

**FTLP/4M**

**Manual**

**Version 1.0**

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**BRUKER - SPECTROSPIN AG**

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## General

1.1

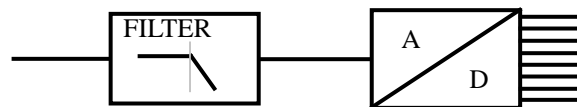
This document describes the board FTLP/4M. It includes the description of the hard- and software interface. In special there is a section giving hints on troubleshooting. Finally the complete technical data shows the performance of this board.

## System overview

1.2

For measurements in digital systems, analog to digital converters are used. So the analogbandwith must be reduced with a lowpassfilter. „Antialiasing-Filter“ is the technical name given to this type of filter.

*Figure 1: digital measurement system*



The FTLP-board is an antialiasing-filter, which is designed for the fast AD-converter system FADC.

You will find more details about the system configuration, in the RCU-manual (P/N: Z31209).



## Description

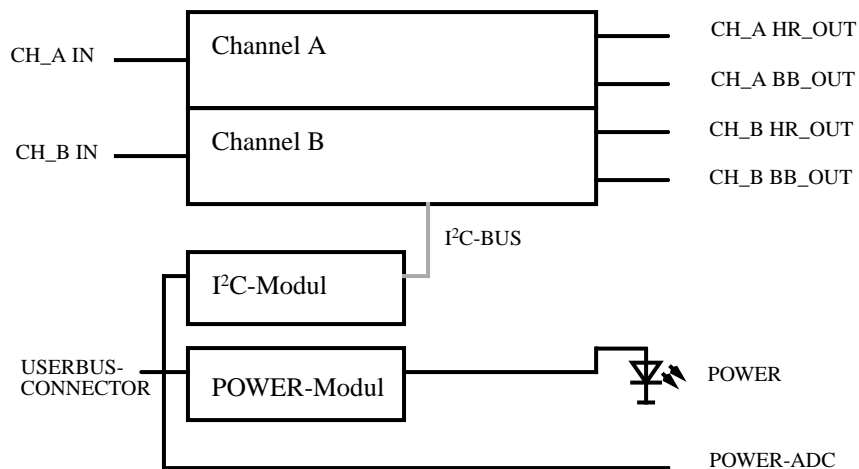
2.1

The boardname FTLP/4M is a mnemonics word for  
**FILTER LOWPASS / 4MHZ - BOARD.**

## Board overview

2.1.1

Figure 2: block diagram



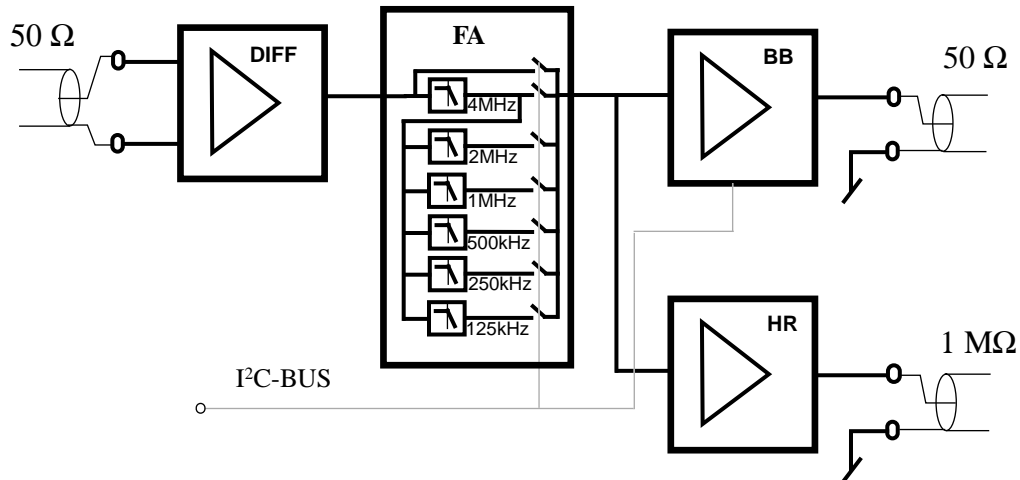
The FTLP/4M is a two channel lowpass filtersystem with variable 3dB-frequencies.

The filtermodules of FTLP/4M are designed as dedicated 4 pole Butterworth type. The selection of a particular filterpath is realised with a I<sup>2</sup>C bus system.

The supply voltage for the filter electronic is generated on the board. Each voltage is controlled and its status is displayed on the front panel with a common green LED „POWER“.

On the front panel connector „POWER-ADC“ is the standard AQR power supply (+/-19V and +/-9V). With this connector the FTLP supplies the analog part of the FADC.

Figure 3: filterchannel



One filterchannel includes four blocks:

**Inputamplifier (DIFF):**

The differential inputamplifier is designed especially for a high common mode rejection.

