Elektro-Automatik

SCPI

STANDARD COMMANDS FOR PROGRAMMABLE INSTRUMENTS

电源供应器系列的
指令清单
Command List
For Power Supplies

适用于 / For use with

IF-G1 / IF-E1B / IF-E2B / IF-E1*

* 已停产 / discontinued

1. 结束符

提示

这只适用于GPIB (IF-G1)卡！使用以太网卡时，不需特殊结束符，只要普通字符串EOS (0x00)字节即可。

SCPI指令以纯文本发送。末尾必须用下面这个分界符表示：

LF (Line Feed, 0xA, ASCII 10).

从产品发出的信息需先由主机（PC/SPC等）发送一消息。如果主机等待回复，就是说指令结尾带有一“?”，IF-G1会回复。

用来设定状态或数值的指令始终由指令本身和一个或多个数值，以逗号隔开而组成。举例：

<指令>␣<数值 1>,␣<数值 2>....

可按缩减或完整格式发送任何指令。下面章节描述以大写字母组成的简短格式的指令，它们始终是完整格式的一部分。

3.03以上 IF-G1 固件版本的产品有更改：

- 可接受额外的分界符：

  CR+LF

  CR

  分别与**EOI**组合一起
- 指令也可以小写字母组成

2. 语法格式

按照“1999 SCPI Command reference”规则。

下列句法格式可能出现于指令中和/或回复中：

<Numeric value>

这个数值相当于显示器上的值，取决于产品的额定值。它适用：

- 该值必须在指令后发送，且用空格隔开
- 也可用下面的代替数值

MIN (相当于最小参数值)

注意！

大于额定值的设定值将返回一错误！

<NR1> 无小数点的数值

<NR2> 带小数点的数值

<NR3> 带小数点和指数的数值

<NRf> 包含<NR1>或<NR2>或<NR3>

单位	V	Volt
	A	Ampere
	W	Watt
	OHM	Ohm
	s	分钟

<CHAR> 0..255：十进制数（输出）

<+INT> 0..32768：正整数（输出）

<B0> 1或ON：功能被激活
0或OFF：功能未启用

<B1> NONE：本地操作，可转为远程控制
LOCal：本地操作，可读取数据
REMote：允许产品远程受控

<B2> ON或1：按x个循环自动测量
ONCE或0：按x个循环测量一次，用*TRG触发

<ERR> 错误和事件数 (-800至399)

<SRD> 字符串

<LF> 一行结束的标识 (换行符，0x0 A)

<Time> [[ddd], [hh], [mm], [s]s.s[s][s][s][s][s][s]
标准格式是以秒(s.s)为单位

; 分号用来分割一条消息内的多个指令

: 冒号用来分开主要和次要关键字

[ ] 在括号内的小写字母和项目为可选项

? 问号等同于询问。查询可结合数据传输。此时需耐心等待系统回应

-> 产品回复

3. SCPI指令

3.1 IEEE488.2 通用指令

***IDN?** 返回产品识别码，包括：
用户文本，产品供销商，产品名称，系列号，固件版本，插入的接口卡系列号和固件版本<LF>

***RST** 按下列步骤重设产品：
- 设为远程控制模式（如果允许）
- 设输出/输入为OFF
- 重设产品所有过去的报警

***STB?** 读出Status Byte Register，然后清除

下列指令仅支持GPIB卡IF-G1：

***TRG** 触发一个测量

***CLS** 清除GPIB控制器的所有事件和状态寄存器

***ESE** <CHAR> 设置Event Status Enable Register

***ESE?** 读出Event Status Enable Register

***ESR?** 读出Event Status Register，读取后即清除

***SRE** <CHAR> 设置Service Request Enable Register

***SRE?** 读出Service Request Enable Register

3.2 事件系统

事件寄存器与寄存器分配的原理在下也图表中有解释。

可通过读取Status Register STB (GPIB, Ethernet)查询产品上的事件。

状态寄存器STB包括下面几个位元：

Bit 0: 不用

Bit 1: 不用

Bit 2: *err*，错误队列已满；该队列读取后即清除，并重设位元。此队列可容纳至少4个错误。

Bit 3: *ques*, Questionable Status Register被激活（出现一个或多个事件）

Bit 4: 不用

Bit 5: *esr*，标准的Event Status Register (ESR)，被Event Status Enable Register (ESE)屏蔽，以信号显示出现了一个或多个事件

Bit 6: rsv，始终为激活状态

Bit 7: *oper*，以信号显示出现了一个或多个事件，并存储于Operation Status Register内

如果出现的事件可以报告，可通过使能寄存器里的对应位元（***ESE**，***SRE**和**STAT:QUES:ENAB**, **STAT:OPER:ENAB**）将各种事件元报告给STB。

*ESR*的位元组成如下：

Bit 0: 操作完成

Bit 1: 不用

Bit 2: 查询错误

Bit 3: Device Dependent Error (硬件缺陷等)；从-399至-300，以及100...399

Bit 4: Execution Error （超过电流极限和其它极限）；从-299至-200

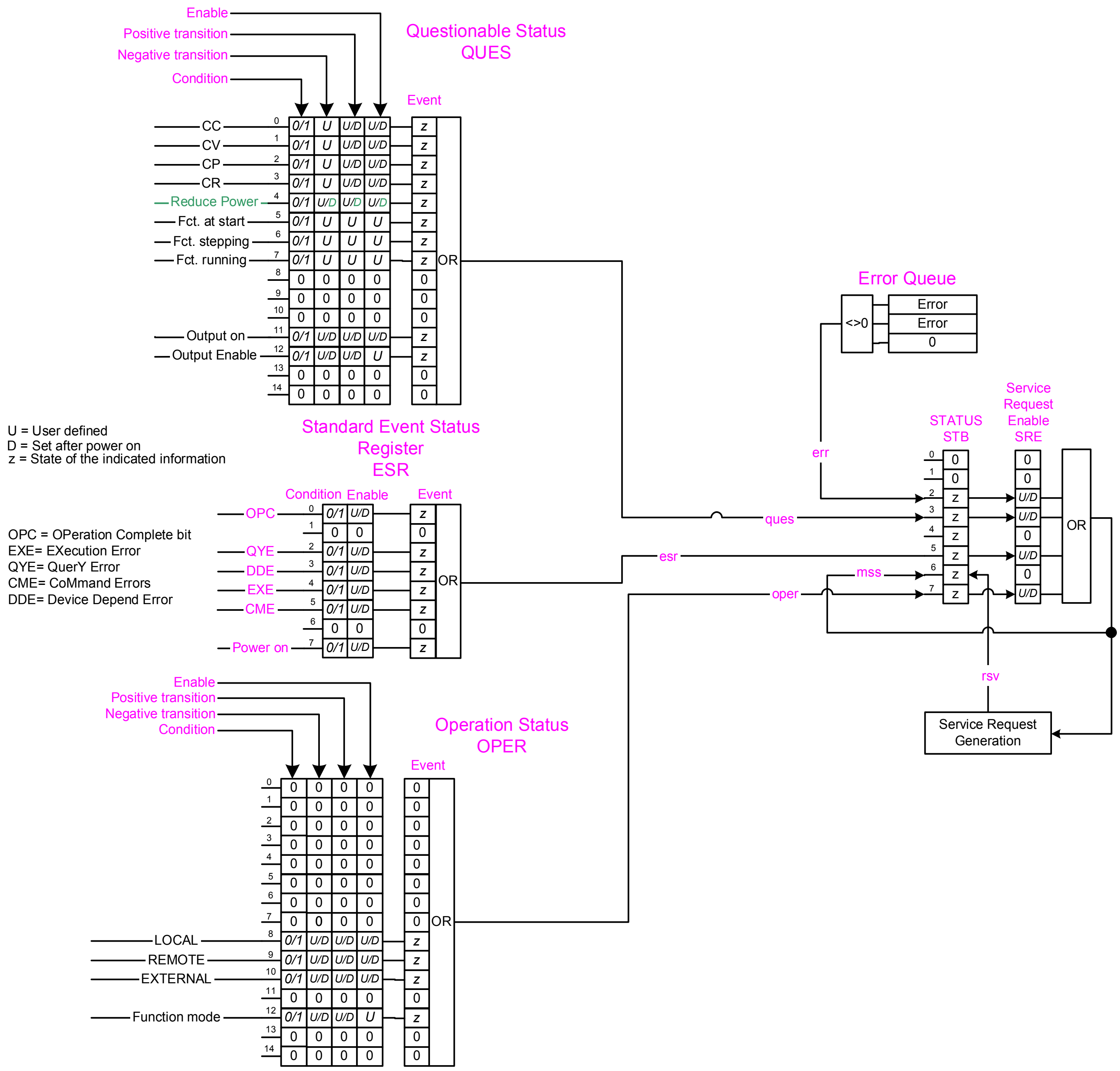
Bit 5: Command Error(指令错误）；Errors从-199至-100

Bit 6: 不用

Bit 7 Power On (产品被打开)

用***CLS**指令可清除事件和状态寄存器。

3. 3 寄存器区



U = User defined
D = Set after power on
z = State of the indicated information

OPC = OPeration Complete bit
EXE= EXecution Error
QYE= QuerY Error
CME= CoMmand Errors
DDE= Device Depend Error

