FLUKE®

Synthesized Function Generators with Versatile Arbitrary Waveform Capabilities

Technical Data

PM 5136: 5 MHz

- **High performance at a budget price**

PM 5138A: 10 MHz

- **Output voltage of 40 Vpp**

PM 5139: 20 MHz

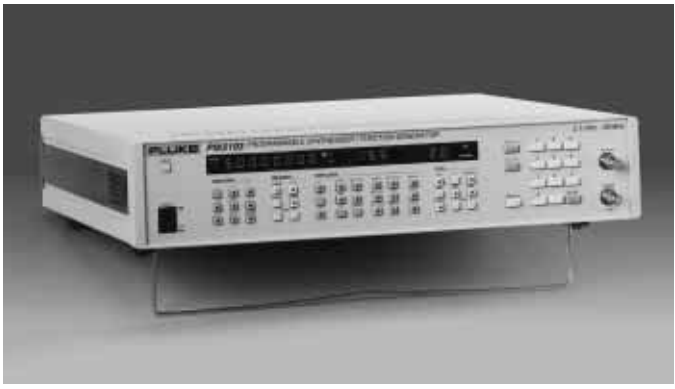
- **24 Arbitrary waveform-memories**

Fluke PM5136, PM5138A, PM5139 Synthesized Function Generators with arbitrary waveform

Synthesized Function Generator

PM 5193: 50 MHz

- **Quartz crystal precision for long-term stability**
- **10 MHz external synchronization (PM 5193S)**
- **Video modulation facilities (PM 5193V)**



Fluke PM5193 Synthesized Function Generator

PM 5136
- High performance at a budget price
- Frequency range from 0.1mHz to 5MHz (20Vpp)
- High accurate signals, low distortion
- In practice proved mechanical and electronic design
- Large backlit display and easy menu controlled operation
- Continuously variable symmetry
- 7 Standard waveforms: sine, triangle, square, pos/neg pulse, pos/neg/ sawtooth
- Internal and external modulation modes: AM, FM, Lin. Sweep, Log. Sweep and Burst
- 9 Setting memories
- GPIB/IEEE 488.2 interface (optional)

PM5138A *as PM5136, incl.:*
- Output voltage of 40 Vpp for all waveforms, including arbitrary
- Frequency from 0.1 mHz to 10 MHz
- 24 Arbitrary waveform–memories
- Arbitrary functionality supported via AnyWave™ software package
- AnyWave™ software included
- 9 additional setting memories to store frequently used settings
- Arbitrary–waveforms, Gate and PSK modulation
- Selectable output impedance, 50Ω or 600Ω
- GPIB or RS 232 interface (optional)

PM5139 *as PM5138A, incl:*
- Frequency from 0.1 mHz to 20 MHz. *(20Vpp)*
- 10 Standard waveforms including sine and trainle pulses, haversine
- Programmable modulation frequencies
- Low output impedance Z_O.

Wide range of applications
These top–value generators, built on years of experience, combine high precision with easy operation, making it the ideal choice for a wide range of applications like automotive, mechanical, calibration, telecom, audio, component–testing, medical, education and training. Applications that require higher frequencies are perfectly suited for the PM5139, while the PM5138A is extremely usefull when higher output voltages are required. This higher output, 40 Vpp, available for the complete bandwidth up to 20 MHz and also for the 24 arbitrary waveforms, makes this instrument ideal for tranducer simulation up to 14 Vrms for the automotive industry.

Simple, menu–controlled operation
To change a setting, all that's needed is to make a selection from the 5–line menu and operate the corresponding buttons. Specific functions can be accessed directly via control buttons which are conveniently located in a separate field. For example: store or recall of instrument–settings. Numeric values are set precisely by a large rotary control (which can be disabled to secure the setting). At all times, you get a clear indication of the instrument setting by the large backlit LCD display.

Accurate setting of modulation parameters
Modulation parameters such as modulation depth, deviation, number of cycles and start/stop phase can be set with high accuracy. The modulation/trigger source is programmable with a wide frequency range of 1 mHz to 100 kHz, and an accuracy of 0.1%. The sweep parameters f_{start}, f_{stop}, time, lin/log and sweep mode are independently programmable.

