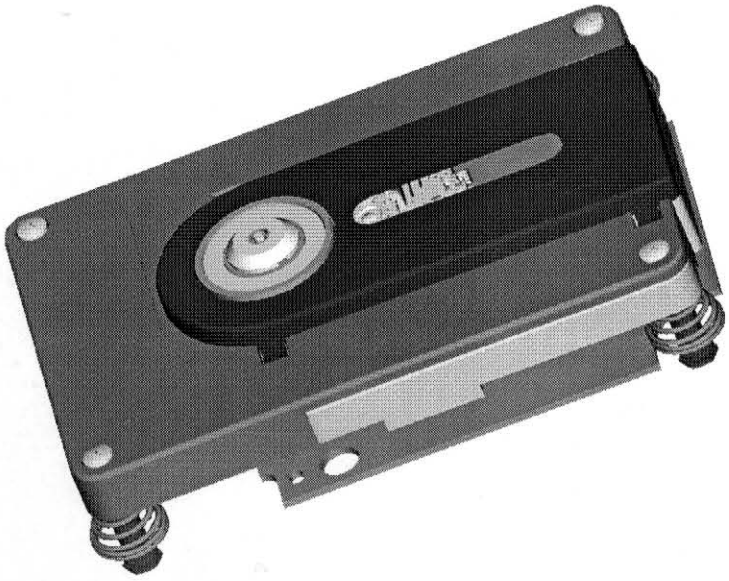
DATA SHEET



VAU 1254/31 "CD-PRO2M"
CD player unit for Audio and Video CD applications

Product specification
Version 1.0

Nov. 2003

Note: ***For the CD mechanism see Data Sheet of the VAM1254/21***
For further information see starter kit Premium 10501

Philips Components

PHILIPS

Type Number :- VAU1254/31
Code Number (12NC) :- 9305 025 25431

Revision History

Version	Nr.	Page	Date	Remarks
0.1	-		15-11-2002	New
1.0			15-11-2003	Release

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TABLE OF FIGURES

1. SCOPE OF THIS DOCUMENT

This document gives the commercial specification of the CD player unit VAU 1254/31 for use in Audio and Video CD applications.

Please ensure to observe the following, otherwise, PHILIPS may not be able to assume the responsibility for things to happen:

- Always use the CD unit within the conditions given in the specification
- No additional process be given to the CD unit.
- Ensure the set containing PHILIPS units is in compliance with the rules and regulations for spurious radiation
- Ensure that the set, containing the PHILIPS unit, is in compliance with requirements according lasersafety
- Always adhere to the handling instructions

1.1 Features

- The VAU1254/31 is an assembly of VAM1254/21, and PCB containing the electronics to form a functional highly integrated CD-player unit for audio and Video CD applications.
- Suitable for 12 and 8 cm discs according to the RED BOOK specifications (IEC908)
- applicable in horizontal and one vertical position; resp. Z up and X downward see fig 1
- Optimized for single speed; prepared for double speed
- Robust design for industrial and professional applications
- Backward compatible with VAU1254/11 "CD-PRO2"
- Micro-controller flashable
- CD-ReWriteable compatible

2. GENERAL SPECIFICATIONS

Performance characteristics based on Standard test conditions (See Chapter 3).

2.1 Mechanical Specification

Parameter	Min.	Typ.	Max.	Unit	Notes
Dimensions					See fig. 10
Read-out diameter (inside)		47.4 ± 0.6		mm	
Read-out diameter (outside)		117.5 ± 0.5		mm	
Weight		418		gr	

2.1.1 Connector types

Connector number	Connector name	Connector type	Remark
1003	IEC958 EBU output	PH-S	2 pin JST 2mm SMD connector
1004	DSA	PH-S	6 pin JST 2mm SMD connector
1005	I2S	PH-S	6 pin JST 2mm SMD connector
1007	16MHz CLK (optional)	PH-S	3 pin JST 2mm SMD connector
1214	Power supply	PH-S	4 pin JST 2mm SMD connector
1217	Audio output	PH-S	4 pin JST 2mm SMD connector
1220	Flash uP	PH-S	6 pin JST 2mm SMD connector

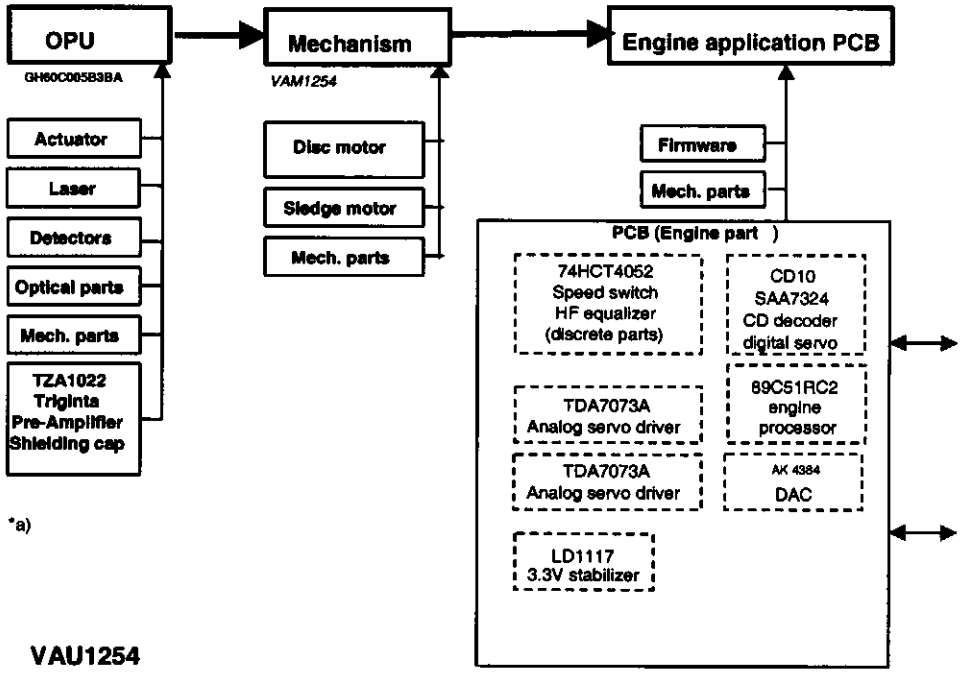
2.1.2 Connections

For foil layout see Fig 8a.
For OPU circuit diagram see Fig 8b.
For mechanical data of foil see Fig 8c.
Foil for T/T motor, sledge motor and switch mechanical data see Fig 9.

2.2 Electronic interface

Connector layout see Fig 18.

2.2.1 Block diagram



2.2.2 Interfaces

- Digital output
- Analog output
- 12S output
- DSA interface
- Supply input
- Flash interface

3. MEASURING CONDITIONS

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

- Reference Electronics
  - Circuit diagram Premium 10502
  - For measuring circuit: Signal monitor, see Fig 5.

