

# SOMAT<sup>XR</sup> MX590B-R

## Pressure amplifier

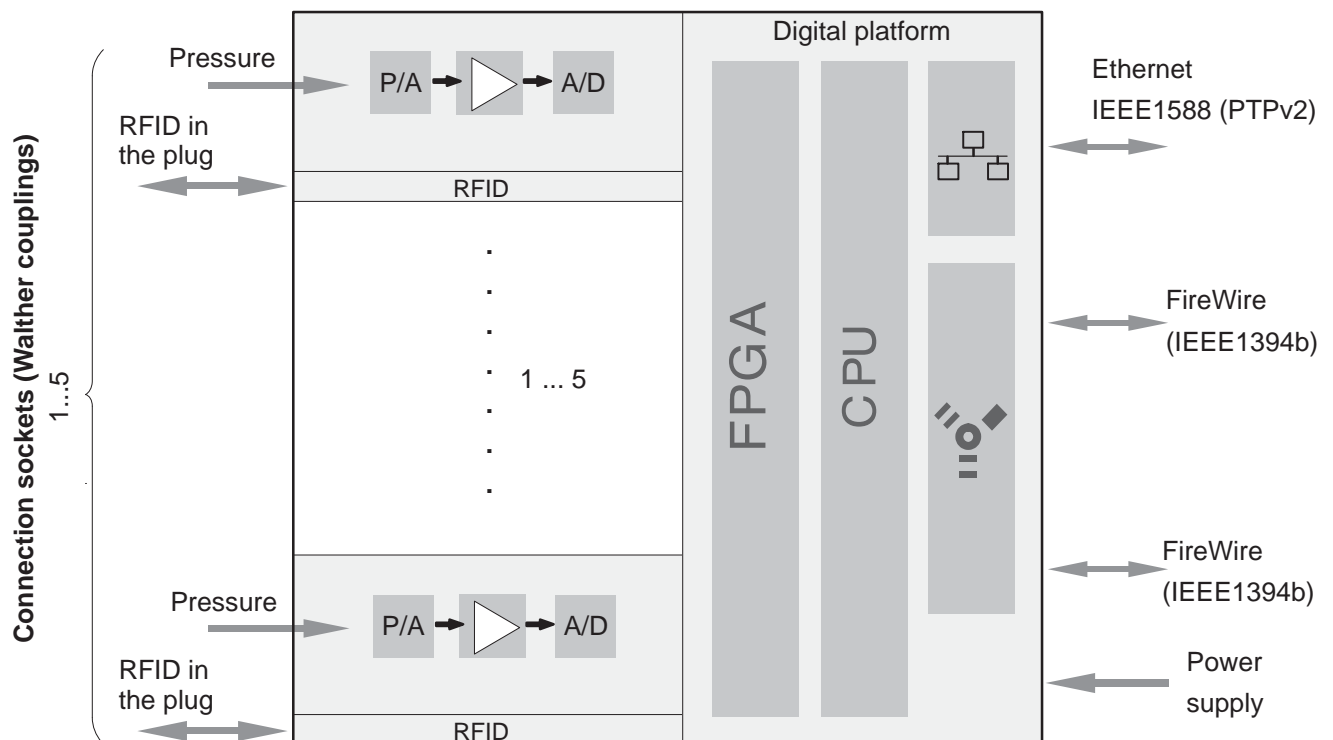
### Special features

- Configurable with up to 5 individual pressure transducers
- Pressure measurement: absolute, up to 10 bar; relative, up to 25 bar
- Sampling rate up to 40 kS/s per channel, active low pass filter
- Automatic measuring point identification via TEDS (RFID)
- Use in harsh environments (shock, vibration, temperature, dewing, moisture)

Data sheet



### Block diagram



# Specifications MX590B-R

General specifications		
<b>Inputs</b>	Number	Maximal 5
<b>Transducer technologies per connector</b>		Pressure transducer (integrated)
	bar	0 ... 4; absolute
	bar	0 ... 6; absolute
	bar	0 ... 10; absolute
	bar	± 0.5 relative
	bar	0 ... 1.6; relative
	bar	-1 ... +4; relative
	bar	-1 ... +16; relative
	bar	0 ... 25; relative
<b>A/D conversion per channel</b>		24-bit delta-sigma converter
<b>Sample rates</b>	S/s	Decimal: 0.1 ... 40,000 HBM Classic: 0.1 ... 19,200
<b>Function</b>		Pressure measuring, direct
<b>Signal bandwidth, max. (-3 dB)</b>	Hz	0 ... 7,770 (Linear Phase FIR filter)
<b>Active low-pass filter</b>		Bessel, Butterworth, Linear Phase, Filter „off“ <sup>1)</sup>
<b>Transducer connector<sup>2)</sup></b>		Walther Type LP-004 Nippel
Less than 10 bar		Aluminum
10 bar and more		Stainless steel
<b>Supply voltage range (DC)</b>	V	10 ... 30 (nominal (rated) voltage 24 V)
<b>Supply voltage interruption, max. (at 24 V)</b>	ms	5 <sup>3)</sup>
<b>Power consumption</b>	W	< 6
<b>Ethernet (data link)</b>		10Base-T / 100Base-TX
Protocol (Addressing)	-	TCP/IP (direct IP address or DHCP)
Plug connection	-	ODU MINI-SNAP, 8 pins
Max. cable length to module	m	100
<b>Synchronization options</b>		FireWire based synchronization
FireWire IEEE1394b		Ethernet based Precision Time Protocol
Ethernet PTPv2 IEEE1588		Ethernet based Network Time Protocol
Ethernet NTP		
<b>IEEE1394b FireWire (optional voltage supply)</b>		IEEE 1394b (HBM modules only)
Max. current from module to module	A	1.5
Plug	-	ODU MINI-SNAP, 8 pins
Max. cable length between nodes	m	5
Max. number of modules connected in series (daisy chain)	-	12 (= 11 hops <sup>4)</sup> )
Max. number of modules in a IEEE1394b FireWire system (including hubs <sup>5)</sup> )	-	24
Max. number of hops	-	14
<b>Nominal (rated) temperature range</b>	°C	-40... +80 dew point resistant
Altitude de-rating	-	-
Maximum temperature a 0 m	°C	+80
Maximum temperature a 2,500 m	°C	+70
Maximum temperature a 5,000 m	°C	+55
<b>Storage temperature range</b>	°C	-40 ... +85
<b>Relative humidity</b>	%	5 ... 100
<b>Protection class</b>		III <sup>6)</sup>
<b>Degree of protection</b>		IP65/IP67 nach EN 60529

