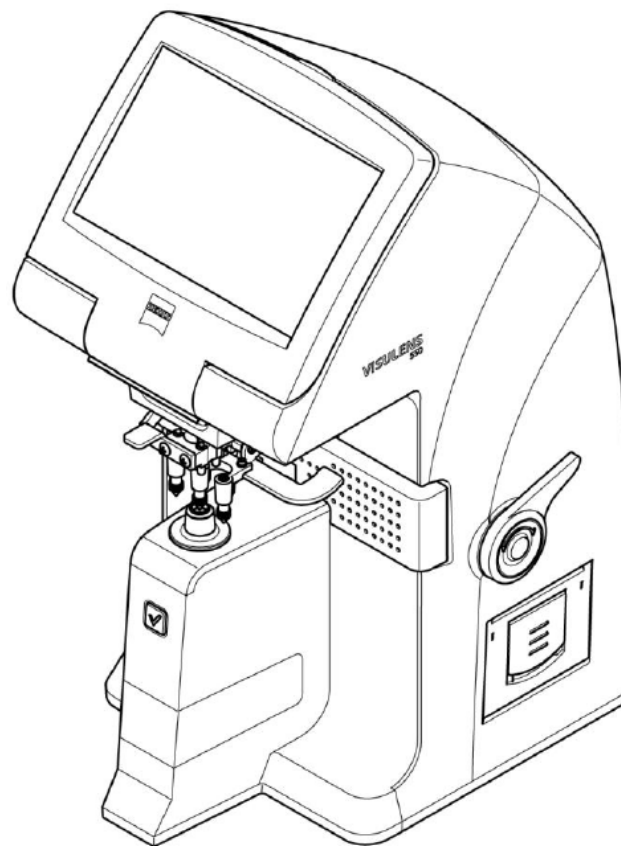


ZEISS VISULENS 550

Digital Lensmeter

Interface Definition
Version 1.0



Revision	Chapter/Page	Change reason
1.0	All	Initial release

Contents

1. General.....	4
1.1 Purpose.....	4
1.2 References.....	4
1.3 Acronyms.....	4
1.4 Tables.....	4
1.5 Figures.....	4
2. Intended Use.....	5
3. Output Formats.....	6
3.1 Text Formats.....	6
3.2 XML Formats.....	17
3.3 PDF Formats.....	17
3.4 DICOM Formats.....	17
4. Communication Interfaces.....	18
4.1 Serial interface.....	19
4.2 USB interface.....	21
4.3 LAN Interfaces.....	22
5. Miscellaneous.....	30
5.1 Rounding.....	30
5.2 Device Serial Number.....	31
Appendices.....	32
Appendix 1: PDF printout examples.....	32
Appendix 2: Device Parameter Table.....	32

1. General

1.1 Purpose

This document specifies data output formats as delivered by ZEISS VISULENS 550 Digital Lensmeter.

1.2 References

- [1] ZEISS VISULENS 550 Digital Lensmeter User Manual 2268-038
- [2] CARL ZEISS VISION Interface definition – Device connectivity PMS 003/15 Version 1.2
- [3] VISULENS 550 DICOM Conformance Statement Version 1.0
- [4] Common Specification for output data of Ophthalmic Examination Equipment 01. (JOIA Std. 001-1.5-2016)

1.3 Acronyms

ADD	Addition power
AXIS	Axis of cylinder
CYL	Cylinder
EMR	Electronic Medical Record
GUI	Graphical User Interface
NC	Not Connected
PD	Interpupillary distance
PX	X-directional prism power
PY	Y-directional prism power
UV	UV transmission ratio
SPH	Sphere

1.4 Tables

Table 1: Placeholder definitions.....	6
Table 2: Serial interface connector pinout.....	19
Table 3: Serial interface parameters default values	19
Table 4: USB interface parameters default values	21
Table 5: Shared folder interface parameters default values	22
Table 6: Web service interface parameters default values	25
Table 7: Web service interface function definitions	26
Table 8: Device rounding parameters default values	30

1.5 Figures

Figure 1: Device output button and data interface connectors.....	18
Figure 2: Example demonstrating v1.6 mapping of serial numbers	31

2. Intended Use

The ZEISS VISULENS 550 Digital Lensmeter is a device for measuring the refractive power of contact lenses and spectacle lenses and for displaying measurement values for sphere, cylinder and prism.

The ZEISS VISULENS 550 Digital Lensmeter also measures the PD (pupil distance) and contains a UV protection ratio test. The ZEISS VISULENS 550 Digital Lensmeter can measure both individual frameless lenses and framed glasses. Bi-focal or progressive lenses can also be checked with this device. In addition, it can measure hard and soft contact lenses easily and accurately using a special mechanical jig.

3. Output Formats

3.1 Text Formats

All text formats use ASCII encoded characters. The format definitions presented within the subsequent sections use the placeholders presented in Table 1.

Table 1: Placeholder definitions

Placeholder	Options/Description			
[S]	Number sign information			
	+	43	0x2B	Positive sign
	-	45	0x2D	Negative sign
	*	42	0x2A	Sign for undefined number
[N]	Digit as part of natural or floating point number			
	0	48	0x30	Natural number [0..9]
	1	49	0x31	
	2	50	0x32	
	3	51	0x33	
	4	52	0x34	
	5	53	0x35	
	6	54	0x36	
	7	55	0x37	
	8	56	0x38	
	9	57	0x39	
	*	42	0x2A	Digit of undefined number
[X]	Single character out of [0..9] or [A..Z]			
	0..9	48..57	0x30..0x39	One-digit natural number
	A..Z	65..90	0x41..0x5A	Upper case character
[E]	Side allocation information			
	S	83	0x53	Single measurement without side allocation
	L	76	0x4C	Single measurement allocated to left side
	R	82	0x52	Single measurement allocated to right side
	B	66	0x42	Two measurements allocated to left resp. right side

3.1.1 Format “v1.6 Compatibility”

Byte	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Description			Device Name¹											
ASCII	<CR>	<LF>	V	I	S	U	L	E	N	S	5	0	0	<CR>
Decimal	13	10	86	73	83	85	76	69	78	83	53	48	48	13
Hexadecimal	0x0D	0x0A	0x56	0x49	0x53	0x55	0x4C	0x45	0x4E	0x53	0x35	0x30	0x30	0x0D

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
		Measurement Time Stamp															
		Year				Month		Day			Hour		Minute		Second		
<SP>	<CR>									<CR>							<CR>
32	13	[N]	[N]	[N]	[N]	[N]	[N]	[N]	[N]	13	[N]	[N]	[N]	[N]	[N]	[N]	13
0x20	0x0D									0x0D							0x0D

33	34	35	36
		Measured Lenses	
<SP>	<CR>		<CR>
32	13	[E]	13
0x20	0x0D		0x0D

¹ Format v1.6 has been defined for predecessor device VISULENS 500 with hard coded product name. For backward compatibility this name is kept unchanged here.

