ECC®

IDCS2000

网络自动控制低压成套开关设备

Intelligent Type Low Voltage Cubicle

中国·上海中科电气集团

SHANGHAI CHINA-SCIENCE ELE.GROUP, CHINA

上海人民电力设备股份有限公司

SHANGHAI RENMIN ELECTRIC POWER EQUIPMERIL CO., LTD.

型号含义
Type designation

I D C S 2 0 0 0

- 系统 System
- 控制 Command
- 分散 Distract
- 智能型 Brain

概述

IDCS2000智能低压开关柜是上海中科电气集团公司自动化研究所自行开发的智能型固定分隔式低压成套开关设备，该智能柜应用电气自动化技术，网络控制技术，信息传输技术，计算机技术，集保护、监测、控制、通信等多种功能于一体，对低压电器的一次主设备实现保护、遥测、遥信、遥调，对二次设备和辅助设备实现远方控制和管理，同时对受控设备自诊断故障功能，并与上一级调度自动化系统进行通信，为实现电力系统自动化组建基础平台。

特点

- 设计合理：根据进口、国产等各种开关电气的特点进行单元化设计，组合成功能单元。
- 结构通用，组装灵活：C型型材满足各种结构形式，防护等级及使用环境条件的要求。
- 标准模块：可以分别组成保护、操作、转换、控制等标准单元模块结构任意选用组装。
- 安全防护：采用区域之间的隔离以及功能单元进线和出线之间的相互隔离，有效地加强安全防护性能。
- 技术参数：主要技术参数处于国际领先水平。

General

IDCS 2000 Intelligent Type Low Voltage Switchgear is a kind of intelligent fixed compartmental low voltage complete set equipment self developed by Automation R&D Center of Shanghai China-Science Electric Group Corporation.

With electric automation technology, network control technology, information transmission technology and computer technology, the switchgear integrates them with various functions such as protection, supervision, control and communication as a whole, realizes protection, remote measurement, remote communication, remote control and remote adjustment to main primary equipments, remote control and management to secondary equipment, and meanwhile, realizes fault self diagnoses to the controlled equipments, communicates with upstream dispatching automation system. As a matter of fact, it forms a fundamental platform to bring the electric power system into automatization.

Features

- Reasonable design: Unitized design is done as per electric feature of imported and localized switching products. Then a functional unit is combined from single units.
- General structure and flexible assembly: Type C shaped materials satisfy requirements of various structural form, degree of protection and working conditions.
- Standard module: Any selection and assembly of standard modules to form protection, operation, conversion and control module structure is possible.
- Safety and protection: Separation between zones and separation between unit incoming and outgoing wires effectively strengthen safety and protection functions.
- Technical performance: Main technical parameters are in internationally advanced position.

主要技术参数
Main technicaldata

表1

项目名称 Deseription	相关参数 Parameter
额定绝缘电压（V） Rated insulating voltage	1000
额定工作电压（V） Rated working voltage	380
额定频率（HZ） Rated frequency	50（60）
水平母线额定电流（A） Rated current for horizontal busbar	≤5000
垂直母线额定电流（A） Rated current for vertical busbar	≤2500
主母线短时（1S）耐受电流最大值（KA） Max value of short time (1s) withstand current on main busbar	100（有效值） (rms)
配电母线短时（1S）耐受电流最大值（KA） Max value of short time (1s) withstand current on distributing busbar	90（有效值） (rms)
传输速率 Transmission rate	9600b/s～12Mb/s
最大传输距离 Maximum transmission distance	2000(m)
测量精度 Measurement accuracy	<±1%
传输介质 Transmission medium	二极RS485. 半双工 Two wires, RS485, Half dual
协议 Protocol	MODBUS RTU。PROFIBUS-DP等 MODBUS RTU, PROFIBUS-DP etc.
组态监控软件 Grouped supervision software	IDCS2000
系统工作温度 System working temperature	-20℃+70℃

注：外壳防护等级：IP30/IP40/IP55
装置类型：动力中心柜，配电柜，功率因素自动补偿柜。

Note 1: Degree of protection for enclosure: IP30 / IP40 / IP55
Assembly sort: PC, distributing cubicle, power factor automatic compensating cubicle.

