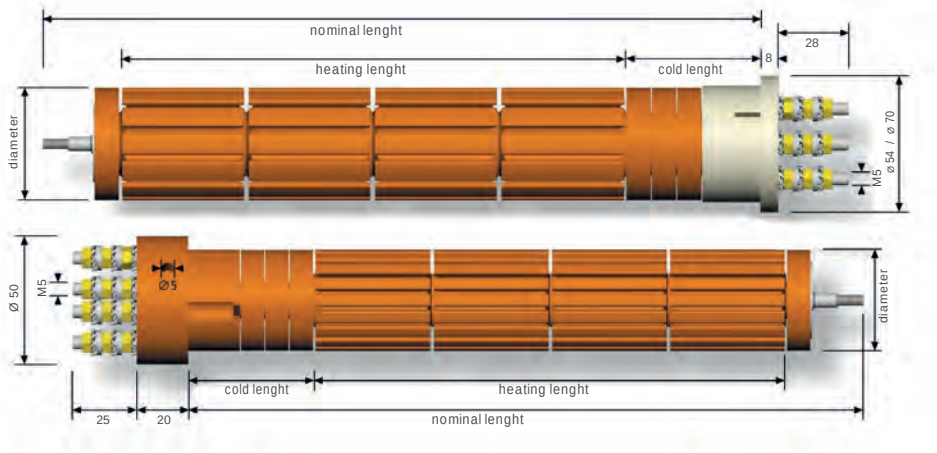
SINGLE-TUBE FOR WASHING SYSTEMS, DEGREASING WITH AGGRESSIVE AGENTS
(FREON, TRICHLOROETHENE, CAUSTIC SODA) AND FOOD

- **2" Gas - 2 "1 /2 Ga s stain less steel connection or flanged or without connection**
- **Aisi 316 or titanium (TI) sheath**
- **Element diameter 44.5/63.5**
- **Voltage 230V/400V on ø 44.5 and 63.5**
- **IP64 protection**
- **They are available as spare parts for all thermal ranges**



Especially suitable for direct heating of washing fluids and of alkalin solutions.
To allow a maximum freedom of choice in the design of the plant, we adapt our products to specific needs:

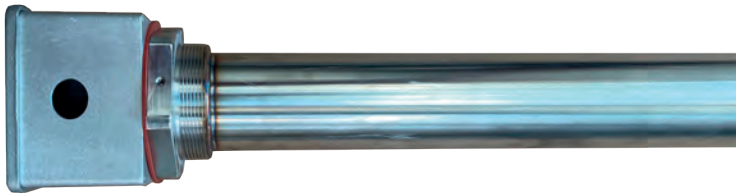
- cartridge heating bodies without outer tubular sheaths in varied diameters, installation lengths and specific loads, customised according to different requirements;
- cartridge heating bodies with outer tubular sheaths of varied materials and with multiple fixing possibilities, such as flanges or threaded nipples.

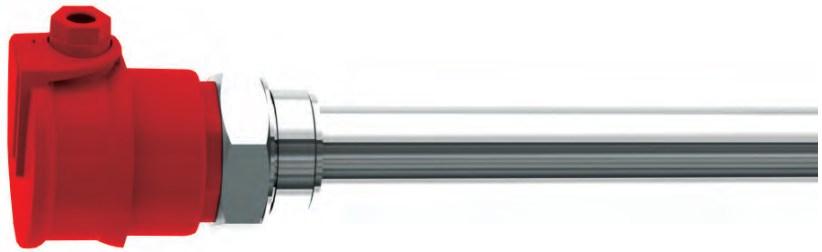
Specifications of cartridge heating bodies
Cartridge heating bodies have grooved bodies made of a ceramic material with a high degree of electrical insulation, a good mechanical strength and an excellent resistance to temperature changes. Resistive coils are built with high temperature resistant filaments, and design parameters ensure an excellent thermal conductivity and a long service life. Under the connecting head, there is a 50 mm unheated area.
This unheated section can be extended on request.
Heating cartridges are available in a wide range of supply voltages, up to a maximum of 500V, with a single-phase and three-phase connection.
The modular structure allows us to make customised solutions at any time by variations in the rated length, the rated voltage and the rated power.