图解：
CC/CV/CP/CR = 当前运行的调整模式
Reduce Power = 功率降额激活（仅针对PSI 9000系列）
Fct. at start/running/stepping = 函数管理器状态
Output on = 产品的输入和输出都打开
Output enable = 输出的自动打开被激活
LOCAL = 产品位于本地模式，不允许进入远程控制模式
REMOTE = 产品经数字接口被远程控制着
EXTERNAL = 产品经模拟接口卡和内置模拟接口而受控
Function mode = 函数管理器激活

3. 4 状态指令

(按照“1999 SCPI Command reference”规格：20 Status Subsystem)

Operation Status Register (*OPER*) (见上页图表)将多个状态（远程，本机等）存储于*Condition*寄存器内，一旦用*Enable*按键激活，即可转给*Event*寄存器. *Positive transition*和*Negative transition*掩码决定是否由上升沿或下降沿来触发事件。可用这个功能感测状态的出现和/或消失。

这同样适用于Questionable Status Register (*QUES*)。*OPER*的配置如上图所示，只有当“local”信号从低至高变化时，它才产生一事件。另一方面，“Function mode”信号在下降沿也会产生事件。

STATus

:OPERation		根据状态操作
【:EVENT】?	-><NR1>	查询Status Operation Register内的事件
:CONDition?	-><NR1>	查询*OPER*事件条件
:ENABle	<NR1>	启动*OPER*事件
:ENABle?	-><NR1>	查询
:PTRtransition	<NR1>	只有在上升沿才可触发事件
:PTRtransition?	-><NR1>	查询
:NTRtransition	<NR1>	只有在下降沿才可触发事件
:NTRtransition?	-><NR1>	查询
:QUEStionable		产品和函数的具体事件
【:EVENT】?	-><NR1>	查询Questionable Status Register下的事件
:CONDition?	-><NR1>	查询*QUES*事件条件
:ENABle	<NR1>	启动*QUES*事件
:ENABle?	-><NR1>	查询
:PTRtransition	<NR1>	只有在上升沿才可触发事件
:PTRtransition?	-><NR1>	查询
:NTRtransition	<NR1>	只有在下降沿才可触发事件
:NTRtransition?	-><NR1>	查询

举例：

STAT:OPER?	查询OPERation Status Event Register
STAT:OPER:ENAB␣1919	启动OPERation Status Event register所有事件

3. 5 系统指令

(按照“1999 SCPI Command reference”规格：19 Aource Subsystem)

SYSTem:

ERRor:ALL?	-><Err>[,<Err>]…	查询错误队列，用来读取错误描述和代码； *err*，*esr*和*ESR*位元：*Condition*被清除
ERRor:NEXT?	-><Err>	查询队列的最后一个错误；如果队列为空， *err*，*esr* 和*ESR*位元：*Condition*被清除

提示

询问错误时会卡返回一通讯与设备错误，而卡则只返回通讯错误。

LOCK		
[:STATE]	<B0>	1 或 No =如果未被锁定，产品进入遥控模式。 0 或 OFF =退出远程控制模式，返回正常操作

⚠ 注意！

只有产品未处于远程模式时才可进行监控。意思是：此时只能查询实际数值和状态。要查询设定状态、模式和设定值，需通过**LOCK:STATE 1**或**LOCK 1**，以及***RST**（见章节3. 1)将产品转为远程模式。

若想完成这个转换，必须解锁远程模式。关于条件、锁定和模式的更多信息，请查看使用产品的说明书。

锁定状态可通过下面这个指令查询：

SYSTem:

LOCK

:OWNer? -><B1> 获取当前锁定状态

NONE： 如果返回，可将产品设为远程模式
(在*OPER:Condition*下，位元8,9,10=0)

LOCal： 产品处于本机模式，禁止进入远程模式
（在*OPER:Condition*下，位元8=1,9=0,10=0)
外部模式被当做LOCal模式。
(在*OPER:Condition*下，位元8=0,9=0,10=1)

REMote： 产品处于远程模式
(在*OPER* Register下，位元8=0,9=1,10=0)

VERSion? -><SRD> 查询SCPI-版本

举例：

SYST:LOCK:OWN?	查询锁定状态，决定是否允许进入远程模式
SYST:LOCK:STAT˽1	将产品转为远程模式（现在允许设定数值）
SYST:LOCK˽ON	同上

⚠ 注意！

下面两指令仅在**IF-E1, IF-E2B**与**IF-E1B**卡下有效！

SYSTem:

DATA

:SET <CHAR> 传输二进制格式的封装电报
这儿：发送数据（**SET**）（见章节3.9.1)
在另外的„Programming“用户手册和相关object list 文档内可查到更多关于封装电报的信息

举例：

SYST:DATA:SET˽50,˽100,˽0 发送十六进制电报0x32 0x64 0x00到产品上。
如果产品处于远程控制模式，输出电压将设为100%。

SYSTem:

DATA

:REQuest <CHAR> 传输二进制格式的封装电报
这儿：请求数据（也可见章节3.9.1）
在另外的„Programming“用户手册和相关object list文档内可查到更多关于封装电报的信息

举例：

SYST:DATA:REQ˽50 发送十六进制电报0x32到产品上。
它请求电压设定值.
相当于SCPI指令**SOUR:VOLT?**
将返回两个值例如**100**，**0**。它们相当于0x6400十六进制值，表示100%的设定值。

⚠ 注意！

下面的指令仅在以太网卡IF-E1B下有效！

SYSTem:

COMMunicate:

NETwork

:MAC?	-><SRD>	查询以太网卡的MAC地址
:IPADdress?	-><SRD>	查询产品的实际IP地址，将以典型格式返回。如：192.168.0.2
:IPADdress	<CHAR>	以逗号分开的十进制命令设定IP地址。 这仅当产品关闭并再次打开后方有效。
:MASK?	-><SRD>	查询产品实际子网掩码地址，将以典型格式返回。如：255.0.0.0
:MASK	<CHAR>	用命令设置子网掩码。这仅当产品关闭并再次打开后方有效。
:GATEway?	-><SRD>	查询产品实际网关地址，将以典型格式返回。如：0.0.0.0
:GATEway	<CHAR>	用命令设置网管掩码。这仅当产品关闭并再次打开后方有效。

举例：

SYST:COMM:NET:IPAD␣192,␣168,␣0,␣2 如果产品位于远程控制模式，将设定IP地址为192.168.0.2。

3. 6 控制输出指令

激活/停止功率输出。

OUTPut[:STATe]?	-><B0>	查询电子负载输出状态
OUTPut[:STATe]	<B0>	打开/关闭电子负载输出

举例：

OUTP␣ON	打开电源输出，但不重设报警或警告，也不解除这些功能。意即：若出现报警，则不能执行该指令。

3. 7 测量指令

用来读取最新测量结果（实际值）。

MEASure

[:SCALar]

:VOLTage[:DC]?	-><NRf>Unit	查询：实际电压
:CURRent[:DC]?	-><NRf>Unit	查询：实际电流
:POWer[:DC]?	-><NRf>Unit	查询：实际功率
:ARRay?	-><NRf>Unit, <NRf>Unit …	查询：实际电压、电流和功率

举例：

MEAS:CURR?	测量并返回实际电流，。
MEAS:ARR?	返回一组实际值，包括：U，I，P。

3. 8 设定值指令

❗ 提示

指令后加一问号可回读设定值。关于电子负载的A，B和A/B模式，请阅读该产品的说明书！

I. 电压设定值/过压门限

(按照“1999 SCPI Command reference”规格：19 Source Subsystem)

[SOURce:]

VOLTage

[:LEVel]?	-><NRf>Unit	查询最后设定电压值
[:LEVel]	<NRf+>[Unit]	设定电压
:PROTection[:LEVel]	<NRf+>[Unit]	设定过压（OVP）极限（仅当输出关闭时）
:PROTection[:LEVel]?	-><NRf>Unit	查询过压（OVP）极限

举例：

VOLT␣5.05	设置输出电压为5,05 V
VOLT␣6.91␣V	设置6.91 V，并带单位
VOLT?	查询最后设定值
SOUR:VOLT:PROT␣67	如果产品输出关闭，将OVP过压极限设为67 V，否则忽略该指令，并产生一错误。

提示

SOUR:VOLT:PROT指令的最大值一般与在产品上能手动调节的OVP极限值相同。典型值为产品额定电压的110%。举例：一台360 V型号的产品，原则上应该可接受396 V的OVP值（SOUR:VOLT:PROT 396)。但是实际设定起来却不可行，因为计算错误。并将退回一个错误信息“数据超出范围”。故建议一低一点的数字，如：395 V。

提示

PSI 8000和PSI 9000系列产品的应用：设定过压极限值时，可能出现输入数值不被接受的情况，因为它超过某一监控设定值。查查产品菜单“配置 -> 文档 -> 监控 -> 极限值”下的„U >“ 设定。如果需求值低于U>，则产品不会接受。也可参考电源产品用户指导说明书关于监控特征的详细描述。

II. 电流设定值

(按照“1999 SCPI Command reference”规格：19 Source Subsystem)

[SOURce:]

CURRent

[:LEVel]?	-><NRf>[Unit]	查询电流最后设定值
[:LEVel]	<NRf+>Unit	设定电流

举例：

CURR␣20.00	设置输入电流极限为20 A

III. 功率设定值

(按照“1999 SCPI Command reference”规格：19 Source Subsystem)