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		°

Test discs

Description	Test Disk	Code Number
Playability check + error correction	SBC444A	7104 099 24991
Audio performance	SBC429	7104 087 04911
Vibration, shock	SBC442 Burn-in	7104 087 04861
Mechanical noise	SBC442 Burn-in	7104 087 04861
Skew optical	0.6° 8cm	7104 099 28261
Vertical deviation disc	+/-0.5mm	7104 099 24970
Eccentricity	150µm	7104 099 24961
Max. Dia. Disc	-	7104 087 32772
80 minutes disc		-
CDR test disc Taiyo Yuden		7104 099 92841
CDRW Normal reflection Audio disc		7104 099 96591

4. PERFORMANCE SPECIFICATION

Performance characteristics based on the above mentioned standard test conditions

4.1 Audio Performance

Remark:

- Used test disc: SBC429
- 1 kHz unless specially stated
- Audio performance is related to DAC IC AK4384 and TS462 Op Amp stage

	Parameter	Typical values	Units
1	Output voltage (0 dB level)	1.5	Vrms
2	Channel unbalance	< 0.85	dB
3	SNR (bipolar zero, unweighted)	> 85	dB
4	SNR ('A' weighted)	> 100	dB
5	Dynamic range for –60dB at 1 KHz	-28	dB
6	THD (20 Hz-20 KHz)	-80	dB
7	THD+N for 0dBFS at 1 kHz	-85	dB
8	Channel crosstalk for 1kHz at 0dBFS	> 90	dB

4.2 Playability

Parameter	Requirement
Wedge	900 µm
Black dot	800 µm
Eccentricity (Amplitude)	150 µm
Fingerprint	No audible defects
Heavy fingerprint	No track jump
Skew disc 8 cm	0.6° max first 10min

General criteria: No audible defects.

4.3 Mechanical Noise

Measured with Brüel & Kjaer Sound Level Meter 2230 when using a CD or finalized CDR

Play/Pause/Standby	Max. [33-T.B.D] dBA
Search/jump	≤ [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
Noise definition of LEQ : Steady noise level that produces the same energy as a time variant sound over a stated period

4.4 Transport (unpacked)

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

4.5 Transport (packed)

In packaging, acc to UN-D 1400

4.6 Electro Magnetic Compatibility (EMC)

25 KV target in built-in situation (provided state of the art of design-in and good workmanship) IEC61000-4-2 (IEC801-2:1991) grounding of mounting-plate has to be guaranteed.

5. RELIABILITY CONDITIONS

Note: Environmental conditions acc. to UAN-D1590

5.1 Operating Environment

Temperature	Operating	+5 °C - +55 °C
Humidity range		5% to 90% RHD
Shock Resistance:	Test disc	Burn-in 7104 087 04861 track 1 and track 20
	Specified values(min 2 σ values)	3.5g during 3 msec in X, Y and Z direction Requirements: no audible mute
	Typical average values (horizontal use)	5g in X direction 6g in Y direction 10g in Z direction

5.2 Storage environment

Temperature range	-25°C to +55°C
Humidity range	5% to 95% RH
Duration: 48 Hours	+70 °C

Note: Recovery under room conditions before measurement Min 4 hour. No dew allowed
After the test and recovery, the deviations of characteristics from the standard values must be within the tolerance specified in the reliability specifications

5.3 Dry heat Exposure test

Dry heat (IEC68-2-2 Ba)	
Storage	55°C, Duration: 14 Days
Exposure	70°C, Duration: 2 Days

Note: Recovery under room conditions before measurement Min 4 hour. No dew allowed
After the test and recovery, the deviations of characteristics from the standard values must be within the tolerance specified in the reliability specifications

5.4 Damp Heat Exposure test

Damp heat (IEC68-2-3 Ca)	
Storage	40°C, Duration: 21 Days
Operating	1 hour at 25°C

Note: Recovery under room conditions before measurement Min 4 hour. No dew allowed.
After the test and recovery, the deviations of characteristics from the standard values must be within the tolerance specified in the reliability specifications

6. CYCLIC HEAT EXPOSURE TEST

Test according to IEC 68-2-30-Db

7. RELIABILITY SPECIFICATIONS

Lifetime:	750 hours B1
	7500 hours B10
MTBF:	>30000 hours
	(100% duty cycle)
Sledge movements:	500k cycles (full stroke)
AQL:	0.65% major
	1.50% minor

8. DESIGN-IN INFORMATION

8.1 Connector description

IEC958 EBU output

PIN	Name	I/O	Description
1	Dig-GND	O	Ground
2	EBU dig data (IEC958)	O	External clock input (8.4672 MHz)

DSA interface

PIN	Name	I/O	Description
1	ACK	I/O	Acknowledge
2	DDA	I/O	Data
3	DST	I/O	Strobe
4	DRST	I	Reset
5	GND	O	Ground
6	LASER OFF	I	Control input for laser H = laser on, L = laser off

I2S output

PIN	Name	I/O	Function
1	EF	O	C2 error flag
2	SCLK	O	Serial clock
3	WCLK	O	Word clock
4	DATA	O	Data
5	GND	O	Ground
6	V4	O	Versatile output

Optional: 16MHz clock output

PIN	Name	I/O	Function
1	Dig-GND	O	Ground
2	CLK16	O	16.9344 MHz clock input
3	Dig-GND	O	Ground

Power input

PIN	Name	I/O	Function
1	GND	I	Ground pin 9V (not connected on PCB to ground pin 5V)
2	+9 V supply	I	9 volt supply for drivers TDA7073
3	GND	I	Ground pin 5V (not connected on PCB to ground pin 9V)
4	+5 V supply	I	5 volt supply

Audio output

PIN	Name	I/O	Function
1	Right audio	O	Audio output right channel
2	A-GND	O	Analog ground
3	A-GND	O	Analog ground
4	Left audio	O	Audio output left channel

Flash interface

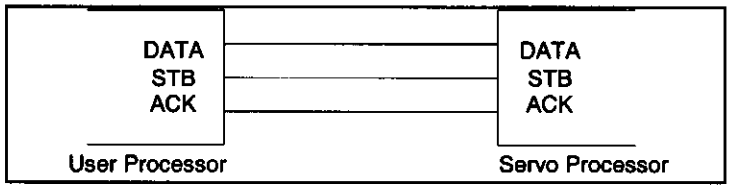
PIN	Name	I/O	Function
1	+12 V supply	I	12 volt for flashing uP
2	PSEN	I	Program strobe enable
3	RXD	I	Serial input port
4	TXD	O	Serial output port
5	GND	I	Ground
6	Reset	I	Power On Reset Pulse to Microprocessor

8.2 Software / Control

8.2.1 DSA interface

The DSA-bus is an asynchronous, bi-directional, internal bus designed for communication between two micro processors in one set. It consists of three bi-directional lines:

- DATA - for starting synchronisation and data transfer
- STB- for data strobe (DATA is valid while STB is low)
- ACK - for starting synchronisation, data transfer-acknowledge and communication-acknowledge



