# Table of Contents

## Symbol Introduction

- Message symbols .................................................................................................. 7
- Changes (errors) .................................................................................................. 7
- Symbols used on the system components ........................................................ 8

### 1.1 Update Information

- General information .......................................................................................... 10
- New Release ......................................................................................................... 10
  - Version -20 ....................................................................................................... 10
  - Version -21 ....................................................................................................... 10
  - Version -22 ....................................................................................................... 10
  - Version -23 ....................................................................................................... 10
  - Version -25 ....................................................................................................... 10
  - Version -26 ....................................................................................................... 10
  - Version -27 ....................................................................................................... 10

### 2.1 Introduction to AMI[^2]

- General information .......................................................................................... 12
- Installation Requirements .................................................................................... 12

### 2.2 Installation Tools

- Tools: .................................................................................................................. 13

### 3.1 E-Stop

- Emergency Stop button ....................................................................................... 16
- External E-Stop and Limit switch .......................................................................... 16

### 3.2 Mounting and Electrical Installation

- Introduction .......................................................................................................... 18

### 3.3 Main Components

- AMI[^2] industrial control panel ................................................................. 19
- Enclosure labeling Standard ................................................................. 20
- Enclosure labeling Deluxe ................................................................. 20

### 3.4 Grounding and Wiring Guidelines

- Proper wiring of system grounds ................................................................. 21
3.5 AMI G2 Installation

AM1 mounting fasteners .......................... 24

3.6 Cable Connections

Rear panel ............................................. 25
Cable routing ......................................... 25

3.7 Electrical Wiring

Removing the cabinet cover ....................... 26
Spindle motor wiring, standard model ......... 26
Spindle inverter ...................................... 27
Spindle motor wiring, deluxe model .......... 27
Coolant pump ....................................... 28
Guards ................................................. 29
Vector/Home switch connection ................ 30

3.8 Electrical Information

AMI G2 Specification ................................. 31
Switching Inputs 24 Vdc (PLC) .................. 32
Switching Outputs 24 Vdc (PLC) ............... 32
Fuse ratings .......................................... 33
Connections .......................................... 34
AMI Signal - 37 pin out .............................. 34
Servo Power output - pin out .................... 35

3.9 Interconnect Cable

AMI G2 ................................................... 36
Connecting cable .................................... 36

3.10 Product Overview and Dimensions

Dimensions: ............................................ 37
AMI G2 dimensions ................................. 37
AMI G2 Interface .................................... 38
PCBA pin out ........................................... 38
PCBA pin out ID 1071952-xx ............... 39
Pin outs for TB1 ...................................... 40
Pin outs for TB3 ................................................................................................ 40
Pin outs for TB4 ................................................................................................. 41
Pin outs for TB16 ................................................................................................. 41
JUMPERS ........................................................................................................... 41
Pin outs for X1 .................................................................................................... 42
Pin outs for X4 .................................................................................................... 42
Pin outs for X12 ................................................................................................. 42
Diagostic Leds ................................................................................................. 43

3.11 System Equipment

Console ID 745604-0x, 1113777-0x ................................................................... 44

3.12 System Interconnect

Console, motor cabling, & connection .............................................................. 45

3.13 Interconnect and Wiring Diagram (Standard)

Console interconnect ......................................................................................... 46
Standard single phase wiring diagram .............................................................. 47

3.14 Interconnect and Wiring Diagram (Deluxe)

Console interconnect ......................................................................................... 48
Deluxe single phase wiring diagram ................................................................. 49
Deluxe three phase wiring diagram ................................................................. 50

3.15 Wiring Diagram

Electrical wiring ................................................................................................ 51
E-Stop ladder wiring diagram ............................................................................ 52

3.16 Control Panel Wiring Diagram

Electrical wiring ................................................................................................ 53
Electrical wiring diagram .................................................................................. 54
Electrical wiring diagram .................................................................................. 55

4.1 Software Setup and Configuration

Configuring AMIG\(^2\) in MILLPWR\(^2\) Software .............................................. 58
External E-Stop .................................................................................................. 58
Remote GO ......................................................................................................... 58
Indexer ............................................................................................................... 58
Machine Guards ............................................................................................... 58
Coolant Flood and Mist ..................................................................................... 59
5.1 Maintenance

General care........................................................................................................... 64
Cleaning.................................................................................................................. 64
Symbol Introduction

AMI$^G_2$ Installation Manual Symbols

Message symbols

This symbol indicates that there is one or more of the following risks when using the described function
- Danger to work piece
- Danger to fixtures
- Danger to tool
- Danger to machine
- Danger to operators

Damage!
This symbol indicates that there is risk of damage, or electrical shock if instructions are not adhered to.

Different from machine to machine!
This symbol indicates that instructions may apply differently from one type of machine to another type of machine.

Refer to another Manual!
This symbol indicates that information required is located elsewhere (i.e. Machines Owner Manual).

Advice!
This symbol indicates that an Advice tip is being provided. Important, and/or additional information about the function described.

Changes (errors)
HEIDENHAIN Corporation is continuously striving to improve. Please help HEIDENHAIN Corporation by sending your request to the following e-mail address: sales@heidenhain.com
Visit www.acu-rite.com for latest version of this manual.
Symbols used on the system components

Where the following symbols appear on the AMiG2 system components, or in this document, they alert you to important safety considerations.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>———</td>
<td>This symbol is used to denote “Direct Current”.</td>
</tr>
<tr>
<td>~</td>
<td>This symbol is used to denote “Alternating Current”.</td>
</tr>
<tr>
<td>⬇️</td>
<td>This symbol is used to denote “Earth (ground) terminal”.</td>
</tr>
<tr>
<td>⬇️</td>
<td>This symbol is used to denote “Protective conductor terminal”.</td>
</tr>
<tr>
<td>⬇️</td>
<td>This symbol is used to denote the power switch “On (supply)” position.</td>
</tr>
<tr>
<td>⬇️</td>
<td>This symbol is used to denote the power switch “Off (supply)” position.</td>
</tr>
<tr>
<td>⚠️</td>
<td>This symbol denotes “Caution, risk of electric shock”.</td>
</tr>
<tr>
<td>⚠️</td>
<td>This symbol denotes “Caution, risk of danger”. Refer to the accompanying information or documentation to protect against personal injury or damage to the unit.</td>
</tr>
</tbody>
</table>
Update Information
AMI$^G2$

ACU-RITE AMI$^G2$
1.1 Update Information

General information

Updates to hardware and installation are documented in this section.

New Release

Version -20
- New product release.

Version -21
- Pin out tables and schematics were updated.

Version -22
- Updated information regarding to alter settings, auto lube control, speed input, and spindle delay. See Chapter 4.
- Software features available require MILLPWRG2 software 751005-04 or newer.

Version -23
- Updated the Console, motor cabling, & connection diagram. See Chapter 3.13.

