青岛创梦仪器有限公司

Qingdao Chuangmeng Instrument Co. Ltd.

钻井液油水（固相）分离装置

OIL AND WATER RETORT

使用手册

版本 1.0

Version 1.0

请你仔细阅读《使用手册》，正确掌握本产品的安装和使用方法。阅读后请将本《使用手册》妥善保管，以备今后进行检修和维护时使用。

Please read the Instruction Manual carefully, for correctly grasping the installation and using method of this product. Please keep properly this Instruction Manual after reading, for the usage during troubleshooting and maintenance in the future.

联系方式 Contact:
邮编 Zip code：266100
网址 Website：www.qdcmyq.com
电话 Tel：86-0532-66993768
传真 Fax：86-0532-66993744
邮箱 E-mail：cmtech@sina.com
公司地址：中国·青岛市市北区温州路 7 号
生产基地：青岛市城阳区流亭街道兴海路 3 号
Address：No. 7 Wenzhou Road, City Northern District, Qingdao City, China
Production base：No. 3 Xinghai Road, Liuting Street, Chengyang District, Qingdao

一、概述

钻井液油水（固相）分离装置是用来分离和测定水基钻井液样品中水、油和固相体积的仪器。仪器采用外加热蒸馏方式，避免内加热所形成干烧（过温），50ml 大容量蒸馏体，测试精度与常规（20ml）相比得到了提高。该仪器操作简单，是了解固相浓度和组成水基钻井液粘度、滤失控制的基础。是用于实验室和现场理想的专用仪器。

二、型号及规格

型号	名称	不同配置处	特点
1400	钻井液油水（固相）分离装置	采用外加热蒸馏方式	防止干烧

三、仪器的主要技术参数

名称	技术参数
电源	AC220V±5% 50/60Hz
加热功率	1000W
蒸馏体容量	50±0.2ml
液体回收率	>98%
最高加热温度	500℃

四、仪器的结构及工作原理

（一）组成部分

1、蒸馏体：耐腐蚀不锈钢材料精制而成。

2、液体冷凝体：具有足够的容量以便油和水的蒸气在离开冷凝体之前冷却至蒸发温度以下。

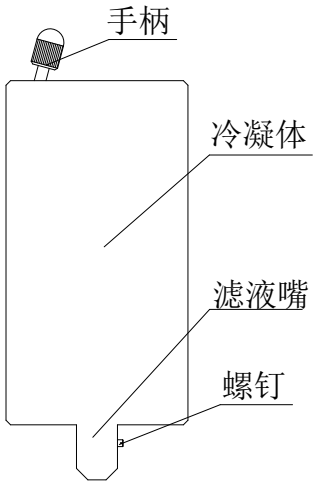
3、加热体：具有足够的功率以便在一定时间之内将样品温度升至液相蒸发温度以上，而不致使固相沸腾出来。

