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FLYBACK TRANSFORMER SPECIFICATION

CODE : **1372.7077 D**

FIRST ISSUE DATE : **25/10/2004**

Esplanade 100Hz
32” 16:9 RF

SPEC CONTROL
06/06/2005

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A	30.03.2005	Sala S.	Frasca M.	Toscano G.		
B	15.05.2005	Sala S.	Frasca M.	Toscano G.	15-E1 11-12-13	Focus cables length 450→500mm Material list updated

1.1 Description

This specification describes a slots wound flyback transformer.
The magnetic circuit of the transformer comprises two soft ferrite U-cores gluedtogether.
The primary and high voltage windings are wound on two plastic bobbins placedconcentrically. They are encapsulated with epoxy resin in a pre-moulded case together with the HV diodes and all the annexed materials.
Potentiometers for focus and Vg2 adjustment are fully incorporated.The connection to the external circuit is made via terminal pins which enable the mounting on a printed-circuit board.
The EHT voltage is provided via an EHT cable consisting of an HV lead wire and a rubber cap for the CRT anode.
The focus and Vg2 connections are once-only insertions.

1.2 Application

The transformer has been designed to provide the required scanning amplitude and voltages to a 90°-110° colour CRT for TV set or colour monitors.

1.2.1 Operating conditions

Operating ambient temperature:	-10°C to +60°C
Operating humidity range non condensing	10% to 90%RH

Ambient temperature is the medium value measured at 30 mm. of distance from the surface of the transformer.
When the transformer is placed inside a metallic shield the above temperature value will be referred to the inside of the shield even if it is closer then 30 mm to the FBT.

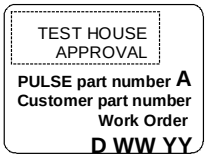
1.3 Storage conditions

Short term storage temperature -25°C to +60°C, RH ≤ 95%
The transformer can be stored for 6 months in the original packaging at the following average conditions
Tamb ≤ +40°C, RH ≤ 90%
After storage to allow a minimum of 24 hours recovery time before using.

1.4 Marking

On the transformer body there will be placed a label indicating:

- Test House Approval
- Pulse part number
- Changing index of revision **A**: a letter wich is increased from A to Z for every FBT modification
- Customer part number
- Work Order
- Production date
  Day of week (Monday/Saturday) **D**: a letter from “a” to “f”
  Week of year **WW**: a number from 1 to 52
  Year **YY**: last two digit



1.5 Packaging

Refer to Eldor specification **CEI 4.2 225 004**.

1.6 Weight

The transformer weight is approx **415** g.

1.7 Process controll

100% of the FBT controlled in production.

2.0 MECHANICAL CHARACTERISTICS

2.1 Mechanical drawing

See drawing page **16**

2.2 Drilling plane

See drawing page **16**

2.3 Performances

2.3.1 *Twist strength*

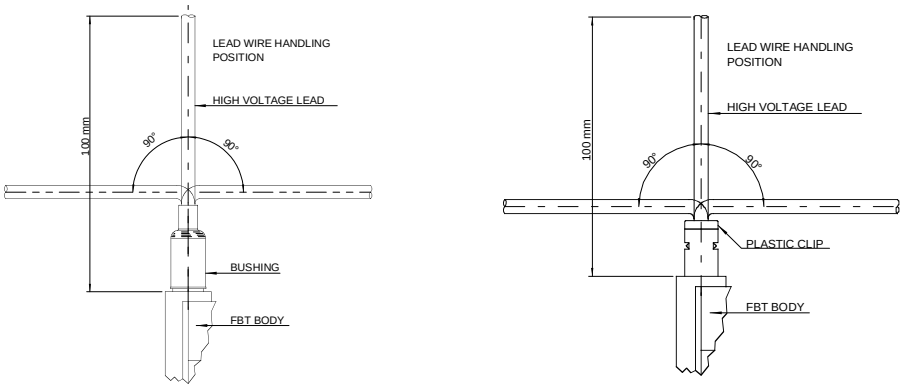
The anode lead wire gripped at 120 ± 5mm from the chimney top shall be able to be rotated by 180° in both directions for 2 cycles without presenting any cut or damage at the way out position.

2.3.2 Lead pulling test

The high voltage anf focus output cable lead shall withstand the pulling test (at 5Kg for 30 seconds) without any damage of the mechanical structure or without affecting electrical characteristics.

2.3.3 Lead Bending test

The high voltage and focus output lead shall be put in the direction of the axis of the lead and pulled by the weight (gradually up to 1Kg). Then the lead shall be bent as shown in the fig. below. After 3 bends both mechanical and electrical characteristics shall not be affected.

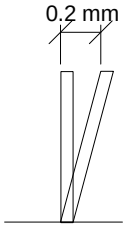


2.3.4 Robustness of termination

The robustness of the terminations for printed wiring pins must be in accordance with IEC 60068 PT2-21 test Ua1/Ub method 1.

2.3.5 Inclination of the pins

The inclination of the pins shall be less than 0.2mm as shown in the figure below.



2.3.6 Solderability of the terminals (pins and leads)

Solderability test shall be done according to IEC 60068 PT2-20 test Ta, method 1 (wetting).
Temperature: 235°C ± 5°C (time 2 ± 0.5sec).
The wetted area must be ≥ 95%

2.3.7 Bending pin

All the pins can be bent except pins: **10**

2.3.8 Potentiometers mechanical characteristics

Approved supplier	**Eldor**	
Shaft rotation angle	Focus Screen	180 ± 10° 140 ± 10°
Operating torque	The force needed to rotate the shaft will be from It shall be max	3 to 20mN·m
Starting torque		≤20mN·m
Torque against stop		900mN·m
Axial thrust on shaft		150N
Radial thrust on shaft	Not applicable	

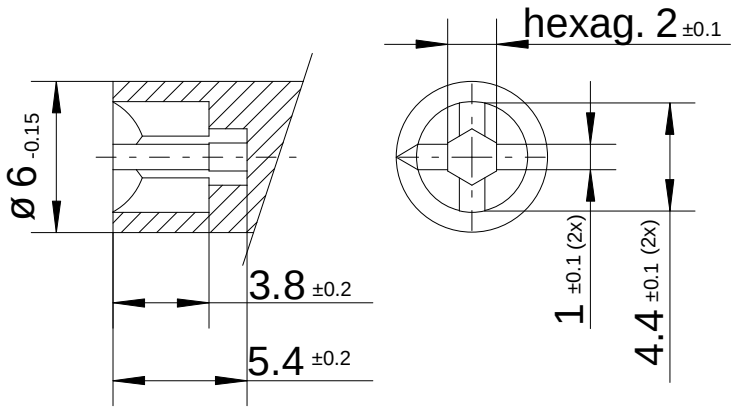
Focus and Vg2 rotors at minimum position (counter clock wise) at delivery.