Version -25
- Updated the Control Panel Wiring Diagram in Chapter 3.17.
  Removed the Automatic Oiler option in Chapter 3.8.

Version -26
- Updated the E-Stop wiring diagram. See Chapter 3.1.

Version -27
- Added electrical specifications for switching inputs and switching outputs. See Chapter 3.8.
2.1 Introduction to AMIG2

General information

The AMIG2 industrial control panel provides Auxiliary Machine Interface (AMI) and spindle control for MILLPWRG2.

The AMIG2 should only be used with MILLPWRG2 consoles. There are two configurations of AMIG2 as described on page 19. The standard MILLPWRG2 console (ID 745604-01 Index >= B, 745604-03 Index >= B, 1113777-01, or 1113777-03) can be used with either AMIG2 configuration. The inverter control spindle requires the spindle control console (ID 745604-02 Index >= B, 745604-04 Index >= B, 1113777-02, or 1113777-04).

The software features described in this document require MILLPWRG2 Software 751005-04 or newer.

The AMIG2 should only be installed and operated as described in this manual. Commissioning, maintenance, inspection, and operation are only to be performed by trained personnel. For more information on MILLPWRG2 please refer to the MILLPWRG2 Installation Manual (ID 1034382-2x), and User's Manual (ID 1034384-2x).

Installation Requirements

Machine location must provide proper clearances for mounting and wiring the AMIG2. Only install the AMIG2 in its intended orientation.
2.2 Installation Tools

Tools:

Tools required for installation:

**Drills and Taps**
1. 1/4” center drill
2. 3/8” variable speed drill (heavy duty)
3. #7 Drill (.201”)
4. 1/4-20 UNC Tap with handle

**Drivers**
1. Hex key 3/16” (Ball driver)
2. Hex key 2.5mm (Ball driver)

**Hammers**
1. Ball Peen (12 oz)

**Measurement tools & levels**
1. Measuring tape - 12 ft
2. Level - 8”

**Screwdrivers**
1. Small, non-conductive, flat tip
2. #2 Phillips Head

**Miscellaneous**
1. 20 ft extension cord
2. Deburring tool
2.2 Installation Tools
Mounting & Electrical Installation AMI G2
3.1 E-Stop

Emergency Stop button

- The Emergency Stop button, and Overtravel limit switches are wired in series. When any of them open, power to the motor servos is removed. Correct installation is vital for safety.

External E-Stop and Limit switch

Refer to the drawing for the AMI\textsuperscript{G2} system. All external E-Stops are wired to TB3. Refer to the wiring table TB3 see “PCBA pin out” on page 38.

- Parts required for this installation step are included with the Limit Switch Kit (ID 33000127).

Emergency Stop buttons must be installed in the system. Ensure that the relay contacts have a sufficient rating for the application.

Never alter these circuits to defeat their function. Serious injury, or machine damage could result. Observe all applicable codes as to the placement and labeling of Emergency Stop buttons.
Locate the tie-wrap anchors and the 10-32 x 1/4” Phillips head screws.
On the left side of the arm along the center, punch three locations 10” apart.
Drill and tap 10-32 x 1/2” deep at the punched locations.
Attach the tie-wrap anchors to the arm with the PHMS.

1. X axis limit switch
2. Y axis limit switch
3. 1/2” NPT nut
4. Wire: RED X1
5. Wire: BLACK X2
6. Wire: RED Y1
7. Wire: BLACK Y2
8. Coolant Harness

Remove the metal 1/2” NPT nut from the X and Y axis limit switch cable.
Insert the X and Y limit switch cable into the hole in the control cabinet [1]. Secure the connection.
Connect the red and black X axis leads to screw terminals TB3-3 and TB3-4 of the AMI\(^2\) interface board.
Connect the red and black Y axis leads to screw terminals TB3-5 and TB3-6 of terminal block 14 of the AMI\(^2\) interface board.
3.2 Mounting and Electrical Installation

Introduction

The following system drawings are available for reference:

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>745604-0x, 1113777-0x</td>
<td>Console System Equipment, see page 44</td>
</tr>
<tr>
<td>1026815</td>
<td>Console, motor cabling, &amp; connection, see page 45</td>
</tr>
<tr>
<td>1085469</td>
<td>Interconnect and single phase (Standard), see page 46</td>
</tr>
<tr>
<td>1117579</td>
<td>Interconnect, single and three phase (Deluxe), see page 48</td>
</tr>
<tr>
<td>1117582</td>
<td>DC system wiring, see page 51</td>
</tr>
<tr>
<td>1117581</td>
<td>E-Stop Ladder Wiring, see page 52</td>
</tr>
<tr>
<td>1111657</td>
<td>Control Panel Wiring, see page 53</td>
</tr>
</tbody>
</table>
3.3 Main Components

**AMI$^G2$ industrial control panel**

The AMI$^G2$ is a compact electrical cabinet designed to be used with MILLPWR$^G2$ consoles.

The AMI$^G2$ provides commonly used machine interfaces and spindle control. There are two configurations of the AMI$^G2$ available.

**AMI$^G2$ Standard ID 1109611-01**

The AMI$^G2$ Standard has I/O that can be used for various purposes. For example:

- Machine guards
- Limit switches
- Automatic oiler

- AMI Program Step. The AMI Program Step allows the programmer to specify the outputs to be turned ON or OFF, or PULSED for a certain duration. This can be used to control external devices such as an indexer.

- The AMI$^G2$ Standard can also be used with an inverter controlled spindle. The spindle control console is required for inverter controlled spindle. The console provides the standard ± 10 Vdc and a spindle override knob.

**AMI$^G2$ Deluxe ID 1109611-05**

The AMI$^G2$ Deluxe includes everything in the Standard configuration plus the ability to control spindle and coolant pump using M-Functions for controlling direction (forward or reverse) and turning the spindle off.
The standard MILLPWR\textsuperscript{G2} console (ID 745604-01 Index \(\geq\) B, 745604-03 Index \(\geq\) B, 1113777-01, 1113777-03) can be used with either AMIG\textsuperscript{G2} configuration. The inverter control spindle requires the spindle control console (ID 745604-02 Index \(\geq\) B, 745604-04 Index \(\geq\) B, 1113777-02, 1113777-04). The possible combinations of consoles and AMIG\textsuperscript{G2} are summarized in the table below:

### Console ID’s

<table>
<thead>
<tr>
<th>AMIG\textsuperscript{G2} Std.</th>
<th>AMIG\textsuperscript{G2} DLX</th>
</tr>
</thead>
<tbody>
<tr>
<td>745604-01 Index (\geq) B</td>
<td>Basic I/O</td>
</tr>
<tr>
<td>745604-03 Index (\geq) B</td>
<td>Basic I/O, Spindle Direction Control, Coolant Pump</td>
</tr>
<tr>
<td>1113777-01</td>
<td>Basic I/O, Spindle Direction Control, Coolant Pump, Inverter Control</td>
</tr>
<tr>
<td>1113777-03</td>
<td>Basic I/O, Spindle Direction Control, Coolant Pump, Inverter Control</td>
</tr>
</tbody>
</table>

#### Enclosure labeling Standard

- The enclosure label is located on the outside of the unit, to one side, and contains information and identification specific to that enclosure.

