空气加热器
Air heater

RHR 翅片式加热器
Finned tubular heaters

空气电加热器
Electric air heater

PK 陶瓷加热元件
Ceramic heating unit

4.0

TÜRK+HILLINGER
THERMAL TECHNOLOGY

RHR

RHR 型翅片式加热器
FINNED TUBULAR HEATERS TYPE RHR

通用信息

加热空气和其他的气体时，为了增加加热器的热传递，在管式加热器的周围装上一圈钢带。因为增加表面积和湍流，翅片式加热器相对普通管状加热器可以保持更高的热负荷。这使得加热器表面温度减少和长度变短。

因此T+H的翅片式加热器主要用于加热气体或空气，并且加热器和介质之间要求保持较小的温差。

- 用于空调中，使可燃性灰尘的沉积最小
- 用于干燥设备中，使被干燥物的柔顺
- 在干燥机中，使得温度分布均匀和保持加热器最高表面温度较低，因此延长加热器寿命
- 在收缩箔包装机中，这些加热元件允许稳定的温度耗散并防止箔过热。

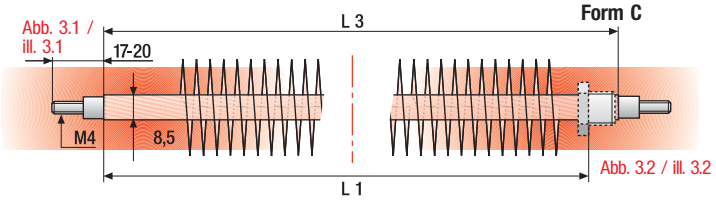
General information

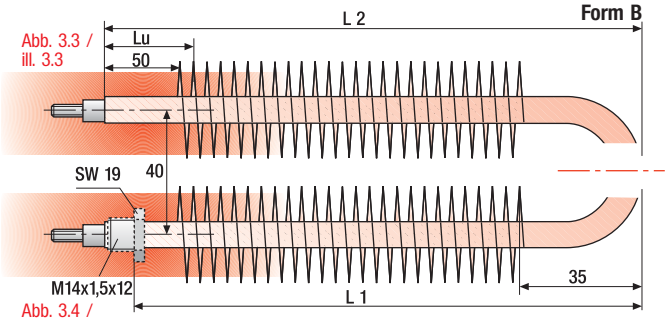
In order to increase the heat transfer of tubular heaters for the heating of air and gases tubular heaters are equipped with a steel strip coiled around the heater. Thus enlarging the surface area and increasing turbulences, finned tubular heaters can sustain a higher thermal loading than normal tubular heaters. The surface temperature decreases and the heaters become shorter.
Therefore T+H finned tubular heaters should be applied where it is required to heat gases or air at temperatures where the differences between the heater and the medium should remain small.

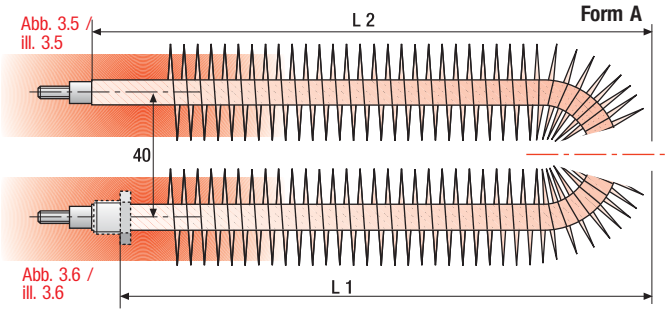
- For air conditioners the deposits of combustible dust is minimized.
- In drying apparatus the drying goods are smoothly treated.
- For varnish dryers you can obtain an even temperature distribution and the maximum surface temperature of the heater can be kept low thus increasing its lifetime.
- Within shrink foil packaging machines these heating elements allow a stable temperature dissipation and prevent the foil from overheating.

