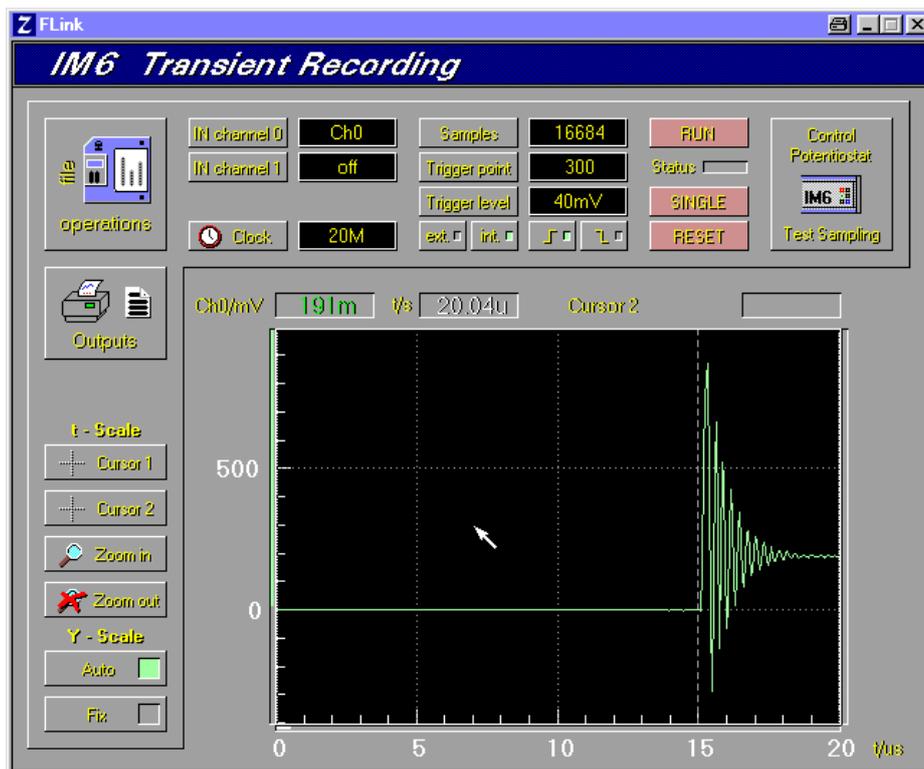
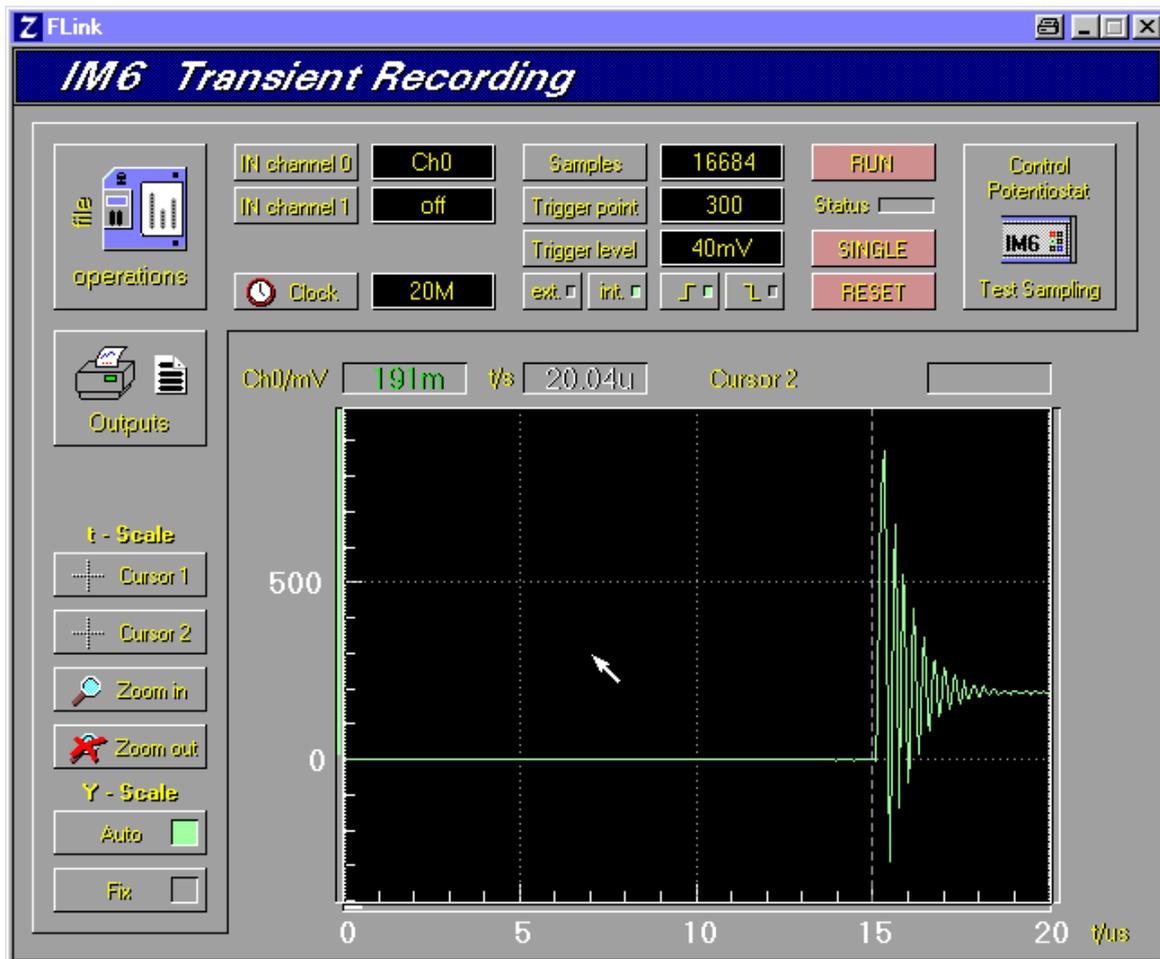