1. Product name
2. ID number
3. Serial number
4. Index
5. Bar Code
6. Wiring Diagram ID number

#### Enclosure labeling Deluxe

- The 3 phase Deluxe enclosure label is located on the outside of the unit, to one side, and contains information and identification specific to that enclosure.

1. Product name
2. ID number
3. Serial number
4. Index
5. Bar Code
6. Wiring Diagram ID number
3.4 Grounding and Wiring Guidelines

Proper wiring of system grounds

- Verify that building grounds conform to local codes at the time of installation. The CNC requires two ground paths from the building wiring: one via the AC 120 V line cord (factory installed), and one via the 3-Phase, AC 230 V wiring connected during installation (included with M-function control cabinets). Each enclosure has an assigned central ground point.

If in doubt that a proper building ground exists, consult a qualified electrician.

Central ground point - AMI\textsuperscript{G2} enclosure

1. Central Ground Buss Bar
2. AMI\textsuperscript{G2}
General wiring guidelines

- Follow the electrical guidelines described here for any configuration that deviates from a standard CNC configuration. Failure to follow these guidelines can result in damage to the equipment, or bodily injury.

- **Warning! Risk of electrical shock**
  A risk of electrical shock exists if this product is not properly grounded. To avoid the hazard, always use a 3-conductor (grounded) power cord and ensure the ground is properly wired to the building installation.

- Do not apply power until instructed to do so.

- Follow these general wiring guidelines:
  - Do not run signal wiring and power wiring in the same conduit. Where paths must cross, make their intersections perpendicular.
  - Segregate I/O wiring by signal type. Route wiring with different signal characteristics by separate paths whenever possible. To prevent crosstalk, do not run harnesses that contain different signal types parallel to one another.
  - Establish a low-impedance, single-point ground. All noise reduction techniques depend upon proper grounding.
  - Routing and grounding servo wiring is more important than wire length.
  - Make signal wiring as short and direct as possible.

**Isolation transformer**

AC 120 V line must be provided.

- An electrostatic-shielded isolation transformer with a rating of 2 KVA is recommended for the control system.
- If output devices are connected through the transformer, add their maximum VA requirements to determine the correct transformer size.
3.5 AMIG<sup>2</sup> Installation

Procedure:

- Caution when lifting the control cabinet. The weight of the two enclosures are approximately 12 lbs, and 14 lbs. Follow applicable safety regulations for lifting.

- Machine location must provide proper clearances for mounting and wiring the control cabinet and console. Insure space around the machine allows for the control cabinet, and console cabling harnesses.

- The hardware mounting kit includes an assortment of spacers to accommodate different machine surfaces for mounting to the side of the column.

- If mounting the cabinet to the side of the column, then insure that the first top column mounting hole is 6 inches back from the knee’s way. This will insure that the table will not collide with the cabinet or any of it’s components.
3.5 AMIG2 Installation

AMI mounting fasteners

1. Spacer
2. AMIG2 Mounting Ear
3. Flat washer
4. Lock washer
5. Mounting bolt

The listed parts below are included in the installation kit for mounting the box.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>689418-23</td>
<td>Spacer</td>
</tr>
<tr>
<td>380108-185</td>
<td>1/4-20 x 1-1/2” SHCS</td>
</tr>
<tr>
<td>385039-121</td>
<td>1/4” lock washer</td>
</tr>
<tr>
<td>200593-35</td>
<td>1/4” flat washer</td>
</tr>
</tbody>
</table>

AMIG2 enclosure can be located on either side, or back of the column. First select the location of the enclosure. Insure that the front side of the AMIG2 enclosure is not protruding past the front of the knee ways of the column when mounting on the side of the column.

Center the enclosure on the side of the column, locate the top two mounting holes approximately 4” down from the top of the column. Use a level to position the enclosure true with the machine.

Center-punch the two locations on the column.

Drill and tap hole locations for a 1/4-20 UNC thread.

Attach the enclosure with a spacer, 1/4-20 x 1-1/2” SHCS, 1/4” flat washer and the 1/4” lock washer at each hole location.

Locate the two lower mounting holes and repeat the above procedure.

Torque the four fasteners to 60-75 lb-in.
### 3.6 Cable Connections

#### Rear panel

The ACU-RITE MILLPWR\textsuperscript{G2} console rear panel connection for the control cabinet.

1. Power switch  
2. Power connector  
3. Servo Power 120 V AMI connector  
4. Earth (ground) terminal  
5. Ethernet port  
6. USB port  
7. KT 130 Edge Finder  
8. Pendant (Remote switch)  
9. RS-232-C connector  
10. Auxiliary Machine Interface (AMI) connector  
11. Servo connector (X, Y, and Z)  
12. Grounding Edger Finder  
13. Encoder Inputs (W and Z axis)  
14. Spindle connector (not shown)  
15. VGA connector (not shown)

#### Cable routing

- Connectors 3 Servo Power 120 V AMI connector, and 10 Auxiliary Machine Interface (AMI) connector, located on the underside of the control cabinet.

The AMI\textsuperscript{G2} should only be connected to MILLPWR\textsuperscript{G2} consoles.
3.7 Electrical Wiring

Removing the cabinet cover

To ensure complete disconnect from the Mains, 3-Phase wiring must be wired to an external disconnect box, or terminated with a plug. Always disconnect from Mains power supply before opening the control cabinet.

- Shut the power off to the cabinet by turning the power switch to the OFF position which is located on the front panel cover. The cover can not be removed with the switch in the ON position.
- Four fasteners attach the front panel cover to the cabinet. Unscrew the two lower screws using a Phillips screwdriver.
- These are non-removable fasteners attached to the cover, and are retained to the cover when it is removed.
- Unscrew the two upper screws, and pull the cover horizontal away from the front of the cabinet.
- Restore cover once all internal connections are done. Torque these fasteners to 5.1 lb-in.

Spindle motor wiring, standard model

For systems without the M-Functions for the spindle motor.

1 AMIG2 cabinet
2 Incoming single phase power (terminal block)
3 Central ground bus bar
4 Disconnect switch
5 Power supply
Spindle inverter

Follow the inverter’s instructions for installation and configuration. The wiring guidelines for connecting an inverter to AM|G² are based on common inverter applications.

Wiring spindle inverter

AM|G² can interface to an external inverter drive. DAC output from AM|G² is -10 Vdc to +10 Vdc (BiPolar) or 0 to 10 Vdc (UniPolar).

