

# OVERALL SOLUTION TO ENVIRONMENTAL FRIENDLY REFRIGERANTS FILLING 环境友好制冷剂充注及安全整体解决方案

SCHENCK SHANGHAI MACHINERY – AGRAMKOW  
上海申克机械有限公司 - 安科中国

# FEATURE 冷媒特性

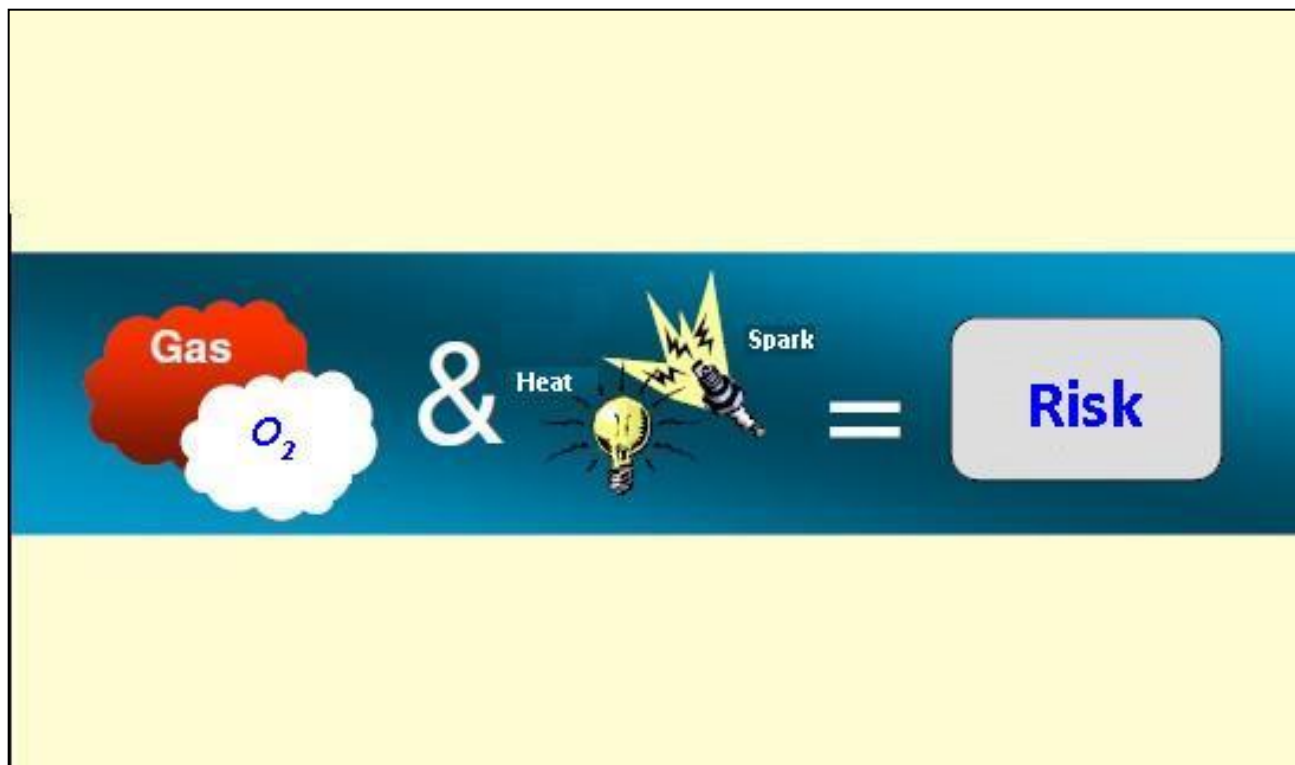
	ODP 臭氧消耗潜能值	GWP 全球变暖潜能值	Mass 分子量	L.E.L (% v/v)	U.E.L (% v/v)	Class 等级
R290	0	0.01	44.9	2.1	9.5	A3
R32	0	0.11	52.0	14.0	31.0	A2 (A2L)
R22	0.045	1662	86.48			
R410a	0.000	2612	72.58			

- **Replace R22/R410a**      用于替代 R22/R410a
- **Environmental Friendly**      环保工质
- **Flammable!**      可燃工质

**安全!**



# EXPLOSION TRIANGLE 危险（爆炸）的条件



# HOW? 如何解决



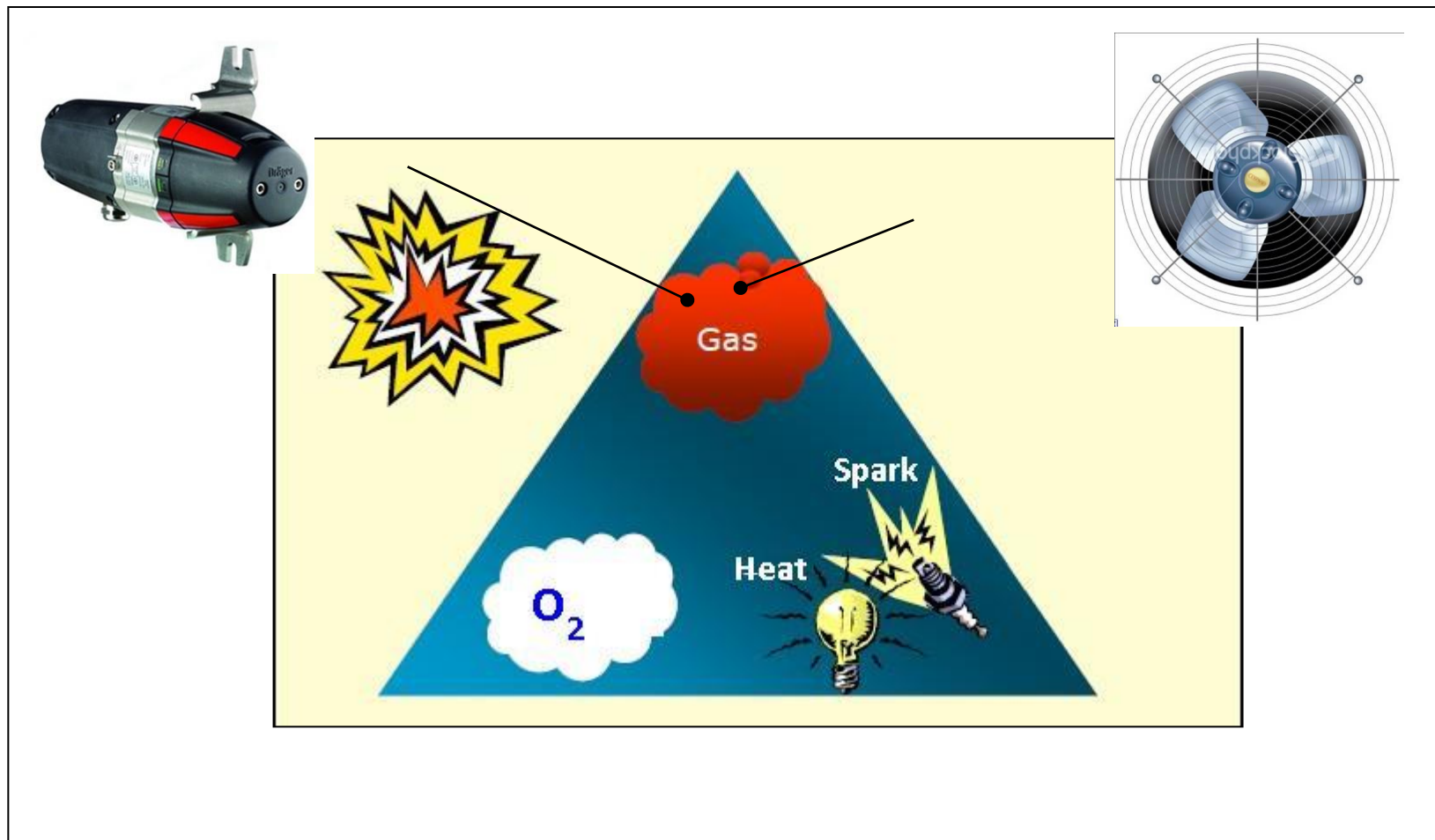
## Working Area工作区域:

