

SCHOTT AR-Glas®

Tubing and Rod of Special Glass



SCHOTT
glass made of ideas



Glass Tubing around the world

With an annual production capacity of more than 110,000 tons and production sites on three continents, SCHOTT's Tubing Business Segment is one of the leading manufacturers of glass tubing worldwide.

Through a comprehensive sales network customers in almost every country in the world can be supplied with around 60 different glass types in a wide range of dimensions. All production sites work towards a joint strategy in the areas of R&D, production, quality assurance and logistics. A continuous exchange of technological know-how ensures SCHOTT is a worldwide leader in the tubing field.

SCHOTT Mitterteich, with a staff of 1200 and an annual production capacity of more than 65,000 tons, is the main site for SCHOTT's Tubing Business Segment. Along with coordinating the production and quality assurance for all the business segment's locations worldwide, Mitterteich also coordinates worldwide sales and marketing. New products are also developed and tested here in our own laboratories.

SCHOTT Special Glass Tubing

Glass tubing is an indispensable base material for next generation products and applications in fields such as alternative energy, environmental technology, lighting, microelectronics and medicine. It is the variability of glass as a material which makes it so versatile. Special glass, and in particular AR-Glas®, can provide a custom-made solution to almost any specific problem.

As one of the largest manufacturers worldwide, SCHOTT offers a wide range of dimensions with short lead-times. All special glass tubing and rod from SCHOTT is comprehensively controlled and monitored starting with the raw materials and continuing all way up through shipping and transport. Optoelectronic control mechanisms continuously check the production process to guarantee both high quality and extremely tight geometrical tolerances for our AR-Glas® special glass.

Innovation for the Future

SCHOTT does not only have more than 100 years of experience with glass as a material but with our on-going process innovation, highly-developed technology and fundamental know-how, the Business Segment Tubing is continuously setting the standard for the market.

With our own chemical and physics laboratories, as well as a special scientific and technical consulting team to support our customers, SCHOTT is ideally positioned to research and develop the next-generation solutions.

Contents



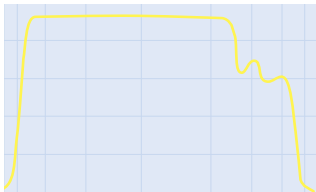
SCHOTT AR-Glas®
The best in quality and service

p. 4



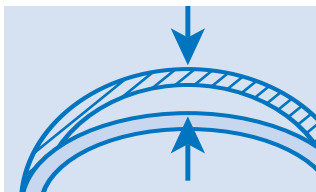
SCHOTT AR-Glas® Product Range

p. 5-8



Physical and Chemical Properties

p. 9



Technical Terms of Supply

p. 10-11

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AR-Glas® for
Solar Collectors



AR-Glas®
in the Laboratory



AR-Glas®
for Artistic
Applications



AR-Glas® for
Food Packaging

Ordering around the clock

*All dimensions shown in this
brochure can be ordered online at:
www.schott.com/tubing/ecom*



AR-Glas® can be ordered around the clock using our convenient and easy to use online shop. The comprehensive and secure login features make ordering simple.







Further information and individual login data are available by phone +49 (0) 9633/80-100, fax +49 (0) 3641/28889-214, or by email at customerservice.tubing@schott.com








Scientific Services

The Scientific Services department of SCHOTT Tubing is available to customers for all questions concerning glass properties, processing and the various applications of AR-Glas®. We offer a wide scope of services ranging from preventative product analysis and independent testing to customer-specific analysis. Equipped with its own chemical and physics laboratories this team of qualified experts is optimally suited to handle any question.






