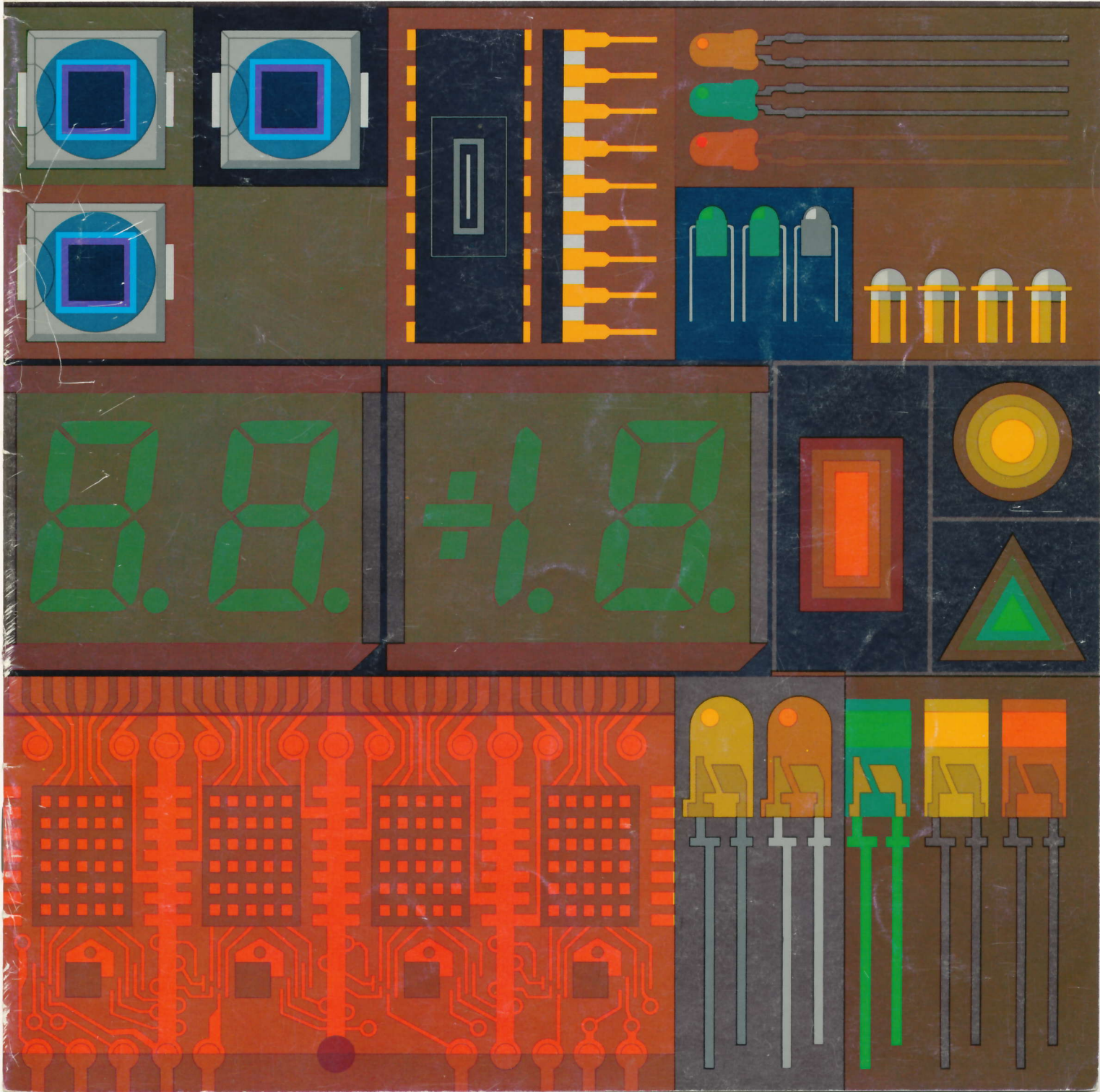


Opto-electronic Semiconductor Circuit Elements





optoelektronik

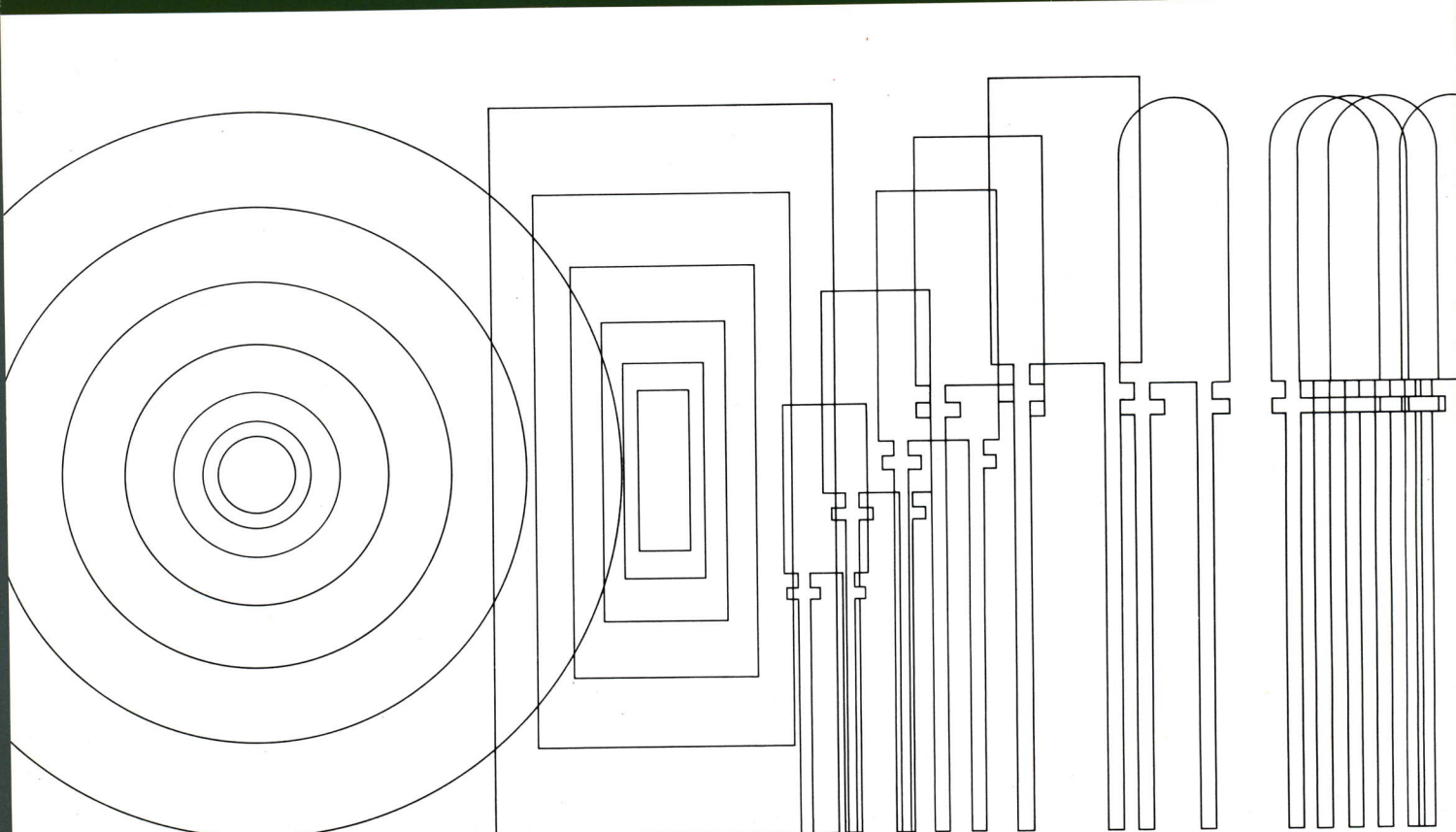
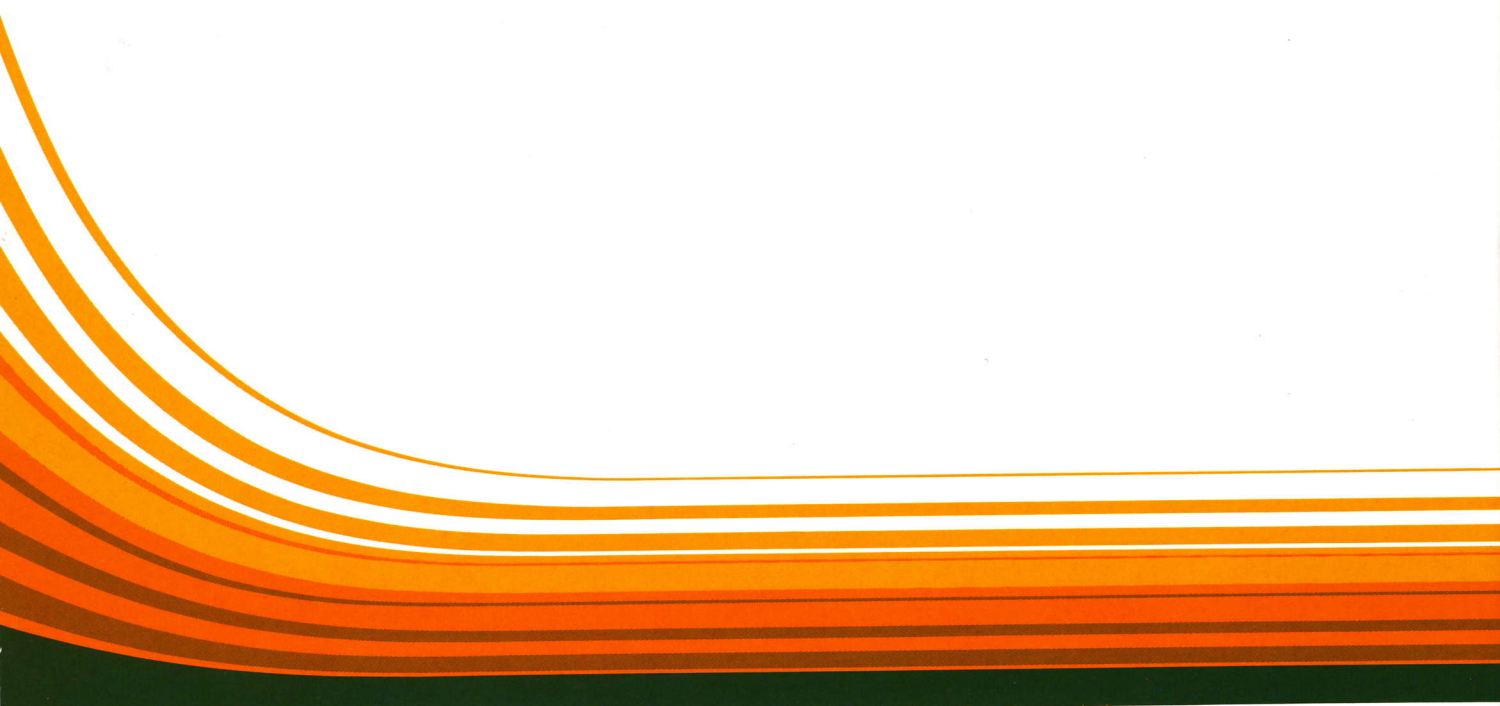
**Opto-electronic
Semiconductor Circuit Elements**



