




# High Power Electronic Loads ZS vs. PLI

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This document shows functional and SCPI command differences between ZS and PLI production series A and B electronic loads. Refer to user manuals for detailed analysis.

Rev. 5

			
<b>Manufacturer</b>	H&H	H&H	H&H
<b>Series</b>	<b>ZS</b>	<b>PLI</b>	<b>PLI</b>
		<b>Production Series A</b>	<b>Production Series B</b>
<b>Continuous power max.</b>	28,800 W	28,800 W	28,800 W
<b>Voltage classes</b>	60 V, 120 V, 300 V, 600 V, 800 V, 1200 V	60 V, 120 V, 300 V, 600 V, 800 V, 1200 V	60 V, 120 V, 300 V, 600 V, 800 V, 1200 V
<b>Current ranges</b>	2/3/4	1	1
<b>Basic operating modes</b>	CC, CV, CR, CP	CC, CV, CR, CP	CC, CV, CR, CP
<b>Combined operating modes</b>	CC+CV, CR+CC+CV, CP+CC+CV, CV+CC by overcurrent and undervoltage protection	CC+CV, CR+CC+CV, CP+CC+CV, CV+CC by overcurrent and undervoltage protection, <b>IUA mode at discharge function</b>	CC+CV, CR+CC+CV, CP+CC+CV, CV+CC by overcurrent and undervoltage protection, <b>IUA mode at discharge function</b>
<b>Min. input voltage Vmin for Imax</b>	1 V (60 V and 120 V devices) 2 V (>=300 V devices)	1.2 V (60 V and 120 V models) 2 V (>=300 V models) 5 V (PLIxxxEC models)	1.2 V (60 V and 120 V models) 2 V (>=300 V models) 5 V (PLIxxxEC models)
<b>Input capacity</b>	ca. 2 µF/1,000 W	ca. 2 µF/600 W	ca. 2 µF/600 W
<b>Operating temperature</b>	5 ... 40 °C	5 ... 40 °C	5 ... 40 °C
<b>Power derating</b>	-1.2 %/°C for Ta > 21 °C	-1.2 %/°C for Ta > 21 °C	-1.2 %/°C for Ta > 21 °C
<b>Voltage setting</b>			
Accuracy	0.2 % of setting 0.05 % of range	0.2 % of setting 0.05 % of range	0.2 % of setting 0.05 % of range
Resolution	16 bits	14 bits	14 bits
<b>Current setting</b>			
Accuracy	0.2 % of setting 0.05 % of range	0.2 % of setting 0.05 % of range	0.2 % of setting 0.05 % of range
Resolution	16 bits	14 bits	14 bits
<b>Resistance setting (local)</b>			
Accuracy	1.4 % of setting 0.3 % of current range	1.4 % of setting 0.3 % of current range at >5 % of voltage range	1.4 % of setting 0.3 % of current range at >5 % of voltage range
<b>Resistance setting (remote)</b>			
Accuracy	1 % of setting 0.3 % of current range	1.4 % of setting 0.3 % of current range at >5 % of voltage range	1.4 % of setting 0.3 % of current range at >5 % of voltage range
Resolution	16 bits	14 bits	14 bits
<b>Power setting (local)</b>			
Accuracy	1.4 % of setting 0.5 % of range	0.35 % of setting, 0.1 % of range (V and I > 30 % of range) 0.7 % of setting, 0.25 % of range (V or I < 30 % of range)	0.35 % of setting, 0.1 % of range (V and I > 30 % of range) 0.7 % of setting, 0.25 % of range (V or I < 30 % of range)
<b>Power setting (remote)</b>			
Accuracy	1 % of setting 0.5 % of range	0.35 % of setting, 0.1 % of range (V and I > 30 % of range) 0.7 % of setting, 0.25 % of range (V or I < 30 % of range)	0.35 % of setting, 0.1 % of range (V and I > 30 % of range) 0.7 % of setting, 0.25 % of range (V or I < 30 % of range)
Resolution	16 bits	14 bits	14 bits
<b>Protections</b>			
Hardware protections and warnings	OCP, OPP, OTP protection OV, UV warning	OCP, OPP, OTP protection UV, RV, OV warning	OCP, OPP, OTP protection UV, RV, OV warning
Accuracy variable undervoltage protection	1.4 % of setting (local) 1 % of setting (remote, 16 bits resolution) 0.3 % of range	1.4 % of setting 0.3 % of range 12 bits resolution	1.4 % of setting 0.3 % of range 12 bits resolution
Accuracy variable overcurrent protection	1.4 % of setting (local) 1 % of setting (remote, 16 bits resolution) 0.3 % of range	1.4 % of setting 0.3 % of range 12 bits resolution	1.4 % of setting 0.3 % of range 12 bits resolution
<b>Rise/fall time</b>	model-specific	model-specific	model-specific, <b>factor 3 faster than production series A (except PLI6xx, PLI12xx, PLI21xx)</b>
<b>Measurement/display</b>			
Display	4 digits LED voltage 4 digits LED current	<b>Graphical User Interface</b>	<b>Graphical User Interface, enhanced menu navigation</b>
Voltage measurement accuracy	0.2 % of meas. value 0.05 % of range ±1 digit	0.03 % of meas. value 0.02 % of range 18 bits	0.01 % of meas. value 0.005 % of range 23 bits
Current measurement accuracy	0.2 % of meas. value 0.05 % of range	0.2 % of meas. value 0.05 % of range 18 bits	0.2 % of meas. value 0.05 % of range 23 bits
Resistance measurement accuracy	--	calculated of voltage and current measurement	calculated of voltage and current measurement
Power measurement accuracy	--	calculated of voltage and current measurement	calculated of voltage and current measurement
<b>Remote measurement in static modes</b>			
Voltage measurement accuracy	0.1 % of meas. value 0.05 % of range	0.03 % of meas. value 0.02 % of range	0.01 % of meas. value 0.005 % of range
Current measurement accuracy	0.2 % of meas. value 0.05 % of range	0.2 % of meas. value 0.05 % of range	0.2 % of meas. value 0.05 % of range

Resistance measurement accuracy	--	calculated of voltage and current measurement	calculated of voltage and current measurement
Power measurement accuracy	--	calculated of voltage and current measurement	calculated of voltage and current measurement
ADC resolution	18 bits	18 bits	23 bits
Reset state of voltage protection	--	regulating	switching
Dynamic function (LIST)	with Option ZS13	standard	standard
Number of dynamic settings	50 list points with ramp and dwell times (LIST)	300 list points with ramp and dwell times (LIST)	300 list points with ramp and dwell times (LIST)
