



winkler



↓ Energy

↓ Weight

↓ Space



## HEATING SOLUTIONS FOR RAIL APPLICATIONS

2010-09

Heating plays an important role for the safety, reliability and comfort in railway environments, both with regard to rail vehicles and infrastructure.

Snow, ice and extreme changes of temperature can result in the complete failure of mechanical, hydraulic, and electric systems. These problems can be avoided by the provision of suitable electric heating.

Our products offer solutions for temperature maintenance and freeze protection using specially designed electric heating elements and the associated control & monitoring equipment.

Winkler heating devices are always tailored to the specific application.

Backed by more than 30 years of experience, we employ a broad range of technologies to determine the best solution.

**Winkler products comply with all the relevant standards and railway requirements.**

Vibration test in accordance to **EN61373**, fire test in accordance to **DIN 54837**, smoke and toxicity test in accordance to **DIN 5510-2**, electronic equipment used on rolling stock in accordance to **DIN 50155, SIL (safety integrity level) 50128+50129**

**A) Heating cable type WKT**

- Floors
- Wall panels
- Pantographs
- Piping



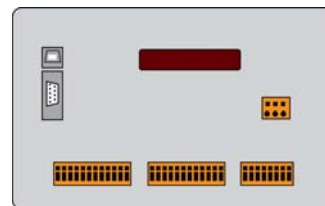
**B) Silicone heaters type WOS**

- Floors
- Fire extinguishing bottles
- Steps
- Faeces containers
- Sand pipes
- Electronic components
- Drives for switches



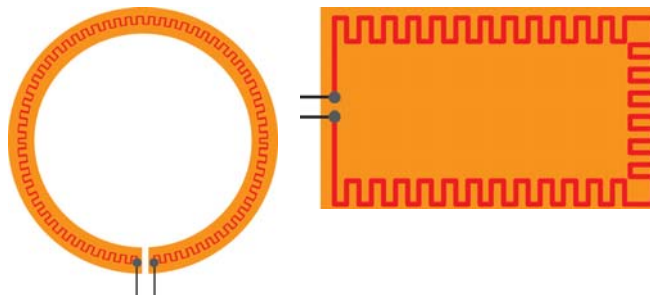
**C) Temperature controllers type WR**

Controllers are customer and project-specific developments according to performance specifications



**D) Heating foils type WOF**

- Displays
- Instruments
- Electronic components
- Ticket machines



**E) Heated hoses and heated pipes type WSKS**

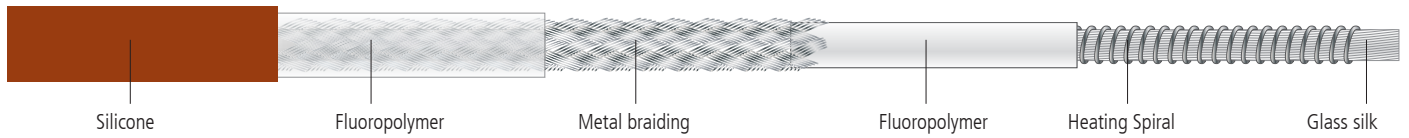
- Hydraulic lines in drives for switches
- Water hoses



**Applications**

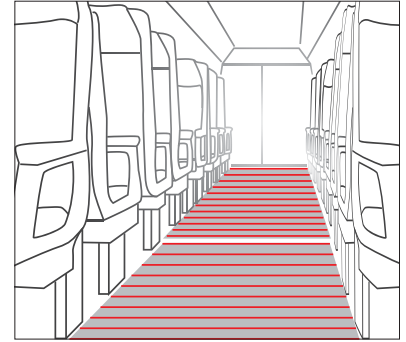
For heating, e.g., floors, wall panels, large surfaces, current collectors, pipes.  
The cable can be fitted into sections, laid along pipes or sewn onto mats.

