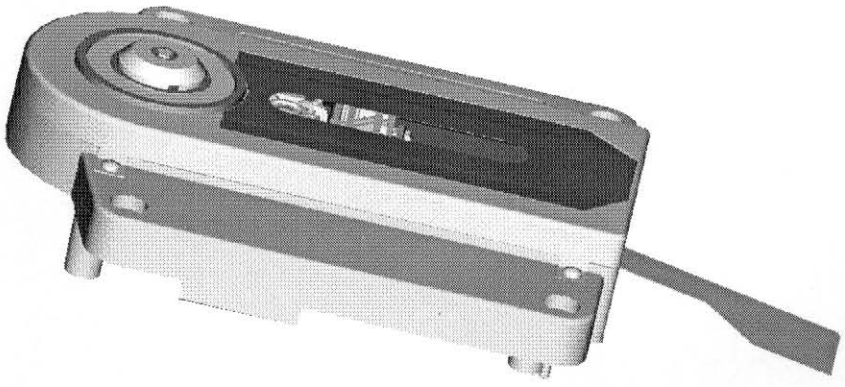
Philips Optical Storage

DATA SHEET



VAM1254/21

CD mechanism for 1x & 2x speed applications

Product specification
Version 1.0

November 2003

PHILIPS

Type Number :- VAM1254/21
Code Number (12NC) :- 9305 022 25421

Revision History

Version	Nr.	Page	Date	Remarks
1.0	-		20-11-2003	First Release.

TABLE OF CONTENTS

TABLE OF FIGURES

1. SCOPE OF THIS DOCUMENT

- This document describes the Commercial specification of the CD mechanisms VAM1254/21 for use in Audio/Video-CD application areas.
- The specifications parameters affecting form, fits or function of the CD mechanism may be altered in consultation with client.
- Please ensure to observe the following, otherwise. PHILIPS may not be able to assume the responsibility for things to happen :
  - * Always use the CD mechanism(s) within the conditions given in the specification
  - * No additional process be given to the CD mechanism(s)
  - * Ensure the set contains PHILIPS CD mechanism(s) is in compliance with the rules and regulations for spurious radiation
  - * Measure the leakage of laser output from a set containing the CD mechanism(s) and ensure that the set is in compliance with applicable requirements
  - * Always adhere to the handling instructions

Features

- The VAM1254/21 is a modular CD-mechanism, using a 2-stage, 3 spots system
- Suitable for single speed; prepared for double speed
- Suitable for 12 and 8 cm discs according to the RED BOOK (IEC908)
- Applicable in horizontal and one vertical position: Z up and X downward see fig 1.
- Same form factor as VAM1254/01
- Robust design for industrial and professional Audio/Video applications

2. GENERAL SPECIFICATIONS

Performance characteristics based on Standard test conditions (See Page 8, Content Nr. 3)

2.1 Opto-Specifications

Parameter	Min.	Typ.	Max.	Unit	Notes
Laser wavelength	760	780	800	nm	at 30 °C
Numerical aperture		0.45			
Working distance		1.8		mm	
Power intensity		340	680	mW	out of objective lens
Focus error detection					Single Foucault
Radial error detection					3-beam method

2.2 Mechanical Specification

Mechanical

Parameter	Min.	Typ.	Max.	Unit	Notes
Dimensions					See fig. 8
Read-out diameter (min)	46.8	47.4	48	mm	Mechanical stop
Read-out diameter (max)	117	117.5	118	mm	Mechanical stop
Position switch point (PSP)	23.1	24.1	25.1	mm	Centre nominal position to centre of turntable
Weight of CD mechanism		241		gr	
Switch at open position	Actuator outside the position switch point				
Switch at closed position	Actuator inside the position switch point				
Access time			4	sec	$Disc_i$ to $Disc_o$ at 3 Vdc Typical applied at sledge motor Measured on burn-in test disc

Electromechanical

Parameter	Min.	Typ.	Max.	Unit	Notes
Current consumption			300	mA	In play condition : horizontal
Focusing direction	See fig. 5a A positive voltage to flex pin 13 moves the objective lens towards the disc				
Radial direction	See fig. 5a A positive voltage to flex pin 15 moves the objective lens towards the centre of the disc.				
Sledge motor	See fig. 6 A positive voltage to the flex pin 1 will make the sledge moves outwards.				
Optical turntable movement	See fig. 6 A positive voltage to the flex pin 6 will make the turntable rotates clockwise.				

2.3 Electrical Specification

Disc drive motor

Parameter	Min.	Typ.	Max.	Unit	Notes
Motor	Detail information refer to chapter Nr. 6.2				Mabuchi RF-300CH-11400

Sledge drive motor

Parameter	Min.	Typ.	Max.	Unit	Notes
Motor	Detail information refer to chapter Nr. 6.2				Mabuchi FF-030-PK

3. MEASURING CONDITIONS

The following test conditions and equipment are always applied unless otherwise defined.

- Reference Electronics: Premium 10502 application
- Circuit diagram Premium 10502
- For measuring circuit : Signal monitor

Standard test conditions	Min.	Typ.	Max.	Unit
Ambient temperature		23 ± 5		°C
Relative humidity	45		75	% RH
Air pressure	86		106	kPa
Setting angle horizontal, front to back angle		0 ± 5		°
Setting angle horizontal, side to side angle		0 ± 5		°
With 4 pieces of recommended suspensions (Refer to VAU1254/10)				

Test disc:

	Test Disk for CD-R/W	Test Disk for CD-Audio	
Description	**Code Number**	**Test Disk**	**Code Number**
Low reflection Audio	7104 099 96581	-	-
High reflection Audio	7104 099 96601	-	-
Playability check	7104 099 96611	SBC444A	7104 099 24991
Vibration/Shock	-	Burn-in	7104 087 04861
Mechanical Noise	-	Burn-in	7104 087 04861
Vertical Deviation Disc	7149 099 24972 *	0.4 degree/12 cm	7104 099 24972
Skew disc	- *	0.6 degree/8 cm	7104 099 28261
Eccentricity	7104 099 24961 *	150 µm	7104 099 24961
80 min. Audio Disc	-	T.B.D	T.B.D

* Note : The playability of these discs have been verified by simulation. This is done by reducing the laser power to 25% of the original setting. This reduces the HF level also to 25% of the original setting. The other conditions of playability measurements remain the same.

4. PERFORMANCE SPECIFICATIONS

Performance characteristics based on Standard test conditions

4.1 Actuator Performance

Parameter	Min.	Typ.	Max.	Unit	Notes
Actuator (Focus/Tracking)					
Temperature factor fo					See fig. 12
AC Sensitivity		Nom. -0.4		%/deg	
Moving mass		Nom. 0.6		gr	
Mechanical Damping Q	8		15		
Focusing actuator					
Resonance Frequency		30 ± 4		Hz	
AC sensitivity		0.25 ± 20%		N/A	200 Hz
Sensitivity DC		0.65 ± 20%		mm/V	
Resistance		18 ± 15%		Ω	
Inductance		270		μH	
Stroke	± 0.8			mm	
Maximum deviation from ideal actuator characteristic					See fig. 13
Tracking actuator					
Resonance Frequency		50 ± 6		Hz	
AC sensitivity		0.25 ± 20%		N/A	200 Hz
Sensitivity DC		0.24 ± 20%		mm/V	
Resistance		18 ± 15%		Ω	
Inductance		170		μH	
Stroke (Up/Down)	± 0.42			mm	
Maximum deviation from ideal actuator characteristic					See fig. 14

4.2 Optics / Electrical

Parameter	Min.	Typ.	Max.	Unit	Notes
RF signal					
RF signal amplitude	0.19	0.30	0.45	mA(Acpp)	
Straylight			15% of Isum		
Jitter for CD-Audio at N = 1 (After MTF correction)			28	ns	
Focus error signal					
Focus S-curve amplitude		34% of Isum			
Slope of S-curve					Monotonic
Change of slope from 5°C to 55°C	-20		20	%	relative to 25°C
Peak to peak value of S-curve		12		µm	
Radial error signal					
Radial error signal		10% of Isum			
Allowed Change of radial error signal from 5°C to 55°C	-20		20	%	relative to 25°C
Change of radial error from track 1 to 24	-15		15	%	

Note: Isum = Sum(AC) of OPIC CA photodiode output while in focus
Vtotal = Total OPIC photodiode output while in focus, including straylight
Straylight = OPIC output photodiode output without disc

4.3 Playability specification

Parameter	CD-R/W (See Page 8, Content Nr. 3 for Test Disc)	CD-Audio
Wedge	900 µm *	900 µm
Black dot	800 µm	800 µm
Eccentricity (Amplitude)	150 µm *	150 µm
Vertical deviation disc	No failure when: * - startup - Playing last track	No failure when: - startup - Playing last track
Fingerprint	No audible defects	No audible defects
Heavy fingerprint	No track jump	No track jump
Thick disc	No failure *	No failure
Thin disc	No failure *	No failure

General criteria : No audible defects.
Reference Electronics :- Premium 10502 application
* Note : The playability of these discs have been verified by simulation. This is done by reducing the laser power to 25% of the original setting. This reduces the HF level also to 25% of the original setting. The other conditions of playability measurements remain the same.

