

EPCOS Product Brief 2013

Power Factor Correction

Power Quality Solutions

PQS key components from EPCOS cover the entire range of products needed for successful power factor correction. All parts are carefully matched to each other. With this unique portfolio, we are more than a supplier of products: Power Quality Solutions is the strategy that has been developed to fulfill the demand of the market to offer solutions rather than single components. This product brief gives an overview of all PQS products for detuned and tuned power factor correction. For detailed information, please refer to the PFC Product Profile and data sheets, available in the Internet at www.epcos.com/pfc, or contact our local sales office.

PQS key components




- PFC capacitors
 - PhaseCap Premium/ Compact/HD
 - PhiCap
 - PoleCap
 - MKV capacitors
- Power factor controllers and measuring devices
 - BR604, BR6000, BR7000, BR7000-I
 - MMI6000 and MMI7000
 - Grid analysis tool MC7000-3
- Capacitor contactors
 - J230/N230 series
- Thyristor modules for dynamic PFC
 - TSM-LC-I, TSM-LC, TSM-HV series
- Reactors
 - Antiresonance harmonic filter
 - Discharge reactor
- Accessories

PQS



Power Factor Correction: Capacitors






Technical data			
			
Series	PhaseCap Premium Premium power capacitors for low-voltage power factor correction	PhaseCap Compact Compact power capacitors for low-voltage power factor correction	PhaseCap HD High-density power capacitors for low-voltage power factor correction
Features			
Technology	MKK	MKK	MKK
Inrush current	High pulse current withstand capability up to $300 \cdot I_R$	High pulse current withstand capability up to $400 \cdot I_R$	High pulse current withstand capability up to $300 \cdot I_R$
Discharge resistor/module	Ceramic discharge resistor pre-mounted up to 690 V AC; external discharge module for 765 and 800 V AC	Ceramic discharge resistor pre-mounted; external discharge module for types ≥ 690 V	External discharge module pre-mounted
Safety system	Triple: <ul style="list-style-type: none"> • Self healing • Overpressure disconnecter • Dry technology 	Dual: <ul style="list-style-type: none"> • Self healing • Overpressure disconnecter 	Triple: <ul style="list-style-type: none"> • Self healing • Overpressure disconnecter • Dry technology
Impregnation	Inert gas, dry, non-PCB	Semi dry biodegradable resin, non-PCB	Inert gas, dry, non-PCB
Rated voltage V_R	230 ... 800 V AC	230 ... 1000 V AC	400 ... 525 V AC
Power Q_R	5 ... 33 kvar	5 ... 37.1 kvar	40 ... 60 kvar
Rated frequency f_R	50/60 Hz	50/60 Hz	50/60 Hz
Winding	Concentric	Concentric (S-types stacked)	Stacked
Mounting position	Upright/horizontal	Upright/horizontal ¹⁾	Upright
Ordering code	B25667C*	B25673A* B25673S*	B25669*
Applications			
	<ul style="list-style-type: none"> • Automatic PFC equipment • Individual fixed PFC • Fixed PFC • Tuned and detuned capacitor banks • 690 and 800 V AC series for usage in harsh application conditions such as wind turbines and industrial applications with heavy harmonic loads 	<ul style="list-style-type: none"> • Automatic PFC equipment • Individual fixed PFC • Fixed PFC • Tuned and detuned capacitor banks • 690 to 1000 V AC series for usage in harsh application conditions such as wind turbines and industrial applications with heavy harmonic loads 	<ul style="list-style-type: none"> • Automatic PFC equipment • Individual fixed PFC • Fixed PFC • Detuned capacitor banks

¹⁾ S-types: when mounting in horizontal position, additional mechanical support is recommended to prevent breaking of mounting bolt in case of mechanical shock or vibrations. This support should be placed at short distance below the bead at the top end of the capacitor.

