Chapter 2

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Chapter 2: Installation and Wiring

AMBIENT CONDITIONS

**Ambient Environmental Conditions for Use:**

<table>
<thead>
<tr>
<th>Ambient Conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>-10°C to 40°C (14°F to 104°F)</td>
</tr>
<tr>
<td><strong>Relative Humidity</strong></td>
<td>0 to 90% (non-condensing)</td>
</tr>
<tr>
<td><strong>Atmosphere Pressure</strong></td>
<td>86 kPa to 106 kPa</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>9.8 m/s² (1G) less than 10 Hz, 5.9 m/s² (0.6G) 10 to 60 Hz</td>
</tr>
<tr>
<td><strong>Installation Location</strong></td>
<td>Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust</td>
</tr>
<tr>
<td><strong>Enclosure Rating</strong></td>
<td>IP20: Protection against contact by fingers. Protection against medium-size foreign objects</td>
</tr>
</tbody>
</table>

**Storage Conditions**

The AC drives should be kept in their shipping cartons or crates until they are installed. In order to retain their warranty coverage, they should be stored as described below if they are not to be installed and used within three months.

- Store in a clean and dry location free from direct sunlight and corrosive fumes.
- For storage of longer than 3 months, store within an ambient temperature range of -20 °C to 30 °C (-4°F to 86°F).
- For storage of 3 months or less, store within an ambient temperature range of -20 °C to 60 °C (-4°F to 140°F).
- Store within a relative humidity range of 0% to 90% and non-condensing environment.
- Store within an air pressure range of 86 kPa to 106 kPa.
- DO NOT store in an area with rapid changes in temperature. (It may cause condensation and frost.)
- DO NOT place directly on the ground.

If the drive is stored or is otherwise unused for more than a year, the drive’s internal DC link capacitors should be recharged before use. Otherwise, the capacitors may be damaged when the drive starts to operate. We recommend recharging the capacitors of any unused drive at least once per year. (Refer to Chapter 6, “Maintenance and Troubleshooting” for information about recharging DC link capacitors.)
INSTALLATION

Install the AC drive in an enclosure that is specifically designed to house electrical and electronic control equipment. Provide proper spacing within the enclosure to allow the dissipation of heat produced by the drive and any other included electrical and electronic equipment. Ventilation or air conditioning may also be required, depending upon the application.

**WARNING:** FAILURE TO OBSERVE THESE PRECAUTIONS MAY DAMAGE THE DRIVE AND VOID THE WARRANTY!

Improper installation of the AC drive will greatly reduce its life. Observe the following precautions when installing the drive:

- Do not mount the AC drive near heat-radiating elements or in direct sunlight.
- Do not install the AC drive in a place subjected to high temperature, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.
- Mount the AC drive securely on a flat, rigid, non-flammable surface.
- Mount the AC drive vertically and do not restrict the air flow to the heat sink fins.

**WARNING:** AC DRIVES GENERATE A LARGE AMOUNT OF HEAT WHICH MAY DAMAGE THEM. AUXILIARY COOLING METHODS ARE TYPICALLY REQUIRED IN ORDER NOT TO EXCEED MAXIMUM AMBIENT TEMPERATURES.

**Minimum Clearances and Air Flow**

**Diagram Directional Arrows**

- Air Inflow: Blue Arrow → →
- Air Outflow: Red Arrow → →
- Distance: Black Arrows ↔ ↔

<table>
<thead>
<tr>
<th>Minimum Clearances</th>
<th>Installation Method</th>
<th>HP</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single drive installation</td>
<td>1–5</td>
<td>150</td>
<td>50</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.5–20</td>
<td>175</td>
<td>75</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25–75</td>
<td>200</td>
<td>75</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>150</td>
<td>75</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Side-by-side horizontal installation</td>
<td>1–5</td>
<td>150</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.5–20</td>
<td>175</td>
<td>75</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25–75</td>
<td>200</td>
<td>75</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>150</td>
<td>75</td>
<td>100*</td>
<td></td>
</tr>
</tbody>
</table>

* Add divider plate of equal height and depth of drives between each drive, as highlighted above at C. This is to prevent air from blowing directly from one drive into the other.

