



德国VULKAN LOKRING公司

洛克环管路连接技术

在制冷行业的应用



深圳市德邻科技有限公司

2016-05-26



solder - free  
tube connection

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# 1. 洛克环管路连接技术概要

## 1.1 LOKRING

- 德国VULKAN集团成立于1889年，总部位于德国北威州鲁尔工业区Herne。上世纪六十年代NASA（美国航空航天局）发明了LOKRING管接头，用于美国航天飞机燃料管路连接。
- 1979年德国VULKAN集团将该专利买下并成立VULKAN LOKRING公司专业生产LOKRING管接头，并将其应用到民用领域。从第一个用户德国AEG公司开始批量使用以来，时至今日，经过不断的产品开发和更新，LOKRING公司已经建立了遍及全球的分支机构。每年生产、销售各种规格的LOKRING接头约2亿个以上，累计至今使用在世界各地制冷系统中的LOKRING接头已有几十亿个，其可靠性得到了时间的考验。
- 深圳市德邻科技有限公司是德国VULKAN LOKRING公司在中国区的授权专业代理商，专业为客户提供最佳的管路连接、检漏、微型制冷系统等技术解决方案。





**LOKRING: Weltweite Verbindungen**  
LOKRING: connecting worldwide

**VULKAN LOKRING**

**VULKAN LOKRING Rohrverbindungen GmbH & Co. KG**  
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 Phone +49 23 25 92 23 04 \_ Fax +49 2 32 55 12 22  
 E-mail: info.lok@vulkan24.com \_ www.vulkan24.com

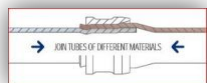
**GPS coordinates for your navigation system**  
 52° 8,54' N / 7° 19,34' E  
 We look forward to meeting you here!





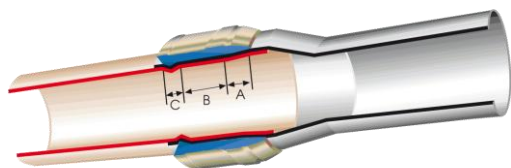
# 1. 洛克环管路连接技术概要

## 1.2 LOKRING连接原理



通过对材料的挤压变形，径向均匀地压缩管子，使他们与衬套紧紧地形成金属与金属密封面。再加上压接前滴加的LOKRING密封液在压接到位后很快固化，更加彻底封死了所有轴向泄漏通道。

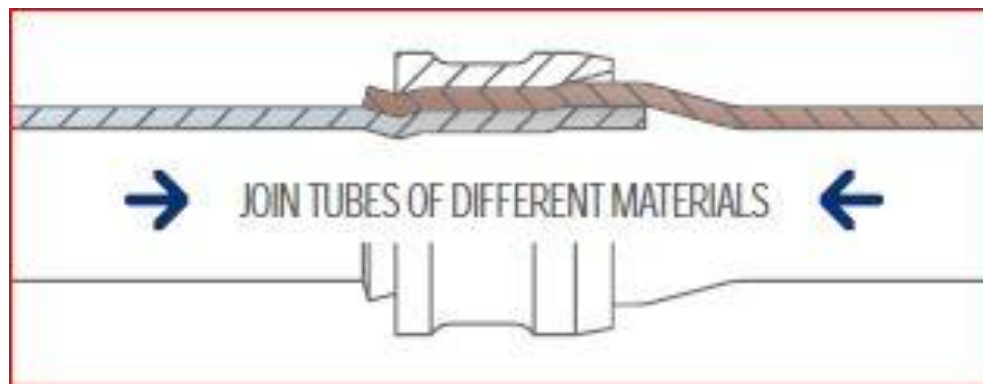
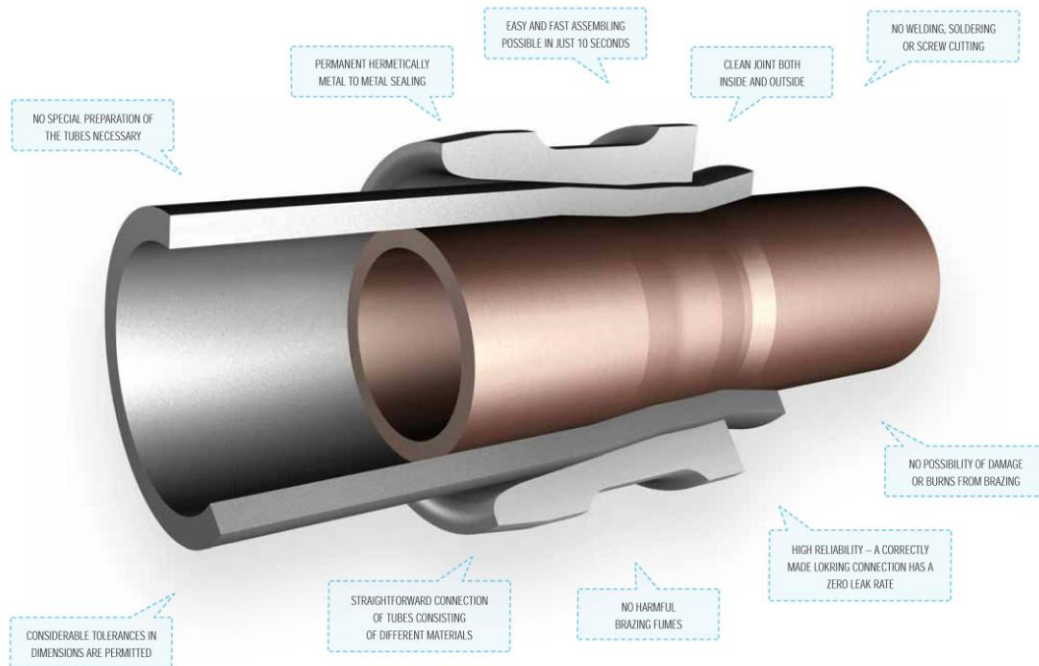
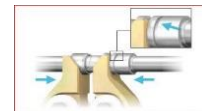
洛克环专用工具符合人体工学，使用时不需要动力源，操作者只需要轻轻压下钳子即可完成连接工作。



## 1.2 洛克环可连接的常用管路材料

copper	—	—	copper
copper	—	—	steel
steel	—	—	steel
aluminium	—	—	aluminium
aluminium	—	—	copper
aluminium	—	—	steel

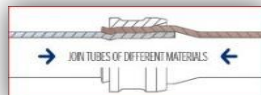
## 1.3 LOKRING连接原理示意图





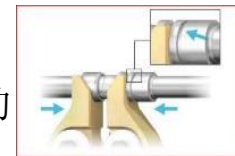
# 1. 洛克环管路连接技术概要

## 1.4 LOKRING安装步骤(单环)



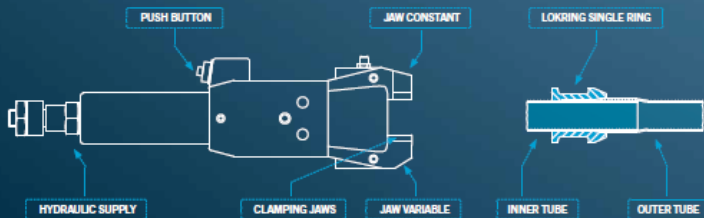
## 1.5 LOKRING安装步骤(复合环)

一个连接体、两个环、四个步骤—这就是所有要做的



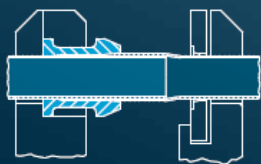
44 | LOKRING SINGLE RING – TOOLS & FUNCTION

### HYDRAULIC ASSEMBLY TOOL OPERATIONAL INSTRUCTION



01 STEP

Slide the LOKRING over the inner tube so that the chamfer faces towards the tube end to be joined. Move the inner tube into the outer tube to at least "the length of the LOKRING + 3 mm" (in cases involving flared tubes, it should be up to the stop) and apply LOKPREP between the mated tubes. Place the tool in such a way that the clamping jaws are positioned on the side of the outer tube and the LOKRING can be pushed to the end of the outer tube.



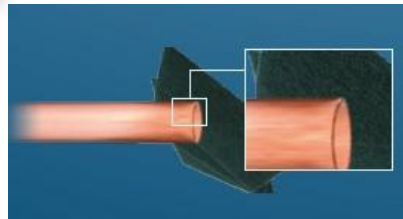
02 STEP

Following the actuation of the push button, the outer tube is clamped by the clamping jaws and the LOKRING is pushed over the outer tube. After the assembly, the tool switches off automatically and can be removed from the tube joining.



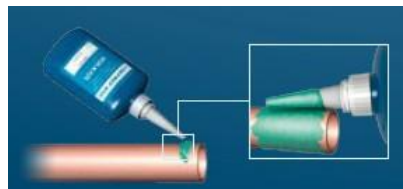
### 步骤01 管路末端处理

为了确保连接，管路末端要保持金属光泽并且没有加工过程中产生的纵向沟槽。使用洛克林专用砂纸和清洁布处理管路末端（表面干净的管路无需处理）。必要时使用倒角器去除管口毛刺。



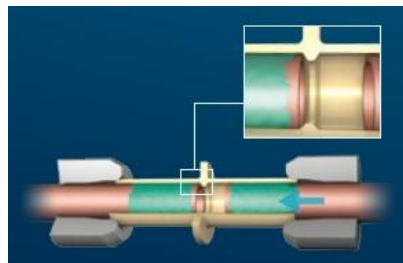
### 步骤02 涂密封液(LOKPREP)

使用导管将密封液涂到管上，使管的圆周都处于湿润状态。涂密封液时稍微离管路末端1mm以上的距离，避免液体流入管路内侧。



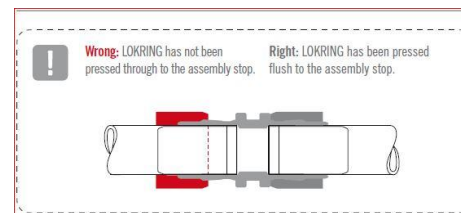
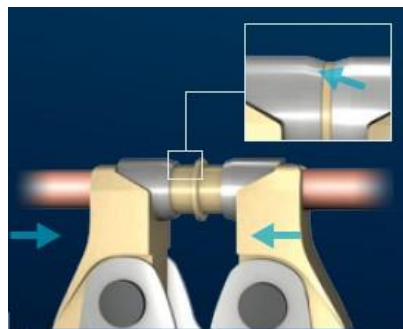
### 步骤03 插入管路

