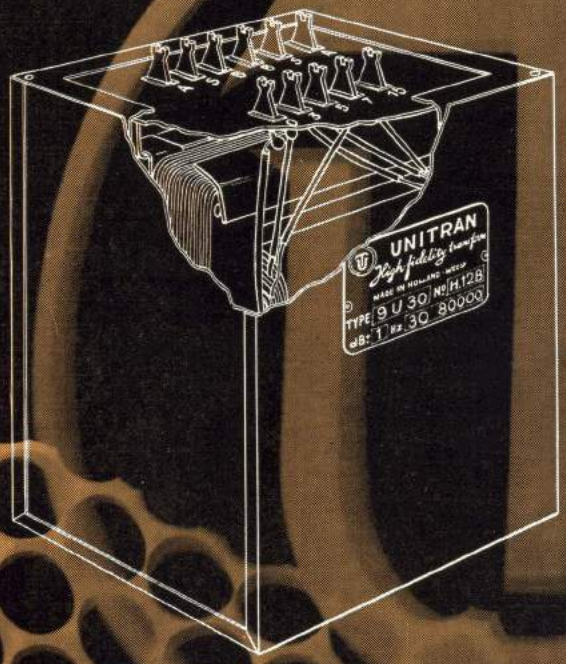
UNITRAN



The makers of **UNITRAN** transformers and electronical apparatus are also specialized in non-standard transformers of any kind for your special needs

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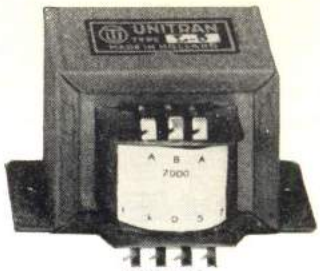
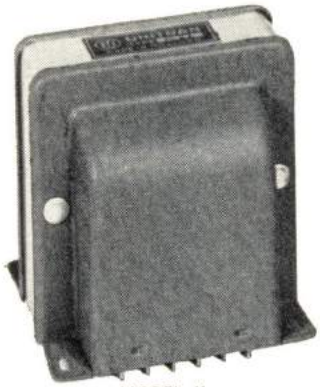

MODEL E

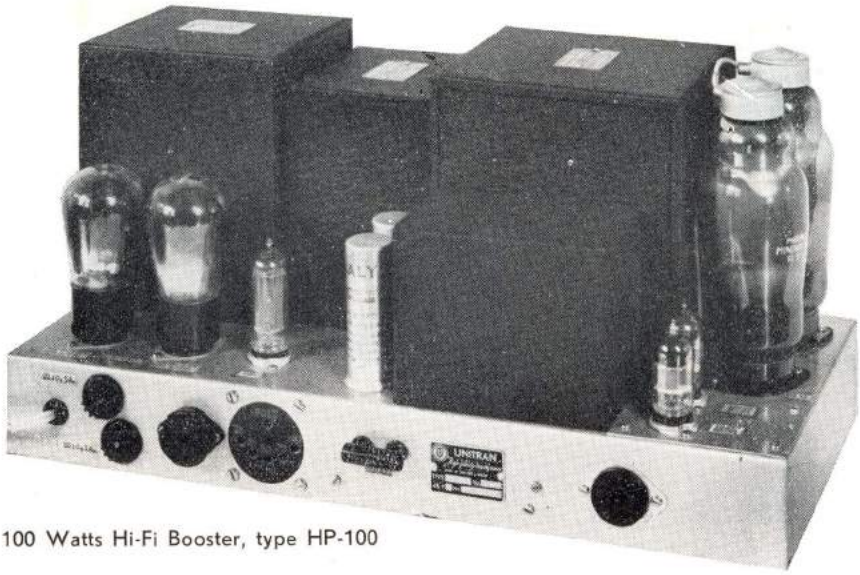
UNITRAN TRANSFORMERS


MODEL K


MODEL C

The makers of **UNITRAN transformers and electronic apparatus** introduce themselves as being a 15 years-old engineering - and manufacturing-company in the Netherlands, recognized as suppliers to **nato-forces, broadcasting-stations, and industry** at home and abroad.

- **Laboratory-quality at production-line cost.**
- **Fully impregnated and compound-filled.**
- **All internal connections welded.**
- **Specialized in non-standard transformers of any kind for your special needs.**



100 Watts Hi-Fi Booster, type HP-100

MODEL F

UNITRAN

Electronic apparatus for:

Audio-frequency,

Ultrasonics,

Measuring,

Telemetering up to 30 channels on telephoneline

etc.

„Build it yourself"

Hi-Fi-Amplifier 25 Watts, type HV 10/25 Also in 10 Watts-version

UNITRAN

also manufactures a
complete line of universal
control-amplifiers and
Hi-Fi-booster-amplifiers
of 10 – 500 Watts.
Frequency-response:
± 1 dB 20 – 20.000 c/s
intermodulation: < 0,6%
distortion: < 0,2%

10 Watts Hi-Fi-booster type GP 10

MODEL A-B

MODEL B-B

MODEL B-A

Universal Hi-Fi control-amplifier for all
our booster-amplifiers up to 500 Watts

TABLE 1 OUTPUT-TRANSFORMERS FOR P.P. STAGES (see also table 12 for applications)

This complete range of Output transformers from 6 to 600 Watts is specially designed for HIGH-QUALITY AMPLIFIERS with an overall-feedback of 20 dB and more, featuring high self-inductance, low leakage-reactance, high efficiency and low distortion. Carefully balanced windings ensure stable operation. Several items with SCREENGRID-TAPS.