**WARNING:** MAXIMUM AMBIENT TEMPERATURES MUST NOT EXCEED 40°C (104°F)!
**Chapter 2: Installation and Wiring**

**DIMENSIONS**

**UNITS = MM [IN]**

**FRAME A**

*Part Numbers: GS3-21P0, GS3-22P0, GS3-41P0, GS3-42P0*

---

**WARNING**

- Risk of electrical shock. Wait 10 minutes after removing power before servicing.
- Do not connect AC power to output terminals T1, T2, and T3.

---

**DISPLAY**

- FWD/REV
- JOG
- STOP
- RUN
- ENTER

---

**Dimensions**

- **Frame A**
  - Height: 173.0 [6.81] mm
  - Width: 185.0 [7.28] mm
  - Depth:
    - **Part Numbers**:
      - GS3-21P0, GS3-22P0, GS3-41P0, GS3-42P0

---

**Notes**:

- All values are given in millimeters (mm) unless otherwise specified.
- Dimensions may vary slightly due to manufacturing tolerances.

---

**Accessories**:

- **R2.75 [0.11]**
- **8.7 [0.34]**
- **5.5 [0.22]**

---

**Integration Tips**

- Ensure proper mounting and electrical connections to avoid damage.
- Regular maintenance checks are recommended for optimal performance.

---

*AutomationDirect*
**Dimensions (continued)**

**Units = mm [in]**

**Frame A with Fan**

*Part Numbers: GS3-43P0*

---

**WARNING**

- Do not connect AC power to output terminals T1, T2, and T3.
- Avoid any unauthorized short circuits after removing power source.

---

**Display**

- Dia. 22.0 (0.87)
- Dia. 28.0 (1.10) (2X)
- R2.75 (0.11)
- 8.7 (0.34)
- 5.5 (0.22)
Chapter 2: Installation and Wiring

**DIMENSIONS (CONTINUED)**

**UNITS = MM [IN]**

**FRAME B**

*Part Numbers: GS3-23P0, GS3-25P0, GS3-45P0*

---

**WARNING**

**Dimensions (continued)**

**UNITS = MM [IN]**

**FRAME B**

*Part Numbers: GS3-23P0, GS3-25P0, GS3-45P0*
**Dimensions (continued)**

**Units = mm [in]**

**Frame C**

*Part Numbers: GS3-27P5, GS3-2010, GS3-2015, GS3-47P5, GS3-4010, GS3-4015*

---

**WARNING**

Do not connect AC power to output terminals T1, T2 and T3. Risk of electric shock. Wait 10 minutes after removing power before servicing.
**Chapter 2: Installation and Wiring**

*Dimensions (continued)*

*Units = mm [in]*

**Frame D**

*Part Numbers: GS3-2020, GS3-2025, GS3-2030, GS3-4020, GS3-4025, GS3-4030*

![Diagram of Frame D dimensions with part numbers and dimensions in millimeters and inches.]

- **Dimensions:**
  - Height: 403.8 [15.90"
  - Width: 384.0 [15.12"
  - Depth: 250.0 [9.84"

- **Part Numbers:**
  - GS3-2020
  - GS3-2025
  - GS3-2030
  - GS3-4020
  - GS3-4025
  - GS3-4030

- **Notices:**
  - Do not connect AC power to output terminals T1, T2, and T3.
  - Risk of electrical shock. Wait 10 minutes after removing power before servicing.

- **Entrances:**
  - Diameter: 10.0 [0.39"
  - Diameter: 205.4 [8.08"

- **Discontinued:**
  - Diameter: 42.0 (1.65"
  - Diameter: 28.0 (1.1"

- **Additional Measurements:**
  - 10.0 [0.39"
  - 13.0 [0.51"
  - 226.0 [8.90"
  - 250.0 [9.84"
  - 205.4 [8.08"
**DIMENSIONS (CONTINUED)**

**UNITS = MM [IN]**

**FRAME E**

*Part Numbers: GS3-2040, GS3-2050, GS3-4040, GS3-4050, GS3-4060*

**Dimensions (continued)**

- **Frame E**
  - Part Numbers: GS3-2040, GS3-2050, GS3-4040, GS3-4050, GS3-4060
  - Diagonal 62.0 (2.44) mm
  - Height: 589.0 (23.19) mm
  - Width: 560.0 (22.05) mm
  - Depth: 260.0 (10.24) mm
  - Two smaller dimensions are also shown, Dia. 22.0 (0.87) mm and 18.0 (0.71) mm.
  - Another dimension is shown as 20.0 (0.83) mm, and another as 13.0 (0.51) mm.
**DIMENSIONS (CONTINUED)**

**UNITS = MM [IN]**

**FRAME F**

*Part Numbers: GS3-4075, GS3-4100*
Circuit Connections

**Danger!**

**Hazardous Voltage!** Before making any connection to the AC drive, disconnect all power to the AC drive, and wait five minutes for DC bus capacitors to discharge.