1) Filter OFF is recommended only for real-time applications to achieve short latencies.

2) Suitable couplings are not included among the items supplied. HBM provides versions with TEDS and M12x1.5 external thread under part numbers 1-CON-S3006T (aluminum with FKM seal) and 1-CON-S3007T (stainless steel with FFKM seal). Information about versions without TEDS: [www.walther-precision.de/en](http://www.walther-precision.de/en)

3) Uninterruptible Power Supply (UPS) ) for prolonged interruption of power, available as an accessory.

4) Hop: transition from module to module or signal conditioning/distribution via IEEE1394b FireWire (hub, backplane)

5) Hub: IEEE1394b FireWire node or distributor

6) The DC voltage supply must meet the requirements of IEC 60950-1 on a SELV voltage supply.

## Specifications (Continued)

<b>EMC requirements</b>		per EN 61326-1
<b>Mechanical tests</b>		
Vibration		as per EN 60068-2-6
Acceleration	m/s <sup>2</sup>	50
Duration (per axis)	min	30
Frequency	Hz	5 to 65
Shock		as per EN 60068-2-27
Acceleration	m/s <sup>2</sup>	350
Pulse duration (half-cosinus)	ms	6
Number of shocks (per axis)	-	3 positive, 3 negative
<b>Dimensions, horizontal (H x W x D)</b>	mm	80 x 205 x 172
<b>Operating altitude, max.</b>	m	5,000
<b>Weight, max.</b>	g	2,600

### Version and order code

**K-MX590B-R-1-2-3-4-5**

For the figures 1 to 5 at the end, please specify the desired order code for channels 1 to 5



Channel: 1 2 3 4 5

Mesuring range	Color code	Order code
0 .. 4 bar absolute	Blue	A
0 ... 6 bar absolute	Green	B
0 ... 10 bar absolute	Yellow	C
±0.5 bar relative	Red + Black	D
0 ... 1,6 bar relative	Black	E
-1 ... 2,5 bar relativ	Blau + Braun	K
-1 ... +4 bar relative	Red + Blue	F
-1 ... +10 bar relative	Blue + Yellow	G
-1 ... +16 bar relative	Orange	H
0 ... +25 bar relative	Brown	I
Empty (blank plate)	-	0
<b>Example: K-MX590B-R-A-A-D-0-H</b>		
Channel 1 + 2		0 ... 4 bar, absolute
Channel 3		±0.5 bar, relative
Channel 4		Empty (blank plate)
Channel 5		-1 ... 16 bar relative

## Specifications (Continued)

Pressure transducer (all measuring ranges except 500 mbar)		
Accuracy class		0.2
Noise at 25 °C with 10 Hz Bessel filter	$\mu\text{V/V}$	< 0.01
Zero error	%	< 0.1 of full scale value
Linearity error	%	< 0.1 of full scale value
Relative reversibility error	%	< 0,15 of full scale value
Zero drift	% / 10 K	< 0.1 of full scale value
Full-scale drift	% / 10 K	< 0.1 of measured value
Long-term-drift	%	< 0.1 of full scale value/ year