**Filterarray (FA):**

Six filtermodules with different 3dB-frequencies and a bypass-path are selectable by the I<sup>2</sup>C bus. For filter bandwidths lower than 4MHz, there are two filtermodules connected in series. About that, the system has filterpaths with 8 poles, but the selected lower filter is dominating.

**BB-Outputamplifier (BB):**

The broad band path with a special high bandwidth has two different gains. These are selectable by the I<sup>2</sup>C bus.

**HR-Outputamplifier (HR):**

The high resolution path is additionally included for future use.



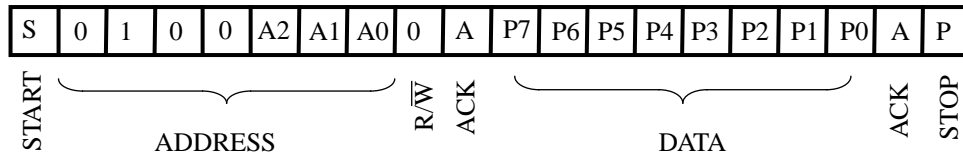
## Board Interface

## 2.2

Standard I<sup>2</sup>C-BUS components are implemented on the FTLP/4M board. To use this board, the I<sup>2</sup>C-system must conform to the I<sup>2</sup>C specification defined by Philips. Refer to I<sup>2</sup>C specification for further details.

The board function is controlled with the I/O expander PCF8574T .

Figure 4: complete data transfer



## ADDRESS

## 2.2.1

On the FTLP/4M board the I/O expander I<sup>2</sup>C address pins are routed to the backplane connector and are fixed with pullup resistors, so the backplane defines the I<sup>2</sup>C address, when the board is plugged in, alternatively the lower address pins are always high.

The actual I<sup>2</sup>C-address is defined by the slot of the AQR-system.

Table 1. I<sup>2</sup>C-Address

Function	Address in AQR-SLOT „FLT“	Address-range	IC-type
Port identification	AC HEX	A0-AF HEX	X24022
Port controlling	4C HEX	40-4F HEX	PCF8574

Table 2. Board Function

P7 MSB	P2	P1	P0 LSB	Channel A&B	Bypass	3dB- frequencies	BB-Gain
X	H	H	H	OFF (OV)	OFF	---	---
X	L	L	L	ON	ON	---	X
X	L	L	H	ON	OFF	125 kHz	X
X	L	H	L	ON	OFF	250 kHz	X
X	L	H	H	ON	OFF	500 kHz	X
X	H	L	L	ON	OFF	1 MHz	X
X	H	L	H	ON	OFF	2 MHz	X
X	H	H	L	ON	OFF	4 MHz	X
L	X	X	X	X	X	X	1
H	X	X	X	X	X	X	5