Material specifications for the outer tubular sheaths
Depending on the conditions of use and requirements, we offer you different materials with different types of fastening.
Il the surface load of the outer tubular sheath depends on type of use.
This ability to customise projects is a guarantee of long life and operation.

Possibility of fixing and terminal casings of outer tubular sheaths
We have provided a variety of attachments for your applications.
Depending on the type of application, the outer tubular sheaths can be supplied without a fixing flange, with a welded or screwed flange or with a threaded nipple.
If there are multiple outer tubular sheaths placed close to each other, we recommend fitting a central terminal casing. If there are only single outer tubular sheaths or there is a large distance between them, a special protection must be selected for each sheath.
As a single protection, you can choose between the BC polypropylene (PP) or BC/L polyvinyl fluoride (PVDF) terminal casings.
With the SB mounting key, the protection is quick and easy to mount.
Alternatively, especially for high temperatures, you can also use the B galvanised steel terminal casing.

Electrical safety
According to EN 60519/1-2, cartridge heating bodies are classified as class I protection devices. All contact metal parts (outer tubular sheaths) are connected to the protection lead.





Ø 63.5 MM SINGLE TUBE - 2"1/2 GAS CONNECTION 400V THREE-PHASE IP64 COMPLETE WITH A FCL6 TYPE BOX HORIZONTAL USE ONLY				
L./mm	W	D.	Cold lenght	Code
600	3000	63,5	100	113.X.000010
710	4000	63,5		113.X.000020
900	5000	63,5		113.X.000030
900	6000	63,5		113.X.000040
1200	7000	63,5		113.X.000050
1200	8000	63,5		113.X.000060
1800	10000	63,5		113.X.000070
2000	11000	63,5		113.X.000080

OTHER FORMATS ON DEMAND

Different lengths, power and cold areas are available, as well as single-phase 230V versions

Ø 44.5 MM SINGLE TUBE - 2" GAS STAINLESS STEEL CONNECTION 230V SINGLE PHASE IP64 - WITH BC MODEL BOX HORIZONTAL USE ONLY				
L./mm	W	D.	Cold lenght	Code
400	1500	44,5	to be stated at the order stage	113.X.000090
500	2000	44,5		113.X.000100
600	2500	44,5		113.X.000110
700	3000	44,5		113.X.000120
800	3500	44,5		113.X.000130

Ø 44.5 MM SINGLE TUBE - 2" GAS STAINLESS STEEL CONNECTION 400V THREE-PHASE IP64 - WITH BC MODEL BOX HORIZONTAL USE ONLY				
L./mm	W	D.	Cold lenght	Code
400	1500	44,5	to be stated at the order stage	113.X.000140
500	2000	44,5		113.X.000150
600	2500	44,5		113.X.000160
700	3000	44,5		113.X.000170
800	3500	44,5		113.X.000180
900	4000	44,5		113.X.000190
1000	4500	44,5		113.X.000200
1200	5000	44,5		113.X.000210
1400	6000	44,5		113.X.000220
1600	7000	44,5		113.X.000230
1800	8000	44,5		113.X.000235
2000	9000	44,5		113.X.000238

STRAIGHT SINGLE-TUBE HEATERS

Straight single-tube heaters are for a direct-type electric heating that is more suitable for a wide range of process fluids.
Excellent corrosion resistance is ensured by the use of various types of materials.
The various mounting possibilities respond to the most diverse heating needs.
The use of materials with a high quality standard is a guarantee for a long life and a good reliability of our products, which allow you to operate plants at a low rate of faults.
The straight single-tube heater has a modular structure and it consists of an outer tubular sheath (built from different types of materials), a "long-life" heating cartridge (inner thermal field), a terminal casing, a power cord (optional).

OUTER TUBULAR SHEATH

We can offer you the most suitable materials for each application.
The heating section has a permanent ring marking (minimum immersion length) and is equal to about two-thirds of the nominal length of the tube.
The part of the pipe that stays above the marking is not heated.
The heated part must always be immersed in the liquid even at large variations of the liquid level!

