



Boiler Combustion Air Flow Measurement System

(Multi-point cross section WELLBAR dedicated to the air flow sensor)

- Energy-saving
- Correct measurement
- Safety and reliability
- Maintenance-free property



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Brief description

Boiler combustion in a thermal power plant affects the running safety and economical efficiency of the electric power plant to a large extent. Combustion is controlled and adjusted with purpose and plan so as to realize the best running mode for the boiler. Main parameters affecting the combustion condition are measured correctly. Primary air, air quantity of secondary air and primary air coal dust concentration are major factors affecting the combustion. Therefore, primary and secondary air parameters of the electric power plant are adjusted reasonably according to factors including boiler load situation, burner form and coal kind. The key for realizing economical efficiency, environment protection and safe operation is establishing excellent air power condition in the furnace .

At present, the air quantity in the boiler of thermal power plant is generally measured by a traditional Venturi wind measuring device, a wing-type wind measuring device, a backrest pipe wind measuring device, a uniform-speed pipe wind measuring device, a thermal flow meter and a multi-point cross section wind measuring device. Since primary and secondary air and powder making ventilation pipeline of the boiler in the electric power plant has an extremely short or hardly straight pipe section, and a T-shaped pipeline, an L-shaped bent pipe, an adjusting air valve and a variable-diameter pipe are distributed with extremely limited distance, flow state of air stream in the pipeline varies, causing rotating flow and pulsed flow, laminar flow, eddy flow and full development of flow. Limited arrangement space of a powder making system, no enough straight pipe section on a cold and hot air pipeline (or load air and bypath air passage), position of the wind measuring device, unstable air stream, great difference between cold and hot states of the flow field and great difference of the flow field under different working conditions in the hot state, hot and cold air (or load wind and bypath air) is further effected. Moreover, primary and secondary air and powder making air refer to dust-containing air stream. The measuring hole of the abovementioned kind of wind measuring device directly contacts the air stream and dust enters without exiting, so that it is easy to cause blockage. The blocking problem of the measuring primary element has not been solved, causing high workload of thermal maintenance and high pressure loss of wind measuring device. These practical phenomena result in the fact that the measuring accuracy of the air flow cannot be ensured and that automatic input efficiency of boiler combustion is low.

All devices of AFMS boiler combustion air flow measurement system are assembled at home by imported components and parts. The system consists of a world's advanced bullet-head sensor, an AM series of intelligent flow rate control transmitter and an automatic anti-purging control device system. A boiler combustion air flow measurement system device with accuracy and stability, energy-saving and environment-friendly properties, safety and reliability and long-term maintenance-free property is mainly provided for a thermal power plant. Problems of non-enough air flow measurement straight pipe section, incorrect measurement and severe dust blockage existing in the running process of a power plant boiler are solved fundamentally.

Characteristics, advantages and practical values of AFMS system

Measuring system

- High measuring accuracy, excellent linearity and repeatability, and high performance price ratio are achieved;
- Bullet-head sensor made by advanced design concept is capable of generating accurate and stable pressure difference signal;
- The probe structure has high intensity, wearing resistance, no leakage and anti-blocking property;
- The multi-point cross section measuring mode is used to solve the problem of inaccurate measurement caused by large pipe diameter and non-enough straight pipe section;
- An automatic zeroing differential pressure transmitter with high accuracy and ultralow measuring range is used to obtain stable value during low flow rate measurement;
- Unique anti-purging technology is applicable for normal work under various air stream environments with high dust contents;
- Individual design scheme is provided for user, and the position and number of measuring point are adjusted to realize multi-point cross section measurement.

Optimized combustion

- Accurate air flow measuring data is supplied to improve the combustion efficiency of the boiler;
- Leveling of coal dust distribution between burners is solved to ensure that the wind-coal ratio of each burner reaches an appropriate level;
- It is ensured that each burner supplies coal dust and air into the furnace according to a certain wind-powder ratio so as to achieve better combustion effect in the furnace;
- The primary and secondary air flows are adjusted to control the centre of boiler combustion flame and to prevent boiler coking and pipe explosion;



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- Low-nitrogen combustion is realized to remarkably reduce the coal consumption of the machine set and to reduce the emission of nitrogen oxide;
- Air supplying quantity and air inducing quantity are adjusted reasonably so as to maintain negative pressure in the hearth and ensure safe running of the boiler.

Energy-saving and emission-reduction

- The air stream pressure loss of the sensor probe is low, so that the electricity consumption of the fan is reduced;
- The quantities of cold and hot air at the inlet of a coal grinding machine are adjusted reasonably to ensure appropriate granularity of the coal dust and to reduce the electricity consumption of the coal grinding machine;
- The air flow is adjusted reasonably to lower the smoke emission temperature, improve the thermal efficiency and reduce the energy consumption;
- Accurate air-coal ratio is provided to improve the combustion efficiency and reduce the emission of nitrogen oxide .