将涂好密封液的管路端部插入连接体内部。确认管路末端顶到连接体内部的限位处，然后在连接过程中保持位置不窜动。



### 步骤04 压接

使用压接钳，用钳口顶住环的末端，双手反复推动压接钳臂，钳口沿着洛克环的轴向施加压力，直到将洛克环推到限位位置。

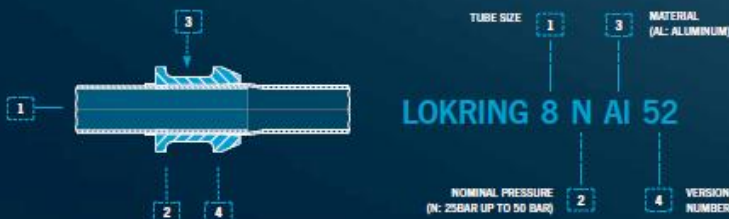


## 2. 洛克环管路连接主要技术参数及测试

### LOKRING SINGLE RING INFORMATION, DESIGN AND CALCULATION

- ➔ REQUESTED INFORMATION:** Due to the wide range of size and tolerance of tubes, it is unfortunately not possible to catalogue all of the available LOKRING sizes in this brochure. The individually required LOKRING SINGLE RING is designed according to the tube samples and details that are provided by the customer. To enable the design and calculation of the most suitable LOKRING the following information is required:
- ④ tube materials, tube dimensions, dimensional tolerances and the wall thickness of tubes.
  - ④ location of the joining, which may cause stress such as vibration or torsion to the connection point.
  - ④ any physical or thermal manipulation on the tubes following the assembly of the LOKRING like bending or brazing.
  - ④ the refrigerant that is used in the system.

**➔ DESIGN, CALCULATION AND ARTICLE CODE:** Based on the information provided by the customer, VULKAN LOKRING will be able to both calculate and design the most suitable LOKRING SINGLE RING. This will be tested on the tube samples that are provided by the customer. VULKAN LOKRING will supply an application drawing to the customer that will confirm the tube dimensions and tolerances, as well as the suitable LOKRING SINGLE RING, by article code.



#### ➔ PERMISSIBLE AREAS OF APPLICATION

- ④ Operating pressure:\* PN (nominal pressure) – 25 bar (362.5psi) up to 50 bar (725psi)
- ④ Test pressure: P<sub>t</sub> (4 x PN) – 100 bar (1450 psi) up to 200 bar (2900 psi)
- ④ Temperature range: -50°C to +150°C (-58°F to 302°F)
- ④ Tube wall thickness: 0.5 mm to 1.5 mm
- ④ Tube diameter: 1.6 mm to 16 mm

\* Depending on tube materials.



#### TUV APPROVAL FOR ALL REFRIGERATION SYSTEMS AND HEAT PUMPS

The EU standard (EN 378-2), German TÜV (Technical Control Board) and newer refrigerants such as R 410 A make high demands on tube connections in refrigeration and air-conditioning technology. For the first time, each of these requirements can now be met through a solder-free tube connection. The type-examination tests carried out by the TÜV were not only passed without exception by the LOKRING® tube connection, the requirements were even exceeded as far as air-tightness, durability and reliability were concerned. Here is an extract from the tests carried out by the TÜV:



TEST	REQUIREMENT	RESULT
Leak test	Airtight (<math>2 \times 10^{-6}</math> mbar l/s below 4.6)	④ Hermetically sealed
Temperature and alternating pressure resistance test	Airtightness after 2000 cycles with temperatures changing between -10°C and 110°C and pressure loads alternating by $\pm 40$ bar during a cycle period of 15 min.	④
Dust test	5 x rated pressure (250 bar)	④ 350 – 400 bar (tube burst)
Inner pressure threshold test	2 x 10 <sup>6</sup> load change from 1 – 50 bar	④
Pressure test	At least 1.1 x rated pressure (gaseous)	④
Alternating loading test	2 x 10 <sup>6</sup> load change, inner pressure 50 bar	④

In addition to the comprehensive TÜV tests, the LOKRING® tube connection was tested to maximum extreme loads in tensile tests. The result is impressive: The connection can withstand a pullout force of up to 40 kN without any problems. This corresponds to a weight of approx. 4 tonnes, in other words the weight of a fully grown elephant!

#### ➔ TECHNICAL FEATURES

- ④ Hermetically sealed metal/metal tube connection through surface compression, i.e. no O-ring or cutting ring seal.
- ④ Permanent tube connection according to EU standard EN 378-2
- ④ Purely mechanical tube connection, i.e. <math></math>solder-free tube connection without thermal method such as soldering or welding.

#### ➔ PERMISSIBLE AREAS OF APPLICATION

- ④ Operating pressure:\*\* 50 bar with 5-fold safety, i.e. 250 bar.
- ④ Temperature range: -50°C to +150°C
- ④ Tube diameter:\*\* 1.6 to 35 mm
- ④ Tube wall thickness: 0.5 to 1.5 mm
- ④ We will be happy to provide advice on further areas of application.

\* The maximum operating pressure for LOKRING aluminium pipe joints is 25 bar.

\*\* The maximum pipe diameter for LOKRING aluminium pipe joints is 1.6 to 35 mm for this approval.

**VULKAN  
LOKRING**

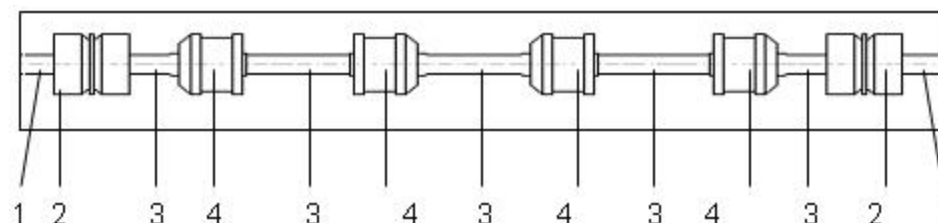
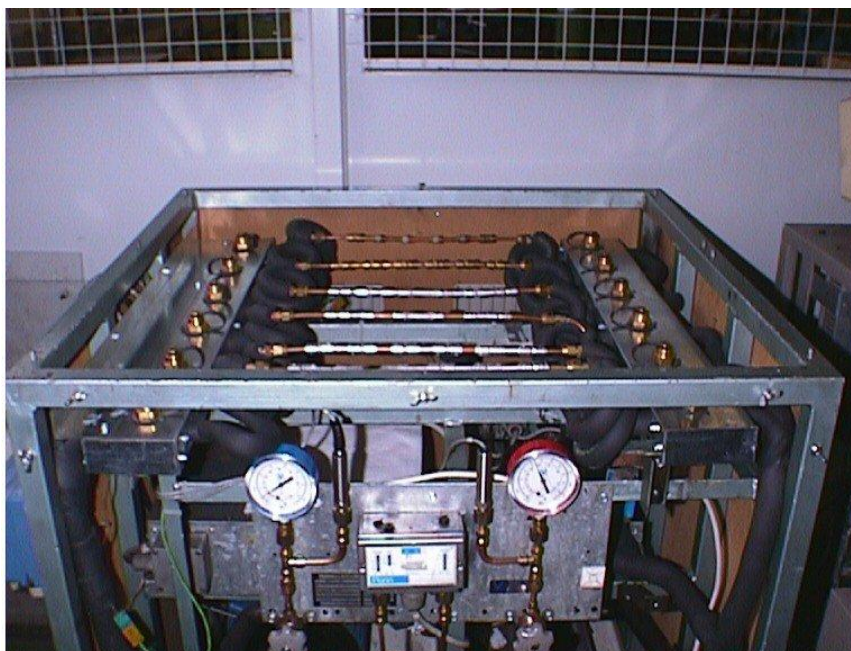
**VULKAN LOKRING  
CERTIFICATES**





## 2.1 LOKRING管路连接测试-冷/热循环试验

视频



Parts: 1 = Copper tube 6 x 1      2 = LOKRING 8/6 NR Al 00  
 3 = Aluminium tube 8 x 1      4 = LOKRING 8 N Al 52  
 LOKPREP: 61

### Test result

Probes No.	LOKRING-joining		Combination Tube Material	Numbers of Temperatur alternations (cooling - heating)
	Type	Quantity [pcs]		
1	8 NK Al 00	4	Al / Al	9216
	8/6 NR Al 00	2	Al / Cu	9216
2	8 NK Ms 00	4	Cu / Cu	11518
	8/6 NR Ms 00	2	Cu / Cu	11518
3	8 NK Al 00	4	Al / Cu	6334
	8/6 NR Al 00	2	Al / Cu	6334
4	8 N Al 52	4	Al / Al	11518
	8/6 NR Al 00	2	Al / Cu	11518
5	8 N Ms 15	4	Cu / Cu	11518
	8/6 NR Ms 00	2	Cu / Cu	11518
6	8 N Al 52	4	Al / Cu	11518
	8/6 NR Al 00	2	Al / Cu	11518