2.3.9 Potentiometers electrical characteristics

Total resistance = **75** Mohm ± **15**%
Focus setting ability: not available
Vg2 setting ability: not available

REMARK: Vfocus and Vg2 measured with equipment with Internal Resistance ≥ 10GΩ

2.3.10 Drawing of knob



2.3.11 EHT Cable with Anode Cap

EHT Cable Strength	Push-in into the FBT chimney	30N or less
	Pull-out from the FBT chimney	45N for 1 minute

3.0 ELECTRICAL CHARACTERISTICS

For pins identification refer to drawing of page **16**

3.1 Static characteristics

3.1.1 Inductance and DC resistance:

Measurement of inductance is made using a LCR bridge at frequency of 1KHz at output voltage of 1 V r.m.s.
Measurement of resistance is made using a four wire ohmmeter.
Temperature should be 23 ± 2°C.

	L(µH)	Tol.(%)	R(mΩ)	Tol.(%)
Between pin **1** and pin **3**	**1290**	± **10**	**214**	±10

3.1.2 Insulation resistance

The insulation resistance shall be more than 150MΩ in the following conditions:
- between windings
- between each winding and the core

The applied voltage shall be 1000Vdc for 60 seconds.

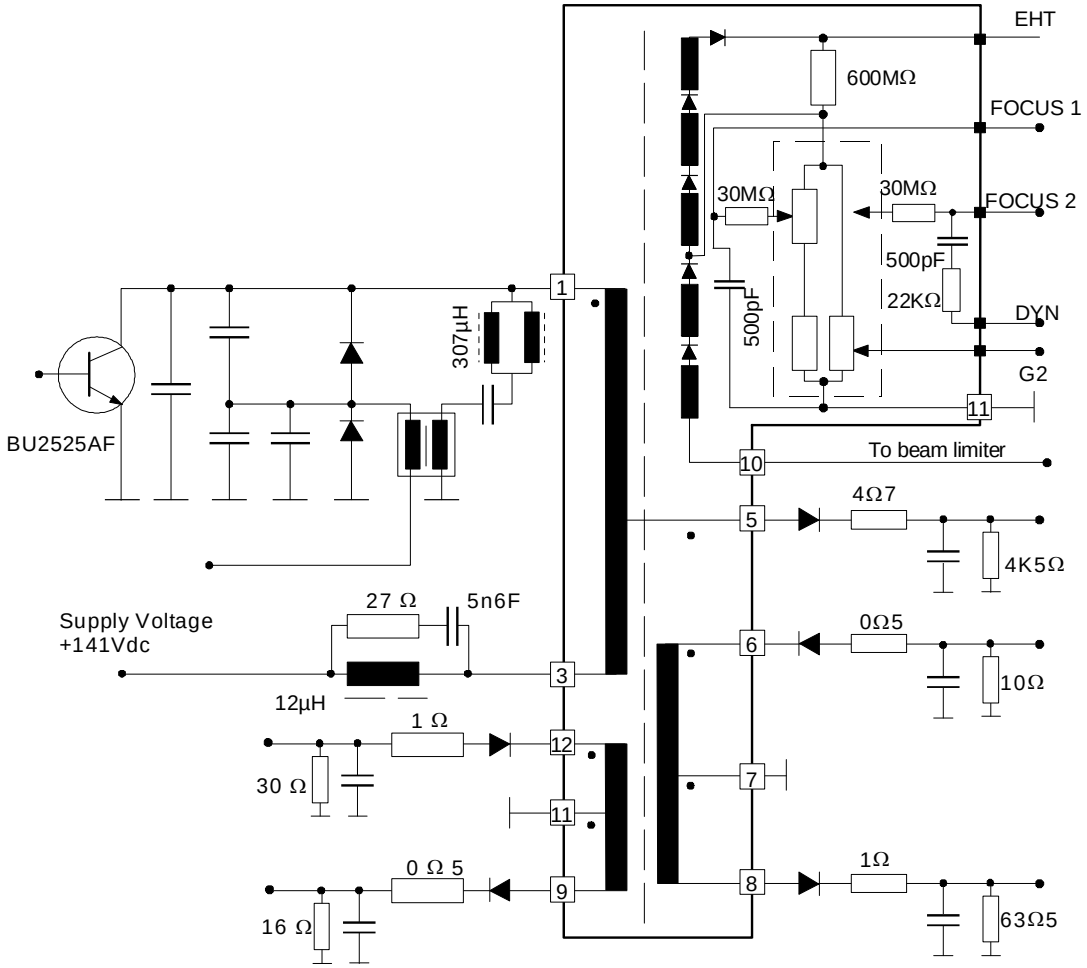
3.1.3 Withstanding voltage

The transformer shall withstand a voltage of 1.5kV r.m.s. for 60 seconds between each winding and the core.
The frequency of the test voltage shall be 50 or 60Hz.

3.1.4 Breakdown voltage

The transformer shall withstand for 1 minute an EHT value **1.3** times the nominal value without showing any corona, arcing or other failure.

3.2 Test circuit diagram and application conditions



CRT	(Brand)	W76ERF072X44
	(Type)	32" 16:9 RF
Deflection angle	(°)	110
Neck diameter	(mm)	29
Horizontal frequency	(kHz)	31.250
Horizontal blanking time	(µsec)	6
Active video time	(µsec)	26
Active video size	(%)	6 overscan

3.3 Electrical performances

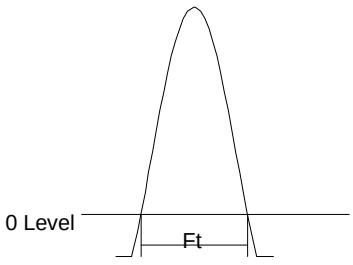
Electrical parameters		@ 0 mA Beam Min	@ 1.8 mA Beam Max	Tol.	Notes
Supply voltage	(V_{DC})	141	141	Nom.	
Supply current	(mA)	395	740	± 40	
Flyback time	(µsec)	5.45		± 0.2	1)
Peak collector voltage	(Vpp)	1209	1253	± 20	
Peak collector current	(Ap)	7.2	7.65		
Iy deflection current	(App)	11	11		
Ringing ratio	(%)	11	9	15 max	2)