**veb werk für fernsehelektronik berlin
im veb kombinat mikroelektronik**

Already today we are preparing the morrow

 **optoelektronik**

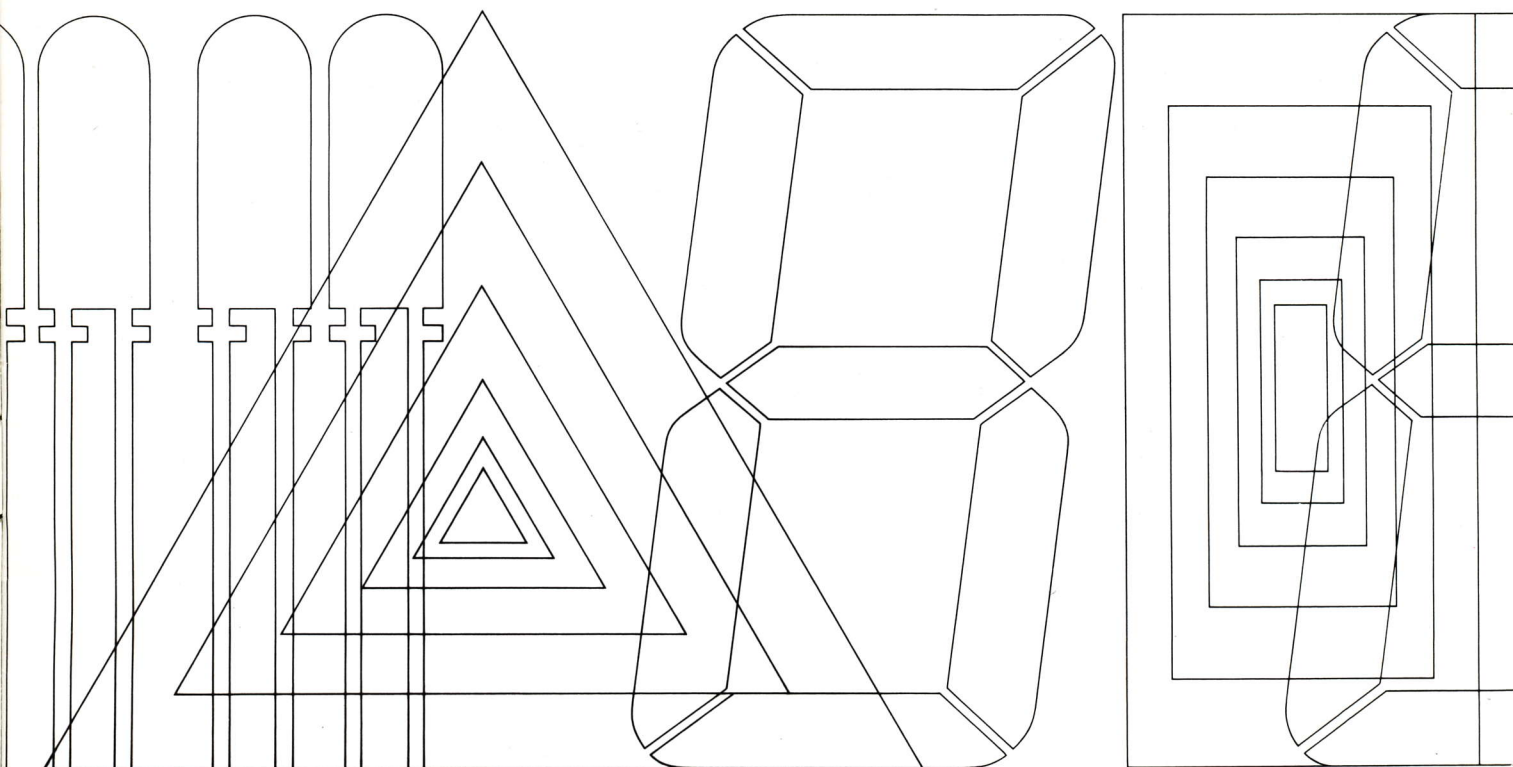


With the violent development of electronics, particularly of microelectronics which opens permanently new and more various possibilities of application, new and higher claims are made on developers and manufacturers of opto-electronic components which can be accomplished by most modern methods of research, development, and manufacture in close co-operation with users.

Basing on experiences of decades of years in manufacture of vacuum- and semiconductor circuit elements, VEB Werk für Fernsehelektronik has developed to a leading manufacturer of opto-electronic circuit elements of GDR who is presenting here a comprehensive program of opto-electronics comprising products for universal possibilities of application but also components for special use.

In development laboratories, construction offices and in manufacture departments, there are created products which meet completely the high requirements of the user industry regarding parameters and finish. High quality materials, modern manufacturing plants and methods and the highly qualified know-how of our co-operators warrant like conscientious tests and quality checks the convincing quality of our products.

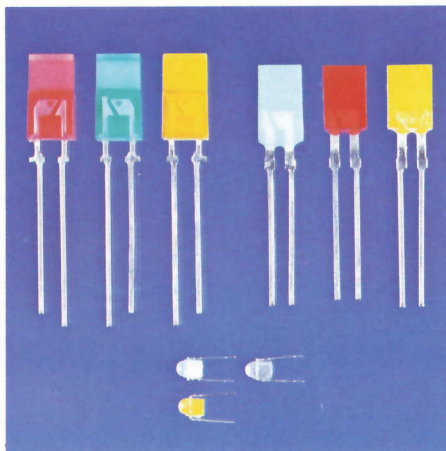
Beside the common service we offer technical advice and application to our customers in case of need by our highly qualified engineers.



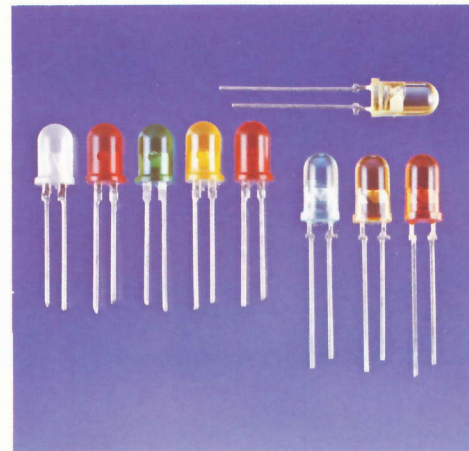
We are specialists for development and manufacture of opto-electronic circuit elements