4、量筒：容量 50ml。

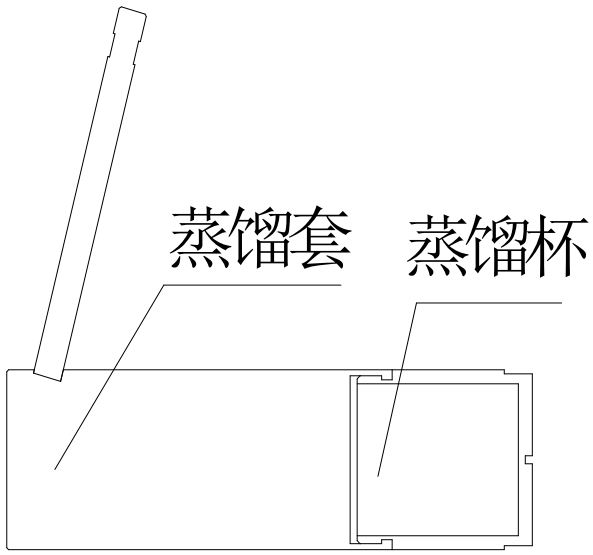
5、试管刷：清洗量筒用的毛刷。

6、刮刀：用来刮取蒸馏体内剩余的固相成分。

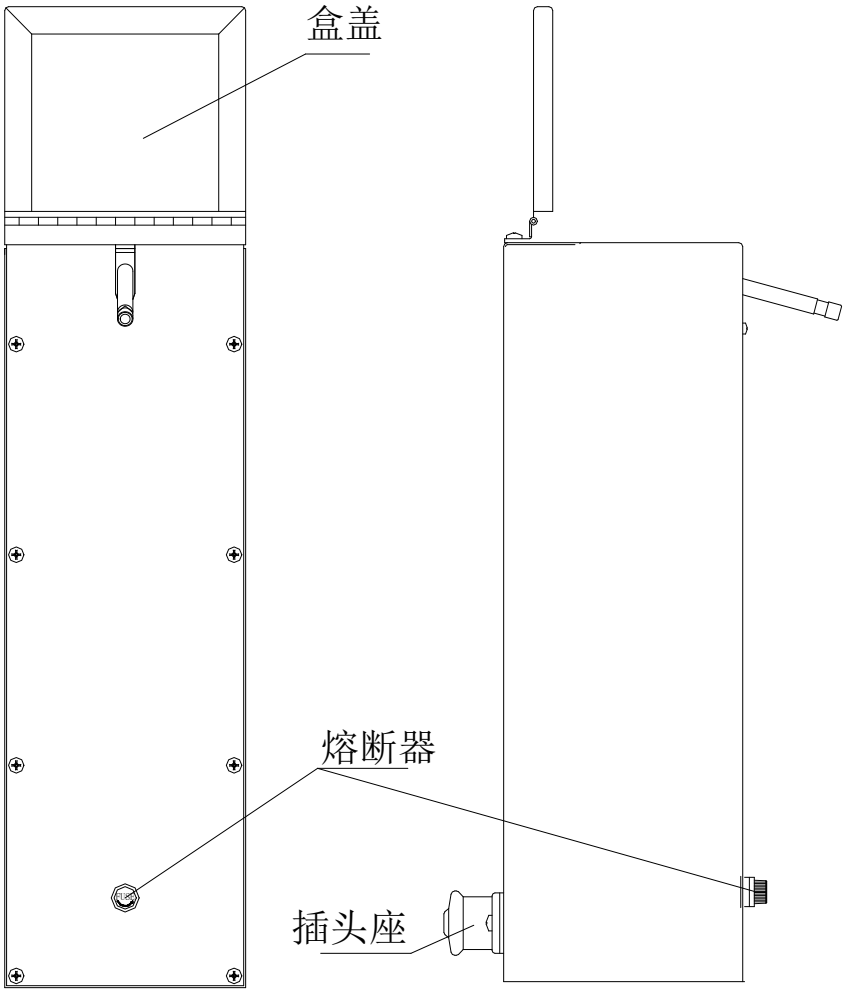
7、箱体：采用全不锈钢材料制成，固定盛装其他部件用的容器。



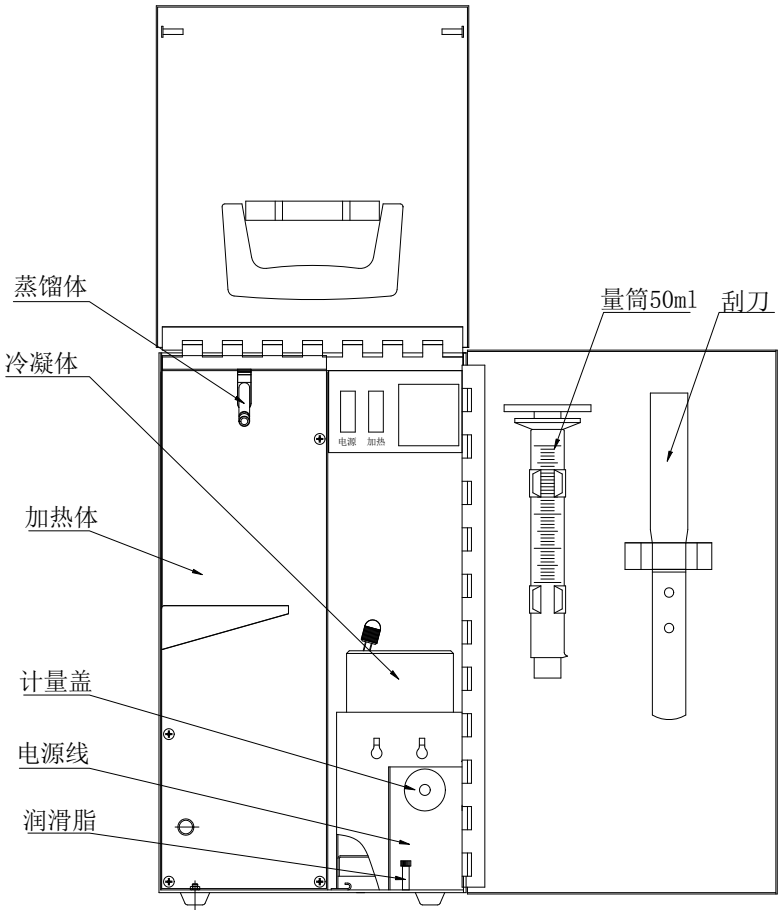
冷凝体结构图



蒸馏体结构图



加热体结构图



油水（固相）分离装置结构图

（二）工作原理

在蒸馏体外加热已知体积的水基钻井液样品,使其液相成分蒸发,而后使之冷凝并收集在带刻度的量筒内,液体体积直接从量筒中油相和水相的读值得出。总的固相体积（悬浮的和溶解的）从差值（样品总体积－液相体积）得到。由于任何溶解的固体将留在蒸馏体内，所以必须经过计算才能确定悬浮固相体积。也可通过计算得到低比重固相和加重材料的相对体积。

五、仪器的操作

1）检查仪器各部件是否清洁干燥。
2）取有代表性的样品，通过马氏漏斗粘度计（12 目）倒入容器中。充分搅拌样品，排出空气，使样品混合均匀。
3）将蒸馏杯水平放置，用清洁的注射器或直接将样品缓慢注入蒸馏杯中。用计量盖将液面与蒸馏杯上端刮平，使所取样品的体积为 50ml。
4）用湿布擦净蒸馏套的丝扣，将带丝扣的蒸馏套拧紧在蒸馏杯上。

注：为保证密封，丝扣上需抹一些润滑油或润滑脂。

5）调整手柄，将蒸馏体的引流管紧紧插入冷凝体隔热套小孔内，拧紧手柄。
6）打开保温盖，将组装好的蒸馏体-冷凝体组合体小心放入加热体、冷凝体支架内，盖好保温盖。
7）将量筒垂直接在冷凝体的滤液嘴口下。
8）接通电源，打开电源、加热开关，实验开始。直至冷凝体再没有液体排出，断电。