# TRANSIENT RECORDING



### 1. Main Menu

All settings of the the transient recorder TR8M as well as the course of the measurements are controlled from the main menu. After the acquisition the stored data are displayed in an U(t)-, I(t)- or U(t)&I(t) diagram. Furthermore they are prepared for export.



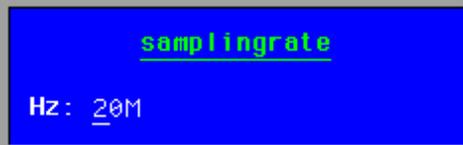
## 2. Configuration of the channels

The transient recorder is able to record data in one or two tracks. With the **IN channel** function both channels can be switched on and off separately, whereas one channel must be active. Each active channel is routed to an input. As an input you can define one of the external inputs (**Ch0** or **Ch1**) or the **Potential** or **Current** paths from the internal analogue bus of the IM.

<b>input Ch0</b>		<b>off</b>	Track <b>Ch0</b> off
INI channel 0	<b>Ch0</b>	<b>Ch0</b>	Track <b>Ch0</b> gets data from external input Ch0
INI channel 1	<b>off</b>	<b>Potential</b>	Track <b>Ch0</b> gets <b>Potential</b> data from IM analogue bus
<b>input Ch1</b>		<b>off</b>	Track <b>Ch1</b> off
INI channel 0	<b>Potential</b>	<b>Ch1</b>	Track <b>Ch1</b> gets data from external input Ch1
INI channel 1	<b>off</b>	<b>Current</b>	Track <b>Ch1</b> gets <b>Current</b> data from IM analogue bus

## 3. Set the sampling rate

The sampling rate of the transient recorder may be defines in a wide range from 1 kHz up to 20 MHz for two-track measurements. For single-track measurements the sampling rate goes up to 40 MHz. To input the sampling rate click on the **Clock** button. This will open an input box where you can input the required sampling rate.

 <b>Clock</b>	<b>20M</b>	

## 4. Setting of the memory and the trigger function

The measuring time of a shot is results from the sampling rate and the number of samples

$$\text{Measuring time} = \text{sampling rate} \cdot \text{samples}$$

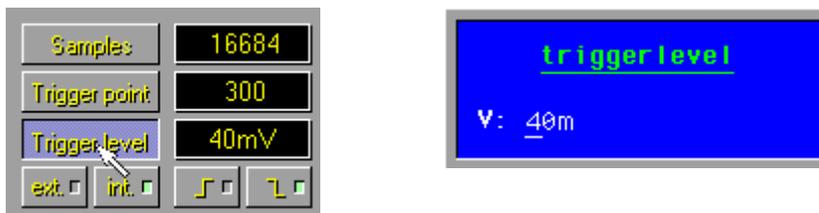
To input the number of samples click on the **Samples** button. Input the number of samples in the input box.



The pre-trigger option takes a part of the defined number of samples to measure the signal before the trigger event. It may be interesting to investigate which conditions lead to a erroneous trigger event. Here it may be helpful to define all samples as pre-trigger samples. To input the number of pre-trigger samples click on the **Trigger Point** button and input the number in the input box.



Input the trigger threshold by clicking on the **Trigger Level** button. The threshold is input in [V].



The trigger signal can come from the input **Ch0** or from the trigger input **TREXT**. Select the channel with the buttons **ext** and **int**.



The trigger event may be a rising or a falling slope. Select the slope with the buttons '↑' or '↓'.



### 5. Start and end of a measurement

The measurement is controlled by the buttons **RUN**, **STOP**, **RUN/STOP** und **SINGLE**.