系统与结构

IDCS2000智能柜是分成内置和外置安装集成智能模块的两种方案，内置是不带显示模块，操作显示除就地操作显现功能。

◆ IDCS2000智能低压开关柜的特点：

* 引入PC、MCC柜的电缆仅为输入、输出电缆和一根双绞现场总线的网线，无需控制电缆进PC、MCC柜中。因此节省了大量控制电缆，同时节省了控制电缆的接线时间，又增加了电缆的整洁度，而且减少了线头接触脱落造成了设备事故的隐患。
* PC、MCC抽屉单元控制回路简洁标准，复杂的连锁功能只需要通过智能模块完成功能需求，无须增加控制回路的多品种元器件。因此减少了元器件品种。
* 具有可编程序的操作功能和保护功能，使数据可参数化、任意变更、任意重新设定，具有灵活的可操作性。
* 整个控制系统具有很强自诊断、自动保护、自动处理的能力，避免事故的发生，消除设备损坏的隐患，从而提高了设备的使用效率，具有很高的经济效益。
* 具备标准化的生产模式，便于流水线生产，缩短制造工期、设计、结构、安装、调试、设备同一格式，便于集中管理，简化繁琐的生产工序。
* 可视化的人机界面，随时观察运行状态，并可预调试及通过软件变更复杂接线，操作灵活，一目了然。

现场总线及智能控制模块

IDCS2000智能柜采用的IDCS2000是基于国外先进的配电系统，自动化技术，完全汉化的组态操作监控系统管理软件。IDCS2000配电系统适用于低压和中压（35KV以下）供电、配电系统的变电、受电、馈电、电动机控制中心（MCC）的监控和各种终端配用电的远程控制与管理，IDCS2000可以支持MODBUS-RTU、PROFIBUS-DP、DEVICENET、ABB-SPABUS等多种现场总线，与Schneider、DAE、ABB、GE、SEG、SIEMENS等公司的额产品可以很好的连线。IDCS2000系统集中监视监测、保护、控制、管理和通信熔入一体，功能强大，完全汉化，易于使用，扩展性强的智能配电网络自动监控系统。

◆ IDCS2000智能柜主要功能具有“五遥”功能：遥测、遥信、遥控、遥调和遥视。

* 遥测：可以实时对系统进行电流、电压、有效功率、无效功率、功率因数、有功电度、无功电度、频率、动作、时间、分合闸次数等进行不断的采集、分析、处理、记录、显示曲线、棒图、自动生成报表。

System and structure

There are two schemes in assembly of integrated intelligent module in IDCS2000 Intelligent Switchgear: Built-in and placed-out modes. A built-in switchgear does not have a display module. Beside local operation display, the operation program is carried out by a remote computer with its technical parameters displayed on computer screen. A placed-out switchgear has both local and remote operation display functions.

◆ Key points:

* Cables entering in PC and MCC Cubicles are incoming cable, outgoing cable and a two-wire stranded network line for field bus only. There is no need to have control cable in PC and MCC Cubicles. In this way, a large quantity of control cable is saved, so is the wiring time of control cable. On the other hand, more neat array in cable compartment and without the potential accident of wire head dropping off from connection.
* Simple and easy control circuits in PC and MCC drawer unit. Complicated interlocking function is executed by an intelligent module only, without the need of many kinds of components and apparatus.
* With programmable operation and protection functions, all data are parameterized which may be easily modified and reset full of flexibility and reliability.
* The whole system possesses very powerful functions of self-diagnose, self-protection and self-disposal. This plays a very important role to avoid faults, clear away the potential damage so as to raise the equipment application efficiency with a high economical benefit consequently.
* With standardized productive mode for convenience of Productive line so as to shorten manufacturing, design, assembly, installation and regulation period.

It is easy for collective management since productive procedure is greatly simplified.

* Operation status may be watched at any time through a visualized man-machine interface. Through this interface, pre-regulation is possible. And still more, we can change the complicated wiring only through the software with flexible operation and visual status.

Field bus and intelligent control module

IDCS2000 software used in IDCS2000 Intelligent Switchgear is based on overseas advanced distributing system, automation technology, and entirely Chinese orientation set operation supervision. IDCS2000 Distributing System is suitably used in low voltage and medium voltage (up to 35kV) power supply and power distribution systems for electricity transformation, acceptance, motor control center (MCC) supervision, remote control and management for various terminal electric distribution and consumption.

IDCS2000 supports a variety of field buses such as MODBUS - RTU, PROFIBUS - DP, DEVICENET, ABB - SPABUS, offers a very good connection to Schneider, DAE, ABB, GE, SEG and Siemens products. With supervision, inspection, protection, control and communication functions, IDCS2000 is a powerful, entire Chinese orientation, easy to use, and extendable automatic control system in intelligent distributing network.