9）使蒸出的液相冷却至室温，并读取总液相 VL、油和水的体积百分数 VO 和 VW（如油水界面不清晰，

可滴入 1～2 滴破乳剂)。
10)仪器冷却。拆卸固相含量蒸馏体的各部件，用干净的小毛刷清理蒸馏套的引流管和冷凝体的隔热套、滤液嘴，保持干燥以备下一次使用。
11）直接读出测量数据，计算钻井液的固相含量。
对于两种常用的水基钻井液——淡水钻井液和盐水钻井液，计算的方法不同。

淡水钻井液固相含量计算

①总固相含量 VS：

$$VS = 100 -（VW+VO），\%$$

式中 VS——淡水钻井液中总固相体积含量（包括粘土地、钻屑等低密度固相和多数情况下为重晶石的加重材料等高密度固相），%；
VO——由固相含量测定仪测得的钻井液中油的体积含量，%；
VW——由固相含量测定仪测得的钻井液中水的体积含量，%。

②钻井液中固相的平均密度 ρ S：

$$\rho S = \frac{100 \cdot \rho m-(VW \cdot \rho w+ VO \cdot \rho O)}{VS}, g/cm^3$$

式中 ρ S——钻井液中固相的平均密度，g/cm^3；
ρ m——钻井液密度，g/cm^3；
ρ w——水的密度，通常取得 1.0 g/cm^3；
ρ O——油的密谋，通常取暖.48 g/cm^3。

③钻井液中低密度固体（包括粘土和钻屑）的体积含量 VLG：

$$VLG = \frac{VS \quad \rho WM- \rho s}{\rho WM- \rho LG}，\%$$

式中 VLG——钻井液中低密度固体（包括粘土和钻屑）的体含量，%；
ρ WM——加重材料的密度，g/cm^3
ρ s——钻井液中固相的平均密度，g/cm^3
ρ LG——低密度固体的密度（可实测求得或设 ρ LG=2.60 g/cm^3），g/cm^3。