4.4 Mechanical Noise

	Max (with 3σ Std Deviation)	Typ	Remarks
Noise during play	33-T.B.D. dBA		
Noise during jump Tr 1 to Tr 20 (bi-directional)	50-T.B.D. dBA		

Test disc : Burn-in track 1 and 20
Measuring set-up : Microphone distance = 10 cm above turntable
Position = above the objective lens Must be measured in free field (anechoic room), hard noise reflecting materials in direct environment are not permitted and ambient noise should be < 22 dBA.
Horizontal running.

4.5 Shock Sensitivity

Requirement	No audible mute		
Measuring conditions (In play mode, horizontal position)	CD mechanism has to be suspended in the 4 pcs of recommended suspension with 2mm clearance around and with magnetic clamping system		
	Test disc :	Burn-in 7104 087 04861, Tr 1 and 20.	
	X	Min. 2σ value: 3.5g during 3msec, typical 5g	See fig 1
	Y	Min. 2σ value: 3.5g during 3msec, typical 5g	
	Z	Min. 2σ value: 3.5g during 3msec, typical 10g	

Note : Criteria – No audible mute

4.6 Transport (unpacked)

Impact	acc IEC 68-2-27-Ea	Max. 100g / duration 6 msec / 3 x 6 directions	
Bumps	acc IEC 68-2-29-Eb	Max. 40g / duration 6 msec / 500 x 3 directions	
Vibrations	acc IEC 68-2-6-Fc	10 to 58Hz 0.2mm p-p, 58 to 150Hz, sides, 5 sweeps per side	3

4.7 Transport (packed)

In packaging, acc to UN-D 1400

4.8 ESD

25 KV target in built-in situation (provided state of the art of design-in and good workmanship) IEC (1000-4-2(IEC 801-2:1991) grounding of mounting-plate has to be guaranteed.

5. RELIABILITY CONDITIONS

Note: Environmental conditions acc. to UAN-D1590

5.1 Operating Environment

Operational	Temperature range	5 °C to +55 °C
	Humidity range	5 % to 90 % RHD

Note : Functioning without major performance faults or functional faults

5.2 Storage Environment

Storage (Long term)	Temperature range	-25 °C to + 55 °C
	Humidity range	5 % to 95 % RHD
(Short term)	Exposure	48h at 70 °C

5.3 Dry Heat Exposure Test

Temperature range	+ 70 °C, Duration : 48 hours

5.4 Damp Heat Exposure Test

Temperature range	+ 40 °C, Duration : 21days

5.5 Cyclic Heat Test

Test according to IEC 68-2-30-Db.

6. DESIGN-IN INFORMATION

6.1 General

It is a modular CD mechanism using a 2-stage, 3-spot system and contains the following parts:

- a light pen with holographic lightpath
- the actuator
- the disc motor containing a DC motor with a turntable prepared for mechanical and/or magnet clamping
- the mounting-plate with the sledge drive
- the foil with the laser supply

Refer to Premium 10502 Reference Application Document

Position For Operation And Storage In Set

Operation	Horizontal	Disc upwards	See fig. 1
	Vertical	X-axis downward	
Storage	Horizontal	Z-axis upwards	

Magnetic Clamping Turntable

Parameter		Min.	Typ.	Max.	Unit	Notes
Eccentricity of cone				20	μm	
Clamping force	Vertical	1.82			N	with 1.5mm disc
	Horizontal	1.35			N	with 1.5mm disc
Skew				45	μm	
Weight on turntable				70	N	

6.2 Motor Information

Mabuchi RF-300CH-11400 Motor Data

INFORMATION TAKEN FROM SUPPLIER

Standard Operating Condition

Parameter	Min.	Typ.	Max.	Unit	Notes
Rated voltage		3.9		Vdc	
Working voltage range	2.8		6	Vdc	
Rotation direction					CW & CCW

Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit	Notes
Rated load current at rated voltage			195	mA	
No load current at rated voltage			35	mA	
No load starting voltage			0.8	V	
Starting current at rated voltage	335	375	415	mA	

R*(the resistance in one pole)

Mabuchi FF-030-PK Motor Data

INFORMATION TAKEN FROM SUPPLIER

Standard Operating Condition

Parameter	Min.	Typ.	Max.	Unit	Notes
Rated voltage		6		Vdc	
Working voltage range	3.7		7	Vdc	
Rotation direction					CW & CCW

Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit	Notes
Rated load current at rated voltage			200	mA	
No load current at rated voltage			80	mA	
No load starting voltage			1.3	V	
Starting current at rated voltage			510	mA	

R*(the resistance in one pole)

6.3 Handling Instructions

- Usage and storage in dusty, high temperature and high humidity environments should be avoided.
- To avoid damage to the LDGU by electrostatic discharges, measuring equipment and operators must be grounded during handling (See fig. 16). The user of this unit must take all necessary precautions to avoid ESD (Electro-Static Discharge) failures during handling and assembly of this unit into his end product.
- Contamination of the objective lens will influence the performance.
  Avoid fingerprints on the lens, handle the mechanism in a clean environment.
- The actuator with lightpath has been adjusted carefully during manufacturing.
  High forces on this part may damage the unit and have to be avoided.
  Avoid touching and high forces on this part!! Do not disassemble or readjust!!
- Safety: The (invisible) laser beam may damage the human eye. Avoid that people can look directly or indirectly into the objective lens when the power is switched on.
- Fast heating up (e.g. by bringing the mechanism from a cold place into a warm and humid room) can result in moisture condensing on the lens, thus influencing the playability for a certain time. Before checking the performance the mechanism should stabilise for at least 4 hours. See also the recovery times mentioned in UAN-D 1590

9. SAFETY STANDARDS

VAM1254/21 has been designed to comply with safety standards of various countries. However, since its approval depends on the application, this unit is not approved as a unit. It is prepared for the following standards:

IEC65

EN60065

UL 1492

UL 6500

UL filenumber: E143838 typenumber: VAM12##

Fig. 1: Definition of axes, working position and storage position

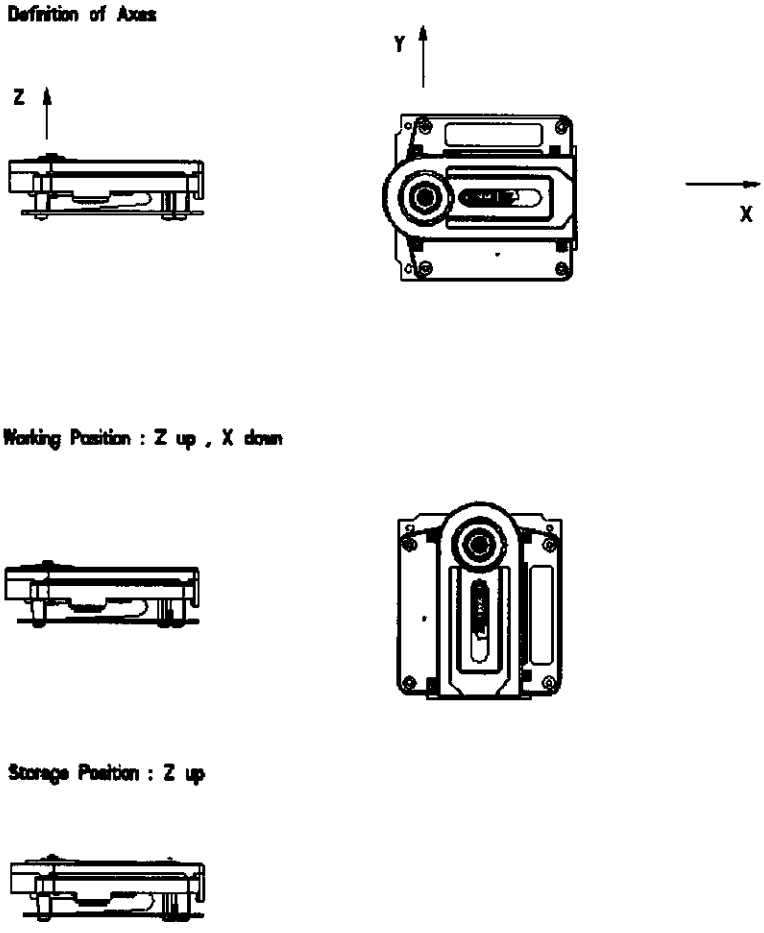


Fig. 2: Exploded view VAM1254/21

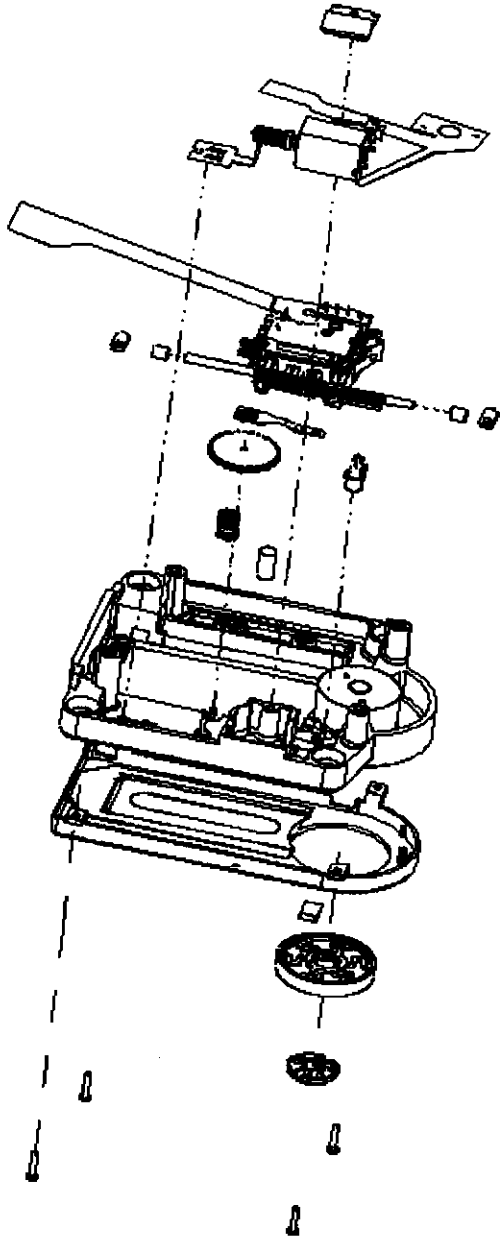


Fig. 4: Set angle of vertical running

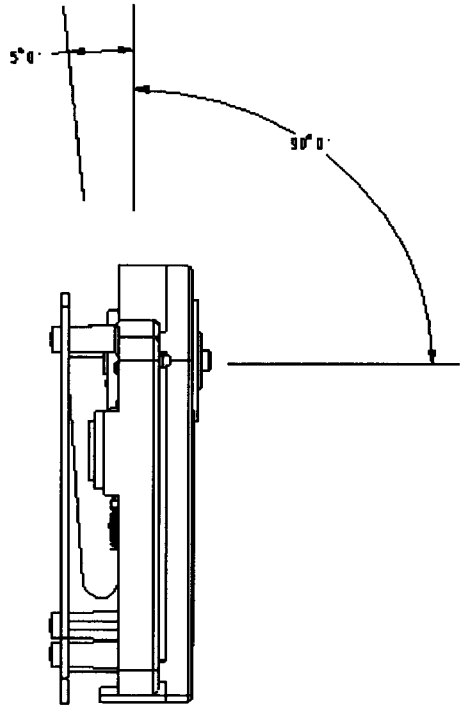
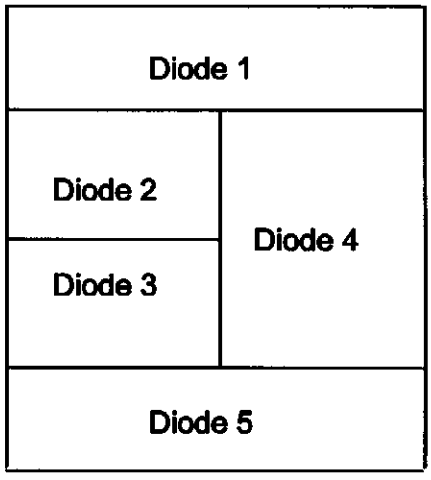


Fig. 5a: Photodiode layout / Flexfoil connections

Photodiode layout:



Flexfoil Connections:

Flexfoil connections:

Cu-side

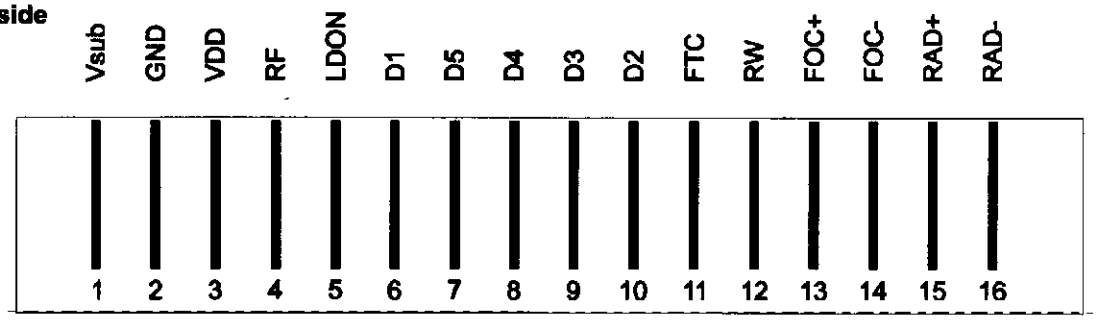


Fig. 5b: OPU circuit diagram

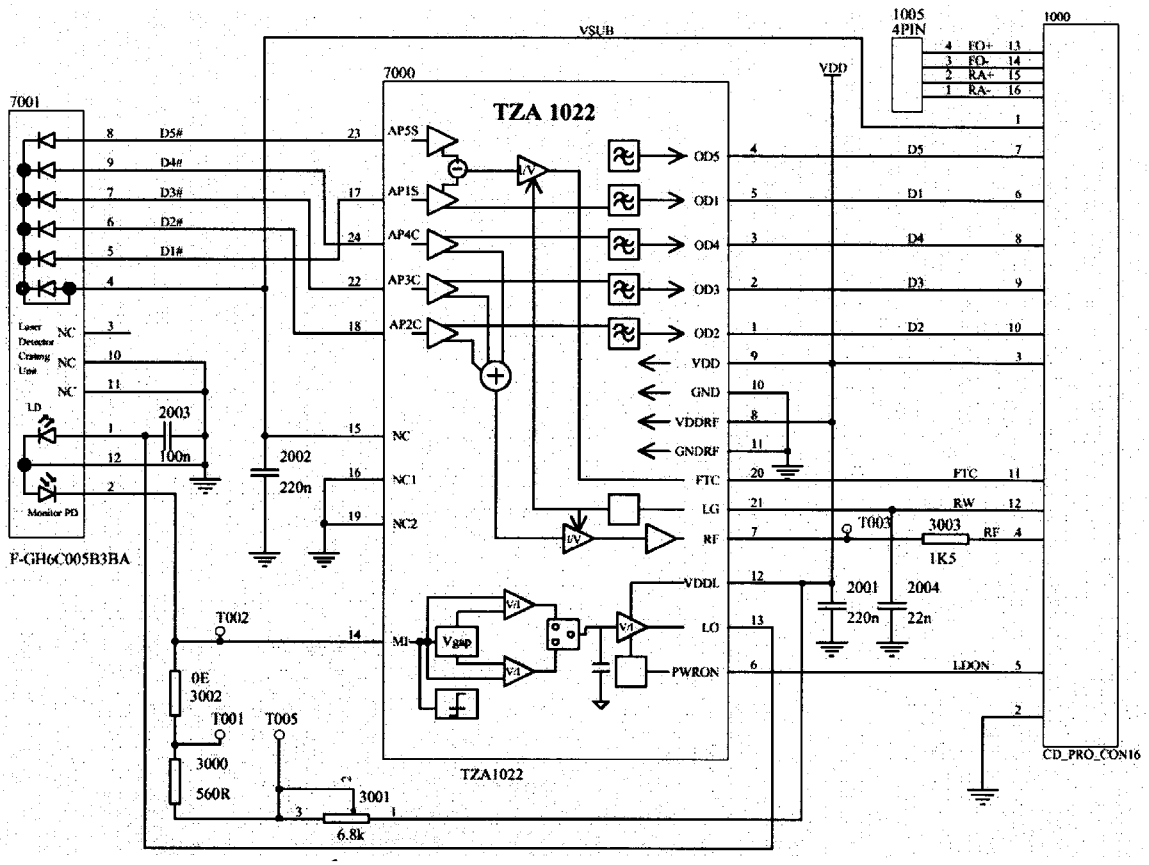


Fig. 5c: OPU flexfoil mechanical data

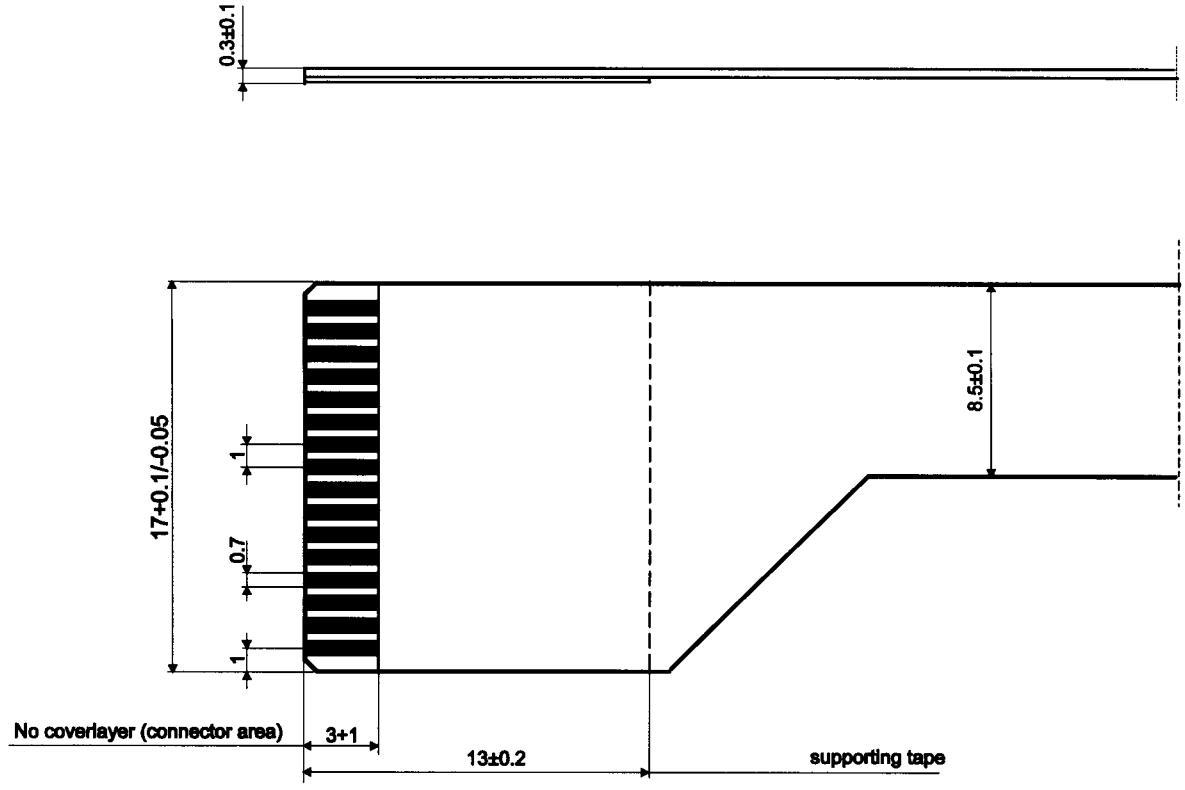
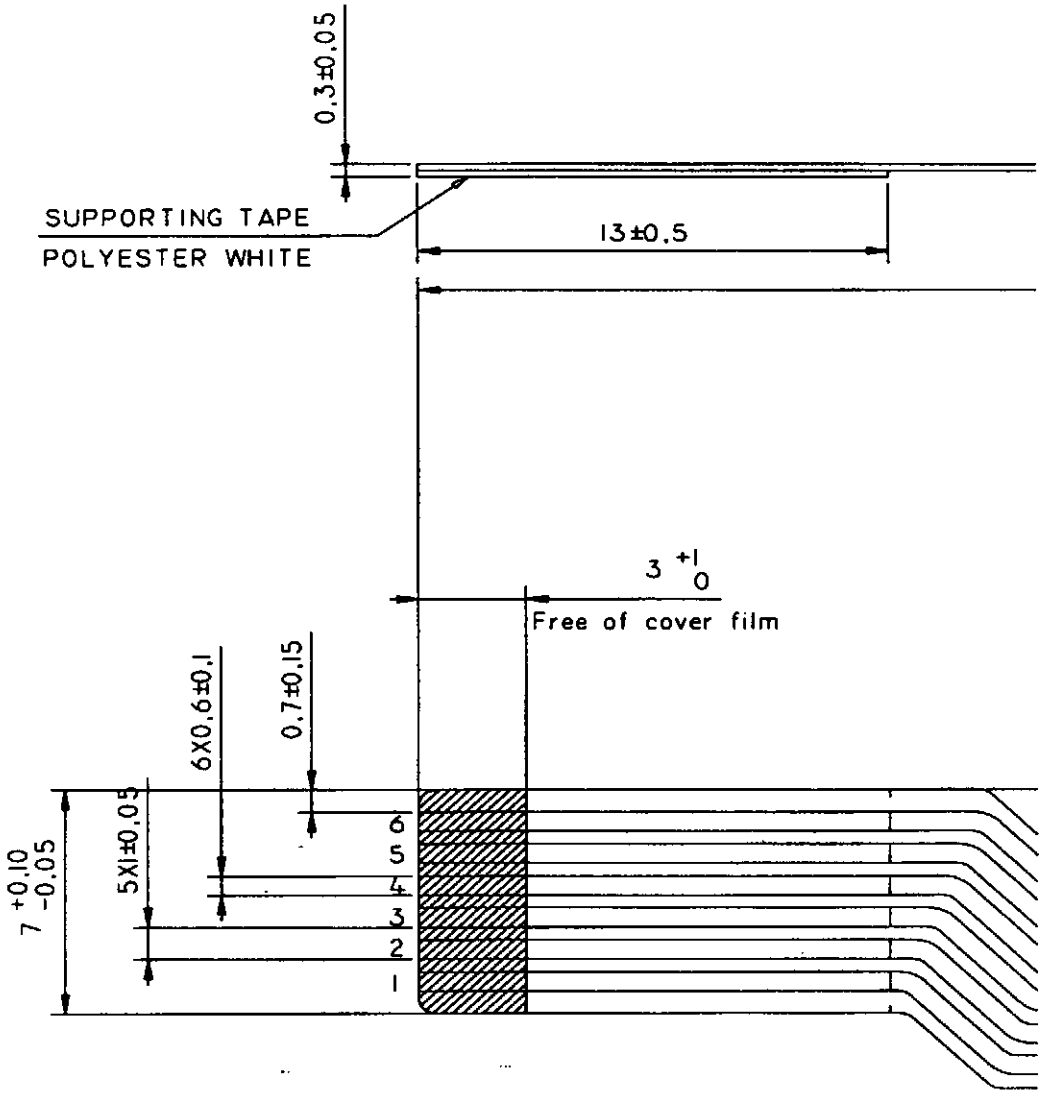


