

# **Data analysis software for PC**

## **Operation manual**

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## Features

This software is intended to analyzing FMD data which measured by UNEXEF. FMD value (Vasodilatation Rate) is extremely significant index to evaluate vascular endothelial function.

The information showing the endothelial reaction characteristics included in the trend of vascular diameter and blood flow can be obtained.

Using this software, the information can be taken out easily and used effectively.

- Computer must meet certain requirements in order to install the software.

Recommended requirements

OS: Windows 7,8,10

CPU: Core Duo 1.6GHz or higher

HDD: 1GB or higher

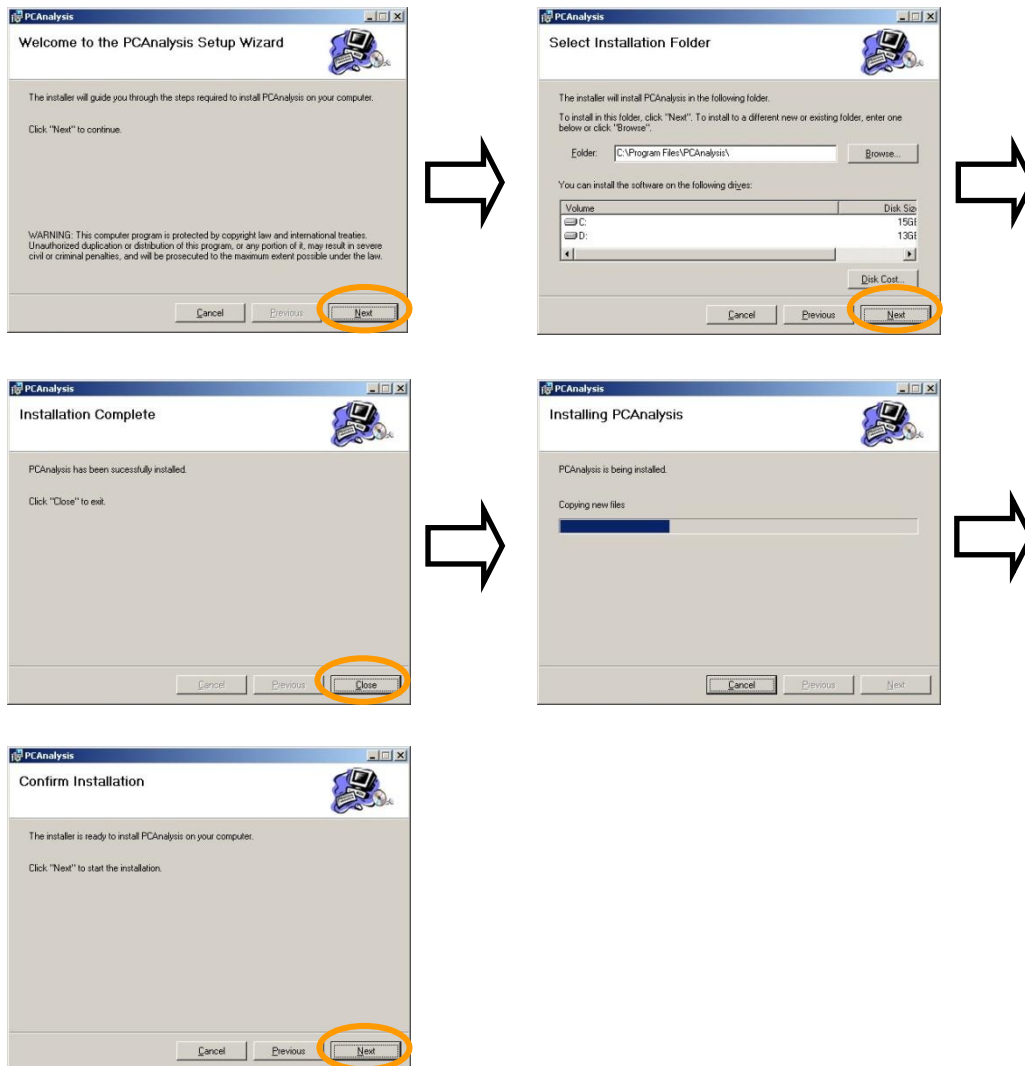
RAM: 512MB or higher

Display: 1024x768 or higher

- This software is appropriate for the data of certain UNEXEF versions.  
UNEX EF38G Ver.8.20.XX

## 1. Software Installation

Click the installer [PCAnalysisXXXX(.msi)] to install analysis software after inserting PC Analysis USB flash memory. Then follow the direction.