Performance comparison among other air flow measuring devices of the electric power plant

Table 1 Performance comparison table for several air flow measuring devices

Product name	Measuring accuracy	Pressure loss	Requirement on straight pipe section	Anti-blocking performance	Output stability
Venturi	High	Little	High	Ordinary	Ordinary
Wing type	Ordinary	Great	Ordinary	Ordinary	Better
Backrest pipe	Ordinary	Little	High	Better	Ordinary
Constant-speed pipe	High	Little	Ordinary	Ordinary	Better
Thermal flow meter	Ordinary	Little	High	Good	Better
AFMS measuring system	High	Little	Low	Best	Good

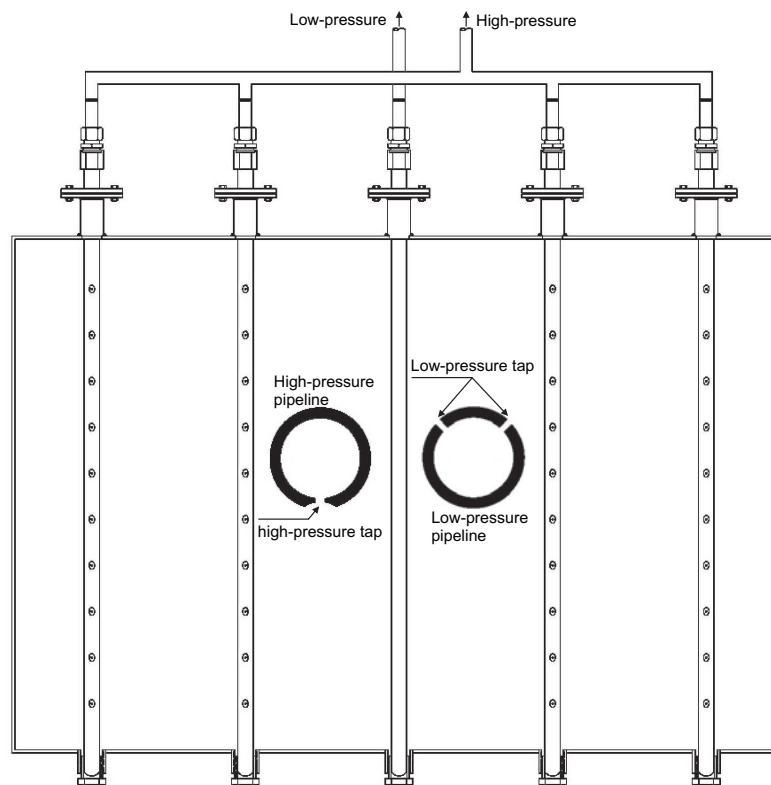
Table 2 Characteristic mapping table for several air flow measuring devices

Product name	Advantage	Disadvantage
Venturi	Inserted type, convenient installation, little resistance, good energy-saving performance and high reaction speed	Easily-blocked pressure tap, great running maintenance, unsuitability for powder-containing medium, unsuitability for air flow measurement on big air passage by single-point arrangement and low output differential pressure
Wing type	High reaction speed and average flow speed on big air passage by multi-point measurement	Large size, inconvenient installation, high air passage resistance and energy wastage, easily-blocked pressure tap, great running maintenance and unsuitability for powder-containing medium
Backrest pipe	Inserted type, convenient installation, little resistance, good energy-saving performance, high reaction speed, anti-blocking property, applicability for high-concentration coal dust air stream and little running maintenance	Only suitability for measurement of horizontal pipeline, easily broken dust clearing rod and easily block pressure guide pipe after long-term use
Constant-speed pipe	Inserted type, convenient installation, little resistance, good energy-saving performance, high reaction speed and capacity for measuring average flow speed of big air passage by multi-point measurement	Easily-blocked pressure tap, great running maintenance, unsuitability for powder-containing medium and low output differential pressure
Thermal flow meter	Inserted type, convenient installation, little resistance, good energy-saving performance, high reaction speed, no blockage during non-differential pressure measurement, little running maintenance and high low-flow speed accuracy	Hysteresis phenomenon, high and non-directional price, dust accumulation on electrode affecting the measuring accuracy, unsuitability for measurement of big pipeline air flow by single-point arrangement, damageable electronic component and great maintenance
AFMS measuring system	Inserted type, convenient installation, little resistance, energy-saving ,high reaction speed,no requirement on the straight pipe section by multi-point arrangement, suitability for measuring dust-containing air stream on big air passage, automatic purging, maintenance-free property, stability and reliability	High price

Working principle

Basic measuring principle

The bullet-head probe is inserted into the air passage. When fluid flows through the probe, a high-pressure distribution region is formed at its front part (upstream direction) and a low-pressure distribution region is formed at its back part. The sensor is opened with multiple pairs of pressure taps arrayed according to a certain rule in the high-pressure region so as to measure pressure on each point of the fluid. Full pressure, i.e., high-pressure value P1 (including dynamic pressure of each point, also called average value between speed pressure and static pressure) of the fluid is measured along the upstream direction of the end portion. Pressure tap in the low-pressure region only measures the average value, i.e., low-pressure value P2, among static pressures of multiple points of the fluid along its side wall (downstream direction). P1 and P2 are input into an AM intelligent flow rate computer, and the differential pressure and practical flow rate of the fluid are calculated and displayed.