* 遥信：可以实时对开关的运行状态，保护工作等开关量进行监测，计算机实时显示和自动报警，并对各柜内开关的状态，受控设备的运行状态，事故跳闸，过流、过压、合闸信号，同时在屏幕上将要选择开关的状态反馈回来，确认后执行分闸或合闸，以及受控设备的启动或停止。也可通过计算机设备流程图界面遥控操作，并实时记录操作的时间、类型和开关号等。
* 遥控：通过计算机屏幕选择相应的变电站号、开关号的分、合闸信号，同时在屏幕上将要选择开关的状态反馈回来，确认后执行分闸或合闸，以及受控设备的启动或停止。也可通过计算机设备流程图界面遥控操作，并实时记录操作的时间、类型和开关号等。
* 遥调：计算机通过现场总线传输数据即：各种电参量、动作状态给智能柜执行模块，执行模块严格按照计算机整定参数，动作步骤进行操作，同时执行模块将修整的电参量、动作状态通过双向窜行传输总线给计算机的控制中心，实现系统通信网络，当地-远程互联、互操的开放式互联网络时新的网络集成式全分布式控制系统。
* 遥视：IDCS2000配电系统通过有线电视将各个配电室所有设备及信息尽收眼底。操作计算机就可以对整个供、配电系统进行观察、收集运行参数、控制、操作、监视、查阅历史运行曲线、自动生成报表打印。
* DCS2000配电系统采用了标准的开发式现场总线MODBUS RTU、DEVICE NET、ABB-SPABUS、PROFIBUS-DP，将A类单股铜芯双绞屏蔽线或光纤电缆与具有通讯功能的智能模块快速连接，从而实现主站通过总线开关柜内电气元件通信，设置参数，远程分合闸控制，读取负载参数等。
* 智能模块可选有：MM Ⅱ、MM Ⅲ、MPR－6、ST500、ST300、BAG、MS3UF50、3UF52、SRTU、EPM\PSM、DPM、DC150、CLS150、PM、DL05等多种产品，以上模块可分成：功能不同，价格不同的两种产品，用户根据技术要求可选择的使用，见表2。

◆ The five remote functions of IDCS2000 Intelligent Switchgear: Remote measurement, remote communication, remote control, remote adjustment and remote view.

* Remote measurement Ceaselessly collecting, analysis, and treatment of different data such as current, voltage, positive power, reactive power, frequency, operation, time, opening and closing operation number etc., displaying them in form of curves, bar drawing and automatically generating report forms and applications.
* Remote communication Supervision of switching and protecting status in real time, computer real time display, and automatic alarm. Showing component status in each cubicle, control device operating situation, accidental trip, overcurrent, overvoltage signals. Remote operation may be realized through a flow chart interface in a computer. Operation time, type and apparatus may also be recorded in real time.
* Remote control Select opening and closing signals for corresponding number of a substation, a cubicle and an electric apparatus in a computer screen, remote operation may be done through a flow chart interface in a computer. Operation time, type and apparatus may also be recorded in real time.
* Remote adjustment Via a field bus, a computer can transmit data including various electric parameters and operation status to intelligent executive modules. Then the executive modules operate relevant apparatus strictly as per setting value and operation procedure given by the computer. Meanwhile, the executive modules transmit the electric parameters and operating status to be modified to computer control center through dual direction serial field bus. Hence the systematic communication, local-remote open type interconnection and inter-operation, integrated and fully distributed control system.
* Remote view Through cable TV, the IDCS2000 Distributing System will let you see all equipments and parameters at all distributing rooms. In this way, the operating computer helps you watch all power supply and distributing systems, collect operating parameters, control, operate, supervise and look up historical operating curves. Still, the system will automatically generate reports and print them.
* Applying standard open type field bus such as MODBUS RTU, DEVICE NET, ABB - SPABUS, PROFIBUS - DP, the IDCS 2000 Distributing System connects the A Type single copper core double stranded shielded wires to the intelligent modules in quick speed for the master station to communicate with electric apparatus in cubicles via a bus, and consequently set parameters, remote control of opening and closing operations, access of load parameters and so on.
* As for intelligent modules, many of them can be selected: MM II, MM III, MPR - 6, ST500, ST300, BAG, MSG, 3UF50, 3UF52, SRTU, EPM/PSM, DPM, DC150, CLS150, PM, DL05 etc.. Generally speaking, customers may select them for appropriate functions at reasonably prices as per requirements specified.

