



PHB-FALCON
SEIKO
PRINTHEAD DRIVER BOARD
HARDWARE USER GUIDE

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Version 1.2

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1 Overview

PHB-FALCON is AEWA printhead driver board for SEIKO 1024GH, 508GS, 254GS and 510BN printheads. It connects to AEWA Print Manager Board (APMB) via optical fiber cable which makes the data transfer immune to electromagnetic interference.

Features

- Supports 4 different printhead types from SEIKO
 1. 1024HG, 360 dpi, 1024 nozzles, model code IEB1024N0L.
 2. 508GS, 180 dpi, 508 nozzles, model code IRH2513.
 3. 510BN, 180 dpi, 510 nozzles, model code IRH1513.
 4. 254GS, 180 dpi, 254 nozzles, model code IRH3223
- Optical fiber interface for long distances, 600 Mbits/sec.
- Generates accurate printhead driving voltages which are factory programmed. Printhead voltages can be further adjusted for special ink types.
- Printhead voltage control with respect to temperature.
- Correct voltage sequencing during power ON and power OFF.
- Gray scale printing, up to 16 levels (8 levels for 508GS, binary for 510BN).
- Printing waveform is generated and programmed with ApmbWave software and stored in the EEPROM.
- 4 different tickle pulse generation logic during printing and not printing phases to keep nozzles always active (not for 510BN).
- Special logic to reduce crosstalk between nozzles even when printing with very big drops.
- Printhead temperature monitor, over temperature protection.
- Firmware update over optical interface.
- Single 48V input voltage with reverse polarity, over current and surge current protection.
- SHA Encryption for firmware copy protection.
- Small footprint, 110mm x 90mm.
- Easy software integration with APMB SDK which supports native C++ and .NET programming languages such as C# or Visual Basic.
- Compatible with APRINT RIP and print software.



2 Board Components

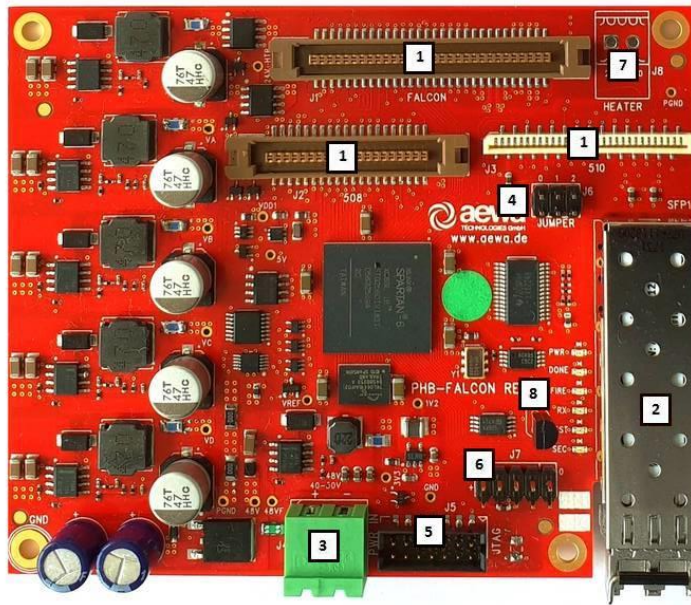


IMAGE 1 – PHB-FALCON BOARD COMPONENTS

2.1 Printhead Connectors (J1, J2 and J3)

PHB-FALCON has three connectors to connect to the printheads:

- J1 – To 1024HG printhead, through 60-pin flat cable.
- J2 – To 508GS printhead, through 40-pin flat cable.
J2 – To 254GS cable through 40-pin flat cable and 254GS printhead adapter.
- J3 – To 510BN printhead, through 30-pin FFC cable.

Please see “Connectors and Cables” chapter for the manufacturer and part numbers of supported components.

IMPORTANT: Don't connect or unconnect the printhead cable when the printhead board is powered on. This may damage the printhead and/or the printhead board.

2.2 Optical Interface (SFP1)

PHB-FALCON connects to AEWA Print Manager Board (APMB) over optical fiber cable. Fiber cable is connected to an SFP (small form factor pluggable) transceiver module and plugged into the SFP connector.

PHB-FALCON is delivered with SFP transceiver module, but the optical cable is not included since the distance from the PHB-FALCON to APMB differs from system to system.

Following table shows the fiber cables supported.