Flow rate calculation formulae

1. Volume flow rate formula:

$$Q=0.12645KYD^2 \sqrt{\Delta P/\rho}$$

2. Mass flow rate formula:

$$M=0.12645KYD^2 \sqrt{\Delta P \times \rho}$$

Where Q - Volume flow in m³/h under operating conditions.

M - Mass flow in Kg/h.

ΔP - Differential pressure, Kpa.

ρ - Density in Kg/m³ of the fluid being measured under operating conditions.

K - Flow coefficient, the magnitude of which is related to the structure of the sensor, fluid flow conditions and caliber sizes etc. and it shall be calculated through experiments.

Y - Gas expansion factor, the magnitude of which is related to the gas pressure, the flow rate, the area ratio and the magnitude of pressure difference and shall be calculated through experiments.

D - Equivalent diameter of the measured pipe, mm



Working principle of automatic anti-purging

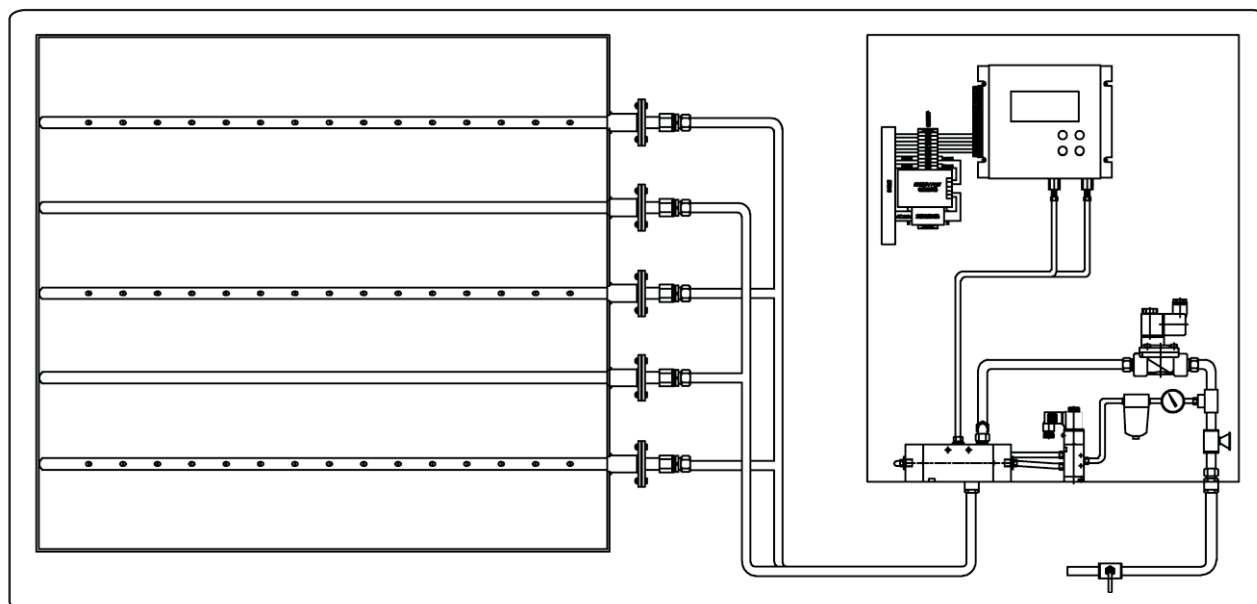
The automatic anti-purging device consists of a intelligent flow rate computer and an automatic purging component. The intelligent flow rate computer is an ultra-low pressure intelligent flow rate computer (transmitter) capable of converting differential pressure signal, process temperature and static pressure input output by the sensor probe into linearly output flow rate, temperature and pressure signal. Input differential pressure, absolute pressure and temperature signal are converted into digital signals to be processed by a micro processor and calculated by square root. The air temperature compensates with pressure correction density to obtain accurate air volume or mass flow rate.

The following functional components are configured in the intelligent flow rate computer: a four-line liquid crystal display for setting, calibrating and displaying process parameter, a high-accuracy low-differential pressure transmitter for detecting a sensor differential pressure signal, an absolute pressure transmitter for detecting static pressure on the sensor as the pressure compensation while performing flow rate mathematical model calculation, a component, which is adaptable to various temperature sensor ports and is used for acting temperature compensation during flow rate calculation, an automatic zeroing component for clearing zero deviation of the differential pressure transmitter, an automatic clearing management component for outputting flow rate, temperature, absolute pressure and special function and a component for filtering signal noise, isolating input power supply and regulating the ratio between maximum flow rate pressure and minimum flow rate pressure.

