

Különleges transzformátorok



Molnár Károly

PowerQuattro Zrt.

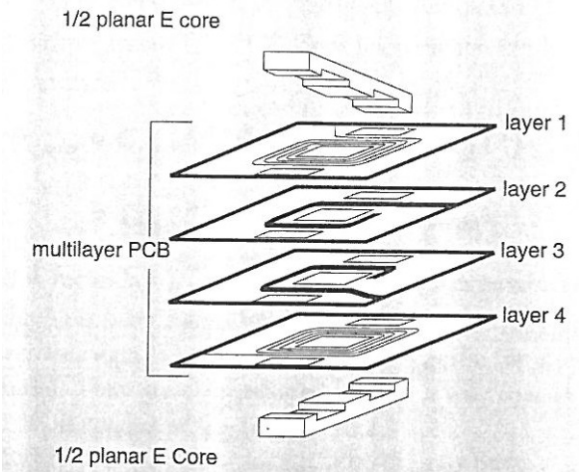
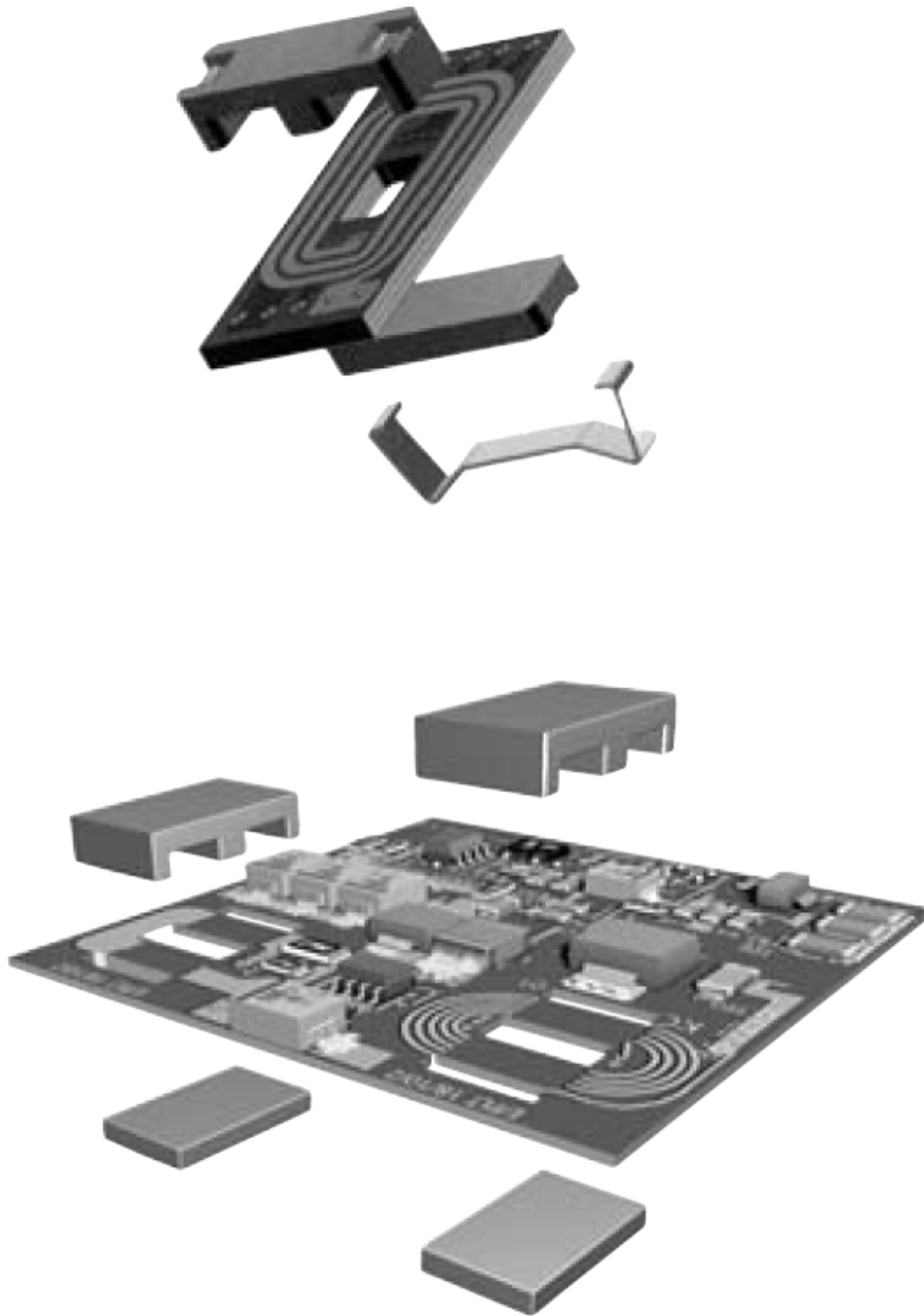
Fejlesztési igazgató



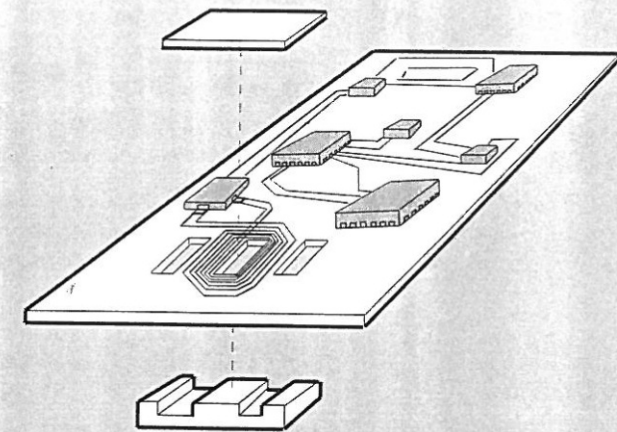
Planár transzformátorok

Payton's state of the art Planar Magnetics, bring the following unique benefits that enable us to provide innovative solutions for your specific application:

