



(Version 2 Amendment in 2010)

CMS 系列油气分离计量系统 使用说明书

CMS Series Oil-Gas Separated Measurement System Usage Description

- ◇ 单井计量
- ◇ Single Well Measurement
- ◇ 井组计量
- ◇ Well Group Measurement
- ◇ 计量站计量
- ◇ Measure Station Measurement
- ◇ 分队计量
- ◇ Separated Team Measurement
- ◇ 联合站计量
- ◇ United Station Measurement



西 安 东 风 机 电 有 限 公 司

XI'AN DONGFENG MACHINERY & ELECTRONIC CO., LTD.

目 录

Catalog

1. 概述.....	3
1.GENERAL DESCRIPTION.....	3
2. 结构及原理描述.....	4
2.STRUCTURE & PRINCIPLE DESCRIPTION.....	4
3. 选型说明及主要技术参数.....	6
3.OPTION TYPE DESCRIPTION & MAIN TECHNICAL PARAMETER.....	6
4. 安装地基要求.....	8
4.INSTALLATION FOUNDATION REQUIREMENT.....	8
5. 使用操作指南.....	11
5.USAGE OPERATION MANUAL.....	11
6. 车载移动式使用说明.....	13
6.VEHICULAR TYPE USAGE DESCRIPTION.....	13
7. 技术支持.....	15
7.TECHNOLOGY SUPPORT.....	15

概述

General Description

1.1 CMS 系列油气分离计量系统是我公司研制开发的一款多相流测量系统。它采用了先进的柱状旋流式气-液分离技术，对气液进行分离，利用科里奥利质量流量计对液相精确测量。由于科里奥利质量流量计具有精度高、量程宽、免维护和流通性强等特点，且基本上不受流体物性（如密度和粘度）的影响，因此特别适用于油田流态复杂，流量变化大，含水变化大等复杂工矿。

1.1 CMS Series Oil-Gas Separated Measurement System is multi-phase flow Measurement system researched & developed in our company. CMS employs advanced Gas-Liquid Cylindrical Cyclone Separated Technology to separate Gas & Liquid, and uses Coriolis Mass Flow Meter to measure the accuracy of gas & liquid. Because of the high accuracy, wide measure ratio, without maintain and strong flow characteristics of Coriolis Mass Flow Meter, meanwhile is also not affected by liquid physical characteristics(such as density & viscosity), and the CMS is very specially applied to oil field complicated flow condition, varied flow, varied water content, etc complicated mining industry.

1.2 CMS 系列油气分离计量系统在测量显示油水混合液的总质量、瞬时流量、密度的同时，且在适合的工况下能推算出含水比、产油量，其精度误差完全满足国标《油田油气集输设计规范（GB50350 -2005）》规定的单井油气水计量准确度的要求，同时也完善了目前国内油井采出液多相流混相输送计量的工艺技术。

1.2 CMS Series Oil-Gas Separated Measurement System can measure and display mixed liquid total mass, instant flow and density, meanwhile which can also calculate water content ratio, oil production at the suitable industry condition, and the accuracy error totally meets international «oil field oil-gas integrated output design regulation(GB50350 -2005)» regulated single well oil-gas measured accuracy requirement, also complete the current domestic oil well produced liquid multi-phase flow mixed phase transport measured technology.

1.3 CMS 系列油气分离计量系统的各种产品，在设计制造过程中采用和满足了下列相关规范和标准：

1.3 Every elements of CMS Series Oil-Gas Separated Measurement System meet the below relevant regulations and standards during the process of design & production:

GB50350-2005 油田油气集输设计规范

Oil-field Oil-Gas integrated transport design regulation

GB 3836 爆炸性环境用防爆电气设备

Explosion Ambient usage Ex-proof electric equipment

SY/T6682-2007 用科里奥利流量计测量液态烃流量

Using coriolis mass flow meter to measure liquid hydrocarbons flow

SY 0402-2000 石油天然气站内工艺管道工程施工及验收规范

Petroleum gas station technological pipeline project construction & acceptance regulation

