

# DATASHEET APUASYN20(-X) Specification v1.30

Ultra-Agile Signal Sources from 8 kHz to 20 GHz  
(Single and Multi-Channel Versions)



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## DEFINITIONS

- The specifications in the following pages describe the warranted performance of the instrument for  $23 \pm 5$  °C after a 30-minute warm-up period (unless otherwise stated).

**Min/Max:** Parameter range that is guaranteed by product design, and/or production tested. Warranted performance specifications include guard-bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

**Typical:** Expected mean values, not warranted performance.

## INTRODUCTION

- The APUASYN20 is a very compact, very agile signal source series with frequency range of up to 20 GHz. It combines fast switching speed with low phase noise and good signal purity.

The single-channel unit is available as flange- and rack-mountable module or in a compact desktop enclosure with color touch display and front panel control.

The multi-channel version APUASYN20-X is available in 1, 2, 3 or 4 channel configurations in a standard 1U 19" rack-mountable enclosure. For high phase coherence, RF channels are locked to a common frequency reference.

The APUASYN20 has standard communication ports USB and ETHERNET, and optionally GPIB. All communication ports support the SCPI 1999 command set. The APUASYN20 also features an FCP (Fast Control Port) allowing for ultra-fast user-controlled list sweeping and frequency hopping.