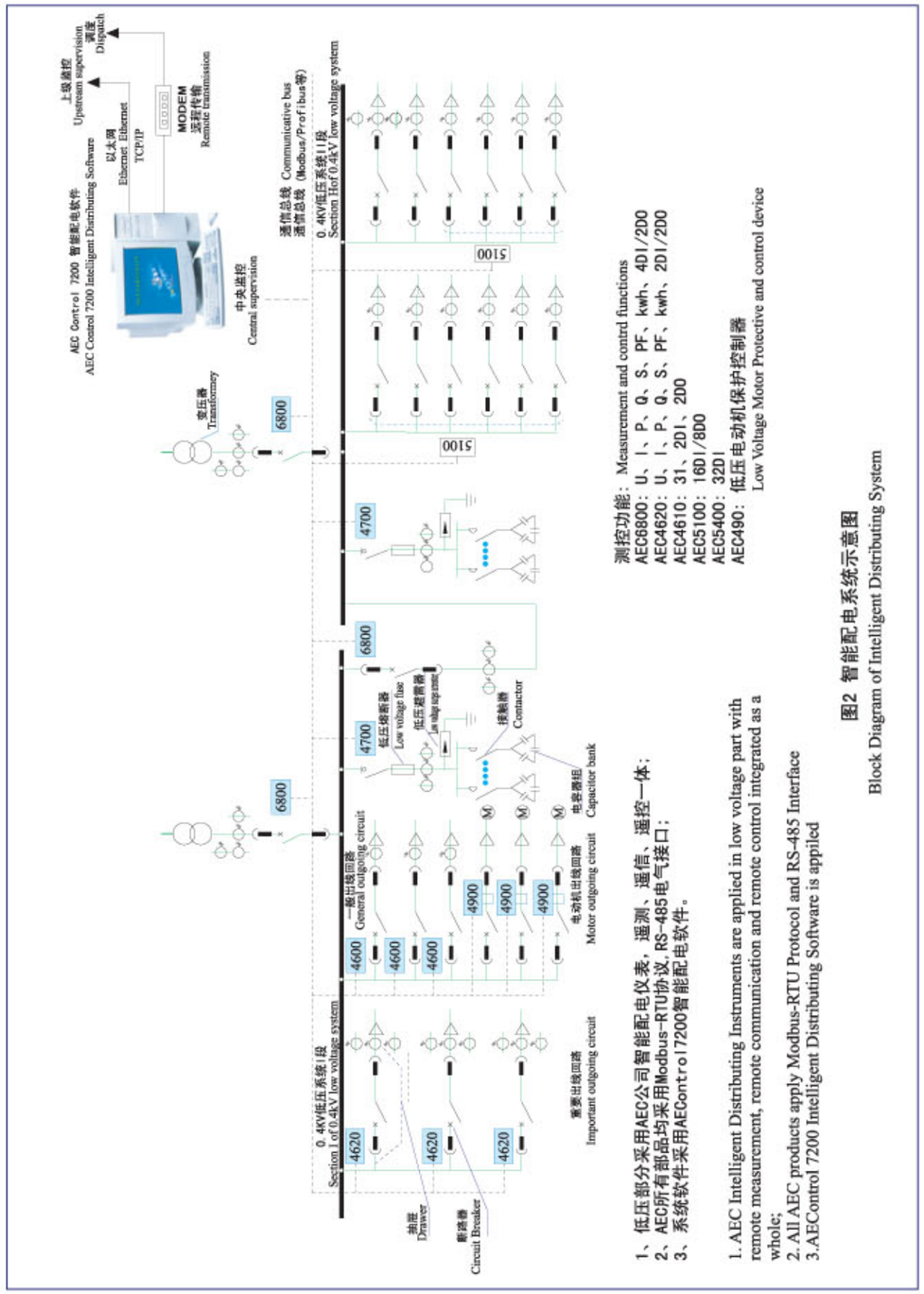
For detail, please refer to the following list.