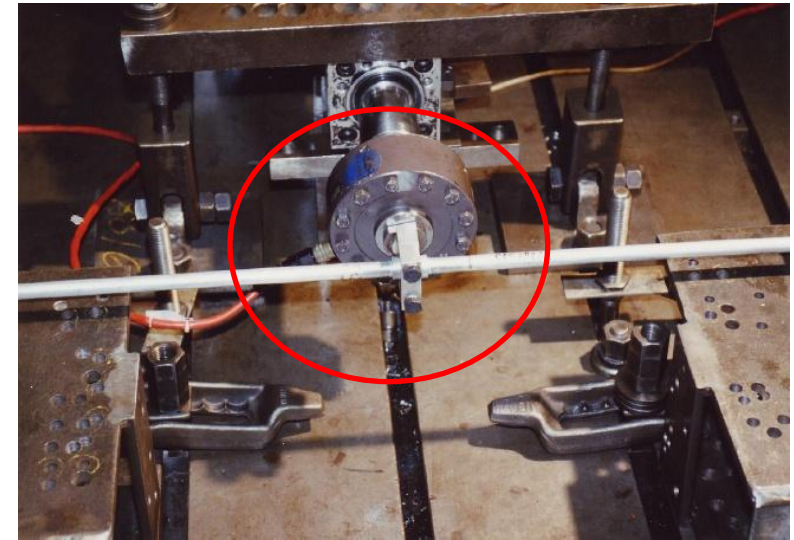
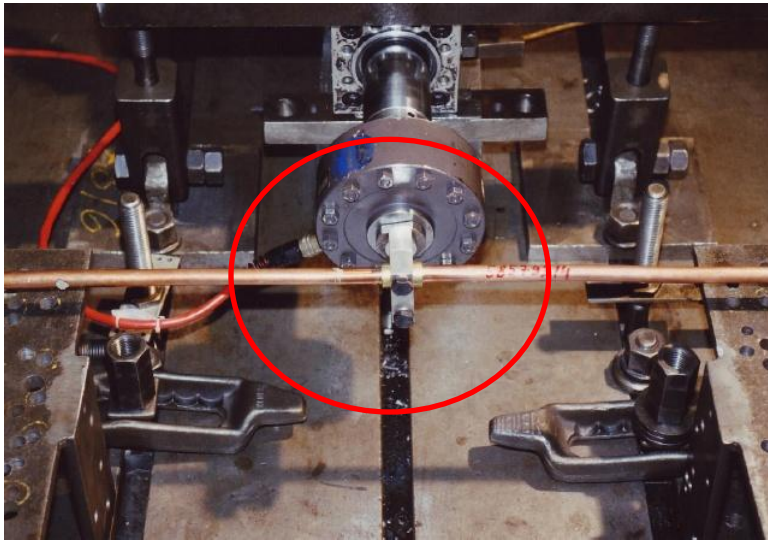
### Test conditions :

The test is carried out under the following conditions:

Refrigerant: R 410A  
 Refrigerating machine oil: Ester oil SW 68  
 Temperature (min./max.): -20°C / +130°C  
 Pressure (min./max.): 2 bar / 25 bar  
 Duration of cycle: 300 sec. cooling / 300 sec. heating



## 2.2 LOKRING管路连接测试-弯曲试验



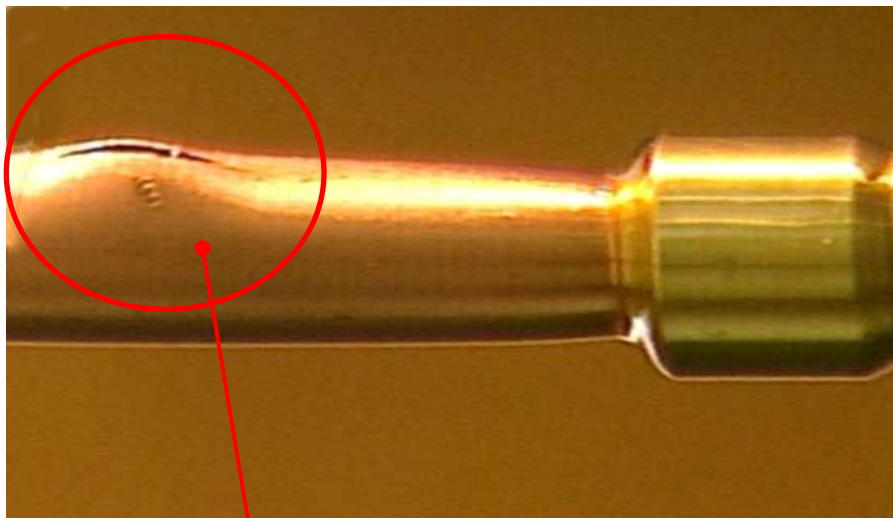
**Method of testing:**  
flexural-type test under these conditions:

Pb. No. 585792/ 3  
Amplitude:  $s = \pm 2,68 \text{ mm}$   
Internal pressure:  $p = 50 \text{ bar}$   
Load alternation:  $N = 2 \times 10^8$

Sample No.	Da x s [mm]	Tube cobination Material / -No.	Tube joining type Material / No.	Lok-prep	PN $p_s$ [bar]	$p_r$ (1,3 * $p_s$ ) [bar]	$P_F$ ( $S_F$ * $p_s$ ) [bar]	$P_F$ IST [bar]	Test results Notice
1.1.1.1	08x1 06x1	Al 99.5 F7 / 3.0255.08 SF-Cu F22 / 2.0090.10	LR 6 NAL 70 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	195	longitudinal crack Al-tube
1.1.1.2	08x1 06x1	Al 99.5 F7/ 3.0255.08 SF-Cu F 22 /2.0090.10	LR 6 NAL 70 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	210	longitudinal crack Al-tube
1.1.1.3	08x1 06x1	Al 99.5 F 7 / 3.0255.08 SF-Cu F 22 /2.0090.10	LR 6 NAL 70 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	150	longitudinal crack Al-tube
1.1.2.1	08x1 08x1	Al 99.5 F 7 / 3.0255.08 Al 99.5 F 7 / 3.0255.08	LR 8 NAL 52 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	220	longitudinal crack Al-tube
1.1.2.2	08x1 08x1	Al 99.5 F 7 / 3.0255.08 Al 99.5 F 7 / 3.0255.08	LR 8 NAL 52 single ring AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	220	longitudinal crack Al-tube

1.2.3.1	08x1 08x0,8	Al 99.5 F 7 / 3.0255.08 St 35.8 / 1.0305	LR 8 NK Al 00 connectors AlMgSi Pb F 28 / 3.0615.71	LP 65	25	32,5	150	245	longitudinal crack Al-tube
1.2.3.2	08x1 08x0,8	Al 99.5 F 7 / 3.0255.08 St 35.8 / 1.0305	LR 8 NK Al 00 connectors AlMgSi Pb F 28 / 3.0615.71	LP 65	25	32,5	150	240	longitudinal crack Al-tube

## 2.3 LOKRING管路连接测试-耐压(爆破)试验



### Technical data:

#### Admission pressure circle

max. working pressure: 350 bar  
 max. output: 4 l/min with 7 bar compressed air pressure and 140 bar hydraulic pressure  
 mode of driving: pneumatic  
 need for air: 1,12 Nm<sup>3</sup>/min at 7 bar air pressure

### Test result:

There were no deviation from the test basis. At the burst pressure tests no permanent deformation appeared. At the burst pressure tests no tube connection failed. The test results are shown in the test list (enclosure A).

Sample No.	Da x s [mm]	Tube combination Material / -No.	Tube joining type Material / No.	Lok-prep	PN p <sub>s</sub> [bar]	p <sub>r</sub> (1,3 * p <sub>s</sub> ) [bar]	P <sub>F</sub> (S <sub>F</sub> * p <sub>s</sub> ) [bar]	P <sub>F</sub> IST [bar]	Test results Notice
1.1.1.1	08x1 06x1	Al 99.5 F7 / 3.0255.08 SF-Cu F22 / 2.0090.10	LR 6 NAL 70 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	195	longitudinal crack Al-tube
1.1.1.2	08x1 06x1	Al 99.5 F7 / 3.0255.08 SF-Cu F 22 / 2.0090.10	LR 6 NAL 70 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	210	longitudinal crack Al-tube
1.1.1.3	08x1 06x1	Al 99.5 F7 / 3.0255.08 SF-Cu F 22 / 2.0090.10	LR 6 NAL 70 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	150	longitudinal crack Al-tube
1.1.2.1	08x1 08x1	Al 99.5 F7 / 3.0255.08 Al 99.5 F7 / 3.0255.08	LR 8 NAL 52 single rings AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	220	longitudinal crack Al-tube
1.1.2.2	08x1 08x1	Al 99.5 F7 / 3.0255.08 Al 99.5 F7 / 3.0255.08	LR 8 NAL 52 single ring AlMgSi Pb F 28 / 3.0615.71	LP 61	25	32,5	125	220	longitudinal crack Al-tube
⋮									
1.2.3.1	08x1 08x0,8	Al 99.5 F7 / 3.0255.08 St 35.8 / 1.0305	LR 8 NK Al 00 connectors AlMgSi Pb F 28 / 3.0615.71	LP 65	25	32,5	150	245	longitudinal crack Al-tube
1.2.3.2	08x1 08x0,8	Al 99.5 F7 / 3.0255.08 St 35.8 / 1.0305	LR 8 NK Al 00 connectors AlMgSi Pb F 28 / 3.0615.71	LP 65	25	32,5	150	240	longitudinal crack Al-tube



## 2.4 LOKRING管路连接测试-耐环境老化试验



Chem Lab Control # 4144, Lokrings, CCT Test, Horizontal in cabinet, 4362 hours



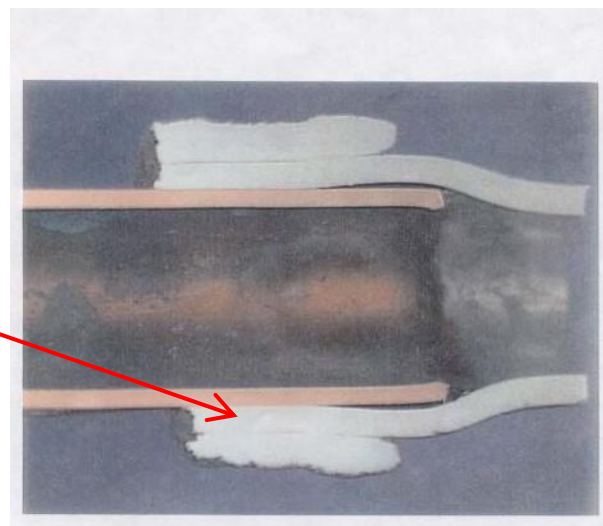
Horizontal Copper Tube/Aluminum Tube Lokring Sample After Cyclic Corrosion Test.

M3501 Approx. 4.2x

经4362小时耐环境老化试验后,铜管、铝管表面已出现锈蚀,但洛克环连接点连接正常,未发现泄漏。



Chem Lab Control # 4144, Lokrings, CCT Test, Vertical in cabinet, aluminum toward top, 4362 hours



Vertical Copper Tube/Aluminum Tube Lokring Sample After Cyclic Corrosion Test.

