Smart Titrator®

PAT940

Dedicated for Petroleum Analysis

*The **next generation** in titration*

Smart, Simple, Swipe Technology

Improving productivity - the ethos behind PAT940

Introducing a more user friendly and robust titrator combined with the latest touch screen/swipe technology.

User friendly is a common phrase bounced around in many different industries. It is easy to say but not always true! Processes in the work place should be made as easy as they can to improve productivity and operational efficiency.

- Light 'finger touch' screen with swipe reduce and enlargement functionality with graphs
- Touch enabled QWERTY keypad that pops up for all data entry
- Store up to 1000 methods and 1000 results
- 50 shortcuts can be saved to the Homepage to quick start favourite methods
- Continuous dosing operation for manual titrations

There are many complex methods within all industry types in the titration world, therefore introducing a more user friendly and robust potentiometer combined with the latest touch screen technology, is the perfect combination. PAT940 utilises the latest capacitive touch screen technology, what does that mean? This is the technology that your smart phone uses.

Titration with capacitive touch screen technology

Benefits of a capacitive touch screen

Seamless finish

Projected capacitive screens consist of a sandwich of two spaced layers of insulating glass coated with ITO (Indium tin oxide) on the inside. The glass is 1.2mm thick with a flush front and is more resistant to casual scratches and blemishes and won't deform over time or shrink with heat.

Operational with gloves on

The inoperability of touch screens whist wearing gloves has been a complication for many companies that require employees to wear protective equipment. PAT940 has elevated sensitivity so the capacity screen can detect electrical impulses even if the impulse is insulated by a glove.

Superior image quality

High quality manufacturing processes are critical to projected capacitive touch screens producing near 100% optical clarity, resolution, luminance and sharpness.

Making life easier in a demanding industry

Focusing on the challenges faced within the petrochemical world

Monitoring the performance of new and used oils, such as crudes, transformer, lubricants and diesel fuels, is an important requirement. Titration is only one of many analytical techniques used which allows the quantitative determination of a specific substance dissolved in a sample.

Crude Oil Components

Crude oil is a liquid found within the earth comprised of hydrocarbons, trace metals and organic compounds. It is formed over millions of years through the process of heating and compression of organic materials, where the remains, commonly zooplankton and prehistoric algae, have settled on the bed of an ocean or lake. Physical compaction of these sediments due to pressure increase on burial is called diagenesis, thus forming sedimentary rock.

Why are hydrocarbons so important

- Hydrocarbons contain a large amount of energy. Gasoline, diesel fuel and paraffin wax are derived from crude oil and take advantage of this energy
- Hydrocarbons can take on many different forms, such as the smallest form which is methane (CH_4). Longer chains with five or more carbons are liquid and any longer can be tar or wax. By chemically cross linking these hydrocarbon chains, substances such as synthetic rubber, nylon and plastic can be produced

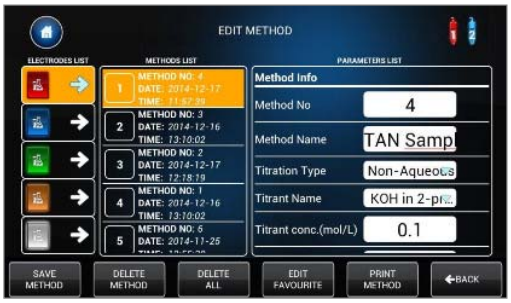
Screen Navigation Made Easy

Uncomplicated Programming

Ease of operation is key to optimizing routine tasks. Ploughing through screens with numerous sub options is tedious and time consuming. PAT940 is able to load and run a method in less than a minute from the homepage.

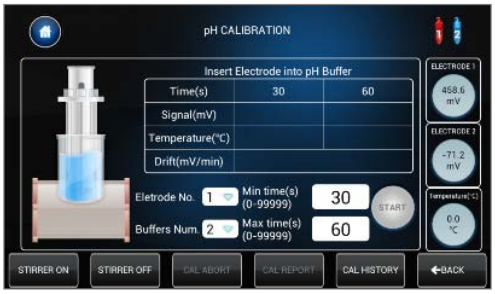
Updating favourites for a quick start

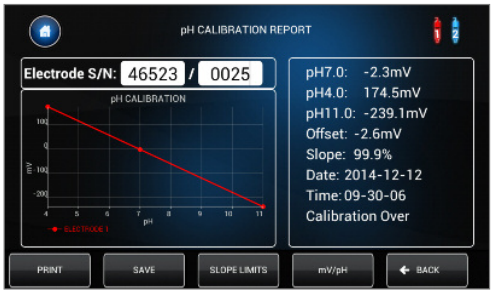
- Run a favourite method with one touch
- When loading the method table simply tick which ones you wish to add to favourites
- Regardless of which screen you are in, an icon appears on every screen to take you back to your homepage