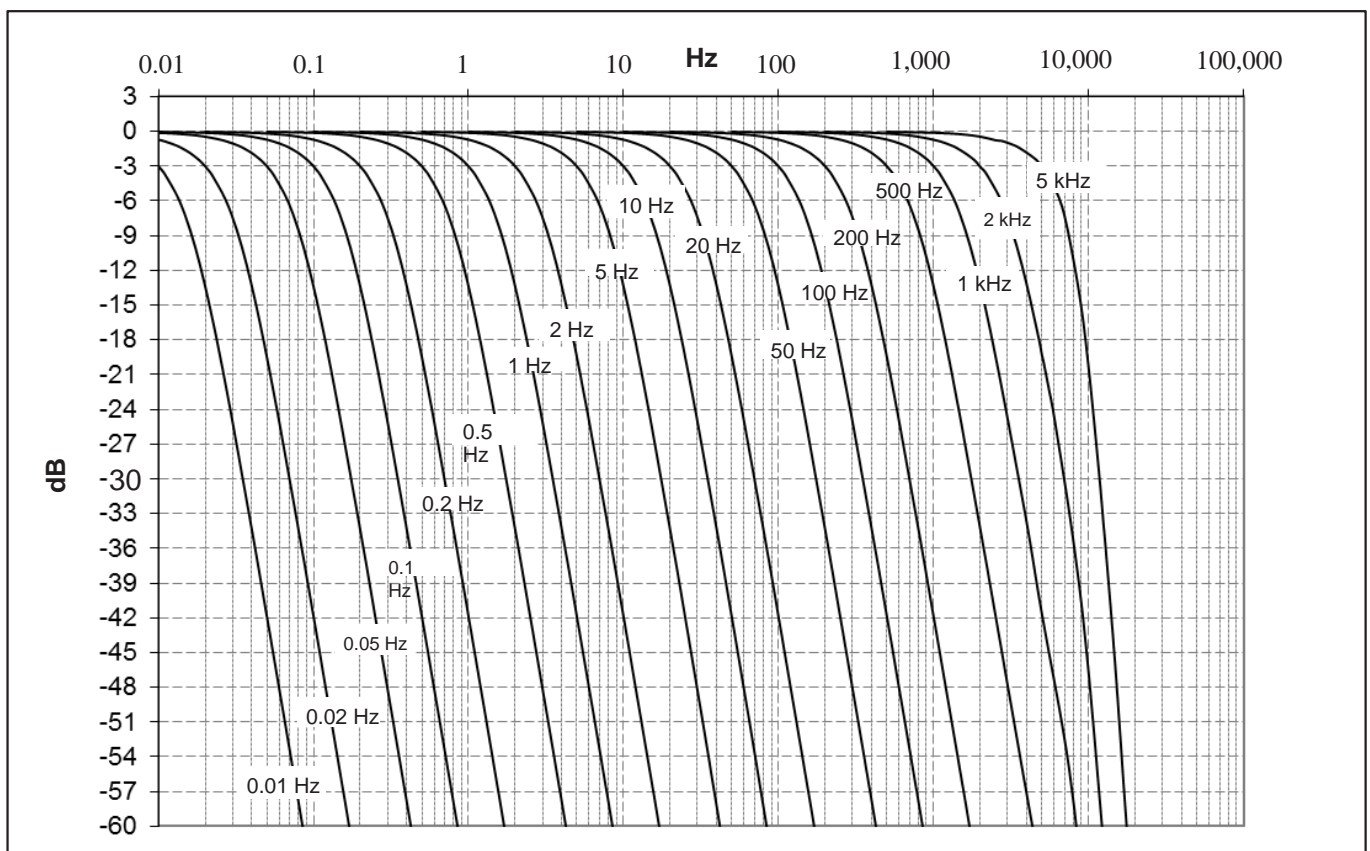
Pressure transducer (measuring range 500 mbar)		
Accuracy class		0.3
Noise at 25 °C with 10 Hz Bessel filter	$\mu\text{V/V}$	< 0.02
Zero error	%	< 0.2 of full scale value
Linearity error	%	< 0.1 of full scale value
Relative reversibility error	%	< 0.15 of full scale value
Zero drift	% / 10 K	< 0.3 of full scale value
Full-scale drift	% / 10 K	< 0.1 of measured value
Long-term-drift	%	< 0.2 of full scale value/ year

## Decimal sample rates and digital low-pass filters, 4th order Bessel

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime <sup>*)</sup> (ms)	Rise time (ms)	Overshoot (%)	Sample rate (S/s)
Bessel	3,041	5,000	9,935	0.043	0.08	3.6	40,000
	1,188	2,000	5,141	0.13	0.2	0.9	40,000
	594	1,000	2,561	0.29	0.3	0.85	40,000
	296	500	1,273	0.62	0.7	0.8	40,000
	118	200	508	1.6	1.7	0.8	40,000
	59	100	254	3.2	3.5	0.8	40,000
	30	50	127	6.5	7	0.8	40,000
	12	20	51	16.4	17.5	0.8	40,000
	6	10	25	34.5	35	0.8	20,000
	3	5	13	69	70	0.8	10,000
	1.2	2	5.1	168	175	0.8	10,000
	0.6	1	2.5	332	350	0.8	5,000
	0.3	0.5	1.3	663	700	0.8	1,000
	0.1	0.2	0.5	1,652	1,750	0.8	1,000
	0.06	0.1	0.25	3,299	3,500	0.8	500
	0.03	0.05	0.13	6,598	7,003	0.8	100
0.01	0.02	0.05	16,495	17,508	0.8	100	
0.006	0.01	0.02	32,989	35,016	0.8	50	

<sup>\*)</sup> The A/D Converter's delay time for the sample rate 40 kS/s is 65  $\mu$ s and for all other rates it is 128  $\mu$ s. This delay time is not taken into account in the "runtime" column. The anti-aliasing filter's delay time (160  $\mu$ s) is not accounted for as well. Hence 225  $\mu$ s or 288  $\mu$ s need to be added to the "runtime".

