |  | 4/0 × 2P |  | 100-L12 | YF-1, YET-300-1 | TD-324, TD-312 | TP-100 | 100-051-560 |
 |  | 250 × 2P |  | 150-L12 | YF-1, YET-300-1 | TD-325, TD-313 | TP-150 | 100-051-562 |
 |  | 300 × 2P |  | 150-L12 | YF-1, YET-300-1 | TD-325, TD-313 | TP-150 | 100-051-562 |
460 V Class

### 4008-D+

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### 4016-D+

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### 4030-D+

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<td>YA-5</td>
<td>AD-955</td>
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</table>

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.

Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-561].

Example 2: Models with 4/0 AWG × 4P for both input and output require four sets for input terminals and four sets for output terminals, so the user should order eight sets of [100-051-559].
<table>
<thead>
<tr>
<th>Model</th>
<th>Wire Gauge (AWG, kcmil)</th>
<th>Screw Size</th>
<th>Crimp Terminal Model Number</th>
<th>Tool Machine No.</th>
<th>Die Jaw</th>
<th>Insulation Cap Model No.</th>
<th>Code &lt;1&gt;</th>
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</thead>
<tbody>
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<td>YA-4</td>
<td>AD-902</td>
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<td>YF-1, YET-300-1</td>
<td>TD-323, TD-312</td>
<td>TP-080</td>
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<td>YA-5</td>
<td>AD-953</td>
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<td>YA-5</td>
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<td>YA-5</td>
<td>AD-955</td>
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<td>YA-5</td>
<td>AD-955</td>
<td>TP-060</td>
<td>100-051-265</td>
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<td>80-8</td>
<td>YF-1, YET-300-1</td>
<td>TD-323, TD-312</td>
<td>TP-080</td>
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<td>2/0 × 2P</td>
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</tbody>
</table>

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.

Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-561].

Example 2: Models with 4/0 AWG × 4P for both input and output require four sets for input terminals and four sets for output terminals, so the user should order eight sets of [100-051-559].
## Table: Wire Gauge and Crimp Terminal Model Number

<table>
<thead>
<tr>
<th>Model</th>
<th>Wire Gauge (AWG, kcmil)</th>
<th>Screw Size</th>
<th>Crimp Terminal Model Number</th>
<th>Tool Machine No.</th>
<th>Tool Die Jaw</th>
<th>Insulation Cap Model No.</th>
<th>Code &lt;1&gt;</th>
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<td>80-L12</td>
<td>YF-1, YET-300-1</td>
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<tr>
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<td>300 × 4P</td>
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<td>YF-1, YET-300-1</td>
<td>TD-325,TD-313</td>
<td>TP-150</td>
<td>100-051-561</td>
</tr>
<tr>
<td>41040-D+</td>
<td>4/0 × 8P</td>
<td>M12</td>
<td>100-L12</td>
<td>YF-1, YET-300-1</td>
<td>TD-324,TD-312</td>
<td>TP-100</td>
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<tr>
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<td>250 × 8P</td>
<td></td>
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<td>YF-1, YET-300-1</td>
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<td>TD-325,TD-313</td>
<td>TP-150</td>
<td>100-051-561</td>
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</tbody>
</table>

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.
Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-561].
Example 2: Models with 4/0 AWG × 4P for both input and output require four sets for input terminals and four sets for output terminals, so the user should order eight sets of [100-051-559].

**NOTE:** Use crimp insulated terminals or insulated shrink tubing for wiring connections. Wires should have a continuous maximum allowable temperature of 75°C 600 VAC UL-approved vinyl-sheathed insulation.

## Table: Wire Gauge and Crimp Terminal Model Number

<table>
<thead>
<tr>
<th>Model</th>
<th>Wire Gauge (AWG, kcmil)</th>
<th>Screw Size</th>
<th>Crimp Terminal Model Number</th>
<th>Tool Machine No.</th>
<th>Tool Die Jaw</th>
<th>Insulation Cap Model No.</th>
<th>Code &lt;1&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+ to 2057-D+, 4008-D+ to 4030-D+</td>
<td>11, 12, 21, 31</td>
<td>14</td>
<td>M3.5</td>
<td>R2-3.5</td>
<td>YA-4</td>
<td>AD-900</td>
<td>100-106-516</td>
</tr>
</tbody>
</table>

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.
Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-561].
Example 2: Models with 4/0 AWG × 4P for both input and output require four sets for input terminals and four sets for output terminals, so the user should order eight sets of [100-051-559].
Installing Input Fuses

**NOTICE**

If a fuse is blown or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices. Check the wiring and the selection of peripheral devices to identify the cause. Contact Magnetek before restarting the converter or the peripheral devices if the cause cannot be identified.

