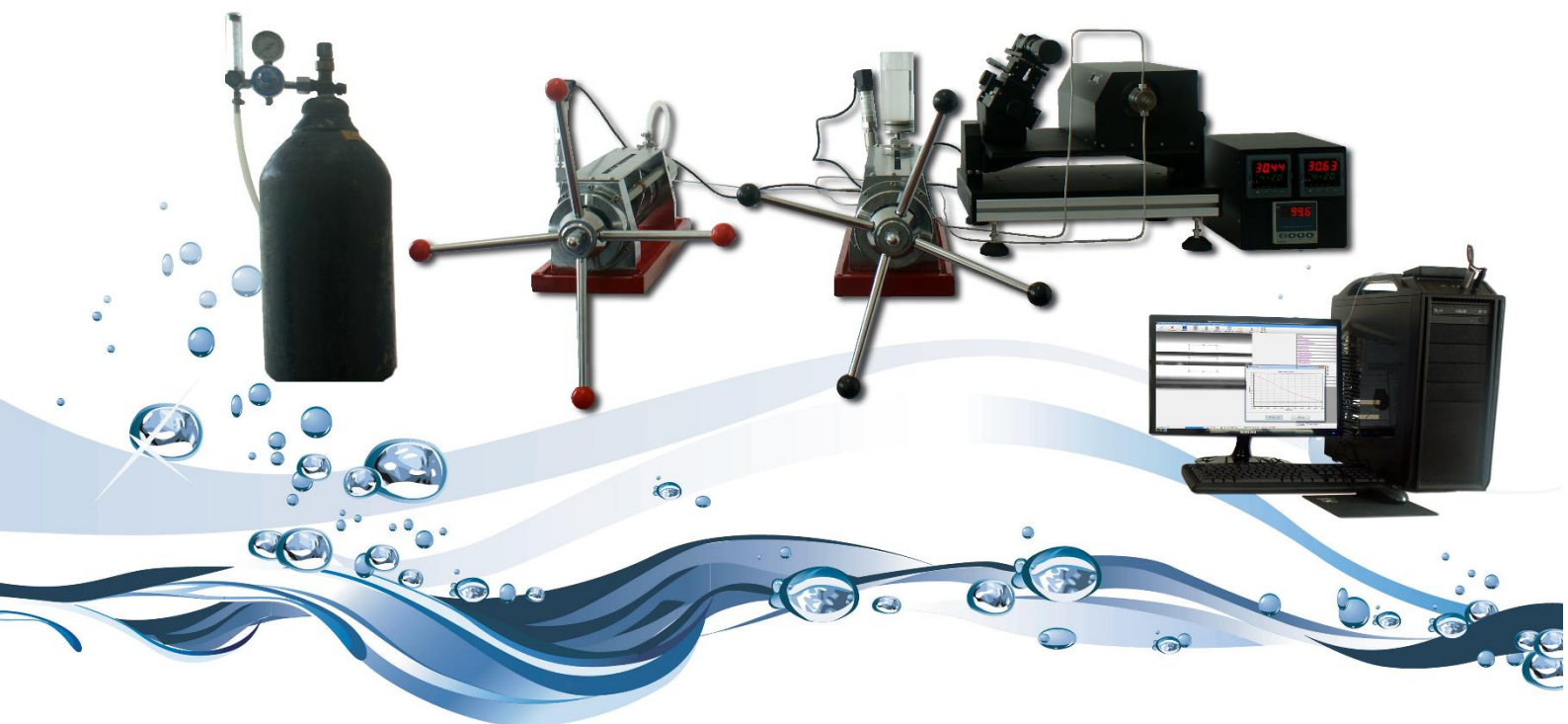# High Pressure & Temperature
Spinning drop Interfacial tensiometer

Model TX500HP

一 *Max Pressure: 70MPa, Temp. Range: -30-200℃*

Ultra high pressure and temperature spinning drop interfacial tensiometer model TX500HP is special designed for measurement of interface tension (IFT) between liquid-gas/liquid-fluid system under high pressure and high temperature. Max pressure can reach to 70MPa and temperature range is between -30-200℃. IFT measurement via pressure and temperature is very useful for application such as Enhanced Oil Recovery (tertiary oil recover). TX500HP can be used to measure IFT between ASP or binary liquid mixture systems and crude oil in the simulated condition with high pressure and temperature with min value about 10^{-7}mN/m. And beyond that, it can be used to measure IFT of your system with compressed liquid gas such as CO_2 or natural gas with extra connector port for gas system.