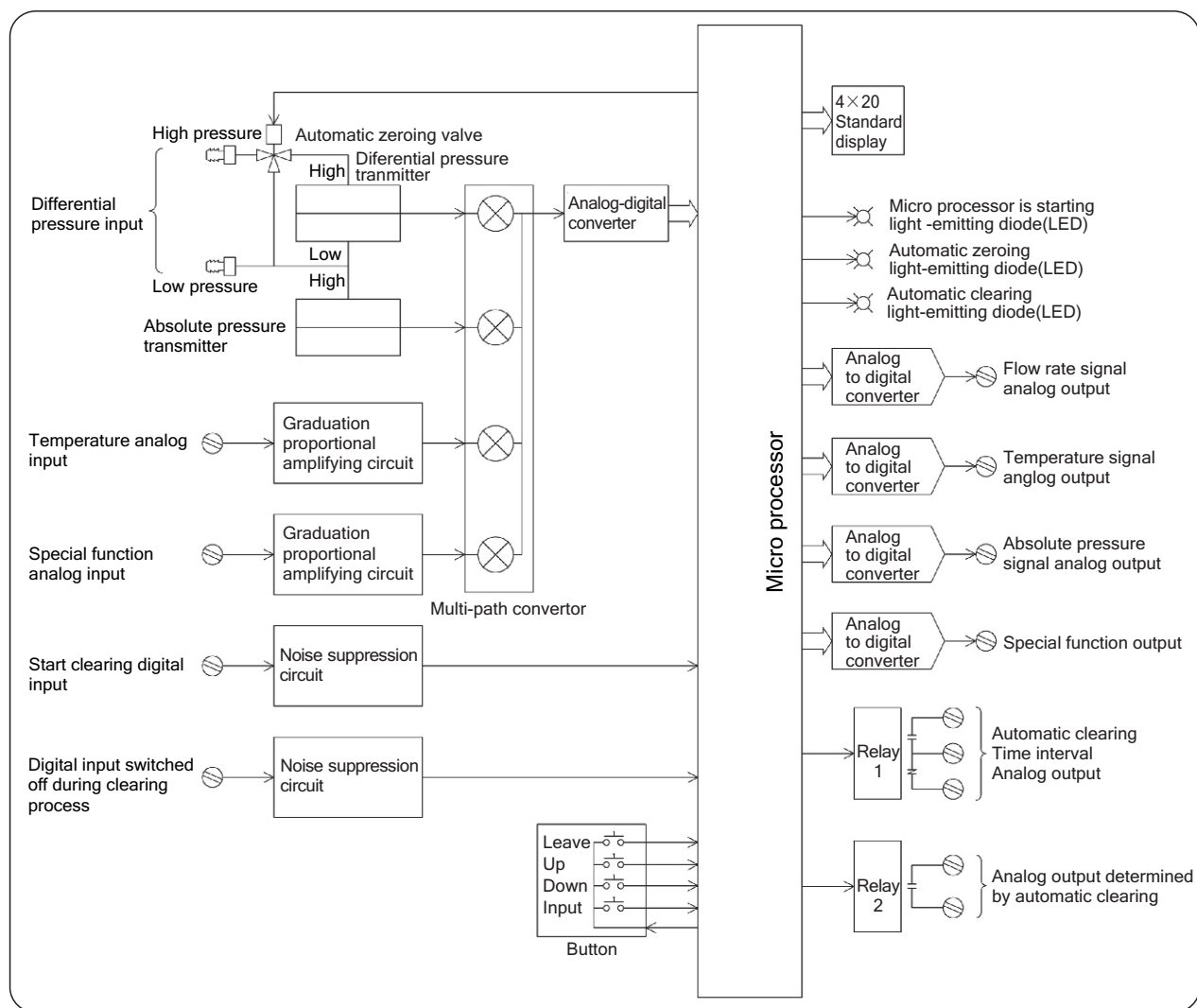
The micro processor periodically and automatically performs zeroing command according to designed sequence. The system enters suspend mode during the automatic zeroing command period. After entering the suspend mode, all normal mode processes will stop and all output and display parameters will remain as final data before suspension. A high-pressure hole connecting the high-pressure pipe and the differential pressure transmitter is isolated by a separating valve; meanwhile, high and low pressure sides of the differential pressure transmitter are switched on, causing zero differential pressure. After a short stabilization period, zero point deviation signal on the transmitter will be measured and stored in the micro processor, and the separating valve restores to the state during the measurement. Subsequently, stabilization period of the process signal is passed, and the suspend mode ends to restore the normal mode for starting normal measurement. During the normal operation, the micro processor subtract the zero point deviation value from the measured value, and the stored zero point data is not replaced by a new deviation value until the next automatic zeroing period has been finished. The automatic zeroing function fundamentally eliminates measuring error caused by the differential pressure transmitter.

The automatic purging component consists of two pneumatic valves, two electromagnetic valve components, a filter, a valve, a pressure gauge and a pipeline, and is connected with a differential pressure output pipeline of the sensor probe.

Automatic clearing management command is performed automatically and periodically by intelligent flow rate computer according to pre-set time. The system enters suspend mode during the clearing command period. A control signal is output by intelligent flow rate computer to the electromagnetic valve so as to control the action of the pneumatic valve, which switches the measuring pipeline from the sensor probe to intelligent flow rate computer at the same time. High and low-pressure ends of the differential pressure transmitter face towards the air so as to prevent high-pressure air from damaging the differential pressure transmitter during the purging process. After delaying for several seconds, the high-pressure air main electromagnetic valve is opened. The high-pressure air purges the sensor probe via the pneumatic valve. Dust accumulated in the sensor probe and the pressure guide pipe is cleared to ensure that the measuring pipeline is smooth. At the end of the purging process, the high-pressure air main electromagnetic valve is closed and the purging power supply is switched off. After delaying for 10 seconds and ensuring that the pipeline air stream is stable by measurement, the electromagnetic valve switches intelligent flow rate computer off and is connected with the measuring loop of the sensor probe. And then, the stabilization period of the process signal is finished. The suspend mode ends and normal mode restores to start measurement of normal process. Automatic purging ensures that the sensor probe and the pressure guide pipe are not blocked under dust-containing air stream environment and can work stably so as to realize maintenance-free management during the measuring process.