Light emitter diodes
special designs

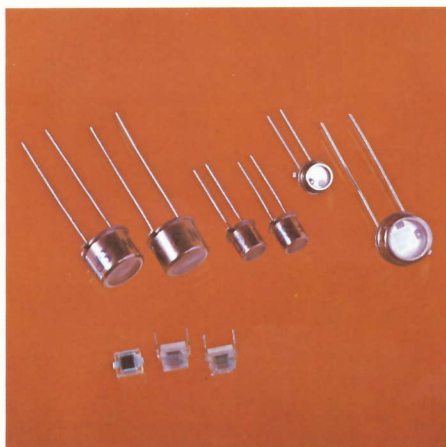


Light emitter diodes
5 mm diameter

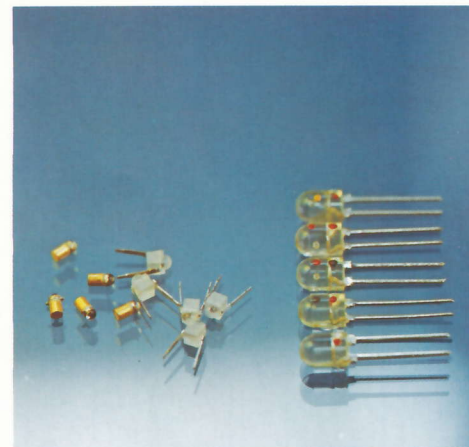


**Radiation
transmitters**

Si-photodiodes
Si-sensor cell

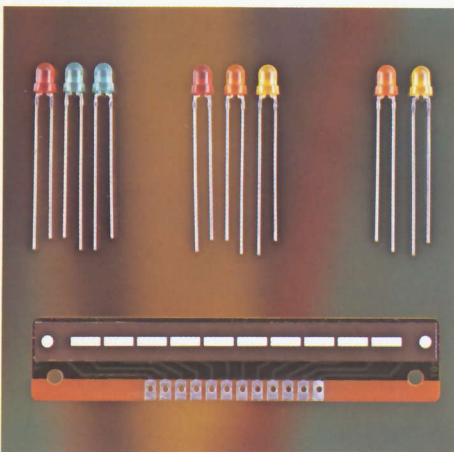


Si-phototransistors

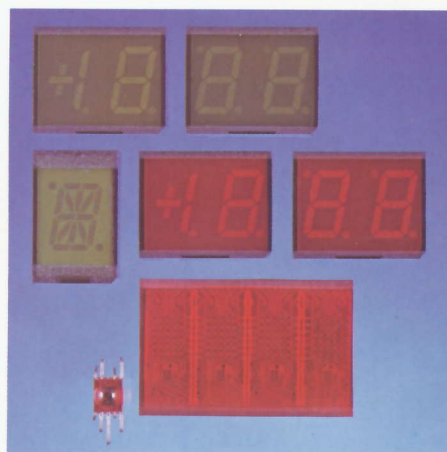


**Radiation
receivers**

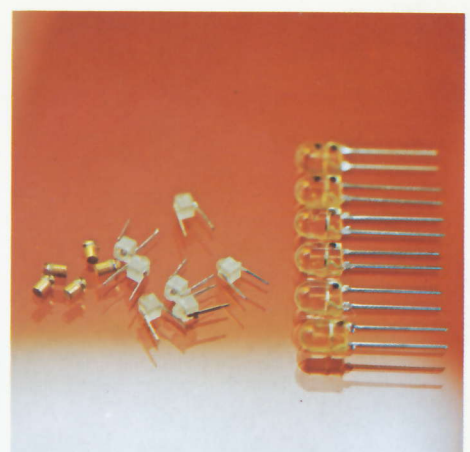
Light emitter diodes
3 mm diameter



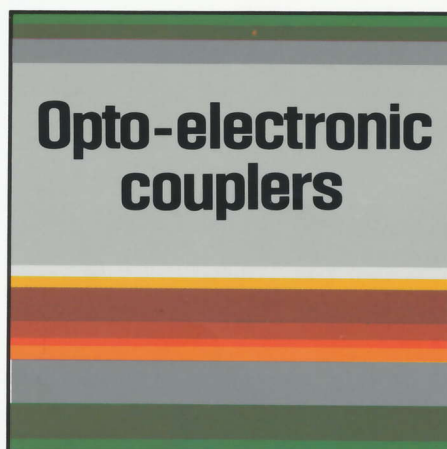
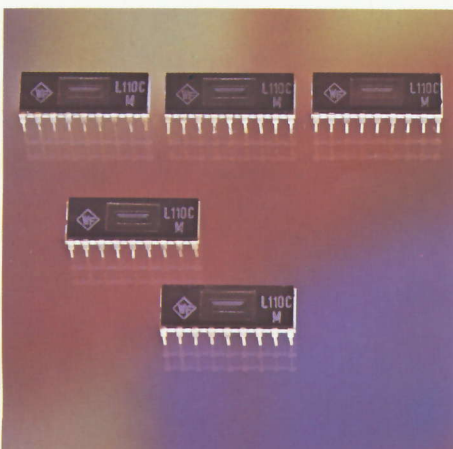
Light emitter displays



Infrared emitter diodes



CCD-line



Opto-electronic couplers



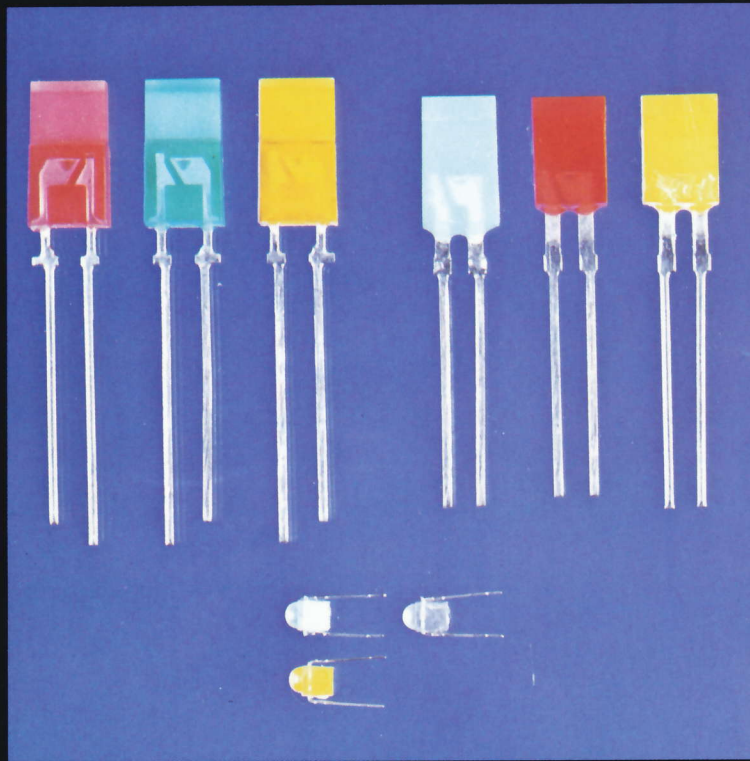


Radiation transmitters

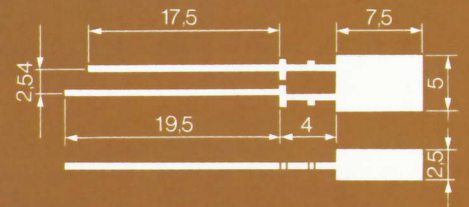
Light emitter diodes

Special design

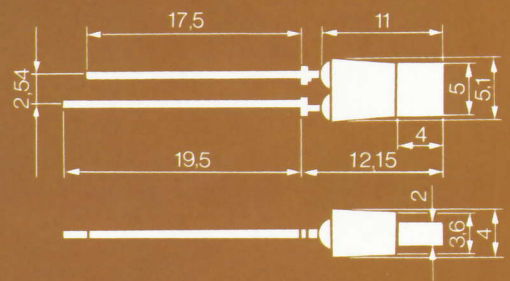
WF optoelektronik



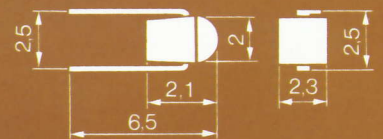
VQA 14
VQA 24
VQA 34



VQA 18
VQA 28
VQA 38



VQA 15
VQA 25
VQA 35



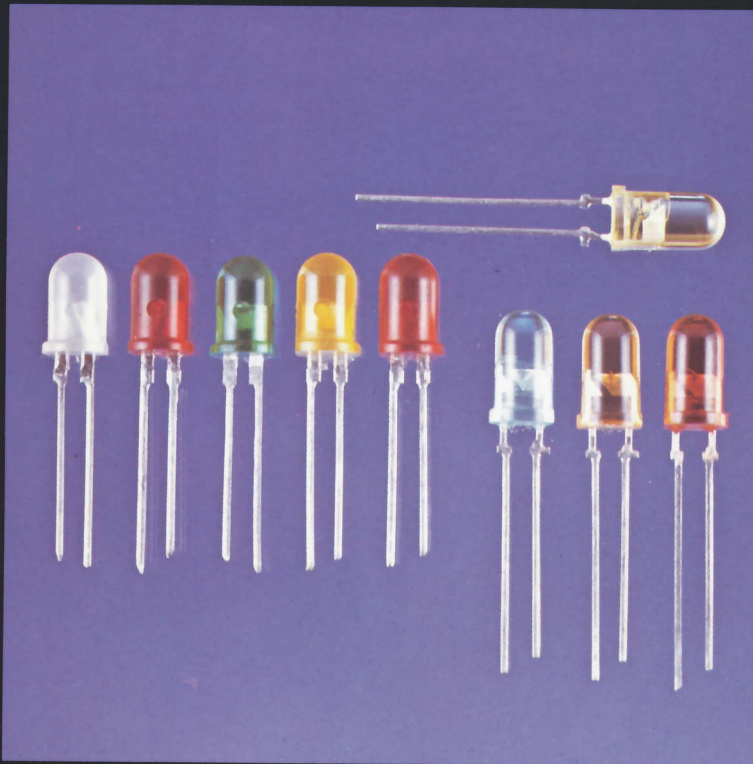
Type	Light colour	Parameters at $\vartheta_a = 25^\circ\text{C}$			Forward current I_F mA	Wave length λ_{max} nm	Technology	Colour of casing
		Radiation angle Θ degree	Light intensity at $I_{V_{\text{min}}}$ mcd					
VQA 14	red	100	0.4...2.0	20	635	TSN	red diffuse	
VQA 24	green	100	0.4...2.0	20	565	GaP	green diffuse	
VQA 34	yellow	100	0.4...2.0	20	590	TSN	yellow diffuse	
VQA 15	red	100	0.4...0.9	20	660	GaAsP	white clear	
VQA 25	green	100	0.4...3.0	10	565	GaP	green clear	
VQA 35	yellow	100	0.4...3.0	20	590	TSN	yellow clear	
VQA 18	red	100	0.4...2.0	20	635	TSN	red diffuse	
VQA 28	green	100	0.4...2.0	20	565	GaP	green diffuse	
VQA 38	yellow	100	0.4...2.0	20	590	TSN	yellow diffuse	

All light emitter diodes will be supplied in assorted way according to the light intensity groups. The light intensity of individual diodes in one packing unit is scattering max. by factor 2.