[Shortcut to PCAnalysis. Exe] will be appeared on the desktop.



## 2. Measurement data collection

Collect data from UNEXEF. (May vary due to the type of EF)

1. Insert an external memory device to the USB slot on UNEXEF.
2. Click [Result List] or [Individual Record] tab.

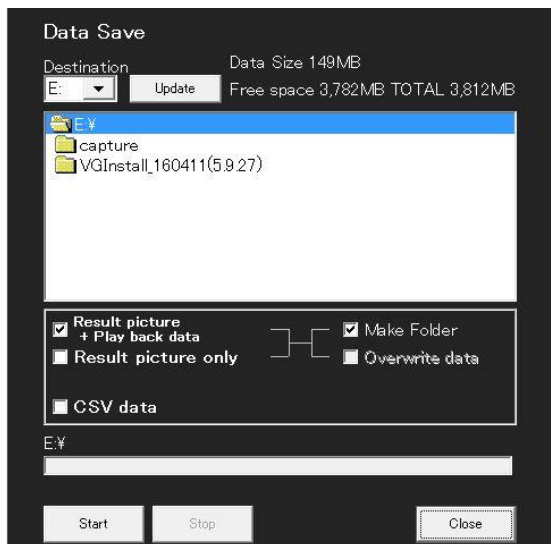
The selected data will be colored in blue.

	Date	ID	Name	Age	Sex	Base	Max	FMD	Method
49	2016/06/23 14:19	12345	SHO	36	M	3.92	4.10	4.6	FMDs
50	2016/06/23 14:07	1234567	SZK SZK	32	M	4.91	5.02	2.2	FMDs
51	2016/06/23 13:54	1234567	SZK SZK	32	M	4.79	5.05	5.4	FMDs
52	2016/06/22 18:09	123456	OKU OKU	27	M	3.93	4.39	11.7	FMD
53	2016/06/22 16:25	123456789	TDK	20	M	3.78	4.02	6.1	FMDs
56	2016/06/22 16:05	123456789	TDK	20	M	4.80	4.99	4.0	FMDs
57	2016/06/22 15:51	12345678	MTST	15	M	3.63	3.74	3.0	FMDs
58	2016/06/22 15:39	12345678	MTST	15	M	3.46	3.77	9.0	FMDs
59	2016/06/22 15:16	1234567	SZK SZK	32	M	3.72	3.76	1.1	FMDs
60	2016/06/22 15:05	1234567	SZK SZK	32	M	4.90	5.15	5.1	FMDs
61	2016/06/22 14:51	123456	OKU OKU	27	M	4.25	4.31	1.4	FMDs
62	2016/06/22 14:38	123456	OKU OKU	27	M	4.28	4.55	6.3	FMDs

Click to select data.

3. Click [Save] on the result list.

The data save sheet below shows up.



- ① Select the destination drive.
- ② Check [Result picture + Play back data].
- ③ Click [Start]
- ④ Click [Close] after data saving.

The data will be saved in the folder named

DATA\_BACK\_<year month date>\_<time>\_<ID>.

\*When [Make Folder] is chosen, the folder name will be

Folder\_<year month date>\_<time>.

### 3. Data analysis

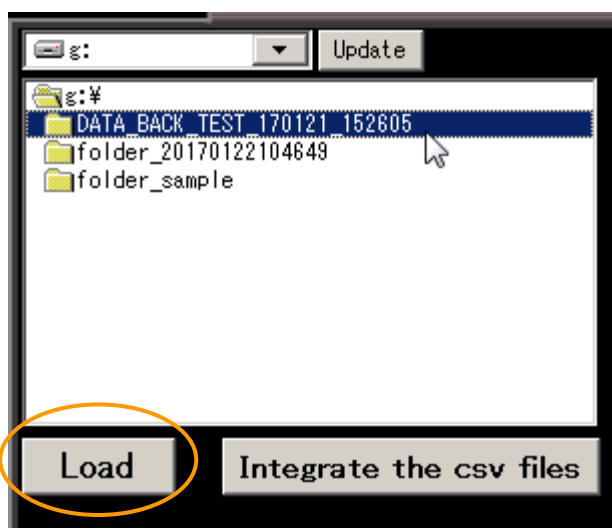
#### 3.1 Measurement data loading.