Time resolution	200 µs	200 µs	200 µs
Number of measurement points	2,000	8,000	40,000
Number of iterations	infinite	4,000,000,000	999,999
Maximum dwell, ramp and sample time	2,000 s	800,000 s	1,000 s
Voltage measurement accuracy	0.15 % of meas. value 0.07 % of range	0.2 % of meas. value 0.1 % of range	0.1 % of meas. value 0.05 % of range
Current measurement accuracy	0.3 % of meas. value 0.07 % of range	0.2 % of meas. value 0.1 % of range	0.2 % of meas. value 0.1 % of range
Resolution	15 bits	12 bits	16 bits
Rectangle function	by TRANsient function	by LIST function	by LIST or RECTangle function with amplitude and offset
Watchdog function	yes	yes	yes
Save/recall settings	no	2 memories + 1 for power off settings	9 memories + 1 for power off settings
MPP tracking	yes, hill climbing method	yes, optional, hill climbing method	yes, optional, configurable sweep functionality to find global MPP, readable and displayable V/I characteristic
Battery test function	yes, stop criterion test-end voltage, data logging by trigger system	yes, several stop criteria, IUa mode, data logging with follow-up time	yes, several stop criteria, IUa mode, data logging with follow-up time, combineable with LIST function
Internal resistance measurement	no	yes, like specified e.g. in DIN EN 61951, DIN EN 61960	yes, like specified e.g. in DIN EN 61951, DIN EN 61960
Data logging to USB MSD	no	yes, sample rate 0.5 s, 1 s, 5 s, 10 s	yes, sample rate 0.5 ... 30 s with 0.1 s resolution
Trigger system	yes (extern, bus)	yes (extern, bus, manual, voltage)	yes (extern, bus, manual, voltage, current)
Keylock function	no	yes	yes
Preset function	no	yes	yes
t/V graph, t/I graph	no	no	yes
V/I characteristic	no	no	yes
Screenshot function	no	no	yes
Permissible potentials of neg. load input	±125 V (DC or AC) to PE ±500 V (DC or AC) to PE with ZS06 option	±125 V (DC or AC) to PE	±125 V (DC or AC) to PE ±800 V (DC or AC) to PE with PLI06 option
I/O port	standard, not isolated isolated version ZS06 optional	standard, not isolated isolated version PLI06 optional	standard, not isolated isolated version PLI06 optional
Analog control	0 ... 5 V or 0 ... 10 V	0 ... 10 V	0 ... 10 V
Analog control sampling rate	analog/real time	analog/real time	analog/real time
Ext. setting control	0 ... I <sub>max</sub> 0 ... V <sub>max</sub> 0 ... P <sub>max</sub>	0 ... I <sub>max</sub> 0 ... V <sub>max</sub> 0 ... I <sub>protmax</sub> 0 ... V <sub>protmax</sub>	0 ... I <sub>max</sub> 0 ... V <sub>max</sub> 0 ... I <sub>protmax</sub> 0 ... V <sub>protmax</sub>
Monitor signals	I, V, P	I, V	I, V
Monitor sampling rate	analog/real time	analog/real time	analog/real time
Digital control signals (inputs)	load on-off emergency off (remote shut-down) control input for ext. control activation operating mode control trigger input setting A-B setting range control	load on-off remote shut-down control input for ext. control activation operating mode control trigger input readable logic input	load on-off remote shut-down control input for ext. control activation operating mode control trigger input readable logic input
Digital outputs	overload trigger output during dynamic operation (setting A-B) UVP status	overload load on-off trigger output programmable logic output	overload load on-off trigger output programmable logic output
Digital outputs' voltage levels	5 V / 24 V (switchable)	3.3 V, 5 V, 12 V, externally programmable up to 24 V	3.3 V, 5 V, 12 V, externally programmable up to 24 V
Permissible potential of GNDs at standard I/O port	max. ±2 V (DC or AC) to Input- max. ±125 V (DC or AC) to PE	max. ±2 V (DC or AC) to Input- max. ±125 V (DC or AC) to PE	max. ±2 V (DC or AC) to Input- max. ±125 V (DC or AC) to PE
Permissible potential of GNDs at isolated I/O port	max. ±500 V (DC or AC) to Input- max. ±125 V (DC or AC) to PE	max. ±125 V (DC or AC) to Input- max. ±125 V (DC or AC) to PE	max. ±800 V (DC or AC) to Input- max. ±125 V (DC or AC) to PE
Sense terminals	binding post or safety laboratory socket	binding post or safety laboratory socket	Phoenix PH2/7.62-ST16
Data interfaces			
	USB optional	USB standard	USB standard
	RS-232 optional	RS-232 standard	RS-232 standard
		CAN standard	CAN standard, can be internally terminated
	external Ethernet optional	Ethernet standard	Ethernet standard
	GPIB optional	GPIB optional	GPIB optional
SCPI syntax	yes	yes	yes
LabVIEW drivers	yes, NI certified	yes, NI certified	yes, NI certified
Software tools	yes	yes	yes
Firmware update	by flashing tool via RS-232	via USB MSD (front)	via USB MSD (front)
Master-Slave operation in system connection	no	no	yes

Safety compliance	DIN EN 61010-1 DIN EN 61010-2-030	DIN EN 61010-1 DIN EN 61010-2-030	DIN EN 61010-1 DIN EN 61010-2-030
EMC compliance	DIN EN 61326-1 DIN EN 55011 DIN EN 61000-3-2 DIN EN 61000-3-3	DIN EN 61326-1 DIN EN 55011 DIN EN 61000-3-2 DIN EN 61000-3-3	DIN EN 61326-1 DIN EN 55011 DIN EN 61000-3-2 DIN EN 61000-3-3
Front panel color	RAL 7032	RAL 7032	RAL 7035
Calibration	Free H&H calibration service for new device, another free calibration within warranty period	Free H&H calibration service for new device, another free calibration within warranty period	Free H&H calibration service for new device, another free calibration within warranty period

# SCPI Commands ZS vs. PLI

- For identical commands/queries, the following notes must be considered:
- The setting values after resetting the system may differ.