**Recommended Branch Circuit Protection**

Magnetek recommends installing an appropriate harmonic filter that has built-in input fuses to maintain compliance with UL508C.

The fuses are listed in Table C-6.

### Table C-6: Recommended Branch Circuit Protection

<table>
<thead>
<tr>
<th>Model</th>
<th>Harmonic Filter Module</th>
<th>Fuse</th>
<th>Manufacturer</th>
<th>Fuse Ampere Rating (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-D+</td>
<td>HF-2015-D+</td>
<td>350GH-32ULTC</td>
<td>HINODE</td>
<td>32</td>
</tr>
<tr>
<td>2030-D+</td>
<td>HF-2030-D+</td>
<td>350GH-50ULTC</td>
<td>HINODE</td>
<td>50</td>
</tr>
<tr>
<td>2057-D+</td>
<td>HF-2057-D+</td>
<td>350GH-125ULTC</td>
<td>HINODE</td>
<td>125</td>
</tr>
<tr>
<td>2083-D+</td>
<td>HF-2083-D+</td>
<td>170M1371</td>
<td>BUSSMANN</td>
<td>250</td>
</tr>
<tr>
<td>2140-D+</td>
<td>HF-2140-D+</td>
<td>350GH-250ULTC</td>
<td>HINODE</td>
<td>250</td>
</tr>
<tr>
<td>2200-D+</td>
<td>HF-2200-D+</td>
<td>170M4015</td>
<td>BUSSMANN</td>
<td>550</td>
</tr>
<tr>
<td>2270-D+</td>
<td>HF-2270-D+</td>
<td>170M4016</td>
<td>BUSSMANN</td>
<td>630</td>
</tr>
<tr>
<td>2400-D+</td>
<td>HF-2400-D+</td>
<td>170M4019</td>
<td>BUSSMANN</td>
<td>900</td>
</tr>
<tr>
<td>4008-D+</td>
<td>HF-4008-D+</td>
<td>660GH-16ULTC</td>
<td>HINODE</td>
<td>16</td>
</tr>
<tr>
<td>4016-D+</td>
<td>HF-4016-D+</td>
<td>660GH-40ULTC</td>
<td>HINODE</td>
<td>40</td>
</tr>
<tr>
<td>4030-D+</td>
<td>HF-4030-D+</td>
<td>660GH-63ULTC</td>
<td>HINODE</td>
<td>63</td>
</tr>
<tr>
<td>4043-D+</td>
<td>HF-4043-D+</td>
<td>170M1369</td>
<td>BUSSMANN</td>
<td>160</td>
</tr>
<tr>
<td>4058-D+</td>
<td>HF-4058-D+</td>
<td>170M1370</td>
<td>BUSSMANN</td>
<td>200</td>
</tr>
<tr>
<td>4086-D+</td>
<td>HF-4086-D+</td>
<td>660GH-200ULTC</td>
<td>HINODE</td>
<td>200</td>
</tr>
<tr>
<td>4145-D+</td>
<td>HF-4145-D+</td>
<td>660GH-315ULTC</td>
<td>HINODE</td>
<td>315</td>
</tr>
<tr>
<td>4210-D+</td>
<td>HF-4210-D+</td>
<td>170M4016</td>
<td>BUSSMANN</td>
<td>630</td>
</tr>
<tr>
<td>4300-D+</td>
<td>HF-4300-D+</td>
<td>170M4018</td>
<td>BUSSMANN</td>
<td>800</td>
</tr>
</tbody>
</table>
Low Voltage Wiring for Control Circuit Terminals

Wire low voltage wires with NEC Class 1 circuit conductors. Refer to national state or local codes for wiring. The external power supply shall be a UL listed Class 2 power supply source or equivalent only.

**Table C-7: Control Circuit Terminal Power Supply**

<table>
<thead>
<tr>
<th>Input/Output</th>
<th>Terminal Signal</th>
<th>Power Supply Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-function digital inputs</td>
<td>S1, S2, S3, S4, S5, S6, S7, S8, SC</td>
<td>Use the internal LVLC power supply of the converter. Use class 2 for external power supply.</td>
</tr>
<tr>
<td>Multi-function analog inputs</td>
<td>+V, –V, A1, A2, A3, AC</td>
<td></td>
</tr>
</tbody>
</table>

**Converter Short-Circuit Rating**

This converter is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 240 VAC for 230 V class converters and 480 VAC for 460 V class converters, when protected by fuses as specified on the Table C-6.