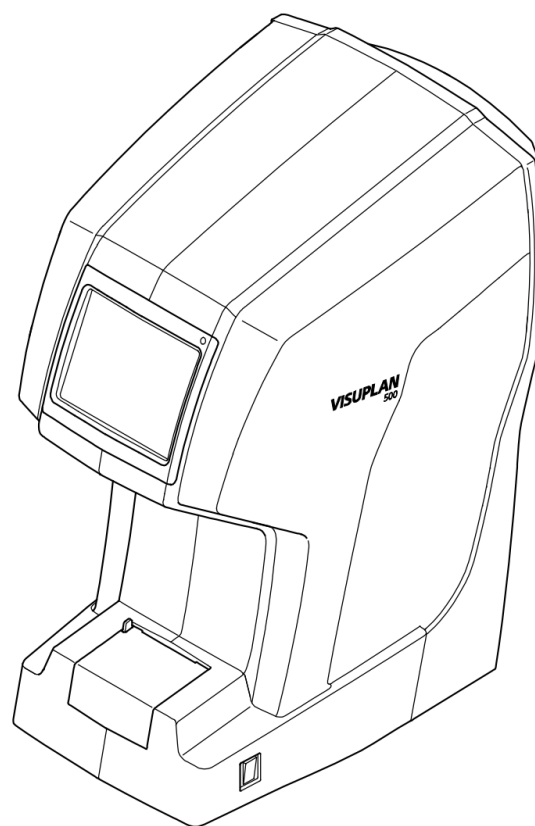


# VISUPLAN 500

## Non-Contact Tonometer

Interface Definition  
Version 1.4





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## 1. General

### 1.1 Purpose

This documentation specifies the interface for data output from the VISUPLAN 500.

### 1.2 Definitions and Acronyms

OS	Oculus sinister, left eye
OD	Oculus dexter, right eye
AVE	Average
EMR	Electronic medical record
IOP	Intra ocular pressure
TBD	To be defined

### 1.3 Tables

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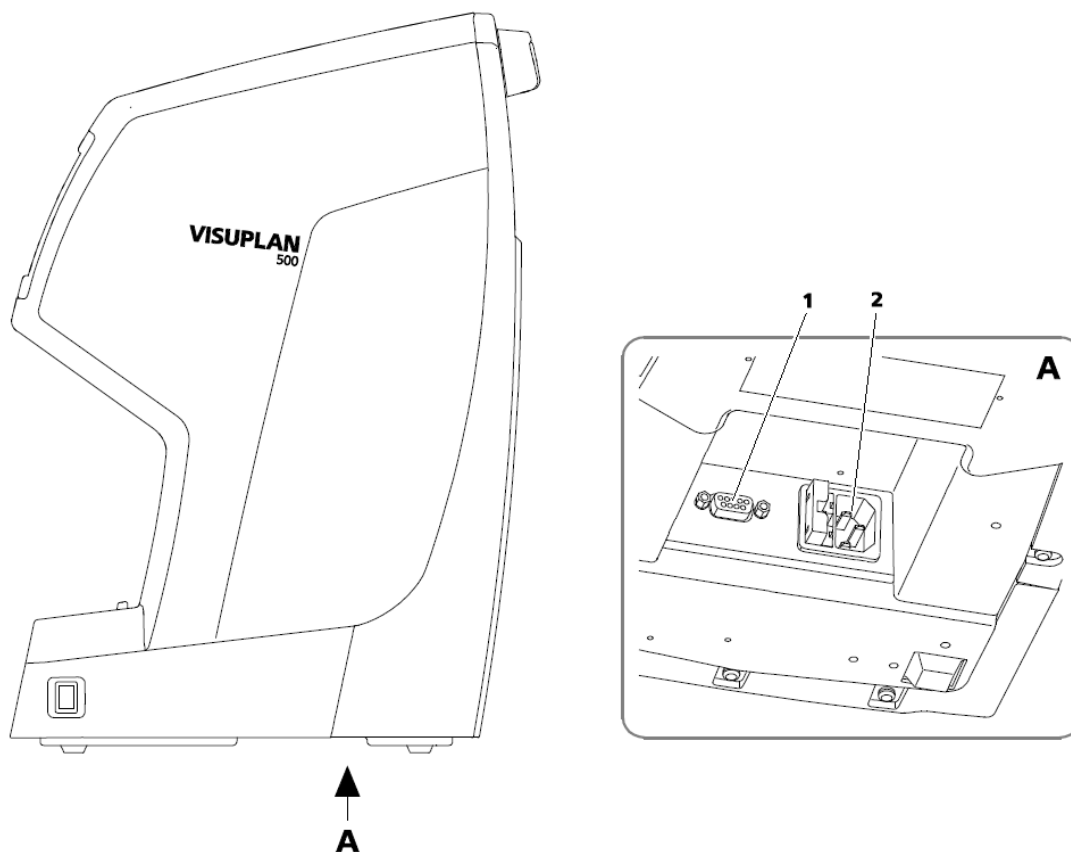
### 1.4 Figures

