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



Transformers

Introduction

Overview






Single-phase transformers

Version	Rated power kVA	Rated input voltage V AC	Rated output voltage V AC	Protection class	Page
4AM, 4AT safety, isolation, control and mains transformers					
4AM safety (mains transformers) and control transformers					
 4AM	with one input voltage	0.063 ... 1.0	230 ± 5 %; 400 ± 5 %; 440 ± 5 %; 500 ± 5 %	24; 42	I 10/4
	for European voltages	0.063 ... 1.0	400/230 ± 15 V	24; 42	I 10/4
 4AT	multi-voltage version	0.063 ... 1.0	550 ... 208; 600 ... 230	24; 42	I 10/4
4AM safety transformers (mains transformers)					
	with one input voltage	0.025 ... 0.04	230 ± 5 %; 400 ± 5 %; 440 ± 5 %; 500 ± 5 %	24; 42	I 10/4
4AM, 4AT isolation, control and mains transformers					
	4AM and 4AT with one input voltage	4AM: 0.063 ... 2.5; 4AT: 4 ... 10	230 ± 5 %; 400 ± 5 %; 440 ± 5 %; 500 ± 5 %	110; 2 × 115; 230	I 10/4
 4BT	4AM and 4AT with one input voltage, without cULus	4AM: 0.063 ... 2.5; 4AT: 4 ... 10	660 ± 5 %; 690 ± 5 %	230	I 10/4
	4AM in European voltage design	0.063 ... 2.5	400/230 ± 15 V	2 × 115	I 10/4
	4AM and 4AT in multi-voltage design	4AM: 0.063 ... 2.5; 4AT: 4 ... 10	550 ... 208; 600 ... 230	2 × 115	I 10/4
4AM isolation and mains transformers					
	4AM with one input voltage	0.025 ... 0.04	230 ± 5 %; 400 ± 5 %; 440 ± 5 %; 500 ± 5 %	110; 230	I 10/4
 4AX24	4AM and 4AT with one input voltage, without cULus	0.025 ... 0.04	660 ± 5 %; 690 ± 5 %	230	I 10/4
4AM, 4AT transformers with selectable voltages					
	4AM and 4AT safety, isolation, control and mains transformers and autotransformers	4AM: 0.025 ... 2.5; 4AT: 4 ... 16	selectable; 4AM: 12 ... 690 ¹⁾ ; 4AT: 24 ... 690 ¹⁾	selectable; 4AM: 12 ... 690 ¹⁾ ; 4AT: 24 ... 690 ¹⁾	I 10/4
4BT power transformers					
 4BT for supply of medical premises	4BT transformers with selectable voltages	18 ... 250	selectable; 100 ... 1000 ¹⁾	selectable; 100 ... 1000 ¹⁾	I 10/14
4AX22, 4AX23 safety transformers					
	resin-enclosed	0.1 ... 1	230	24; 42	II 10/17
4AX24 isolation transformers					
	resin-enclosed	0.16 ... 2.5	230	230	II 10/18
4AT isolation transformers					
 4AT for supply of medical premises	for supply of medical premises	2.5 ... 8	230	230-115	I 10/19
4FL, 4FK voltage regulators					
 4FK	4FL transformer-type	2.2 ... 63	230	230	I 10/20
	4FK magnetic-type	0.12 ... 0.75 1 ... 2.5 3.15 ... 10	230/selectable 110 ... 500 230/selectable 110 ... 500 400/selectable 110 ... 500	230/selectable 110 ... 500 230/selectable 110 ... 500 230/selectable 110 ... 500	I 10/21
4CH, 4CP variable-ratio transformers					
 4CH	4CH toroidal-core variable-ratio transformers	0.28 ... 3.22 0.69 ... 3.22	400 230	0 ... 230 stepless 0 ... 230 stepless	I 2) 10/21
	4CP pillar-type variable-ratio transformers	13.8 ... 207	400	0 ... 400 stepless	I 2) 10/21

1) **cULus** max. 600 V.

2) For more information see the Interactive Catalog CA 01 and the A&D Mall.