  - The actual numeric settings when passing parameters MIN or MAX may differ.
  - The format of transferred parameters can differ.
  - The format of returned values and strings may differ.
  - The assignment of status registers can differ.
  - The control behavior with regard to speed and accuracy may differ.
  - The scope of commands can differ.

Use the user manuals to analyze the detailed differences between the ZS and PLI series commands/queries.  
 n. a. = not available

ZS (Reference)	PLI (A)	PLI (B)	Remark
<b>Common Commands</b>			
*CLS	*CLS	*CLS	
*ESE	*ESE	*ESE	
*ESE?	*ESE?	*ESE?	
*ESR	*ESR?	*ESR?	
*IDN?	*IDN?	*IDN?	
*OPC	*OPC	*OPC	
*OPC?	*OPC?	*OPC?	
n. a.	*OPT?	*OPT?	
n. a.	*RCL	*RCL	
*RST	*RST	*RST	
n. a.	*SAV	*SAV	
*SRE	*SRE	*SRE	ZS loads do not produce an SRO, independent from the set register value.
*SRE?	*SRE?	*SRE?	
*STB?	*STB?	*STB?	
*TRG	*TRG	*TRG	
*TST?	*TST?	*TST?	
*WAI	*WAI	*WAI	
<b>Device-dependent Commands</b>			
<b>Subsystem ACQuisition</b>			
n. a.	ACQuisition[:STATE]	ACQuisition[:STATE]	
n. a.	ACQuisition[:STATE]?	ACQuisition[:STATE]?	
n. a.	ACQuisition:STIME	ACQuisition:STIME	
n. a.	ACQuisition:STIME?	ACQuisition:STIME?	
n. a.	ACQuisition:TRIGger	ACQuisition:TRIGger	
n. a.	ACQuisition:TRIGger?	ACQuisition:TRIGger?	
<b>Subsystem CHANnel</b>			
CHANnel	n. a.	n. a.	
INSTrument			
<b>Subsystem CURRent</b>			
CURRent[:LEVel][:IMMediate]	CURRent[:LEVel][:IMMediate]	CURRent[:LEVel][:IMMediate]	
CURRent[:LEVel][:IMMediate]?	CURRent[:LEVel][:IMMediate]?	CURRent[:LEVel][:IMMediate]?	
CURRent[:LEVel]:TRIGgered	CURRent[:LEVel]:TRIGgered	CURRent[:LEVel]:TRIGgered	
CURRent[:LEVel]:TRIGgered?	CURRent[:LEVel]:TRIGgered?	CURRent[:LEVel]:TRIGgered?	
CURRent:MODE	n. a.	n. a.	
CURRent:MODE?	n. a.	n. a.	
CURRent:PROTection[:LEVel][:HIGH]	CURRent:PROTection[:LEVel]	CURRent:PROTection[:LEVel]	
CURRent:PROTection[:LEVel][:HIGH]?	CURRent:PROTection[:LEVel]?	CURRent:PROTection[:LEVel]?	
CURRent:PROTection:TRIPped?	n. a.	n. a.	
CURRent:RANGE	n. a.	n. a.	
CURRent:RANGE?	n. a.	n. a.	
CURRent:RANGE:AUTO	n. a.	n. a.	
<b>Subsystem DATA</b>			
n. a.	DATA:DELeTe	DATA:DELeTe	
DATA:POINts?	DATA:POINts?	DATA:POINts?	
TRACe:POINts?			
DATA:REMOve?	DATA:REMOve?	DATA:REMOve?	
TRACe:REMOve?			
<b>Subsystem DELay</b>			
DELay	n. a.	n. a.	
<b>Subsystem FORMat</b>			
n. a.	FORMat[:DATA]	FORMat[:DATA]	
n. a.	FORMat[:DATA]?	FORMat[:DATA]?	
n. a.	FORMat:SREGister	FORMat:SREGister	
n. a.	FORMat:SREGister?	FORMat:SREGister?	
<b>Subsystem FUNction</b>			
n. a.	FUNction:MEASure:IREsistance[:STATE]	FUNction:MEASure:IREsistance[:STATE]	
n. a.	FUNction:MEASure:IREsistance[:STATE]?	FUNction:MEASure:IREsistance[:STATE]?	
n. a.	FUNction:MEASure:IREsistance:CURRent?	FUNction:MEASure:IREsistance:CURRent?	
n. a.	FUNction:MEASure:IREsistance:CURRent?	FUNction:MEASure:IREsistance:CURRent?	
n. a.	FUNction:MEASure:IREsistance:DWELl?	FUNction:MEASure:IREsistance:DWELl?	
n. a.	FUNction:MEASure:IREsistance:DWELl?	FUNction:MEASure:IREsistance:DWELl?	
n. a.	FUNction:MEASure:IREsistance:RESistance?	FUNction:MEASure:IREsistance:RESistance?	
