Honeywell

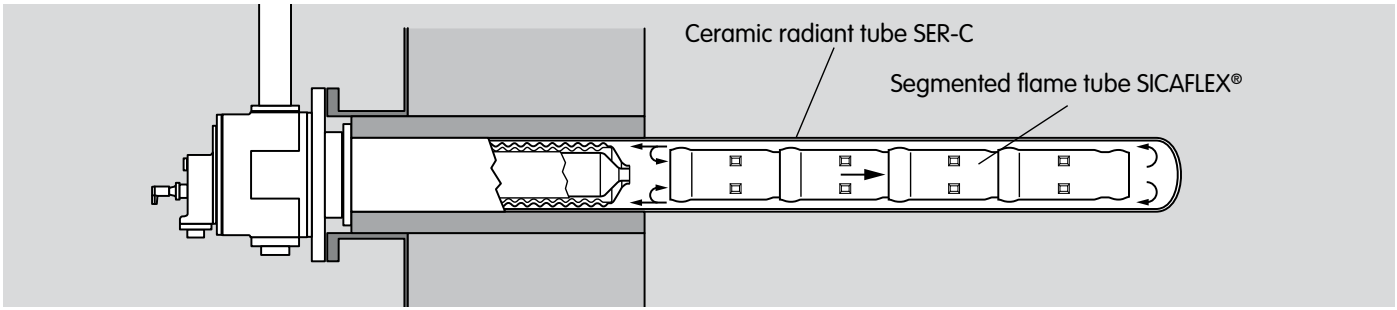
Ceramic radiant tube SER-C

Technical Information · GB
7 Edition 07.19

- Suitable for high temperature applications and high radiation output due to ceramic material
- Can be used in many applications due to different radiant tube diameters
- Patented flange connection for improved gas tightness
- No counter bearing required due to high dimensional stability
- Long maintenance intervals, no rotation of radiant tube
- Long service life due to high resistance to oxidation and corrosion

Contents

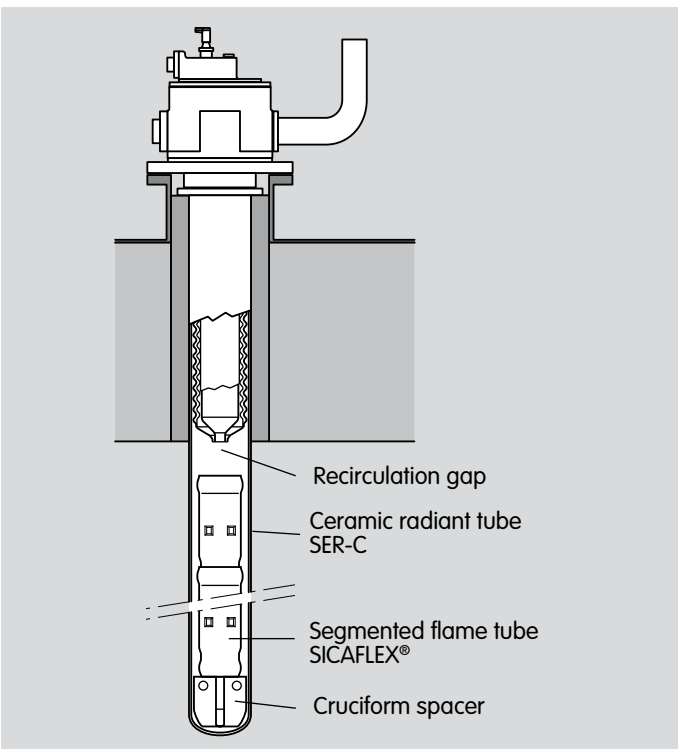
= To be continued



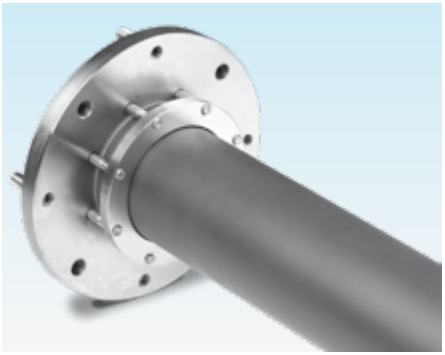
1 Application

The ceramic radiant tube SER-C (SER = single ended radiant tube) is used in conjunction with a self-recuperative burner for indirect heating in heat treatment processes where the combustion gases must be separated from the product.