Wire S+ to TB4-1
Wire S- to TB4-2
Wire Spindle EN to TB4-3
Wire (FWD) to TB3-12
Wire (REV) to TB3-14
Wire the fault output from the spindle inverter to TB4-5 (spindle inverter input).

Spindle motor wiring, deluxe model

To ensure complete disconnect from the Mains, 3-Phase wiring must be wired to an external disconnect box, or terminated with a plug. Always disconnect from Mains power supply before opening the control cabinet.

For systems using the M-Functions for the spindle motor, refer to drawing 1117579-00 page 1 of 3 on page 48.

- There are knock outs provided in the cabinet for connecting the incoming 3-Phase power.

1 AM|G² cabinet
2 Incoming 3-Phase power
3 Central ground bus bar
4 Reversing contactors
5 Thermal overload
6 Spindle motor
7 Disconnect switch

- Attach the incoming 3-Phase power leads to the disconnect switch 7.
- Install the non-terminated end of the harness into one of the lower access holes of the AM|G². Secure the harness with the connector.
- Connect spindle motor wires to the reversing contact 5.
3.7 Electrical Wiring

Coolant pump

To ensure complete disconnect from the Mains, 3-Phase wiring must be wired to an external disconnect box, or terminated with a plug. Always disconnect from Mains power supply before opening the control cabinet.

For machines that have a coolant pump installed, refer to drawing 1117579-00 page 3 of 3 on page 50.

- Connect the coolant flood pump harness as specified by the manufacturer to T1, T2, and T3.
- Insert the harness into the lower hole on the under side of the AMIG2 that is labeled COOLANT.
Guards

A jumper wire is factory installed between TB16-14 and TB16-16. This is required when no guards are present.

Guards must be connected to TB16 of the AMI\textsuperscript{G2} interface board with a DPST switch, or equivalent. Multiple guards are allowed, but must be wired in series.

Connecting a guard:

- Wire Pin 16 (24 V) to one pole of the guard switch in the closed state.
- Wire Pin 15 (GND) to one pole of the guard switch in the open state.

When the guards are closed, the guard circuit is energized, and enables the spindle, coolant and servo drives.

This is indicated by the red LED on the AMI\textsuperscript{G2} interface board marked GOP1 (D27):

- ON = normal operation
- OFF = guards opened, system halted.

When overridden, it is indicated by the red LED on the servo interface board marked GOVR (D25):

- ON = Guards overridden.
- OFF = Normal operation.
Vector/Home switch connection

Vector switches are done using TB3 input pins 9 (X), 11 (Y), 13 (Z) on AMI\textsuperscript{G2} interface.
## 3.8 Electrical Information

### AMI G2 Specification

To ensure complete disconnect from the Mains, the 3-Phase wiring must have an external disconnect box, or terminated using a plug. Always disconnect the AMI G2 from the Mains power supply before opening the control cabinet.

<table>
<thead>
<tr>
<th>Specification</th>
<th>AMI G2 Standard</th>
<th>AMI G2 Deluxe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Power Input from console</td>
<td>AC 100 ... 120 V (±10 %)</td>
<td>AC 100 ... 120 V (±10 %)</td>
</tr>
<tr>
<td></td>
<td>50 Hz ... 60 Hz (±2 %)</td>
<td>50 Hz ... 60 Hz (±2 %)</td>
</tr>
<tr>
<td>Replaceable Fuses:</td>
<td>See &quot;Fuse ratings&quot; on page 33</td>
<td>See &quot;Fuse ratings&quot; on page 33</td>
</tr>
<tr>
<td>Motor Power Input: Single Phase</td>
<td>AC 100 ... 120 V (±10 %)</td>
<td>AC 100 ... 120 V (±10 %)</td>
</tr>
<tr>
<td></td>
<td>50 Hz ... 60 Hz (±2 %)</td>
<td>50 Hz ... 60 Hz (±2 %)</td>
</tr>
<tr>
<td></td>
<td>(max. 1.47 kW)</td>
<td>(max. 1.47 kW)</td>
</tr>
<tr>
<td>Motor Power Input: 3-Phase</td>
<td>AC 220 ... 485 V (±10 %)</td>
<td>AC 220 ... 485 V (±10 %)</td>
</tr>
<tr>
<td></td>
<td>50 Hz ... 60 Hz (±2 %)</td>
<td>50 Hz ... 60 Hz (±2 %)</td>
</tr>
<tr>
<td></td>
<td>(max. 3.7 kW)</td>
<td>(max. 3.7 kW)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ° ... 45 °C (32 ° ... 113 °F)</td>
<td>0 ° ... 45 °C (32 ° ... 113 °F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 ° ... 70 °C (-4 ° ... 158 °F)</td>
<td>-20 ° ... 70 °C (-4 ° ... 158 °F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>&lt; 80 % RH</td>
<td>&lt; 80 % RH</td>
</tr>
<tr>
<td>Protection (IEC 60529)</td>
<td>Type 12 K (IP 54)</td>
<td>Type 12 K (IP 54)</td>
</tr>
<tr>
<td>SCCR</td>
<td>5 kA</td>
<td>5kA</td>
</tr>
<tr>
<td>Weight</td>
<td>12 lbs (5.4 kg)</td>
<td>14 lbs (6.3 kg)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Sheet metal</td>
<td>Sheet metal</td>
</tr>
</tbody>
</table>
Switching Inputs 24 Vdc (PLC)

Input signals of the switching inputs for the AM\textsuperscript{G2} PCB:

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>“1” Signal: Vi</th>
<th>13 V to 30.2 V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“0” Signal: Vi</td>
<td>-20 V to 3.2 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current ranges</th>
<th>“1” Signal: Vi</th>
<th>3.8 mA to 8.9 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“0” Signal: Vi when Vi = 3.2 V</td>
<td>1.0 mA</td>
</tr>
</tbody>
</table>

Switching Outputs 24 Vdc (PLC)

- **Voltage range**
  - “1” Signal: Vi | 13 V to 30.2 V

- **Current ranges**
  - Single 24 Vdc output | <=100 mA
  - All 24 Vdc outputs | <=500 mA

- **Note:** The switching outputs need a minimum load of 5 mA to operate correctly. Outputs conform to EN 61131-2.

- **Permissible load:** Resistive load (ohmic load)—inductive load (e.g. relay, contactor) only with quenching diode parallel to inductance.
- **Short circuiting:** One output is permissible. No more than one output may be short-circuited at one time.