SY/T0090-2006 油气田及管道仪表控制系统设计规范

Oil-gas field & pipeline instruments controlled system design
regulation

SY/T0515-2007 分离器规范

Separator regulation

1.4 系统特点：

1.4 System Characteristics

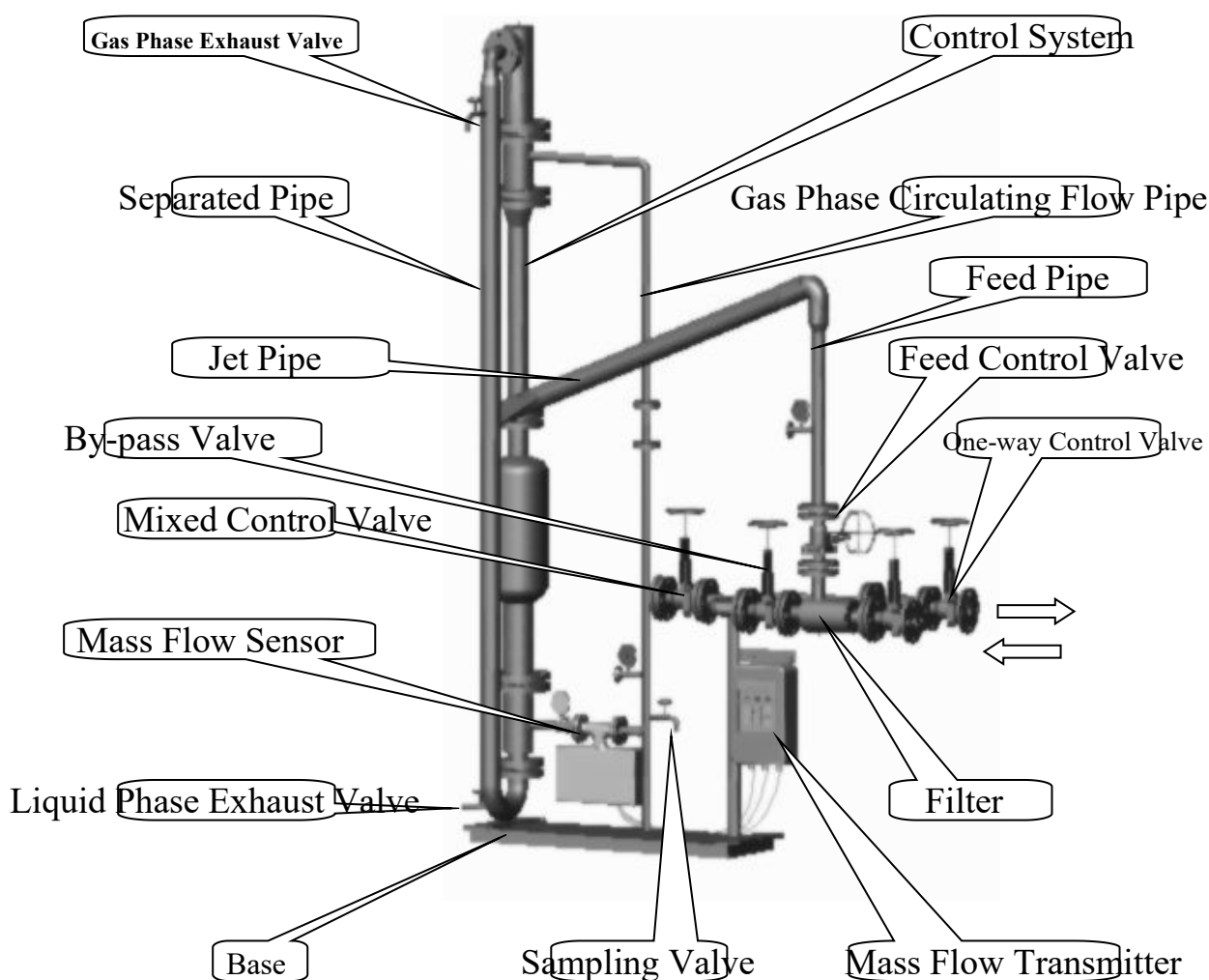
- ◇ 计量精度高、实时在线测量；
- ◇ High accuracy, real-time on-line measurement;
- ◇ 操作简单、方便移动，易安装、易维护；
- ◇ Easy operation, convenient movement, easy installation, convenient maintain;
- ◇ 占地体积小、重量轻；
- ◇ Small size, light weight;
- ◇ 可靠性高，维护量少；
- ◇ High reliability, little maintain;
- ◇ 适用性广，量程比宽；
- ◇ Wide application, wide measure ratio;
- ◇ 配套的质量流量计为本公司自主生产，知名度高，性能可靠。
- ◇ The matched mass flow meters are produced by our own company, which are well-known and reliable.

2. 结构及原理描述

2. Structure & Principle Description

2.1 结构示意图

2.1 Structure Schematic Diagram



2.2 结构组成

2.2 Structure Components

CMS 系列油气分离计量系统由以下五大部分组成：

CMS Oil-Gas Separated Measurement System is Made of the below 5

Main Parts:

气液分离系统，气液分离控制系统，原油计量仪器，气体计量仪器，阀门及管路部件。

Gas-Liquid Separated System, Gas-Liquid Separated Control System, Crude- Oil Measured Instrument, Gas Measured Instrument, Valves & Pipeline Elements.

2.3 工作原理

2.3 Working Principle

2.3.1. 气液两相分离工作原理

2.3.1. Gas-Liquid two-phase separated working principle

CMS 系列油气分离计量系统工作原理如上图所示,进口由倾角向下的管道与铅垂管道相连,多相流经进液管进入主分离器。由于旋流作用,在主分离器中,离心力、重力和浮力形成一个倒圆锥型的涡流面。密度大的液相沿铅垂管道的管壁流到分离器底部,密度小的气相沿涡旋的中央上升至分离器顶部,最终气相和液相分别从分离器的顶部和底部排出。并通过自力式控制系统调整液位和压力,实现两相充分分离,分离后的液相及气相,分别通过液体及气体单相流量计计量。分离器的精确设计是保证系统整体性能的关键。精确的分离器设计可以确保在复杂的工况下,气液两项良好分离,以保证仪表的计量精度。根据用户提供的工况、测量精度要求,我公司可以重新修正 CMS 系列油气分离计量系统的尺寸,并设计、制造以及配套的仪表控制系统。CMS 系列油气分离计量系统适应面广,可涵盖现今大多数的油井及过程集输。

CMS working principle as per the above schematic diagram, entrance is connected by down dip angle pipeline and vertical pipeline, multi-phase flow goes into main separator through feed liquid pipe. Because of rotational flow function, Centrifugal Force, Gravity and Buoyancy Force become a turnover pyramid type vortex surface in separator. Large density liquid phase flow into separator bottom along the wall of vertical pipeline, while small density gas phase goes up to the top of separator along the center of vortex, finally gas phase and liquid phase separately discharged from separator top and bottom. Meanwhile adjusts liquid level and pressure through automatic control system to achieve two phases completely separated, and the separated liquid phase and gas phase separately measured by liquid and gas single phase flow meter. The precision design of separator is the key to ensure whole performance of system. Accuracy separator design will make sure well separate of liquid and gas phase under the complicated industry condition, to ensure measure accuracy of instrument. According to customers' supplied industry condition, measured accuracy requirements, our company can re-amend CMS Series size, and to design, manufacture and relevant instrument control system. CMS covers a wide application, including current major oil-well and process integrated transfer.