- » ATEX 1999/92/EC
- » 当地规范《使用可燃性制冷剂生产家用和类似用途房间空调器安全技术规范》  
(实施日期: 2017-04-01)
- » End user responsibility  
用户责任

## Equipment Manufacturer设备:

- » ATEX 2014/34/EU
- » Manufacturer responsibility  
设备供应商责任

# SOLUTION 如何解决



# R290 CASE项目案例 — 中国客户



- |               |                  |
|---------------|------------------|
| 1. 珠海格力空调     | R290生产线交钥匙工程     |
| 2. 广东美的空调     | R290生产线交钥匙工程     |
| 3. 滁州扬子空调     | R290生产线交钥匙工程     |
| 4. 四川长虹空调     | R290生产线交钥匙工程     |
| 5. 芜湖格力空调     | R290生产线安全&通风系统   |
| 6. 芜湖美的空调     | R290生产线交钥匙工程     |
| 7. 宁波奥克斯空调    | R290生产线交钥匙工程     |
| 8. 江门海信空调     | R290生产线交钥匙工程     |
| 9. 合肥海尔空调     | R290生产线安全&通风系统   |
| 10. 广东美的空调    | R290试生产线交钥匙工程    |
| 11. 芜湖美智空调    | R290生产线交钥匙工程     |
| 12. 广东顺德海信冷柜  | R290冷媒充注机及安全系统   |
| 13. 澳柯玛股份有限公司 | R290冷媒充注机及安全系统   |
| 14. 杭州马尼托瓦    | R290冷媒充注机及安全通风系统 |
| 15. 上海富申冷机    | R290冷媒充注机及安全通风系统 |

- 1条线, 2009年通过TÜV认证
- 1条线, 2013年通过TÜV认证
- 1条线, 2014年通过TÜV认证
- 1条线, 2015年通过TÜV认证
- 2条线, 2015年通过TÜV认证
- 1条线, 2016年通过TÜV认证
- 1条线, 2016年通过TÜV认证
- 1条线, 2016年通过TÜV认证
- 1条线, 含TÜV认证
- 1条线, 含TÜV认证
- 1条线, 含TÜV认证





## CASE #1 成功案例



全球第1条示范线：  
珠海格力空调  
完成认证时间：2009年

R290 turn-key line in GREE Zhuhai  
安科为格力电器提供交钥匙工程  
(世界首条R290分体空调生产线)



安科为格力电器提供交钥匙工程

# CERTIFICATE

No. TÜV- IS-UL 1 528 804

This is to certify that

**Object:** R 290-Charging Plants  
for Production of Air Conditioner  
Safety Equipment

**Supplier:** Agramkow, Fluid Systems A/S  
DK-6400 Sonderborg

**Operator:** Gree Electric Appliances Inc.  
Jinji West Rd.;Zhu Hai,  
Guangdong; P.R. China

meets the requirements of the TÜV SÜD Industrie Service GmbH.  
It was installed according to the relevant International Standards.  
The charging plant with Propane as refrigerant has been  
submitted to an audit to verify compliance with the state  
of the art. The system was audited in the period  
from 26<sup>th</sup> September to 1<sup>st</sup> October 2010.

This Certification is based on Final Report  
Safety Inspection of R 290 Charging PLANT  
Project: GTZ-Gree Propane Charging Plants

TÜV IS-ULM-Ri/Ga  
File No.: GTZ/GRE-PRC-03/10

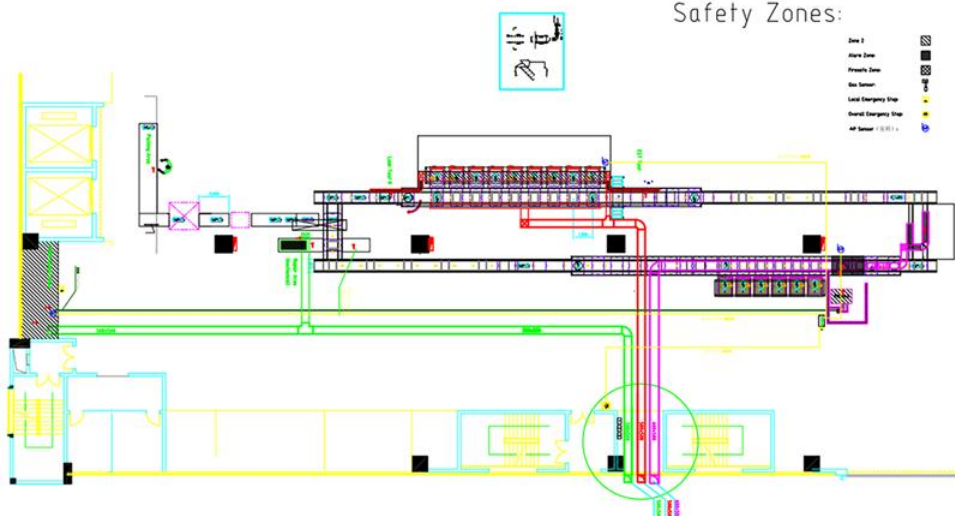
This Certification is valid until  
30<sup>th</sup> September 2013

Ulm, 4<sup>th</sup> December 2010  
TÜV SÜD Industrie Service experts

K-J Richardt

B. Gassebner

TÜV SÜD Industrie Service GmbH, Niederlassung Ulm, Benzstrasse 17 D-89079 Ulm  
Tel. +49 (731) 49 15-2 30 Fax +49 (731) 49 15-3 40 e-mail: Karl-Josef.Richardt@tuev-sued.de





## CASE #2 成功案例



示范线：  
广东美的空调  
完成认证时间：2013年



R290 turn-key line in Midea Shunde  
安科为美的空调提供交钥匙工程



# 安科为美的空调提供交钥匙工程

2013-05-05-03-Safety-Inspection-ver101

TÜV RHEINLAND (China) Ltd.