8.2.2 Command set summary

Command name	Type	opcode	Parameter
COMMANDS TO SERVO PROCESSOR			
Play title	Servo	01h	Title number (hex)
Stop	Servo	02h	XX
Read TOC	Servo	03h	00
Pause	Mode	04h	XX
Pause Release	Mode	05h	XX
Search forward at low speed, with Border flag cleared	Servo	06h	00h
Search forward at high speed, with Border flag cleared	Servo	06h	01h
Search forward at low speed, with Border flag set	Servo	06h	10h
Search forward at high speed, with Border flag set	Servo	06h	11h
Search backward at low speed, with Border flag cleared	Servo	07h	00h
Search backward at high speed, with Border flag cleared	Servo	07h	01h
Search backward at low speed, with Border flag set	Servo	07h	10h
Search backward at high speed, with Border flag set	Servo	07h	11h
Search release	Servo	08h	-
Get title length	Info	09h	Track number (hex)
Get complete time	Info	0Dh	XX
Goto time	Servo	10h	Abs. Min. (hex)
		11h	Abs. sec. (hex)
		12h (start)	Abs. frm. (hex)
Read Long TOC	Servo	14h	00

Command name	Type	opcode	Parameter
Set mode	Mode	15h	Mode settings
Get last error	Info	16h	XX
Clear error	Info	17h	XX
Spin up	Servo	18h	00
Play A-time till B-time	Servo	20h	Absolute start time minutes (hex)
		21h	Absolute start time seconds (hex)
		22h	Absolute start time frames (hex)
		23h	Absolute stop time minutes (hex)
		24h	Absolute stop time seconds (hex)
		25h (start)	Absolute stop time frames (hex)
Release A->B time	Mode	26h	XX
Get Disc Identifiers	Info	30h	XX
Get disc status	Info	50h	XX
Set volume	Mode	51h	Volume level (hex)
Clear TOC	Mode	6Ah	XX
Set DAC mode	Mode	70h	DAC mode
Reserved for Vendor Unique commands	-	A0h-AFh	
SERVICE COMMANDS TO SERVO PROCESSOR			
Service Mode Off	Servo	F0h	00h
Request Servo Version Number and activate Service Mode		F0h	01h
Sledge off		F1h	00h
Sledge outside for 300msec		F1h	01h
Focus off		F2h	00h
Focus on		F2h	01h
Turntable motor off		F3h	00h
Turntable motor on		F3h	01h
Radial off		F4h	00h
Radial on		F4h	01h
Laser on		F5h	00h
Laser off		F5h	01h
Diagnostics		F6h	XX
High gain / Low gain		F7h	XX
Jump grooves		F8h	MSB number of grooves
		F9h (start)	LSB number of grooves
RESPONSE COMMANDS FROM SERVO PROCESSOR			
Found	Servo	01h	Xx
Go to time found			40h
Paused			41h
Pause released			42h
Spinned up			43h
Play A-B Start found			44h
Play A-B End found			45h
Stopped	Servo	02h	Xx

Command name	Type	opcode	Parameter
Disc status	Info	03h	No disc present / disc present Disc size 8cm / 12 cm High/low reflectance disc Finalised/unfinalised disc
Error values	Info	04h	Error value
Length of title	Info	09h	LSB byte of seconds of requested title (hex)
		0Ah	Msb byte of seconds of requested title (hex)
Actual title	Servo	10h	New track number (hex)
Actual index	Servo	11h	New index number (hex)
Actual minutes	Servo	12h	New minutes (hex)
Actual seconds	Servo	13h	New seconds (hex)
Absolute time	Info	14h	New abs. minutes (hex)
		15h	New abs. seconds (hex)
		16h	New abs. frames (hex)
Mode status	Info	17h	Mode settings
TOC values	Servo	20h	Min. track number (hex)
		21h	Max. track number (hex)
		22h	Start time lead-out min. (hex)
		23h	Start time lead-out sec. (hex)
		24h	Start time lead-out frm. (hex)
A->B Time released	Mode	26h	xx
Disc identifiers	Info	30h	Disc identifier 0 of the CD
		31h	Disc identifier 1 of the CD
		32h	Disc identifier 2 of the CD
		33h	Disc identifier 3 of the CD
		34h	Disc identifier 4 of the CD
Volume level	Mode	51h	Volume level (hex)
Long TOC values	Servo	60h	Track number (hex)
		61h	Control & Address field
		62h	Start time minutes (hex)
		63h	Start time seconds (hex)
		64h	Start time frames (hex)
TOC Cleared	Info	6Ah	xx
DAC mode	Mode	70h	DAC mode
Servo Version Number	Servo	F0h	Servo version number

xx = don't care

9. POWER SUPPLY REQUIREMENTS

9.1 Overall requirement

Voltage name	voltage			Noise	current			
	Min	Typ	Max		min	typ	Max	Peak
	(v)	(V)	(V)	(mVpp)	(mA)	(mA)	(mA)	(mA)
+5V	4.5	5	5.5	100			300	
+9V	8.1	9	9.9	100			200	700

It is recommended that power-on/off tests be carried out before actual implementation to determine whether there is any audible plop sound during power-on/off or whether they meet the application's requirement.

Recommendation for Power Supply Start Up Sequence to Avoid Audible Plop Sound During Power On/Off

1. During Power-On, the +5V supply should be turned on first, followed by the +9V supply. Recommended delay is at least 20msec between the turning on of the two supplies.

2. Similarly, during Power-Off, the +9V supply should be turned off first, followed by the +5V supply. Recommend delay is at least 20msec between the turning off of the two supplies.

3. The above recommendations assume that the decay time for both supplies is negligible (<<20msec). If the decay time is not negligible for any of the supplies, the delay time for power on or off should be increased accordingly.

Important notice: The +9V supply must be turned on within 2 sec after the +5V supply is present, otherwise the audio may be muted.

10. HANDLING INSTRUCTIONS

- Usage and storage in dusty, high temperature and high humidity environments should be avoided.
- To avoid damage by electrostatic discharges, measuring equipment and operators must be grounded during handling (See fig. 19). 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!!**
- 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

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.

