AMP-1000v14 type

METAL DIVERTER

User manual

AMPE technology Co., Ltd

http://www.ampecn.com

Contents

Ⅰ.Overview

1、Use and structural features

AMP-1000v14 metal diverter is used in fore-spinning procedure of cotton mill, which can be installed on the conveying pipe of the blow room machine directly. As an important and necessary machine for safety production, it can detect and remove the metal material automatically with high and stable sensitivity. The parameter of sensitivity and the diverter action time can be set on panel. The diverter action time also can be adjusted automatically according to the size of the metal material.

（1）Metal detecting and diverting principle

When the raw cotton (which contains iron wire, screw, wash, steel reed, etc.) passes the detecting zone of metal detector, the diverter will be driven to remove the cotton into the collector box and prevent the metal material from entering into the next blow room machinery, meanwhile eliminate the hidden fire danger. It can also avoid the damage of some important machine, such as mixer, card and so on.

（2）Diverter

The diverter has two models, one is A201, and the other is A102

Model A201: Pneumatic diverter (require 0.6~0.8MPa compressed air) is composed of A201 diverter and collector box. A201 diverter utilizes three-way air rocking plate type valve structure, which has rapid response speed and less wind pressure loss. The collector box has mesh clapboard to assure the smooth passing of the air flow and reliable separating of the material that includes metal particles. In the procedure of both positive and negative pressure, this diverter can work effectively.

Model A102: It is the traditional big three-way electronic diverter mechanism, it has a 90 degree bend which can remove the heavy impurities, and has high efficiency. It is suitable for negative pressure process because of the larger windage. Due to the required installation of the straight pipe position is very short, so that it can be installed in the limited installation distance.

（3）Control Circuit

The circuit board in control box is designed with a joint-insert type connection.

If the circuit board has been damaged, users only need to change the reserving circuit board, the problem can be solved instantly. It makes sure that the maintenance is very simple and convenient.

2、Technical parameter

1、Power Source：AC220V±10% 50Hz；
2、Sensitivity：Steel ball diameter more than Φ3mm (Ferromagnetic material)
3、Power consumption：＜100VA；
4、Compressed air pressure range:：0.6～0.8MPa；(note: Model A102 diverter doesn't need gas supply)
5、Environment Temperature:：（-10～40）℃
6、Environment Humidity:（20～75）%RH

II．Installing

1、Control box installation

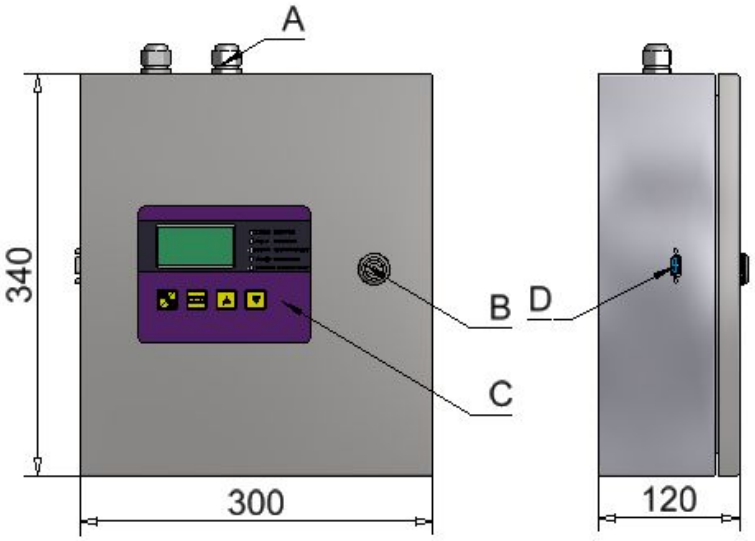
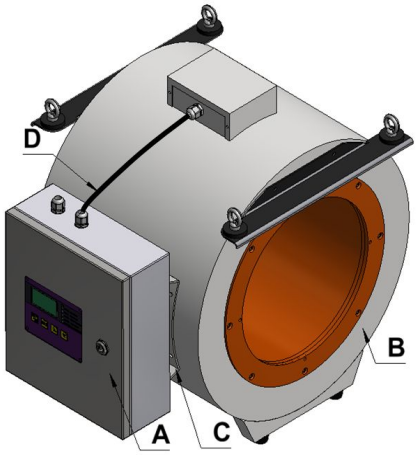