Figure 5: flow diagram for troubleshooting

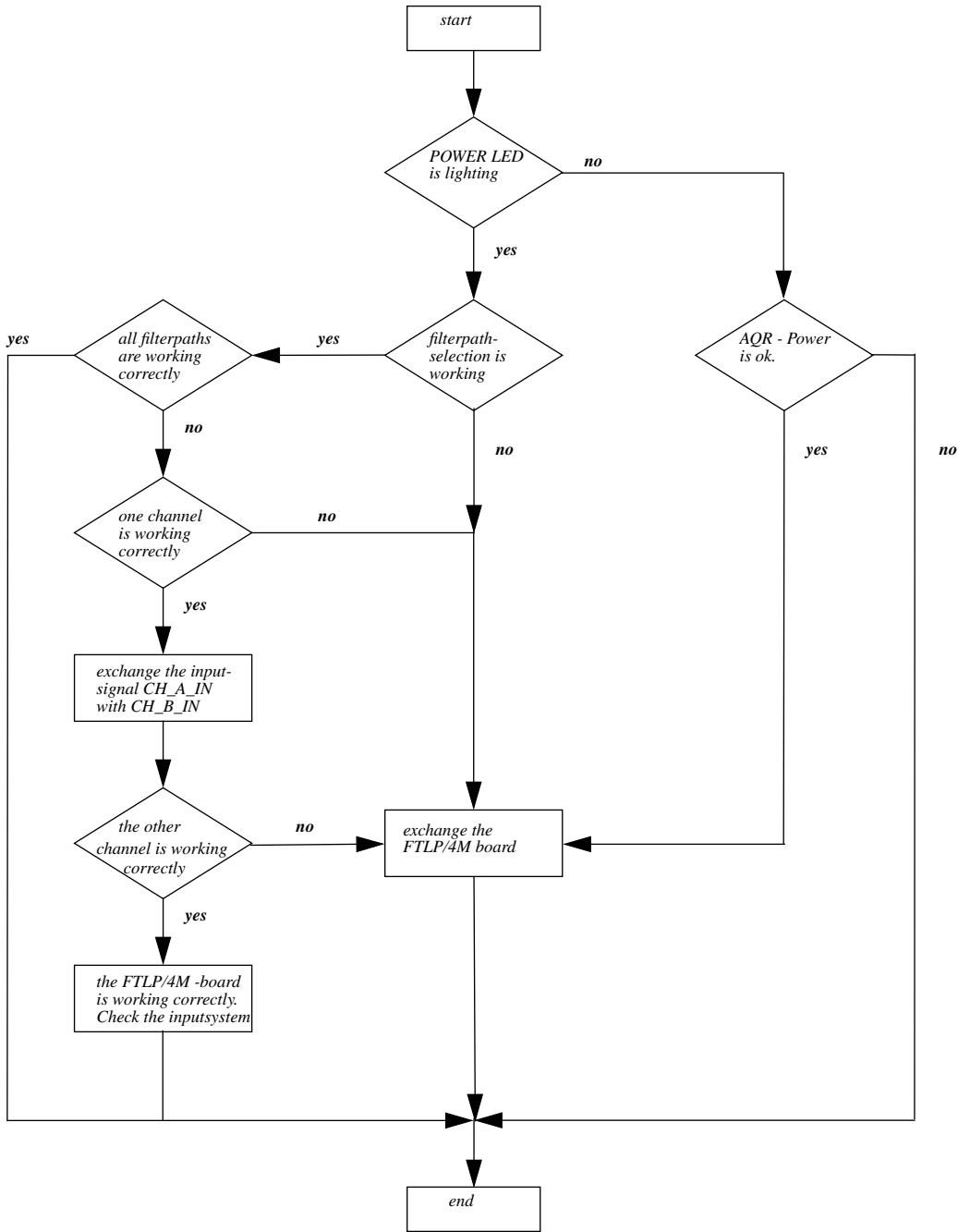


Table 3. Filterboard

Number of Filterchannel	2
Number of different 3dB-frequencies	6
Bypass	yes

Table 4. Filterchannel

Modul	3dB-frequency	settling time <sup>1</sup>
Filter 1	125 kHz	20 $\mu$ s
Filter 2	250 kHz	10 $\mu$ s
Filter 3	500 kHz	5 $\mu$ s
Filter 4	1 MHz	2.5 $\mu$ s
Filter 5	2 MHz	1.5 $\mu$ s
Filter 6	4 MHz	0.8 $\mu$ s
Bypass	---	0.2 $\mu$ s

Note 1: time from the input transition until the outputsignal arrived 90% of the final value.

**Table 5. Inputamplifier**

PARAMETER	CONDITIONS	TYP	UNITS
Input Voltage Range		1	V <sub>pp</sub>
Full Power Bandwidth		10	MHz
Input Resistance		50	Ω

**Table 6. BB-Outputamplifier**

PARAMETER	CONDITIONS	TYP	UNITS
DC Gain	P7=0	1	
DC Gain	P7=1	5	
Output Voltage Swing	V <sub>in</sub> =1V <sub>pp</sub> Gain=1	1	V <sub>pp</sub>
Output Voltage Swing	V <sub>in</sub> =1V <sub>pp</sub> Gain=5	5	V <sub>pp</sub>
Full Power Bandwidth		10	MHz
Output Resistance		50	Ω
Output Offset Voltage	Gain=1	+/- 10	mV
Output Offset Voltage	Gain=5	+/- 50	mV
Output Noise	Gain=1	300	μV <sub>rms</sub>
Output Noise	Gain=5	1	mV <sub>rms</sub>

**Table 7. HR-Outputamplifier**

PARAMETERS	CONDITIONS	TYP	UNITS
DC Gain		10	
Output Voltage Swing	V <sub>in</sub> =1V <sub>pp</sub>	10	V <sub>pp</sub>
Full Power Bandwidth		2	MHz
Output Resistance		35	Ω
Maximum Output Current		50	mA
Output Offset Voltage		+/-150	mV
Output Noise		2	mV <sub>rms</sub>

**Table 8. Power Supply Requirements**

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage 19V		14.5	19	21	V
Supply Voltage -19V		-14.5	-19	-21	V
Supply Voltage 9V		8	9	15	V
Supply Current 19V	V=19V		0.35	0.5	A
Supply Current -19V	V=-19V		-0.35	-0.5	A
Supply Current 9V	V=9V		0.15	0.3	A

**Table 9. Mechanical**

HF-CONNECTOR	ST KOAX SMA BU W PRT L=29,5mm 85SMA50-0-X2857 Nr.22656
„POWER ADC“ -CONNECTOR	ST BU 9W PRT MINI-D KPL. DE-9S-1A8N-A197 Nr.14462
USERBUS-CONNECTOR	ST SFT 48 W PRT DIN 41612-C/2 100-348-053 Nr.22744
Board dimensions	Standard „HF-KASSETTE“ 6HE / Double Extended(220mm) / 7TE

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