

STANDARDS

Transformers Power Supplies Switch Mode Power Supplies DC-UPS





Innovation is our standard

The foundation stone of our medium-sized company was laid over 50 years ago, and in that time, the company's name has stood for continuity in the production and development of electrical and electronic devices and components. Today, the range of multipurpose standard solutions and individual user-friendly developments sets the standard in the fields of power supply units, transport systems and textile machine systems.

Renowned customers from around the world have profited from our best value philosophy, which we have implemented both consistently and conscientiously. The products and system solutions resulting from this philosophy have proved their value both in a technical and functional sense and also through their price-performance ratio. This excellent reputation for high quality reflects the efforts of the company to meet the highest standards of efficiency, engineering and state-of-the-art production.

Right from the first idea up to the complete solution, Frei is able to provide all-round competence from a single source. This is mirrored in the planning and construction divisions, which possess state-of-the-art computer systems, fully-equipped machining and testing sections and, in particular, in the highly qualified and committed employees with their outstanding level of specialist knowledge.

This is the starting point both for innovative and individual solutions and for on-going optimisation of existing products, in order both to strengthen our market position and to find the fastest route to the customer with the help of our service-orientated sales organisation.

Half a century after our foundation, technical curiosity is still at the heart of our company's research and activities. We are always trying to find new avenues. Why not test our experience and competence? We are always able to find the optimum solution, which is both economically viable and which provides a long return on investment – even for the most difficult problem.



HEWLETT
PACKARD

For use with CSA certified HP PC Equipment and their Accessories only

220-240V ~ / 100-120V ~
50-60Hz 300VA max.

220-240V ~ T1 BE 250V
100-120V ~ T3 2A 250V

POWER

RS-232

19 V ~

19 A ~

ABB

23VG23
24 V / 2 A

PE
N
L1

K 1
K 2
LB 1
LB 2
Uf 2
Uf 1
-Ub
+Ub
-Ua
-Ua
+Ua
+Ua

F 2 (2.5 A/F)




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Single-Phase Safety Transformer

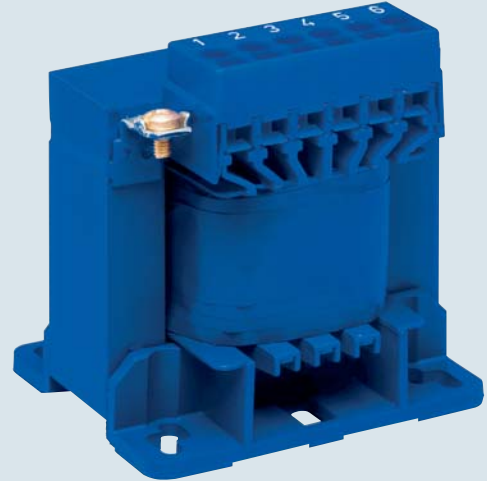


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SERIES W 40 to W 160 (FTE)

According to VDE 0570 / EN 61558 part 2 – 6 

- Shell-type transformer / EI configuration
- Performance range 63 – 250 VA, Frequency 50 / 60 Hz
- Protective system IP 00, mounting suitability to IP 20
- Class I construction, Insulation class T40 / B
- Separate windings
- Screw terminals on primary side with self-lifting disk for wire cross sections up to 1,5 mm²
- Additional push-on terminal 2,8 x 0,8 DIN 46244
- Footplate for mounting
- Contact protection to VBG 4
- Standard bolt-on dimensions to DIN 41308 (e' x f')





Technical Data

Nominal power VDE  [VA]	Series  [VA]	Snap fastening optional W	No-load loss approx. [W]	Voltage drop approx. [%]	Efficiency approx. [%]	Weight approx. [kg]	
							W
63	50	40	•	5	10,4	80	1,1
90	70	60	•	6	9,5	83	1,4
120	100	90	•	9	8,3	85	2,0
200	140	125	–	12	10,0	87	2,8
250	180	160	–	15	8,3	88	3,2



- Snap fastening optional available

Ordering Data

Nominal power VDE  [VA]	Series  [VA]	Part No. W	230 V	400 V
			24 V	24 V
63	50	W 40-	80.00	81.00
90	70	W 60-	80.00	81.00
120	100	W 90-	80.00	81.00
200	140	W 125-	80.00	81.00
250	180	W 160-	80.00	81.00

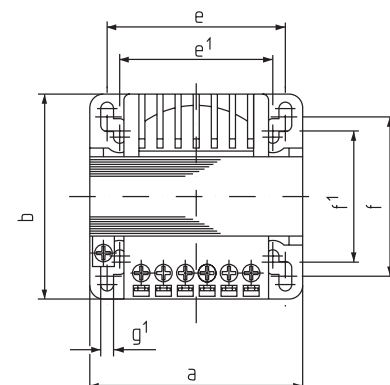
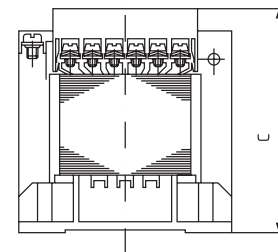
Other voltages on request