- Unparalleled working frequency range from 50 kHz - 2 MHz
- Dramatically reduced size and weight (approx. 5g per 100W)
- High efficiency, typically 97-99%
- Unmatched parameter consistency
- Low leakage inductance (less than 0.2% for ungapped cores)
- Competitive prices
- Minimum Electromagnetic Interference (EMI)
- Operating temperature range from -40°C to +130°C
- 5 W - 25,000 W range in one unit
- 4kV primary-to-secondary dielectric isolation
- 6-12 mm creepage and clearance distance between primary and secondary windings
- All SMPS topologies



stand alone transformer



integrated into PCB

Planar principles

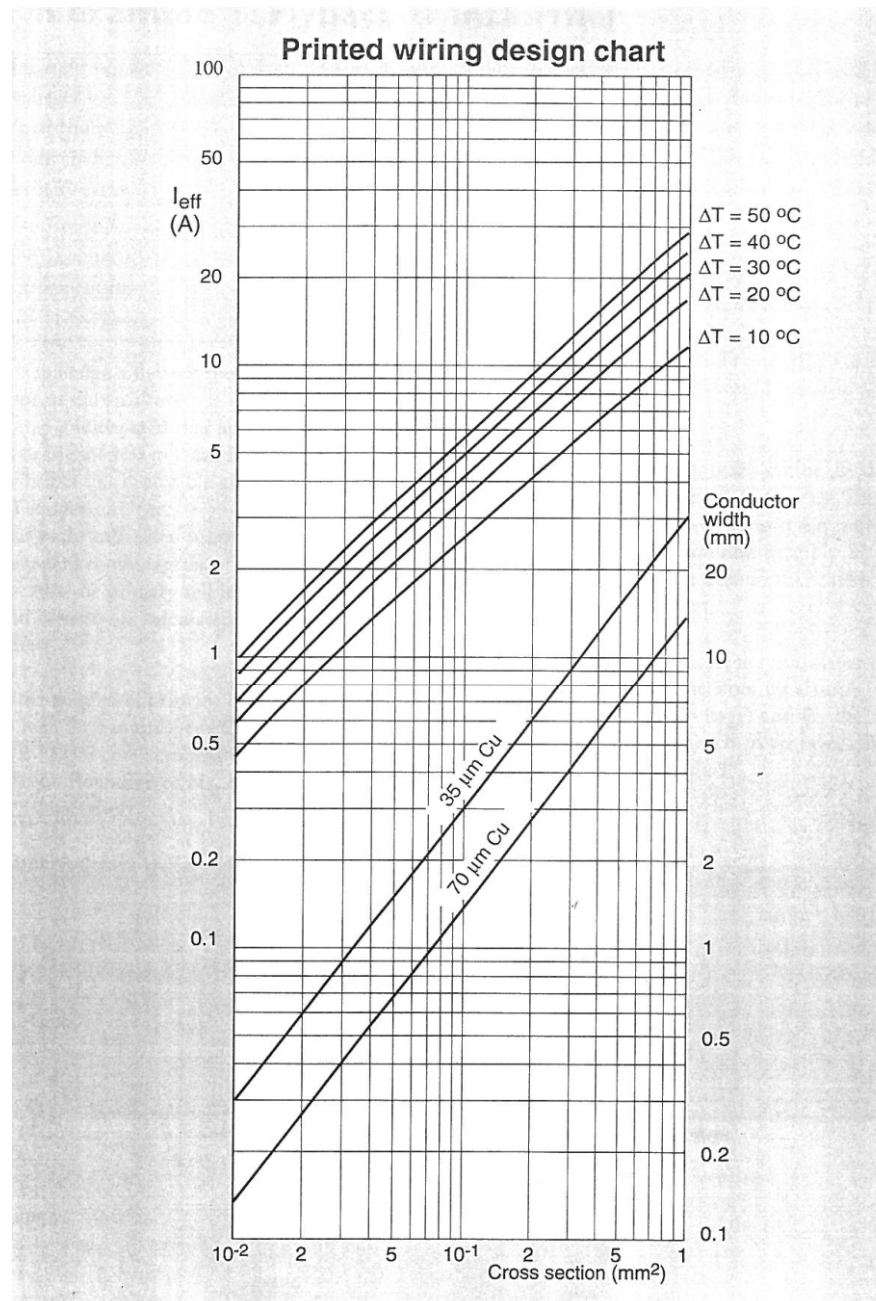


Fig. 2 Relation between current, dimensions of tracks in PCB's and temperature rise.

Power Capacity 5 to 15W

DESCRIPTION

The Payton SIZE 14 provides a planar solution for low power applications (such as telecommunications) providing high efficiency, low EMI, excellent repeatability, low profile and weight with an operating temperature range of -40°C to +130°C.

1. TRANSFORMER APPLICATION

POWER CAPACITY	DIMENSIONS (mm)	TYPICAL WEIGHT	DIELECTRIC ISOLATION	OPERATING VOLTAGE	OPERATING CURRENT (RMS)
5W, flyback at 100 kHz 15W, forward at 500 kHz	L = 15-20 W = 15 H = 5-7	5 gr	Up to 750 V _{RMS}	100 V _{peak} max.	10 A max.

Typical efficiency: 97-99%.

Recommended frequency range: 100 kHz-2.5 MHz.

Topologies:

Full bridge; Half bridge; Push-pull; Forward; Flyback; Boost; Buck; Cuk; Resonant topologies (in order of preference).

Mounting Options:

a. Horizontal b. Vertical c. SMT

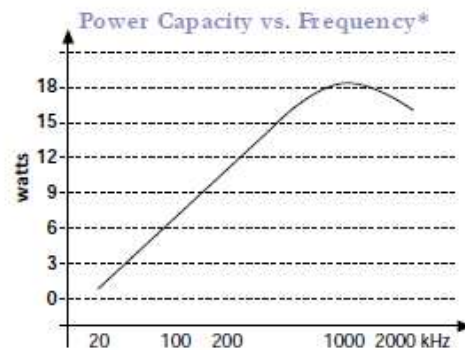
2. INDUCTOR APPLICATION

STANDARD A_L (nH/turn ²)	630	400	315	160	100	63
TYPICAL VALUE OF MAX. Amper-Turns	5	9.5	12.5	31	45	88

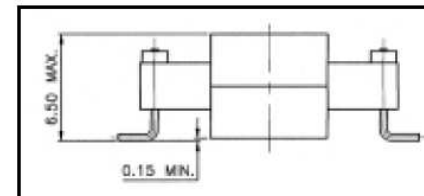
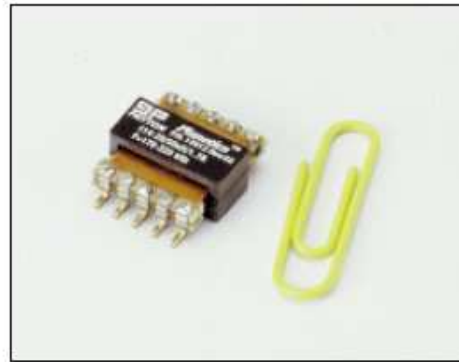
A_L values not listed are available upon request.