type	power (W_{max})	prim. imp. (k. Ohms)	sec. imp. and voltages (Ohms) (V)	freq.range ± 1 dB (c/s)	feedback	screen-grid. taps (% Z)	case	replaces type
L5	7	7	5–7 Ohms	30–10.000	0,25% (1)	–	10B -E	L5
15U10	7	15	3–5–7–15 Ohms	30–50.000	(3)	–	10A -C	–
9U13	15	9	3–5–7–15 Ohms	30–80.000	(3)	18,5	12 -C	9U11
4U62	15	2,5/4	3–5–7–15 Ohms	30–80.000	(3)	–	12 -C	–
6U38	30	6,5	3–5–7–15–400 Ohms (100 V)	30–80.000	(3)	18,5	17A -C	6U33
10U72	30	10/6,6	(2)	10–80.000	(3)	18,5	20B -C	032
4U63	35	3,6	3–5–7–15–400 Ohms (100 V)	25–50.000	(3)	18,5	17A -C	4U58
3U50	55	3,2	7– 15–22–45– 90–180 Ohms 20– 30–35–50– 70–100 V.	25–50.000	(3)	18,5	17B -C	(4U58)
6U50	55	6,5	7– 15–22–45– 90–180 Ohms 20– 30–35–50– 70–100 V.	25–50.000	(3)	18,5	17B -C	–
11U21	100	11/6	6,2–12,5–25–50–100 Ohms 25– 35–50–70–100 V.	20–45.000	2×4%	18,5	20C -C	–
16U10	300	16	(4)	15–35.000	(4)	(4)	25B -C	–
22U10	600	22	(4)	15–30.000	(4)	(4)	25BD-C	–

(1) in cathode-lead of pre-ampl. (2) 1,7-6,8-15-27-42-61-83-109 Ohms for Williamson ampl. (3) feedback up to 30dB from secondary. (4) on request.

TABLE 2 CROSS-OVER FILTERS FOR WOOFER-TWEETER SYSTEMS

A series of screened filters with small dimensions, very low insertion-loss and negligible waveform-distortion for TWO- AND THREE-CHANNEL SYSTEMS. Equipped with taps for matching different voice-coil impedances.

type	power ($W_{max.}$)	prim. imp. Ohms	sec. imp. woofer (Ohms)	sec. imp. tweeter (Ohms)	cross-over freq. (c/s)	case
10X15	10	15	15	3–5–7–15	600	12 -F
25X15	25	15	15	3–5–7–15	600	17A -F
10X16	25	15	15	3–5–7–15	3000	17A -F

TABLE 3 MATCHING TRANSFORMERS FOR VOICE-COILS

These transformers are designed for matching different voice-coil impedances to sources of low impedance or to 100 VOLTS DISTRIBUTING SYSTEMS. Taps allow for different power-consumption of each speaker.

type	power ($W_{max.}$)	power at 100 V (W)	prim. imp. Ohms	sec. imp. Ohms	freq. range ± 1 dB (c/s)	case
10L10	10	3–6–10	3333–1667–1000	3–5–7–15	20–20.000	12 -C/F
25L10	25	10–15–25	1000–667–400	3–5–7–15	20–20.000	17A -C/F
25L15(1)	25	auto-trafo	3–5–7–15–30	3–5–7–15–30	20–20.000	17AL -C/F

(1) e.g. to match woofer to cross-overfilter.

TABLE 4 MODULATION TRANSFORMERS

These modulation transformers have great FLEXIBILITY by giving maximum number of matchings with minimum number of taps. They are designed for QUALITY TRANSMITTERS up to 600 WATTS.

type	power ($W_{max.}$)	prim. imp. (k. Ohms)	sec. imp. (k. Ohms)	freq. range ± 2 dB (c/s) Zp = 5. k. Ohms	Zp = 15 k. Ohms	feedback	max. sec. d.c. mA	case	replaces
3M12	30	5–15	0,36-24,6	20–15.000	60–30.000	2×5%	150	17A -C	3M12
3M11	80	5–15	0,36-24,6	15–12.000	40–25.000	2×5%	200	17B -C	3M11
3M10	300	5–15	0,36-24,6	10–10.000	20–20.000	–	300	25B -C	3M10

TABLE 5 INTERSTAGE TRANSFORMERS

There are UNITRAN transformers for driving push-pull grids with or without grid-current. DRIVER-TRANSFORMER TYPE 10-D-39 features secondaries with extremely LOW RESISTANCE and feedback windings with practically ZERO LEAKAGE-REACTANCE.

type	prim. imp. (k. Ohms)	sec. imp. (Ohms)	freq. range ± 1 dB (c/s)	transf. ratio (u)	max. level 30 c/s dBm	sec. V.	feedback	magn. shield dB	case	replaces
MCD	10	100.000 p.p.	20 – 20.000	1 : 1,6 + 1,6	0	2×5	–	16	3B -A	MCD
10A10S	10	100.000 p.p.	15 – 30.000	1 : 1,6 + 1,6	+24	2×50	–	16	10 -C	10A10S
10D39 (1)	10 p.p.	1600 p.p.	30 – 15.000	2,5 : 1	+38	2×50	2×20%	–	12 -C	–

(1) for AB2 and B2 amplifiers; see also table 12, note 2.

TABLE 6 EQUALIZERS

Type 25F11 is a unit for connection between penthode and grid of following tube. Type MC40 contains 2 chokes for in filter-circuits.

type	prim. imp. (k. Ohms)	sec. imp.	freq. range ± 1 dB c/s)	bass dB	treble dB	case	replaces
25F11	50	grid	40 – 15.000	– 10 to + 20	– 10 to + 10	10 -C	25F11
MC40	L_1 = 28H	L_2 = 0,25H	20 – 20.000	– 25 to + 25	– 25 to + 25	3C -A	–

TABLE 7 OUTPUT TRANSFORMERS FOR SINGLE TUBES

Designed for single output-stages of receivers and small amplifiers up to 8 watts with better performance than usually obtainable in one-tube output-systems.

type	watts	prim. imp. (k. Ohms)	sec. imp. Ohms	freq. range ± 2dB (c/s)	max. d.c. (mA)	tubes	case	replaces
L2	4	3,5/7	2.5 – 5 – 8	50 – 10.000	56/40	UL41, UBL21/EL3, EL41, EBL21, 6V6, 7C5, 25L6, 35L6, 50L6	10A- E	L2
3U12	8	3,5	2.5 – 5 – 8	40 – 12.000	80	EL5, EL6, 6L6, KT66, 6Y6	14A-K	3U12
7U21	6	5/7	2.5 – 5 – 8	30 – 15.000	60/45	EL84, EL41, EBL21, 6V6, 7C5	12C-K	–

TABLE 8 LOW-LEVEL INPUT TRANSFORMERS

Designed for input-matchings of lines, microphones (also crystal-types), low-impedance pick-ups etc. to lines and grids. Very low sensitivity to magnetic fields by triple shielding with high-permeability alloys. Items for chassis-mounting and for cable-connection.