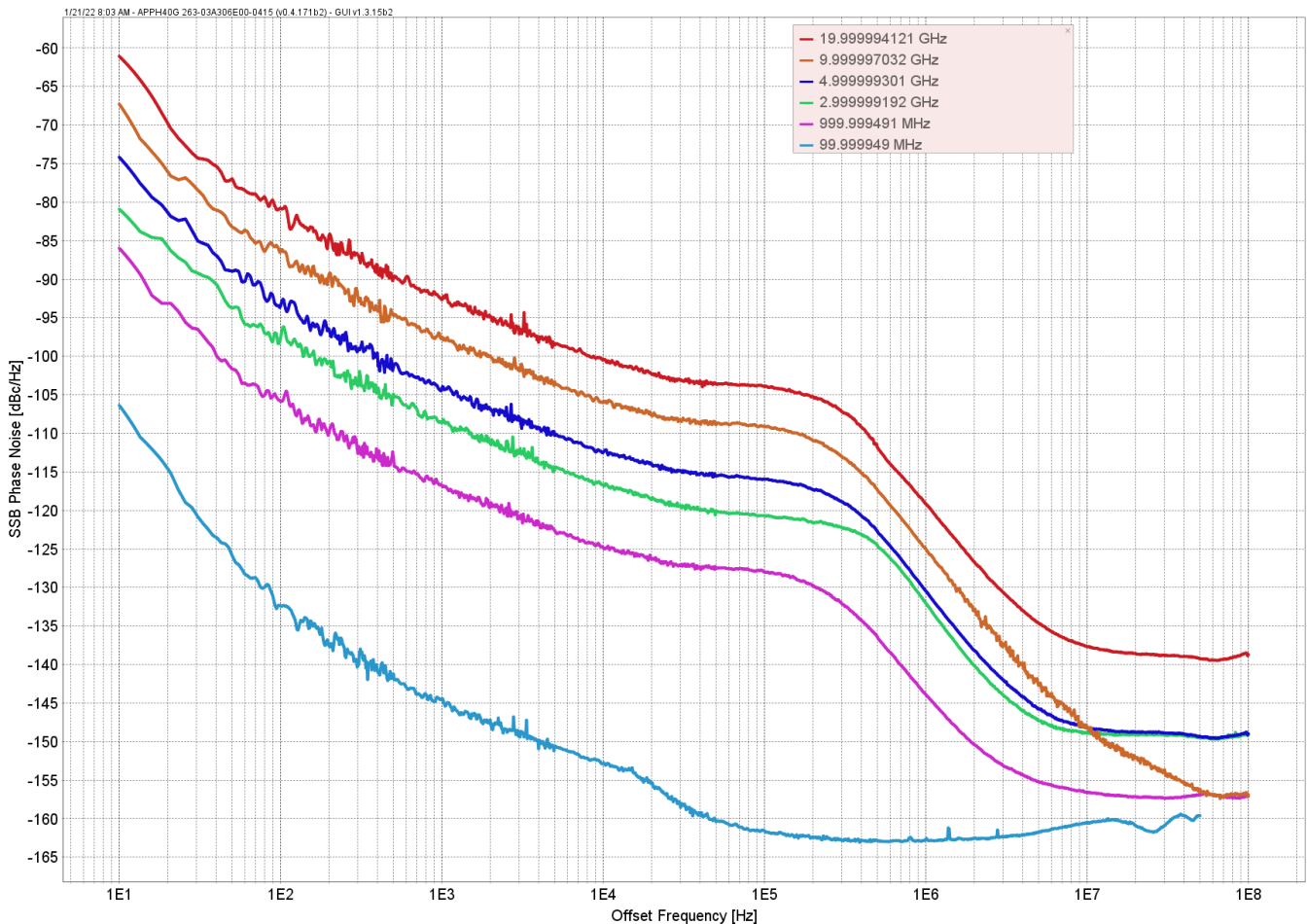
## Frequency Parameters / Range

PARAMETER	MIN	TYPICAL	MAX	NOTE
Frequency range	100 kHz 8 kHz		20 GHz 20 GHz	Option 8K
Resolution		0.01 Hz		
Phase resolution		0.1 deg		
Switching speed		200 $\mu$ s 5 $\mu$ s	500 $\mu$ s 10 $\mu$ s	In sweep mode Option FS

## Phase Noise

PARAMETER	MIN	TYPICAL	MAX	NOTE
SSB Phase noise at 1 GHz				See also plots
at 10 Hz from carrier		-85 dBc/Hz		
at 1 kHz from carrier		-115 dBc/Hz		
at 20 kHz from carrier		-125 dBc/Hz		
at 10 MHz from carrier		-155 dBc/Hz		

Figure 1: Phase Noise Performance



## Spectral Purity

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Output harmonics</b>				$P_{out} = 0 \text{ dBm}$
<3.0 GHz		-15 dBc	0 dBc	
3.0 - 7.5 GHz		-25 dBc	-10 dBc	
7.5 – 12.0 GHz		-30 dBc	-20 dBc	
>12.0 GHz		-40 dBc	-30 dBc	
<b>Sub-harmonics</b>				$P_{out} = 0 \text{ dBm}$
< 10.0 GHz		-80 dBc	-50 dBc	
10.0 – 18.0 GHz		-55 dBc	-40 dBc	
>18.0 GHz		-40 dBc	-20 dBc	
<b>Non-harmonic spurious</b>				(10 kHz < offset < 500 MHz)
<=18.0 GHz		-65dBc	-50dBc	
>18.0 GHz		-55 dBc	-35dBc	

Figure 2: Harmonic performance at 0 dBm - Harmonic output power [dBc] vs. frequency [Hz]



## Level Performance

PARAMETER	MIN	TYPICAL	MAX	NOTE
Range	0 dBm		+18 dBm	Settable to -10 to +23 dBm
Resolution		0.5 dB		