## Decimal sample rate : Bessel filter amplitude response

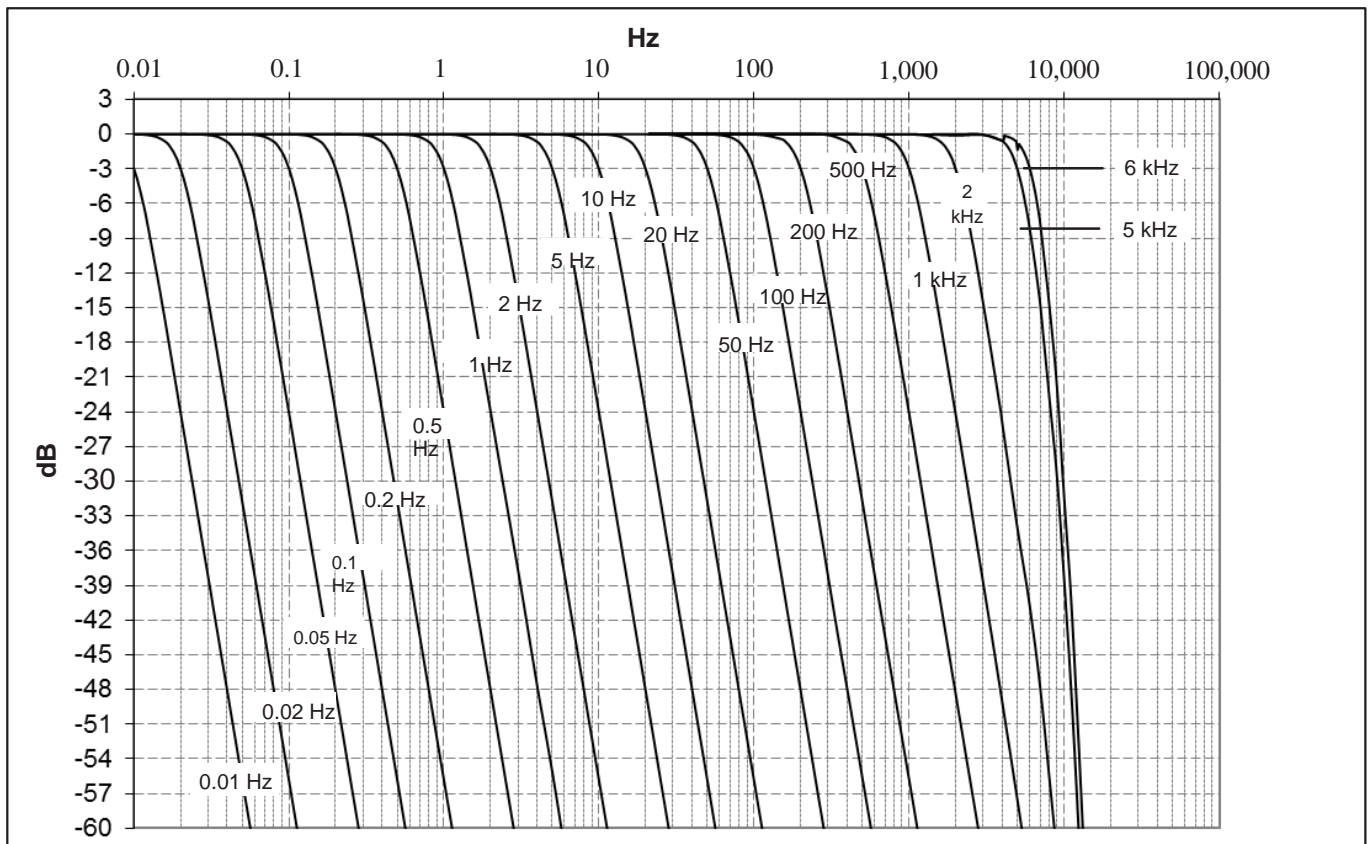


## Decimal sample rates and digital low-pass filters, 4th order Butterworth

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) <sup>*)</sup>	Rise time (ms)	Overshoot (%)	Sample rate (S/s)
Butterworth	5,198	6,000	8,722	0.08	0.08	15.2	40,000
	4,274	5,000	7,667	0.10	0.09	13.7	40,000
	1,690	2,000	3,491	0.23	0.2	11	40,000
	844	1,000	1,768	0.46	0.4	11	40,000
	422	500	888	0.9	0.8	11	40,000
	169	200	355	2.2	1.9	11	40,000
	84	100	178	4.5	3.9	11	40,000
	42	50	89	9.2	7.7	11	20,000
	17	20	35.5	23	19.3	11	20,000
	8.4	10	17.8	45	39	11	20,000
	4	5	8.9	90	77	11	20,000
	1.7	2	3.5	225	193	11	20,000
	0.8	1	1.8	449	387	11	20,000
	0.4	0.5	0.9	898	774	11	10,000
	0.17	0.2	0.3	2,241	1,930	11	10,000
	0.08	0.1	0.18	4,481	3,861	11	5,000
	0.04	0.05	0.09	8,962	7,721	11	1,000
0.02	0.02	0.03	22,405	19,303	11	1,000	
0.008	0.01	0.02	44,810	38,606	11	500	

<sup>\*)</sup> The A/D Converter's delay time for the sample rate 40 kS/s is 65 μs and for all other rates it is 128 μs. This delay time is not taken into account in the "runtime" column. The anti-aliasing filter's delay time (160 μs) is not accounted for as well. Hence 225 μs or 288 μs need to be added to the "runtime".