Figure 1: Sketch map of control box

A. hanging ornaments
B. door lock
C. display panel
D. RS232 communication interface



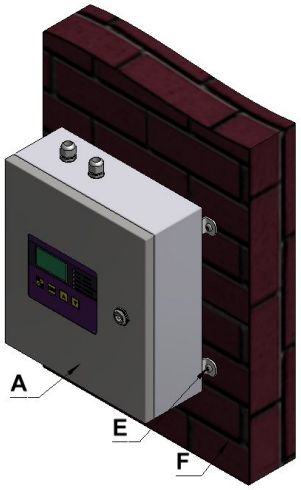


Figure 2.a Figure 2.b

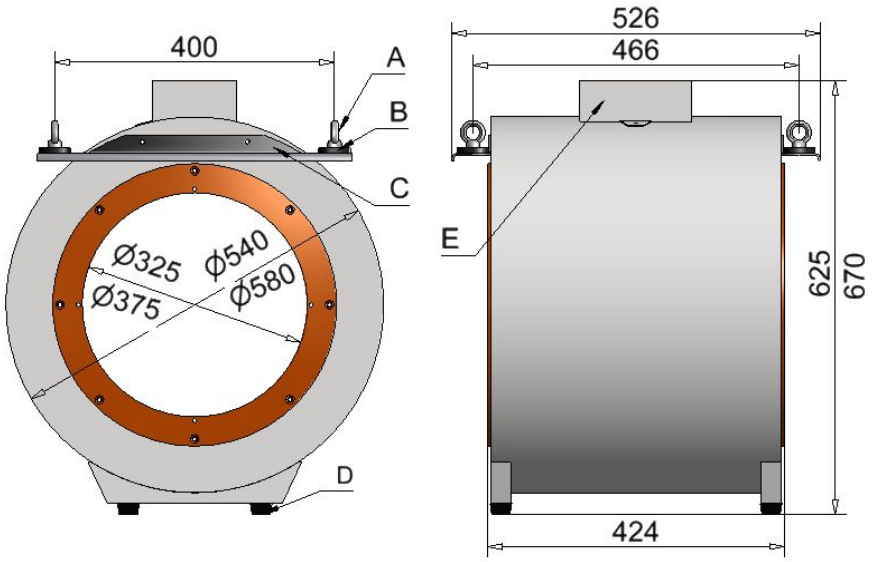
A. Control box B. Metal detector C. support of detector D. signal cable

E. hanging ornaments F. Wall

Figure 2：Diagram of control box installing

As above shown, there are four Φ6mm mounting holes on the bottom of the control box, users should use proper fasteners to install the control box on the metal detector (as Figure 2.a) or on the wall (as Figure 2.b). We'd better choose proper installation position according to the actual condition so as to operate easily.

2、The installation of the metal detector



A. Hoisting ring

B .Insulating washer

C. Hanging support

D. Insulation pad

E. Junction box

Figure 3: Sketch map of the metal detector

A) Metal detector can be hung by metal bar (as Fig3.a), if the installation position near the wall, metal support can be used (as Fig3.b).

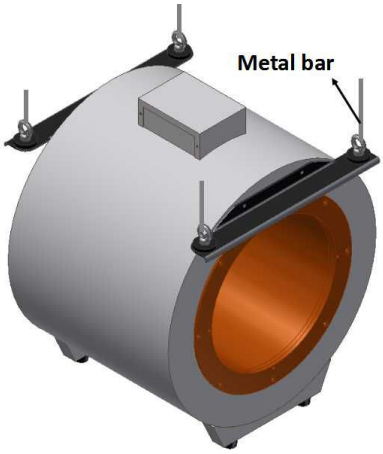


Figure 3.a

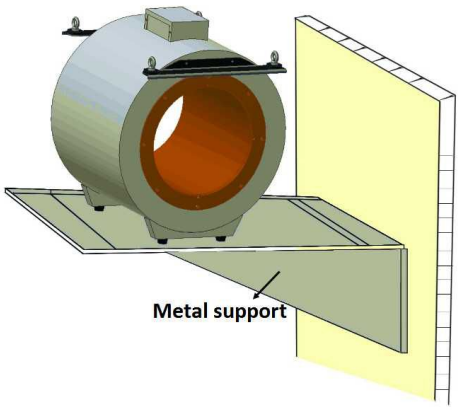


Figure 3.b

B) The metal material mustn't be left in the inner cavity of the metal detector during installation. Please pay more attention to the insulation between the detector cover and bolt or any other metal material when metal detector is hung.

C) Metal detector should be firmly installed to avoid misacting when the detector works. The non- metal duct should go through from the center of the inner cavity and at least keep 5mm from inner wall of metal detector. (as figure4.c)

D) Metal detector should be far away from the devices that generate the electromagnetic radiation such as electric motor, transformer and daylight lamp etc. Furthermore, it should be far away from moving or vibrating metal substance, for example, fan etc. The cables with big current shall also keep away from the detector. (as figure4.d)

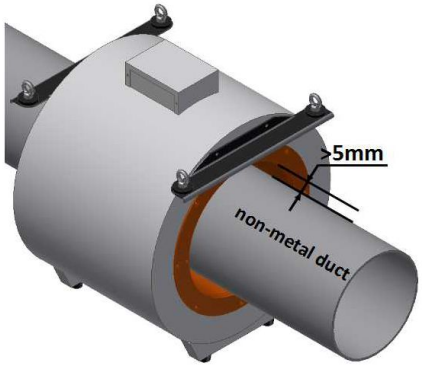


Figure4.c

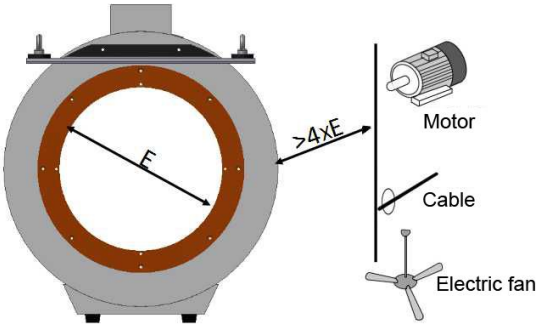


Figure 4.d

E) The location that the metal detector is installed is very sensitive to the electromagnetic interference. For example, in the workshop, there is air conditioner and a big power inverter is used (over 15KW) and it is within 25m, it may cause the misacting. So please install RFI filter to the main connecting wire. The nearer the install position to the AC motor driver the better it is. And if you adjust the inverter's PWM wave carrying frequency, the interference would also relatively decrease. (as figure 4.e）