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## 2. Intended Use

A non-contact tonometer is used to determine the intraocular pressure of the human eye to assist optometrists and ophthalmologists in diagnosing and treating ocular pathologies.

### 3. Connectors



**Figure 1 Type and connector location**

1	Connector DB9 female	Serial interface RS232
2	IEC 60320 connector	Power supply
3		
4		
5		

**Table 1 Available connectors and data interfaces**

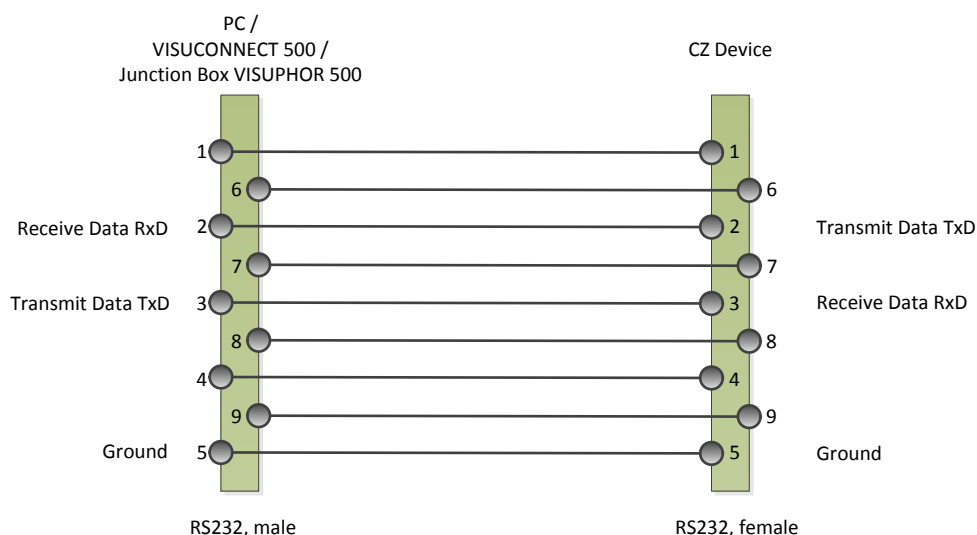
#### 3.1 RS232 Connector Pin Setup

The VISUPLAN 500 supports data output operations via the RS-232 serial interface via a female DB9-type connector. The pin configuration of this connector is shown in Table 4.

Pin	Signal	Pin	Signal
1	-	6	-
2	Transmit Data	7	-
3	Receive Data	8	-
4	-	9	-
5	Signal ground		

**Table 2 Device serial port pin configuration**

N.B.: Connecting to a standard PC should be possible through a standard commercial version of the shelf 1:1 cable i.e. a cable, with straight through connections, not crossing transmit and receive lines 2 (Received Data) and 3 (Transmitted Data), respectively (see Figure 2).



**Figure 2 RS-232 DB 9 pin configuration**

### 3.2 Serial Interface Setup

Baud Rate	19200
Data Bits	8
Parity Bit	No Parity Bit
Stop Bits	1 Stop Bit
Code:	ASCII Code (encoded as HEX)

**Table 3 Default serial interface setup**

Handshaking is not supported by the device

### 3.3 Data Transmission Mode

The data is transferred via serial interface as soon as the user pushes the "Print" button located on the device. The mode of data transfer is push, i.e. an EMR system cannot initiate data queries from the device itself.