- **PLC outputs must not be connected to a 24 V supply or to other PLC outputs with a difference in potential. This could cause the voltage present at the PLC outputs to transmit to the power supply. The PLC outputs that can be switched off may be supplied with this voltage.**
### Fuse ratings

<table>
<thead>
<tr>
<th>Fuse #</th>
<th>Dimensions</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>10 x 38 mm</td>
<td>T 30A/600 VAC UL T 32A/690 VAC IEC</td>
</tr>
<tr>
<td>F2</td>
<td>10 x 38 mm</td>
<td>T 30A/600 VAC UL T 32A/690 VAC IEC</td>
</tr>
<tr>
<td>F3</td>
<td>10 x 38 mm</td>
<td>T 30A/600 VAC UL T 32A/690 VAC IEC</td>
</tr>
<tr>
<td>F1(PCB)</td>
<td>6.3 x 32 mm</td>
<td>T 5A/250 VAC</td>
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</tbody>
</table>

⚠️ Use only replacements fuses meeting the rated specifications.

---

![Diagram](image-url)
### Connections:

AMI Signal - 37 pin out

![Diagram of 37-pin connector](image)

<table>
<thead>
<tr>
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<th>Pin</th>
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<tr>
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</tr>
<tr>
<td>O3 COOL ON</td>
<td>6</td>
</tr>
<tr>
<td>O4 SPDL FWD</td>
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<td>O5 SPDL REV</td>
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<td>O8 LUBE ON</td>
<td>9</td>
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<td>O18 MIST ON</td>
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<td>11</td>
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<tr>
<td>I0 HOME SW X</td>
<td>12</td>
</tr>
<tr>
<td>I1 HOME SW Y</td>
<td>13</td>
</tr>
<tr>
<td>I2 HOME SW Z</td>
<td>14</td>
</tr>
<tr>
<td>I7 SPDL OVL</td>
<td>15</td>
</tr>
<tr>
<td>I8 COOL OVL</td>
<td>16</td>
</tr>
<tr>
<td>I19 SHARED I1</td>
<td>17</td>
</tr>
<tr>
<td>I20 SHARED I2</td>
<td>18</td>
</tr>
<tr>
<td>I21 SHARED I3</td>
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</tr>
<tr>
<td>I22 GUARD</td>
<td>20</td>
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</tr>
<tr>
<td>CTRL RDY</td>
<td>24</td>
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<td>I31 DRIVE EN</td>
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<td>I11 HOME SW U</td>
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<td>O28 AUX 3</td>
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<td>O29 AUX 4</td>
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<td>I3 CTRL ACK</td>
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<td>I24 SPDL AT-REST</td>
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<td>I25 REMOTE GO</td>
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</tr>
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<td>I26 LOW OIL</td>
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</tr>
<tr>
<td>I27 SPDL GEAR</td>
<td>35</td>
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<tr>
<td>SPINDLE DAC+</td>
<td>36</td>
</tr>
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<td>SPINDLE DAC-</td>
<td>37</td>
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<tr>
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### Servo Power output - pin out

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<td>1</td>
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</tr>
<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>Ground</td>
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</table>

![Diagram of Servo Power output - pin out]
3.9 Interconnect Cable

AMI\textsuperscript{G2}

Connecting cable

<table>
<thead>
<tr>
<th>ID</th>
<th>Cable, Console to control cabinet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1117505-05</td>
<td>16.4 ft (5 m)</td>
</tr>
</tbody>
</table>
3.10 Product Overview and Dimensions

Dimensions:

AMI$^G^2$ dimensions

DIMENSIONS: INCHES
3.10 Product Overview and Dimensions

**AMI² Interface**

**ID 1071952-xx**

**PCBA pin out**

General Notes:

- If dead-stop limits, or additional E-Stop buttons are not being used, jumpers must be placed at their corresponding location on TB3: (1-2), (3-4), (5-6), (7-8).
- Remove factory installed jumper from TB16 when using machine guards.

- To access the shared I/O at TB16, (Guards Safety and Quill will be disabled).
  - Remove harness from TB4.
  - Add jumper from TB16-14 to TB16-16.
### Pin outs for TB1

<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
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</tr>
<tr>
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<td>N NEUTRAL</td>
</tr>
<tr>
<td>3</td>
<td>N</td>
<td>NEUTRAL</td>
</tr>
<tr>
<td>4</td>
<td>N</td>
<td>NEUTRAL</td>
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<tr>
<td>5</td>
<td></td>
<td>L1 AC IN</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>T1 AC OUT</td>
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### Pin outs for TB3

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<th>9</th>
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<tbody>
<tr>
<td>EXTERNAL ESTOP</td>
<td>EXTERNAL ESTOP</td>
<td>X-LIMIT</td>
<td>X-LIMIT</td>
<td>Y-LIMIT</td>
<td>Y-LIMIT</td>
<td>Z-LIMIT</td>
<td>Z-LIMIT</td>
<td>I0 HOME SW X</td>
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<tr>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>O3</td>
<td>COOL ON</td>
<td>I1</td>
<td>HOME SW Y</td>
<td>O4</td>
<td>SPDL FWD</td>
<td>I2</td>
<td>HOME SW Z</td>
<td>O5</td>
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<tr>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
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<tr>
<td>I24</td>
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<td>AUX 1</td>
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<td>REMOTE GO</td>
<td>O27</td>
<td>LOW OIL</td>
<td>I26</td>
</tr>
<tr>
<td>28</td>
<td>29</td>
<td>30</td>
<td>31</td>
<td>32</td>
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<tr>
<td>+24 V</td>
<td>COM</td>
<td>+24 V</td>
<td>COM</td>
<td>+24 V</td>
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</table>
### 3.10 Product Overview and Dimensions

#### Pin outs for TB4

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<td>1</td>
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<tr>
<td>4</td>
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<td>5</td>
<td>BLACK</td>
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<td>6</td>
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<tr>
<td>7</td>
<td></td>
<td>COM</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>ESTOP OUT</td>
</tr>
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</tr>
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#### Pin outs for TB16

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<th>8</th>
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<tbody>
<tr>
<td>I19</td>
<td>I20</td>
<td>I21</td>
<td>I22</td>
<td>O17</td>
<td>/</td>
<td>COM</td>
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<td>SHARED_I1</td>
<td>SHARED_I2</td>
<td>SHARED_I3</td>
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<td>14</td>
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<td>/</td>
<td>I22</td>
<td>GUARD SW</td>
<td>INPUT</td>
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</table>

#### JUMPERS

Other jumpers have no user functionality and are not to be moved.