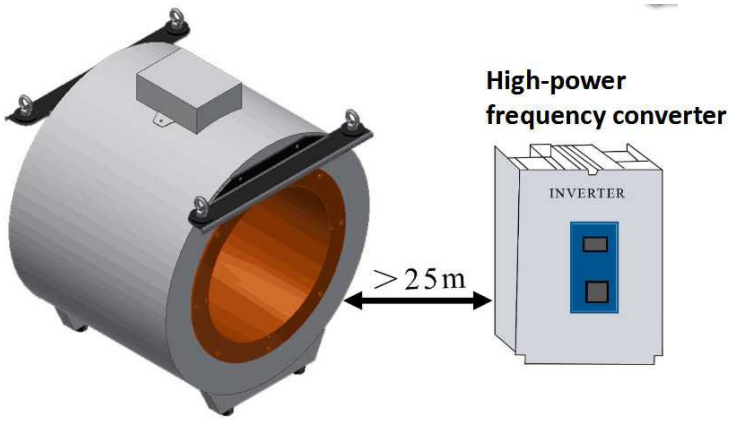
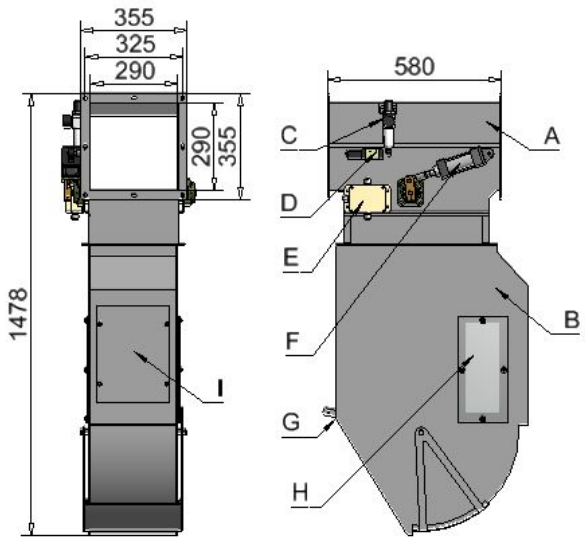


Figure 4.e

F) Power should be connected from the input parts of the power. It mustn't be connected to the wire of large power load which acts frequently of the load wire producing strong electromagnetic interference. Otherwise the mistake action of the device may be occurred due to the interference of the power source.

3、The installing of actuator unit

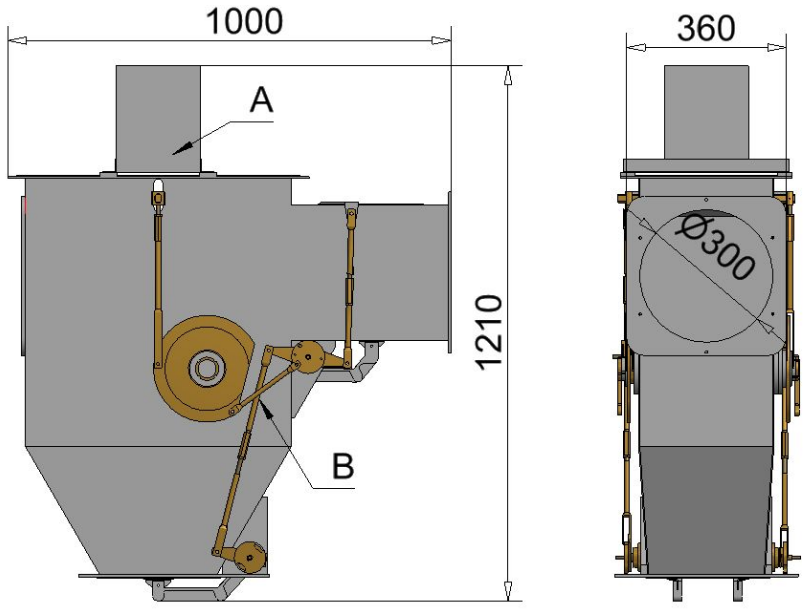


A) .Diverter
B) .Collector box
C) .Air filtration reducing valve
D) .Electromagnetic valve
E) .Junction box
F) .Cylinder
G). Pull rod
H). Observation window
I). Pressure adjusting pad

Figure 5：Model A201 Parts and external dimension of actuator unit

（1）The actuator unit is composed of two parts: diverter and collector box（as Figure 5）.The diverter is connected to conveying pipe by square to circular pipe and installed with metal rods, and when installing, pay attention to the direction of inlet and outlet. 0.6～0.8MPa stable and clean compressed air must be provided.

（2）The inlet of Model A102 diverter is circular, it connected with the glass steel pipe by circular to circular pipe. And outlet is square, it connected with conveying pipe by square to circular pipe. Diverter can be hung by metal rods.