LONG-LIFE HEATING CARTRIDGE

Long-life heating cartridges have grooved bodies made of a ceramic material with a high degree of electrical insulation and a good mechanical strength. Resistive coils are built with special filaments that withstand high temperatures, and the design parameters ensure an optimal flow of thermal energy to the fluid to be heated. Heating cartridges are available in a wide range of supply voltages, up to a maximum of 500V, with a single-phase or three-phase connection.

BC-LC TERMINAL CASING

The standard terminal block is made of polypropylene. Good mechanical, thermal and chemical resistance ensures they can be used with most process liquids. At very high temperatures (>80°C) or with strong oxidising substances (e.g., electrolytes of chromium or HNO3), the PVDF (BC/L or LC/L) protection is recommended. The protection rating is IP65 (EN 60529).
Supply cable connection is also possible with the mounted protection, by removing the cover using the SB or SL mounting key.

ELECTRICAL SAFETY

According to EN 60519/1-2 tubular heaters belong to protection class 1.
All metal contact parts are connected to the protection lead. To ensure the grounding protection even to non-electro-conductive sheaths, a protective coil is mounted on the heating cartridge. If the supply circuit provides differential protection, maximum electrical safety is guaranteed.
All heaters are manufactured under the VDE brand name.

ACCESSORIES

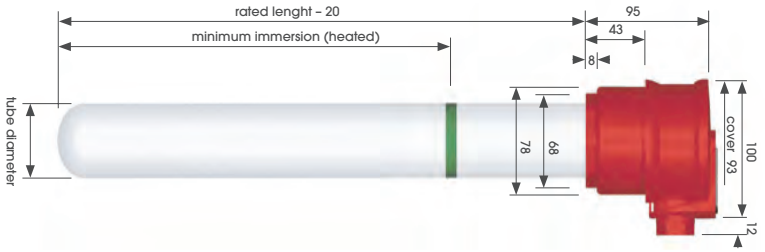
- EM - HM - ML sleeve-spacer
- HB - HL support
- SRF protection tube
- SB - SL mounting key
- THB - SHB support

Chemicals in process liquids raise the most varied concernd related to the corrosion resistance of materials used. However, in the selection phase, we must also consider the physical problems that may arise (fouling), and thermal limits (surface load).
Advantages and disadvantages of individual materials are given separately in the list of resistors. The specific surface load for tubes is given in W/cm2 based on minimum immersion and rated power.

TUBULAR HEATERS

STRAIGHT SINGLE TUBE HEATERS FOR SPECIAL BATHS

- **Special hard porcelain sheath vitrified ø 54 (PS)**
- **Heating part with permanent ring marking**
- **Polypropylene terminal block**
- **IP65 Protection**
- **Voltage: 230V - 400V**
- **Box model: BC IP65, polypropylene**



AVAILABLE ON REQUEST

Sheath of:

- Technical glass Ø 50 (TG)
- Quartz glass Ø 52 (QS)
- PTFE Ø 48 (FC)
- Stainless steel AISI 316 Ø 45 (KB)
- Titanium Ø 45 (TI)
- Terminal casing: Box model: BC/L IP65, polyvinyl fluoride (PVDF)