SCHOTT AR-Glas® Tubing

Outside Diameter (OD)	Wall Thickness (WT)	Weight per Tube Length approx. 1500 mm	Carton/ DENSOPACK®		Pallet Load	
 mm	 mm	 g	 Number of Tubes	 Weight approx. kg	 Weight approx. kg	
4	±0.10	0.50 ±0.02	21	582	12.0	540.0
	±0.10	0.70 ±0.03	27	551	15.0	540.0
	±0.13	0.90 ±0.03	33	548	18.0	486.0
5	±0.10	0.50 ±0.02	27	378	10.0	450.0
	±0.10	0.70 ±0.03	36	367	13.0	468.0
	±0.13	0.90 ±0.03	44	386	17.0	459.0
6	±0.10	0.50 ±0.02	33	618	20.0	420.0
	±0.10	0.70 ±0.03	44	252	11.0	495.0
	±0.10	0.90 ±0.03	54	278	15.0	540.0
	±0.14	1.10 ±0.03	64	252	16.0	432.0
7	±0.10	0.50 ±0.02	38	418	16.0	448.0
	±0.10	0.70 ±0.03	52	193	10.0	450.0
	±0.10	0.90 ±0.03	65	186	12.0	540.0
	±0.13	1.10 ±0.03	77	196	15.0	540.0
8	±0.10	0.50 ±0.02	44	380	16.8	352.8
	±0.10	0.70 ±0.03	60	342	20.6	432.6
	±0.10	0.90 ±0.03	76	266	20.0	420.0
	±0.13	1.10 ±0.03	90	234	20.9	438.9
9	±0.13	0.50 ±0.02	50	340	17.0	357.0
	±0.13	0.70 ±0.03	69	289	19.8	415.8
	±0.13	0.90 ±0.03	86	238	20.4	428.4
	±0.15	1.10 ±0.03	103	204	20.9	438.9
10	±0.13	0.60 ±0.03	67	270	17.9	375.9
	±0.13	0.80 ±0.03	87	240	20.8	436.8
	±0.15	1.00 ±0.03	106	165	17.5	367.5
	±0.15	1.20 ±0.04	125	165	20.5	430.5
11	±0.13	0.60 ±0.03	74	256	18.8	451.2
	±0.13	0.80 ±0.03	96	208	20.2	420.0
	±0.15	1.00 ±0.03	118	169	19.9	417.9
	±0.15	1.20 ±0.04	139	143	19.8	415.8
12	±0.13	0.60 ±0.03	81	238	19.2	345.6
	±0.13	0.80 ±0.03	106	196	20.7	372.6
	±0.15	1.00 ±0.03	130	156	20.2	424.2
	±0.15	1.20 ±0.04	153	126	19.2	345.6
13	±0.13	0.60 ±0.03	88	208	18.2	436.8
	±0.13	0.80 ±0.03	115	182	20.9	376.2
	±0.15	1.00 ±0.03	142	143	20.2	363.6
	±0.15	1.20 ±0.04	167	117	19.5	351.0