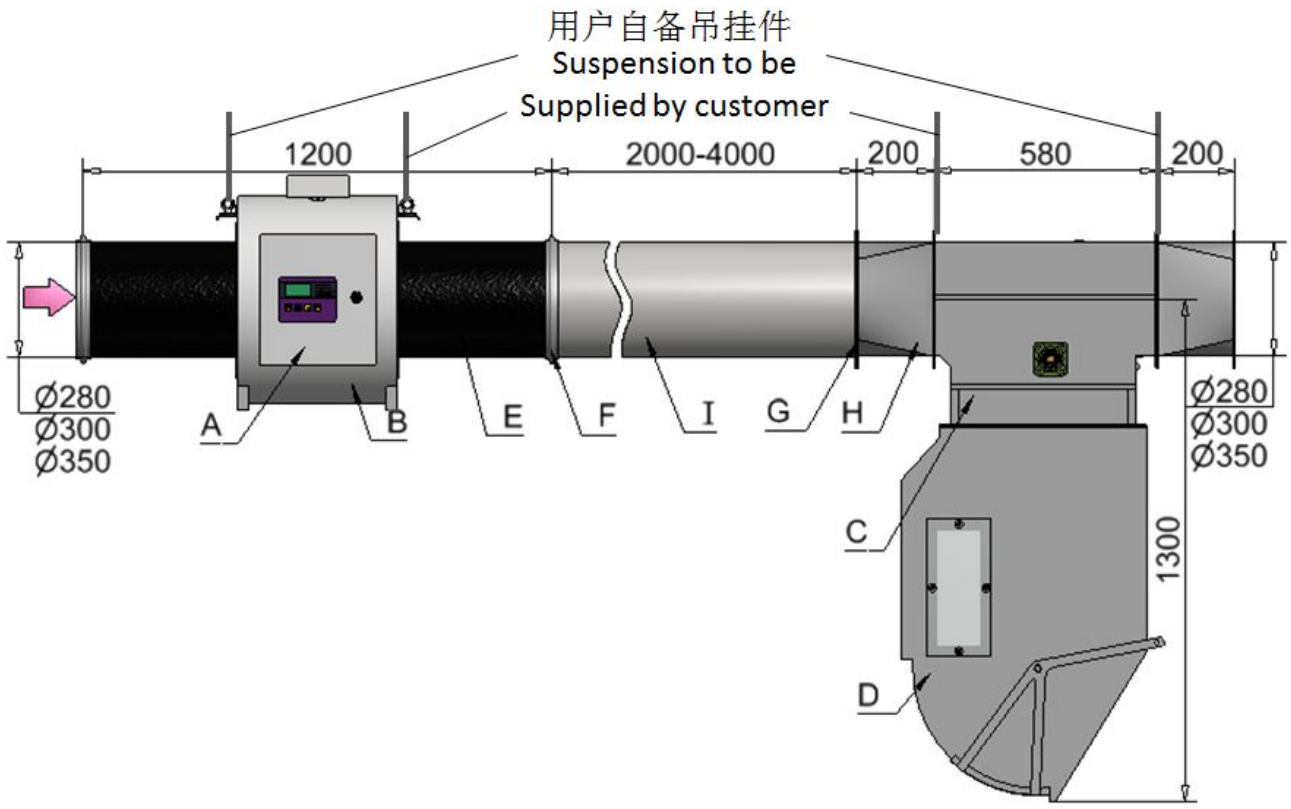


A. Electromagnetic iron box
B. Linkage

Figure 6：Model A102 Parts and external dimension of actuator unit

4、The standard installation

（1） Model A201 diverter：



A MD-1000 Control box
B M-1000-Φ Metal detector
C A201-A Diverter
D A201-B Collector box
E NM-1200-Φ Glass steel pipe
F F-NM-Φ Clamp hoop
G S-Φ-Flange
H K-Φ-Square to circular pipe
I Connection pipe to be supplied by user

Figure 7 : Installation of AMP-1000v14 equipped with A201 diverter

Before installing the AMP-1000v14, you need to calculate the right distance between the metal detector and the diverter. You can do this with the following formula.

The **Distance** is the metal detector to the diverter.

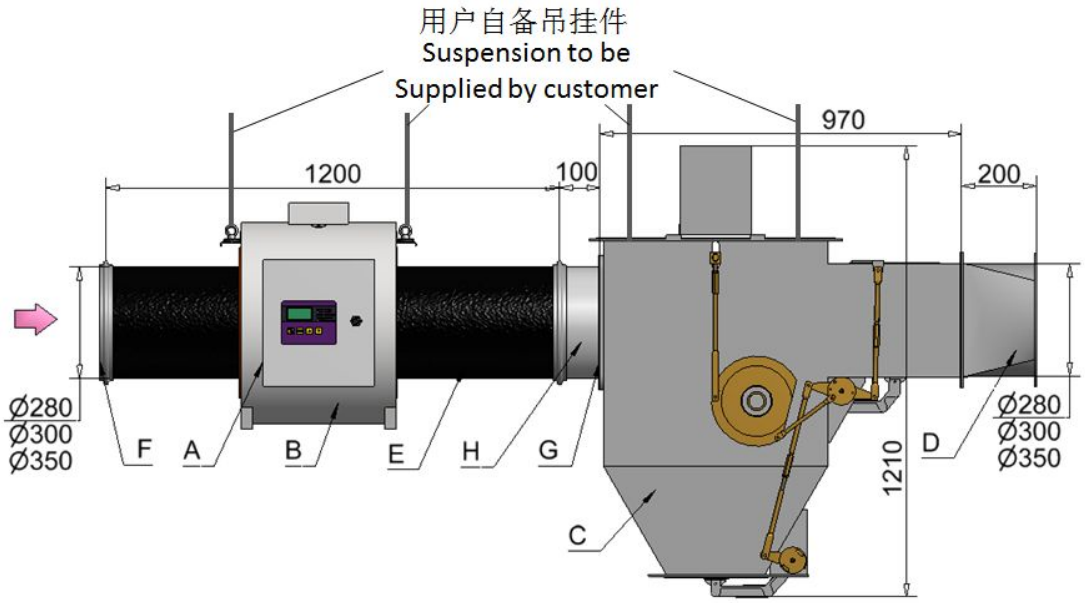
The **Transport velocity** is the material transport velocity in the pipeline.

