

Rope Length Transmitter

Tilt Angle Sensor

**Precision Rotary Potentiometer**

Joystick

Pedal Actuated Transmitter

Wind Sensor



# THE PRECISION ROTARY POTENTIOMETER

For measuring mechanical angle precision potentiometers are still an important part in the field of angular position transmitters nowadays. Being passive sensors, i. e. without own electronics, they are used in many industrial sectors because of their versatility and flexibility. They are particularly used in:

- Power braking control elements for railway vehicles as well as ship telegraphs
- Rudder and propeller systems for ships
- Control drives for systems in the field of energy management and chemical industry
- Lifting gears and slewing mechanisms of cranes and excavators
- Tail vanes for meteorological measurements
- As dancer potentiometers for textile and paper machinery
- As well as for measurements in the field of mechanical, apparatus and medical engineering

Potentiometric transmitters have either a high-resolution resistance element of conductive plastic or a high-resolution gold or constantan wire. Thus ensuring the provision of user-specific resistance and angle values as well as Function courses, if required.

Almost every version can be equipped with several tracks (up to 6 tracks) to allow a redundancy in the measuring process. Version PW45W10 is furthermore designed as multiturn potentiometer and can thus be used as a potentiometric multiturn transmitter for max. 10 turns.

Several versions are equipped with incorporated signal converters having current or voltage outputs in two, three or four wire system.

Especially for use in applications subject to heavy mechanical stress, for example heavy-duty, a series of protective casings with an IP code up to IP 68 is available, partly equipped with gearing and limit switches.





## RING WINDING

Resistance elements as ring winding with wire winding on an anodised aluminium anchor ring can be provided with any circuit, angle and resistance values.

- Wiper limited by stops
- Wiper continuous rotation over 360° with reactive winding
- Wiper continuous rotation over 360° without reactive winding (sawtooth shape)
- Any arrangement of shorted sections
- Any arrangement of tappings
- Special windings with characteristic curve of the linear or sin/cos type
- Two electrically isolated windings on a winding former, angle  $\leq 175^\circ$



## STRAIGHT WINDING

Resistance elements as straight winding with wire winding on a coated former of copper wire are used in potentiometers of the multiple-turn or linear type but also in single-turn potentiometers with active angles up to max. 350°.





- Wiper limited by stops
- Wiper continuous rotation over 360° only for purposes of putting into operation
- Any arrangement of shorted sections
- Any arrangement of tappings



## CONDUCTIVE PLASTIC

Resistance elements of conductive plastic, imprinted on glassfiber reinforced supports. The max. active angle amounts to 355°. Smaller angles, tappings and shorted sections on request.

- Wiper limited by stops
- Wiper continuous rotation over 360°
- Any arrangement of shorted sections
- Any arrangement of tappings
- Sin/cos characteristic curve
- Two electrically isolated windings on a winding former, angle  $\leq 175^\circ$



System versions	potentiometric	potentiometric	potentiometric	potentiometric
				
Mechanical Data				
Model types	PW 609/309	PW 611	PW 613	PW 620
Resistance element	straight-shaped	straight-shaped	straight-shaped	straight-shaped
Material of housing	aluminium, anodised	aluminium, anodised	aluminium, anodised	aluminium, anodised
Size	synchro 9	synchro 11	synchro 13	synchro 20
Diameter of housing	22.2 mm	28 mm	36.5 mm	50.8 mm
IP code of housing	IP 30	IP 30	IP 30	IP 30
Diameter of shaft	3 / 6 mm	6 mm	6 mm	6 mm
Shaft bearing	ball / sintered bearing	ball / sintered bearing	ball / sintered bearing	ball / sintered bearing
Material of shaft	stainless steel	stainless steel	stainless steel	stainless steel
Adjustment speed max.	360 rpm	360 rpm	360 rpm	360 rpm
Torque	0.03 Ncm	0.04 Ncm	0.05 Ncm	0.05 Ncm
Torque (oil-filling)	–	–	–	–
max. active angle ( $\pm 0.5^\circ$ )	340°	340°	345°	350°
max. stop angle	340°	340°	345°	345°
Multiple version	threefold	threefold	sixfold	sixfold
Functional winding	–	–	–	–
Oilfilling (optional)	–	–	–	–
Weight *	15 g	20 g	40 g	70 g
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Life time ***	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles
Electrical Data				
Temperature range	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C
Test voltage	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.
Value of resistance	up to 10 k $\Omega$	up to 10 k $\Omega$	up to 20 k $\Omega$	up to 20 k $\Omega$
Resistance tolerance	5 %	5 %	5 %	5 %
Linearity tolerance	$\pm 0.5$ %	$\pm 0.5$ %	$\pm 0.2$ %	$\pm 0.2$ %
Resolution (windings) **	1033	1369	1851	3434
Rated Power	0.5 W	0.5 W	1 W	1 W
Switches	–	–	–	–
Connection	Faston plug / solder connection	Faston plug / solder connection	Faston plug / solder connection	Faston plug / solder connection
Other				
Fastening	clamp fixing/ optional threaded holes	clamp fixing/ optional threaded holes	clamp fixing/ optional threaded holes	clamp fixing/optional central fixing, threaded holes
Article number	1107Z01	1122Z02	1567Z80	1577Z80

