

High Temperature TOC and TN_b

liquiTOC

Ultra Pure Water • Waste Water • Solids



New Technology for Compact Performance



elementar
Analysensysteme GmbH

100 years German Technology
for quality and environment control



elementary simple

The organic carbon content in drinking water, waste water and other water gains more and more importance as being a basic screening parameter as well as an indicator for water quality. A lot of users appreciate the advantages: **no expensive sample pretreatment, high level of automation, short analysis time and high precision with an environmentally friendly operation.**

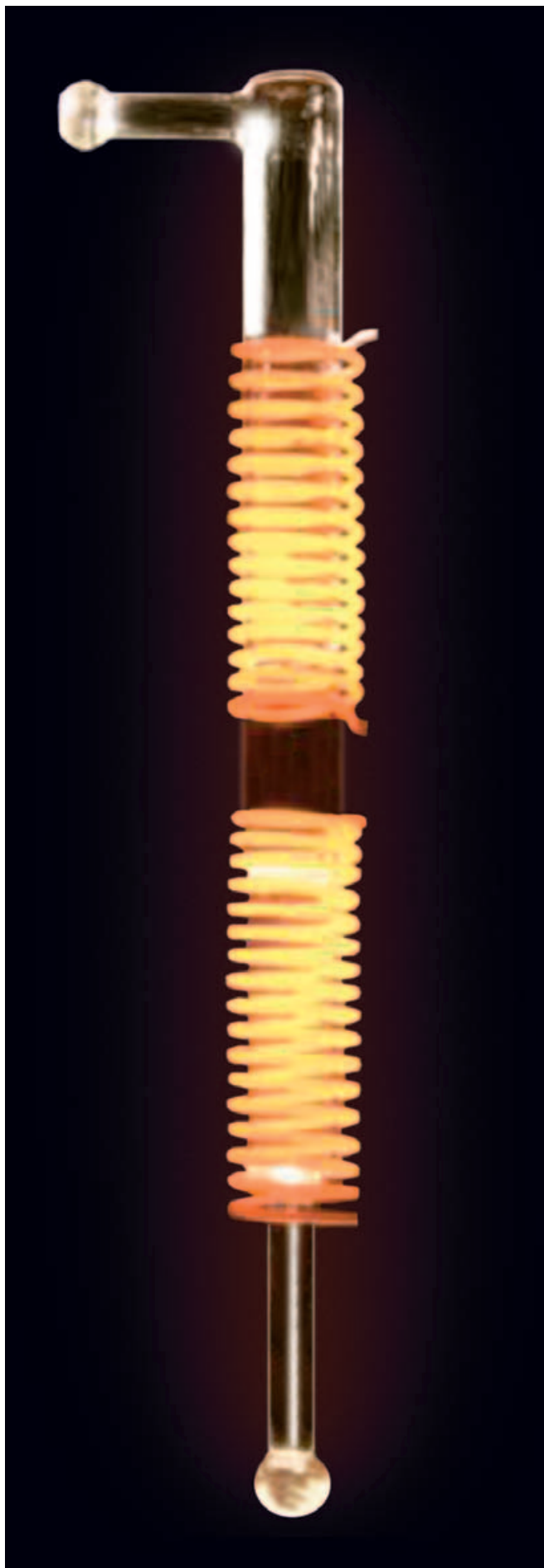
The **liquiTOC** was developed to take advantage of all of these features in an easy to operate, reliable and flexible analyzer.