n. a.	FUNction:MEASure:IREsistance:RESistance?	FUNction:MEASure:IREsistance:RESistance?	
n. a.	FUNction:MEASure:IREsistance:TIME?	FUNction:MEASure:IREsistance:TIME?	
n. a.	FUNction:ZVOLTage?	FUNction:ZVOLTage?	
n. a.	FUNction:MPPT[:STATE]	FUNction:MPPT[:STATE]	
n. a.	FUNction:MPPT[:STATE]?	FUNction:MPPT[:STATE]?	
n. a.	FUNction:MPPT:ENERgy?	FUNction:MPPT:ENERgy?	
n. a.	n. a.	FUNction:MPPT:MPPT?	
n. a.	n. a.	FUNction:MPPT:SWEEp[:IMMediate]	
n. a.	n. a.	FUNction:MPPT:SWEEp:DATA?	
n. a.	n. a.	FUNction:MPPT:SWEEp:DATA:POINts?	
n. a.	n. a.	FUNction:MPPT:SWEEp:DIRection	
n. a.	n. a.	FUNction:MPPT:SWEEp:DIRection?	
n. a.	n. a.	FUNction:MPPT:SWEEp:PERIOD?	
n. a.	n. a.	FUNction:MPPT:SWEEp:PERIOD?	
n. a.	n. a.	FUNction:MPPT:SWEEp:TIME	
n. a.	n. a.	FUNction:MPPT:SWEEp:TIME?	
<b>Subsystem GTL</b>			
GTL	SYStem:LOCAl	SYStem:LOCAl	
<b>Subsystem INPut</b>			
INPut[:STATE]	INPut[:STATE]	INPut[:STATE]	
OUTPut[:STATE]			
INPut[:STATE]?	INPut[:STATE]?	INPut[:STATE]?	
OUTPut[:STATE]?			
<b>Subsystem LIST</b>			
n. a.	LIST:ACQuisition[:STATE]	LIST:ACQuisition[:STATE]	

LIST:COUNT	LIST:COUNT	LIST:COUNT	
n. a.	LIST:COUNT?	LIST:COUNT?	
LIST:CURRENT[:LEVEL]	LIST:CURRENT[:LEVEL]	LIST:CURRENT[:LEVEL]	
n. a.	LIST:CURRENT[:LEVEL]?	LIST:CURRENT[:LEVEL]?	
n. a.	LIST:CURRENT[:LEVEL]:POINTS?	LIST:CURRENT[:LEVEL]:POINTS?	
LIST:CURRENT:RTIME	LIST:RTIME	LIST:RTIME	
LIST:CURRENT:DWELL	LIST:DWELL	LIST:DWELL	
LIST:CURRENT:STRAMP	LIST:STIME:RTIME	LIST:STIME:RTIME	
LIST:CURRENT:STDWELL	LIST:STIME:DWELL	LIST:STIME:DWELL	
n. a.	LIST:DWELL?	LIST:DWELL?	
n. a.	LIST:DWELL:POINTS?	LIST:DWELL:POINTS?	
n. a.	LIST:MODE	LIST:MODE	
n. a.	LIST:MODE?	LIST:MODE?	
LIST:POWER[:LEVEL]	LIST:POWER[:LEVEL]	LIST:POWER[:LEVEL]	
n. a.	LIST:POWER[:LEVEL]?	LIST:POWER[:LEVEL]?	
n. a.	LIST:POWER[:LEVEL]:POINTS?	LIST:POWER[:LEVEL]:POINTS?	
LIST:POWER:RTIME	LIST:RTIME	LIST:RTIME	
LIST:POWER:DWELL	LIST:DWELL	LIST:DWELL	
LIST:POWER:STRAMP	LIST:STIME:RTIME	LIST:STIME:RTIME	
LIST:POWER:STDWELL	LIST:STIME:DWELL	LIST:STIME:DWELL	
LIST:RESISTANCE[:LEVEL]	LIST:RESISTANCE[:LEVEL]	LIST:RESISTANCE[:LEVEL]	
n. a.	LIST:RESISTANCE[:LEVEL]?	LIST:RESISTANCE[:LEVEL]?	
n. a.	LIST:RESISTANCE[:LEVEL]:POINTS?	LIST:RESISTANCE[:LEVEL]:POINTS?	
LIST:RESISTANCE:RTIME	LIST:RTIME	LIST:RTIME	
LIST:RESISTANCE:DWELL	LIST:DWELL	LIST:DWELL	
LIST:RESISTANCE:STRAMP	LIST:STIME:RTIME	LIST:STIME:RTIME	
LIST:RESISTANCE:STDWELL	LIST:STIME:DWELL	LIST:STIME:DWELL	
n. a.	LIST:RTIME?	LIST:RTIME?	
n. a.	LIST:RTIME:POINTS?	LIST:RTIME:POINTS?	
LIST:STATE	LIST[:STATE]	LIST[:STATE]	
LIST:STATE?	LIST[:STATE]?	LIST[:STATE]?	
n. a.	LIST:STIME:DWELL?	LIST:STIME:DWELL?	
n. a.	LIST:STIME:DWELL:POINTS?	LIST:STIME:DWELL:POINTS?	
n. a.	LIST:STIME:RTIME?	LIST:STIME:RTIME?	
n. a.	LIST:STIME:RTIME:POINTS?	LIST:STIME:RTIME:POINTS?	
LIST:VOLTAGE[:LEVEL]	LIST:VOLTAGE[:LEVEL]	LIST:VOLTAGE[:LEVEL]	
n. a.	LIST:VOLTAGE[:LEVEL]?	LIST:VOLTAGE[:LEVEL]?	
n. a.	LIST:VOLTAGE[:LEVEL]:POINTS?	LIST:VOLTAGE[:LEVEL]:POINTS?	