Versatile modulation mode selection
Modulation modes such as AM, FM and sweep are selected from the modulation mode menu. All waveforms can be modulated, even the user–defined arbitrary waveforms. The burst mode can be triggered via the internal modulation/trigger source or via the external modulation input. Bursts may also be manually triggered by a front panel key. The single–shot mode in burst can be used with all waveforms, including arbitrary.

Arbitrary waveform function via GPIB/IEEE–488 / RS232 link
Both the PM 5138A and PM 5139 with GPIB/IEEE–488 or RS232 installed, provide the versatile arbitrary waveform capability, a powerful aid to the generation of custom test signals. User defined arbitrary waveforms can be created and modified on a PC, using Fluke's AnyWave™ software package. and then downloaded to the generator. A waveform captured by a Digital Oscilloscope can also be transfered to a PC and modified by the same software. This package is a powerful tool for creating, capturing and modifying the desired signals, and transferring them quickly and easily to the function generator.

Application example:
In mechanical vibration analysis, such as shock testing, a DSO can capture the output of an accelerometer and transfer the vibration waveform either to a PC for modification or directly to the PM 5138A or PM 5139 to reproduce it when needed, without having to repeat the actual experiment. The waveform can then be sent continuously, as a burst for a defined number of cycles, or when triggered by an external source.

Synthesizer/function generator
PM5193
- Wide frequency range: 0.1 mHz to 50 MHz
- Quartz crystal precision for long-term stability
- Full range of standard waveform functions
- Choice of internal and external modulation modes
- 8-digit resolution for high precision
- Programmable settings speed operation
- IEEE-488 interface standard.
- Versatile rear-panel inputs and outputs
- 10 MHz external synchronization (PM 5193S)
- Video modulation facilities (PM 5193V)

If you want precision, versatility and value in a waveform generator, that covers your requirements exactly, choose the top-of-the-line PM 5193, with its 50 MHz frequency range. This model offers you a comprehensive choice of waveform functions, AM, FM, gating and burst modes extend flexibility, and can be modulated either internally by the generator, or by an external source. Linear and logarithmic sweeps with fully independent start and stop frequencies and sweep times can also be made with three different sweep modes (sweep and flyback, sweep and hold, sweep up and down).

Quartz crystal precision
The quartz crystal precision of this generator gives you the assurance of reproducible frequency settings within very closely defined limits. Aging rates for these crystals are less than 1 p.p.m./year. Coupled with the negligible setting error (<1 p.p.m / year), this generator gives you true long-term reference performance.

10 MHz external synchronization
For applications demanding traceability to an external standard, the PM 5193S generator can be synchronized with external standards at 10 MHz, or sub-harmonics such as 1, 2 or 5 MHz.

Video modulation facilities
The PM 5193V adds video modulation facilities. The standard IEEE-488 interface makes this instrument ideally suited for automated testing routines on video equipment, for example testing the IF units of video recorders and CTV receivers.