④钻井液中加重材料的体积含量 VWM：

$$VWM=VS-VLG，\%$$

$$VWM=\frac{VS \quad \rho s- \rho LG}{\rho WM- \rho LG} \quad ，\%$$

⑤钻井液中低密度固体的重量含量 WLG：

$$WLG=10（VLG\times \rho LG），kg/m^3$$

$$WLG=3.5（VLG\times \rho LG）,1b/bbl$$

⑥钻井液中加重材料的重量含量 WWM:

$$WWM=10(VWM\times \rho WM) \quad ，kg/m^3$$

WWM=3.5(VWM× ρ WM) ，1b/bbl

盐水钻井液的固相和液相含量的计算

①盐水钻井液滤液的密度 ρ WC：

$$\rho WC=1+0.00000109 \cdot CCl$$

式中 ρ WC——盐水钻井液滤液的密度，g/cm³

CCl——钻井液滤液分析得出的钻井液中 CL^- 的浓度，mg/L

②盐水钻井液中修正了的总固相体积含量 VSC：

$$VSC=VS-VW\frac{(CCl)}{1680000-1.21 \cdot CCl}$$

式中 VSC——含盐钻井液中修正了的总固相体积含量（减去了盐的体积），%

VS——固相含量测定仪测出的总固相体积含量，%

VW——固相含量测定仪测出的水的体积含量，%

③盐水钻井液中低密度固体体积含量 VLG：

$$VLG=\frac{1}{(\rho WM-\rho LG)}[100 \cdot \rho WC+VSC(\rho WM-\rho WC)-100 \cdot \rho m-VO(\rho WC-\rho O)],\%$$

