



# PA SDI-Drives Midi™ PA SDI-Drives Maxi™

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## Start-Up Instructions

Version 08.30

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## 1. Target Group

These Start-Up instructions are intended for those who have previous experience with CNC systems from Power Automation. Basic knowledge of handling, programming and parameterization is assumed and will therefore not be further discussed. Additional reading is strongly recommended. Power Automation does not guarantee that this document is free of errors, accurate or complete and therefore, assumes no liability.

## 2. System Requirements

- PA 8000 CNC with SDI Interface X21
  - Windows XP SP2
  - Microsoft .Net Framework 1.1
  - CNC software version 3.1.0 incl. DriveApp software version 2.02 or higher
  - Superbus firmware 7A (PCI Revision 17) or higher
- USB Dongle with software option 420000 „Software Interface for PA SDI-Drives“
- PA SDI-Drives Midi, Maxi
- PA SDI-Motors PAH, PAT or compatible external motors
- SDI motor cable MKBKxxM15, MKBKBxxM15
- SDI feedback cable RKBKxxM, EKBKxxM-x
- SDI interface cable IKxxxMC7E
- 24V power supply for supplying power to the drive logic and the motor brake (s).

## 3. Recommended and applied literature

- PA CNC documentation
- PA SDI-Drives Midi/Maxi „user-, installation- and maintenance manual“
- PA SDI-Drives Midi/Maxi “SDI interface manual”
- PA SDI-Motors „user-, installation- and maintenance manual“



## 4. Wiring

1. Connect motors and drive(s) with the designated cables according to the connection diagrams in the PA SDI-Motors Manual (User-, Installation- and Maintenance Manual) starting page 16.
  - Please pay special attention to the cable labeling.
  - For motors with brakes (e.g. PAT3-0130-60-320-**B**-S1) only use cables with integrated brake wires (MKBK**B**xxM15) or pin compatible cables according to the cable specification KDS20000.
  - For motors without brake (e.g. PAT3-0130-60-320-S1) cables with or without brake wires as well as pin compatible cables according to the cable specification can be used.
  - For motors with Resolver Feedback (Option: –R2 or no option) only use cables of cable type RKBKxxM or pin compatible cables according to the cable specification.
  - For motors with EnDat feedback (Options: ECN, EQN, ECI, EQI) only use cables of cable type EKBKxxM-E or pin compatible cables according to the cable specification.
  - For motors with Hiperface Feedback (Options: SKS, SKM, SRS, SRM) only use cables of cable type EKBKxxM-H or pin compatible cables according to the cable specification.
  - Connect the cable shields to the designated places on the drive.
2. Connect the SDI plug J1 of the first drive to the SDI plug X21 of the CNC system with an SDI interface cable of cable type IKxxxMC7E.  
If available, connect the SDI plug J1 of the second drive to the SDI plug J2 of the first drive with an SDI interface cable of cable type IKxxxMC7E. If available, connect the SDI plug J1 of the third drive (address 2) to the SDI plug J2 of the second drive with an SDI interface cable of cable type IKxxxMC7E and so forth.  
With a small screw driver position the rotary switch SW1 of the first drive on address 0, the rotary switch of the second drive on address 1, the rotary switch of the third drive on address 2 and so forth.
3. Connect the main power to the drive on plug X1B according to the connection diagram and pin assignment shown in the PA SDI-Drives Midi/Maxi Manual (User-, Installation- and Maintenance Manual) Maxi: starting page 21 and Midi: starting page 28.
4. Connect the 24V power supply to the drive on plug X1A according to the connecting diagram and pin assignment shown in the PA SDI-Drives Midi/Maxi Manual (User-, Installation- and Maintenance Manual) Maxi: starting page 21 and Midi: starting page 28.  
The 24V voltage source for the drive logic has to provide a minimum of 1.5A per drive. The required current of the 24V voltage source for the brake(s) is dependent of the motor size according to the table included in the PA SDI-Motors Manual (User-, Installation- and Maintenance Manual).