RHR

形状
SHAPES







L1, L2, L3 客户可指定。标准类型见第6页

L1, L2, L3 as per customer specification. Standard types see page 6

装配
翅片管式加热器可按直线状或弯曲状地供货，并可选配M14×1，5 螺纹接头为装配做好准备（见插图）。A型和B型通常配备螺纹接头。

结构和公差
- 由于生产原因，加热器的端部必须没有翅片的，最小为✕✐毫米。末端未加热区（Lu)的长度需要比无翅片区长至少5毫米。
- 按DIN 44874 长度公差 ±2%, 但最小±5 mm
- 更精确的公差须在订货时说明。对于加热器形，尺寸公差可在订货时是可协商的。
- 翅片管状加热器在没有弯曲的情况下在弯曲部分内减少了表面负荷，以避免过热（特殊类型的加热器）。

如订购或询价，请注明尺寸要求。

弯曲
T+H翅片管式加热器可在翅片和无翅片区域弯曲。由于弯曲需要特殊的弯曲夹具，所以该类加热器的弯曲只能在我们工厂进行。

其他形状可以定制.

Assembly
Finned tubular heaters can be supplied straight or bent and with or without threaded nipple M14 x 1,5 ready for the assembly (see illustrations). Shape A and B are normally equipped with a threaded nipple.

Construction and tolerances
- Due to production reasons the ends of the heaters have to be unfinned for min. 50 mm. The unheated ends need to be at least 5 mm longer than the unfinned portion.
- The length tolerance i.a.w. DIN 44874 is of ±2%, but min. ±5 mm.
- More precise tolerances must be stated on order. For shaped heaters, the dimensional tolerances are negotiable at time of order.
- Finned tubular heaters with an unfinned bend have a reduced surface loading within the bent portion in order to avoid overheating (special type heater).

In case of order or enquiry please indicate the dimensions i.a.w. your requirements.

Bending
T+H finned tubular heaters can be bent within the finned and the unfinned portion. As the bending requires special bending fixtures the heaters can only be bent at our premises.

Other shapes on request.

RHR

类型
TYPES

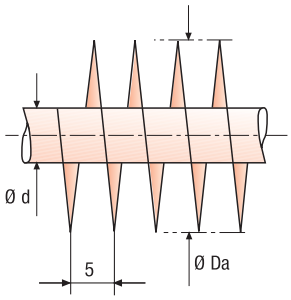


Abb. 4.1 / ill. 4.1

标准类型 / STANDARD SIZES		
Ø 外径 Da Ø Outer Da	Ø 加热器直径 d Ø Heater d	型号 Type code
20 mm	8,5 mm	820
28 mm	8,5 mm	828

其他最大到20mm直径.可以定制

Other heater diameters upto 20 mm upon request.

接出
CONNECTIONS

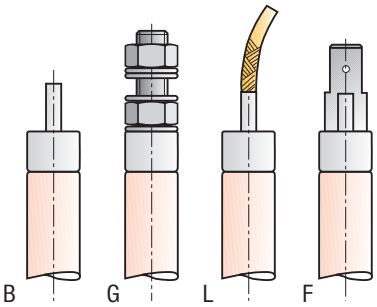


Abb. 4.2 / ill. 4.2

T+H翅片管式加热器可提供如左图的连接。连接类型的设计符合DIN 44874, part 2要求。

加热器直径
8,5 mm
B Ø 3,5 mm螺杆
G 螺栓 M4
L 导线连接
F 极片连接

T+H finned tubular heaters can be supplied with the connections indicated alongside. The designation of the connection types complies with standard DIN 44874, part 2.

Heater diameter
8,5 mm
B bolt connector Ø 3,5 mm
G threaded bolt M4
L lead connection
F tab connector

RHR

测试

T+H翅片管式加热器符合VDE标准。100%按DIN EN 60335（VDE 0700）测试。

.

Test

T+H finned tubular heaters comply with the VDE standards. Each heater has to undergo an individual test i.a.w. DIN EN 60335 (VDE 0700).

材料
MATERIALS

材料

护套的材料 为1.4541的CrNi钢。 材料号1.4541的CrNi钢翅片翅片的高度 6 mm或 10 mm，厚度 0.25mm；材料号 1.0112的低碳钢翅片高度10mm, 厚度0.3mm。其他材料可以定制。

护套上最高许可温度:

CrNi钢 (C)	材料号. 1.4541	到 550°C
低碳钢(CF)	材料号. 1.0112	到 400°C

Materials

The sheath material is CrNi-steel material no. 1.4541 (AISI 321). The fins are made of CrNi-steel 1.4541, fin height 6 mm or 10 mm, thickness 0,25 mm or mild steel material no. 1.0112, fin height 10 mm, thickness 0,3 mm. Other materials can be supplied upon request.