## Decimal sample rates : Butterworth filter amplitude response

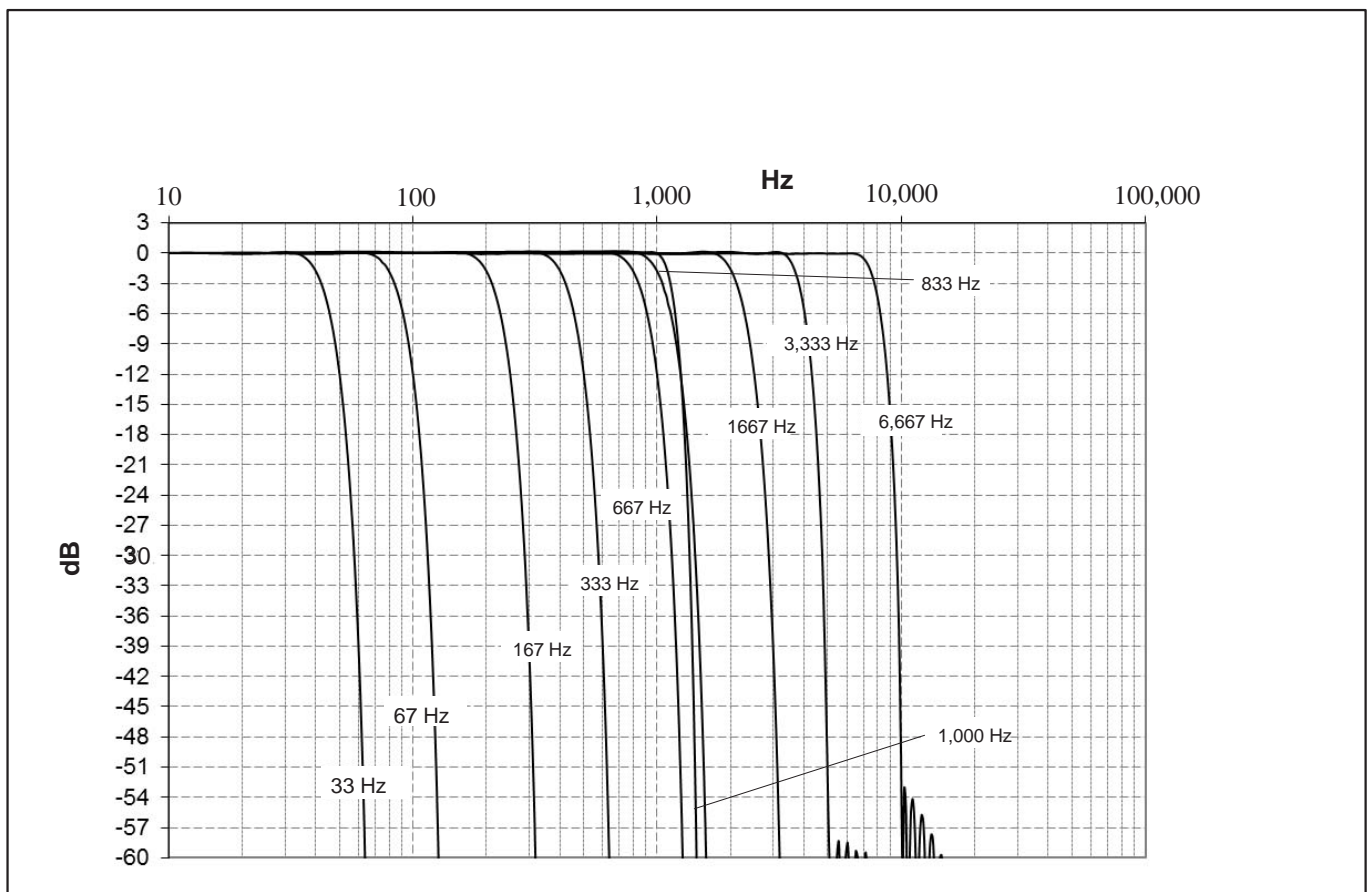


## Decimal sample rates and digital low-pass filters, linear phase (FIR)

Type	Start of level drop (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime <sup>*)</sup> (ms)	Rise time (ms)	Overshoot (%)	Sample rate (S/s)
Linear Phase	6,667	7,770	9,220	0.41	0.06	8.6	40,000
	3,333	3,800	4,540	0.78	0.12	8.6	40,000
	1,667	2,120	2,700	2.41	0.28	8.6	5,000
	1,000	1,130	1,300	6.21	0.544	8.6	2,500
	833	1,050	1,345	4.01	0.551	8.6	2,500
	667	840	1,080	4.8	0.694	8.6	1,000
	333	420	540	10.4	1.39	8.6	1,000
	167	210	270	26.9	2.73	8.6	500
	67	84	108	50.2	6.88	8.6	200
	33	42	54	108	13.8	8.6	100

<sup>\*)</sup> The A/D Converter's delay time for the sample rate 40 kS/s is 65  $\mu$ s and for all other rates it is 128  $\mu$ s. This delay time is not taken into account in the "runtime" column. The anti-aliasing filter's delay time (160  $\mu$ s) is not accounted for as well. Hence 225  $\mu$ s or 288  $\mu$ s need to be added to the "runtime".

