Specifications

Nominal, Typical, Supplement and Approximate values show the supplemental data of this product and these do not guarantee the performance.
 -1-2-5 sequence; A sequence of numbers that repeats like 1,2,5,10,20,50,100,200,500.

Measured signal system

Input coupling	A, A-B: AC/DC selectable
	AC coupling with two-stage cascaded 1st order
	HPF, fc: 0.1Hz (nominal)
	I: AC/DC selectable, after converting the voltage
	C (LI5660 only) : DC (Always automatically cancel DC component)
	HF (LI5660 only): AC, when input impedance is 50 Ω , the AC-couple stage is positioned after the 50 Ω termination one. fc: 1 kHz (nominal)
Input ground	Float/Connect to chassis selectable
	Withstand voltage : ± 1 Vpk max. (DC+AC)
	Impedance to chassis: 10 k Ω (float, nominal), 11 Ω (connected to the chassis, nominal)
Line filter	Selectable: through (disabled), fundamental wave rejection (50 Hz or 60 Hz), 2nd order harmonic rejection (100 Hz or 120 Hz), or
	rejection of both fundamental and 2nd order harmonic
	Attenuation: 20 dB or more (at f ₀) * When using the input C and HF, Line filter is disable regardless of Line filter settings.

Voltage measurement

		LI5660	LI5655	LI5650	LI5645					
Input connector		BNC (front panel A, B, C, HF)	BNC (front panel A, B)	•						
Input type		A, C, HF (single-end), A-B (differential)	A (single-end), A-B (differenti	ial)						
Frequency range	Э	A, A-B, C: 0.5 Hz to 3 MHz	A, A-B: 0.5 Hz to 3 MHz	A, A-B: 1 mHz to 250 kHz						
		HF: 10 kHz to 11 MHz								
Sensitivity		A, A-B: 10 nV to 1 V F. S. (1-2-5 sequer	nce)	•						
		C: 1 mV to 10 V F. S. (1-2-5 sequence)								
		HF: 1 mV to 1 V F. S. (1-2-5 sequence)								
Voltage	A, A-B	±0.5 % (1 kHz, signal level ≥ 1 mV, at 2	3 ±5°C)*1	±0.5 % (1 kHz, signal level ≥ 1 n	nV, at 23 ±5°C)*1					
accuracy		±2 % (1 kHz, signal level ≥ 1 μV)*1		±2 % (1 kHz, signal level ≥ 1 μV)*1					
		±0.5 % (≤ 20 kHz, sensitivity 100 mV to	o 1 V, at 23 ±5°C)*2	±0.5 % (≤ 20 kHz, sensitivity 10	0 mV to 1 V at 23 ±5°C)*2					
		±1 % (≤ 50 kHz, sensitivity 100 mV to 1	V)*2	±1 % (≤ 50 kHz, sensitivity 100	mV to 1 V)*2					
		±2 % (≤ 100 kHz, sensitivity 100 mV to	1 V)*2	±2 % (≤ 100 kHz, sensitivity 100) mV to 1 V)*2					
		± 3 % (\leq 1 MHz, sensitivity 100 mV to 1	V)*2	±3 % (≤ 250 kHz, sensitivity 100) mV to 1 V)*2					
		± 5 % (\leq 3 MHz, sensitivity 100 mV to 1	V)*2							
	С	±0.5 % (≤ 20 kHz)								
		±1 % (≤ 50 kHz)								
		±2 % (≤ 100 kHz)								
		±3 % (≤ 1 MHz)								
		±5 % (≤ 3 MHz)								
		1 V to 10 V sensitivity, with full-scale signal,								
		dynamic reserve LOW								
	HF	± 3 % (\leq 1 MHz, input impedance 1 MΩ)								
		\pm 5 % (≤ 3 MHz, input impedance 1 MΩ)								
		$\pm 7 \% (\leq 10 \text{ MHz}, \text{ input impedance 50 } \Omega)$								
		± 14 % (≤ 11 MHz, input impedance 50 Ω)								
		Dynamic reserve LOW,								
		sensitivity 100 mV to 1 V, full-scale signal								
Voltage accuracy	A, A-B	± 100 ppm / °C (supplementary value)								
temperature drift		1 kHz, dynamic reserve LOW, input A,	sensitivity 1 V, signal level 100	% of F. S.						
Input	A, B	10 M Ω (nominal), 50 pF in parallel (sup)	plementary)							
impedance	С	1 MΩ (nominal),								
		50 pF in parallel (supplementary)								
	HF	1 M Ω (nominal),								
		50 pF in parallel (supplementary)								
		50Ω (nominal)								
Input referred	A, A-B	4.5 nV// Hz (supplementary)								
noise		Dynamic reserve LOW, sensitivity 1 m	/ or less, 1 kHz, input short							
common-mode	A-B	at least 100 dB								
		AC coupling, 50 Hz to 1 kHz, signal source impedance 0 Ω, dynamic reserve LOW and sensitivity 20 mV or less								
		(or MED and 2 mV or less)		-						
Harmonic	А, А-В	-80 dBc or less (10 Hz to 5 kHz, 2 to 3)	rd order harmonics, each order	r)						
Maximum input		Dynamic reserve LOW, sensitivity 1 V,	signal level 30% of F.S.							
voltage	A, D, A-D	± 3 V (Each terminal Voltage and difference)	ential voltage at DC coupling)							
(linear operating		Dynamic reserve High, sensitivity 1 v								
(intear operating		± 30 V								
range) HF		Dynamic reserve HIGH, sensitivity 10 v								
Non-destructivo	AB	AC coupling: 10 Vrms (sino) DC: 40 V								
maximum input	Α, Β	DC coupling: $\pm 14 V$								
	C	± 42V								
Voltage	HE	± 72 v								
			I							