13. SAFETY STANDARDS

The VAU1254/31 is prepared for the following standards on safety:

IEC 65
EN 60065
UL 1492
UL 6500

UL filenumber: E143838 typenumber: VAU12##

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

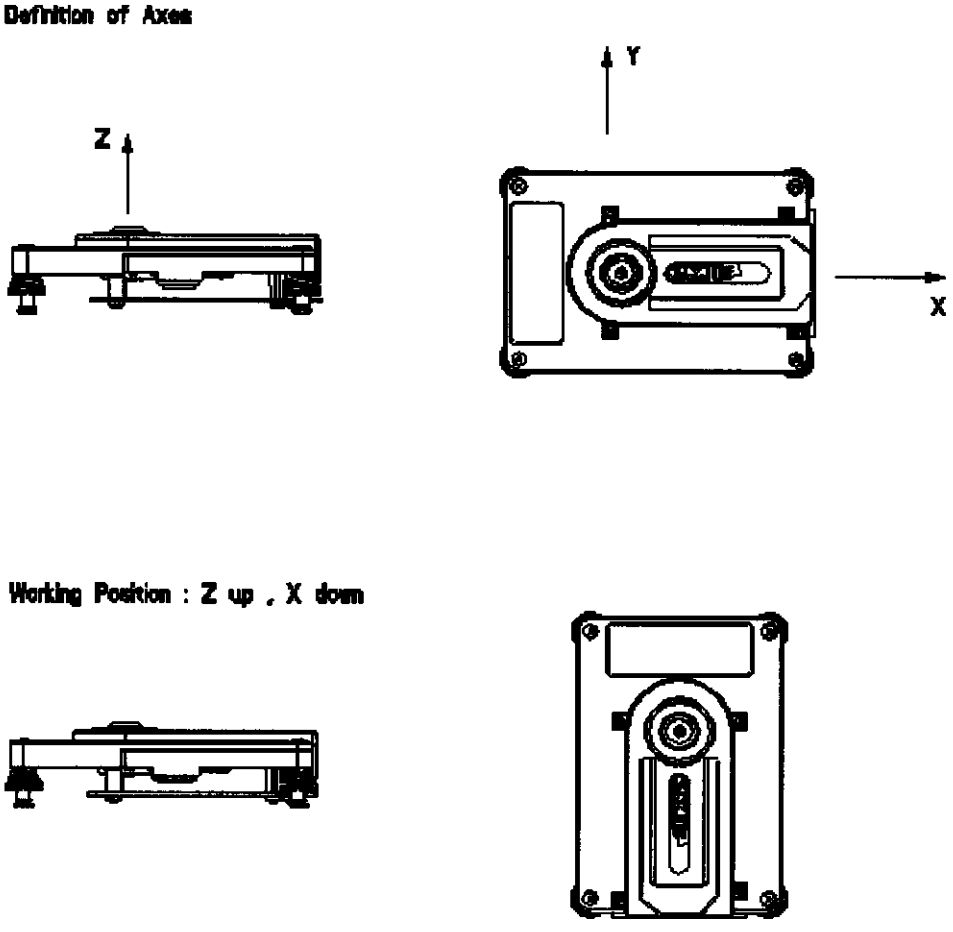


Fig 2: Block Diagram

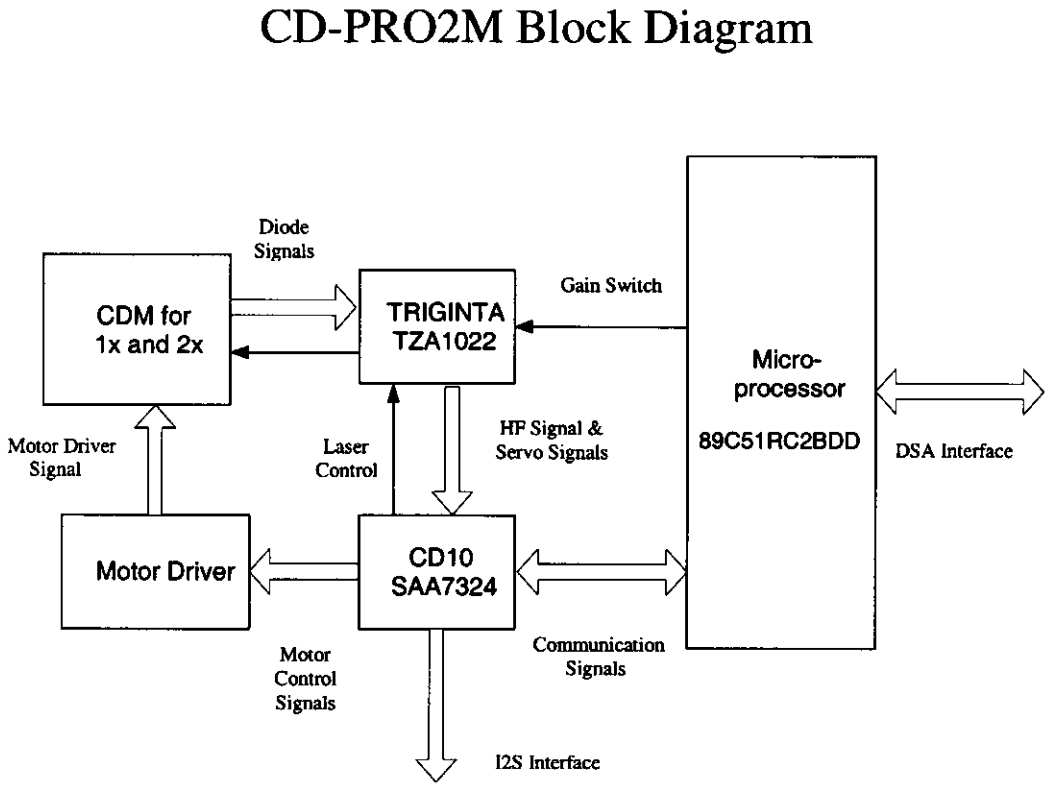


Fig 3: Exploded view Audio Unit

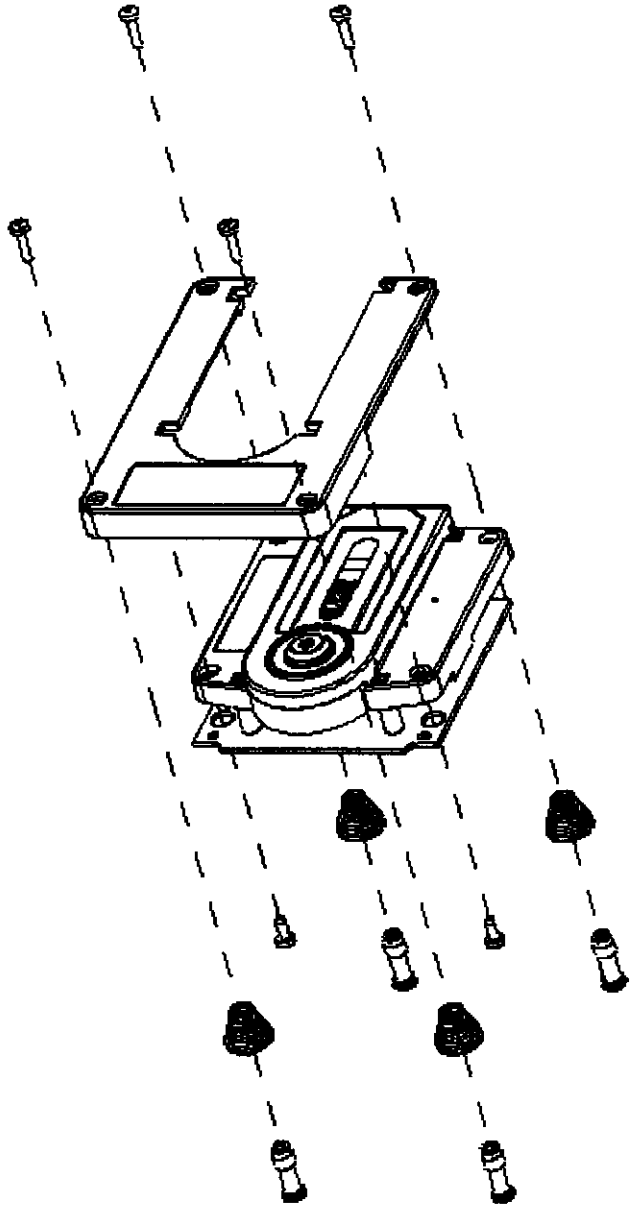