## Decimal sample rates: amplitude response, linear phase (FIR)



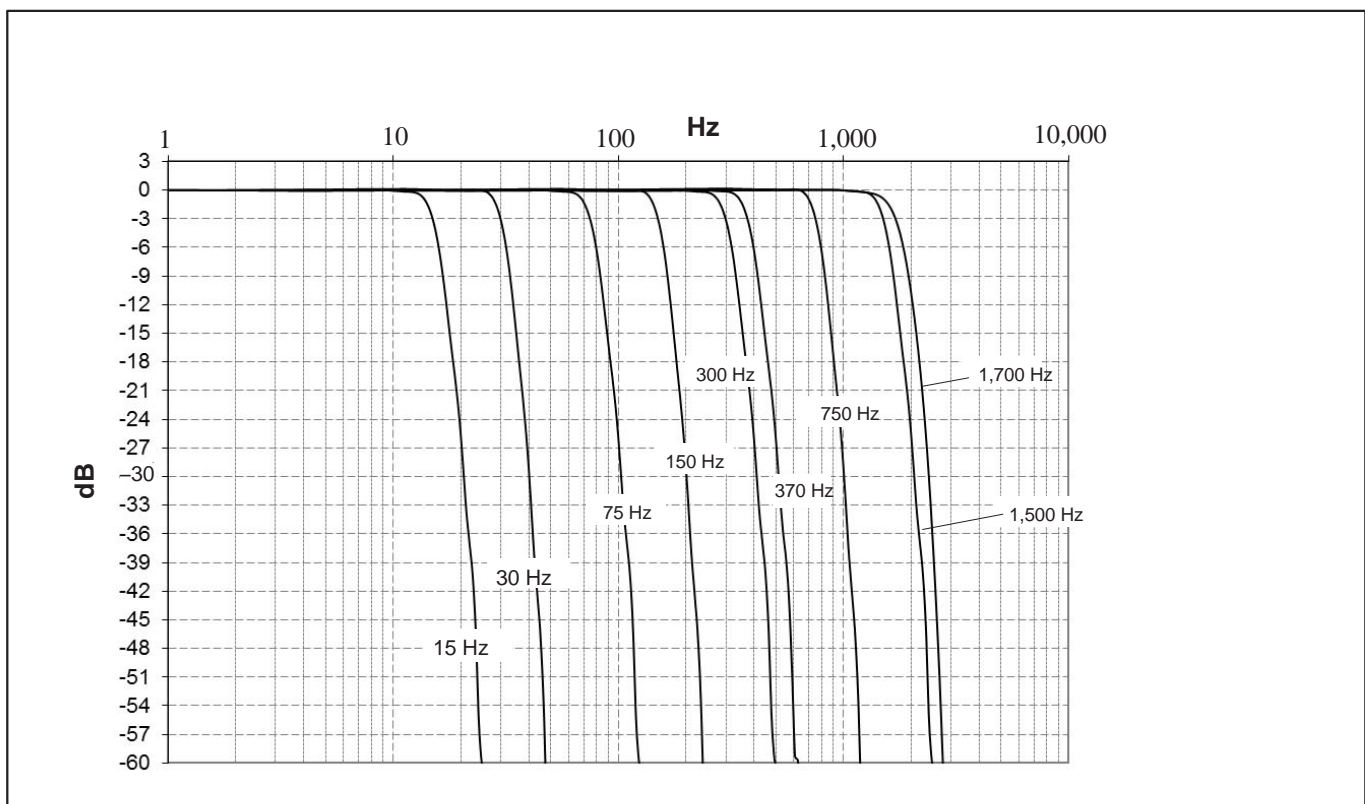


## Decimal sample rates and digital low-pass filters, Butterworth (FIR)

Type	Start of level drop (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime <sup>*)</sup> (ms)	Rise time (ms)	Overshoot (%)	Sample rate (S/s)
Butterworth	1,498	1,700	2,220	3.2	0.285	15.6	10,000
	1,384	1,500	1,887	3.48	0.346	18.7	10,000
	698	750	924	5.56	0.682	18.7	5,000
	344	370	471	14.1	1.40	18.7	2,500
	275	300	377	17.3	1.75	18.7	1,000
	140	150	185	27.6	3.41	18.7	1,000
	69	75	94	71.8	6.97	18.7	500
	28	30	37	139	17.0	18.7	200
	14	15	19	358	34.9	18.7	100

<sup>\*)</sup> The A/D Converter's delay time is 128  $\mu$ s. This delay time is not taken into account in the "runtime" column. The anti-aliasing filter's delay time (160  $\mu$ s) is not accounted for as well. Hence 288  $\mu$ s need to be added to the "runtime".