Model	PM 5136	PM 5138A	PM 5139	PM5193
Frequency characteristics				
Nominal Range	0.1 mHz – 5 MHz	0.1 mHz – 10 MHz	0.1 mHz – 20 MHz	0.1 mHz – 50 MHz
Operational Range				
Sine, pos/neg pulse	5 MHz	10 MHz	20 MHz	50 MHz
Square wave	5 MHz	10 MHz	20 MHz	20 MHz
Triangle	500 kHz	500 kHz	500 kHz	200 kHz
Pos./neg. sawtooth	20 MHz	50 kHz	50 kHz	20 kHz
Sine … , triangle pulse			50 kHz	
Haversine			50 kHz	50 kHz
Resolution	4_ digits, max. 0.1 mHz			8 digits, max. 0.1 mHz
	10 Hz (f_C>200kHz)*3			
Setting error	± 2 x 10^{-6} (± 2 ppm)			± 1 x 10^{-6}
Residual FM deviation (measuring bandwidth 10Hz–20kHz)		(f_C≥5MHz) <10ppm, 1ppm typical	(f_C>10MHz) <10ppm, 1ppm typical	
	<100Hz, 13Hz typical	(f_C≤5MHz) <100Hz, 13Hz typical	(f_C≤10MHz) <100Hz, 13Hz typical	
Phase noise at 1kHz distance from carrier	< –80dBc/Hz			< –80dBc/Hz (f_C<2MHz)
Phase jitter rms, (measuring bandwidth 10Hz–20kHz)				<3mrad (f_C<2MHz)
Frequency jitter rms (meas. Bandw 10Hz–20kHz)				<0.02%, <1200Hz f_C≥2MHz)
Temperature coëfficient	<±0.2ppm / K			
Aging	<±1ppm / year			
Drift	<±0.3ppm in 7 hours			
Synchronization by an external reference	f_{REF}=10MHz/N, N=1, 2, 3...10			f_{REF}=7.5–10MHz for programmed frequency f_P≤2.147MHz and f_{REF}=8.6±0.5MHz for f_P>2.147MHz
Output characteristics				
Main Output				
Connector BNC socket	On front			On front, optional at rear
Impedance	50Ω	50Ω or 600Ω	50Ω or LOW Z_O	50Ω
Load capability	Short circuit proof			
Max. external voltage	±15V < 3min	50Ω: ±15V 600Ω: ±24V	50Ω: ±15V < 3min LOW Z_O : ±12V < 3min	±12V < 3min
AC voltage	independent of DC setting within: ….			
Ranges	± 10V window	± 20V window	± 10V window	± 10V window
I resolution 1 mV	0 – 0.200 Vpp	0 – 0.400 Vpp	0 – 0.200 Vpp	0 – 0.200 Vpp
II resolution 10mV	0.20 – 2.00 Vpp	0.40 – 4.00 Vpp	0.20 – 2.00 Vpp	0.21 – 2.00 Vpp
III resolution 100 mV	2.0 – 20.0 Vpp	4.0 – 40.0 Vpp	2.0 – 20.0 Vpp	2.1 – 20.0 Vpp
Accuracy for AC voltages Basic setting error *2	> 10mVpp	> 20mVpp	> 10mVpp	> 2Vpp
	±2.0%, 1Hz < f_C < 200kHz			
Amplitude flatness *2				
f_C: 1Hz–200kHz	±0.03dB	±0.03dB	±0.03dB	±0.05dB
f_C: 200kHz –5MHz	±0.07dB	±0.07dB	±0.07dB	±0.07dB
f_C: 5MHz –10MHz		±0.1dB	±0.1dB	±0.1dB
f_C: 10MHz –20MHz			±0.2dB	±0.2dB
f_C: 20MHz –50MHz				±0.5dB
DC voltage	independent of AC setting within: …			
	± 10V window	± 20V window	± 10V window	± 10V window
Range (open circuit)	±10V resolution 100mV			
Error limits *2	±2.0% ±50mV	±2.0% ±100mV	±2.0% ±50mV	±2.0% ±80mV
TTL Output 0/5V, Z_O=50Ω Fan–out	BNC on rear panel > 4 TTL inputs			BNC on front > 5 TTL inputs