LIST:VOLTAGE:RTIME	LIST:RTIME	LIST:RTIME	
LIST:VOLTAGE:DWELL	LIST:DWELL	LIST:DWELL	
LIST:VOLTAGE:STRAMP	LIST:STIME:RTIME	LIST:STIME:RTIME	
LIST:VOLTAGE:STDWELL	LIST:STIME:DWELL	LIST:STIME:DWELL	
n. a.	LIST:TRIGGER[:ENABLE]	LIST:TRIGGER[:ENABLE]	
<b>Subsystem MEASURE</b>			
MEASURE:CHARGE[:DC]?	FUNCTION:DISCHARGE:CHARGE?	FUNCTION:DISCHARGE:CHARGE?	
MEASURE:CURRENT[:DC]?	MEASURE:CURRENT?	MEASURE:CURRENT?	
MEASURE:ENERGY[:DC]?	FUNCTION:MPPT:ENERGY?	FUNCTION:MPPT:ENERGY?	
MEASURE:EXTERNAL[:DC]?	FUNCTION:DISCHARGE:ENERGY?	FUNCTION:DISCHARGE:ENERGY?	
MEASURE:MPP[:DC]?	n. a.	n. a.	
MEASURE:POWER[:DC]?	n. a.	n. a.	
MEASURE:RESISTANCE[:DC]?	MEASURE:POWER?	MEASURE:POWER?	
n. a.	MEASURE:RESISTANCE?	MEASURE:RESISTANCE?	
MEASURE:VOLTAGE[:DC]?	MEASURE:TEMPERATURE?	MEASURE:TEMPERATURE?	
	MEASURE:VOLTAGE?	MEASURE:VOLTAGE?	
<b>Subsystem MODE</b>			
MODE:CURRENT[:DC]	FUNCTION:MODE	FUNCTION:MODE	
FUNCTION:CURRENT[:DC]			
MODE:POWER[:DC]	FUNCTION:MODE	FUNCTION:MODE	
FUNCTION:POWER[:DC]			
MODE:RESISTANCE[:DC]	FUNCTION:MODE	FUNCTION:MODE	
FUNCTION:RESISTANCE[:DC]			
MODE:VOLTAGE[:DC]	FUNCTION:MODE	FUNCTION:MODE	
FUNCTION:VOLTAGE[:DC]			
MODE:MPP	FUNCTION:MPPT[:STATE]	FUNCTION:MPPT[:STATE]	
FUNCTION:MPP			
MODE?	FUNCTION:MODE?	FUNCTION:MODE?	
FUNCTION?			
<b>Subsystem PCYCLE</b>			
PCYCLE:CURRENT	n. a.	n. a.	
PCYCLE:POWER	n. a.	n. a.	
PCYCLE:RESISTANCE	n. a.	n. a.	
PCYCLE:VOLTAGE	n. a.	n. a.	
PCYCLE:TIME	n. a.	n. a.	
PCYCLE:TRIGGERED	n. a.	n. a.	
PCYCLE:MODE	n. a.	n. a.	
PCYCLE:MODE?	n. a.	n. a.	
PCYCLE:STATE	n. a.	n. a.	
PCYCLE:STATE?	n. a.	n. a.	
<b>Subsystem PORT</b>			
n. a.	PORT:IO:IPIN?	PORT:IO:IPIN?	
n. a.	PORT:IO:OPIN	PORT:IO:OPIN	
n. a.	PORT:IO:OPIN?	PORT:IO:OPIN?	
<b>Subsystem POWER</b>			
POWER[:LEVEL][:IMMEDIATE]	POWER[:LEVEL][:IMMEDIATE]	POWER[:LEVEL][:IMMEDIATE]	
POWER[:LEVEL][:IMMEDIATE]?	POWER[:LEVEL][:IMMEDIATE]?	POWER[:LEVEL][:IMMEDIATE]?	
POWER:MODE	n. a.	n. a.	
POWER:MODE?	n. a.	n. a.	
POWER:RANGE	n. a.	n. a.	
POWER:RANGE?	n. a.	n. a.	
n. a.	POWER[:LEVEL][:TRIGGERED]	POWER[:LEVEL][:TRIGGERED]	
n. a.	POWER[:LEVEL][:TRIGGERED]?	POWER[:LEVEL][:TRIGGERED]?	
n. a.	POWER:PEAK?	POWER:PEAK?	
<b>Subsystem PROGRAM</b>			
PROGRAM[:SELECTED]:BEGIN	n. a.	n. a.	
PROGRAM[:SELECTED]:DELETE[:SELECTED]	n. a.	n. a.	
PROGRAM[:SELECTED]:DELETE:ALL	n. a.	n. a.	
PROGRAM[:SELECTED]:END	n. a.	n. a.	
PROGRAM[:SELECTED]:NAME	n. a.	n. a.	
PROGRAM[:SELECTED]:STATE	n. a.	n. a.	
<b>Subsystem RESISTANCE</b>			
RESISTANCE[:LEVEL][:IMMEDIATE]	RESISTANCE[:LEVEL][:IMMEDIATE]	RESISTANCE[:LEVEL][:IMMEDIATE]	
RESISTANCE[:LEVEL][:IMMEDIATE]?	RESISTANCE[:LEVEL][:IMMEDIATE]?	RESISTANCE[:LEVEL][:IMMEDIATE]?	
RESISTANCE[:LEVEL]:TRIGGERED	RESISTANCE[:LEVEL]:TRIGGERED	RESISTANCE[:LEVEL]:TRIGGERED	
RESISTANCE[:LEVEL]:TRIGGERED?	RESISTANCE[:LEVEL]:TRIGGERED?	RESISTANCE[:LEVEL]:TRIGGERED?	
RESISTANCE:MODE	n. a.	n. a.	
RESISTANCE:MODE?	n. a.	n. a.	
RESISTANCE:RANGE	n. a.	n. a.	