Fig 4: Exploded view CD mechanism

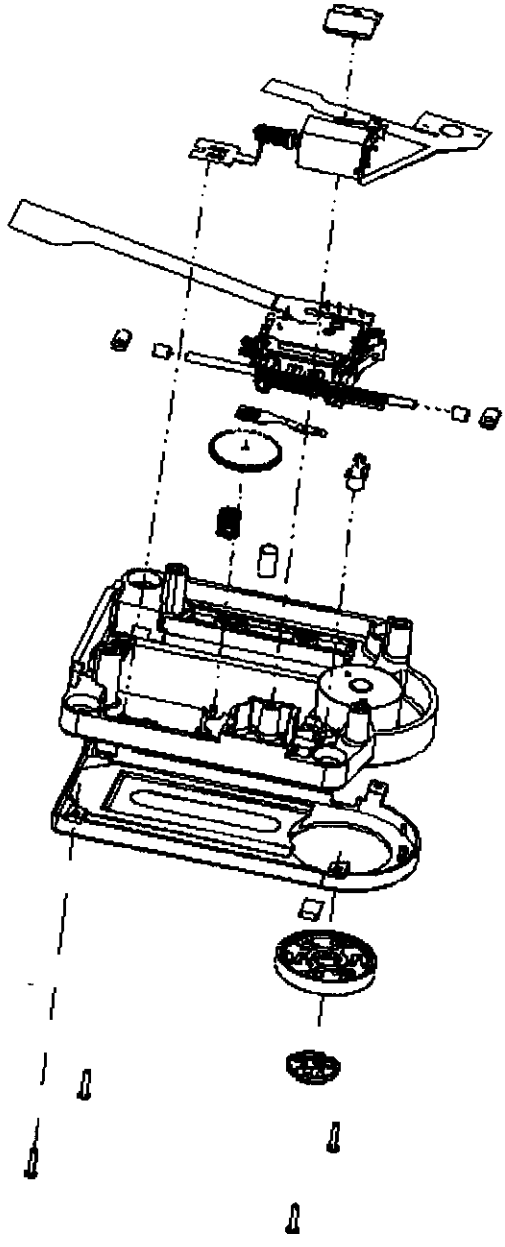


Fig 6a: Recommended Suspension

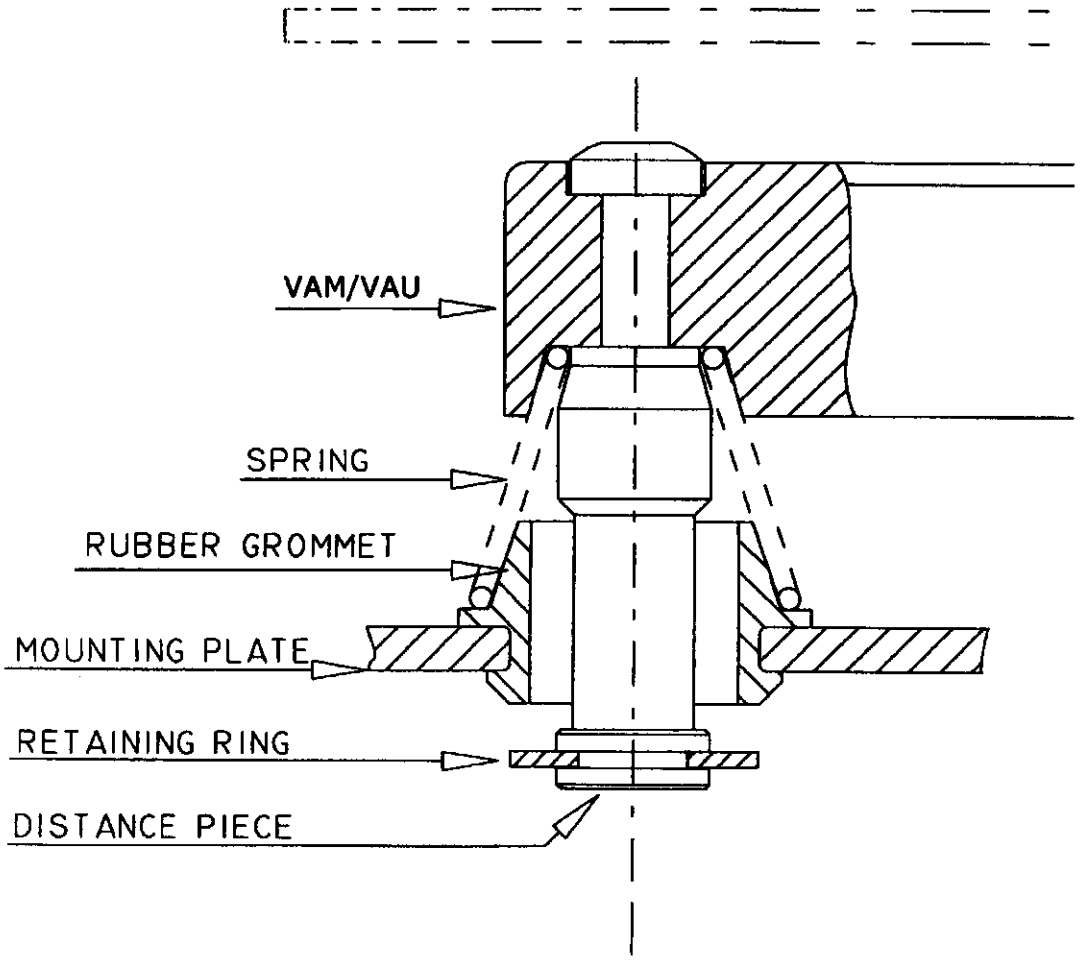
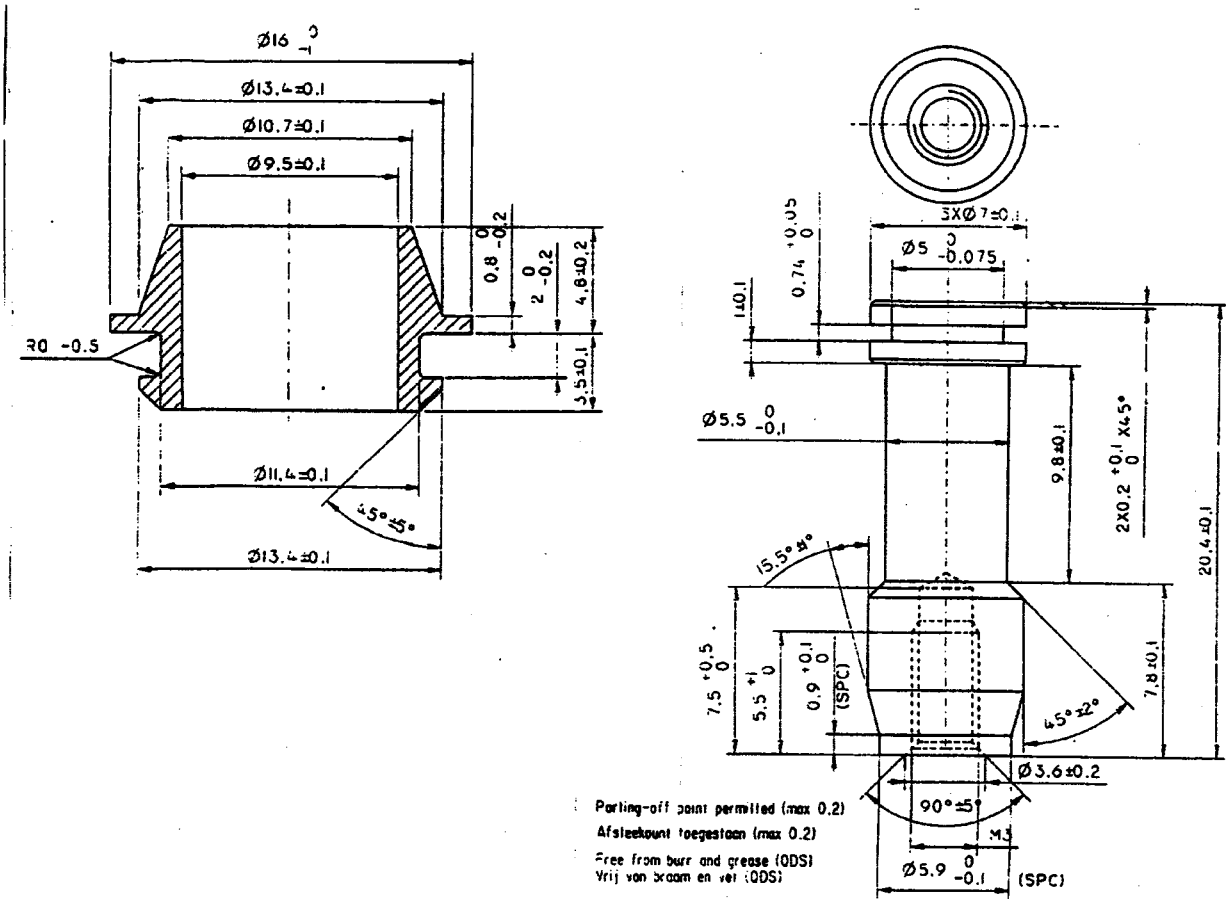