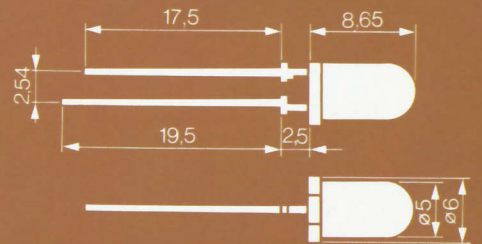
Light intensity groups	A	B	C	D	E	F	G
$I_{V_{\text{min}}}$	0.4	0.6	0.9	1.35	2.0	3.0	4.0 mcd

Light emitter diodes

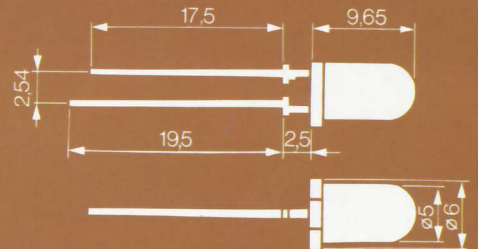
5 mm diameter



VQA 10
VQA 13
VQA 13-1
VQA 23
VQA 33



VQA 16
VQA 26
VQA 36
VQA 46



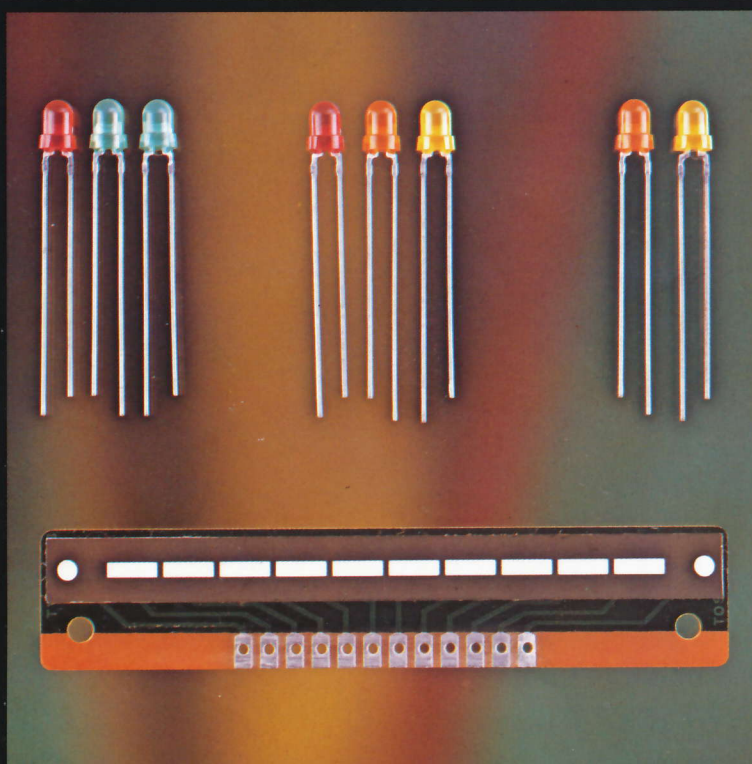
Type	Light colour	Parameters at $\vartheta_a = 25^\circ\text{C}$		Forward current I_F mA	Wave length λ_{max} nm	Technology	Colour of casing
		Radiation angle Θ degree	Light intensity at $I_{V_{\text{min}}}$ mcd				
VQA 10	red	60	0.6 ... 3.0	10	635	TSN	red diffuse
VQA 13	red	60	0.4 ... 4.0	20	660	GaAsP	white diffuse
VQA 13-1	red	60	0.4 ... 4.0	20	660	GaAsP	red diffuse
VQA 23	green	60	0.6 ... 4.0	10	565	GaP	green diffuse
VQA 33	yellow	60	0.4 ... 4.0	20	587	GaAsP	yellow diffuse
VQA 16*	red	25	1.35 ... 10.2	10	635	TSN	red clear
VQA 26*	green	25	1.35 ... 10.2	10	565	GaP	green clear
VQA 36*	yellow	25	1.35 ... 10.2	10	590	TSN	yellow clear
VQA 46*	orange	25	1.35 ... 10.2	10	610	TSN	orange clear

* Interim technical data

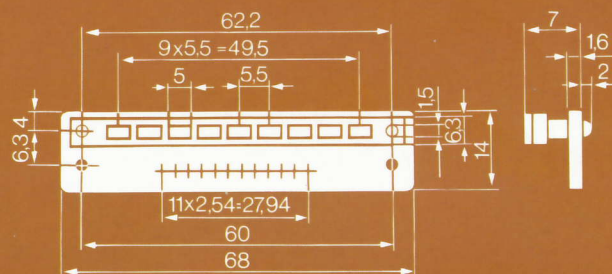
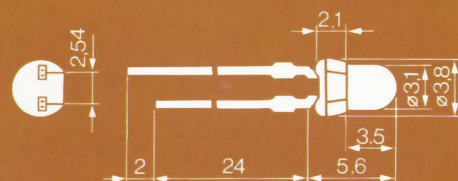
Light emitter diodes

3 mm diameter

WF optoelektronik

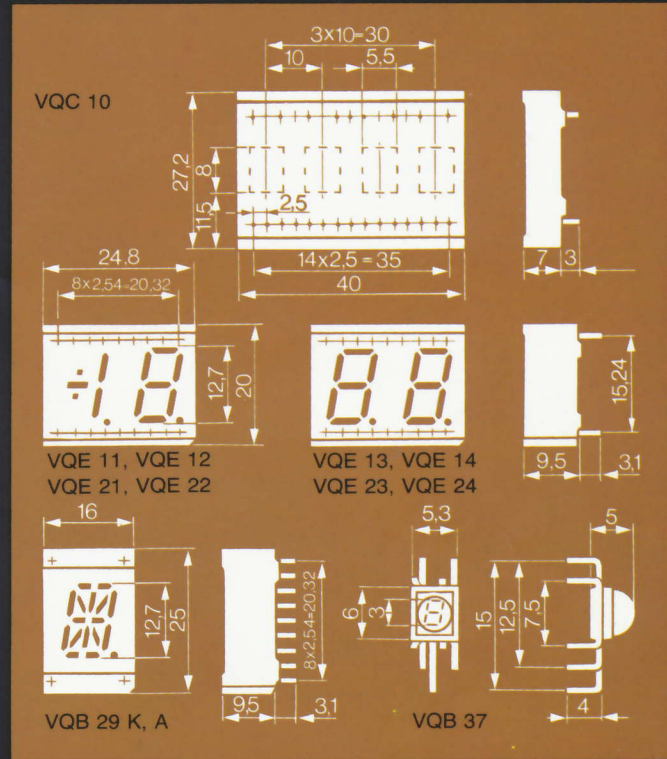
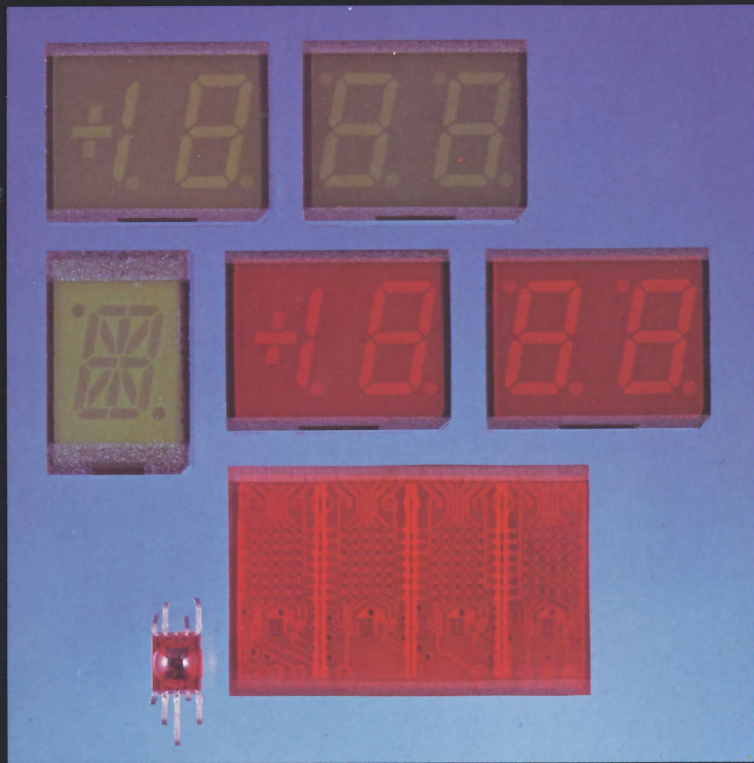


VQA 17
VQA 27
VQA 37
VQA 47



Type	Light colour	Parameters at $\vartheta_a = 25^\circ\text{C}$	Forward current	Wave length	Technology	Colour of casing	
		Radiation angle Θ degree	Light intensity at I_{Vmin} mcd	I_F mA	λ_{max} nm		
VQA 17	red	60	0.4 ... 2.0	10	635	TSN	red diffuse
VQA 27	green	60	0.4 ... 2.0	10	565	GaP	green diffuse
VQA 37	yellow	60	0.4 ... 2.0	10	590	TSN	yellow diffuse
VQA 47	orange	60	0.4 ... 2.0	10	610	TSN	orange diffuse