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<thead>
<tr>
<th>JP</th>
<th>DEFAULT</th>
<th>DESCRIPTION</th>
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<tr>
<td>JP3</td>
<td>1-2</td>
<td>2-3: ENABLED E-STOP OUT</td>
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<tr>
<td>JP9</td>
<td>1-2</td>
<td>2-3: ENABLED SHARED_I4 (I22 AT TB16-4)</td>
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<td>JP10</td>
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<td>2-3: ENABLED SHARED_O1 (O17 AT TB16-5)</td>
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<td>2-3: ENABLED SHARED_I1 (I19 AT TB16-1)</td>
</tr>
<tr>
<td>JP12</td>
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<td>2-3: ENABLED SHARED_I3 (I21 AT TB16-3)</td>
</tr>
<tr>
<td>JP13</td>
<td>1-2</td>
<td>2-3: ENABLED SHARED_I2 (I20 AT TB16-2)</td>
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### Pin outs for X1

<table>
<thead>
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<td>SPDL REV</td>
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<td>O17</td>
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<td>ESTOP</td>
<td>+24</td>
<td>N/A</td>
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<td>GND</td>
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<td>BLACK</td>
<td>GND</td>
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<td>+24 V</td>
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<td>6</td>
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<td>+24 V</td>
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### Diagnostic Leds

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<th>SilkScreen</th>
<th>Description</th>
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<td>SWX</td>
<td>I0</td>
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<tr>
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<td>E-STOP</td>
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<td>RST2</td>
<td>RESET2</td>
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<td>RST1</td>
<td>RESET1</td>
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<td>COOL</td>
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<td>REV</td>
<td>SPDL_REV</td>
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<td>AUX2</td>
</tr>
<tr>
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<td>GREEN</td>
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<td>OUT4</td>
<td>AUX3</td>
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<td>SWY</td>
<td>I1</td>
</tr>
<tr>
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<td>COVL</td>
<td>COOL OVL</td>
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<td>SPDL OVL</td>
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<td>+24 V</td>
<td>+24 V DC</td>
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<td>D34</td>
<td>GREEN</td>
<td>OFF</td>
<td>IN2</td>
<td>I24</td>
</tr>
<tr>
<td>D35</td>
<td>GREEN</td>
<td>OFF</td>
<td>OUT2</td>
<td>AUX1</td>
</tr>
<tr>
<td>D36</td>
<td>GREEN</td>
<td>OFF</td>
<td>IN3</td>
<td>I25</td>
</tr>
<tr>
<td>D37</td>
<td>GREEN</td>
<td>OFF</td>
<td>IN4</td>
<td>I26</td>
</tr>
<tr>
<td>D38</td>
<td>GREEN</td>
<td>OFF</td>
<td>IN5</td>
<td>I27</td>
</tr>
<tr>
<td>D39</td>
<td>GREEN</td>
<td>OFF</td>
<td>OUT5</td>
<td>AUX4</td>
</tr>
<tr>
<td>D42</td>
<td>GREEN</td>
<td>OFF</td>
<td>GOPN2</td>
<td>GRD II CLOSED</td>
</tr>
<tr>
<td>D50</td>
<td>GREEN</td>
<td>OFF</td>
<td>S1O1</td>
<td>I19</td>
</tr>
<tr>
<td>D51</td>
<td>GREEN</td>
<td>OFF</td>
<td>S1O2</td>
<td>I20</td>
</tr>
<tr>
<td>D52</td>
<td>GREEN</td>
<td>OFF</td>
<td>S1O3</td>
<td>I21</td>
</tr>
<tr>
<td>D53</td>
<td>GREEN</td>
<td>OFF</td>
<td>S1O4</td>
<td>I22</td>
</tr>
<tr>
<td>D54</td>
<td>GREEN</td>
<td>OFF</td>
<td>S1O5</td>
<td>O17</td>
</tr>
</tbody>
</table>
3.11 System Equipment

Console ID 745604-0x, 113777-0x
3.12 System Interconnect

Console, motor cabling, & connection

Document ID 1026815

---

**Notes (Unless Otherwise Specified):**
1. Spindle Override is only available on the spindle control consoles 745604-02/04.
2. Touch probe dongle 809495-01 only required when used with 745604-XX consoles.

---

**Spindle Motor**
- 1109611-01 Standard / 1109611-05 Deluxe
  - Oil / Coolant

**Lube Pump**
- 745604-02/04, 1113777-02/04 Spindle Control / VGA
  - 745604-01/03, 1113777-01/03 Standard / VGA

**AC 120 V / 15 A**

---

**Spindle Motor**
- 1117505-05

---

**Remote Motor Electronics**
- (20337242 W/O BRAKE, 20337248 W/BRAKE)
- 2033-239 W/O BRAKE
- 2033-249 W/BRAKE

---

**Remote Start**
- 387900664

---

**X Axis Motor**
- 2033104/2033117

**Z Axis Motor**
- 2033125

**Y Axis Motor**
- 2033104/2033117

---

**Rotary Encoder**
- 585231-xx

---

**W Axis**
- Linear Encoder

---

**Linear Encoder**
- Optional

---

**Limit Switch**
- 585231-xx

---

**Spindle Motor**
- 1117505-05

---

**Encoder Inputs**
- (3x) Servo Signals

---

**Servo Power**
- AC Power AMI G2 and Servo Motors

---

**Encoder S**
- Position Encoders

---

**Touch Probe**
- TS Touch Trigger Probe

---

**VGA Output (optional)**
- VG

---

**Input for Remote Start/Stop**
- PENDANT

---

**Input for Edge Finder (Probe)**
- EDGE FINDER

---

**Ethernet Connection**
- NETWORK

---

**RS232 Interface**
- SERIAL PORT

---

**USB Interface**
- US

---

**PLC Input/Output to Machine**
- AMI

---

**Oil Coolant**
- Oiler Input to AMI Box
- Coolant Pump Input to AMI G2

---

**Limit Switch Inputs to AMI G2**

---

**Oiler**
- OIL

---

**Coolant**
- COOLANT

---

**Spindle Motor**
- Spindle Motor

---

**Touch Probe Dongle**
- 809495-01

---

**SFM 3D**
- 809495-01

---

**KT 130**
- 809495-01

---

**KT 3D**
- 809495-01
3.13 Interconnect and Wiring Diagram (Standard)

Console interconnect

Document ID 1085469 Page 1 of 2
Standard single phase wiring diagram

SUPPLY AND INSTALLATION OF 3PHASE WIRING TO THE MAINS IS THE RESPONSIBILITY OF THE OEM OR ENDUSER. INSTALLATION SHOULD ONLY BE PERFORMED BY A QUALIFIED ELECTRICIAN AND IN ACCORDANCE WITH THE LOCAL ELECTRICAL CODE.