M3500 Approx. 4.2x

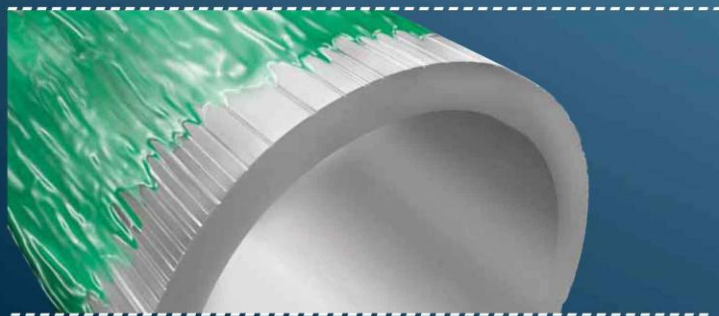
经4362小时耐环境老化试验后,铜管、铝管表面已出现锈蚀,但洛克环连接点连接正常,未发现泄漏。



## 2.5 LOKPREP/密封液固化曲线

→ 38 | LOKRING SINGLE RING – TOOLS & FUNCTION

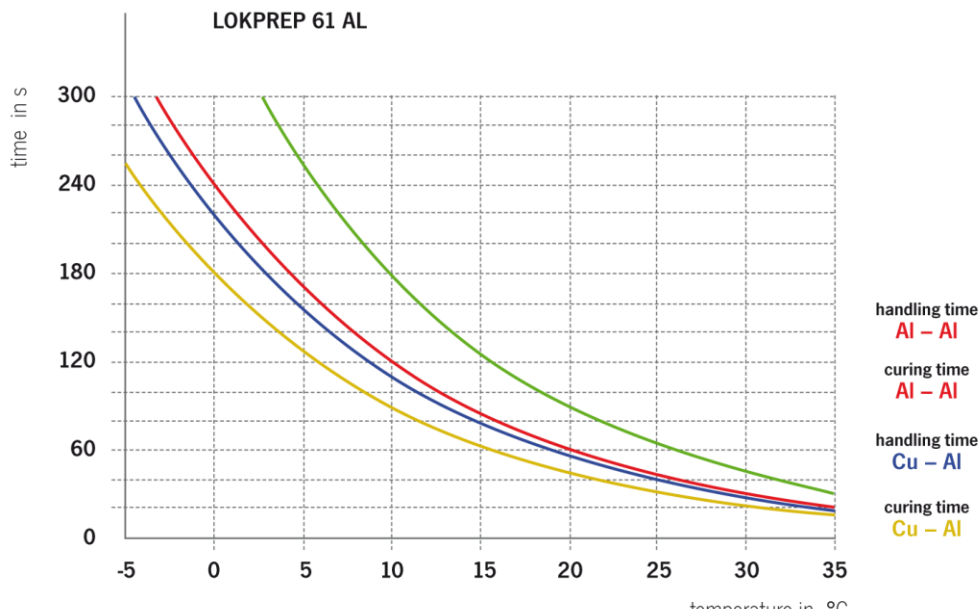
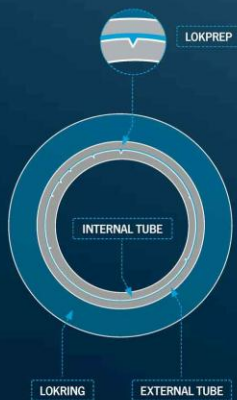
### LOKPREP ITS FUNCTION AND USE



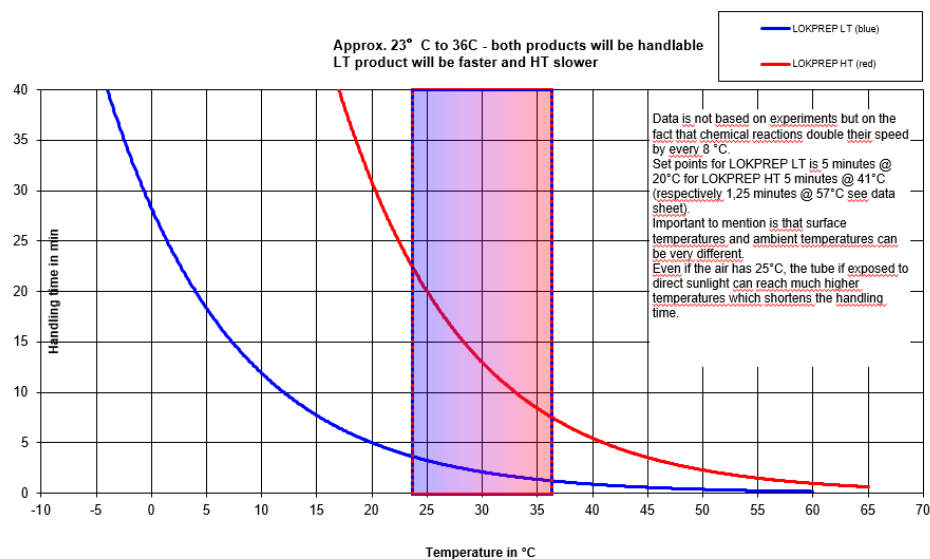
Metal tubes can have production-related longitudinal grooves or surface scratches. However, these faults can be compensated for by moistening the surfaces of the tube ends that are to be connected with LOKPREP fluid prior to assembly. Thanks to its capillary characteristic, it automatically covers the surfaces of the inserted tubes and flows into microscopic cavities and fills these out completely.

Rather than being an adhesive, LOKPREP is in fact an anaerobic sealant that hardens under oxygen exclusion and when in contact with free metal ions. At the end of the hardening process the LOKPREP sealant retains a permanently elastic structure. This means that it does not get brittle and therefore compensates for material-specific deformations. As LOKPREP does not contain solvents that have to evaporate during hardening, the finished connection is ready for pressurising and use shortly after assembly.

There are different types of LOKPREP in order to achieve an optimal effect that is primarily dependent on the materials used, the installation conditions and the ambient temperature. The choice of the LOKPREPs to be used is defined by VULKAN LOKRING after the customer specifies the application.



### Make a correct assembly



VULKAN  
LOKRING

## LOKRINGEN

### PROFESSIONELL ROHRE VERBINDEN

So werden Sie Spezialist für lötfreie Rohrverbindungen

VULKAN  
LOKRING

## REFRIGERATION AND AIR CONDITIONING

### INSTALLATION, SERVICE AND ORIGINAL EQUIPMENT





### 3.1 LOKRING空调行业典型应用 (VRV/VRF)

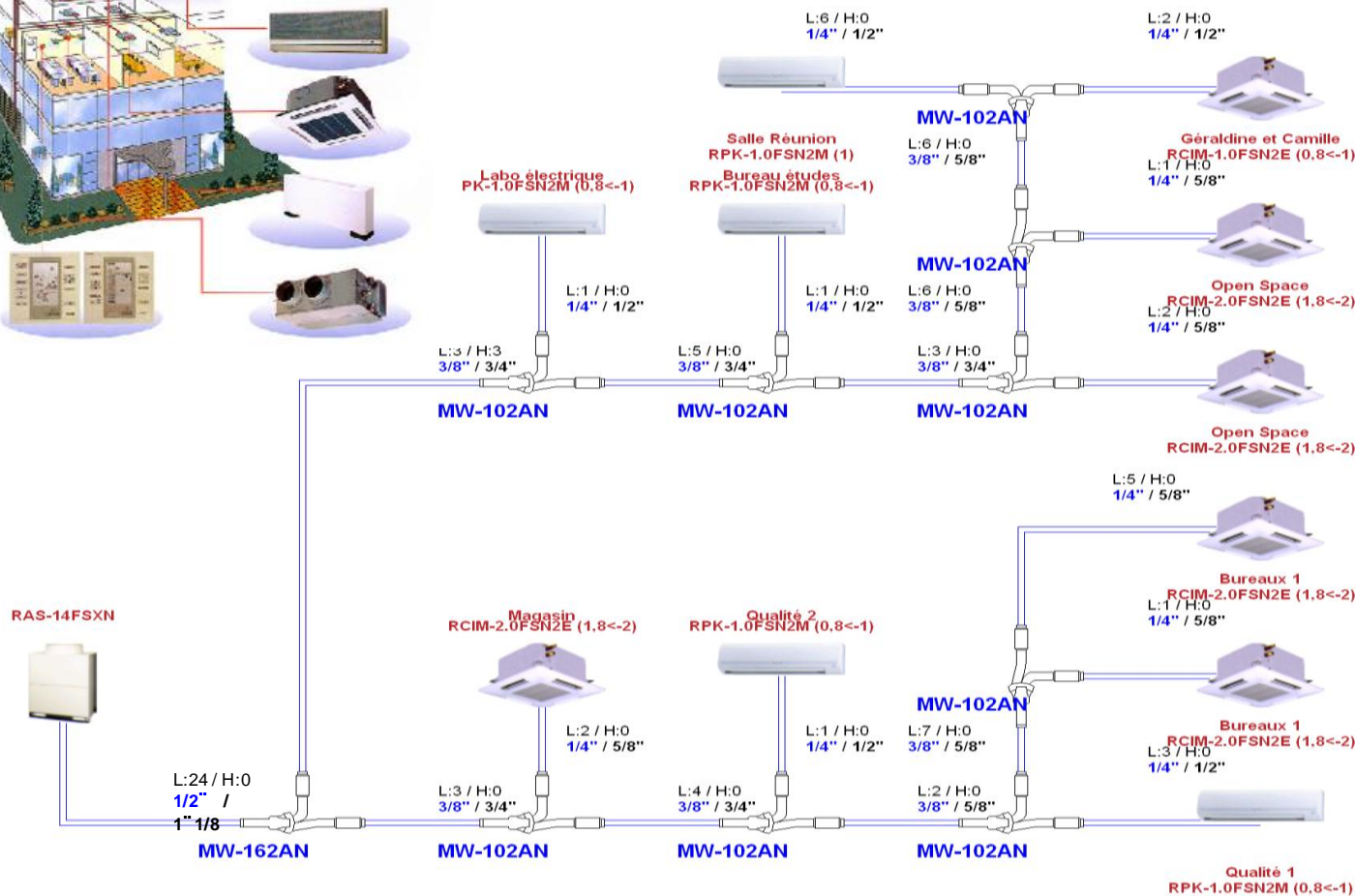


- Operating pressure: \* 50 bar with 5-fold safety, i.e. 250 bar.
- Temperature range: -50 °C to +150 °C
- Tube diameter:\*\* 1.6 to 35 mm
- Tube wall thickness: 0.5 to 1.5 mm
- We will be happy to provide advice on further areas of application.