Byte
Description

	37	38	39	40
			Start right side section²	
	<SP>	<CR>	R	<CR>
Data	32	13	82	13
	0x20	0x0D	0x52	0x0D

	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
	Right side refraction values																	
	SPH in [diopeters]							CYL in [diopeters]							AXIS in [°]			
	[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>
				46			13				46			13				13
				0x2E			0x0D				0x2E			0x0D				0x0D

	59	60	61	62	63	64	65	66	67	68	69	70	71	72
	Right side prism values													
	PX in [prism diopters]							PY in [prism diopters]						
	[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>
				46			13				46			13
				0x2E			0x0D				0x2E			0x0D

	73	74	75	76	77	78	79	80	81	82	83	84	
	Right side ADD values³												
	ADD NEAR in [diopeters]							ADD INTERMEDIATE in [diopeters]					
	[S]	[N]	.	[N]	[N]	<CR>	[S]	[N]	.	[N]	[N]	<CR>	
			46			13			46			13	
			0x2E			0x0D			0x2E			0x0D	

² Section is also used for single measurements without side allocation.

³ In case of single ADD value field "ADD NEAR" is used while "ADD INTERMEDIATE" is undefined (i.e. **.**).

Byte	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Description	Right side UV transmission values															
	@ 365nm in [%]			@ 375nm in [%]			@ 395nm in [%]			@ 405nm in [%]						
Data	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>
				13				13				13				13
				0x0D				0x0D				0x0D				0x0D

	101	102	103	104	105
	Right side PD value in [mm]				
	[N]	[N]	.	[N]	<CR>
			46		13
			0x2E		0x0D

Byte	106	107	108	109
Description			Start left side section	
	<SP>	<CR>	L	<CR>
Data	32	13	76	13
	0x20	0x0D	0x4C	0x0D

110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
Left side refraction values																	
SPH in [diopeters]							CYL in [diopeters]							AXIS in [°]			
[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>
			46			13				46			13				13
			0x2E			0x0D				0x2E			0x0D				0x0D

128	129	130	131	132	133	134	135	136	137	138	139	140	141
Left side prism values													
PX in [prism diopeters]							PY in [prism diopeters]						
[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>
			46			13				46			13
			0x2E			0x0D				0x2E			0x0D

142	143	144	145	146	147	148	149	150	151	152	153
Left side ADD values⁴											
ADD NEAR in [diopeters]						ADD INTERMEDIATE in [diopeters]					
[S]	[N]	.	[N]	[N]	<CR>	[S]	[N]	.	[N]	[N]	<CR>
		46			13			46			13
		0x2E			0x0D			0x2E			0x0D

⁴ In case of single ADD value field “ADD NEAR” is used while “ADD INTERMEDIATE” is undefined (i.e. **.**).

Byte	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169
Description	Left side UV transmission values															
	@ 365nm in [%]			@ 375nm in [%]			@ 395nm in [%]			@ 405nm in [%]						
Data	[N]	[N]	[N]	<CR> 13 0x0D	[N]	[N]	[N]	<CR> 13 0x0D	[N]	[N]	[N]	<CR> 13 0x0D	[N]	[N]	[N]	<CR> 13 0x0D

	170	171	172	173	174
	Left side PD value in [mm]				
	[N]	[N]	.	[N]	<CR>
			46		13
			0x2E		0x0D

	175	176	177	178	179	180	181
	PD total value in [mm]						
	<SP>	<CR>			.		<CR>
	32	13	[N]	[N]	46	[N]	13
	0x20	0x0D			0x2E		0x0D

	182	183	184	185	186	187	188	189	190	191	192	193	194	195
	Device Serial Number⁵													
	Instrument Code						Hardware code		Series counter					
	<SP>	<CR>	9	7	0	2							<CR>	<EOT>
	32	13	57	55	48	50	[X]	[X]	[X]	[X]	[X]	[X]	13	4
	0x20	0x0D	0x39	0x37	0x30	0x32							0x0D	0x04

⁵ Format v1.6 has been defined for predecessor device VISULENS 500 with hard coded instrument code "9702". For details on serial number structure and mapping between VISULENS 550 and VISULENS 500 numbers see section 5.2.

3.1.2 Format “v1.7”

Preliminary remark: this format is directly derived from “v1.6”. The only difference is avoiding definition of constant values for Device Name and Serial Number.

Byte	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Description			Device Name⁶											
Data	<CR>	<LF>	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	<CR>
	13	10												13
	0x0D	0x0A												0x0D

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
		Measurement Time Stamp																
		Year				Month			Day			Hour		Minute		Second		
<SP>	<CR>	[N]	[N]	[N]	[N]	[N]	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	[N]	[N]	[N]	<CR>	
32	13									13							13	
0x20	0x0D									0x0D							0x0D	

33	34	35	36
		Measured Lenses	
<SP>	<CR>	[E]	<CR>
32	13		13
0x20	0x0D		0x0D

⁶ For device VISULENS 550 the device name “VISULENS550” (without space) is used. Other devices utilizing this format may use other values.