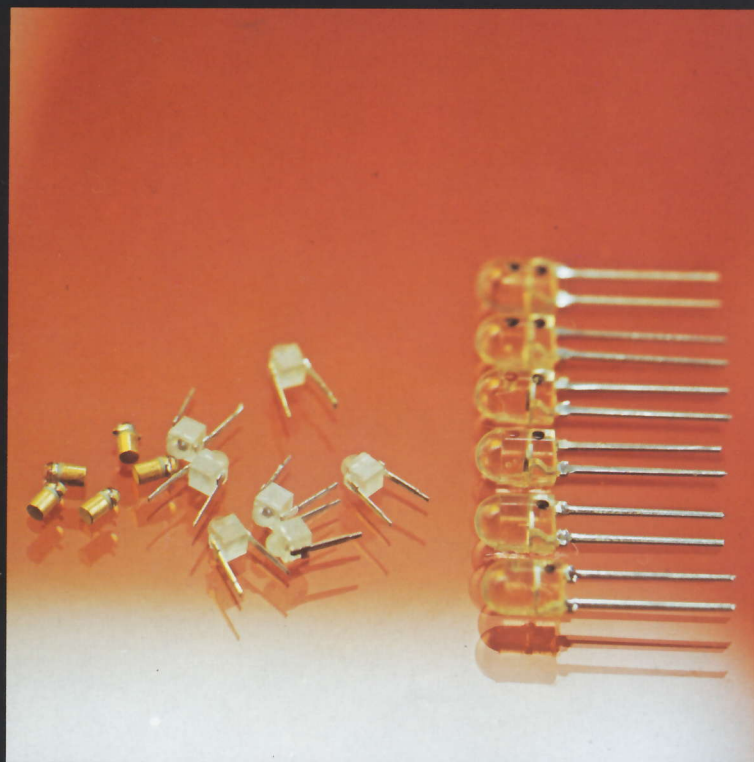
Light emitter displays



Type	Symbol	Light colour	Light intensity/ Segment I_{Vmin} mcd	Light intensity/ Segment at I_F (I_{FRM}) mA	Forward current/ segment max. I_F mA	Forward voltage/segment type	
						U_F V	at I_F (I_{FRM}) mA
VQB 37		red	0.015	(7)	5	1.7	(7)
VQE 11		red	0.1	10	20	1.8	10
VQE 21		green	0.23	10	20	2.0	10
VQE 12		red	0.1	10	20	1.8	10
VQE 22		green	0.23	10	20	2.0	10
VQE 13		red	0.1	10	20	1.8	10
VQE 23		green	0.23	10	20	2.0	10
VQE 14		red	0.1	10	20	1.8	10
VQE 24		green	0.23	10	20	2.0	10
VQB 29 K*		green	0.23	10	15	2.0	15
VQB 29 A*		green	0.23	10	15	2.0	15
VQC 10		red	0.025 at U_{IZ} 5 V		max. line input current at U_{IZ} = 5 V 500 mA		

* Interim technical data

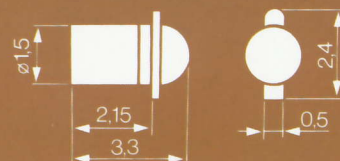
Infrared emitter diodes



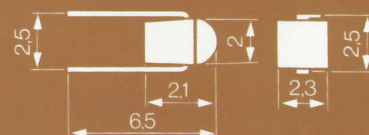
VQ 110



VQ 120



VQ 121



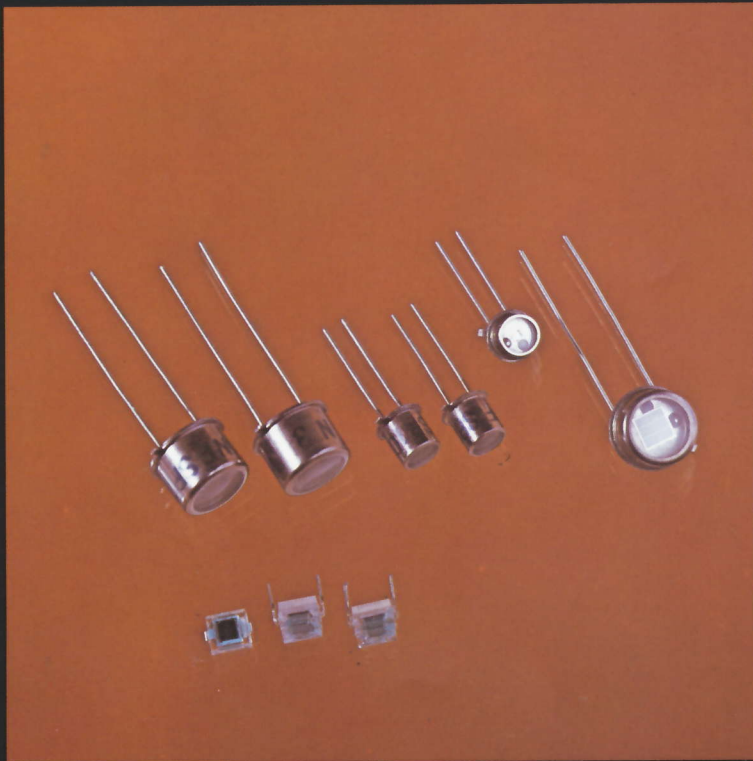
VQ 123: For outline drawing see VQA 17

Type	Casing	Parameters at $\vartheta_a = 25^\circ\text{C}$				Wave length at max. emission λ_p nm
		Forward voltage U_F V	Radiant intens. I_e $\mu\text{W}/\text{sr}$	Radiation output Φ_e at I_F mW	mA	
VQ 110	plastic with lens	≤ 1.5	≥ 200		50	940
VQ 110 B	plastic with lens	≤ 1.5	≥ 800		50	940
VQ 110 C	plastic with lens	≤ 1.5	≥ 1800		50	940
VQ 120 A	metal-ceramics-glass	≤ 1.5		≥ 0.4	50	940
VQ 120 B	metal-ceramics-glass	≤ 1.5		≥ 0.7	50	940
VQ 120 C	metal-ceramics-glass	≤ 1.5		≥ 0.10	50	940
VQ 121 A	plastic with lens	≤ 1.5		≥ 0.8	50	940
VQ 121 B	plastic with lens	≤ 1.5		≥ 1.2	50	940
VQ 123*	plastic with lens	≤ 1.5	≥ 3000		50	940

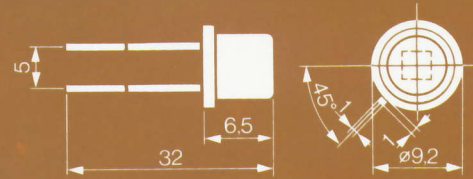
Radiation receivers

Silicon-photodiodes

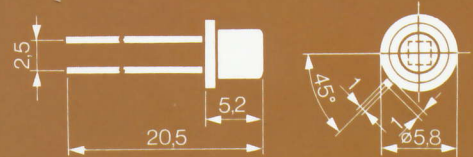
WF optoelektronik



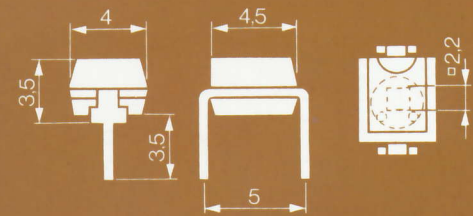
SP 101
SP 103



SP 102



SP 105

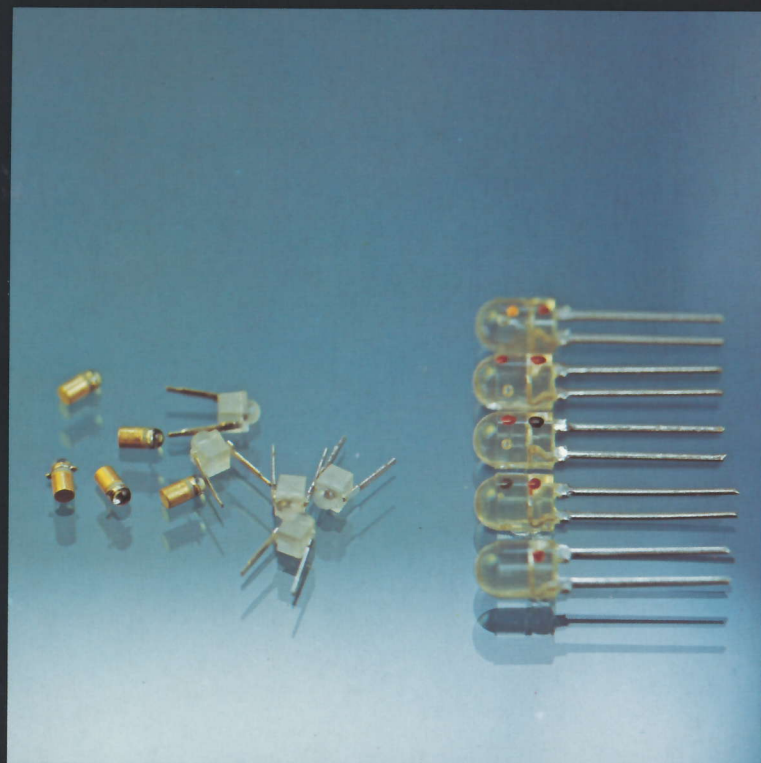


Type	Casing	Limit characteristics at $\theta_a = 25^\circ\text{C}$		Characteristics Wave length at max. spectral response λ_{smax} nm	Reverse d.c. current at $E_v = 1000 \text{ lx}$ $U_R = 20 \text{ V}$ I_R μA	Rate of rise time at $U_R = 20 \text{ V}$ $R_L = 50 \Omega$ t_r ns	Limit frequency f_{max} MHz
		Reverse d.c. voltage $U_R \text{ max}$ V	Reverse d.c. current at $E_o = 0 \text{ lx}$ I_R mA				
SP 101	B 3 mod.	25	1	820	15	10	135
SP 102	A 3 mod.	25	1	820	1.25	5	150
SP 103	B 3 mod.	25	3	820	50	10	120

Silicon-sensor cell

Type	Casing	Characteristics Short-circuit current at $E_v = 1000 \text{ lx}$ I_k μA	No-load voltage $R_L = \leq 10 \Omega$ U_o mV	Zero resistance at $U_R = 10 \text{ mV}$ R_o Ω	Wave length at max. spectral response λ_{smax} nm
SP 105	Plastic	3	440	$1 \cdot 10^{10}$	555