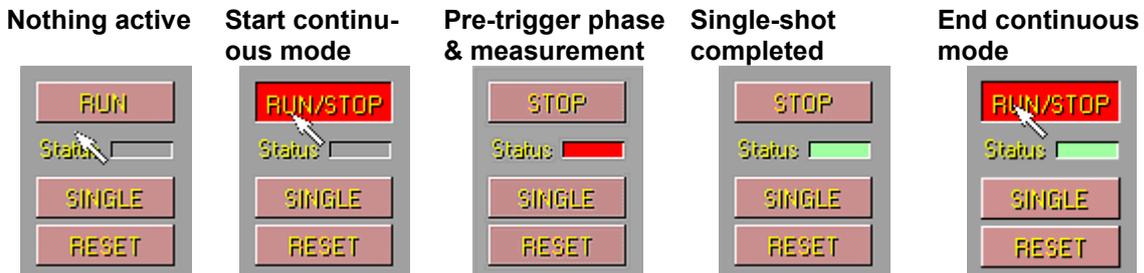
#### Single-shot mode

You can trigger a single-shot by clicking on the **SINGLE** button. The running measurement is indicated by the **Status LED**.



#### Continuous mode

Click on the **RUN/STOP** button to activate the oscilloscope mode. After starting the measurement by clicking on the **RUN** button the TR8M waits for a trigger event to perform a single-shot. After completing a single-shot the data are transferred to the main memory and displayed graphically on the screen. While displaying a shot the TR8M is waiting for the next trigger event. The **Status LED** always shows the state of the measurement. To end the continuous mode click on the **RUN/STOP** button again.



#### Reset the TR8M

Some specific settings may lead to undesirable effects. Here some examples:

##### **Parameter**

Trigger level higher than the maximum amplitude of the signal used for triggering

=>

##### **Effect**

No trigger event. The TR8M and the software seem to sleep

Very low sampling rate at a very high number of samples, e.g.:  $f=1\text{kHz}$  & 4M samples

=>

One single-shot runs 4000 sec = 1.11 h. TRxM and software seem to sleep in this period of time

Trigger source is set to **ext** and no signal is connected to the **Trigger Input**

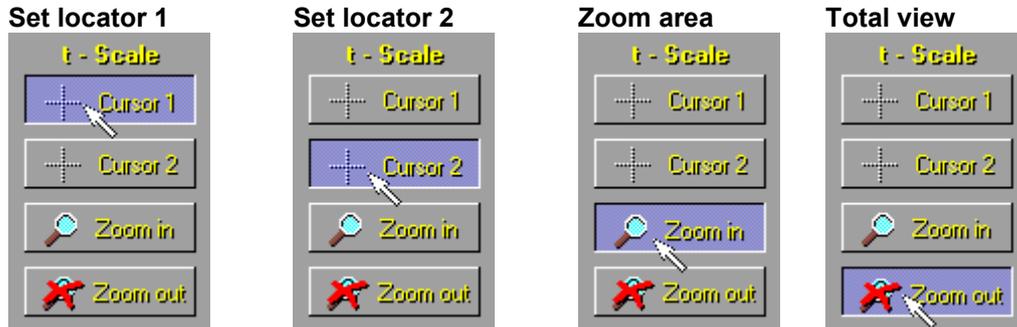
=>

No trigger event. The TR8M and the software seem to sleep

If you encounter such an effect (Status LED is green and TR8M and software seem to sleep) reset the TR8M by pressing the **RESET** button.

**6. Darstellung der Messdaten**

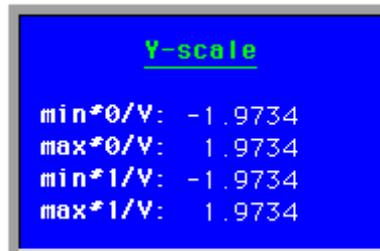
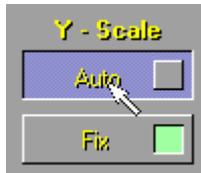
After finishing a measurement (in single-shot or continuous mode) the data measured at last are displayed on the screen. For a first visual analysis cursor and zoom functions are provided.



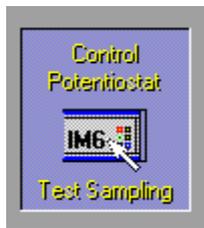
The scaling of the graph can be done automatically or manually.

Select the automatic scaling by clicking on the **AUTO** button. Minima and maxima of the graph are calculated and applied.

Select the user-defined scaling by clicking on the **FIX** button. You can set the minima and maxima of the graph in the up-coming input box.



### 7. The IM interface



To set e.g. the DC parameters of a shut-down measurement click on the **Control Potentiostat** button. The Test Sampling page of the EIS program comes up where you can input those parameters.