TEST	REQUIREMENT	RESULT
Leak test	Airtight (< 2 x 10 <sup>-6</sup> mbar l/s helium 4.6)	✔️ Hermetically sealed
Temperature and alternating pressure resistance test	Airtightness after 2500 cycles with temperatures changing between -10 °C and 110 °C and pressure loads alternating by ± 40 bar during a cycle period of 15 min.	✔️
Burst test	5 x rated pressure (250 bar)	✔️ 350 - 400 bar (tube burst)
Inner pressure threshold test	2 x 10 <sup>6</sup> load change from 1 - 50 bar	✔️
Pressure test	At least 1.1 x rated pressure (gaseous)	✔️
Alternating bending test	2 x 10 <sup>6</sup> load change, inner pressure 50 bar	✔️



### 3.2 LOKRING 空调行业典型应用 (VRV/VRF)



Article name	Quantity
LOKTUBE YT 9.53	9
LOKTUBE YT 12.7	1
LOKTUBE YT 16	4
LOKTUBE YT 19	5
LOKTUBE YT 28.6	1
LOKRING 9.53 NKMS 50	16
LOKRING 12.7 NKMS 50	1
LOKRING 16 NKMS 50	9
LOKRING 19 NKMS 50	8
LOKRING 28.6 NKMS 50	4 to 7*
* Depends of elbows location	
LOKRING 9.53/6.35 NRMS 50	11
LOKRING 12.7/9.53 NRMS 50	2
LOKRING 16/12.7 NRMS 50	3
LOKRING 19/12.7 NRMS 50	3
LOKRING 19/16 NRMS 50	4
LOKRING 28.6/19 NRMS 50	2
LOKRING 28.6 NBK CU 50	3
LOKRING LR-EURO- 6.35 EBK	11
LOKRING LR-EURO-12.7 EBK	7
LOKRING LR-EURO-16 EBK	5
LOKIN 6.35 VHMS 08	22
LOKIN 9.53 VHMS 08	18
LOKIN 12.7 VHMS 08	14
LOKIN 16 VHMS 10	18
LOKIN 19 VHMS 10	10
LOKIN 28.6 VHMS 10	19
LOKPREP LT 15 ML	4
LOKPREP HT 15 ML	





solder - free  
tube connection





### 3.3 洛克环连接技术的优势（VRV/VRF）

#### 3.3.1 传统安装、维修方法 (家用空调/中央空调)

- 1 要携带沉重的用于焊接的器材及气瓶。
- 2 使用氮气防止焊接时的氧化作用。
- 3 焊接会产生难闻的气味和有毒的气体。
- 4 易燃的制冷剂有着火的危险。
- 5 焊接会造成管路的表面损伤。
- 6 成本密集、劳动密集、服务不友好。



① 申办动火许可证

② 准备安全防护器材

③ 安全防护措施

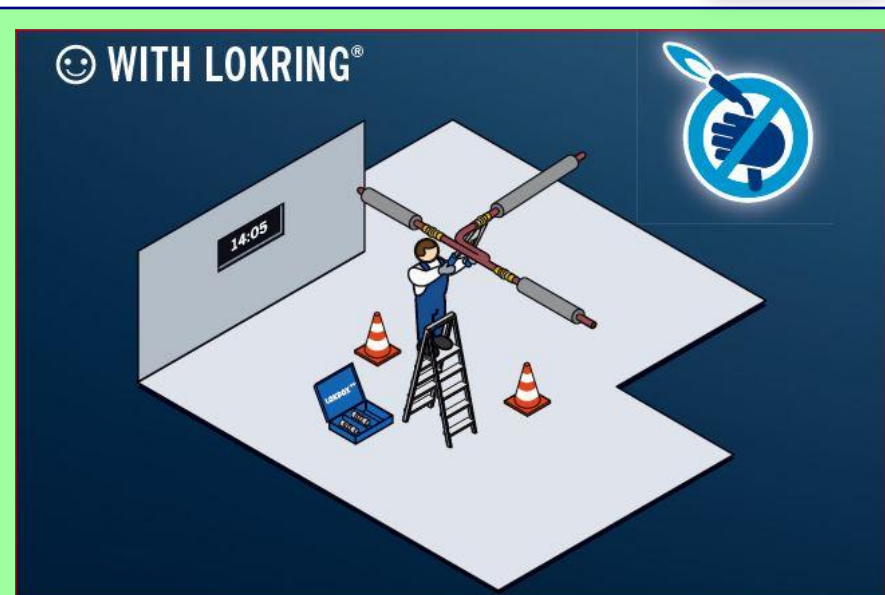
④ 各相关人员到现场

⑤ 施工

⑥ 清洁施工现场

#### 3.3.2 LOKRING安装、维修方法 (家用空调/中央空调)

- 1 免焊接连接，无高温明火，无需做防火保护，安全可靠。
- 2 具有永久的密封效果。
- 3 节省40%以上的时间和费用。
- 4 可以在客户工作区域内现场维修，或在客户正常营业中维修。
- 5 安装、维修简洁不需要重型连接设备。
- 6 清洁、快速、安全、环保，顾客乐于接受。



洛克环优势

- 1、综合成本低
- 2、无需焊接，无高温明火
- 3、不受工人熟练程度和工作情绪影响
- 4、牢固而富有弹性的金属对金属密封
- 5、高可靠性，无电化学腐蚀
- 6、无杂质、污染物产生，环保维修
- 7、快速简便，可手工操作
- 8、无需对管路进行特殊的预处理





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## LOKRING SINGLE RING

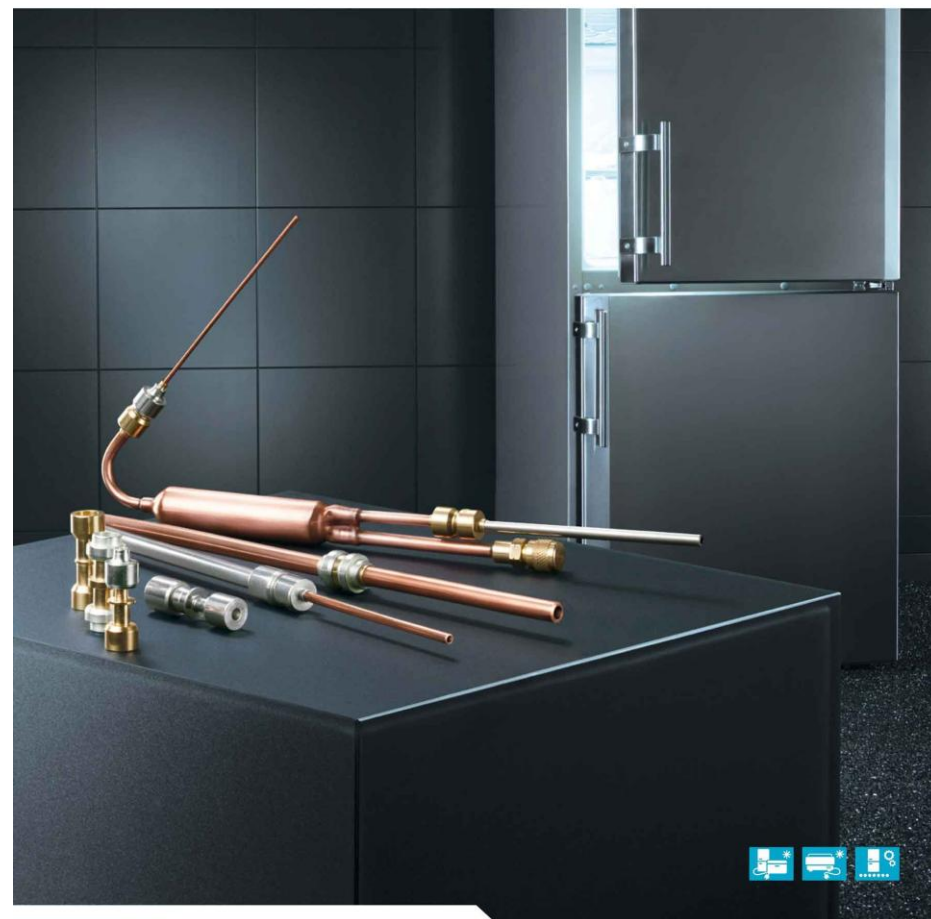
MECHANICAL TUBE JOINING SYSTEM FOR REFRIGERANT LINES