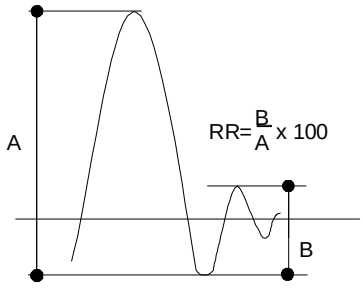
HV output voltages					
EHT voltage	(kV)	31.4	29.8	± 0.8	
Riht (from 0 to 1.8)	(MΩ)	0.88		1 max	
Focus 1 min	(%of EHT)	19.6		± 2.1	
Focus 1 max	(%of EHT)	34.2		± 1.3	
Focus 2 min	(%of EHT)	19.6		± 2.1	
Focus 2 max	(%of EHT)	34.2		± 1.3	
G2 min	(%of EHT)	0.3		+ 0.3	
G2 max	(%of EHT)	5.4		± 1.3	

@ 0 mA Beam						
Auxiliary voltages	Vpp	Vdc	Vrms	@I(mA)	Tol. (%)	3)
Pin n° 5	+98	+204		45	± 5.5	
Pin n° 6	+73.5	-7.3		700	± 3.5	
Pin n° 8	-118	+13.7		200	± 3.5	
Pin n° 9	-118	+13.7		800	± 3.5	
Pin n° 12	+132	-15.3		500	± 3.5	

1) Flyback time must be measured at zero level of collector pulse with oscilloscope input set on AC

2) Ringing ratio must be measured placing a capacitive probe close to the upper face of the FBT at the centre of vertical ripple, as per the following drawing





3) All the measurements must be taken with the auxiliary voltages fully loaded.

3.4 Temperatures

3.4.1 Temperature rise of the primary coil

The rise in primary winding or core shall be measured by thermo elements in the following condition: I beam **1.8**mA (long term average) and max loads, according to the test circuit.
See par. 3.2-3.3. Transformer must be placed in free air conditions (See IEC60068 PT1 clause 4.4)

Rise of temperature after 4 hours must be lower than **40°C.**

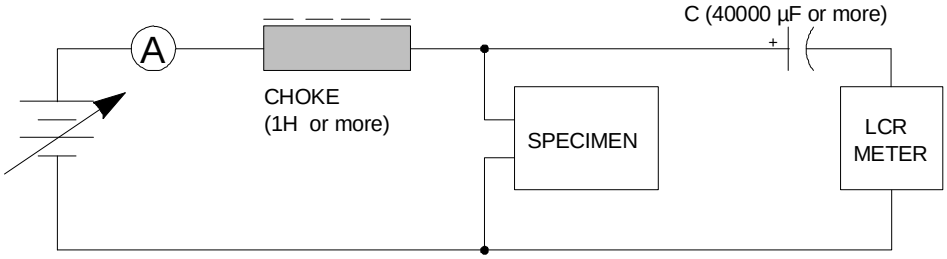
3.4.2 Maximum allowable temperatures

In the application, TV set with cabinet closed, at the maximum allowable ambient temperature (See IEC60068-PT1 clause 4.6.2) and at the maximum working conditions after 4 hours the temperature of the transformer core must be ≤ **100°C.**
To satisfy the above conditions it is recommended to provide the FBT with sufficient cool air flow around it.
In particular It is reccomended that air flowing and power components locations around FBT area is able to guarantee that even in the worst working conditions and at ambient temperature of 40°C, the temperature at a distance of 3 cm from FBT doen't overcome the limit of 60°C.

3.5 Core saturation

Test must be performed in the following way:

a) The FBT must be placed in oven at ambient temperature of 100°C for 2 hours.
b) Using the circuit below, connect the primary winding to LCR meter operating at frequency of 1 kHz and output voltage of 1 V.
c) Superimpose through the power supply, step by step, a dc current and read on the LCR meter the corresponding value of the inductance. Do this up to a current value of 1.35*nominal input current.
d) The value of the inductance must be greater than 0.7*Lnom.



4.0 QUALIFICATION TESTS

4.1 Environmental tests

TEST	CONDITIONS	IEC REF
1) Damp heat, steady state	T=+40°C; RH=93% Test duration: 21 days	60068 PT2-78
2) Dry heat	T=+100°C Test duration: 96h	60068PT2-2 test Ba
3) Cold	T=-25°C Test duration: 96h	60068 PT2-1 test Aa
4) Damp heat, cyclic	21 cycles: +25°C/+40°C; 93%RH 11h@+25°; 11h@+40° transition times: 1h - 21 days	60068 PT2-30 test Db
5) Change of temperature	5 cycles: -25°/+100°C 3h@-25°; 3h@+100°; transition times<1'	60068 PT2-14 test Na

Remarks:
After test, condensed humidity must be removed from surface.

After each of these tests the FBT shall satisfy the following:
a) Electrical parameters: All the electrical values of the FBT tested after 4 hours, in normal temperature and humidity , must be within the margin fixed in the specification.
b) Mechanical parameters: The FBT must satisfy the specification of item 2.
c) Others: No defects such as crack in the case, crack between moulded resin and case must be found.

4.2 Life tests

TEST	CONDITIONS	IEC REF
Very High Temperature	T=+90°C V=1.1xVnom output - I beam 100µA Test duration: 1000h	
High Temperature High Humidity	T=+40°C; RH=95% V=1.1xVnom output - I beam 100µA Test duration: 1000h	

Remarks:
Temperature condition must be at 30 mm. distance from the surface of center body of the FBT.
After the tests the transformer must satisfy initial value within the tolerances.

4.3 Other series qualification tests

TEST	CONDITIONS	IEC REF
Low air pressure Operation	P=600 mBar V=Vnom - no load Test duration: 30' (at room temp)	60068 PT2-13 test M
Flammability	According to UL 94 standard and IEC 60065, clause 14.4.1	60065
Solderability	T=235°C for 2" ± 0.5 after 24h of high temperature test	60068 PT2-20 Ta method 1
Operating Temperature	Primary winding & core temperature check vs. Spec.	60065
Salt Spray Test	5% NaCl solution. 10 shots per direction (with chimney cap on the EHT cable)	
Insulation resistance	Core to primary winding: Core to secondary winding Primary to secondary windings	
Breakdown voltage	According to specification (see par. 3.1.4)	
Core saturation	Room temp. - High Temp (100°C) Saturation curve vs. Spec	