\* Single version

\*\* depend on resistance value and active angle

\*\*\* Life time depends on load. Influencing factors are: environmental conditions, adjustment speed as well as acceleration.

System versions	potentiometric	potentiometric	potentiometric
			
Mechanical Data			
Model types	PW 613	PW 620	PW 1023
Resistance element	ring	ring	ring
Material of housing	aluminium, anodised	aluminium, anodised	aluminium, anodised
Size	synchro 13	synchro 20	synchro 23
Diameter of housing	36.5 mm	50.8 mm	60 mm
IP code of housing	IP 30	IP 30	IP 65
Diameter of shaft	6 mm	6 mm	6 / 10 mm
Shaft bearing	ball / sintered bearing	ball / sintered bearing	ball bearing
Material of shaft	stainless steel	stainless steel	stainless steel
Adjustment speed max.	360 rpm	360 rpm	360 rpm
Torque	0.05 Ncm	0.05 Ncm	2.5 Ncm
Torque (oil-filling)	1 Ncm	1 Ncm	–
max. active angle ( $\pm 0.5^\circ$ )	360°	360°	360°
max. stop angle	345°	345°	345°
Multiple version	sixfold	sixfold	twice
Functional winding	optional	optional	optional
Oilfilling (optional)	PW 613 / ÖF	PW 620 / ÖF	–
Weight *	40 g	70 g	380 g
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Life time ***	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles
Electrical Data			
Temperature range	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C
Test voltage	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.
Value of resistance	up to 20 k $\Omega$	up to 20 k $\Omega$	up to 20 k $\Omega$
Resistance tolerance	2 %	2 %	2 %
Linearity tolerance	$\pm 0.2$ %	$\pm 0.2$ %	$\pm 0.2$ %
Resolution (windings) **	2100	max. 2321	max. 2321
Rated Power	2.5 W	2.5 W	2.5 W
Switches	max. 2	max. 2	–
Connection	Faston plug / solder connection	Faston plug / solder connection	plug / cable
Other			
Fastening	clamp fixing/ optional threaded holes	clamp fixing/ optional central fixing, threaded holes	clamp fixing + threaded holes
Article number	1567Z80	1577Z80	5720Z52

System versions	potentiometric	potentiometric	potentiometric
			

Mechanical Data			
Model types	PW 0045	PW 45	PW 45 W 3
Resistance element	straight-shaped	ring	straight-shaped
Material of housing	thermoplastic	thermoplastic	brass / thermoplastic
Size	FSG-design	FSG-design	FSG-design
Diameter of housing	45 mm	45 mm	45 mm
IP code of housing	IP 30	IP 30	IP 30
Diameter of shaft	6 mm	6 mm	6 mm
Shaft bearing	sintered bearing	sintered bearing	sintered bearing
Material of shaft	stainless steel	stainless steel	stainless steel
Adjustment speed max.	60 rpm	360 rpm	360 rpm
Torque	0.5 Ncm / 5 Ncm	0.3 Ncm / 3 Ncm	0.5 Ncm
Torque (oil-filling)	–	1 Ncm	–
max. active angle ( $\pm 0.5^\circ$ )	$280^\circ / 345^\circ$	$360^\circ$	$1,080^\circ$ (3 revolutions)
max. stop angle	$280^\circ / 345^\circ$	$345^\circ$	$1080^\circ$
Multiple version	–	twice	twice
Functional winding	–	optional	–
Oilfilling (optional)	–	PW45 / ÖF	–
Weight *	40 g	70 g	100 g
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Life time ***	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles

Electrical Data			
Temperature range	$-30^\circ \text{C}$ up to $+80^\circ \text{C}$	$-30^\circ \text{C}$ up to $+80^\circ \text{C}$	$-30^\circ \text{C}$ up to $+80^\circ \text{C}$
Test voltage	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.
Value of resistance	up to 25 k $\Omega$	up to 20 k $\Omega$	up to 25 k $\Omega$
Resistance tolerance	5 %	2 %	5 %
Linearity tolerance	$\pm 0.5 \%$	$\pm 0.3 \%$	$\pm 0.1 \%$
Resolution (windings) **	max. 2312	max. 2321	max. 5783
Rated Power	1.5 W	2.5 W	2 W
Switches	–	–	–
Connection	solder connection	solder / screw connection	solder connection

Other			
Fastening	central fixing + threaded holes	threaded holes/ optional central fixing	central fixing/ optional clamp fixing
Article number	1511Z07	1500Z05	1302Z10

\* Single version

\*\* depend on resistance value and active angle

\*\*\* Life time depends on load. Influencing factors are: environmental conditions, adjustment speed as well as acceleration.



System versions	potentiometric	potentiometric	potentiometric
			
Mechanical Data			
Model types	PW 45 W 10	PW 55	PW 70
Resistance element	straight-shaped	straight-shaped	ring
Material of housing	brass / thermoplastic	thermoplastic	thermoset
Size	FSG-design	FSG-design	FSG-design
Diameter of housing	45 mm	□ 55 mm	70 mm
IP code of housing	IP 30	IP 30	IP 30
Diameter of shaft	6 mm	hollow shaft 6 x 6 mm	6 mm
Shaft bearing	sintered bearing	plastic bearing	sintered bearing
Material of shaft	stainless steel	stainless steel	stainless steel
Adjustment speed max.	360 rpm	60 rpm	360 rpm
Torque	0.5 Ncm	0.2 Ncm	0.5 Ncm
Torque (oil-filling)	–	–	1 Ncm
max. active angle ( $\pm 0.5^\circ$ )	3,600° (10 revolutions)	350°	360°
max. stop angle	3,600°	345°	350°
Multiple version	twice	stackable	sixfold
Functional winding	–	–	optional
Oilfilling (optional)	–	–	PW 70 / ÖF
Weight *	150 g	30 g	140 g
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Life time ***	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles
Electrical Data			
Temperature range	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C
Test voltage	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.
Value of resistance	up to 25 kΩ	up to 20 kΩ	up to 50 kΩ
Resistance tolerance	5 %	5 %	2 %
Linearity tolerance	$\pm 0.1$ %	$\pm 0.5$ %	$\pm 0.15$ %
Resolution (windings) **	max. 21049	1620	max. 3621
Rated Power	2 W	1.5 W	6 W
Switches	–	–	max. 6
Connection	solder connection	Faston plug	solder / screw connection
Other			
Fastening	central fixing/ optional clamp fixing	4 mounting holes Ø 3.2 mm	central fixing/ optional central fixing
Article number	1300Z10	1573S10	1700Z04

System versions	potentiometric	potentiometric	potentiometric
			

Mechanical Data			
Model types	PK 309	PK 611	PK 613
Resistance element	conductive plastic	conductive plastic	conductive plastic
Material of housing	alu anodised	alu anodised	alu anodised
Size	synchro 9	synchro 11	synchro 13
Diameter of housing	22.2 mm	28 mm	36.5 mm
IP code of housing	IP 30	IP 30	IP 30
Diameter of shaft	3 / 6 mm	6 mm	6 mm
Shaft bearing	ball / sintered bearing	ball / sintered bearing	ball / sintered bearing
Material of shaft	stainless steel	stainless steel	stainless steel
Adjustment speed max.	1,000 rpm	1,000 rpm	1,000 rpm
Torque	0.03 Ncm	0.04 Ncm	0.05 Ncm
Torque (oil-filling)	–	–	–
max. active angle ( $\pm 0.5^\circ$ )	345°	345°	352°
max. stop angle	340°	340°	345°
Multiple version	threefold	threefold	sixfold
Function course	optional	optional	optional
Oilfilling (optional)	–	–	–
Weight *	15 g	20 g	40 g
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Life time ***	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles

Electrical Data			
Temperature range	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C
Test voltage	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.
Value of resistance	1 k $\Omega$ up to 10 k $\Omega$	1 k $\Omega$ up to 10 k $\Omega$	1 k $\Omega$ up to 10 k $\Omega$
Resistance tolerance	$\pm 20 \%$	$\pm 20 \%$	$\pm 10 \%$
Linearity tolerance	$\pm 2 \% / \pm 0.5 \%^{**}$	$\pm 2 \% / \pm 0.2 \%^{**}$	$\pm 1.5 \% ; \pm 0.15 \%^{**} / \pm 0.5 \%$
Resolution	almost infinite	almost infinite	almost infinite
Rated Power	0.5 W	0.5 W	1 W
Switches	–	–	–
Connection	Faston plug / solder connection	Faston plug / solder connection	Faston plug / solder connection

Other			
Fastening	clamp fixing/ optional threaded holes	clamp fixing/ optional threaded holes	clamp fixing/ optional threaded holes
Article number	1125Z01	1120Z02	1565Z02




\* Single version

\*\* depend on resistance value and active angle

\*\*\* Life time depends on load. Influencing factors are: enviromental conditions, adjustment speed as well as acceleration.



System versions	potentiometric	potentiometric	potentiometric
			
Mechanical Data			
Model types	PK 16 - 613	PK 620	PK 1023
Resistance element	conductive plastic	conductive plastic	conductive plastic
Material of housing	alu anodised	alu anodised	alu anodised
Size	synchro 13	synchro 20	synchro 23
Diameter of housing	36.5 mm	50.8 mm	60 mm
IP code of housing	IP 30	IP 30	IP 65
Diameter of shaft	6 mm	6 mm	6 / 10 mm
Shaft bearing	ball / sintered bearing	ball / sintered bearing	ball bearing
Material of shaft	stainless steel	stainless steel	stainless steel
Adjustment speed max.	1,000 rpm	1,000 rpm	1,000 rpm
Torque	0.05 Ncm	–	2.5 Ncm
Torque (oil-filling)	–	1 Ncm	–
max. active angle ( $\pm 0.5^\circ$ )	5,632° (16 revolutions)	355°	355°
max. stop angle	5,632°	345°	345°
Multiple version	single	sixfold	twice
Function course	optional	optional	optional
Oilfilling (optional)	–	–	–
Weight *	120 g	70 g	380 g
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Life time ***	10 - 50 millions cycles	10 - 50 millions cycles	10 - 50 millions cycles
Electrical Data			
Temperature range	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C
Test voltage	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.	550 V, 50 Hz, 1 min.
Value of resistance	1 k $\Omega$ up to 10 k $\Omega$	1 k $\Omega$ up to 10 k $\Omega$	1 k $\Omega$ up to 10 k $\Omega$
Resistance tolerance	$\pm 10 \%$	$\pm 10 \%$	$\pm 10 \%$
Linearity tolerance	$\pm 1.5 \%$ ; $\pm 0.15 \%$ ** / $\pm 0.5 \%$	$\pm 1.5 \%$ / $\pm 0.1 \%$ **	$\pm 1.5 \%$ / $\pm 0.1 \%$ **
Resolution	almost infinite	almost infinite	almost infinite
Rated Power	1 W	1 W	1 W
Switches	–	max. 2	–
Connection	Faston plug / solder connection	Faston plug / solder connection	plug / cable
Other			
Fastening	clamp fixing/ optional threaded holes	clamp fixing/ optional threaded holes, central fixing	clamp fixing + threaded holes
Article number	1565Z81	1575Z81	5710Z52

System versions	potentiometric		potentiometric		potentiometric	
						

### Mechanical Data

Model types	PW 613 - MU	PK 613 - MU	PW 620 - MU	PK 620 - MU	PW 1023 - MU	PK 1023 - MU
Resistance element	ring	conductive plastic	ring	conductive plastic	ring	conductive plastic
Material of housing	alu anodised		alu anodised		alu anodised	
Size	synchro 13		synchro 20		synchro 23	
Diameter of housing	36.5 mm		50.8 mm		60 mm	
IP code of housing	IP 30		IP 30		IP 65	
Diameter of shaft	6 mm		6 mm		6 / 10 mm	
Shaft bearing	ball / sintered bearing		ball / sintered bearing		ball bearing	
Material of shaft	stainless steel		stainless steel		stainless steel	
Adjustment speed max.	360 rpm	1,000 rpm	360 rpm	1,000 rpm	360 rpm	1,000 rpm
Torque	0.05 Ncm		0.05 Ncm		2.5 Ncm	
max. active angle ( $\pm 0.5^\circ$ )	360°	352°	360°	355°	360°	355°
max. stop angle	345°		345°		345°	
Weight	130 g		130 g		380 g	
Vibration resistance	5 - 200 Hz, 10 g		5 - 200 Hz, 10 g		5 - 200 Hz, 10 g	
Shock resistance	50 g, 6 ms		50 g, 6 ms		50 g, 6 ms	
Life time ***	10 - 50 millions cycles		10 - 50 millions cycles		10 - 50 millions cycles	