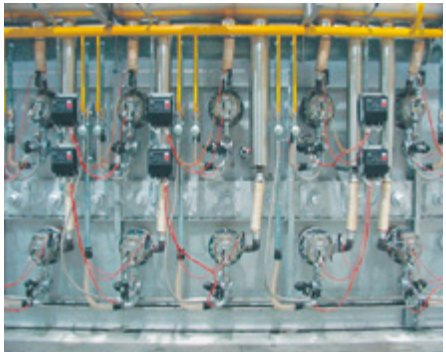
A flame tube must be fitted inside the ceramic radiant tube SER-C to guide the hot flue gases. In the case of vertical installation, a cruciform spacer must also be fitted to ensure optimum sizing of the recirculation gap, see page 12 (Accessories).



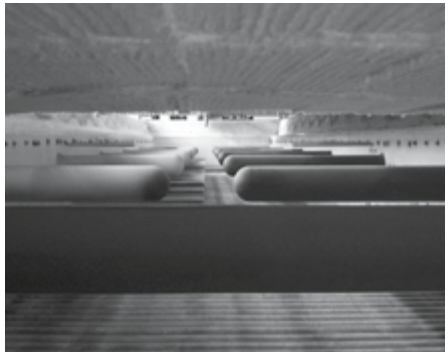
1.1 Application examples



The ceramic radiant tube SER-C with patented flange connection is gas-tight.



Roller hearth furnace for steel tube production



Ceramic radiant tubes SER-C in roller hearth furnace during installation work

2 Selection

The ceramic radiant tube SER-C has dimensions suitable for use with ceramic self-recuperative burner ECOMAX..C.

Standard combinations:

Radiant tube	Burner	Segmented flame tube
SER-C 100/088	ECOMAX 0C	SICAFLEX 100/088/084
SER-C 142/128*	ECOMAX 1C	SICAFLEX 142/127/123
SER-C 162/148*	ECOMAX 2C	SICAFLEX 162/147/143
SER-C 202/188*	ECOMAX 3C	SICAFLEX 202/186/182

** Versions with flange connection for smaller burners are available- see selection table.*

A special design is available for applications with a large hydrogen content (> 40%) in the protective atmosphere.

2.1 Selection table

	-W1000 to -W2600	-W1000 to -W2600	-W1500 to -W3000	-Eco 0C	-Eco 1C	-Eco 2C	-Eco 3C	X	Y	Z
SER-C 100/088	●			●				○	○	○
SER-C 142/128		●		○*	●			○	○	○
SER-C 162/148			●	○*		●		○	○	○
SER-C 202/188			●	○*	○*	○*	●	○	○	○