Power Factor Correction: Capacitors



Technical data			
			
Series	PhiCap Power capacitors for low-voltage power factor correction	PoleCap Power capacitors for outdoor applications or harsh environmental conditions	MKV Power capacitors for high ambient temperatures and especially demanding loads
Features			
Technology	MKP	MKP/MKK	MKV
Inrush current	High pulse current withstand capability up to $200 \cdot I_R$	High pulse current withstand capability up to $200 \cdot I_R$	High pulse current withstand capability up to $500 \cdot I_R$
Discharge resistor/module	Ceramic discharge resistor pre-mounted for B32344E series; discharge resistors included in delivery for other series	Integrated discharge resistor	Ceramic discharge resistor pre-mounted
Safety system	Dual: <ul style="list-style-type: none"> • Self healing • Overpressure disconnecter 	Triple: <ul style="list-style-type: none"> • Self healing • Overpressure disconnecter • Dry technology 	Dual: <ul style="list-style-type: none"> • Self healing • Overpressure disconnecter
Impregnation	Semi-dry biodegradable soft resin, non-PCB	Inert gas, non-PCB	Oil, non-PCB
Rated voltage V_R	230 ... 525 V AC	400 ... 525 V AC	400 ... 800 V AC
Power Q_R	0.5 ... 30 kvar	0.5 ... 30 kvar	4.2 ... 30 kvar
Rated frequency f_R	50/60 Hz	50/60 Hz	50/60 Hz
Winding	Stacked	MKP: stacked MKK: concentric	Stacked
Mounting position	Upright	Upright/horizontal	Upright/horizontal
Ordering code	B32340C* series: single-phase, fast-on terminals B32343C* series: three-phase, fast-on terminals B32344E* series: three-phase, optimized capacitor safety terminals	B25671A*	B25836B*
Applications			
	<ul style="list-style-type: none"> • Automatic capacitor banks • Fixed PFC • Detuned PFC systems 	<ul style="list-style-type: none"> • Pole mounted PFC, i.e. outdoor applications • Fixed PFC inside or outside a cabinet in surroundings with high dust or moisture concentrations • Automatic PFC systems to reduce labor costs 	<ul style="list-style-type: none"> • Applications with high thermal loading • AC applications in industrial electronics, e.g. high dv/dt • Tuned harmonic filters • Industrial applications with heavy harmonic loads



Power Factor Correction: Key Components



Technical data																							
Series	Power Factor Controllers BR604 and BR6000 V6.0																						
Features																							
	<p>Large and multifunctional display (2 x 16 characters, backlight for BR6000 series) BR6000-HD with OLED display</p> <p>Menu driven handling (plain language)</p> <p>Self-optimizing control capability</p> <p>Recall function of recorded values</p> <p>Automatic initialization possible for BR6000</p> <p>Option: interface RS485 for BR6000</p>																						
Technical data																							
	<ul style="list-style-type: none"> • Supply voltage BR604: 230 V AC, 50/60 Hz BR6000: 110 ... 230 V AC, 50/60 Hz • Measuring voltage: BR604: = supply voltage 230 V AC BR6000: 30 ... 525 V AC (L-N) or (L-L) • Sensitivity: 50 mA/10 mA • Measuring current BR6000: X:5 A / X:1 A 																						
Ordering code																							
	<table border="0"> <tr> <td>BR604 (4 steps)</td> <td>B44066R6004E230</td> </tr> <tr> <td>BR6000-R6 (6 steps)</td> <td>B44066R6006E230</td> </tr> <tr> <td>BR6000-R12 (12 steps)</td> <td>B44066R6012E230</td> </tr> <tr> <td>BR6000-HD6</td> <td>B44066R6506E230</td> </tr> <tr> <td>BR6000-HD12</td> <td>B44066R6512E230</td> </tr> <tr> <td>BR6000-R12/S485 (12 steps with RS485 interface)</td> <td>B44066R6412E230</td> </tr> <tr> <td>BR6000-T6 (6 steps for dynamic PFC)</td> <td>B44066R6106E230</td> </tr> <tr> <td>BR6000-T12 (12 steps for dynamic PFC)</td> <td>B44066R6112E230</td> </tr> <tr> <td>BR6000-T12/S485 (12 steps for dynamic PFC, interface RS485)</td> <td>B44066R6412E231</td> </tr> <tr> <td>BR6000-T6R6 (6 transistor outputs, 6 relay outputs for mixed compensation, e. g. standard/dynamic)</td> <td>B44066R6066E230</td> </tr> <tr> <td>BR6000-T6R6/S485 (6 transistor outputs, 6 relay outputs for mixed compensation, e. g. standard/dynamic, with interface RS485)</td> <td>B44066R6466E230</td> </tr> </table>	BR604 (4 steps)	B44066R6004E230	BR6000-R6 (6 steps)	B44066R6006E230	BR6000-R12 (12 steps)	B44066R6012E230	BR6000-HD6	B44066R6506E230	BR6000-HD12	B44066R6512E230	BR6000-R12/S485 (12 steps with RS485 interface)	B44066R6412E230	BR6000-T6 (6 steps for dynamic PFC)	B44066R6106E230	BR6000-T12 (12 steps for dynamic PFC)	B44066R6112E230	BR6000-T12/S485 (12 steps for dynamic PFC, interface RS485)	B44066R6412E231	BR6000-T6R6 (6 transistor outputs, 6 relay outputs for mixed compensation, e. g. standard/dynamic)	B44066R6066E230	BR6000-T6R6/S485 (6 transistor outputs, 6 relay outputs for mixed compensation, e. g. standard/dynamic, with interface RS485)	B44066R6466E230
BR604 (4 steps)	B44066R6004E230																						
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Power Factor Correction: Key Components