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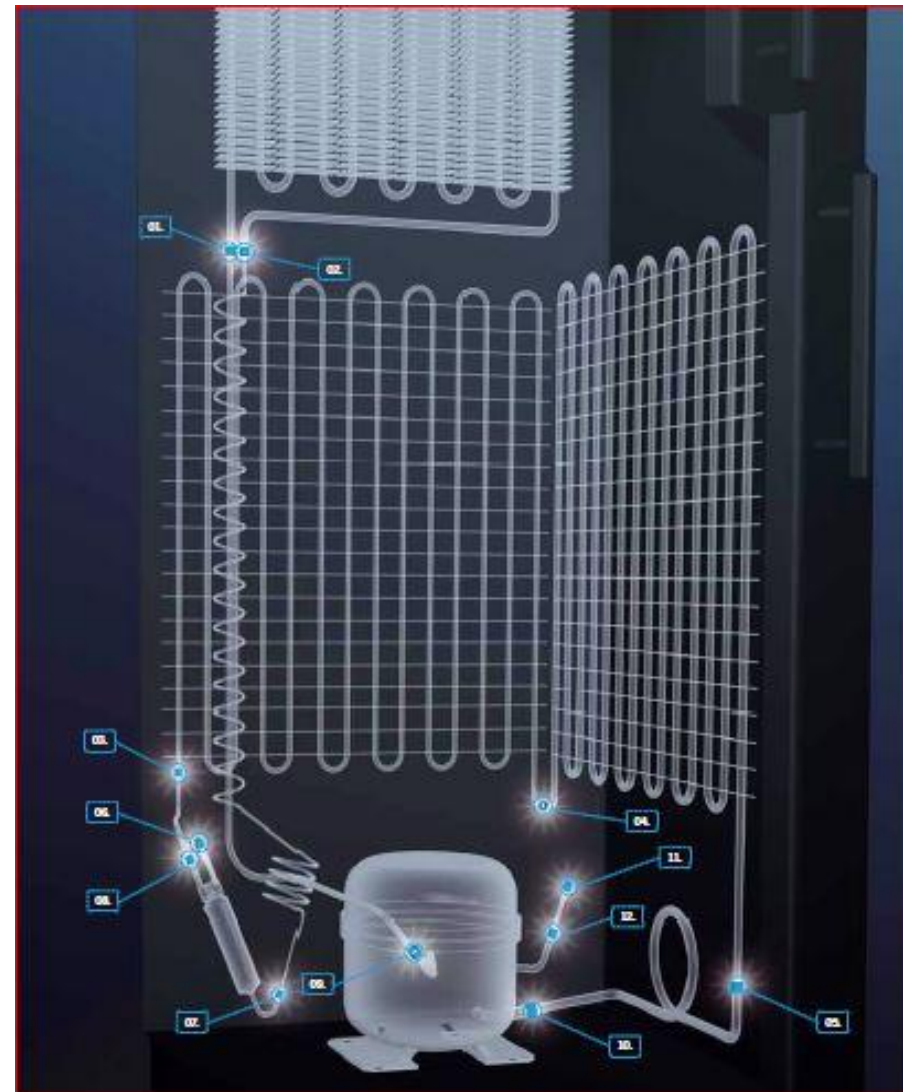
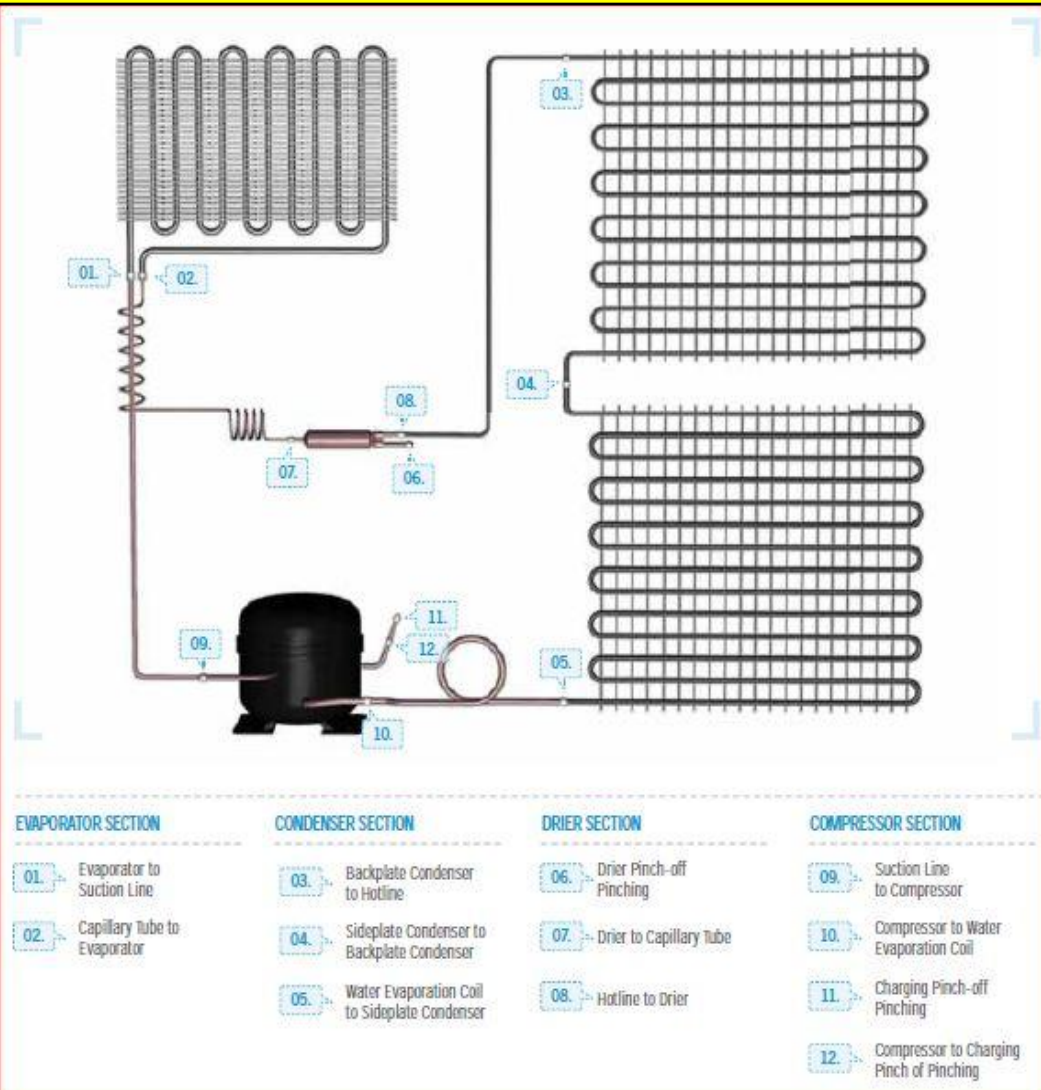
## REFRIGERATION APPLIANCES SERVICE AND ORIGINAL EQUIPMENT

Tube connection technology, tools, and accessories for installation of plug-in refrigerators



## 4.1 LOKRING冰箱/冷柜行业典型应用（OEM）

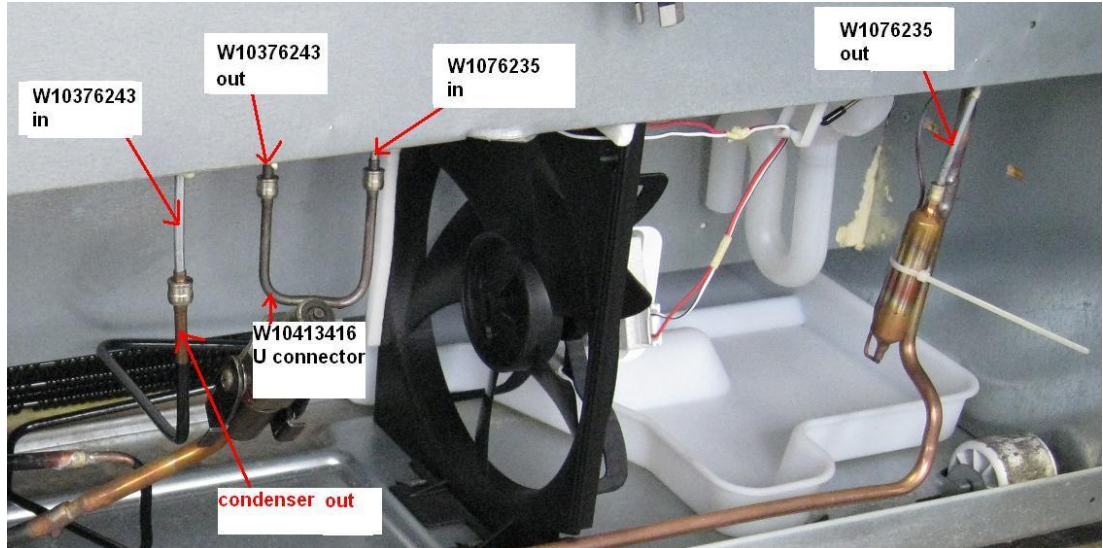
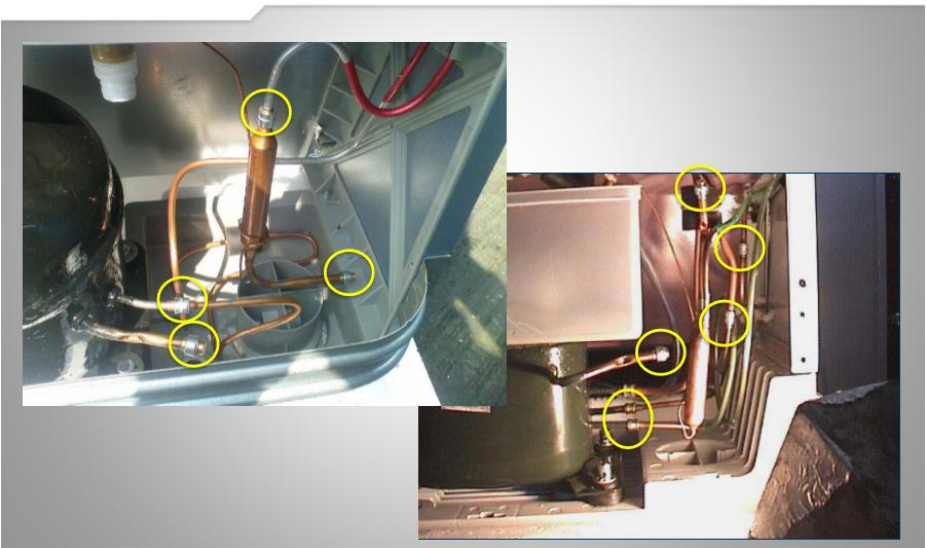
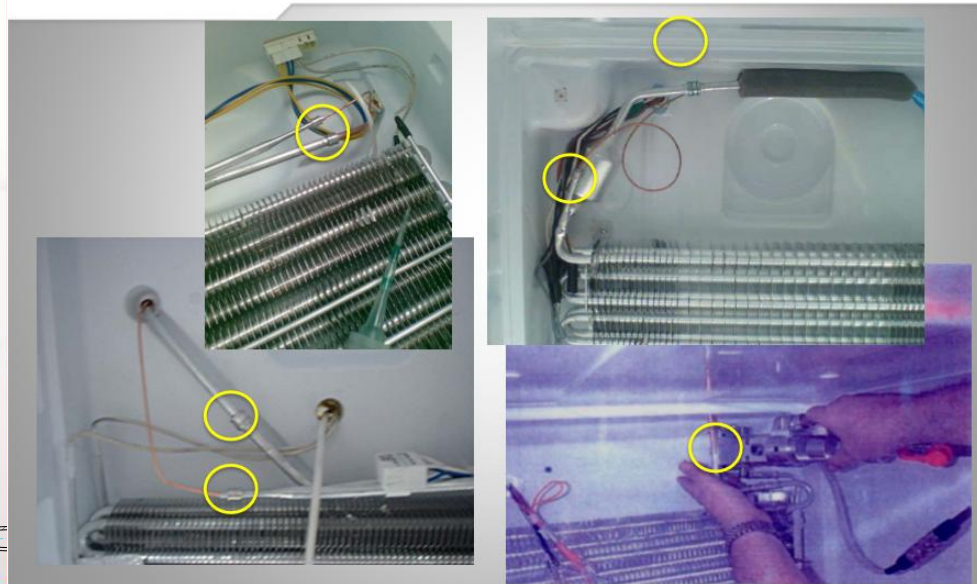
全密闭制冷系统对冷媒泄漏量的要求非常严格，制冷系统焊接点质量直接影响整机性能。