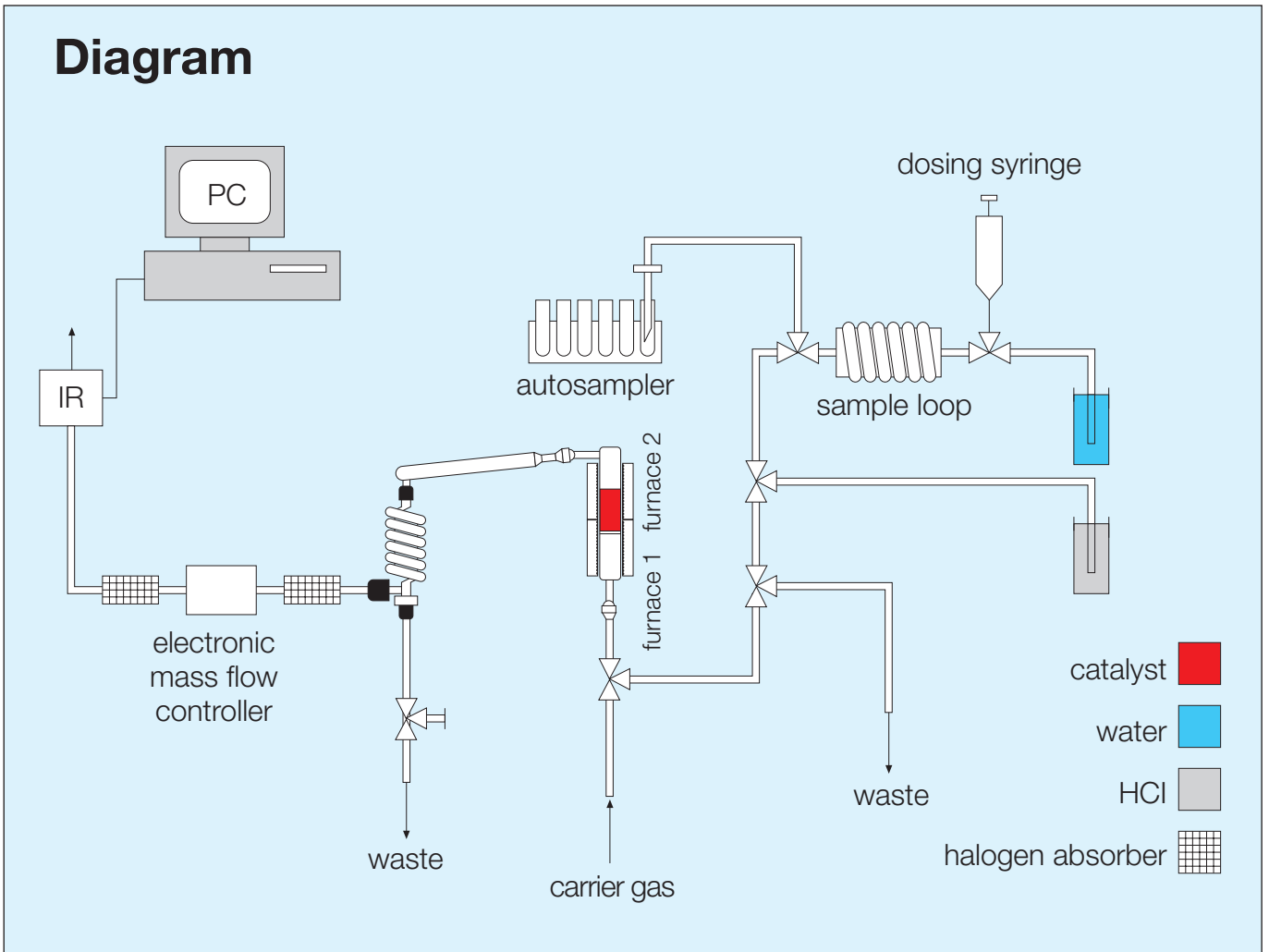
The **liquiTOC** is based on the experience in TOC analysis gathered since 1973 by Heraeus in Germany and Elementar as its successor. A completely new technique has now been realized with the **liquiTOC** in order to analyze routine samples in an uncomplicated way.

Special attention has been paid to simple handling in routine operation, maintenance-free and cost saving operation – without compromises in terms of analytical performance.