**Structure**

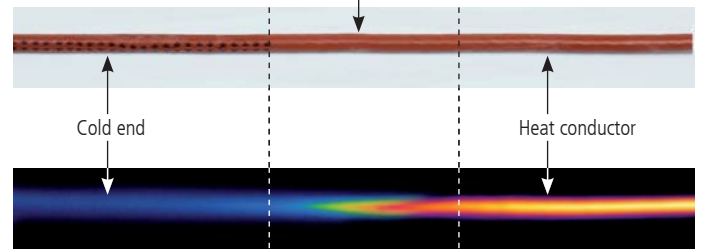


**Characteristics and advantages**

- Robust structure with high-quality insulation material
  - high resistance against mechanical and thermal influences
- Spiralled heat conductor
  - no longitudinal expansion during heating process
  - greater flexibility
  - safety against breakage
- „Seamless Technology“ connection between cold end and heat conductor
  - ideal electrical connection without risk of interruption, loose contacts or contact resistance
  - no risk of moisture penetration
  - unchanging cross-section without thickening at the transition between cold end and heat conductor
- Wide range of resistance values available
  - customized design of voltage, power and length

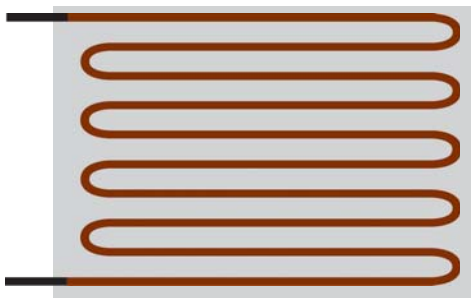
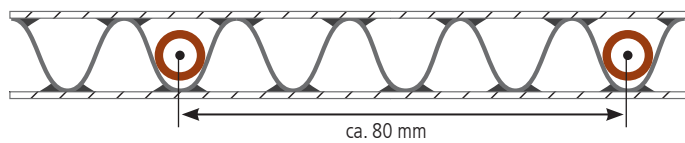


**Seamless Technology**

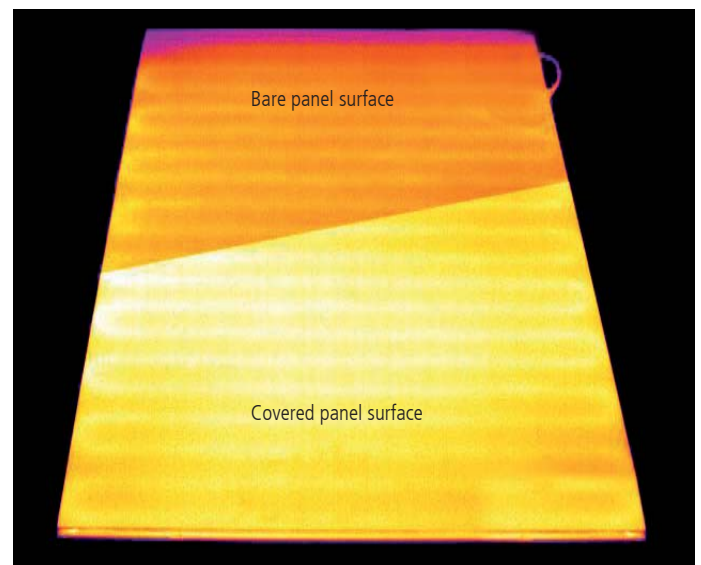


Thermographic camera image

**Installation example: Aluminium sandwich panel of Metawell GmbH**



**Vibration tested in accordance to EN61373**



Thermographic camera image

$\varnothing = \text{ca. } 5 \text{ mm}$ 
 $L_{\text{max}} = 50 \text{ m}$   
 $L_{\text{min}} = 1 \text{ m}$ 
 $50 \text{ g/m}$ 
 $U_{\text{max}} = 500 \text{ V}$ 
 $P_{\text{max}} = 50 \text{ W/m}$ 
 $T_{\text{max}} = 150 \text{ }^\circ\text{C}$ 
 $R_{\text{min}} = 25 \text{ mm}$