Special feature

- Replaceable thermal fuse
- Snap fastening on rail DIN EN 50022-35 for W 40 – W 90
- Snap fastening for
W 40/W 60 X140100-00001
W 90 X140100-00002
-  



Dimensions [mm]

a	b	c	e	e'	f	f'	g
78	70	82	65	55	52	45	4,8
84	71	87	70	64	55	47	4,8
84	86	87	70	64	70	61	4,8
105	86	100	88	80	62	62	5,3
105	96	100	88	80	70	70	5,3

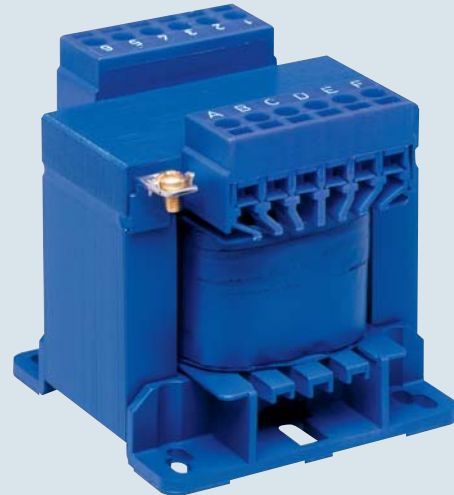






SERIES L 40 bis L 160 (FST)



According to VDE 0570 / EN 61558 part 2 – 2/4  

- Shell-type transformer / EI configuration
- Performance range 63 – 250 VA, Frequency 50/60 Hz
- Protective system IP 00, mounting suitability IP 20
- Class I construction, Insulation class T 40/B
- Separate windings, primary 2 tapping $\pm 5\%$
- Screw terminals on primary side with self-lifting disk for wire cross sections up to 1,5 mm²
- Additional push-on terminal 2,8 x 0,8 DIN 46244
- Footplate for mounting
- Contact protection to VBG 4
- Standard bolt-on dimensions to DIN 41308 (e' x f')





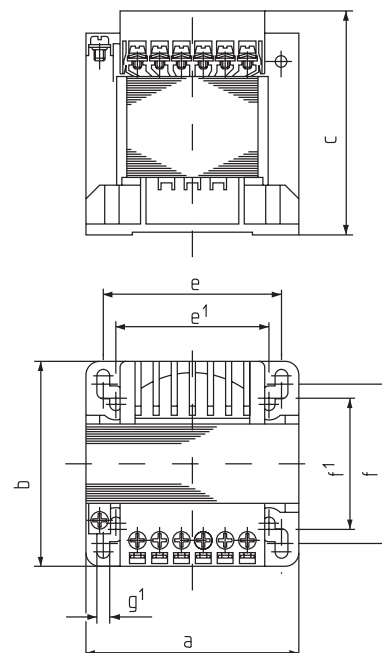
Technical Data							
Nominal power VDE  [VA]	Series  L	Short surge power DKB cos φ 0,5 [VA]	No-load loss approx. [W]	Voltage drop approx. [%]	Efficiency approx. [%]	Weight approx. [kg]	
63	50	40	145	5	9,5	80	1,1
90	70	60	190	6	8,8	83	1,4
120	100	90	270	9	9,7	85	2,0
200	140	125	460	12	8,6	87	2,8
250	180	160	625	15	8,4	88	3,2

Dimensions [mm]							
a	b	c	e	e'	f	f'	g
78	69	82	65	56	52	42	4,8
84	71	87	70	64	55	47	4,8
84	85	87	70	64	68	61	4,8
105	86	100	88	80	62	62	5,3
105	96	100	88	80	70	70	5,3

Ordering Data								
Nominal power VDE  [VA]	Series  L	Part No.	230 V $\pm 5\%$		230 V $\pm 5\%$		230 V $\pm 5\%$	
			230 V	230 V	420 / 440 / 500 V $\pm 5\%$	230 V	230 V 24 V	400 V $\pm 5\%$
63	50	L 40-	75.00	76.00	77.00	78.00	79.00	
90	70	L 60-	75.00	76.00	77.00	78.00	79.00	
120	100	L 90-	75.00	76.00	77.00	78.00	79.00	
200	140	L 125-	75.00	76.00	77.00	78.00	79.00	
250	180	L 160-	75.00	76.00	77.00	78.00	79.00	

Other voltages on request

Special feature	
• Replaceable thermal fuse	
• Snap fastening on rail DIN EN 50022-35 for L 40 – L 90	
• Snap fastening for	
L 40/L 60	X140100-00001
L 90	X140100-00002
•  	





Single-Phase Control Transformer



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SERIES U 200 to U 1450 (SETB)