5.0 SAFETY

According to international standard **IEC 60065**

5.1 Approvals

TEST HOUSE	STANDARD	REFERENCE NBR
VDE	EN 60065	**4936**
UL	UL 6500	**E100521**

5.2 Safety material list

NR.	FBT PART NAME	KIND OF MATERIAL	MANUFACTURER	TRADE MARK/TYPE	UL RATING	UL FILE NUMBER
1	FBT HOUSING	Polyphenylene Oxide	GE Plastics BV	Noryl PX1394	94 V-0	E45329
		PPE	Asahi Kasei	Xyron 540Z	94 V-0	E82268
2	HIGH VOLTAGE BOBBIN	Polyphenylene Oxide	GE Plastics BV	Noryl SE 1 GFN 2	94 V-1	E45329
		PPE	Asahi Kasei	Xyron G702V	94 V-1	E82268
3	LOW VOLTAGE BOBBIN	Polybutylene terephtalate	GE Plastics BV	Valox 420 SE0	94V-0	E45329
		PBT	Mitsubishi	Novaduran 5010GN6-30	94 V-0	E53664
4	CASTING COMPOUND	Epoxy resin and hardener	Huntsman LLC.	XB 5711-XB 5712	94 V-0	E96722
			Wuxi Wells Synthetic Material Co. Ltd	9002 GA – 9002 GA	94-V-0	E197926
			Kyocera Chemical Co.	TCG 1123A/B	94-V-0	E43857
6	ANODE CAP	Silicone Rubber Compound	Shin-Etsu Chemical Co. Ltd.	KE-5612GU	94 V-0	E48923
			GE Toshiba Silicone Co Ltd	TSE2186U	94 V-0	E56745
7	EHT CABLE	PVC Insulated Wire	Sumitomo Electric Industries Ltd.	Style 3239 AWG20 40kV DC 105°C CSA type TV-40	VW-1	E41105
			Taisho Electric Industrial Co. Ltd.	Style 3239 AWG20 40kV 105°C DC VJE 261K	VW-1	E35688
			LG Cable Ltd.	Style 3239 AWG20 40kV DC 105°C	VW-1	E52853
			Hangzhou Yongjin	Style 3239 AWG20 40kV DC 105°C	VW-1	E209647
8	FOCUS CABLE	PVC Insulated Wire	Sumitomo Electric Industries Ltd.	Style 3239 AWG20 20kV DC 105°C CSA type TV-20	VW-1	E41105
			Taisho Electric Industrial Co. Ltd.	Style 3239 AWG20 20kV 105°C DC VJE 261K	VW-1	E35688
			LG Cable Ltd.	Style 3239 AWG20 20kV DC 105°C	VW-1	E52853
			Hangzhou Yongjin	Style 3239 AWG20 20kV DC 105°C	VW-1	E209647
9	POTENTIOMETER HOUSING	PBT	GE Plastics Japan Ltd.	PDR4908	94 V-0	E45587
		Polycarbonate	GE Plastics Japan Ltd.	PC940	94 V-0	E45587
10	ROTOR OF POTENTIOMETER	Polycarbonate	GE Plastics Japan Ltd.	Lexan 500R	94 V-0	E45587

SEE PAGE 17

5.2 Safety material list

NR.	FBT PART NAME	KIND OF MATERIAL	MANUFACTURER	TRADE MARK/TYPE	UL RATING	UL FILE NUMBER
11	SCREEN CABLE	PVC Insulated Wire	Sumitomo Electric Industries Ltd.	Style 3476 AWG20 3KV DC 105°C CSA type TV-6	VW-1	E41105
			Sumitomo Electric Industries Ltd.	Style 1032 AWG20 1.2kV DC 90°C CSA type TR-32	VW-1	E41105
			LG Cable Ltd.	Style 3476 AWG20 3KV DC 105°C CSA type TV-6	VW-1	E52853
			Hangzhou Yongjin	Style 1032 AWG20 1.2kV DC 90°C	VW-1	E209647
12	POTENTIOMETER BACK COVER	Polyphenylene Oxide	GE Plastics Japan Ltd.	Noryl PX9406P	94 V-0	E45587
13	CHIMNEY CAP	Silicone Rubber Compound	GE Toshiba Silicones Co. Ltd.	TSE 2183U	94V-0	E56745
				TSE 2186U	94V-0	E56745
			Shin-Etsu Chemical Co. Ltd.	KE-5612GU	94V-0	E48923
16	BRACKET and BLEEDER HOLDER	Polycarbonate	GE Plastics Japan Ltd.	Lexan 500R	94 V-0	E45587

SEE PAGE 17

Other materials

NR.	FBT PART NAME	KIND OF MATERIAL	MANUFACTURER	TRADE MARK/TYPE	UL RATING	UL FILE NUMBER
	CRIMPED TERMINAL	Brass copper tin-plated	Eklinker, JST,	SIN-21T-1.8S (B)		E60389
	WIRES x Low voltage	Enamelled copper wire	Nexans Dong Yang cable ltd Heng Ya Electric Kun Shan Ltd.	Class F (155°C) Grade 2 Ø **0.40**mm **0.25**mm (LV)	VW-1 VW-1 VW-1	E67139 E206407 E245514
	WIRES x high voltage	Enamelled copper wire	Elektrisola Atesina S R L	Class F (155°C) Grade3 Ø **0.060**mm (HV)	VW-1	E125650
	DIODES		Tianjin Zhong-Huan semiconductor Co Fuji	2CL01 ESJA08-08		
	CORE	Soft ferrite	DMEGC Magnetics co. Ltd. Dongyangguan Ferroxcube TDG (Tiantong) King Tech Isu Samhwa Epcos AG Ferrites Div.	DMR40 3C30		
	CONDUCTIVE RUBBER	Silicon conductive	Helvoet Hsiang Wei Rubber			
	FIXING GLUE	Polyurethane	Rohm&Haas	RX-3		
	CONNECTING TAG	Tinned brass	De Galeazzi Ekinler	Thickness 0.5mm		
	CONNECTING WIRE	Tinned brass	Neumayer Edelhoff Adolf Wencheng Hong YI	Thickness 0.8mm		
	BLEEDER	Thick film metal glaze resistor	Hokuriku Chunlon corp.			
	RESISTOR	Carbon Carbon film	Kamaya Uni-Royal			
	HIGH VOLTAGE CAPACITORS	Polyester film	Taitsu Taiwan Thick-Film ind corp			
	PRIMARY PINS	Nickel silver	Neumayer Edelhoff Adolf Wencheng Hong YI	NS 6218 type		

6.0 PRECAUTIONS

The following instructions must be strictly followed by the transformer user.
Any deviation not specifically authorised in writing by Pulse Italy S.r.l. will relieve the company of all responsibility including safety and warranty on the product.