Stress free editing and creating methods

- Setting up methods is no longer a tedious task of clicking through lots of screens
- Simply scroll through parameters and use drop down boxes all on the same screen to edit or create your method
- Press a field and enter information using the automatic pop up keypad or choose an option from a predefined list





- Select up to 5 buffers when performing a calibration
- Select your own minimum and maximum waiting times for measure value acceptance
- Temperature can be entered manually or continually monitored with a temperature probe
- Automatic buffer recognition after each measurement

Conforms to Recognised Standards

PAT940 has a compact PODULAR design with anodised aluminium side panels to repel aggressive solvents. The instrument supports, dynamic, incremental and manual titration modes with pre-programmed methods conforming to ASTM standards..

Total Acid Number	ASTM D664 ASTM D974
Total Base Number	ASTM D2896 ASTM D4739
Mercaptan Sulphur	ASTM D3227
H2S, Mercaptan Sulphur	UOP 163 UOP 212
Saponification Number	ASTM D94
Organic Chlorides in Crude	ASTM D4929
Iodine Value of Biodiesel	EN 14111

Please contact us with any application enquiries relating to crude oil, biofuels, petroleum products and other recognised standards.

PAT940 Smart Titrator® Electrodes

To help you choose the right electrode, a range called E-Chem® PATrodes dedicated for PAT 940 Smart Titrators only have been developed. It is important that you use only PATrodes with PAT940 titrators. Our PATrodes are designed, manufactured in the UK, are of high quality and each are supplied with a certificate of conformity.

Each PATrode has a colour coded cap based on industry type to make it easier for you when selecting the right electrode.

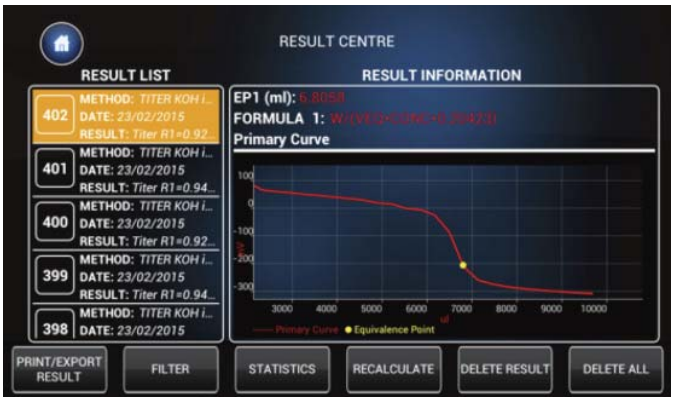
GR Part Code	Electrode Description	Electrolyte	Titration Type and industry
594033	E-Chem®PATrode Red	1M LiCl in ethanol	Non-Aqueous
594034	E-Chem®PATrode Blue	3M KCl	Acid-Base, aqueous, acidity alkalinity, concentrated alkalis, acidity/alkalinity of domestic, natural source & rainwater
594036	E-Chem®PATrode Yellow	1M KNO_3	Precipitation, H2S, mercaptans, carbonyl sulfides, sulfides, chlorides in crude
594056	E-Chem®PATrode Green	3M KCl	Iodine value in biodiesel, edible fats and oils

Perfect Podularity

Perform multiple titrations

The modern design platform provides you with all the interfaces you need to plan your workload and perform analyses to the standards you set.

- Standalone system 1 consists of a Dispense POD®, Titrate POD® and Control POD® for running singular titrations.
- Standalone System 2 consists of the addition of another Dispense POD® and Titrate POD® allowing you to run two different titrations simultaneously. This can reduce titration and time and prevent cross contamination of titrants.
- Connect up to 16 Dispense PODs® in a daisy chain if required, these are compact and take up little bench space.
- Set up methods and perform other tasks while titrations are running
- Switch between titrations by the push of an icon.
- Review, export and print results whilst titrations are running.