Max. allowable temperature on the sheath:

CrNi-steel (C)	material no. 1.4541	upto 550°C
Mild steel (CF)	material no. 1.0112	upto 400°C

对浸没深度的建议
ADVICE ON THE IMMERSION LENGTH

浸没深度为长度L1（如图3.6）。在寒冷条件下，需要考虑热膨胀。浸没深度为990毫米在护套温度为500°C时，加热器伸长的长度约为10毫米。

膨胀系数: 1,8 mm/m 每100K

The immersion length is the length L1 (acc. ill. 3.6) in cold condition. Heat expansion needs to be considered. At an immersion length of 990 mm and a sheath temperature of 500°C the lengthening of the heater is approximately 10 mm.

Expansion ratio: 1,8 mm per m and 100K

RHR

标准类型
STANDARD TYPES

für / for d = 8,5 mm 230 V

Typ Type	P in W P in W	浸没长度 mm immersion length mm	RHR加热器表面荷载 W/cm² Surface loading of the tubular heater in W/cm²
828 C 50 5GA	330	240	3,1
	500	240	4,7
	670	240	6,3
	1000	240	9,4
828 C 64 5GA	1000	310	6,9
828 C 80 5GA	1000	390	5,3
	1330	390	7,1
	1500	390	8,0
	2000	390	10,7
828 C 100 5GA	670	490	2,8
	1000	490	4,2
	1330	490	5,5
	1500	490	6,3
	1670	490	7,0
	2000	490	8,3

类型 Type	P in W P in W	浸没长度 mm immersion length mm	表面荷载 in W/cm² Surface loading of the tubular heater in W/cm²
828 C 125 5GA	1000	615	3,3
	1330	615	4,3
	1670	615	5,4
	2000	615	6,5
	3000	615	9,8
828 C 160 5GA	2000	790	5,4
	3000	790	8,0
828 C 200 5GA	2000	990	4,2
	3000	990	5,9

其他型号，电压，功率 或长度可以定制
Further types, other voltage, performance or length on request

RHR 订货号说明
Short designation RHR

例如:
Example:

8 28 C 100 5 G A

- A — Form / shape
- G — 接出类型 / connection type
- 5 — 不加热区 Lu长度 cm / unheated length Lu in cm
- 100 — 直线型 cm/ straight lenght in cm C *
- 28 — D = 28 mm (翅片直径/ fin diameter)
- 8 — d = 8,5 mm

*C 护套和翅片材料时不锈钢
CF 护套是不锈钢， 翅片是低碳钢

C sheath material and fins in stainless steel or
CF sheath material in stainless steel, fins in mild steel

RHR

计算
CALCULATION

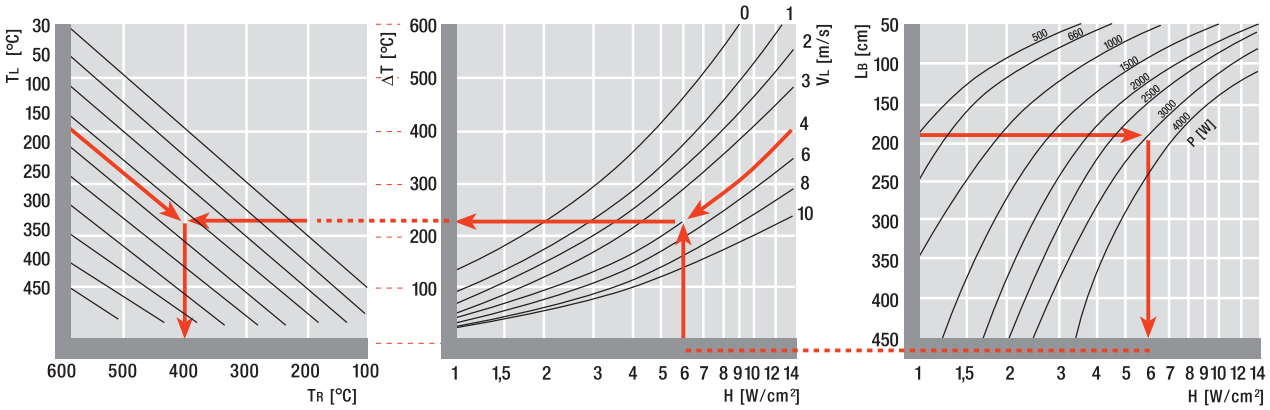


Abb./Ill. 7.1 Abb./Ill. 7.2 Abb./Ill. 7.3

TL 最高空气温度
max. air temp

ΔT 护套和空气的温差
temp. diff. between sheath and air

TR 最高护套温度
max. sheath temp.