[SOURce:]

POWer

[:LEVel]?	-><NRf>Unit	查询功率最后设定值
[:LEVel]	<NRf+>[Unit]	设定功率

举例：

POW:LEV␣2300	将产品功率极限设为2300 W，只要该值在允许范围内。 如果产品对该指令没有反应，可能其功率值不可调

IV. 内阻设定值

(按照“1999 SCPI Command reference”规格：19 Source Subsystem)

[SOURce:]

RESistance

[:LEVel]?	-><NRf>Unit	查询内阻最后设定值
[:LEVel]	<NRf+>[Unit]	设置内阻设定值

举例：

RES␣1.300	Set将所需内阻设定值设为1.3Ω。

3.9 特殊指令

3.9.1 SYST:DATA:SET 与 SYST:DATA:REQ

> **提示**
>
> *这只应用于IF-E1B-以太网卡！*

只有经以太网端口操作，网卡仅能运行SCPI指令，从章节3开始有详细介绍。

此外，本卡提供了两个以十六进制格式给产品发送电报的指令，它与面向对象二进制协议相似（在“Programming”说明指导中有描述）。这些指令的目的是控制那些无特定SCPI产品的功能。利用这两个SCPI指令，可控制PSI 9000或PSI 8000系列的函数管理器。执行该操作，仅需建立如下电报即可：

对于SYST:DATA:SET ： **ON, DATA**

对于SYST:DATA:REQ : **ON**

所有**ON**与**DATA**都转化成十进制数值，并通过SYST:DATA:SET指令发送给产品。*重点！所有字节必须用冒号隔开。*

发送参数，如一设定值或一状态给产品时，需用到**DATA**。**DATA**字节数必须正确，否则接口卡会返回一错误。**DATA**长度在对象清单（见object lists说明指导）中有定义，而且会有不同。

以发送设定电压值为例，需要一个16位的整数，形成两个字节和由两冒号分开的十进制数值，从而组成SYST:DATA:SET指令。

第一个值**ON**，代表对象清单第一栏的对象号（即：一指令）。它定义**DATA**的目标。对象号和数据组成的数值被认为是一设定指令，而单独的对象号则为查询指令。

例1：

0x4700可当电压设定值发送。根据object lists，如果是PSI 8000，则为对象50。

形成的SCPI指令类似如下：

SYST:DATA:SET␣50,␣71,␣0

此处数值 0x4700被分为两个字节，0x47与0x00，而且每个都转换成十进制数值。

例2：

可从产品上查询电压、电流和功率的实际值。这需由REQuest完成。按照object lists，对象71可一次性返回所有6个单字节的实际值。请求类似如下：

SYST:DATA:REQ␣71

产品可能返回这样的6个十进制数值：

71,␣67,␣37,␣21,␣127,␣24,␣16

第一个数值为对象，其它为实际值。两个比邻数值组成一个16位值，它代表百分比式的实际值。故这6个值形成下面组合十六进制值：

67,␣37,␣21,␣127,␣24,␣16

0x4325, 0x157F, 0x1810

将其转换成十进制或十六进制百分比值为（VB，C或其它类似）：

百分比值 = 第一个值 * 256 + 第二个值

上面例子的头两个字节则转换成的十进制值17189，即：67 * 256 + 37和0x4325十六进制。

形成三个16位的值或者顺序定义如下：

第一个值为是几点呀，第二个为时间电流，第三则为实际功率，每个都为额定值的百分比数值。之后，需将他们转换成实际值。可参考“Programming”说明指导章节1.7。

为了将转换后的百分比值转成真实实际值，需用到负载的额定值。举例：如一台PSI 9080-100负载，其额定值为80 V，100 A 和 3000 W。形成的第二个公式如下：

真实实际值 = 额定值 * 百分比值 / 25600

按照上面举例产品，0x157F的百分比电流值将为：

100 A * 5503 / 25600 = 21.5 A

> **提示**
>
> *这个实例相当于SCPI指令MEAS:ARR?。意思是，该指令将按计算值返回相同数值。可能会出现由MEAS:ARR?指令返回的数值因很小的转换错误而使小数位出现细微的不同。*

4. 错误

错误信息按错误队列集合在一起。*err*位元指示是否有新的错误出现。可通过服务请求呼叫查询错误。可分开查询错误队列，读取后自动清除。

<ERR>	信息	描述
0	“No error“	错误队列为空，未出现任何错误
-100	“Command error“	使用了无效的指令
-101	“Invalid character”	...在指令字符串内
-102	“Syntax error“	
-103	“Invalid separator“	
-108	“Parameter not allowed”	
-109	“Missing parameter“	
-113	“Undefined header“	未知指令
-120	“Numeric data error”	
-131	“Invalid suffix”	或者单位
-141	“Invalid character data“	
-151	“Invalid string data“	
-200	“Execution error“	一般错误，用于各种状态
-201	“Invalid while in local”	产品为本地模式，故阻止进入远程模式
-203	„Command protected“	拒绝进入序列控制或
		该功能未启用（R模式）
		拒绝访问函数参数
-223	“Too much data“	
-224	“Illegal parameter value”	
-225	“Out of memory”	
-240	“Hardware error”	超过最大CAN节点/未知的CAN节点/无网管功能
-241	„Hardware missing”	
-220	“Parameter error”	未定义对象
-221	“Settings conflict“	读-写规则被破坏，禁止访问
		仅当OUTPUT OFF时方可进入菜单
		拒绝访问设定值
-222	“Data out of range”	数值超过上限或下限
-223	“Too much data“	对象长度不正确
-232	“Invalid format“	时间格式错误
-350	“Queue overflow”	错误和事件缓冲区已满
-360	“Communication error”	多种通讯错误（也见Programming用户手册中章节3.7）
		结构错误
		校验和不正确
		等
-361	“Parity error in program message“	RS232处：奇偶性错误
-362	“Framing error in program message“	
-363	“Input buffer overrun“	
-365	“Time out error“	

产品形成的有关报警、警告和通知类错误信息（详情请见对应产品的使用说明和接口卡的使用说明）：

<ERR>	信息	描述
100 - 199	见 „Programming“用户手册中第3.9章节的报警表	仅显示，第一列和第十列错误节点与该表中的错误节点相同
200 - 299	见 „Programming“用户手册中第3.9章节的报警表	警告，第一列和第十列错误节点与该表中的错误节点相同
300 - 399	见 „Programming“用户手册中第3.9章节的报警表	报警，第一列和第十列错误节点与该表中的错误节点相同

5. 附录

5.1 SCPI指令概览

Main	1.Sub	2.Sub	3.Sub	数值	PS8000T	PS8000DT/2U/3U	PSI8000T/DT/2U/3U	PSI800R	PSI9000	EL3000/EL9000	备注
CURR				0...Imax	•	•	•	•	•	•	
CURR?				Iset	•	•	•	•	•	•	
CURR:	LEV			0...Imax	•	•	•	•	•	•	EL系列：A 或 B级别，视设定项目而定
CURR:	LEV?			Iset	•	•	•	•	•	•	EL系列：A 或 B级别，视设定项目而定
CURR:	HIGH			CURR:LOW...Imax						•	EL系列：AB级
CURR:	HIGH?			0...Imax						•	EL系列：AB级
CURR:	LOW			0...CURR:HIGH						•	EL系列：AB级
CURR:	LOW?			0...Imax						•	EL系列：AB级
ERR:	ALL?			3个错误字符串	•	•	•	•	•	•	
ERR:	NEXT?			1个错误字符串	•	•	•	•	•	•	
INP				1，0，ON，OFF						•	
INP?				ON，OFF						•	
INP:	STAT			1，0，ON，OFF						•	
INP:	STAT?			ON，OFF						•	
LOCK				1，0，ON，OFF	•	•	•	•	•	•	
LOCK?					•	•	•	•	•	•	
LOCK:	STAT			1，0，ON，OFF	•	•	•	•	•	•	
LOCK:	STAT?				•	•	•	•	•	•	
LOCK:	OWN?			REM，LOC，NONE	•	•	•	•	•	•	
MEAS:	VOLT?			1个值	•	•	•	•	•	•	
MEAS:	CURR?			1个值	•	•	•	•	•	•	
MEAS:	POW?			1个值	•	•	•	•	•	•	
MEAS:	ARR?			3个值	•	•	•	•	•	•	
MEAS:	VOLT:	DC?		1个值	•	•	•	•	•	•	
MEAS:	CURR:	DC?		1个值	•	•	•	•	•	•	
MEAS:	POW:	DC?		1个值	•	•	•	•	•	•	
MEAS:	SCAL:	VOLT?		1个值	•	•	•	•	•	•	
MEAS:	SCAL:	CURR?		1个值	•	•	•	•	•	•	
MEAS:	SCAL:	POW?		1个值	•	•	•	•	•	•	
MEAS:	SCAL:	ARR?		3个值	•	•	•	•	•	•	
MEAS:	SCAL:	VOLT:	DC?	1个值	•	•	•	•	•	•	
MEAS:	SCAL:	CURR:	DC?	1个值	•	•	•	•	•	•	
MEAS:	SCAL:	POW:	DC?	1个值	•	•	•	•	•	•	
OUTP				1，0，ON，OFF	•	•	•	•	•		
OUTP?				ON，OFF	•	•	•	•	•		
OUTP:	STAT			1，0，ON，OFF	•	•	•	•	•		
OUTP:	STAT?			ON，OFF	•	•	•	•	•		
POW				0...Pmax	•	•	•	•	•	•	
POW?				Pset	•	•	•	•	•	•	
POW:	LEV			0...Pmax	•	•	•	•	•	•	
POW:	LEV?			Pset	•	•	•	•	•	•	
POW:	HIGH			POW:LOW...Pmax						•	
POW:	HIGH?			0...Pmax						•	
POW:	LOW			0...POW:HIGH						•	
POW:	LOW?			0...Pmax						•	
PULS:	WIDT:	LOW		50us...100s						•	EL系列：AB级
PULS:	WIDT:	LOW?		50us...100s						•	EL系列：AB级
PULS:	WIDT:	HIGH		50us...100s						•	EL系列：AB级
PULS:	WIDT:	HIGH?		50us...100s						•	EL系列：AB级
PULS:	TRAN			30us...200ms						•	EL系列：AB级
PULS:	TRAN?			30us...200ms						•	EL系列：AB级
PULS:	TRAN:	LEAD		30us...200ms						•	EL系列：AB级
PULS:	TRAN:	LEAD?		30us...200ms						•	EL系列：AB级
RES				0...Rmax			•		•	•	EL系列：A 或 B级别，视设定项目而定
RES?				Rset			•		•	•	EL系列：A 或 B级别，视设定项目而定
RES:	LEV			0...Rmax			•		•	•	EL系列：A 或 B级别，视设定项目而定
RES:	LEV?			Rset			•		•	•	EL系列：A 或 B级别，视设定项目而定
RES:	HIGH			RES:LOW...Rmax						•	
RES:	HIGH?			0...Rmax						•	
RES:	LOW			0...RES:HIGH						•	
RES:	LOW?			0...Rmax						•	
SOUR:	VOLT			0...Umax	•	•	•	•	•	•	
SOUR:	VOLT?			Uset	•	•	•	•	•	•	
SOUR:	VOLT:	LEV		0...Umax	•	•	•	•	•	•	
SOUR:	VOLT:	LEV?		Uset	•	•	•	•	•	•	
SOUR:	VOLT:	HIGH		VOLT:LOW...Umax						•	
SOUR:	VOLT:	HIGH?		0..Umax						•	
SOUR:	VOLT:	LOW		0...VOLT:HIGH						•	
SOUR:	VOLT:	LOW?		0...Umax						•	