Technical data				
				
Series	Power Factor Controllers BR7000/BR7000-T		Power Factor Controller BR7000-I	
Features				
	<p>Illuminated graphic display, 128 x 64 dots, 8 lines Menu driven handling (plain language) HELP-button for interactive help text BR7000 for conventional PFC systems BR7000-T for dynamic PFC systems</p> <p>Three-phase display of numerous parameters as real value and in % Three-phase measuring Controlling three-phase, single-phase, mixed mode 2 isolated interfaces</p>		<p>Illuminated graphic display, 128 x 64 dots, 8 lines Menu driven handling (plain language) HELP-button for interactive help text BR7000-I standard version BR7000-I/S485 with interface RS485</p> <p>Single-phase measuring Measuring device mode for simultaneous display of 3 parameters (large display also) 3-digit display of the power factor (cos φ) / switchable display as tan φ Display of values as bargraph-diagram possible</p>	
Technical data				
	<ul style="list-style-type: none"> Supply voltage: 110 ... 230 V AC, $\pm 15\%$, 50/60 Hz Measuring voltage: <ul style="list-style-type: none"> 3 · 30 ... 440 V AC (L-N); 3 · 50 ... 760 V AC (L-L), 50/60 Hz Measuring current: 3 · X:5 A / X:1 A, selectable Power consumption: about 3 VA Operating ambient temperature: -20 ... +60 °C <p>BR7000:</p> <ul style="list-style-type: none"> 15 switching outputs 3 additional alarm/message relays 2 independent interfaces <p>BR7000-T:</p> <ul style="list-style-type: none"> 15 transistor outputs 3 additional alarm/message relays 2 independent interfaces <p>Evaluation software BR7000-SOFT incl. in the delivery Versions BR7000-HD and BR7000-T-HD with OLED display</p>		<ul style="list-style-type: none"> Supply voltage: 110 ... 230 V AC, $\pm 15\%$, 50/60Hz Measuring voltage: <ul style="list-style-type: none"> 30 ... 440 V AC (L-N); 50 ... 760 V AC (L-L), 50/60 Hz Measuring current: X:5 A / X:1 A, selectable Power consumption: about 3 VA Operating ambient temperature: -20 ... +60 °C <p>BR7000-I/S485:</p> <ul style="list-style-type: none"> 12 relay outputs for capacitor 1 relay output (message/alarm/fan) Additional external input Additional message relay Serial interface RS485 Evaluation software BR7000-SOFT incl. in the delivery 	
Ordering code				
	BR7000	B44066R7415E230	BR7000-I	B44066R7012E230
	BR7000-HD	B44066R7515E230	BR7000-I/S485	B44066R7112E230
	BR7000-T	B44066R7615E230		
	BR7000-T-HD	B44066R7715E230		
PC software BR7000-SOFT				
	<p>Connection to RS485 of BR6000-R12/S485 and BR7000 / BR7000-I/S485 Administration of several PF controllers possible Comfortable analysis of recorded values Direct connection to USB port of a PC via USB-adapter Included in the delivery of BR6000-R12/S485, BR7000 and BR7000-I/S485</p>			