According to VDE 0570 / EN 61558 part 2 – 2/4  

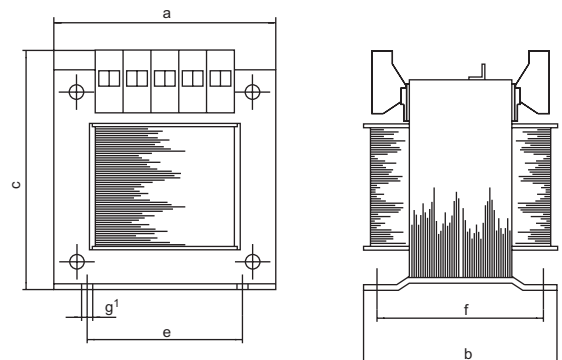
- Shell-type transformer / EI configuration
- Performance range 320 – 2500 VA
- Frequency 50/60 Hz
- Insulation class T 40/B
- Protective system IP 00, mounting suitability to IP 20, Class I construction
- Separate windings, primary 2 tapping $\pm 5\%$
- Vacuum-impregnated
- Transformer terminals
- Footplate for mounting
- Contact protection to VBG 4
- Standard bolt-on dimensions to DIN 41308



Technical Data						
Nominal power [VA]	Series U	Short surge power DKB $\cos \varphi 0,5$ [kVA]	No-load loss approx. [W]	Voltage drop approx. [%]	Efficiency approx. [%]	Weight approx. [kg]
320	200	0,76	14	7,0	89	4,2
400	250	1,1	19	7,0	90	5,2
500	280	1,35	22	5,5	91	6,9
630	450	1,5	21	5,5	91	7,8
800	550	2,0	35	5,0	92	10,1
1000	650	2,6	45	4,3	93	13,6
1600	1050	4,1	80	3,3	95	16,7
2500	1450	6,2	100	2,7	95	24,0

Dimensions [mm]					
a	b	c	e	f	g ¹
120	93	120	90	73	5,8
120	104	120	90	85	5,8
120	124	120	90	106	5,8
150	122	155	122	90	7,0
150	140	155	122	106	7,0
150	165	155	122	134	7,0
174	160	170	135	121	7,0
192	185	190	170	140	8,5



Ordering Data						
Nominal power [VA]	Part No. U	230 V $\pm 5\%$ 230 V	400 V $\pm 5\%$ 230 V	420 / 440 / 500 V $\pm 5\%$ 230 V	230 V $\pm 5\%$ 24 V	400 V $\pm 5\%$ 24 V
320	U 200-	75.00	76.00	77.00	78.00	79.00
400	U 250-	75.00	76.00	77.00	78.00	79.00
500	U 280-	75.00	76.00	77.00	78.00	79.00
630	U 450-	75.00	76.00	77.00	78.00	79.00
800	U 550-	75.00	76.00	77.00	78.00	79.00
1000	U 650-	75.00	76.00	77.00	78.00	79.00
1600	U 1050-	75.20	76.20	77.20	78.20	79.20
2500	U 1450-	75.20	76.20	77.20	78.20	79.20



Special feature

- Up to 850/750 VA total power with UL/CSA approval available

SERIES N 2,4 to N 10,0 (SETLB)

According to VDE 0570 / EN 61558 part 2 – 2/4  

- Shell-type transformer / UI configuration
- Performance range 3,2 – 12,0 kVA
- Frequency 50/60 Hz
- Insulation class T 40/B
- Protective system IP 00, mounting suitability to IP 20, Class I construction
- Separate windings, primary 2 tapping $\pm 5\%$
- Vacuum-impregnated
- Terminal blocks
- Footplate for mounting
- Contact protection to VBG 4
- With air duct, vertical mounting position
Horizontal installation will reduce power by about 10%

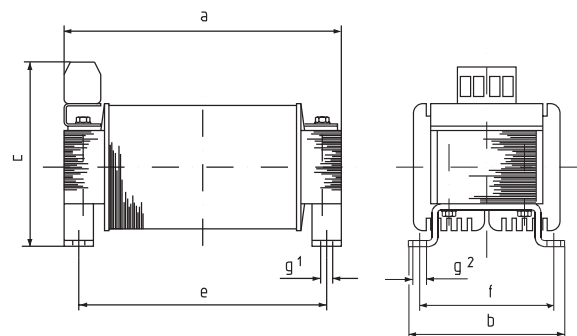


Technical Data						
Nominal power [kVA]	Series N	Short surge power DKB $\cos \varphi 0,5$ [kVA]	No-load loss approx. [W]	Voltage drop approx. [%]	Efficiency approx. [%]	Weight approx. [kg]
3,2	2,4	9,3	57	3,7	94,5	27,0
4,0	2,5	9,8	56	3,5	95,0	32,0
5,0	3,0	11,9	89	2,9	95,5	40,0
6,3	4,0	16,1	103	2,5	96,0	50,0
8,0	5,0	16,5	112	2,5	96,0	65,0
10,0	7,5	22,9	145	2,1	96,5	80,0
12,0	10,0	30,0	160	2,1	96,7	100,0



Dimensions [mm]						
a	b	c	e	f	g ¹	g ²
260	200	210	208	178	13	9
300	225	210	240	194	13	9
315	240	200	256	208	13	9
315	240	230	256	208	13	9
370	280	220	296	243	16	12
370	280	250	296	243	16	12
370	280	280	296	243	16	12