Main	1.Sub	2.Sub	3.Sub	数值	PS8000T	PS8000DT/2U/3U	PSI8000T/DT/2U/3U	PSI800R	PSI9000	EL3000/EL9000	备注
SOUR:	CURR			同上	•	•	•	•	•	•	
SOUR:	CURR?			同上	•	•	•	•	•	•	
SOUR:	CURR:	LEV		同上	•	•	•	•	•	•	
SOUR:	CURR:	LEV?		同上	•	•	•	•	•	•	
SOUR:	CURR:	HIGH		同上						•	
SOUR:	CURR:	HIGH?		同上						•	
SOUR:	CURR:	LOW		同上						•	
SOUR:	CURR:	LOW?		同上						•	
SOUR:	POW			同上	•	•	•	•	•	•	
SOUR:	POW?			同上	•	•	•	•	•	•	
SOUR:	POW:	LEV		同上	•	•	•	•	•	•	
SOUR:	POW:	LEV?		同上	•	•	•	•	•	•	
SOUR:	POW:	HIGH		同上						•	
SOUR:	POW:	HIGH?		同上						•	
SOUR:	POW:	LOW		同上						•	
SOUR:	POW:	LOW?		同上						•	
SOUR:	RES			同上			•		•	•	
SOUR:	RES?			同上			•		•	•	
SOUR:	RES:	LEV		同上			•		•	•	
SOUR:	RES:	LEV?		同上			•		•	•	
SOUR:	RES:	HIGH		同上						•	
SOUR:	RES:	HIGH?		同上						•	
SOUR:	RES:	LOW		同上						•	
SOUR:	RES:	LOW?		同上						•	
SOUR:	VOLT:	PROT		0...110% Umax	•	•	•	•	•		OVP
SOUR:	VOLT:	PROT?		0...110% Umax	•	•	•	•	•		OVP
SOUR:	VOLT:	PROT:	LEV	0...110% Umax	•	•	•	•	•		OVP
SOUR:	VOLT:	PROT:	LEV?	0...110% Umax	•	•	•	•	•		OVP
SOUR:	PULS:	WIDT:	LOW	同上						•	
SOUR:	PULS:	WIDT:	LOW?	同上						•	
SOUR:	PULS:	WIDT:	HIGH	同上						•	
SOUR:	PULS:	WIDT:	HIGH?	同上						•	
SOUR:	PULS:	TRAN		同上						•	
SOUR:	PULS:	TRAN?		同上						•	
SOUR:	PULS:	TRAN:	LEAD	同上						•	
SOUR:	PULS:	TRAN:	LEAD?	同上						•	
STAT:	OPER?				•	•	•	•	•	•	
STAT:	OPER:	EVENT?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	COND?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	ENAB		0-32767	•	•	•	•	•	•	
STAT:	OPER:	ENAB?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	PTR		0-32767	•	•	•	•	•	•	
STAT:	OPER:	PTR?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	NTR		0-32767	•	•	•	•	•	•	
STAT:	OPER:	NTR?		0-32767	•	•	•	•	•	•	
STAT:	QUES?			0-32767	•	•	•	•	•	•	
STAT:	QUES:	EVENT?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	COND?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	ENAB		0-32767	•	•	•	•	•	•	
STAT:	QUES:	ENAB?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	PTR		0-32767	•	•	•	•	•	•	
STAT:	QUES:	PTR?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	NTR		0-32767	•	•	•	•	•	•	
STAT:	QUES:	NTR?		0-32767	•	•	•	•	•	•	
SYST:	COMM:	NET:	IPAD	0, 0, 0, 0 - 255, 255, 255, 255	•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	COMM:	NET:	IPAD?	0.0.0.0 - 255.255.255.255	•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	COMM:	NET:	GATE	0, 0, 0, 0 - 255, 255, 255, 255	•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	COMM:	NET:	GATE?	0.0.0.0 - 255.255.255.255	•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	COMM:	NET:	MAC?		•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	COMM:	NET:	MASK	0, 0, 0, 0 - 255, 255, 255, 255	•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	COMM:	NET:	MASK?	0.0.0.0 - 255.255.255.255	•	•	•		•	•	仅IF-E1B/IF-E2B有
SYST:	DATA:	SET		如ASCII样的电报对象	•	•	•	•	•	•	仅IF-Ex有：设置一些东西
SYST:	DATA:	REQ		如ASCII样的电报对象	•	•	•	•	•	•	仅IF-Ex有：请求一些东西
SYST:	ERR:	ALL?		同上	•	•	•	•	•	•	
SYST:	ERR:	NEXT?		同上	•	•	•	•	•	•	
SYST:	LOCK			同上	•	•	•	•	•	•	
SYST:	LOCK:	STAT		同上	•	•	•	•	•	•	
SYST:	LOCK:	OWN?		同上	•	•	•	•	•	•	
SYST:	VERS?			SCPI版 (1999.0)	•	•	•	•	•	•	

Main	1.Sub	2.Sub	3.Sub	数值	PS8000T	PS8000DT/2U/3U	PSI8000T/DT/2U/3U	PSI800R	PSI9000	EL3000/EL9000	备注
VOLT				同上	•	•	•	•	•	•	
VOLT?				同上	•	•	•	•	•	•	
VOLT:	LEV			同上	•	•	•	•	•	•	
VOLT:	LEV?			同上	•	•	•	•	•	•	
VOLT:	HIGH			同上						•	
VOLT:	HIGH?			同上						•	
VOLT:	LOW			同上						•	
VOLT:	LOW?			同上						•	
VOLT:	PROT			同上	•	•	•	•	•		OVP
VOLT:	PROT?			同上	•	•	•	•	•		OVP
VOLT:	PROT:	LEV		同上	•	•	•	•	•		OVP
VOLT:	PROT:	LEV?		同上	•	•	•	•	•		OVP
*RST					•	•	•	•	•	•	
*IDN?				字符串，最多128个字符	•	•	•	•	•	•	
*STB?				0...255	•	•	•	•	•	•	
*ESR?				0...255	•	•	•	•	•	•	
*ESE				0...255	•	•	•	•	•	•	
*ESE?				0...255	•	•	•	•	•	•	
*CLS					•	•	•	•	•	•	
*TRG					•	•	•	•	•	•	
*SRE				0...255	•	•	•	•	•	•	
*SRE?				0...255	•	•	•	•	•	•	

🟨	要求设备已处于远程控制模式
🟩	仅IF-E1或IF-E2网卡才有，有些指令要求远程控制模式
🟧	仅GPIB卡IF-G1有

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1. End tokens

Note

This applies only to GPIB (IF-G1)! Using Ethernet, no special end token is required, just the normal string EOS byte (0x00).

SCPI commands are sent as plain text. The end has to be marked with a delimiter:

LF (Line Feed, 0xA, ASCII 10).