Member of TÜV Rheinland Group



## CERTIFICATE

Of Safety Inspection In Regards Of Explosion Safety

Orderno.: 1140008330

Scope: R-290 Charging plant at Midea factory No. 9 Workshop,  
Project Number Agramkow 40998.

Requirement(s): European Directive for Explosion Protection ATEX 1999/92/EC  
The relevant code(s) and standard(s) defined by TÜV Rheinland in regards of Explosion Safety  
(See inspection report for details)

Applicant: Schenck Shanghai Machinery Co., Ltd. – Agramkow  
2<sup>nd</sup> Floor, No. 1111 Fengxiang Road,  
Bao Shan District, Shanghai 200444  
PR China

Location: Guangdong Midea Refrigeration Equipment Co.,Ltd.  
No. 9 Workshop – 5<sup>th</sup> Industrial AREA Midea  
Ling Gang, Bei Jiao Town  
Shunde District Foshan City 528311  
PR China

User: Guangdong Midea Refrigeration Equipment Co., Ltd.

The inspection plan and results are listed in the confidential inspection report no. 16802442.

This is to certify that the installation meets the basic requirements as listed in the inspection report in regards of Explosion Safety. This certificate follows the certification rules agreed and signed between all parties. The safety is only continuously met when all safety procedures are followed which are defined in the confidential inspection report.

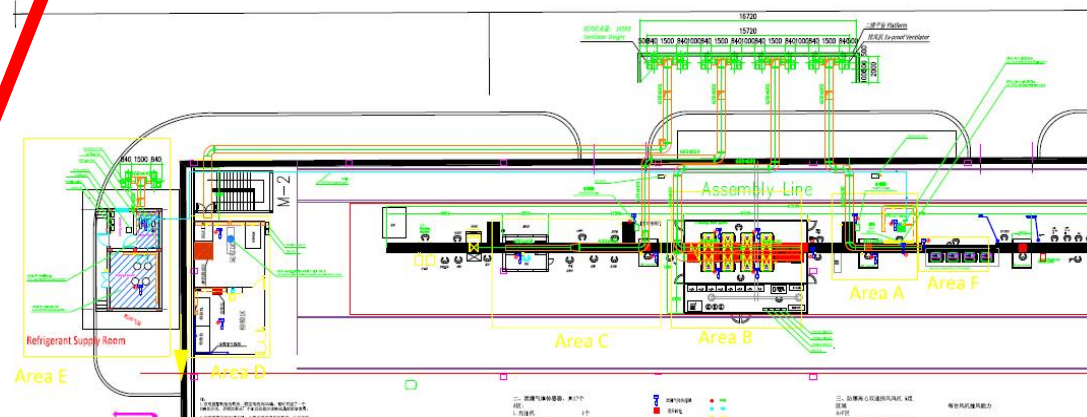
This certificate shall only be reproduced in its entire and without any change.

Date: 15.11.2013  
Expiry Date: 15.11.2014



*Thomas Fuhrmann*  
Dipl.-Ing. Thomas Fuhrmann  
Director Industrial Services,  
Greater China

TÜV Rheinland (China) Ltd. – Industrial Services – Unit 707, AVIC Bldg., No. 10B, Central Road, East 3<sup>rd</sup> Ring Road, Chaoyang District, Beijing, 100022, P.R. China



# CERTIFICATE R290项目TÜV证书



TÜV RHEINLAND (China) Ltd.  
Member of TÜV Rheinland Group

**CERTIFICATE**

Of Safety Inspection In Regard Of Explosion Safety

Order no.: 11/0008333

Scope: R 290 Charging plant in Midas Factory No. 9 Workshop,  
Project Number Agreement 40956.

Requirements: European Directive for Explosive Protection ATEX 2002/76/EC  
The relevant codes and standards defined by TÜV Rheinland in regards of Explosion Safety  
(See inspection report for details)

Applicant: Schenck Shanghai Machinery Co., Ltd. - Agrarwerk  
27 Floor, No. 1111 Fongqing Road,  
Jiao Jiao District, Shanghai 200444  
PR China

Location: Guangdong Midas Refrigeration Equipment Co., Ltd.  
No. 5 Workshop - 5<sup>th</sup> Industrial Area Midas  
Ling Sheng, 30 Jiao Town  
Shenhe District, Taizhou City 320111  
PR China

User: Guangdong Midas Refrigeration Equipment Co., Ltd.

The inspection plan and results are linked to the confidential inspection report no. 15002845.

This is to certify that the installation meets the basic requirements as listed in the inspection report in regards of Explosion Safety. This certificate follows the certification rules agreed and signed between all parties. The safety is only continuously met when all safety procedures are followed which are defined in the confidential inspection report.

This certificate shall only be reproduced in its entire and without any change.

Date: 19.11.2023  
Expiry Date: 19.11.2024

TÜV Rheinland (China) Ltd. - Industrial Services - Unit 707, AWC Bldg., No. 108, Central Road, East 3<sup>rd</sup> Ring Road, Chaoyang District, Beijing, 100022, P.R. China

顺德美的R290项目

芜湖美的R290项目

TÜV RHEINLAND (China) Ltd.  
Member of TÜV Rheinland Group

**CERTIFICATE**

Of Safety Inspection In Regard Of Explosion Safety

Order no.: 214001333

Scope: R 290 Charging plant in Yong Factory No. 3 Workshop,  
Project Number Agreement 483002117

Requirements: European Directive for Explosive Protection ATEX 2002/76/EC  
The relevant codes and standards defined by TÜV Rheinland in regards of Explosion Safety  
(See inspection report for details)

Applicant: Schenck Shanghai Machinery Co., Ltd. - Agrarwerk  
27 Floor, No. 1111 Fongqing Road,  
Jiao Jiao District, Shanghai 200444  
PR China

Location: CHINA YANGZI GROUP CHUZHOU YANGZI AIR CONDITIONER CO., LTD  
1602006 Shanghai North Road,  
Economic & Technology Development Zone,  
Chuzhou City, Anhui Province,  
PR China

User: CHINA YANGZI GROUP CHUZHOU YANGZI AIR CONDITIONER CO., LTD

The inspection plan and results are linked to the confidential inspection report no. 15002422\_000

This is to certify that the installation meets the basic requirements as listed in the inspection report in regards of Explosion Safety. This certificate follows the certification rules agreed and signed between all parties. The safety is only continuously met when all safety procedures are followed which are defined in the confidential inspection report.