**Warning:** Any electrical or mechanical modification to this equipment without prior written consent of AutomationDirect.com, Inc. will void all warranties, may result in a safety hazard, and may void the UL listing.

**Warning:** Do not connect the AC input power to the T1, T2, and T3 output terminals. Doing this will damage the AC drive.

**Warning:** Tighten all screws to the proper torque rating. See "Main Circuit Wiring" later in this chapter.

**Wiring Notes:** Please read prior to installation:

1) During installation, follow all local electrical, construction, and safety codes for the country in which the AC drive is to be installed.

2) Make sure the appropriate protective devices (circuit breaker or fuses) are connected between the power supply and AC drive.

3) Make sure that the leads are connected correctly and the AC drive is properly grounded. (Ground resistance should not exceed 0.1Ω.)

4) Use ground leads that comply with AWG/MCM standards and keep them as short as possible.

5) Do not use a power circuit contactor or disconnect switch for run/stop control of the AC drive and motor. This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.

6) Multiple DURApulse GS3 units can be installed in one location. All of the units should be grounded directly to a common ground terminal. The DURApulse GS3 ground terminals may also be connected in parallel, as shown in the figure below. Make sure there are no ground loops.

7) When the AC drive output terminals T1, T2, and T3 are connected to the motor terminals T1, T2, and T3, respectively, the motor will rotate counterclockwise (as viewed from the shaft end of the motor) when a forward operation command is received. To reverse the direction of motor rotation, switch the connections of any of the two motor leads.

8) Make sure that the power source is capable of supplying the correct voltage and required current to the AC drive.

9) Do not attach or remove wiring when power is applied to the AC drive.

10) Do not inspect components unless inside “POWER” lamp is turned off.

11) Do not monitor the signals on the circuit board while the AC drive is in operation.

12) GS3 series DURApulse drives cannot be used with single-phase motors.

13) Route the power and control wires separately, or at 90 degree angle to each other.

14) If a filter is required for reducing EMI (Electro Magnetic Interference), install it as close as possible to the AC drive. EMI can also be reduced by lowering the Carrier Frequency.

15) If the AC drive is installed in a place where a load reactor is needed, install the filter close to the T1, T2, and T3 side of AC drive. Do not use a Capacitor, L-C Filter (Inductance-Capacitance), or R-C Filter (Resistance-Capacitance), unless approved by AutomationDirect.

16) When using a GFCI (Ground Fault Circuit Interrupt), select current sensor with sensitivity of 200mA, and not less than 0.1-second detection to avoid nuisance tripping.
**Motor Operation Precautions**

1. When using the AC drive to operate a standard 3-phase induction motor, notice that the energy loss is greater than for an inverter duty motor.
2. Avoid running a standard induction motor at low speed, which may cause the motor temperature to exceed the motor rating due to limited airflow produced by the motor’s fan.
3. When the standard motor operates at low speed, the output load must be decreased.
4. If **100% output torque** is desired at **low speed**, it may be necessary to use a special “inverter-duty” rated motor.

**Short Circuit Withstand (SCCR)**

Models through 50 hp are suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes; 10,000A for models 60 hp through 100 hp. The maximum voltage is 240V for all 230V models, and 480V for all 460V models.

**Applicable Codes**

All *DURApulse* GS3 AC drives are Underwriters Laboratories, Inc. (UL) and Canadian Underwriters Laboratories (cUL) listed, and therefore comply with the requirements of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC). Installation intended to meet the UL and cUL requirements must follow the instructions provided in “Wiring Notes” as a minimum standard. Follow all local codes that exceed UL and cUL requirements. Refer to the technical data label affixed to the AC drive and the motor nameplate for electrical data. The “Circuit Protection Devices” section in Appendix A, lists the recommended fuse part number for each *DURApulse* GS3 part number. These fuses (or equivalent) must be used on all installations where compliance with U.L. standards is required.
**Terminal Wiring Diagrams**