表2

产品名称 Product	功能描述 Function description
智能电动机控制器 MM Ⅱ 、Ⅲ（GE） MPR-（DAE） ST500（国产） (domestic made) BAG（ABB） MSG（ABB） ST520（国产） (domestic made) 3UF50（西门子） (Siemens) 3UF52（西门子） (Siemens)	监视三相电流、接地电流、电动机温度、电压、时间、具有过载、堵转、过流、欠流、漏电、过压、欠压等保护功能。启动起式有：直接起动、逆起动、Y-△起动，自耦变降压起动等，标准RS485通信接口、MODBUS-RTU、PROFIBUS-DP等通信协议。 Supervision of three-phase current, earth current, motor temperature, voltage and time, with protective functions of overload, rotation block, overcurrent, lack of phase, earth leakage, overvoltage and undervoltage. Start up mode: Direct, reverse, Y-△, with automatic transformer voltage drop. Standard RS485 Communicative Interface, MODBUS - RTU, PROFIBUS - DP communicative protocols.
网络电力仪表（DAE）Electric power network meters (DAE)	
DPM420	同时测量并显示电压、电流、有功、无功、功率因数、频率、有功电度和无功电度，并有开关量输入输出，精度0.2%，标准RS485通信接口，MODBUS-RTU通信协议。 Simultaneous measurement and display voltage, current, active and reactive power, power factor, frequency, kilowatthour and kilovarhour value, with switching input and output, accuracy 0.2%. Standard RS485 Communicative Interface, MODBUS-RTU communicative protocol
DPM430	DPM420功能加上自动抄表，异常记录及最大值和最小值记录 Automatically recording meters, abnormal recordings, maximum and minimum record functions and all functions of DPM 420
EPM420	同时测量并显示三相电压、电流、有功功率、无功功率、功率因数、频率、有功电度和无功电度，精度0.5%，标准RS485通信接口，MODBUS-RTU协议。 Simultaneous measurement and display 3-phase voltage, current, active and reactive power, power factor, frequency, kilowatthour and kilovarhour value, with accuracy 0.5%. Standard RS485 Communicative Interface, MODBUS-RTU communicative protoco
EPM450	内部测量至31次谐波，显示系统总谐波含量，不平衡度，其余功能同EPM420 Internal measurement up to 31st harmonic wave and displaying total harmonic wave component in the system, imbalance degree and all functions of EPM 420
PSM330	同时测量并显示三相电压和电流，精度0.5%，标准RS485通信接口，MODBUS-RTU协议。 Simultaneous measurement and display 3-phase voltage and current, with accuracy 0.5%. Standard RS485 Communicative Interface, MODBUS-RTU communicative protocol
PSM340	同时测量并显示三相电压和电流，精度0.5%，标准RS485通信接口，MODBUS-RTU通信协议。 Simultaneous measurement and display 3-phase voltage and current, with accuracy 0.5%. Standard RS485 Communicative Interface, MODBUS-RTU communicative protocol
断路器、开关智能化模块（DAE）Circuit breaker and switching device intelligent module (DAE)	
SRTU510	16路遥信（开关量）输入，6路继电器遥控输出，RS485通信接口，MODBUS-RTU协议。 16-way remote communication (switching quantity) input, 6-way relay remote control output, RS485 Communicative Interface, MODBUS-RTU communicative protocol
SRTU510P	16路遥信（开关量）输入（8脉冲记数输入），6路继电器遥控输出，RS485通信接口，MODBUS-RTU通信协议。 16-way remote communication (switching quantity) input (8-pulse counting input), 6-way relay remote control output, standard RS485 Communicative Interface, MODBUS-RTU communicative protocol
SRTU530	8路遥信（开关量）输入（0-5V或4-20MA）输入和6路继电器遥控输出，标准RS485通信接口，MODBUS-RTU通信协议 8-way remote communication (switching quantity) input (0-5V or 4-20mA), 6-way relay remote control output, standard RS485 Communicative Interface, MODBUS-RTU communicative protocol

续表2

产品名称 Product	功能描述 Function description
PM-100（施耐德）(Schneider) PM-150（施耐德）(Schneider) PM-300（施耐德）(Schneider)	同时测量并显示三相电压、电流、有功功率、无功功率、功率因数、频率、有功电度和无功电度。标准RS485通信接口，MODBUS-RTU通信协议。 Simultaneous measurement and display 3-phase voltage and current, active and reactive power, power factor, frequency, kilowatthour and kilovarhour value. Standard RS485 Communicative Interface, MODBUS-RTU communicative protocol
SRTU530P	12路遥信（开关量）输入（4脉冲记数输入），8路模拟量（0-5V或4-20MA）输入，标准RS485/232通信接口（任选），定时记录功能，MODBUS-RTU通信协议。 12-way remote communication (switching quantity) input (4-pulse counting input), 8-way simulating quantity (0-5V or 4-20mA), standard RS485/232 Communicative Interface (optional), timing record function, MODBUS-RTU communicative protocol
SRTU540	32路遥信（开关量）输入，带SOE功能，标准RS485通信接口，MODBUS-RTU通信协议。 32-way remote communication (switching quantity) input, with SOE function, standard RS485 Communicative Interface, MODBUS-RTU communicative protocol
DL05	8路遥信（开关量）输入、6路继电器遥控输出，可编程，可扩展模拟RS485通信接口，MODBUS-RTU通信协议 8-way remote communication (switching quantity) input, 6-way relay remote control output, programmable, extendable simulation, RS485 Communicative Interface, MODBUS-RTU communicative protocol
DC150	DC150数据集中器作用 集中所有通讯元件提供的信息、记录具有通讯功能继电器的转换及跳闸事件，并提供相应的时间标记、通讯设备寻址功能、48个输入、输出回路 DC150 Parameter Collector collects all information offered by communicative components, records all communication functioned relay switching over status and tripping events, offering relative time label, communicative equipment address search function, 48 input and output circuits
CLS150	CLS150指示与就地控制模块：显示设备状态ON/OFF，脱扣或事故脱扣、工作/退出设备控制（ON、OFF、复位）、就地控制遥控被禁止、远程控制、就地控制被禁止 CLS 150 Indicating and Local Control Module: Displaying equipment ON/OFF status, tripping or accident tripping, work/exit, equipment control (ON, OFF and Reset), remote control prohibited when in local control status, and local control prohibited when in remote control status
SC150	SC150指示与控制接口：向DC150传输状态信息，短路器的信道、故障原因、接听命令等 SC 150 Indicating and Control Interface: Transmitting status information, communicative channel of the circuit breaker, fault reason and command reception to DC150
配电网自动化FTU（DAE） SPM60 Distributing network Automation FTU (DAE) SPM 60	14路交流输入，监测两回线三相系统，测量参数：相/线电流、中线电流、相/线电压、有功功率、无功功率、功因、电度、频率、相序以及谐波分量（2-15次），波形记录：自动记录触发点前后十周的波形数据，2路直流输入，8路光隔离开关量输入（SOE）8路继电器输出（SBO），2路RS-232工作通讯口，1路RS-232维护通讯口，支持同步或异步通讯方式，支持DNP3.0、IEC870-5、MODBUS-RTU、CDT等多种通讯协议。 14-way AC inputs, supervise two-way three-phase systems; measurement of: phase/line current, neutral current, phase./line voltage, active and reactive power, power factor, frequency, kilowatthour and kilovarhour value, phase order and harmonic components (from 2nd - 15th) and wave form record; automatic record ten cycles of wave form before and after trig point, 2-way DC inputs, 8-way optic isolating switching isolating quantity inputs (SBO); two-way RS-232 working communicative interfaces, one-way RS-232 maintenance communicative interface; supporting synchronous or asynchronous communicate modes, supporting various communicative protocols such as DNP3.0, IEC870-5, MODBUS-RTU and CDT and so on
系统软件 System software	
IDCS2000	使用35KV以下的配电工作业组态软件 Suitably used in distributing industrial combination software with rated voltage up to 35kV