Model	PM 5136	PM 5138A	PM 5139	PM5193
Waveforms				
Asymmetrie				
$f_C \leq 20kHz$	1% – 99%, resolution 1%	sine, square, triangle, pos./neg. pulses		
f_C : 20kHz – 5MHz	20% – 80%, resolution 1%		square, pos./neg. pulses	
Sinewave				
Frequency range	0.1 mHz – 5 MHz	0.1 mHz – 10 MHz	0.1 mHz – 20 MHz	0.1 mHz – 50 MHz
Output range open circuit	0 – 20 Vpp	0 – 40 Vpp	0 – 20 Vpp	0 – 20 Vpp
Distortion for output voltages and frequencies	10–70% of voltage range maximum*2 1Hz – 500kHz	25–100% of voltage range maximum*2 1Hz – 500kHz	10–70% of voltage range maximum*2 1Hz – 500kHz	5–100% of voltage range maximum*2 1Hz – 200kHz
Total harm.distortion	< 0.4%, 0.1% typical	< 0.4%, 0.1% typical	< 0.4%, 0.1% typical	< 0.5%, 0.2% typical
Harmonics fc:1Hz – 500kHz	<–48dBc	<–42dBc	<–48dBc	<–43dBc
Harmonics fc:500kHz–5MHz	<–40dBc	<–34dBc	<–40dBc	<–37dBc
Harmonics fc:5MHz–10MHz		<–30dBc	<–36dBc	<–34dBc
Harmonicsfc:10MHz–20MHz			<–34dBc	<–30dBc
Harmonicsfc:20MHz–50MHz				<–30dBc
Subharmonics fc < 5MHz	<–60dBc	<–60dBc	<–60dBc	
Subharmonics fc > 5MHz		<–38dBc	<–38dBc	
Square, Positive / Negative Pulses				
Frequency range	0.1 mHz – 5 MHz	0.1 mHz – 10 MHz	0.1 mHz – 20 MHz	0.1 mHz – 20 MHz for square and for pulses: 0.1 mHz – 50 MHz
Output range open circuit	0 – 20Vpp	0 – 40Vpp	0 – 20Vpp	0.2 – 20Vpp
Pos/Neg. pulse open circuit	0 – 10 Vpp	0 – 20 Vpp	0 – 10 Vpp	1.0 – 10Vpp
Rise–/Fall time (at 50 % symmetry)*2				
f_C: 0.1 mHz – 500 kHz	≤ 30 ns			10 ns typical < 11.5 ns
f_C > 500 kHz	≤ 20 ns			
f_C: 0.1mHz – 20MHz				Square: 10ns typ.<11.5ns
f_C: 0.1mHz – 50MHz				Pulse: 3ns typical <4.5ns
Aberration *2	< 2% (AC > 200 mVpp)			< 2 % (+20mV,range I)
Asymmetry	See Waveforms			
Triangle				
Frequency range	0.1 mHz – 500 kHz			0.1 mHz – 200 kHz
Output range	0 – 20 Vpp	0 – 40 Vpp	0 – 20 Vpp	0 – 20 Vpp
Linearity error	< 0.2% (f_C<20 kHz)			< 1% (f_C<200 kHz)
Asymmetry	See Waveforms			
Positive / negative sawtooth				
Frequency range	0.1 mHz – 50 kHz			0.1 mHz – 20 kHz
Output range	0 – 10 Vpp	0 – 20 Vpp	0 – 10 Vpp	0 – 10 Vpp
Linearity error	<0.2% (f_C < 20kHz)			<1.0% (f_C < 20kHz)
Sine pulse, triangle pulse, haversine				**Haversine**
Frequency range			0.1 mHz – 50 kHz	0.1 mHz – 50 kHz
Output range			0 – 10 Vpp	0 – 10 Vpp
Arbitrary (Instruments with interface)				
Frequency range		0.1 mHz – 20 kHz		
Sample frequency		max. 20.48 MS/s		
Waveform memories		24 (non volatile)		
Memory length		1024 (10 bits)		
Vertical resolution		1023 (10 bits)		
Programmable		via interface with a PC or direct with a DSO		
Full scale output range		0 – 40Vpp open circuit	0 – 20Vpp open circuit	