This certificate shall only be reproduced in its entire and without any change.

Date: 17.10.2024  
Expiry Date: 18.10.2025

TÜV Rheinland (China) Ltd. - Industrial Services - Unit 707, AWC Bldg., No. 108, Central Road, East 3<sup>rd</sup> Ring Road, Chaoyang District, Beijing, 100022, P.R. China

滁州扬子R290项目

江门海信R290项目

TÜV RHEINLAND (China) Ltd.  
Member of TÜV Rheinland Group

**CERTIFICATE**

Of Safety Inspection In Regard Of Explosion Safety

Order no.: 151001390

Scope: R 290 Charging plant in north side of Changhong factory 30th Workshop  
Project Number Agreement 480300010

Requirements: European Directive for Explosive Protection ATEX 2002/76/EC  
The relevant codes and standards defined by TÜV Rheinland in regards of Explosion Safety  
(See inspection report for details)

Applicant: Schenck Shanghai Machinery Co., Ltd.  
Agrarwerk and floor, No. 1111 Fongqing Road, Jiao Jiao District, Shanghai, PR China  
(See inspection report for details)

Location: SICHUAN CHANGHONG AIR CONDITIONING CO., LTD.  
No. 35, Eastmining Road, High-Tech Park, Mingyong, Sichuan, P.R. China  
(Zip Code: 623000)

User: SICHUAN CHANGHONG AIR CONDITIONING CO., LTD.

The inspection plan and results are linked to the confidential inspection report no. 15077315.000

This is to certify that the installation meets the basic requirements as listed in the inspection report in regards of Explosion Safety. This certificate follows the certification rules agreed and signed between all parties. The safety is only continuously met when all safety procedures are followed which are defined in the confidential inspection report.

This certificate shall only be reproduced in its entire and without any change.

Date: 27.03.2025  
Expiry Date: 26.03.2026

TÜV Rheinland (China) Ltd. - Industrial Services - Unit 707, AWC Bldg., No. 108, Central Road, East 3<sup>rd</sup> Ring Road, Chaoyang District, Beijing, 100022, P.R. China

绵阳长虹R290项目

芜湖格力R290项目

TÜV RHEINLAND (China) Ltd.  
Member of TÜV Rheinland Group

**CERTIFICATE**

Of Safety Inspection In Regard Of Explosion Safety

Order no.: 15412404

Scope: R 290 Charging plant in north side of Oakes Rise in Jiao workshop, AJA and Industrial  
Park 8th  
Project Number Agreement 480010040

Requirements: European Directive for Explosive Protection ATEX 2002/76/EC  
The relevant codes and standards defined by TÜV Rheinland in regards of Explosion Safety  
(See inspection report for details)

Applicant: Schenck Shanghai Machinery Co., Ltd.  
Agrarwerk and floor, No. 1111 Fongqing Road, Jiao Jiao District, Shanghai, PR China  
(Zip Code: 200444)

Location: Ningbo OX Air-Conditioning Co., Ltd.  
No. 1105, North Ming Road, Jiao Jiao Industrial Park Area, Ningbo City, Zhejiang  
P.R. China  
(Zip Code: 315005)

User: Ningbo OX Air-Conditioning Co., Ltd.

The inspection plan and results are linked to the confidential inspection report no. 15077315.000

This is to certify that the installation meets the basic requirements as listed in the inspection report in regards of Explosion Safety. This certificate follows the certification rules agreed and signed between all parties. The safety is only continuously met when all safety procedures are followed which are defined in the confidential inspection report.

This certificate shall only be reproduced in its entire and without any change.

Date: 16.01.2024  
Expiry Date: 15.01.2025

TÜV Rheinland (China) Ltd. - Industrial Services - Unit 707, AWC Bldg., No. 108, Central Road, East 3<sup>rd</sup> Ring Road, Chaoyang District, Beijing, 100022, P.R. China

宁波奥克斯R290项目



# NATIONAL STANDARD 行业国标

各位同事，大家好！

我们共同完成的生产可燃性制冷剂房间空调器行业标准已经获得工信部批准并发布，2017年4月实施。附件是公告照片和这次批准的行业标准列表，供各位参考。

再次感谢工作组中各位对于标准制定所做出的贡献，希望后期这个工作组还能继续一起工作，希望各位保持联系！

祝好

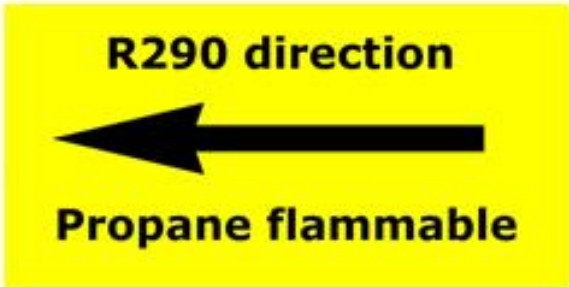
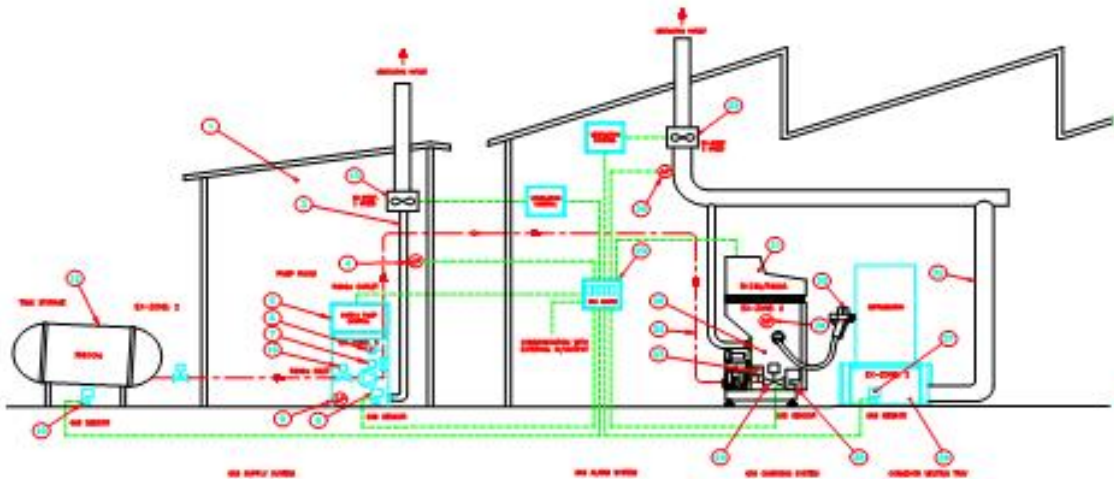
## 使用可燃性制冷剂生产家用和类似用途制 冷器具安全技术规范

