

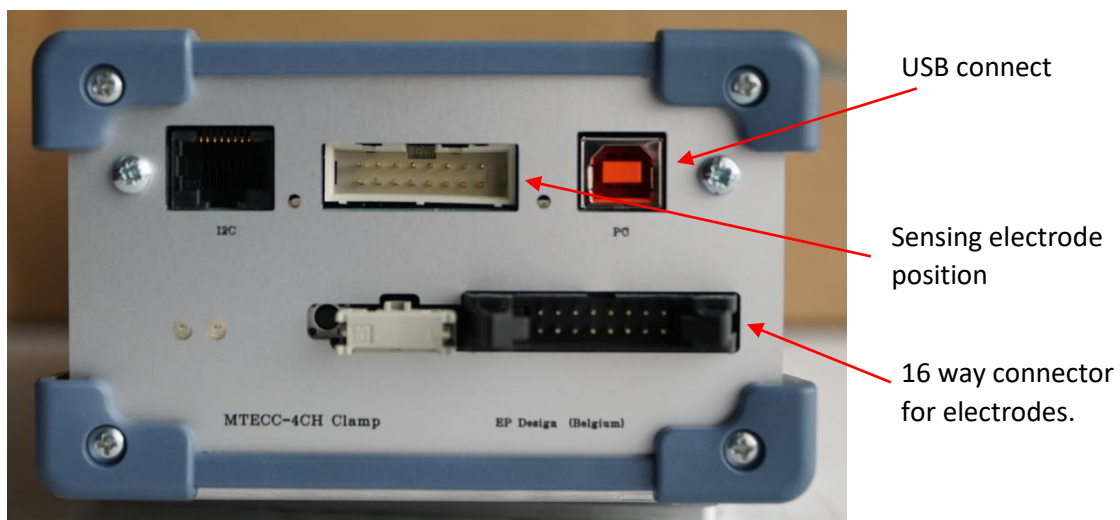
## MTECC - 4 Channel clamp for recording PD-RT

### 1 - Electronic recording system.

The electronic equipment for recording transepithelial parameters (PD and RT) consist of:

- (1) a four channel MTECC board as used in the 24 channel system (lower part in Fig. 1).
- (2) USB interface for connection to the PC and for sensing the position of the 4 channel electrode holder (upper part in the Fig. 1).

Fig. 1:



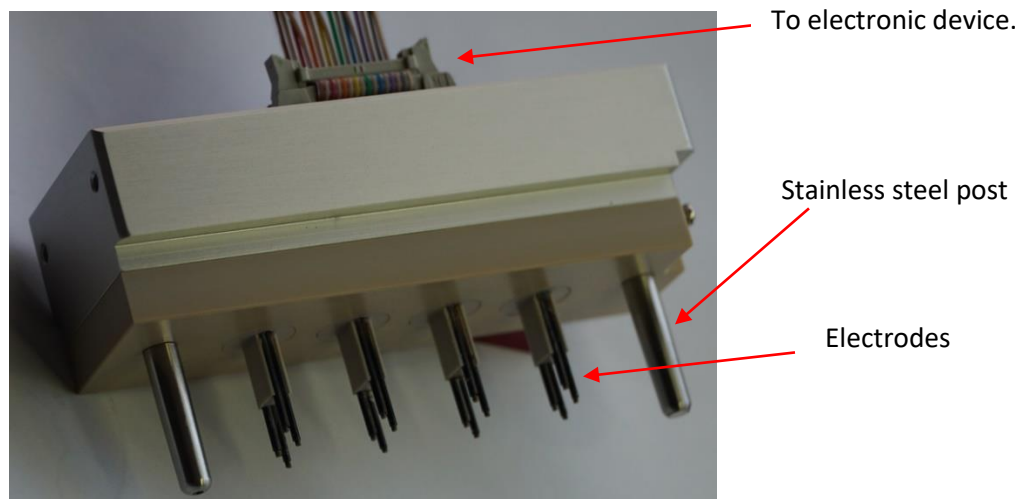
Powered through USB connection. No additional power supply required.

### 2 – Electrode manifold.

The 4 channel electrode manifold is shown in Fig. 2.