STRAIGHT MINI HEATERS FOR SPECIAL BATHS

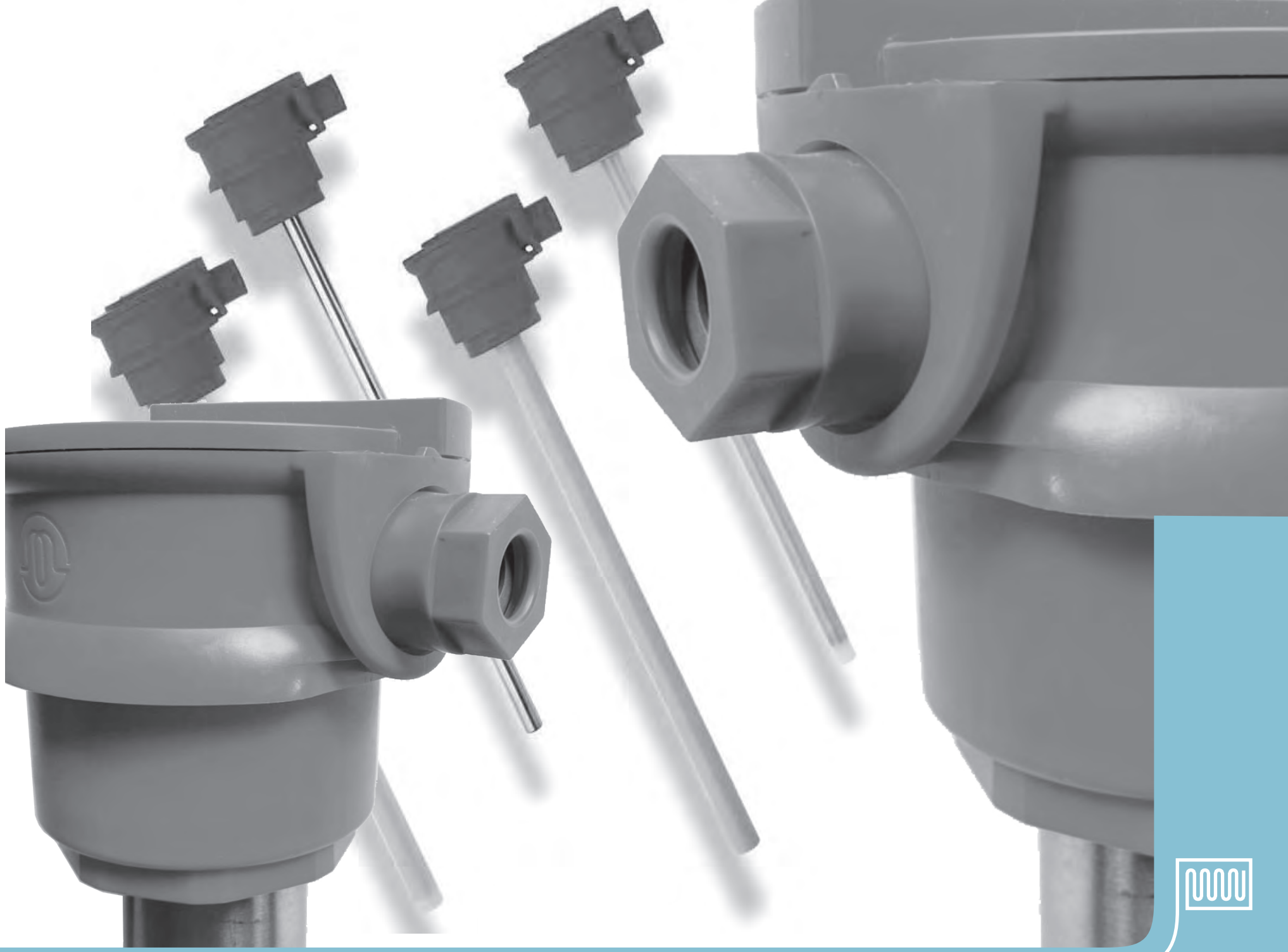
- **Special hard porcelain sheath vitrified ø 28 (PS)**
- **Heating part with permanent ring marking**
- **Polypropylene terminal block**
- **IP65 Protection**
- **Voltage: 230V**
- **Box model: LC IP65, polypropylene**

AVAILABLE ON REQUEST

Sheath of:

- Technical glass Ø 28 (TG) up to a rated length of 500
- Stainless steel AISI 316 Ø 25 (KB)
- Titanium Ø 25.4 (TI)
- Terminal casing: Box model: LC/L IP65, polyvinyl fluoride (PVDF)