Model	PM 5136	PM 5138A	PM 5139	PM5193
Modulation				
Modes	AM, FM, Burst, Sweep	AM, FM, Burst, Sweep, Gate, PSK		AM, FM, Burst, Sweep, Gate
AM				
Carrier frequency	0.1 mHz – 5 MHz	0.1 mHz – 10 MHz	0.1 mHz – 20 MHz	0.1 mHz – 50 MHz
Carrier waveforms	All	All incl. arbitrary*1, except PSK		All excl. pulses
Internal AM				
Modulation frequency	1 kHz ± 0.01%	10 Hz – 100 kHz, max. resolution 1 Hz ± 0.1%		10 Hz – 200 kHz
Modulation waveform	Sine			
Modulation Depth	0–100%, resolution 1%			
Envelope THD for ≤ 98%				<2.0%,
Mod. depth: ≤ 90%	<0.5%, <0.15% typical		<0.7%,	
≤ 90% and f_C ≤ 15MHz			<0.5%, <0.15% typical	
≤ 50%, fm = 100Hz – 20kHz and f_C ≤ 30MHz				<1%
External AM				
Modulation frequency	0 to 200 kHz			
Modulation Depth	0–100%			
EnvelopeTHD ≤ 98%				< 1.5% *(50Ω)
Mod. depth: ≤ 90%	<0.5%, <0.15% typical		<0.7%,	
≤ 90% and fC ≤ 15MHz			<0.5%, <0.15% typical	
≤ 50%,and fC ≤ 30MHz				<0.71% *(600Ω)
*with (.. Ω) output impedance of modulation signal source				
FM				
Carrier frequency	0.1 mHz – 5 MHz	0.1 mHz – 10 MHz	0.1 mHz – 20 MHz	> 2 MHz
Carrier waveforms	All	All incl. arbitrary*1, except PSK		Sine, square, pulses
Internal FM				
Modulation frequency	1 kHz ± 0.01%	10 Hz – 100 kHz, max. resolution 1 Hz ± 0.1%		10 Hz – 200 kHz
Modulation waveform	Sine			
Deviation	0 – 2 % resolution ± 0.01%			10 kHz – 200 kHz, resolution 1 kHz
Modulation distortion, THD	<0.4%, typ. 0.12% for 1% deviation			<2.0%, <1.0% for freq. dev. ≤ 100kHz, mod. freq. 200Hz–50kHz, and f_C ≤ 30MHz
External FM				
Modulation frequency	10 Hz to 200 kHz			
Deviation	0 – 2 %			max. 200kHz with sine modulation
Phase Shift Keying (PSK)	Carrier phase keying between 0° and 180°, non–coherent			
Carrier waveforms		Sine, triangle, square		
Carrier frequency range		Total range		
PSK, internal keying freq.		10Hz – 100kHz, 50% duty cycle		
PSK, external keying freq.		0 – 200kHz, TTL signal		
Burst				
Carrier frequency	0.1 mHz – 2 MHz			
Carrier waveform	All, phase–coherent on/off – switching			
On periods per Burst	1 – 2000			1 – 200
Start/Stop – Phase	0°	0° –180° ...+180°, resolution 1° for sine, triangle and f_C ≤ 20kHz		0° start/stop level at peaks for haversine, sawtooth and pulses
Burst trigger modes				
Internal (Manually)	Single & Continuous with 1kHz ± 0.01% rep. freq	Single & Continuous with 1mHz – 100kHz repetition frequency		Single & Continuous with 1kHz repetition frequency
External via Mod. input	with 0 – 200kHz repetition frequency			1kHz max. repetition freq.