**Applications**

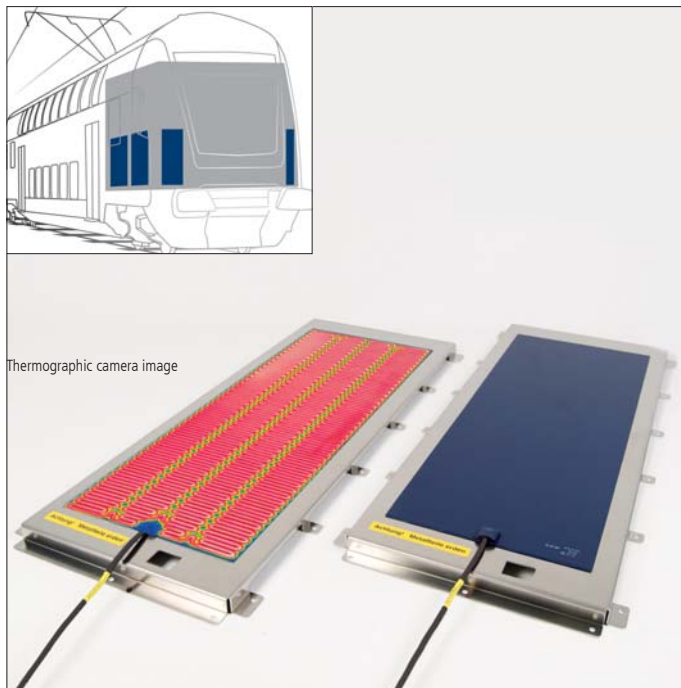
For heating, e.g., floors, fire extinguishing bottles, steps, faeces containers, sand pipes, electronic components, drives for switches

**Characteristics and advantages**

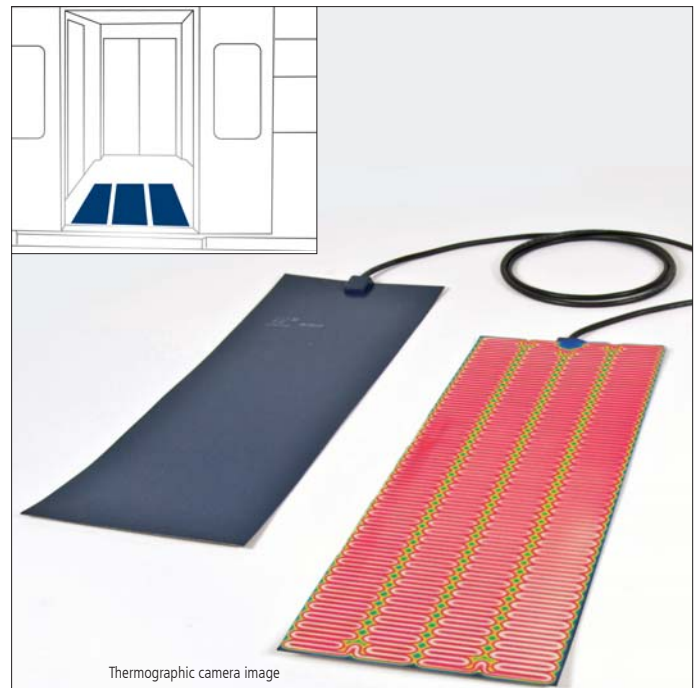
- Heat conductor embedded between two layers of vulcanized silicone with glass-fabric reinforcement
  - flexibility combined with high mechanical strength
  - moisture resistant (IP65)
- Application-specific shape and individual heat conductor layout
  - excellent fitting accuracy
  - optimized and even heat distribution
- Thermal insulation with silicone foam possible
  - no additional insulation expenditure after installation
- Wide range of installation options available (self-adhesive foil, hooks, eyelets, Velcro tape)
  - easy and safe installation for permanent operation



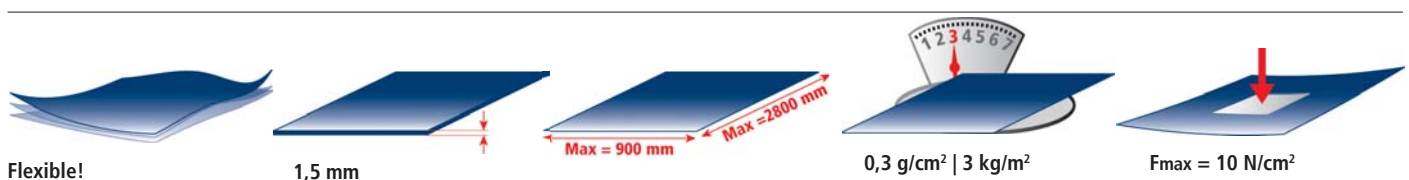
Silicone heaters with insulation foam for the frost protection of water bottles for fire suppressing systems



Silicone heaters mounted on aluminum panels for the heating of electronic equipment



Silicone heaters for the heating of the entry areas in trams





Silicone heaters for the de-icing of steps



Silicone heaters for the heating of sandtubes of emergency brakes

TEMPERATURE CONTROLLERS TYPE WR



Silicone heaters for the heating of switch drives



Controllers are customer and project-specific developments according to performance specifications