## Decimal sample rates: Butterworth filter amplitude response (FIR)



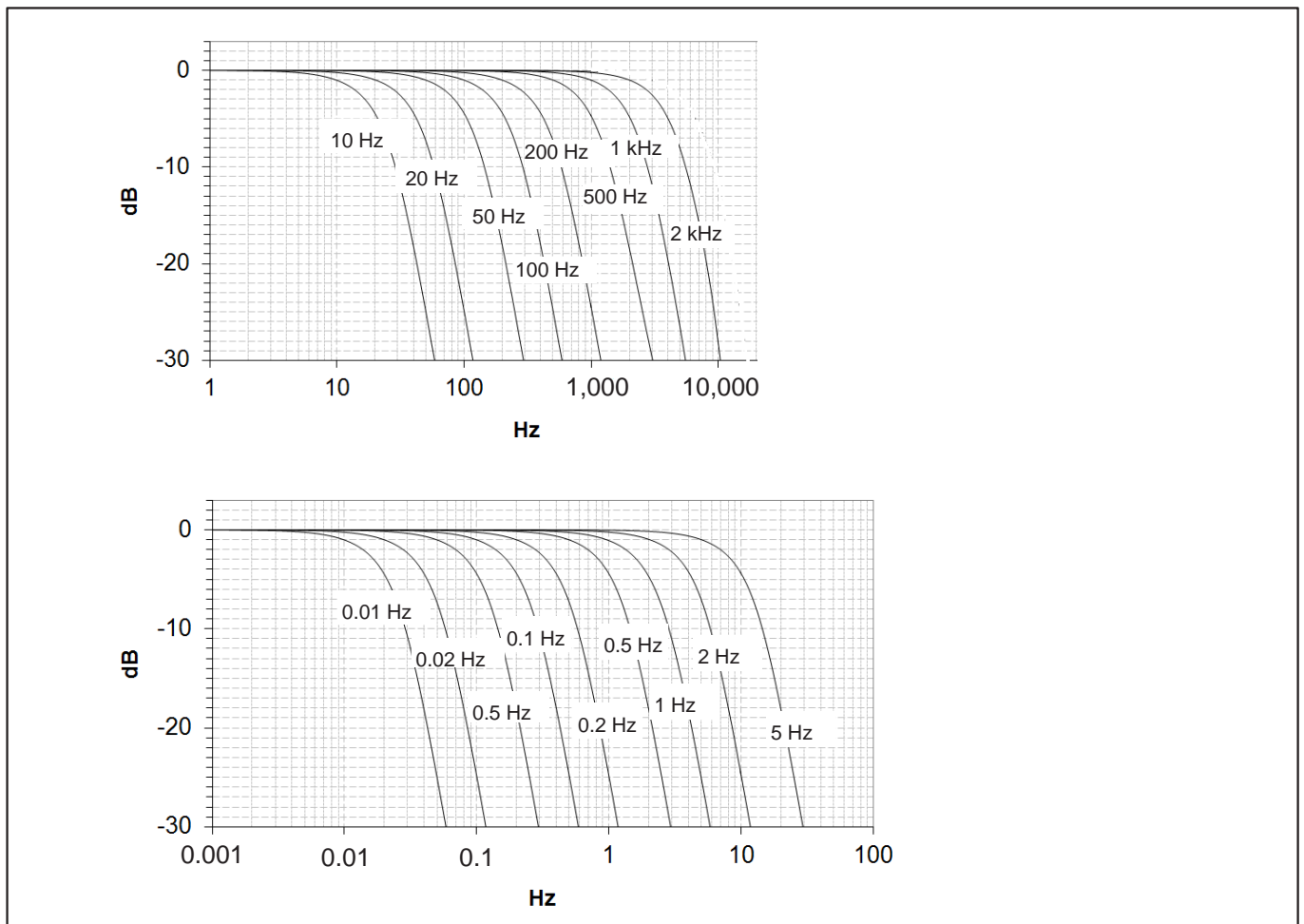


## Classic HBM sample rates and digital low-pass filters, 4th order Bessel

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) <sup>*)</sup>	Rise time (ms)	Overshoot (%)	Sample rate (S/s)
Bessel	2,000	3,210	8,100	0.15	0.1	1.5	19,200
	1,000	1,630	4,050	0.24	0.2	1.4	19,200
	500	820	2,120	0.4	0.43	1.4	9,600
	200	335	860	1	1.04	1	9,600
	100	167	430	2	2.1	0.8	9,600
	50	83	215	4	4.28	0.8	9,600
	20	33.7	85	10	10.6	0.8	9,600
	10	16.5	42	20	21.3	0.8	9,600
	5	8.4	21	40	41.6	0.8	2,400
	2	3.4	8.5	99	104	0.8	2,400
	1	1.6	4.2	200	214	0.8	2,400
	0.5	0.83	2.1	400	420	0.8	300
	0.2	0.34	0.85	1,000	1,060	0.8	300
	0.1	0.17	0.43	2,000	2,130	0.8	300
	0.05	0.084	0.21	3,940	4,200	0.8	20
	0.02	0.033	0.085	10,000	10,600	0.8	20
	0.01	0.017	0.042	20,100	21,300	0.8	20

\*) The A/D Converter's delay time for the sample rate 38.4 kS/s is 65  $\mu$ s and for all other rates it is 128  $\mu$ s. This delay time is not taken into account in the "runtime" column. The anti-aliasing filter's delay time (160  $\mu$ s) is not accounted for as well. Hence 225  $\mu$ s or 288  $\mu$ s need to be added to the "runtime".