### 8. File operations



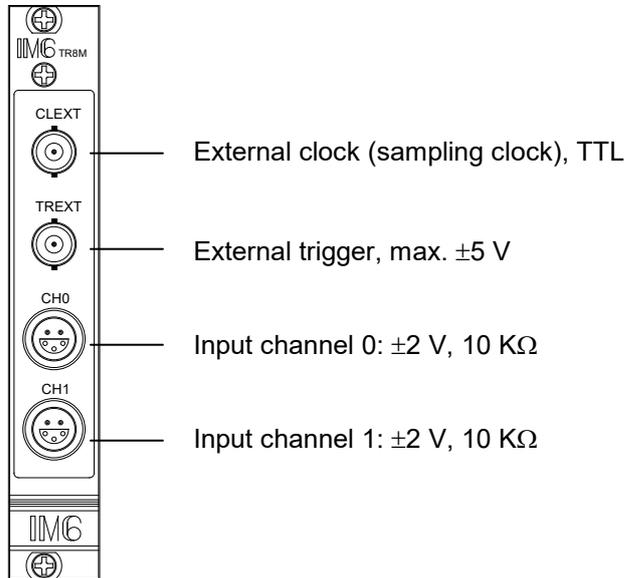
Click on File Operations to call the file manager of the Thales software. Here you can save and load measurements and parameter sets. Parameter sets are stored together with the measurement data.

### 9. Datenausgabe



Click on the **Outputs** button to display the graph on the total display. This is useful for printouts.

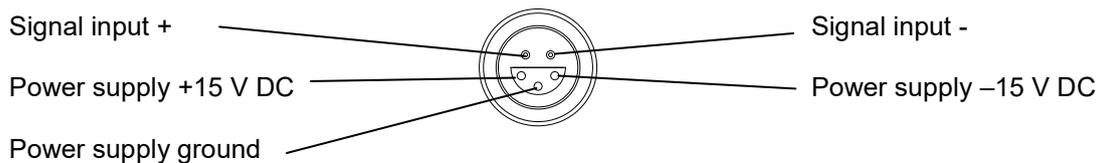
**10. Transient Recording Module TR8M**



The hardware extension module TR8M for the Electrochemical Workstations IM6 and IM6e is optimized for the investigation of fast electrical events which need to be measured with a high time resolution and fixed phases in two channels. A typical application is the investigation of pulse and transient responses.

As soon as the module is plugged into the IM system it is detected by the Thales software. When starting the program modules *PVI*, *Pulse* or *TRC* located in the *Time Domain* menu the programming of the transient recorder is available. In *PVI* and *Pulse* the ranges and menus are extended accordingly, in *TRC* parameters are input directly in the program window.

The outlets for connection of the measuring signals, trigger and clock are located on the front panel of the module. On the other hand, the measuring signals may also be the potential and current channels of the IM system. These are connected internally, so that no external connections are necessary. For feeding external probes and instrumentation amplifiers the outlets provide a power supply of  $\pm 15\text{V} / 50\text{mA}$ .

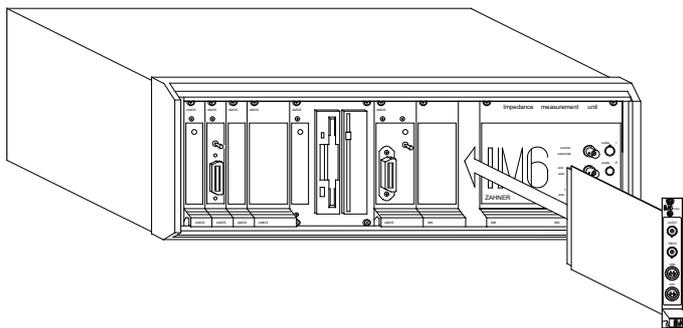


## Technical Specifications

Max. sampling rate	40 MHz one channel, 20 MHz two channels
Channels	2
Max. input voltage	±2 V (external), ±2 V (internal)
Input impedance	10 KΩ
Resolution	12 Bit
Power supply outlet	±15 VDC / 0.05 A
Onboard sample memory	8 MWords
Trigger modes	Level, slope, pre-trigger, source (internal/external)
Max. trigger level	±5 V (60 Ω)
Clock	max. ±5 V
Configuration	By software
Power supply	+5 V / 0.55 A, +15 V / 0.07 A, -15 V / 0.1 A
Dimensions	4 TE (one IM slot)

## Installation

In case you got the TR8M module separately, you have to install the card into a free IM-Extension slot.



- **Disconnect the IM system from mains!**
- Remove the front panel named "IM6 Extensions"
- Plug in the TR8M module into one of the free slots and fix it with the screws.
- Re-connect the IM system to mains and switch it on
- The software will detect the new module automatically