

Measurement Features	
Measurement Functions	Frequency, Frequency Burst, Period, Frequency Ratio, Time Interval, Pulse Width, Rise- and Fall-Times, Phase, Duty Factor, Voltage Level
Frequency A, B, C	<p>Range:</p> <p>Input A, B: 0.001 Hz to 300 MHz (PM 6690/0xx)</p> <p>Input C (option): Up to 3 GHz (PM 6690/6xx), up to 8 GHz (PM 6690/7xx)</p> <p>Resolution: 12 digits in 1s measuring time</p> <p>Aux parameters: Vmax, Vmin, Vp-p</p>
Frequency Burst A, B, C	<p>Frequency and PRF of repetitive burst signals can be measured without external control signal and with selectable start arming delay.</p> <p>Functions:</p> <p>Frequency in burst (in Hz)</p> <p>PRF (in Hz)</p> <p>Number of cycles in burst</p> <p>Range: Input A, B, C: See Frequency spec.</p> <p>Minimum burst duration: 40 ns (80 ns above 160 MHz)</p> <p>Minimum number of pulses in burst:</p> <p>Input A or B: 3 (6 above 160 MHz)</p> <p>Input C: 3 x prescaler factor</p> <p>PRF range: 0.5 Hz to 1 MHz</p> <p>Start delay range: 10 ns to 2 s, 10 ns resolution</p> <p>Aux parameters: PRF, number of cycles in burst</p>
Period A, B, C Average	<p>Range:</p> <p>Input A,B: 3.3 ns to 1000 s</p> <p>Input C: 330 ps to 10 ns (PM 6690/6xx) 125 ps to 5 ns (PM 6690/7xx)</p> <p>Resolution: 100 ps (single); 12 digits/s (average)</p> <p>Aux parameters: Vmax, Vmin, Vp-p</p>
Frequency Ratio A/B, B/A, C/A, C/B	<p>Range: 10⁻⁹ to 10¹¹</p> <p>Input frequency:</p> <p>Input A, B: 0.1 Hz to 300 MHz</p> <p>Input C (option): Up to 3 GHz, up to 8 GHz</p> <p>Aux parameters: Freq 1, Freq 2</p>
Time Interval A to B, B to A, A to A, B to B	<p>Range:</p> <p>Normal calculation: 0 to +106 s</p> <p>Smart calculation: -106 s to +106 s</p> <p>Resolution: 100 ps</p> <p>Min. pulse width: 1.6 ns</p> <p>Smart calculation: Smart Time Interval to determine sign (A before B or B before A)</p>

Positive and Negative Pulse Width A, B	Range: 1.6 ns to 106 s Min. pulse width: 1.6 ns Aux parameters: Vmax, Vmin, Vp-p
Rise and Fall Time A, B	Range: 700 ps to 1000 s (max. freq. 160 MHz) Trigger levels: 10% and 90% of signal amplitude, or manual Min. pulse width: 1.6 ns Aux parameters: Slew rate, Vmax, Vmin
Phase A Relative to B, B relative to A	Range: -180° to +360° Resolution: 0.001° to 100 kHz, decreasing to 0.1° to 10 MHz, 1° to 160 MHz Resolution can be improved via averaging (Statistics) Frequency range: up to 160 MHz Aux parameters: Freq (A), Va/Vb (in dB)
Positive and Negative Duty Factor A, B	Range: 0.000001 to 0.999999 Frequency range: 0.1 Hz to 300 MHz Aux parameters: Period, pulse width
Vmax, Vmin, Vp-p A, B	Range: -50 V to +50 V, -5 V to +5 V, within the ranges of max. input voltage Frequency range: DC, 1 Hz to 300 MHz Mode: Vmax, Vmin, Vp-p Resolution: 2.5 mV Auxiliary parameters: Mode Vmax: Vmin, Vp-p Mode Vmin: Vmax, Vp-p Mode Vp-p: Vmin, Vmax
Time stamping A, B	Raw time stamp data together with pulse counts on input A or B, accessible via GPIB or USB only. Max sample speed: See GPIB specifications Max frequency: 160 MHz Timestamp resolution: 100 ps

All measurements are displayed with a main parameter value and smaller auxiliary parameter values (with reduced resolution).

Some measurements are available only as auxiliary parameters.