3. TYPICAL THERMAL IMPEDANCE FOR DIFFERENT COOLING CONDITIONS

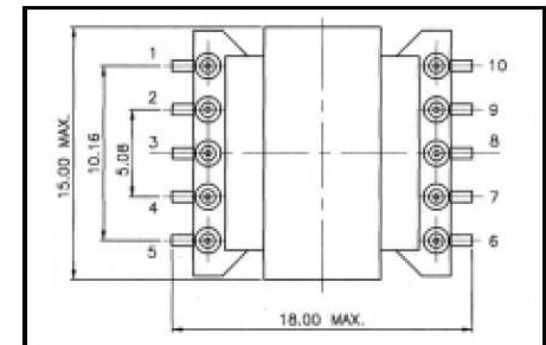
NATURAL COOLING (Hot Spot - Air)	BLOWING AIR 3m/sec (Hot Spot - Air)	ONE SIDE HEATSINK (Hot Spot - Heatsink)	TWO SIDES HEATSINK (Hot Spot - Heatsink)
65°/W	40°/W	20°/W	10°/W



* For single output DC to DC forward power supply transformer with turns ratio of 4.



SIDE VIEW



TOP VIEW

All dimensions are given in mm.

Power Capacity 5 to 20kW

DESCRIPTION

The Payton SIZE 5000 provides a planar solution for high power applications (such as traction, induction heating etc.) providing high efficiency, low EMI, excellent repeatability, low profile and weight with an operating temperature range of -40°C to +130°C.

1. TRANSFORMER APPLICATION

POWER CAPACITY	DIMENSIONS (mm)	TYPICAL WEIGHT	DIELECTRIC ISOLATION	OPERATING VOLTAGE	OPERATING CURRENT (RMS)
5kW (forward at 50 kHz) 20kW (full bridge at 100 kHz)	L = 180-230 W = 104-145 H = 20-60	2-3 kg	500 V _{oc} 4k V _{rms}	1000 V _{peak} max.	1000A max.

Typical efficiency: 97-99%.

Recommended frequency range: 20 kHz-300 kHz.

Topologies:

Full bridge; Half bridge; Push-pull; Forward;
Resonant topologies (in order of preference).

Mounting Options:

a. Horizontal b. Vertical

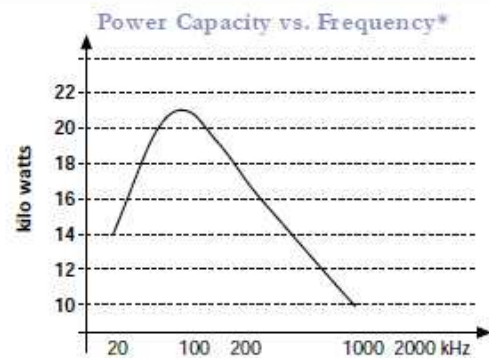
2. INDUCTOR APPLICATION

STANDARD A_L (nH/m²)	1600	1000	630	400	315	250	160
TYPICAL VALUE OF MAX. Amper-Turns	190	310	490	790	950	1202	1500

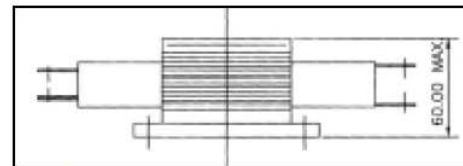
A_L values not listed are available upon request.

3. TYPICAL THERMAL IMPEDANCE FOR DIFFERENT COOLING CONDITIONS

NATURAL COOLING (Hot Spot - Air)	BLOWING AIR 3m/sec (Hot Spot - Air)	ONE SIDE HEATSINK (Hot Spot - Heatsink)	TWO SIDES HEATSINK (Hot Spot - Heatsink)
1.7°/W	1.3°/W	1.6°/W	0.8°/W

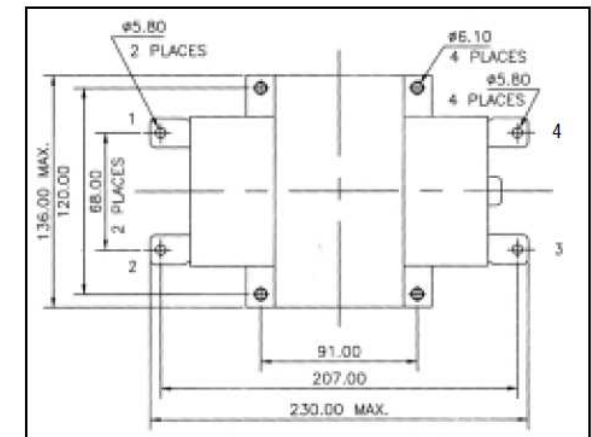


* For single output AC to DC full bridge power supply transformer with turns ratio of 6.



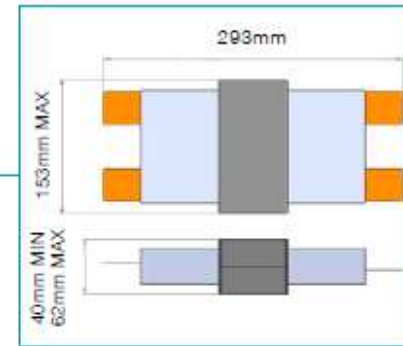
SIDE VIEW

All dimensions are given in mm.



TOP VIEW

SIZE 2400 80kW MAX POWER



Custom Transformer Parameters

OUTPUT POWER	INPUT VOLTAGE	FREQUENCY	OUTPUT VOLTAGE	OUTPUT CURRENT	URNS RATIO	PRIMARY INDUCTANCE
80kW MAX	1000V MAX	1MHz MAX	1000V MAX	1200A MAX	CUSTOM	CUSTOM

Example Transformer Specifications

OUTPUT POWER	INPUT VOLTAGE	FREQUENCY	OUTPUT VOLTAGE	OUTPUT CURRENT	URNS RATIO
80kW	650V	20kHz	400V	200A	13:10

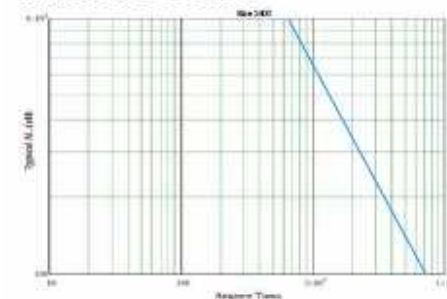
Topologies

- Full Bridge
- Half-Bridge
- Flyback
- Boost
- Push Pull
- Resonant
- Forward
- Buck

Additional Technical Information

Isolation Voltage:	
Primary - Secondary	5.5kVrms
Primary - Core	2.75kVrms
Secondary - Core	2.75kVrms
Switching Frequencies	20kHz-3MHz
Weight	5kg (typ.)

