A7 Analog PLC
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1. A7 ANALOG PLC

The A7 Analog PLC (Programmable Logic Controller) is an analog I/O (input/output) device for communication between the A7 MIG Welding system and a welding robot. The I/O modules used in the A7 Analog PLC are provided by Beckhoff.

This manual describes the A7 Analog PLC connection diagrams and configuration operations required when upgrading from Kemparc Pulse to A7 MIG Welder.

This manual is intended for the use of trained specialists in control and automation engineering.

For any other information on the PLC system, refer to Beckhoff Information System in https://www.beckhoff.com/.

Product names and trademarks

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2. A7 LITE ANALOG PLC

The following displays the A7 Lite Analog PLC module package.

<table>
<thead>
<tr>
<th>OA1</th>
<th>0A1</th>
<th>1A1</th>
<th>9A1</th>
<th>9A2</th>
<th>9A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0A1</td>
<td>CX8090</td>
<td>1A1</td>
<td>EL1809</td>
<td>9A1</td>
<td>9A2</td>
</tr>
<tr>
<td>CPU WIN CE</td>
<td>16 DI 24V</td>
<td>16 24V</td>
<td>16 DO 24V</td>
<td>16 -0V</td>
<td>EtherCat</td>
</tr>
<tr>
<td>X001</td>
<td>1 24V</td>
<td>0V 5</td>
<td>1 Ch1</td>
<td>Ch9</td>
<td>1 24V</td>
</tr>
<tr>
<td>X101</td>
<td>2 Ch2</td>
<td>Ch10 10</td>
<td>2 24V</td>
<td>24V 10</td>
<td>2 Ch2</td>
</tr>
<tr>
<td>X102</td>
<td>2 24V</td>
<td>24V 6</td>
<td>3 Ch3</td>
<td>Ch11 11</td>
<td>3 24V</td>
</tr>
<tr>
<td>S101</td>
<td>3 0V</td>
<td>0V 7</td>
<td>5 Ch5</td>
<td>Ch13 13</td>
<td>5 24V</td>
</tr>
</tbody>
</table>

The I/O modules are the following:
- **OA1 - CX8090 (CPU WIN CE)**
- **1A1 - EL1809 (Digital input terminal, 16 x 24V DC)**
- **9A1 - EL9188 (Potential distribution terminal, 16 x 24V DC)**
- **2A1 - EL2809 (Digital output terminal, 16 x 24V DC)**
- **9A2 - EL9189 (Potential distribution terminal, 16 x 0V DC)**
- **9A3 - EK1110 (EtherCAT coupler)**

The connection diagram of each module is described in its own section.

*Connection diagram of OA1* on page 10
*Connection diagram of 1A1/9A1* on page 11
*Connection diagram of 2A1/9A2* on page 12
*Connection diagram of 9A3* on page 8
2.1 Connection diagram of 0A1

This section describes the connection diagram of 0A1 - CX8090 (CPU WIN CE).

X001 - Ethernet 192.168.02
X101 - Ethernet DHCP
X102 - Ethernet DHCP
S101 - DIP switch
1 - ON
2 - ON
3 - ON
4 - ON
5 - ON
6 - ON
7 - ON
8 - ON
9 - ON
10 - OFF

1 - Jump to 0A1/2
2 - Jump to 0A1/1
3 - Jump to 0A1/5
4 - PE
5 - Jump to 0A1/3
6 - 24VDC power
7 - 0V power
8 - PE
2.2 Connection diagram of 1A1/9A1

This section describes the connection diagrams of the following:

- 1A1 - EL1809 (Digital input terminal, 16 x 24V DC)
- 9A1 - EL9188 (Potential distribution terminal, 16 x 24V DC)

1 - Channel bit 0
2 - Channel bit 1
3 - Channel bit 2
4 - Channel bit 3
5 - Channel bit 4
6 - Channel bit 5
7 - Channel bit 6
8 - Channel bit 7
9 - StartWelding
10 - WireInch
11 - WireRetract
12 - GasBlow
13 - AirBlow
14 - TouchSensorOn
15 - OnlineControl
16 - ErrorReset
2.3 Connection diagram of 2A1/9A2

This section describes the connection diagrams of the following:

- 2A1 - EL2809 (Digital output terminal, 16 x 24V DC)
- 9A2 - EL9189 (Potential distribution terminal, 16 x 0V DC)

1 - ErrorNumber bit 0
2 - ErrorNumber bit 1
3 - ErrorNumber bit 2
4 - ErrorNumber bit 3
5 - ErrorNumber bit 4
6 - ErrorNumber bit 5
7 - ErrorNumber bit 6
8 - ErrorNumber bit 7
9 - Ready
10 - PowerSourceReady
11 - CycleOn
12 - ArcOn
13 - GasFlowOK
14 - TouchSensed
15 - Error
16 - CollisionDetected
2.4 Connection diagram of 9A3

This section describes the connection diagram of 9A3 - EK1110 (EtherCAT coupler).
3. A7 FULL ANALOG PLC

The following displays the A7 Full Analog PLC module package.

The I/O modules are the following:

- 0A1 - CX8090 (CPU WIN CE)
- 1A1 - EL1809 (Digital input terminal, 16 x 24 V DC)
- 9A1 - EL9188 (Potential distribution terminal, 16 x 24 V DC)
- 2A1 - EL2809 (Digital output terminal, 16 x 24 V DC)
- 9A2 - EL9189 (Potential distribution terminal, 16 x 0 V DC)
- 3A1 - EL3004 (4-channel analog input terminal 0…20 mA, single-ended, 12 bit)
- 4A1 - EL4038 (8-channel analog output terminal -10…+10 V, 12 bit)
- 9A3 - KL9187 (Potential distribution terminal, 8 x 0 V DC)
- 9A4 - EK1110 (EtherCAT coupler)

The connection diagram of each module is described in its own section.