Power Factor Correction: Key Components



Technical data			
			
Series	Multi Measuring Interface MMI6000	Multi Measuring Interface MMI7000	Grid Analysis Tool MC7000-3
Features			
	<p>Coupling with PF controller BR6000 via interface for determination of real capacitor current</p> <p>Capacitor protection by step switch-off at current limit</p> <p>Fast trigger for dynamic PFC</p> <p>Independent switching of a single capacitor step</p> <p>Stand-alone measuring device with interface for read-out</p> <p>Single-phase measurement of V, I, P, Q, S, cos φ, f, W, T (read out via RS485)</p> <p>Panel mounting instrument</p> <p>Recording of maximum values</p> <p>Graphical menu (DE/E)</p>	<p>Display of harmonics as bar chart: harmonic of voltage up to 51st and harmonic of current up to 51st</p> <p>Oscilloscope mode: for graphic display of a complete oscillation incl. harmonics</p> <p>Display editor: for free programming of display for measured values</p> <p>Scan mode: for rotating display of selected values</p> <p>Display and recording of minimum and maximum values with time stamp</p> <p>Three-phase measuring and display of numerous parameters: V, I, P, Q, S, cos φ, f, W, T, THD-V, THD-I</p> <p>Panel mounting instrument</p> <p>Graphical menu (DE/E/ES/RU/TR)</p> <p>Integrated help function</p> <p>Display of date and time</p>	<p>Measuring, display and storage of numerous parameters</p> <p>Illuminated full graphic display, 128 x 64 dots</p> <p>Comfortable programming of recording interval</p> <p>Display and internal storage of max. values with time stamp</p> <p>Display of date and time</p> <p>Large number of display options</p> <p>Fast and easy evaluation of measured values, with PC software included in the delivery</p>
Technical data			
	<ul style="list-style-type: none"> Operating voltage: 230 V AC Measuring voltage: 230 V AC ±15% Measuring current: X:5 A / X:1 A Rated frequency f_R: 50/60 Hz Power consumption: < 4 VA Sensitivity: 40 mA LCD display 2 x 16 characters; alphanumeric 	<ul style="list-style-type: none"> Operating voltage: 110 ... 230 V AC ±15% Measuring voltage (3-phase): 3 · 30 ... 440 V AC (L-N) 3 · 50 ... 760 V AC (L-L) Measuring current: X:5 A / X:1 A Rated frequency f_R: 50/60 Hz Power consumption: < 5 VA Sensitivity: 50 mA/10 mA Illuminated full graphic LCD display, 128 x 64 dots 	<ul style="list-style-type: none"> Operating voltage (auxiliary voltage): 110 ... 230 V AC Measuring voltage (3-phase): 3 · 30 ... 440 V AC (L-N) 3 · 50 ... 760 V AC (L-L) Power consumption: < 5 A Large number of accessories included: 3 safety measuring cables 1 safety measuring line 4 safety dolphin clips Windows-based software on CD-ROM 1 memory SD-Card (1 GB) 1 power lead
Ordering code			
	<p>MMI6000-R (standard version with relay output) B44066M6000E230</p> <p>MMI6000-T (dynamic version with transistor output) B44066M6100E230</p>	<p>MMI7000-B (basic version) B44066M7100E230</p> <p>MMI7000-S (incl. 2 interfaces RS485) B44066M7200E230</p> <p>MMI7000-E (extended version with additional interface, memory card and additional in- and outputs) B44066M7300E230</p>	<p>B44066M7777E230</p> <p>Ordering code for flexible current clamps (not included in the delivery, but mandatory for operation): please refer to page 10.</p>



Power Factor Correction: Key Components



Technical data				
Series	Capacitor Contactors J230/N230		Thyristor Modules for Dynamic PFC	
Features				
	<p>Excellent damping of inrush current</p> <p>Soft switching of capacitors to increase the life expectancy of PFC systems, contactors and capacitors</p> <p>Reduced ohmic losses</p> <p>High safety standards</p> <p>Reduction of voltage sags and transients</p> <p>Series J230: with pre-charge resistors for conventional PFC systems without reactors</p> <p>Series N230: without pre-charge resistors for detuned PFC systems</p>		<p>Easy installation: usage similar to a contactor</p> <p>Ultra-short reaction time, almost no inrush current</p> <p>Switching time: approx. 5 ms</p> <p>Permanent self controlling of various parameters:</p> <ul style="list-style-type: none"> • Voltage • Phase sequence • Capacitor output <p>Display of</p> <ul style="list-style-type: none"> • Operation • Faults • Activation <ul style="list-style-type: none"> • Maintenance-free • Long service life • No switching noise <p>TSM-LC-I for single-phase</p>	
Technical data				
	<ul style="list-style-type: none"> • Voltage: 400 ... 690 V • Output: 12.5 ... 100 kvar • Auxiliary contacts: included (normally open) • Mounting: integrated DIN-rail • Approval: cUL, CCC (up to 75 kvar) 		<p>TSM-LC-I:</p> <ul style="list-style-type: none"> • Output at: 230 V = 10 kvar, 400 V = 16 kvar, 440 V = 18 kvar, 480 V = 20 kvar, 525 V = 22 kvar <p>TSM-LC:</p> <ul style="list-style-type: none"> • Output at 400 V: 10, 25, 50, 100, 200 kvar <p>TSM-HV:</p> <ul style="list-style-type: none"> • Output at 690 V: 50 and 200 kvar 	
Ordering code				
	J230 series N230 series	B44066S****J230 B44066S****N230	TSM-LC-I: TSM-LC: TSM-HV:	B44066T1022E520 B44066T0***E402 B44066T0050E690 B44066T0200E690