A transmission from the device requires to first sent a message from the host (PC/SPC etc). The IF-G1 will reply, if the host expects a reply. This is the case, if the end of the command is a „?“.

Commands that have to set a state or a value always consist of the command itself and one or multiple values, seperated by commas. Example:

<COMMAND>␣<Numeric value 1>, ␣<Numeric value 2>...

You can sent any command in its short or complete form. In the following section the short form is given in **capital** letters and is always a part of the complete form.

Changes since IF-G1 firmware version 3.03:

- Additional delimiters accepted:

  CR+LF

  CR

  each together with **EOI**
- Commands can also be given in lowercase letters

2. Syntax format

Specification according „1999 SCPI Command reference”.

Following syntax formats can occur in commands and/or replies:

<Numeric value>

This numeric value corresponds to the value in the display of the device and depends on the nominal values of the device. It applies:

- the value must be sent after the command and seperated by a space

- instead of a numeric value you can also use

MIN (corresponds to the minimum value of the parameter)

Attention!

Set values bigger than nominal values will return an error!

<NR1> Numeric value without decimal place

<NR2> Numeric value with decimal place

<NR3> Numeric value with decimal place and exponent

<NRf> Contains <NR1>,<NR2>,<NR3>

<NRf+> Contains <NR1>, <NR2>, <NR3>

Unit	V	Volt
	A	Ampere
	W	Watt
	OHM	Ohm
	s	Seconds

<CHAR> 0..255: Decimal number (output)

<+INT> 0..32768: positive integer number (output)

<B0> 1 or ON: Function is activated
0 or OFF: Function is deactivated.

<B1> NONE: local operation, switching to remote control is possible
LOCal: local operation, reading of data is possible
REMote: remote control of the device is allowed

<B2> ON or 1: automatic measurement with x rounds
ONCE or 0: one-shot measurement with x rounds, triggered by *TRG

<ERR> Error and event number (-800 to 399)

<SRD> String

<LF> End of line token (line feed, 0x0 A)

<Time> [[ddd], [hh], [mm], [s]s.s[s][s][s][s][s][s]
Standard format is in seconds (s.s)

; The semicolon is used to seperate multiple command within a message

: The colon is used to seperate major keywords from minor keywords

[ ] Small letters and items in rectangular brackets are optional

? The question mark identifies a query. The query can be combined with a data transmission. Here you need to take care to wait for response of the system before sending data

-> Reply from the device

3. SCPI commands

3.1 Common IEEE488.2 commands

***IDN?** Returns the device identification, consisting of:
User text, device vendor, device name, device serial number, device firmware version, serial number(s) and firmware version(s) of plugged interface cards<LF>

***RST** Resets the device by doing this:
- setting it into remote control mode (if allowed)
- setting output/input to OFF
- resetting all past alarms of the device

***STB?** Reads the Status Byte Register, which is cleared after reading

The following commands are only supported by the GPIB interface IF-G1:

***TRG** Triggers a measurement

***CLS** Clears all event and status registers of the GPIB controller

***ESE** <CHAR> Sets the Event Status Enable Register

***ESE?** Reads the Event Status Enable Register

***ESR?** Reads the Event Status Register, which is cleared after reading

***SRE** <CHAR> Sets the Service Request Enable Register

***SRE?** Reads the Service Request Enable Register

3.2 Event system

The scheme of the event registration and register assignment is illustrated in the diagram on the next page.

Events can be queried from the device by reading the Status Register STB (GPIB, Ethernet).

The status register STB consists of these bits:

Bit 0: Not used

Bit 1: Not used

Bit 2: *err*, Error queue full; this queue is cleared by reading it and the bit is also reset. The list can hold up to 4 of the last errors

Bit 3: *ques*, Questionable status register is active (on or more events have occured)

Bit 4: Not used

Bit 5: *esr*, the standard Event Status Register (ESR), masked by the Event Status Enable Register (ESE), is signalising that one or more events have occured

Bit 6: rsv, always active

Bit 7: *oper*, signalises, that one or more events have occured and are stored in the Operation Status Register

The event bits of the various registers report to the STB, if events have occured that are enabled to be reported, by the corresponding bits in the enable registers (***ESE**, ***SRE** resp. **STAT:QUES:ENAB**, **STAT:OPER:ENAB**).

The bits of the *ESR* are as follows:

Bit 0: Operation complete

Bit 1: Not used

Bit 2: Query error

Bit 3: Device Dependent Error (Hardware defective etc.); errors from -399 to -300 resp. 100...399

Bit 4: Execution Error (current limitation, other limits exceeded); errors from -299 to -200

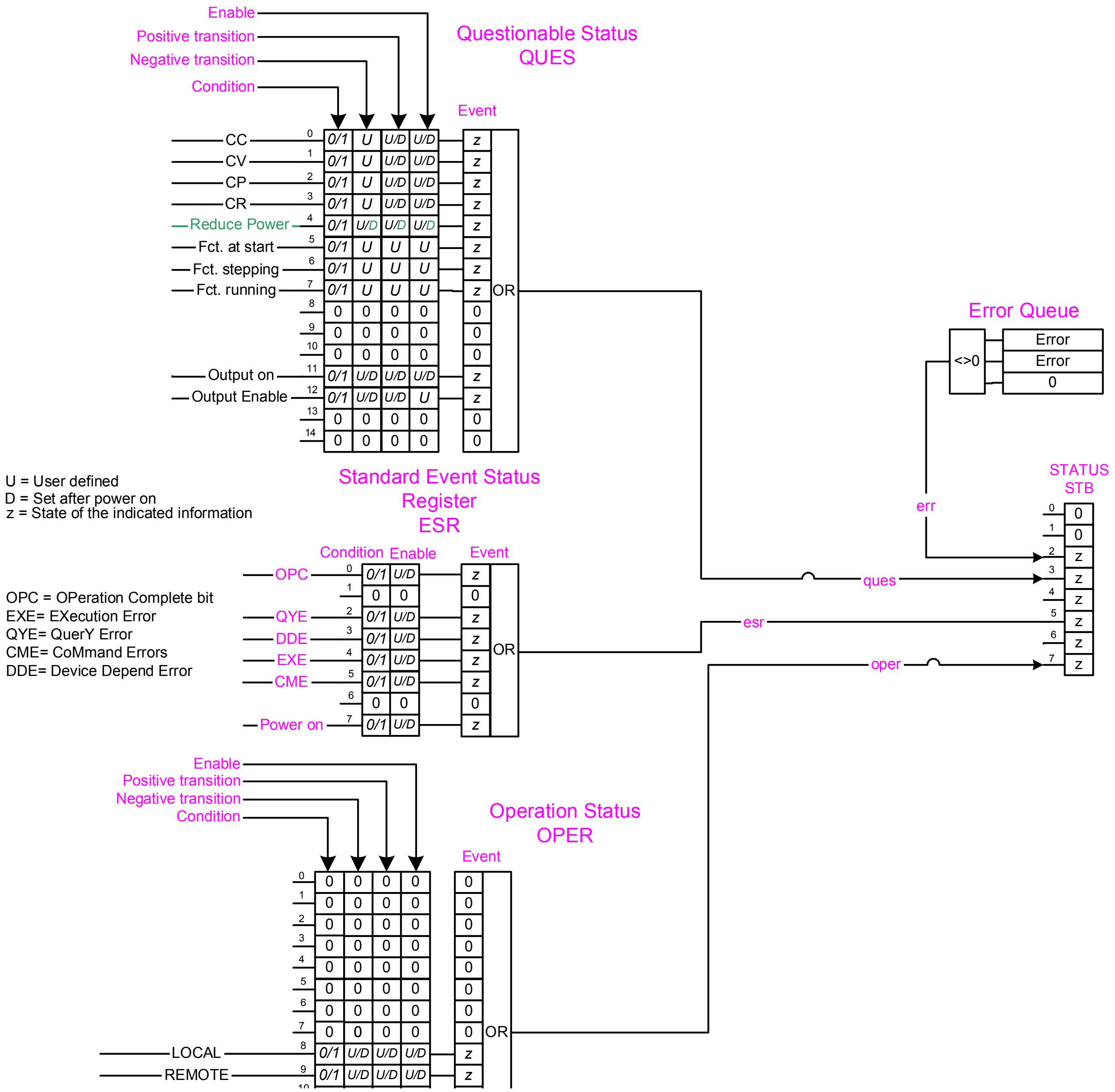
Bit 5: Command Error; Errors from -199 to -100

Bit 6: Not used

Bit 7 Power On (device was turned on)

Event and status registers can be cleared by using the command ***CLS**.

3.3 Register block



U = User defined
D = Set after power on
z = State of the indicated information

OPC = OPeration Complete bit
EXE= EXecution Error
QYE= QuerY Error
CME= CoMmand Errors
DDE= Device Depend Error

Legend:
CC/CV/CP/CR = currently active regulation mode
Reduce Power = power derating active (PSI 9000 series only)
Fct. at start/running/stepping = function manager status
Output on = Input resp. output of the device is on
Output enable = auto-on for the output is activated
LOCAL = device is in local mode, remote control is not allowed
REMOTE = device is remotely controlled by a digital interface card
EXTERNAL = device is controlled by the analogue interface card resp. the built-in analog interface
Function mode = function manager active

3.4 Status commands

(Specification according to „1999 SCPI Command reference“:19 StatusSubsystem)

The Operation Status Register (*OPER*) (see diagram on previous page) stores the several status (remote, local etc.) in register *Condition* and forwards them to the register *Event*, as long as they are enabled by *Enable*. The masks *Positive transition* and *Negative transition* determine if the events are triggered by a rising edge or a falling edge. This can be used to sense the appearance and/or disappearance of a status.