The **Reaction time** is defined as the time taken by diverter to reach activated position after receiving a switching impulse.

The range of the **Safety factor** is 1.2~1.3.

The ‘ I ’ in the above figure 7 is a piece of connection pipe, it should be supplied by customer. The length of the pipe is normally from 2m to 4m, corresponding to transport velocity from 10m/s to 25m/s;

（2）Model A102 diverter：

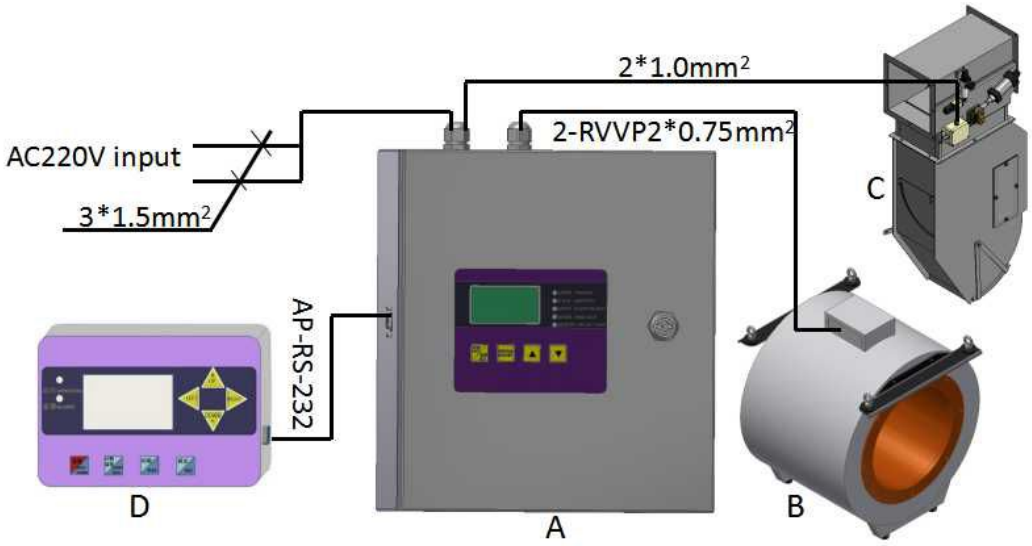


A MD-1000 Control box
B M-1000-ΦMetal detector
C A102 Diverter
D K-Φ Square to circular pipe
E NM-1200-Φ Glass steel pipe
F F-NM Clamp hoop
G S-Φ Flange
H C-300