H 表面荷载
surface loading

VL 空气流速
air velocity

LB 加热长度
heated length

P 功率 Watt
performance in Watt

bei/for d=8,5 mm

$$H = \frac{P}{L_B \times 2{,}67} \ (W/cm^2)$$

P = 功率 Watt
LB = 加热长度 cm

P = Performance in Watt
L_B = heated length in cm

表面荷载和空气温度的关系
翅片管式加热器的表面荷载W/cm2表面负荷与护套管直径有关

上图的计算举例
空气流速 VL: 4 m/s
所需空气温度 TL : 180°C
护套温度 TR : 400°C

加热长度 LB: 180 cm
功率 P: 3000 W
表面荷载: 6 W/cm²

Abb. 7.1/7.2 Abb. 7.3

Relation between specific surface loading and air temperature
The specific surface loading in W/cm² of finned tubular heaters is bound to the sheath diameter:

Calculation example for the above diagram
Air velocity VL: 4 m/s
Required air temperature TL: 180°C
Sheath temperature TR: 400°C

heated length LB: 180 cm
performance P: 3000 W
surface loading H: 6 W/cm²

图. 7.1/7.2 图. 7.3

RHR 询价参数
ENQUIRY RHR

询价
为了提交询价和处理订单我们需要如下参数：

- 加热器直径和翅片D直径
- 功率
- 翅片材料
- 弯曲形状
- 数量
- 非加热区长度和无翅片区长度
- 加热器环境温度
- 被加热介质和介质流速
- 电压
- 管长
- 接出类型
- 加热器应用

Quotation
In order to submit a quotation or for order processing we need the following data:

- heater diameter and fin diameter
- wattage
- fin material
- bending form
- quantity
- unheated length and unfinned length
- ambient temperature of heater
- medium to be heated and velocity of medium
- voltage
- tube length
- connection type
- application of heater

HRR

HRR 型空气加热器
AIR HEATER TYPE HRR

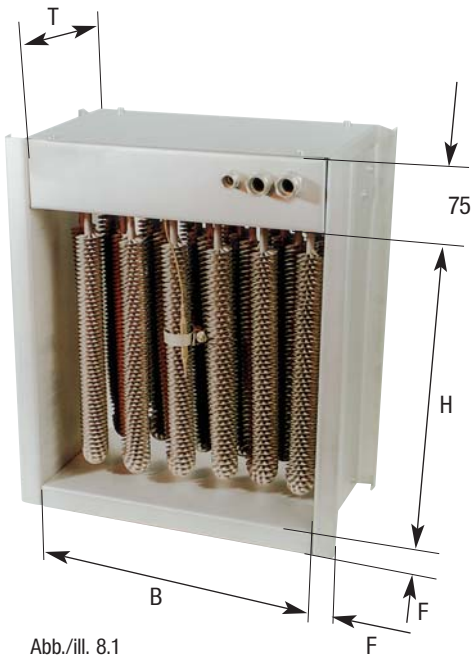


Abb./ill. 8.1

T+H 的 HRR型空气加热器由管状加热器或翅片式加热组成，加热器组装组装在由镀锌钢板或不锈钢制成的金属外壳中。如图 8.1 所示，外壳可以适应各种应用。对于大多数应用中，采用翅片管T状加热元件，因为增加的表面积所以在加热元件上表面温度更低。因此提供了低功率密度和长寿命 ，也减小了壳体的尺寸

通过电气联锁，必须保证加热器只有在风扇被激活时才能运行。为了防止空气过滤器过热和避免过高的出口温度，空气加热器可以配备恒温器和/或温度限制器。

T+H air heaters type HRR consist of tubular heaters or finned tubular heaters assembled into a sheet metal housing made of zinc plated steel or stainless steel. According to the requirements given by the specification the housings can be adapted to various applications as per the illustrations indicated beside. For most applications finned tubular heating elements are used as their increased surface area allows low surface temperatures on the heating elements thus providing a low watt density and a long lifetime with reduced housing dimensions.

By means of electrical interlock it has to be assured that the heater can only be operated when a fan has been activated. In order to prevent the air filter from overheating and to avoid a too high outlet temperature the air heaters can be equipped with a thermostat and/or a temperature limitor.