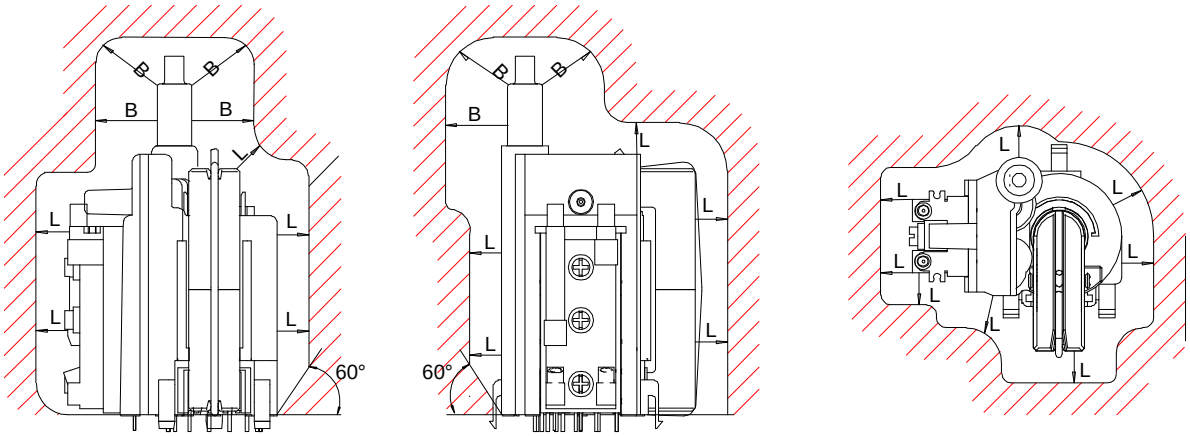
6.1 Application

The transformer has been designed, optimized and tested according to the enclosed circuit (par. 3.2).
Changes in critical components (i.e. deflection yokes, flyback capacitor, supply voltage, etc.) or working conditions could compromise performances, reliability and safety of the product.
FBT protection circuit: materials of FBT are organic compound. In case of short circuit it may generate smoking. Therefore, it is requested to provide a protective circuit which stops FBT operation by detecting input current to prevent the smoke release.

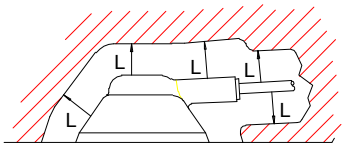
6.2 Mounting precautions

6.2.1 Clearance area

The FBT must be located in such a manner that all the peripheral metal/conductive parts stay outside of the area as indicated in the figure below.
The core under the dry High Temperature Atmosphere may charge a few thousand Volt. Therefore, pay attention to placing components around the core to avoid the core discharge.
The distance between the anode cap and any low potential part must be at least 10mm.
In case of sharp edges the distance must be increased to 15mm minimum.
For a better reliability of the FBT, an EHT cable whit silicone chimney must be used.



L = 10 mm (min.)
B = 20 mm (min)



ANODE CAP

6.3 Handling precautions

- do not give any mechanical shock to the FBT especially to the ferrite core which is very fragile. In case of drop or shock the FBT must not be used.
- do not lift or move the FBT holding it by its anode, focus or Vg2 cables.
- do not bend the terminal pins of the transformer
- do not wet the transformer with any liquid, especially hydrocarbon halogenide (carbon tetrachloride, freon, etc.) or aromatic hydrocarbon (toluene, etc.). These solvents which are sometimes used to clean the PCBs after soldering, may cause cracks or melting of the FBT case.
- do not dirt the FBT with oil materials which may cause cracks in the FBT case. Fastening screws must be cleaned from the adhered oil prior to use.
- do not push sharp pins or hard materials against the anode cap. They may pierce holes into the silicon rubber and the high voltage may leak through them causing electric shock.

6.4 Arcing absorption

Provide the CRT electrodes circuit with spark gaps. In case of CRT flashover, the high voltage rectifiers diodes inside the FBT night be damaged.

6.5 Anode cap connection

When connecting the anode cap to the CRT button, make sure to hook firmly both the legs of the anode spring into the cavity.
Make sure also that the rubber cap adheres completely to the glass of the CRT funnel.
Once assembled on the CRT the anode cap must not be turned around.

6.6 Mounting on PCB

In order to prevent peeling off the PCB copper foil because of the moving of the pins, mount the transformer so that the whole FBT base touches closely the PCB.