*GS3-21P0, GS3-22P0, GS3-41P0, GS3-42P0, GS3-43P0*

*GS3-23P0, GS3-25P0, GS3-45P0*

*GS3-27P5, GS3-47P5, GS3-2010, GS3-4010, GS3-2015, GS3-4015*
Terminal Wiring Diagrams (continued)

GS3-2020, GS3-4020, GS3-2025, GS3-4025, GS3-2030, GS3-4030

GS3-2040, GS3-2050

GS3-4040, GS3-4050, GS3-4060
Terminal Wiring Diagrams (continued)
GS3-4075, GS3-4100

[Diagram of GS3-4075, GS3-4100 terminal wiring]

### Main Circuit Wiring

**Main Circuit Terminals**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1, L2, L3</td>
<td>Input Power</td>
</tr>
<tr>
<td>T1, T2, T3</td>
<td>AC Drive Output</td>
</tr>
<tr>
<td>B1, B2</td>
<td>Braking Resistor Connection (Under 20HP)</td>
</tr>
<tr>
<td>+z, – (negative)</td>
<td>External Dynamic Brake Unit (20HP &amp; Over)</td>
</tr>
<tr>
<td>Ground</td>
<td></td>
</tr>
</tbody>
</table>

**Main Circuit Wiring Specifications**

<table>
<thead>
<tr>
<th>AC Drive Model</th>
<th>Input Current (A)</th>
<th>Output Current (A)</th>
<th>Wire Range (AWG)</th>
<th>Terminal Tightening Torque (kgf·cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS3-21P0</td>
<td>5.7</td>
<td>5</td>
<td>10-18</td>
<td>18</td>
</tr>
<tr>
<td>GS3-22P0</td>
<td>7.6</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS3-23P0</td>
<td>15.5</td>
<td>10</td>
<td>8-12</td>
<td>30</td>
</tr>
<tr>
<td>GS3-25P0</td>
<td>20.6</td>
<td>17</td>
<td>2-8</td>
<td>40</td>
</tr>
<tr>
<td>GS3-27P5</td>
<td>26</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS3-2010</td>
<td>34</td>
<td>33</td>
<td>10-18</td>
<td>18</td>
</tr>
<tr>
<td>GS3-2015</td>
<td>50</td>
<td>49</td>
<td>8-12</td>
<td></td>
</tr>
<tr>
<td>GS3-2020</td>
<td>60</td>
<td>65</td>
<td>2-8</td>
<td>40</td>
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<td>GS3-2025</td>
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<tr>
<td>GS3-2030</td>
<td>90</td>
<td>90</td>
<td></td>
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<tr>
<td>GS3-2040</td>
<td>110</td>
<td>120</td>
<td>2/0-3/0</td>
<td>200</td>
</tr>
<tr>
<td>GS3-2050</td>
<td>142</td>
<td>145</td>
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<td>GS3-41P0</td>
<td>3.2</td>
<td>2.7</td>
<td>10-18</td>
<td>18</td>
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<tr>
<td>GS3-42P0</td>
<td>4.3</td>
<td>4.2</td>
<td>8-12</td>
<td>30</td>
</tr>
<tr>
<td>GS3-43P0</td>
<td>5.9</td>
<td>5.5</td>
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<tr>
<td>GS3-45P0</td>
<td>11.2</td>
<td>8.5</td>
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<td>GS3-47P5</td>
<td>14</td>
<td>13</td>
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<tr>
<td>GS3-4010</td>
<td>19</td>
<td>18</td>
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<td>GS3-4015</td>
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<td>GS3-4020</td>
<td>32</td>
<td>32</td>
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<td>GS3-4025</td>
<td>39</td>
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<td>GS3-4030</td>
<td>49</td>
<td>45</td>
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<tr>
<td>GS3-4040</td>
<td>60</td>
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</tr>
<tr>
<td>GS3-4050</td>
<td>63</td>
<td>73</td>
<td>2-4</td>
<td>57</td>
</tr>
<tr>
<td>GS3-4060</td>
<td>90</td>
<td>91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS3-4075</td>
<td>130</td>
<td>110</td>
<td>2/0-3/0</td>
<td>200</td>
</tr>
<tr>
<td>GS3-4100</td>
<td>160</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
 POWER WIRING DIAGRAMS