1 at least 30 % full-scale signal (sensitivity), dynamic reserve LOW

*2 DC coupling, dynamic reserve LOW and full-scale signal

Current measurement (not equipped with I	LI5645)
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-		,							
	LI5660		LI5655			LI5650			
Input connector	BNC (Front panel)								
Input type	Single-end								
Frequency range	0.5 Hz to maximum values (nominal, 3 dB reduction	s shown in the table frequency)	e below		1 mHz to maximum value (nominal, 3 dB reduction	s shown in the table frequency)	e below		
	Cs	Convers	ion gain		Cs	Convers	sion gain		
	connected cable capacitance +	1 M (10 ⁶) [V/A]	100 M (10 ⁸) [V/A]		connected cable capacitance +	1 M (10 ⁶) [V/A]	100 M (10 ⁸) [V/A]		
	None	1 MHz	10 kHz		None	250 kHz	10 kHz		
	150 pF	1 MHz	10 kHz		150 pF	250 kHz	10 kHz		
	1000 pF	150 kHz	1.5 kHz		1000 pF	150 kHz	1.5 kHz		
Sensitivity	100 fA to 1µA full-scale (a	at 1 M [V/A])		_					
	10 fA to 10 nA full-scale (a	at 100 M [V/A]) Both	1-2-5 sequence						
Current accuracy	±1% (nominal) At 23 =	±5°C, dynamic rese	ve LOW, sensitivity 1	1μ	A (1 M V/A at 1 kHz) as w	ell as sensitivity			
	10 nA	(100 M V/A at 125 H	lz), 30 % or more of f	full	I-scale sensitivity signal, b	oth typical value.			
Current accuracy temperature drift	± 150 ppm / °C Dynan	nic reserve LOW, su	pplementary value fo	or (1 M [V/A], 1 kHz) and (100) M [V/A], 125 Hz)			
Input referred noise	150 fA/√Hz (1M [V/A], 1kH	lz) 15 fA/ _√ Hz (100N	I [V/A], 125Hz) Both	SL	upplementary value				
Input impedance	1 kΩ (1M [V/A]) ,100 kΩ (1	100M [V/A]) Both s	upplementary value						
Maximum input current	±3 µA DC coupling, dyna	amic reserve HIGH,	conversion gain 1 M	[V	//A], sensitivity 1 µA				
(linear operating range)			-						
Non-destructive maximum input current	+ 10mA								

Noise density measurement											
	LI5660	LI5655	LI5650	LI5645							
Sensitivity	Voltage: 20 nV/√Hz to 1 V/√Hz(A	, A-B) Current: 1 pA/√Hz to	1 μA/√Hz (at 1 M [V/A])	Voltage: 20 nV/√Hz to 1 V/√Hz							
	1 mV/ _v /Hz to 10 V/ _v /Hz (C*) 100 fA/√Hz	to 10 nA/√Hz (at 100 M [V/A])	(A, A-B), 1-2-5 sequence							
	1 mV/ _v /Hz to 1 V/ _v /Hz (H	IF*)									
		All in 1-2-5 sequen	Ce *1 15660 only								