RESISTANCE:RANGE?	n. a.	n. a.	
RESISTANCE:RANGE:AUTO	n. a.	n. a.	
<b>Subsystem SERVICE</b>			
n. a.	SERVICE:CALIBRATION[:STATE]	SERVICE:CALIBRATION[:STATE]	

n. a.	SERVICE:CALibration[:STATE]?	SERVICE:CALibration[:STATE]?		
n. a.	SERVICE:PRODUCTION[:STATE]	SERVICE:PRODUCTION[:STATE]		
n. a.	SERVICE:PRODUCTION[:STATE]?	SERVICE:PRODUCTION[:STATE]?		
<b>Subsystem SETUP</b>				
SETUp:ADC	n. a.	n. a.		
SETUp:ADC?	n. a.	n. a.		
SETUp?	n. a.	n. a.		
<b>Subsystem SFUNCTION</b>				
SFUNction:BATtery:ENable	FUNCTION:DISChArge[:STATE]	FUNCTION:DISChArge[:STATE]		
SFUNction:BATtery:ENable?	FUNCTION:DISChArge[:STATE]?	FUNCTION:DISChArge[:STATE]?		
SFUNction:BATtery:STATe	FUNCTION:DISChArge[:STATE]	FUNCTION:DISChArge[:STATE]		
SFUNction:BATtery:TEVoltage	FUNCTION:DISChArge:STOP:VOLTage	FUNCTION:DISChArge:STOP:VOLTage		
SFUNction:BATtery:TEVoltage?	FUNCTION:DISChArge:STOP:VOLTage?	FUNCTION:DISChArge:STOP:VOLTage?		
n. a.	FUNCTION:DISChArge:CHARge?	FUNCTION:DISChArge:CHARge?		
n. a.	FUNCTION:DISChArge:ENERgy?	FUNCTION:DISChArge:ENERgy?		
n. a.	FUNCTION:DISChArge:STOP:CHARge	FUNCTION:DISChArge:STOP:CHARge		
n. a.	FUNCTION:DISChArge:STOP:CHARge?	FUNCTION:DISChArge:STOP:CHARge?		
n. a.	FUNCTION:DISChArge:STOP:CURRent	FUNCTION:DISChArge:STOP:CURRent		
n. a.	FUNCTION:DISChArge:STOP:CURRent?	FUNCTION:DISChArge:STOP:CURRent?		
n. a.	FUNCTION:DISChArge:STOP:ENable	FUNCTION:DISChArge:STOP:ENable		
n. a.	FUNCTION:DISChArge:STOP:ENable?	FUNCTION:DISChArge:STOP:ENable?		
n. a.	FUNCTION:DISChArge:STOP:ENERgy	FUNCTION:DISChArge:STOP:ENERgy		
n. a.	FUNCTION:DISChArge:STOP:ENERgy?	FUNCTION:DISChArge:STOP:ENERgy?		
n. a.	FUNCTION:DISChArge:STOP:EVENT?	FUNCTION:DISChArge:STOP:EVENT?		
n. a.	FUNCTION:DISChArge:STOP:TIME	FUNCTION:DISChArge:STOP:TIME		
n. a.	FUNCTION:DISChArge:STOP:TIME?	FUNCTION:DISChArge:STOP:TIME?		
n. a.	FUNCTION:DISChArge:STOP:VOLTage	FUNCTION:DISChArge:STOP:VOLTage		
n. a.	FUNCTION:DISChArge:STOP:VOLTage?	FUNCTION:DISChArge:STOP:VOLTage?		
n. a.	FUNCTION:DISChArge:TIME?	FUNCTION:DISChArge:TIME?		
SFUNction:EXPOntial:ENable	n. a.	n. a.		
SFUNction:EXPOntial:ENable?	n. a.	n. a.		
SFUNction:EXPOntial:STATe?	n. a.	n. a.		
<b>Subsystem STATUS</b>				
STATus:OPERation:CONDition?	STATUS:OPERation:CONDition?	STATUS:OPERation:CONDition?		
STATus:OPERation:ENable	STATUS:OPERation:ENable	STATUS:OPERation:ENable		
STATus:OPERation:ENable?	STATUS:OPERation:ENable?	STATUS:OPERation:ENable?		
STATus:OPERation[:EVENT]?	STATUS:OPERation[:EVENT]?	STATUS:OPERation[:EVENT]?		
STATus:PRESet	STATUS:PRESet	STATUS:PRESet		
STATus:QUESTionable:CONDition?	STATUS:QUESTionable:CONDition?	STATUS:QUESTionable:CONDition?		
STATus:QUESTionable:ENable	STATUS:QUESTionable:ENable	STATUS:QUESTionable:ENable		
STATus:QUESTionable:ENable?	STATUS:QUESTionable:ENable?	STATUS:QUESTionable:ENable?		
STATus:QUESTionable[:EVENT]?	STATUS:QUESTionable[:EVENT]?	STATUS:QUESTionable[:EVENT]?		
<b>Subsystem SYSTEM</b>				
n. a.	SYSTEM:COMMunicate:CAN:ADDRESS	SYSTEM:COMMunicate:CAN:ADDRESS		
n. a.	SYSTEM:COMMunicate:CAN:ADDRESS?	SYSTEM:COMMunicate:CAN:ADDRESS?		
n. a.	SYSTEM:COMMunicate:CAN:BAUD	SYSTEM:COMMunicate:CAN:BAUD		
n. a.	SYSTEM:COMMunicate:CAN:BAUD?	SYSTEM:COMMunicate:CAN:BAUD?		
n. a.	n. a.	SYSTEM:COMMunicate:CAN:TERMination		
n. a.	n. a.	SYSTEM:COMMunicate:CAN:TERMination?		