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LOKRING FOR OEMs  
AREAS OF APPLICATION





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## REFRIGERATION APPLIANCES

SERVICE AND ORIGINAL EQUIPMENT



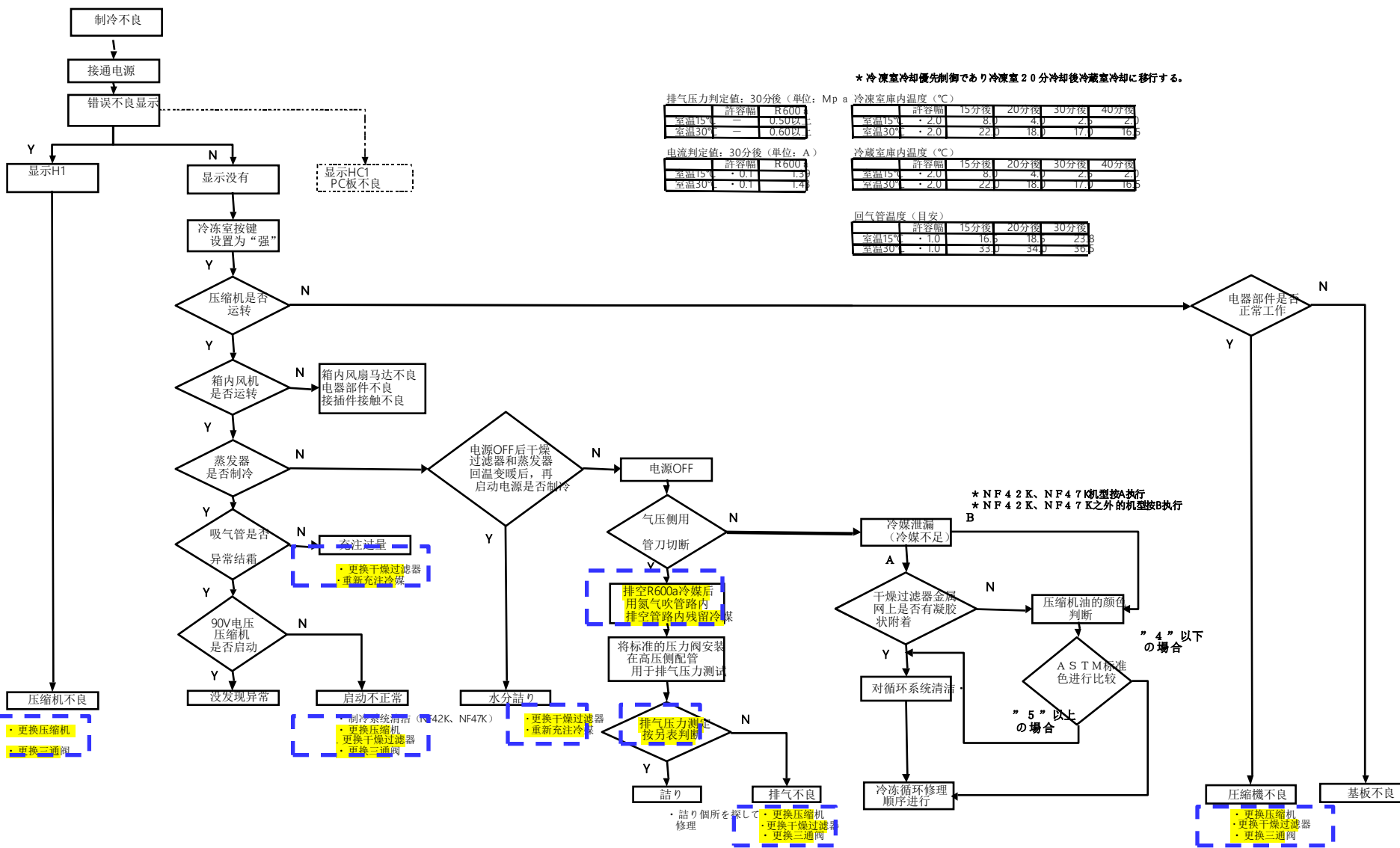
LOKRING TUBE CONNECTION TECHNOLOGY  
EASY. QUICK. HERMETICALLY SEALED.





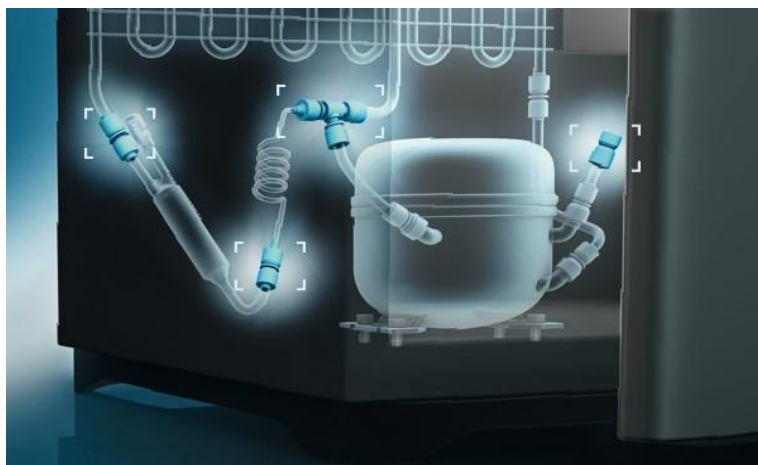
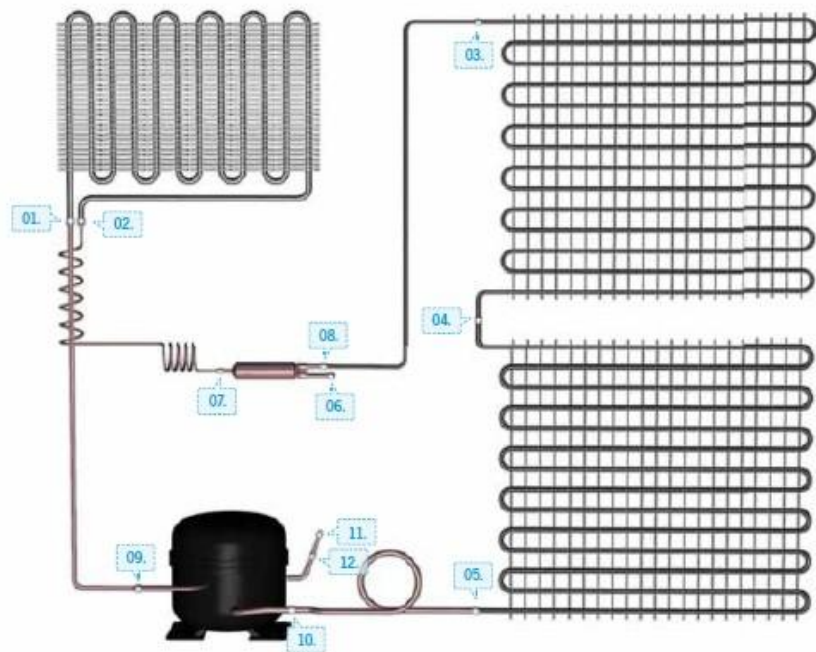
## 4.2. LOKRING冰箱/冷柜行业典型应用(售后维修)

### 4.2.1 冰箱/冷柜制冷系统故障维修流程图（参考）



## 4.2. LOKRING冰箱/冷柜行业典型应用(售后维修)

### 4.2.2 使用LOKRING维修介绍



### 4.2.3 洛克环典型应用

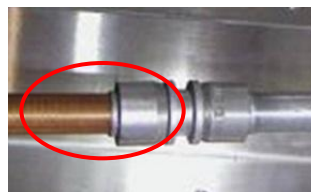
01蒸发器与回气管连接

02蒸发器与毛细管连接

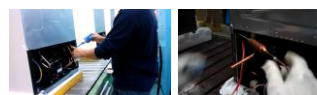


03热管与背部冷凝器连接

04背部冷凝器与侧板冷凝器连接



05工艺管与冷凝器连接



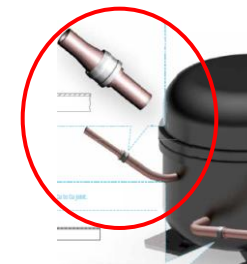
07毛细管与干燥过滤器连接

08干燥过滤器与冷凝管连接



09回气管与压缩机连接

12压缩机与加液管连接



06干燥器工艺管堵头

10压缩机排气管与冷凝管连接

11加液管工艺管堵头





## 4.3 洛克环连接技术的优势（售后维修）

### 4.3.1 传统维修方法（冰箱/冷柜）

- 1 需要人工搬运、卡车运输，维修费用较高。
- 2 维修时间长，影响客户使用。
- 3 焊接过程中动用明火存在危险，需要大范围的防火保护。
- 4 维修过程中使用易燃的气体存在爆炸的危险。
- 5 维修过程中产生有毒的气体（光气、含氧和氯的酸以及二恶英等）