Figure 8：Installation of AMP-1000v14 equipped with A102 diverter

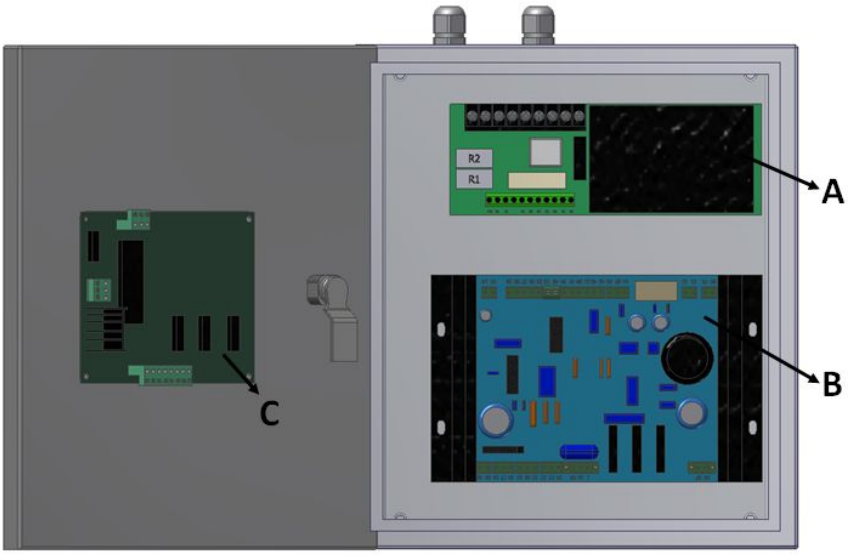
Ⅲ. Electric wring

1、Electric wring



A. Control box B. Metal detector C .Diverter D .APU-01 (alternative）

Figure 9 a： the illustration of AMP-1000v14 connecting with other parts



A. Power board B. Control board C. APU-02 Display panel

Figure 9 b：Sketch map within control box

2、Power main board connecting instruction

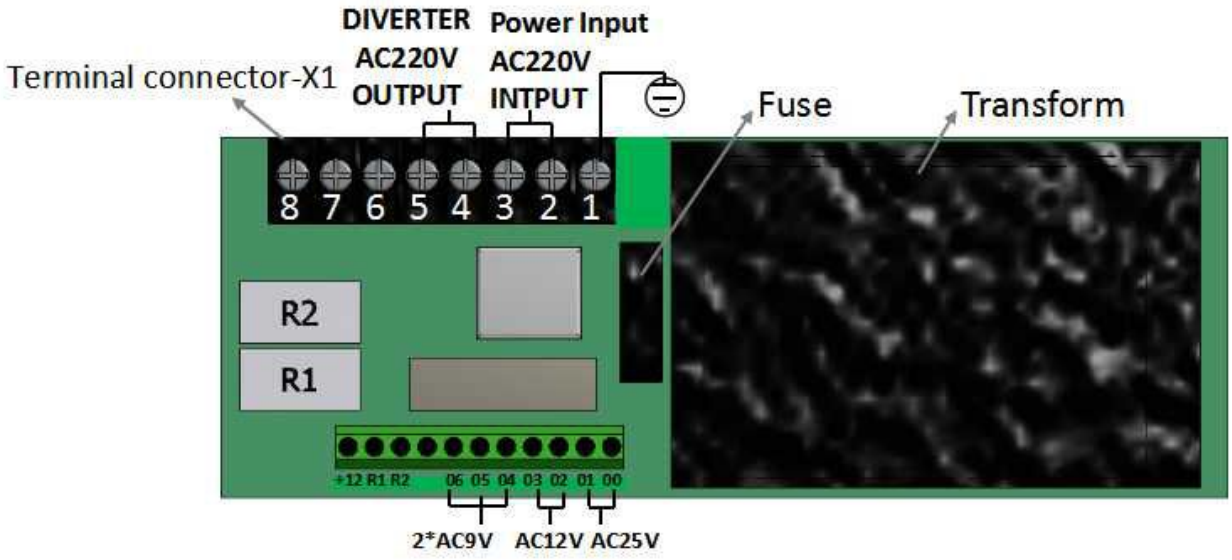


Figure 10 a：Wire connecting of power main board

a) The input power of terminal 2 and 3 are AC220V, terminal 1 should be grounded. Please avoid using the same power together with other equipment that may cause radiation. If possible please supply the power individually.

b) The outing power of terminal 4 and 5 are AC220V, we suggest using more than RVV1.0mm2 line with insulation cover.

3、Electric wiring of the main board to the metal detector

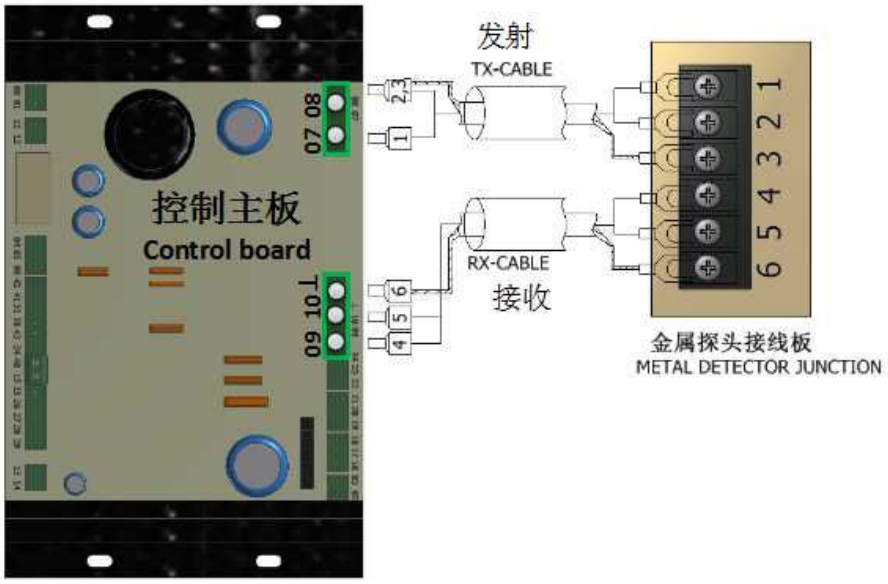


Figure 10 b：The connection diagram of metal signal cable

The terminals that in the junction box of the metal detector be connected with control board by two pieces of shielded cables. Terminals 1,2,3 be connected with TX-cable, terminal 1 be connected with terminal 7 of control board; terminals 2,3 be connected terminal 08. Terminals 4,5,6 be connected with RX-cable, and be connected with terminals 09,10, ⊥ of board in turn.

4、Grounding and safety

a) AMP-1000v14 must be grounded according to the safety standard of local government. This equipment needs to be separately grounded
b) It is suggested that the grounded wire be as short as possible. It is prohibited to be grounded together with other equipment.
c) While overhauling, please first shut down the power supply and turn off the compressed air supply. The maintenance work that needs climbing should be carried out by more than two people.

Ⅳ. Debugging and usage maintenance

1、 Indicative and adjustable parameter of the control panel

After completing the installation, first carry out the energizing test. If the displayer shows normally after the energizing, the following procedure is the understanding and the setting of the parameters.