Each electrode unit has 4 electrodes made of Ag/AgCl pellets: 2 voltage sensing electrodes and 2 current sending electrodes. The manifold has 2 stainless steel posts for precise positioning of the manifold on the plate holder. One post has a tag that is sensed by sensors mounted in the transwell plate holder. This enables the computer program to start the recording when the electrodes are placed on the plate holder.

Fig. 2:



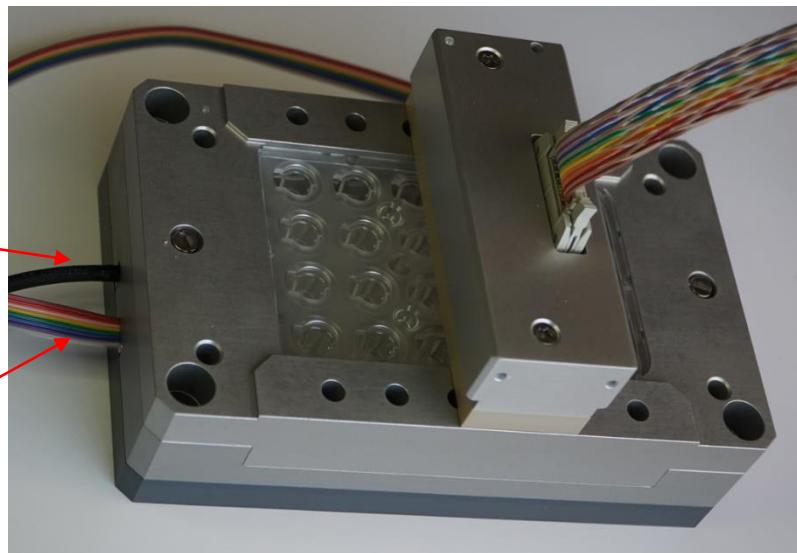
### 3 – Plate Holder-warmer.

The plate holder has

- (1) a heating circuit and temperature sensor (Pt resistor). Heating is placed in the bottom part. Heater and sensor are connected to temperature controller.
- (2) Holes in the cover for positioning the 4 way electrode manifold.
- (3) sensors for the tag in the post electrode manifold. These six sensors are connected to the computer USB interface with an eight way flat cable.
- (4) Holes for the 24 channel manifold that can be used as well in manual as well as robot controlled positioning.

Cable to temperature controller

Cable connected to sensors

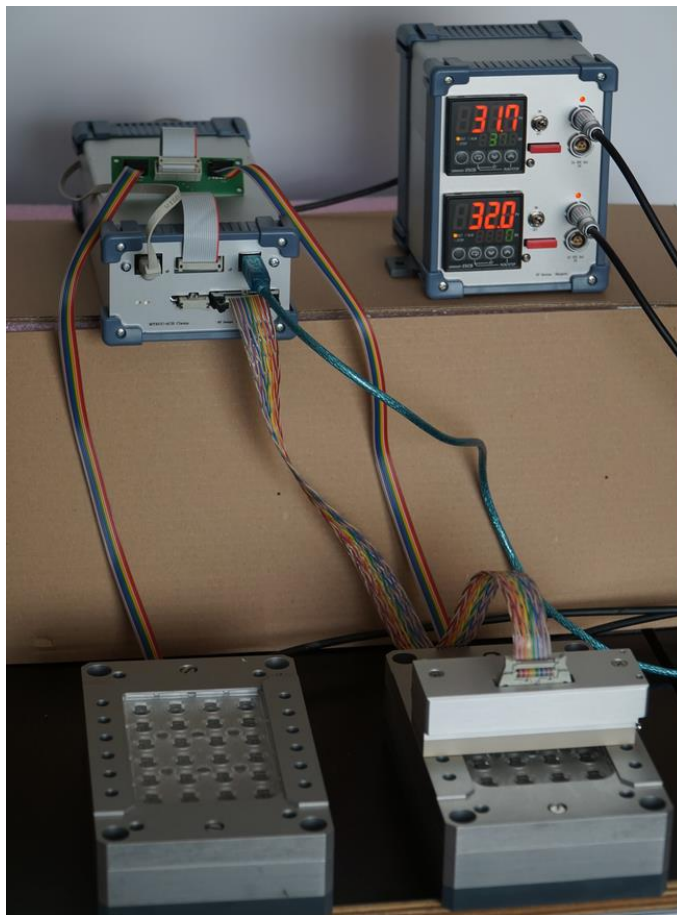


### 4 – Other parts used for setup of recording system.

- (1) Power supply
- (2) Temperature controller.