1. Insert an external device used in data collection to PC.
2. Click [Shortcut to PCAnalysis] on the desktop.

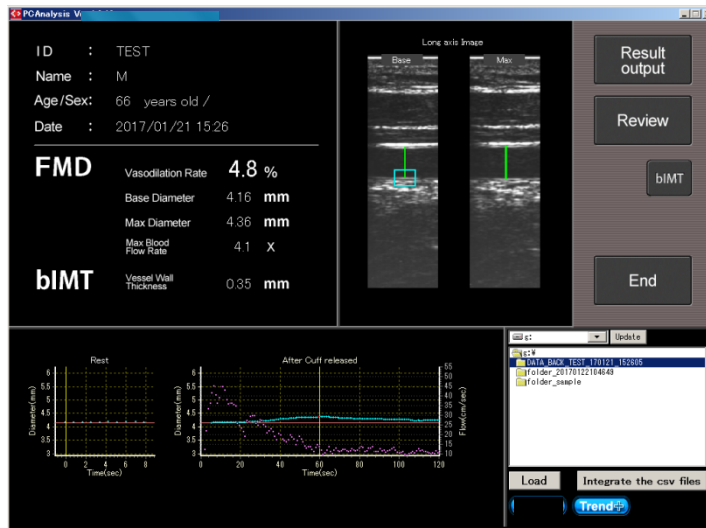
An initial screen of PC Analysis shows up.



3. Select the destination drive and click/select data. Click [Load].



4. The result of the selected data will be appeared after load  
Then click [Trend] to start analyze the data.



### 3.2. Export measurement numeric data to spreadsheet.

Click [Result output] and select the destination folder.

The measured result is saved in a CSV file.

File name: [ID] \_ [Date] \_Detail.csv

Items: [Patient Info]

ID,

Name,

Sex,

Method,

Date,

[FMD data]

Baseline(mm),

Max diameter(mm),at(s),

Vasodilation Rate{base}(%),

Rest diameter(mm),

Vasodilation Rate{rest}(%),

[Blood Flow]

Max Blood Flow MAG(x)

Rest Blood Flow(cm/s)

Max Blood Flow(cm/s),at(s)

## [Patient Info2]

Heartrate(bpm)

Sys(mmHg),Dia(mmHg)

Age,Year,Month,Day

## [Med.history]

Hypertension, Diabetes, Hyperlipidemia, COPD, Heart Failure, Stroke, CKD, IGT, Family history, AF, CAD

## [Daily Habit]

Smoking, Drinking, Exercise, Menopause

## [Measurement Info]

Operator

Measured Arm

Food,Intake, time(hrs ago)

Meds. , Intake time(hrs ago)

Smoking, Intake time(hrs ago)

Caffein, Intake time(hrs ago)

Menstruation

## [Optional Measurements]

bIMT(mm)

L-FMC(%)

## [Beat-by-beat data]

Elapsed time(sec)

Diameter(mm)

Correction(mm)

BloodFlowVelocity(cm/sec)

**3.3. Export multiple measurement data to single spreadsheet.**

Click [Integrate the csv files] and select the destination folder.

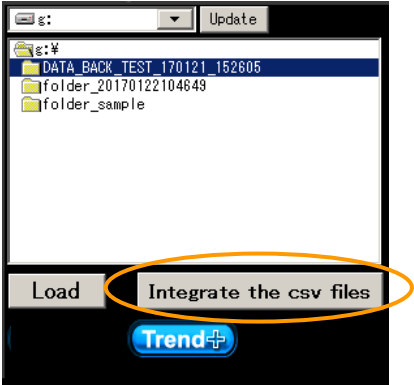
The measured result is saved in a CSV file combined with another data.

(This file does not include [beat-by-beat] data.)

File name: INTEGRATE\_[the current date].csv

Items: Same as 3.2 ,except for [beat-by-beat data]





Each analyzed CSV file in the PCAnalysis folder

A	B	C	D	E	F	G	H	I
1	PatientID	Measureme	Rest	Diams	Max	Diams	at	
2	KD-R	#####	4.3	4.38	68.5	1.9	4.31	1.6
3								0.36

A	B	C	D	E	F	G	H	I
1	PatientID	Measureme	Rest	Diams	Max	Diams	at	
2	KD-R	#####	4.31	4.5	69.3	4.4	4.31	4.4
3								0.31