## 4. Definition of Serial Numbers

### 4.1 Overall Concept

For each initial device of a product variant a 10 digit *starting number* is defined according to the rules described in the following section. This number is then used to initialize a counter that rises by increments of one for all subsequent equivalent devices.

### 4.2 Starting Number

The structure of the starting number is defined as per the following definition:

1	2	3	4	5	6	7	8	9	10
<b>P</b>	<b>P</b>	<b>P</b>	<b>P</b>	<b>V</b>	<b>V</b>	<b>Y</b>	<b>Y</b>	<b>M</b>	<b>M</b>
<b>Product code</b>				<b>Product variant</b>		<b>Current calendar</b>		<b>Current month</b>	

**Table 4 Starting number definition**

<b>Placeholder</b>	<b>Definition</b>	<b>Input</b>
PPPP	Product code, for VISUPLAN 500	9703
VV	Product variant/version	Pre-series, start with: 00 Series, start with: 10, for each modification 02 is added, i.e. 10, 12, 14, etc.
YY	Last two digits of calendar year of production	13 stands for 2013
MM	Month of production	i.e. 10 stands for October

**Table 5 Placeholders for starting number definition**



## 5. Data Format

### 5.1 Obtained Data Overview

All transferred data is hexadecimal encoded. The following data is obtained using the VISUPLAN 500. In the case of a single measurement, the average IOP equals the value of the measured IOP of the corresponding eye. The data stream length remains unchanged regardless of the user-selected measurement mode.

Dataset	Length in Bytes
Device name	14
Time stamp	18
Measured eye / User-selected unit	8
Right IOP (mmHg) / Number of measurements	34
Right IOP (kPa)	36
Left IOP (mmHg) / Number of measurements	34
Left IOP (kPa)	36
Device serial number	14
<b>Total</b>	<b>194</b>

**Table 6 Dataset lengths**

### 5.2 Definitions

Placeholder	Definition						
[N]	Number [0...9] , if not set: hex: 2A, int: 42						
[H][H]	Hexadecimal value, [H] represents a value between [0...9] or a character between [A...F]						
[X]	Character between [0...9] and [A...Z]						
[E][E]	Defines mode of measurement. Allowed characters: [O][S] ... OS is measured [O][D] ... OD is measured [B][O] ... Both eyes are measured						
[U][U]	[H][G] ... mmHg [P][A] ... kPa						
[M]	[1 ... 4], number of measurements						
[B]	<table border="0"> <tr> <td>{,}</td> <td>curly brackets: indicate a measurement value that the device rates as faulty because it differs from its measurement series more than 5mmHg</td> </tr> <tr> <td>0x20</td> <td>white space: indicates reliable measurement values</td> </tr> <tr> <td>*</td> <td>asterisk: indicates no measurement value available</td> </tr> </table>	{,}	curly brackets: indicate a measurement value that the device rates as faulty because it differs from its measurement series more than 5mmHg	0x20	white space: indicates reliable measurement values	*	asterisk: indicates no measurement value available
{,}	curly brackets: indicate a measurement value that the device rates as faulty because it differs from its measurement series more than 5mmHg						
0x20	white space: indicates reliable measurement values						
*	asterisk: indicates no measurement value available						

**Table 7 Data format definitions**

If a data set is not defined, i.e. only one eye is measured, the data package values are set to the **default value hex 2A (int: 42)**.

Fractional portion is separated by a period (Hex: 0x2E, int: 46), i.e. 2\_50.

### 5.3 Control Characters

Character	Hex/Int	Definition
CR	0D / 13	Beginning / End of data set or data tag.
LF	0A / 10	Beginning of data set.
EOT	04 / 4	Number [0...9] , if not set: hex: 2A, int: 42.
Not Set (*)	2A / 42	Measurement value not applicable.