Three-phase transformers

Version	Rated power kVA	Rated input voltage V AC	Rated output voltage V AC	Protection class	Page
4AP, 4AU safety, isolation, control and mains transformers					
4AP, 4AU isolation, control and mains transformers					
 4AP20	4AP and 4AU in two-voltage version	0.63 ... 16	Y 500-400 / Δ 289-230	Y 400 / Δ 230	I 10/28
	4AP and 4AU in multi-voltage version	0.63 ... 16	Y 520 ... 360 / Δ 300 ... 208	Y 400 / Δ 230	I 10/28
4AP isolation and mains transformers					
	in two-voltage version	0.16 ... 0.4	Y 500-400 / Δ 289-230	Y 400 / Δ 230	I 10/28
4AP, 4AU transformers with selectable voltages					
 4AU	4AP and 4AU safety, isolation, control and mains transformers and autotransformers	4AP: 0.16 ... 5; 4AU: 6.3 ... 16	selectable; 4AP: 12 ... 690 ¹⁾ ; 4AU: 24 ... 690 ¹⁾	selectable; 4AP: 12 ... 690 ¹⁾ ; 4AU: 24 ... 690 ¹⁾	I 10/28
	4BU power transformers				
 4BU	4BU matching transformers with one input voltage	18 ... 180 ²⁾	Δ 400, 400 ± 5 %, 440, 440 ± 5 %, 480, 480 ± 5 %/ Y 400, 400 ± 5 %, 440, 440 ± 5 %, 480, 480 ± 5 %	Y 208, 400	I 10/35
	4BU matching transformers with cULus approval with one input voltage	18 ... 180 ²⁾	Δ 400, 400 ± 5 %, 440, 440 ± 5 %, 480, 480 ± 5 %/ Y 400, 400 ± 5 %, 440, 440 ± 5 %, 480, 480 ± 5 %	Y 208, 400	I 10/35
 4BU	4BU transformers with selectable voltages	18 ... 400	selectable 100 ... 1000 ¹⁾	selectable 100 ... 1000 ¹⁾	I 10/35
	4AP, 4AU autotransformers				
	for matching purposes acc. to EN 61558-2-13	4AP: 5 ... 22.5; 4AU: 12.5 ... 50	4AP, 4AU: 480 ... 380 4AP, 4AU: 480 ... 400 (380) ³⁾	4AP, 4AU: 400 4AP, 4AU: 230 (220) ³⁾	I 10/39
4FL voltage regulators					
	4FL transformer-type	6.8 ... 190	400	400	I 10/40
4CJ, 4CQ variable-ratio transformers					
 4FL	4CJ toroidal-core variable-ratio transformers	2.07 ... 9.66	400	0 ... 400 stepless	I 4)
	4CQ pillar-type variable-ratio transformers	16 ... 240	400	0 ... 400 stepless	I 4)

1) **cULus** max. 600 V.

2) For other ratings up to 400 kVA see the Interactive Catalog CA 01 and the A&D Mall.

3) Operating with 380 V AC three-phase at the input terminals results in an output voltage of 220 V AC three-phase.

4) For more information see the Interactive Catalog CA 01 and the A&D Mall.

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Overview

4AM../4AT.. transformers

With the right transformer, the right voltage will be available whatever the conditions.

Our transformers are the right choice for each application: They work reliably, safely and worldwide under a wide range of different conditions.

The transformers are configured in user-friendly combinations as isolation, control and mains transformers according to EN 61558-2-4, -2-2, -2-1, or as safety, control and mains transformers according to EN 61558-2-6, -2-2, -2-1, or as autotransformers according to EN 61558-2-13 with selectable input and output voltages.

Note: Mains transformers with ≤ 50 V on the output side are, in the case of SIRIUS transformers, always designed as safety transformers.

Our transformers offer optimal protection through high permissible ambient temperatures up to 40 °C or 55 °C, a high short-time rating in the case of control transformers, fuseless construction and due to its safety standard "Safety inside" EN 61558.

Design

Standards

EN 61558-2-6, -2-4, -2-2, -2-1, -2-13

The standard EN 61558 with the VDE classification VDE 0570 is the European edition of the international standard IEC 61558 (Safety of power transformers, power supply units and similar) and has completely replaced the previous standards VDE 0550 and VDE 0551.

Some of the transformers are subject to more stringent manufacturing and testing conditions in view of these changes.

Transformers for general applications always have double or reinforced insulation with SELV voltages (can be touched, maximum 50 V AC and 120 V DC), i.e. these transformers are exclusively safety isolation transformers.

Furthermore, all transformers are supplied with information on the protective elements with which they are protected against short-circuit and overload.

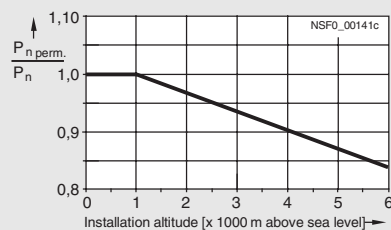
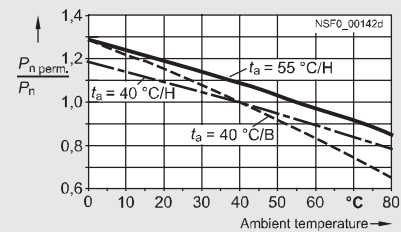
The SIRIUS transformer series contains the combined features of safety, isolation and control or mains transformers, i.e. one transformer for (virtually) all applications. SIRIUS transformers comply with the highest requirements (and with regard to safety the most stringent requirements) of the transformer designs contained in this catalog. A SIRIUS transformer is the right one whatever the application.

Rated output P_n at high ambient temperature – the reference for thermal load capacity

Reference conditions under which the transformers have the rated power P_n stated in the tables:

- Continuous operation P_n
- Frequency AC 50 Hz ... 60 Hz
- Degree of protection IP00
- Installation altitude up to 1000 m above sea level and
- Ambient temperature t_a , type-dependent 40 °C or 55 °C.

Other installation and operating conditions than this will affect the permissible continuous load capacity. In the case of the 4AM transformers, for example, with a low ambient temperature of 30 °C an increase in load of 8 % is possible (see load characteristics).



Load characteristics: Permissible transformer continuous load in relation to the ambient temperature and the installation altitude

Short-time rating $P_{shortt.}$ of control transformers – the characteristic variable for the dynamic capacity

The most important selection criterion for control transformers is their short-time rating $P_{shortt.}$. This is required for switching on electromagnetic loads, e.g. contactors with high making current in relation to the holding current. According to EN 61558-2-2 "Special requirements for control transformers" the output voltage with this load should not drop more than 5 % in relation to the rated voltage in order to ensure safe switching.