Safety technical code for using isobutane as refrigerant  
in household and similar refrigerating appliances industry

《使用可燃性制冷剂生产家用和类似用途房间空调器安全技术规范》  
(实施日期：2017-04-01)



# 1. PRE-ENGINEERING 项目方案设计



**R290 加液区**  
**R290 CHARGING STATION**

禁止吸烟  
No smoking

禁止明火  
No open fire

禁打手机  
No phone call

禁止危险品  
No dangerous goods

禁止穿化纤服装  
Prohibit wearing chemical fiber clothing

1. 本区域为防爆区域，用于充注易燃易爆冷媒R290;  
This is Explosion-proof area for filling of flammable media R290;

2. 本区域内严禁烟火;  
No smoking, no open fire;

3. 严禁在区内从事可能产生火花的作业;  
Works which may produce sparks prohibited;

4. 严禁在区内穿、脱和拍打化纤服装;  
No wearing, taking off or beating of chemical fiber clothing;

5. 不得携带危险品进入区内;  
Do not carry dangerous goods into the area;

6. 区内禁止使用手机。  
Do not use mobile phone in the area.



## 2. ZONING PLAN 分区

Zone 2: EX-Danger (exceptionally and only shortly)

二级危险区：仅当异常时出现且短暂的泄漏

Alarm Zone:

Electrical equipment min. IP54

Non Ex-approved components to be automatically switch off in case of gas alarm

报警区：电气设备最低IP54等级

当出现气体报警时非防爆设备/元件须自动断电

Fire safe: No use of open fire

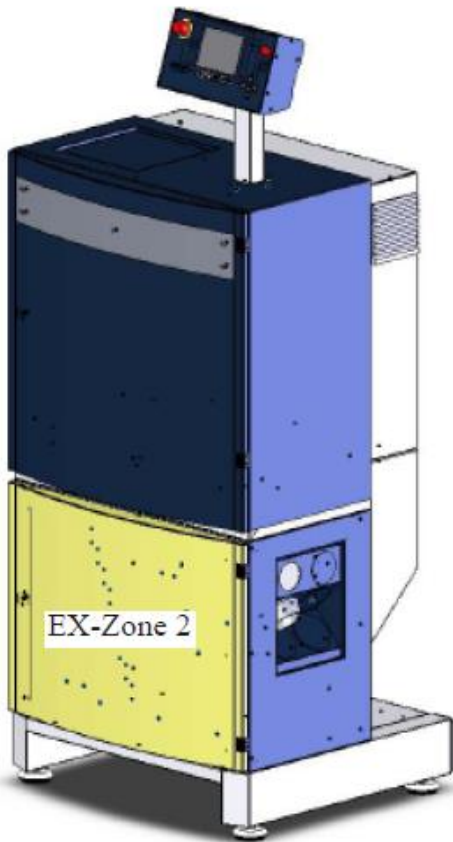
无明火区：不能使用明火，以泄漏源为中心半径5米的空间。

Warning signs to be located in the area.