Figure 3: Typical Maximum Output Power

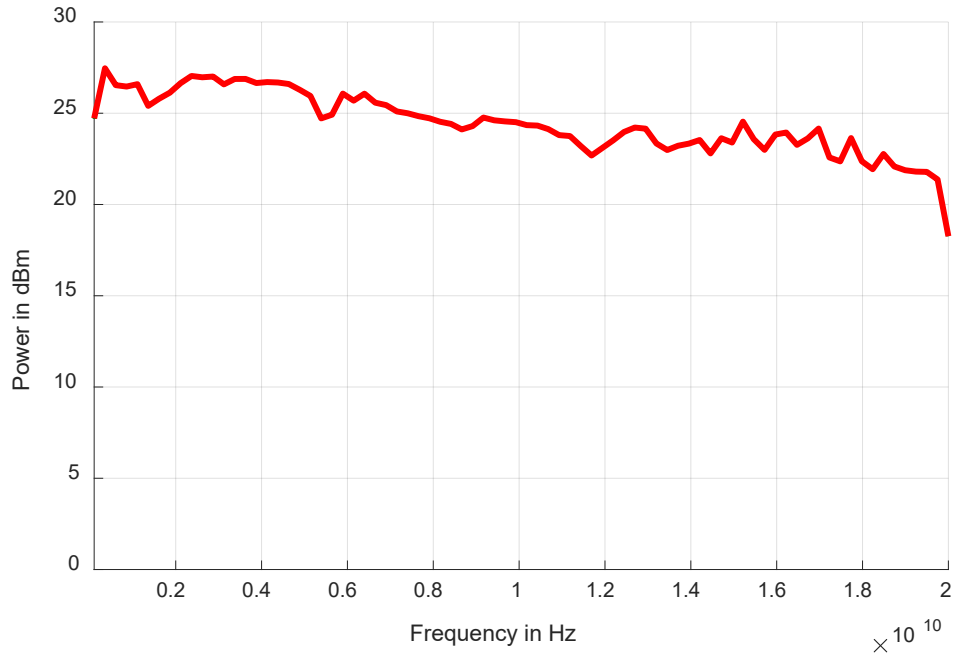


Figure 4: Power linearity

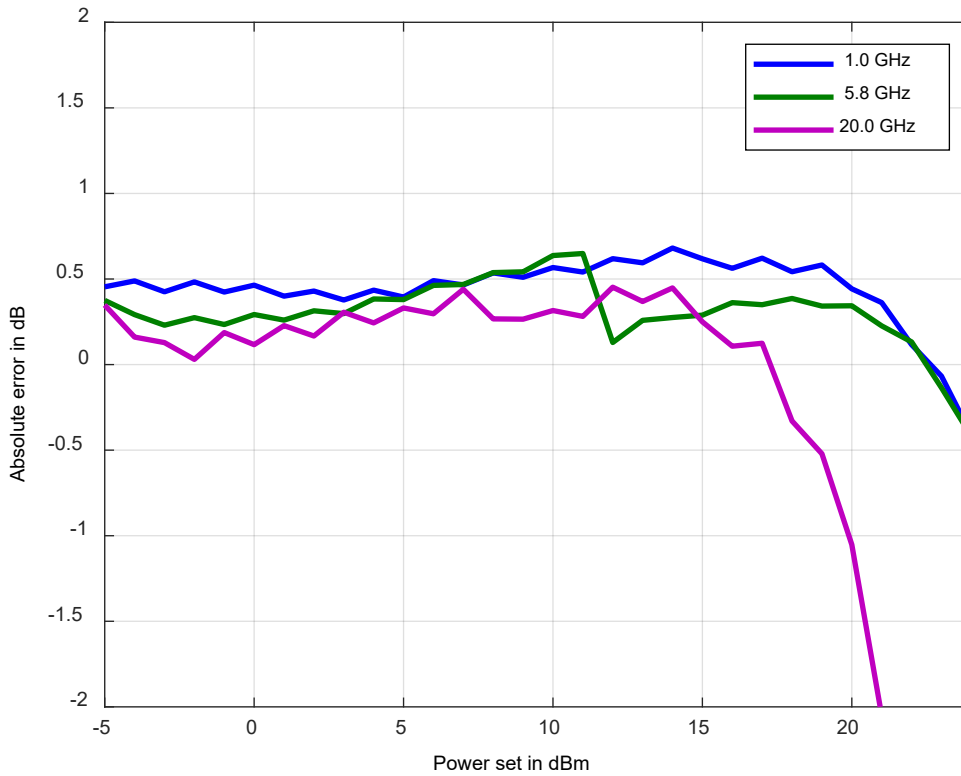
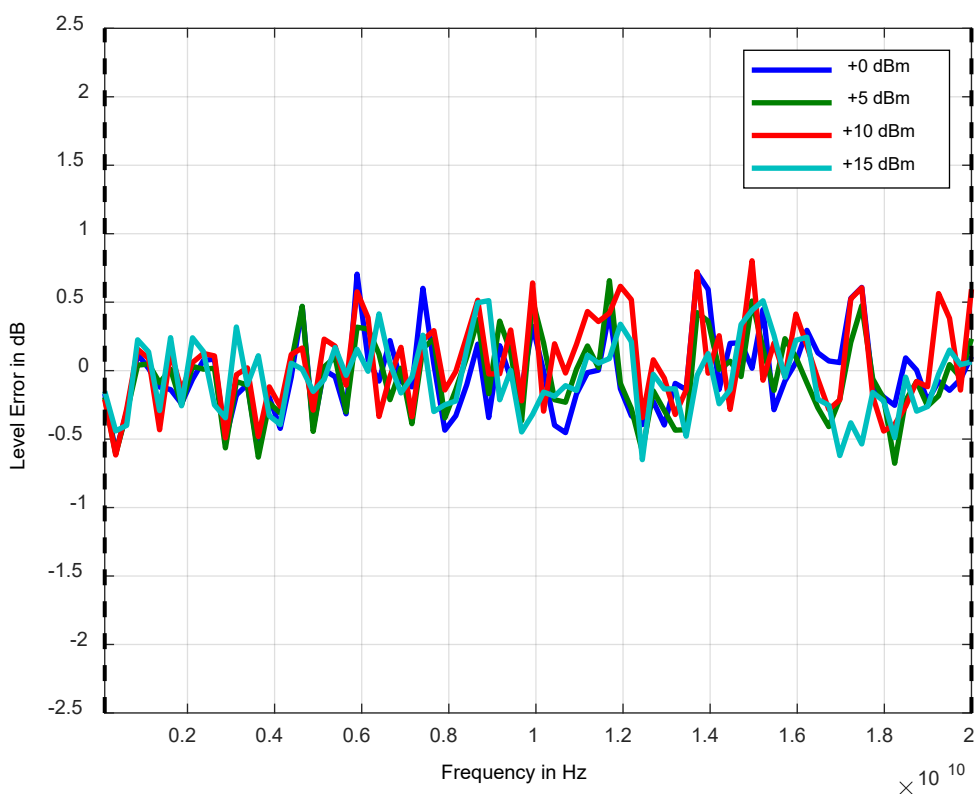