2.3.2. CMS 系列油气分离控制原理

2.3.2. CMS Control Principle

CMS 油气分离计量系统采用自力式控制原理,根据现场工况的流型模

拟，充分考虑了液位、压力、气液流量和阀位之间的相互关联，组成了完善的复合调节系统。通过建立正确的气液分离模型和采用完善的控制系统，使分离器实现良好的气液平衡，达到理想的分离效果，从而保证计量的准确性。

CMS employs automatic control principle, according to industry condition flow type simulation on-site, meanwhile considering completely of the relationship among liquid level, pressure, gas-liquid flow and valve location, to composite perfect complex adjustment system. Through building correct gas-liquid separated model and using perfect control system, to achieve good gas-liquid balance of separator and get the reasonable separated effects, then to ensure the accuracy of measurement.

2.3.3. 计量原理

2.3.3. Measurement Principle

流体经过分离后，被分离成气相和液相两种状态，气相可通过气体流量计进行计量，液相由质量流量计进行计量。而质量流量计又以其特殊的原理可通过输入现场纯水和纯油的密度来进行计算得出流过的纯水量和纯油量，实现对油井产油的单量功能。

After separated, flow liquid separated into gas-phase and liquid-phase, and gas-phase can be measured by gas flow meter, liquid-phase can be measured by mass flow meter. Meanwhile because of mass flow meter special principle, which can calculate the flowed pure water and pure oil mass by outputting on-site pure water and pure oil density, to achieve the single-measurement function of oil-well

produced oil.

另外该装置还可由计算机对测量参数进行分析处理，自动生成液、气、水（油）瞬时参数曲线，生产日报等，也可根据用户需要实现计量参数的远程监测。

Moreover this device can also analyse & deal with the measured parameter by computer, then automatically to generate liquid, gas, water(oil) instant parameter curved line, daily production report etc, also can achieve the remote monitor of measured parameter as per customers' requirements.

3. 选型说明及主要技术参数

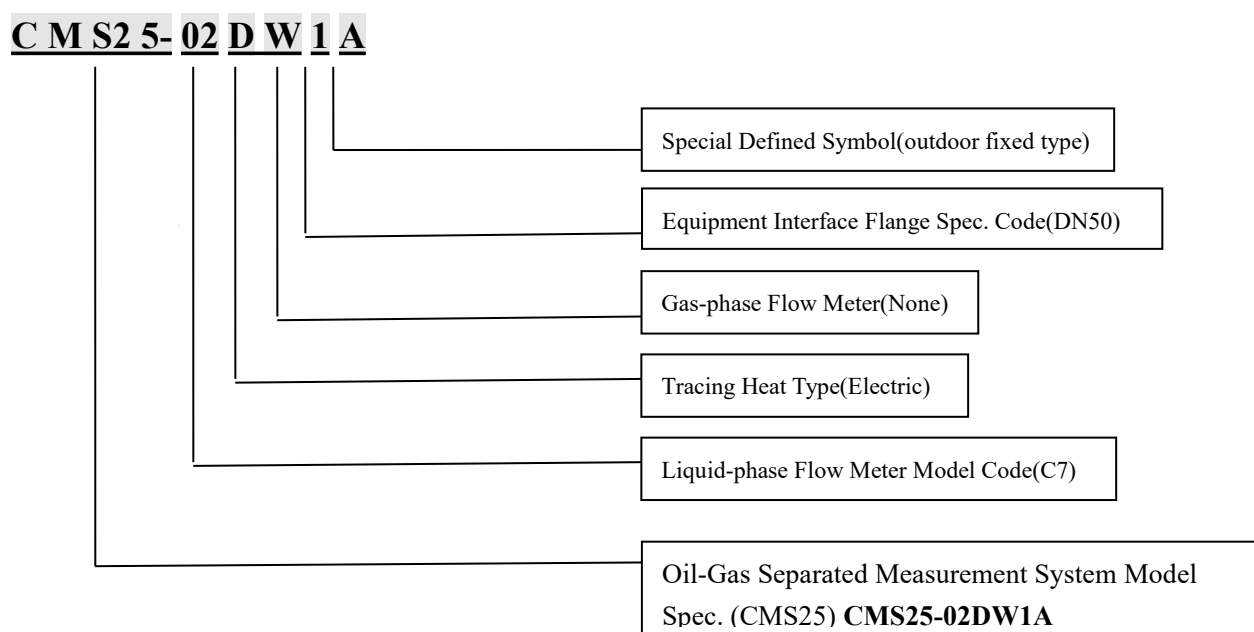
3. Type Option Description & Main Technology Parameter

3.1 选型

3.1 Type Option

举例说明： 例如 CMS25-02DW1A

For Example: CMS25-02DW1A



选型对应表:

Type Option Relevant Sheet:

Oil-Gas Separated Measurement System Spec. Model	Liquid-phase Mass Flow Meter Model		Tracing Heat Type	Gas-phase Flow Meter	Equipment Interface Flange Spec.			Special Defined Symbol
	Code	Products Model			Code	Caliber	G/B No.	
CMS25	01	C3	W (None) D (Electric) S (Water) Tracing heat type as per customers' requirements, preferred option is electric tracing heat.	W(None) Y (Yes) Gas Measurement as per customers' requirements	1	DN50	GB/T9 119 -2000 PN40	A: (outdoor fixed type) B: (indoor fixed type) C: (vehicular type) D: (system type) T: (special order)
	09	G15						
	02	C7						
	10	G25						
CMS50	03	C20			1	DN50		
	10	G25						
	04	C36						
	11	G50						
CMS80	05	C75			2	DN80		
	06	C150						
	11	G50						
CMS100	07	C360			3	DN100		
	08	C600			4	DN150		