Byte	37	38	39	40
Description			Start right side section⁷	
	<SP>	<CR>	R	<CR>
Data	32	13	82	13
	0x20	0x0D	0x52	0x0D

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	
Right side refraction values																		
SPH in [diopters]								CYL in [diopters]							AXIS in [°]			
[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>	
			46			13				46			13				13	
			0x2E			0x0D				0x2E			0x0D				0x0D	

59	60	61	62	63	64	65	66	67	68	69	70	71	72
Right side prism values													
PX in [prism diopters]							PY in [prism diopters]						
[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>
			46			13				46			13
			0x2E			0x0D				0x2E			0x0D

73	74	75	76	77	78	79	80	81	82	83	84	
Right side ADD values⁸												
ADD NEAR in [diopters]							ADD INTERMEDIATE in [diopters]					
[S]	[N]	.	[N]	[N]	<CR>	[S]	[N]	.	[N]	[N]	<CR>	
		46			13			46			13	
		0x2E			0x0D			0x2E			0x0D	

⁷ Section is also used for single measurements without side allocation.

⁸ In case of single ADD value field "ADD NEAR" is used while "ADD INTERMEDIATE" is undefined (i.e. **.**).

Byte	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Description	Right side UV transmission values															
	@ 365nm in [%]			@ 375nm in [%]			@ 395nm in [%]			@ 405nm in [%]						
Data	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>
				13				13				13				13
				0x0D				0x0D				0x0D				0x0D

	101	102	103	104	105
	Right side PD value in [mm]				
	[N]	[N]	.	[N]	<CR>
			46		13
			0x2E		0x0D

Byte	106	107	108	109
Description			Start left side section	
	<SP>	<CR>	L	<CR>
Data	32	13	76	13
	0x20	0x0D	0x4C	0x0D

110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
Left side refraction values																	
SPH in [diopeters]							CYL in [diopeters]							AXIS in [°]			
[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>	[N]	[N]	[N]	<CR>
			46			13				46			13				13
			0x2E			0x0D				0x2E			0x0D				0x0D

128	129	130	131	132	133	134	135	136	137	138	139	140	141
Left side prism values													
PX in [prism diopters]							PY in [prism diopters]						
[S]	[N]	[N]	.	[N]	[N]	<CR>	[S]	[N]	[N]	.	[N]	[N]	<CR>
			46			13				46			13
			0x2E			0x0D				0x2E			0x0D

142	143	144	145	146	147	148	149	150	151	152	153
Left side ADD values⁹											
ADD NEAR in [diopeters]							ADD INTERMEDIATE in [diopeters]				
[S]	[N]	.	[N]	[N]	<CR>	[S]	[N]	.	[N]	[N]	<CR>
		46			13			46			13
		0x2E			0x0D			0x2E			0x0D

⁹ In case of single ADD value field “ADD NEAR” is used while “ADD INTERMEDIATE” is undefined (i.e. **.**).

Byte	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169
Description	Left side UV transmission values															
	@ 365nm in [%]			@ 375nm in [%]			@ 395nm in [%]			@ 405nm in [%]						
Data	[N]	[N]	[N]	<CR> 13 0x0D	[N]	[N]	[N]	<CR> 13 0x0D	[N]	[N]	[N]	<CR> 13 0x0D	[N]	[N]	[N]	<CR> 13 0x0D

	170	171	172	173	174
	Left side PD value in [mm]				
	[N]	[N]	.	[N]	<CR>
			46		13
			0x2E		0x0D

	175	176	177	178	179	180	181
	PD total value in [mm]						
	<SP>	<CR>			.		<CR>
	32	13	[N]	[N]	46	[N]	13
	0x20	0x0D			0x2E		0x0D

	182	183	184	185	186	187	188	189	190	191	192	193	194	195
	Device Serial Number¹⁰													
	Instrument Code						Hardware code		Series counter					
	<SP>	<CR>											<CR>	<EOT>
	32	13	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	13	4
	0x20	0x0D											0x0D	0x04

¹⁰ For device VISULENS 550 the instrument code “9714” is used. For details on serial number structure see section 5.2.

3.2 XML Formats

3.2.1 Format “XML JOIA”

For a description of JOIA format refer to [4].

3.2.2 Format “XML ZEISS”

For a description of this format refer to [2].

Remark: This format is intended for communication to i.Com mobile resp. VISUCONSULT.
For integration of other EMR solutions JOIA format is recommended.

3.3 PDF Formats

3.3.1 Format “PDF Standard”

See example printout in Appendix 1.

3.3.2 Format “PDF Enhanced”

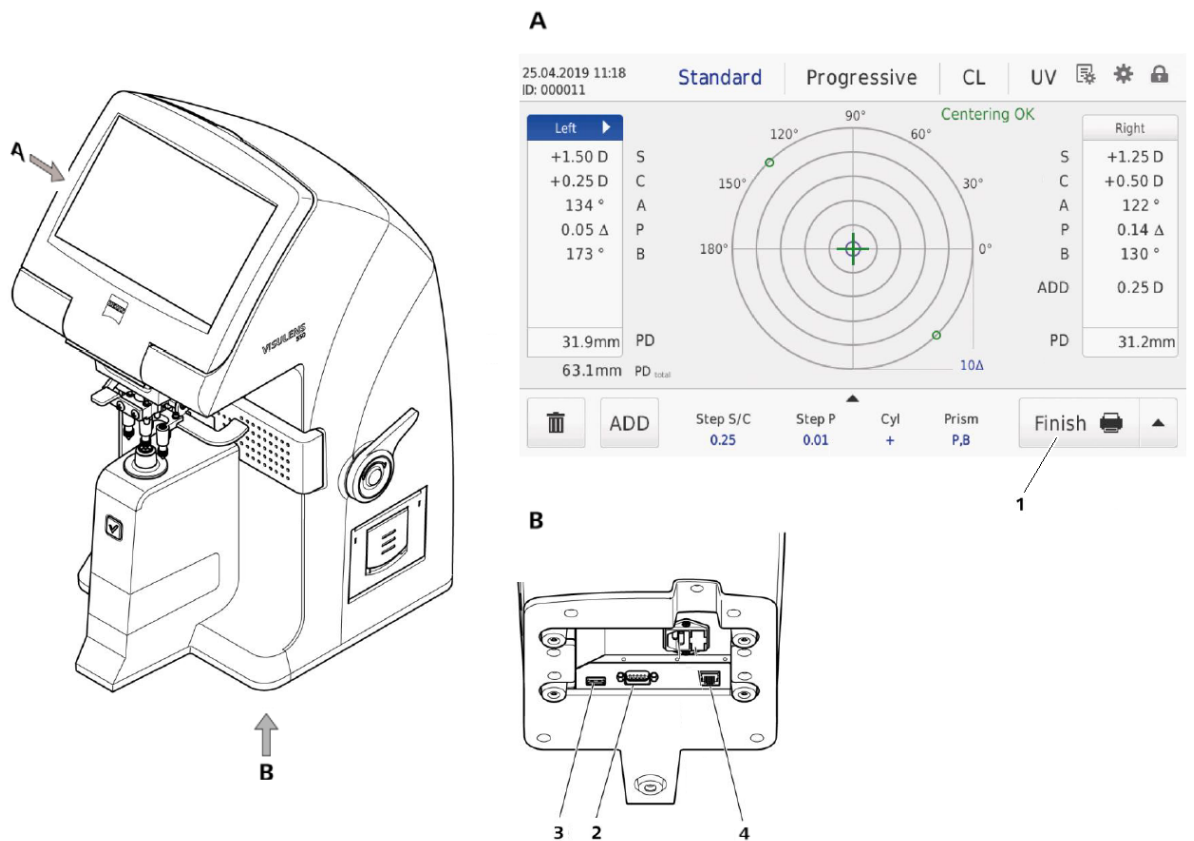
See example printout in Appendix 1.