STRAIGHT HEATERS FOR SPECIAL BATHS - PORCELAIN (PS)					
Lenght (mm)	Power (KW)	Min. immersion (mm)	PS	Voltage 230V	Voltage 400V
315	0,40	225	1,6	113.X.000240	-
	0,63		2,5	113.X.000250	113.X.000560
400	0,63	275	1,9	113.X.000260	113.X.000570
	1,00		3,0	113.X.000270	113.X.000580
500	0,80	360	1,6	113.X.000280	-
	1,00		2,0	113.X.000290	-
	1,40		2,8	113.X.000300	113.X.000590
630	1,25	460	1,9	113.X.000310	-
	1,60		2,4	113.X.000320	113.X.000600
	2,00		3,0	113.X.000330	113.X.000610
800	1,00	560	1,2	113.X.000340	-
	1,60		1,9	113.X.000350	113.X.000620
	2,00		2,4	113.X.000360	113.X.000630
	2,50		3,0	113.X.000370	113.X.000640
1000	1,25	725	1,2	113.X.000380	-
	1,60		1,5	113.X.000390	113.X.000650
	2,00		1,9	113.X.000400	113.X.000660
	2,50		2,3	113.X.000410	113.X.000670
	3,15		2,9	113.X.000420	113.X.000680
	3,50		3,2	113.X.000430	113.X.000690
1250	1,00	875	0,8	113.X.000440	-
	1,60		1,2	113.X.000450	113.X.000700
	2,00		1,5	113.X.000460	113.X.000710
	2,50		1,9	113.X.000470	113.X.000720
	2,80		2,1	113.X.000480	113.X.000730
	3,50		2,6	113.X.000490	113.X.000740
	4,00		3,0	113.X.000500	113.X.000750
1600	2,00	1125		113.X.000510	113.X.000760
	3,15			113.X.000520	113.X.000770
1600	3,50	1125		113.X.000530	113.X.000780
	4,00			113.X.000540	113.X.000790
	4,50			-	113.X.000800
	6,00			-	113.X.000810
2000	4,00	1400		113.X.000550	113.X.000820
	4,50			-	113.X.000830
	5,00			-	113.X.000840
	6,00			-	113.X.000850
2500	4,50	1750		-	113.X.000860
	6,30			-	113.X.000870
3150	5,00	2200		-	113.X.000880
	7,00			-	113.X.000890
STRAIGHT MINI HEATERS FOR SPECIAL BATHS - PORCELAIN (PS)					
200	0,315	130	3,7	113.X.000900	
300	0,250	180	1,9	113.X.000920	
	0,315		2,4	113.X.000930	
	0,400		3,1	113.X.000940	
400	0,400	280	1,9	113.X.000950	
	0,800		3,7	113.X.000960	
500	0,500	330	1,9	113.X.000970	
	0,800		3,1		
	1,000		3,9	113.X.000980	
630	0,500	460			
	1,000				
	1,250				
800	0,500	560			
	1,000				
	1,500				
1000	1,000	725			
	1,600				



SINGLE-TUBE HEATERS WITH FIRE CONTROL SYSTEM

Straight heaters with ABS (Anti-Burn System) minimize possible thermal damages to the systems and tanks in the event of a partial or complete loss of the liquid to be heated. Although Regulation EN 60519/1-2 specifies that electrically heated systems must be equipped by the user with a technology that allows safe use (protection against overheating and against dry operation), even the best safety technology cannot protect systems from errors made by operators or from incorrect maintenance.

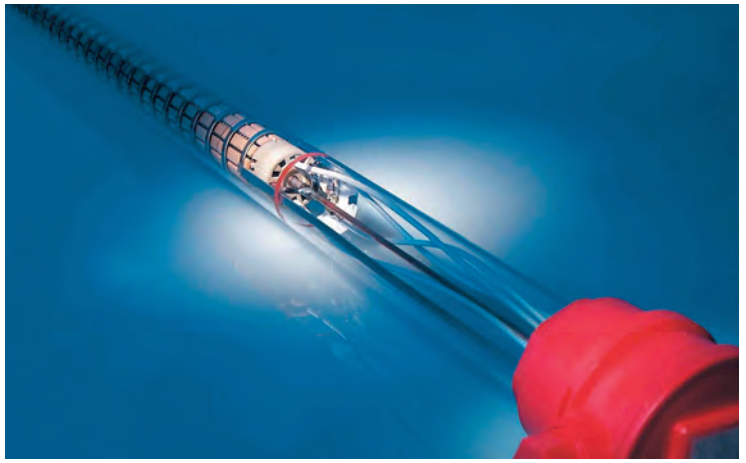
The following "critical" situations in liquid solutions up to 100°C can be avoided by using an immersion safety heater with an anti-burn system:

- operation of the heater even at a low level of liquid (due, for example, to the evaporation of the fluid);
- operation of the heater even in the absence of liquid (due, for example, to a sudden and unexpected loss of fluid);
- operation of the heater when the heat transfer from the tube of the immersion heater to the fluid is reduced (for example, due to high fouling on the immersion tube).