3.2 型号规格及相关参数**3.2 Model Spec. & Relevant Parameter**

Model Spec.	Nominal Diameter	Liquid-phase Flow Range (t/d)	Pressure-proof Testing Pressure (MPa)	Rated Pressure (MPa)	Sensor Interface Flange Spec. GB/T9115.1-2000	Outside Dimension(M) (L×W×H)
CMS25-01	DN25	1.8 -- 15	6	4	DN15 PN40	1.6×0.6×2.6
CMS25-02	DN25	4.2 -- 30	6	4	DN25 PN40	1.6×0.6×2.6
CMS50-03	DN40	12 -- 240	6	4	DN25 PN40	2.0×0.8×3.4
CMS50-04	DN50	21.6 -- 320	6	4	DN50 PN40	2.0×0.8×3.4
CMS80-05	DN50	45 -- 900	6	4	DN50 PN40	

CMS80-06	DN80	90 -- 1800	6	4	DN80 PN40	
CMS100-07	DN100	216 – 4320	6	4	DN100 PN40	6.0×2.0×5.5
CMS100-08	DN150	360 - 7200	6	4	DN150 PN40	6.0×2.0×5.5
CMS25-09	DN25	1.8 - 20	6	4	DN15 PN40	1.6×0.6×2.6
CMS25-10	DN25	4.2-- 50	6	4	DN25 PN40	1.6×0.6×2.6
CMS50-10	DN25	12 -- 240	6	4	DN25 PN40	2.0×0.8×3.4
CMS50-11	DN50	30-- 600	6	4	DN50 PN40	2.0×0.8×3.4
CMS80-11	DN50	45-- 900	6	4	DN50 PN40	

注：以上参数是在以下标准工况下：

Note: the above parameter as per the below standard industry condition:

- ✧ 环境温度20℃，大气压力为101.325KPa；
- ✧ Ambient temperature 20℃, atmosphere pressure 101.325KPa;
- ✧ 动力粘度小于400mPa.S,密度小于0.9160g/cm³的中质原油；
- ✧ Kinetic viscosity less than 400mPa.S, density less than 0.9160g/cm³ middle crude oil;
- ✧ 系统内部压损0.1MPa。
- ✧ System internal pressure loss 0.1MPa。

3.3 CMS油气分离计量系统技术参数

3.3 CMS Oil-Gas Measurement System Technology Parameter

- 液相测量误差 $\leq \pm 3\%$
- Liquid-phase measurement error $\leq \pm 3\%$
- 含水率相对误差 $\leq \pm 3\%$
- Water content relative error $\leq \pm 3\%$
- 气相测量误差 $\leq \pm 10\%$
- Gas-phase measurement error $\leq \pm 10\%$
- 额定压力：4.0 Mpa
- Rated pressure: 4.0 Mpa
- 耐压试验压力: 6.0 MPa
- Pressure-proof testing pressure: 6.0 MPa

3.4 适用范围

3.4 Range of Application

- 介质动力粘度：0~1000mPa. S
- Medium kinetic viscosity: 0~1000mPa. S
- 含水率：1~100%
- Rates of water content: 1~100%

- 介质温度: 5~80℃
- Medium temperature: 5~80℃
- 环境温度: -20℃~55℃
- Ambient temperature: -20℃~55℃
- 环境湿度: 10~85%
- Ambient humidity: 10~85%
- 气油比: 小于300m³/t
- Gas-oil ratio: less than 300m³/t

3.5 防爆要求

3.5 Explosion-proof Requirements

CMS系列油气分离计量系统符合GB3836中所规定的相关要求。

其防爆标志为:

CMS Oil-Gas Separated Measurement System as per GB3836
Stipulated Relevant Requirements, Which Explosion-proof Mark as
Below:

- Exib II CT3~T6 系统配套C系列传感器+B1变送器
- Exib II CT3~T6 system matched C series sensor+B1 transmitter
- Exdib II BT3~T6 系统配套G系列传感器+IPT150变送器
- Exdib II BT3~T6 system matched G series sensor+IPT150 transmitter
- Exe II T5~T6 系统配套的电伴热带
- Exe II T5~T6 system matched electric tracing heat belt

3.6 防护等级

3.6 Protection Class

CMS系列油气分离计量系统的外壳防护等级为IP67.

CMS series oil-gas separated measurement system outside shell
protection class is IP67

3.7 结构材料

3.7 Structure Material

气液分离控制部分材料: 0Cr18Ni9

Gas-oil separated control parts material: 0Cr18Ni9

底座部分材料: Q235A

Bases parts material: 0Cr18Ni9

管路结构部分材料：20钢，传送液体用无缝钢管。

Pipeline structure parts material: 20 steel, for transferring liquid to use seamless steel pipe.

3.8 液相质量流量计接口电参数

3.8 Liquid-phase Mass Flow Meter Interface Electric Parameter

电源：220VAC \pm 15%,50Hz; 或24VDC \pm 10%

Power supply:220VAC \pm 15%,50Hz; or 24VDC \pm 10%

引线口：分体安装接线盒接口G3/4";一体安装同变送器要求。

Leading wire interface:divided installation junction box interface is G3/4, integrated installation as per transmitter requirement.

