

DATA SHEET

SCALE TAPE LINEAR 

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1. Overview

The standards from NUMERIK JENA are available in different types and materials:

- Stainless steel
- Floatglas
- BOROFLOAT® 33 Borosilicate Glass
- ROBAX® Glass ceramic

In the following we have listed the properties of the standards.



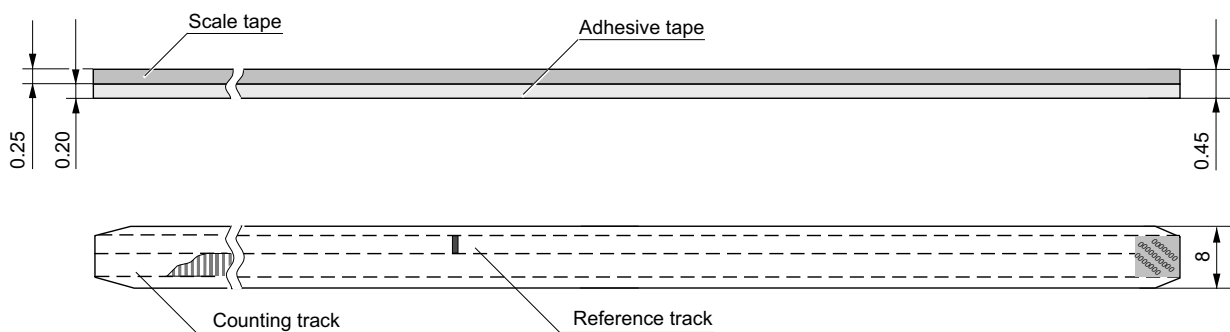
2. Steel - standards

The steel scale tapes from NUMERIK JENA are available in two different versions:

- SINGLEFLEX
- DOUBLEFLEX (not suitable for vacuum applications)

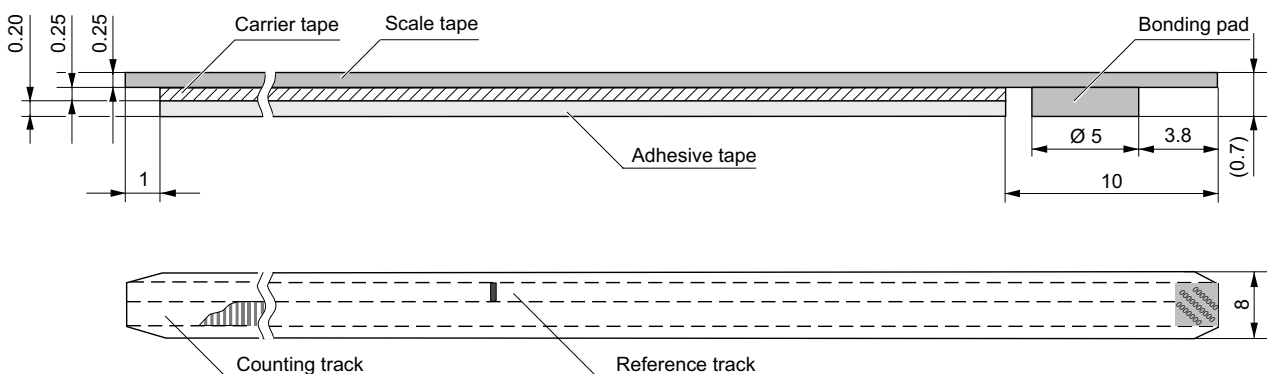
2.1. SINGLEFLEX

The SINGLEFLEX-scale tape consists of a single stainless steel tape with an applied incremental track and one or more reference marks or a PRC code. The scale tape is equipped with a double-sided adhesive tape and can be mounted easily on the machine element.



2.2. DOUBLEFLEX

The DOUBLEFLEX-scale tape consists of two superimposed stainless steel tapes. Both of them are divided by a tension uncoupled sheen of oil which ensures the adhesion between the steel tapes. The incremental track and one or more reference marks or a PRC code are applied on the upper steel tape. The lower steel tape is equipped with a double-sided adhesive tape and can be mounted easily on the machine element.