Safety immersion heaters in the straight range with an anti-burn system can take both vertical and horizontal positions in tanks and other systems.
Please note that the normal protection systems against overheating and dry operation must be installed both in the systems and in the tanks, even for the immersion heaters in the straight range with anti-burn systems.
The optimal solution for dealing with this situation is our range of floats, conductive level probes and related control electronics. We will be happy to advise you on the solution that suits your safety needs.

MONO-PHASE OR TWO-PHASE CONNECTION

The integrated anti-burn system blocks too high temperatures and turns off the heater. The heater remains off until the safety circuit is manually reset.
This can only be done if the other safety devices are used correctly, and both the tank and the heater are in a good condition. Heater cartridges are available for all stated voltages up to 400 V and with a given power up to 6.0 kW.



THREE-PHASE CONNECTION

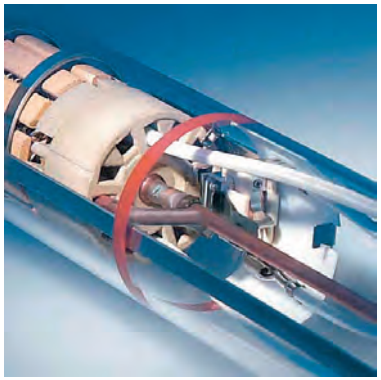
When the immersion tube reaches a temperature that is too high, the integrated anti-burn system disables the resistor using an electronic device called DSW 3/2 and a power relay. The heater is then switched off until the safety circuits in the immersion resistor and the electronics are manually restored.
A necessary prerequisite for the proper use of this procedure is that all devices used operate properly and that both the tank and the resistor are in a good condition. The anti-burn system can be installed in all three-phase resistors with rated voltages up to 400V and a current consumption from 1.8 to 16 A.

The DSW 3/2 differential current monitor controls currents in the individual phases (L1, L2, L3) of a three-phase power supply. When the limit value set for power consumption is exceeded, the power contactor switches off via the relay contact and the display shows an error message. The recommended limit value for power consumption imbalance is 5%.
The actual parameters of the process (e.g., phase current) are indicated on the display. If the values exceed or do not reach the set limits, the display shows the corresponding error message.

The DSW 3/2 differential current monitor is activated in the following situations:
- overload protection (for monitoring the current consumption);
- phase current malfunction (if the temperature limiter in the immersion heater is enabled);
- phase current malfunction (if the heating resistor stops working or in case of a cable breakage).

After an “error” phase, the DSW 3/2 differential current monitor can be reset directly from the control keys.
If the error is not solved, the differential current monitor goes in the alarm state again and the corresponding error message is shown on the display.
The DSW 3/2 differential current monitor is an IO link device.
Therefore, it can be used as a sensor/actuator for transferring data parameters to the PLC (via the IO link protocol).

With a PLC and an IO link you can also monitor the following parameters:
- monitoring of phase current overload;
- monitoring for an insufficient phase current;
- monitoring of the 2 joint variables;
- monitoring of current imbalances;
- detection of the three-phase powered state;
- phase sequence detection (inductive load).



DSW 3/2 TECHNICAL DATA

Code	221.x.000200
Dimensions	W = 45 mm, H = 86 mm, D = 80 mm
Mounting	35 mm guides (with DIN EN 60715)
Ambient temperature	-25...60°C
Maximun humidity	10...95 % (no condensation)
Power supply voltage	24 V DC ± 15 %
Power consumption	2,5 W a 24 V DC
Measurement input	3 x I with I_{MAX} = 16 A~
Output	Relay contact 230 V / 3 A~
Terminal section	1,5 mm^2...4 mm^2

TABLE OF SINGLE TUBES FOR DSW 3/2

Immersion heaters with detected power [kW] per 400V 3PH	Max. number of heaters for DSW 3/2
1,6 / 2,0	5
2,5	4
3,15 / 3,5	3
4,0 / 5,0	2
6,3 / 7,0 / 8,0 / 10,0	1

TYPE DESIGNATION

... - ... ... / ... - ... ...