Type	prim. imp. Ohms	sec. imp. Ohms	ratio (u)	freq-range ±1dB (c/s)	max.level 30c/s dBm.	sec.V	magn. shield dB	application	remarks	case	replaces
MC20	200	100 k	1:22,5	20 – 20.000	0	10	±60	micr/line – grid	cable-transf.	3B -B	MC200
MC21 (1)	cryst.micr.	line (50)	45:1	20 – 20.000	0	0,22	–	crist. micr. to line	,,	3A -B	MC1
MC22 (1+2)	line (50)	grid	1:45	20 – 20.000	0	10	±60	line tot grid	,,	3B -B	MC2
MC23	1,5	100 k	1:250	20 – 20.000	0	10	±60	dyn.p.u. – grid	,,	3B -B	–
MC24 (2)	1,5	50	1:5,7	20 – 20.000	0	0,22	±60	dyn.p.u. – line	,,	3B -B	–
MC25	50/200	100 k	1:45/22,5	20 – 20.000	0	10	±60	micr/line – grid	chass. mount.	3B -A	MC5
11A17SS	50/125/200	60 k	1:34 – 11	15 – 30.000	+10	20	±60	,, ,, ,,	,, ,,	10 -C	11A17SS
11A18SS	333/500-600	100 k. p.p.	1:45 – 14	15 – 30.000	+10	2×15	±60	,, ,, p.p. ,,	,, ,,	10 -C	11A18SS

(1) set for crist-micr. via long line (up to several miles) to grid.
(2) for low.imp. p.u./micr. via long line to grid.

TABLE 9 POWER-TRANSFORMERS FOR AMPLIFIERS (for applications see also table 12)

A complete line of power-transformers for receivers, amplifiers and transmitters, for input-powers up to 1000 Watts. Static shielding, low temperature rise, good regulation, low magnetic stray-fields. Special item for voltage-doubling (19V10). Several taps for different primary and secondary voltages

type	prim.voltage	secondary voltages				dc voltages and currents		case	replaces
		anode	bias	heaters(ampl.)	heaters(rect.)	choke-input.	cond.input.		
2P10	110 – 127 – 220	2×325	–	2×3,15V.2A	_	270V.35mA	350V.20mA	12 -C	12P38
K1	110 – 127 – 220	2×280	–	2×3,15V.2,5A	4V.1A	220V.85mA	280V.60mA	14A -D	K1
K10	127 – 220 – 240	2×260	–	2×3,15V.4A	4V.2A	200V.150mA	250V.100mA	17A -D	12P37N
9P10	110 – 127 – 220	2×310	–	2×3,15V.3A	4 – 5V.2,5A	260V.170mA	310V.110mA	17AL -C	R2
15P20	110 – 127 – 220	2×350/425	1×25	2×3,15V.4A	4 – 5V.3,75A	300V.250mA 350V.220mA	375V.170mA 450V.150mA	17B -C	12P21/12P36
20P10	110 – 127 – 220	2×350/425	1×50	2×3,15V.8A	4 – 5V.3,75A	300V.350mA 350V.280mA	375V.240mA 450V.200mA	20B -C	–
20P12	110 – 127 – 220	2×350/525	1×50	2×3,15V.8A	4 – 5V.3,75A	300V.300mA 450V.240mA	375V.220mA 550V.180mA	20B -C	–
19V10	110 – 127 – 220	1×360/480(1)	2×60	2×3,15V.8A	2,5 – 4 – 5V.5A 2,5 – 4 – 5V.5A 4 – 5V.1A	600V.300mA – 800V.220mA(1)	65V.50mA	20B -C	–
15P21	220(3)	2×1700 – 2300(2) 2×875	–	–	–	1500V.330mA – 2000V.250mA (2) 750V.60mA		25B -C	–
9H10	110 – 127 – 220	2×425	2×120	2×5V.6,5A 2×3,15V.6A	2×1,25V.5A 2×1,25V.5A 4 – 5V.2,5A 4 – 5V.2,5A	350V.100mA	450V.70mA 130V.50mA	20B -C	–
20P11	220(4)	2×2800 – 3350 2×580	–	–	–	2500V.380mA – 3000V.320mA 500V.50mA		25BD -C	–
17H10	110 – 127 – 220	2×425	2×120	2×2,5V.15A 2×2,5V.15A 2×3,15V.6A	2×1,25V.5A 2×1,25V.5A 4 – 5V.2,5A 4 – 5V.2,5A	350V.100mA	450V.70mA 130V.50mA	25B -C	–

(1) 1 x 360-390-420-450-480V. for voltage-doubling with center-tapped input-choke type 35S60, giving: 600V.300mA+300V.60mA, 650V.280mA+325V.60mA, 700V.260mA+350V.60mA, 750V.240mA+375V.60mA or 800V.220mA+400V.60mA.
(2) 2x1700, 2000, 2300V. giving: 1500V.300mA, 1750V.260mA or 2000V.225mA
(3) Use type 9H10 as auto-transformer. (4) Use type 17H10 as auto-tranformer.

TABLE 10 SMOOTHING-CHOKES (for applications see also table 12)

These chokes combine HIGH SELF-INDUCTANCE AND LOW RESISTANCE, thus giving LOW RIPPLE and GOOD REGULATION.