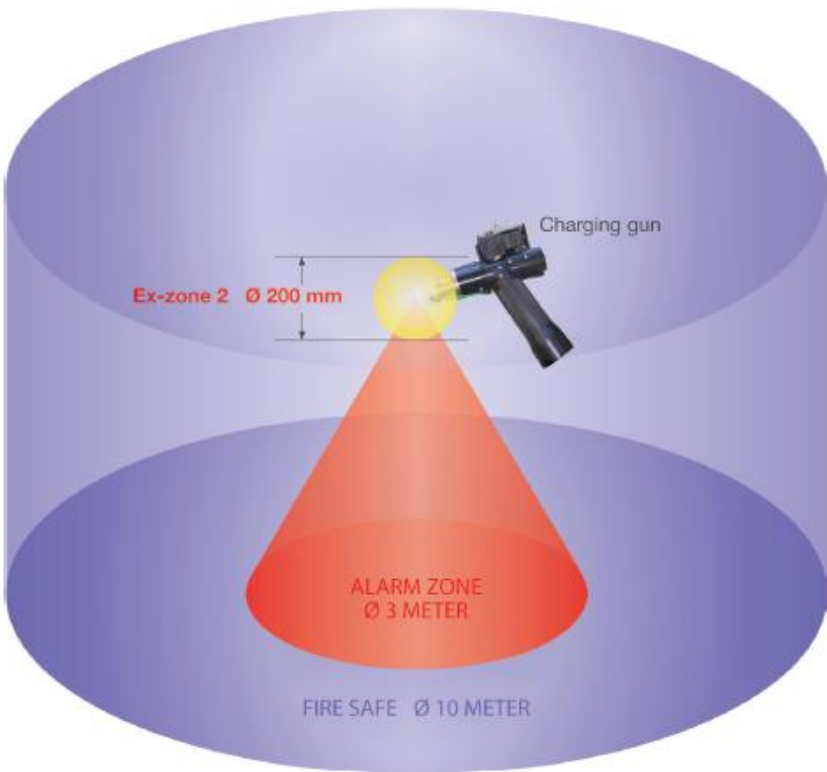
所有区域要有标识

## 2. ZONING PLAN 分区

### Zone Definition Station

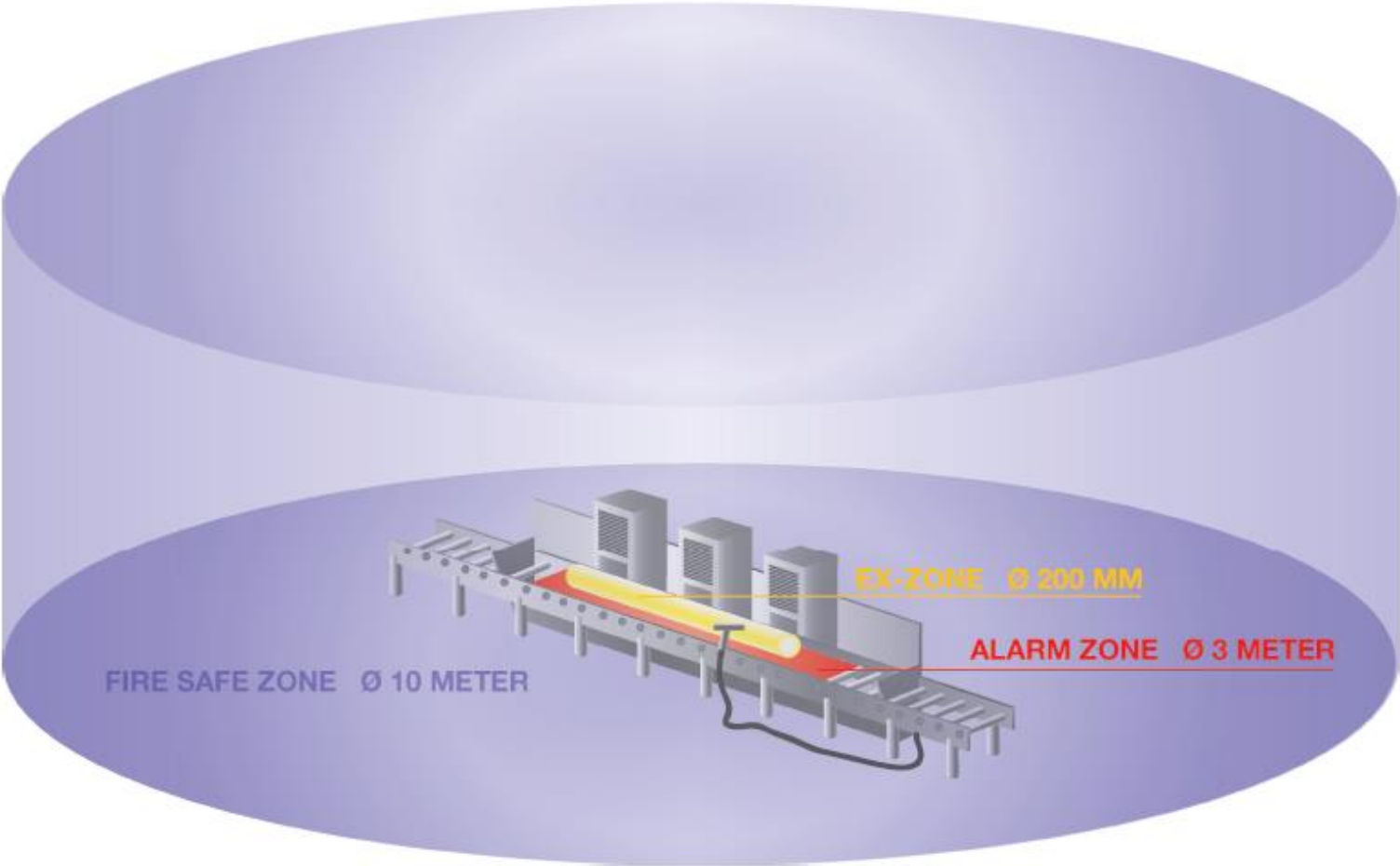


### Zone Definition Gun



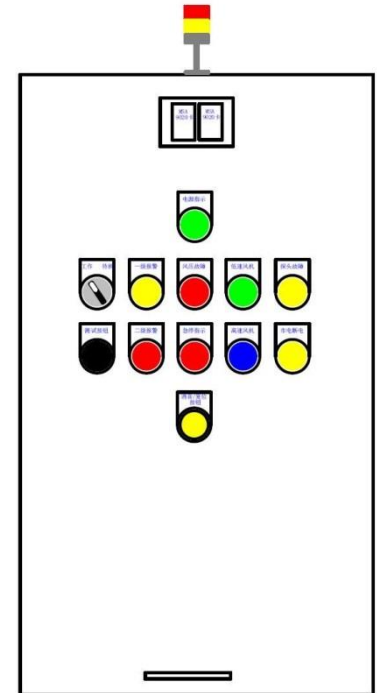
## 2. ZONING PLAN 分区

Conveyor EX-zone



## 3. SAFETY MONITORING 安全监控系统

- **Safety system must comply with safety standard**  
安全系统必须符合安全标准
- **Gas sensor**  
气体传感器监测可能的气体泄漏
- **Delta P, Flow Switch**  
压差开关, 流量开关
- **Emergency Stop**  
急停开关
- **UPS**  
不间断电源
- **Communication matrix**  
功能确认





# 4. Charging 冷媒充注

## 国标要求:

- 必须选用带有国家认可标志的防爆认证灌注机
- 灌注机枪头应采用气动机械锁扣装置与空调器制冷剂管路连接，充注过程中避免互相脱离
- 灌注完成后，确保没有残余制冷剂释放到现场
- 当灌注机运行参数超出设置值时，设备通过声光报警来提示操作人员

## 我们的设备:

- 系统连接后首先判断自身真空是否合格，然后对公母接头空间进行抽真空；完成后才与空调管路连接，避免公母接头的空间破坏空调管路真空；也避免枪头未正确连接时充注冷媒。
- 充注完成后，设备先对枪头的残余冷媒进行回吸，回吸完成后（系统自动检测判断），自动与空调接头脱开，没有残余冷媒释放到现场。
- 充注速度: 40/60 g/s \* (R290)  
120 ~ 220 g/s (R32)
- 充注精度: +/- 0.5%

ZERTIFIKAT

CERTIFICATE

CERTIFICADO

CERTIFICAT

### CERTIFICATE

**TYPE EXAMINATION CERTIFICATE**

Equipment or Protective System intended for use in potentially explosive atmospheres Directive 2014/34/EU

Type Examination Certificate number: **TÜV IT 16 ATEX 051 X**

Equipment or Protective System: Evacuation and charging station  
Type: CEMAC-X

Manufacturer: Schenck Shanghai Machinery Co., Ltd.

Address: No. 1111, Fengxiang Road, Shanghai 200444, PR China

This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

TÜV Italia certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report no. R 16 EX 039

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0: 2012+A11:2013	EN 60079-11: 2012	EN 60079-15: 2010
EN 1127-1: 2011	EN ISO 80079-36: 2016	EN ISO 80079-37: 2016

If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

This TYPE EXAMINATION CERTIFICATE relates only to the design, examination and tests of the specified equipment or protective system in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

The marking of the equipment or protective system shall include the following:

Ex

II -3G

Ex nA ic IIA T3 -Gc

II -3G

Ex h IIA T3 -Gc

This certificate may only be reproduced in its entirety and without any change, schedule included.