Depending on their application, control transformers 4AM and 4AT ≤ 16 kVA are optimized for high short-time ratings with comparatively low ratings and thus small size.

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Low inrush current – primary-side short-circuit and overload protection with standard circuit-breakers

The single-phase transformers 4AM and 4AT for the power range ≤ 16 kVA have been designed for protective devices which provide reliable protection against short-circuits or overloads.

Standard 3RV and 3VF circuit-breakers offer optimum protection. In this way the transformers are protected on the primary side against both short-circuits and overload, without the possibility of nuisance tripping on startup. The low inrush current, the short-circuit current and the thermal load capacity on overload are matched to the tripping characteristics of the circuit-breakers.

It is also possible to protect the transformers on the secondary side against short-circuits and overloads with circuit-breakers or miniature circuit-breakers with C characteristics.

Note: The specified primary-side circuit-breakers are for protecting the primary side of transformers in the event of short-circuits and overload on the secondary side. In the event of a possible short-circuit on the feeder lines between the protective device and the primary side of the transformer, the rated short-circuit breaking capacity of the circuit-breaker must be taken into account with regard to the maximum possible prospective short-circuit current at the place of installation. For these device assignments, see the tables in the "Technical specifications".

ASIST configuration tool

PC program for selecting control transformers in German, English and Danish.

The current version of the ASIST program is available on the Internet at

<http://www.siemens.com/sidac>

and can be downloaded.

EN 61558-2-2 requires that the short-time rating is stated on the rating plate only in the case of a power factor $p.f. = 0.5$ of the load. The short-time rating of control transformers essentially depends on the $p.f.$ of the load. This increases particularly with smaller power factors. The exact calculation of the short-time rating with related $p.f.$ is therefore even more important. The ASIST PC program has been developed as a configuration tool to minimize the time required to calculate the necessary type size, and ensures that the most suitable control transformer is selected in terms of engineering and price (see also "Technical specifications").

Design

Standard version

All 4AM and 4AT transformers are supplied for screw mounting on a mounting plate (exception: 4AM32 to 4AM40 transformers are supplied as standard for both screw-fixing and with integrated standard rail mounting).

Standard mounting rail fixing

All 4AM single-phase transformers from 25 VA to 500 VA offer a considerable saving potential in mounting requirements with snap-on mounting to the 35 mm standard mounting rail for horizontal mounting. For the 4AM single-phase transformers from 63 VA to 250 VA, snap-on mounting for the 35 mm standard mounting rail has been integrated into the fixing plate for the transformer as standard.

- Integrated version
The 4AM32, 4AM34, 4AM38, and 4AM40 single-phase transformers are supplied as standard for screw mounting as well as with an integrated snap-on mounting for the 35 mm standard mounting rail according to EN 50022.
- Optional version
4AM23, 4AM26, 4AM43, 4AM46 and 4AM48 single-phase transformers are supplied on request with a pre-mounted adapter for mounting on a 35 mm standard mounting rail.

Connections

Screw terminal

The 4AM transformers up to a rated current of 60 A and 4AT transformers up to a rated current of 81 A in the standard version are supplied with screw terminals.

For higher currents, the transformers are supplied with flat connections or with threaded pins.

Cage Clamp terminal

A large number of the 4AM single-phase transformers for currents ≤ 24 A can be supplied on request with screwless Cage Clamp terminals (no multi-voltage design possible). The ground connection is designed as a Cage Clamp terminal.

Enclosure mounting

4AM and 4AT transformers are also available in protective enclosures of the degree of protection IP23 and IP54.

Required specifications for requests and orders for 4AM and 4AT transformers with selectable voltages

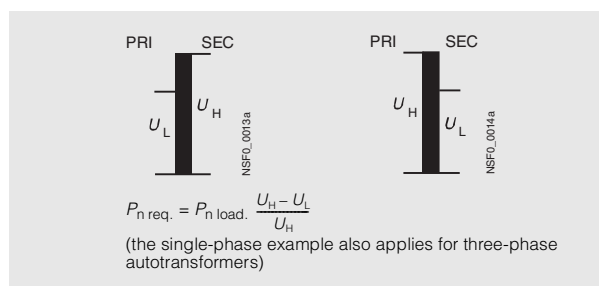
Rated power P_n (output division with separate SEC windings, $P_n = P_1 + P_2$, throughput rating = load rating for autotransformers), PRI and SEC voltages, frequency, vector group, degree of protection (power reduction with degrees of protection other than IP00), Order No. stem.

The Order No. stem is added to the Order No. for delivery.

Example:

Single-phase transformer with selectable voltages 0.16 kVA
PRI 415 V $\pm 5\%$, SEC 115 V,
Frequency 50 Hz ... 60 Hz,
Degree of protection IP00,
Shield winding,
Order No. stem 4AM38 4.

4AM and 4AT autotransformers: Determine the type rating P_n req.