Type	self.ind. (H)	d.c. (mA)	max.d.c. (mA)	resistance (Ohms)	max. d.c.volts when used as input-choke	following filter cap. (micr. F) for 100 × ripple-attentation	case	replaces
3C10	40	30	40	650	300 (1)	6	10 -C	74C30, 10C50
6C10	20	60	85	225	300 (1)	12	10 -C	10C49
13C10	10	130	170	150	300 (1)	24	10 -C	10C25
20C10	10	200	250	90	400 (1)	24	19A -C	(10C10)

(1) See note 1 of table 11.

TABLE 11 SWINGING CHOKES (with center-tap for voltage-doubling; for applications see also table 12)

UNITRAN swinging chokes have a high range of selfinductance, give high ripple-attenuation and require a low bleeder-current. All items are CENTER-TAPPED for operation in choke-input VOLTAGE-DOUBLING circuits.

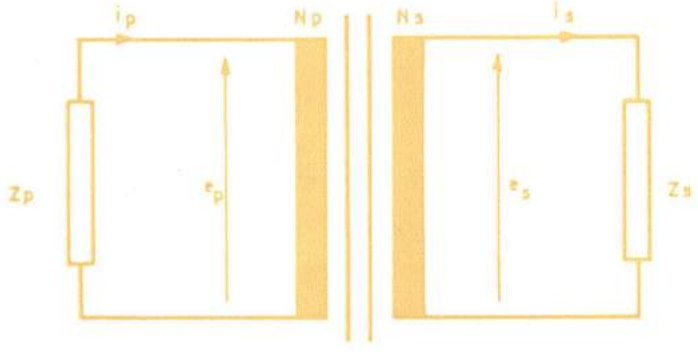
Type	self.ind. (H)	d.c. (mA)	max.d.c. (mA)	resistance (Ohms)	max. d.c. volts when used as input-choke	filter-cap.	case	replaces
35S30	30 – 5	0 – 350	420	70	600 (1)	6 (2×12) (2)	17A-C	10C10
35S60	30 – 5	0 – 350	420	85	1200 (1)	6 (2×12) (2)	17B-C	–
25S120	30 – 5	0 – 250	320	150	2000 (1)	6 (2×12) (2)	20A-C	–
31S200	30 – 5	0 – 310	350	200	3000 (1)	6 (2×12) (2)	20B-C	–

(1) due to a.c. core-saturation at 50 c/s mains; for 60 c/s multiply with 1,2; for use with input-capacitor multiply with 1,5. (2) minimum value for filter-capacitor (for voltage-doubling 2 capacitors in series); ripple 6% approx.

OUTPUT TRANSFORMERS FOR PUSH-PULL STAGES

Table I of this catalogue offers a series of p.p. outputtransformers, especially designed for application in audio-amplifiers of highest quality and with power-ratings from 6 to 600 Watts. Use of special core-laminations with high initial permeability and low losses, combined with an intricate system of interleaved windings for low leakage-reactance and capacitance, ensure a frequency-response, far beyond the limits of audibility. This is essential for stable operation under high degrees of overall-feedback (up to 30 dB and even more). Several types are equipped with screengrid-taps for decreasing screengrid-dissipation.

IMPEDANCE MATCHING WITH TRANSFORMERS



In an ideal transformer, with a primary coil of N_p turns and a secondary coil of N_s turns the transformer-ratio $u = N_p / N_s$ is equal to the voltage-ratio e_p / e_s. As this ideal transformer nor looses neither produces power, the input power $W_p = e_p \cdot i_p$ is equal to the outputpower $W_s = e_s\, i_s$ Consequently the current ratio must be reciproque to the voltage- and turns-ratio, so: $\frac{i_p}{i_s} = \frac{1}{u}$.

The primary impedance $Z_p = \frac{e_p}{i_p}$ and the secondary impedance $Z_s = \frac{e_s}{i_s}$.

The ratio of these impedances is $\frac{Z_p}{Z_s} = \frac{e_p \cdot i_s}{e_s \cdot i_p} = u^2$, or in words:

The impedance-ratio of a transformer is equal to the square of the turns-ratio and herefore the turns-ratio must be equal to the square root of the impedance-ratio required, so: $u = \sqrt{\frac{Z_p}{Z_s}}$.

A UNITRAN transformer may not be an ideal transformer in the sense of the theory mentioned above, certainly it offers the nearest possible approach to it as the losses, inherent to each transformer, have been reduced to the utmost minimum. Consequently, UNITRAN transformers behave as close as possible to the theory. And as they are precision products, the result of more than 15 years of "know-how" in his field, they are fully dependable.

REFLECTED IMPEDANCE

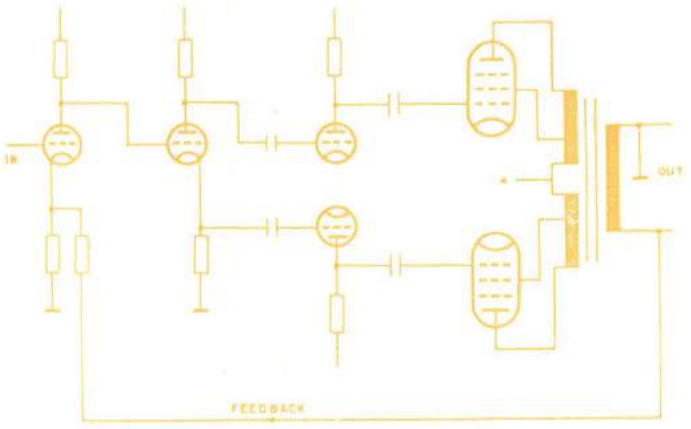
When a transformer with turns-ratio u is loaded with an impedance Z_s on its secondary coil, the impedance, measured between the primary terminals, $Z'_p = u^2 Z_s$. This "reflected impedance" Z'_p works as the load-impedance for the signal source. However, this reflected impedance need not to be, and generally is not, equal to the internal impedance of this source (the so-called "generator-impedance"), but it has to be the optimal load-impedance for this source; e.g. in the case of an outputtransformer, supplying audio power from a power-amplifier tube to a voicecoil, the generator-impedance of the tube may be higher (pentode, tetrode) or lower (triode, feedback-pentode) than the optimum load-impedance of the tube.