Inductor Selection



Alapfogalmak

$$B \left[\frac{V \text{ sec}}{m^2} \right]$$

$$\text{Tesla} = T \quad 1T = 10^4 \text{ Gauss}$$

$$H \left[\frac{A}{m} \right]$$

$$\mu \left[\frac{V \text{ sec}}{A m} \right]$$

$$\Phi [V \text{ sec}]$$

$$\Psi [V \text{ sec}]$$

$$\mu = \frac{B}{H} \rightarrow \frac{dB}{dH}$$

$$\mu = \mu_0 \mu_r$$

$$\mu_0 = 4\pi 10^{-7} \frac{V \text{ sec}}{A m}$$

$$T \rightarrow \frac{V \text{ sec}}{m^2} = \frac{N}{A m} = \frac{J}{A m^2}$$

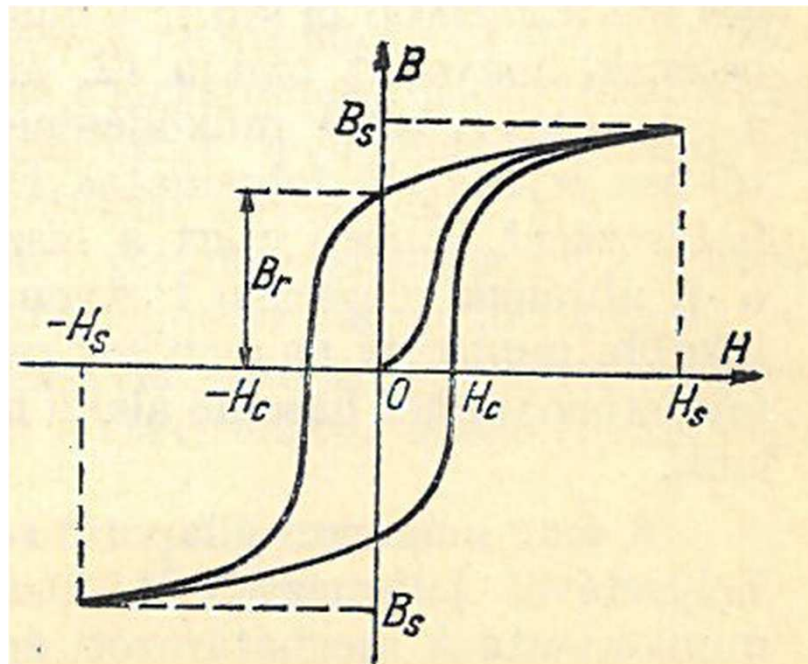
$$W \text{ sec} = V A \text{ sec} = \frac{Nm}{A m^2}$$

$$\mu \rightarrow \frac{V \text{ sec}}{m^2} \frac{m}{A} = \frac{V \text{ sec}}{A m}$$

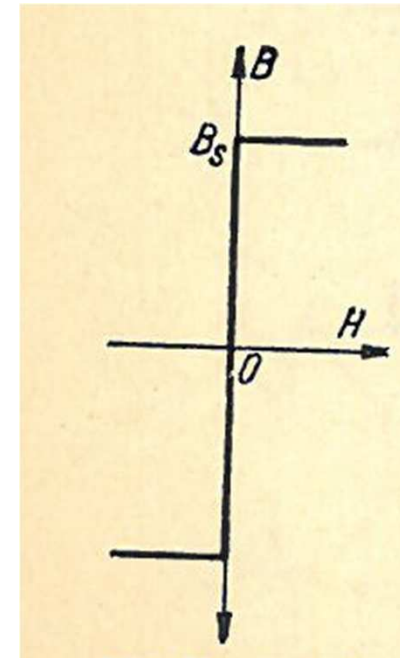
Transzduktor (Mágneses erősítők)

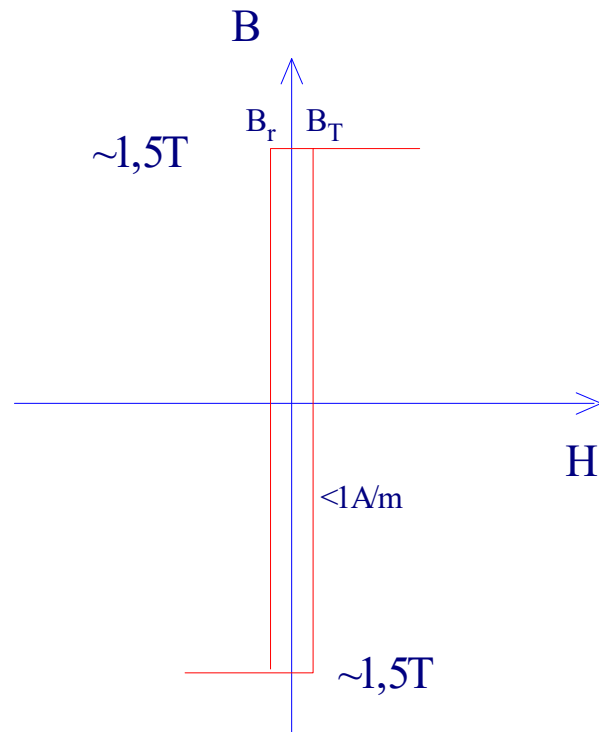
(ψ, ϕ)