## 5 – Picture of setup.



## 6 – Software interface for recording PD – RT.

(1) Example of protocol table.

Experiment protocol setup				
	Command	Variable	Value	
1	Define Variable	A	1	
2	Define Variable	B	2	
3	Begin Endless Loop		0	
4	Define Variable	C	1	
5	Begin Loop	K-count	6	
6	Target Platform	A	0	
7	Target column	C	0	
8	Move to Target		0	
9	Record Rt	PD+RT	1	
10	Target Platform	B	0	
11	Move to Target		0	
12	Record Rt	PD	1	
13	Increment Variable	C	0	
14	End Loop		0	
15	End Endless Loop		0	
16	Stop		0	

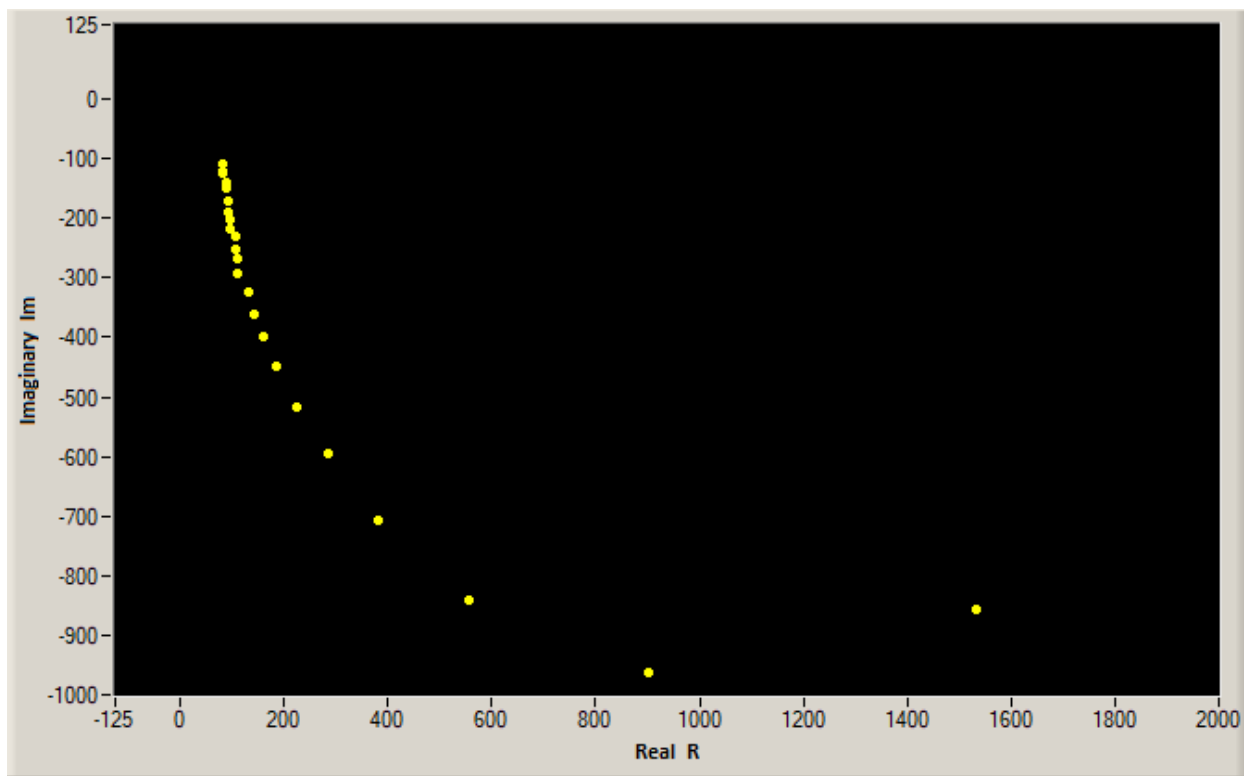
This table is made by the user and depends on the protocol of the experiment that will be used. Once the experiment started the operator has to accomplish the electrode movements as programmed with the executable: “Make Protocol 4CH”.