Fiber Cable Type	Distance between PHB and APMB
OM2, 62.5µm/125µm, Multimode fiber, with LC connectors	0.5-300m
OM3, 50µm/125µm, Multimode fiber, with LC connectors	0.5-500m

TABLE 1 - SUPPORTED OPTICAL FIBER CABLES

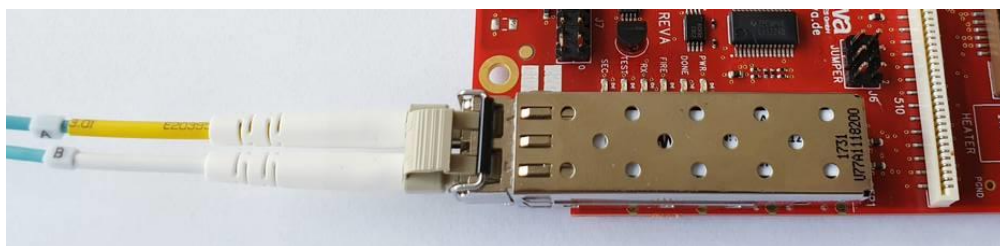


IMAGE 2 - OPTICAL FIBER CONNECTION WITH SFP MODULE



2.3 Power Input Connector (J4)

J4 is a 2-port terminal block connector for power input. Switching mode or analog AC/DC power converters can be used. Converters with PFC feature is recommended. Following table can be used to estimate the total current usage. Maximum current consumption is given for maximum speed and printhead voltage with all nozzles printing.

Parameter	Value
Input Voltage	48V (40V – 50V)
Max. current consumption, with 1024HG printhead, without heater	2.4A @48V
Max. current consumption, with 1024HG printhead, with heater	3.1A @48V
Max. current consumption, with 508GS printhead, without heater	0.9A @48V
Max. current consumption, with 508GS printhead, with heater	1.1A @48V
Max. current consumption, with 510BN printhead, without heater	0.5A@48V
Max. current consumption, with 510BN printhead, with external 8W heater	0.7A@48V
Max. current consumption, not printing	0.2A @48V

TABLE 2 -INPUT POWER SPECIFICATIONS

2.4 Jumper (J6)

J6 is a 3-port jumper. It selects between different printhead types as shown in the following table:

Jumper 2	Jumper 1	Jumper 0	Printhead Type
Open	Open	Open	1024HG
Open	Open	Closed	508GS, Wavespec 2
Open	Closed	Open	508GS, Wavespec 1, Standard type
Open	Closed	Closed	510BN
Closed	Open	Open	254GS

TABLE 3 – JUMPER J6, FUNCTION TABLE



2.5 JTAG Connector (J5)

This connector is for internal use by AEWA for testing, debugging and updating the firmware. PHB-FALCON firmware can also be updated over optical interface using ApmbDiag or APRINT software.

2.6 Test Connector (J7)

Test header. Only for AEWA internal usage.

2.7 External Heater Connector for 510BN (J8)

2-port connector for an external heater (Maximum 24W) connection. Only for 510BN printhead.

Starting with Revision B of the PHB-FALCON, a different connector type is used. Please see “Connectors and Cables” section.

2.8 LEDs

There are 6 diagnostics LEDs on the PHB-FALCON PCB.

PWR LED is connected to the 3.3V voltage rail. It is ON when board power is OK.

DONE LED is ON when FPGA firmware is loaded correctly, otherwise none of the features of PHB-FALCON is available.

FIRE LED is ON when printhead nozzles are active and printing. It switches OFF when printing is stopped.

RX LED is ON when AEWA Print Manager Board is sending printing data to PHB-FALCON board, otherwise it is OFF.

SEC LED is OFF when SHA Encryption keys programmed into the device is correct. If this LED is ON, printing functions of the PHB-FALCON board are disabled.

TEST LED is error indicator LED. Following table shows errors reported by TEST LED.

TEST LED Behavior	Meaning
OFF	No error. Image data stream is counting data.
ON	No error. Image data stream is not counting data.



Blink once, than OFF for 1 second	Checksum Error. Incoming data packages from Print Manager Board have CRC checksum errors.
Blink 2 times, than OFF for 1 second	Data packaging error. Incoming data packages from Print Manager Board have wrong number of bytes.
Blink 3 times, than OFF for 1 second	Speed error. Printing speed or row to row delay setting is too high.
Blink 4 times, than OFF for 1 second	Waveform error. Either no waveform is loaded or the loaded waveform has errors.
Blink 5 times, than OFF for 1 second	No meaning. Reserved for future use.
Blink 6 times, than OFF for 1 second	Printhead voltages are switched off due to an over temperature or voltage error condition.

TABLE 4 – TEST LED FUNCTIONS

Same errors can also be read by APMB software. More error types might be added in future with firmware updates.