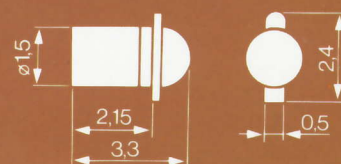
Silicon-phototransistors



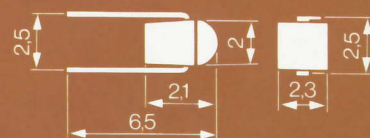
SP 201



SP 211

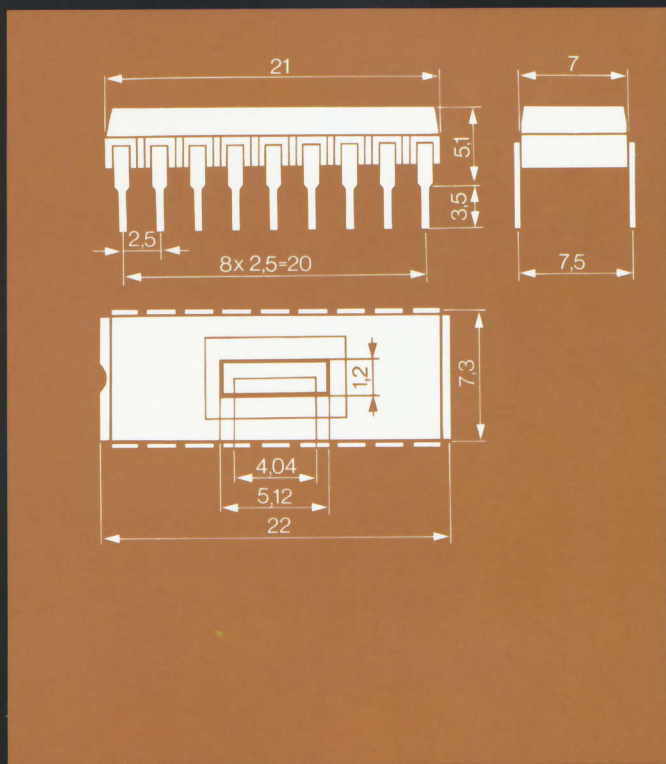
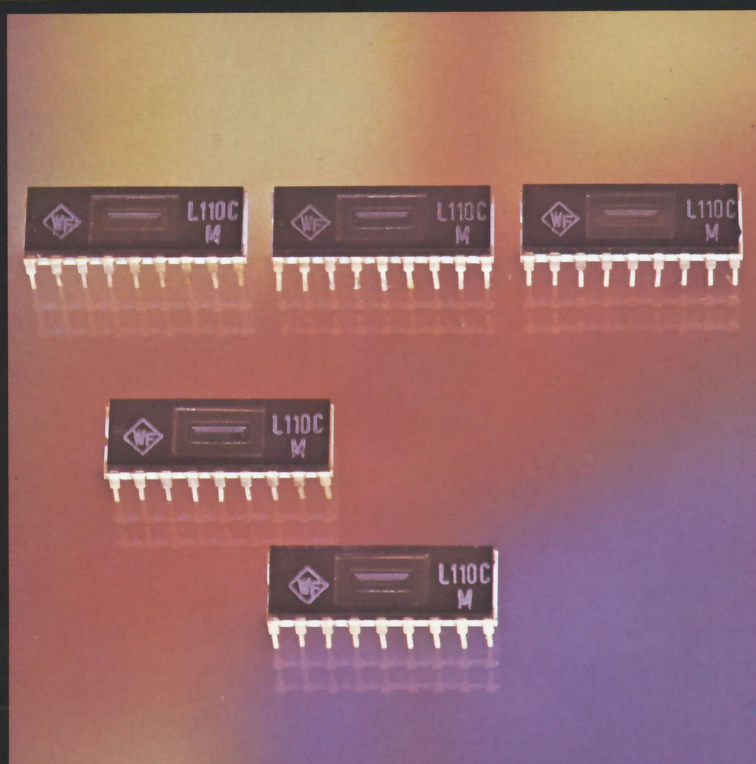


SP 212



Type	Casing	Limit characteristics		Characteristics at $\vartheta_a = 25^\circ\text{C}$		
		Collector emitter voltage	Total loss power	Max. spectral response	Rise and decay time	Collector current at $E_v = 1000 \text{ lx}$ $U_{CE} = 5 \text{ V}$
		$U_{CE} \text{ max}$ V	$P_{\text{tot}} \text{ max.}$ mW	λ_p nm	$t_r; t_f \text{ typ.}$ μs	I_C mA
SP 201	plastic with lens	32	50	780	5	0.25
SP 201 A	plastic with lens	32	50	780	5	1.2–2.3
SP 201 B	plastic with lens	32	50	780	5	2.7–5.7
SP 201 C	plastic with lens	32	50	780	5	4.7–8.4
SP 201 D	plastic with lens	32	50	780	5	7.0
SP 211	metal–ceramics–glass	50	50	850	5	≥ 0.25
SP 211 A	metal–ceramics–glass	50	50	850	5	0.4–0.8
SP 211 B	metal–ceramics–glass	50	50	850	5	0.63–1.25
SP 211 C	metal–ceramics–glass	50	50	850	5	1.0–2
SP 211 D	metal–ceramics–glass	50	50	850	5	1.6–3.2
SP 212 A	plastic with lens	50	100	850	4	≥ 0.4
SP 212 B	plastic with lens	50	100	850	4	≥ 0.6
SP 212 C	plastic with lens	50	100	850	4	≥ 1.0
SP 212 D	plastic with lens	50	100	850	4	≥ 1.6

Monolithic self-scanning light receiver with 256 elements as well as two charge transfer gates, two 2-phase analogous sliding registers, one output-charge detector with preamplifier and one compensation-output amplifier



Type	Casing	Characteristics at $\vartheta_a = 25^\circ\text{C}$					Sensitivity ²⁾
		Saturation output voltage U_{SAT} mV	Mean dark signal ADS % U_{SAT}	Light signal difference ¹⁾ PRNU % U_{SAT}	Dynamic range at $t_{\text{int}} \approx 275 \mu\text{s}$ DR	Dark signal difference DSNU % U_{SAT}	
L 110 C	DIL 18-pole mod.	200	0.1	± 4	500	2.0 max	0.4

Static operating characteristics		
Voltage at drain of output transistor U_{DO} V	Voltage at drain of resetting transistor U_{DR} V	Voltage within output gate of slide register U_{GO} V
15 ± 0.5	15 ± 0.5	7

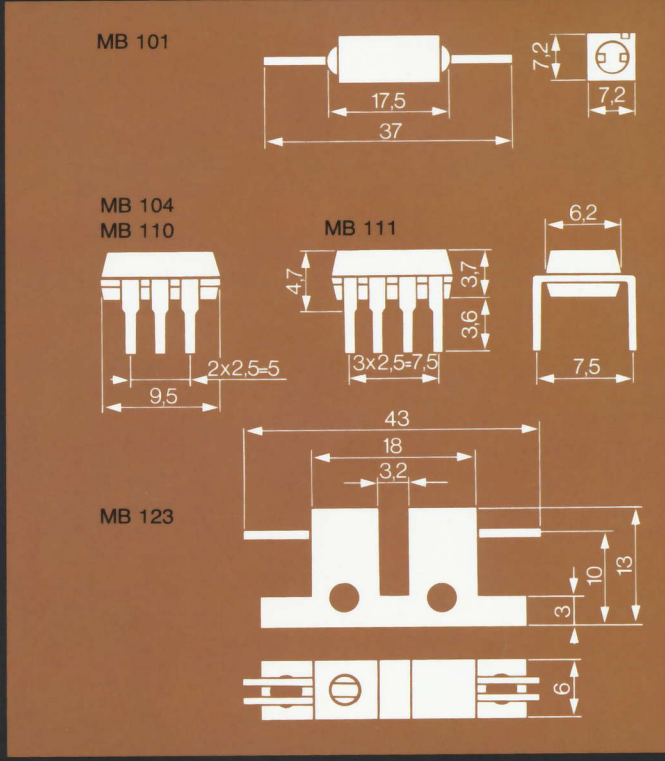
¹⁾ Measurement at 50% U_{SAT} , the first and the last elements being not taken into consideration

²⁾ $1 \text{ lx} = 4.65 \mu\text{J cm}^{-2}$

Opto-electronic couplers

Opto-electronic couplers

 **optoelektronik**












Type	Casing	IR-transmitter		Receiver	Collector emitter voltage U_{CE} V	Reverse d.c. voltage U_R V	Coupling element		Rise and decay time t_r, t_f typ μs
		Forward current I_F mA	Reverse d.c. voltage U_R V				Insulation voltage U_{IO} kV	Transmission factor	
MB 101	plastic	50	2	phototrans.	15		5	$\geq 4\%$	5.0
MB 104 A	DIL 6-pole	40	6	phototrans.	70		4.3	$\geq 40\%$	2.0
MB 104 B	DIL 6-pole	40	6	phototrans.	70		4.3	$\geq 100\%$	2.0
MB 104 C	DIL 6-pole	40	6	phototrans.	70		4.3	$\geq 160\%$	2.0
MB 104 D	DIL 6-pole	50	6	phototrans.	70		4.3	$\geq 240\%$	2.0
MB 110	DIL 6-pole	100	3	photodiode		50	2	$\geq 0.2\%$	0.05
MB 111	DIL 8-pole	30	3	photodiode			2.8		0.1
MB 123	plastic	50	2	phototrans.	15		5.0	$\geq 4\%$	5.0
MB 125	miniplastic	50	3	phototrans.	16			$\geq 4\%$	10.0







Comparison-List

WF	Siemens	Hewlett Packard	General Instruments	Telefunken	Texas Instruments	Toshiba
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Light emitter diodes of 5 mm diameter

VQA 10		CQV 21	5082-4650	MV 5774	CQX 38	TIL 228	TLR 113
VQA 13		-	5082-4887	-	-	-	-
VQA 13-1		CQV 20	5082-4881 5082-4855	MV 5051	CQY 40 L	TIL 220	-
VQA 23		CQV 25	(5082-4950)	MV 5253	CQY 72 L · V 169 P	TIL 234	TLG 113
VQA 33		CQV 23	(5082-4550)	-	CQY 74 L · V 170 P	TIL 224	TLY 113
VQA 16		CQV 51	-	-	V 310 P	-	-
VQA 26		CQV 55	-	(MV 5252)	V 312 P	-	TLG 132
VQA 36		CQV 53	-	(MV 5352)	V 313 P	-	TLY 132
VQA 46		-	-	(MV 5152)	V 311 P	-	TLO 132




of 3 mm diameter

VQA 17		CQV 11	(HLMP-1300)	-	CQX 25 N	TIL 216	TLR 124
VQA 27		CQV 15	(HLMP-1500)	MV 5274	CQX 26 N	TIL 232	TLG 124
VQA 37		CQV 13	(HLMP-1400)	MV 5374	CQX 27 N	TIL 212	TLY 124
VQA 47		-	-	MV 5154	CQX 42 N	-	TLO 124













