NUMERIK JENA

SIMPLY PRECISE

DATASHEET

GRADUATED DISK

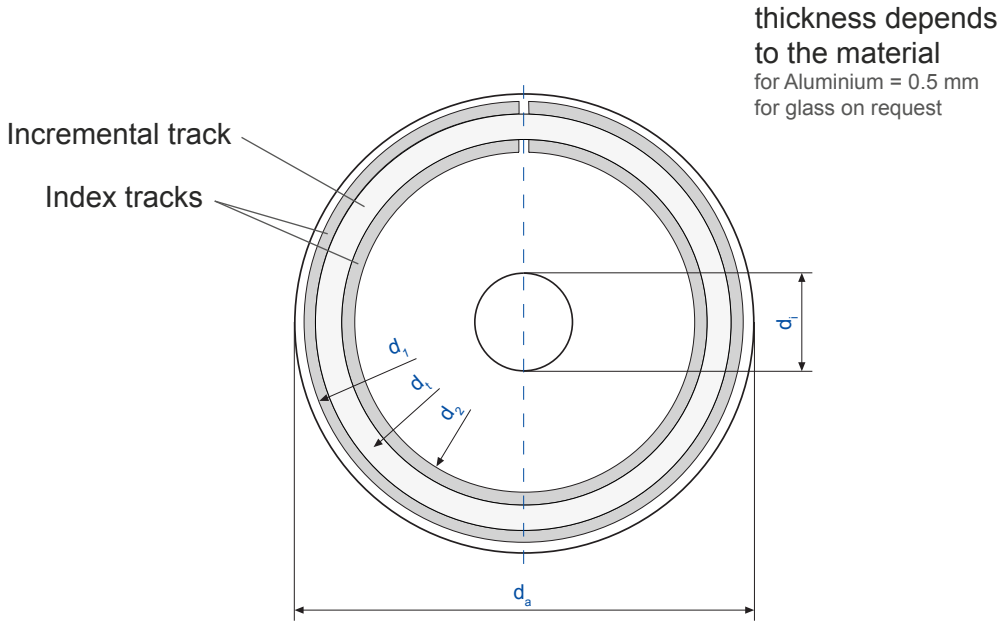
Properties of Graduated Disks

Index

1. Overview

The graduated disks from NUMERIK JENA are available in different sizes and versions. Hereto we have a big selection of obtainable graduated disks in supply but on request we also manufacture at customer‘s option.

Our graduated disks are made of an aluminium alloy. They are also available in glass on request.



d_i	Inside diameter of the graduated disk
d_a	Outside diameter of the graduated disk
d_t	Center diameter of the incremental track
d_1	Outside diameter of the index track
d_2	Inside diameter of the index track
Z	Number of lines of the graduated disk