TABLE A	Volts-Power-Impedance						
Power Watts dBm	VOLTS				IMPEDANCE (ohms) for		
	3 Ohms	5 Ohms	7 Ohms	15 Ohms	50 V	70V	100 V
1 + 30	1,73	2,25	2,65	3,9	2500	5000	10000
2 + 33	2,45	3,16	3,75	5,5	1250	2500	5000
3 + 34,5	3	3,88	4,6	6,7	830	1660	3333
4 + 36	3,48	4,5	5,3	7,8	625	1250	2500
5 + 37	3,9	5	5,9	8,7	500	1000	2000
6 + 38	4,25	5,5	6,5	9,5	417	835	1670
8 + 39	4,9	6,35	7,5	11	312	625	1250
10 + 40	5,5	7,1	8,4	12,2	250	500	1000
15 + 41,5	6,7	8,7	10,2	15	166	333	667
20 + 43	7,8	10	11,8	17,3	112	225	500
25 + 44	8,7	11,2	13,3	19,2	100	200	400
30 + 44,5	9,5	12,3	14,5	21,3	83	166	333
40 + 46	11	14,1	16,8	24,5	62	125	250
50 + 47	12,3	15,8	18,8	27,5	50	100	200
60 + 48	13,4	17,3	20,5	30	42	84	167
80 + 49	15,5	20	23,7	34,7	31	62	125
100 + 50	17,3	22,5	26,5	38,8	25	50	100
150 + 51,5	21,3	27,5	32,5	47,5	17	33,5	67
200 + 53	24,5	31,6	37,5	55	12,5	25	50
300 + 54,5	30	39	46	67	8,3	16,6	33,3

100 V-SYSTEM

Outputtransformers for powers upwards 25 Watts may have their output terminals marked with impedances and/or with voltages. The relation between power W, voltage e and impedance Z is: $W = \frac{e^2}{Z}$, $Z = \frac{e^2}{W}$ and $e = \sqrt{ZW}$ For the commonly used 100 V-system the relation between Power and Impedance is found in table A.

By means of UNITRAN matching transformers (see table 3), voice coils of different impedances and power-capabilities may be matched to 100 V distributing systems. The system behaves in analogy to a mains-power system of 100 Volts, each speaker being matched by its transformer to consume its nominal power, the line-voltage being held constant by the voltage-feedback of the amplifier, irrespective of loading.



Example: A 100 Watts amplifier has to supply its power to several speakers, e.g.: one 25 Watts speaker of 15 Ohms, one 15 Watts speaker of 15 Ohms, five 6 Watts speakers of 7 Ohms each and ten 3 Watts speakers of 3 Ohms each, totalling 100 Watts. The 25 W and 15 W speakers are each matched to 100 V with a matching transformer type 25 L 10 (10-15-25 W for 3-5-7-15 Ohm), the 6 and 3 Watts units with type 10 L 10 (3-6-10 W for 3-5-7-15 Ohm). When connecting the voice coils to the correspondent impedance-tap of the secondary and the 100 V line to the correspondent Watts-tap of the primary, the matching transformer automatically matches the speaker to the line. If for some reasons, e.g. the acoustical division of sound-intensities, a speaker has to consume less than its nominal power, the line is connected to the tap, corresponding with this lower power, or the voice coil to a lower impedance-tap. Furthermore groups of speakers may be switched to a lower power-consumption by lowering the line-voltage of these groups, the outputtransformer-secondary being supplied with taps for steps of 3 dB (100 V, 70 V, 50 V, 35 V, etc.). In all cases, the output-impedance of the amplifier and the input-impedance of the matching transformer can be found from table A; these impedances are not important, however, as long as the total nominal power of all speakers does not exceed the nominal amplifier-power. For a partly loaded amplifier, the loading-impedance is higher than the nominal amplifier-impedance; this does not affect the operation of the system, as the amplifier is fully capable of supplying this lower power at the higher impedance

FEEDBACK

Due to the extremely low reactive losses of UNITRAN outputtransformers, special feedback-windings have become superfluous, the secondary winding being used for this purpose, except for special cases where the secondary has to be free from earth. Overall-feedback up to 30 dB is quite possible.

Furthermore most UNITRAN outputtransformers are equipped with taps for screengrid-feedback. The impedance between the taps in 18,6% of the total primary impedance.

DEVIATIONS FROM NOMINAL IMPEDANCES

When a transformer is used for higher (lower) impedances than the nominal values, the frequency characteristic of the transformer will shift to higher (lower) frequencies. As the frequency-band of UNITRAN outputtransformers is much wider than the audio spectrum, reasonable deviations from the nominal impedances are quite tolerable, the audio spectrum still remaining within the flat part of the transformer characteristic. E.g. a transformer, labeled for matching 9000 Ohms to 15 Ohms, may equally well be used for 6000 to 10 Ohms, 12000 to 20 Ohms, etc. The impedance-ratio remains constant.

Table 12 gives a survey of the application-possibilities of these output-transformers. If your special problem is not solved there and then, request our engineering-department.