$$\Theta = NI$$



$H (\Theta, i_\mu)$





$$\frac{B_r}{B_T} \geq 0,95$$

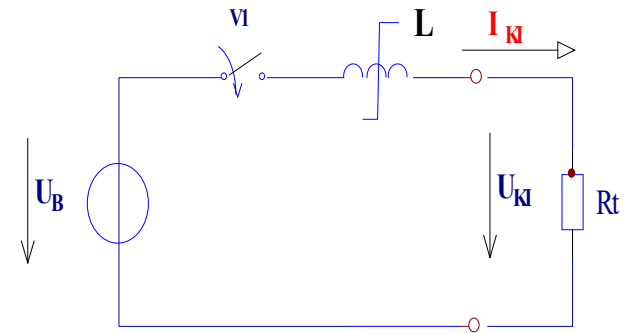
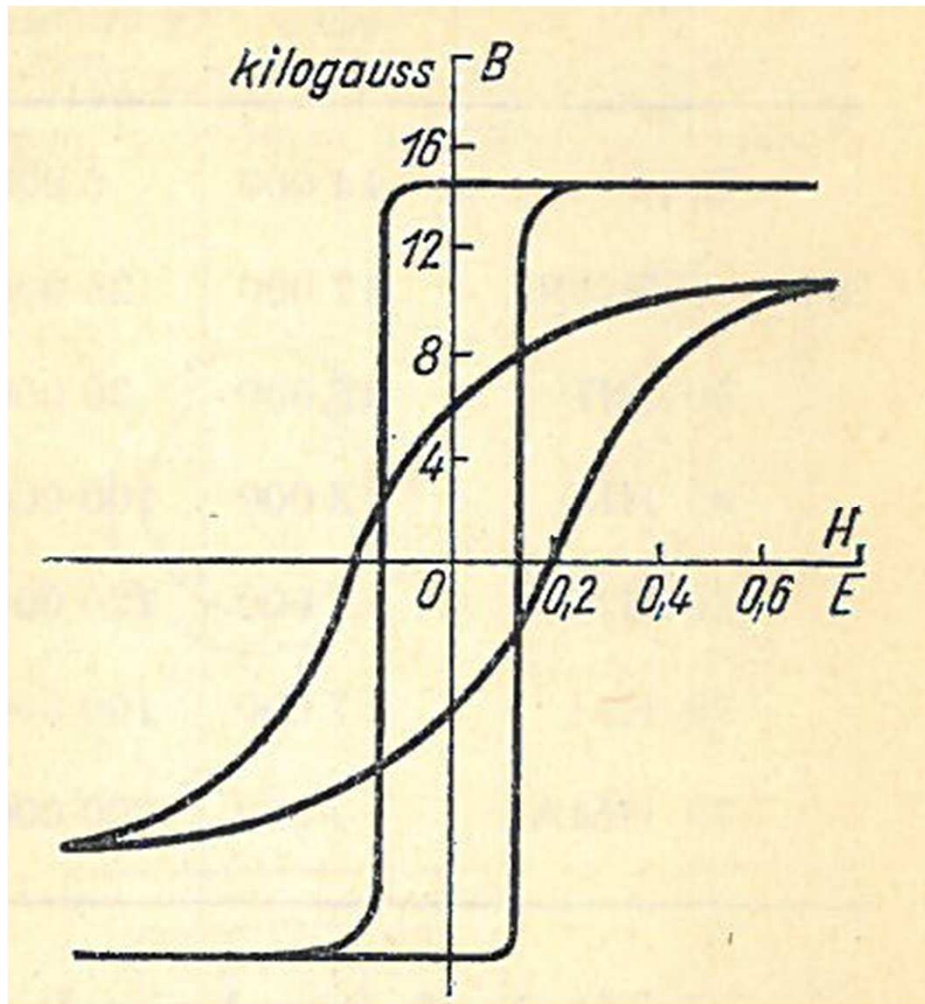
$$T_c = 600^\circ C$$

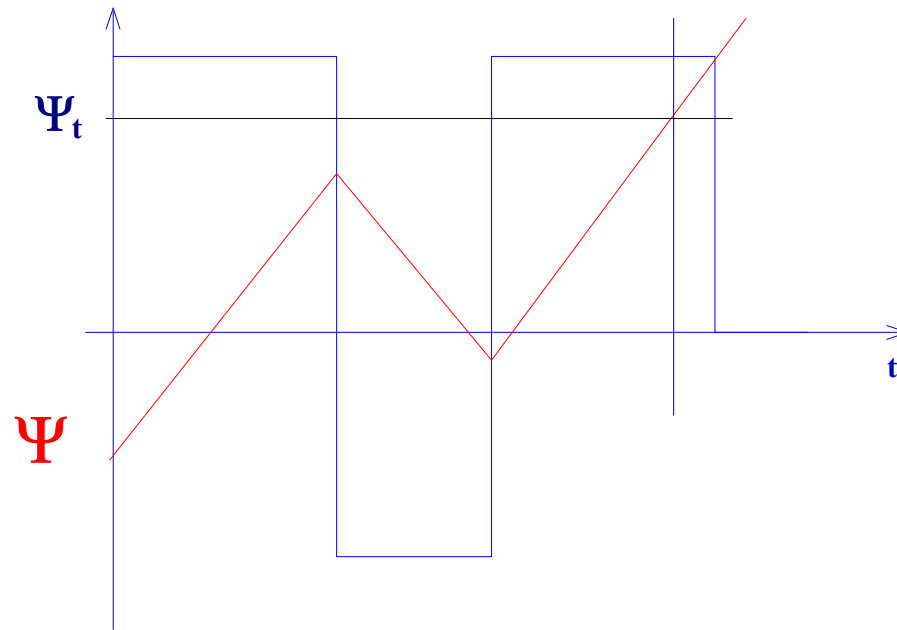
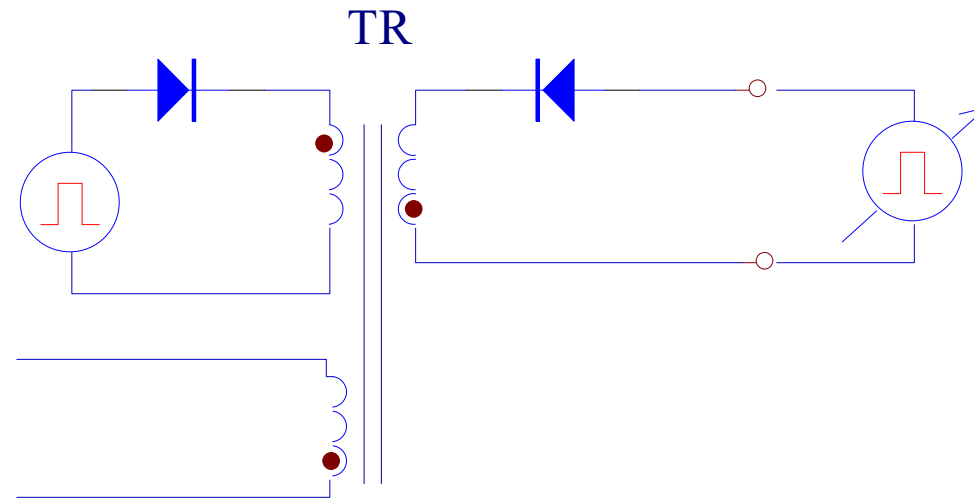
$$\mu_{max} > 6 * 10^5 \left[\frac{V \ sec}{A \ m} \right]$$