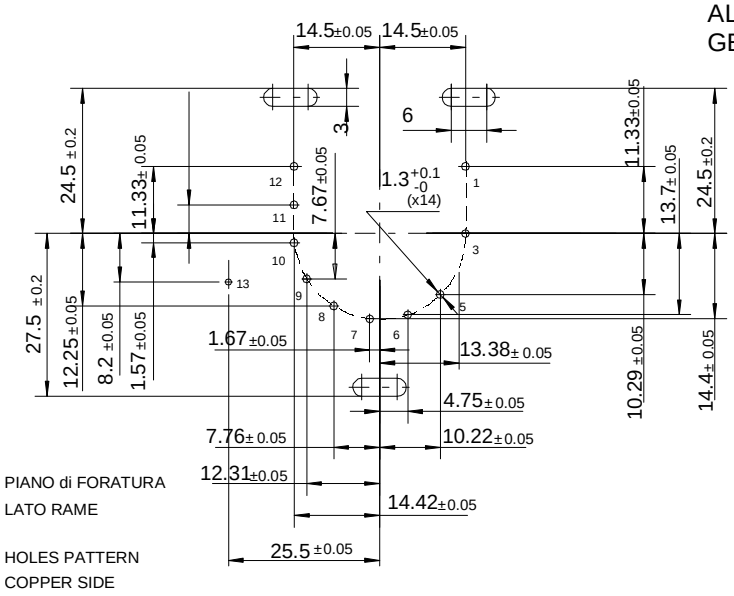
6.7 Soldering

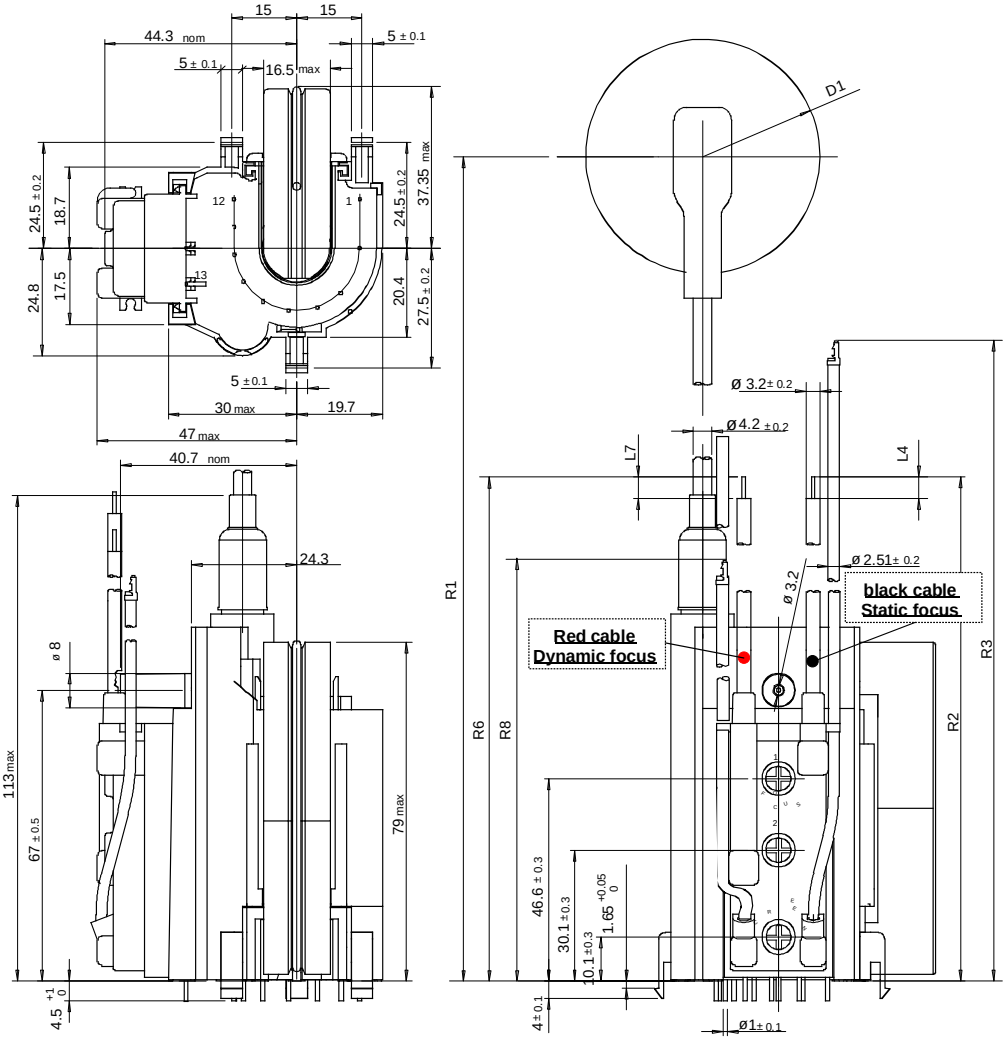
Pins soldering shall be carried out at a temperature lower than 260°C for 5 seconds max.

MECHANICAL DRAWINGS

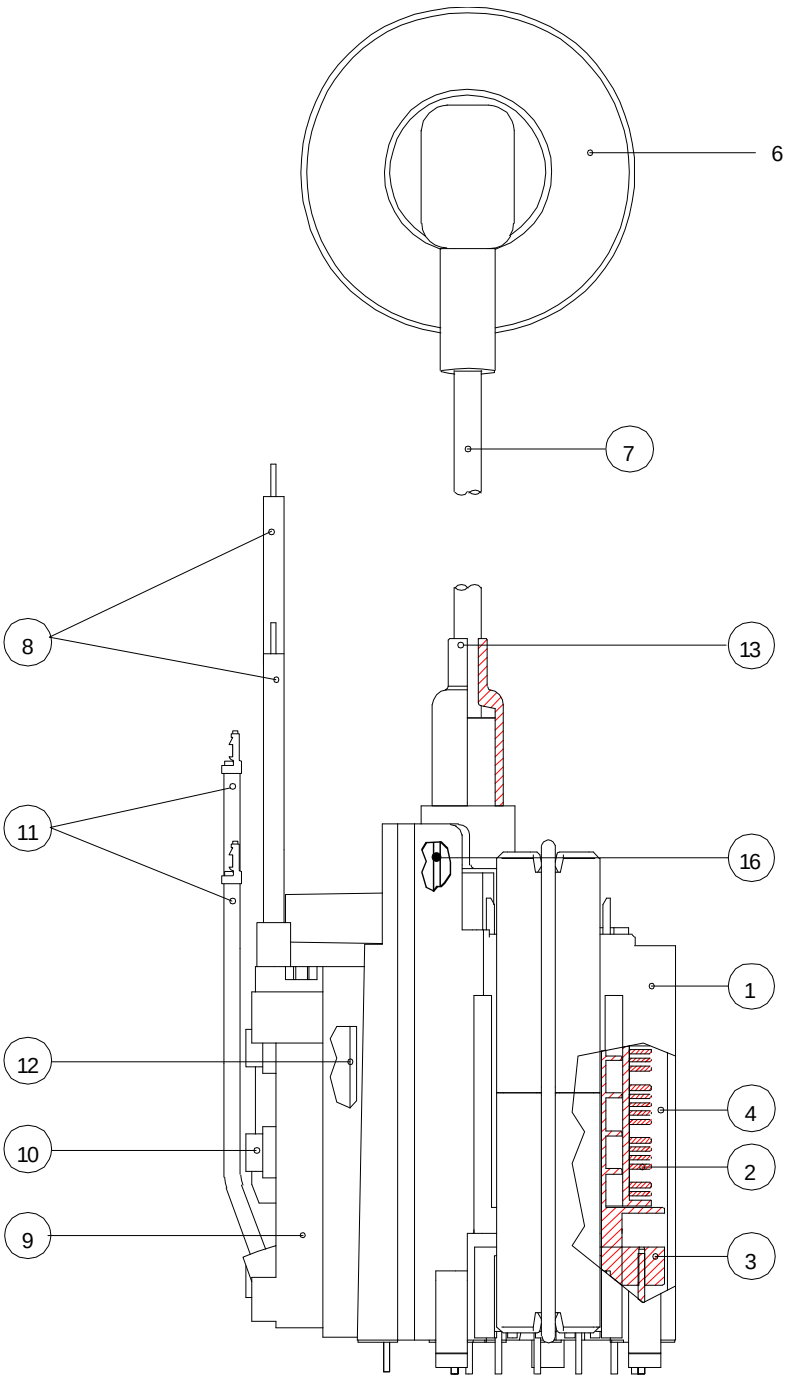
ALL DIMENSIONS IN mm
GENERAL TOLERANCE ± 0.2