Ordering Data			
Nominal power [kVA]	Part No. N	400 V $\pm 5\%$ 2 x 115 V	Ex stock
3,2	N 2,4-	86.20	•
4,0	N 2,5-	86.20	•
5,0	N 3,0-	86.20	–
6,3	N 4,0-	86.20	–
8,0	N 5,0-	86.20	–
10,0	N 7,5-	86.20	–
12,0	N 10,0-	86.20	–

Other voltages on request



SERIES Q 60 to Q 1450 (USTN/USTB)

According to VDE 0570 / EN 61558 part 2 – 2/4  

- Shell-type transformer / EI configuration
- Performance range 80 – 2000 VA
- Frequency 50/60 Hz
- Insulation class T40/B
- Protective system IP 00, mounting suitability to IP 20, Class I construction
- Separate windings, primary 200 – 500 V switchable
- Vacuum-impregnated up to Q 200
- Transformer terminals
- Footplate for mounting
- Contact protection to VBG 4
- Standard bolt-on dimensions to DIN 41308



Technical Data

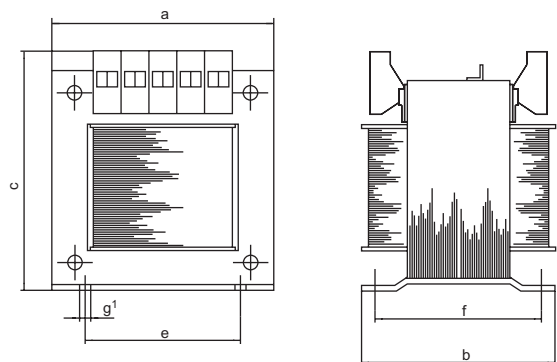
Nominal power [VA]	Series Q	Short surge power DKB cos φ 0,5 [VA]	No-load loss approx. [W]	Voltage drop approx. [%]	Efficiency approx. [%]	Weight approx. [kg]
80	60	170	6	15,0	82	1,5
100	90	240	9	11,0	84	2,1
160	125	410	12	10,0	86	3,0
200	160	560	15	8,3	87	3,4
250	200	585	18	8,8	87	4,2
320	250	945	22	7,3	89	5,2
400	280	1170	26	7,1	89	6,9
500	450	1570	30	6,6	90	7,8
630	550	1800	35	5,5	91	10,1
800	650	2400	45	4,8	92	13,6
1300	1050	3935	31	4,1	93	16,7
2000	1450	6575	45	3,2	94	24,0

Dimensions [mm]

a	b	c	e	f	g ¹
85	88	93	64	51	4,8
85	102	93	64	63	4,8
105	90	108	80	63	5,8
105	92	108	80	71	5,8
120	93	120	90	73	5,8
120	104	120	90	85	5,8
120	124	120	90	106	5,8
150	122	155	122	90	7,0
150	140	155	122	106	7,0
150	165	155	122	134	7,0
174	160	170	135	121	7,0
192	185	190	170	140	8,5

Ordering Data

Nominal power [VA]	Part No. Q	200 – 550 V 2 x 115 V	200 – 550 V 19/24/29/42/48 V switchable	Primary stress [V]
80	Q 60-	89.00	99.20	200/220/230/
100	Q 90-	89.00	99.20	250/270/280/
160	Q 125-	89.00	99.20	330/350/370/
200	Q 160-	89.00	99.20	380/390/400/
250	Q 200-	89.00	99.20	420/430/440/
320	Q 250-	89.00	99.20	450/470/490/
400	Q 280-	89.00	99.20	500/550 V
500	Q 450-	89.00	99.20	
630	Q 550-	89.00	99.20	
800	Q 650-	89.00	99.20	
1300	Q 1050-	89.20	–	
2000	Q 1450-	89.20	–	





Special feature

- Up to 850/1000 VA total power with UL/CSA approval available



SERIES P 2,4 to P 2,5 (USTLB)

According to VDE 0570 / EN 61558 part 2 – 2/4  

- Shell-type transformer / UI configuration
- Performance range 2,6 – 3,2kVA
- Frequency 50 / 60 Hz
- Insulation class T40 / B
- Protective system IP 00, mounting suitability to IP 20, Class I construction
- Transformer terminals
- Footplate for mounting
- Contact protection to VBG 4
- With air duct, vertical mounting position
- Horizontal installation will reduce power by about 10%

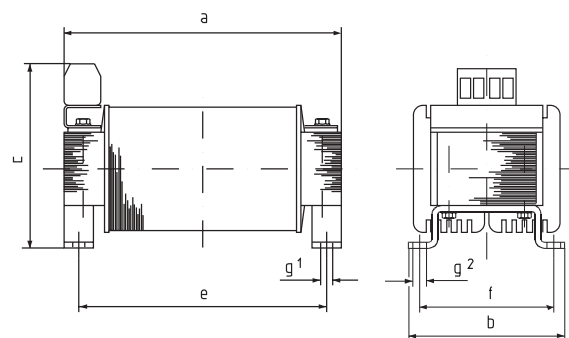


Technical Data						
Nominal power	Series-	Short surge power	No-load-loss	Voltage-drop	Efficiency	Weight
[kVA]	P	DKB cos φ 0,5 [kVA]	approx. [W]	approx. [%]	approx. [%]	approx. [kg]
2,6	2,4	6,3	57	3,7	94,5	27,0
3,2	2,5	7,4	56	3,5	95,0	32,0