n. a.	SYSTEM:COMMunicate:GPIB:ADDRESS	SYSTEM:COMMunicate:GPIB:ADDRESS		
n. a.	SYSTEM:COMMunicate:GPIB:ADDRESS?	SYSTEM:COMMunicate:GPIB:ADDRESS?		
n. a.	SYSTEM:COMMunicate:LAN:DHCP[:STATe]	SYSTEM:COMMunicate:LAN:DHCP[:STATe]		
n. a.	SYSTEM:COMMunicate:LAN:DHCP[:STATe]?	SYSTEM:COMMunicate:LAN:DHCP[:STATe]?		
n. a.	SYSTEM:COMMunicate:LAN:DNS[:ADDRESS]	SYSTEM:COMMunicate:LAN:DNS[:ADDRESS]		
n. a.	SYSTEM:COMMunicate:LAN:DNS[:ADDRESS]?	SYSTEM:COMMunicate:LAN:DNS[:ADDRESS]?		
n. a.	SYSTEM:COMMunicate:LAN:GATeway[:ADDRESS]	SYSTEM:COMMunicate:LAN:GATeway[:ADDRESS]		
n. a.	SYSTEM:COMMunicate:LAN:GATeway[:ADDRESS]?	SYSTEM:COMMunicate:LAN:GATeway[:ADDRESS]?		
n. a.	SYSTEM:COMMunicate:LAN:HOSTName?	SYSTEM:COMMunicate:LAN:HOSTName?		
n. a.	SYSTEM:COMMunicate:LAN:IP[:ADDRESS]	SYSTEM:COMMunicate:LAN:IP[:ADDRESS]		
n. a.	SYSTEM:COMMunicate:LAN:IP[:ADDRESS]?	SYSTEM:COMMunicate:LAN:IP[:ADDRESS]?		
n. a.	SYSTEM:COMMunicate:LAN:MAC[:ADDRESS]	SYSTEM:COMMunicate:LAN:MAC[:ADDRESS]		
n. a.	SYSTEM:COMMunicate:LAN:MAC[:ADDRESS]?	SYSTEM:COMMunicate:LAN:MAC[:ADDRESS]?		
n. a.	SYSTEM:COMMunicate:LAN:PORT	SYSTEM:COMMunicate:LAN:PORT		
n. a.	SYSTEM:COMMunicate:LAN:PORT?	SYSTEM:COMMunicate:LAN:PORT?		
n. a.	SYSTEM:COMMunicate:LAN:SUBNet[:MASK]	SYSTEM:COMMunicate:LAN:SUBNet[:MASK]		
n. a.	SYSTEM:COMMunicate:LAN:SUBNet[:MASK]?	SYSTEM:COMMunicate:LAN:SUBNet[:MASK]?		
n. a.	SYSTEM:COMMunicate:SERIAL:BAUD	SYSTEM:COMMunicate:SERIAL:BAUD		
n. a.	SYSTEM:COMMunicate:SERIAL:BAUD?	SYSTEM:COMMunicate:SERIAL:BAUD?		
n. a.	SYSTEM:COMMunicate:SERIAL:BITS?	SYSTEM:COMMunicate:SERIAL:BITS?		
SYSTEM:COMMunicate:SERIAL:CONTROL:RTS	n. a.	n. a.		
SYSTEM:COMMunicate:SERIAL[:RECEive]:PACE	n. a.	n. a.		
n. a.	SYSTEM:COMMunicate:SERIAL:PARity	SYSTEM:COMMunicate:SERIAL:PARity		
n. a.	SYSTEM:COMMunicate:SERIAL:PARity?	SYSTEM:COMMunicate:SERIAL:PARity?		
n. a.	SYSTEM:COMMunicate:SERIAL:SBITS	SYSTEM:COMMunicate:SERIAL:SBITS		
n. a.	SYSTEM:COMMunicate:SERIAL:SBITS?	SYSTEM:COMMunicate:SERIAL:SBITS?		
n. a.	SYSTEM:COMMunicate:VCP:BAUD	SYSTEM:COMMunicate:VCP:BAUD		
n. a.	SYSTEM:COMMunicate:VCP:BAUD?	SYSTEM:COMMunicate:VCP:BAUD?		
n. a.	SYSTEM:COMMunicate:VCP:BITS?	SYSTEM:COMMunicate:VCP:BITS?		
n. a.	SYSTEM:COMMunicate:VCP:BITS?	SYSTEM:COMMunicate:VCP:BITS?		
n. a.	SYSTEM:COMMunicate:VCP:PARity	SYSTEM:COMMunicate:VCP:PARity		
n. a.	SYSTEM:COMMunicate:VCP:PARity?	SYSTEM:COMMunicate:VCP:PARity?		
n. a.	SYSTEM:COMMunicate:VCP:SBITS	SYSTEM:COMMunicate:VCP:SBITS		
n. a.	SYSTEM:COMMunicate:VCP:SBITS?	SYSTEM:COMMunicate:VCP:SBITS?		
n. a.	SETTING:EXTErnal:ENable	SETTING:EXTErnal:ENable		
n. a.	SETTING:EXTErnal:ENable?	SETTING:EXTErnal:ENable?		
SYSTEM:CONTROL	SETTING:EXTErnal[:STATe]	SETTING:EXTErnal[:STATe]		
SYSTEM:CONTROL?	SETTING:EXTErnal[:STATe]?	SETTING:EXTErnal[:STATe]?		
n. a.	SYSTEM:DATE	SYSTEM:DATE		
n. a.	SYSTEM:DATE?	SYSTEM:DATE?		
n. a.	SYSTEM:ERROR:ALL?	SYSTEM:ERROR:ALL?		
n. a.	SYSTEM:ERROR:COUNT?	SYSTEM:ERROR:COUNT?		
SYSTEM:ERROR?	SYSTEM:ERROR[:NEXT]?	SYSTEM:ERROR[:NEXT]?		