1、低压部分采用AEC公司智能配电仪表，遥测、遥信、遥控一体；
2、AEC所有部品均采用Modbus-RTU协议，RS-485电气接口；
3、系统软件采用AEControl7200智能配电软件。

1. AEC Intelligent Distributing Instruments are applied in low voltage part with remote measurement, remote communication and remote control integrated as a whole;
2. All AEC products apply Modbus-RTU Protocol and RS-485 Interface
3. AEControl 7200 Intelligent Distributing Software is appiled

图2 智能配电系统示意图
Block Diagram of Intelligent Distributing System

ECC China-Science

柜体结构及区域划分 Panel Structure and Compartment Division

柜体基本结构是由C型型材装置组成，C型材是以M=2.5mm为模数安装孔的敷铝锌钢板通过专用数近代生产设备加工而成，全部柜架及内层隔板均采用敷铝锌钢板，四周门板，侧板用冷轧钢板静电粉末喷涂防锈蚀处理，前后开门，双面维护，前门为可以观察开关设备状态的高强度豪华钢化玻璃装饰门，玻璃装饰门印花处理边框镶磁性密封橡皮条，密封效果好，装置根据需要固定分隔四个小室：即主母线室，电器室，电费室和垂直母线室（如下图）

Basically, the cubicle frame is formed with Type C Shaped Material. By C Shaped Material, we here mean a kind of sheet steel covered with aluminum and zinc with several assembly holes in a modular value of M = 2.5mm and then machined through specially digital controlled machines. All frames and supports or internal partitions are of sheet steel covered with aluminum and zinc except for door plates and side walls which are of cold rolled sheet steel with static powder spray and anti-corrosion treatment. The cubicle is double door with double side maintenance. There is a high re-enforced luxury steeled glass decorated door within the front door for watching the inside apparatus status. This decorated door is through flower printing treatment with embedded magnetic rubber strips in side frames resulting in excellent sealing effect. Generally, this kind of the switchgear features efficient heat dissipation effect, constant current carried through, easy in installation and maintenance without need of holes piercing, high intensity and good peak value and short time withstand capacity. As per the requirement, there are four compartments in the cubicle, i.e., main busbar compartment, electric apparatus compartment, cable compartment and vertical busbar compartment.