Outputs and Inputs

Inputs A and B	<p>Frequency range:</p> <p>DC-coupled: DC to 300 MHz</p> <p>AC-coupled: 10 Hz to 300 MHz</p> <p>Impedance: 1 MΩ// 20 pF or 50 Ω(VSWR \leq 2:1)</p> <p>Trigger slope: Positive or negative</p> <p>Max. channel timing difference: 500 ps</p> <p>Sensitivity:</p> <p>DC-200 MHz: 15 mVrms</p> <p>200-300 MHz: 25 mVrms</p> <p>Attenuation: x1, x10</p> <p>Dynamic range (x1): 30 mVp-p to 10 Vp-p within \pm5 V window</p>
Trigger	<p>Trigger level: Read-out on display</p> <p>Resolution: 2.5 mV</p> <p>Uncertainty (x1): \pm (15 mV + 1% of trigger level)</p> <p>AUTO trigger level: Trigger level is automatically set to 50% point of input signal (10% and 90% for Rise/Fall Time) or can be set by the user</p> <p>AUTO hysteresis:</p> <p>Time: Min. hysteresis window (plus hysteresis compensation)</p> <p>Frequency: 33% and 67% of input signal amplitude</p> <p>Analog noise reduction filter: Nominal 100 kHz, RC-type.</p> <p>Digital low pass filter: Variable 1 Hz to 50 MHz cut-off frequency</p> <p>Max input voltage without damage:</p> <p>1 MΩ: 350 V (DC + AC pk) to 440 Hz, falling to 12 V rms (x1) at 1 MHz</p> <p>50 Ω: 12 Vrms</p> <p>Connector: BNC</p>
Optional Prescalers (C-input)	
3 GHz RF Input option (PM 6690/6xx)	<p>Rear Panel Inputs and Outputs</p> <p>100 to 300 MHz: 20 mVrms to 12 Vrms</p> <p>0.3 to 2.5 GHz: 10 mVrms to 12 Vrms</p> <p>2.5 to 2.7 GHz: 20 mVrms to 12 Vrms</p> <p>2.7 to 3.0 GHz: 40 mVrms to 12 Vrms</p> <p>Prescaler factor: 16</p> <p>Input impedance: 50 Ω nominal, VSWR <2.5:1</p> <p>Max voltage without damage: 12 Vrms, pin-diode protected</p> <p>Connector: Type N Female</p>

8 GHz RF Input option (PM 6690/7xx)	<p>Operating Input Voltage Range:</p> <p>200 to 500 MHz: 20 mVrms to 7 Vrms</p> <p>0.5 to 3.0 GHz: 10 mVrms to 7 Vrms</p> <p>3.0 to 4.5 GHz: 20 mVrms to 7 Vrms</p> <p>4.5 to 6.0 GHz: 40 mVrms to 7 Vrms</p> <p>6.0 to 8 GHz: 80 mVrms to 7 Vrms</p> <p>Prescaler Factor: 256</p> <p>Input Impedance: 50 Ω nominal, VSWR <2.5:1</p> <p>Max Input Voltage Without Damage: 7 Vrms</p> <p>Connector: Type N Female</p>
Rear Panel Inputs and Outputs	<p>Reference Input: 1, 5, or 10 MHz; 0.1 to 5 Vrms sine</p> <p>Input impedance: > 1 kΩ (AC coupled)</p> <p>Reference Output: 10 MHz; >1 Vrms sine into 50Ω</p> <p>Arming Input: Arming of all measuring functions</p> <p>Frequency Range: DC to 80 MHz</p> <p>Rear panel measurement inputs (option PM6690/xx2): A, B, C</p> <p>Impedance: Channels A and B: 1 MΩ // 50 pF or 50 Ω (VSWR 2:1); channel C: 50 Ω</p> <p>Connectors: Type SMA female for rear input C, BNC for all other inputs/outputs</p>
Auxiliary Functions	
Trigger Hold-Off	<p>Time Delay Range: 20 ns to 2 s, 10 ns resolution</p>
External Start and Stop Arming	<p>Modes: Start, Stop, Start and Stop Arming</p> <p>Input channels: A, B or E (External Arming)</p> <p>Max rep. Rate for Arming signal:</p> <p>Channel A,B: 160 MHz</p> <p>Channel E: 80 MHz</p> <p>Start Time Delay Range: 20 ns to 2 s, 10 ns resolution</p>
Statistics	<p>Functions: Maximum, Minimum, Mean, Δ (Max-Min), Standard Deviation and Allan Deviation</p> <p>Display: Numeric, histograms or trend plots</p> <p>Sample Size: 2 to 2*10⁹ samples</p> <p>Limit qualifier: OFF or Capture values above/below/inside or outside limits</p> <p>Measurement pacing</p> <p>Pacing time range: 2 μs to 1000 s, max 10 k measurements/sec.</p> <p>Mathematics</p> <p>Functions: (K*X+L)/M and (K/X+L)/M. X is current reading; K, L and M are constants which can be set via keyboard or as frozen reference value (X0) obtained through earlier measurement</p>