**Table 8** Data format definitions

## 6. Data Stream

### 6.1 Device Name

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Device Name													
Data Stream (Hex)	0D	0A	56	49	53	55	50	4C	41	4E	35	30	30	0D
Character (ASCII)	CR	LF	V	I	S	U	P	L	A	N	5	0	0	CR
Integer (Dezimal)	13	10	86	73	83	85	80	76	65	78	53	48	48	13

### 6.2 Time Stamp

	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Time Stamp		Year				Month		Day		Hour		Minute		Seconds			
Data Stream (Hex)	20	0D	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	0D
Character (ASCII)		CR	[N]	[N]	[N]	[N]	[N]	[N]	[N]	[N]	CR	[N]	[N]	[N]	[N]	[N]	[N]	CR
Integer (Dezimal)	32	13									13							13

### 6.3 Measured Eye, measurement unit

	33	34	35	36	37	38	39	40
	Measured Eye		Eye			User selected Unit		
Data Stream (Hex)	20	0D	[H][H]	[H][H]	0D	[H][H]	[H][H]	0D
Character (ASCII)		CR	[E]	[E]	CR	[U]	[U]	CR
Integer (Dezimal)	32	13			13			13

### 6.4 Right Eye IOP (mmHg)

	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
	Right Eye (mmHg)				Measurements	IOP 1 (mmHg)					IOP 2 (mmHg)						
Data Stream (Hex)	20	0D	4F	44	0D	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	0D
Character (ASCII)		CR	O	D	CR	[M]	CR	[B]	[N]	[N]	[B]	CR	[B]	[N]	[N]	[B]	CR
Integer (Dezimal)	32	13	79	68	13		13					13					13

	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
	IOP 3 (mmHg)				IOP 4 (mmHg)					IOP AVG (mmHg)							
	[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D
	[B]	[N]	[N]	[B]	CR	[B]	[N]	[N]	[B]	CR	[B]	[N]	[N]	.	[N]	[B]	CR
					13					13				46			13

## 6.5 Right Eye IOP (kPa)

	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91		
	Right Eye (kPa)					IOP 1 (kPa)					IOP 2 (kPa)								
Data Stream (Hex)	20	0D	4F	44	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D		
Character (ASCII)		CR	O	D	CR	[B]	[N]	.	[N]	[B]	CR	[B]	[N]	.	[N]	[B]	CR		
Integer (Dezimal)	32	13	79	68	13			46			13			46			13		
	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
	IOP 3 (kPa)					IOP 4 (kPa)					IOP AVG (kPa)								
	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	[H][H]	0D
	[B]	[N]	.	[N]	[B]	CR	[B]	[N]	.	[N]	[B]	CR	[B]	[N]	.	[N]	[N]	[B]	CR
			46			13			46			13			46				13

## 6.6 Left Eye IOP (mmHg)

	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
	Left Eye (mmHg)				Measurements	IOP 1 (mmHg)				IOP 2 (mmHg)							
Data Stream (Hex)	20	0D	4F	53	0D	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	0D
Character (ASCII)		CR	O	S	CR	[M]	CR	[B]	[N]	[N]	[B]	CR	[B]	[N]	[N]	[B]	CR
Integer (Dezimal)	32	13	79	83	13		13					13					13

128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
IOP 3 (mmHg)				IOP 4 (mmHg)						IOP AVG (mmHg)						
[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	[H][H]	0D	[H][H]	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D
[B]	[N]	[N]	[B]	CR	[B]	[N]	[N]	[B]	CR	[B]	[N]	[N]	.	[N]	[B]	CR
				13					13				46			13

### 6.7 Left Eye IOP (kPa)

	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161
	Left Eye (kPa)				IOP 1 (kPa)						IOP 2 (kPa)						
Data Stream (Hex)	20	0D	4F	53	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D
Character (ASCII)		CR	O	S	CR	[B]	[N]	.	[N]	[B]	CR	[B]	[N]	.	[N]	[B]	CR
Integer (Dezimal)	32	13	79	83	13			46			13			46			13

162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
IOP 3 (kPa)					IOP 4 (kPa)						IOP AVG							
[H][H]	[H][H]	2E	[H][H]	[H][H]	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	0D	[H][H]	[H][H]	2E	[H][H]	[H][H]	[H][H]	0D
[B]	[N]	.	[N]	[B]	CR	[B]	[N]	.	[N]	[B]	CR	[B]	[N]	.	[N]	[N]	[B]	CR
		46			13			46			13			46				13