U<sub>max</sub> = 800 V



P<sub>max</sub> = 0,6 W/cm<sup>2</sup>  
6 kW/m<sup>2</sup>



T<sub>max</sub> = 180 °C



Ambient temperature  
-40 °C +80 °C



Certified  
DIN  
5837 + 5310-2

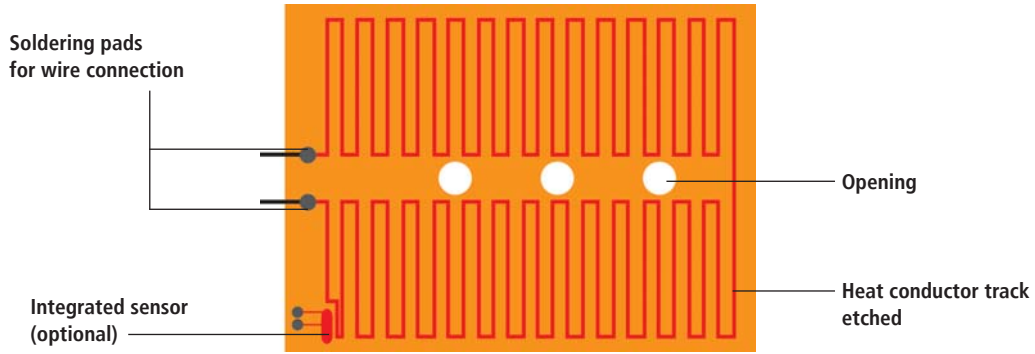


IP65

**Applications**

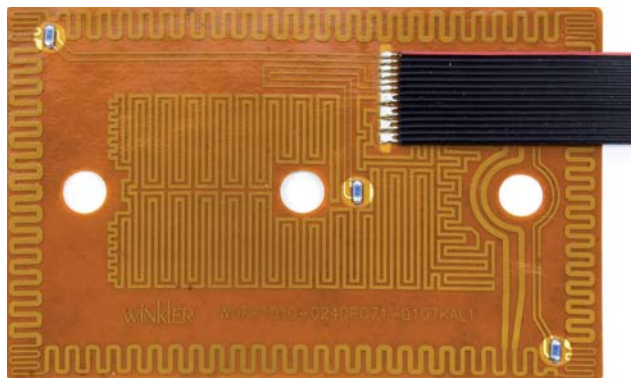
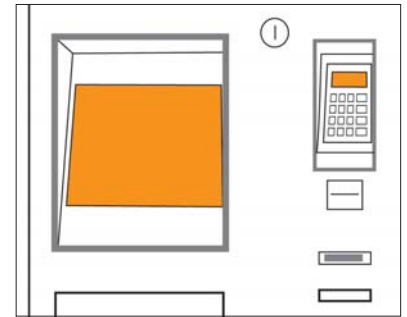
For heating, e.g., displays, ticket machines, instruments, electronic components.

**Structure**



**Characteristics and advantages**

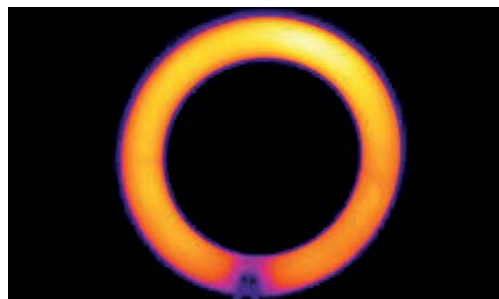
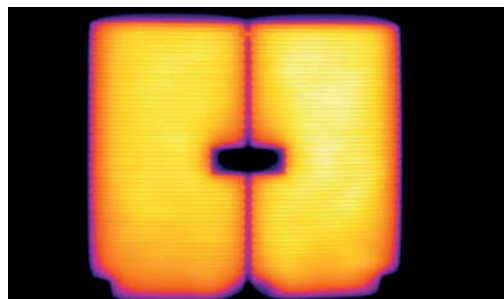
- Etched heat conductor enclosed between two thin polyimide foils
  - minimal thickness and light weight
  - fast heating up time
- Allows minimal heat conductor spacing
  - suitable for heating very small areas
  - several heating circuits with different power densities possible
- Application-specific shape and individual heat conductor layout
  - enables heat application on complex surfaces
  - precise and even heat distribution
- Easy installation using self-adhesive foil



Example Heating foil with flat cable, three sensors, openings and several heating circuits



Example Circular heating foil with soldering pads and openings



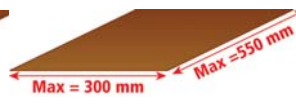
Thermographic camera image



Flexible!