Model	PM 5136	PM 5138A	PM 5139	PM5193
Sweep				
Carrier waveform	All			
Sweep functions	Single Continuous Hold/Release Reset to start frequency			Single Continious
Sweep characteristics	Linear or logarithmic Up or down			
Sweep modes	Sweep and flyback Sweep and hold Sweep from f_{start} to f_{stop} and back to f_{start}			
Sweep ranges max.	1mHz – 5MHz	1mHz – 5MHz 50kHz – 10MHz	1mHz – 10MHz 50kHz – 20MHz	1mHz – 50MHz
Sweep time	10ms – 1000s			10ms – 999s
Number of frequency steps	Sweep time / 1ms			4096 max.
Gate	Non-coherent signal keying			
Carrier frequencies		All		
Carrier waveforms		All		All except pulses
Gate, internal				
Keying frequency		10Hz – 100kHz		10Hz – 200kHz
Duty cycle		50%		
Gate, external				
Keying frequency		0 – 200kHz, TTL signal		0 – 500kHz
Interface bus remote control				
Isolation	in- and outputs galvanically separated with opto-couplers			
Control capability	all functions and characteristics			
GPIB/IEEE-488.2	Address range 0 - 30 and listen only mode			
RS232				
Baud rate / data ../ stop bits		110-19200 / 7 or 8 / 1 / odd, even or no parity		
Handshake		hardware or software (Xon/Xoff)		
Miscellaneous				
Instrument settings	1 + 9			
Rear connectors	modulation input / triggering input / reference input / TTL output / modulation output / penlift output / sweep output / 10 MHz reference output / interface bus connector *1 / power connector			
Dimensions (HxWxD)	105 x 315 x 405 mm			105 x 440 x 430 mm
Weight	6.7 kg	6.1 kg	6.7 kg	10.5 kg
Operating conditions				
Temperature	Reference 23°C ± 1°C, Operating + 5 .. +40°C Storage –40 .. +70°C			
Safety	According to CE regulation 73/23: EN 61010-1, CAT II, Pollution Degree 2			
EMC	According to CE regulation 89/336: Emission according to EN 55 011 Group 1 Class B, respectively CISPR 11. Immunity according to EN 50 082-1, inclusive IEC 801-2, -3, -4.			
Power / line frequency	100,120,220,240V / 50 - 60 Hz ± 5%			
Power consumption	42W	66W	58W	105W

*1 Instruments with GPIB/IEEE 488.2 or RS232 interface

*2 Zo=50Ω, Rl=50Ω, Modulation off

*3 Via GPIB interface

FLUKE®

Ordering Information

PM 5136/00n 5 MHz Programmable Function Generator
PM 5136/02n 5 MHz Programmable Function Generator with GPIB/IEEE 488.2 interface

PM 5138A/10n 10 MHz Programmable Function Generator
PM 5138A/12n inclusive GPIB/IEEE–488.2 interface and Arbitrary
PM 5138A/13n inclusive RS232 interface and Arbitrary

PM 5139/00n 20 MHz Programmable Function Generator
PM 5139/02n inclusive GPIB/IEEE–488.2 interface and Arbitrary
PM 5139/03n inclusive RS232 interface and Arbitrary.

Power options
n = 1 Universal European 220 V
n = 3 Standard North American 120V
n = 4 United Kingdom 240 V
n = 5 Switzerland 220 V
n = 8 Australia 240 V

PM5193 U.S.Versions 120V
PM 5193M Programmable Synthesizer/Function Generator
PM 5193SM Programmable Synthesizer/Function Generator with 10MHz reference input
PM 5193VM Programmable Synthesizer/Function Generator with Video Modulation

PM5193 European Versions 220V
PM 5193 Programmable Synthesizer/Function Generator
PM 5193S Programmable Synthesizer/Function Generator with 10MHz reference input
PM 5193V Programmable Synthesizer/Function Generator with Video Modulation

Included with PM5193
Line cord, rack mounting brackets, programming card, and Certificate of calibration practices

Accessories
PM 9051 BNC to 4 mm banana adapter
PM 9551 50 ohm to 600 ohm Adapter
PM 9581/01 50 ohm feed–through termination 3 W
PM 9585/01 50 ohm feed–through termination 1 W
Y8021 Shielded DEEE–488 Cable, 1m
Y8022 Shielded DEEE–488 Cable, 2m
Y8023 Shielded DEEE–488 Cable, 4m
PM 9564 19 inch Rackmount kit for PM5136/38A/39
Rackmounting brackets for PM5193 are included

Factory Warranty
One year product warranty

Manuals
Operators Manual included with instrument

Fluke Corporation
P.O. Box 9090, Everett, WA 98206

Fluke Europe B.V.
P.O. Box 1186,
5602 BD Eindhoven,
The Netherlands

For more information call:
In the U.S.A.: (800) 443–5853
or Fax: (425) 356–5116
In Europe/M–East:
+31 (0)40 2 678 200
or Fax: +31 (0)40 2 678 222
In Canada: (905) 890–7600
or Fax: (905) 890–6866
From other countries:
+1(425) 356–5500
or Fax: +1 (425) 356–5116
Web access: http://www.fluke.com

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