These requirements are met by means of a new combustion technology (patent applied for) which works with a two-zone combustion in one dynamic heater. This results in an optimum protection of the catalyst when analyzing difficult sample matrices. The **liquiTOC** enables the user to analyze samples like drinking water, ground water, processing water, surface water, water for injection for the pharmaceutical industry, municipal and industrial waste water and even highly contaminated sewage plant inlets with one and the same instrument configuration. POC, TIC, TOC, TC and as an option also TN_b can be analyzed in these matrices with one single sample injection.

Ready-to-use pre-configured parameter sets are available to the user, making the **liquiTOC** a real plug-and-play analyzer.





The heart of the **liquiTOC** is the patented reactor system which contains two furnaces. The first furnace is operated dynamically between 90°C and 900°C whereas the second one that heats the catalyst serves for a post combustion with a of temperature of 900°C.



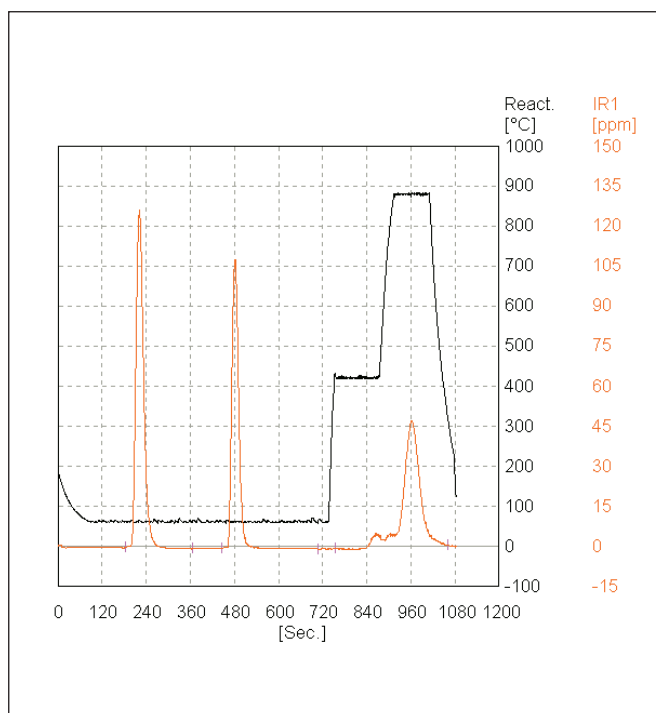
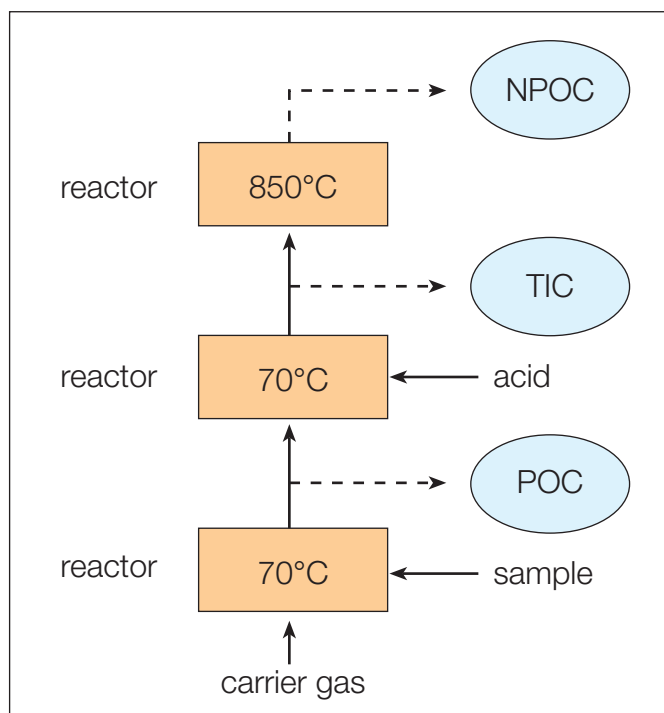
The sample is brought into the combustion system by a stepper motor controlled dosing syringe. A sample loop avoids the direct contact of the sample with the dosing syringe thus avoiding contaminations and damages when analyzing particles containing samples. The measuring gas is dried in a 3 steps process which guarantees an optimum protection of the infrared (IR) detector. An electronic massflow controller before the IR detector guarantees the stable flow of the carrier gas through the detector thus enabling a reproducible analysis with different injection volumes up to 4 ml (!).