A	B	C	D	E	F	G	H	I
1	PatientID	Measureme	Rest	Diams	Max	Diams	at	
2	MTN-R	#####	4.58	4.94	64.2	7.9	4.63	6.7
3								0.23

A	B	C	D	E	F	G	H	I
1	PatientID	Measureme	Rest	Diams	Max	Diams	at	
2	MTST-R	#####	3.29	3.55	69.7	7.9	3.3	7.6
3								0.19



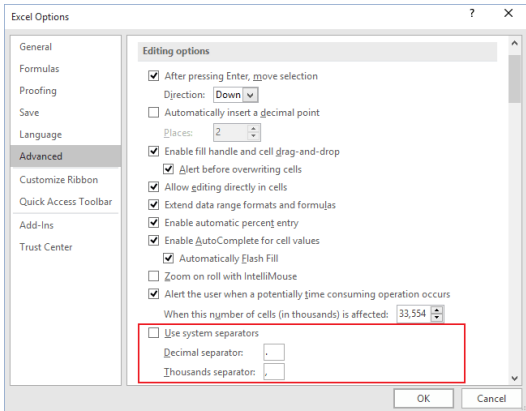
Into one File

A	B	C	D	E	F	G	H	I
1	PatientID	Measureme	Rest	Diams	Max	Diams	at	
2	KD-R	#####	4.3	4.38	68.5	1.9	4.31	1.6
3	KD-R	#####	4.31	4.5	69.3	4.4	4.31	4.4
4	MTN-R	#####	4.58	4.94	64.2	7.9	4.63	6.7
5	MTST-R	#####	3.29	3.55	69.7	7.9	3.3	7.6
6	MYSK-R	#####	4.17	4.34	69.8	4.1	4.17	4.1
7	MYSK-R	#####	4.17	4.4	64.7	5.5	4.19	5
8	TNK-R	#####	3.02	3.26	47.2	7.9	3.05	6.9
9	TNK-R	#####	3.02	3.31	65.5	9.6	3.06	8.2
10	WD-R	#####	3.76	4.06	69	8	3.81	6.6
11	WD-R	#####	3.76	4	69.1	6.4	3.78	5.8
12								0

**Note**

Applications such as Microsoft Excel are capable of reading data in CSV format. However, CSV file is described with dot as decimal separator. Occasionally, It need to change decimal separator to comma, it depending on the region or OS settings.

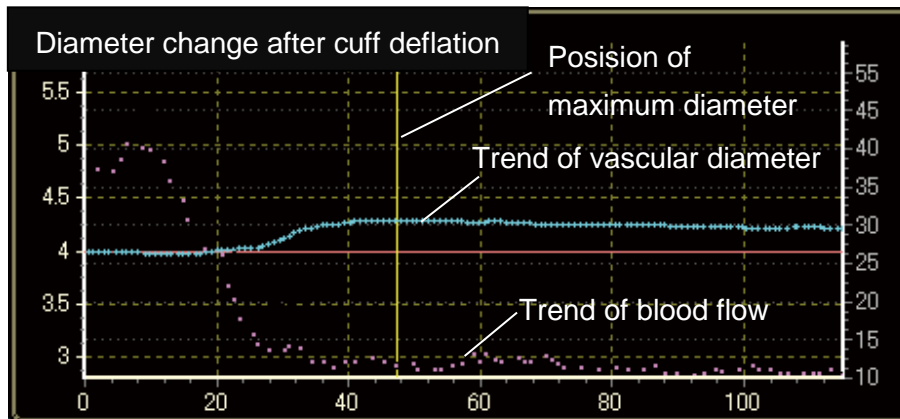
Example of Settings dialog.  
Excel 2010-2016  
Option – Advanced