3.4 DICOM Formats¹¹

For a description of DICOM output refer to [3].

¹¹ Format available starting with software version v1.0.2

4. Communication Interfaces



- 1: Finish button on device's GUI
- 2: RS232 connector
- 3: USB connector
- 4: LAN connector

Figure 1: Device output button and data interface connectors

Generally, data output is *enabled* during the finish measurement workflow process which is triggered by pushing the Finish button (1, Figure 1) on the device's Graphical User Interface (GUI).

Normally data transmission is initiated by the device: as part of the finish process device sends data to all enabled interfaces. For a description on according configuration options refer to [1].

To pull data from the device refer to section 4.3.5.

4.1 Serial interface

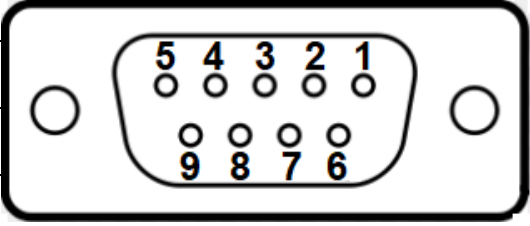
4.1.1 Connector

The device features a RS232 connector (2, Figure 1) of type D-SUB 9, female.

For details on the RS232 connector pinout refer to Table 2. Connecting the device to a standard PC or VISUPHOR 500 Junction Box can be achieved using a commercial of the shelf 1:1 cable (i.e. a cable without wires 2 and 3 crossed).

Table 2: Serial interface connector pinout

Pin	Description
1	NC
2	Transmit Data
3	Receive Data
4	NC
5	Ground
6	NC
7	Clear to send
8	Ready for receiving
9	NC



4.1.2 Interface Parameters

Table 3 presents default values of serial interface parameters. For a description on according configuration options refer to [1].

Table 3: Serial interface parameters default values

Parameter	Default value
Baud rate	19200 Bd
Number of Data bits	8
Number of Stop bits	1
Parity	None
Handshaking	None

4.1.3 Interface Protocols

4.1.3.1 Blind Transmission

Data is plainly written to serial interface without any remote station interaction.

4.2 USB interface

4.2.1 Connector

The device features a USB connector (3, Figure 1) of type A receptacle.

4.2.2 Interface Parameters

USB interface solely supports class for mass storage devices.

Table 4 presents default values of USB interface parameters. For a description on according configuration options refer to [1].

Table 4: USB interface parameters default values

Parameter	Default value
Output path 1	data\txt
Output format 1	v1.6
Output path 1	data\pdf
Output format 1	pdfEnhanced

4.3 LAN Interfaces

4.3.1 Connector

The device features a LAN connector (4, Figure 1) of type 8P8C female.

4.3.2 Shared Folder Interface

4.3.2.1 Interface Parameters

Table 5 presents default values of shared folder interface parameters. For a description on according configuration options refer to [1].

Table 5: Shared folder interface parameters default values

Parameter	Default value
Share	
User	
Password	
Input path	device\input
Input timer	5s
Output path 1	data\txt
Output format 1	v1.6
Output path 2	data\pdf
Output format 2	xmlJOIA

4.3.2.2 JOIA Input Processor

Placing a file with filename in format *_joia.xml in configured input directory schedules a lensmeter measurement on device if input file (1) contains a complete and valid patient node and (2) does not contain lensmeter data.

4.3.3 Socket Interface

Device supports communication to the following ZEISS products:

- ZEISS i.com Mobile resp. VISUCONSULT using according SOAP interface. For details see [2]
- ZEISS FORUM using DICOM interface¹². For details refer to [3].

Beside this application specific interfaces, the device supports the protocols described hereinafter.

4.3.3.1 Generic Transmission Protocol

Data is plainly written to client without any remote station interaction.

¹² Interface available starting with software version v1.0.2

4.3.4 Network Printer Interface

Supported printer language is direct PDF. For a description on how to configure a printer refer to [1].

4.3.5 Web Service Interface

The web service technology is REST over HTTP. Request URLs syntax is

```
http://<deviceName>:<port>/webservice/<function>?<parameterDefinition>
```

with

- `deviceName` hostname or IP address of device
- `port` webservice port
- `function` name of function as per Table 7
- `parameterDefinition` ampersand & separated list of `parameterName=parameterValue` value pairs.

Table 6 presents default values of web service interface parameters. For a description on according configuration options refer to [1].