(详见质量流量计使用说明书)

(for detailed information pls. Refer to mass flow meter operation description)

3.9 电伴热功率：

3.9 Electric Tracing Heat Power:

CMS25系列：电伴热需要功率1.375kw。

CMS25 series: electric tracing heat need power is 1.375kw.

CMS50系列：电伴热需要功率1.75kw。

CMS50 series: electric tracing heat need power is 1.75kw.

CMS100系列：电伴热需要功率5.5kw。

CMS100 series: electric tracing heat need power is 5.5kw.

3.10 设备重量：单位：kg

3.10 Equipment Weight: Unit: kg

设备型号 Type	CMS25A	CMS25C	CMS50A	CMS50C	CMS100
重量 Weight	320	520	650	730	2100

4. 安装地基要求

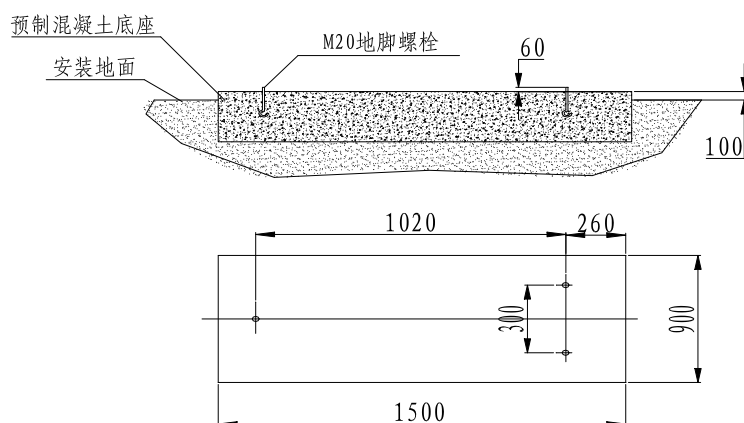
4. Installation Foundation Requirement

4.1 CMS25 系列

4.1 CMS25 Series

该系列设备既可室外安装也可室内安装，当室内安装时，要求室内净高度至少达到 3 米。安装地面为混凝土结构，可按以下尺寸预置三个固定螺栓，以便固定设备底座，并将相应管道引至安装位置。如下图：

This series can be installed both outdoor and indoor, when installed indoor, the room required net height at least up to 3m. And installed base should be concrete construction, you can pre-place three fixed bolts as per the below dimension to fix the equipment base, meanwhile need to lead the relevant pipeline to installation location place. Such as the below diagram:



以上尺寸均以毫米为单位。混凝土厚度视地面状况而定，一般不少于 500 毫米。

The above dimensions are all counted as per unit(mm). Concrete height as per floor condition, generally no less than 500mm.

设备安装到位后用地埋螺栓将其固定牢靠，然后将被测量管线正确

接入设备接口：进口总控阀和出口总控阀。同时将质量流量传感器正确接入仪表安装口并与相应的质量流量变送器进行线路连接。并反复检查确保接线无误。安装完成后检查各法兰连接螺栓保证全部锁紧。

After installed, fixed equipment by grounded bolts, then to connect correctly the measured pipeline into equipment interface:entrance general control valve and exit general control valve. Meanwhile to put mass flow sensor correctly into instrument interface and connect with the relevant mass flow transmitter. Also checking repeatedly to ensure correct wire connected.

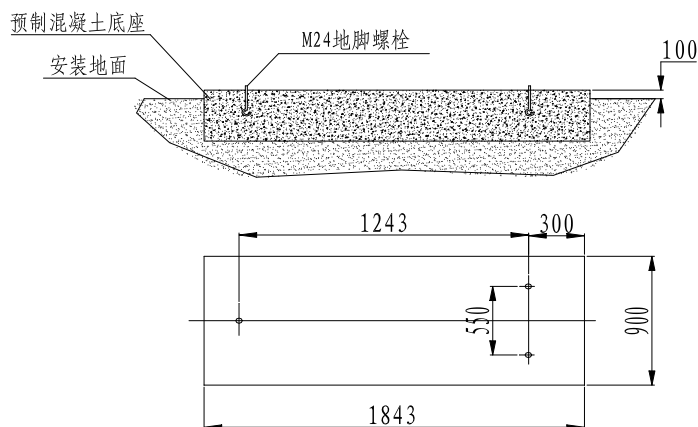
After installation, to check each flange connection thread and ensure all are tightly locked.

4.2 CMS50 系列

4.2 CMS50 Series

该系列设备可根据用户现场使用情况选择室内或室外安装。地基为水泥混凝土结构，深度不小于 500mm;预埋地脚螺栓深度不小于 200mm,地脚螺栓外漏高度不小于 60mm。安装尺寸如下图：

This series can be installed both outdoor and indoor as per usage condition. The ground base should be cement concrete structure and depth no less than 500mm; depth of pre-embedded anchor bolts no less than 200mm, exposed height of anchor bolts no less than 60mm. Installation dimension refers to the below diagram:

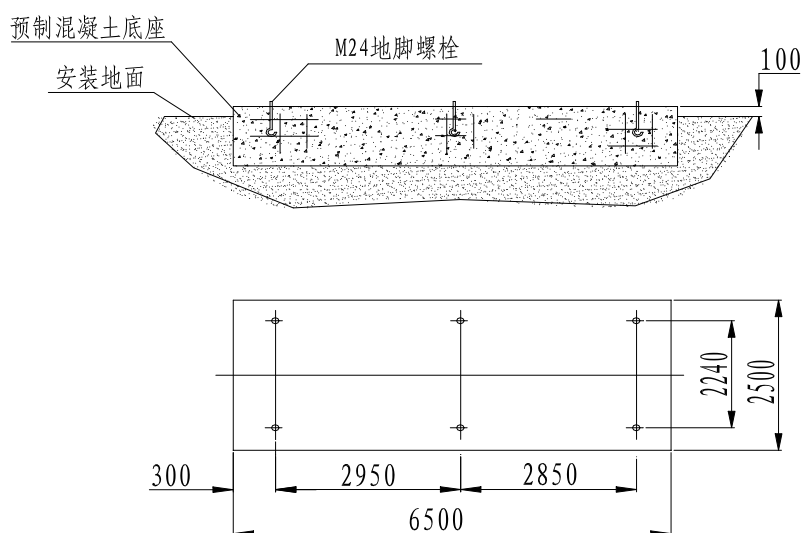


4.3 CMS100 系列

4.3 CMS100 Series

该系列设备可根据用户现场使用情况选择在室外安装。地基为钢筋混凝土结构，预埋地脚螺栓深度不小于 400mm，钢筋混凝土深度不小于 800mm。地脚螺栓外露高度不小于 80mm。安装尺寸如下图：

This series can be installed both outdoor and indoor as per usage condition. The ground base should be reinforced concrete structure ,depth of pre-embedded anchor bolts no less than 400mm, depth of reinforced concrete no less than 800mm. Exposed height of anchor bolts no less than 80mm. Installation dimension refers to the below diagram:



5. 使用操作指南

5. Operation Guide

对于油井产量的计量，由于油井生产情况较为复杂，不同的油井油.气.水产量差异很大，同时存在原油中含砂.含蜡等不同现象，（过程集输的计量也存在上述情况）所以在使用中必须严格按下列要求进行操作。

About the measurement of oil-well production, because of the complicated oil-well production condition, different oil-well produces oil, gas and water is also very different, meanwhile crude oil contents sand and wax, etc (**procedure**

gathering & transporting measurement also has the same above condition), so you have to be serious to operate as per the below requirement.

5.1 设备安装初始所有阀门应为关闭状态。检查各法兰连接接口保证无漏点。

5.1 All Valves Should Be Closed State While Equipment Installation Initially. Checking Each Flange Connection Interface And Ensuring without leakage point.

第一步：主管道检测

First Step: Main Pipeline Check

管路接好后，保持混合控制阀、进液控制阀关闭状态，打开旁通阀门，让油井来液进入系统旁通，冲刷管线，半小时后先打开进液控制阀，再打开混合控制阀，关闭旁通阀，使油井来液进入测量系统，同时细听管道是否有油气连续通过阀门的流动声，压力表有压力显示，有油气连续通过的流动声则主管道顺畅，工作正常。反之则主管路不通，需进行调整，直至工作正常为止。

After connected pipeline, ensuring mixed control valve, feed liquid control valve to be closed, then to open bypassing valve and let the oil-well liquid enter into system bypassing valve to wash pipeline, after half hour, firstly to open feed liquid control valve, then to open mixed control valve and close bypassing valve to let oil-well liquid enter into measuring system, meanwhile to listen carefully whether there is flow sound when oil-gas continuously flow through valve and pressure gauge has pressure data, if there is flowing sound of oil-gas continuously flow

through valve, main pipeline is in working order. On the other hand, main pipeline is stoppage, and need to be adjusted until main pipeline is in working order.

第二步：设备检查

Second Step: Equipment Check

此时可听见油气混合物经过进液控制阀和进液管进入分离管时产生的流动声，同时前后压力表显示压力升高，由此确定进液管路部分工作正常。

At the same time you can hear the flowing sound when oil-gas mixture flowing through feed liquid control valve and feed liquid pipe entering into separated pipeline, meanwhile before and after pressure gauge displays pressure raised, from this to confirm feed liquid pipeline parts are in working order.

第三步：进入工作

Third Step: Entering Into Working

当混合控制阀打开后：压力表显示压力回落，并达到一定数值后保持稳定，进液管压力表显示数值略大，传感器出口压力表显示数值相对较小。系统进出口相互压差数值根据油井工况各不相同。贴近管道可听见液体流动声。同时质量流量变送器显示有相应流量，由此确定整个设备运行正常。

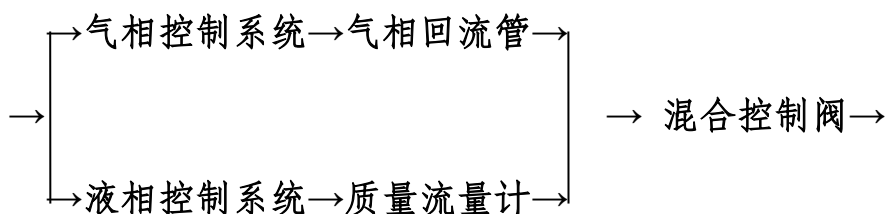
After to open mixed control valve: pressure gauge displaying pressure fallen, and then keeping stability after the fallen value up to some

certain value, and feed liquid pipeline pressure gauge displaying value is bigger, whereas sensor outlet pressure gauge displaying value is relative smaller. System entrance and exit mutual pressure difference value is so different according to oil-well industry condition. Approaching pipeline you can hear liquid flowing sound. Meanwhile mass flow transmitter will display the relevant flow rate, from this to confirm the whole equipment is in working order.