Fig. 6: Motors / switch foil



1 SL-OUT+(+=TO DISCMOTOR)
2 SL-OUT-
3 SLSW
4 GROUND
5 TTM-
6 TTM+

Fig. 7: Dimension sketch

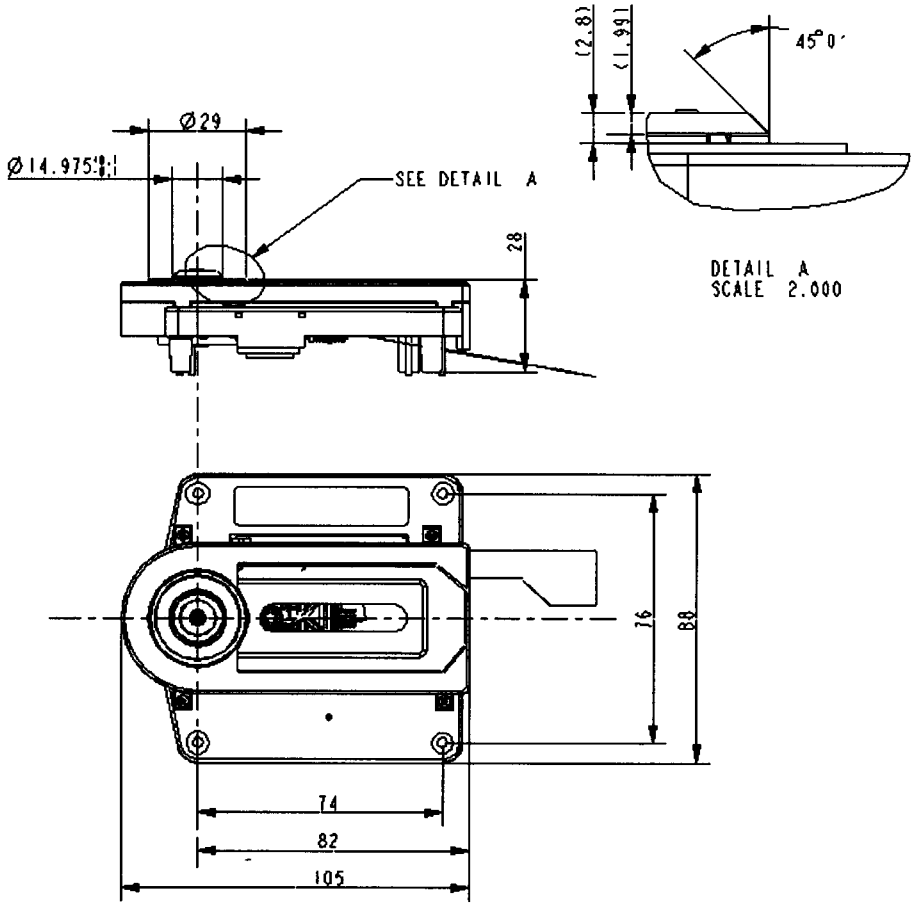