Step-up transformer (figure on the left) and step-down transformer (figure on the right)

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Technical specifications

Transformers	Type	4AM	4AT
• Version		EI core	UI core
• Performance range (with IP00)	kVA	0.025 ... 2.5	> 2.5 ... 16
• Approvals		cULus	
Voltage range	V	≤ 690	
• Approvals for USA, Canada	V	≤ 600	
Rated frequency	Hz	50 ... 60	
Thermal class		B	H
• According to UL/CSA		Class 130	Class 180
Ambient conditions		Protection against harmful ambient conditions: Complete impregnation in polyester resin Climate-proof for mounting in rooms with an external climate to DIN 50010	
Rated ambient temperature			
• At rated output	°C	40	55
• Maximum value (after reduced output depending on load characteristics, (see "Design"))	°C	80	
• Minimum value	°C	-25	
Relative air humidity			
• Average up to	%	80	
• Maximum value for 30 days/year	%	95	
• At 40 °C occasionally	%	100	
Safety class		I	
Degree of protection			
• Without enclosure		IP00	
• With protective enclosure (according to "Selection and Ordering Data", see Catalog LV 1)		IP23 or IP54	
• Version		IP23, IP54: steel enclosure coated with epoxy resin, color gray RAL 7032	
Installation height		Up to 1000 m above sea level (above this, derating is necessary)	
Protective devices			
• External		The transformers can be protected against short-circuits and overload on the primary and secondary side with circuit-breakers. For reliable protection against short-circuits, overload and touch, the cables between the output terminals of the transformer and the load must have a negligible line impedance. For more details see DIN VDE 0100 (Erection of low-voltage systems) Part 410, Part 520 (particularly section 525) and part 610. Assigned protective devices (see "Technical Specifications")	
Connection technique		The permissible conductor cross-sections are assigned to the specified terminal types.	
• Terminal arrangement (see "Schematics")		Refer to DIN VDE 0298-4 and EN 60204 (VDE 0113-1) for the permissible conductor cross-sections for the specified current according to the installation type.	
• For terminal designs and connectable cross-sections (see "Project Planning Aids")		Other terminal sizes than standard versions on request.	
Mounting position		The permissible mounting position for each version is shown in the "Project Planning Aids".	

Further technical specifications can be found on the Internet at <http://www.siemens.com/sidac>.

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Rated power outputs at different ambient temperatures

- With galvanically isolated windings
- Degree of protection IP00
- According to EN 61558, **CE**

Transformer Type	Rated power P_n kVA	Permissible transformer load depending on the ambient temperature							
		$t_a = 60\text{ °C}$	$t_a = 55\text{ °C}$	$t_a = 50\text{ °C}$	$t_a = 45\text{ °C}$	$t_a = 40\text{ °C}$	$t_a = 35\text{ °C}$	$t_a = 30\text{ °C}$	$t_a = 25\text{ °C}$
4AM23 4	0.025	0.021	0.022	0.023	0.024	0.025	0.026	0.027	0.0278
4AM26 4	0.04	0.0336	0.0352	0.0368	0.0384	0.04	0.0416	0.0432	0.0444
4AM32 4	0.063	0.0529	0.0554	0.058	0.0605	0.063	0.0655 ¹⁾	0.068 ¹⁾	0.0699 ¹⁾
4AM34 4	0.1	0.084	0.088	0.092	0.096	0.1	0.104 ¹⁾	0.108 ¹⁾	0.111 ¹⁾
4AM38 4	0.16	0.134	0.141	0.147	0.154	0.16	0.166 ¹⁾	0.173 ¹⁾	0.178 ¹⁾
4AM40 4	0.25	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.278
4AM43 4	0.315	0.265	0.277	0.29	0.302	0.315	0.328	0.34	0.35
4AM46 4	0.4	0.336	0.352	0.368	0.384	0.4	0.416	0.432	0.444
4AM48 4	0.5	0.42	0.44	0.46	0.48	0.5	0.52	0.54	0.555
4AM52 4	0.63	0.529	0.554	0.58	0.605	0.63	0.655	0.68	0.699
4AM55 4	0.8	0.672	0.704	0.736	0.768	0.8	0.832	0.864	0.888
4AM57 4	1	0.84	0.88	0.92	0.96	1	1.04	1.08	1.11
4AM61 4	1.6	1.34	1.41	1.47	1.54	1.6	1.66	1.73	1.78
4AM64 4	2	1.68	1.76	1.84	1.92	2	2.08	2.16	2.22
4AM65 4	2.5	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.78
4AT30 3	4	3.88	4	4.12	4.24	4.4	4.52	4.64	4.76
4AT36 1	5	4.85	5	5.15	5.3	5.5	5.65	5.8	5.95
4AT36 3	6.3	6.11	6.3	6.49	6.68	6.93	7.12	7.31	7.5
4AT39 1	8	7.76	8	8.24	8.48	8.8	9.04	9.28	9.52
4AT39 3	10	9.7	10	10.3	10.6	11	11.3	11.6	11.9
4AT43 0	11.2	10.9	11.2	11.5	11.9	12.3	12.7	13	13.3
4AT43 1	12.5	12.1	12.5	12.9	13.3	13.8	14.1	14.5	14.9
4AT43 2	14	13.6	14	14.4	14.8	15.4	15.8	16.2	16.7
4AT45 0	16	15.5	16	16.5	17	17.6	18.1	18.6	19

1) For control transformers, the values $t_a = 40\text{ °C}$ apply.