The two steel tapes are uncoupled mechanically. This ensures that the upper steel tape can expand independently of the lower steel tape due to thermal variations of the ambient temperature. By reference of the ambient temperature and the expansion coefficient of the steel tape it is possible to determine occurring length deviation of the increments. This allows you to subtract out the deviation of the measurement results.

Properties - Stainless steel scale tape (directed and polished)		
Indication	Sandvik 7C27Mo2	EN 1.4034
Mechanical properties	Density ρ (at 25 °C)	7.7 g/cm ³
	Tensile strength	1730 N/mm ²
Thermal properties	Coefficient of linear thermal expansion α	10.6 x 10 ⁻⁶ K ⁻¹
	Specific thermal capacity c_p (20 - 100 °C)	460 J x (kg x K) ⁻¹
	Specific thermal conductivity λ (20 °C)	24 W x (m x K) ⁻¹
Geometric properties	Peak-to-valley height of Ra	10 nm
	Width	8.0 (±0.03) mm
	Thickness	0.254 (±0.004) mm
	Flatness	< 0.3 % of width
	Straightness	constrained to 1.0 mm/m
	Ring bending	< 10 mm / 300 mm
Optical properties	Reflectance coefficient	46 - 50

3. Glass - standards

The standards from NUMERIK JENA are available in different types of glass:

- Floatglas
- BOROFLOAT® 33 Borosilicate Glass
- ROBAX® Glass ceramic

In the following we have listed the properties of the glass types.

Properties - Floatglas		
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 α (0 - 300 °C)	$9.7 \times 10^{-6} \text{ K}^{-1}$
	Specific thermal capacity c_p (20 °C)	0.72 KJ x (kg x K) ⁻¹
	Point of deformation	490 °C (± 10 °C)
Optical properties	Refraction index n_d	1.52 (588 nm)
Chemical properties	Main constituents	SiO ₂ (69 - 74%), CaO (5 - 12%), NaO (12 - 16%), MgO (0 - 6%), AlO (0 - 3%)

