

Focus Metal-glaze Preset (FMP), Vertical type (VERT)

FMP-PRT-VERT

FEATURES

- Designed for mounting on to a printed-circuit board
- High temperature and voltage stability
- Wide design freedom.

APPLICATIONS

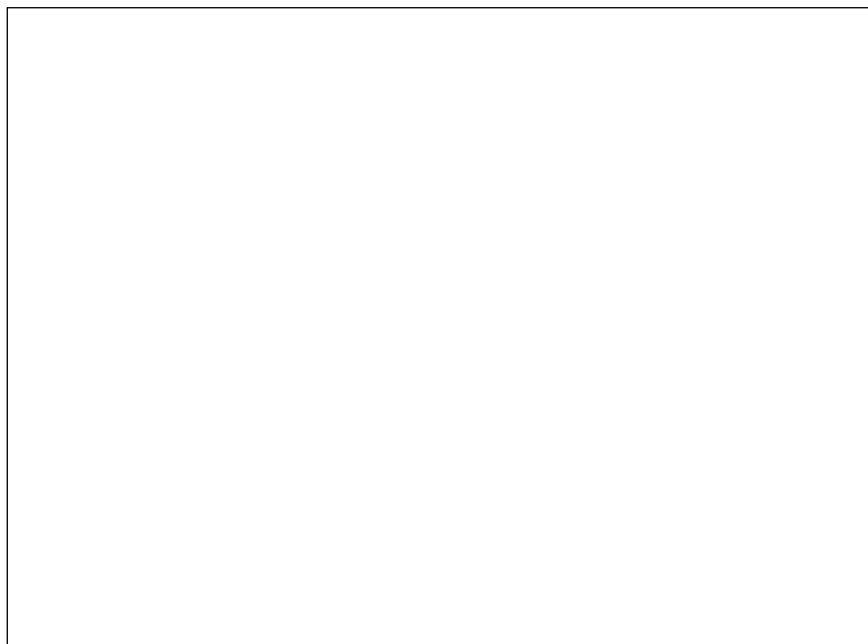
- Focus and screen voltage adjustment in colour televisions and monitors
- Control of any EHT generation source with maximum output of 10 kV.

DESCRIPTION

Each focus unit comprises six thick film resistance elements on a ceramic (Al₂O₃) substrate in a synthetic (glass reinforced) case. Two of the resistance elements are potentiometers, one for focus voltage and one for screen voltage.

Electrical connection with the high voltage input (a) and focus voltage output (b1) (see Fig.1) is achieved by simply pressing single-core stripped wires into the respective holes. For the recommended cable types see Table 1 and for the stripping length of the recommended wires see Fig.4. Connections for screen voltage output (b2) and earth (c) is effected through the printed-circuit board with a print tag.

The focus units are designed to be mounted on to printed-circuit boards, separate from the EHT source. Two snap-lock pins extending from the case provide mechanical support.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Resistance	33 MΩ to 200 MΩ
Tolerance (% of total resistance)	±7.4%, ±10%, ±15% and ±20%
Maximum dissipation at T _{amb} = 70 °C	2.9 W
Maximum application voltage	16 kV
Setting ability (IEC 393/6.34)	
focus	±25 V; max. 10 s
screen	±5 V; max. 10 s
Temperature characteristic of resistance (20 to 100 °C)	≤100 × 10 ⁻⁶ /K
Voltage coefficient of resistance	≤2 × 10 ⁻⁶ /V
Climatic category	25/070/21

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DESIGN VARIATIONS

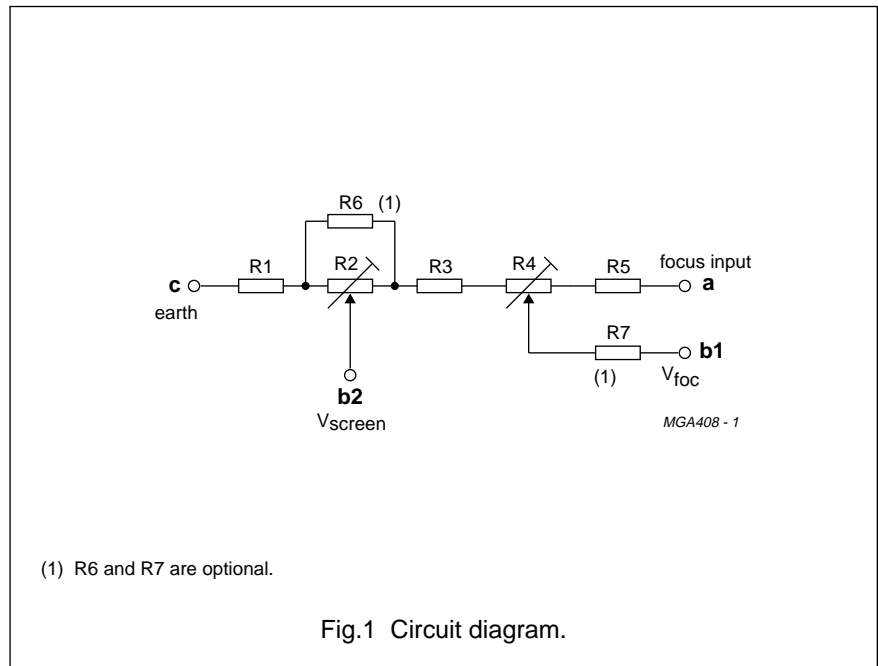
Variations to suit customer requirements are possible on the following:

- Total resistance
- Focus and screen voltage ranges
- Capacitance values
- Connections
- Shafts.