以下为设备正常工作时液体在设备中的流向示意图：

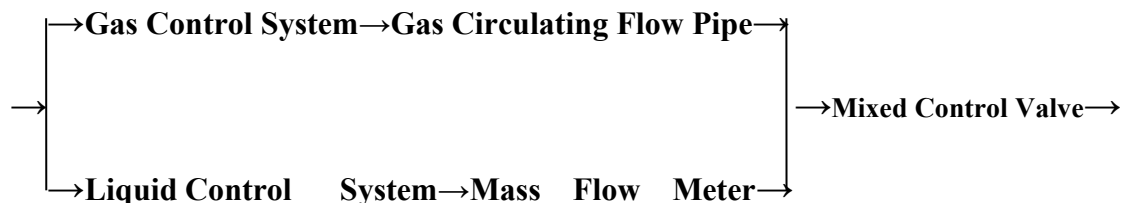
Following is the schematic diagram of liquid flowing in the equipment as normal working:

单井管线→过滤器→进液控制阀→进液管→射流管→分离管→



→单向控制阀→出口总控阀→进入混合管线

Single Well Pipeline→Filter→Feed Liquid Control Valve→Feed Liquid Pipe→Jet Flow Pipe→Separated Pipe→



→Single Direction Control Valve→Outlet General Control Valve→Entering Into Mixed Pipeline

第四步：质量流量计标零

Forth Step: Mass Flow Meter Zero Point Calibration

系统正常运行半小时以上，先打开旁通阀让油井来液走旁通，然后依次关闭混合控制阀和进液控制阀，保证系统内质量流量计传感器内部充满介质且处于静态，然后根据质量流量计说明书进行流量计标零。标零结束后再打开相关阀门，开始进行计量。注意：使用前，请详细阅读质量流量计使用说明书。

After half-hour of the system normal operation, firstly to open bypassing valve and let oil-well feed liquid go through bypassing valve, then to close mixed control valve and feed liquid valve one by one, ensuring mass flow meter sensor inner is fully filled with medium and static of the system, then to make zero point calibration as per mass flow meter description manual. After zero point calibration to open the relevant valve and begin to measure.

Note: Pls. read carefully mass flow meter usage description manual before operation.

5.2 此设备根据使用环境的不同可能需要相应的配套设施。

5.2 The equipment may require the relevant supporting facilities as per the different usage environment.

◇ 如果此设备所使用的环境每年中最低气温低于 10℃, 且进入设

备的油温也较低，那就需要相应的伴热保温设施，以防停井后原油在计量腔内凝固造成再次启动困难。

- ✧ If the lowest ambient temperature for the equipment under 10℃ every year, moreover, the temperature oil flowing into equipment is also lower, you need to prepare the relevant tracing heat temperature protected facilities, to avoid the crude oil be frozen in the measured chamber and difficultly restart.
- ✧ 如果该设备停用，则在停用前，打开排空阀，将腔内吹扫排空，以防后续使用时管路堵塞。
- ✧ If the equipment stopped, to open exhaust-valve before stopped and to exhaust air completely in the equipment chamber, to avoid the pipeline blocked in the future usage.
- ✧ 一般情况下，在夏季环境日最低气温高于 25℃的情况下，应关闭伴热电源。（根据介质情况确定）
- ✧ For normal condition, in summer if the lowest ambient temperature is more than 25℃ every day, you should close tracing heat power.(according to medium condition)

根据客户现场环境一般可采取以下两种方法进行伴热：

To normally employ the below two ways tracing heat as per customers' in-site environment:

5.2.1 设备工作环境年最低气温不低于 10℃，且动力粘度小于 400mPa.S

的中质原油和轻质原油，可在设备进口处配套相应规格的水套式换热

器对进油进行一定的加热即可正常使用。

5.2.1 If working environment temperature no less than 10°C of the equipment every year, moreover, kinetic viscosity of middle crude oil and light crude oil less than $400\text{mPa}\cdot\text{S}$, to match the relevant specification water-jacket heat exchanger to heat the crude oil, then the equipment will be in normal working order.

5.2.2 设备工作环境年最低气温低于 5°C ，且动力粘度在 $400 \sim 10000\text{mPa}\cdot\text{S}$ 的稠油，可采取电伴热方式进行伴热，保证设备内油温不低于 20°C 。

5.2.2 If the lowest working environment temperature under 5°C , moreover, kinetic viscosity between $400 \sim 10000\text{mPa}\cdot\text{S}$ of thick oil, to employ electric tracing heat to heat the thick oil and ensure the oil temperature in the equipment no less than 20°C .

5.2.3 对于含蜡量大于 30%，凝固点高于 35°C 的高凝原油，可采用电伴热的方式，温控器控制温度，保证设备腔内油温不低于 50°C 。

5.2.3 For the crude oil who has the wax content more than 30% and condensation point more than 35°C , to employ electric tracing heat, and temperature controller to control the temperature, ensuring temperature in the equipment chamber no less than 50°C .

5.2.4 具体的伴热保温方式可根据不同的环境条件做不同的选择。

5.2.4 To choose the specific tracing heat according to the different environment condition.

6. 车载移动式使用说明

Vehicular Type Operation Description

移动式计量系统，主要针对边远油井的计量而设计。可方便的置于小型货车上，可用于多组井口或者在井站使用。其相关结构技术要求 and 各项参数和固定式油气分离计量系统相同。

The movable measurement system is mainly designed for the measurement of the remote wells. It can be placed in the light van easily and used for multi-group wells or wells field. The relevant structure technology requirements and all the parameters are the same with the stationary oil-gas separated measurement system.

6.1 运输注意事项:

Notes for transport:

第一:保持所有阀门关闭.