Phase sensitive detector section

	-							
LI5660		LI5655		LI5650	LI5645			
2 phase (Rcos θ ,	Rsinθ), Dual P	PSD (primary	PSD secondary PSD).		2 phase (Rcos θ, Rsin θ), 1 PSD (primary PSD).		
Sensitivity, time c	onstant, phase,	XY offset, d	ynamic reserve			-		
Measurement frequency					*1 Not equipped with LI5645			
Detection mode	Primary	PSD	Secondary PSD*1		*2 2-phase detection is at one frequence *3 The fundamental and a barmonic co	cy. Imponent of one input signal are measured		
SINGLE*2	Fundamental/Frac	ction Harmonic	None		simultaneously.			
DUAL1*1 *3	Fundamental/Frac	ction Harmonic	Fundamental/Harmor	nic	*4 Two independent frequency compor	nents (primary and secondary) of one input		
DUAL2*1 *4	Primary fre	equency	Secondary frequence	;y	*5 The secondary PSD is connected in	cascade with the primary PSD, so after a		
CASCADE*1 *5	Primary fre	equency	Secondary frequence	зy	signal is detected by the primary PS	D, it is further detected by the secondary PSD.		
At least 100 dB (s	upplementary)	LOW/MEDI	UM/HIGH 3-point sel	ectat	ble (common in primary PSD	and secondary PSD)		
Time constant: 1	µs to 50 ks (1-2	2-5 sequence	e)	Time constant: 5 µs to 50 ks (1-2-5 sequence)				
Attenuation slope	e: 6, 12, 18. 24 c	dB/oct		Attenuation slope: 6, 12, 18. 24 dB/oct				
Synchronous filte	er: On/Off			Synchronous filter: On/Off				
0.001° rms (at 1 k	Hz, attenuation	n slope : 18 c	IB/oct or more)	0.001° rms (at 1 kHz, attenuation slope : 18 dB/oct or more)				
0.003° rms(at 100) kHz, attenuati	on slope : 12	2 dB/oct or more)	0.003° rms(at 100 kHz, attenuation slope : 12 dB/oct or more)				
0.01° rms (at 3 M	Hz, attenuation	slope : 12 d	B/oct or more)	0.01° rms (at 250 kHz, attenuation slope : 12 dB/oct or more)				
Supplementary; r	eference signa	l is external	sine wave 1 Vrms,	Supplementary; reference signal is external sine wave 1 Vrms,				
time constant 100	0 ms, synchron	ization filter	OFF	time	e constant 100 ms, synchron	ization filter OFF		
± 0.01°/ °C (100 H	$z \le frequency$	≤ 10 kHz)		± 0.	01° °C (100 Hz \leq frequency \leq	≤ 10 kHz)		
± 0.03°/ °C (10 kHz < frequency ≤ 100 kHz)				± 0.	.03°/ °C (10 kHz < frequency :	≤ 100 kHz)		
± 0.2°/ °C (100 kH	₂ 0.2°/ °C (100 kHz < frequency ≤ 3 MHz)				2°/ °C (100 kHz < frequency :	≤ 250 kHz)		
Supplementary va	alue when input	A and extern	nal reference signal	Sup	plementary value when input	A and external reference signal		
are both sine wav	e 1Vrms.			are	both sine wave 1Vrms.			
	LI566 2 phase (Rcos θ, Sensitivity, time c Detection mode SINGLE*2 DUAL1*1*3 DUAL2*1*4 CASCADE*1*5 At least 100 dB (s Time constant: 1 Attenuation slope Synchronous filte 0.001° rms (at 1 k 0.003° rms(at 100 0.01° rms (at 3 M Supplementary; r time constant 100 ± 0.01°/ °C (100 k+ ± 0.02°/ °C (100 k+ Supplementary va are both sine wav	LI5660 2 phase (Rcos θ, Rsin θ), Dual F Sensitivity, time constant, phase, Detection mode Primary SINGLE*2 Fundamental/Frad DUAL1*1*3 Fundamental/Frad DUAL2*1*4 Primary frad CASCADE*1*5 Primary frad At least 100 dB (supplementary) Time constant: 1 µs to 50 ks (1-2 Attenuation slope: 6, 12, 18. 24 cd Synchronous filter: On/Off 0.003° rms (at 1 kHz, attenuation Supplementary; reference signa time constant 100 kHz, attenuation Supplementary; reference signa time constant 100 Hz ≤ frequency ± 0.01°/ °C (100 Hz ≤ frequency ± 0.2°/ °C (100 kHz < frequency	$\begin{tabular}{ c c c c c } \hline $Li5660$ \\ \hline 2 phase (Rcos θ, Rsin θ), Dual PSD (primary Sensitivity, time constant, phase, XY offset, diversity, the tabular of tab$	$\begin{tabular}{ c c c c c } \hline $L15660$ & $L15655$ \\ \hline 2 phase (Rcos θ, Rsin θ), Dual PSD (primary PSD secondary PSD Sensitivity, time constant, phase, XY offset, dynamic reserve \\\hline \hline $Sensitivity, time constant, phase, XY offset, dynamic reserve \\\hline \hline $Detection mode & $Measurement frequency $PSD $Secondary PSD^*1$ \\\hline $SINGLE*2$ Fundamental/Fraction Harmonic $None $DUAL1*1*3$ Fundamental/Fraction Harmonic Fundamental/Harmon $DUAL2*1*4$ $Primary frequency $Secondary frequency $Secondary frequency $CASCADE*1*5$ $Primary frequency $Secondary frequency $CASCADE*1*5$ $Primary frequency $Secondary frequency $At least 100 dB (supplementary) LOW/MEDIUM/HIGH 3-point self $Time constant: 1 μ to 50 ks (1-2-5 sequence) $Attenuation slope: 6, 12, 18. 24 $dB/oct $Synchronous filter: $On/Off 0.001° rms (at 1 kHz, attenuation slope : 18 $dB/oct or more] 0.003° rms(at 100 kHz, attenuation slope : 12 $dB/oct or more] 0.010° rms (at 3 MHz, attenuation slope : 12 $dB/oct or more] $Supplementary; reference signal is external sine wave 1 $Vrms$, time constant 100 ms, synchronization filter OFF \pm \vert 0.01% C (100 Hz \vert frequency $\equiv 100 kHz) \vert \vert 100 kHz \vert \vert 100 kHz \vert \vert 100 kHz \vert \vert 100 kHz \vert \vert \vert 100 kHz \vert \vert \vert \vert 100 kHz \vert \ver	LI5660LI56552 phase (Rcos θ , Rsin θ), Dual PSD (primary PSD secondary PSD).Sensitivity, time constant, phase, XY offset, dynamic reserveDetection modeMeasurement frequency Primary PSDSINGLE*2Fundamental/Fraction HarmonicDUAL1*1*3Fundamental/Fraction HarmonicDUAL2*1*4Primary PSDDEtection dds (supplementary)Secondary frequency Secondary frequencyCASCADE*1*5Primary frequencyAt least 100 dB (supplementary)LOW/MEDIUM/HIGH 3-point selectal Time constant: 1 µs to 50 ks (1-2-5 sequence)Attenuation slope: 6, 12, 18. 24 dB/octAttenuation slope: 6, 12, 18. 24 dB/oct or more)0.001° rms (at 1 kHz, attenuation slope : 18 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.000.01° rms (at 3 MHz, attenuation slope : 12 dB/oct or more)0.00<	LI5660 LI5655 LI5650 2 phase (Rcos θ, Rsin θ), Dual PSD (primary PSD secondary PSD). Sensitivity, time constant, phase, XY offset, dynamic reserve ************************************		