Fig. 8: Optical lightpath

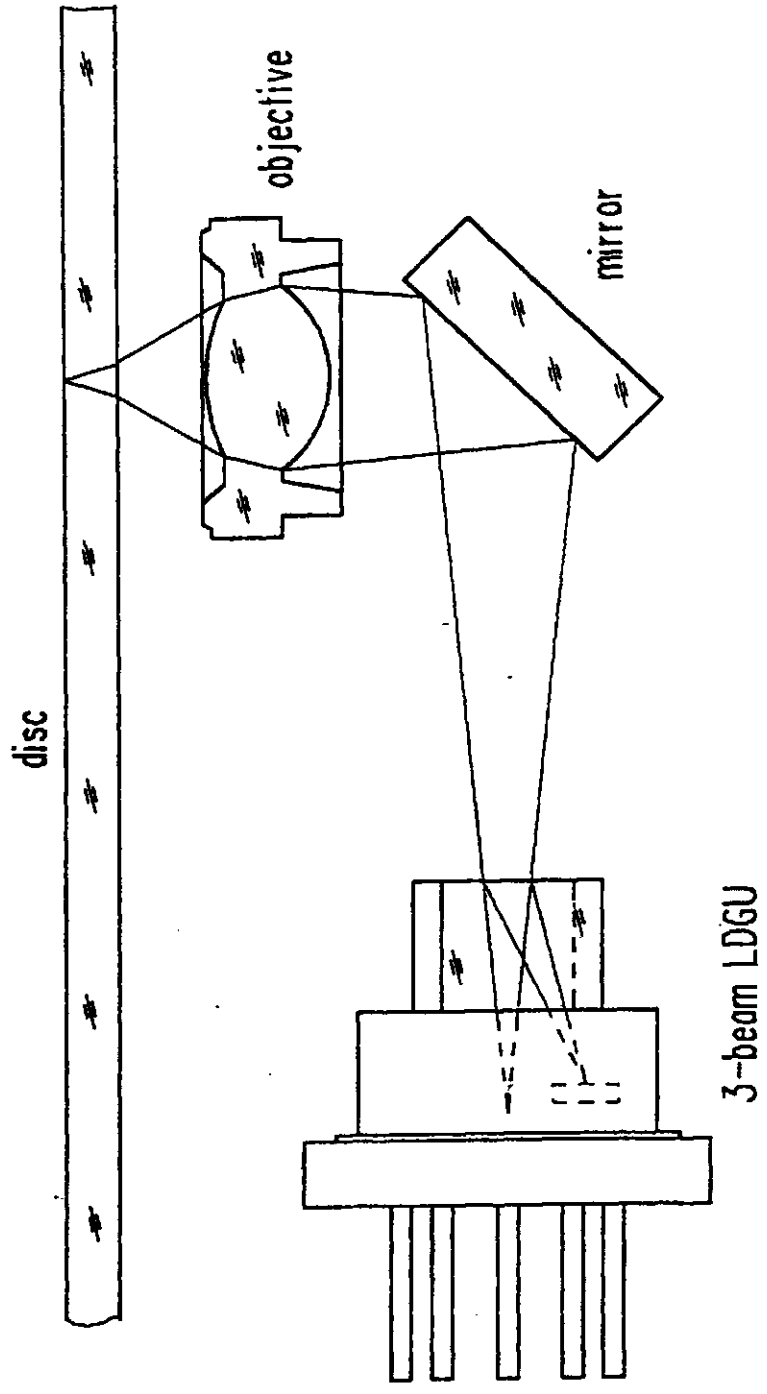


Fig. 9: Focus S-curve

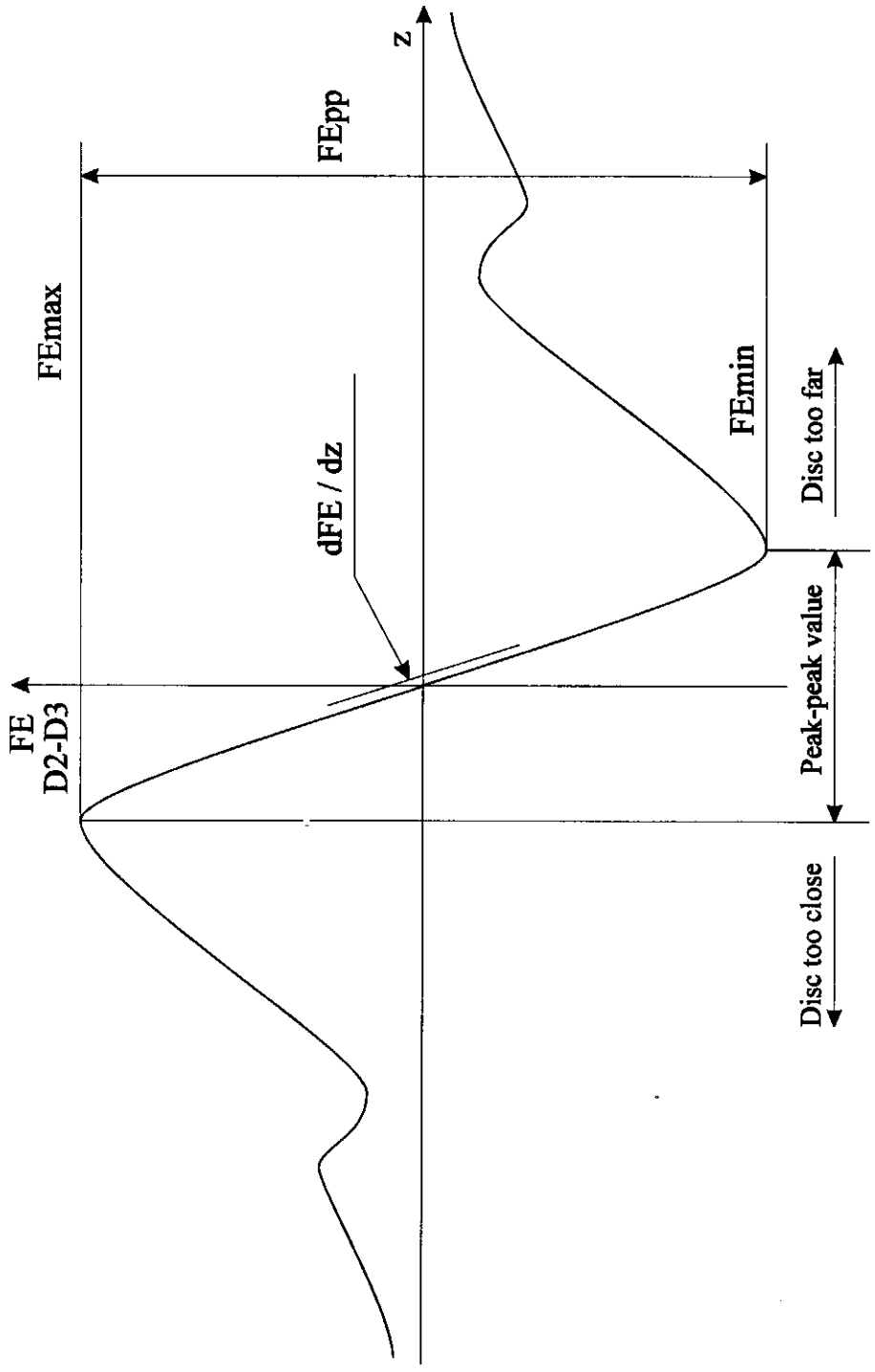
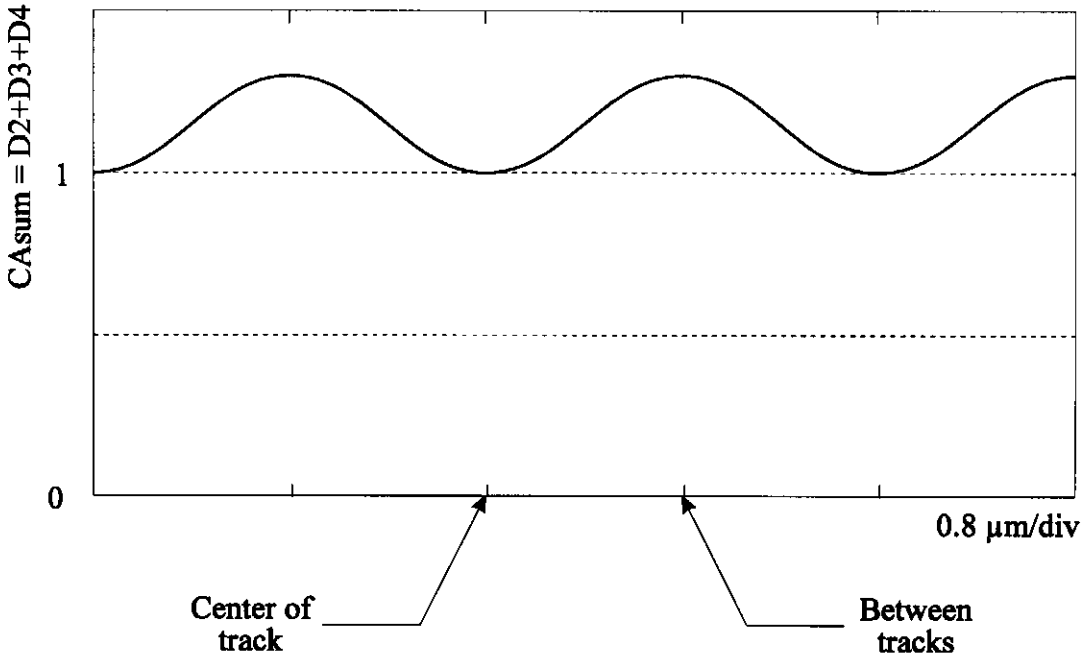