Special designs

VQA 14		CQV 36	-	-	V 510 P	-	-
VQA 24		CQV 39	-	-	V 512 P	-	-
VQA 34		CQV 38	-	-	V 513 P	-	-
VQA 18		-	-	-	-	-	TLR 208
VQA 28		-	-	-	-	-	TLG 208
VQA 38		-	-	-	-	-	TLY 208
VQA 15		LD 461	5082-4100	(MV 50)	(CQY 41 N) · (V 139 P)	TIL 261	-
VQA 25		LD 471	5082-4190	(MV 52)	(CQY 73 N)	TIL 271	-
VQA 35		LD 491	5082-4150	(MV 53)	(CQY 75 N)	TIL 281	-

Diode-lines

VQF 15		-	-	-	(D 630 P)	-	TLR 8101
VQF 25		-	-	-	-	-	TLG 8101
VQF 35		-	-	-	-	-	-

LED-displays

VQB 37		-	-	(MAN 31)	-	(TILD 100)	-
VQC 10		-	-	-	-	-	-
VQC 11		(HA 2147r)	-	MAN 6750	CQX 86 K	TIL 816	TLG 326
VQE 12		(HA 2143r)	-	MAN 6730	CQX 86 A	-	TLG 327
VQE 13		(HA 2144r)	-	MAN 6740	CQX 87 K	TIL 815	TLG 324
VQE 14		(HA 2142r)	-	MAN 6710	CQX 87 A	TIL 814	TLG 325
VQE 21		-	-	-	CQX 90 K	TIL 828	TLG 326
VQE 22		-	-	-	CQX 90 A	-	TLG 327
VQE 23		-	-	-	CQX 91 K	TIL 827	TLG 324
VQE 24		-	-	-	CQX 91 A	TIL 826	TLG 325
VQB 29 K		-	-	-	-	-	TLG 370
VQB 29 A		-	-	-	-	-	TLG 371

WF	Siemens	General Instruments	Telefunken	Texas Instruments	Valvo
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Infrared-emitter diodes

VQ 110	(SFH 402) (CQY 78)	(ME 7021) (ME 7121)	(CQY 99)	(TIL 32)	(CQY 11 c) (CQY 49 c)
VQ 120	CQY 57 I	(ME 60) (ME 61)	(CQY 36) (CQY 37)	TIL 23 TIL 24 TIL 41	CQY 50 CQY 52
VQ 121	LD 261	-	(CQY 37)	TIL 41	-
VQ 123	SFH 409	-	-	-	-

Photodiodes/phototransistors

SP 101	(BPX 61)	-	-	(TIXL 51)	-
SP 102	(BPX 65)	-	(BPW 24)	(TIXL 53)	(BPY 77)
SP 103	(BPX 63)	-	(BPW 24)	-	(BPY 13)
SP 201	BP 103 B	-	BPW 40	(TIL 78)	BPX 95 B
SP 211	-	-	(BPW 16)	LS 611 LS 612 LS 613	BPX 71-201
SP 212	BPX 81	-	-	TIL 621	-

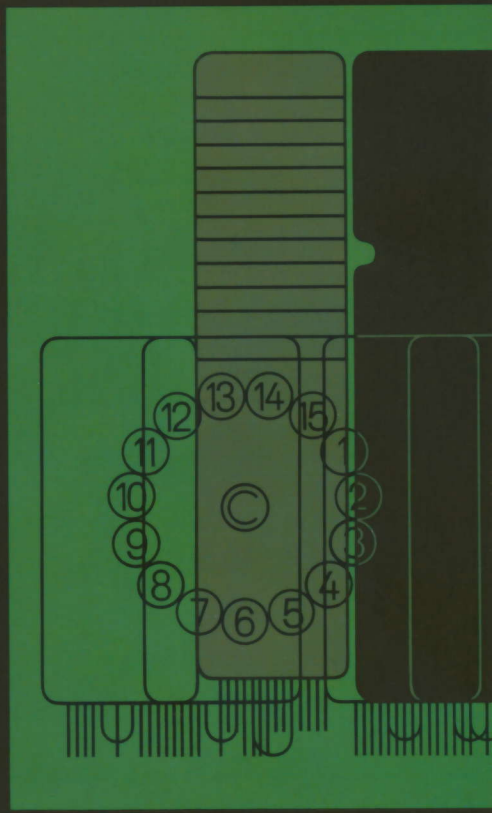
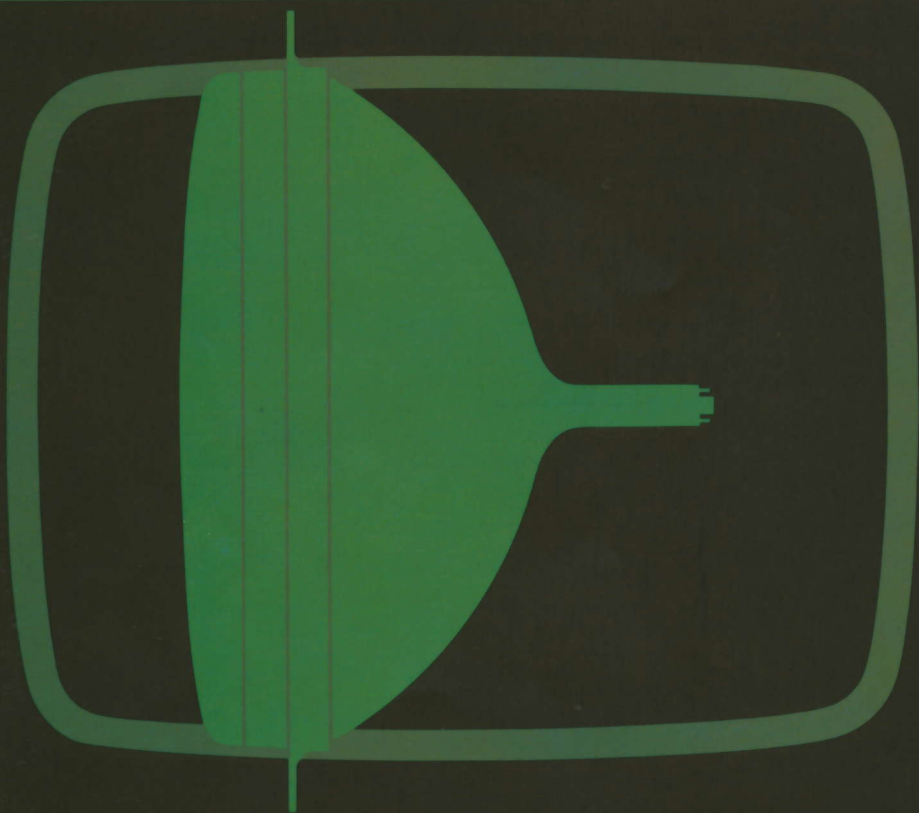
Opto-electronic couplers

MB 101	-	MCT 5-10	(CNY 21)	TIL 109	(CNY 42)
MB 104	CNY 17	MCT 210	(CQY 80)	TIL 123 TIL 125 TIL 126	-
MB 110	-	MCD 2	-	-	-
MB 111	-	MCL 611	-	-	-
MB 125	SFH 900	-	-	-	-

() Type in parenthesis has slight differences regarding type, electrical and critical data.

Electronic Tubes

 **elektronik**



Picture tubes

T. V. receivers

Picture tubes

Photomultiplier tubes

Gas-discharge tubes

- Numeral and symbol display tubes
- Stabilizer tubes
- Thyatron tubes

Transmitter valves

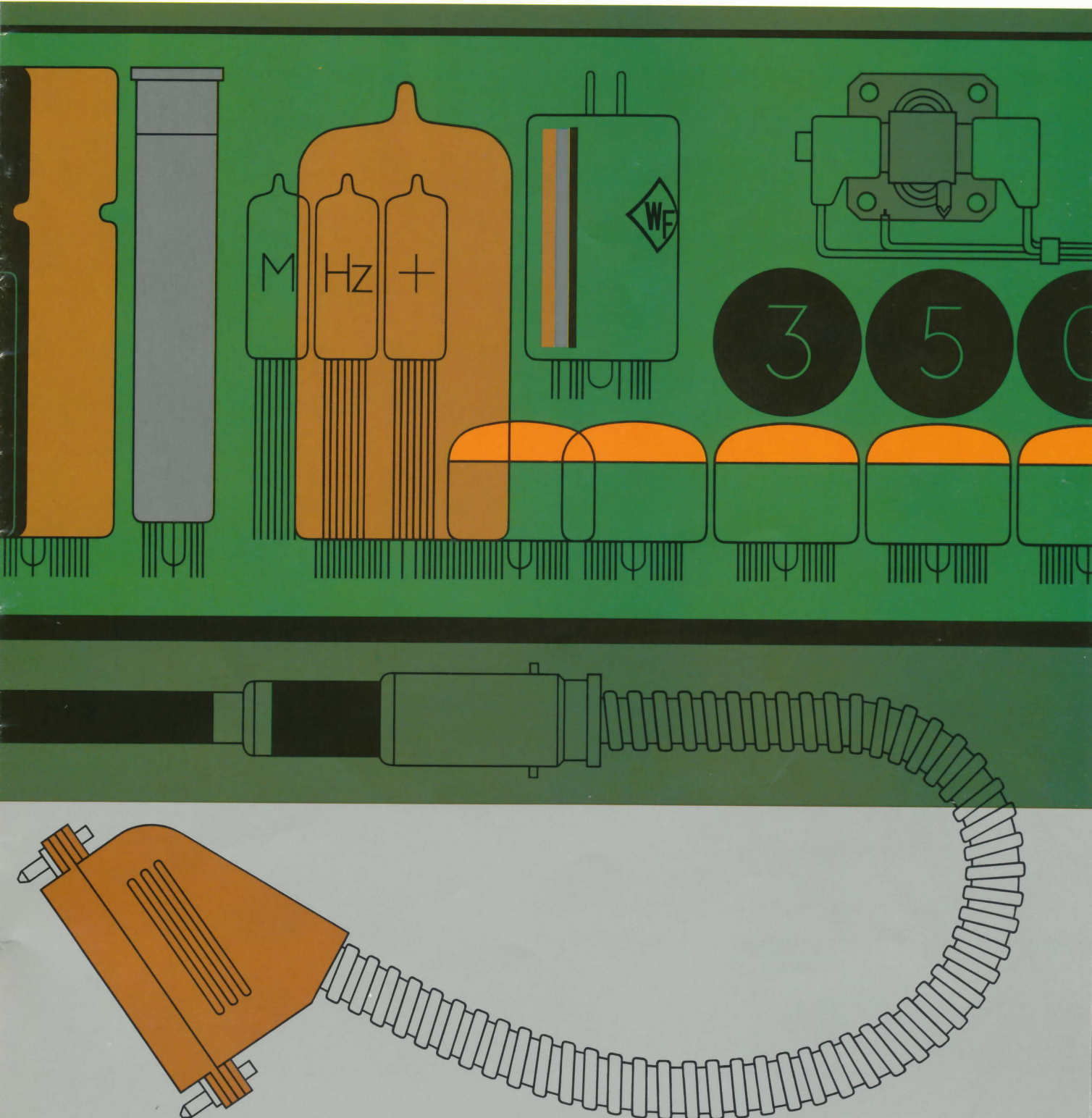
- Triodes
- Tetrodes
- Double-tetrodes
- Pentodes