Figure 5: Power level accuracy



### Level Uncertainty and VSWR

PARAMETER	MIN	TYPICAL	MAX	NOTE
Level uncertainty		$\pm 1.5$ dB		
Output impedance		50 $\Omega$		
VSWR		1.7	2.0	

### Reverse Power Protection

PARAMETER	MIN	TYPICAL	MAX	NOTE
DC voltage		7 V		
RF power			23 dBm	

### Channel to Channel Performance

PARAMETER	MIN	TYPICAL	MAX	NOTE
Isolation				
< 3.0 GHz	90 dB			
3.0 – 8.0 GHz	70 dB			
>8.0 GHz		60 dB		
Relative phase stability		15 mrad		@5 GHz over 5 hours

Figure 6: Channel to channel isoaltion - The measurement shows the impact of channel #2, #3 and #4 at  $f_0+9$  MHz on the channel #1 channel under test) operating at  $f_0$ . All channels have 10 dBm output power.

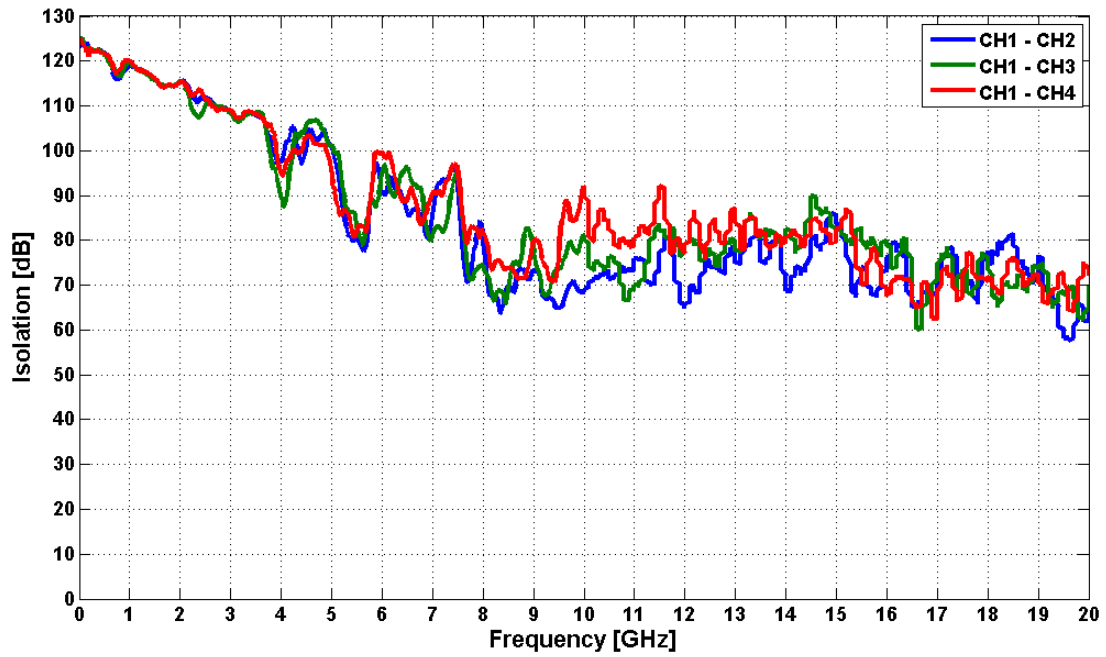
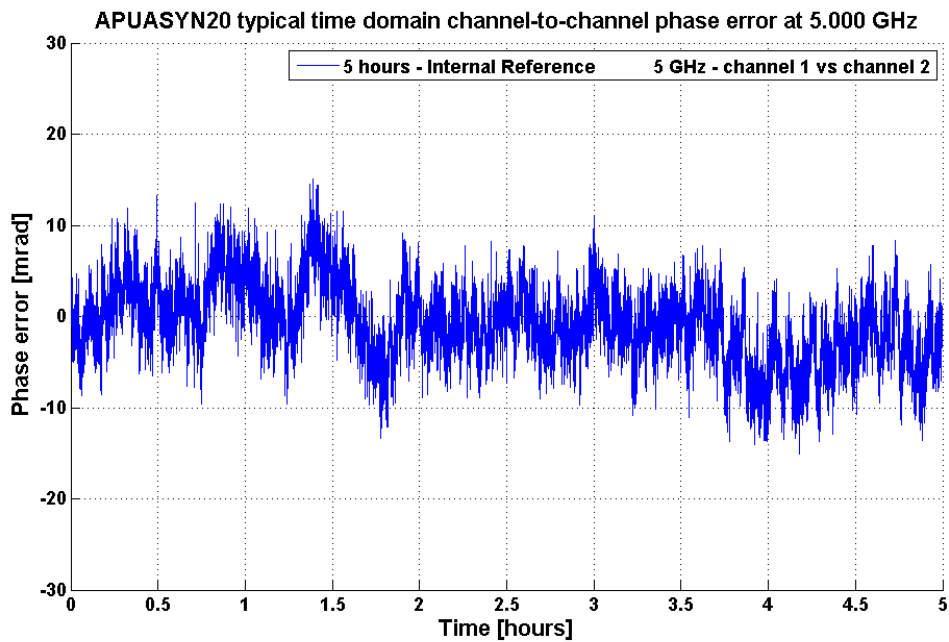


Figure 7: Channel to channel phase stability - The measurement shows the phase fluctuation between two RF channels in the same device, measured over 5 hours with a 5 GHz CW signal.



## Modulation Capabilities

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Pulse modulation</b>				
On/off ratio		60 dB		
Repetition frequency	DC		10 MHz	
Pulse width	30 ns		20 s	
Pulse rise/fall time		9 ns		
Pulse trainlength (pulses)	2		4192	



Video crosstalk		-40 dB		