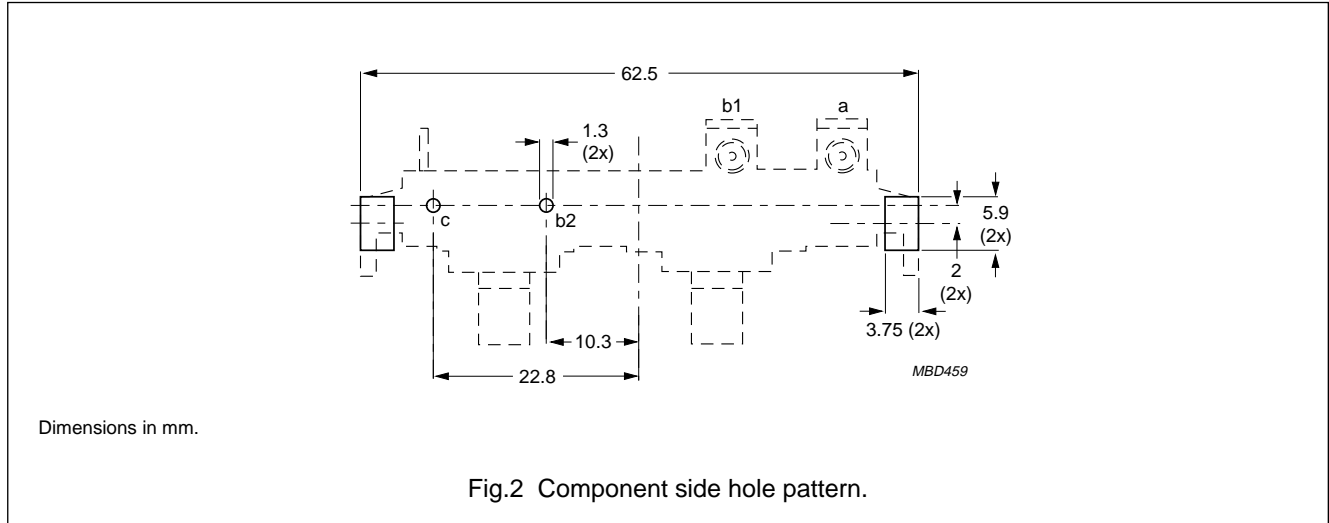
APPROVAL

The products have been approved as a safety product.