Fig. 10: Radial curve



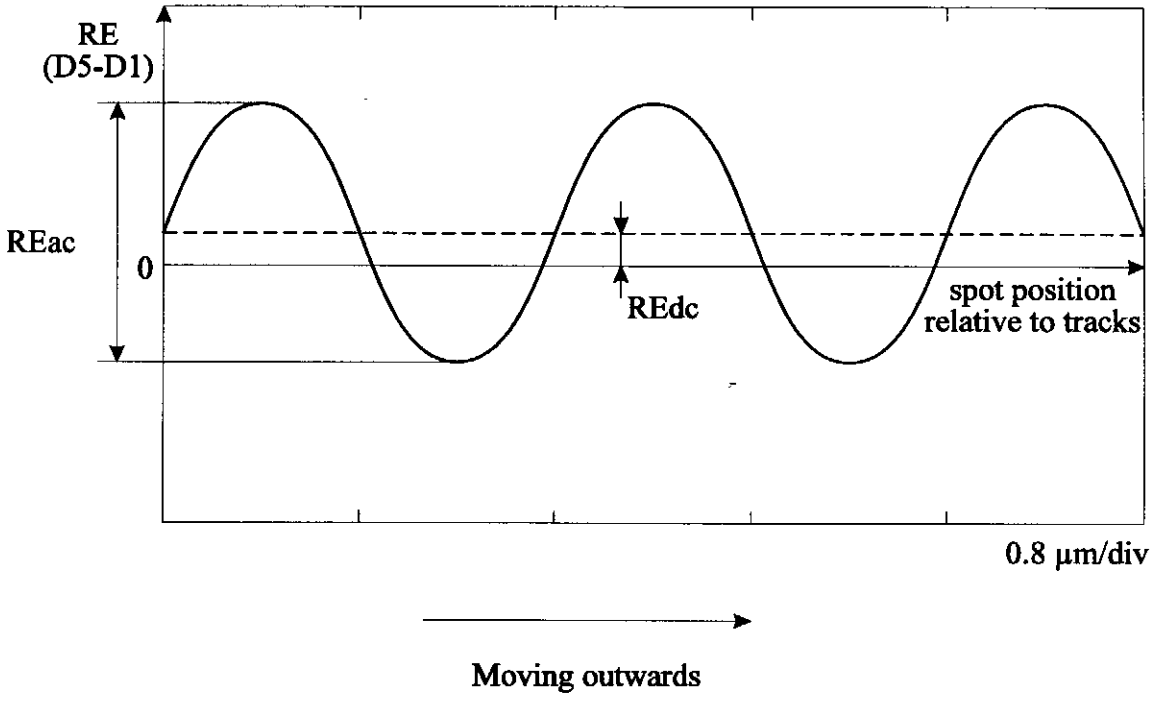


Fig. 11: Temperature dependency

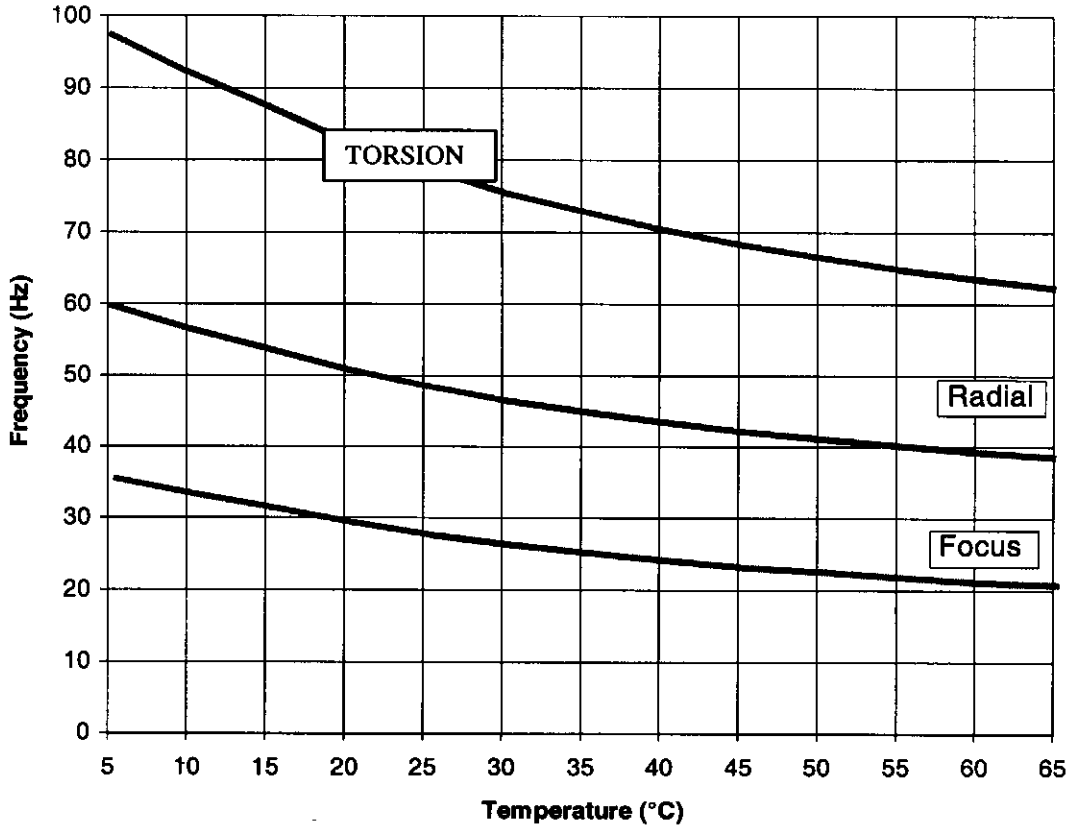
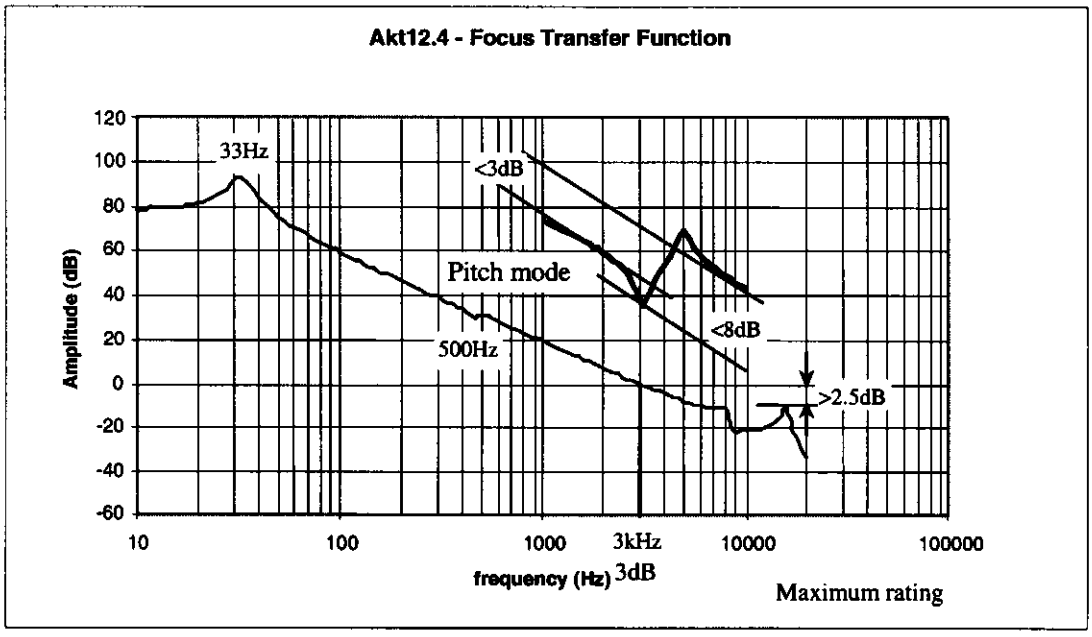


Fig. 12: Focus characteristics of actuator



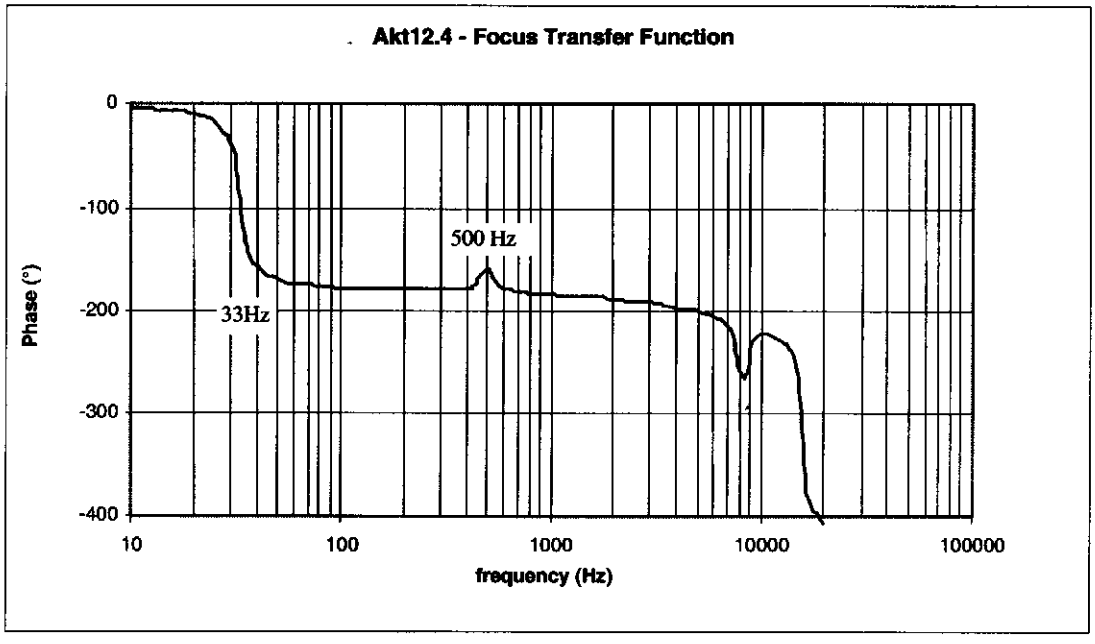
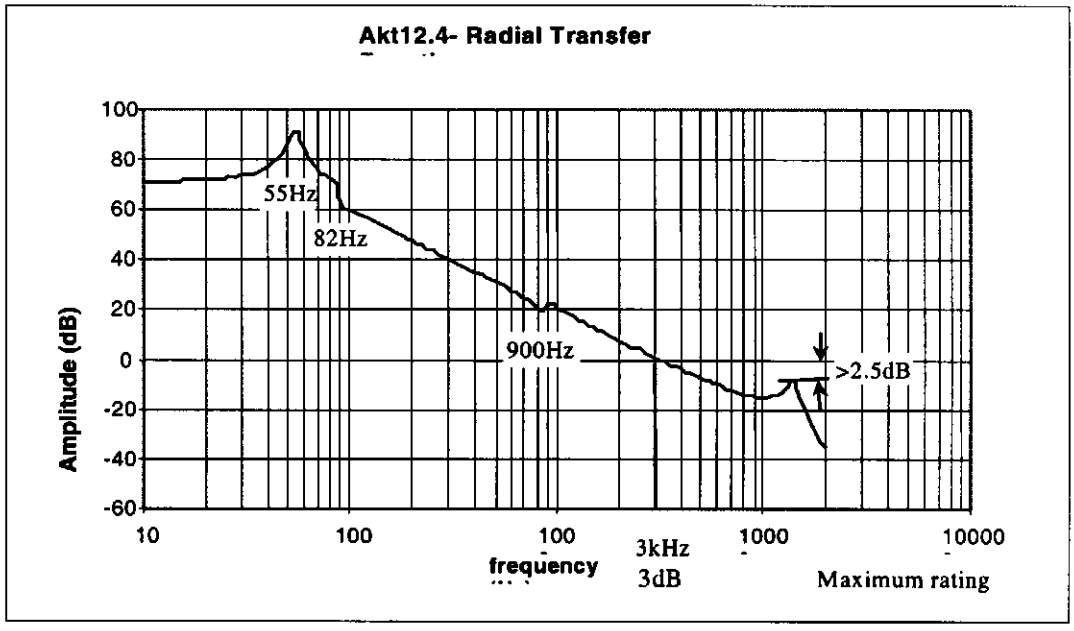