2. Graduated Disks - Types

Type	d_i [mm]	d_a [mm]	d_t [mm]	d_1 [mm]	d_2 [mm]	d_L [mm]	d [mm]	Z
RS 13/5.5/2048*	5.5 + 0.03	19 $^{0}_{-0.5}$	13	18	8	-	-	2,048
RS 13/6/2048*	6 + 0.03	19 $^{0}_{-0.5}$	13	18	8	-	-	2,048
RS 19/6/3600	6 + 0.1	26 $^{-0.2}_{-0.5}$	19	24	14	-	-	3,600
RS 19/9/3600	9 + 0.1	26 $^{-0.2}_{-0.5}$	19	24	14	-	-	3,600
RS 29/16/900	16 + 0.1	36 $^{-0.2}_{-0.5}$	29	34	24	-	-	900
RS 29/16/1000	16 + 0.1	36 $^{-0.2}_{-0.5}$	29	34	24	-	-	1,000
RS 29/16/4500	16 + 0.1	36 $^{-0.2}_{-0.5}$	29	34	24	-	-	4,500
RS 29/20/900	20 + 0.1	36 $^{-0.2}_{-0.5}$	29	34	24	-	-	900
RS 39/9,97/3600	25 + 0.1	46 $^{-0.2}_{-0.5}$	39	44	34	-	-	3,600
RS 39/10/2048	10 M5	46 $^{-0.2}_{-0.5}$	39	44	34	14.5	2.3	2,048
RS 39/25/1800	25 + 0.1	46 $^{-0.2}_{-0.5}$	39	44	34	-	-	1,800
RS 39/25/2048	25 + 0.1	46 $^{-0.2}_{-0.5}$	39	44	34	-	-	2,048
RS 39/25/3600	25 + 0.1	46 $^{-0.2}_{-0.5}$	39	44	34	-	-	3,600
RS 39/25/6000	25 + 0.1	46 $^{-0.2}_{-0.5}$	39	44	34	-	-	6,000
RS 39/30/3600	30 + 0.1	46 $^{-0.2}_{-0.5}$	39	44	34	-	-	3,600
RS 45/30/9000	30 + 0.1	54 $^{-0.2}_{-0.5}$	45	50	40	-	-	9,000
RS 64/48,5/2048	48,5 + 0.1	71 $^{-0.2}_{-0.5}$	64	69	59	-	-	2,048
RS 64/48,5/4096	48,5 + 0.1	71 $^{-0.2}_{-0.5}$	64	69	59	-	-	4,096
RS 64/48,5/9000	48,5 + 0.1	71 $^{-0.2}_{-0.5}$	64	69	59	-	-	9,000
RS 64/48,5/10000	48,5 + 0.1	71 $^{-0.2}_{-0.5}$	64	69	59	-	-	10,000
RS 92/70/3600	70 + 0.1	100 $^{-0.2}_{-0.5}$	92	97	87	-	-	3,600
RS 92/70/9000	70 + 0.1	100 $^{-0.2}_{-0.5}$	92	97	87	-	-	9,000
RS 92/70/18000	70 + 0.1	100 $^{-0.2}_{-0.5}$	92	97	87	-	-	18,000
RS 92/76/3600	76 + 0.1	100 $^{-0.2}_{-0.5}$	92	97	87	-	-	3,600
RS 92/80/3600	80 + 0.1	105 $^{-0.2}_{-0.5}$	92	97	87	-	-	3,600
RS 142/120/5400	120 + 0.2	150 $^{-0.2}_{-0.5}$	142	147	137	-	-	5,400
RS 142/120/8192	120 + 0.2	150 $^{-0.2}_{-0.5}$	142	147	137	-	-	8,192
RS 142/120/18000	120 + 0.2	150 $^{-0.2}_{-0.5}$	142	147	137	-	-	18,000
RS 142/122/5400	122 + 0.2	150 $^{-0.2}_{-0.5}$	142	147	137	-	-	5,400
RS 142/128/18000	128 + 0.2	150 $^{-0.2}_{-0.5}$	142	147	137	-	-	18,000
RS 192/160/24000	160 + 0.2	200 $^{-0.2}_{-0.5}$	192	197	187	-	-	24,000

* Not for RIK 4

(other sizes on request)

3. Properties - Aluminium Graduated Disk

Product	4270GP, MIRO® 27	Extra Bright Rolled, reflection
Material / Alloy	AL 99.85 (to DIN EN 573-3)	Hard (to DIN EN 485-2)
	Density	~ 2.71 kg/m^3
	Melting point	~ 650°C
Mechanical Properties	Tensile strength	160 - 200 N/mm^2
	Modulus of Elasticity	71000 N/mm^2
	Yield strength	140 - 180 N/mm^2
	Elongation (A50)	≥ 2%
	Deformation / Bending	≥ 1.5 x gauge of material [Bending radius]
Thermal Properties	Coefficient of thermal expansion α	~ 24 x 10^{-6} K^{-1}
	Specific thermal capacity c_p $_{(20 - 100\ °C)}$	~ 900 J x (kg x K)$^{-1}$
	Specific thermal conductivity λ $_{(20\ °C)}$	~ 222 W x (m x K)$^{-1}$
Geometrical Properties	Thickness	0.5 (±0,04) mm
	Radius	on request (ordering key)