5. Connect BGND (X1A, Pin 3) additionally with PE (GND) of the drive to eliminate noise.
6. Wire external connections to plug X10 on the SDI interface board. See PA SDI-Interface Manual Page 13 (Paragraph 3.2). Essential connections for operating are pins 5, 6, 7 and 8.



## 5. Parameter Settings of the Drives

1. Start the CNC control and sign-in as accustomed.
2. Open the file DriveCfgSDI in the folder „C:\Program Files\Power Automation\User Data\Examples“.
3. Select the drive type for every drive in chapter “Set-Up” by deleting “;” in the beginning of the line of the first motor. E.g. for a Midi drive (MI205/MI305) with one-phase feed: *ADDR=0.1,1,X,Midi\_1phase\_default.txt*. Select the 2<sup>nd</sup> and the 3<sup>rd</sup> motor equally. Copy the required parameter files from folder „...\Examples“ in into folder ...\User Data“.
4. Save the file as “DriveCfg.ini” in the folder “User Data” and start the CNC Software.
5. Start the drive monitor under Setup\Machine Setup\Digital drive Tool.
6. By clicking the icon “SDI1” in the upper left part select the first drive (address 0).
7. Only the number of drives that are connected will be displayed.
8. To connect the drive click on the icon “Connect” to the right of the drive icon and wait until the process is finished. Now click Communication/Connect
9. In the „File“ Menu select „Load parameter“ and go to the „C:\Program Files\Power Automation\DriveApp\Motor parameters“ directory.
10. Select the matching file for the first motor in accordance with the type written on the label and select axis 1 for sending the parameter.
11. If 2 or 3 motors are connected to the drive repeat Step 9 accordingly.
12. In the left display next to „Setting“ (offline) activate the “+” box. The parameters are sorted in groups. You can select the parameter groups with a click.

Enter the following parameter manually:

- If a motor has a holding brake (e.g. PAT3-0130-60-320-**B**-S1) and you want to use an automatic holding brake control, change the value of parameter 18 **M-BRAKE** to 1d.



Check the following important parameters:

- For Midi drives value of parameter 34 **G-VMAINS** for all motors must be set to 230d. For Maxi drives this value must be set to 480d.
  - If you are using a drive in a 1-phase mode, you need to change the two lowest order Bits of parameter P44 **G-MASKE2** to 0 and the two lowest order Bits of parameter P46 **G-MASKD** to 1 for all axes.
  - Parameter 72 **P-PSCALE** must be set to 14d for all motors with resolver feedback (including prefixes).
13. Select „Save parameter“ in the „File“ menu and save the file with file name „SDI\_DRIVE1.txt“ into the C:\Program Files\Power Automation\User Data“ directory. Select all axes and confirm your action with „OK“. Close the program. You can also choose your own file name. It cannot include any space characters and has to match the file name in the DriveCfg.ini.
  14. Repeat steps 6 to 13 for drive 2 and 3 considering the following differences:
    - In step 6 select SDI2 for the second drive (address 1) and SDI3 (address 2) for the third drive.
    - In step 13 save the parameter of the second drive with file name „SDI\_DRIVE2.txt“ and those of the third drive with file name „SDI\_DRIVE3.txt“.
  15. Close the CNC software and the drive monitor and start the Windows Explorer. Now go to folder „C:\Program Files\Power Automation\User Data“.
  16. Open the file DriveCfg.ini and put „;“ in the beginning each line in chapter „Set-Up“.
  17. Delete „;“ signs in front of the used motors in the beginning of each line in chapter „Runtime“. If necessary change the axes letters and the channel affiliation.
  18. Save the file and close it.