HRR

配置和规格
CONFIGURATIONS AND EXECUTIONS

标准规格
一般来说，我们按照你的规格制造空气加热器。对于空气出口温度小于80°C的通道空气加热器，我们推荐选用以下H 值（图8.1），因为这样就可能采用标准的RHR。

推荐尺寸 H: 250 mm, 320 mm, 400 mm, 500 mm, 630 mm 和 800 mm

可能的配置和规格
- 法兰加热器 HRF 型或 HRF-AK 型
- 圆柱形加热器 HRZ 优选直径 100 mm，125 mm,，150 mm，200 mm, 250 mm und 300 mm
- 开机接线盒（AK）用于较高空气温度的加热器
- 接线盒的最高防护等级可达 IP64
- 焊接的密封空气空间
- 绝缘电阻> 10MΩ
- 无硅
- 运行电压 24 V und 3 x 690 V
- 规范电路
- RHR 型配有电热偶
- 电热元件运行温度低
- 低压力损耗
- 对于海上应用，加热器符合GL/DNV准则。

Standard executions
In general we manufacture air heaters confrom to your specifiactions. For duct air heaters with air outlet temperatures less than 80°C the following dimensions of H are favorable because of the then possible employment of standard RHR (see illustration 8.1):

Preferred dimensions H: 250 mm, 320 mm, 400 mm, 500 mm, 630 mm and 800 mm

Possible configurations and specifiactions
- Flange heaters HRF or HRF-AK
- Cylindrical air heaters HRZ with the preferential diameters 100 mm, 125 mm, 150 mm, 200 mm, 250 mm and 300 mm
- Heaters for higher air temperatures with set off terminal box (AK)
- Protection Degree of the connection box up to IP64
- Air space sealed by welding
- Insulation resistance > 10 MΩ
- Silicone-free execution
- Operating voltages between 24 V and 3 x 690 V
- Specification of the circuit steps
- Execution with thermocouple mounted at the RHR
- Low temperatures at the heating element
- Low pressure losses
- for maritime applications, heaters conform to GL/DNV guidelines

HRR

接出
CONNECTION

导线的连接是由护套夹来实现的，护套夹在加热元件的连接上。外壳上插头连接器或接触夹块的特殊方式也可选 用。

自动控制器和/或限制器安装目的是集成对空气加热器的控制。自动控制器通常被用作首先切换的安全特征。

The connection of the leads is effected by sheath clips, which are placed on the connections of the heating elements. Special executions over plug connectors at the housing or contact clamp blocks are possible.

Automatic controllers and/or limiters mounted by us are intended to integration into the control of the air heater. The automatic controller is usually used as safety feature which is switched first.

材料
MATERIALS

外壳由镀锌钢或1.4301高级钢制成。管状加热元件由1.4541优质钢制成，翅片由1.4541高级钢或1.0112钢制成。

平面管式加热元件护套材料可选用 下列材料:
1.4541, 1.4828, 1.4876 和 2.4858

其他材料可定制

The housings are made of galvanized steel or high-grade steel 1.4301. The tubular heating elements are manufactured of high-grade steel 1.4541 and the finning is produced of high-grade steel 1.4541 or steel 1.0112.

Possible sheath materials of plane tubular heating elements:

1.4541, 1.4828, 1.4876 and 2.4858

Other materials on request.

文件
DOCUMENTATION

您可以收到所需加热元件的原理草图和所有重要的技术细节的数据清单。

You receive a data sheet of the desired heating element with a principle sketch and all important technical details.

HRR 型询价
ENQUIRY HRR

为了提交报价或订单，我们需要以下数据:

- 电压
- 功率
- 加热区数量
- 空气吞吐量
- 外壳尺寸
- 入口温度
- 出口温度
- 加热介质（侵蚀介质)
- 数量
- 带/不带恒温器
- 或温控器
- 配置与实施

In order to submit a quotation or in case of an order we need the following data:

- voltage
- wattage
- number of heated zones
- air throughput
- outside dimensions of housing
- inlet temperature
- outlet temperature
- medium to be heated (aggressive medium)
- quantity
- with/without thermostat or limitor
- configuration and execution

计算
CALCULATION

$$\dot{Q} = \dot{V}_n \cdot \delta \cdot c_p \cdot \Delta T$$

$$\dot{V}_n = \frac{\dot{V}_T \cdot 273}{273 + T}$$

对空气和气体加热所需功率计算如下：

The calculation of the required performance for the heating of air and gases applies as follows:

$\dot{Q}$ = 热流 J/s / heat flow in J/s
$\dot{V}_n$ = 流速 m^3/h / volumetric current in m^3/h / bei /at (0 °C/1013 mbar)
$\dot{V}_T$ = 在T温度下的流速 / volumetric current at temperature
δ = 密度 kg/m^3 / density in kg/m^3
c_p = 比热容 J/kg K / specific heat in J/kg K
ΔT= 温差 K / temperature difference in K
(入口温度- 出口温度) / (inlet temp. - outlet temp)
T = 温度 °C / temperature in °C

$$P = \frac{\dot{V}_n \cdot \Delta T}{2500}$$

为了简化在90%的热效率加热空气的计算，可以采用下列方程（考虑到热传导和辐射引起的损失、由于压力和温度改变引起密度和比热的变化不被考虑）：

In order to simplify the calculation for the heating of air at an efficiency of 90% the following equation can apply (losses due to heat conduction and radiation are considered, changes of density and specific heat due to changing pressures and temperatures to be rejected):

P = 功率 kW / performance in kW
$\dot{V}_n$ = 流速 m^3/h / volumetric current in m^3/h

$$v = \frac{\dot{V}_n}{A}$$

$$A = \frac{\dot{V}_n}{v}$$

气体流速和加热通道

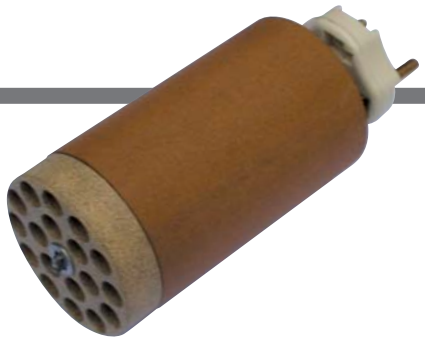
Velocity of air current and section of heating channel:

v = 气流流速 m/s / velocity of air stream in m/s
A = 加热器通道截面积 m^2 / section of heater channel in m^2
$\dot{V}_n$ = 流速 m^3/h / volumetric current in m^3/h

对于空气加热器，我们推荐1～10 m/s的气流速度，随着空气速度的增加，加热器的空气阻力大大增加。

For air heaters we recommend velocities of the air stream of 1 -10 m/s. With an increasing air velocity the air resistance of the heater greatly increases.

PK



PK 型陶瓷加热元件
CERAMIC HEATING UNITS TYPE PK

我们制造 PK型陶瓷加热单元，该加热器可加热空气 至600℃。陶瓷加热器可选用金属外壳。

加热器直径 13–85 mm， 典型的风量 2–100 m3/h。

We manufacture ceramic heating units type PK to heat up air up to 600° C. The ceramic heaters are available with or without metal casings.

The diameter range is from 13 – 85 mm for typical air volume from 2 – 100 m³/h.

on request
CUSTOMER-SPECIFIC
KUNDENSPEZIFISCH
auf Anfrage

您的全方位的合作伙伴
YOUR COMPETENT PARTNER

我们向您推荐我们广泛的产品，以及我们在电热元件领域的最新发展。

We highly recommend to you our established wide range of products as well as our latest developments in the field of electric heating elements.

- **HLP 型大功率加热棒**
  High performance cartridge heater type HLP
- **RHK 型管状加热器**
  Tubular heaters type RHK
- **RKF 型扁平管状加热器**
  Flat tubular heaters type RKF
- **EHK 型浸没式加热器**
  Immersion heaters type EHK

02.2018.250 TECHNISCHE ÄNDERUNGEN VORBEHALTEN / TECHNICAL DATA ARE SUBJECT TO CHANGE

公司

中国分公司 太泓电热科技（南京）有限 公司
南京栖霞区金马路3号
Tel. 025 5850 6579
Mobile 17302583397
luxin@turk-hillinger.com
www.turk-hillinger.com

Türk+Hillinger GmbH
Föhrenstr. 20
78532 Tuttlingen
Germany
Tel. +49 74 61-70 14 0
Fax +49 74 61-70 14 110
info@tuerk-hillinger.de
www.tuerk-hillinger.de

TÜRK+HILLINGER
THERMAL TECHNOLOGY