AUTHORITY	FILE REFERENCE
UL	UC
VDE	4421
BSI	7637



MECHANICAL DATA



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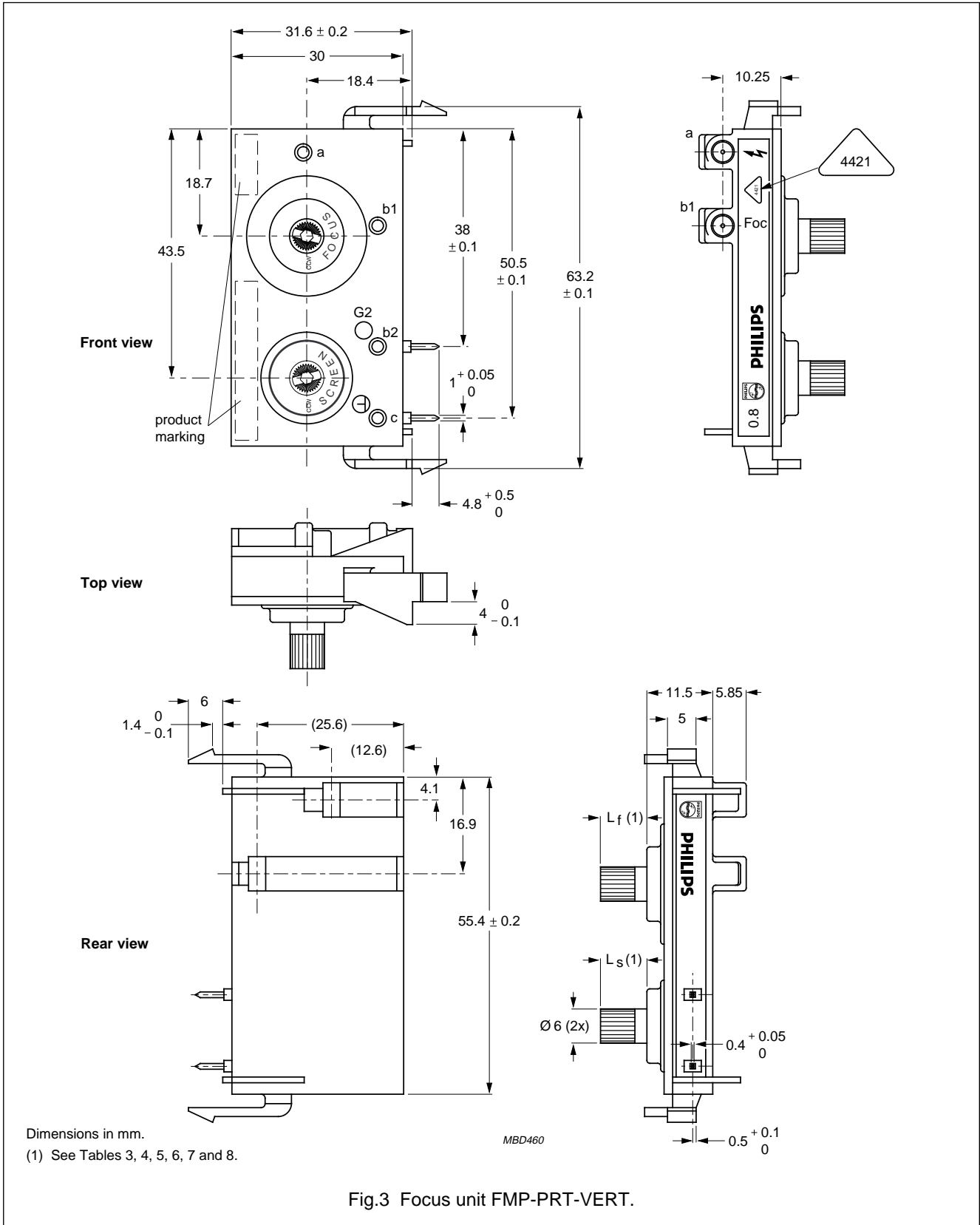
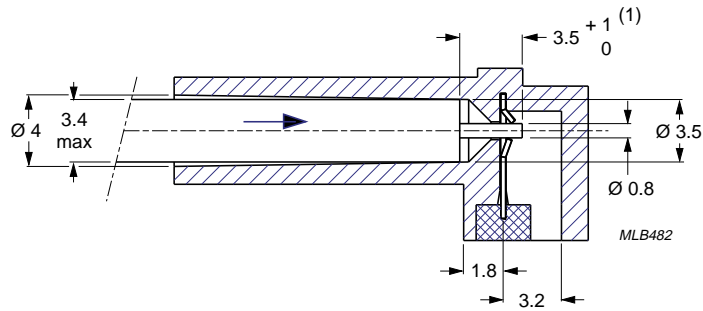


Fig.3 Focus unit FMP-PRT-VERT.

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Connection details



Dimensions in mm.

(1) Stripping length (under consideration for modification).

Fig.4 Wire clamp connection (a), focus connection (b1).

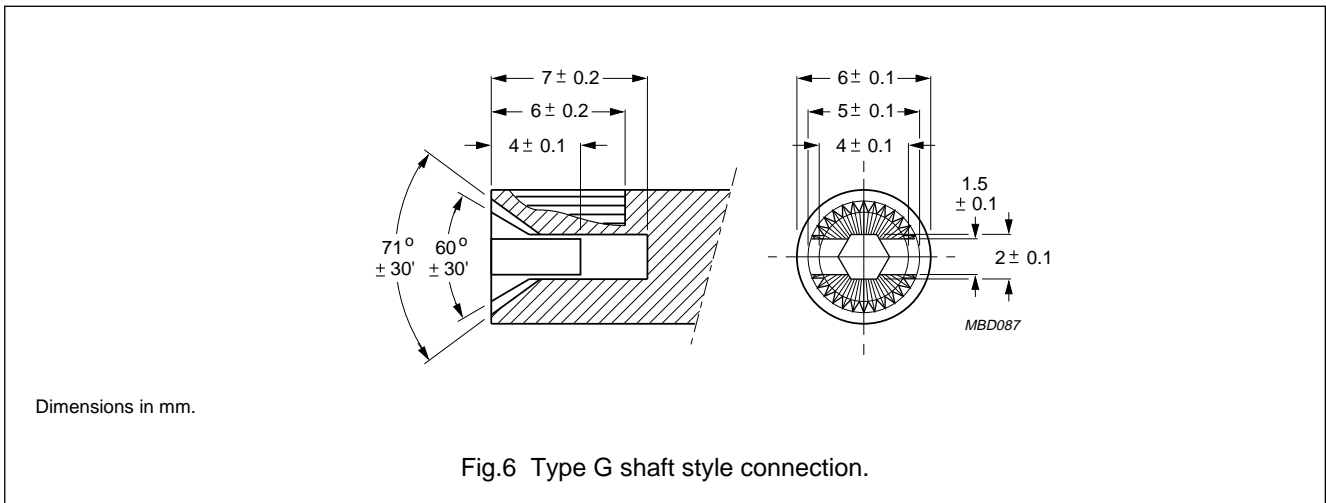
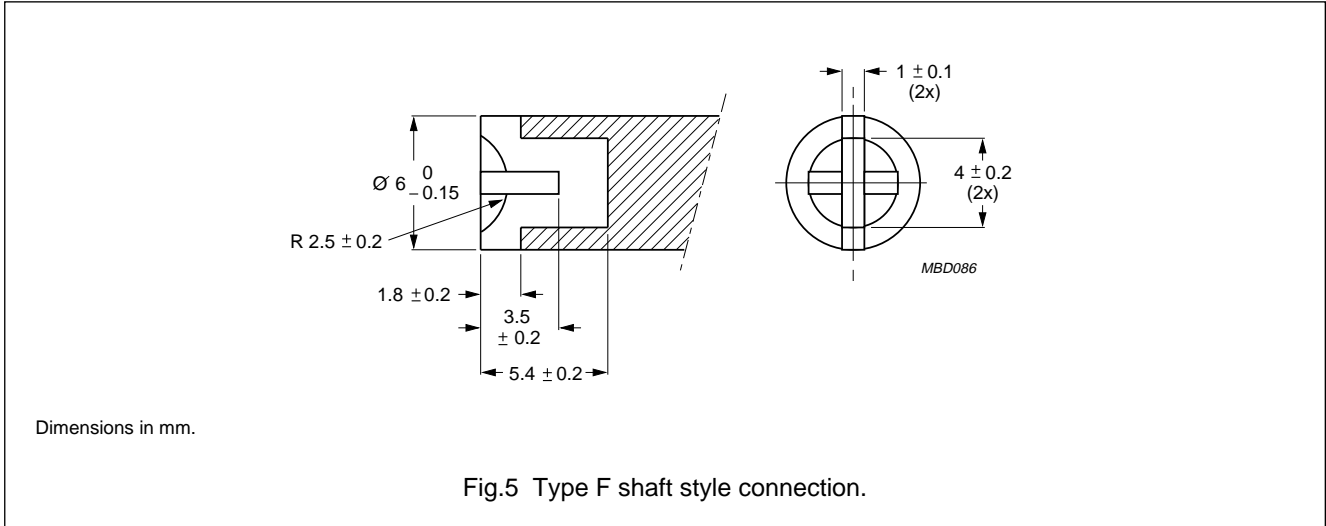
Table 1 Recommended connecting wire.