NOTES 4, 5

ACU-RITE AMI G2
3.14 Interconnect and Wiring Diagram (Deluxe)

Console interconnect

Document ID 1117579 Page 1 of 3

NOTES

1. IF USING EDGE FINDER WITH A 745604-XX CONSOLE, TOUCH PROBE DONGLE (809495-01) NEEDS TO BE PLUGGED INTO TOUCH PROBE PORT

AMI G2 BOX CONNECTIONS ON PAGE 2

2. Z AXIS ROTARY MOTOR (2033190) DOES NOT NEED EXTERNAL ENCODER

3. X AXIS MOTOR 2033104/2033117

Z AXIS MOTOR 2033125/2033190

Edge Finder 272714-03 or 272714-04

Note 1

Linear Encoder

X axis encoder signals

Manual Z encoder signals

Optional external VGA

VGA signals

Start/Stop remote 387900664

Start/Stop control signals

Touch probe signals cables

Optional remote motor electronics

20337242 series I w/o brake/

20337243 series II w/o brake/

20337248 series II w brake

MOTOR SERIES I W/O BRAKE 20337239/

SERIES II W/O BRAKE 20337240/

SERIES II W BRAKE 20337249

Servo signals

AC OUT

Note 2

X axis motor 2033104/2033117

Y axis motor 2033104/2033117

Y axis encoder signals

Z axis encoder signals

Z axis encoder / limit switch

KT-130 interface 1085476-01

Manual Z linear encoder (2x system only)

KT-130 edge finder 283273-S1

AC to servos

AC to AMIG2 box

AMI G2 box signals 1117505-05

AC to AMIG2 box

AMI G2 box signals 1117505-05

AC to servos

AC to AMIG2 box

AMI G2 box signals 1117505-05

AC to AMIG2 box

AMI G2 box signals 1117505-05

AC to servos

AC to AMIG2 box

AMI G2 box signals 1117505-05

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AC to AMIG2 box

AMI G2 box signals 1117505-05

AC to servos

AC to AMIG2 box

AMI G2 box signals 1117505-05

AC to AMIG2 bo
3.14 Interconnect and Wiring Diagram (Deluxe)

Deluxe three phase wiring diagram

Document ID 1117579 Page 3 of 3
3.15 Wiring Diagram

DC SYSTEM WIRING DIAGRAM

AC MAINS
120 VAC IN
60Hz
15A MAX

SERVO
POWER
120 VAC OUT
60Hz
15A MAX

AC POWER IS
DAISY CHAINED TO
AMI G2 BOX AND
EACH MOTOR

SERVO
POWER
TO INTERNAL CIRCUITRY

DC-DC
Converter

TO INTERNAL CIRCUITRY

POWER SUPPLY,
100W, +24V

15A ON/OFF
BREAKER
SWITCH

DOTTED LINE
REPRESENTS
CHASSIS / PROTECTIVE EARTH

CONSOLE
3.15 Wiring Diagram

AMIG2 E-STOP LADDER DIAGRAM

NOTES
1. ▶ INPUT SIGNALS FROM CONSOLE.
2. ◀ OUTPUT SIGNALS TO CONSOLE.
3. ADDITIONAL E-STOPS CAN BE WIRED EXTERNALLY TO TB3 OF THE AMIG2. REFER TO INSTALLATION MANUAL.
4. THIS PAGE ONLY USED WHEN AMIG2 IS INSTALLED. REF DOC 1111657 FOR FULL WIRING DIAGRAM.

AMIG2 RELAY FUNCTIONS
K1 – SERVO TURN ON
K4 – BRAKE
K7 – CONTROL LOOP
Supply and installation of 3 phase wiring to the mains is the responsibility of the OEM or end user. Installation should only be performed by a qualified electrician and in accordance with the local electrical code.

Use 14 AWG or larger, 60°C (140°F) wire.

Use copper conductors only.

Torque SW1 to 15 lb-in.
FACTORY INSTALLED COLOR CODING ACCORDING TO UL 508A

ALL UNGROUNDED AC POWER WIRES ARE BLACK.
ALL GROUNDED AC POWER WIRES ARE WHITE.
ALL UNGROUNDED DC CONTROL WIRES ARE BLUE.

X41-X ARE PLC OUTPUTS.
X42-X ARE PLC INPUTS.
ON = 24 V, OFF = 0 V.
Normandy closed E-stop devices and limit switches can be connected at TP3. Refer to installation manual.

JP1 and JP10 not installed by default. SW1 is shorted by default (no guards).

Reset button not used.
3.16 Control Panel Wiring Diagram
Software Setup and Configuration
AMI²

ACU-RITE AMI²
4.1 Software Setup and Configuration

Configuring AM\textsuperscript{G2} in MILLPWR\textsuperscript{G2} Software

The default MILLPWR\textsuperscript{G2} software and corresponding AM\textsuperscript{G2} PLC are preconfigured for most default machine behaviors. It may still be necessary to enable, disable, or configure some features for a particular machine.

- To alter most settings, use the Machine Functions dialogue in the Installation Setup area of the MILLPWR\textsuperscript{G2} control software. For more details, refer to Chapter 4.6 “Installation Setup” in the MILLPWR\textsuperscript{G2} User Manual (ID 1034382-2x).
- To alter configuration data parameters, refer to the MILLPWR\textsuperscript{G2} Installation Manual (ID 1034382-2x). See Chapter 4.6 “Installation Setup” for instructions on how to access the Advanced Configuration mode of the software.
- Contact HEIDENHAIN Corporation for assistance to alter PLC source.

External E-Stop

- When all external E-Stop switches are properly wired in series with the dead-stop limit circuit at TB3, there is no software or PLC configuration necessary.

Remote GO

- When a remote GO input is properly wired to TB3, there is no software or PLC configuration necessary.

Indexer

The indexer output is controlled via a running program using the Auxiliary Function step and the corresponding auxiliary output.

- When an indexer control output is properly wired to TB3, there is no software or PLC configuration necessary.

Machine Guards

The use of machine guards can be enabled or disabled by setting the Guards field within the Machine Functions setup dialogue, to the appropriate Enabled or Disabled value.
Coolant Flood and Mist

- When the coolant flood and coolant mist outputs are properly wired at TB3, there is no software or PLC configuration necessary.

The coolant outputs are controlled via a running program, using the Coolant field in the Auxiliary Function step.

Automatic Lubrication

- AMIG2 is capable of controlling a lubrication pump automatically, allowing for machine lubrication based on axes travel distance.

- To enable the lubrication pump control, set the Lube field within the Machine Functions setup dialogue to Enabled. This will also enable the monitoring of the oil level, so the input signal must be properly wired at TB3.

- Once the Lube field is set to Enabled, the Distance field becomes editable. Enter the distance any of the axes (X, Y, or Z) should travel before the pump is activated.

Spindle Control

Directional Control

- When a spindle motor is properly wired to an AMIG2 with supplied forward/reverse contactors, there is no additional setup required to control only the spindle direction.

DAC Output Voltage

- The MILLPWRG2 control must be configured to output the correct DAC voltage required by the spindle drive, if one is in use.

- In the Machine Functions setup dialogue, set the Polarity field to Bipolar (±10 Vdc) or to Unipolar (0 Vdc to +10 Vdc) as required.
4.1 Software Setup and Configuration

**Speed Inputs**

If a spindle drive is to be used which supports outputting signals to the NC controller, then these two “at speed” and “at rest” signal outputs can be connected to AMI\(^G2\) at TB3.