Ultra-frequency tubes

- Disk-seal triodes
- Pulse magnetrons
- Travelling-wave tubes
- Reflex klystrons

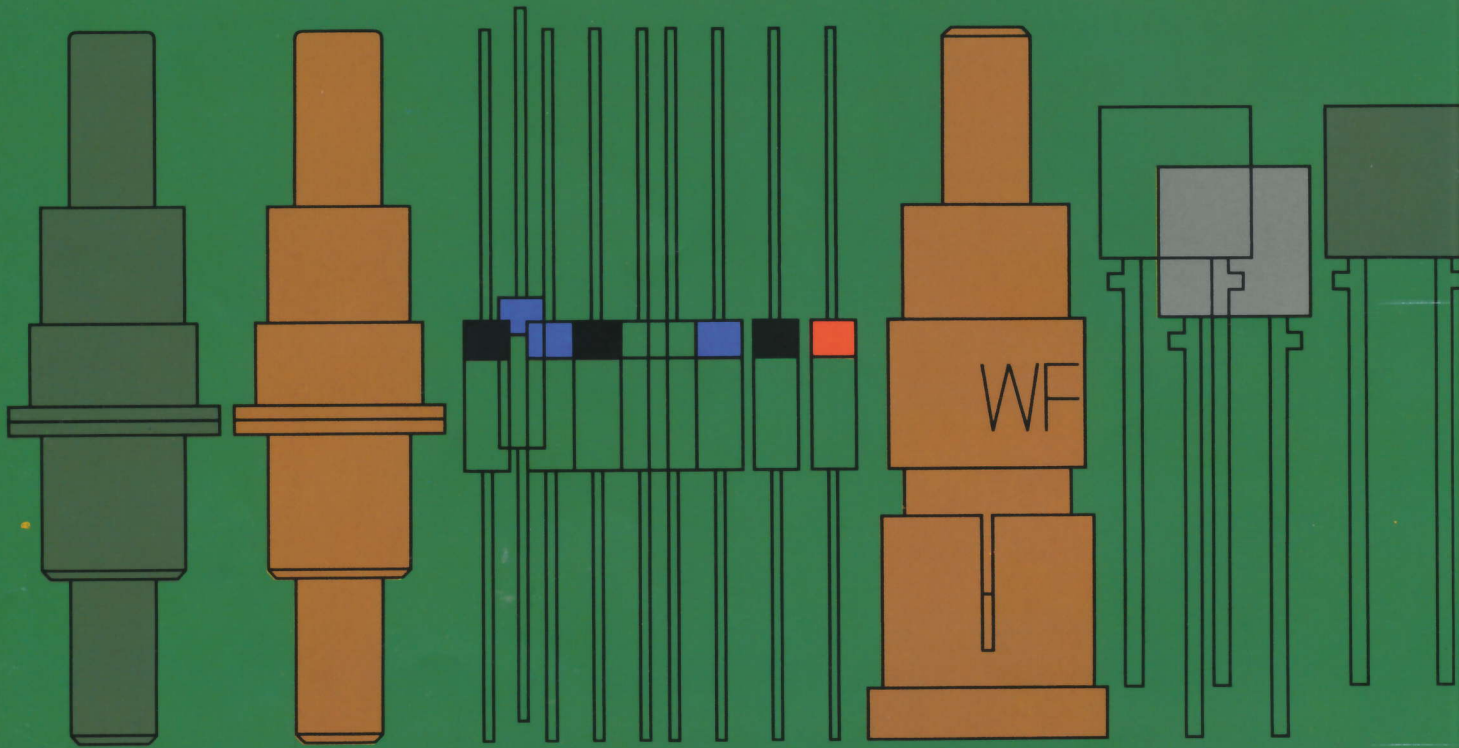
The VEB Werk für Fernsehelektronik has given decisive impulse to the electronic industry of our Republic. The first mass production of picture tubes in Europe and the production of the first semiconductor components in GDR are two essential points in the history of our factory only.

To-day, our production program comprises approx. 650 products which prove themselves in our national economy and which have obtained their valuation by users in more than 30 countries.



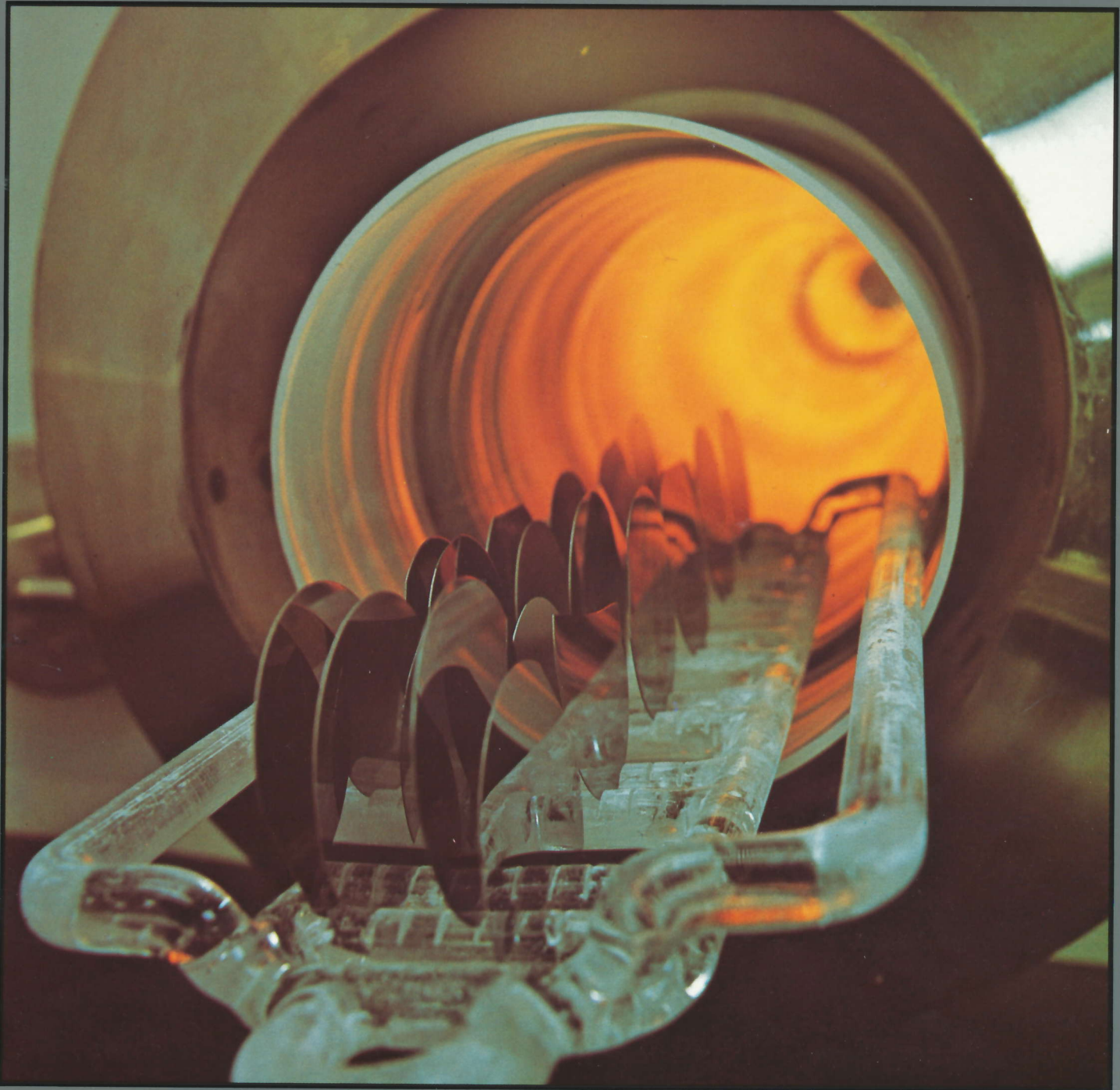
Semiconductors

 **elektronik**



Semiconductor components

- Si-Z-diodes
- Reference elements
- Storage-varactor diodes



RFT



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Subject to modifications in interest of
technical progress

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