CONNECTION	MANUFACTURER	STYLE AND TYPE	INSULATION MAX. Ø (mm)	CATALOGUE NUMBERS
Focus in (a) and Focus out (b1)	Pope (The Netherlands)	UL758 AWM 3239 CSA 20 kV (DC) AWG20 VW-1 105 °C	3.35	0722 388 00005
	Taisho (Japan)	E35688 AWM 3239 CSA 20 kV (DC) AWG20 VW-1 105 °C	3.4	0722 456 00014
	Sumitomo (Japan)	UL3239 AWM 3239 CSA 20 kV (DC) AWG20 VW-1 105 °C	3.4	0722 456 00015

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Shaft style connection details



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Table 2 Additional information.

PARAMETER	MIN.	TYP.	MAX.	UNIT
Focus unit				
Climatic category (IEC 68)	25/070/21			
Inflammability of materials	self-extinguishing in accordance with UL94-VO			
Potentiometers				
Angle of rotation				
focus	225	230	235	deg
screen	255	260	265	deg
Starting torque	–	–	30	mNm
Operating torque	3	–	30	mNm
Operating torque ratio	–	–	3	
Permissible end stop torque (adjustment tool)	–	–	150	mNm
Permissible end stop torque (manual)	–	–	300	mNm
Permissible push force on shaft	–	–	50	N
Permissible pull force on shaft; note 1	–	–	50	N
Mechanical life; focus/screen	–	50	–	cycles
Weight	–	16	–	g
Connectors a and b1				
Insertion force of wire	–	–	25	N
Extraction force of wire	50	–	–	N

Note

1. Not applicable for L_s or $L_f \leq 5$ mm.

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PRODUCT OVERVIEW

Table 3 Overview of product types.

PARAMETERS	CATALOGUE NUMBER 2322 460				UNIT
	90207	90208	90209	90211	
Resistances					
Resistance (R_{ac})	40 \pm 15%	40 \pm 15%	50 \pm 10%	200 \pm 20%	M Ω
Resistor network (see Fig.1)					
R1	0.78	1.28	17.0	3.3	M Ω
R2/R6	4.1	4.54	14.0	20.3	M Ω
R3	23.18	20.98	19.0	61.4	M Ω
R4	11.92	13.18	–	59.0	M Ω
R5	0.02	0.02	–	56.0	M Ω
R7	10.0 \pm 25%	10.0 \pm 25%	–	–	M Ω
Voltages					
Maximum application voltage (V_{ac})	10.0	10.0	10.0	16.0	kV
V_{foc} ; note 1					
range	75.3 to 99.9	71 to 99.9	38 to 57	46 to 68	%
minimum	70.15 \pm 5.15	67.0 \pm 4.0	34.0 \pm 4.0	42.5 \pm 3.5	%
maximum	99.95 \pm 0.05	99.95 \pm 0.05	62.0 \pm 5.0	72.0 \pm 4.0	%
V_{screen} ; note 1					
range	2.7 to 9.4	3.8 to 12.8	–	2.3 to 9.6	%
minimum	1.95 \pm 0.75	3.2 \pm 0.6	–	1.65 \pm 0.65	%
maximumLL	12.2 \pm 2.8	14.55 \pm 1.75	–	11.8 \pm 2.2	%
Dissipation					
Total maximum dissipation	2.9	2.6	2.2	1.3	W
Shaft data					
Type and length (see Figs 5 and 6)					
focus; note 2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	mm
screen; note 3	type F: 1.5 \pm 0.2	type F: 1.5 \pm 0.2	–	type G: 8.1 \pm 0.2	mm
Colour					
focus	black	black	black	black	
screen	black	black	–	black	
Delivery position					
focus	FCCW	FCCW	FCCW	FCCW	deg
screen	FCCW	FCCW	–	FCCW	deg

Note

1. Given in % of V_{ac} .
2. Length L_f (see Fig.3).
3. Length L_s (see Fig.3).

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Table 4 Overview of product types.