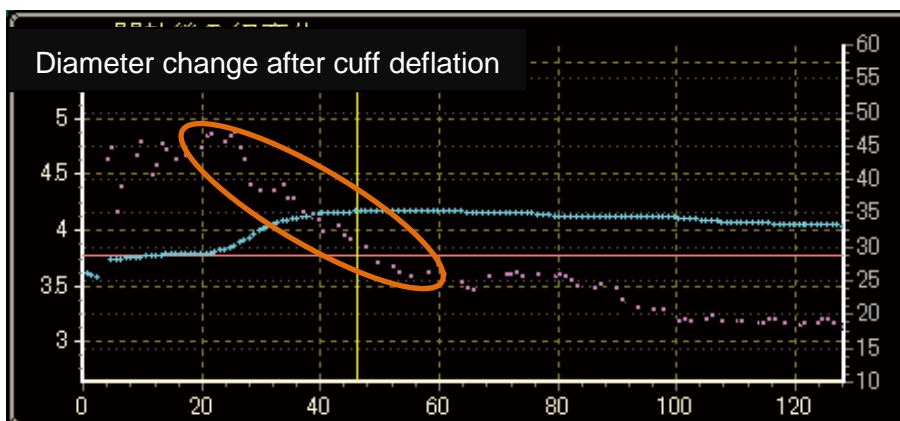
## 4. Trend analysis

### 4.1 Characteristics of the trend graph

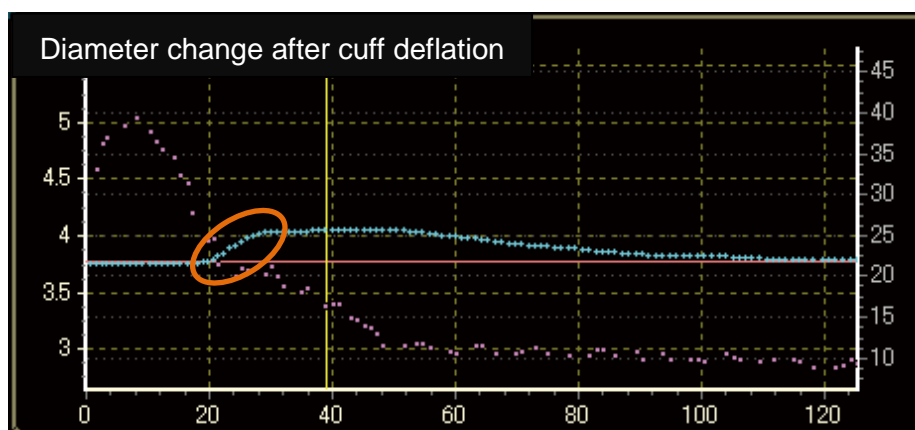
Even if the same FMD value, the trend form of vascular diameter is different.



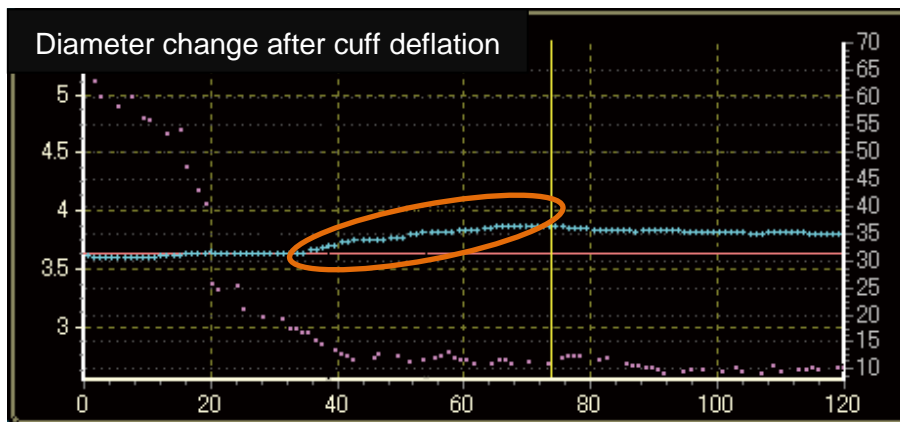
The example of long-lasting increase in blood flow.



The example which the time of start dilation and maximum diameter is earlier.



The example which the time of start dilation and maximum diameter is delayed.



## 4.2 Trend data analysis

The picture below shows up after [Trend+] button is clicked. [Analysis] button is blinking in green. Click it to start.



The picture below is a sample of the trend analysis results.

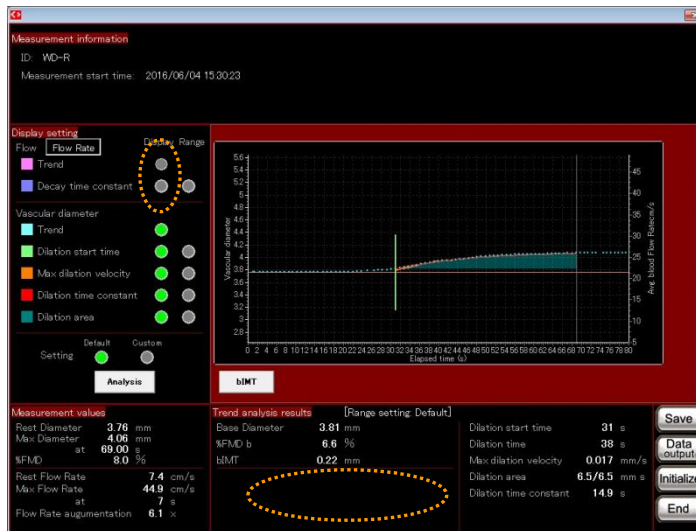


Click {Save} if necessary.