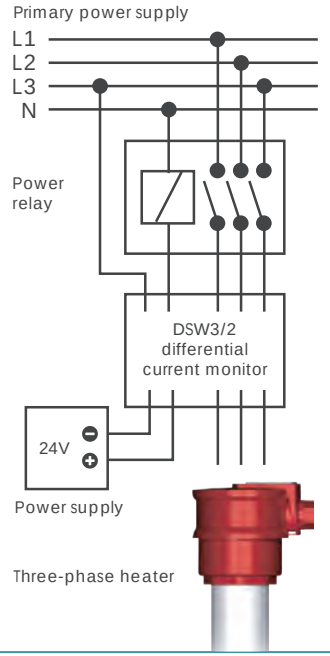
- ... Current type
- ... Rated voltage
- ... Rated power
- ... Nominal lenght
- ... Immersion tube material

T = immersion heater with anti-burn, single-phase
A = immersion heater with anti-burn, three-phase

Example: T - PS 630 / 1,6 - 230 Ws
Immersion heater
straight series with anti-burn system,
porcelain tube,
rated tube length of 630 mm;
Detected power: 1.6 kW;
Detected voltage: 230V (single phase)

Notes on restrictions
The DSW 3/2 differential current monitor cannot be used with other control instruments that have phase angular control or for groups of signals that change sine waves.

THREE-PHASE CONNECTION



ANGULAR IMMERSION HEATERS FOR SPECIAL BATHS (BW)

- **Aisi 316 connection (ø 45)**
- **Heating part with permanent ring marking**
- **Terminal casing: Box model: BC IP65, polypropylene (PP)**

Angular tubular heaters are a form of electric heating that is most suitable for all containers with a low or very variable level of fluid.
The heated horizontal outer tubular sheath allows heating from the bottom of the vessel and ensures an optimal flow of thermal energy to the fluid, as well as a good distribution of heat.
Nominal power is determined decisively by the length of the horizontal outer tubular sheath.
Since you can take advantage of the entire length for heating, a relatively high power is also possible. The unheated vertical outer tubular sheath can be individually adapted to the depth of the vessel. These custom sizes virtually allow any adaptation to vessel geometry.
The compact structure reduces the footprint, thus making the design more effective and economical.
Some standard types of these heaters are given in the table. The surface load is given in W/cm2, based on the rated horizontal heated section and on the rated power. By varying the rated power and the length of the outer tubular sheath, the maximum permissible surface load can be adapted to process fluids.
Angular tubular heaters include the horizontal heated outer tubular sheath with a “long-life” heating cartridge, a vertical unheated outer tubular sheath and a terminal casing.

OUTER TUBULAR SHEATH

The horizontal outer tubular sheath is welded to the vertical one.
The use of different sheath materials ensures an excellent corrosion resistance.
The use of materials with a high quality standard is a guarantee for a long life and a good reliability of our products, which allow you to operate plants at a low rate of faults. To comply with the minimum distance from the bottom of the vessel or for fixing, the angular support feet are welded on the horizontal outer tubular sheath.

“LONG-LIFE” HEATING CARTRIDGE

The “long-life” heating cartridges have grooved bodies made of a ceramic material with a high degree of electrical insulation and a good mechanical strength. Resistive coils are built with special filaments that withstand high temperatures, and the design parameters ensure an optimal flow of thermal energy to the fluid to be heated. Heating cartridges for angular tubular heaters are available in a wide range of supply voltages, up to 500V, with a single-phase or three-phase connection. Heating cartridges cannot be replaced by the user!

TERMINAL CASING

The standard BC terminal casing for angular tubular heaters is made of polypropylene. Good mechanical, thermal and chemical resistance ensures they can be used with most process liquids.
At very high temperatures (>80°C) or with strong oxidising substances (e.g., electrolytes of chromium or HNO3), the BC/L PVDF protection is recommended.
The protection rating is IP65 (EN 60529).
Cable connection is also possible with the mounted protection, by removing the cover using the SB mounting key.