PARAMETERS	CATALOGUE NUMBER 2322 460				UNIT
	90212	90213	90214	90215	
Resistances					
Resistance (R_{ac})	33.3 \pm 7.4%	120 \pm 15%	120 \pm 15%	120 \pm 15%	M Ω
Resistor network (see Fig.1)					
R1	23.64	2.1	1.5	1.5	M Ω
R2/R6	9.64	10.2	10.2	10.2	M Ω
R3	0.02	77.7	64.5	65.7	M Ω
R4	–	21.0	20.4	25.2	M Ω
R5	–	9.0	23.4	17.4	M Ω
R7	–	17.0 \pm 20%	25.0 \pm 20%	25.0 \pm 20%	M Ω
Voltages					
Maximum application voltage (V_{ac})	10.0	11.0	13.0	13.0	kV
V_{foc} ; note 1					
range	75 to 99.9	78 to 90	67 to 78	68 to 83	%
minimum	71.0 \pm 4.0	75.0 \pm 3.0	63.5 \pm 3.5	64.5 \pm 3.5	%
maximum	99.95 \pm 0.05	92.5 \pm 2.5	80.5 \pm 2.5	85.5 \pm 2.5	%
V_{screen} ; note 1					
range	–	3 to 8.5	2 to 8	2 to 8	%
minimum	–	1.75 \pm 1.25	1.25 \pm 0.75	1.25 \pm 0.75	%
maximum	–	10.25 \pm 1.75	9.75 \pm 1.75	9.75 \pm 1.75	%
Dissipation					
Total maximum dissipation	3.2	1.2	1.7	1.7	W
Shaft data					
Type and length (see Fig.6)					
focus; note 2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	mm
screen; note 3	–	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	mm
Colour					
focus	black	black	black	black	
screen	–	black	black	black	
Delivery position					
focus	FCCW	FCCW	FCCW	FCCW	deg
screen	–	FCCW	FCCW	FCCW	deg

Note

1. Given in % of V_{ac} .
2. Length L_f (see Fig.3).
3. Length L_s (see Fig.3).

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Table 5 Overview of product types.

PARAMETERS	CATALOGUE NUMBER 2322 460				UNIT
	90216	90217	90219	90221	
Resistances					
Resistance (R_{ac})	120 \pm 15%	180 \pm 15%	33 \pm 10%	33 \pm 10%	M Ω
Resistor network (see Fig.1)					
R1	2.97	5.4	13.86	23.1	M Ω
R2/R6	10.23	47.7	11.88	8.58	M Ω
R3	78.6	126.9	7.26	1.32	M Ω
R4	23.16	–	–	–	M Ω
R5	5.04	–	–	–	M Ω
R7	17.0 \pm 20%	–	–	–	M Ω
Voltages					
Maximum application voltage (V_{ac})	11.0	13.0	8.5	8.5	kV
V_{foc} ; note 1					
range	80 to 93.3	75 to 96	46 to 75	75 to 94	%
minimum	76.5 \pm 3.5	70.5 \pm 4.5	42.0 \pm 4.0	70.0 \pm 5.0	%
maximum	95.8 \pm 2.5	97.0 \pm 1.0	78.0 \pm 3.0	96.0 \pm 2.0	%
V_{screen} ; note 1					
range	3.75 to 9	–	–	–	%
minimum	2.475 \pm 1.275	–	–	–	%
maximum	11.0 \pm 2.0	–	–	–	%
Dissipation					
Total maximum dissipation	1.2	1.1	2.5	2.5	W
Shaft data					
Type and length (see Fig.6)					
focus; note 2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	mm
screen; note 3	type G: 8.1 \pm 0.2	–	–	–	mm
Colour					
focus	black	black	black	black	
screen	black	–	–	–	
Delivery position					
focus	FCCW	FCCW	FCCW	FCCW	deg
screen	FCCW	–	–	–	deg

Note

1. Given in % of V_{ac} .
2. Length L_f (see Fig.3).
3. Length L_s (see Fig.3).

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Table 6 Overview of product types.