	Outside Diameter (OD)	Wall Thickness (WT)	Weight per Tube Length approx. 1500 mm	Carton/ DENSOPACK®		Pallet Load
	 mm	 mm	 g	 Number of Tubes	Weight approx. kg	 Weight approx. kg
14	±0.12	0.60 ±0.03	95	180	17.0	408.0
	±0.12	0.80 ±0.03	125	168	20.9	376.2
	±0.14	1.00 ±0.03	154	120	18.4	386.4
	±0.15	1.20 ±0.04	182	110	19.9	417.9
15	±0.14	0.60 ±0.03	102	154	15.7	376.8
	±0.14	0.80 ±0.03	134	143	19.1	343.8
	±0.14	1.00 ±0.04	166	121	19.9	358.2
	±0.18	1.20 ±0.04	196	100	19.5	409.5
16	±0.14	0.60 ±0.03	109	143	15.6	374.4
	±0.14	0.80 ±0.03	144	132	18.9	453.6
	±0.14	1.00 ±0.04	177	110	19.4	349.2
	±0.18	1.20 ±0.04	210	99	20.7	434.7
17	±0.14	0.80 ±0.03	153	120	18.3	439.2
	±0.14	1.00 ±0.04	189	100	18.8	451.2
18	±0.18	0.80 ±0.03	163	110	17.8	427.2
	±0.19	1.00 ±0.04	201	99	19.8	356.4
	±0.19	1.20 ±0.04	238	81	19.2	345.6
	±0.23	1.50 ±0.05	293	72	21.0	441.0
19	±0.18	0.80 ±0.03	172	99	17.0	408.0
	±0.19	1.00 ±0.04	213	90	19.1	343.8
	±0.23	1.50 ±0.05	310	63	19.5	351.0
20	±0.19	0.80 ±0.04	182	90	16.3	391.2
	±0.19	1.00 ±0.04	224	90	20.1	361.8
	±0.19	1.20 ±0.05	267	72	19.1	343.8
21	±0.19	0.80 ±0.04	191	80	15.2	364.8
	±0.19	1.00 ±0.04	236	80	18.8	451.2
22	±0.19	0.80 ±0.04	201	72	14.4	432.0
	±0.19	1.00 ±0.04	248	72	17.8	427.2
	±0.19	1.20 ±0.05	295	64	18.8	451.2
23	±0.19	0.80 ±0.04	209	63	13.2	316.8
	±0.19	1.00 ±0.04	260	63	16.3	391.2
	±0.23	1.50 ±0.05	381	49	18.6	446.4

SCHOTT AR-Glas® Tubing

Outside Diameter (OD)	Wall Thickness (WT)	Weight per Tube Length approx. 1500 mm	Carton/ DENSOPACK®		Pallet Load	
 mm	 mm	 g	 Number of Tubes	Weight approx. kg	 Weight approx. kg	
24	±0.19	1.00 ±0.04	272	56	15.2	364.8
	±0.19	1.20 ±0.05	323	56	18.0	432.0
	±0.23	1.50 ±0.05	399	49	19.5	351.0
25	±0.19	0.80 ±0.04	229	56	12.8	307.2
	±0.24	1.50 ±0.05	417	42	17.4	365.4
26	±0.19	1.00 ±0.04	296	48	14.1	338.4
	±0.24	1.20 ±0.05	352	48	16.8	403.2
	±0.24	1.50 ±0.05	433	48	20.8	374.4
28	±0.19	1.00 ±0.04	319	42	13.4	402.0
	±0.24	1.20 ±0.05	380	42	15.9	381.6
	±0.24	1.50 ±0.05	468	42	19.7	354.6
30	±0.24	1.20 ±0.05	407	35	14.2	340.8
	±0.29	1.50 ±0.06	503	35	17.6	422.4
32	±0.24	1.20 ±0.05	435	30	13.1	393.0
	±0.29	1.50 ±0.06	539	30	16.2	388.8
34	±0.24	1.20 ±0.05	463	30	13.9	333.6
	±0.29	1.50 ±0.06	574	30	17.2	412.8
36	±0.40	1.20 ±0.06	492	20	9.8	343.0
	±0.40	1.50 ±0.07	609	20	12.2	427.0
38	±0.40	1.20 ±0.06	522	20	10.4	249.6
	±0.40	1.50 ±0.07	645	20	12.9	309.6
40	±0.50	1.20 ±0.08	550	20	11.0	264.0
	±0.50	1.50 ±0.08	680	20	13.6	326.4



In addition to the dimensions above, different lengths and outside diameters up to 70 mm are available upon request.

Tubing with outside diameters between 5 - 30 mm can be additionally coated to protect from scratches. (minimum quantity is 2 tons).