R1	=	**740**	±	20mm
R2	=	**550**	±	20mm
R3	=	**565**	±	20mm
L4	=	**10**	±	1mm
R6	=	**525**	±	20mm
L7	=	**10**	±	1mm
R8	=	**325**	±	20mm
D1	=	**Ø65**	±	2mm



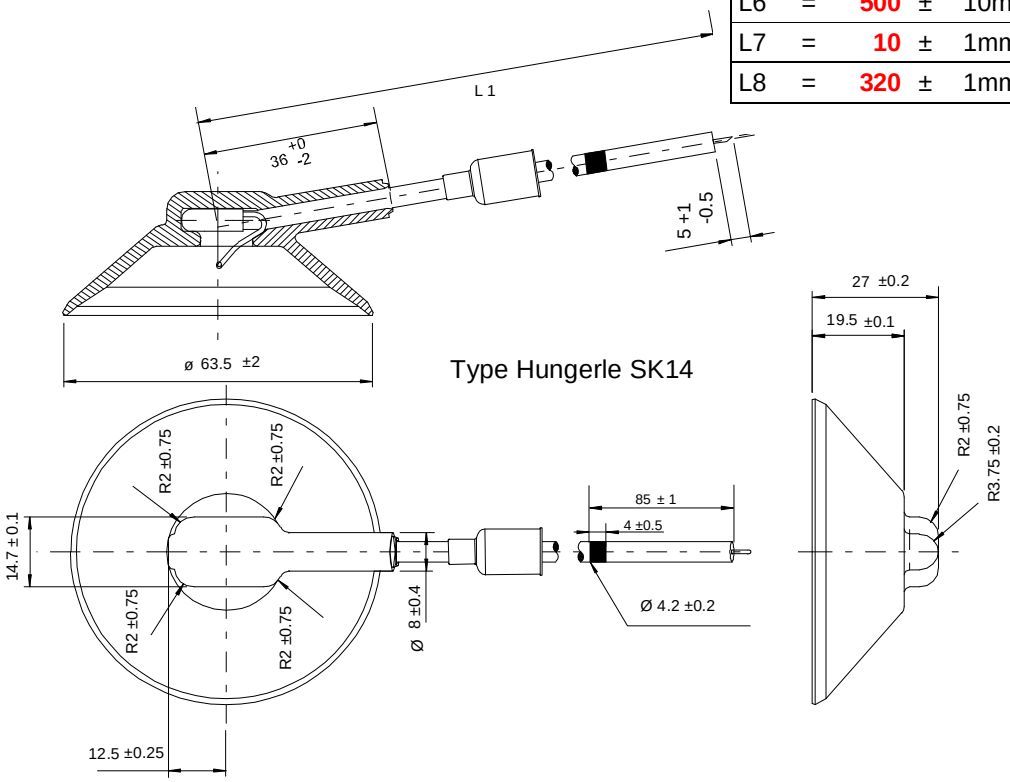


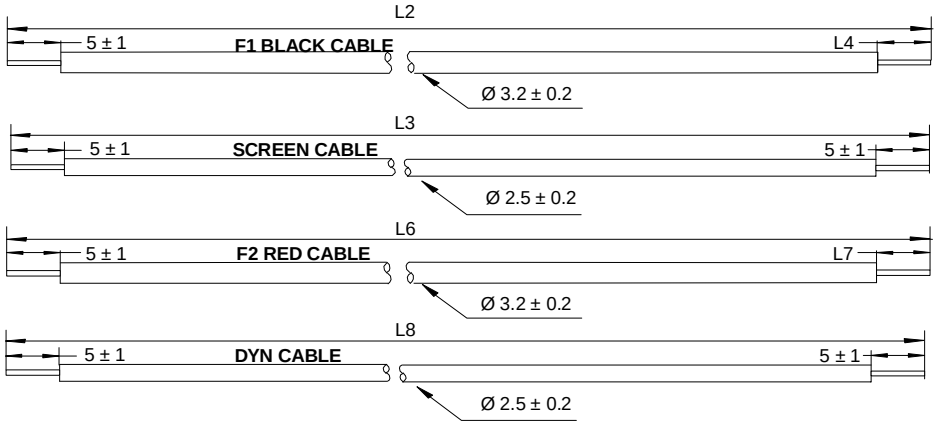
MATERIAL LIST REFERENCE



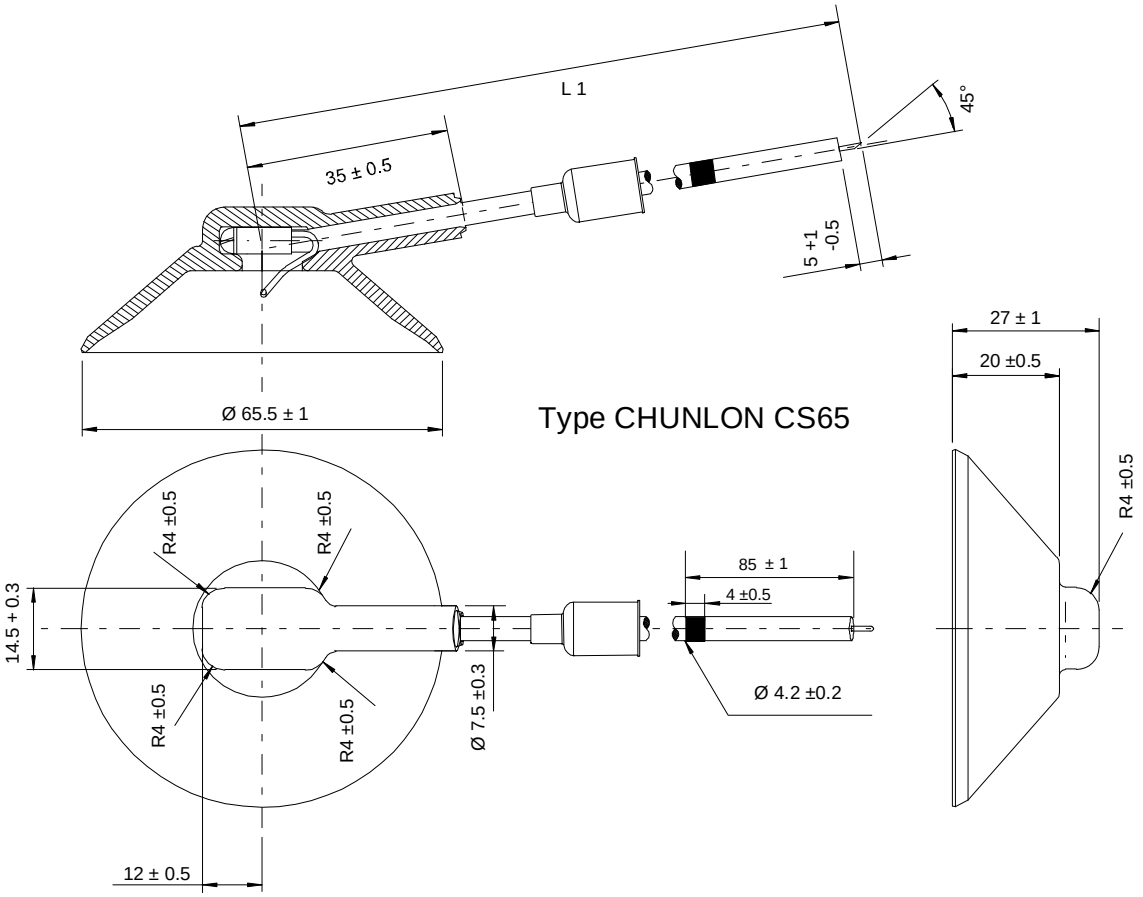
DRAWINGS OF CABLES ALONE

L1	=	**710**	±	10mm
L2	=	**500**	±	10mm
L3	=	**560**	±	10mm
L4	=	**10**	±	1mm
L6	=	**500**	±	10mm
L7	=	**10**	±	1mm
L8	=	**320**	±	1mm





Pulse A TECHNITROL COMPANY	FLYBACK TRANSFORMER SPECIFICATION **1372.7077 D**	
	CUSTOMER CODE **242253100079**	ISSUE **B**
	DOC.N. **W4.04 220 571**	ENCLOSURE **1**

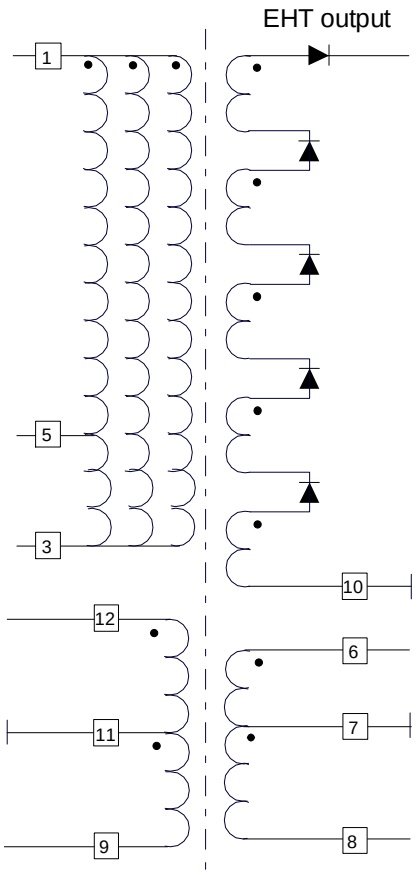


ANODE CAP MARKING	MANUFACTURER	MATERIAL
CS 65	Shin-Etsu Chemical	KE-5612G
SK-14	Bayer AG	Silopren LSR 2255 VP
	Wacker Chemie	Elastosil LR 3001/55
	Dow Corning	Silastic 9220/55

WINDINGS AND CORE DATA

Primary, auxiliary and EHT windings.

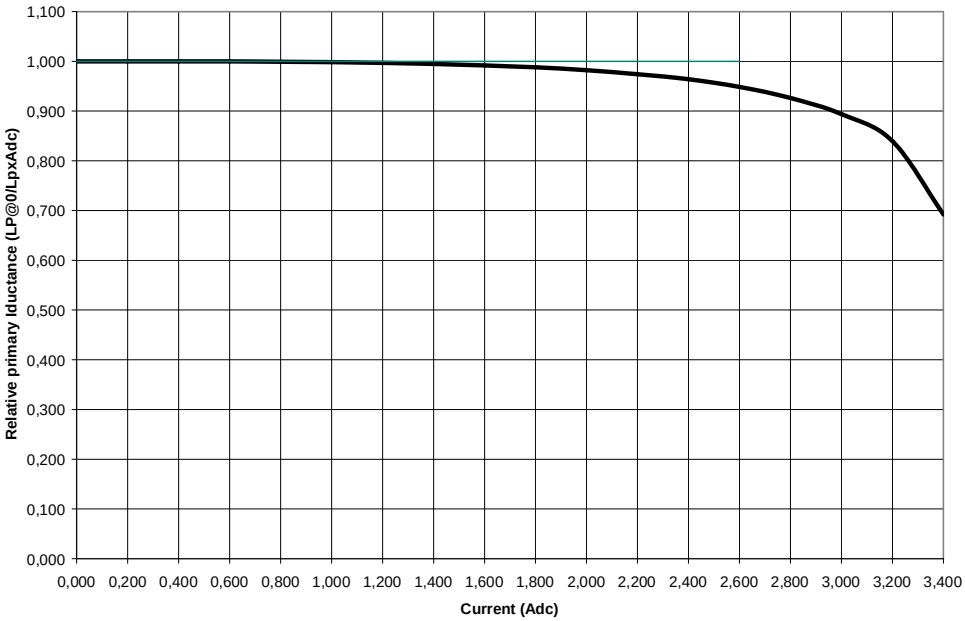
Terminal No.	Name	Number of turns
1-3	V B / Collector	**72**
5-3	+210V	**5**
7-6	Heater	**5**
7-8	+13.8V	**8**
11-9	+13.2V	**8**
11-12	-15.4V	**9**
10-EHT	EHT	**2122**



Magnetic circuit

Airgap = **1** mm (inside) + **100** µm (outside)
Ae = **194** mm^2
Le = **176** mm
Core materials = **DMR40 or Equivalent**

SATURATION CURVE @ 100°C



SCHEDA DI APPROVAZIONE
APPROVAL FORM

ATTENZIONE: PHILIPS DATA: 06/06/2005
ATTENTION: DATE:

Spett. Cliente, Vi chiediamo di controllare questa specifica e restituirci il presente modulo firmato per l'approvazione. Preghiamo comunicare eventuali osservazioni in merito.
Distinti saluti.

Dear Customer, you are kindly requested to review this specification and send back to us only this form signed off for approval.
If you have any remarks, please let us know.
Best regards.

PULSE ITALY s.r.l. con s.u.
Documentation Management

DATE OF APPROVAL:	ISSUED BY:	CHECKED BY:	APPROVED BY:

REMARKS:

Mail for the attention of:

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