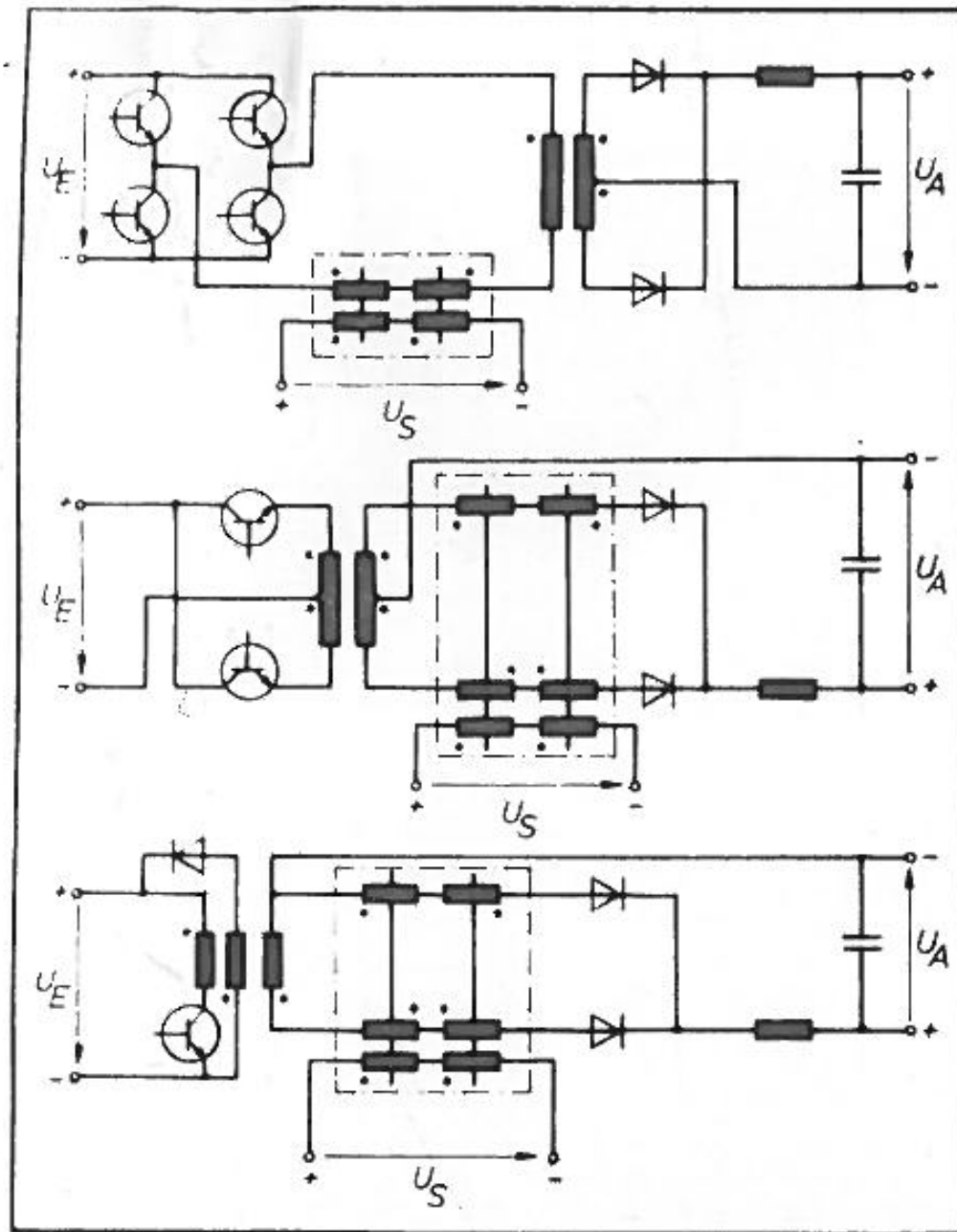
Régen Permenorm 5000Z

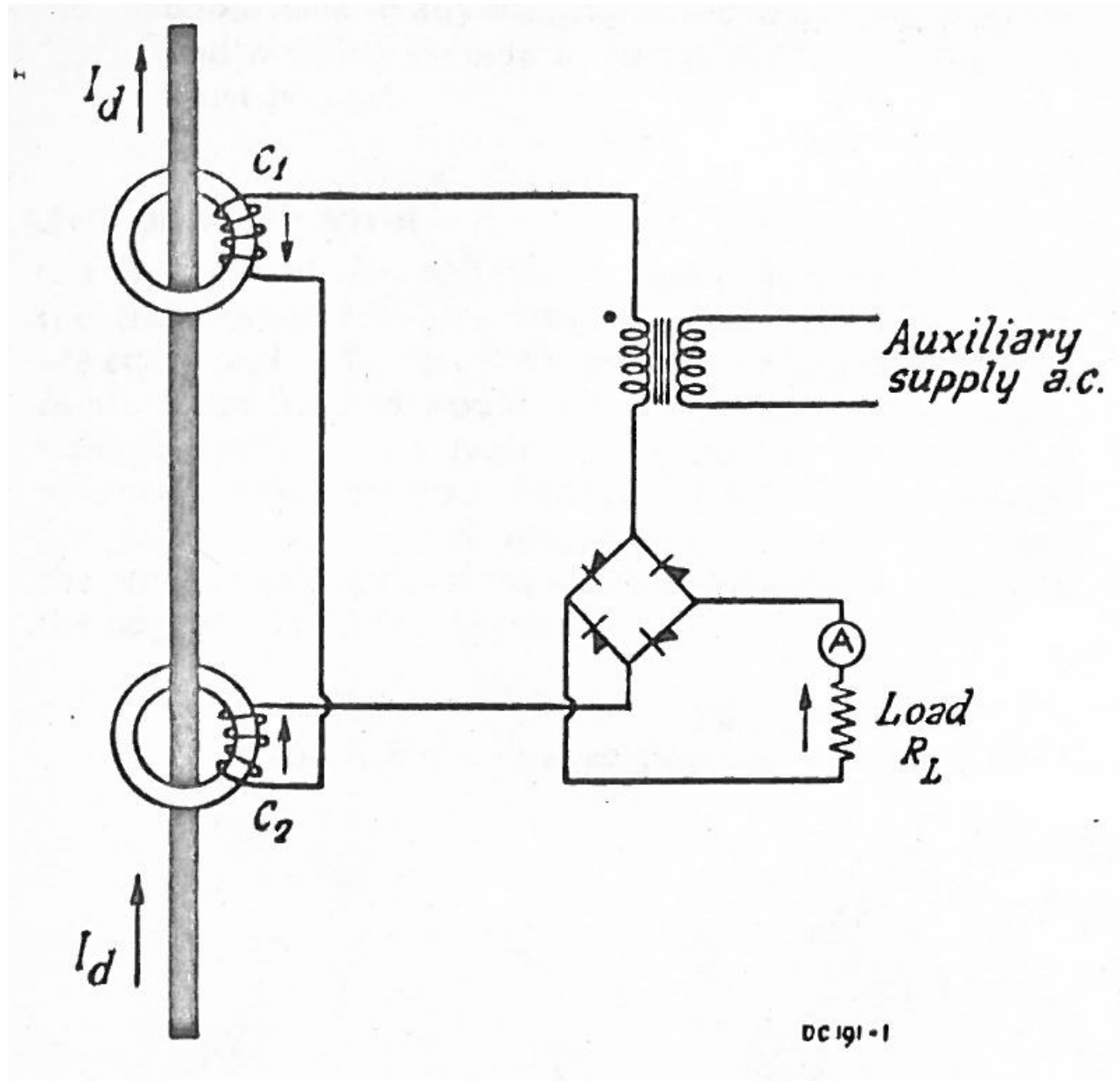
Ma Vitroperm 800Z (100kHz)