SCHOTT AR-Glas® Rod

Outside Diameter	Carton Contents		Pallet
 mm	 Number of Rods	 Weight approx. kg	 Weight approx. kg
3 ±0.10	509	13.5	445.5
4 ±0.15	308	14.5	478.5
5 ±0.15	217	16.0	528.0
6 ±0.15	141	15.0	495.0
7 ±0.20	104	15.0	495.0
8 ±0.20	79	15.0	495.0
9 ±0.20	60	14.3	471.9
10 ±0.25	49	14.4	475.2
12 ±0.25	33	14.0	462.0
14 ±0.30	24	13.8	455.4
16 ±0.35	20	15.1	543.6
20 ±0.50	16	18.8	507.6
25 ±0.70	9	16.6	448.2

Rod with an outside diameter of up to 30 mm is available upon request.

All tubing and rod dimensions shown in this brochure are available on short notice. All carton contents and weights are approximate.

SCHOTT AR-Glas®

Physical and Chemical Properties

Physical Properties

Coefficient of mean linear thermal expansion α (20 °C; 300 °C) acc. to DIN ISO 7991	$9.1 \cdot 10^{-6} \text{ K}^{-1}$
Transformation temperature T_g	525°C
Temperature of the glass at viscosity η in dPa · s:	10 ¹³ (annealing point) 530°C 10 ^{7.6} (softening point) 720°C 10 ⁴ (working point) 1040°C
Density ρ at 25 °C	2.50 g · cm ⁻³
Modulus of elasticity E (Young's modulus)	$73 \cdot 10^3 \text{ N} \cdot \text{mm}^{-2}$
Poisson's ratio μ	0.22
Thermal Conductivity λ_w bei 90°C	$1.1 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$
Temperature for the specific electrical resistance of $10^8 \Omega \cdot \text{cm}$ (DIN 52 326) $t_{k 100}$	200°C
Logarithm of the electric volume resistivity ($\Omega \cdot \text{cm}$)	at 250°C 7.1 at 350°C 5.7
Dielectric properties (1 MHz, 25°C)	
Dielectric constant (permittivity) ϵ	7.2
Dielectric loss factor (dissipation factor) $\tan \delta$	$70 \cdot 10^{-4}$
Refractive index ($\lambda = 587.6 \text{ nm}$) n_d	1.514
Stress-optical coefficient (DIN 52 314) K	$2.7 \cdot 10^{-6} \text{ mm}^2 \cdot \text{N}^{-1}$

Chemical Composition

(main components in approx. weight %)

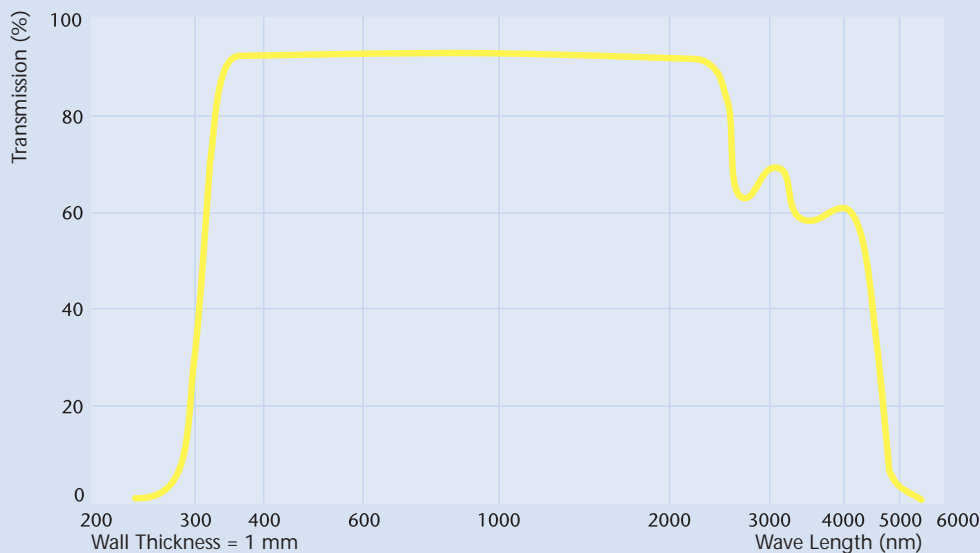
SiO ₂	B ₂ O ₃	K ₂ O	Al ₂ O ₃
69	1	3	4

Na ₂ O	BaO	CaO	MgO
13	2	5	3

Chemical Resistance

Hydrolytic Class (DIN ISO 719)	HGB 3
Acid Class (DIN 12116)	Class S 1
Alkali Class (DIN ISO 695)	Class A 2