0,2 mm

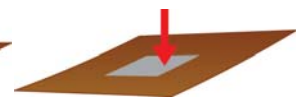


Max = 300 mm

Max = 550 mm



0,05 g/cm<sup>2</sup> | 0,5 kg/m<sup>2</sup>



F<sub>max</sub> = 10 N/m<sup>2</sup>



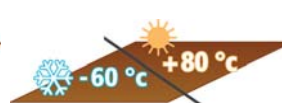
U<sub>max</sub> = 230 V



P<sub>max</sub> = 0,8 W/cm<sup>2</sup>  
8 kW/m<sup>2</sup>



T<sub>max</sub> = 180 °C

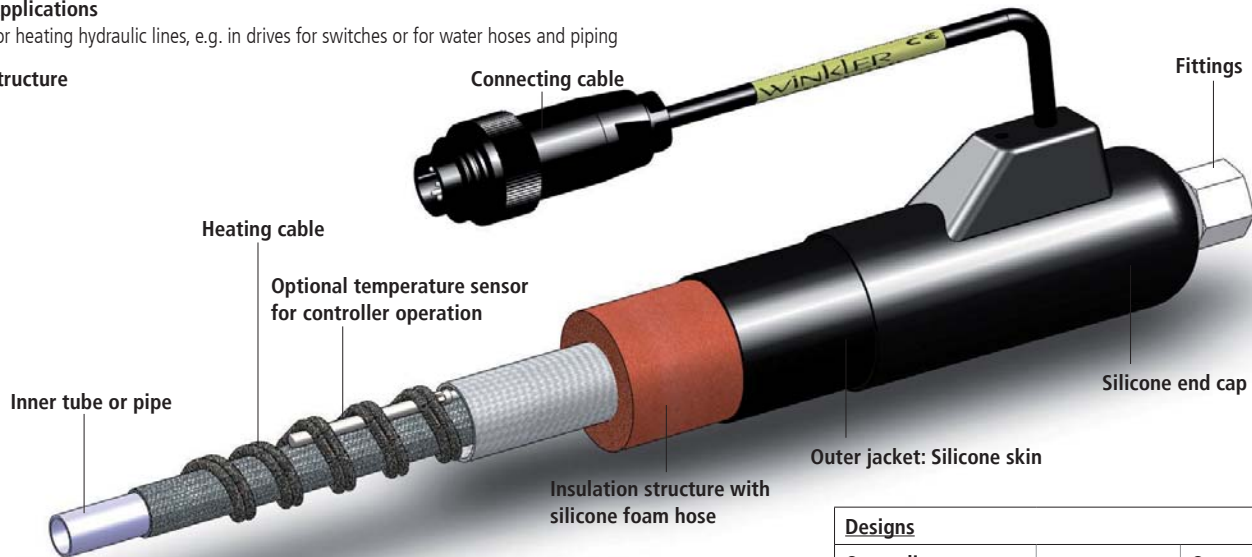


Ambient temperature

**Applications**

For heating hydraulic lines, e.g. in drives for switches or for water hoses and piping

**Structure**



**Characteristics and advantages**

- Spiralled heat conductor with high-quality insulation materials
  - heating of hoses without loss of flexibility
  - even heat distribution
  - moisture resistant
- Thermal insulation structure with silicone foam and robust silicone outer jacket
  - ideal thermal insulation combined with high mechanical strength
  - high flexibility, small bending radius possible
- Compact system ready for connection including inner tube, heater and thermal insulation
  - easy and fast installation for permanent operation
- Wide range of possible lengths, diameters and fittings

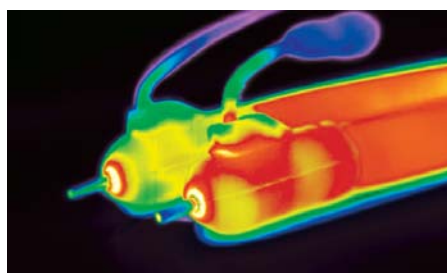
Designs		
Outer diameter of inner tube		Outer diameter of heated hose
10-25 mm		S3 (50 mm)
6-16 mm		S2 (40 mm)
4-10 mm		S1 (30 mm)