Technical Specifications

Display	Capacitance touch screen Width 152mm Height 89mm Resolution:
Dispense POD®	
Multiple linking PODs:	Up to 16 Dispense PODs® can be linked simultaneously
Syringe volumes:	12.5 ml and 5 ml
Drive Design:	Maintenance-free, direct drive stepper motor
Stroke Speed:	4.2 seconds to 800 minutes per stroke (3200 minutes in microstep mode)
Step Resolution:	24,000 steps
Imprecision (full stroke):	≤0.1% CV @ 50µl to 100 µl ≤0.05% CV @ 250µl to 5ml
Inaccuracy (full stroke):	≤1% syringe volume
Measurement Modes:	Dynamic equivalence point titration Incremental equivalence point titration Manual titration Calibration with automatic buffer recognition
Potentiometry	
mV Range:	-3200 - +3200 mV
Accuracy:	± 0.1 mV (± 0.0016 pH).
Resolution:	0.1mV
Amplifier Input Impendence:	> 10 12Ω
Storage	
Methods	Up to 1000
Results	Up to 1000
Favourite Methods	Up to 50
Temperature	
Measuring Range Pt100:	0.0 - 100°C
Resolution Pt100:	0.1°C
Measuring accuracy Pt100:	± 0.3°C (with linear calibration)
Interfaces	
USB ports:	2 USB (Type A sockets) for connection of printers, USB sticks
Wireless Communication:	Bluetooth Printing
Titrate POD®:	2X Titrate POD® 9 PIN D-type (female) RS232
Balance:	1x 9 PIN D-type (female) RS232
Autosampler:	1x 9 PIN D-type (female) RS232
Network Connection:	LAN RJ-45 connector, ethernet
Electrodes:	2x 6 pin LEMO (male)
Dispense POD:	BUS RS485 Kycon 4 pin for series connections
Ambient Temperature	
Operating Temp Range:	-10 to +45°C
Operating humidity:	8-90% RH non-condensing
Storage Temp Range:	-20 to +70°C
Storage Humidity:	5-95% RH no-condensing
External Power Supply	
Supply Voltage	110V/220V
Frequency	50-60Hz
Power Consumption	160W
Electrode Recognition:	Colour coded E-Chem® electrodes with auto recognition technology
Dialog Languages:	English, German, French, Spanish, Chinese, Russian, Polish
Weight:	approx 7.5kg
Dimensions:	Control POD® 25x13x22cm, Titrate POD® 40x25x9cm, Dispense POD® 14x14x5cm

Ordering Information

594000	PAT940 Smart Titrator® Standalone System 1
	Comprises of:
594005	Control POD® with 24VDC 7A PSU Power Pack
594006	Titrate POD® with RS232 Cable 500mm and Cable Kycon 500mm
594007	Dispense POD® with Cable Kycon 500mm, RS485 Cable (2pin) 500mm and Syringe Assembly Kit
594033	E-Chem® PATrode Red (for non-aqueous titrations)
594010	Bottle Cap with drying Tube, dessicant filled
301802	170ml Standard Titration Vessel
503028	PTFE Stirrer 6x20mm (Pack of 5)

594001	PAT940 Smart Titrator® Standalone System 2
	Comprises of:
594005	Control POD® with 24VDC 7A PSU Power Pack
594004	2x Titrate POD® with RS232 Cable 500mm and Cable Kycon 500mm
594055	2x Dispense POD® with Cable Kycon 500mm, RS485 Cable (2pin) 500mm and Syringe Assembly Kit
594033	E-Chem® PATrode Red (for non-aqueous titrations)
594010	2x Bottle Cap with drying Tube, dessicant filled
301802	2x 170ml Standard Titration Vessel
503028	PTFE Stirrer 6x20mm (Pack of 5)

Spares/Accessories	
594047	Control POD® (cables not included)
594049	Dispense POD® (syringe, cables and tubing not included)
594048	Titrate POD® (cables not included)
594010	Bottle Cap with Drying Tube, Desiccant Filled
594020	Drying tube with Desiccant
549013	12.5ml Syringe Assembly Kit
594014	Dispensing Tip (1 Pack)
594015	Bottle / Syringe Tubing (700mm)
594016	Tubing from Syringe to Dispensing Tip (600mm)
594017	12.5ml Syringe
595005	Control POD® with 24VDC 7A PSU Power Pack
594006	Titrate POD® with RS232 Cable 500mm and Cable Kycon 500mm
594007	Dispense POD® with one Cable Kycon 500mm, RS485 Cable (2 pin) 500mm and Syringe Assembly Kit
594022	1m to IEC UK Cable
594023	1m to IEC Euro Cable
594024	1m to IEC US Cable
594025	1m to IEC to India Cable
594026	1m to IEC to China Cable
594038	Cable Kycon to Kycon 500mm
594039	Cable Kycon to Kycon 1000mm
594040	RS232 to RS232 Cable (9 pin d-sub) 500mm
594041	RS485 to RS485 Cable (2 pin) 500mm
301802	170ml Standard Titration Vessel
594052	24VDC 7A PSU Power Pack
594033	E-Chem® PATrode Red (for non-aqueous titrations)
594034	E-Chem® PATrode Blue (for aqueous titrations)
594056	E-Chem® PATrode Green (for redox titrations which change in pH value)
594036	E-Chem® PATrode Yellow (for precipitation titrations)
594043	210ml Titration Vessel
503028	PTFE Stirrer 6x20mm (Pack of 5)
594058	Titrant Bottle and Insert

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Certificates

All PAT940 Smart Titrators®, are supplied with calibration certificate traceable to national standards.
For additional technical information, specifications, MSDS data, user manuals, and exhibition news, visit our website at: www.gecil.com

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