The same applies for the Questionable Status Register (*QUES*). The configuration for the *OPER*, as shown in the diagram, would cause an event only if the signal „local“ changes from low to high. The signal „Function mode“, on the other hand, would cause the event also at a falling edge.

STATus

:**OPERation**		Operation depending status
[:**EVENT]?**	-><+INT>	Queries the events in the Status Operation Register
:**CONDition?**	-><+INT>	Query *OPER* event conditions
:**ENABle**	<+INT>	Enable events for *OPER*
:**ENABle?**	-><+INT>	Query
:**PTRtransition**	<+INT>	Event will be triggered only at rising edge
:**PTRtransition?**	-><+INT>	Query
:**NTRtransition**	<+INT>	Event will be triggered only at falling edge
:**NTRtransition?**	-><+INT>	Query
:**QUEStionable**		Device and function specific events
[:**EVENT]?**	-><+INT>	Query the events in the Questionable Status Register
:**CONDition?**	-><+INT>	Query *QUES* event conditions
:**ENABle**	<+INT>	Enable events for *QUES*
:**ENABle?**	-><+INT>	Query
:**PTRtransition**	<+INT>	Event will be triggered only at rising edge
:**PTRtransition?**	-><+INT>	Query
:**NTRtransition**	<+INT>	Event will be triggered only at falling edge
:**NTRtransition?**	-><+INT>	Query

Examples:

STAT:OPER?	Queries the OPERation Status Event Register
STAT:OPER:ENAB˽255	Enables all events for the OPERation Status Event register

3.5 System commands

(Specification according to „1999 SCPI Command reference“:19 Source Subsystem)

SYSTem:

ERRor:ALL?	-><Err>[,<Err>]…	Queries the error queue, used to read out error descriptions and codes; the bits *err*, *esr* and *ESR:Condition* are cleared
ERRor:NEXT?	-><Err>	Queries only the last error from the queue; if the queue is empty, bits *err*, *esr* and *ESR:Condition* are cleared

Note

When querying errors, a GPIB card returns communication and device errors, an Ethernet card only returns communication errors.

LOCK		
[**:STATE**]	<B0>	1 or No = puts the device into remote control mode, if not blocked 0 or OFF = exits remote control mode, returns to normal device operation

⚠ **Attention!**

If not in remote mode, the device can only be monitored. It means, you can only query actual values and status. In order to set status, modes and set values, you need to switch the device to remote mode with LOCK:STATE 1 or LOCK 1 respectively *RST (also see section 3.1).

In order to do so, the remote mode must not be blocked. More information about conditions, blocks and modes can be found in the operating guide of your device.

The lock state can be queried by this command:

SYSTem:

LOCK		
:OWNer?	-><B1>	Get the current lock state NONE: if returned, the device can be put to remote mode (Bits 8,9,10 =0 in *OPER:Condition*) LOCal: device is in local mode and blocked for remote mode (Bits 8=1,9=0,10=0 in *OPER:Condition*) External mode is interpreted as LOCal. (Bit 8=0,9=0,10=1 in *OPER:Condition*) REMote: the device is in remote control mode (Bit 8=0,9=1,10=0 in *OPER* Register)
VERSion?	-><SRD>	Query SCPI version

Examples:

SYST:LOCK:OWN?	Queries the lock state to determine if remote mode is allowed
SYST:LOCK:STAT␣1	Puts the device in remote control mode (setting of values allowed now)
LOCK␣ON	Ditto

⚠ Attention!

The following two commands are only supported by the Ethernet cards IF-E1, IF-E2B and IF-E1B!

SYSTem:

DATA		
:SET	<CHAR>	Transports an encapsulated telegram in binary format Here: Send data (**SET**) (also see section 3.9.1) Further information about encapsulated telegram can be found in the external guide „Programming“ and in the related object list files

Example:

SYST:DATA:SET␣50,␣100,␣0	Sends the hexadecimal telegram 0x32 0x64 0x00 to the device. If the device is in remote control, it will set the output voltage to 100%.

SYSTem:

DATA		
:REQuest	<CHAR>	Transports an encapsulated telegram in binary format Here: REQuest data (also see section 3.9.1) Further information about encapsulated telegram can be found in the external guide „Programming“ and in the related object list files

Example:

SYST:DATA:REQ␣50	Sends the hexadecimal telegram 0x32 to the device. This requests the voltage set value and corresponds to the SCPI command **SOUR:VOLT?** The response will be two values, for example **100,0**. They corrrespond to the hexadecimal value 0x6400 and translate to 100% set value.

⚠ **Attention!**

The following command is only supported by the Ethernet card IF-E1B!

SYSTem:

COMMunicate:

NETwork

:MAC?	-><SRD>	Query the MAC address of the Ethernet card
:IPADdress?	-><SRD>	Query the actual IP address of the unit, which will be returned in the typical format. Example: 192.168.0.2
:IPADdress	<CHAR>	Set IP address via commandwith comma seperated decimals. This will only be effective if the unit is switched off and then on again.
:MASK?	-><SRD>	Query the actual subnet mask address of the unit, which will be returned in the typical format. Example: 255.0.0.0
:MASK	<CHAR>	Set subnet mask via commandwith comma seperated decimals. This will only be effective if the unit is switched off and then on again.
:GATEway?	-><SRD>	Query the actual gateway address of the unit, which will be returned in the typical format. Example: 0.0.0.0
:GATEway	<CHAR>	Set gateway address via command, with comma seperated decimals. This will only be effective if the unit is switched off and then on again.

Example:

SYST:COMM:NET:IPAD˽192,˽168,˽0,˽2 Will set IP 192.168.0.2, if device is in remote control.

3.6 Commands to control the output

Activates/deactivates the power output.

OUTPut[:STATe]?	-><B0>	Queries the state of the power supply output
OUTPut[:STATe]	<B0>	Switches the power supply output on/off

Examples:

OUTP␣ON	Switches the power output on, but does not reset alarms or warnings and also does not quit them. It means, if an alarm is persistent the command can‘t be executed.

3.7 Measurement commands

Used to read the latest measured results (actual values).

MEASure

[:SCALar]

:VOLTage[:DC]?	-><NRf>Unit	Query: Actual voltage value
:CURRent[:DC]?	-><NRf>Unit	Query: Actual current value
:POWer[:DC]?	-><NRf>Unit	Query: Actual power value
:[ARRay]?	-><NRf>Unit, <NRf>Unit …	Query: Actual voltage, actual current, actual power

Examples:

MEAS:CURR?	Measures and returns the actual current.
MEAS:ARR?	Returns a sequence of actual values. These are: U, I, P

3.8 Set value commands

Note

Set values can also be read back by attaching a question mark to the command.

I. Voltage set value/ Overvoltage threshold

(Specification according to „1999 SCPI Command reference“:19 Source Subsystem)

[SOURce:]

VOLTage

[:LEVel] ?	-><NRf>Unit	Queries the last set value for voltage
[:LEVel]	<NRf+>[Unit]	Set voltage
:PROTection[:LEVel]	<NRf+>[Unit]	Set overvoltage (OVP) threshold (only if output is off)
:PROTection[:LEVel]?	-><NRf>Unit	Query the OVP threshold

Examples:

VOLT␣5.05	Sets 5,05 V output voltage.
VOLT␣6.91␣V	Set 6.91 V, given with unit.
VOLT?	Queries the last set value
SOUR:VOLT:PROT␣67	Sets the OVP threshold to 67 V, if the output of the device is off. Else the command is ignored and an error is generated.

Note

The maximum value for the command SOUR:VOLT:PROT is generally the same as the OVP threshold maximum you can manually adjust on the device. It is typically 110% of the nominal device voltage. For a 360 V model, a OVP value of 396 V should be accepted (SOUR:VOLT:PROT 396). But is not accepted in any case when trying to set the max. value, because of calculation errors. It will return a „Data out of range“ error. It is thus recommended to set a lower value like 395 V, for example.

Note

This applies to devices of series PSI 8000 and PSI 9000: when setting the overvoltage threshold value it may occur that the value is not accepted because it exceeds a certain supervision setting. Check the setting „U >“ in the device menu „Profile -> Supervision -> U thresholds“. If the desired OVP value is lower than U>, it is not accepted by the device. Also refer to the user guide of the power supply for details about the supervision feature.

II. Current set value

(Specification according to „1999 SCPI Command reference“:19 Source Subsystem)

[SOURce:]

CURRent

[:LEVel]?	-><NRf>[Unit]	Queries the last set value for current
[:LEVel]	<NRf+>Unit	Set current

Example:

CURR␣20.00 Sets the current limit to 20 A.

III. Power set value

(Specification according to „1999 SCPI Command reference“:19 Source Subsystem)

[SOURce:]

POWer

[:LEVel]?	-><NRf>Unit	Queries the last set value for power
[:LEVel]	<NRf+>[Unit]	Set power

Examples:

POW:LEV␣2300 W Sets the device to 2300 W power limitation, as long as this value is permitted. If a device does not react to this command, it might not feature an adjustable power value.