simply versatile

6 Parameters simply out of 1 sample

The parameters TIC, TC, POC, NPOC, TN_b and TOC can be easily determined out of just one sample without instrument modification and with just one injection. This is due to a multi-functional reactor which can be used during one analysis run for purging the POC, for purging the TIC after acidification and for oxidation of the NPOC to CO_2 as well as TN_b to NO .

TIC	=	total inorganically bound carbon
TC	=	total carbon
POC	=	purgeable organic carbon
NPOC	=	non purgeable organic carbon
TN_b	=	total nitrogen (bound)
TOC	=	total organically bound carbon



The analysis run can of course be shortened if there is no need to analyze some of these parameters. In this case POC and TIC can also be purged externally in the autosampler or in the vial. This saves analysis time. After each analysis all sample wetted parts will be automatically flushed to keep memory effects as low as possible.

The entire system is PC controlled under Windows (95, 98, ME, XP, NT or 2000). The data will be stored as ASCII files and can be transferred to table calculation programs without any problems. An implementation into a LIMS system or other data networks is also possible.

The stepper motor controlled syringe dosing allows freely selectable sample volumes between 0.02 ml - 4 ml. In connection with a 3-channel-

detector, a dynamic measuring range of 50 $\mu\text{g/l}$ - 10,000 mg/l is made possible without modifications.

Particles containing solutions with particle sizes up to 200 μm can be easily measured. For most practical applications particles up to 500 μm are also no problem due to all sample carrying parts having an inner diameter of 0.8 mm.

The handling is made particularly easy for the user: only sample name and type have to be entered, everything else will be done by the instrument. The automatic monitoring of all relevant instrument parameters such as gas flows, combustion temperature, etc. via an electric sensor allows a safe operation also over night.

The system is almost maintenance free. Only the reactor should be removed and flushed in regular intervals (for drinking water e.g. every 500 samples). Since the reactor is only held by 2 ground-in clamps, the entire cleaning process takes only 7 minutes including cooldown and heatup of the furnace.

The **liquiTOC** can be completed to a fully automatic analytical system: including an autosampler which may be equipped with either a 36 or 53 position carousel (or even as an option with 89 positions). 27 positions (in case of the 36 option) or 41 positions (in case of the 53 option) can be stirred.

A solids option is also available. The installation is simple: only exchange the combustion tube then mount the feeding unit with two knurled head screws – ready. No need for an additional furnace – therefore this solids option is unbeatabably inexpensive.

The **liquiTOC** also measures total bound nitrogen (TN_b) simultaneously with very few additional expenditures. The customer has two options for the detection: the common chemiluminescence detection as well as a new technique. For the measuring range $> 5 \text{ mg/l}$ the IR detection will be used, whereas for the sensitive range of $< 5 \text{ mg/l}$ a chemosensor will be used. By this a large detection range can be covered in an inexpensive and high performance way.



multiple applications



Injection water for the pharmaceutical industry and other ultra pure water types require a high detection ability and precision. These requirements can only be met with sensitive detectors and high sample volumes. **liquiTOC** can handle injection volumes up to 4 ml which is unique for high temperature TOC analyzers. The detection limit is 3 ppb, exceeding the requirements of the USP 24 by far. If main application is the analysis of ultra pure water, **liquiTOC trace** is the right instrument.



Drinking water has very special demands on TOC analysis due to its (hopefully) low TOC contents in the presence of typically high concentrations of TIC. By controlled purging and measuring of TIC as well as direct analysis of TOC the liquiTOC is particularly suited for drinking water.