SYSTEM:FAN	SYSTEM:COOLing[:MODE]	SYSTEM:COOLing[:MODE]		
SYSTEM:FAN?	SYSTEM:COOLing[:MODE]?	SYSTEM:COOLing[:MODE]?		
n. a.	SYSTEM:HELP:HEADers?	SYSTEM:HELP:HEADers?		
n. a.	SYSTEM:KLOCK	SYSTEM:KLOCK		
n. a.	SYSTEM:KLOCK?	SYSTEM:KLOCK?		
SYSTEM:LANGUage	n. a.	n. a.		
SYSTEM:LANGUage?	n. a.	n. a.		
SYSTEM:PARAMeter	SERVICE:VALue	SERVICE:VALue		
SYSTEM:PARAMeter?	SERVICE:VALue?	SERVICE:VALue?		
n. a.	SYSTEM:PRESet	SYSTEM:PRESet		
SYSTEM:PROTEction[:LEVel]	INPUT:WDOG:DELay	INPUT:WDOG:DELay		
SYSTEM:PROTEction[:LEVel]?	INPUT:WDOG:DELay?	INPUT:WDOG:DELay?		
n. a.	INPUT:WDOG:RESet	INPUT:WDOG:RESet		
SYSTEM:PROTEction:STATe	INPUT:WDOG[:STATe]	INPUT:WDOG[:STATe]		
SYSTEM:PROTEction:STATe?	INPUT:WDOG[:STATe]?	INPUT:WDOG[:STATe]?		
SYSTEM:PROTEction:TRIPped?	n. a.	n. a.		
n. a.	SYSTEM:REMOte	SYSTEM:REMOte		
SYSTEM:SPEEd	FUNCTION:SPEEd	FUNCTION:SPEEd		
SYSTEM:SPEEd?	FUNCTION:SPEEd?	FUNCTION:SPEEd?		
SYSTEM:STRing	SERVICE:STRing?	SERVICE:STRing?		
n. a.	SYSTEM:TIME	SYSTEM:TIME		
n. a.	SYSTEM:TIME?	SYSTEM:TIME?		
SYSTEM:VERSion?	SYSTEM:VERSion?	SYSTEM:VERSion?		

Subsystem TRIGger			
n. a.	ABORT	ABORT	
n. a.	INITiate[:IMMediate]	INITiate[:IMMediate]	
n. a.	INITiate:CONTInuous	INITiate:CONTInuous	
n. a.	INITiate:CONTInuous?	INITiate:CONTInuous?	
n. a.	TRIGger[:SEQuence][:IMMediate]	TRIGger[:SEQuence][:IMMediate]	
n. a.	TRIGger[:SEQuence]:DELay	TRIGger[:SEQuence]:DELay	
n. a.	TRIGger[:SEQuence]:DELay?	TRIGger[:SEQuence]:DELay?	
n. a.	TRIGger[:SEQuence]:HOLDoff	TRIGger[:SEQuence]:HOLDoff	
n. a.	TRIGger[:SEQuence]:HOLDoff?	TRIGger[:SEQuence]:HOLDoff?	
n. a.	n. a.	TRIGger[:SEQuence]:LEVel:CURRent	
n. a.	n. a.	TRIGger[:SEQuence]:LEVel:CURRent?	
n. a.	TRIGger[:SEQuence]:LEVel:VOLTage	TRIGger[:SEQuence]:LEVel:VOLTage	
n. a.	TRIGger[:SEQuence]:LEVel:VOLTage?	TRIGger[:SEQuence]:LEVel:VOLTage?	
n. a.	TRIGger[:SEQuence]:SLOPe	TRIGger[:SEQuence]:SLOPe	
n. a.	TRIGger[:SEQuence]:SLOPe?	TRIGger[:SEQuence]:SLOPe?	
TRIGger[:SEQuence]:SOURce	TRIGger[:SEQuence]:SOURce	TRIGger[:SEQuence]:SOURce	
TRIGger[:SEQuence]:SOURce?	TRIGger[:SEQuence]:SOURce?	TRIGger[:SEQuence]:SOURce?	
TRIGger[:SEQuence]:TIMER	n. a.	n. a.	
TRIGger[:SEQuence]:TIMER?	n. a.	n. a.	
Subsystem VOLTage			
VOLTage:CRANge	n. a.	n. a.	
VOLTage:CRANge?	n. a.	n. a.	
VOLTage[:LEVel][:IMMediate]	VOLTage[:LEVel][:IMMediate]	VOLTage[:LEVel][:IMMediate]	
VOLTage[:LEVel][:IMMediate]?	VOLTage[:LEVel][:IMMediate]?	VOLTage[:LEVel][:IMMediate]?	
VOLTage[:LEVel]:TRIGgered	VOLTage[:LEVel]:TRIGgered	VOLTage[:LEVel]:TRIGgered	
VOLTage[:LEVel]:TRIGgered?	VOLTage[:LEVel]:TRIGgered?	VOLTage[:LEVel]:TRIGgered?	
VOLTage:MODE	n. a.	n. a.	
VOLTage:MODE?	n. a.	n. a.	
VOLTage:PROTection[:LEVel][:LOW]	VOLTage:PROTection[:LEVel]	VOLTage:PROTection[:LEVel]	
VOLTage:PROTection[:LEVel][:LOW]?	VOLTage:PROTection[:LEVel]?	VOLTage:PROTection[:LEVel]?	
VOLTage:PROTection:TRIPped?	n. a.	n. a.	
VOLTage:RANGe	n. a.	n. a.	
VOLTage:RANGe?	n. a.	n. a.	
VOLTage:RANGe:AUTO	n. a.	n. a.	
n. a.	VOLTage:PROTection:REGulation[:STATe]	VOLTage:PROTection:REGulation[:STATe]	
n. a.	VOLTage:PROTection:REGulation[:STATe]?	VOLTage:PROTection:REGulation[:STATe]?	