LOW-LEVEL INPUT TRANSFORMERS

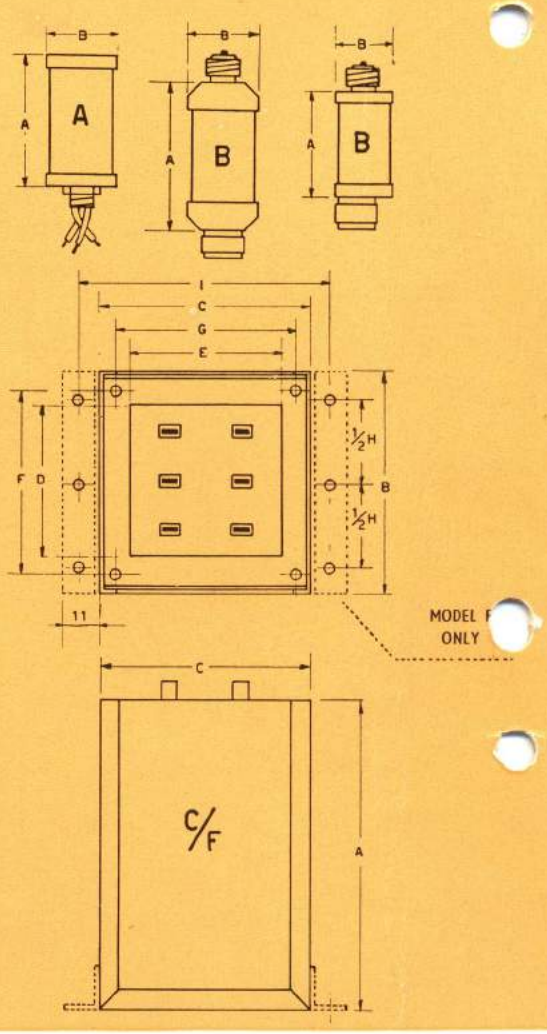
UNITRAN low-level transformers, as shown in table 8, combine high turns-ratio to wide frequency range. Triple magnetic shielding with high-permeability alloys provide very low sensitivity to magnetic fields. All types, acting into grids, are of the unloaded type: the secondary impedance labeled is the reflected primary impedance. The frequency response of these transformers is governed by the ratio of primary load to the self-inductance, leakage-reactance and winding-capacity. Appreciable deviations from the nominal impedances will therefore influence the frequency response. Higher (lower) impedances will shift response in the bass-region to higher (lower) frequencies, and will drop (lift) the high-frequency end of the response curve. These transformers do not load the signal source, and hence, the secondary voltage is at least 6 dB higher than with a loaded input transformer. Due to their small dimensions they have a limited operation level, which mainly depends on core-saturation. The maximum levels, mentioned in table 8, correspond with low-distortion operation at 30 c/s. If the lowest frequency used is higher than 30 c/s, the undistorted level may be increased proportionally. Table B shows the connection of dBm and Neper to volt-, current- and power-ratios, and to level on several impedances, with a reference-level of 1 mW = 0 dBm.
Apply the same considerations to table 5 (interstage-transformers).

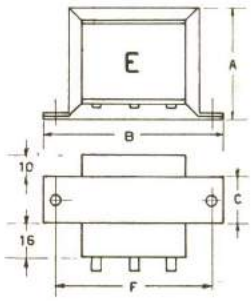
TABLE B — dBm, Neper, Volts Watts

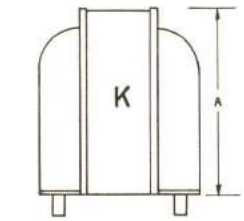
dBm	Neper	e_2/e_1 , i_2/i_1	W_2/W_1	Level 200 Ohms	Level 600 Ohms	Level 10 kOhms	Level 100 kOhms
—80	—9,6	10^{-4}	10^{-8}	44,7 μV	77 μV	316 μV	1 mV
—70	—8,4	$3,16.10^{-4}$	10^{-7}	141 μV	250 μV	1 mV	3,16 mV
—60	—7,2	10^{-3}	10^{-6}	447 μV	770 μV	3,16 mV	10 mV
—50	—6	$3,16.10^{-3}$	10^{-5}	1,41 mV	2,5 mV	10 mV	31,6 mV
—40	—4,8	10^{-2}	10^{-4}	4,47 mV	7,7 mV	31,6 mV	100 mV
—30	—3,6	$3,16.10^{-2}$	10^{-3}	14,1 mV	24,5 mV	100 mV	316 mV
—20	—2,4	0,1	10^{-2}	44,7 mV	77,5 mV	316 mV	1 V
—14	—1,8	0,2	0,04	90 mV	155 mV	630 mV	2 V
—10	—1,2	0,316	0,1	141 mV	245 mV	1 V	3,16 V
—8	—0,96	0,4	0,16	179 mV	310 mV	1,27 V	4 V
—6	—0,72	0,5	0,25	230 mV	397 mV	1,62 V	5,1 V
—4	—0,48	0,63	0,4	283 mV	490 mV	2 V	6,3 V
—3	—0,36	0,71	0,5	316 mV	550 mV	2,25 V	7,1 V
—2	—0,24	0,79	0,62	350 mV	615 mV	2,5 V	7,9 V
—1	—0,12	0,89	0,79	400 mV	695 mV	2,83 V	9 V
0	0	1	1	447 mV	775 mV	3,16 V	10 V
+1	+0,12	1,12	1,26	500 mV	870 mV	3,55 V	11,2 V
+2	+0,24	1,26	1,58	565 mV	975 mV	4 V	12,6 V
+3	+0,36	1,41	2	635 mV	1,1 V	4,5 V	14,2 V
+4	+0,48	1,58	2,5	707 mV	1,22 V	5 V	15,6 V
	+0,72	2	4	895 mV	1,55 V	6,4 V	20 V
	+0,96	2,5	6,3	1,12 V	1,94 V	7,9 V	25 V
+10	+1,2	3,16	10	1,41 V	2,45 V	10 V	31,6 V
+14	+1,8	5	25	2,24 V	3,88 V	16 V	50 V
+20	+2,4	10	100	4,47 V	7,75 V	31,6 V	100 V
+30	+3,6	31,6	1000	14,1 V	24,5 V	100 V	316 V