● = standard, ○ = available
** Additional flue gas guide tube FGT kit required.*

Order example
SER-C 142/128-W1500 -Eco 1C

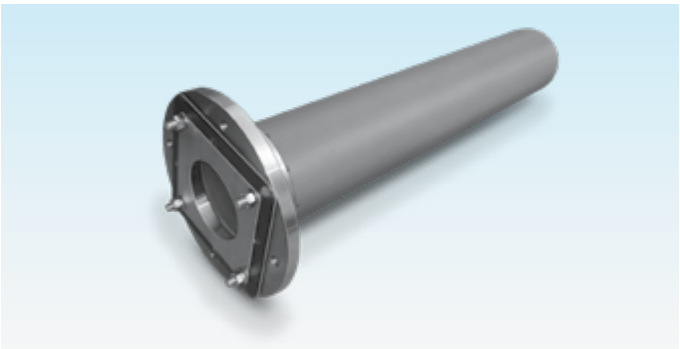
2.1.1 Type code

Code	Description
SER-C	Ceramic single ended radiant tube
	OD/ID [mm]
100/088	100/088
142/128	142/128
162/148	162/148
202/188	202/188
	Length W [mm]
-W1000	1000
-W1100	1100
-W1200	1200
-W1300	1300
...	...
-W3000	3000
	Flange connection for
-Eco 0C	ECOMAX 0C
-Eco 1C	ECOMAX 1C
-Eco 2C	ECOMAX 2C
-Eco 3C	ECOMAX 3C
-FN	third-party product
-	
X	Connection dimensions different from standard
Y	For hydrogen
Z	Special version*

** Further information on request.*

3 Project planning information

3.1 Scope of delivery/delivery of items



Ceramic radiant tube with fitted flange connection including burner seal, threaded bolts, nuts and washers for burner attachment.

The mounting gasket for installation between SER-C and the furnace flange is supplied.

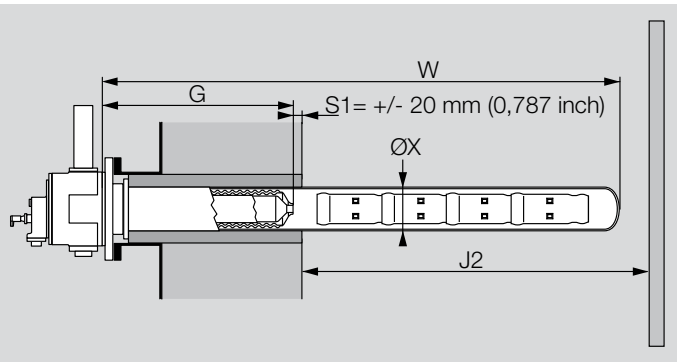
Before delivery, all radiant tubes undergo non-destructive testing for possible capillary cracks. On receiving the delivery, check that the shock sensors on the packaging are intact. A liquid inside a glass tube turns irreversibly red upon heavy impact during transportation.

3.2 Radiant tube length

The length **W** of the radiant tube SER-C depends on the clear furnace width (furnace height) **J2** and the burner length **G**.

Calculation

W ≤ J2 + G + S1 – 40 mm

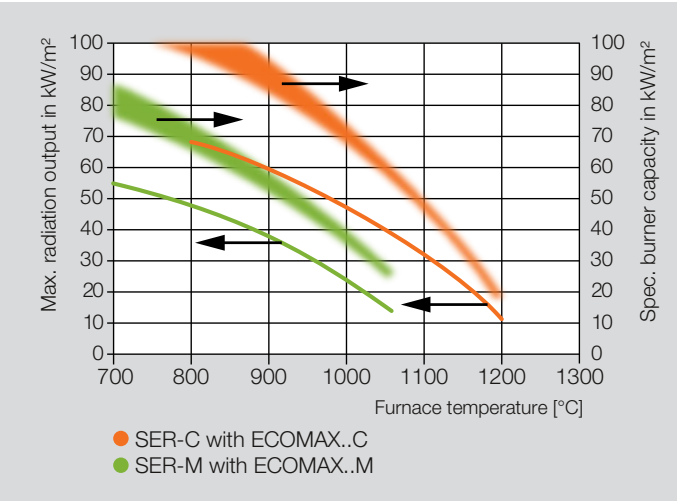


The minimum length of the radiant tube depends on the burner length **G** and the flame length.

Calculation

W > G + 2 x flame length

When designing a radiant tube heating system, it must also be ensured that the permitted material temperatures of the radiant tube, flame tube and burner are not exceeded. Precise determination of these temperatures requires calculation of heat exchange.



3.3 Installation

Install the radiant tube shock-free and free of mechanical stress. Force must not be applied to the radiant tube by the furnace lining.

Ensure that there are threaded bolts on the furnace flange to attach the ceramic radiant tube to the furnace. The furnace flange must be level with and at right angles to the opening in the furnace wall.

Ensure that there is an annular gap between the radiant tube and the furnace lining. The annular gap should be at least 40 mm.