Power Factor Correction: Key Components



Technical data		
		
Series	Reactors – Antiresonance Harmonic Filter	Reactors – Discharge Reactor
Features		
	High harmonic loading capability, very low losses High linearity to avoid choke tilt, low noise emission	Fast discharge for fast reconnection of capacitors Reduced losses Shockproof case for DIN-rail mounting
Technical data		
	<ul style="list-style-type: none"> • Voltage: 400 V, 440 V, 690 V • Frequency: 50 or 60 Hz • Output: 10 ... 100 kvar • Harmonics (duty cycle = 100%): $V_3 = 0.5\% V_R$ $V_5 = 6.0\% V_R$ $V_7 = 5.0\% V_R$ $V_{11} = 3.5\% V_R$ $V_{13} = 3.0\% V_R$ • Effective current: $I_{rms} = \sqrt{(I_1^2 + I_3^2 + \dots + I_{13}^2)}$ • Fundamental current: $I_1 = 1.06 \cdot I_R$ (50 Hz or 60 Hz current of capacitor) • Temperature protection: microswitch (NC) • Detuning factor: 5.67%, 7%, 14% 	<ul style="list-style-type: none"> • Voltage: 230 ... 690 V • Frequency: 50/60 Hz • Discharge time (t): 230 V: up to 25 kvar < 10 s up to 50 kvar < 20 s up to 100 kvar < 40 s 400 ... 525 V: up to 25 kvar < 5 s up to 50 kvar < 10 s up to 100 kvar < 20 s 525 ... 690 V: up to 25 kvar < 3 s up to 50 kvar < 6 s up to 100 kvar < 12 s
Ordering code		
	B44066D*	B44066E9900L001

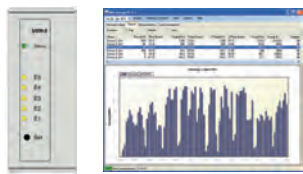


Power Factor Correction: Accessories



Accessories			
	 <p>Data logger DataLOG SD PF controller BR6000/BR7000</p>	 <p>USB to RS485 converter PF controller BR6000/BR7000</p>	 <p>RJ45 adapter PF controller BR6000/BR7000 Multi Measuring Interface MMI6000/MMI7000</p>
Features			
	<p>Usage for PF-controllers, BR6000-R12/S485 (from V5.0) and BR7000</p> <ul style="list-style-type: none"> Recording of all grid parameters as well as of all relevant parameters of a compensation system, including switching sequences, switching on-time of all steps and temperature Direct connection to the controller interface via Ethernet cable is possible; 0.5 m cable is included Recording time up to several weeks Ready to use with a plastic casing Dimensions 66 x 28 x 66 mm Recording of measured values on SD-card (1 GB card included available) Evaluation of values with Windows based software, included in the delivery 	<ul style="list-style-type: none"> For connection of BR6000 or BR7000 with interface RS485 to PC with USB-interface. Connection of several devices at RS485 possible. 	<p>3 versions available:</p> <ul style="list-style-type: none"> Connection to the interface terminals of BR6000, BR7000, MMI6000 or MMI7000 via LAN cable Simple connection of several devices via the RS485 bus, for example: <ul style="list-style-type: none"> Connection of several BR6000, BR7000 or MMI7000 to a PC with BR7000-SOFT software Interconnection of several BR6000 or MMI6000/MMI7000 Connection of BR6000 with MMI6000 <p>Suitable for: 1xRJ45 for BR6000/BR7000/MMI7000</p> <p>Suitable for: 2xRJ45 for BR6000/BR7000/MMI7000</p> <p>Suitable for: 2xRJ45 for MMI6000</p>
Ordering code			
	B44066R1311E230	B44066R3333E230	<p>1xRJ45 for BR6000/BR7000/MMI7000: B44066R1611E230</p> <p>2xRJ45 for BR6000/BR7000/MMI7000: B44066R1711E230</p> <p>2xRJ45 for MMI6000: B44066R1811E230</p>