Issue date: 07th October 2016

ACCREDIA

ISO 9001:2015

ISO 14001:2015

ISO 45001:2018

ISO 50001:2018

ISO 55001:2018

ISO 59001:2018

ISO 60000:2018

ISO 60001:2018

ISO 60002:2018

ISO 60003:2018

ISO 60004:2018

ISO 60005:2018

ISO 60006:2018

ISO 60007:2018

ISO 60008:2018

ISO 60009:2018

ISO 60010:2018

ISO 60011:2018

ISO 60012:2018

ISO 60013:2018

ISO 60014:2018

ISO 60015:2018

ISO 60016:2018

ISO 60017:2018

ISO 60018:2018

ISO 60019:2018

ISO 60020:2018

ISO 60021:2018

ISO 60022:2018

ISO 60023:2018

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ISO 60025:2018

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ISO 60027:2018

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ISO 60088:2018

ISO 60089:2018

ISO 60090:2018

ISO 60091:2018

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## 4. Charging 冷媒充注

### 国标要求:

- 必须选用带有国家认可标志的防爆认证灌注机
- 灌注机枪头应采用气动机械锁扣装置与空调器制冷剂管路连接，充注过程中避免互相脱离
- 灌注完成后，确保没有残余制冷剂释放到现场
- 当灌注机运行参数超出设置值时，设备通过声光报警来提示操作人员

### 我们的设备:

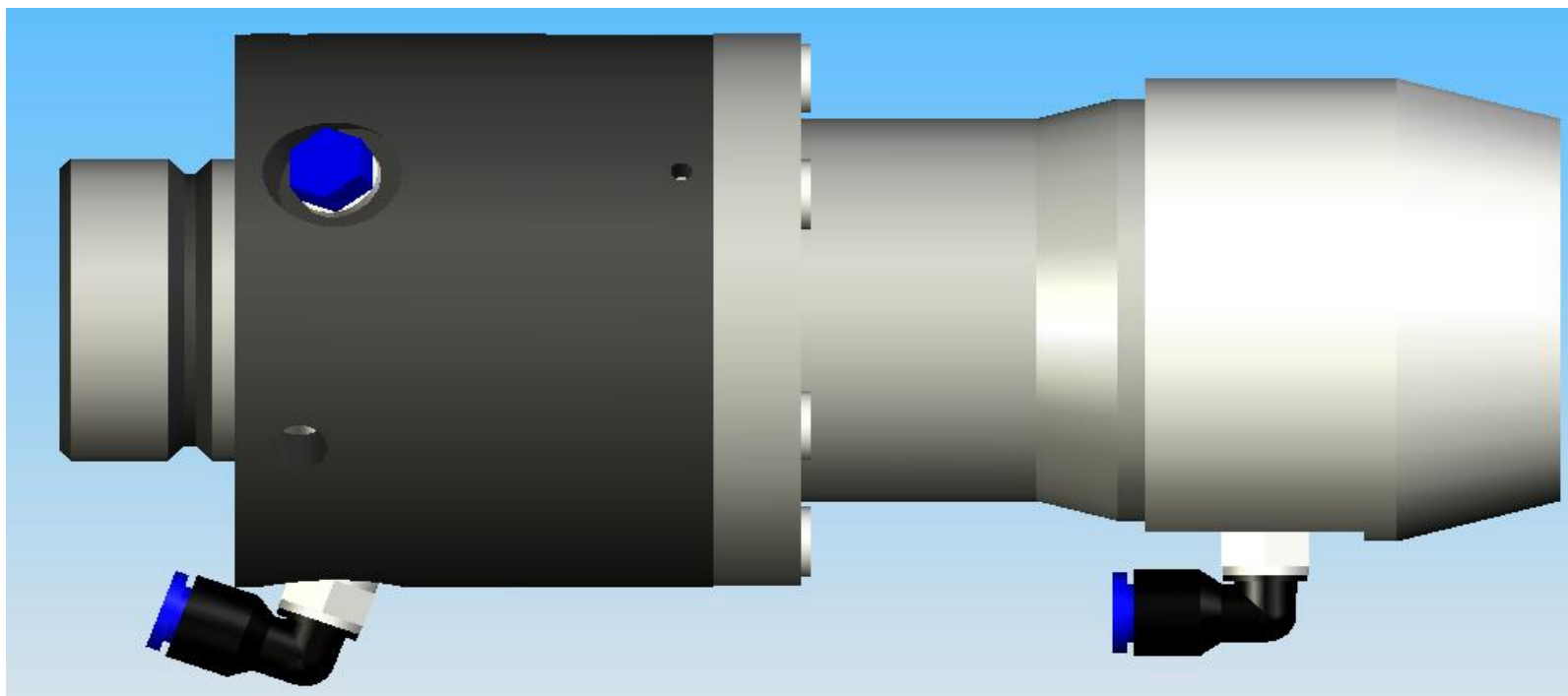
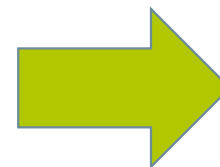
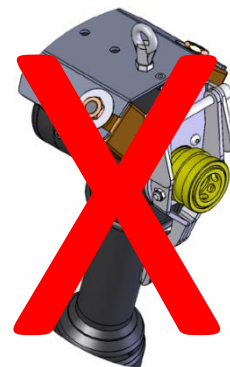
- 系统连接后首先判断自身真空是否合格，然后对公母接头空间进行抽真空；完成后才与空调管路连接，避免公母接头的空间破坏空调管路真空；也避免枪头未正确连接时充注冷媒。
- 充注完成后，设备先对枪头的残余冷媒进行回吸，回吸完成后（系统自动检测判断），自动与空调接头脱开，没有残余冷媒释放到现场。
- 充注速度: 40/60 g/s \* (R290)  
120 ~ 220 g/s (R32)
- 充注精度: +/- 0.5%



## 4. Charging 冷媒充注

为什么要使用自动脱枪(ADC)?