## 6. Parameter Setting of the CNC Software

1. Start the CNC software.
2. Open the example file "DefaultSDI.mpf". Go to <SETUP><Machine Setup> and start the machine parameter editor. Make sure the CNC is in the EMERGENCY OFF mode.
3. Switch to page „All parameter“ and as accustomed go to group „NCAddressFormat“ and activate your axes according to your configuration, matching the setting of the DriveCfg.ini file.
4. Go to group „Axis Control“ and set the parameter for every axes as follows:
  - Machine parameter **MachIncrementsPerRev** = 2 high (32 - P-PSCALE). Set the machine parameter MachIncrementsPerRev to 40000h (2 high 18) and 262144d respectively.
  - For SDI always set **IncrementsPerRev**. The value is consistent to the actual traverse path of the axis per motor revolution (thousandth millimeter) (e.g. 10000d for 10mm / revolution).
  - Set **MachToInternalInc** =  $\text{IncrementsPerRev} / \text{MachIncrementsPerRev}$ . (e.g. 0.0381469d at IncrementsPerRev = 10000d)
  - Set parameter **GainSpeedFactor** =  $(\text{AxisSpeedMaxAppl} \times 1.25) / \text{Gain}$  (e.g. for Gain of 1 = 45000d and AxisSpeedMaxAppl = 36000d)
5. Set all further required parameter as explained.
6. Save the machine parameter file (e.g. SDIMachPar.mpf).
7. Close the CNC software.



## 7. PLC Interface

The CNC/PLC Interface has the following relevant signals:

1. **ON\_READY** (DWORD 9): One bit per axis is set when the drive is ready to be switched on. Bit ON\_READY01 is relevant for the first axis, ON\_READY02 is relevant for the second axis and so forth.
2. **IN\_DRON** (DWORD 02) for SDI drives can only be set if ON\_READY for the appropriate axis is set. The CNC communicates the enable signal to the appropriate axis as soon as IN\_DRON is set by the SPS. Bit IN\_DRON01 is relevant for the first axis, IN\_DRON02 is relevant for the second axis and so forth.
3. **ON\_CONTROL** (DWORD 12): One bit per axis is set when the drive is in regulation. Bit ON\_CONTROL01 is relevant for the first axis; ON\_CONTROL02 is relevant for the second axis and so forth.

Example code is contained in the project „SystemtestSDI.pro“ in the „C:\PAData\IEC1131 Projects\“ folder.

## 8. Referencing

1. The reference cycles including the accompanying machine parameter are identical to those of analog systems.
2. Like for analog systems, all options including gantry axes are available for SDI systems.
3. All SDI measuring systems are absolute within one revolution for the CNC. The marker position is replaced by the zero position of the measuring system.

## 9. Probe Logic (M80)

1. The CNC probe logic for SDI drives is identical to the probe logic for analog drives.
2. The measuring input is the 4th digital input (plug X10, pin 4) of the drive. See PA SDI-Interface Manual Page 13 for reference.
3. The measuring input of every connected drive has to be wired, because the CNC expects measured data for all axes.
4. With parameter **A-EDGE** the trigger is set to rising or falling edge.
5. Set parameter **A-CAPREF** = 0.



## 10. General Information

- CNC versions 3.1.x supports only Resolver Feedback. Hiperface, Endat and Sin/Cos will be available according to the information of the „Development Roadmap“ with CNC version 3.2.0.
- Analog inputs of the drives and several other functions will be available according to the information of the „Development Roadmap“.
- The position loop is closed in the CNC. Position loop in the drive will be available according to the information of the „Development Roadmap“.
- A mixed mode of SDI and analog drives is possible. At the moment there is still a down time between the SDI and analog axes. Therefore the analog axes are not in sync with the SDI axes. For axis use such as heights control axis, spindles and so on this is not a critical factor. When using interpolating linear axes, a mixed mode will most likely cause a contour error. The file DriveCfgSDIanalog.ini contains sample code for mixed mode. Mixed mode without down time between SDI and analog drives will be available according to the information of the „Development Roadmap“.

## 11. Start-Up and troubleshooting

- You find useful information to optimize the drive on page 54 of PA SDI-Drives Midi/Maxi „User-, installation- and maintenance manual“
- You find useful information for the start-up as well as for troubleshooting on pages 48 to 52 of the PA SDI-Motor Midi/Maxi „User-, installation- and maintenance manual“