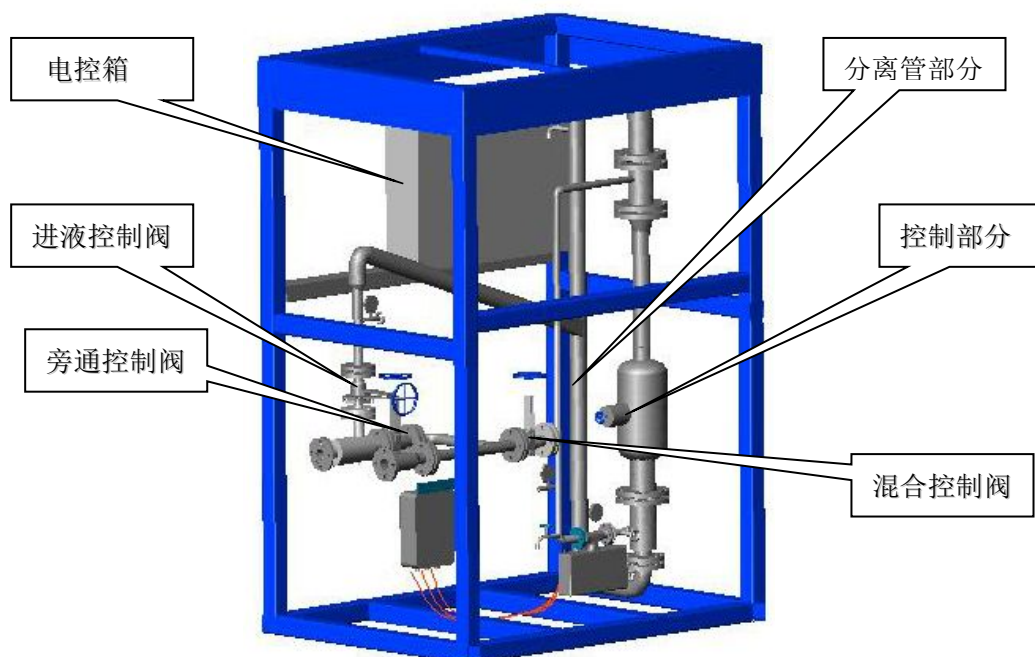
First: keep all the valves close.

第二: 计量系统属精密设备，运输过程要求汽车低速驾驶，时速低于 15 公里/小时，避免颠簸，整机在运输车辆上牢靠固定。搬运过程要轻抬轻放，必要时可用吊车。

Second: For the measurement system is a kind of precision system, the vehicle should run at low speed, lower than 15km/h and avoid bump. The equipment should be tied firmly in the transport vehicle. The equipment should be gently moved, if necessary, the hoist can be used.

结构示意图如下图:

Structure diagram is as follows:



电控箱 electric cabinet

分离管部分 separator tube part

进液控制阀 fluid entry control valve

控制部分 control part

混合控制阀 mixture control valve

6.2 计量步骤:

Measurement steps:

第一步：选择要进行计量的油井，根据现场情况，选择连接口。

First step: choose the well to be measured, and choose the connector according to the situation.

第二步：将移动计量系统用软管接入要计量的单井流程，注意进出口方向。

Second step: connect the movable measurement system to the measured single-well with flexible pipes. Pay attention to the directions of the exits and entrances.

第三步：通电：移动计量系统使用电源为交流 220V，所配电缆为三芯电缆，

第三芯为接地线。由专业电工接通电源。

Third step: power-on: the power supply of the movable measurement system is AC220V.

The cable provided is three-core cable and the third core is the ground wire. The power supply is connected by professional electrician.

第四步：选择单量时间。

Fourth step: choose the single-well measurement time.

第五步：保持混合控制阀、进液控制阀关闭状态，打开旁通阀门，开通抽油机，让油井来液进入系统旁通，使井口杂质，如腊块等从旁通流走并冲刷管线，半小时后先打开进液控制阀、混合控制阀然后关闭旁通控制阀倒换流程，使油井来液进入计量系统进行计量。当计量时间达到所设定的单量时间时，累计流量则自动换算成当时的日产量，并且不随着瞬时流量累计。

Fifth step: keep the mixture control valve and fluid entry control valve close. Open bypass valve and beam-pumping unit to let the fluid from the well enter the system bypass. And the impurity such as wax block will pass through the bypass pipe and wash the pipe. After half an hour, open the fluid entry valve and mixture control valve and then close the bypass control valve to replace the process to make the fluid from the well enter the measurement system and measure. When the measurement time reaches the preset single-well measurement time, the total flow will be automatically converted to the current daily output and will not be accumulated with instantaneous flow.

第六步：计量完毕后，将系统底部放空阀打开放空，然后关闭所有阀门，和运输车牢靠固定好，就可以移动运输了。

Sixth step: after the measurement, open the emptying valve at the bottom of the system, and then close all the valves and fasten it at the transport vehicle. Then it can be transported.

7. 注意事项

Attentions

- ✧ 该系统中的测量仪器及电伴热部分在使用中必需可靠接地。
- ✧ The measurement instrument and electrical heat tracing of this system must be fixed to the ground firmly.
- ✧ 控制部分中的拉伸弹簧为易损件，损坏后及时更换。
- ✧ Extension springs of the control part are quick-wear parts, please change on time if damaged.
- ✧ 车载移动式油气分离计量系统，在使用中电缆线的连接要可靠，在移动中不能划伤表皮绝缘层。在停止测量后，设备内部要排空并进行吹扫干净。
- ✧ For the vehicular movable type oil-gas separated measurement system, its cables should be connected firmly in use, and the surface insulator should not be scratched when moving. After measurement, the internal of the equipment should be emptied and cleared.
- ✧ 该设备要定期进行保养维护，包括电器部分和机械部分。保持设备表面洁净，不能有油污。定期检查各阀门的关闭是否正常。
- ✧ The equipment should be maintained regularly, including electrical part and mechanical part. Keep the surface of the equipment clean, without greasy dirt. Regularly check if the valves are shut.