式中 VLG——盐水钻井液中低密度固体体积含量，%

ρ WM——加重材料密度，g/cm³；

ρ LG——低密度固体密度，g/cm³；

ρ WC——盐水钻井液滤液的密度，g/cm³；

VSC——盐水钻井液中修正了的总固相体积含量，%；

ρ m——盐水钻井液的密度，g/cm³；

VO——固相含量测定仪测出的油的体积含量，%；

ρ O——油的密度，g/cm³。

④盐水钻井液中加重材料的体积含量 VWM：

VWM= VSC- VLG，%

式中 VWM——盐水钻井液中加重材料的体积含量，%

⑤盐水钻井液中低密度固体重量含量 WLG：

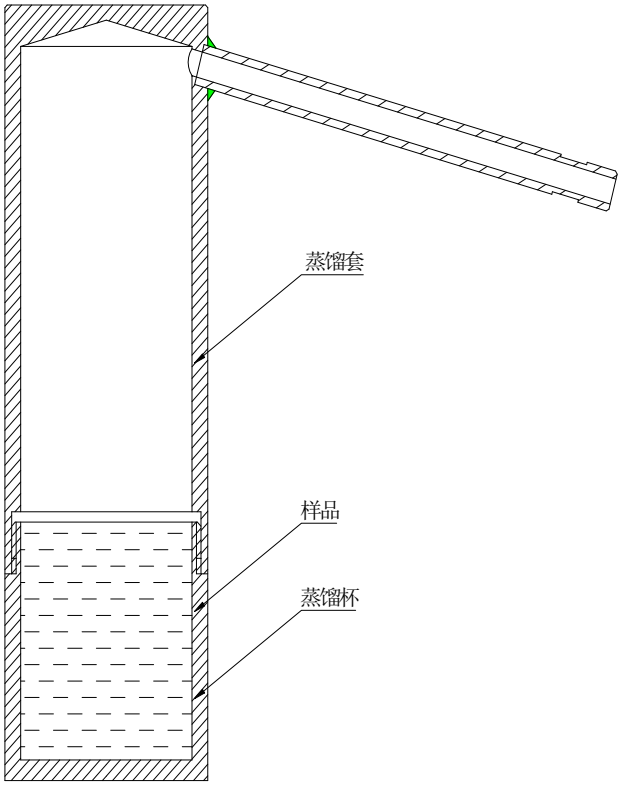
WLG=10（VLG× ρ LG），kg/m³

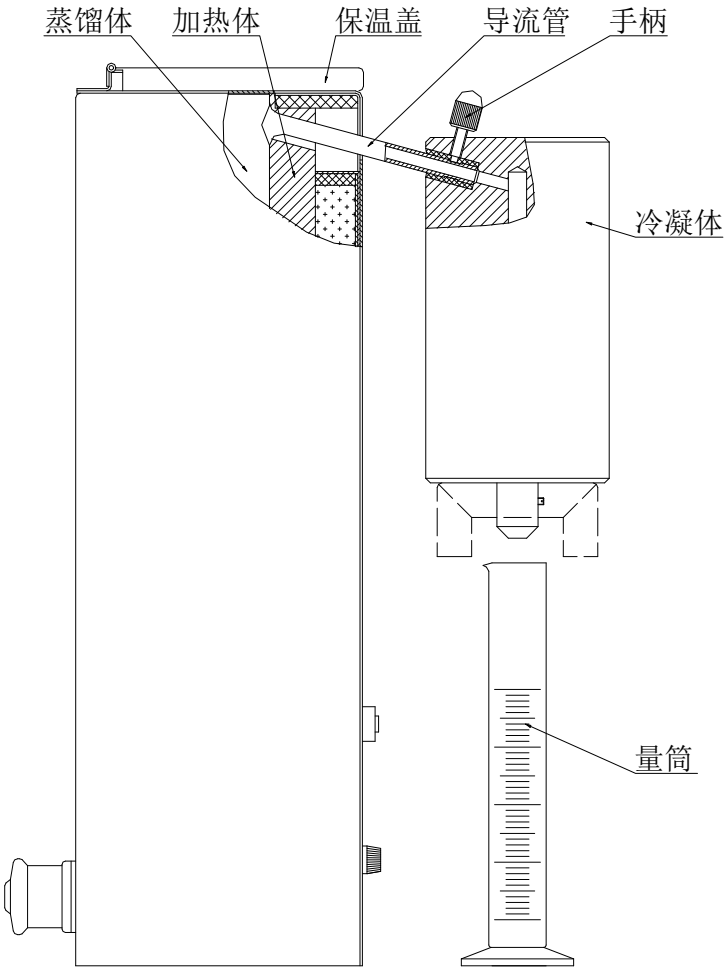
WLG=3.5（VLG× ρ LG），1b/bbl

⑥盐水钻井液中加重材料的重量含量 WWM：

WWM=10（VWM× ρ WM），kg/m³

WWM=3.5（VWM× ρ WM），1b/bbl


蒸馏套
样品
蒸馏杯


蒸馏体
加热体
保温盖
导流管
手柄
冷凝体
量筒

六、仪器的维护与保养

1、清洗各部件，将仪器置于干燥环境中。
2、移动、维修或保养仪器时，要轻拿、轻放，以免造成部件变形，影响精度和使用。
3、加热时通电时间不宜过长，一般蒸馏约 40 分钟。
4、蒸馏杯和蒸馏套之间的密封面不要损伤，以免影响密封。

七、故障的判定与排除

故障	原因	维修方法
加热体通电不加热	加热棒坏	更换加热棒
	电线插头接触不好	检查电线接头各插头是否插牢
	保险丝烧坏	更换保险丝

八、一年备件（选配）

序号	编号	名称及规格	单位	数量
1	G0103	量筒（50ml）	只	10
2	14026	刮刀	只	2
3	P03120	毛刷	只	10
4	P0369	毛刷	只	10
5	P0133	保险丝（8A）	个	20

I. overview

The instrument provides a means for separating and measuring the volumes of water and solids contained in a sample of drilling fluid. The equipment is heated by outside device.50ml of drilling fluid is heated to vaporize the liquid component which are then condensed and collected in a graduated cylinder. Calculations can be to determine the quality of water and solids or the volume percentages of them. For heated by the outer, the test accurate is increased compared with 20ml retort. Avoid over heating by inside heater. Retorts are easy to operate, used to the lab and locale widely. It is base to understand the concentration of solids and the conglutination of drilling fluid. The characteristic of retort provided with configuration easily, operation conveniently, which is the perfect special instruments used to the lab and locale widely.

Ⅱ.Model and Specification

Model	Name	Different configurations	Characteristic
1400	OIL AND WATER RETORT	Distillation by external heating	Prevent dry burning

Ⅲ.The Main Technical Parameters

Name	Technical parameter
Power supply	AC220V±5% 50/60Hz
Power	1000W
Capacity of distillatory	50±0.2ml
Liquid recovery rate	>98%
Maximum temperature	500℃

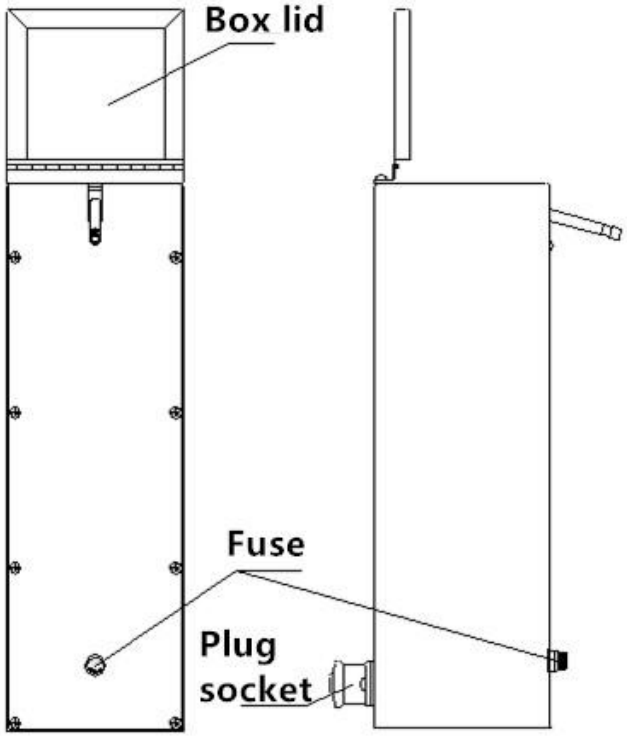
IV. The Structure and Working Principle of the Instrument