Dimensions [mm]						
a	b	c	e	f	g ¹	g ²
260	200	210	208	178	13	9
300	225	210	240	194	13	9

Ordering Data		
Nominal power	Part No.	Primary stress
[kVA]	P	200/220/230/250/270/280/330/350/370/380 400/420/430/440/450/470/490/500/550 V Secondary stress 2 x 115 V
2,6	P 2,4-	89.20
3,2	P 2,5-	89.20

Other voltages on request



SERIES W 60 to W 160, S 250 to S 650 (SFTE/STEBL)

According to VDE 0570 / EN 61558 part 2 – 13 ϕ

- Shell-type transformer / EI configuration
- Performance range 1,5 – 17,5 A, Frequency 50 / 60 Hz
- Without galvanic isolation
- Protective system IP 00, mounting suitability to IP 20, Class I construction
- Insulation class T40 / B
- Footplate for mounting
- Contact protection to VBG 4

Series W 60 to W 160

- Screw terminals on primary side with self-lifting disk for wire cross sections up to 1,5 mm²
- Additional blade terminal 2,8 x 0,8 DIN 46244

Series S 250 bis S 650

- Vacuum-impregnated
- Bracket for wall mounting
- Transformer terminals



Technical Data					
Load current [A]	Series W	No-load loss [approx.W]	Voltage drop [approx.%]	Efficiency [approx.%]	Weight [approx. kg]
1,5	W 60	6	7,0	83	1,4
2,0	W 90	9	5,0	85	2,0
3,5	W 125	12	4,5	87	2,8
4,2	W 160	15	4,0	88	3,2

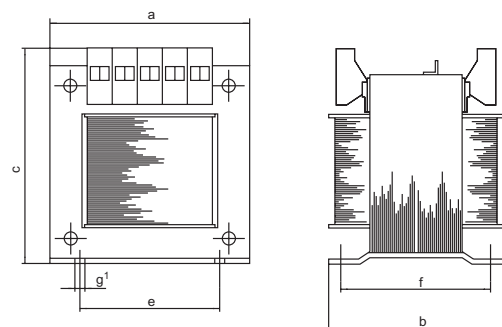
Series S					
Load current [A]	Series S	No-load loss [approx.W]	Voltage drop [approx.%]	Efficiency [approx.%]	Weight [approx. kg]
7,5	S 250	22	3,0	90	5,2
10,5	S 300	26	3,0	90	6,6
12,5	S 450	30	3,0	91	7,8
15,0	S 550	35	2,5	92	10,1
17,5	S 650	45	2,5	92	13,6

Ordering Data		
Load current [A]	Part No. W/S	Primary stress 230 V Secondary stress 80/100/125/150/175/200/230 V
1,5	W 60-	83.00
2,0	W 90-	83.00
3,5	W 125-	83.00
4,2	W 160-	83.00
7,5	S 250-	83.20
10,5	S 300-	83.20
12,5	S 450-	83.10
15,0	S 550-	83.10
17,5	S 650-	83.20

Other voltages on request

Dimensions [mm]					
a	b	c	e	f	g ¹
84	71	87	64	47	4,8
84	86	87	64	61	4,8
105	86	100	80	62	5,8
105	96	100	80	70	5,8

Series S					
a	b	c	e	f	g ¹
120	104	120	90	85	5,8
135	108	135	104	87	5,8
150	112	150	122	90	5,8
150	135	150	122	106	7,0
150	160	150	122	134	7,0



Special feature	
• Replaceable thermal fuse W 60 – W 160	
• Snap fastening for DIN rail for W 60 and W 90	
• Snap fastening	
W 60	X140100-00001
W 90	X140100-00002



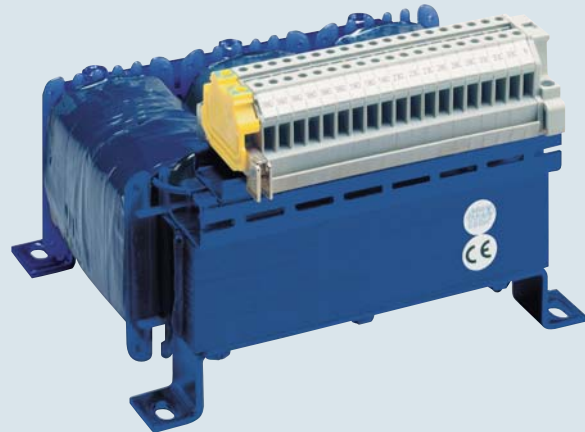
SERIES R 0,2 to R 2,0 (DTL / DTBL)