Properties - BOROFLOAT® 33 Borosilicate Glass

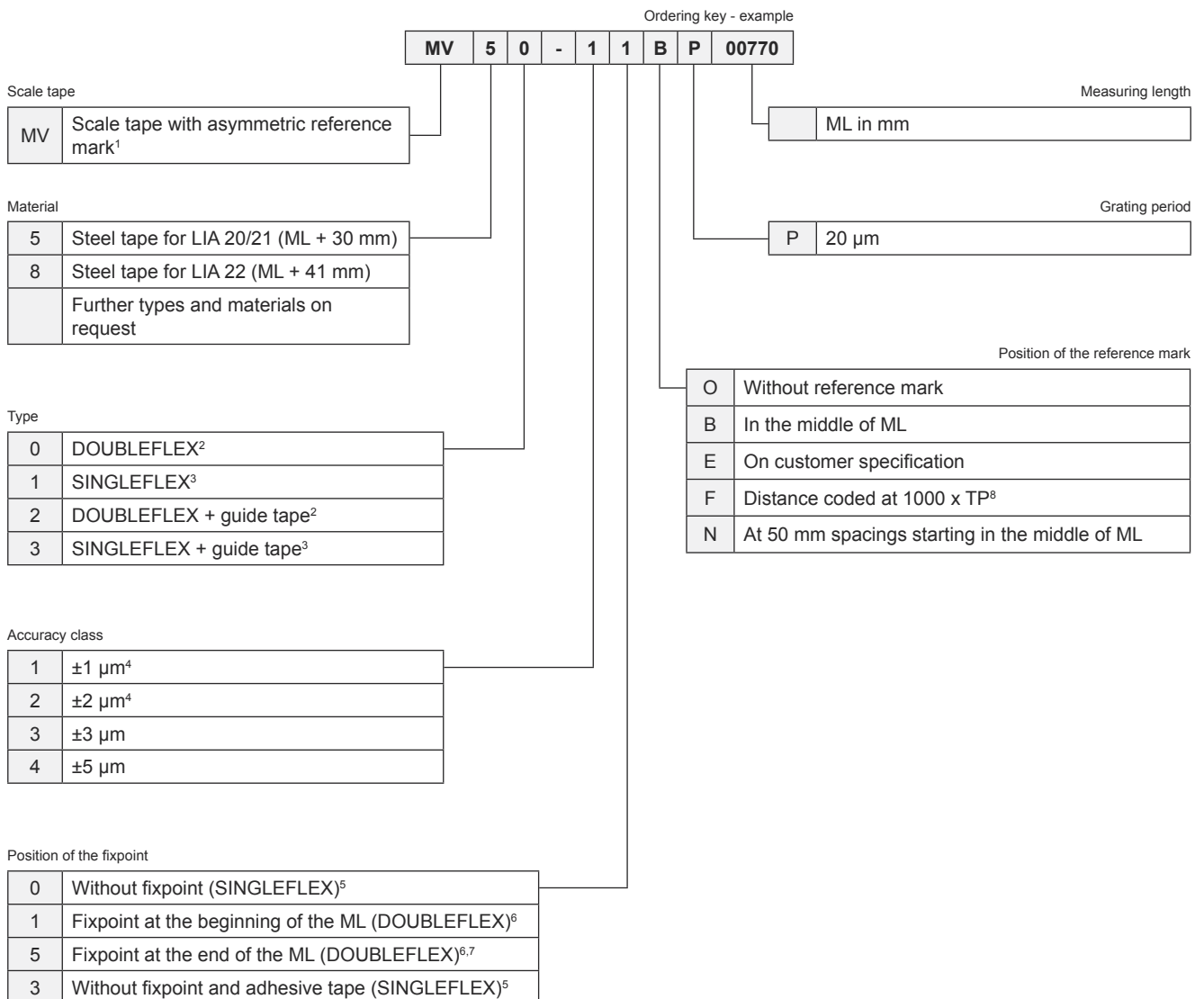
Mechanical properties	Density ρ (at 25 °C)	2.2 g/cm ³
	Young's modulus E (at 25 °C)	64 kN/mm ² (to DIN 13316)
	Knoop hardness (^{HK} 0.1/20)	480 (to ISO 9385)
	Poisson's ratio μ	0.2 (to DIN 13316)
	Bending strength δ	25 Mpa (to DIN 52292 T 1)
	Impact resistance	The impact resistance of BOROFLOAT® 33 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 α (20 - 180 °C)	3.25 x 10 ⁻⁶ K ⁻¹ (to ISO 7991)
	Specific thermal capacity c_p (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 δ_{max} (< 10 h)	500 °C
	for long-term usage δ_{max} (< 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 ₂ O ₃ (2%), Na ₂ O/K ₂ O (4%), B ₂ O 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	

Properties - ROBAX® Glass ceramic

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 α _(20 - 700 °C)	$(0 \pm 0.5) \times 10^{-6} \text{ K}^{-1}$
	Specific heat c_p _(20 - 100 °C)	$0.8 \times 10^3 \text{ J} \times (\text{kg} \times \text{K})^{-1}$
	Thermal conductivity λ _(90 °C)	$1.6 \text{ W} \times (\text{m} \times \text{K})^{-1}$
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 linear measuring systems in the respective data sheets or visit our website www.numerikjena.com.

4. Ordering key - MV (incremental)



¹ This type is suitable for the following measuring systems with two-field scanning: LIA 20/21/22, LIK 21/22/23, Kit L2