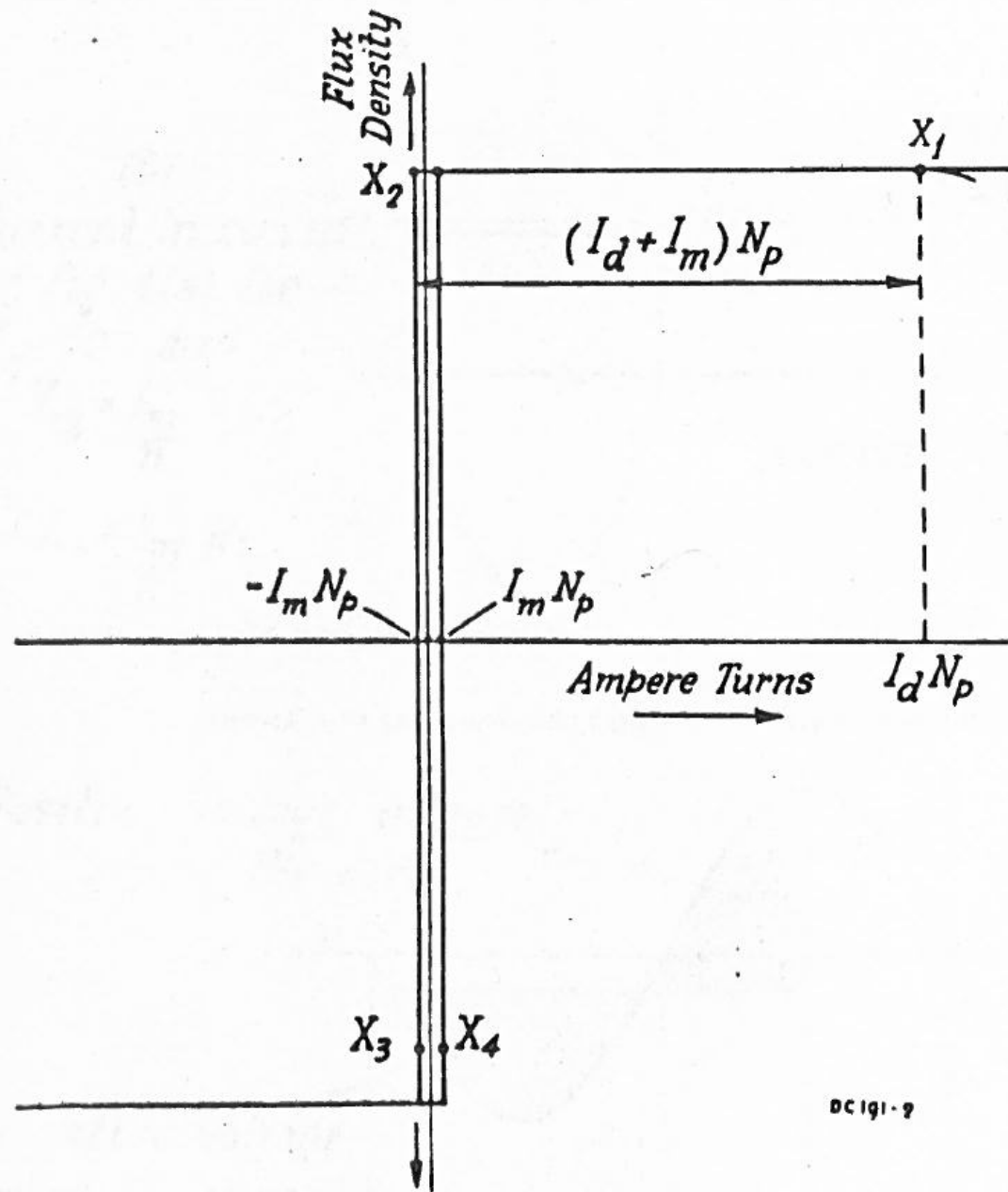
Transzformátor » GANZ » 1885!