Operating characteristics

- According to EN 61558-2-6, EN 61558-2-4, EN 61558-2-2, EN 61558-2-1

Transformer Type	Rated power P_n 50 Hz ... 60 Hz 1000 m above seal level Degree of protection IP00	Core size	Voltage rise in no-load operation (operating temperature) u_R approx.	Voltage drop on rated load ¹⁾ u_Z approx.	Short-circuit voltage ¹⁾ u_Z approx.	Efficiency η approx.
Type	kVA	%	%	%	%	%
4AM: $t_a = 40\text{ °C/B}$						
4AM23 4	0.025	EI 60/20	26	17.6	17.6	74
4AM26 4	0.04	EI 66/22	23	15.3	15.3	76
4AM32 4	0.063	EI 84/28	10	8.4	8.4	85
4AM34 4	0.1	EI 84/42	10	7.7	7.7	86
4AM38 4	0.16	EI 96/44	10.4	7.6	7.7	86
4AM40 4	0.25	EI 96/58	7.2	5.4	5.4	89
4AM43 4	0.315	EI 105/60	6.6	4.9	5	90
4AM46 4	0.4	EI 120/52	5.7	4.3	4.4	91
4AM48 4	0.5	EI 120/72	5	3.8	3.8	91
4AM52 4	0.63	EI 150/48	4.7	3.6	3.7	92
4AM55 4	0.8	EI 150/65	4	3	3.1	92
4AM57 4	1	EI 150/90	3.2	2.5	2.5	93
4AM61 4	1.6	EI 174/82	2.4	1.9	2.1	96
4AM64 4	2	EI 174/102	2.1	1.7	1.9	96
4AM65 4	2.5	EI 192/110	1.6	1.3	1.6	96
4AT: $t_a = 55\text{ °C/H}$						
4AT30 3	4	UI 150/75	3.9	2.8	2.8	95
4AT36 1	5	UI 180/75	5.6	3.9	3.9	94
4AT36 3	6.3	UI 180/75	4.4	3.1	3.2	95
4AT39 1	8	UI 210/70	4.4	3.1	3.2	95
4AT39 3	10	UI 210/70	3.5	2.5	2.8	96
4AT43 0	11.2	UI 240/80	3.9	2.8	2.8	95
4AT43 1	12.5	UI 240/80	3.5	2.5	2.6	96
4AT43 2	14	UI 240/80	3.1	2.2	2.4	96
4AT45 0	16	UI 240/107	2.9	2.1	2.1	96

Calculation of heat dissipation P_V

$$P_V = \frac{P_n (100 - \eta)}{\eta} \text{ [kW]}$$

1) Winding reference temperature 20 °C.

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Primary-side short-circuit and overload protection with motor starter protectors

Version with one input voltage

Transformer	Rated power P_n	Motor starter protector version: Motor protection ¹⁾	Rated input voltage U_{IN} in V																			
			690	660	600	575	550	525	500	480	460	440	415	400	380	240	230	220	208	200	190	
4AM23 4	0.025	3RV10 11-□□□10 Setting value in A	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0CA	0CA	0CA	0CA	0DA	0DA	
4AM26 4	0.04	3RV10 11-□□□10 Setting value in A	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0BA	0BA	0BA	0BA	0CA	0CA	0EA	0EA	0EA	0EA	0FA	0FA	
4AM32 4	0.063	3RV10 11-□□□10 Setting value in A	0BA	0BA	0BA	0BA	0CA	0CA	0CA	0CA	0CA	0DA	0DA	0DA	0DA	0FA	0GA	0GA	0GA	0GA	0GA	
4AM34 4	0.1	3RV10 11-□□□10 Setting value in A	0DA	0DA	0EA	0EA	0EA	0EA	0EA	0FA	0FA	0FA	0FA	0GA	0GA	0GA	0JA	0JA	0JA	0JA	0KA	0KA
4AM38 4	0.16	3RV10 11-□□□10 Setting value in A	0FA	0FA	0FA	0FA	0FA	0GA	0GA	0GA	0GA	0HA	0HA	0HA	0HA	0KA	0KA	1AA	1AA	1AA	1AA	
4AM40 4	0.25	3RV10 11-□□□10 Setting value in A	0HA	0HA	0HA	0HA	0JA	0JA	0JA	0JA	0JA	0KA	0KA	0KA	0KA	1BA	1BA	1CA	1CA	1CA	1CA	
4AM43 4	0.315	3RV10 11-□□□10 Setting value in A	0JA	0JA	0JA	0JA	0KA	0KA	0KA	0KA	1AA	1AA	1AA	1AA	1AA	1CA	1DA	1DA	1DA	1DA	1DA	
4AM46 4	0.4	3RV10 11-□□□10 Setting value in A	0KA	0KA	0KA	0KA	1AA	1AA	1AA	1AA	1AA	1BA	1BA	1BA	1BA	1DA	1DA	1EA	1EA	1EA	1EA	
4AM48 4	0.5	3RV10 11-□□□10 Setting value in A	1AA	1AA	1AA	1BA	1BA	1BA	1BA	1BA	1BA	1CA	1CA	1CA	1CA	1EA	1FA	1FA	1FA	1FA	1FA	
4AM52 4	0.63	3RV10 11-□□□10 Setting value in A	1AA	1BA	1BA	1BA	1BA	1BA	1CA	1CA	1CA	1CA	1DA	1DA	1DA	1FA	1FA	1FA	1GA	1GA	1GA	
4AM55 4	0.8	3RV10 11-□□□10 Setting value in A	1CA	1CA	1CA	1DA	1DA	1DA	1DA	1DA	1DA	1DA	1EA	1EA	1EA	1GA	1GA	1HA	1HA	1HA	1HA	
4AM57 4	1	3RV10 11-□□□10 Setting value in A	1DA	1DA	1DA	1DA	1EA	1EA	1EA	1EA	1EA	1EA	1FA	1FA	1FA	1HA	1HA	1JA	1JA	1JA	1JA	
4AM61 4	1.6	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1FA	1FA	1FA	1FA	1FA	1GA	1GA	1GA	1GA	1HA	1HA	1HA	1HA	1KA	--	--	--	--	--	
4AM64 4	2	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1GA	1GA	1GA	1GA	1HA	1HA	1HA	1HA	1HA	1JA	1JA	1JA	1JA	--	--	--	--	--	--	
4AM65 4	2.5	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1GA	1GA	1HA	1HA	1HA	1JA	1JA	1JA	1JA	--	--	--	--	--	--	--	--	--	--	
4AT30 3	4	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1JA	1JA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4AT36 1	5	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1KA	1KA	1KA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4AT36 3	6.3	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4AA	4AA	4BA	4BA	4BA	4BA	4CA	4CA	4CA	4CA	4DA	4DA	4DA	--	--	--	--	--	--	
4AT39 1	8	3RV10 21-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4BA	4BA	4CA	4CA	4CA	4DA	4DA	4DA	4DA	--	--	--	--	--	--	--	--	--	--	
4AT39 3	10	3RV10 21-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4CA	4CA	4DA	4DA	4DA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4AT43 0	11.2	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	4EA	4EA	4EA	4EA	4FA	4FA	4FA	4FA	4GA	4GA	4GA	4HA	--	--	--	--	--	--	
4AT43 1	12.5	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	4EA	4FA	4FA	4FA	4FA	4FA	4GA	4GA	4GA	4HA	4HA	--	--	--	--	--	--	--	
4AT43 2	14	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	4FA	4FA	4FA	4FA	4GA	4GA	4HA	4HA	4HA	--	--	--	--	--	--	--	--	--	
4AT45 0	16	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4FA	4FA	4GA	4GA	4HA	4HA	--	--	--	--	--	--	--	--	--	--	--	--	--	