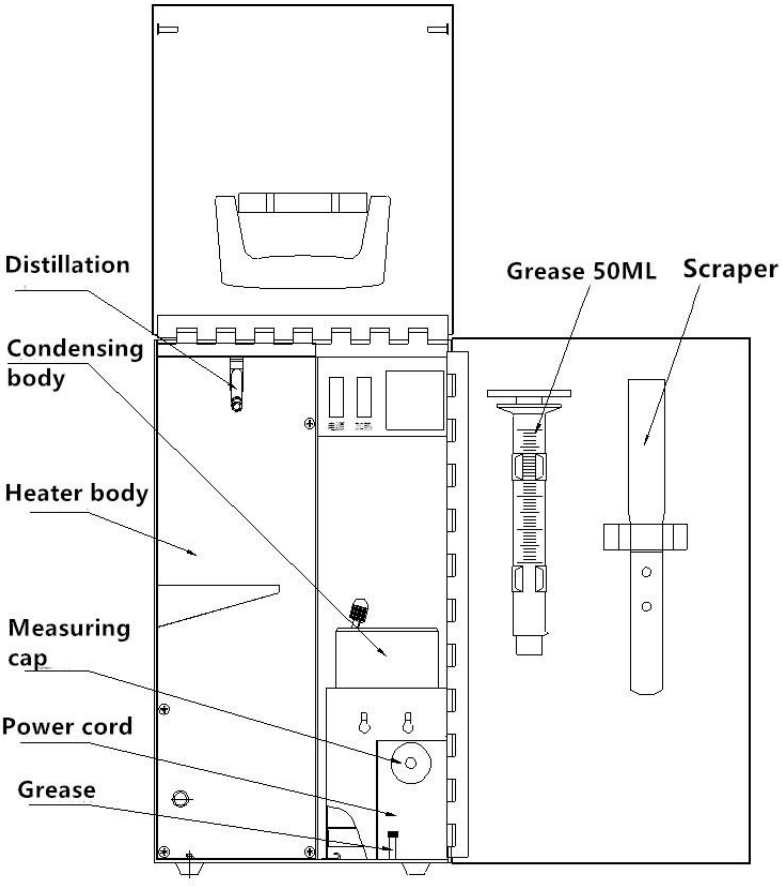
(A) Components

1. Distillate: Refined from corrosion-resistant stainless steel.
2. Liquid condensate: It has enough capacity to cool the vapor of oil and water below the evaporation temperature before leaving the condensate.
3. Heater: It has enough power to raise the sample temperature above the evaporation temperature of liquid phase within a certain period of time without boiling out the solid phase.
4. Measuring barrel: capacity 50ml.
5. Test tube brush: brush for cleaning measuring cylinder.
6. Scraper: It is used to scrape the remaining solid components in the distillation body.
7. Box: Made of stainless steel, the container for other parts is fixed.

(B) Working principle

A known volume of drilling fluid sample is heated by outside device to vaporize the liquid component. They are then condensed and collected in a graduated cylinder. Liquid volumes are determined from reading the water phases on the graduated cylinder. The total volume of solids, both suspended and dissolved, is obtained by noting the difference of the total sample volume versus the final liquid volume collected. Calculations are necessary to determine the volume of suspended solids since any dissolved solids will be retained in the retort. Relative volumes of low-gravity solids and weight materials may also be calculated.