Table 6: Web service interface parameters default values

Parameter	Default value
Device hostname ¹³	VISULENS550_<serialnumber>
IP address	
Port	8080

Example:

On query

```
http://192.168.99.57:8080/webservice/getParameter?id=default1::lanSocketProtocol#default2::lanSocketProtocol
```

device replies something like

```
<reply status="200">  
  <parameter id="default1::lanSocketProtocol" value="DICOM"/>  
  <parameter id="default2::lanSocketProtocol" value="SOAP"/>  
</reply>
```

¹³ Parameter available starting with software version v1.0.2. Parameter can be controlled using webserver interface menu "Advanced settings".

Table 7: Web service interface function definitions

Function	Request Method	Parameter	Description
getParameter	GET		Function to retrieve current device parameter value(s) resp. value(s) stored in a named profile. If parameter <code>id</code> is undefined values of all current parameter values are replied.
		<code>id</code> (optional)	Name of queried device parameter. For a complete list of device parameter names refer to Appendix 2. Alternatively parameter value stored in default or user profile may be queried using syntax <code>profileName::parameterName</code> . Valid profile names are <code>default1</code> , <code>default2</code> and – depending on existence – <code>user1</code> , <code>user2</code> , <code>user3</code> , <code>user4</code> , <code>user5</code> To retrieve values for a list of parameters separate definitions by hash character #.
setMeasurement ¹⁴	GET		Function to set current device parameter value(s) resp. value(s) stored in a named profile using GET-mode.
		<code>id</code>	Name of set device parameter(s) of type Read/Write. For a complete list of device parameter names refer to Appendix 2. Read-only parameters are marked. Alternatively parameter value stored in default or user profile may be set using syntax <code>profileName::parameterName</code> . Valid profile names are <code>default1</code> , <code>default2</code> and – depending on existence – <code>user1</code> , <code>user2</code> , <code>user3</code> , <code>user4</code> , <code>user5</code> To set values for a list of parameters separate definitions by hash character #.

¹⁴ Function available starting with software version v1.0.2

Function	Request Method	Parameter	Description
		value	Value to be assigned to device parameter identified by id attribute. For a complete list of parameter options refer to Appendix 2. In case of setting list of parameters separate value definitions by hash character #.
	POST	Function to set current device parameter value(s) resp. value(s) stored in a named profile using POST-mode. Posted data is list of parameter nodes in format <pre><parameter id="..." value="..." /> <parameter id="..." value="..." /> ... <parameter id="..." value="..." /></pre>	
getMeasurement	GET	Function to retrieve measurement data in given format(s) addressed either by internal or external measurement ID(s).	
		id	External measurement ID of retrieved measurement. To retrieve several measurements separate definitions by hash character #.
		iid	Internal measurement ID of retrieved measurement as 6 digit integer with leading zeros. To retrieve several measurements separate definitions by hash character #.
		format	Format of retrieved measurement. Valid values are v1.6, v1.7, xmlJOIA, xmlZEISS, pdfStandard, pdfEnhanced, lpStandard, lpEnhanced
setMeasurementsList ¹⁵	POST	Function to transfer list of patient/customer data to device to setup device measurement schedule. Written list is limited to a size of 9 list elements. List format is <pre><measurement id="..."><patient>...</patient></measurement> <measurement id="..."><patient>...</patient></measurement> ...</pre>	

¹⁵ Function available starting with software version v1.0.2

Function	Request Method	Parameter	Description
			<pre><measurement id="..."><patient>...</patient></measurement></pre> <p>with id attribute defining entry of scheduled measurement as displayed on the device's GUI. Data within patient node is structured as follows:</p> <pre><patient> <nameFamily value="..." /> <nameGiven value="..." /> <gender value="..." /> <dateOfBirth value="..." /> <id value="..." /> <issuer value="..." /> </patient></pre>
setFile	POST		<p>Function to write file to device's system interface controller. There are two type of function calls</p> <ol style="list-style-type: none"> 1) File path and authentication signature provided as separate argument. Posted data is base64 encoded file content. 2) Posted data is XML-type function definition in the format <pre><function fid="setFile" host="SIC"> <signature> <!--base64 encoded function call authentication code--> </signature> <file id="filepath" type="binary"> <!--base64 encoded file contents--> </file> </function></pre>
		id (optional)	Destination file path for function calls of type 1)
		signature (optional)	Authentication signature for function calls of type 1)
update	POST		<p>Function to handle <i>first step</i> of device firmware update. Posted data is base64 encoded update file. Replied data contain update token in the syntax</p>

Function	Request Method	Parameter	Description
		<code><reply status="..." token="..." /></code>	
		storage	Define type of memory on where to buffer update data. Valid values are <ul style="list-style-type: none"> • <code>usb</code> data is buffer on device's USB memory stick • <code>lan</code> data is buffer on mounted network drive
	GET	Function to handle <i>second step</i> of device firmware update with the purpose to query result of update process. Upon success function replies something like <code><reply status="200" .../></code> . Upon failure returned status code and message node informs about according root cause.	
	token	Token to identify update process.	

5. Miscellaneous

5.1 Rounding

Device features parameters to activate or deactivate rounding of data output on level of format type. Rounding itself is defined by the step parameters step S/C and step P. Table 7 presents default values for all these parameters. For a description of rounding parameters including configuration options refer to [1].

Table 8: Device rounding parameters default values

Parameter	Default value 1	Default value 2
Rounding text formats	Enabled	Disabled
Rounding XML formats	Disabled	Disabled
Rounding PDF formats	Enabled	Enabled
Rounding DICOM formats	Disabled	Disabled
Step S/C	0.25	0.25
Step P	0.01	0.01

5.2 Device Serial Number

The device VISULENS 550 uses the 10-digit serial number format

Instrument Code				Hardware Code		Series Counter			
[N]	[N]	[N]	[N]	[N]	[N]	[N]	[N]	[N]	[N]

with the following definitions:

- Instrument Code:
 - Defining product type
 - Value 9714 corresponds to VISULENS 550
 - Value 9702 corresponds to VISULENS 500 (its predecessor)
- Hardware Code:
 - Pre-series devices: 00
 - Series devices: 10, incremented by 2 for each hardware change
- Series Counter:
 - initial value is production month of first device for given hardware version in format YYYYMM
 - incremented by 1 for each subsequent equivalent device
 - the first time the value reaches 9999 the counter is reset to 0000 and Hardware Code is incremented by 1. Reaching 9999 the second time the serial number is discontinued.