Modulation source		Int. / Ext.		
External input threshold	0.85 V	0.9 V	0.95 V	TTL compatible
External input voltage range	-0.5 V		+5.5 V	TTL compatible
External input hysteresis		60 mV		
Delay (to RF)		20 ns	40 ns	

## Sweeping Capability

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Frequency / List sweep</b>				
Sweep type: linear, logarithmic, random				
Step time	500 $\mu$ s 5 $\mu$ s		200 s	Option FS
Timing resolution		5 ns		
Timing accuracy per point		20 ns		
<b>Generalized list sweep</b>				
Allows for individual setting of frequency, step-time, and off-time for each point				

## Frequency Reference

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Reference frequency input</b>	1 MHz		200 MHz	Integer MHz
Reference input level	-5 dBm	0 dBm	+13 dBm	
Lock Range			+/- 1.0 ppm	
Reference input impedance		50 $\Omega$		
<b>Internal reference frequency output</b>		100 MHz		
Initial accuracy of internal reference		$\pm$ 40 ppb		calibrated at 23 $\pm$ 3 $^{\circ}$ C
Temperature stability (0 to 50 degC)			$\pm$ 100 ppb	
<b>Aging</b>				
Aging 1 <sup>st</sup> year		0.5 ppm		
Aging per day			5 ppb	After 30 days operation
Warm-Up time		5 min		
Output of internal reference		+0 dBm 50 $\Omega$		