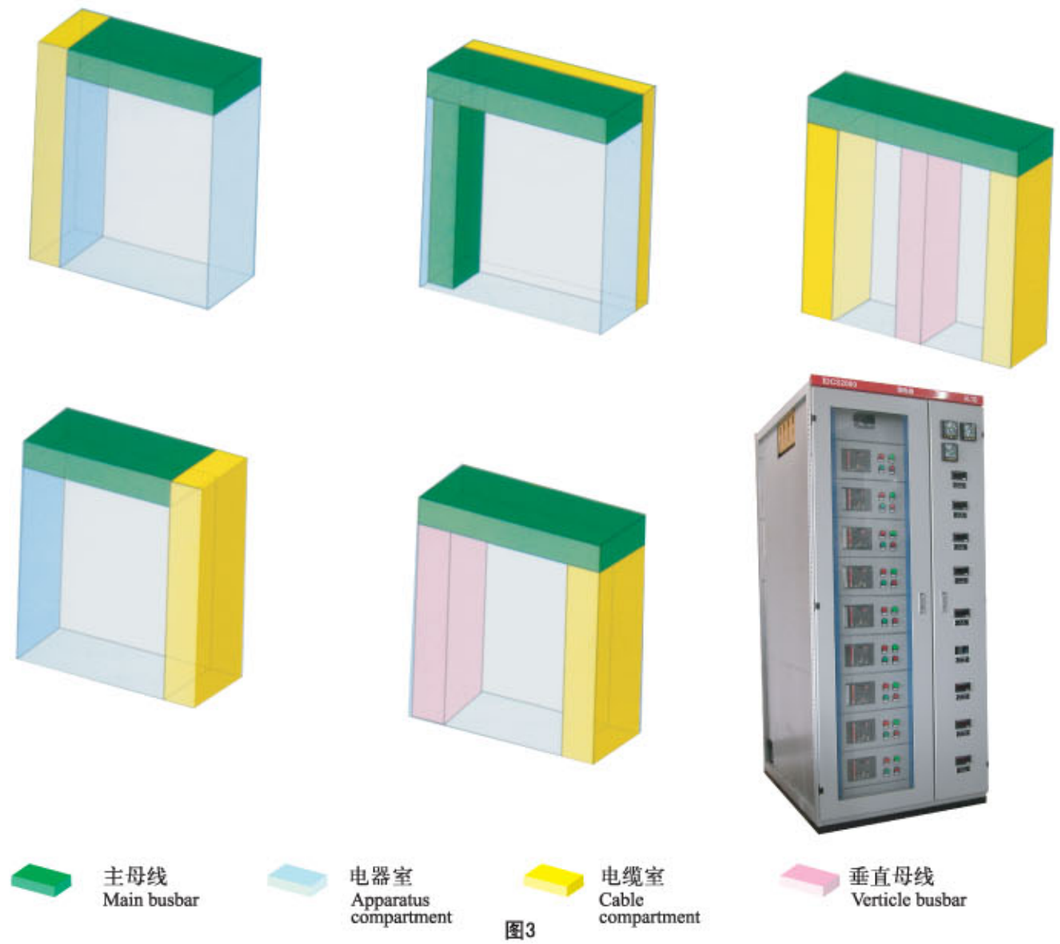


图3

散热效果好，载流均一，安装维护方便，无需打孔，强度高，动热稳定性好.

It features efficient heat dissipation, uniform current carrying, easy installafion and maintenance with sufficient intensity, no need to piercing holes peak and short time current endurance.