1) Two-pole or single-pole motor starter protectors can be connected (3 conducting paths in series).

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Primary-side short-circuit and overload protection with motor starter protectors

European voltage and multi-voltage version

Trans- former	Rated power P_n	Motor starter protector ¹⁾	Rated input voltage U_{1N} in V																	
			690	660	600	575	550	525	500	480	460	440	415	400	380	240	230	220	208	200
Circuit-breaker version: Transformer protection																				
4AM23 4	0.025	3RV14 21-□□□10 Setting value in A	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0AA	0CA	0CA	0CA	0CA	0CA	0CA
4AM26 4	0.04	3RV14 21-□□□10 Setting value in A	0AA	0AA	0AA	0AA	0AA	0BA	0BA	0BA	0BA	0BA	0BA	0BA	0CA	0DA	0DA	0DA	0EA	0EA
4AM32 4	0.063	3RV14 21-□□□10 Setting value in A	0BA	0BA	0BA	0CA	0CA	0CA	0CA	0CA	0DA	0DA	0DA	0DA	0FA	0FA	0FA	0GA	0GA	0GA
4AM34 4	0.1	3RV14 21-□□□10 Setting value in A	0DA	0DA	0EA	0EA	0EA	0EA	0EA	0FA	0FA	0FA	0FA	0FA	0HA	0HA	0HA	0HA	0JA	0JA
4AM38 4	0.16	3RV14 21-□□□10 Setting value in A	0FA	0FA	0GA	0GA	0GA	0GA	0HA	0HA	0HA	0HA	0HA	0HA	0KA	0KA	0KA	1AA	1AA	1AA
4AM40 4	0.25	3RV14 21-□□□10 Setting value in A	0HA	0HA	0HA	0JA	0JA	0JA	0JA	0JA	0KA	0KA	0KA	0KA	1BA	1BA	1BA	1BA	1BA	1BA
4AM43 4	0.315	3RV14 21-□□□10 Setting value in A	0JA	0JA	0JA	0KA	0KA	0KA	0KA	0KA	0KA	0KA	0KA	1AA	1AA	1CA	1CA	1CA	1CA	1CA
4AM46 4	0.4	3RV14 21-□□□10 Setting value in A	0KA	0KA	0KA	1AA	1AA	1AA	1AA	1AA	1AA	1AA	1AA	1BA	1BA	1DA	1DA	1DA	1DA	1DA
4AM48 4	0.5	3RV14 21-□□□10 Setting value in A	1AA	1AA	1AA	1AA	1BA	1BA	1BA	1BA	1BA	1BA	1BA	1CA	1CA	1EA	1EA	1EA	1EA	1EA
4AM52 4	0.63	3RV14 21-□□□10 Setting value in A	1AA	1BA	1BA	1BA	1BA	1CA	1CA	1CA	1CA	1CA	1CA	1DA	1DA	1FA	1FA	1FA	1FA	1FA
4AM55 4	0.8	3RV14 21-□□□10 Setting value in A	1BA	1CA	1CA	1CA	1CA	1DA	1DA	1DA	1DA	1DA	1EA	1EA	1GA	1GA	1GA	1GA	1GA	1GA
4AM57 4	1	3RV14 21-□□□10 Setting value in A	1DA	1DA	1DA	1DA	1EA	1EA	1EA	1EA	1EA	1EA	1FA	1FA	1HA	1HA	1HA	1HA	1HA	1HA
4AM61 4	1.6	3RV14 21-□□□10 Setting value in A	1FA	1FA	1FA	1FA	1GA	1GA	1GA	1GA	1GA	1GA	1GA	1GA	1KA	1KA	1KA	1KA	1KA	1KA
4AM64 4	2	3RV14 21-□□□10 Setting value in A	1FA	1GA	1GA	1GA	1HA	1HA	1HA	1HA	1HA	1HA	1HA	1HA	4AA	4AA	4AA	4AA	4AA	4AA
4AM65 4	2.5	3RV14 21-□□□10 3RV14 31-□□□10 Setting value in A	1HA	1HA	1HA	1JA	1JA	1JA	1JA	1JA	1JA	1JA	1JA	1KA	1KA	4BA	4BA	4BA	4BA	4BA
Circuit-breaker version: Motor protection																				
4AT30 3	4	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1JA	1JA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4AT36 1	5	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1KA	1KA	1KA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4AT36 3	6.3	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4AA	4AA	4BA	4BA	4BA	4BA	4CA	4CA	4CA	4CA	4DA	4DA	4DA	--	--	--	--	--
4AT39 1	8	3RV10 21-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4BA	4BA	4CA	4CA	4CA	4DA	4DA	4DA	4DA	--	--	--	--	--	--	--	--	--
4AT39 3	10	3RV10 21-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4CA	4CA	4DA	4DA	4DA	--	--	--	--	--	--	--	--	--	--	--	--	--
4AT43 0	11.2	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	4EA	4EA	4EA	4EA	4FA	4FA	4FA	4FA	4GA	4GA	4GA	4HA	--	--	--	--	--
4AT43 1	12.5	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	4EA	4FA	4FA	4FA	4FA	4FA	4GA	4GA	4GA	4HA	4HA	--	--	--	--	--	--
4AT43 2	14	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	4FA	4FA	4FA	4FA	4GA	4GA	4HA	4HA	4HA	--	--	--	--	--	--	--	--
4AT45 0	16	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4FA	4FA	4GA	4GA	4HA	4HA	--	--	--	--	--	--	--	--	--	--	--	--