Kino

Ultra high pressure & temperature
spinning drop interfacial tensiometer
Model TX500HP

⬭ **Spinning Drop Method Used For Ultra-low Interfacial Tension Measurement：**

Under conditions of constant temperature and constant pressure, interface energy increases as interface area increases. The increment of interface energy per unit area is referred to as interface tension, which is formed for the different attractive forces of molecules on both sides of interface to molecules on the interface. Spinning drop interfacial tensiometer can accurately analyze low / ultra-low interface tension, while normal methods such as Wilhelmy plate method and Du Nouy ring method are incapable of measuring such low values.

In general, interface tension of 10^{-2}-10^{-1}mN/m is referred to as low interface tension, and that of below 10-3mN/m as ultra-low interface tension.

To measure ultra-low interface tension, the original balance between gravity and interface tension should be artificially altered to enable the shape of balanced droplet can be easily measured. Making system rotate to increase action of centrifugal force field is the measurement principle of spinning drop method. As shown below：
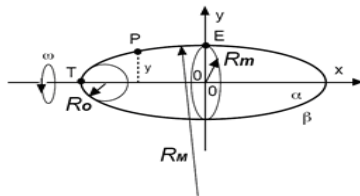
⬭ **Application**

- IFT measurement of liquid-gas, liquid-fluid or liquid-fluid and liquid gas via pressure and temperature
- Development of ASP, binary liquid mixture systems or carbon-dioxide flooding in oil field
- Measuring surface tension or interface tension under high pressure and setup temperature by spinning drop method (max pressure:75Mpa and max temperature: 200℃)
- Development of surfactant

⬭ **Schematic Draw of TX500HP**
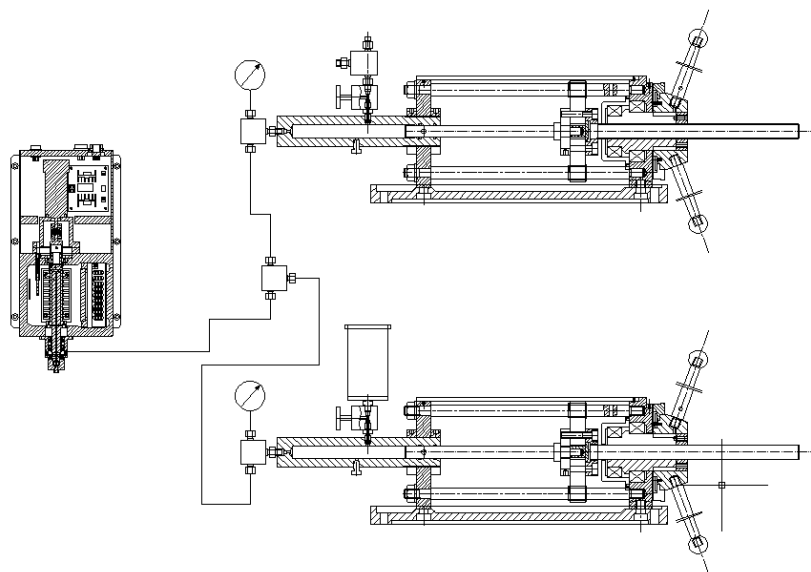
⬭ **Performance feature**

Leading technology at ultra-high pressure and temperature spinning drop chamber with easy operation and safer

1, various spinning drop chamber with different pressure for choice to meet your special need (5M Pa, 10M Pa, 30M Pa, 50M Pa, 70M Pa　or customization)

2, Build in heating system with max temperature 200℃ or more（Accepting custom-made）

3, Removable spindle system: Replaceable sample tube and easier to clean sample tube and sealing part to avoid cross pollution

4, Dynamic sealing system and high speed spindle made of Ti to promise dependable sealing and lower locked-rotor torque

5, Providing extra connector port for inert gas, nature gas or CO_2

Mechanics-professional and easy to operate

1, Mechanics of three-axis precision positioning stages for lens control provide you clearer imaging and more accurate imaging position;

2, Lens tilt control and level control of chamber facilitate determining baseline between melt and solid and easy to get a vertical needle.

3, Tilted unit for adjusting vision angle of parallel background light to promise a good drop shape.