The flange thickness **P1** of the radiant tube including the burner gasket and the thickness **N1** of the mounting gasket add up to either 34 or 37 mm (1.34" or 1.46"), depending on the size.

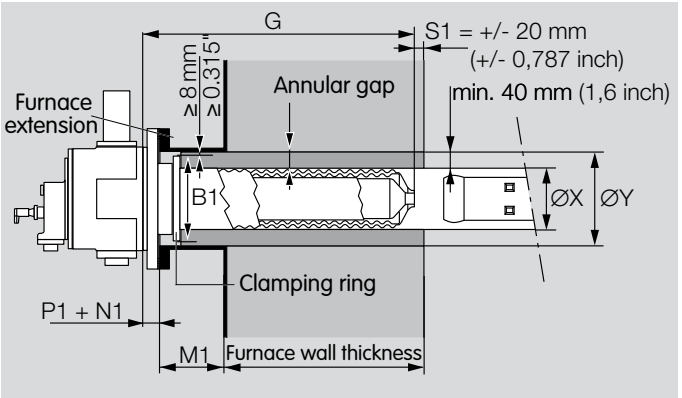
Plan the height of the furnace extension **M1** so that the front edge of the recuperator is flush with the interior furnace wall. Permitted tolerance: max. +/- 20 mm (+/- 0.787") for **S1.**

Calculation

M1 = G – (P1 + N1) – furnace wall thickness.

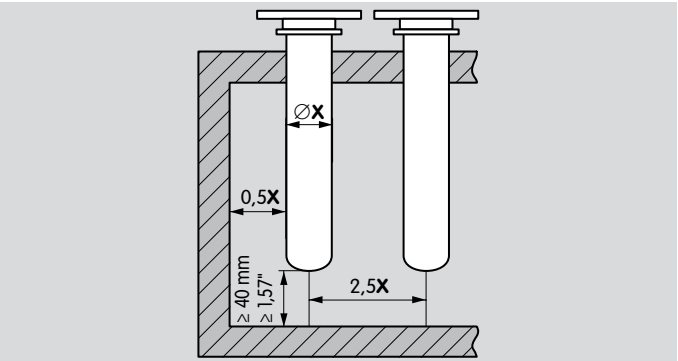
When dimensioning the internal diameter of the furnace extension, note the diameter **B1** of the clamping ring.

Loosely wrap a ceramic fiber blanket or similar material around the radiant tube before installing it in the furnace.



Radiant tube	Clamping ring SER-C ∅B1		Ceramic radiant tube ∅X		Lining ∅Y	
	mm	inch	mm	inch	mm	inch
SER-C 100/088	160	6,3	100	3,94	› 180	≥ 7,1
SER-C 142/128	200	7,87	142	5,59	› 222	≥ 8,7
SER-C 162/148	220	8,66	162	6,38	› 242	≥ 9,5
SER-C 202/188	260	10,2	202	7,95	› 282	≥ 11,1

3.4 Radiant tube distances



The center to center distance of the radiant tubes should be ≥ 2.5**X**. The distance of the radiant tube from the furnace wall, from the furnace floor, or the load to be heated should be 0.5**X** to the side of the radiant tube and ≥ 40 mm (1.57") to the end of the radiant tube.

3.5 Resistance of SiSiC

The ceramic radiant tube SER-C consists of reaction-bound silicon carbide (SiSiC), infiltrated with metallic silicon. During the manufacturing process, a protective layer made of SiO_2 is formed on the surface, which ensures very good chemical resistance. When installing the tubes, it must be ensured that the protective layer on the ceramic surface is not damaged.

Once the tubes have been installed (and, where necessary, once the furnace has been tempered), annealing the radiant tubes for at least 72 hours in a moist air atmosphere at maximum furnace temperature is recommended. The optimal humidity level for this is 50 to 70%. Only then should the furnace be purged and operated with a protective atmosphere.