Fig 6b: Suspension Piece Parts



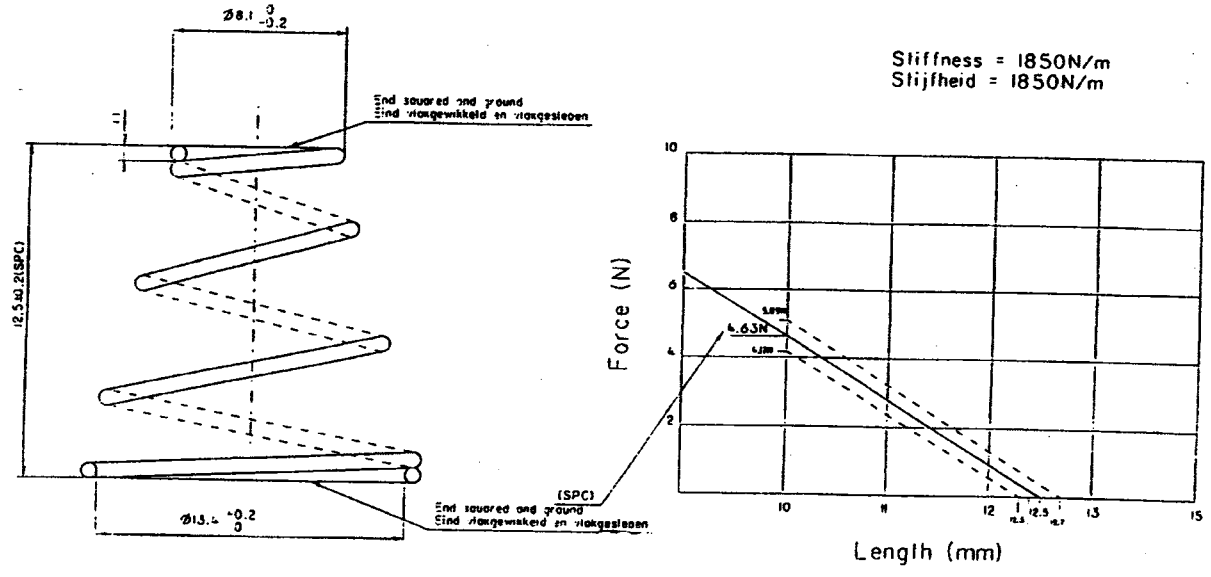


Fig 7: Set Angle of Vertical Running

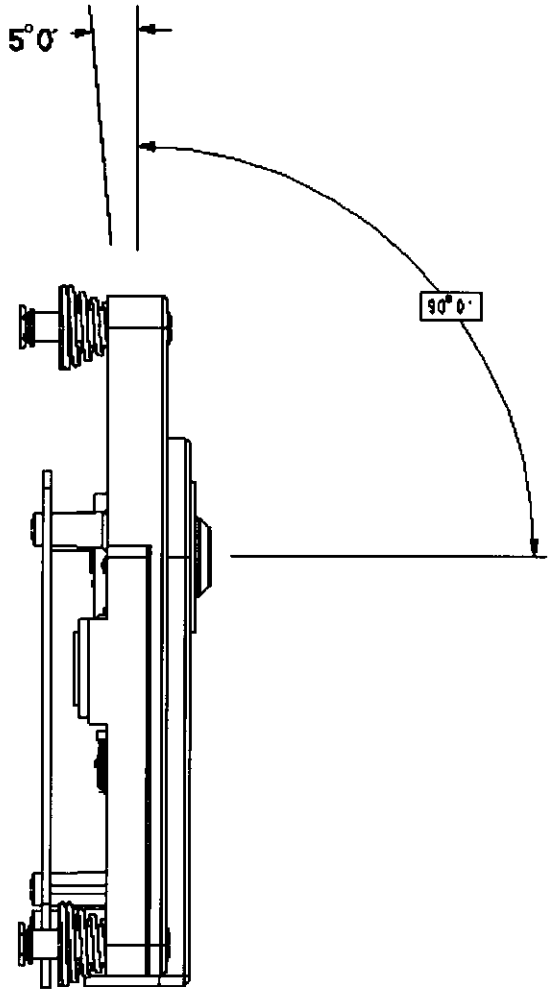


Fig 8: Dimension sketch

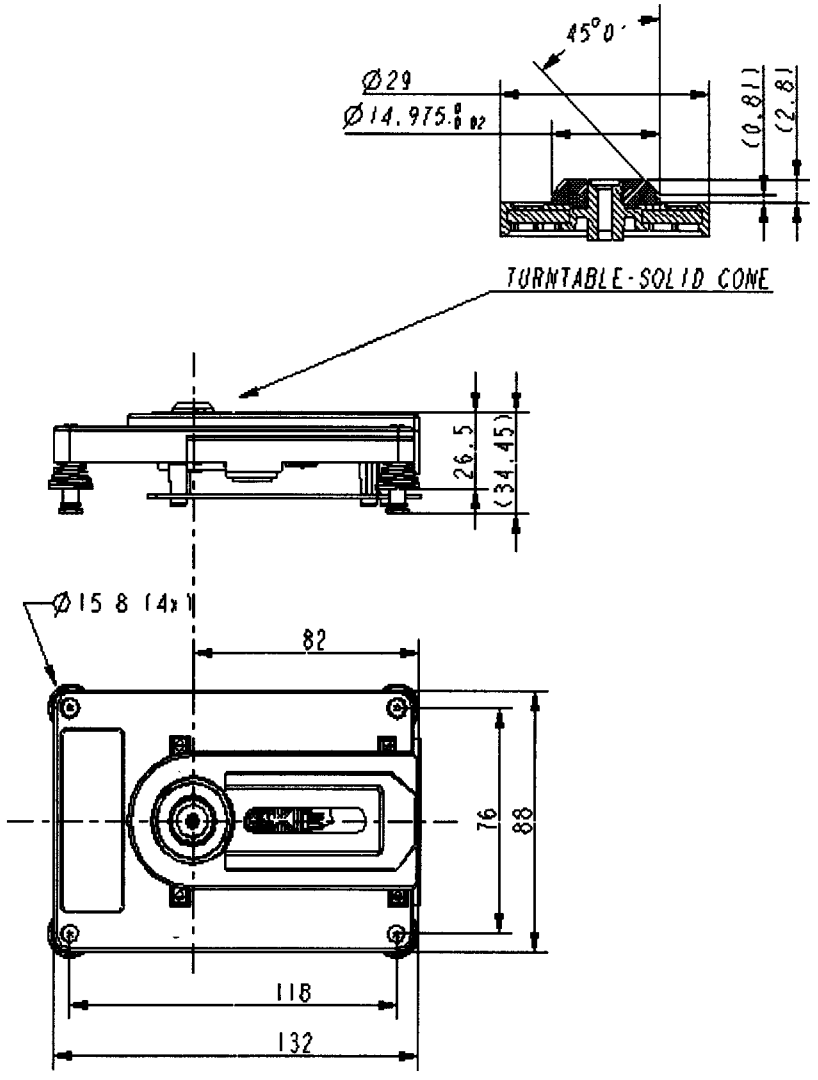
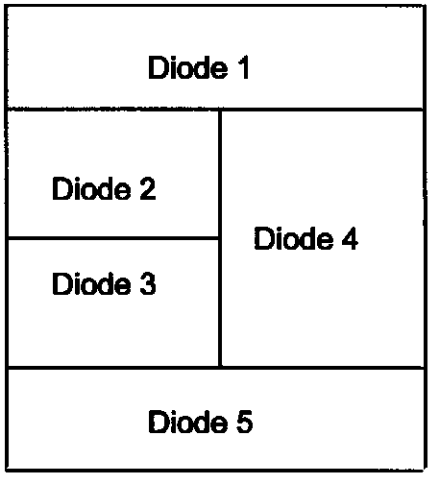


Figure 8a. Photodiode Layout / Flexfoil Connections.

Photodiode layout:



Flexfoil Connections:

Flexfoil connections:

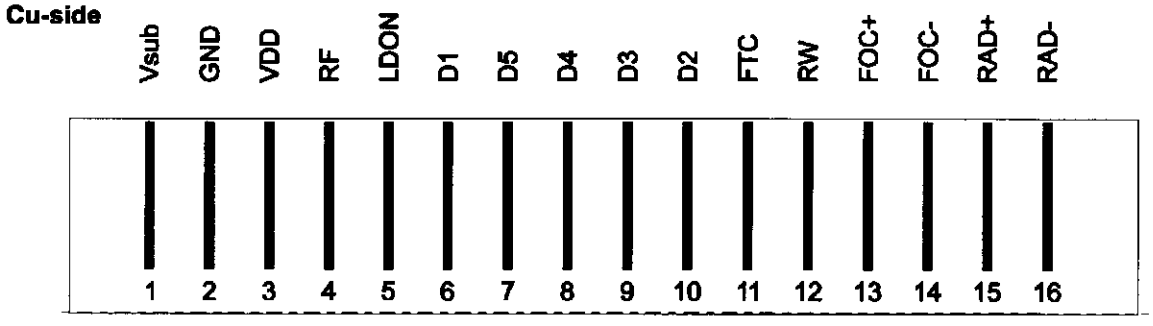


Figure 8c. OPU Flexfoil Mechanical Data

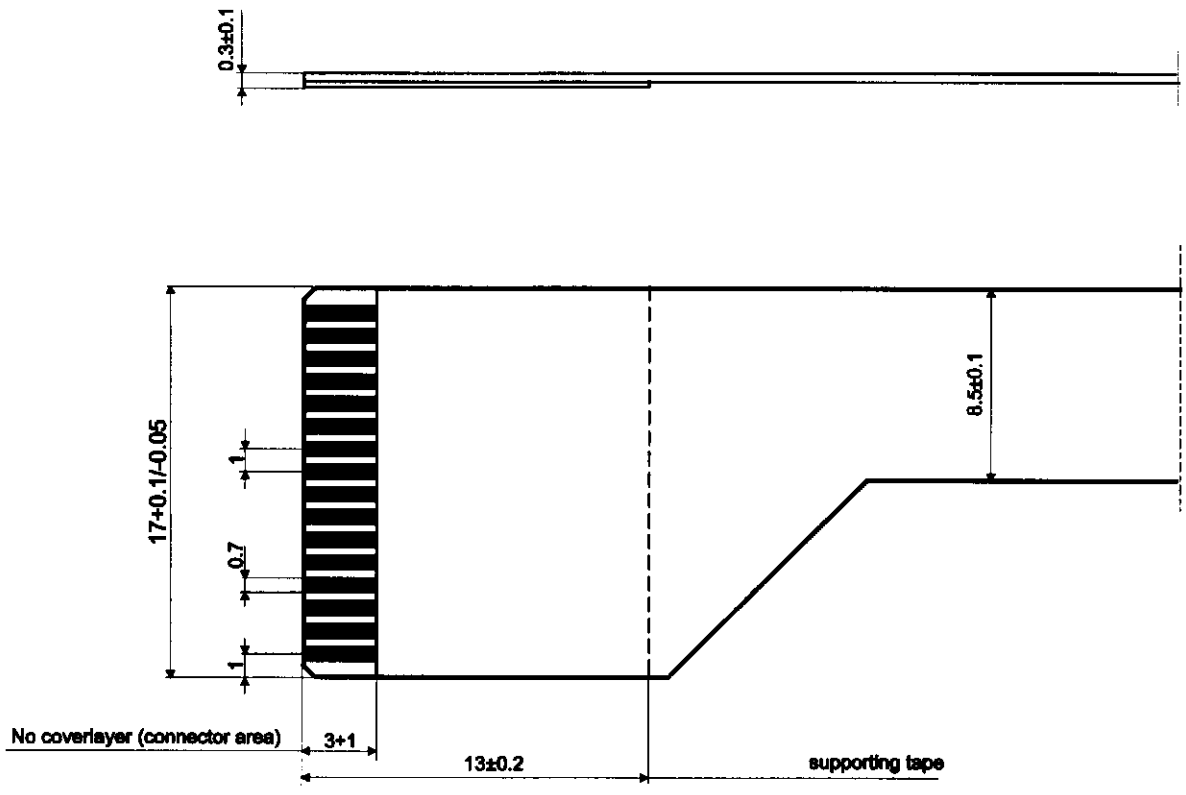


Fig 9: Sketch turntable

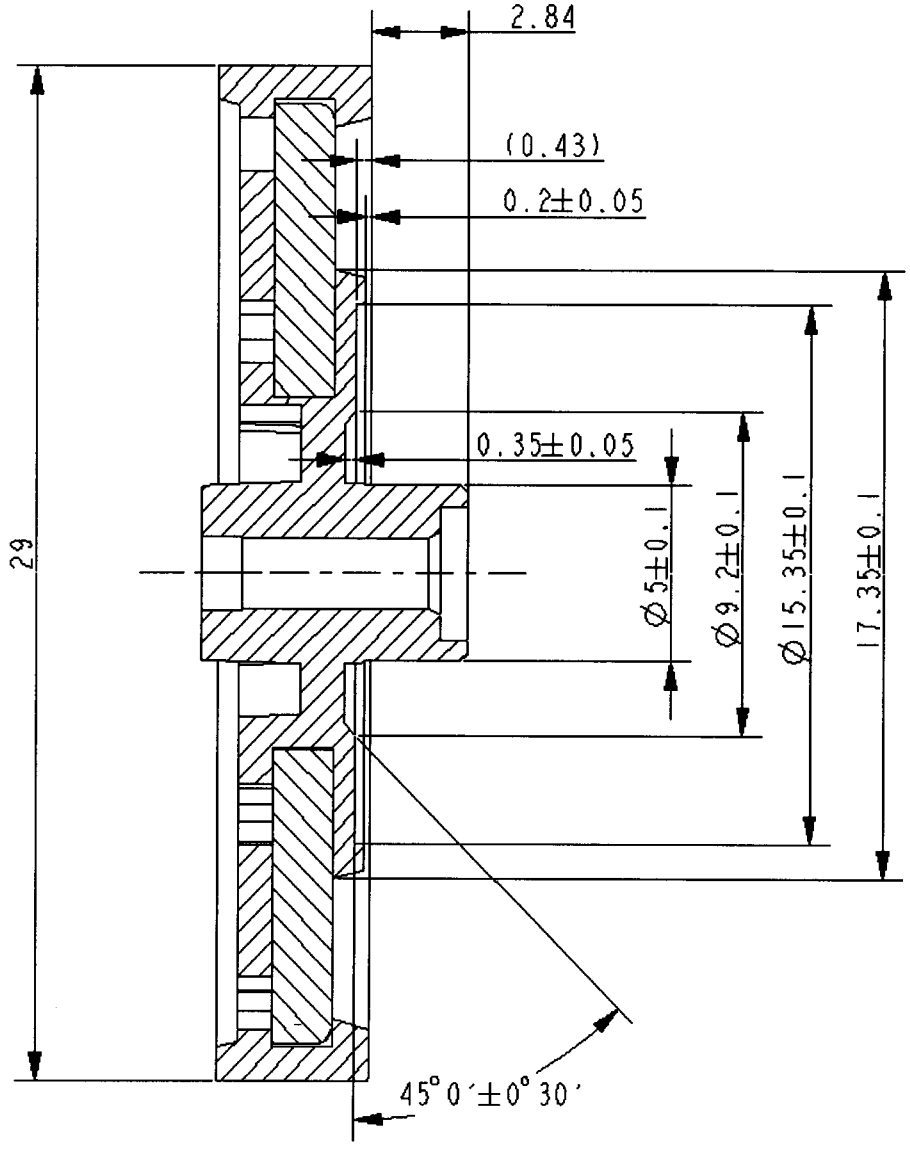


Fig 10: Connector Layout

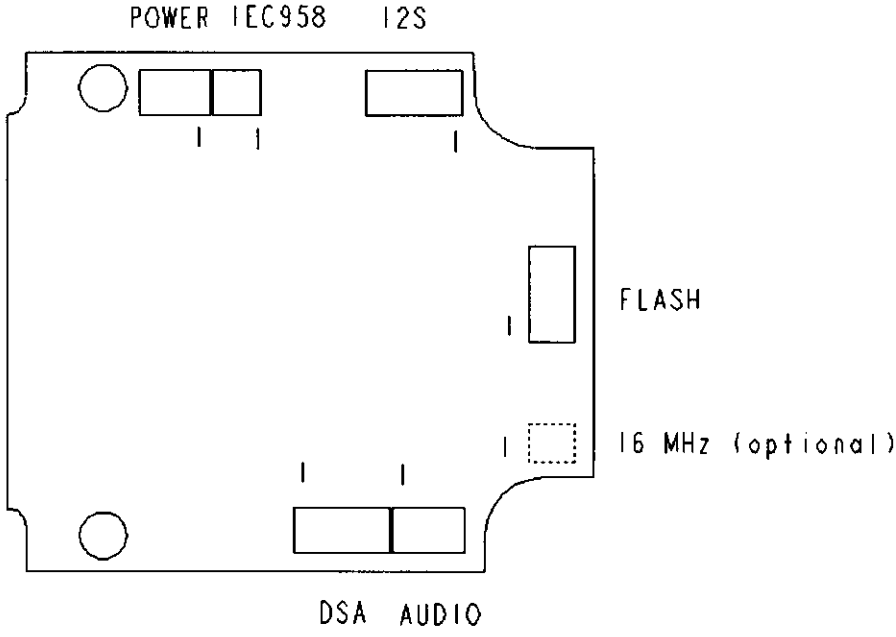


Fig 11: ESD protection

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)