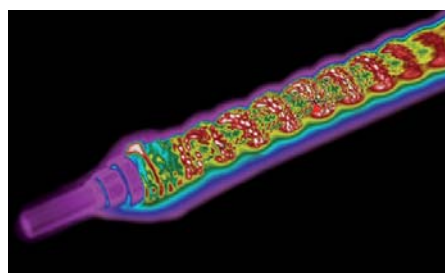
Example  
Heated hoses designs S1 and S2



Example  
Different fittings for a customized application



Thermographic camera image



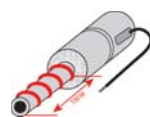
Lmax = 20 m



Ø = 4-25 mm



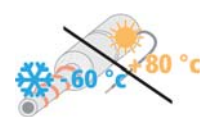
Umax = 400 V



Pmax = 100-250 W/m



Tmax = 180 °C



Ambient temperature



IP55

Winkler GmbH is an independent, medium-sized company located in Heidelberg (Germany). For 30 years we have been developing and manufacturing a broad range of electric heating solutions for industry and laboratory applications.

**We supply reliable and durable products made of high-quality materials.**

We are the right partner for innovative and quick answers to your requirements. Customized solutions and flexible manufacturing are our particular strengths. Our experienced specialists will offer you sound advice and - together with you - develop the heating solution tailored to your application.

**Winkler - Your heating solution!**



Headquarter



Heidelberg

**Winkler GmbH**  
Englerstrasse 24  
D-69126 Heidelberg  
Germany

Tel. +49-6221-3646-0  
Fax +49-6221-3646-40  
E-Mail: sales@winkler.eu  
www.winkler.eu



**Your contact:**

**Wolfgang Weis**  
Sales Manager OEM Surface Heaters

Tel: +49-6221-3646-20  
Fax: +49-6221-3646-40

www.weis@winkler.eu



## Tested to DIN 54837 and DIN 5510-2



Die Prüfstelle ist „Assoziierter Partner der Benannten Stelle Interoperabilität“ und vom Eisenbahn-Bundesamt anerkannt.

Deutsche Bahn AG  
Systemverbund Bahn  
DB Systemtechnik  
Prüfstelle  
Pionierstraße 10  
32423 Minden

**Prüfbericht**  
**Brandprüfung nach DIN 54837**



Dokument: 08-P-4010-VTZ35-PR-0351  
Datum: 06.03.2008

Fachabteilung: DB Systemtechnik  
Instandhaltungstechnik  
Werkstofftechnik, Schwachstellenanalysen  
Bahntechnikerring 74  
14774 Brandenburg-Kirchmöser



Anwendung siehe Blatt die DQS GmbH  
Deutsche Gesellschaft für Zertifizierung von Managementsystemen  
zertifiziertes Qualitätsmanagementsystem

Die Prüfergebnisse beziehen sich ausschließlich auf die im Prüfbericht beschriebenen Prüfobjekte. Dieser Prüfbericht darf nicht ohne schriftliche Genehmigung des Auftraggebers veröffentlicht werden. Eine auszugsweise Vervielfältigung bedarf zusätzlich der Zustimmung der Prüfstelle.



Die Prüfstelle ist „Assoziierter Partner der Benannten Stelle Interoperabilität“ und vom Eisenbahn-Bundesamt anerkannt.

Deutsche Bahn AG  
Systemverbund Bahn  
DB Systemtechnik  
Prüfstelle  
Pionierstraße 10  
32423 Minden

**Prüfbericht**  
**Rauchgastoxizität nach DIN 5510-2, Anhang C**



Dokument: 08-P-4010-VTZ35-PR-0352  
Datum: 06.03.2008

Fachabteilung: DB Systemtechnik  
Instandhaltungstechnik  
Werkstofftechnik, Schwachstellenanalysen  
Bahntechnikerring 74  
14774 Brandenburg-Kirchmöser



Anwendung siehe Blatt die DQS GmbH  
Deutsche Gesellschaft für Zertifizierung von Managementsystemen  
zertifiziertes Qualitätsmanagementsystem

Die Prüfergebnisse beziehen sich ausschließlich auf die im Prüfbericht beschriebenen Prüfobjekte. Dieser Prüfbericht darf nicht ohne schriftliche Genehmigung des Auftraggebers veröffentlicht werden. Eine auszugsweise Vervielfältigung bedarf zusätzlich der Zustimmung der Prüfstelle.