## (2) User interface of recording software.

## (3) RT/PD/Rs Data panel that during an experiment with dummies.

Plate #1							Plate #2						
	VT	RT	leq	RS	Cm	RTX Entry		VT	RT	leq	RS	Cm	RTX Entry
1 - A1	-29.4	1043	28.1	59.8	0.46	4	1 - A1	-30.3	1000	1.0	0.0	0.00	2
2 - B1	-29.2	550	53.1	60.7	0.46	5	2 - B1	-30.3	1000	1.0	0.0	0.00	2
3 - C1	-29.6	1054	28.1	55.4	0.93	4	3 - C1	-30.6	1000	1.0	0.0	0.00	2
4 - D1	-29.0	549	52.8	51.9	0.89	5	4 - D1	-29.9	1000	1.0	0.0	0.00	2
5 - A2	-29.3	1045	28.1	59.0	0.45	4	5 - A2	-30.3	1000	1.0	0.0	0.00	2
6 - B2	-29.2	549	53.1	60.9	0.46	5	6 - B2	-30.3	1000	1.0	0.0	0.00	2
7 - C2	-29.6	1053	28.1	54.2	0.91	4	7 - C2	-30.6	1000	1.0	0.0	0.00	2
8 - D2	-29.0	550	52.8	52.1	0.90	5	8 - D2	-29.9	1000	1.0	0.0	0.00	2
9 - A3	-29.3	1045	28.1	58.6	0.46	4	9 - A3	-30.3	1000	1.0	0.0	0.00	2
10 - B3	-29.2	552	52.8	60.1	0.46	5	10 - B3	-30.3	1000	1.0	0.0	0.00	2
11 - C3	-29.6	1059	27.9	55.2	0.92	4	11 - C3	-30.6	1000	1.0	0.0	0.00	2
12 - D3	-29.0	550	52.7	52.3	0.90	5	12 - D3	-29.9	1000	1.0	0.0	0.00	2
13 - A4	-29.3	1044	28.1	58.9	0.46	4	13 - A4	-30.3	1000	1.0	0.0	0.00	2
14 - B4	-29.2	551	52.9	58.3	0.45	5	14 - B4	-30.3	1000	1.0	0.0	0.00	2
15 - C4	-29.6	1060	27.9	53.9	0.88	4	15 - C4	-30.6	1000	1.0	0.0	0.00	2
16 - D4	-29.0	550	52.7	52.0	0.89	5	16 - D4	-29.9	1000	1.0	0.0	0.00	2
17 - A5	-29.3	1043	28.1	58.3	0.45	4	17 - A5	-30.3	1000	1.0	0.0	0.00	2
18 - B5	-29.2	551	52.9	60.8	0.46	5	18 - B5	-30.3	1000	1.0	0.0	0.00	2
19 - C5	-29.6	1059	28.0	54.5	0.89	4	19 - C5	-30.6	1000	1.0	0.0	0.00	2
20 - D5	-29.0	552	52.6	53.0	0.91	5	20 - D5	-29.9	1000	1.0	0.0	0.00	2
21 - A6	-29.3	1045	28.1	59.5	0.46	4	21 - A6	-30.3	1000	1.0	0.0	0.00	2
22 - B6	-29.2	550	53.1	59.9	0.46	5	22 - B6	-30.3	1000	1.0	0.0	0.00	2
23 - C6	-29.6	1052	28.1	54.8	0.90	4	23 - C6	-30.6	1000	1.0	0.0	0.00	2
24 - D6	-29.0	550	52.8	52.2	0.91	5	24 - D6	-29.9	1000	1.0	0.0	0.00	2

(4) High frequency impedance recording for determining  $R_s$ .



$R_s$  is obtained at high frequencies as intercept of the impedance curve with real axis of the Nyquist plot.

Data are stored in ASCII format on the hard disk. Can be imported in MS Excell.