Other Functions	Measuring Time: 20 ns to 1000 s for Frequency, Burst and Period Average. Single cycle for other measuring functions Timebase Reference: Internal, External or Automatic Display Hold: Freezes result, until a new measurement is initiated via Restart Limit alarm: Indication on front panel and/or SRQ via GPIB Limit values: Lower limit (limit 1), Upper limit (limit 2) Settings: OFF or Alarm if value is above/below/inside or outside limits On alarm: Alarm, STOP or CONTINUE Display: Numerical + Graphical Stored instrument set-ups: 20 instrument setups can be saved/recalled in non-volatile memory; 10 can be user protected. Display: Backlit LCD Graphics screen for menu control, numerical read-out and status information Number of digits: 14 digits in numerical mode Resolution: 320 * 97 pixels
GPIB Interface	Programmable functions: All front panel accessible functions Compatibility: IEEE 488.2-1987, SCPI 1999 Model 53131A compatibility mode Interface Functions: SH1, AH1, T6, L4, SR1, RL1, DC1, DT1, E2 Max. measurement Rate Via GPIB: 2k readings/s (block) or 350 readings/s individually triggered To Internal Memory: 250k readings/s, 100 k readings/s with cal on Internal Memory Size: 750k readings.
USB Interface	USB version: 2.0 Full Speed (11 Mbit/s)
Calibration	Mode: Closed case, menu controlled. One-shot. Cal. Frequencies: 0.1, 1, 5, 10, 1.544 and 2.048 MHz

Environmental Specifications

Environmental Data	Class of Product: Class 3 according MIL-PRF-28800F Operating Temp: 0°C to +50°C Storage Temp: -40°C to +71°C Humidity: 5% to 95% (10°C to 30°C) 5% to 75% (30°C to 40°C) 5% to 45% (40°C to 50°C) Altitude: 4600m Vibration: Random and sinusoidal according to MIL-PRF-28800F, Class 3 Shock: Half-sine 30G per MIL-PRF-28800F, Bench handling Transit Drop Test: The optional heavy duty transport case and the soft carrying case have been tested according to MIL-PRF-28800F Reliability: MTBF 30 000 h (calculated value) Safety: Designed and tested for measurement Category I, Pollution Degree II in accordance with EN/IEC 61010-1:2001; CAN/CSA-C22.2 No 61010.1-04 (incl. approval) EMC: EN61326 (1997) A1 (1998), increased test levels according to EN 50822-2 Group 1, Class B
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Power Requirements	Basic version: 90 to 265 Vrms, 45 to 440 Hz, < 40 W
Dimensions	210 x 90 x 395 mm (8.25 x 3.6 x 15.6 in)
Weight	Net 2.7 kg (5.9 lb), Shipping 4.5 kg (9.9 lb)

PM6690 Time Base Options				
Timebase Option:		Standard (/x1x)	High Stability (/x5x)	Ultra High Stability (/x10x)
Time Base Type:		Standard	OCXO	OCXO
Uncertainty due to:				
- Aging				
	per 24 hours (1)	n.a.	< 5 x 10 ⁻¹⁰	< 3 x 10 ⁻¹⁰
	per month	< 5 x 10 ⁻⁷	< 1 x 10 ⁻⁸	< 3 x 10 ⁻⁸
	per year	< 5 x 10 ⁻⁶	< 5 x 10 ⁻⁸	< 1.5 x 10 ⁻⁷
- Temperature variation:				
	0°C ... 50°C	< 1 x 10 ⁻⁵	< 5 x 10 ⁻⁹	< 2.5 x 10 ⁻⁹
	20°C ... 26°C (2)	< 3 x 10 ⁻⁶	< 1 x 10 ⁻⁹	< 4 x 10 ⁻⁹
- Power voltage variations				
	± 10%	< 1 x 10 ⁻⁸	< 5 x 10 ⁻¹⁰	< 5 x 10 ⁻¹⁰
Short Term Stability $\tau = 1$ s		n.a.	< 1 x 10 ⁻¹¹	< 5 x 10 ⁻¹¹
(Root Allan Variance) $\tau = 10$ s		n.a.	< 1 x 10 ⁻¹¹	< 5 x 10 ⁻¹¹
Power-on Stability: deviation vs. final value after 24 hr 'on'-time, after a warm-up time of 10 min.:		n.a.	< 1 x 10 ⁻⁸	< 5 x 10 ⁻⁸
Typical total uncertainty, for operating temperature 20°C ... 26°C, at 2 σ (95%) confidence interval:				
- 1 year after calibration		< 7 x 10 ⁻⁶	< 6 x 10 ⁻⁸	< 1.7 x 10 ⁻⁷
- 2 years after calibration		< 1.2 x 10 ⁻⁵	< 1.2 x 10 ⁻⁷	< 3.5 x 10 ⁻⁷

Notes:

n.a. not discernible, negligible versus 1 C temperature variation

(1) after 1 month of continuous operation

(2) typical values

Option Code	Option Description
Specify an input option	
PM 6690/0xx	no C-input, 300 MHz frequency range
PM 6690/6xx	3 GHz Input C
PM 6690/8xx	8 GHz Input C
PM 6690/xx1	Standard inputs

PM 6690/xx2	Rear Panel Inputs
Specify a Time Base Option	
PM 6690/x1x	Standard timebase
PM 6690/x5x	High Stability Oven Time Base; 0.01 ppm/month
PM 6690/x6x	Ultra High Stability Oven Time Base; 0.003 ppm/month