ADC: **A**uto-**D**is**C**onnection

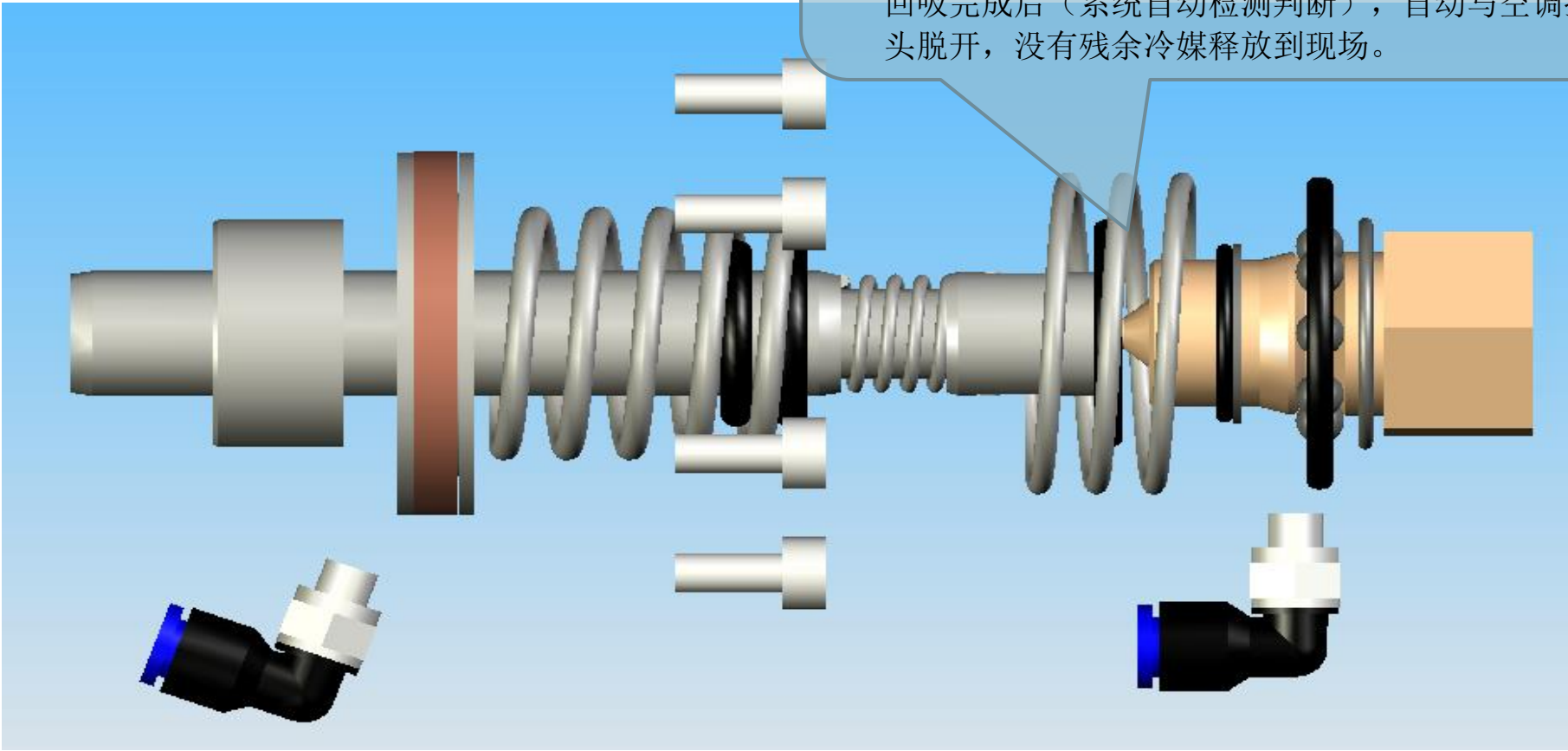


## 4. Charging 冷媒充注

为什么要使用自动脱枪(ADC)?

ADC: **A**uto-**D**is**C**onnection

- 系统连接后首先对公母接头空间进行抽真空，完成后才与空调管路连接；避免公母接头的空间破坏空调管路真空，也确保连接可靠。
- 充注完成后，设备先对枪头的残余冷媒进行回吸，回吸完成后（系统自动检测判断），自动与空调接头脱开，没有残余冷媒释放到现场。







## 5. POWER CONTROL CABINET 电源控制

➤ **Uninterrupted power supply**

不间断电源

- **Safety system**

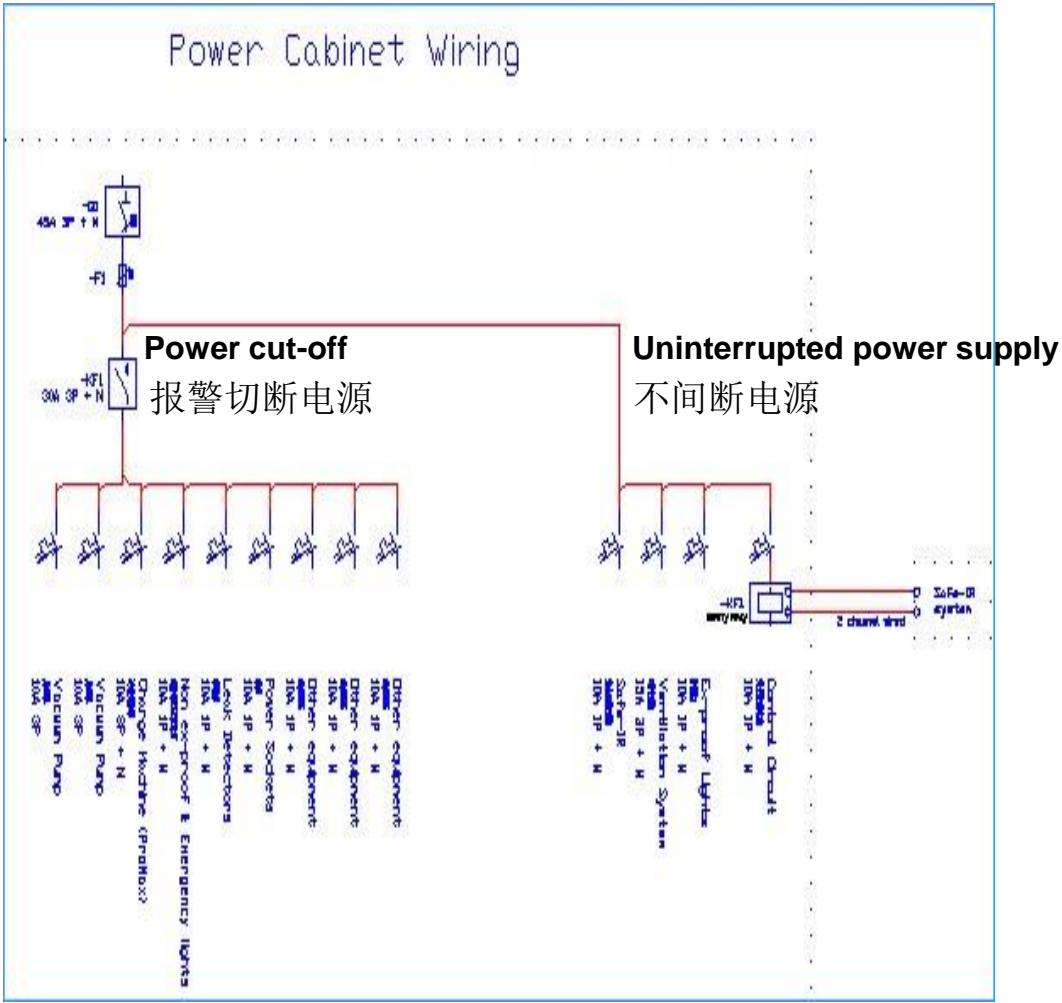
安全系统

- **Ventilation system**

通风系统

➤ **Power cut-off**

报警时切断电源



## 6. VENTILATION 通风系统

- Qualified supplier
- 合格的供应商（资质）
- Design capacity and ducting per layout and site situation
- 根据线体图纸和实际场地设计通风方案
- Ex proof centrifugal ventilators
- 防爆离心风机，一用一备
- Interaction with safety system
- 安全系统与通风系统通讯
- 24-hour or stand-by
- 24小时运转或待机模式
- Lightning rod
- 避雷针
- Grounding
- 接地连接
- Test Report
- 检测报告