**DRIVES UNDER 20HP**

*Users must connect wiring according to the circuit diagram shown below.*

```
<table>
<thead>
<tr>
<th>Power Source</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-240V±10% (50,60Hz±5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>380-480V±10% (50,60Hz±5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use any two of L1, L2, L3 for 230V 1-phase models

Grounding resistance less than 0.1Ω

```

**Note:** Grounding terminals are internally connected.

- Main circuit (power) terminals

---

**DRIVES 20–30HP (230VAC) & 20–60HP (460VAC)**

*Users must connect wiring according to the circuit diagram shown below.*

```
<table>
<thead>
<tr>
<th>Power Source 3 phase</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-240V±10% (50,60Hz±5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>380-480V±10% (50,60Hz±5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grounding resistance less than 0.1Ω

```

**Note:** Grounding terminals are internally connected.

- Main circuit (power) terminals

---
Users must connect wiring according to the circuit diagram shown below.

**Power Wiring Diagrams (continued)**

**Drives 40–50hp (230VAC) & 75–100hp (460VAC)**

- Users must connect wiring according to the circuit diagram shown below.

- **Main circuit (power) terminals**
  - Power Source: 3 phase
  - 200-240V±10% (50,60Hz±5%)
  - 380-480V±10% (50,60Hz±5%)

- **DURAPULSE GS3-xxxx**
- **Dynamic Brake Unit (optional)**
- **Braking resistor (optional)**
- **Note: Grounding terminals are internally connected.**
- **Grounding resistance less than 0.1Ω**

- AC Motor
- Motor grounding terminal

- **JUMPER**
- **L1**, **L2**, **L3**
- **T1**, **T2**, **T3**
- **Note: Grounding terminals are internally connected.**
## Control Terminal Designations

<table>
<thead>
<tr>
<th>Terminal Symbol</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>DC Voltage Source</td>
<td>(+24V, 20mA), used only for AC drive digital inputs wired for source mode operation</td>
</tr>
<tr>
<td>DI1</td>
<td>Digital Input 1</td>
<td></td>
</tr>
<tr>
<td>DI2</td>
<td>Digital Input 2</td>
<td></td>
</tr>
<tr>
<td>DI3</td>
<td>Digital Input 3</td>
<td></td>
</tr>
<tr>
<td>DI4</td>
<td>Digital Input 4</td>
<td>Input Voltage: Internally Supplied (see Warning below)</td>
</tr>
<tr>
<td>DI5</td>
<td>Digital Input 5</td>
<td>Sink Mode: Low active, (V_{inL,\text{Min}} = 0V, V_{inL,\text{Max}} = 15V); (I_{in,\text{Min}} = 2.1,\text{mA}, I_{in,\text{Max}} = 7.0,\text{mA})</td>
</tr>
<tr>
<td>DI6</td>
<td>Digital Input 6</td>
<td>Source Mode: High active, (V_{inH,\text{Min}} = 8.5V, V_{inH,\text{Max}} = 24V); (I_{in,\text{Min}} = 2.1,\text{mA}, I_{in,\text{Max}} = 7.0,\text{mA})</td>
</tr>
<tr>
<td>DI7</td>
<td>Digital Input 7</td>
<td>Input response: 12–15 ms</td>
</tr>
<tr>
<td>DI8</td>
<td>Digital Input 8</td>
<td></td>
</tr>
<tr>
<td>DI9</td>
<td>Digital Input 9</td>
<td></td>
</tr>
<tr>
<td>DI10</td>
<td>Digital Input 10</td>
<td></td>
</tr>
<tr>
<td>DI11</td>
<td>Digital Input 11</td>
<td></td>
</tr>
<tr>
<td>DCM</td>
<td>Digital Common</td>
<td></td>
</tr>
<tr>
<td>+10V</td>
<td>Internal Power Supply</td>
<td>+10VDC (10mA maximum load)</td>
</tr>
<tr>
<td>AI1</td>
<td>Analog Input</td>
<td>0 to +10 V input only</td>
</tr>
<tr>
<td>AI2</td>
<td>Analog Input</td>
<td>0 to 20 mA / 4 to 20 mA input</td>
</tr>
<tr>
<td>AI3</td>
<td>Analog Input</td>
<td>-10 to +10 V input only</td>
</tr>
<tr>
<td>ACM</td>
<td>Analog Common</td>
<td></td>
</tr>
<tr>
<td>R1O</td>
<td>Relay Output 1 Normally Open</td>
<td>Resistive Load: (240,\text{VAC} - 5,\text{A (N.O).} / 3,\text{A (N.C.)}; 24,\text{VDC} - 5,\text{A (N.O.).} / 3,\text{A (N.C.)})</td>
</tr>
<tr>
<td>R1C</td>
<td>Relay Output 1 Normally Closed</td>
<td>Inductive Load: (240,\text{VAC} - 1.5,\text{A (N.O).} / 0.5,\text{A (N.C.)}; 24,\text{VDC} - 1.5,\text{A (N.O.).} / 0.5,\text{A (N.C.)})</td>
</tr>
<tr>
<td>R1</td>
<td>Relay Output 1 Common</td>
<td></td>
</tr>
<tr>
<td>DO1</td>
<td>Photocoupled digital output</td>
<td>12–48 VDC, 50 mA</td>
</tr>
<tr>
<td>DO2</td>
<td>Photocoupled digital output</td>
<td></td>
</tr>
<tr>
<td>DO3</td>
<td>Photocoupled digital output</td>
<td></td>
</tr>
<tr>
<td>DOC</td>
<td>Digital Output Common</td>
<td></td>
</tr>
<tr>
<td>FO</td>
<td>Digital Frequency Output</td>
<td>Maximum 50mA @ 48VDC, Scalable squarewave, 50% duty cycle output</td>
</tr>
<tr>
<td>AO</td>
<td>Analog Output</td>
<td>0 to +10V, 2mA Output</td>
</tr>
</tbody>
</table>