3 Mechanical Dimensions

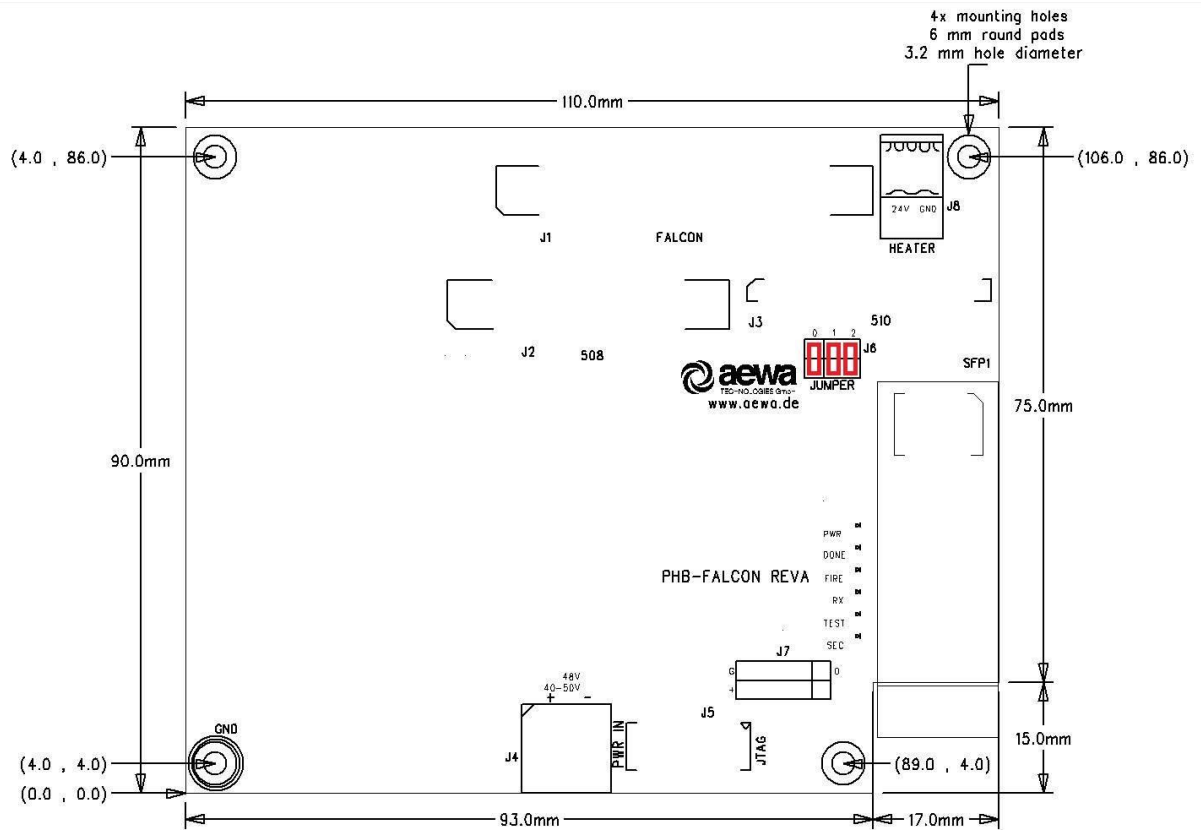


IMAGE 3 – PHB-FALCON MECHANICAL DIMENSIONS

4 Connectors and Cables

PHB-FALCON is assembled with very high quality industrial terminal blocks and connectors for power and input/output. Following table lists the PCB connectors and their mating cable connectors.

Description	PCB Side	Mating Side
J1, 1024HG printhead connector	60-pin PCB connector Manufacturer: KEL Part Number: 8930E-060-178MS-F	60-pin flat cable connector Manufacturer: KEL Part Number: 8925R-060-179-F
Cable for J1		60-pin flat cable Manufacturer: 3M Part Number: 3754/60 or equivalent
J2, 508GS printhead connector	40-pin PCB connector Manufacturer: KEL Part Number: 8930E-040-178MS-F	40-pin flat cable connector Manufacturer: KEL Part Number: 8925R-040-179-F
Cable for J2		40-pin flat cable Manufacturer: 3M Part Number: 3754/40 or equivalent
J4, Power input connector	PCB header, 5.08 mm raster, 2 poles, MSTBA 2,5/ 2-G-5,08 Manufacturer: Phoenix Contact Order No: 1757242	Plug, 5.08 mm raster, 2 poles, MSTB 2,5/ 2-ST-5,08 Manufacturer: Phoenix Contact Order No: 1757019 or equivalent
J8, External Heater Connector for 510BN printhead	Weidmüller, 3.5mm raster, 2 pins SL 3.50/02/180G Order No: 1604470000 After REVB: PCB header, 2.5mm raster, 2 poles Manufacturer: Phoenix Contact Order No: 1778557	Weidmüller, 3.5mm raster, 2 pins BL 3.50/02/180 SN or BX Order No: 1597360000 After REVB: Plug, 2.5mm raster, 2 poles Manufacturer: Phoenix Contact Order No: 1778832 or equivalent

TABLE 5 – CONNECTORS AND CABLES



5 Ordering Information

Order No	Item
PHB-FALCON	PHB-FALCON PCB.
PHB-FALCON-CC	PHB-FALCON PCB with conformal coating for harsh environments.
KAK60-XX	Assembled cable for 1024HG printhead. XX is the length of the cable in centimeters between 5 and 50.
KAK40-XX	Assembled cable for 508GS printhead. XX is the length of the cable in centimeters between 5 and 50.

TABLE 6 – ORDERING INFORMATION