4. Properties - Floatglas Graduated Disk

Mechanical Properties	Density ρ (at 25 °C)	2.49 g/cm^3
	Young's modulus E (at 25 °C)	70 kN/mm^2
	Poisson's ratio μ	0.23
Thermal Properties	Coefficient of linear thermal expansion $\alpha_{(0 - 300\ °C)}$	9.7 x 10^{-6} K^{-1}
	Specific thermal capacity $cp_{(20\ °C)}$	0.72 KJ x $(kg \times K)^{-1}$
	Point of deformation	490 °C (± 10 °C)
Optical Properties	Refraction index n_d	1.52 (588 nm)
Chemical Properties	Main constituents	SiO2 (69 - 74%), CaO (5 - 12%), NaO (12 - 16%), MgO (0 - 6%), AlO (0 - 3%)

5. Properties - BOROFLOAT® 33 Borosilicate Glass Graduated Disk

Mechanical Properties	Density ρ (at 25 °C)	2.2 g/cm^3
	Young's modulus E (at 25 °C)	64 kN/mm^2 (to DIN 13316)
	Knoop hardness (^{HK} 0.1/20)	480 (to ISO 9385)
	Poisson's ratio μ	0.2 (to DIN 13316)
	Bending strength δ	25 Mpa (to DIN 52292 T 1)
	Impact resistance	The impact resistance of BOROFLOAT® 33 is dependent on the way it is fitted, panel size and thickness, the type of impact it is subjected to and certain other parameters not indicated here.

Thermal Properties	Coefficient of linear thermal expansion $\alpha_{(20 - 180\ °C)}$	3.25 x 10^{-6} K^{-1} (to ISO 7991)
	Specific thermal capacity cp $_{(20 - 100\ °C)}$	0.83 KJ x (kg x K)$^{-1}$
	Specific thermal conductivity λ $_{(90\ °C)}$	1.2 W x (m x K)$^{-1}$
	Maximum operating temperature	
	for short-term usage δmax $_{(< 10\ h)}$	500 °C
	for long-term usage δmax $_{(< 10\ h)}$	450 °C
	Resistance of thermal gradients (RTG)	
	1 - 100 h	90 K
	> 100 h	80 K

Chemical Properties	Main constituents	SiO_2 (81%), Al_2O_3 (2%), Na_2O/K_2O (4%), B_2O_3 (13%)
	Hydrolytic resistance	
	to ISO 719 / DIN 12 111	Class HGB 1
	to ISO 720	Class HGA 1
	Acid resistance	
	to ISO 1776 / DIN 12 116	1
	Alkali resistance	
	to ISO 695 / DIN 52 322	A2

6. Properties - ROBAX® Glass Ceramic Graduated Disk

Mechanical Properties	Density ρ (bei 25 °C)	2.6 g/cm^3
	Young's modulus E	93 kN/mm^2 (to DIN 13316)
	Poisson's ratio μ	0.25 (to DIN 13316)
	Bending strength δ	35 Mpa (to DIN 52292 T 1)
	Impact resistance	The strength of glass ceramic is material constant. It is dependent on the size and thickness of the panel, the finish condition (edge working, drillings, etc.), usage conditions, (kind and distribution of defects on the surface), and the time related and kind of impact load and the type of panel installation.

Thermal Properties	Coefficient of mean linear thermal expansion $\alpha_{(20 - 700\ °C)}$	$(0 \pm 0.5) \times 10^{-6}\ K^{-1}$
	Specific heat c_p $_{(20 - 100\ °C)}$	$0.8 \times 10^3\ J \times (kg \times K)^{-1}$
	Thermal conductivity $\lambda_{(90\ °C)}$	$1.6\ W \times (m \times K)^{-1}$

Chemical Properties	The chemical composition of ROBAX® complies with the requirements for glass ceramic in accordance with EM 1748 T2. ROBAX® is made of ecologically safe raw materials. The glass can be re-used through recycling of the material.