- In the Machine Functions setup dialogue, set the Inputs field to Enabled or Disabled as required.
- If set to Enabled, you may want to set the Delay field to “0”, as any delay value will still take effect, essentially overriding the status of the at-speed and at-rest input signals.

**Spindle Delay**

- The MILLPWR\(^G2\) control must be configured with the amount of delay time for the spindle in use. This is done by setting the number of seconds that the MILLPWR\(^G2\) should wait to allow for a spindle command to take effect.
- In the Machine Functions setup dialogue, enter the amount of time delay (in seconds) required into the Delay field.
- A running program will wait this amount of time for any spindle command before continuing to run, including spindle ramp up, ramp down, and switching directions.

**RPM Definitions**

- The MILLPWR\(^G2\) control must be configured with the supported RPM speeds of the spindle in use.

The RPM speeds are defined in the Machine Functions setup dialogue, using the following fields:

- **Low MIN**: Define the minimum RPM speed of the spindle in LOW gear.
- **Low MAX**: Define the maximum RPM speed of the spindle in LOW gear.
- **High MIN**: Define the minimum RPM speed of the spindle in HIGH gear.
- **High MAX**: Define the maximum RPM speed of the spindle in HIGH gear.

- If no gear changing is necessary, set the Low MAX speed to the spindle’s highest RPM, and then adjust the High MIN value to be at least 1 RPM greater, and then again the High MAX value to at least 1 RPM greater still.
Machine Functions Soft Keys

The MILLPWRG2 software can be configured to access the Machine Functions Soft Keys (MFSK). The MFSK set of soft keys provide manual access and control of some features specific to AMIG2. For details on how to access and use the Installation Settings dialogue refer to the MILLPWRG2 Installation Manual (ID 1034382-2x); see Chapter 4.6 “Installation Setup”.

- To enable these soft keys choose **Machine Functions** from the Installation Settings dialogue.
- Set the parameter MFSK Menu to **Enabled** to display the **Machine Functions** softkey, or select **Disabled** to hide the soft key.
- Once enabled, the soft keys can be accessed while at the DRO screen, or while running a program, by pressing the **Machine Functions** soft key.
- To exit the Machine Functions softkeys and return to the main operations softkeys, press the **CANCEL** key.
The Machine Functions Menu has the following soft keys and features:

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="S_FWD" /></td>
<td><strong>S_FWD</strong>: Turns the spindle motor ON in the Forward direction.</td>
</tr>
<tr>
<td><img src="image" alt="S_REV" /></td>
<td><strong>S_REV</strong>: Turns the spindle motor ON in the Reverse direction.</td>
</tr>
<tr>
<td><img src="image" alt="S_OFF" /></td>
<td><strong>S_OFF</strong>: Turns the spindle motor OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Cool" /></td>
<td><strong>Cool</strong>: Toggles the Coolant Flood circuit ON or OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Mist" /></td>
<td><strong>Mist</strong>: Toggles the Coolant Mist circuit ON or OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Auxiliary Functions" /></td>
<td><strong>Auxiliary Functions</strong>: Switches the menu to the Auxiliary Functions menu that provides the following soft keys:</td>
</tr>
<tr>
<td><img src="image" alt="Aux Output 1" /></td>
<td><strong>Aux Output 1</strong>: Toggles the Auxiliary Output 1 ON or OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Aux Output 2" /></td>
<td><strong>Aux Output 2</strong>: Toggles the Auxiliary Output 2 ON or OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Aux Output 3" /></td>
<td><strong>Aux Output 3</strong>: Toggles the Auxiliary Output 3 ON or OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Aux Output 4" /></td>
<td><strong>Aux Output 4</strong>: Toggles the Auxiliary Output 4 ON or OFF.</td>
</tr>
<tr>
<td><img src="image" alt="Back" /></td>
<td><strong>Back</strong>: Switches the menu back to the previous set of soft keys.</td>
</tr>
</tbody>
</table>
5.1 Maintenance

General care

⚠️ Periodically inspect the system and connecting cables for damage or poor connections. Correct problems before operating the equipment.

Cleaning
▶ Power off the AMI\textsuperscript{G2}.
▶ Disconnect the power cable from the source of power.
▶ Clean exterior surfaces with a cloth dampened with water and a mild detergent.

Never use abrasive cleaners, strong detergents, or solvents.
A
AMI G2
  Box dimensions 37
  Deluxe configuration 19
  Enclosure labeling 20
  General Information 12
  Main components 19
  Specification 31
  Standard configuration 19
Automatic Lubrication 59
C
  Cabinet cover removal 26
  Cable Connections 25
  Cable Routing 25
  Changes (errors) 7
  Configuring AMI G2 in MILLPWRG2 Software 58
Connections 34
  AMI Signal (37 pin out) 34
  Connecting cable 36
  Servo Power output - pin out 35
Console Rear Panel 25
Coolant Flood and Mist 59
Coolant Pump wiring 28
D
  Deluxe wiring diagram
    Single phase 49
    Three phase 50
  Diagnostic Leds 43
E
  Electrical Information 31
  Electrical Wiring 26
  Electrical wiring diagram 51
  Enclosure Central Ground Point 21
  External E-Stop 58
  E-Stop 52
    Emergency Stop button 16
    External E-Stop and Limit switch 16
  E-Stop ladder wiring diagram 52
F
  Fuse Ratings 33
G
  Grounding and Wiring Guidelines 21
  Guards 29
I
  Indexer 58
Installation
  Enclosure location 24
  Mounting fasters 24
  Procedure 23
  Requirements 12
  Tools 13
  Interconnect Cable 36
  Interconnect Diagram Deluxe 48
  Isolation transformer 22
J
  JUMPERS 41
M
  Machine Functions Menu 61
    Soft keys 62
  Machine Guards 58
  Maintenance
    Cleaning 64
Message Symbols
  Advice Attention 7
  Advice Damage 7
  Advice take note 7
  Different between machines 7
  Refer to another Manual 7
Message symbols 7
Mounting and Electrical Installation
  Reference drawing table 18
P
  PCBA Pinout 38
  Pin outs
    TB1 40
    TB16 41
    TB3 40
    TB4 41
    X1 42
    X12 42
    X4 42
R
  Remote GO 58
S
  Software Setup and Configuration 58
  Spindle Control 59
    DAC Output Voltage 59
    Directional Control 59
    RPM Definitions 60
    Speed Inputs 60
    Spindle Delay 60
    Spindle inverter 27
  Spindle inverter wiring 27
  Spindle motor wiring
    Deluxe model 27
    Standard model 26
  Standard single phase wiring diagram 47
  Switching Inputs 24 Vdc (PLC) 32
  Switching Outputs 24 Vdc (PLC) 32
  Symbols used 8
  System Equipment 44
  System grounds 21
U
  Update Information 10
V
  Vector/Home Switch Connection 30
W
  Wiring Guidelines 22