Reference signal system

Reference signal source	REF IN: the external reference signal is used as the p
	and is used as the secondary one at CASCADE*
	INT OSC: internal oscillator · SIGNAL: measuremen

External reference signal

	LI5660 LI5655									
Waveform	SIN F	SIN POS, TTL POS, TTL NEG								
Input connector	BNC (Front panel REF IN)									
Input impedance	1 MΩ	Ω (nomina	l value), ⁻	100 pF in p	baral	lel (supple	mentary	va		
Input voltage range	SIN:	0.3 to 20	Vp-p (sir	ne), TTL: 0	to 5	V, High 2.6	o V or mo	re		
Pulse width (square wave)	40 ns	s or more	(both Hig	gh and Lo	w lev	/el)				
Non-destructive maximum	± 15\	V								
input voltage										
Synchronization frequency range	Signal input	Detection mode	External reference signal	Synchronization frequency range	Sigr inpi	al Detection ut mode	External reference signal	Syr fr		
	A A-B C I	SINGLE DUAL1 DUAL2 CASCADE	SIN POS TTL POS TTL NEG	0.3Hz to 3.2MHz	A A-E I	3 SINGLE DUAL1 DUAL2	SIN POS TTL POS TTL NEG	0. 3.		
		SINGLE DUAL1 DUAL2	TTL POS TTL NEG	8kHz to 11.5MHz		CASCADE				
		CASCADE	SIN POS TTL POS TTL NEG	0.3Hz to 3.2MHz						
Synchronization time	2 periods + 50 ms (supplementary)									
Frequency display resolution	6 digits (0.1 mHz at less than 100 Hz)									
Frequency measurement accuracy	± (4	0 ppm + 1	l count)							

primary PSD's reference frequency at SINGLE, DUAL1*, and DUAL2*,

nt signal (cannot be used when input HF is selected)