Connection diagram of AFMS system



Schematic diagram for the inside of intelligent flow rate computer



Main features

Accurate flow measurement

- Cross-sectional layout of the measuring point type, on-line measurement of the average gas flow cross section;
- Unique design for attempts to prevent the gas contains impurities of the occasion;
- Resistance can be ignored, effectively reducing electrical consumption of the wind;
- Easy installation and maintenance, simple structure, can be run in the main equipment installation and maintenance;
- Long life, 316 stainless steel probe is a special, high temperature corrosion resistance, ensuring long-term stability in harsh conditions;
- None of the stringent requirements of straight pipe, suitable for large diameter, short straight sections of wind measurement.

Flow rate measuring automatic management

- Strong human-computer interface

4~20 liquid crystal display (LCD) is capable of displaying flow rate, temperature, absolute pressure and LED indication function state at the same time; four buttons bring convenience to the user to enter the menu and to set parameters.

- A true high-accuracy intelligent volume/mass flow rate machine created by unique integral design

Intelligent flow rate computer is internally provided with two transmitters. One of the transmitters is an ultra-low natural measuring range differential pressure transmitter (reaching 0~1.27mm of water column at least) capable of maintaining 0.1% of natural measuring range accuracy, outputting water column with an accuracy equivalent to 0.00127mm and ensuring that the differential pressure transmitter can stably transmit differential pressure signal in low-flow rate micro-differential pressure output of the sensor. The other transmitter is an absolute pressure transmitter for measuring the static pressure of the sensor. The absolute pressure transmitter is capable of determining the density of a measured medium via an internal check table by externally connecting the temperature sensor on the probe. The measured differential pressure is processed by root extraction, and the temperature and pressure compensations can obtain high-accuracy mass and volume flow rate data.

- Data hold

After user enters setting menu and performs automatic zeroing and automatic clearing, the system will enter suspend mode. All normal mode processes will be stopped, and all output data will remain as the final data before entering the suspend mode.

- Automatic zeroing

When the differential pressure transmitter is used under ultra-low differential pressure, mechanical, electronic and temperature effects will distort the data, causing the output signal to become very strong and further causing great error in the transmitter. The intelligent flow rate computer has automatic zeroing (AUTO-zero) function for zeroing in an electronic mode within a pre-determined period of time; during the process of performing zeroing command, the computer is capable of maintaining signal transmission. The automatic zeroing circuit is capable of eliminating all unstable factors of temperature, electronic and mechanical output signals. Thus, the apparatus is capable of becoming a flow rate computer capable of calibrating automatically. The automatic zeroing interval can be set within 1~24 h. The shorter the measuring range, the shorter the time interval is. An electronic switch is provided to manually perform zeroing set. This function brings convenience to the manual zeroing or measuring range reset of operators.

Long-term maintenance-free property

- Automatic purging management

Intelligent flow rate computer has two sections of clearing internal timing period time and external connection start. The purging component is automatically controlled to run normally. After the performance of intelligent flow rate computer automatic clearing program command is started, the electromagnetic valve and the pneumatic control valve are controlled to time automatically and supply a large amount of high-pressure air to the sensor probe. Meanwhile, the transmitter or the flow rate computer is isolated to avoid damage caused by excessively high pressure. Periodic clearing in the way can maintain normal operation of the sensor probe so as to prevent blockage. During the process of clearing, the flow rate computer will output signal of last detection result until the whole clearing period is finished. The time interval of the clearing period can be set with the range of 1-24 h.

- Application of unique anti-purging technology reduces maintenance work to zero

It is easy for any type of differential pressure sensor to accumulate dust after long-term operation in the air passage, causing blockages of measuring hole and pressure guide pipe. For example, cold and hot air pipes at the inlet of the coal grinding machine are generally installed vertically such that air stream flows from top to bottom. All sensors are installed vertically to the air stream direction such that the dust enters without exiting and that the blocking time



becomes shorter. Increase or even failure of measuring error is caused, and automatic and effective feed for boiler Combustion is unavailable. The automatic anti-purging device is capable of purging dust in the sensor measuring hole and the pressure guide pipe so as to maintain normal operation of the probe.

Above all, said boiler combustion air flow measurement system is a set of high-accuracy and maintenance-free boiler air flow measurement system with true flow rate detection, accurate differential pressure measurement and automatic operation management.

