



## TFL R5000 SPECIFICATION

The **TFL R5000** is an **ECT and flow analysis measurement system** for use with a suitable control PC and multi-electrode capacitance sensor under normal laboratory conditions. An alternative custom integrated sensor version is available for use under ATEX conditions. Please note that all specifications quoted are based on measurements carried out on a prototype version of the **TFL R5000** and may change in accordance with future technical developments and improvements.

### CAPACITANCE MEASUREMENT DETAILS

System configuration	2 x 8-channel firmware-configurable analogue circuit boards and 1 x Digital Signal Processor (DSP) and PSU board
Number of measurement channels	16 total. (8 channels per analogue circuit board)
Details of capacitance measurement channels	Each channel contains a 16 bit ADC, 3 bit gain control and synchronous demodulator.
Measurement modes	Capacitance or conductance in ECT mode Optional multi-electrode excitation
Number of driven guard channels	16
Single plane ECT sensor operation	Can be used with sensors having up to 16 electrodes. Operation is optimised for 6,8,12 or 16 electrodes
Twin-plane ECT sensor operation	Can be used with sensors having up to 8 electrodes. Operation is optimised for sensors having 6 or 8 electrodes.
Excitation frequency F (15V p-p nominal square wave)	Programmable = 10/N MHz where N is an integer 1 <= N <= 10
Capacitance measurement range	0 - 2000fF (1 pF = 1000fF)
Measurement resolution	0.005fF
Measurement noise level	0.01fF rms at 100 fps
Signal to noise ratio	60dB approx. for 10fF measurement at 100fps
Temperature stability	Approximately 0.005fF per degree Celsius
Data capture rate in frames per second	Up to 8 electrode sensors: 5000fps 9-16 electrode sensors: 2500 fps
Firmware configuration	Firmware is loaded from the DSP to the FPGA on each analogue board on DSP start-up.
Firmware update options	DSP and FPGA firmware can be updated from PC via ethernet link.

### CASE DETAILS

Case dimensions	400x370x200mm excluding handle
Weight	9Kg
Power supply	60-240V AC
Power consumption	20-35Watts



### FRONT PANEL CONNECTORS AND INDICATORS

Capacitance Sensor interface	32 x SMB connectors on front panel
Front panel indicator LED1	Firmware status (blinks)
Front panel indicator LED2	Link status
Front panel indicator LED3	Trigger input
Front panel indicator LED4	Trigger output
Front panel indicator LED5	Supply On

### REAR PANEL CONNECTORS

PC interface	10/100 ethernet connector on rear panel
Trigger I/O interface	3 way DIN connector on rear panel Triggers on close of contacts. Logic output
Diagnostic port	9 way D connector
Power Input	Switched and fused IEC connector module

### SOFTWARE PROGRAMS AVAILABLE

ECT32	Sensor calibration, data capture and display
Sensor Toolkit	Diagnostic capacitance measurement, configuration, data logging and real time flow measurement
CKtool	Sensor calibration and linearisation
BCPtool	Data file conversion
Makemap	Sensitivity matrix file generation
Plot3D	3D plotting software
Flowan	Flow analysis and measurement
MatECT	Matlab utilities

### SOFTWARE ALGORITHMS

Image Reconstruction	Linear Back Projection (LBP) single step Iterative with truncation Landweber regularization (single step) Tikhonov regularization (single step)
Sensor calibration	Capacitance normalisation for permittivity range Generation of C/K files for sensor linearisation
Sensor model	Polynomial
Concentration model	EMWS

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**PROCESS TOMOGRAPHY LTD**  
**64, Courthill House, Water Lane, Wilmslow, Cheshire. SK9 5AJ United Kingdom.**  
**Phone/Fax 01625-418722**  
(From outside UK +44-1625-418722)  
email: [enquiries@tomography.com](mailto:enquiries@tomography.com) Web site: [www.tomography.com](http://www.tomography.com)