A minimum humidity in the protective atmosphere is required in order to maintain the protective layer. Too low a humidity (or too low an O_2 content) may lead to conversion of SiO_2 to gaseous SiO and may thus result in gradual destruction of the protective layer and the radiant tube. In the case of high radiant tube temperatures (> 1150°C or 2100°F) or low dewpoints (< -40°C or -40°F), corrosion of the SiSiC ceramics (white deposits, signs of erosion) cannot be ruled out, especially in hydrogenous protective atmospheres. In this case, a shorter service life is to be expected for the ceramics.

Impurities such as fluorine, chlorine and alkali compounds (e.g. with sodium or potassium) in the furnace atmosphere also lead to chemical attack and shorten the service life of the ceramic radiant tube SER-C.

In the case of sub-stoichiometric burner operation (concentration of CO > 1000 ppm), white deposits can build up on the inside of the radiant tube on the SiSiC over a long period of time. The burners should be adjusted so that an excess air value of 1 – 5% O_2 in the flue gas is reached.

3.6 Leakage rates

The leakage rate of the flue gas into the furnace chamber depends on the difference between the radiant tube internal pressure upon operation of the burner and the furnace pressure.

The patented radiant tube connection is free of shaped fiber parts or other parts which are likely to show significant compression-induced deformation with an associated reduction in tightness. Due to the joint being compressed with steel springs, the seals stay in place regardless of the stresses induced by temperature change when operating burners in intermittent mode. This has been proven in laboratory tests over several weeks. Constant compression and an unchanging sealing function can thus be expected for many years.

Radiant tube	max. specific leakage at the flange connection	
	[$Ndm^3/(mbar \times h)$]	SCFH/"WC
SER-C 142	0.082	7.76×10^{-3}
SER-C 162	0.094	8.9×10^{-3}
SER-C 202	0.117	11.1×10^{-3}

Determining the leakage rate

https://www.kromschroeder.de/marketing/adlatus/leckage_serc/leckage_serc.html

4 Accessories

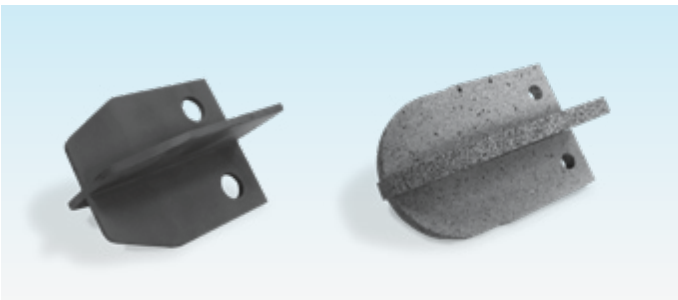
4.1 Segmented flame tube SICAFLEX®

Segmented ceramic flame tubes SICAFLEX® to guide hot flue gases in radiant tubes.

Further information can be found in the Technical Information bulletin “Segmented flame tube SICAFLEX®”.

Order No. on request.

4.2 Cruciform spacer

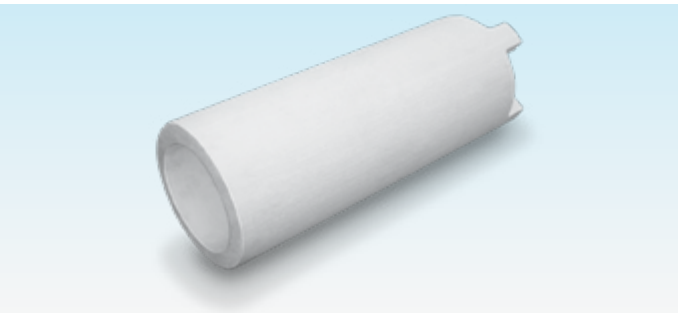


For installation of the segmented flame tube SICAFLEX® in vertical radiant tubes. The cruciform spacer ensures optimum sizing of the recirculation gap between the segmented flame tube and the burner.

Material: refractory clay.

Available on request in different sizes depending on the SICAFLEX® sizes and different heights.

4.3 Flue gas guide tube FGT kit



To guide the flue gases if smaller burners are used than those normally intended; see page 5 (Selection).
The flue gas guide tube ensures sufficient heat exchange via the burner recuperator.