Box lid
Fuse
Plug
socket


Distillation
Condensing
body
Heater body
Measuring
cap
Power cord
Grease
Grease 50ML
Scraper

Ⅴ. Instrument operation

1) Check whether the parts of the instrument are clean and dry.
2) Take representative samples and pour them into the container through the Martensite funnel viscometer (12 meshes). Mix the sample fully and exhaust the air to make the sample mix evenly.
3) Place the distillation cup horizontally and slowly inject the sample into the distillation cup with a clean injector or. The liquid level and the upper end of the distillation cup are scraped flat with the metering cover, so that the volume of the sample is 50 ml.
4) Wipe the screw of the distillation sleeve with a wet cloth and tighten the screw-up sleeve on the distillation cup.
Note: In order to ensure sealing, some lubricating oil or grease should be applied to the thread buckle.
5) Adjust the handle, tightly insert the drainage pipe of the distillate body into the hole of the heat insulation sleeve of the condensate body, and tighten the handle.
6) Open the heat preservation cover, put the assembled distillate-condensate combination into the heater and condensate bracket carefully, and cover the heat preservation cover.
7) Connect the measuring cylinder vertically under the filter nozzle of the condensate.
8) Turn on the power supply, turn on the power supply and the heating switch, and the experiment begins. Until the condensate no more liquid discharged, power off.
9) Cool the evaporated liquid phase to room temperature, and read the volume percentages of total liquid phase VL, oil and water VO and VW (if the oil-water interface is not clear, 1-2 drops of demulsifier can be added).
10) Instrument cooling. Remove the components of the solid content distillate, clean the drain pipe of the distillation sleeve and the heat insulation sleeve and filter nozzle of the condensate with a clean small brush, and keep dry for the next use.
11) Read the measured data directly and calculate the solid content of drilling fluid.
For two commonly used water-based drilling fluids, freshwater drilling fluids and brine drilling fluids, the calculation methods are different.
Calculation of Solid Content of Freshwater Drilling Fluids:
1) Total solid volume content VS：

$$VS=100-(VW+VO),\ \%$$

Where VS——Total solid content of mud including low gravity solid content(clay and shale cuttings)and high gravity solid content(weighting materials, most cases barite) of a fresh water mud,%
VO——Oil content of mud read from retort test,%
VW——Water content of mud read from retort test,%
2) Average specific gravity of mud solidsρS：

$$\rho S=\frac{100\cdot\rho m-(VW\cdot\rho w+VO\cdot\rho O)}{VS},\ g/cm^3$$

WhereρS——Average specific gravity of mud solids，g/cm³,
ρm——Mud specific gravity，g/cm³,
ρw——Water specific gravity, usually as equal to 1.0g/cm³,
ρO——Oil specific gravity, usually as equal to 0.48 g/cm³.
3) Low gravity solids (inclusive clay and cuttings) volume content of mud VLG：

$$VLG=VS\frac{\rho WM-\rho s}{\rho WM-\rho LG},\ \%$$

Where VLG——Low gravity solids(inclusive clay and cuttings) volume content of mud，%,
ρWM——Specific gravity of weighting material，g/cm³,
ρs——Average specific gravity of mud solids，g/cm³,
ρLG——Specific gravity of low gravity solids(can be measured or taken as 2.60 g/cm³)，g/cm³.
4) Weighting material volume content of mud VWM：

VWM=VS-VLG，%

VWM=VS $\frac{\rho s-\rho LG}{\rho WM-\rho LG}$ ，%

5) Low gravity solids weight content of mud WLG：

WLG=10（VLG×ρLG），kg/m³

WLG=3.5（VLG×ρLG）,1b/bbl

6) Weighting material weight content of mud WWM:

WWM=10(VWM×ρWM) ，kg/m³

WWM=3.5(VWM×ρWM) ，1b/bbl

Calculations of Solid and Liquid Content of a Mud Containing Substantial Quantity of Salt

1) Specific gravity of water phase with dissolved saltρWC：

ρWC=1+0.00000109·CCl

WhereρWC——Specific gravity of filtrate of salt water mud，g/cm³,

CCl——CL^- concentration of mud obtained from filtrate chemical analysis，mg/L

2) Total solid volume content corrected in salty mud VSC：

$$VSC=VS-VW\left(\frac{CCl}{1680000-1.21\cdot CCl}\right)$$

Where VSC——Total solid volume content corrected in salt water mud,%

VS——Total solid content of salt water mud obtained from retort test，%

VW——Water volume content of salt water mud obtained from retort test，%

3)Low gravity solids volume content of salt water mud VLG：

$$VLG=\frac{1}{(\rho WM-\rho LG)}[100\cdot\rho WC+VSC(\rho WM-\rho WC)-100\cdot\rho m-VO(\rho WC-\rho O)],\%$$

Where VLG——Low gravity solid volume content of salt water mud，%

ρWM——Specific gravity of weighting material，g/cm³,

ρLG——Specific gravity of low gravity solids，g/cm³,

ρWC——Specific gravity of filtrate of salt water mud，g/cm³,

VSC——Total solid volume content corrected in salt water mud，%,

ρm——Specific gravity of salt water mud，g/cm³,

VO——Oil volume content of salt water mud obtained from retort test，%,

ρO——Specific gravity of oil，g/cm³.