*Except for LI5645

	LI5650	LI5645
alue)		
e, Low 0	.8 V or less (square)	

il e	Synchronization frequency range		Signal input	Detection mode	External reference signal	Synchronization frequency range	Signal input	Detection mode	External reference signal	Synchronization frequency range			
s	0.3Hz to				А	SINGLE	SIN POS	0.3Hz to 260 kHz	Α		SIN POS	0.3Hz to 260kHz	
S G	3.2MHz		A-B I	DUAL2 CASCADE	TTL POS TTL NEG	0.5mHz to 260kHz	A-B	SINGLE	TTL POS TTL NEG	0.5mHz to 260kHz			

Internal Oscillator

		LI5660		LI5655		LI5650	LI5645			
Frequence	CV.	0.3 Hz to 3.2 MHz (A, A	-B, C, I)	0.3 Hz to 3.2 MHz	0.5 mHz to	260 kHz				
/primarv	and\	8 kHz to 11.5 MHz (HF)								
second	darv)	Resolution: 6 digits (0.1 m Hz. less than 100 Hz)								
	,,	Accuracy: ± 40 ppm		,						
		 Oscillates two independent 	dent frec	uencies (primary frequency and se	condarv* frec	quency) at detection r	node DUAL2*. CASCADE*			
Reference	frequency source	Internal / external selec	table		,		,			
Reference	Frequency range	10 MHz ± 0.2 %								
frequency	Waveform	Sine Wave or Square W	ave (duty	(45 to 55%)						
source	Signal level	0.5 Vp-p to 5 Vp-p								
000100	Non-destructive	10 Vn-n								
	maximum input voltage									
	Input impedance	1 kO (nominal)								
	Input coupling	AC								
	Withstand voltage	+ 42 Vpk max. (DC+AC)	(Allowat	ole voltage to ground)						
Sine	Frequency	Primary frequency (with	detectio	on mode SINGLE, DUAL 1*)						
wave		Primary frequency/seco	ndarv* f	requency (Selectable at detection	mode DUAL	2*. CASCADE*)				
output	Amplitude	0 to 10.00 mVrms (res: ().01 mVr	ms) / 0 to 100.0 mVrms (res: 0.1 m)	Vrms) / 0 to 1	.000 Vrms (res: 0.00	1 Vrms)			
		When > 3.2 MHz (LI566	0 / LI565	5) or > 260 kHz (LI5650 / LI5645).	0 Vrms regar	rdless of the setting	-1			
	Amplitude	$\pm (2\% \text{ of setting} \pm 1 \text{ mV})$	< 20 kH	z	+(2% of set	tina + 1 mV) < 20 kHz	7			
	accuracy	$\pm(3\% \text{ of setting} + 1 \text{ mV})$	≤ 100 kł	- Hz	±(3% of set	ting + 1 mV) \leq 100 kF	- Iz			
		\pm (4% of setting + 2 mV)	≤ 1 MHz	1	±(4% of sett	$(ing + 2 mV) \le 260 kH$	łz			
		\pm (7% of setting + 5 mV) \leq 3.2 MHz								
	Maximum output current	± 15 mA								
	Output impedance	50 Ω (nominal)								
	Harmonic distortion	-80 dBc or less (20 Hz ≤ frequency ≤ 5 kHz, no load, 2nd to 5th order) -80 dBc or less (20 Hz ≤ frequency ≤ 5 kHz, no load. 2nd to 5th order)								
	(Output voltage	-70 dBc or less (5 kHz < frequency $\leq 100 \text{ kHz}$, no load, 2nd to 5th order) -70 dBc or less (5 kHz < frequency $\leq 100 \text{ kHz}$. no load, 2nd to 5th order)								
	setting 1 Vrms,	$-60 \text{ dBc or less (100 \text{ kHz} < frequency ≤ 1 \text{ MHz}, 50 \Omega, 2nd to 3rd order)}$ $-60 \text{ dBc or less (100 \text{ kHz} < frequency ≤ 250 \text{ kHz}, 50 \Omega, 2nd to 3rd order)}$								
	supplementary)	-50 dBc or less (1 MHz <	frequenc	$y \le 3$ MHz, 50 Ω , 2nd to 3rd order)						
Square	Frequency	Primary frequency (with	detectio	on mode SINGLE, DUAL1*)						
wave		Primary frequency/seco	ondary* f	requency (at detection mode DUA	L2*, CASCA	DE*, selectable)				
output	Signal level	TTL (0 to 3.3 V, nominal	at no loa	ad),						
		±8 mA max. (suppleme	ntary) Le	ess than 3.2 MHz, Output level fixe	ed in High or	Low (LI5660 / LI5655	ō only)			
Harmonic	Detection mode	The primary frequency	to the PS	SD is n/m times of reference signa	l frequency					
measurement	SINGLE	n range (harmonic) : 1 te	o 63 m	range (sub harmonic) : 1 to 63						
	Detection mode	The primary frequency	to the pri	imary PSD is n/m times of the refe	erence signal	frequency.				
	DUAL1*	The secondary frequen	cy to the	secondary PSD is n times of the r	reference sig	nal frequency.				
		n PRI range (harmonics	number	of primary PSD) : 1 to 63 m PRI	range (sub h	armonics number of	primary PSD) : 1 to 63			
		n SEC range (harmonic	s numbe	r of secondary PSD) : 1 to 63						
	Allowable frequency	Reference signal source		Fundamental frequency range		Harmo	onic frequency range			
	range of Harmonic	REF IN S	Synchroni	zation frequency range to external ref	erence signal		Same as at left			
	measurement	INT OSC	I	nternal oscillator frequency setting ra	nge		Same as at left			
		SIGNAL	Synchr	onization frequency to external refere	nce signal	Regardless of n, m settin	ngs, always operates at n = 1 and m = 1			
Phase ac	ljustment range	$-180.000^{\circ} \text{ to } +179.999^{\circ}$	(resolutio	on 0.001°)						
Orthogor	nality	$\pm~0.001^\circ$ or better (supp	ementar	y)						
Phase ac	curacy	$\pm 1^{\circ}$ (DC coupling, ≤ 10 k	Hz)		±1° (DC cou	pling, ≤ 10 kHz)				
		$\pm 2^{\circ}$ (DC coupling, ≤ 100	kHz)		±2° (DC cou	ıpling, ≤ 100 kHz)				
		$\pm 5^\circ$ (DC coupling, $\leq 1~M$	Hz)		±5° (DC cou	ıpling, ≤ 250 kHz)				
		$\pm 10^{\circ}$ (DC coupling, ≤ 3 M	/IHz)							
		Supplementary value; a	t Sine wa	ive 1 Vms, both input A (sensitivity	1 V) and exte	ernal reference signal	l input			
* Except fo	Except for LI5645									