According to VDE 0570 / EN 61558 part 2 – 13 ⚡

- Three-limb core-type transformer / 3 UI configuration
- Performance range 2,2 – 19,0 A
- Frequency 50 / 60 Hz
- Insulation class T40 / B
- Protective system IP 00, mounting suitability to IP 20, Class I construction
- Vacuum-impregnated
- Footplate for mounting
- Contact protection to VBG 4
- Up to type R 1,0 with air duct
- With air duct, vertical mounting position
- Different mounting position will reduce power by about 10 %

Controlling

- Autotransformer
- Vector group: Yna0

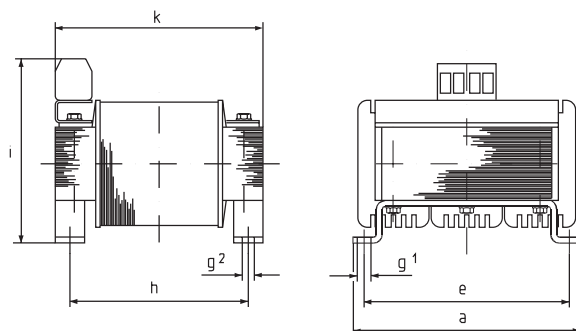


Technical Data					
Load current [A]	Series R	No-load loss [approx.W]	Voltage drop [approx.%]	Efficiency [approx.%]	Weight [approx. kg]
2,2	0,2	20	4,0	89,0	6,0
4,3	0,3	30	3,0	90,0	9,1
5,2	0,5	35	2,5	91,0	10,8
8,0	0,75	50	2,5	92,0	15,0
11,5	1,0	63	2,5	92,5	20,0
14,3	1,5	70	2,0	93,0	23,0
19,0	2,0	85	2,0	93,8	28,0

Dimensions [mm]						
a	k	i	e	h	g ¹	g ²
155	140	121	140	110	7	11
185	180	130	167	130	7	11
185	175	140	167	130	7	11
214	200	155	194	154	7	11
246	225	155	223	176	7	11
246	235	180	223	176	7	11
270	235	190	248	188	9	13


Ordering Data		
Load current [A]	Part No.	Primary stress 400 V Secondary stress 190/240/295/350/400 V
2,2	R 0,2-	84.01
4,3	R 0,3-	84.01
5,2	R 0,5-	84.01
8,0	R 0,75-	84.01
11,5	R 1,0-	84.01
14,3	R 1,5-	84.01
19,0	R 2,0-	84.01

Other voltages on request





SERIES FGSE

According to VDE 0570 / EN 61558 part 2 – 6 

- Ripple < 5 %
- Open mounting version
- Nominal current range 1 – 6 A
- Protective system IP 00
- Transformer according to VDE 0570 part 2 – 6, Class I construction
- Ambient temperature 60°C max.
- Screw terminals on primary side with self-lifting disk for wire cross sections up to 1,5 mm²
- Also flat plug connector 2,8 x 0,8 DIN 46244
- Footplate for mounting
- Short circuit protection by miniature fuse 5 x 20 in the DC circuit
- PFC to EN 61000-3-2
- Contact protection to VBG 4
- Nominal output voltage 24V_{DC} according to 19240
- Off-load voltage < 30,2 V_{DC} with 6 % line over voltage
- Full-load voltage > 20,4 V_{DC} with 10 % line under voltage
- LED “on” indicator



Installation

- Wall mounted, terminals horizontal top and bottom
- Different mounting position will reduce power by about 20 %

Technical Data

Nominal output current [A]	Part No. Input voltage 230 V ± 5%	Transf. Primary current approx. [A]	Part No. Input voltage 400 V ± 5%	Transf. Primary current approx. [A]	Weight approx. [kg]
1,0	145-113	0,2	145-113.001	0,12	1,3
1,6	145-114	0,25	145-114.001	0,15	1,3
2,5	145-125	0,4	145-125.001	0,25	2,2
3,15	145-116	0,5	145-116.001	0,3	2,2
4,0	145-117	0,6	145-117.001	0,35	3,6
6,0	145-119	1,0	145-119.001	0,6	3,6

Dimensions [mm]

a	b	c	e	e'	f	f'	g
78	70	112	65	55	52	45	4,8
78	70	112	65	55	52	45	4,8
84	86	118	70	64	70	61	4,8
84	86	118	70	64	70	61	4,8
105	96	140	88	80	70	70	5,3
105	96	140	88	80	70	70	5,3

Ordering Data

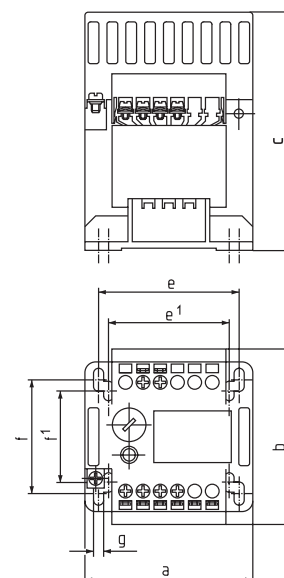
Nominal output current [A]	Part No. 230 V ± 5 % 24 V _{DC}	Part No. 400 V ± 5 % 24 V _{DC}	Part No. 230 / 400 V ± 15 V 24 V _{DC}
1,0	145-113	145-113.001	145-113.010
1,6	145-114	145-114.001	145-114.010
2,5	145-125	145-125.001	145-125.010
3,15	145-116	145-116.001	145-116.010
4,0	145-117	145-117.001	145-117.010
6,0	145-119	145-119.001	145-119.010