①冰箱发生故障，维修人员现场确认故障



②冰箱需要搬运，运输中可能存在碰伤等风险



③没有冰箱可用了，需要冷冻的食品怎么办？



④冰箱包装好，用卡车运送到维修地点



⑤在维修过程中会使用易燃的危险气体，并且具有污染



⑥维修后再用卡车运回到客户家中



⑦搬运过程中存在碰伤的危险。



⑧冰箱放回到原来的位置



⑨维修费用高、劳动力成本高，还耽误客户使用

### 4.3.2 LOKRING维修方法（冰箱/冷柜）

- 1 免焊接连接，无高温明火，安全可靠。
- 2 具有永久的密封效果
- 3 节省40%以上的时间和费用
- 4 可以在客户工作区域内现场维修，或在客户正常营业中维修
- 5 维修简洁不需要重型连接设备
- 6 清洁、快速、安全、环保，顾客乐于接受



①现场移开冰箱



②现场立即维修冰箱。



③维修完毕，放回原位置，平均维修时间小于60min。

#### 洛克环优势

- 1、综合成本低
- 2、无需焊接，无高温明火
- 3、不受工人熟练程度和工作情绪影响
- 4、牢固而富有弹性的金属对金属密封
- 5、高可靠性，无电化学腐蚀
- 6、无杂质、污染物产生，环保维修
- 7、快速简便，可手工操作
- 8、无需对管路进行特殊的预处理



## 4.4 洛克环连接技术的优势（售后维修）

### 4.4.1 传统维修方法 （商用冷柜）

- 1 需要人工搬运、卡车运输，维修费用较高。
- 2 维修时间长，影响客户使用。
- 3 焊接过程中动用明火存在危险，需要大范围的防火保护。
- 4 维修过程中使用易燃的气体存在爆炸的危险。
- 5 维修过程中产生有毒的气体（光气、含氧和氯的酸以及二恶英等）



①冷柜发生问题，维修人员首先到现场确认故障



②商场要把冷柜中的食品转移到其他地方储存



③使用叉车将故障冷柜拖走，并包装好。



④使用卡车运到维修地点，运输过程外观有受损的危险



⑤维修过程中会使用危险的气体，并且具有污染



⑥使用卡车运回到商场，运输过程外观有受损的危险



⑦使用叉车将冷柜拖到销售地点，并打开包装。



⑧商场要将在其他地点临时储存的食品重新搬运过来并重新摆好



⑨商场需要付出高昂的维修费用，并且影响销售

### 4.4.2 LOKRING维修方法 （商用冷柜）

- 1 免焊接连接，无高温明火，安全可靠。
- 2 具有永久的密封效果
- 3 节省40%以上的时间和费用
- 4 可以在客户工作区域内现场维修，或在客户正常营业中维修
- 5 维修简洁不需要重型连接设备
- 6 清洁、快速、安全、环保，顾客乐于接受



①冷柜发生问题，维修人员首先到现场确认故障



②维修人员立刻就可以在现场进行维修，不需要转移冷柜和冷柜内的食品。



③维修费用低，平均维修时间小于60min，避免影响商场销售

#### 洛克环优势

- 1、综合成本低
- 2、无需焊接，无高温明火
- 3、不受工人熟练程度和工作情绪影响
- 4、牢固而富有弹性的金属对金属密封
- 5、高可靠性，无电化学腐蚀
- 6、无杂质、污染物产生，环保维修
- 7、快速简便，可手工操作
- 8、无需对管路进行特殊的预处理





## 5. LOKRING 车辆空调行业典型应用

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### LOKRING & LOKCLIP FÜR BESTE VERBINDUNGEN IM AUTOMOBIL

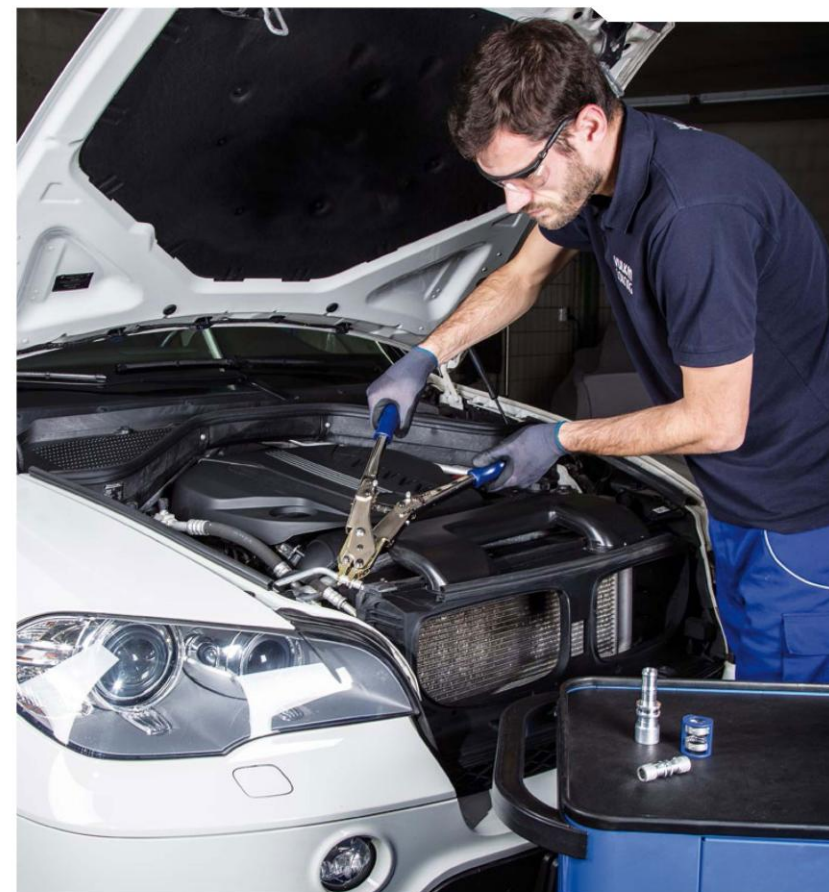
Reparieren und Nachbilden von Rohr- und Schlauchleitungen in Fahrzeug-Klimaanlagen



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LOKRING

### VEHICLE AIR CONDITIONING

FIND THE LEAK! – REPAIR THE LEAK!



# LOKRING® & LOKCLIP

THE PATENTED LOKRING® TUBE CONNECTION SYSTEM PROVIDES AN INNOVATIVE SYSTEM OF SOLDER-FREE TUBE CONNECTIONS FOR EVERY REPAIR SITUATION IN VEHICLE AIR CONDITIONING SYSTEMS.

- ⊕ for universal use, independent of the vehicle type and model year
- ⊕ no waiting for expensive original spare parts
- ⊕ no welding, soldering or thread cutting necessary
- ⊕ in many cases, the faulty line may not even have to be removed
- ⊕ for more than 30 years tried-and-trusted by OEMs
- ⊕ in compliance with EU directive 2006/40/EG



# REPAIR THE LEAK!



WITH LOKRING® & LOKCLIP YOU CAN REPAIR:

- ⊕ Straight tubes and elbows
- ⊕ Hoses
- ⊕ Hose-to-Tube connections
- ⊕ Pressure switch connections
- ⊕ Service ports
- ⊕ Threaded connections



## BUS AIR CONDITIONING AREAS OF NEW APPLICATIONS



**VULKAN  
LOKRING**

## LOKRING FOR AUTOMOTIVE REFRIGERATION AREAS OF APPLICATION

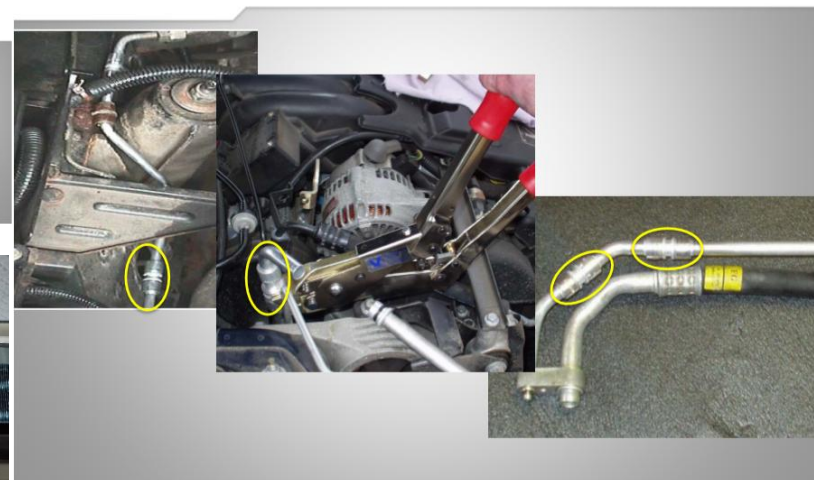


**VULKAN  
LOKRING**

## LOKRING FOR AUTOMOTIVE A/C AREAS OF APPLICATION



**VULKAN  
LOKRING** LOKRING FOR AUTOMOTIVE A/C  
AREAS OF APPLICATION



## 6. LOKRING氮氢检漏方案简介



示踪气体使用**95%氮气**和**5%氢气**的混合气体，混合气体被充注到冰箱系统中用于检测泄漏。示踪气体没有可燃性、无毒、无腐蚀性，对环境没有危害。氢分子是自然界中最小的分子，可以穿过微小的孔，甚至于穿过水泥、发泡泡沫等绝热材料。由于氢分子具有低的粘性，所以具有很高的传播速度，气体到达漏孔很快就能穿过。由于氢气比空气轻，氢气分子会向上扩散，所以可以在管路上方轻易检测到漏点。

这种检测方法，原来是用于制造业，现在已经完全适合在售后服务，具有精度高、可靠、快速、有效、低成本、无本底干扰等特点。

氮氢检漏特点：

- 可以发现微小的泄漏点-- 1ppm(相当于R134a:0.1g/y)
- 可以快捷的开展工作--快速、精确并且经济
- 没有交叉反应—不会由于外部气体产生误报警
- 完全符合标准--EN35 422和EN14 624
- 适合所有的制冷剂--适合所有的系统

示踪气体特点：

- 这种完美的方案—氮氢检测气体
- 拥有最小的分子
- 比空气轻**14倍**
- 不燃烧、无毒、无色、无味
- 适合压力测试
- 价格便宜







德国福尔康洛克林公司  
VULKAN LOKRING



中国区授权专业代理商

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