Arithmetic processing

	0										
Offset adjustment	X, Y: sensitivity of ± 105% (resolution 0.001%)	Both of primary PSD and sec	ondary PSD* can be set								
Expand	X, R:1, 10, 100 (Ratio of X and R is common) Y:1, 10, 100										
	• Primary PSD and secondary PSD* can be set individual • Apparent sensitivity (signal full-scale) is 1 / EXPAND magnification										
	· Unusable when normalize or ratio calculation	Unusable when normalize or ratio calculation is running.									
Normalize	% value = (measured value / standard value) x	100									
(normalize calculation not	dB value = 20 × log10 Measurement values / s	standard values									
available or select from right)	% FS value = (measured value / sensitivity) × 1	00									
	• When detection mode is SINGLE, DUAL1*, DL	JAL2*, the above measuremen	t value = primary PSD output (X or R)							
	· When detection mode is CASCADE*, the above	ve measurement value = secor	ndary PSD output (X or R)								
	Standard value range: voltage 1 nV to 10 V, cur	rrent 1 fA to 1 µA*, resolution 6-	-digit • Unusable when EXPAND of	r Ratio calculation is running							
Ratio	Ratio of measured value A and standard value	B ratio = $K \times A \div B$									
(ratio calculation not	K: 0.1 to 10 (resolution 0.00001)	A (measured value)	B (standard value)	Detection mode							
available or select from right)	A, B: Select from a combination of the right	Primary PSD output (X, Y, R) / Sensitivity	AUX IN 1 Measurement value / 10 V	SINGLE, DUAL1*, DUAL2							
	* Maximum update rate of B is 10 k sample/s	Primary PSD output (X, Y, R) / Sensitivity	Secondary PSD X output / Sensitivity	DUAL1*, DUAL2*							
	When executing expand or normalizing, ratio processing cannot be performed	Secondary PSD output (X, Y, R) / Sensitivity	AUX IN 1 Measurement value / 10 V	CASCADE*							
	ratio processing carnier be performed.										