1) Two-pole or single-pole motor starter protectors can be connected (3 conducting paths in series).

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Secondary-side short-circuit and overload protection with motor starter protector or miniature circuit-breaker

Transformer	Rated power P_n	Motor starter protector version: Motor protection ¹⁾	Rated output voltage U_{2N} in V					Transformer	Rated power P_n	Miniature circuit-breaker	Rated output voltage U_{2N} in V		
			230	115	110	42	24				Type	kVA	Type
4AM23 4	0.025	3RV10 11-□□□10 Setting value in A	0AA	0DA	0DA	0HA	1AA	4AM23 4	0.025	5SX2 □□□-7	--	--	--
4AM26 4	0.04	3RV10 11-□□□10 Setting value in A	0CA	0FA	0FA	0KA	1CA	4AM26 4	0.04	5SX2 □□□-7	--	--	102
4AM32 4	0.063	3RV10 11-□□□10 Setting value in A	0EA	0HA	0HA	1BA	1EA	4AM32 4	0.063	5SX2 □□□-7	--	--	103
4AM34 4	0.1	3RV10 11-□□□10 Setting value in A	0GA	0KA	0KA	1DA	1GA	4AM34 4	0.1	5SX2 □□□-7	105	101	--
4AM38 4	0.16	3RV10 11-□□□10 Setting value in A	0JA	1BA	1BA	1FA	1JA	4AM38 4	0.16	5SX2 □□□-7	--	115	108
4AM40 4	0.25	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1AA	1DA	1DA	1HA	--	4AM40 4	0.25	5SX2 □□□-7	--	--	--
4AM43 4	0.315	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1BA	1EA	1EA	1JA	--	4AM43 4	0.315	5SX2 □□□-7	115	103	116
4AM46 4	0.4	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1CA	1FA	1FA	1KA	--	4AM46 4	0.4	5SX2 □□□-7	102	104	120
4AM48 4	0.5	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1DA	1GA	1GA	--	--	4AM48 4	0.5	5SX2 □□□-7	103	--	125
4AM52 4	0.63	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1EA	1HA	1HA	--	--	4AM52 4	0.63	5SX2 □□□-7	104	106	132
4AM55 4	0.8	3RV10 11-□□□10 3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	1FA	1JA	1JA	--	--	4AM55 4	0.8	5SX2 □□□-7	--	108	140
4AM57 4	1	3RV10 11-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	1GA	1KA	1KA	--	--	4AM57 4	1	5SX2 □□□-7	--	110	150
4AM61 4	1.6	3RV10 11-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	1JA	--	--	--	--	4AM61 4	1.6	5SX2 □□□-7	108	116	--
4AM64 4	2	3RV10 11-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	1KA	--	--	--	--	4AM64 4	2	5SX2 □□□-7	110	120	--
4AM65 4	2.5	3RV10 21-□□□10 3RV10 31-□□□10 3RV10 41-□□□10 3VF32 11-□□□□□-0AA0 Setting value in A	4AA	--	--	--	--	4AM65 4	2.5	5SX2 □□□-7	113	125	--
4AT30 3	4	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4CA	--	--	--	--	4AT30 3	4	5SX2 □□□-7	120	140	--
4AT36 1	5	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4EA	--	--	--	--	4AT36 1	5	5SX2 □□□-7	125	150	--
4AT36 3	6.3	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4FA	--	--	--	--	4AT36 3	6.3	5SX2 □□□-7	132	163	--
4AT39 1	8	3RV10 31-□□□10 3RV10 41-□□□10 Setting value in A	4GA	--	--	--	--	4AT39 1	8	5SX2 □□□-7	140	180	--
4AT39 3	10	3RV10 41-□□□10 Setting value in A	4JA	4MA	--	--	--	4AT39 3	10	5SX2 □□□-7	150	191	--