Main technical indexes of AFMS system

- Measuring accuracy: the measuring accuracy of the system is $\pm 1.0\%$
- Repeatable accuracy: $\pm 0.1\%$
- Applicable pressure: 0~1.6MPa
- Applicable temperature: $-50^{\circ}\text{C}\sim 500^{\circ}\text{C}$
- Applicable medium: air and other low-humidity dust-proof gases
- Anti-purging time: optionally set within the range of 10~120 sec
- Timing time interval: optionally set within the range of 0.01~24h
- Anti-purging gas pressure: 0.5~0.8MPa dry and clean gas
- Joint specification: NPT1/2
- Case specification: 500×600×250mm width×height×depth
- Humidity range: 0~95% of humidity, non-condensation to liquid
- Protection grade: Ip65

Main uses

- Measurement of air flows of various coal-burning/gas-burning boilers and circulating fluidized bed boilers of thermal power plant
- Measurement of coal and hot primary air
- Measurement of coal and hot secondary air
- Measurement of total air flow at the inlet and outlet of air feeder
- Measurement of air flow in double-inlet and double-outlet barrel-type coal grinding machine
- Measurement of air flow at the inlet of medium-speed coal grinding machine
- Measurement of air flows in various air pipes for boiler air passages of circulating fluidized beds
- Measurement of other various air flow measuring occasions

Technical specification

Bullet structure sensor

- Measuring accuracy: $\pm 1.0\%$
- Repeatable accuracy: $\pm 0.1\%$
- Applicable pressure: 0~1.6MPa
- Applicable temperature: $-50^{\circ}\text{C}\sim 500^{\circ}\text{C}$
- Measuring upper limit: determined by technical requirement and probe intensity
- Measuring lower limit: minimum differential pressure is required to be 15Pa
- Measuring range ratio: 10:1
- Applicable pipe diameter: 50mm~15000mm
- Joint specification: NPT1/2
- Applicable medium: air and other low-humidity dust-proof gases
- Requirement on straight pipe section: front 7D and back 3D under general situation
- Multi-point cross section: no need for any straight pipe section; accurate measurement can be ensured by an installation length of 250mm~300mm.





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Intelligent differential pressure transmitting calculation control apparatus

- Accuracy: 0.1% of natural measuring range
- Stability: 0.5% of natural measuring range
- Converter reaction time: 0.5/sec, capable of reaching 98% of step change
- Temperature effect: no temperature effect; calibration by AUTO-zero automatic zeroing function
- Measuring range and zero point regulation: digital, internally provided with a button bringing convenience to operation
- Automatic zeroing: accuracy: calibrating less than 0.1% of measuring range; time: 1~24h with 1h as an interval
- Low-path filter reaction time: 2~250 sec, capable of reaching 98% of step change
- Maximum static pressure limit: 173KPa (25psig)
- Temperature limit range: -29°C~82°C save, -4.5°C~45°C operating
- Humidity range: 0~95% of humidity, non-condensation to liquid
- Analog input: two input ports, one of which is set in the form of jumper wire 0~5VDC, 0~10VDC or 4~20mADC and the other is connected with temperature signal for special application
- Analog output: four standard ports for providing flow rate, temperature, absolute pressure and special function; 0~5VDC, 0~10VDC or 4~20mADC is connected in the form of jumper wire
- Digital input: AUTO-purge automatic clearing start and clearing process interruption are connected in a dry form
- Digital output: determination of AUTO-purge automatic clearing start and clearing process, 3A24V/DC dry-type connection
- Display: four-line display mode, 20 character liquid crystal display mode
- Temperature compensation: linear or non-linear input selects E, K, J, T and RTD types of temperature sensors selected in the form of button
- Pressure compensation: absolute pressure (atmospheric pressure or pipeline static pressure), maximum of 1524mmHg
- Power supply: standard 24VAC (20~28VAC) or 24DC (20~40VDC) automatic conversion; Selection of 120VAC (100~132VAC), externally connected UL safe standard converter
- Power consumption: 54VA/24V AC 48VA/24VDC 108VA/120V AC
- Circuit protection: protected by fuse and reversed polarity



Anti-purging equipment

- Anti-purging time: optionally set within the range of 10~120 sec
- Timing time interval: optionally set within the range of 0.01~24h
- Anti-purging gas pressure: 0.5~0.8MPa dry and clean gas
- Gas source joint specification: NPT1/2
- Temperature limit range: 4.5°C~45°C
- Humidity range: 0~95% of humidity, non-condensation to liquid
- Protection grade: Ip65
- Case specification: 500×600×250 width×height×depth
- Power supply: 220V AC



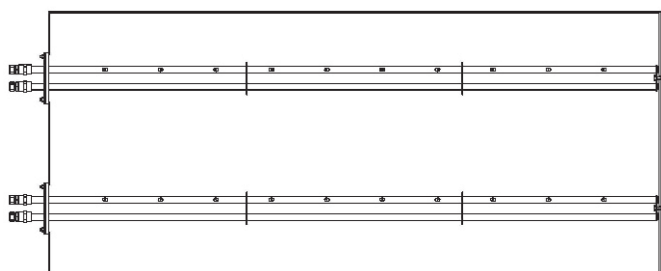


Type selection

Item	Specification code	Explanation
System name	AFMS	Boiler combustion air flow measurement system
Sensor probe type selection	-VRB66	WELLBAR dedicated to the air flow sensor
	-CAMsvp	Multi point cross section air flow sensor
Probe length	Diameter/wall thickness	Round tube size number Unit: mm
	Height/width/wall thickness	Square tube size number Unit: mm
Adaptation temperature sensor	N	No
	K	K type thermoelectric couple
	P	Pt100 type thermal resistor
A measuring probe number	<input type="checkbox"/>	Expressed by number
Intelligent air measurement instrument	-AFC itnn	No differential pressure transmitter
	-AFC itdx	DP transmitter with DP display
	-AFC itfx	DP transmitter with flow display
	-AFC itplus	Mass flow transmitter with Explosion-proof enclosure
Measuring circuit	-01	Single path intelligent air volume measuring instrument
	-02	Double path intelligent air volume measuring instrument
Communication bus interface	MS	MODBUS
	PS	PROFIBUS
	PT	PROFINET
Automatic sweep air blowing device	-ARP03	