* Except for LI5645

Measured value output and display

Parameter	Output/Disalau	Detection mode		
	Output/Display	SINGLE	DUAL1*, DUAL2*, CASCADE*	
	DATA1	X, R, AUX IN 1, NOISE	Xp, Rp, Yp, θp, Xs, Rs, AUX IN 1, NOISE	
	DATA2	Y, θ, AUX IN 1, AUX IN 2	Yp, θp, Xs, Rs, Ys, θs, AUX IN 1, AUX IN 2	
	DATA3	X, R	Xp, Rp, Yp, θp, Xs, Rs	
	DATA4	Υ, θ	Yp, θp, Xs, Rs, Ys, θs	
	Remarks: X, Y, R, 0 suffix	n: harmonic (At harmonic value settings,	p: primary ditector s: secondary ditector	
		n as a suffix. Ex.: Xn)	n: harmonic (At harmonic value settings, n as a suffix. Ex.: Xpn)	

		LI5660	LI5655	LI5650	LI5645	
Analog	Full scale voltage	± 10 V (bipolar signal) , +1	0 V (unipolar signal)			
output	Output voltage range	12 V (no-load)				
	Maximum output current	± 10 mA	10 mA			
	Output impedance	470 Ω (nominal value)	70Ω (nominal value)			
	Output voltage accuracy	± (0.3% + 10 mV) to meas	urement value			
	Maximum update rate	DATA OUT 1/DATA OUT2 ((Front panel) 312.5 k sample/s.	DATA OUT 1/DATA OUT2 (Fro	nt panel) 156.25 k sample/s.	
		DATA OUT 3/DATA OUT4 (DATA OUT 3/DATA OUT4 (Rear panel) 1.5625 M sample/s. DATA OUT 3/DATA OUT4 (Rear panel) 781.25 k sample/s.			
Measurer	nent screen display	Normal: show the measure	ed values (DATA1, DATA2) and key se	ttings Large: enlarged display the	measured values (DATA1, DATA2)	
		Fine: Show the measured values (DATA1, DATA2, DATA3, DATA4) and advanced settings				
		On Normal and Large measurement screens, displays measured values as bar graphs as well as numerical values.				
Numeric	display	Numeric display Measurement value for the full		Measurement value for the full scale		
		Parameter	Range	Resolution	voltage of the analog output	
		Х, Ү	Sensitivity / EXPAND (±120%)	6 digits, at full-scale sensitivity	± sensitivity / EXPAND ratio	
		R	Sensitivity / EXPAND (0 to 120%)	6 digits, at full-scale sensitivity	Sensitivity / EXPAND ratio	
		θ	-180.000 to +179.999 °	0.001 °	± 180 °	
		NOISE (Noise density)	Sensitivity 0 to 120 %	6 digits, at full-scale sensitivity	Sensitivity	
		AUX IN 1, 2	± 12 V	0.001 V	± 10 V	
		Ratio	± 2.4	0.00001	± 2	
		Normalize %	± 240 %	0.001 %	± 200 %	
		Normalize % of full-scale	± 120 % of F.S.	0.001 % of F.S.	± 100 % of F.S.	
		Normalize dB	+ 120 dB	0.001 dB	+ 100 dB	

Monitor output

Monitor signal	Phase sensitive detector input signal	
Maximum output	Maximum output voltage ± 3 V (no-load),	
	maximum output current ± 20 mA	
Output impedance	50 Ω (nominal value)	

Auxiliary input (DC voltage measurement)

Number of channels	2
Maximum allowable	± 12 V
input voltage	
Non-destructive	± 42 V
maximum input	
voltage	
Input impedance	1 MΩ (nominal), 50 pF in parallel (supplementary)
Voltage measurement	\pm (0.3% + 10 mV), when the input ground is equal to
accuracy	the chassis potential
Frequency bandwidth	Highest: 5 kHz (-3 dB) (supplementary value)
Sampling rate	Highest: 125 k sample / s
Floating	Signal Ground
characteristics	Maximum voltage to ground (non-destructive): ± 42 Vpk max. (DC+AC)
	Ground impedance: 1 MΩ (nominal value)
	Signal Maximum voltage to ground: ± 42 Vpk max. (DC+AC)

Auxiliary output (DC voltage output)

Number of channels	2
Output voltage range	± 10.500 V (resolution 0.001 V)
Maximum output	± 5 mA
current	
Output impedance	1 kΩ (nominal value)
Output voltage	± (0.3% + 10 mV), at no load
accuracy	

Automatic setting items

Neasurement	Perform the following items "time constant", "sensitivity", "phase"
Time constant	Set the time constant and attenuation slope corresponding
	to the frequency of the reference signal.
Sensitivity	Set the sensitivity and dynamic reserve according to the input signal
Phase	Set the phase shift value as Y and phase output to a zero
Offset	Set each offset value, X and Y outputs to a zero

Dimensions (LI5660)



The LI5600 series all have the same dimensions,

but the number of terminals on the front and back is different.