Control Terminal Wire Range: 24–12 AWG
Control Terminal Tightening Torque: 5kgf·cm [4lbf·in]

**Warning:** Do NOT connect external voltage sources to the Digital Inputs. Permanent damage may result.

Use twisted-shielded, twisted-pair or shielded-lead wires for the control signal wiring. It is recommended to run all signal wiring in a separate steel conduit. The shield wire should only be connected at the AC drive. Do NOT connect shield wire on both ends.
Users must connect wiring according to the circuit diagram shown below.

**WARNING:** Do not plug a modem or telephone into the DURApulse GS3 RJ-12 serial comm port, or permanent damage may result.

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**Control Wiring Diagram – Sinking Inputs**

DURApulse AC Drive GS3-xxxx

- **Multi-function Digital Inputs:**
  - Forward/Stop
  - Reverse/Stop
  - External Fault (N.O.)
  - Multi-Speed 1
  - Multi-Speed 2
  - Multi-Speed 3
  - Multi-speed 4
  - JOG
  - External Reset
  - Second Accel/Decel Time
  - External Base Block (N.O.)
  - DCM

- **Analog Inputs:**
  - Potentiometer 5kΩ

- **Digital Output Com.:**
  - DO1
  - DO2
  - DO3

- **DOC:**
  - Multi-function Output Contact:
    - AC Drive Running
    - AC Drive Fault
    - At Speed
    - Zero Speed

- **AO:**
  - Multi-function Analog Output:

- **RS-485 Serial Comm Port:**
  - 1: +15V
  - 2: GND
  - 4: SG+
  - 3: SG-
  - 5: NC

---

Factory default setting

Factory default source of frequency command is via the keypad up/down keys

ACM and DCM are isolated from each other

Main circuit (power) terminals
Control circuit terminal
Shielded leads

---

Factory default setting

Factory default source of frequency command is via the keypad up/down keys

ACM and DCM are isolated from each other

Main circuit (power) terminals
Control circuit terminal
Shielded leads

---

Factory default setting

Factory default source of frequency command is via the keypad up/down keys

ACM and DCM are isolated from each other

Main circuit (power) terminals
Control circuit terminal
Shielded leads
Chapter 2: Installation and Wiring

Control Wiring Diagram – Sourcing Inputs

Users must connect wiring according to the circuit diagram shown below.

WARNING: DO NOT PLUG A MODEM OR TELEPHONE INTO THE DURAPULSE GS3 RJ-12 SERIAL COMM PORT, OR PERMANENT DAMAGE MAY RESULT.