4) Weighting material volume content in salt water mud VWM：

VWM= VSC- VLG，%

Where VWM——Weighting material volume content in salt water mud,%

5) Low gravity solids weight content of salt water mud WLG：

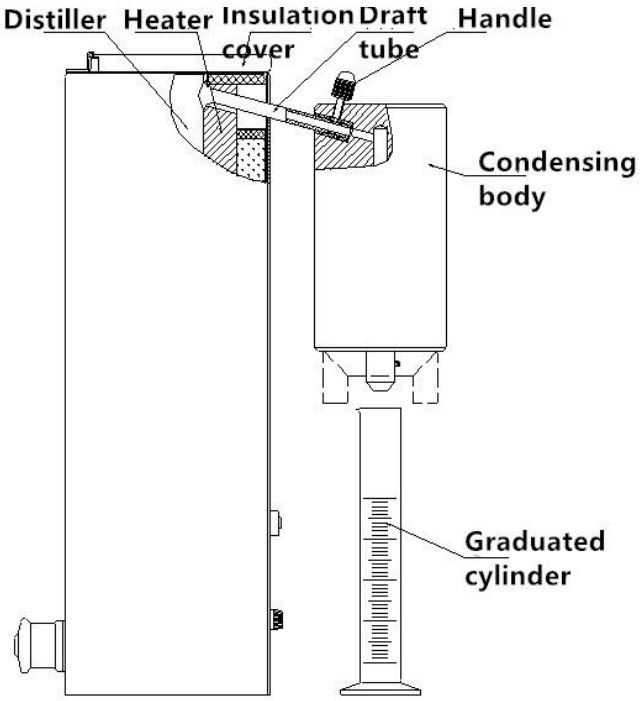
WLG=10（VLG×ρLG），kg/m³

WLG=3.5（VLG×ρLG），1b/bbl

6) Weighting material weight content of sale water mud WWM：

WWM=10（VWM×ρWM），kg/m³

WWM=3.5（VWM×ρWM），1b/bbl



Ⅵ.Maintenance and Maintenance of Instruments

1. Clean the parts and place the instrument in a dry environment.
2. When moving, repairing or maintaining the instrument, it should be handled and handled lightly, so as not to cause deformation of parts, affect accuracy and use.
3. When heating, the electrification time should not be too long. Generally, the distillation time is about 40 minutes.
4. Do not damage the sealing surface between the distillation cup and the distillation sleeve to avoid affecting the sealing.

Ⅶ.Diagnosis and Elimination of Faults

Fault	Reason	Maintenance method
Heater is electrified and not heated	The heating rod is broken.	Replacement of heating rod
	Poor contact of wire plug	Check whether the plugs in the wire connector are fastened
	Fuse burnt out	Replacement of fuses

Ⅷ.One-year spare parts (optional)

No		Name and Specification	Quantity
G0103		Graduated cylinder（50ml）	10
14026		Scraper	2
P03120		Brush	10
P0369		Brush	10
P0133		Fuse（8A）	20

青岛创梦仪器有限公司 装箱单

Qingdao Chuangmeng Instrument Co., Ltd. Packing list

生产企业：青岛创梦仪器有限公司

Manufacturing enterprise: Qingdao Chuangmeng Instrument Co.,Ltd.

生产地址：青岛市城阳区流亭街道兴海路 3 号

Production address: No. 3 Xinghai Road, Liuting Street, Chengyang District, Qingdao

主机型号: 1400

Model of the main motor: 1400

出厂编号：

Manufacturing No:

序号 No	编号	名称及规格 Name and specification	数量 Quantity	备注 Remarks
1		箱体 Box body	1	
2		蒸馏器 Distiller	1	
3		冷凝体 Condensing body	1	
4		电源线 Power cord	1	
5		量筒 Graduated cylinder（50ml）	1	
6		刮刀 Scraper	1	
7		毛刷 Brush	2	
8		杯盖 Cup cover	1	
9		润滑脂 Grease	1	
10		钢丝棉起子 Steel wool screwdriver	1	
11		通孔器 Through hole device	1	
12		钢丝棉 Steel wool	1	
13		使用手册 Operation manual	1	
14		合格证 Certificate	1	