Clearer and higher speed vision system

1, Advanced drop shape profile lens and parallel background light ensures sharper imaging and clearer drop image edge;

2, Continuous zoom industrial lens with magnification of 0.35－4.5X enables larger VOA, suitable for samples of varies volumes;

3, Lens with long working distance (180mm) effectively protect vision system from high temperature;

4, World highest speed camera from Germany can reach 87FPS (WVGA)-340FPS (GIF)

World leading analysis software CAST®4.0

1, Calculating interface tension automatically which is useful for measurement of dynamic interface tension:
You can measure interface tension (IFT) via time by just press one button "measurement" to start capturing drop image, calculating IFT, saving captured images and calculated result without any manual intervention. IFT via rotating speed, temperature, pressure and time will saved and managed by CAST4 and it can be exported into an Excel file.

2, Calculating average IFT based on drop profile instead of two points at drop edge to acquire high precision result.

3, Humanized software design and database management to promise：

(1) Wizard design of standard windows is designed for various measurement operators.

(2) Database management: one-to-one correspondence between measured value and image; query and

modifying of historical data at anytime

(2) Measured data is Excel exportable for you to create your measurement report conveniently.

(3) Secondary modification of eigenvalue. The software will record all your operation traces for you to check measured data, effectively avoiding errors caused by human.

(5) Comfortable language interface designed by Unicode enables more convenient and compatible for you to operate.

⬭ Specification

Specification of spinning drop chamber	Provides system with 5MPa, 10MPa, 30MPa, 50MPa, 70MPa for your choice
Max pressure	30MPa or 70MPa (According to type you selected)
Max speed of motor	10,000 RPM
Control system of motor	Servo System from Switzerland
Heating system	Build-in heating system with max temperature: 200℃ as standard Optional system includes: max 300℃ or Peltier thermostatic system (0℃) or thermostatic water bath system (－80-200℃)
Max temperature	200℃ or customization
ID of sample tube	4mm
Material of sample tube	sapphire glass (Above 10MPa) or quartz glass (Below 10MPa)
Sealing method of sample tube	Both ends open, dynamic sealing, replaceable tube
Material of high speed spindle	Ti
Sampling method of crude oil	Extra dosing hole for sampling crude oil real time
Method for reading pressure	Digital pressure sensor with resolution 0.01MPa, accuracy 0.25, max 100M Pa and interface RS485
Method for reading temperature	Reading temperature of liquid at tube directly by PT100
Resolution of temperature	0.1℃
Extra ports	exhaust port and connector port for gas
High pressure screw piston pump	For liquid-gas or liquid/fluid system (one pump) or for liquid-fluid-liquid gas system (two pumps)
Control method	Manual (Automatically pump for option)
Max pressure	85MPa
Exhaust port	Provided with a drain port at the bottom of the chamber

Max volume of container	100mL (container made of quartz glass with volume 250mL)
Value and tube	Made of stainless steel for high pressure system Hastelloy C276 for option
Control of vision system	
3 axis positioning stage	Positioning stage of XY axis with travel range 60mm and accuracy about 0.01mm, positioning stage of Z axis with travel range 13mm and accuracy 0.01mm.
Tilted stage	For levelness adjustment of vision system with micrometer
Camera	Resolution 130M with speed 60－400FPS, interface: USB3.0
Lens	0.7－4.5X，Zoom: 6.5:1
Background light	Mono LED
Dimension and weight	
Dimension of Main body	90(L)*55(W)*65 (H) cm
Weight of Main body	41kg
Dimension of piston pump	18(L)*90(W)*60 (H) cm / per unit
Weight of piston pump	34kg / per unit
Software and others	
Range of IFT	10^{-6}-100mN/m
Range of readable width	0-4mm depending on ID of tube
Accuracy of reading	0.001mm
Measuring method	Vonnegut method or Bashford-Adams correcting
Calculating method	Pressing one button "measurement" to start capturing drop image, calculating IFT, saving captured images and calculated result without any manual intervention.
Report management	One-to-one correspondence between measured value and image; query and modifying of historical data at any time.
Secondary modification of eigenvalue	The software will record all your operation traces for you to check measured data, effectively avoiding errors caused by human.
Result exporting	All measured result and captured images can be exported.
Live windows	Live video and captured images
Function controlled by software	Speed, focus and position of camera
Real-time curve	IFT via time