PARAMETERS	CATALOGUE NUMBER 2322 460				UNIT
	90222	90223	90224	90225	
Resistances					
Resistance (R_{ac})	100 \pm 15%	100 \pm 15%	80 \pm 15%	40 \pm 10%	M Ω
Resistor network (see Fig.1)					
R1	57.5	72.5	40.4	29.2	M Ω
R2/R6	22.0	24.25	17.6	10.2	M Ω
R3	20.5	3.25	22.0	0.6	M Ω
R7	–	–	3.0 \pm 25%	10.0 \pm 25%	M Ω
Voltages					
Maximum application voltage (V_{ac})	13.0	13.0	13.0	9.5	kV
V_{foc} ; note 1					
range	60 to 78	75 to 96	54 to 70	78 to 98	%
minimum	57.5 \pm 2.5	72.5 \pm 2.5	50.5 \pm 3.5	73.0 \pm 5.0	%
maximum	79.5 \pm 1.5	96.75 \pm 0.75	72.5 \pm 2.5	98.5 \pm 0.5	%
Dissipation					
Total maximum dissipation	2.5	2.0	2.5	2.5	W
Shaft data					
Type and length (see Fig.6)					
focus; note 2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	mm
Colour					
focus	black	black	black	black	
Delivery position					
focus	FCCW	FCCW	FCCW	FCCW	deg

Note

1. Given in % of V_{ac} .
2. Length L_f (see Fig.3).

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Table 7 Overview of product types.

PARAMETERS	CATALOGUE NUMBER 2322 460			UNIT
	90226	90228	90229	
Resistances				
Resistance (R_{ac})	120 \pm 15%	105 \pm 10%	40 \pm 15%	M Ω
Resistor network (see Fig.1)				
R1	1.52	3.885	0.68	M Ω
R2/R6	10.78	7.035	5.82	M Ω
R3	35.7	48.825	20.3	M Ω
R4	39.0	25.935	13.18	M Ω
R5	33.0	19.32	0.02	M Ω
R7	15.0 \pm 15%	17.5 \pm 20%	10.0 \pm 20%	M Ω
Voltages				
Maximum application voltage (V_{ac})	15.0	14.0	9.3	kV
V_{foc} ; note 1				
range	43 to 70	60.9 to 78.1	2.3 to 14.1	%
minimum	40.0 \pm 3.0	56.9 \pm 4.0	1.7 \pm 0.4	%
maximum	72.5 \pm 2.5	81.6 \pm 3.5	16.25 \pm 2.15	%
V_{screen} ; note 1				
range	1.54 to 8	5.4 to 7.9	71 to 99.9	%
minimum	1.27 \pm 0.27	3.7 \pm 1.7	67.0 \pm 4.0	%
maximum	10.25 \pm 2.25	10.4 \pm 2.5	99.95 \pm 0.05	%
Dissipation				
Total maximum dissipation	2.9	2.1	2.6	W
Shaft data				
Type and length (see Figs 5 and 6)				
focus; note 2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	type G: 8.1 \pm 0.2	mm
screen; note 3	type F: 1.5 \pm 0.2	type F: 1.5 \pm 0.2	type F: 1.5 \pm 0.2	mm
Colour				
focus	black	black	black	
screen	black	black	black	
Delivery position				
focus	FCCW	FCCW	FCCW	deg
screen	FCCW	FCCW	FCCW	deg

Note

1. Given in % of V_{ac} .
2. Length L_f (see Fig.3).
3. Length L_s (see Fig.3).

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Table 8 Overview of product types.

PARAMETERS	CATALOGUE NUMBER 2322 460		UNIT
	90231	90232	
Resistances			
Resistance (R_{ac})	100 \pm 20%	100 \pm 20%	M Ω
Resistor network (see Fig.1)			
R1	1.2	1.3	M Ω
R2/R6	15.5	7.7	M Ω
R3	37.8	56.0	M Ω
R4	40.0	34.5	M Ω
R5	5.5	0.5	M Ω
R7	20.0 \pm 20%	20.0 \pm 20%	M Ω
Voltages			
Maximum application voltage (V_{ac})	12.0	12.0	kV
V_{foc} ; note 1			
range	59 to 93	69 to 99	%
minimum	54.5 \pm 4.5	65.0 \pm 4.0	%
maximum	94.5 \pm 1.5	99.5 \pm 0.5	%
V_{screen} ; note 1			
range	1.7 to 14.4	1.8 to 7	%
minimum	1.2 \pm 0.5	1.3 \pm 0.5	%
maximum	16.7 \pm 2.3	9.0 \pm 2.0	%
Dissipation			
Total maximum dissipation	1.8	1.8	W
Shaft data			
Type and length (see Figs 5 and 6)			
focus; note 2	type F: 1.5 \pm 0.2	type F: 1.5 \pm 0.2	mm
screen; note 3	type F: 1.5 \pm 0.2	type F: 1.5 \pm 0.2	mm
Colour			
focus	black	black	
screen	black	black	
Delivery position			
focus	FCCW	FCCW	deg
screen	FCCW	FCCW	deg

Note

1. Given in % of V_{ac} .
2. Length L_f (see Fig.3).
3. Length L_s (see Fig.3).

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SAFETY REQUIREMENTS

In general an area of 10 mm around the focus unit should be free from all conductive parts with sharp edges. Penetration with earthed parts in these areas should be avoided. Full details of these areas are contained in the factory specification related to each catalogue type. The potentiometer parts carrying high voltage should be free from metal particles, solder drops, etc.