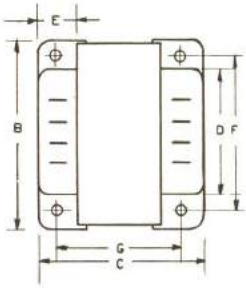
From this table the primary and secondary voltages of input transformers may be found if the input-level is known. E.g. a 200 Ohms microphone with a sensitivity of -70 dB/1 micro-bar gives, for normal speach intensity at 2 feet from microphone, (corresponding to approx. 1 micro-bar and 74 phon), a voltage of 141 micro-volts, and, after transforming to grid (100 kOhms), 3,16 mV; at the highest sound-level (about 124 phon or 50 dB above 1 micro-bar) the secondary voltage will be —20 dBm or 1 Volt. The optimal signal-to-noise ratio obtainable can be calculated from the thermal noise of the input circuit. This thermal-noise voltage, for a bandwidth of 15 kc/s and a temperature of 27° C amounts to a level of —126 dBm. The actual equivalent input noise is at least 6 dB higher (—120 dBm), due to the contribution of tube- and thermal-noise of following stages. Hence, with the microphone, mentioned above, the optimal signal-to-noise ratio obtainable at a normal speech level amounts to 120-70 = 50 db. (measured with 30 phon — weigthing network, 65 dB approx.)

CASE	DIMENSIONS (m.m.)			CHASSIS-HOLE		MOUNTING-CENTERS TYPE C		TYPE C & F		TYPE F		Approx. Weight K.G.
	A	B	C	D	E	F	G	diam.	nr.	H	I	
8 C	65	46,5	43	Ø = 36		32,4	30,6					0,4
10 C	80	57,5	51,5	Ø = 43		41,9	36,9					0,7
10 A-C	80	57,5	65	Ø = 43		43	52					0,8
10 AL-C	69	57,5	65	Ø = 43		43	52					0,8
10 F	80	57,5	51,5	44	39			4,2	4	37	63	0,7
10 A-F	80	57,5	65	44	52			4,2	4	38	77	0,8
10 AL-F	69	57,5	65	44	52			4,2	4	37	77	0,8
12 C	95	78	65	52	50	65	52,8	4,2	4	64	77	1,4
12 L-C	72	78	65	52	50	65	52,8	4,2	4	64	11	1,4
17 A-C	127	93	83	66	61	75,3	66,9	4,2	4	68,5	96	3
17 AL-C	115	93	83	66	61	75,3	66,9	4,2	4	68,5	96	3
17 B-C	133	109	91	66	61	92	76,2	4,2	4	68,5	103	4,3
20 A-C	150	124	98	89	78	106,7	81,8	4,2	4	68,5	110	5,5
20 B-C	150	124	118	89	78	106,7	102	4,2	4	68,5	130	6
20 C-C	150	124	140	89	78	106,7	124,8	4,2	4	68,5	152	9
25 A-C	180	134	118	89	78	2×58,2	101,5	4,2	6	2×61,5	130	9,5
25 B-C	180	134	143	89	102	2×58,2	126	4,2	6	2×61,5	155	12
25 C-C	180	134	168	89	124	2×58,2	151,7	4,2	6	2×61,5	180	15
25 AD-C	230	165	117	122	78	2×73,4	102	5,2	6	2×68,5	129	14
25 BD-C	230	165	143	126	109	2×73,4	127	5,2	6	2×68,5	155	18,5
25 CD-C	230	165	167	129	131	2×73,4	152	5,2	6	2×68,5	179	23,5
3 A-A	42	27,5				Ø = 10						0,1
3 B-A	50	34				Ø = 10						0,2
3 C-A	72	34				Ø = 10						0,3
3 A-B	42	27,5										0,15
3 B-B	60	34										0,25
10 A-E	54	87	23			75		4	4			0,5
10 B-E	54	87	33			75		4	4			0,7
12 A-K	80	67	61	38	14	54,5	42	4,5	4			1,1
12 B-K	80	67	66	38	14	54,5	47	4,5	4			1,2
12 C-K	80	67	71	38	14	54,5	52	4,5	4			1,3
14 A-K	87	85	76	55	22	72	56	4×8	4			1,8
14 B-K	87	85	83	55	22	72	63	4×8	4			2,0
14 C-K	87	85	91	55	22	72	71	4×8	4			2,2
17 A-K	108	92	78	55	22	76,5	58	4×8	4			2,9
17 B-K	108	92	83	55	22	76,5	63	4×8	4			3,2
17 C-K	108	92	91	55	22	76,5	71	4×8	4			3,5
17 D-K	108	92	103	55	22	76,5	83	4×8	4			3,8









UNITRAN TRANSFORMERS

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This table shows at a glance the combinations of OUTPUT- and POWER TRANSFORMERS and CHOKES,
The output-Watts stated refer to secondary Watts, when used without screengrid feedback. With screengrid