² DOUBLEFLEX min. ML = 100 mm; max. ML = 5,000 mm

³ SINGLEFLEX max. ML = 30,000 mm

⁴ Max. ML = 500 mm

⁵ Only for SINGLEFLEX scale tape

⁶ Only for DOUBLEFLEX scale tape

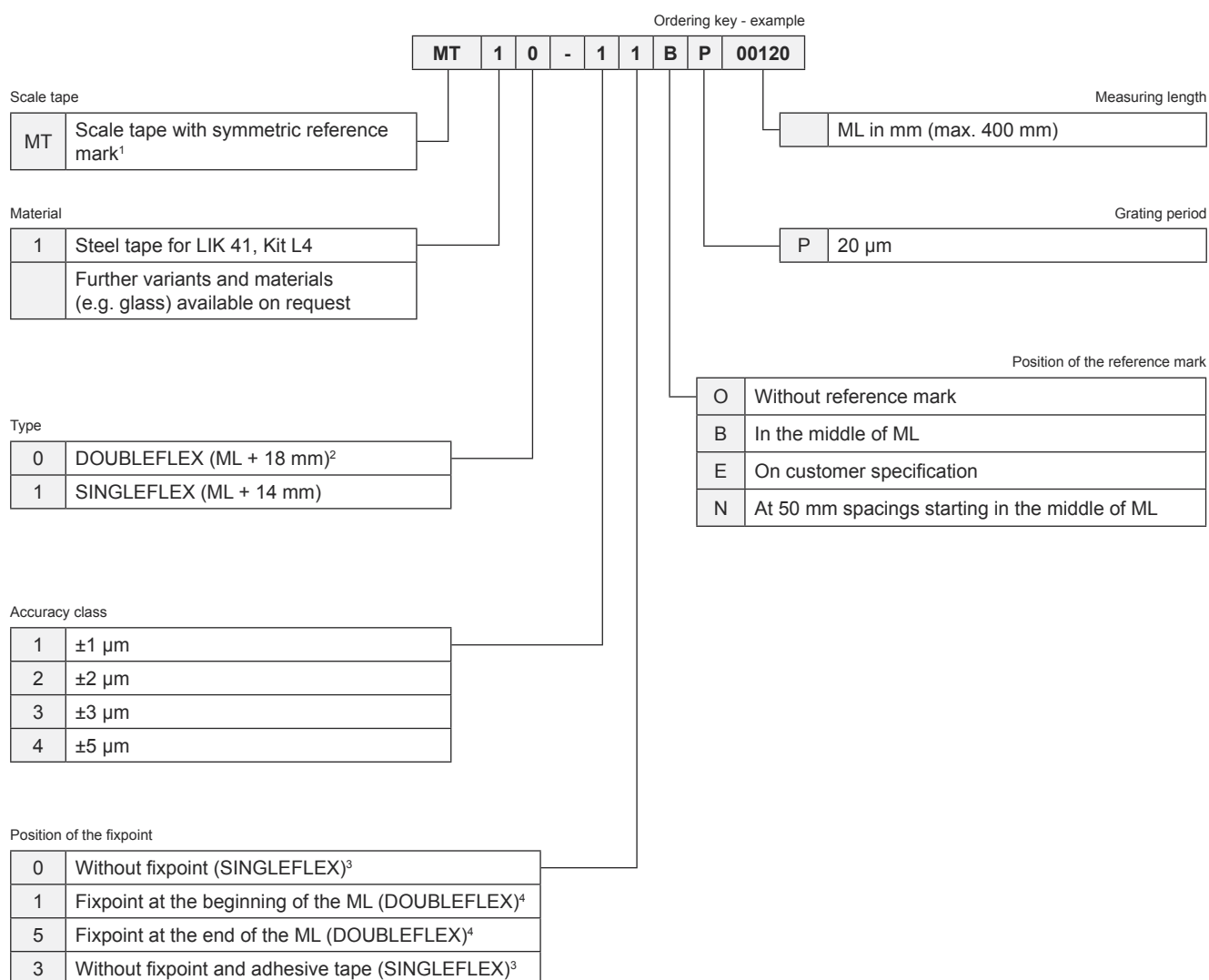
⁷ Only for LIA 20 and LIA 22

⁸ SINGLEFLEX max. ML = 8,750 mm / DOUBLEFLEX max. ML = 5,000 mm

ML - Measuring length

TP - Grating period

5. Ordering key - MT (incremental)



¹ This type is suitable for the following measuring systems with one-field scanning: LIK 41, Kit L4