Selection of sensor number

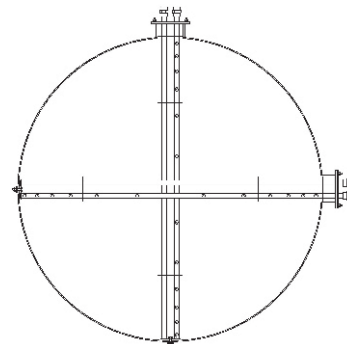
• The rectangular air passage requiring the straight pipe to have an equivalent diameter not less than 7 times at the upstream part and an equivalent diameter not less than 3 times at the downstream part can select the number of sensor probes with the following table as the reference. When the straight pipe section is short, the number of the probes can be increased accordingly.



rectangular pipeline

Reference table for probe number of rectangular pipeline

Equivalent diameter	Probe number	Equivalent diameter	Probe number
100~500mm	1	2100~4000mm	3~4
510~1000mm	1~2	4100~6000mm	4~5
1100~2000mm	2~3	≥6100mm	5~7



round pipeline

Reference table for probe number of round pipeline:

Nominal diameter	Probe number
200~500mm	1
≥500mm	2

• The round pipeline requiring the straight pipe to have an equivalent diameter not less than 7 times at the upstream part and an equivalent diameter not less than 3 times at the downstream part is generally installed separately; the round pipeline with enough long large-size straight pipe section (more than 20 times) that cannot be installed by double-surface support can use semi-pipe measuring mode according to the symmetric distribution relation of flow speed distribution under fully developing turbulent state.

• When the straight pipeline is relatively short, two sensor probes are inserted crossways to measure in an equal-area installation mode.

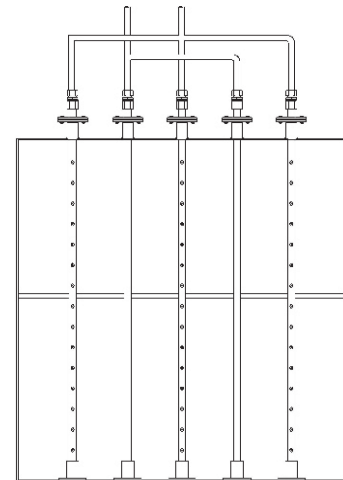


Type selection application case

Thermal secondary air quantity parameters for air pre-heater outlet of a certain 600MW machine set boiler

Measuring medium: hot air
 Pressure: 4KPa
 Temperature: 339°C
 Maximum flow rate: 1575000m³/h
 General flow rate: 1454013m³/h
 Pipe diameter: 4000×5000×4
 Pipe arrangement: horizontal
 Type selection:
 Since the pipeline is big, the inside is provided with multiple internal supporting parts and multiple elbows, the straight pipe section is relatively short and the gas contains dust, four sensor probes form a multi-point cross section installation mode, and an anti-purging device is arranged.
 Recommended model number:
 AMFS-VRB66-5000/4000/4E4-FT4YYN-RC1

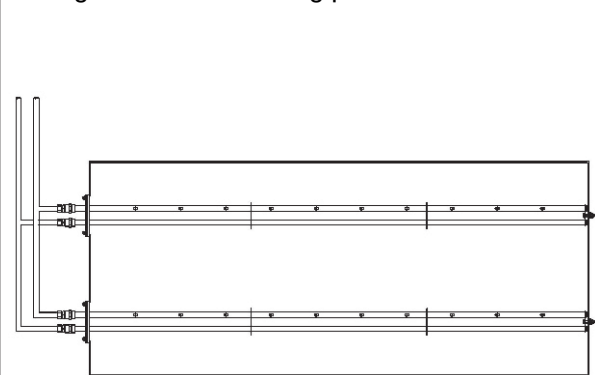
Arrangement of measuring points



Primary air quantity parameters for coal grinding machine outlet of a certain 600MW machine set

Measuring medium: hot air
 Pressure: 18KPa
 Temperature: 359°C
 Maximum flow rate: 360000m³/h
 General flow rate: 345800m³/h
 Pipe diameter: 2000×1800×6
 Pipe arrangement: horizontal
 Type selection:
 The air passage is arranged on the front side of the coal grinding machine. The side face of the pipeline is further provided with a cold air pipe inlet and plasma ignition air. Moreover, the straight pipe section is relatively short and is along the vertical direction, dust-containing air stream flows from top to bottom. Therefore, three sensor probes form a multi-point cross section installation mode, and an anti-purging device is arranged.
 Recommended model number:
 AMFS-VRB66-2000/1800/6E3-FT5YYN-RC1