Other voltages on request

Special feature

- Snap fastening on rail DIN EN 50022 - 35 (not available for 145-117/145-117.001/145-119/145-119.001)
- Snap fastening for

145 – 113	} X140100-00001
145 – 114	
145 – 125	} X140100-00002
145 – 116	





SERIES ESKE

According to VDE 0570 / EN 61558 part 2 – 6

- Ripple < 5%
- Open mounting version
- Nominal current range 10 – 16A
- Protective system IP 00
- Transformer according to VDE 0570 part 2 – 6, Class I construction
- Earth-screen between windings
- Ambient temperature 60°C max.
- Connection to touch-protected screw terminals
- Footplate for mounting
- External fuse
- PFC to EN 61000-3-2
- Contact protection to VBG 4
- Nominal output voltage 24 V_{DC} according to DIN 19240
- Off-load voltage < 30,2 V_{DC} with 6 % line over voltage
- Full-load voltage > 20,4 V_{DC} with 10 % line under voltage

Installation

- Cooling fins vertical
- Different mounting position will reduce power by about 20 %



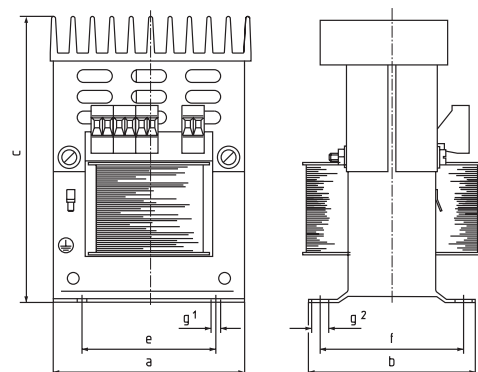
Technical Data				
Nominal output current [A]	Part No. Input voltage 230/400 V ± 15 V	Transf. Primary current approx. [A]	External sec. Fuse gL/gI [A]	Weight approx. [kg]
10,0	148-110	1,4/0,8	10	6,0
16,0	148-116	2,2/1,3	16	8,9

Dimensions [mm]						
a	b	c	e	f	g ¹	g ²
126	105	188	90	85	6,0	12,0
197	112	215	122	90	7,0	14,8

If your application needs more power, we recommend the use of our 3-phase power supplies DSK/DSKE (page 14 + 15) or the switched mode power supply series COMPETENT-COSMO (page 16 – 29).

Ordering Data	
Nominal output current [A]	Part No. 230/400 V ± 15 V 24 V _{DC}
10,0	148-110
16,0	148-116

Other voltages on request





Output behaviour

Behaviour of the power supply when operated outside the specified output values. The most important characteristics are:

- **Constant current mode**

When exceeding the nominal output current, the unit will turn into the constant current mode. The current will be constant, while the voltage decreases.

- **Fold-back mode**

When exceeding the nominal output current, the voltage and the current will decrease.

- **Hicc-up mode**

The unit will switch off, when the current exceeds the nominal value. It will try to switch on periodically to check if the overload still remains. When the overload has been removed, the power supply will switch on automatically.

- **Switch-off mode**

When overloaded, the power supply will switch off. It has to be switched on manually after removing the overload.

Response time

The time the power supply needs after a defined load change until the output voltage will be back within the specified tolerances.

Working temperature

The specified temperature range within which the power supply is allowed to be operated. —> Derating.

DC/DC Converter

A unit which converts a given DC-Voltage into another DC-Voltage by the use of switching technology.

Drift

Changes of output voltages due to the time or the temperature.

Inrush-Current

The peak current while switching on the power supply due to the charging current of the capacitors. Can be limited by the use of special electronic limiters, without this, it is only limited by the impedance of the input current.

Radio interference

Undesired high frequency energy, produced by the switching elements of a power supply. A distinction should be made between conducted and radiated interference.

Conducted interference can be reduced down to allowable values by the help of filters, radiated interference can be minimised with a suitable PC-board as well as by the means of shielding.

Isolation voltage

Isolation voltage is the maximum allowed voltage between two isolated circuits.

Cooling

The removal of the heat which is produced by the losses in the electronic parts. It is to distinguish between radiation and convection (natural and forced with a fan).

Short circuit protected

The protection of a power supply against overload and short circuit. There are different methods, —> Output behaviour.



Load regulation

Changes in the output voltage due to a defined change of the load at the specified output.

Storage temperature

The temperature range, in which the power supply can be stored, not operated, without damaging the unit.

Power factor $\cos \varphi$

The ratio of real power to apparent power. Due to the non-sinusoidal shape of the input current, normally the power factor of switch mode power supplies is below one.