Fig. 13: Radial characteristics of actuator



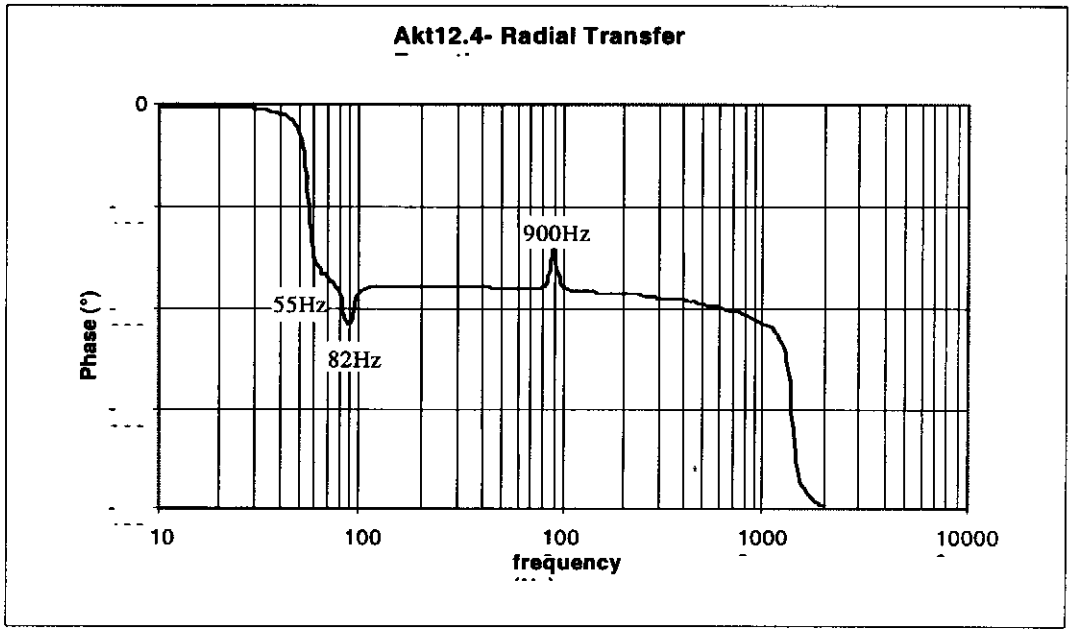


Fig. 14: Turntable sketch

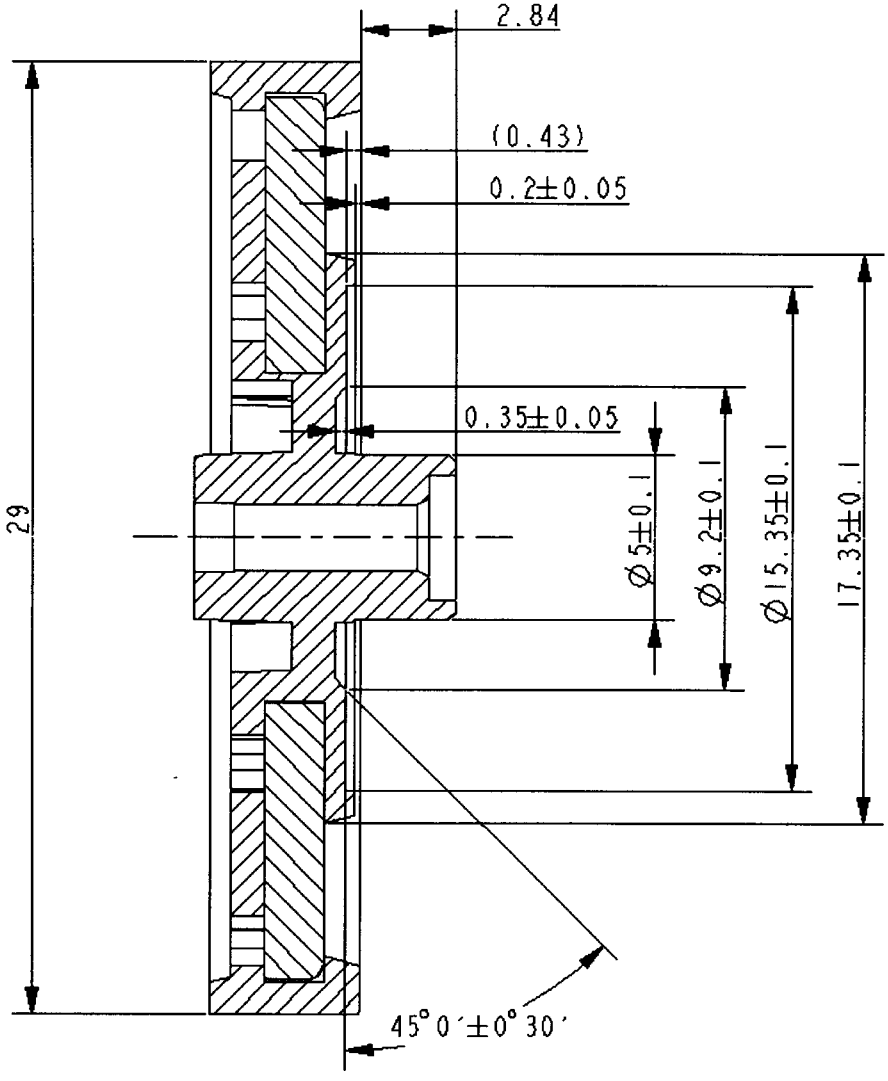


Fig. 15: ESD protection

Unpacking, testing and assembling

A. Avoid surge current or electrostatic discharge
- The mechanism may be damaged if a excessive current is applied to it, even if only a short pulse.
- For safe handling of the mechanism, grounding the human body and the measuring equipment is a must
- Make sure that there is no surge current in the driving circuit

B. Basic ESD countermeasures
- Use humidifiers when the relative humidity in the working environment is below 50%
- Use electroconductive mats over workbenches where the mechanism can be laid down. Resistance between 10^5 Ω and 10^9Ω sq/cm^2
- Use wrist straps (Resistance between 200 kΩ and 1 MΩ).
- When it is difficult to discharge static electricity from the equipment and contacting dielectrics, use Ionises
- All equipment and electric tools which are used, have to be connected to ground via a central grounding point on the table.

C. Introduce on regularly basis audits
- Static potentials must be < 150 V in all cases
- Audit "ALL" ESD countermeasures on regularly basis

D. Using ESD countermeasures
1. Charge-resistant apparel
2. Wrist strap
3. Charge-resistant shoes or ground strap
4. Electroconductive table mat
5. Electroconductive floor mat
6. Ioniser air blower (must not generate ozone for health reasons)
7. ground wire (1 MΩ)