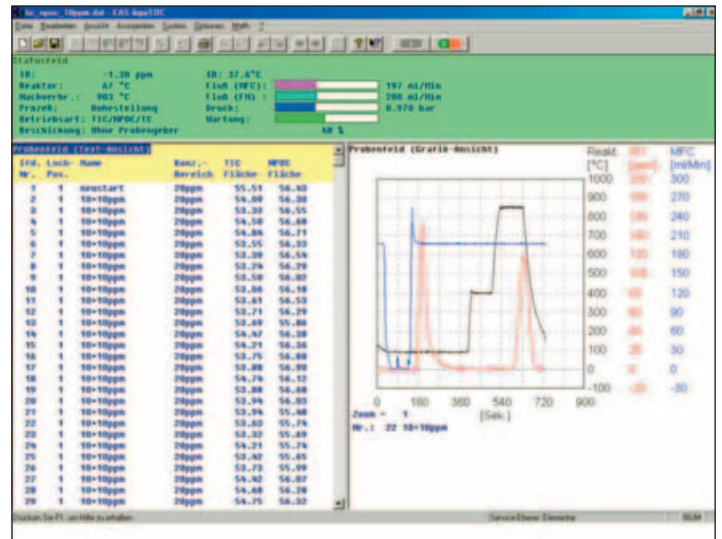


Apart from high TOC concentrations, **waste water** often contain large amounts of salt, suspended matters and other matrix components which are damaging to the combustion catalyst. Due to the patented combustion system a direct contact of the sample with the catalyst is avoided. Therefore, also difficult samples can be routinely and easily measured.

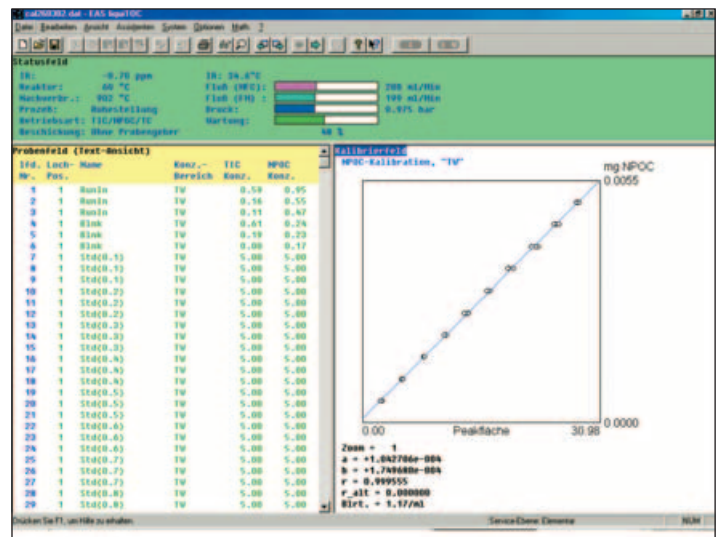


Sea water is a special challenge for every high temperature TOC analyzer. Due to the high salt content of the sample (approx. 35 g/l) sea water usually leads to a fast poisoning of the catalyst. In case of **liquiTOC** the salt will be collected in the lower part of the reactor. This can be easily regenerated by flushing with water without damaging the catalyst. The cleaning procedure is only necessary after every 80 measurements and takes only 7 minutes – from one real sample to the other.

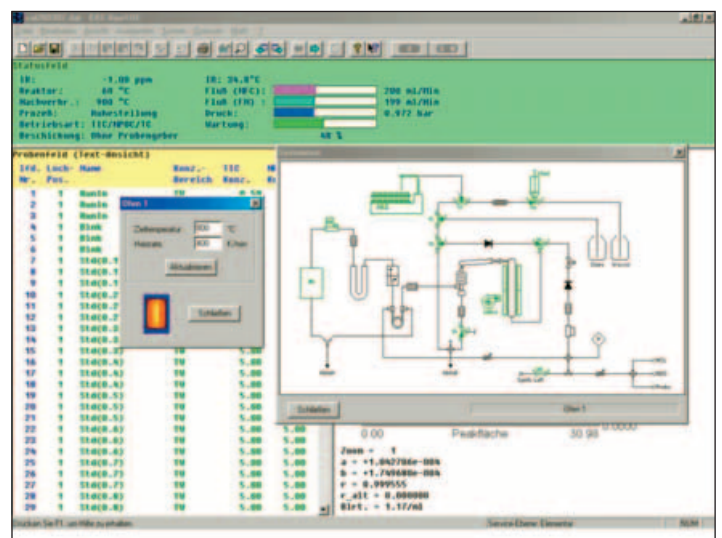
The complete system is controlled by a Windows program. All important instrument information such as pressure, flows, IR signals, temperatures, etc. are measured in real time. All information are stored so that all analysis processes can be followed up after completion of a measuring series. There are different password protected user levels available as well as a statistic function.