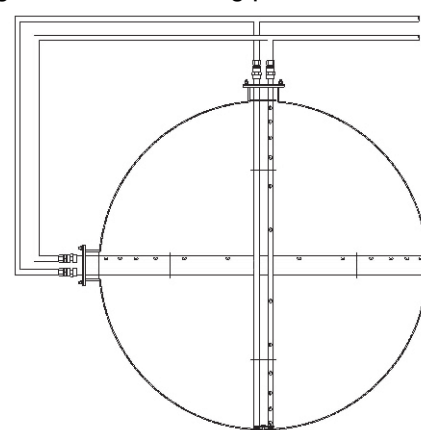
Arrangement of measuring points



Thermal primary air quantity parameters for a certain 300MW machine set

Measuring medium: hot air
 Pressure: 24.2KPa
 Temperature: 280°C
 Maximum flow rate: 298800m³/h
 General flow rate: 245100m³/h
 Pipe diameter: Φ 3020×6
 Pipe arrangement: horizontal
 Type selection:
 After passing through a diffusion tube, the pipeline has a relatively short straight pipe section, so that two sensor probes are arranged crossways.
 Recommended model number:
 AMFS-VRB66-3020/6P2-FT4YYN-RC1

Arrangement of measuring points





Working condition requirement

Upstream working condition			
No.	Definition of working condition	Mounting position	Requirement of upstream straight-line pipeline
1	Outlet of centrifugal fan		3D
2	Outlet of wing-shaft fan		5D
3	Air valve		4D
4	90°C bent pipe with flow guide plate		1.5D
5	90°C bent pipe with no flow guide plate		5D
6	Round pipeline		2D
7	Round pipeline		2D
8	Other device		3D

Upstream working condition			
No.	Definition of working condition	Mounting position	Requirement of upstream straight-line pipeline
1	Other		2D
2	Other		3D
3	Other		1D
4	Deflector		1D
5	Deflector		1D
6	Deflector		1D
7	Deflector		1D
8	Deflector		D/2

Upstream working condition			
No.	Definition of working condition	Mounting position	Requirement of upstream straight-line pipeline
1	Inlet of centrifugal fan		1.5D
2	Inlet of wing-shaft fan		2D
3	Air valve		1D
4	90°C bent pipe with flow guide plate		D/2
5	90°C bent pipe with no flow guide plate		1D
6	Round pipeline		D/2

Upstream working condition			
No.	Definition of working condition	Mounting position	Requirement of upstream straight-line pipeline
1	Round pipeline		D/2
2	Deflector		D/2
3	Deflector		D/2
4	Deflector		D/2

Note: square pipe D is equivalent diameter
Round pipe D is pipeline diameter



Running instruction for on-site installation and debugging

Acceptance for box unlocking

Open instrument packing box, check whether model number and number of the instrument are accordant with the detailed list, whether instruction book, data and appendixes are complete, whether the packing is complete and whether the instruments are damaged, and fill unpacking acceptance check form if the product is qualified.

On-site installation

The measuring point installation position is selected according to design position number, named of the measuring point and the requirement on the smallest straight pipe section, and the proportion of the installation hole is determined by the number of sensors installed on the measuring point. Holes are opened with reference to the size in the instruction book. Hole is opened opposite to the pipeline, and a supporting seat is installed in it so as to realize double surface support of the probe, thereby enhancing the mechanical intensity of the sensor. The sensor is installed after welding, and then the screw is fastened. A sensor probe with a length more than 3m is provided with a middle reinforcing bracket. Each bracket is screwed with a connecting sleeve on the sensor to ensure that the distances between sensors are the same. The inner two sides of the pipeline wall are welded with an angle iron, respectively. Each angle iron is opened with a round hole, and the screw on the bracket is fastened with the angle iron. High pressure and high-pressure side, low pressure and low-pressure side of each probe are connected in parallel, led out by the pressure guide pipe and connected with high and low-pressure sides of the differential pressure transmitter; meanwhile, the sealing of the measuring pipeline is measured.

If an anti-purging case is provided, high and low-pressure output sides of each probe are guided to the purging case by the pressure guide pipe so as to be connected in parallel and to be connected with the high and low-pressure sides on the purging case, respectively. 0.5~0.8MPa of purging clean and dry compressed air is connected to the interface, and sealing states of all pipelines are checked. The electric source, signal and control wires are switched on according to product description of the purging case.

N+1 (N refers to the probe number) round holes with diameters of 50mm are uniformly opened 500mm in front of the probe. A steel pipe with an outer diameter of 50mm, a length of 100mm and a chock plug at the top is welded such that it is convenient to test the air flow.

On-site debugging

It is checked that whether the measuring range of the differential pressure transmitter is accordant with the differential pressure value on a probe tag, and zero deviation is cleared. Configuration is carried out on DCS according to the formula on the calculation sheet. Pressure and temperature compensations are intruded into the formula, and maximum flow rate and minimum flow rate are set.

Cold state or hot state of air flow is marked according to Test Specifications for Boiler Performance in Electric Power Plant so as to obtain average flow rate under various working conditions of the measuring point. Flow rate parameter is displayed by DCS and systematic comparative analysis is carried out so as to evaluation accuracy level is defined for the measuring system.



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