ELECTRICAL SAFETY

We draw attention to the fact that, according to EN 60519/1-2 regulations, users of electric heating systems must ensure their electrical safety (protection against overtemperature and drying).
To achieve this, the optimal solution is to use our level or floating rods with built-in thermal resistors and the related electronic components.
We can offer you the necessary products and advice for all matters related to electrical safety!

ACCESSORIES

Standard supports are available for a secure fixing of angular tubular heaters or a customised flanged attachment can be provided.
We will be happy to advise you on the optimal attachment possibilities for your applications!

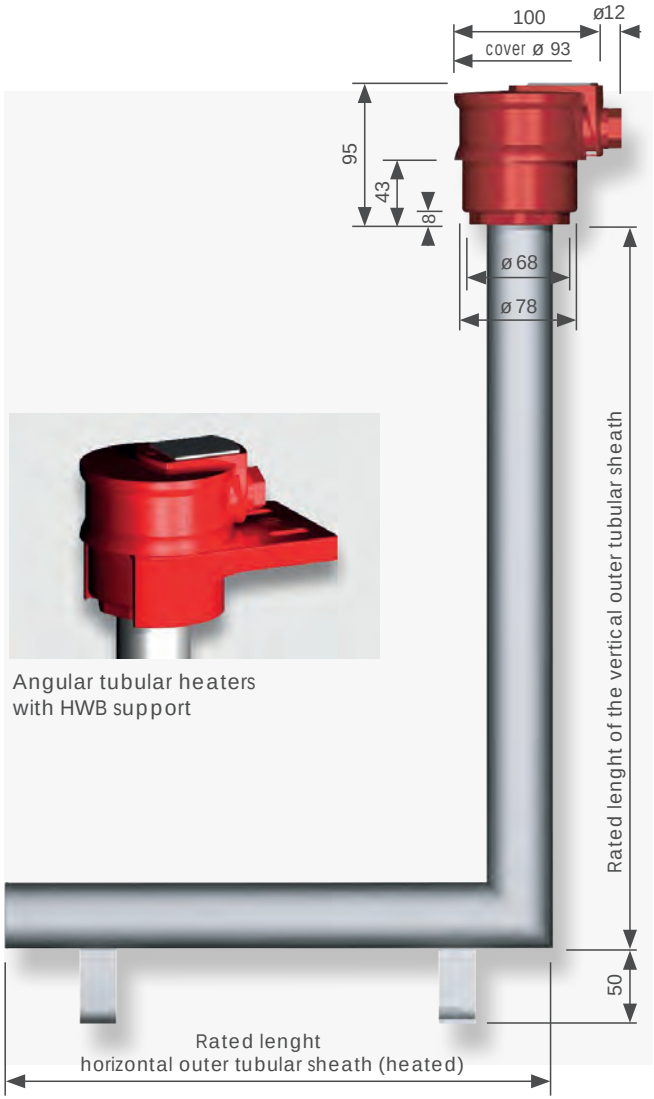
- HWB (PP) support
- HWB/L (PVDF) support
- SB mounting key

Horizontal outer tubular sheath (mm)	Rated power (KW)	Rated voltage 230 V	Rated voltage 400/3 V	KB
250	0,63	113.X.000990	-	3,1
500	2,00	113.X.001000	113.X.001030	3,6
750	3,00	113.X.001010	113.X.001040	3,4
1000	4,00	-	113.X.001050	3,2
1250	5,00	-	113.X.001060	3,2
1500	6,00	-	113.X.001070	3,1
1750	7,00	-	113.X.001080	3,1
2000	8,00	-	113.X.001090	3,1
2250	9,00	-	113.X.001100	3,1
2500	10,00	-	113.X.001110	3,0
2750	11,00	-	113.X.001120	3,0

ANGULAR IMMERSION HEATER MATERIALS

Material logo
Outer tubular sheath diameter [mm]

KB 45 Stainless steel AISI 316
TI 45 Titanium (material no. 3.7035)



Angular tubular heaters
with HWB support