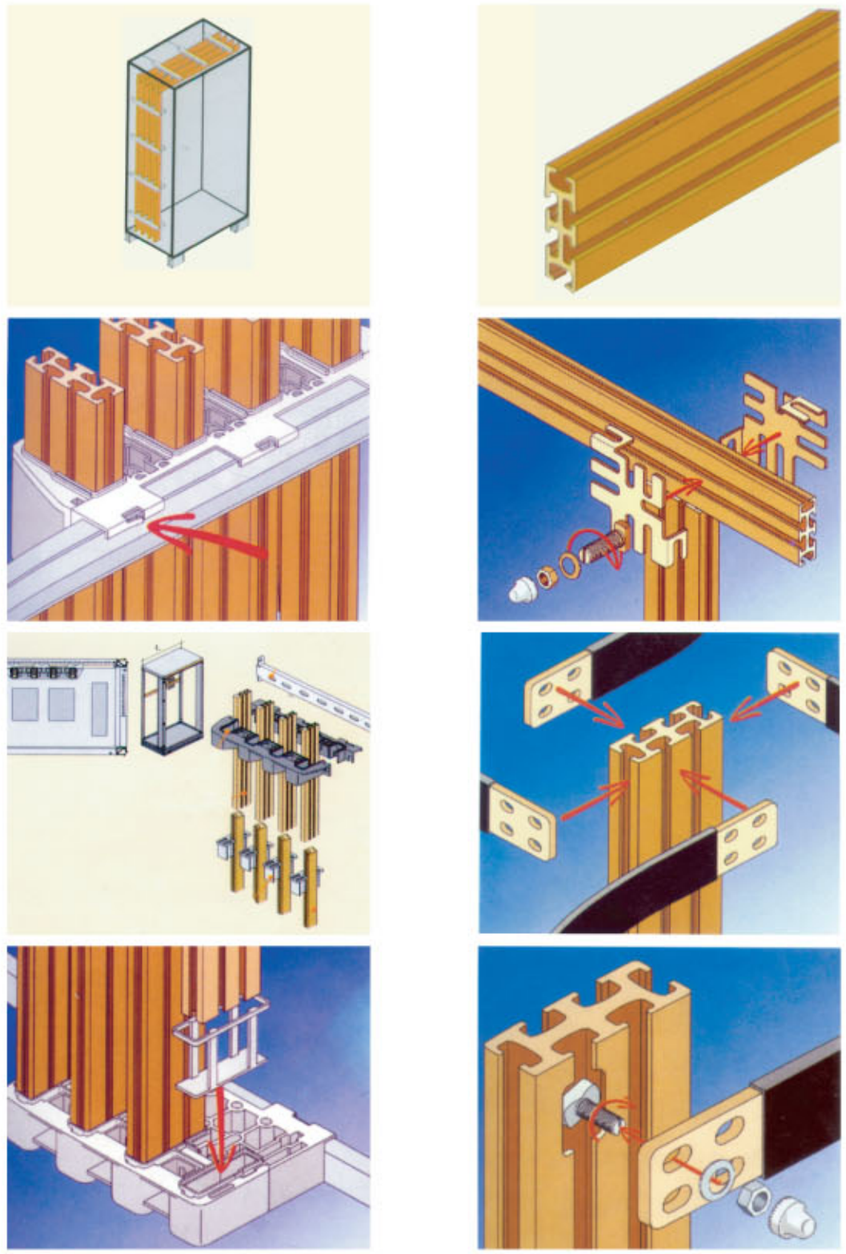


图4　Fig. 4

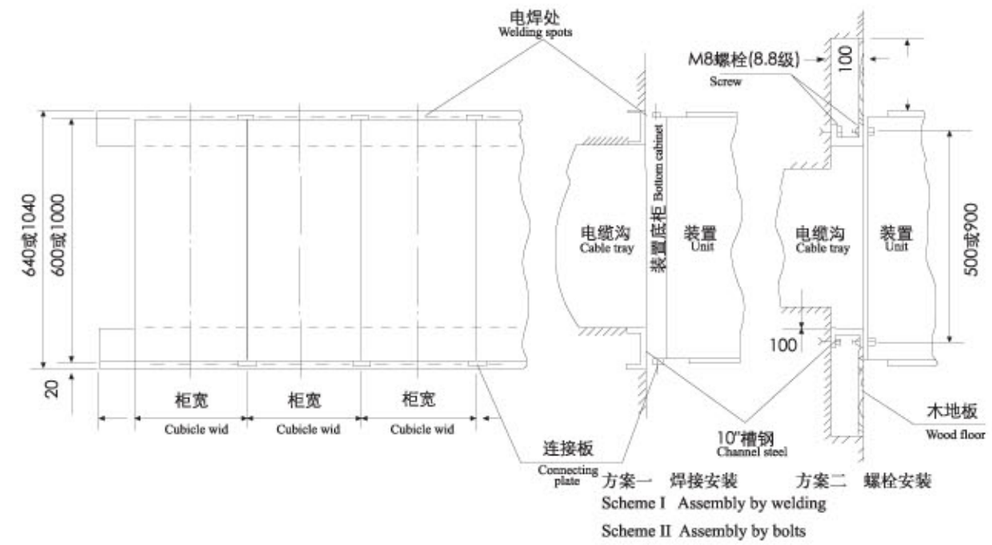


图5 安装示意图

Assembly Schematic Drawing

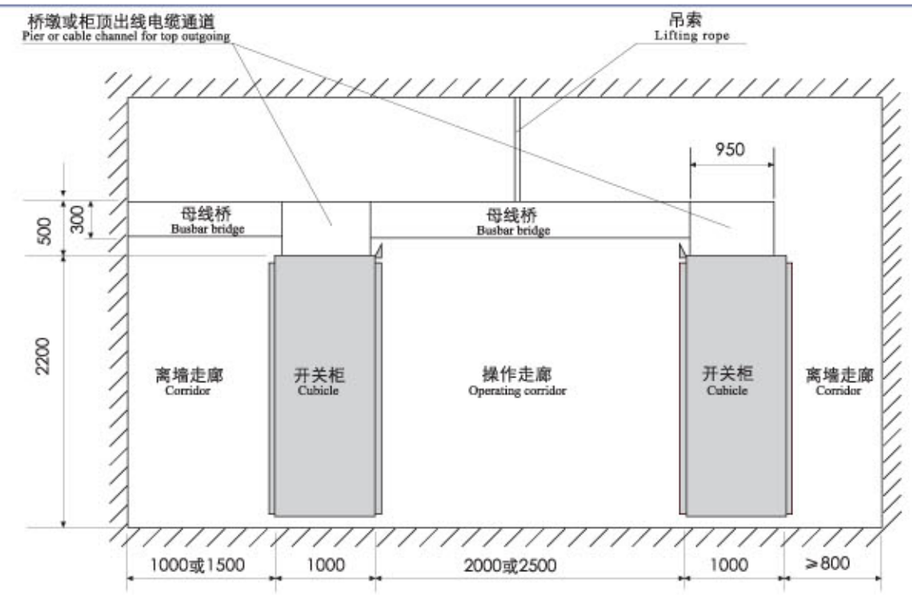


图6 母线桥安装示意图

Busbar Bridge Assembly Schematic Drawing

注：制造厂可根据用户要求提供各种形式的母线桥

Note: The manufacturer will offer different kinds of busbar bridges according to requirements of our customer.