1.1 Metal diverting unit APU-02

Figure11： Diagram of APU-02 panel

a、Use of counting function

a.1 The data displayed in LED is the times of the metal diverter's action. If you want to restart the counting, you can push COUNT/CLR key. After the count reaches 999, the counter will automatically reset and restart the counting.

a.2 Users can read the times of metal diverter's action and judge the rate of metal inclusion in the raw material. And we can also compare it with the calculating value to check the dropped metal particles.

b、Parameter setting

b.1 DATE SET key is used to transform among the following 5 cycling mode: 'working status'→ 'sensitivity'→ 'activation delay'→ 'reset delay'→ 'fan halt delay'. Each time you push DATE SET (parameter setting) key, it changes to next mode in turn. If there was no more operation within 30s, it would automatically return to the working status.

b.2 △,▽ key can increase or decrease the value in the parameter setting.

b.3 The five LEDs on the right of the nixie duct indicates the displayed content of the working nixie duct. They are in turn operation (red), sensitivity (green), activation delay (green), reset delay (green) and fan halt delay. After finishing of parameter setting and resume of working status, the changed parameter is automatically written into the storage devise EEPROM.

c、Parameter setting range and explanation

Parameter	Range of setting	Setting value on delivery
Sensitivity SE	A0, A1, A2 Automatic level	A1
	1~99 Manual level	
Activation delay T1	0.00s～3.00s	0.00s
Reset delay T2	1.00s～3.00s	1.50s
Fan halt delay T3	0.00s～3.00s	0.00s

Table 1: Parameter setting table

c.1 Sensitivity SE

Automatic mode of sensitivity (3 levels): A2 (automatic high sensitivity), A1(automatic medium sensitivity), A0(automatic low sensitivity).

Manual mode of sensitivity, 99 levels: parameter range 1-99, the lowest 1, the

highest 99.

We recommend the A0, A1, A2 automatic mode of sensitivity. A0 and A1 sensitivity levels can satisfy most of the users in spinning mills. In automatic mode, CPU can adapt itself to different working conditions and make the metal diverter maintain the best sensitivity status.

1~99 is the manual setting mode of sensitivity, users can set the sensitivity parameter according to the actual requirement. The values in the range 69-85 can satisfy most of the users in spinning mills.

☞Caution！

Under the working condition that the magnetic interference is big, if you set the sensitivity parameter too high, the misacting of diverter will happen. Under the condition of bad electromagnetic environment, we can decrease the use of sensitivity parameter.

c.2 T1Activation delay T1

"Activation delay", it refers to the delayed time from detecting the metals to diverter acts, it is the best situation: when in a moment of the flap valve opens, metals enters into the diverter. We must operate it according to the drawing size, the parameter value usually be set as the factory value (0.00s).

c.3 Reset delay T2

Reset delay refers to the time from the flap of the diverter opens to the time it resets. The parameter should be confirmed through the experiment. We must assure that cotton including metal substances can drop to the collect box and in the meantime, we must assure that the dropping volume is the minimum and it has minimum influence to the gas flow of normal production. The reset delay parameter's setting precision is 0.01s. Adjust △, ▽ and set the reset delay parameter in the range of 1.00s to 3.00s.

c.4 Fan stop delay

"Fan stop delay", this function is only used when it is under the condition of fire alarm module, because this machine isn't equipped with fire alarm module, this feature isn't enabled.

☞Caution!

If the parameter T2 is set too small, this may cause the condition that material including the metal can't be discharged. If it is too big, the discharged material may become excessive. In general course of event, the value between 1.50s to 2.05s can satisfy the needs. When the instrument detects special big metal substance, reset delay T2 will automatically prolong and increase the dropping time of the cotton batting.

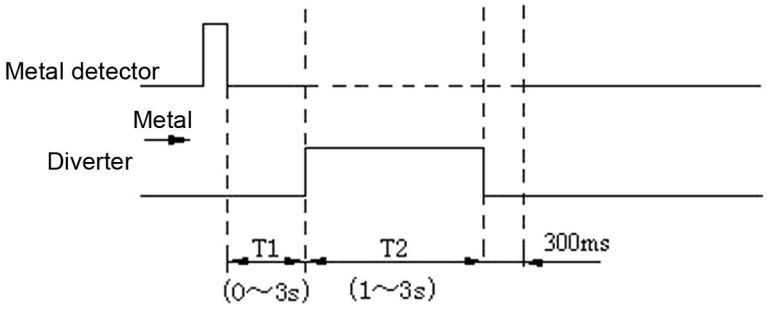


Figure 8：Diagram of metal detector's action status

d、The cautions in the use of APU-02 panel

d.1 After the displayer is energized, it indicates 'APP'. It is the status of delay and preparing to enter the work. 'AP1' is the action delay time, 'RE2' indicates the relay-operating time of the diverter, and 'AP-' is examination postponed. When the count value appears in the LED and the working indicating lamp is on, the metal diverter is in the working state.

d.2 After the initial setting of the parameter, we can wrap the metal with material and simulate the normal running of the material in the pipe. After revising the parameter repeatedly, we can detect properly and divert properly.

d.3 After the setting of the parameter, take the record to restore in case others' misacting. The parameters must be set up by special personnel. The operator is prohibited to change the setting, or trouble may happen.

d.4 This machine has the function of automatic adjustment to the "reset delay" time, that is to say, the function of automatic adjustment of maintenance time after the action of diverter. In case of special big metal substance, the corresponding reset delay time will increase.

d.5 In case of the continuous action of metal detector and if it is necessary to change the setting of the sensitivity, please continuously push the "parameter

setting" button and transform the function to sensitivity adjustment mode and decrease the sensitivity parameter value.

d.6 APU-02 is a computer unit, if strong magnetic interference or other factor happened and caused the parameter unit abnormal, please shut down the main power supply for one minute and then reenergize and recheck every parameter.