Power derating

The necessary reduction of the output power under specified conditions, e.g. when exceeding a specified temperature.

Line regulation

The change at the output voltage with a defined change of the input voltage, while all other parameters stay constant.

Nominal output voltage

Output voltage which is specified for the power supply. The voltage may be adjusted in specified limits below and above the nominal value.

Temperature coefficient

Changing of the output voltage over the specified value, due to a rapid load change.

Hold-up time

The time, while the output voltage is still regulated, though the input voltage has disappeared.

Overshot

Increase of the output voltage over due to the changing of the temperature.

Over current protection

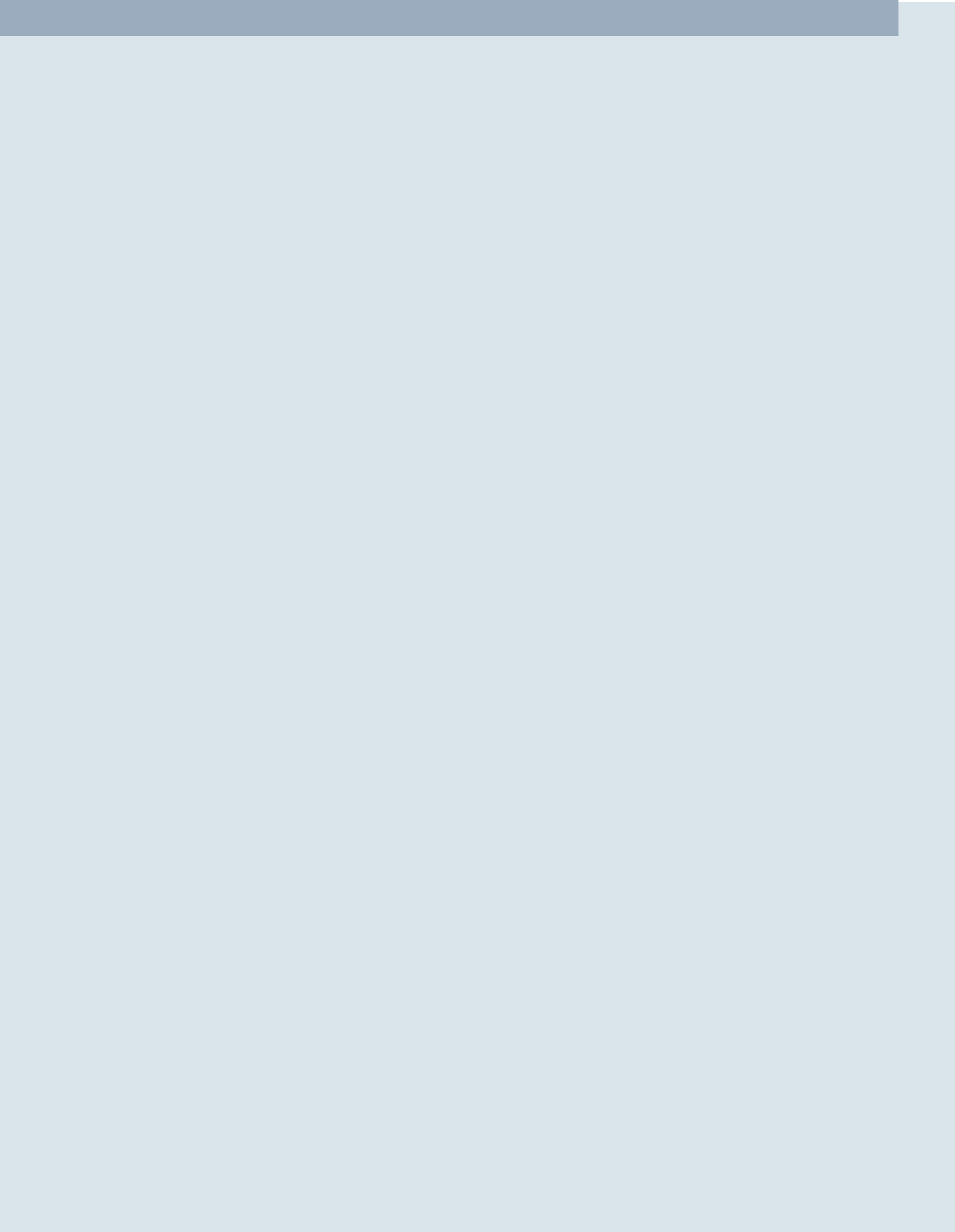
Protection against overload of a power supply due to a too high output current. —> Short circuit protection

Ambient temperature

Temperature of the air in which the power supply is operated. Normally it is measured about 10 mm beneath the operating unit.

Efficiency

The ratio of the output power to the input power, expressed as a percentage. Normally specified at maximum load and nominal input voltage. The efficiency is one of the most important specifications of a power supply. The difference between input power and output power is converted into heat. The improvement of the efficiency therefore means less heat and an improvement of the power losses and therefore a reasonable reduction of the heat.



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