### Electrical Data

Current output	0/4 - 20 mA		0/4 - 20 mA		0/4 - 20 mA	
Max. load current output	600 $\Omega$		600 $\Omega$		600 $\Omega$	
Signal output	2-, 3- or 4-wire circuit		2-, 3- or 4-wire circuit		2-, 3- or 4-wire circuit	
Voltage output	–		0/2-10 V		0/2-10 V	
Load resistance	–		$\geq 2K\Omega$		$\geq 2K\Omega$	
Signal calibration	via trimmer potentiometer		via trimmer potentiometer		via trimmer potentiometer	
Linearity tolerance	$\pm 0.2 \%$		$\pm 0.1 \%$		$\pm 0.1 \%$	
Supply	18-33 V DC		18-33 V DC		18-33 V DC	
Current consumption	approx. 80 mA		approx. 80 mA		approx. 80 mA	
Temperature coefficient	max. 1%/10 K, typical: 0.5%/10 K		max. 1%/10 K, typical: 0.5%/10 K		max. 1%/10 K, typical: 0.5%/10 K	
Temperature range	-30° C up to +80° C		-30° C up to +80° C		-30° C up to +80° C	
Test voltage	550 V, 50 Hz, 1 min.		550 V, 50 Hz, 1 min.		550 V, 50 Hz, 1 min.	
Interference immunity	EN61000-6-2		EN61000-6-2		EN61000-6-2	
Emitted interference	EN61000-6-4		EN61000-6-4		EN61000-6-4	
Connection	Faston plug / solder connection		Faston plug / solder connection		plug / cable	

### Other

Fastening	clamp fixing / optional threaded holes		clamp fixing / optional threaded holes, central fixing		clamp fixing + threaded holes	
Article number	1562Z05	1564Z05	1572Z05	1574Z01	5720Z02	5710Z52

## Protective housing



## Mechanical Data

Model types	G 90	GS 100	GS 120	GS 150
Material of housing	aluminium, gray painted RAL7032	aluminium, gray painted RAL7032	aluminium, gray painted RAL7032	aluminium, gray painted RAL7032
Diameter of housing	80x100 mm	100 mm	120 mm	150 mm
IP code of housing	IP 65	IP 65, optional IP 68	IP 65	IP 65, optional IP 68
Diameter of shaft	6 mm	10/12 mm	10 mm	12 mm
Shaft bearing	ball bearing	ball bearing	ball bearing	ball bearing
Material of shaft	stainless steel	stainless steel	stainless steel	stainless steel
Torque	1.5 Ncm	1.5 Ncm	1.5 Ncm	4 Ncm
Weight	approx. 1 kg	approx. 1.5 kg	approx. 2.5 kg	approx. 3-8 kg
Vibration resistance	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g	5 - 200 Hz, 10 g
Shock resistance	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Temperature range	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C	-30° C up to +80° C
Gearing	1:1 - 1:10, non-backlash 1:1 - 25:1, non-backlash 1:1 - 125:1, low-backlash	1:1 - 1:10, non-backlash 1:1 - 256:1, low-backlash 1:1 - 256:1, non-backlash	1:1 - 1:10, non-backlash 1:1 - 216:1, non-backlash 1:1 - 1296:1, low-backlash	1:1 - 1:10, non-backlash 1:1 - 1296:1, non-backlash
Switches	–	–	max. 10	max. 8
Connection	max. 2 x M16 x 1.5	max. 2 x M16 x 1.5	max. 2 x M25 x 1.5	max. 2 x M16 x 1.5/ optional plug
Other				
Fastening	3 x Ø 5, 3 on p.c. Ø 80 mm	4 x M6, 9 depth on p.c. Ø 70 mm	3 x M6, 12 depth on p.c. Ø 104 mm 3 x Ø 7 on p.c. Ø 145 mm	4 x M8, 12 depth on p.c. Ø 100 mm
Article number	3601Z02	1831S10	1892Z15	1802Z02

\*\*\* Life time depends on load. Influencing factors are: enviromental conditions, adjustment speed as well as acceleration.



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