5.2.1 V1.6 Mapping

To ensure compliance to format “v1.6 Compatibility” serial numbers of VISULENS 550 are mapped to VISULENS 500 serial numbers and vice versa by (1) adding resp. subtracting value 40 to its Hardware Code and (2) keeping Series Counter.

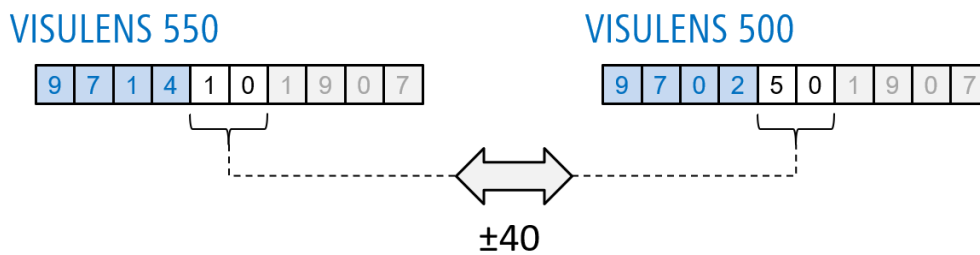


Figure 2: Example demonstrating v1.6 mapping of serial numbers

Appendices

Appendix 1: PDF printout examples

Appendix 2: Device Parameter Table

Customer Doe, John

We make you see again

Date of Birth 1970-07-15
Customer ID 30

Gender Male

Dr. med. Oculus
Practice: Demoroad 123, 0815 Testcity, NY



Examiner Mustermann, Max

Institution Plus Plus Optics

Measurement 19.07.2019 03:00:17 (PM) / ID 000015

Mode Standard

Step S/C 0.25D

Cyl Plus

Step P 0.01Δ

Prism P,B

Lensmeter							
OS left			OU both		OD right		
Refraction							
			PD 36.1mm	PD _{total} 65.9mm	PD 29.9mm		
S +2.00D	C +0.75D	A 44°	SE 2.38D		S +1.75D	C +0.75D	A 52° SE 2.13D
P 0.08Δ		B 124°			P 0.11Δ		B 120°

Transmission						
<380 nm Basic full	380 nm Regular none	400 nm Extended none	Protection Level UV	<380 nm Basic full	380 nm Regular full	400 nm Extended none

Comments:

Signature:



Customer Doe, John

We make you see again

Date of Birth 1970-07-15
Customer ID 30

Gender Male

Dr. med. Oculus
Practice: Demoroad 123, 0815 Testcity, NY



Examiner Mustermann, Max

Institution Plus Plus Optics

Measurement 19.07.2019 03:00:17 (PM) / ID 000015

Mode Standard Step S/C 0.25D Cyl Plus Step P 0.01Δ Prism P,B

Lensmeter									
OS left			OU both		OD right				
Refraction									
			PD 36.1mm	PD _{total} 65.9mm	PD 29.9mm				
S +2.00D	C +0.75D	A 44°	SE 2.38D		S +1.75D	C +0.75D	A 52°	SE 2.13D	
			P 0.08Δ	B 124°				P 0.11Δ	B 120°

Transmission							
<380 nm Basic full	380 nm Regular none	400 nm Extended none	Protection Level UV		<380 nm Basic full	380 nm Regular full	400 nm Extended none

Comments:

Signature:



Customer Doe, John

We make you see again

Date of Birth 1970-07-15
Customer ID 30

Gender Male

Dr. med. Oculus
Practice: Demoroad 123, 0815 Testcity, NY

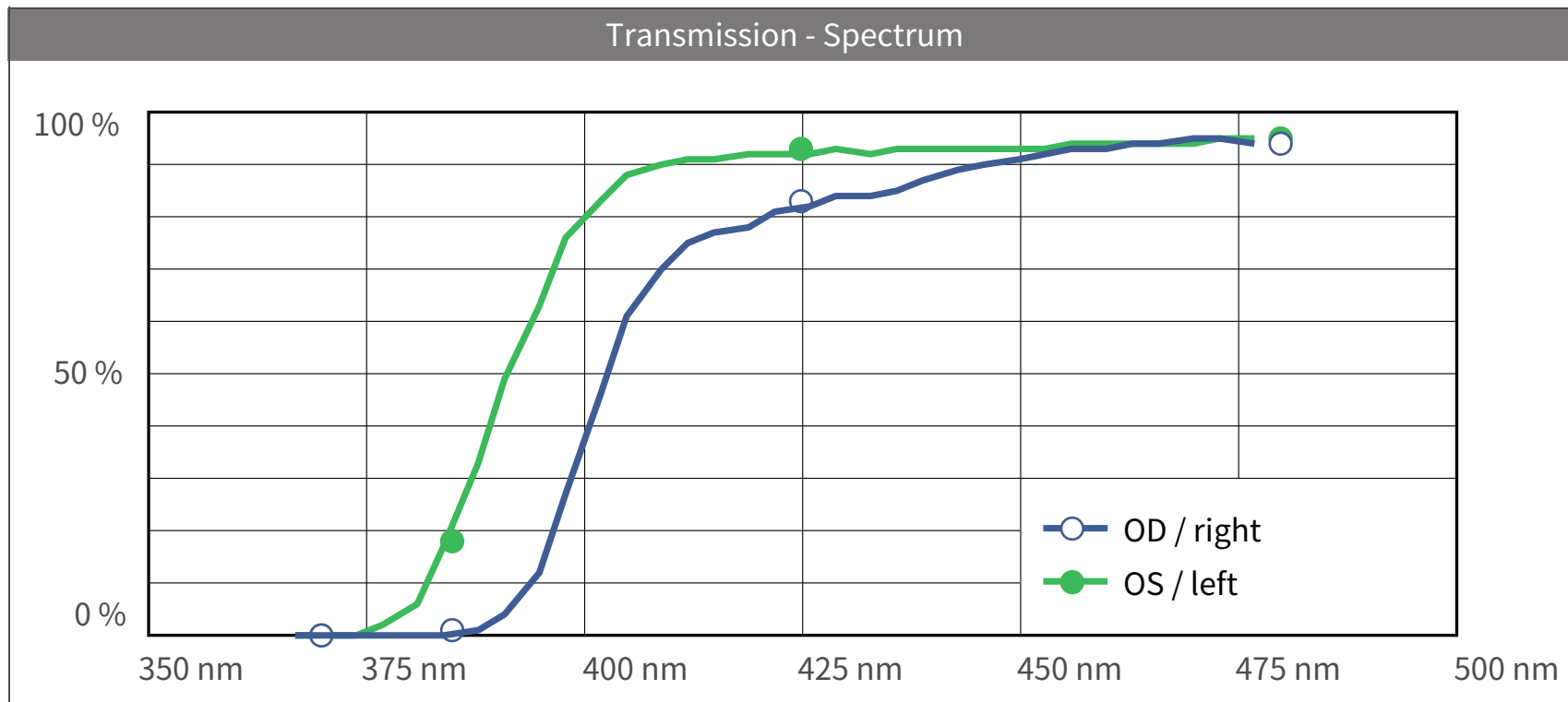


Examiner Mustermann, Max

Institution Plus Plus Optics

Measurement 19.07.2019 03:00:17 (PM) / ID 000015

Lensmeter		
OS left		OD right
Transmission - Samples		
0%	370nm	0%
18%	385nm	1%
93%	425nm	83%
95%	480nm	94%



Comments:

Signature:



Appendix 2: Device Parameter Table

Table: Read/Write parameters

Parameter Name	Parameter Options
abbe	Integer value in range of 30 to 60
beepTouch	none
beepMeasurement	softly
beepError	loudly
clAcquisitionDuration	Numeric value with one decimal digit in the range of 0.5 to 10.0 in 0.5 steps
clAcquisitionMode	shot manual fixed
clPrismScale	5 10 15 20
clStorageDurationAuto	Numeric value with one decimal digit in the range of 0.5 to 10.0 in 0.5 steps
clStorageMode	manual automatic
clTolerance	low mediumLow medium mediumHigh high
cylinderMode	+ - +-
dateDisplay	enabled disabled
dateFormat	DD.MM.YYYY YYYY-MM-DD MM/DD/YYYY
daMode	noAllocation STANDARD ENHANCED
daNeighbor	enabled disabled
daNeighborRoom	enabled disabled
daTime	enabled disabled

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options
daTimeLimit	Integer value between 0 and 1440 in 10 steps
deviceIdentifier	String with a maximum of 64 characters
lanConfigurationMode	DHCP Manual
lanDNS	String with a maximum of 24 characters
lanDNS1	String with a maximum of 15 characters; IP address in format n.n.n.n with n in range of 0 to 255 Read-only in case of DHCP-mode.
lanDNS2	
lanGateway	
lanIPAddress	
lanTimeServer	
lanSubnetMask	
lanFolder	enabled disabled
lanFolderShare	String with a maximum of 64 characters
lanFolderUser	String with a maximum of 32 characters
lanFolderInputPath	String with a maximum of 64 characters
lanFolderInputTimer	Numeric value with one decimal digit in the range of 0.5 and 300 in 0.5 steps.
lanFolderOutput1Path	String with a maximum of 64 characters
lanFolderOutput1Format	noFormat Identifiers of all installed text, PDF and XML formats
lanFolderOutput2Path	String with a maximum of 64 characters
lanFolderOutput2Format	noFormat Identifiers of all installed text, PDF and XML formats
language	German English Spanish French Italian Portuguese Chinese Japanese Korean Russian
languagePrintout	German English Spanish French Italian Portuguese

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options
lanSocket	enabled disabled
lanSocketPeer	String with a maximum of 24 characters
lanSocketPeerID	String with a maximum of 64 characters
lanSocketUser	String with a maximum of 32 characters
lanSocketFormat	noFormat Identifiers of all installed XML and DICOM formats
lanSocketProtocol	noProtocol SOAP DICOM
lanSocketProtocolScheme	icom forum
lanTime	enabled disabled
lanPrinter	enabled disabled
lanPrinterName	noPrinter Valid printer name as string with a maximum of 32 characters
lanPrinterTemplateDefault	noTemplate Identifiers of all installed PDF formats as string with a maximum of 32 characters
lanWebservice	enabled disabled
lanWebserviceUser	String with a maximum of 32 characters
lanWebservicePort	Positive integer value represented as string with maximum number of 8 characters.
modeAtStartup	Lastmode standard progressive cl uv
modePD	off standard averaging
pdfLogoFile	noLogo Valid logo name as string with a maximum of 32 characters
pinProtectionAdministration	enabled disabled
pinProtectionUsage	enabled

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options												
	disabled												
printer	enabled disabled												
printerTemplateDefault	noTemplate Identifiers of all installed LP formats as string with a maximum of 32 characters												
printerHeader	String with a maximum of 256 characters												
printerNotes													
printerFooter													
prismMode	pb xy dxdy												
prismSuppressionMode	threshold all none												
prismSuppressionThreshold	Numeric value with two decimal digits in the range of 0.00 to 1.00 in 0.01 steps												
progressiveStorageMode	manual automatic												
referenceWavelength	eLine dLine												
rfDefault	noOption												
rfOption1	return												
rfOption2	localPrinter												
rfOption3	localPrinterTemplate												
rfOption4	lanPrinter												
rfTemplate0	String with a maximum of 32 characters. Available template options depend on related parameter. Parameters relations: <table border="1" style="margin-left: 40px; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">↔</th> </tr> </thead> <tbody> <tr> <td>rfTemplate0</td> <td>rfDefault</td> </tr> <tr> <td>rfTemplate1</td> <td>rfOption1</td> </tr> <tr> <td>rfTemplate2</td> <td>rfOption2</td> </tr> <tr> <td>rfTemplate3</td> <td>rfOption3</td> </tr> <tr> <td>rfTemplate4</td> <td>rfOption4</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • if related parameter equals option localPrinterTemplate see options for parameter printerTemplateDefault 	↔		rfTemplate0	rfDefault	rfTemplate1	rfOption1	rfTemplate2	rfOption2	rfTemplate3	rfOption3	rfTemplate4	rfOption4
↔													
rfTemplate0		rfDefault											
rfTemplate1		rfOption1											
rfTemplate2		rfOption2											
rfTemplate3	rfOption3												
rfTemplate4	rfOption4												
rfTemplate1													
rfTemplate2													
rfTemplate3													
rfTemplate4													