IV. Internal resistance set value

(Specification according to „1999 SCPI Command reference“:19 Source Subsystem)

[SOURce:]

RESistance

[:LEVel]?	-><NRf>Unit	Queries the last set value for internal resistance
[:LEVel]	<NRf+>[Unit]	Sets the internal resistance set value

Examples:

RES␣1.300 Sets the desired, internal resistance set value to 1.3Ω.

3.9 Special commands

3.9.1 SYST:DATA:SET and SYST:DATA:REQ

> **Note**
>
> *This section only applies to the Ethernet cards IF-E1, IF-E2 and IF-E1B!*

Only via the Ethernet port, the network card is working with SCPI commands, which are described starting section 3.

In addition, the card provides two extra commands which can be used to send a telegram to the device in hexadecimal form, which is similiar to the object orientated binary protocol (as described in the external guide „Programming“). Purpose of these commands is to control features of the device where no particular SCPI is available for. So you can even control the PSI 9000 or PSI 8000 series function manager via these two SCPI commands. In order to do this you only need to build a telegram like this:

SYST:DATA:SET␣**ON, DATA** resp.

SYST:DATA:REQ␣**ON**

All **ON** and **DATA** bytes are decimal values and are sent to the device with the SYST:DATA:SET command. *Important: All bytes must be seperated by commas!*

DATA is required when sending something to the device, like a set value or a status. The number of **DATA** bytes must be correct, else the device will return an error. The **DATA** length is defined in the object lists (see external object lists) and varies from object to object.

For example, when sending a voltage set value, a 16 bit integer is required, which results in two bytes and two comma seperated decimal values for the SYST:DATA:SET command.

The first value, **ON**, represents the object number (i.e. like a command) from column 1 of the object lists. It defines the target for **DATA**. The combination of object number and data is considered as a set command, while the object number alone is considered as a query command.

Example 1:

The value 0x4700 shall be sent as voltage set value. According to the object list of e.g. a PSI 8000 this is object 50.

The resulting SCPI command looks like this:

SYST:DATA:SET␣50,␣71,␣0

Here, the value 0x4700 is seperated into two bytes 0x47 and 0x00 and each one translated to decimal.

Example 2:

The actual values of voltage, current and power shall be queried from the device. This is done by a REQuest. Accroding to the object list, the object 71 returns all three actual values at once in form of six single bytes. The request would look like this:

SYST:DATA:REQ␣71

The device will, for example return, six decimal values:

67,␣37,␣21,␣127,␣24,␣16

Two subsequent values build a 16 bit value, which represents the actual value as per cent. So the 6 values result in these hexdecimal, combined values:

67,␣37,␣21,␣127,␣24,␣16

0x4325, 0x157F, 0x1810

The calculation into decimal or hexadecimal per cent values can also be done like this (VB, C or similiar):

Per cent value = First value * 256 + Second value

For the first two bytes of the example above, this will calculate to a decimal of 17198, ie. 67 * 256 + 37, which again represents the hexadecimal value of 0x4325.

The order or the resulting three 16 bit values is defined:

Firrst value is actual voltage, the second the actual current and the third the actual power, each in per cent of the nominal value of the device. After this, they need to be calculated to real values. See section 1.7 of the external guide „Programming“.

In order to translate the calculated per cent value into a real actual value, the nominal values of the load required as reference. If, for example, the power supply has 80 V, 100 A and 3000 W, like with a PSI 9080-100, a second formula would be this:

Real actual value = Nominal value * per cent value / 25600

For the example above and the per cent value of the current 0x157F, it would result like this:

100 A * 5503 / 25600 = 21.5 A

> **Note**
>
> *This example corresponds to the SCPI command MEAS:ARR?. It means, that the command would return the same values as the calculated ones. It may occur that values returned by MEAS:ARR? command slightly differ in the decimal places due to a small translation error.*

4. Errors

Errors are collected in an error queue. The *err* bit indicates, if a new error has occured. It can be queried with a status register byte call (STB?). The error queue is queried seperately and is automatically cleared when read.

<ERR>	Message	Description
0	“No error“	Error queue empty, no error present
-100	“Command error“	Invalid command used
-101	“Invalid character”	...in the command string
-102	“Syntax error“	
-103	“Invalid separator“	
-108	“Parameter not allowed”	
-109	“Missing parameter“	
-113	“Undefined header“	Command unknown
-120	“Numeric data error”	
-131	“Invalid suffix”	or unit
-141	“Invalid character data“	
-151	“Invalid string data“	
-200	“Execution error“	General error, used for various situations
-201-	“Invalid while in local”	Device is local, so remote mode is blocked
-203	„Command protected“	Access to sequence control denied or
		Feature not enabled (R mode)
		Access to functions parameters denied
-223	“Too much data“	
-224	“Illegal parameter value”	
-225	“Out of memory”	
-240	“Hardware error”	max. CAN nodes exceeded / CAN node unknown/ no gateway
-241	„Hardware missing”	
-220	“Parameter error”	Object not defined
-221	“Settings conflict“	Read-write law violated, no access
		Access to menu only when OUTPUT OFF
		Access to set values denied (device is in slave mode)
-222	“Data out of range”	Values exceeds upper or lower limit
-223	“Too much data“	Object length not correct
-232	“Invalid format“	Time format wrong
-350	“Queue overflow”	Error and event buffer overflow
-360	“Communication error”	Various communication errors (also see section 3.7 of the external guide „Programming“):
		Framing error
		Checksum not correct
		etc.
-361	“Parity error in program message“	at RS232: Parity error
-362	“Framing error in program message“	
-363	“Input buffer overrun“	
-365	“Time out error“	

Further error messages result from device depending alarms, warnings and notifications (see user manual of your device for detailed information and the user manual of the interface card too, for the message):

<ERR>	Message	Description
100 - 199	see alarm table in 3.9 of the external guide „Programming“	displayed only, the ones and tens columns of the error code are identical to the error code in the table above
200 - 299	see alarm table in 3.9 of the external guide „Programming“	warnings, the ones and tens columns of the error code are identical to the error code in the table above
300 - 399	see alarm table in 3.9 of the external guide „Programming“	alarms, the ones and tens columns of the error code are identical to the error code in the table above

5. Appendix

5.1 SCPI command overview

Main	1.Sub	2.Sub	3.Sub	Value(s)	PS8000T	PS8000DT/2U/3U	PSI8000T/DT/2U/3U	PSI800R	PSI9000	EL3000/EL9000	Remark
CURR				0...Imax	•	•	•	•	•	•	
CURR?				Set value of current	•	•	•	•	•	•	
CURR:	LEV			0...Imax	•	•	•	•	•	•	At EL: Level A or B, depending on what is set
CURR:	LEV?			Set value of current	•	•	•	•	•	•	At EL: Level A or B, depending on what is set
CURR:	HIGH			CURR:LOW...Imax						•	At EL: AB level
CURR:	HIGH?			0...Imax						•	At EL: AB level
CURR:	LOW			0...CURR:HIGH						•	At EL: AB level
CURR:	LOW?			0...Imax						•	At EL: AB level
ERR:	ALL?			Up to 3 error strings	•	•	•	•	•	•	
ERR:	NEXT?			1 error string	•	•	•	•	•	•	
INP				1, 0, ON, OFF						•	
INP?				ON, OFF						•	
INP:	STAT			1, 0, ON, OFF						•	
INP:	STAT?			ON, OFF						•	
LOCK				1, 0, ON, OFF	•	•	•	•	•	•	
LOCK?					•	•	•	•	•	•	
LOCK:	STAT			1, 0, ON, OFF	•	•	•	•	•	•	
LOCK:	STAT?				•	•	•	•	•	•	
LOCK:	OWN?			REM, LOC, NONE	•	•	•	•	•	•	
MEAS:	VOLT?			1 value	•	•	•	•	•	•	
MEAS:	CURR?			1 value	•	•	•	•	•	•	
MEAS:	POW?			1 value	•	•	•	•	•	•	
MEAS:	ARR?			3 values	•	•	•	•	•	•	
MEAS:	VOLT:	DC?		1 value	•	•	•	•	•	•	
MEAS:	CURR:	DC?		1 value	•	•	•	•	•	•	
MEAS:	POW:	DC?		1 value	•	•	•	•	•	•	
MEAS:	SCAL:	VOLT?		1 value	•	•	•	•	•	•	
MEAS:	SCAL:	CURR?		1 value	•	•	•	•	•	•	
MEAS:	SCAL:	POW?		1 value	•	•	•	•	•	•	
MEAS:	SCAL:	ARR?		3 values	•	•	•	•	•	•	
MEAS:	SCAL:	VOLT:	DC?	1 value	•	•	•	•	•	•	
MEAS:	SCAL:	CURR:	DC?	1 value	•	•	•	•	•	•	
MEAS:	SCAL:	POW:	DC?	1 value	•	•	•	•	•	•	
OUTP				1, 0, ON, OFF	•	•	•	•	•		
OUTP?				ON, OFF	•	•	•	•	•		
OUTP:	STAT			1, 0, ON, OFF	•	•	•	•	•		
OUTP:	STAT?			ON, OFF	•	•	•	•	•		
POW				0...Pmax	•	•	•	•	•	•	
POW?				Set value of power	•	•	•	•	•	•	
POW:	LEV			0...Pmax	•	•	•	•	•	•	
POW:	LEV?			Set value of power	•	•	•	•	•	•	
POW:	HIGH			POW:LOW...Pmax						•	
POW:	HIGH?			0...Pmax						•	
POW:	LOW			0...POW:HIGH						•	
POW:	LOW?			0...Pmax						•	
PULS:	WIDT:	LOW		50us...100s						•	At EL: AB level
PULS:	WIDT:	LOW?		50us...100s						•	At EL: AB level
PULS:	WIDT:	HIGH		50us...100s						•	At EL: AB level
PULS:	WIDT:	HIGH?		50us...100s						•	At EL: AB level
PULS:	TRAN			30us...200ms						•	At EL: AB level
PULS:	TRAN?			30us...200ms						•	At EL: AB level
PULS:	TRAN:	LEAD		30us...200ms						•	At EL: AB level
PULS:	TRAN:	LEAD?		30us...200ms						•	At EL: AB level
RES				0...Rmax			•		•	•	At EL: Level A or B, depending on what is set
RES?				Set value of resistance			•		•	•	At EL: Level A or B, depending on what is set
RES:	LEV			0...Rmax			•		•	•	At EL: Level A or B, depending on what is set
RES:	LEV?			Set value of resistance			•		•	•	At EL: Level A or B, depending on what is set
RES:	HIGH			RES:LOW...Rmax						•	
RES:	HIGH?			0...Rmax						•	
RES:	LOW			0...RES:HIGH						•	
RES:	LOW?			0...Rmax						•	
SOUR:	VOLT			0...Umax	•	•	•	•	•	•	
SOUR:	VOLT?			Set value of value	•	•	•	•	•	•	
SOUR:	VOLT:	LEV		0...Umax	•	•	•	•	•	•	
SOUR:	VOLT:	LEV?		Set value of value	•	•	•	•	•	•	
SOUR:	VOLT:	HIGH		VOLT:LOW...Umax						•	
SOUR:	VOLT:	HIGH?		0..Umax						•	
SOUR:	VOLT:	LOW		0...VOLT:HIGH						•	
SOUR:	VOLT:	LOW?		0...Umax						•	