Please find further information of our rotary measuring systems in the respective data sheets or visit our website www.numerikjena.com.

7. Cleaning

- Depending on the measuring system‘s mounting attitude and the ambient conditions, it may be necessary to clean the graduated disk and sensor surface of the scanning head (scanning window for counting and reference track) occasionally.
- If the monitoring signal output by the scanning head is used, the encoder indicates that cleaning is necessary.
- When cleaning the components, ensure that the scanning window and graduated disk are not scratched by any deposited particles!
- Dirt should be removed using a soft brush or oil-free compressed air.
- Use cotton balls or a soft and lint-free rag for cleaning. Use a solvent if necessary (e.g. Acetone or Alcohol).
- Ensure that no solvent seeps under the graduated disk! This could adversely affect the adhesive layer and thereby loosening the grating disk.
- ATTENTION: Acetone and Alcohol are inflammable liquids!

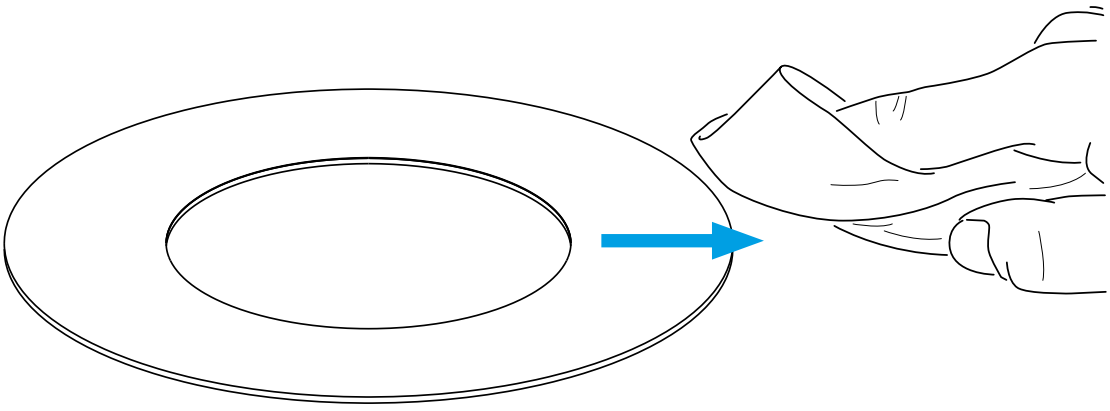


Image 1

8. Ordering Key

Ordering key - example

RS	39/25/3600	GL	UX	B

RS	Graduated disk

Centre Ø of counting track d_t	Inside-Ø graduated disk d_i	Number of lines Z
13*	5.5	2,048
13*	6	2,048
19	6	3,600
19	9	3,600
29	16	900
29	16	1,000
29	16	4,500
29	20	900
39	9.97	3,600
39	10	2,048
39	25	1,800
39	25	2,048
39	25	3,600
39	25	6,000
39	30	3,600
45	30	9,000
64	48.5	2,048
64	48.5	4,096
64	48.5	9,000
64	48.5	10,000
92	70	3,600
92	70	9,000
92	70	18,000
92	76	3,600
92	80	3,600
142	120	5,400
142	120	8,192
142	120	18,000
142	122	5,400
142	128	18,000
192	160	24,000

* Not for RIK 4 (other sizes on request)

Supply

	Without supply (please leave this blank)
B	You want to supply your own hub to glue on the graduated disk.

Service

	Without glueing (please leave this blank)
UX	We will glue the graduated disk to your given hub. On request we are able to manufacture the corresponding hub for you.

Material

	Aluminium - graduated disk (please leave this blank)
GL	Glass - graduated disk (on request only)

NUMERIK JENA GmbH
Im Semmicht 4
07751 Jena
Germany

Phone: +49 3641 4728-0
Fax: +49 3641 4728-202
E-Mail: info@numerikjena.de
www.numerikjena.de

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