Transmission



SCHOTT AR-Glas®

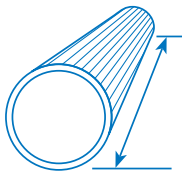
Quality Data

Length

The standard lengths are as follows:

for Tubing	1500 mm (+5 mm / -0 mm)
for Rod	1500 mm (± 20 mm)

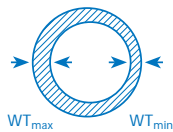
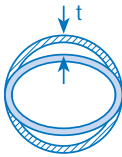
Special sizes of tubing between 1200 and 4000 mm long and with an outside diameter range of 18 to 38 mm are available upon request.



Circularity

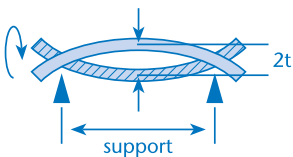
Circularity according to DIN ISO 1101 is dependent on the outside diameter (OD). The following maximum values have been set:

Tubing	
OD < 25 mm	t_{\max} 0.3 % of nominal outside diameter
OD ≥ 25 - 35 mm	t_{\max} 0.5 % of nominal outside diameter
OD > 35 mm	t_{\max} 0.6 % of nominal outside diameter



Siding

Siding – measured within one cross-section – larger than 6 % of the nominal wall thickness is not permitted. ($WT_u = WT_{\max} - WT_{\min}$).



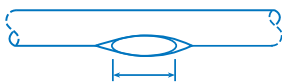
Straightness

Straightness according to DIN ISO 1101 is based on the following maximum values:

Tubing	
OD 4 - < 6 mm	max. 3.0 mm / 1500 mm
OD ≥ 6 mm	max. 0.8 mm / 1000 mm

Stones and Knots

Stones are opaque inclusions, knots are transparent inclusions. Stones and knots with a core size of ≥ 0.5 mm are considered faults.



Airlines

Airlines are an elongated, gaseous inclusion along the length of the tube and are generally not visible to the naked eye. The aggregate airline length is defined by adding together the length of all airlines > 15 mm (or in the case of two or more overlapping airlines, the distance between the extremities of the airlines concerned).

Scratches

A scratch represents a slight surface defect which neither penetrates the depth of the wall, nor permeates it in any way and therefore has an insignificant effect on the mechanical stability.

Tubing of 5-30 mm outside diameter can be coated for protection against scratches.

End Executions

Tubing*	
End execution: plain cut and fused	
Standard: vial fusing with a bead thickness of 0.15 mm	
Other tubing end executions:	Bead Thickness
Slightly fused	0.05 mm
Medium fusing	0.10 mm
Heavy fusing	0.20 mm
Rod	
Plain cut	

*Other end executions available upon request.

Technical Terms of Supply

Detailed information on permissible faults, definition of faults, testing methods and testing units are available upon request. Reduced tolerances are also available upon request. In case of quality complaints the relevant "Technical Terms of Supply" for the application apply to all sales and are binding unless separate written agreements with respect to quality have been entered into.

Packing

≤ OD 7 mm = Cartons
≥ OD 8 mm = DENSOPACK®

DENSOPACK®:

*Tightly packed and covered with shrink film
= effective transport protection*



AR-Glas® and DENSOPACK® are registered trademarks of SCHOTT Group companies.

Subject to technical alterations.

We thank our customers and partners for their kind assistance in providing product samples and photos.

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SCHOTT
glass made of ideas