Main	1.Sub	2.Sub	3.Sub	Value(s)	PS8000T	PS8000DT/2U/3U	PSI8000T/DT/2U/3U	PSI800R	PSI9000	EL3000/EL9000	Remark
SOUR:	CURR			dito	•	•	•	•	•	•	
SOUR:	CURR?			dito	•	•	•	•	•	•	
SOUR:	CURR:	LEV		dito	•	•	•	•	•	•	
SOUR:	CURR:	LEV?		dito	•	•	•	•	•	•	
SOUR:	CURR:	HIGH		dito						•	
SOUR:	CURR:	HIGH?		dito						•	
SOUR:	CURR:	LOW		dito						•	
SOUR:	CURR:	LOW?		dito						•	
SOUR:	POW			dito	•	•	•	•	•	•	
SOUR:	POW?			dito	•	•	•	•	•	•	
SOUR:	POW:	LEV		dito	•	•	•	•	•	•	
SOUR:	POW:	LEV?		dito	•	•	•	•	•	•	
SOUR:	POW:	HIGH		dito						•	
SOUR:	POW:	HIGH?		dito						•	
SOUR:	POW:	LOW		dito						•	
SOUR:	POW:	LOW?		dito						•	
SOUR:	RES			dito			•		•	•	
SOUR:	RES?			dito			•		•	•	
SOUR:	RES:	LEV		dito			•		•	•	
SOUR:	RES:	LEV?		dito			•		•	•	
SOUR:	RES:	HIGH		dito						•	
SOUR:	RES:	HIGH?		dito						•	
SOUR:	RES:	LOW		dito						•	
SOUR:	RES:	LOW?		dito						•	
SOUR:	VOLT:	PROT		0...110% Umax	•	•	•	•	•		OVP
SOUR:	VOLT:	PROT?		0...110% Umax	•	•	•	•	•		OVP
SOUR:	VOLT:	PROT:	LEV	0...110% Umax	•	•	•	•	•		OVP
SOUR:	VOLT:	PROT:	LEV?	0...110% Umax	•	•	•	•	•		OVP
SOUR:	PULS:	WIDT:	LOW	dito						•	
SOUR:	PULS:	WIDT:	LOW?	dito						•	
SOUR:	PULS:	WIDT:	HIGH	dito						•	
SOUR:	PULS:	WIDT:	HIGH?	dito						•	
SOUR:	PULS:	TRAN		dito						•	
SOUR:	PULS:	TRAN?		dito						•	
SOUR:	PULS:	TRAN:	LEAD	dito						•	
SOUR:	PULS:	TRAN:	LEAD?	dito						•	
STAT:	OPER?				•	•	•	•	•	•	
STAT:	OPER:	EVENT?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	COND?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	ENAB		0-32767	•	•	•	•	•	•	
STAT:	OPER:	ENAB?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	PTR		0-32767	•	•	•	•	•	•	
STAT:	OPER:	PTR?		0-32767	•	•	•	•	•	•	
STAT:	OPER:	NTR		0-32767	•	•	•	•	•	•	
STAT:	OPER:	NTR?		0-32767	•	•	•	•	•	•	
STAT:	QUES?			0-32767	•	•	•	•	•	•	
STAT:	QUES:	EVENT?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	COND?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	ENAB		0-32767	•	•	•	•	•	•	
STAT:	QUES:	ENAB?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	PTR		0-32767	•	•	•	•	•	•	
STAT:	QUES:	PTR?		0-32767	•	•	•	•	•	•	
STAT:	QUES:	NTR		0-32767	•	•	•	•	•	•	
STAT:	QUES:	NTR?		0-32767	•	•	•	•	•	•	
SYST:	COMM:	NET:	IPAD	0, 0, 0, 0 - 255, 255, 255, 255	•	•	•		•	•	Only with IF-E1b
SYST:	COMM:	NET:	IPAD?	0.0.0.0 - 255.255.255.255	•	•	•		•	•	Only with IF-E1b
SYST:	COMM:	NET:	GATE	0, 0, 0, 0 - 255, 255, 255, 255	•	•	•		•	•	Only with IF-E1b
SYST:	COMM:	NET:	GATE?	0.0.0.0 - 255.255.255.255	•	•	•		•	•	Only with IF-E1b
SYST:	COMM:	NET:	MAC?		•	•	•		•	•	Only with IF-E1b
SYST:	COMM:	NET:	MASK	0, 0, 0, 0 - 255, 255, 255, 255	•	•	•		•	•	Only with IF-E1b
SYST:	COMM:	NET:	MASK?	0.0.0.0 - 255.255.255.255	•	•	•		•	•	Only with IF-E1b
SYST:	DATA:	SET		Object telegram as ASCII	•	•	•	•	•	•	Only with IF-Ex: Set something
SYST:	DATA:	REQ		Object telegram as ASCII	•	•	•	•	•	•	Only with IF-Ex: Request something
SYST:	ERR:	ALL?		dito	•	•	•	•	•	•	
SYST:	ERR:	NEXT?		dito	•	•	•	•	•	•	
SYST:	LOCK			dito	•	•	•	•	•	•	
SYST:	LOCK:	STAT		dito	•	•	•	•	•	•	
SYST:	LOCK:	OWN?		dito	•	•	•	•	•	•	
SYST:	VERS?			SCPI version (1999.0)	•	•	•	•	•	•	

Main	1.Sub	2.Sub	3.Sub	Value(s)	PS8000T	PS8000DT/2U/3U	PSI8000T/DT/2U/3U	PSI800R	PSI9000	EL3000/EL9000	Remark
VOLT				dito	•	•	•	•	•	•	
VOLT?				dito	•	•	•	•	•	•	
VOLT:	LEV			dito	•	•	•	•	•	•	
VOLT:	LEV?			dito	•	•	•	•	•	•	
VOLT:	HIGH			dito						•	
VOLT:	HIGH?			dito						•	
VOLT:	LOW			dito						•	
VOLT:	LOW?			dito						•	
VOLT:	PROT			dito	•	•	•	•	•		OVP
VOLT:	PROT?			dito	•	•	•	•	•		OVP
VOLT:	PROT:	LEV		dito	•	•	•	•	•		OVP
VOLT:	PROT:	LEV?		dito	•	•	•	•	•		OVP
*RST					•	•	•	•	•	•	
*IDN?				String, max. 128 characters	•	•	•	•	•	•	
*STB?				0...255	•	•	•	•	•	•	
*ESR?				0...255	•	•	•	•	•	•	
*ESE				0...255	•	•	•	•	•	•	
*ESE?				0...255	•	•	•	•	•	•	
*CLS					•	•	•	•	•	•	
*TRG					•	•	•	•	•	•	
*SRE				0...255	•	•	•	•	•	•	
*SRE?				0...255	•	•	•	•	•	•	

🟨 requires the device to be already in remote control mode

🟩 only available with Ethernet card IF-E1 or IF-E2, some commands require remote control mode

🟧 only available with GPIB card IF-G1

🟦 only for specific interface cards

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