Material: Shaped part made of vacuum-formed ceramic fibers (RCF).

Available on request in different sizes and versions suitable for the SER-C and ECOMAX burner sizes.

5 Technical data

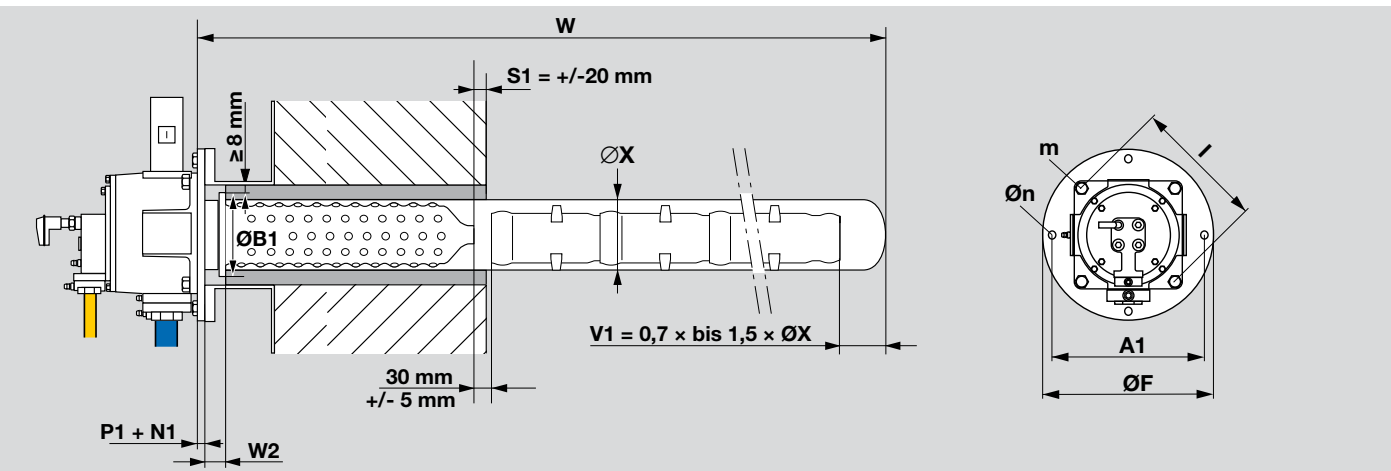
Material:

Radiant tube: SiSiC, max. application temperature 1350°C (2462 °F),

Flange connection: heat-resistant steel, 1.0425 (HII).

Storage temperature: -20°C to +40°C (-4°F to +104°F).