² Min. ML = 100 mm; max. ML = 400 mm

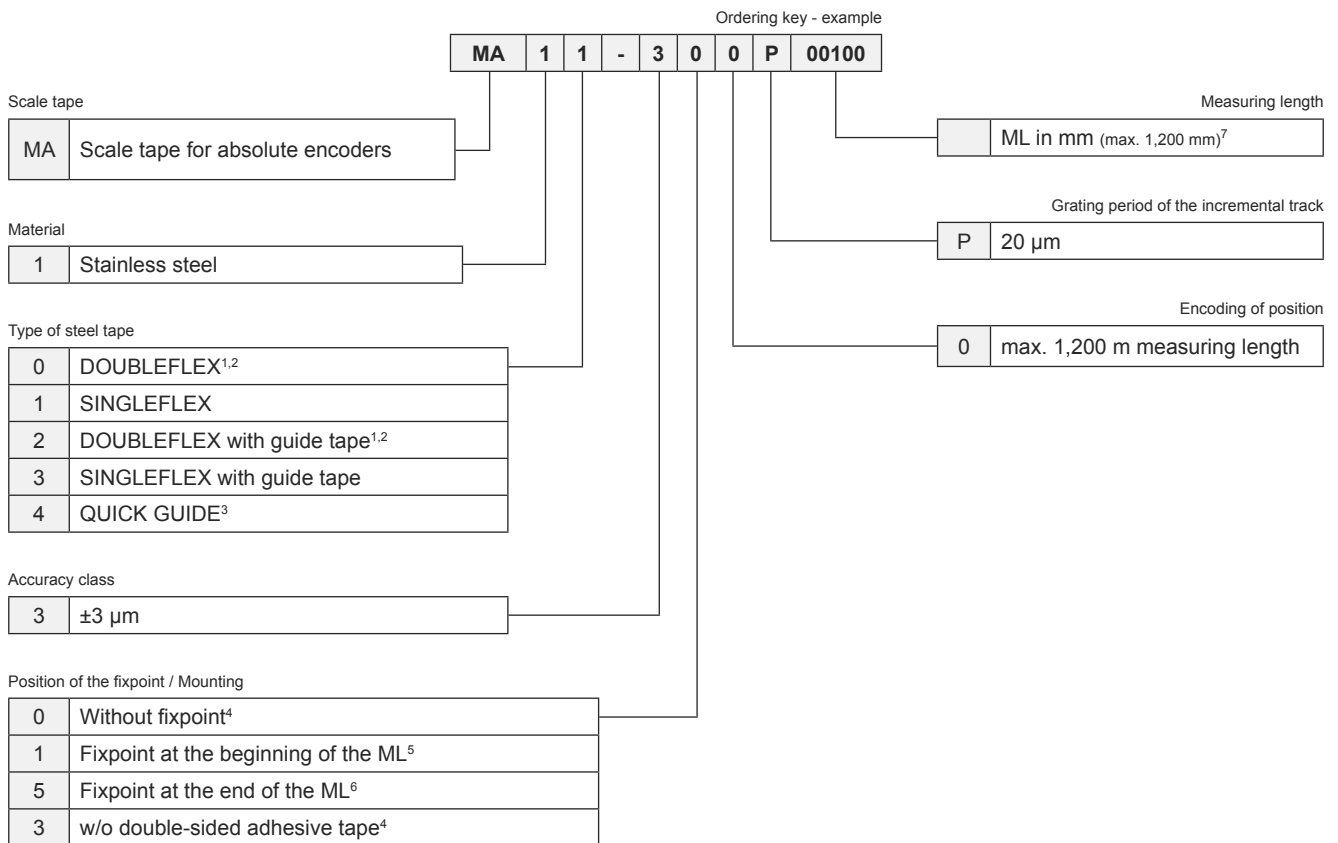
³ Only for SINGLEFLEX scale tape

⁴ Only for DOUBLEFLEX scale tape

ML - Measuring length

TP - Grating period

6. Ordering key - MA (absolute)



¹ Min. ML = 100 mm; max. ML = 1,200 mm

² Not suitable for vacuum applications

³ In combination with fixpoint at the beginning of the ML only

⁴ Only for SINGLEFLEX

⁵ Only for DOUBLEFLEX scale tapes and QUICK GUIDE

⁶ Only for DOUBLEFLEX scale tapes

⁷ Total length = ML + x (SINGLEFLEX x = 17 mm, DOUBLEFLEX x = 25 mm, QUICK GUIDE x = 33 mm)
ML - Measuring length