### 4.3 Modification of analysis condition.

#### 4.3.1 Select display

Click any indexes to delete from the analysis result.



#### 4.3.2 Change the analysis range

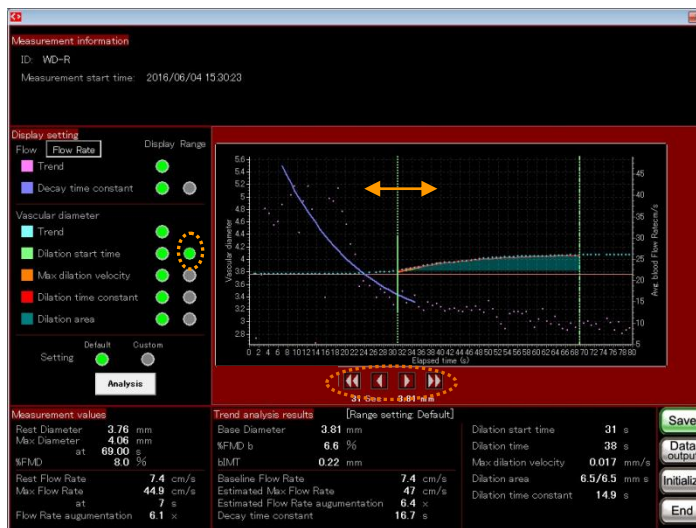
Click a range button to see its analysis range.

Check the range if it is appropriate.

Use the cursors to change the range.

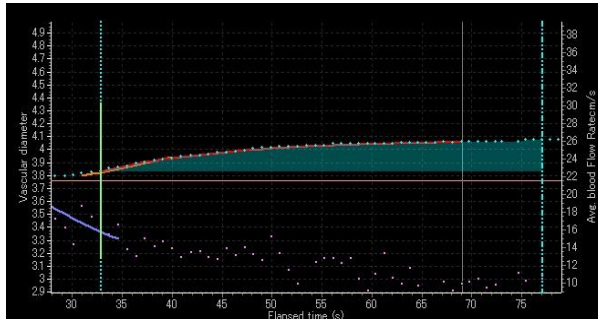
[Analysis] blinks again.

Click it and result will be updated.



### 4.3.3. Enlarge the trend graph

Right click the mouse and drag the graph to enlarge.



### 4.3.4 If analysis failed

Some adjustments will be needed when a message show up .

Measurement values		Trend analysis results [Range setting: Default]		Dilation parameters	
Base Diameter	4.7 mm	Base Diameter	4.7 mm	Dilation start time	26.9 s
%FMD b	3 %	%FMD b	3 %	Dilation time	23.8 s
bIMT	0.24 mm	bIMT	0.24 mm	Max dilation velocity	0.e+0 mm/s
Baseline Flow Rate	8.6 cm/s	Baseline Flow Rate	8.6 cm/s	Dilation area	2.1/2.1 mm <sup>2</sup>
Estimated Max Flow Rate	24.2 cm/s	Estimated Max Flow Rate	24.2 cm/s	Dilation time constant	12.4 s
Estimated Flow Rate augmentation	2.8 x	Estimated Flow Rate augmentation	2.8 x		
Decay time constant	5.5 s	Decay time constant	5.5 s		

Ex) This message tells that the range for the max dilation velocity needs to be adjusted.

Measurement values		Trend analysis results [Range setting: Default]		Dilation parameters	
Rest Diameter	4.76 mm	Base Diameter	4.7 mm	Dilation start time	26.9 s
Max Diameter	4.84 mm	%FMD b	3 %	Dilation time	23.8 s
at	50.70 s	bIMT	0.24 mm	Max dilation velocity	0.e+0 mm/s
	1.7 %	Baseline Flow Rate	8.6 cm/s	Dilation area	2.1/2.1 mm <sup>2</sup>
Rest Flow Rate	8.6 cm/s	Estimated Max Flow Rate	24.2 cm/s	Dilation time constant	12.4 s
Max Flow Rate	17.9 cm/s	Estimated Flow Rate augmentation	2.8 x		
at	1 s	Decay time constant	5.5 s		
Flow Rate augmentation	2.1 x				

Click the range for the max dilation velocity and adjust the range.