RELIABILITY

Maximum cumulative percentage of failures F (n) after n hours (excluding 0 hours rejects).

Percentage rate of failures.

FAILURES	PERCENTAGE
F (300)	≤0.03%
F (10000)	≤0.25%
F (30000)	≤5.0%

LIST OF MATERIALS

NAME OF PART	MATERIAL	TYPE	MANUFACTURER	FLAME CLASS	UL FILE
Case	polycarbonate	Lexan 500 R	General Electric	UL-94-VO	E45329
Shaft	polycarbonate	Lexan 500 R	General Electric	UL-94-VO	E45329
Rotor	modified PPO	Noryl VO-150-B	General Electric	UL-94-VO	E45329
Rubber spring	silicone rubber	K 1238	Philips	UL-94-HB	E45111
Contact plug	silicone rubber	K 1764	Philips	UL-94-VO	E45111
Vacuum grease	silicone grease	TKHV-1	Klüber	–	–

ORDERING

Minimum ordering quantity: 90 pieces.

Order by quoting the 12-digit catalogue number of the potentiometer units and the quantity required.

PRODUCT MARKING

The unit is marked with the date code (year, week and day of manufacture), the operator code, and the last five digits of the catalogue number.

Example of product marking.

MARKING YWWDX 902..	DESCRIPTION
Y	year mark e.g. 1993 = 3
WW	week mark e.g. 52
D	day mark e.g. Wednesday = 3
XX	operator code

If requested the customer reference code can complete the product marking. The customer code is placed after the operator code.

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PACKAGING

The units are blister-packed suitable for automatic handling: 30 units per blister, 3 blisters per box.

LABELLING

The label on the package containing the potentiometers is as shown.

LINE	MARKING	EXPLANATION
1.	MADE IN BELGIUM	Country of origin
2.	POTENTIOMETERS 40M	Product family and resistance values
3.	MFP METAL-GLAZE FOCUS PRESET	Product description
4.	CUST. INFO 2080	Customer information
5.	ORIG A170 RPC HQ	Preference origin code and product centre
6.	QTY 90 DATE 9404	Quantity per standard packing and product code
7.	TYPE FMP	Product description
8.	CODEND 2322 460 90202	Catalogue number (12NC)

MRC294

Fig.7 Packaging label with the customer reference code (example).

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TESTS AND REQUIREMENTS

In these tables the tests can either be:

D = Destructive

ND = Non-destructive.

TEST / CONDITIONS OF TEST	D OR ND	PROCEDURE	PERFORMANCE
Sub-group B1-a	D		
SOLDERABILITY			
Solder iron method in accordance with IEC 68-2-20, Test Ta, method 2: Temperature: 350 °C ±10 °C Solder bit code number: 2622 035 17135 Bit dimensions: 2.5 × 1.5 mm Solder: 60/40 tin/lead Type: Ersin multicore Diameter 1.2 mm with flux 366 Time: 2 ±0.5 s		visual examination	wetting: >95%
Solder bath method in accordance with IEC 68-2-20, Test Ta, method 1: Temperature: 235 °C ±5 °C Immersion time: 2 ±0.5 s		visual examination	wetting: >95%
Sub-group B1-b	ND		
Focus spark gap firing simulation in accordance with PRV-53-8-52/42: R1 = 400 Ω; R2 = 5 MΩ; C1 = 2 nF; P1 = P2 = 600 hPa; V1 = V _{ac} ; V2 = 30 kV; both with shafts FCW; n = 50		visual examination element resistance $\Delta R_{ac}/R_{ac}$ output voltage drift ΔV_{b1} output voltage drift ΔV_{b2}	no visible damage $\leq 3\%$ ≤ 25 V ≤ 5 V
Corona in accordance with PRV-53-8-52/43: 1.3 × V _{ac} ; 60 s; standard atmosphere		corona detection	no corona
Breakdown voltage under pressure in accordance with IEC 68-2-13 test M: V _{ac} ; 30 minutes; 600 hPa; 55 °C		flashover detection breakdown detection	no flashover no breakdown
Sub-group C1	ND		
Mechanical travel		focus screen	210° ±5° 260° ±5°
Starting torque		focus screen	3 to 30 mNm; ratio ≤3 3 to 30 mNm; ratio ≤3
Sub-group C2	ND		
Output ratio range		V _{b1c min} /V _{ac} ; V _{b1c max} /V _{ac} V _{b2c min} /V _{ac} ; V _{b2c max} /V _{ac}	see Tables 3, 4, 5, 6, 7 and 8
Continuity in accordance with PRV-53-8-52/44			smooth, unidirectional
Settability		focus ±25 V screen ±5 V	≤10 s ≤10 s
Robustness of terminations in accordance with IEC-68-2-21 test Vb, method 1		visual examination	no visible damage