LI5650	LI5645

Data Memory

Record data	For each sample data, select arbitrary up to five words from the recorded data	
Recording	Buffer 1, 2: 16 to 8192 sample	
capacity	Buffer 3: 16 to 65536 sample (FIFO)	
Trigger Signal	Internal timer/External trigger/Remote control commands/Manual trigger	
	1 sample recorded when trigger signal is received	
Sampling	LI5660 / LI5655	
interval	Internal timer	
	Range: 1.92 µs to 20 s, repeated at equal intervals,	
	resolution: 640 ns, 6 digits max.	
	External trigger/Remote control commands/Manual trigger	
	Range: ≥ 2.6 µs arbitrary intervals, trigger jitter 640 ns (nominal)	
	LI5650 / LI5645	
	LI5650 / LI5645 Internal timer	
	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals,	
	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max.	
	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger	
	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger Range: ≥ 10 μs arbitrary intervals, trigger jitter 640 ns (nominal)	
External trigge	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger Range: ≥ 10 μs arbitrary intervals, trigger jitter 640 ns (nominal) Signal level: TTL (0 to 5 V, High 2.6 V or more, Low 0.8 V or less),	
External trigge	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger Range: ≥ 10 μs arbitrary intervals, trigger jitter 640 ns (nominal) Signal level: TTL (0 to 5 V, High 2.6 V or more, Low 0.8 V or less), Minimum pulse width: 500 ns (both high and low level)	
External trigge	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger Range: ≥ 10 μs arbitrary intervals, trigger jitter 640 ns (nominal) Signal level: TTL (0 to 5 V, High 2.6 V or more, Low 0.8 V or less), Minimum pulse width: 500 ns (both high and low level) Effective edge: Falling, input impedance: 10 kΩ (nominal)	
External trigge	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger Range: ≥ 10 μs arbitrary intervals, trigger jitter 640 ns (nominal) Signal level: TTL (0 to 5 V, High 2.6 V or more, Low 0.8 V or less), Minimum pulse width: 500 ns (both high and low level) Effective edge: Falling, input impedance: 10 kΩ (nominal) Non-destructive maximum input voltage: ± 15 V	
External trigge Trigger delay time	LI5650 / LI5645 Internal timer Range: 9.6 μs to 20 s, repeated at equal intervals, resolution: 640 ns, 6 digits max. External trigger/Remote control commands/Manual trigger Range: ≥ 10 μs arbitrary intervals, trigger jitter 640 ns (nominal) Signal level: TTL (0 to 5 V, High 2.6 V or more, Low 0.8 V or less), Minimum pulse width: 500 ns (both high and low level) Effective edge: Falling, input impedance: 10 kΩ (nominal) Non-destructive maximum input voltage: ± 15 V 0 to 100 s (resolution: 640 ns, 6 digits max.)	

General

Interface USB USBTMC, USB 2.0 High	speed		
RS-232 4800 / 9600 / 19200 / 384	400 / 57600 / 115200 / 230400 bps		
GPIB Compliance standards II	EEE 488.1, IEEE 488.2		
LAN 10BASE-T / 100BASE-T	X, TCP/IP		
Display 4.3-inch WQVGA, color	LCD		
Power supply AC 100 V ± 10% / 120 V	AC 100 V ± 10% / 120 V ± 10% / 230 V+10%, -14%		
However 250 V or less	However 250 V or less		
50 Hz / 60 Hz ± 2 Hz, pc	ower consumption 75 VA or less,		
over voltage category II			
Operating temperature / 0 to +40°C	0 to +40°C		
humidity range 5 to 85% RH, absolute hum	5 to 85% RH, absolute humidity 1 to 25 g / m ³ , no condensation		
Warm-up time 30 minutes	30 minutes		
Setting memory 9 sets	9 sets		
Resume Return to the last setting	Return to the last settings at power-on state		
Power output for ± 15 V (nominal)			
Preamp 100 mA max. (rear panel	PREAMP POWER)		
RoHS Directive 2011/65/EU			
Safety / EMC EN 61010-1:2010, EN 61	1010-2-030:2010,		
EN 61326-1:2013, EN 61	1326-2-1:2013		
External dimensions 430 (W) × 88 (H) × 400 (I	D) Excluding protrusions		
(mm)			
Weight Approx. 7.5 kg Except f	or accessories		

Accessories and options

Accessories	Instruction manual, CD-ROM (remote control driver etc.)	
	power cord set (3-pin, 2 m)	
	fuse (time lag, 1.0 A / 250 V, φ 5.2 × 20 mm)	
	protective cap* (for current input terminal)	
Option	PA-001-2779 EIA rack-mount kit	
	PA-001-2780 JIS rack-mount kit	

* Except for LI5645