## Trigger

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Trigger Types</b>				Continuous, single (point), gated, gated direction
<b>Trigger Source</b>				external, bus (LAN, USB)
<b>Trigger Modes</b>				Continuous free run, trigger and run, reset and run
Trigger uncertainty		5 $\mu$ s		
External Trigger delay	50 $\mu$ s		40 s	
External Delay Resolution		15 ns		
<b>Trigger Modulo</b>	1		255	Execute only on Nth trigger event
<b>Trigger Polarity</b>		Rising, falling		
<b>External trigger input threshold</b>	0.85 V	0.9 V	0.95 V	TTL compatible

<b>External trigger input voltage range</b>	-0.5 V		+5.5 V	TTL compatible
<b>External trigger input hysteresis</b>		60 mV		

\*TRIG OUT connector not available in standard flange-mount enclosure

# CONNECTORS

## Front Panel



## Rear Panel



## APUASYN20-X Front view



## APUASYN20-X Rear view



## APUASYN20 with Option TOUCH



## APUASYN20-X with Option HI





## Fast Control Port (FCP)

- 8-bit or 16-bit parallel port for fast, time critical settings like frequency
- Sequential submission of 48-bit frequency word or access to pre-defined frequency table
- Optional amplitude control and support for multi-channel models (only with 16-bit bus)
- Signal Source confirms the received data with ACK (only in 8-bit mode) and informs the controller by the BUSY signal while processing the information.

**Connector:** 26 pin 3M Mini-D Ribbon Receptacle

**8-bit Mode:** Address A<3..0>, Data D<3..0>, STROBE, ACK, BUSY

**16-bit Mode:** Address A<7..0>, Data D<7..0>, STROBE, BUSY

**Input signal:** 0 to 5 V

**Input impedance:** 4,7 k $\Omega$

**Maximum toggle rate:** 10 MHz, frequency switching starts after transfer of last byte

## ORDERING INFORMATION



HOST MODEL	PRODUCT	DESCRIPTION
APUASYN20	APUASYN20	20 GHz wideband frequency synthesizer, flange-mount
APUASYN20-X	APUASYN20-X	Multi-channel 20 GHz frequency synthesizer, 19" 1U rack-mount
APUASYN20	<b>Option TOUCH</b>	Desktop enclosure with touch display control
APUASYN20	<b>Option EB</b>	External power bank adapter cable
APUASYN20(-X)	<b>Option 8K</b>	Frequency range extension to 8 kHz
APUASYN20(-X)	<b>Option FS</b>	Fast switching option (with FCP port)
APUASYN20-X	<b>Option HI</b>	High Isolation Enclosure
APUASYN20(-X)	<b>Option GPIB</b>	GPIB interface (only with option TOUCH or 1U rack-mount)
APUASYN20(-X)	<b>Option FLASH</b>	MicroSD card slot for removable SD memory
APUASYN20(-X)	<b>Option DATA</b>	Commercial Calibration Certificate with test data (per channel)
APUASYN20(-X)	<b>Option IEC</b>	IEC 17025 calibration with certificate
APUASYN20(-X)	<b>Option Retrofit</b>	Applies when options are back-ordered
APUASYN20(-X)	<b>Option WE</b>	One year warranty extension (standard: 2 years)
APUASYN20(-X)	<b>Option ReCal</b>	Recalibration with certificate (recommended: 2 years interval)

## GENERAL CHARACTERISTICS

### Remote programming interfaces

Ethernet interface  
USB2.0 device interface  
GPIB (optional)  
Control language: SCPI Version 1999.0

**Power requirements:** 24 VDC; 20 W maximum

**Mains adapter supplied:** 100-240 VAC in / 24 V, 2 A DC out

**Storage temperature range:** – 40 to 70 °C

**Operating temperature range:** 0 to 45 °C

**Operating and storage altitude:** up to 15,000 feet



Safety/EMC complies with applicable Safety and EMC regulations and directives.

<b>Dimensions / Weight</b>	<b>Standard Flange-Mount</b>
Including connectors	W x L x H = 105 x 270 x 60 mm [4.13 x 10.63 x 2.36 in] / ≤1.0 kg
<b>Dimensions / Weight</b>	<b>Option TOUCH</b>
Including connectors	W x L x H = 172 x 273 x 106 mm [6.77 x 10.75 x 4.17 in] / ≤2.5 kg
<b>Dimensions / Weight</b>	<b>APUASYN20-X in 1 HU</b>
Including connectors	W x L x H = 428 x 467 x 44 mm [16.85 x 18.39 x 1.73 in] / ≤10.0 kg

**Recommended calibration cycle:** 24 months