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options
	<ul style="list-style-type: none"> • if related parameter equals option lanPrinterTemplate see options for parameter lanPrinterTemplateDefault • otherwise parameter is not evaluated
roomIdentifier	String with a maximum of 64 characters
screenSaver	5 15 30 disabled
screenBrightness	Integer value in range of 0 to 100
serial	enabled disabled
serialBaudrate	9600 19200 38400 57600 115200
serialNdataBits	7 8
serialNstopBits	1 2
serialParity	none odd even
serialHandshaking	none swXonXoff hwRtsCts
serialFormat	v1.6 v1.7
serialProtocol	Blind
serialProtocolScheme	blind
standardDetection	enabled disabled
standardDetectionSensitivity	low mediumLow medium mediumHigh high
standardDetectionSwitch	enabled disabled

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options
standardPrismScale	5 10 15 20
standardStorageDurationAuto	Numeric value with one decimal digit in the range of 0.5 to 10.0 in 0.5 steps
standardStorageMode	manual automatic
standardTolerance	low mediumLow medium mediumHigh high
stepSC	0.01 0.06 0.12 0.25
stepP	0.01 0.06 0.12 0.25
timeDisplay	enabled disabled
timeFormat	12h 24h
timeSummerFlag	enabled disabled
timeZone	UTC-12:00 UTC-11:00 UTC-10:00 UTC-09:00 UTC-08:00 UTC-07:00 UTC-06:00 UTC-05:00 UTC-04:00 UTC-03:30 UTC-03:00 UTC-02:00 UTC-01:00 UTC UTC+01:00

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options
	UTC+02:00 UTC+03:00 UTC+04:00 UTC+04:30 UTC+05:00 UTC+05:30 UTC+05:45 UTC+06:00 UTC+06:30 UTC+07:00 UTC+08:00 UTC+08:30 UTC+09:00 UTC+09:30 UTC+10:00 UTC+11:00 UTC+12:00 UTC+13:00 UTC+14:00
uiAllocation	confirm accept
uiCursorMode	lens prism
uiDataOverwrite	confirm accept
uiDirectControl	enabled disabled
uiPrismSuppression	confirm accept
uiSideAllocation	manual autoRL autoSRL
uiSidePattern	lr rl
uiSettingChanges	confirm accept
usbFolder	enabled disabled
usbFolderOutput1Path	String with a maximum of 64 characters
usbFolderOutput1Format	noFormat Identifiers of all installed text, PDF and XML formats
usbFolderOutput2Path	String with a maximum of 64 characters

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options												
usbFolderOutput2Format	noFormat Identifiers of all installed text, PDF and XML formats												
uvIntegrationMode	standard												
uvNsamples	Integer value in range of 0 to 8												
uvSample1	Integer value in the range of 365 to 480 in steps of 5												
uvSample2													
uvSample3													
uvSample4													
uvSample5													
uvSample6													
uvSample7													
uvSample8													
uvStyle	protection spectrum protectionSpectrum spectrumProtection												
wfDefault	noOption												
wfOption1	saveDataLocally												
wfOption2	allEnabledInterfaces												
wfOption3	localPrinter												
wfOption4	localPrinterTemplate lanPrinter lanPrinterTemplate												
wfTemplate0	String with a maximum of 32 characters. Available template options depend on related parameter. Parameters relations: <table border="1" style="margin-left: 40px;"> <thead> <tr> <th colspan="2" style="text-align: center;">↔</th> </tr> </thead> <tbody> <tr> <td>wfTemplate0</td> <td>wfDefault</td> </tr> <tr> <td>wfTemplate1</td> <td>wfOption1</td> </tr> <tr> <td>wfTemplate2</td> <td>wfOption2</td> </tr> <tr> <td>wfTemplate3</td> <td>wfOption3</td> </tr> <tr> <td>wfTemplate4</td> <td>wfOption4</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • if related parameter equals option localPrinterTemplate see options for parameter printerTemplateDefault • if related parameter equals option lanPrinterTemplate see options for parameter lanPrinterTemplateDefault • otherwise parameter is not evaluated 	↔		wfTemplate0	wfDefault	wfTemplate1	wfOption1	wfTemplate2	wfOption2	wfTemplate3	wfOption3	wfTemplate4	wfOption4
↔													
wfTemplate0		wfDefault											
wfTemplate1		wfOption1											
wfTemplate2		wfOption2											
wfTemplate3	wfOption3												
wfTemplate4	wfOption4												
wfTemplate1													
wfTemplate2													
wfTemplate3													
wfTemplate4													

Table: Read-only parameters

Appendix 2: Device Parameter Table

Parameter Name	Parameter Options
activeID	String with a maximum of 64 characters
dateLocal	String with a maximum of 10 characters
instrumentCode	String with a maximum of 4 characters
macAddress	String with a maximum of 17 characters
serialnumber	String with a maximum of 10 characters
statusSIC	String with a maximum of 20 characters
statusSerial	
statusUsbFolder	
statusLanTime	
statusLanFolder	
statusLanSocket	
statusLanPrinter	
statusLocalPrinter	
timeLocal	
versionDC	String with a maximum of 15 characters
versionDC_major	String with a maximum of 4 characters
versionDC_minor	
versionDC_bugfix	
versionSIC	String with a maximum of 15 characters
versionSIC_major	String with a maximum of 4 characters
versionSIC_minor	
versionSIC_bugfix	
weekday	Integer value between 0 and 6