The calibration is made especially easy to the user: beside of the normal calibration routine of optional 1-10 points also a calibration can be done over different injection volumes from one solution: no serial dilutions are required. Even entering the calibration sample information will be done by a software wizard.



The system also includes a powerful diagnostic capability. Simply click on the analyzer component which shall be tested in the graphical flow diagram. The operator will be automatically reminded of maintenance intervals. The **liquiTOC** has many other software features such as sleep/wake up functions, statistical reporting, graphical display of all analysis parameters as well as LIMS export capabilities.



Specification liquiTOC – the compact performance

Method:	High temperature oxidation at 850°C - 900°C and detection of the formed CO ₂ (NO optional) by wide range multi-channel NDIR-photometer
Measuring parameters:	TC, TIC, NPOC, TOC, DOC, POC, TN _b (optional)
in compliance with:	DIN 38409H3, ISO 8245, EPA 415.1, European Standard acc. to EN 1484, US-Standard method 5310 A TN _b : DIN 38409 Part 27, ENV 12260 version <i>liquiTOCtrace</i> also in compliance with Pharmacopeia USP24, 643 (2000), EP, Suppl. 2000, 2.2.44
Measuring range:	carbon: 0.05 up to 10000 mg/l C < 0.05 mg/l for version <i>liquiTOC trace</i> nitrogen (optional): 0.5 up to 2000 mg/l N
Detection limit:	3 ppb for C
Precision:	≤ 1 % at ≥ 100 mg/l C ≤ 2 % at ≥ 10 mg/l C ≤ 5 % at ≥ 0.5 mg/l C
Sample volume:	0.02 up to 4 ml
Particle size:	up to 200 µm and larger, in compliance with EN 1484 (depending on shape and composition)
Control and evaluation unit:	PC, Windows® compatible, printer (required for operating the analyzer)
Software:	English or other languages, Windows® 9x, NT and higher, status display during analysis, real-time graphic, GLP suited with data reduction and documentation
Carrier gas:	synthetic air (hydrocarbon ≤ 0.1 mg/l and CO ₂ ≤ 1 mg/l), 2 bar, or oxygen 4.5 consumption approx. 300 ml/min
Supply voltage:	120/230 VAC ± 10 %, 50/60 Hz, ca. 1900 VA
Dimensions:	approx. 400 x 555 x 480 mm (L x W x H) for basic unit
Options:	
TN _b :	additional detection channel for NO measurement
Solids attachment:	for TC/TOC measurements in solids, sludges and suspensions
Automatic sampler:	36 positions with stirring device for 27 positions 53 positions with stirring device for 41 positions special version for 89 positions without stirring function

Issue 07/2002 · Subject to alterations, deviations due to application possible.



Donaustr. 7 · D-63452 Hanau, Germany
Phone ++49 (0) 6181 - 9100- 0
Telefax ++49 (0) 6181 - 910010
Internet: <http://www.elementar.de>
e-mail: info@elementar.de

Tecnología Aplicada Internacional

P.O.Box 1581-2150
San José, Costa Rica
América Central

Teléfono (506) 297 1011
Facsimil (506) 297 2231

www.tecnologia-aplicada.com
info@tecnologia-aplicada.com