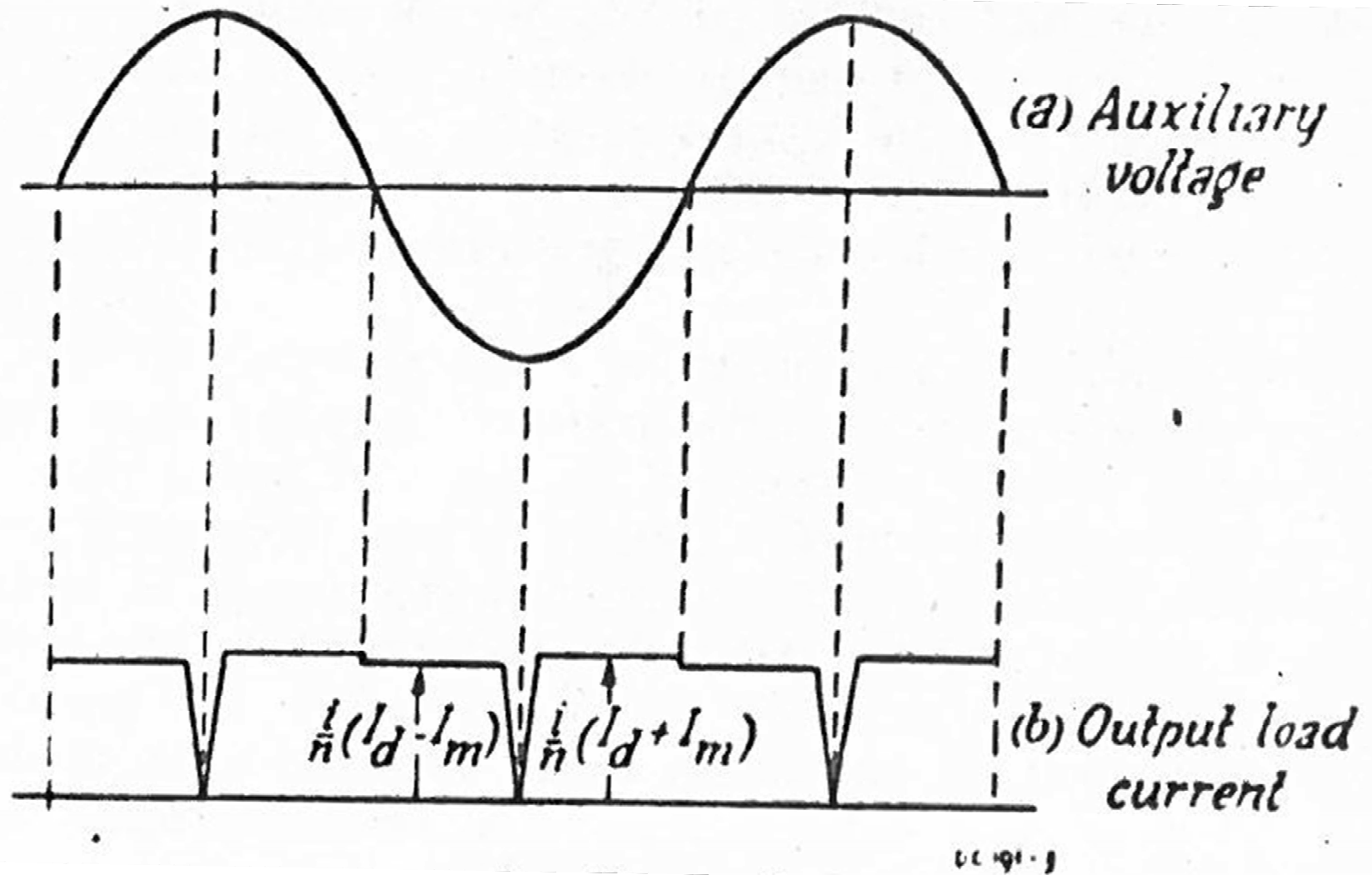


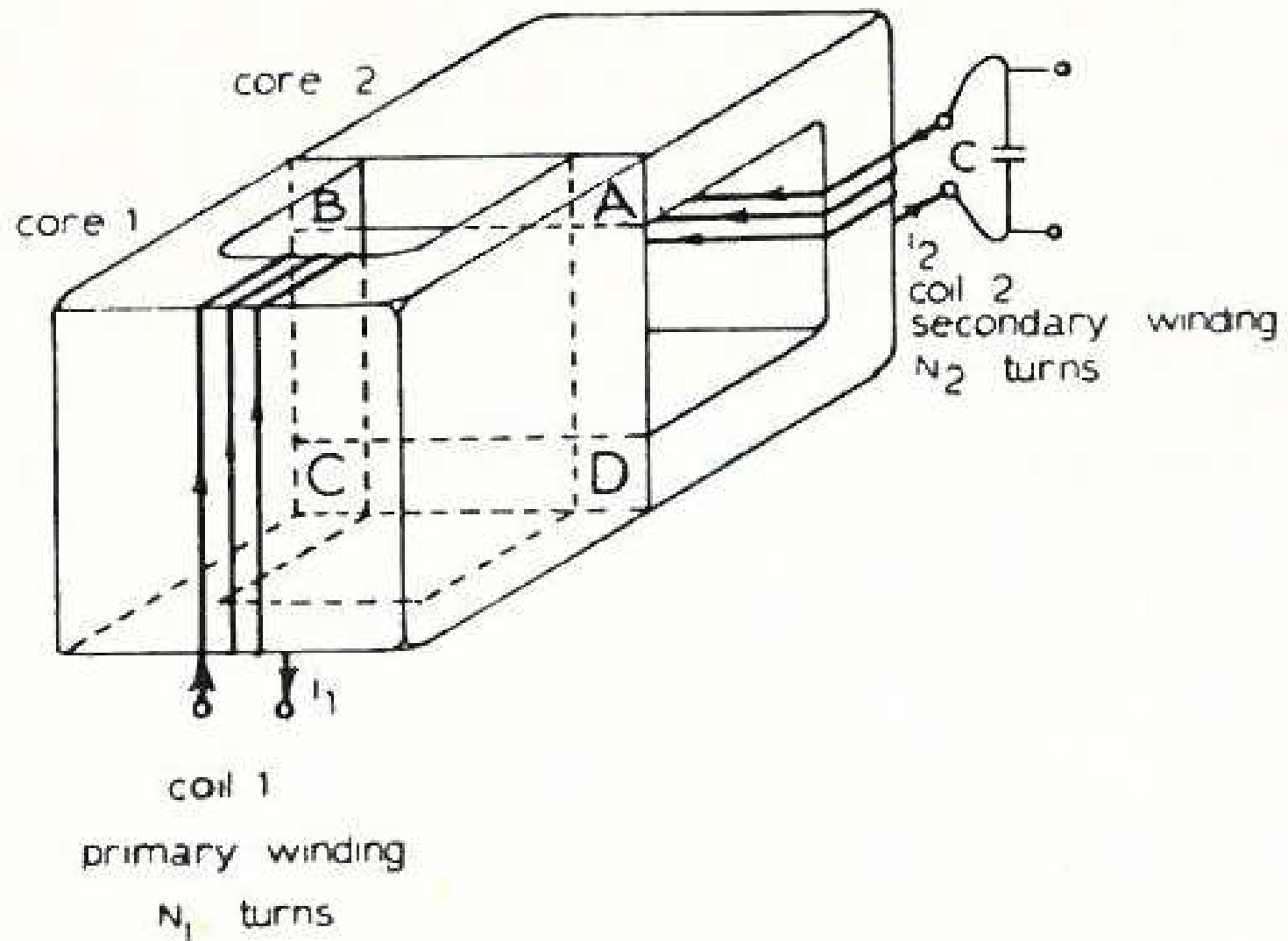












Köszönöm a figyelmet!