## Classic HBM sample rates : Bessel filter amplitude response

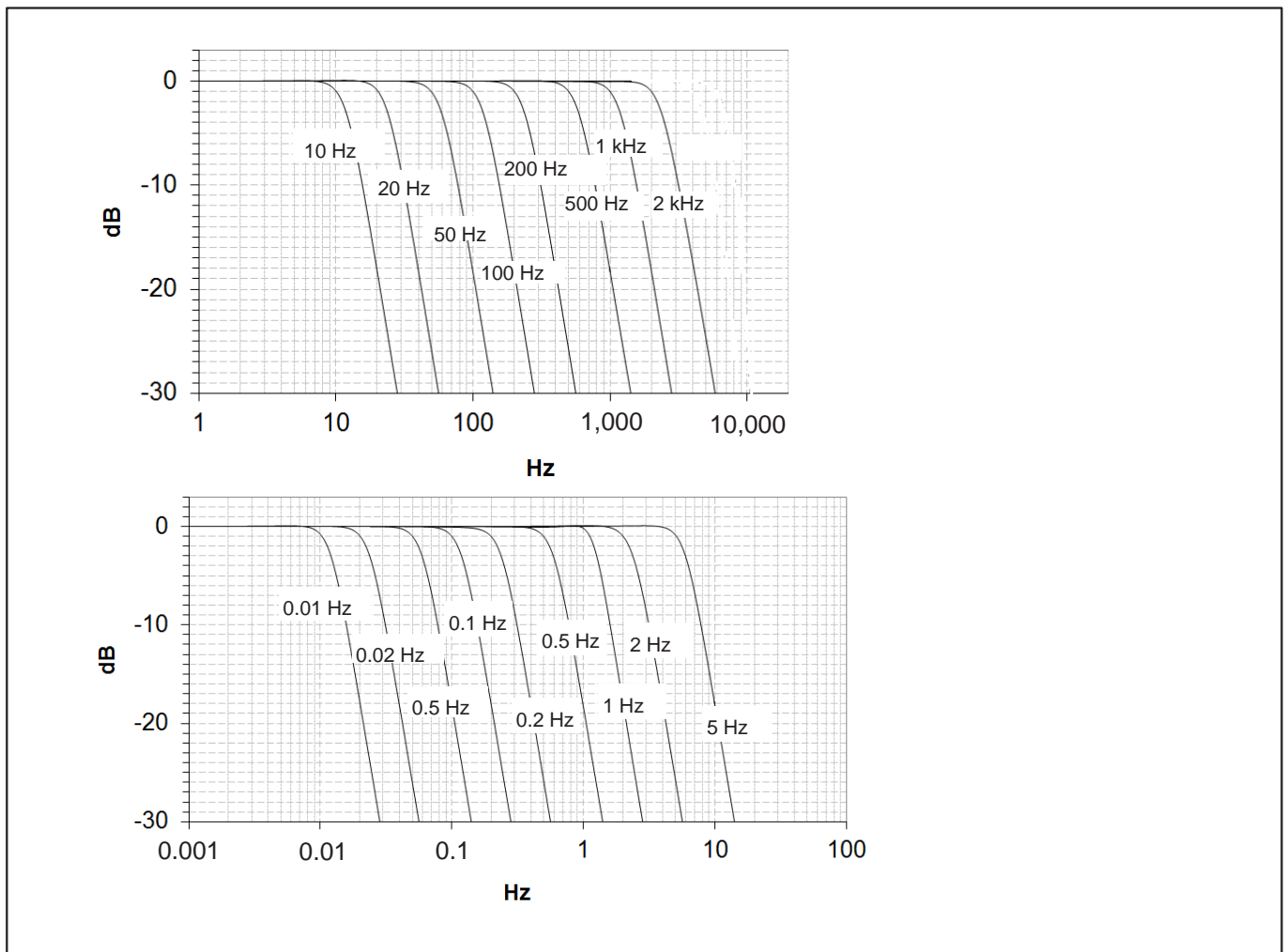


## Classic HBM sample rates and digital low-pass filters, 4th order Butterworth

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) <sup>*)</sup>	Rise time (ms)	Overshoot (%)	Sample rate (S/s)
Butterworth	2,000	2,360	4,331	0.2	0.15	8.5	19,200
	1,000	1,178	2,100	0.38	0.3	11	19,200
	500	586	1,050	0.66	0.66	11	9,600
	200	235	420	1.7	1.6	11	9,600
	100	118	210	3.46	3.2	11	9,600
	50	59	105	6.98	6.6	11	9,600
	20	24	42	17.3	16	11	9,600
	10	12	21	34.9	32	11	9,600
	5	6	10.5	69	66	11	2,400
	2	2.37	4.24	173	160	11	2,400
	1	1.26	2.1	347	320	11	2,400
	0.5	0.6	1.05	701	660	11	300
	0.2	0.236	0.421	1,760	1,600	11	300
	0.1	0.118	0.21	3,510	3,200	11	300
	0.05	0.059	0.105	6,950	6,600	11	20
	0.02	0.0235	0.042	17,500	1,600	11	20
	0.01	0.012	0.021	34,600	3,200	11	20

<sup>\*)</sup> The A/D Converter's delay time for the sample rate 38.4 kS/s is 65 μs and for all other rates it is 128 μs. This delay time is not taken into account in the "runtime" column. The anti-aliasing filter's delay time (160 μs) is not accounted for as well. Hence 225 μs or 288 μs need to be added to the "runtime".

## Classic HBM sample rates : Butterworth filter amplitude response





Subject to modifications.  
All product descriptions are for general information  
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of quality or durability.

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