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TEST / CONDITIONS OF TEST	D OR ND	PROCEDURE	PERFORMANCE
Sub-group C3	D		
Electrical endurance at 70 °C: Temperature: 70 °C ±3 °C Duration: 1000 hours Cyclic load (1.5 hours on and 0.5 hours off) Shafts: mid position		visual examination element resistance $\Delta R/R$ output voltage drift ΔV_{b1} output voltage drift ΔV_{b2} starting torque	no visual damage $\leq 3\%$ ≤ 25 V ≤ 5 V not specified
Sub-group D1	D		
Damp heat, cyclic in accordance with IEC 68-2-30, Test Db: Upper temperature: 40 °C Number of cycles: 21 (1 cycle = 1 hour on and 23 hours off) Shafts: mid position		visual examination element resistance $\Delta R/R$ output voltage drift ΔV_{b1} output voltage drift ΔV_{b2}	no visible damage not specified ≤ 25 V ≤ 5 V
Sub-group D2	D		
Mechanical endurance at room temperature: Number of cycles of operation: 50 Rate: 4 ±1 cycles per minute		visual examination element resistance $\Delta R/R$ starting torque continuity change of output ratios	no visible damage $\leq 3\%$ not specified smooth, unidirectional 0.965 to 1.035 × initial requirements
Sub-group D3	ND		
End - stop torque: Adjustment tool: 150 mNm Manual: 300 mNm Duration: 10 s		visual examination	no visible damage, no deformation
Axial thrust on the shaft: Thrust: 50 N		continuity output voltage drift ΔV_{b1} output voltage drift ΔV_{b2}	smooth, unidirectional not specified not specified
Radial thrust on the shaft: Thrust: 50 mNm (not applicable for L_s or $L_f \leq 5$ mm)		visual examination	no visible damage
Sub-group D4-a	D		
Resistance to soldering heat in accordance with IEC 68-2-20, Test Tb, method 2: Solder iron method Temperature: 350 °C ±10 °C Solder bit code number: 2622 035 17135 Bit dimensions: 2.5 × .5 mm Solder: 60/40 tin/lead Type: Ersin multicore Diameter 1.2 mm with flux 366 Time: 10 ±1 s Shafts: FCCW		element resistance $\Delta R/R$ output voltage drift ΔV_{b2}	$\leq 0.2\%$ ≤ 2 V

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FMP-PRT-VERT

TEST / CONDITIONS OF TEST	D OR ND	PROCEDURE	PERFORMANCE
Sub-group D4-b	D		
Change of temperature in accordance with IEC 68-2-14, Test Na: TA = -25 °C TB = +100 °C Number of cycles: 5 Exposure duration: 30 minutes Shafts: FCCW		visual examination element resistance $\Delta R/R$ output voltage drift ΔV_{b1} output voltage drift ΔV_{b2} operating torque	no visual damage $\leq 1\%$ ≤ 25 V ≤ 5 V 3 to 30 mNm
Sub-group D4-c	D		
Vibration in accordance with IEC 68-2-6, Test Fc, Procedure B4: Frequency range: 10 to 55 Hz Amplitude: 0.75 mm or 98m/s ² Sweep endurance: total duration 6 hours Shafts: mid position		visual examination output voltage drift ΔV_{b1} output voltage drift ΔV_{b2} operating torque	no visible damage ≤ 25 V ≤ 5 V 3 to 30 mNm
Sub-group D4-d	D		
Shock in accordance with IEC 68-2-27, Test Ea: Pulse duration: 11 ms Acceleration: 490 m/s ² Number of shocks: 3 in each of 6 directions Shafts: mid position		visual examination output voltage drift ΔV_{b1} output voltage drift ΔV_{b2} operating torque	no visible damage ≤ 25 V ≤ 5 V 3 to 30 mNm
Sub-group D4-e	D		
Dry heat in accordance with IEC 68-2-2, Test Bb: Temperature: +100 °C Duration: 96 hours Shafts: FCCW		element resistance $\Delta R/R$ output voltage drift ΔV_{b1} output voltage drift ΔV_{b2} operating torque	$\leq 1\%$ ≤ 25 V ≤ 5 V 3 to 30 mNm
Sub-group D4-f	D		
Cold in accordance with IEC 68-2-1, Test Ab: Temperature: -25 °C Duration: 96 hours Shafts: FCCW		element resistance $\Delta R/R$ output voltage drift ΔV_{b1} output voltage drift ΔV_{b2} operating torque	$\leq 1\%$ ≤ 25 V ≤ 5 V 3 to 30 mNm
Sub-group D5	ND		
Temperature characteristic of resistance: +20 °C to +100 °C		TCR	$\leq 100 \times 10^{-6}/K$
Voltage coefficient of resistance in accordance with HQV-14/001		VCR	$\leq 2 \times 10^{-6}/V$
Dimensions (detail)			in accordance with specification

**Focus Metal-glaze Preset (FMP),
Vertical type (VERT)**
FMP-PRT-VERT

TEST / CONDITIONS OF TEST	D OR ND	PROCEDURE	PERFORMANCE
Sub-group ADD1	ND		
Safety test in accordance with PRV-53-8-52/45: 1.3 × V _{ac} during 3 s Test cover: 8204 115 06560		flashover detection breakdown detection	no flashover no breakdown
Sub-group ADD2	D		
Wire forces		push-in force pull-out force	≤25 N ≥50 N
Sub-group ADD3	ND		
Shaft impact test in accordance with PRV-53-8-52/48 (not applicable for L _s or L _f ≤ 5 mm)			no interruptions, no instability