5.1 Dimensions [mm]

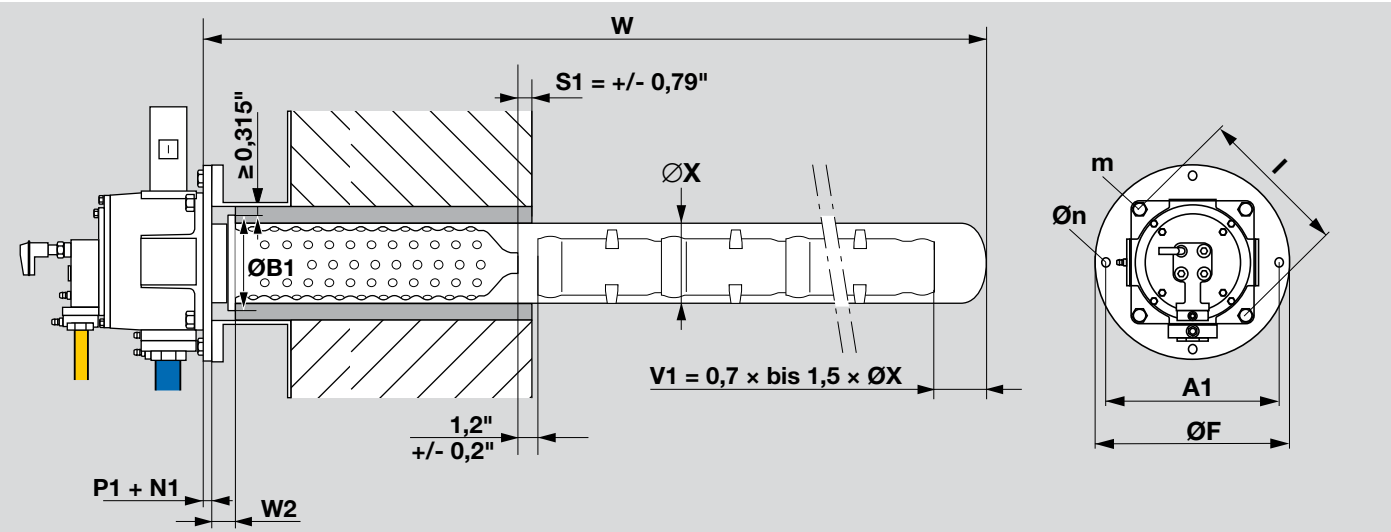


Typ	Dimensions [mm]										
	∅ X	W[1)]	∅ B1	P1 + N1	S1	W2	A1	∅ F	l[2)]	m	∅n
SER-C 100/088	100	1000 – 2600	160	≈ 34	S1 = 0 ± max. 20	35	240	290	210	4xM12	4x14
SER-C 142/128	142	1500 – 2600	200	≈ 37		50	280	330	290	4xM16	4x19
SER-C 162/148	162	1500 – 3000	220	≈ 37		50	280	330	290	4xM16	4x19
SER-C 202/188	202	1500 – 3000	260	≈ 37		50	325	385	330	4xM16	4x19

1) In 100 mm increments.

2) Applicable for standard flange connections, see page 5 (Selection table).

5.2 Dimensions [inch]



Type	Dimensions [inch]								
	∅ X	W[1)]	A1	∅ B1	∅ F	l[2)]	P1 + N1	S1	W2
SER-C 100/088	3.94	39.4 – 102	9.45	6.3	11.4	8.27	≈ 1.34	S1 = 0 ± max. 0.787	1.38
SER-C 142/128	5.59	59.1 – 102	11	7.87	13	11.4	≈ 1.46		1.97
SER-C 162/148	6.38	59.1 – 118	11	8.66	13	11.4	≈ 1.46		1.97
SER-C 202/188	7.95	59.1 – 118	12.8	10.2	15.2	13	≈ 1.46		1.97

[1)] In 4 inch increments.

[2)] Applicable for standard flange connections, see page 5 (Selection table).

6 Maintenance cycles

At least twice per annum, visual inspection together with burner maintenance.

Feedback

Finally, we are offering you the opportunity to assess this “Technical Information (TI)” and to give us your opinion, so that we can improve our documents further and suit them to your needs.

Clarity

- ○ Found information quickly
- ◉ Searched for a long time
- ○ Didn’t find information
  What is missing?
- ○ No answer

Comprehension

- ○ Coherent
- ○ Too complicated
- ○ No answer

Scope

- ○ Too little
- ○ Sufficient
- ○ Too wide
- ○ No answer

Use

- ☐ To get to know the product
- ☐ To choose a product
- ☑ Planning
- ☐ To look for information

Navigation

- ○ I can find my way around
- ○ I got “lost”
- ○ No answer

My scope of functions

- ○ Technical department
- ○ Sales
- ○ No answer

Remarks

Contact

Elster GmbH
Postfach 2809 · 49018 Osnabrück
Strotheweg 1 · 49504 Lotte (Büren)
Germany
Tel. +49 541 1214-0
Fax +49 541 1214-370
hts.lotte@honeywell.com
www.kromschroeder.com

The current addresses of our international agents are available on the Internet:
https://thermalsolutions.honeywell.com ➔ contact us

We reserve the right to make technical modifications in the interests of progress.
Copyright © 2019 Elster GmbH
All rights reserved.

Honeywell

03250777

SER-C · Edition 07.19