UNITRAN TRANSFORMERS

TABLE 12

OUTPUT-TRANSFORMER	OUTPUT WATTS	POWER-AMPLIFIERTUBES	ZERO-SIGNAL VOLTAGES			
			Va (V)	Vg2 (V)	Rg2 (1) Ohm	−Vg1 (V)
15U10	6,5	2×EL42 (EL2, EL90, 6AM5)	250	250	0	–
	7,5	2×EL2	250	250	0	–
	8,5	1×QQC-04/15, 832	250	175	–	20
	9,5	2×6V6, 7C5, 6BW6, 6AQ5, EL91	250	250	0	–
9U13	12	2×6V6, 7C5, 6BW6	285	285	–	–
	13	2×6V6, 7C5, 6BW6	300	300	0	20
	12,5	2×EL3, -11, -33, -41, -83, EBL21, 4694	300	300	0	–
	15	2×EL84	300	300	0	–
	9,5	2×6F6, 42	315	315	–	–
4U62	15	2×AD1, 4683	350	–	–	75
	15	2×2A3, 6A3, 6B4G	325	–	–	68
	12,5	2×EL81, PL81	170	170	0	27
	15	2×EL81, PL81	245	245	0	32
	11,5	2×UL41, UBL21, UBL41	200	200	0	–
	11	2×PL82	200	200	0	–
6U38	21,5	1×QQE-06/40, 829(B)	300	250	–	26
	27,5	2×4688, 4689 (EL5)	375	275	–	–
	25,5	2×807, QE-06/50, 6L6, KT66	375	275	–	23,5
	26,5	2×4699 (EL6, EL12)	375	375	0	–
	26,5	2×4654 (K), (6BG6G)	425	425	0	–
10U72 (3)	15	2×KT66, 807 (6L6, 4689) triode	425	–	–	–
10U72 (4)	30	2×KT66, 807 (6L6, 4689)	425	425	2×100	–
4U63	33	2×EL34	375	375	470	–
	(45)	2× 807, QE-06/50 (6L6, KT66)	375	375	0	22,5
	30	4×EL84	300	300	0	–
3U50	43	2×QQE-06/40, 829 (B) p.p. par.	300	250	–	26
	55	4×4688, 4689 (EL5) „ „	375	375	–	–
	51	4×807, QE-06/50, 6L6, KT66 „ „	375	275	–	23,5
	53	4×4699 (EL6, EL12) „ „	375	375	0	–
	53	4×4654 (K), (6BG6G) „ „	425	425	0	–
	55	2×EL34	425	425	1000	38
11U21	75	2×807, QE-06/50	600	300	0	30
	100	2×PE-06/40	600	300	0	45
	140	2×EL51	750	750	(9)	40
	100	2×EL34	800	400	750	39
16U10	300	2×PB-1/150, OS-70/1750, 828	1750	750	–	120
22U10	600	2×QB-3,5/750	3000	500	–	94

(1) common screengrid - and cathode-resistor. (2) use driver-trafo type 10D39. (3) Williamson amplifier. (4) modified Willia
(7) pre-amplifier-supply. (8) bias. (9) lamp 550V., 68W., may be omitted by use of screengrid taps. (10) Voltage-doubler, see

d chokes for quality-amplifiers from 6 to 600 watts

RMERS and CHOKES, amplifier- and rectifier tubes, zero-signal currents and voltages, cathode- and screengrid resistors, etc.
back. With screengrid feedback the output-power may be somewhat less, dependent on tube-characteristics.

SIGNAL VOLTAGES AND CURRENTS							FILTER CHOKES TYPE		POWER TRANSFORMER TYPE	RECTIFIER TUBES
V) g2	Rg2 (1) Ohm	−Vg1 (V)	Rc(1) (Ohm)	Ia (mA)	Ig2 (mA)	Ig1 (mA)	choke-input	condensor-input		
50	0	–	310	2×20	2×3,2	0	–	6C10	K1	1×EZ2, EZ41, AZ1, AZ41
50	0	–	305	2×27	2×4,5	0				
75	–	20	–	2×3	2×0,4	2×1,5(2)	13C10	–		
50	0	–	200	2×35	2×2,5	0				
35	–	–	250	2×35	2×2,5	0			9P10	1×EZ40, EZ80, AZ1, 5Z4, 7Z4, 80, 5Y3GT, 6V4
00	0	20	260	2×39	2×3	0				
00	0	–	130	2×30	2×4	0				
00	0	–	130	2×36	2×4	0	–	13C10		
35	–	–	320	2×31	2×6	0				
	–	75	–	2×35	–	0				
	–	68	–	2×40	–	0				
70	0	27	–	2×20	2×1,5	0				
45	0	32	–	2×32	2×2,5	0				2×PY82, UY1N, UY41, UY42 (in parallel with each 50 – 100 Ohms in series)
00	0	–	116	2×50	2×7,5	0	–	13C10	MAINS	
00	0	–	135	2×32	2×2,5	0				
50	–	26	–	2×20	2×2	0	20C10	–	15P20	1×AX50, 83
75	–	–	165	2×45	2×5	0				
75	–	23,5	–	2×44	2×2,5	0				
75	0	–	125	2×52	2×6,5	0				
75	0	–	265	2×47	2×5,5	0				
	–	–	300	2×62	–	0				
25	2×100	–	300	2×57	2×5	0	–	20C10	15P20	1× AZ4, GZ32, GZ34 5R4GY, 5V4, 6Z4/84, 5U4
75	470	–	130	2×75	2×12	0				
75	0	22,5	–	2×44	2×2,5	2×2 (2)				
00	0	–	65	2×72	2×8	0				
00	–	26	–	2×40	2×8	0	35S30	–		
75	–	–	83	2×90	2×10	0				
75	–	23,5	–	2×88	2×5	0				
75	0	–	62	2×104	2×13	0	–	35S60	20P10	1×AX50, AZ50, 83, 5R4GY
75	0	–	132	2×93	2×11	0				
75	1000	38	–	2×30	2×4,4	0				
00	0	30	–	2×30	2×2,5	2×1,5 (2)				
00	0	45	–	2×34	2×3	0				
00	(9)	40	–	2×40	2×7,5	0	35S60 (5)	–	19V10 (10)	2×AX50, 83, DCG 1/250, RG250/1000, GU1, 836
00	750	39	–	2×25	2×3	0				
							25S120	–	15P21 (5)	2×DCG 4/1000, RG 250/3000, 866 (A)
00	–	120	–	2×25	2×2	0	35S60	–	(6)	2×DCG 1/250, RG 250/1000, 836, 816
							13C10	13C10	9H10 (7)	1×AZ4, 5R4GY, 5V4, 83(V), 6Z4/84, 80
							6C10	6C10	(8)	1×AZ1, AZ41, 80, 5Y3G
							–	31S200	20P11 (5)	2×DCG4/1000, RG250/3000, 866(A)
							–	35S60	(6)	2×DCG1/250, RG250/1000, 836, 816
00	–	94	–	2×50	2×0,1	0	13C10	13C10	17H10 (7)	1×AZ4, 5R4GY, 5V4, 83(V), 6Z4/84, 80
							6C10	6C10	(8)	1×AZ1, AZ41, 80, 5Y3G

r. (4) modified Williamson-amplifier with screengrid taps on output trafo. (5) anode voltage. (6) screengrid-voltage.
0) Voltage-doubler, see Table 2.