2、Metal diverting function test and adjustment

In the meantime of metal diverting function test, it is necessary to do the setting of parameters such as sensitivity, action delay and reset delay.

a. The sensitivity setting in the control panel controls the sensitivity of detecting metal substance. The higher the sensitivity is, the stronger the ability of discharging the metal substance has. Users can set the sensitivity according to the actual needs. It is suggested that the automatic sensitivity method be used. The diverter can maintain the best working status in this mode.

b. Activation delay parameter can adjust the delay time from the time metal detector detects the metal to the time diverter acts. E.g.: If the parameter was adjusted to minimum 0.00s, and it was proved to be able to discharge metal substance correctly after many times of testing，then this status would indicate that the distance between the metal detector and the diverter is the shortest and it is the most ideal.

☞Caution!

That keeping the distance between the detector and the diverter minimum can make the detected metal substance discharged quickly and assure the minimum volume of cotton dropping. In the meantime, the influence to the normal carding is the minimum. As the installation distance between the detector and the diverter is very short and the activation delay is the minimum, once the metal is detected, the diverter will act immediately. In this working mode, the various size of metal substance discharge rate will reach maximum for the distance they move along with the cotton flow is small.

c. Reset delay parameter refers to the delay time of resetting after the action of the diverter. The parameter can directly affect the cotton dropping volume. It is best

to assure that the metal scraps can be properly discharged but the cotton dropping volume is the minimum.

☞Caution!

Activation delay parameter and reset delay parameter should conform to the actual wind speed and use condition. While debugging, users set it to the best position through the experiment.

d. While the user is carrying out the metal test, please be observant to avoid the metal from entering the blower in the next procedure. The user can use spreader tin- foil not less than 100mm, otherwise 5mm or smaller screw washer with obvious identification. Then wrap it with cotton and let it be plucked by bale plucker or directly put it into the conduct duct. When the indicator of the control box lights and the diverter acts, that indicates that the metal detection function of this equipment is normal.

e. If the diverter has taken the actions, but you can't find the test metal in the collect box, you should carefully observe and repeatedly adjust closing delay parameter until you can reliably discharge the test metal. In the meantime, you should assure the dropping volume is the minimum. After repeat test, if you still can't divert properly, it is necessary to reconsider the installation distance from metal detector to diverter.

☞Caution!

a) The dropping cotton batting in the collect box of diverter needs to be cleaned immediately, or it will damage the diverter.

b) We also need to carry out regular simulation test and check to the metal diverter and trash separator to assure the good working state.

Ⅴ. TREATMENT TO TROUBLE

Regular troubleshooting methods during debug or normal use are listed.

Failure mode	Fault analysis	Fault checking & trouble shooting
LED does not light	1.Power supply circuit 2.Mainboard is damaged or transformer is damaged 3.The adaptor plug on the mainboard becomes flexible 4.fuse	1.Checking the input power of AC220V 2.Checking the output voltage of the mainboard and the output voltage of the transformer 3.Checking the fuse
The metal detector works normally, the display panel indicates "RE2" ,but the diverter does not act	1.The pressure of the gas supply is low 2.The solenoid valve is damaged 3.APU-02 display panel is broken 4.The diverter linking wire or output relay is broken	1.The pressure of the gas should be less than 0.6Mpa 2. The solenoid valve 3.Checking the output voltage between terminal 35 and 36 of the APU-02 display panel, check whether there is DC12V output 4.Checking connecting line of relay, check whether AC220V output
The flap of the diverter is not on the correct position	Flap has been jammed	1.Clean up the material remaining in the collect box of the executive structure. 2.Take down the diverter and adjust the gap between the flap and the side wall.
The flap of the diverter is not on the correct position or working abnormally	1.Flap has been jammed 2.Flap has been out of shape 3.Electromagnetive valve or the air cylinder is broken 4.The pressure of the gas supply is low	1.Checking whether the flap has been jammed 2.Checking whether the flap has been out of shape 3.The Pressure of the gas should be less than 0.6Mpa
The diverter has mistaken actions from metal detecting	1.the influence of the strong electromagnetic radiation 2.metal detector shakes 3Space electromagnetic interference 4..mainboard is broken 5 The metal bar or bracket collides with the detector 6、.there are some metal particles left in the inner of the metal detector 7.the sensitivity has been set too high 8.the communication cables has been flexible	1 Power supply should select the branch which has a large capacity load such as: lighting circuit. 2、Non-metal and the detectors should be Suspended， in order to avoid vibration transmission without filling the other anything 3 the 2 meters around the environment of the detector shouldn't have no power line circuit
The metal detector works normally, and the diverter acts, but the metal particles can't be diverted to the collector box	1.the flap of the diverter has been jammed or not in the correct position 2.the parameters of the delay has been set incorrectly 3.the distance between the metal detector and the diverter is not reasonable 4.The pressure of the gas supply is low	1.Checking the flap of the diverter 2.Checking the AMP-DATE SET, the parameters of the delay 3.Checking the distance between the metal detector and the diverter 4.The Pressure of the gas should be less than 0.6Mpa

Ⅵ. APPENDIX

Appendix 1: Wiring principle of AMP-1000v14 metal diverter