Multi-function Digital Inputs:

- Forward/Stop
- Reverse/Stop
- External Fault (N.O.)
- Multi-Speed 1
- Multi-Speed 2
- Multi-Speed 3
- Multi-Speed 4
- Jog
- External Reset
- Second Accel/Decel Time
- External Base Block (N.O.)
- DCM

Digital Signal Com.

Multi-function Analog Inputs:

- Potentiometer 5kΩ
- AI1 (0 to 10V)
- AI2 (0-20mA or 4-20mA)
- AI3 (-10 to +10V)

Analog Signal Common

Factory default setting

Factory default source of frequency command is via the keypad up/down keys

ACM and DCM are isolated from each other

Main circuit (power) terminals

Control circuit terminal

Shielded leads

DURAPULSE AC Drive GS3-xxxx

Multi-function Output Contact:

- AC Drive Running
- 240VAC/24VDC @ 3A Resistive (N.C.)
- 240VAC/24VDC @ 0.5A Inductive (N.C.)
- 240VAC/24VDC @ 5A Resistive (N.O.)
- 240VAC/24VDC @ 1.5A Inductive (N.O.)

Multi-function Digital Outputs:

- 12-48VDC @ 50mA
- AC Drive Fault
- 12-48VDC @ 50mA
- At Speed
- 12-48VDC @ 50mA
- Zero Speed

Digital Frequency Output:

48VDC @ 50mA max.

1:1, Duty = 50%

Multi-function Analog Output:

- AO
- 12-48VDC @ 50mA
- Output Frequency indication
- 0-10 VDC @ 2mA

RS-485 Serial Comm Port:

1: +15V
2: GND
3: SG+
4: SG−
5: NC

See Power Wiring Diagram
**External Accessories**

1. **Power Supply**
   Please follow the specific power supply requirements shown in Chapter 1.

2. **Fuses**
   Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations.

3. **Contactor (Optional)**
   *Do NOT use a power circuit contactor or disconnect switch for run/stop control of the AC drive and motor.* This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.

4. **AC Line Reactor (Optional)**
   Input line reactors protect the AC drive from transient overvoltage conditions typically caused by utility capacitor switching. Input line reactors also reduce harmonics associated with AC drives, and are recommended for all installations.

5. **EMI filter (Optional)**
   Input EMI filters reduce electromagnetic interference or noise on the input side of the AC drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

6. **RF filter (Optional)**
   RF filters reduce the radio frequency interference or noise on the input or output side of the inverter.

7. **Braking Resistor (Optional)**
   Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% & 20% braking torque without the addition of any external components. Optional braking may be required for applications that have high inertia loads or require rapid deceleration.

8. **AC Line Reactor/Output Filter (Optional)**
   Output line (load) reactors protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also “smooth” the motor current waveform, allowing the motor to run cooler. They are recommended for operating “non-inverter-duty” motors, and when the length of wiring between the AC drive and motor is less than 100 feet. Use Output filters if wiring exceeds 100 feet up to 1000 feet (max).

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Please refer to Appendix A for specifications on DURApulse GS3 AC Drive Accessories.
External Accessories (continued)

1. **Power Supply**
   Please follow the specific power supply requirements shown in Chapter 1.

2. **Fuses**
   Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations.

3. **Contactor (Optional)**
   **Do NOT use a power circuit contactor or disconnect switch for run/stop control of the AC drive and motor.** This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.

4. **AC Line Reactor (Optional)**
   Input line reactors protect the AC drive from transient overvoltage conditions typically caused by utility capacitor switching. Input line reactors also reduce harmonics associated with AC drives, and are recommended for all installations.

5. **EMI filter (Optional)**
   Input EMI filters reduce electromagnetic interference or noise on the input side of the AC drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

6. **RF filter (Optional)**
   RF filters reduce the radio frequency interference or noise on the input or output side of the inverter.

7. **Braking Unit and Braking Resistor (Optional)**
   Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% & 20% braking torque without the addition of any external components. Optional braking may be required for applications that have high inertia loads or require rapid deceleration.

8. **AC Line Reactor/Output Filter (Optional)**
   Output line (load) reactors protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also “smooth” the motor current waveform, allowing the motor to run cooler. They are recommended for operating “non-inverter-duty” motors, and when the length of wiring between the AC drive and motor is less than 100 feet. Use Output filters if wiring exceeds 100 feet up to 1000 feet (max).

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Please refer to Appendix A for specifications on DURApulse GS3 AC Drive Accessories.