Power Factor Correction: Accessories



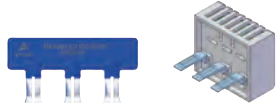


Accessories			
	 <p>UCM-5, MMI-energy PF controller BR6000/BR7000 Multi Measuring Interface MMI6000/MMI7000</p>	 <p>EW-22 BD-xxx Thyristor modules TSM series</p>	 <p>Flexible current clamps Grid analyzing tool MC7000-3</p>
Features			
	<ul style="list-style-type: none"> Recording and evaluation of counter values for processing (via RS485 interface) to PF controller BR6000/BR7000. Bus compatible S0-impulse module for software MMI-energy and BR6000/BR7000 for conversion of counter impulses (Q+, Q-, P+, P-, synchronic) on RS485 (MODBUS-RTU protocol) Accessory for the processing of counter values in the PF-controller (controlling of reactive power related to counter impulses instead of current transformer) Allows processing of counter values via Windows-software MMI-energy (included in the delivery): cost centre management, visualization and evaluation Cross-linking of up to 32 devices (UCM-5, MMI6000, MMI7000) at MODBUS Evaluation software MMI-energy included in the delivery <p>Evaluation software MMI-energy for PC (Windows-compatible, included in the delivery)</p> <ul style="list-style-type: none"> Storage, display and evaluation of power and energy data on PC Single user and network solution available Graphical and numerical cost centre evaluation Supports UCM-5, MMI6000, MMI7000, BR6000, BR7000 at one bus (up to max. 32 devices possible) Zoom function, print function Parameterization of the device 	<p>Discharge resistor block EW-22 Discharge resistor for all types of TSM-LC to achieve fast discharging. At least one piece per step required.</p> <p>Current limitation reactor BD-xxx (not suitable for TSM-HV) Protection of thyristor modules in PFC systems without reactor TSM-LC-I: BD-50*) TSM-LC10: BD-50*) or BD-100 TSM-LC25, TSM-LC50: BD-100 TSM-LC100: BD-200</p>	<p>1x Flexible current clamp "Mini-Flex MMI7000-3" 3x Flexible current clamps "Mini-Flex MMI7000-3"</p>
Ordering code			
	B44066R1411E230	Discharge resistor block EW-22: B44066T0022E400 Current limitation reactor BD-xxx: B44066T0***E400	1x Flexible current clamp: B44066M1301E230 3x Flexible current clamps: B44066M1303E230

*BD-50 production only after ordering

Power Factor Correction: Accessories



Accessories			
			
	Plastic protective case	Plastic protective terminal cover modules for capacitor series	Discharge resistors and discharge
Features			
	Protection class IP54 PhaseCap Premium capacitors	Protection class IP54 PhaseCap Premium PhaseCap Compact (n/a for Ø 100 mm), MKV	Available on request for PhaseCap Premium, PhaseCap Compact, PhaseCap HD, PhiCap B32344 series and MKV capacitors.
Ordering code			
	Capacitor d x h: 116 x 164 mm: B44066X9122 116 x 200 mm: B44066X9142 136 x 200 mm: B44066X9142	PhaseCap: Capacitor d x h: 116 x 164 mm: B44066K0135A000 116 x 200 mm: B44066K0160A000 136 x 200 mm: B44066K0210A000 PhiCap: Capacitor Ø: 53 mm: B44066K0530A000 ¹⁾ 63.5 mm: B44066K0635A000 ¹⁾ 75 mm: B44066K0795A000 85 mm: B44066K0895A000	On request

¹⁾Protection class IP20

Important information: Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products. We expressly point out that these statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. It is incumbent on the customer to check and decide whether a product is suitable for use in a particular application. This publication is only a brief product survey which may be changed from time to time. Our products are described in detail in our data sheets. The *Important notes* (www.epcos.com/ImportantNotes) and the product-specific *Cautions and warnings* must be observed. All relevant information is available through our sales offices.

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