## 6.8 Device Serial Number

	181	182	183	184	185	186	187	188	189	190	191	192	193	194
	SN													
Data Stream (Hex)	<b>20</b>	<b>0D</b>	<b>39</b>	<b>37</b>	<b>30</b>	<b>33</b>	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	[H][H]	<b>0D</b>	<b>04</b>
Character (ASCII)		CR	9	7	0	3	[X]	[X]	[X]	[X]	[X]	[X]	CR	EOT
Integer (Dezimal)	32	13	57	55	48	51							13	4

## 7. Example Data

This scenario is based on three measurements of the right eye

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Text	CR	LF	V	I	S	U	P	L	A	N	5	0	0	CR		CR	2	0	1	3	0	3	2	6	CR
Int	13	10	86	73	83	85	80	76	65	78	53	48	48	13	32	13	50	48	49	51	48	51	50	54	13
Hex	0D	0A	56	49	53	55	50	4C	41	4E	35	30	30	0D	20	0D	32	30	31	33	30	33	32	36	0D

	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	5	1	6	2	3	CR		CR	O	D	CR	H	G	CR		CR	O	D	CR	3	CR		1	2	
49	53	49	54	50	51	13	32	13	79	68	13	72	71	13	32	13	79	68	13	51	13	32	49	50	
31	35	31	36	32	33	0D	20	0D	4F	44	0D	48	47	0D	20	0D	4F	44	0D	33	0D	20	31	32	

	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
	CR		1	1		CR	{	1	3	}	CR	*	*	*	*	CR		1	2	.	0		CR		
32	13	32	49	49	32	13	123	49	51	125	13	42	42	42	42	13	32	49	50	46	48	32	13	32	
20	0D	20	31	31	20	0D	7B	31	33	7D	0D	2A	2A	2A	2A	0D	20	31	32	2E	30	20	0D	20	

	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
CR	O	D	CR		1	.	5		CR		1	.	6		CR	{	1	.	7	}	CR	*	*	.	
13	79	68	13	32	49	46	53	32	13	32	49	46	54	32	13	123	49	46	55	125	13	42	42	46	
0D	4F	44	0D	20	31	2E	35	20	0D	20	31	2E	36	20	0D	7B	31	2E	37	7D	0D	2A	2A	2E	

	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
*	*	CR		1	.	6	0		CR		CR	O	S	CR	0	CR	*	*	*	*	CR	*	*	*	
42	42	13	32	49	46	54	48	32	13	32	13	79	83	13	48	13	42	42	42	42	13	42	42	42	
2A	2A	0D	20	31	2E	36	30	20	0D	20	0D	4F	53	0D	30	0D	2A	2A	2A	2A	0D	2A	2A	2A	



126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
*	CR	*	*	*	*	CR	*	*	*	*	CR	*	*	*	.	*	*	CR		CR	O	S	CR	*
42	13	42	42	42	42	13	42	42	42	42	13	42	42	42	46	42	42	13	32	13	79	83	13	42
2A	0D	2A	2A	2A	2A	0D	2A	2A	2A	2A	0D	2A	2A	2A	2E	2A	2A	0D	20	0D	4F	53	0D	2A

151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
*	.	*	*	CR	*	*	.	*	*	CR	*	*	.	*	*	CR	*	*	.	*	*	CR	*	*
42	46	42	42	13	42	42	46	42	42	13	42	42	46	42	42	13	42	42	46	42	42	13	42	42
2A	2E	2A	2A	0D	2A	2A	2E	2A	2A	0D	2A	2A	2E	2A	2A	0D	2A	2A	2E	2A	2A	0D	2A	2A

176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194
.	*	*	*	CR		CR	9	7	0	3	1	0	1	3	0	9	CR	EOT
46	42	42	42	13	32	13	57	55	48	51	49	48	49	51	48	57	13	4
2E	2A	2A	2A	0D	20	0D	39	37	30	33	31	30	31	33	30	39	0D	04

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VISUPLAN 500 Interface Definition  
Version 1.4  
Specifications subject to changes