*Connection diagram of 0A1* on the next page
*Connection diagram of 1A1/9A1* on page 11
*Connection diagram of 2A1/9A2* on page 12
*Connection diagram of 3A1* on page 13
*Connection diagram of 4A1/9A3* on page 14
*Connection diagram of 9A4* on page 15
3.1 Connection diagram of 0A1

This section describes the connection diagram of 0A1 - CX8090 (CPU WIN CE).

<table>
<thead>
<tr>
<th>Port Description</th>
<th>Connection Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>X001 - Ethernet 192.168.02</td>
<td>1 - Jump to 0A1/2</td>
</tr>
<tr>
<td>X101 - Ethernet DHCP</td>
<td>2 - Jump to 0A1/1</td>
</tr>
<tr>
<td>X102 - Ethernet DHCP</td>
<td>3 - Jump to 0A1/5</td>
</tr>
<tr>
<td>S101 - DIP switch</td>
<td>4 - PE</td>
</tr>
<tr>
<td>1 - ON</td>
<td>5 - Jump to 0A1/3</td>
</tr>
<tr>
<td>2 - ON</td>
<td>6 - 24VDC power</td>
</tr>
<tr>
<td>3 - ON</td>
<td>7 - 0V power</td>
</tr>
<tr>
<td>4 - ON</td>
<td>8 - PE</td>
</tr>
<tr>
<td>5 - ON</td>
<td></td>
</tr>
<tr>
<td>6 - ON</td>
<td></td>
</tr>
<tr>
<td>7 - ON</td>
<td></td>
</tr>
<tr>
<td>8 - ON</td>
<td></td>
</tr>
<tr>
<td>9 - ON</td>
<td></td>
</tr>
<tr>
<td>10 - OFF</td>
<td></td>
</tr>
</tbody>
</table>
3.2 Connection diagram of 1A1/9A1

This section describes the connection diagrams of the following:

- 1A1 - EL1809 (Digital input terminal, 16 x 24V DC)
- 9A1 - EL9188 (Potential distribution terminal, 16 x 24V DC)

1 - Channel bit 0
2 - Channel bit 1
3 - Channel bit 2
4 - Channel bit 3
5 - Channel bit 4
6 - Channel bit 5
7 - Channel bit 6
8 - Channel bit 7
9 - StartWelding
10 - WireInch
11 - WireRetract
12 - GasBlow
13 - AirBlow
14 - TouchSensorOn
15 - OnlineControl
16 - ErrorReset
3.3 Connection diagram of 2A1/9A2

This section describes the connection diagrams of the following:

- 2A1 - EL2809 (Digital output terminal, 16 x 24V DC)
- 9A2 - EL9189 (Potential distribution terminal, 16 x 0V DC)

1 - ErrorNumber bit 0
2 - ErrorNumber bit 1
3 - ErrorNumber bit 2
4 - ErrorNumber bit 3
5 - ErrorNumber bit 4
6 - ErrorNumber bit 5
7 - ErrorNumber bit 6
8 - ErrorNumber bit 7
9 - Ready
10 - PowerSourceReady
11 - CycleOn
12 - ArcOn
13 - GasFlowOK
14 - TouchSensed
15 - Error
16 - CollisionDetected
3.4 Connection diagram of 3A1

This section describes the connection diagram of 3A1 - EL3004 (4-channel analog input terminal 0…20mA, single-ended, 12 bit).

1, 2  WFS  \[0...10V = 0.5...25 \text{ m/min}\]
3, 4  Dynamics  \[0...10V = -9...9\]
5, 6  Voltage/FineTuning  \[0...10V = \text{Voltage 8..46V, FineTuning 0..18}\]
7, 8  Spare
3.5 Connection diagram of 4A1/9A3

This section describes the connection diagrams of the following:

- **4A1 - EL4038** (8-channel analog output terminal -10…+10V, 12 bit)
- **9A3 - KL9187** (Potential distribution terminal, 8 x 0V DC)

```
1  WeldingCurrent  0...10V = 0...1024A
2  WFS            0...10V = 0...25m/min
3  Spare
4  Spare
5  WeldingVoltage 0...10V = 8...46V
6  Spare
7  Spare
8  Spare
```
3.6 Connection diagram of 9A4

This section describes the connection diagram of 9A4 - EK1110 (EtherCAT coupler).
4. SPECIFYING IP ADDRESS

To establish connection to the A7 Analog PLC, specify an IP address:

1. Open a network browser on your computer.
2. Enter the IP address 192.168.0.2/config.
3. Use the following authentication information:
   • User Name: guest
   • Password: 1

4. Click OK.

The Beckhoff Device Manager opens.

The interfaces visible to the operating system are:

- X001 - IP addressing via the operating system; the default is DHCP (Dynamic Host Configuration Protocol), represented in the operating system as FEC1.
- X101/102 - IP addressing via the DIP switches, represented in the operating system as TCCCATMP1. The DIP switches 1…8 are ON and DIP switches 9…10 are OFF.
5. SPECIFYING INTERFACE MODE

Communication between the A7 MIG Welder and a welding robot is based on I/O tables. Specify the I/O table number in the web user interface’s Interface mode field:

1. In the web user interface, go to Welding settings > Welding system > General robot settings.
2. Set the Interface mode to 16.
3. Click Save to save the setting.