Then click [Analysis] again.



The max dilation velocity is now recalculated.

## 4.4 Analysis Items

### Maximum diameter time

The time until maximum diameter after cuff deflation.

### Dilation start time

The time until starting dilation of diameter after cuff deflation.

### Maximum dilation velocity

The maximum value of dilation velocity of diameter from starting dilation to maximum diameter.

### Dilation time

The time from starting dilation of diameter until maximum diameter.

### Dilation area (AUC)

The area under the trend curve of diameter dilation (The area until maximum diameter on default).

### Dilation/decay time constant of vascular diameter

The decay time constant obtained from curve fitting of vascular diameter trend after cuff deflation.

### Maximum flow

Maximum flow velocity cuff deflation (Also convert it into flow quantity).

### Maximum flow time

The time until maximum flow after cuff deflation.



**Flow increase**

Maximum flow/rest flow (Also convert it into flow quantity).

**Decay time constant of flow velocity**

The decay time constant obtained from curve fitting of flow trend after cuff deflation.

**Shear velocity conversion**

Convert the related value of blood flow into shear velocity.

**4.5 Output the results**

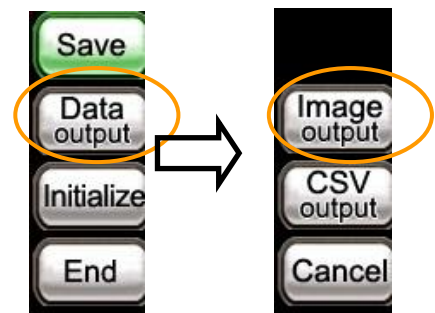
**4.5.1 Export screen image**

Click [Data output] and [Image output].

The analyzed result is saved in a JPEG file.

A {PCAnalysis} folder shows up on desktop.

File name: [ID] \_ [Date] \_T.jpg



< sample image >





#### 4.5.2 Export trend numeric data to spreadsheet.

Click [Data output] and [CSV output].  
 Analysis result is saved in CSV data format.  
 A {PCAnalysis} folder shows up on Desktop.

File name: [ID] \_ [Date] \_T. csv

Items:

[Patient Info]

Patient ID,

Measurement start time

[FMD data]

Rest diameter

Max diameter,

At (Time of max diameter),

%FMD,

Base diameter,

%FMD base,

bIMT,

Dilation start time,

Dilation time,

Max dilation velocity,

Dilation area,

Dilation time constant

[Flow rate]

Rest flow rate

Max flow rate,

At (Time of Max flow)

Flow rate augmentation,

Baseline flow rate,

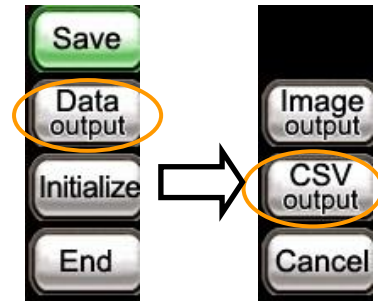
Estimated Max flow rate,

Estimated flow rate augmentation,

Decay time constant,

[Flow volume]

Rest Flow volume



Max flow volume,  
 At (Time of Max flow volume)  
 Flow volume augmentation,  
 Baseline flow volume  
 Estimated Max flow vol.  
 Estimated Flow vol. augmentation  
 Decay time constant,  
 [Shear Rate]  
 Rest shear rate  
 Max shear rate  
 At (Time of Max shear rate)  
 Shear rate augmentation,  
 Baseline shear rate,  
 Estimated Max shear rate,  
 Estimated shear rate augmentation,  
 Decay time constant

<A sample image of CSV output>

PatientID	Measurement start time	Rest Diam	Max Diam	at	%FMD	Base Diam	Max Shear at	Shear Rate	Baseline S	Estimated I	Estimated I	Decay time	Elapsed time(sec)	Diameter(r)
TWD01	2016/3/31 14:11	3.74	3.96	46.9	5.9	3.76	1016	8	3	333.7	1100.7	3.3	21.4	
TWD01														1.000
TWD01														1.500
TWD01														2.400
TWD01														3.500
TWD01														4.600



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