1) Two-pole or single-pole motor starter protectors can be connected (3 conducting paths in series).

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Short-time rating of control transformers $P_{shortt.}^{1)} = f(p.f.)$ for $U_2 = 0.95 \times U_{2N}$

Trans- former	Rated power P_n	Short-time rating $P_{shortt.}^{1)}$ with										Voltage rise in no-load operation (operating temperature)	Voltage drop on rated load (at 20 °C)	Short-circuit voltage (at 20 °C)
		p.f. = 0.1	p.f. = 0.2	p.f. = 0.3	p.f. = 0.4	p.f. = 0.5	p.f. = 0.6	p.f. = 0.7	p.f. = 0.8	p.f. = 0.9	p.f. = 1			
Type	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	u_A %	u_R %	u_Z %
4AM32 4	0.063	0.56	0.37	0.28	0.23	0.19	0.16	0.14	0.12	0.12	0.11	10	8.4	8.5
4AM34 4	0.1	0.96	0.62	0.46	0.37	0.31	0.26	0.23	0.21	0.19	0.17	10	7.7	7.7
4AM38 4	0.16	1.52	0.98	0.73	0.58	0.49	0.42	0.37	0.33	0.3	0.28	10.4	7.6	7.7
4AM40 4	0.25	2.5	1.62	1.24	1	0.85	0.74	0.66	0.59	0.54	0.51	7.2	5.4	5.4
4AM43 4	0.315	3.4	2.15	1.63	1.33	1.12	0.97	0.86	0.77	0.71	0.67	6.6	4.9	5
4AM46 4	0.4	3.51	2.53	2	1.67	1.44	1.26	1.13	1	0.95	0.92	5.7	4.3	4.4
4AM48 4	0.5	5.34	3.75	2.9	2.4	2	1.75	1.55	1.4	1.3	1.25	5	3.8	3.8
4AM52 4	0.63	5.05	3.85	3.15	2.7	2.35	2.1	1.9	1.75	1.65	1.6	4.7	3.6	3.7
4AM55 4	0.8	7.69	5.8	4.65	3.9	3.4	3	2.7	2.5	2.3	2.25	4	3	3.1
4AM57 4	1.0	12.1	8.85	7	5.85	5	4.4	3.95	3.6	3.3	3.2	3.2	2.5	2.5
4AM61 4	1.6	12.1	10.3	9	8.1	7.3	6.8	6.4	6.1	5.9	6.4	2.4	1.9	2.1
4AM64 4	2	15.8	13.5	11.9	10.7	9.7	9	8.5	8.1	7.9	8.6	2.1	1.7	1.9
4AM65 4	2.5	19.6	17.3	15.6	14.3	13.3	12.5	12	11.6	11.5	13.2	1.6	1.3	1.6
4AT30 3	4	45.8	32.6	25.4	20.9	17.8	15.5	13.8	12.5	11.5	11	4.1	2.9	2.9
4AT36 1	5	48	36.7	27.9	22.6	19	16.5	14.6	13.1	12	11.2	5.9	4	4.1
4AT36 3	6.3	54.9	42.1	33.8	28.4	24.5	21.7	19.5	17.8	16.5	16.1	4.7	3.2	3.3
4AT39 1	8	70	53.6	43	36	31.1	27.5	24.8	22.6	21	20.4	4.6	3.2	3.3
4AT39 3	10	64.1	53.3	45.8	40.5	36.4	33.3	30.9	29.1	27.9	29.4	3.7	2.6	2.9
4AT43 0	11.2	117	85.8	67.8	56.3	48.3	42.4	37.9	34.5	31.9	30.7	4.1	2.9	2.9
4AT43 1	12.5	117	89.5	72.9	61.8	53.8	47.9	43.3	39.8	37.2	36.7	3.7	2.6	2.7
4AT43 2	14	111	90	75.9	66	58.7	53.1	48.8	45.5	43.2	44.2	3.3	2.3	2.5
4AT45 0	16	187	140	112	94	81.2	71.7	64.5	59	54.7	53.4	3.1	2.1	2.2

1) $P_{shortt.}$ applies to up to 300 contactor operations per hour.


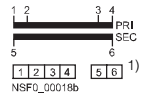
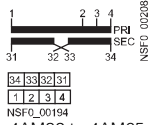
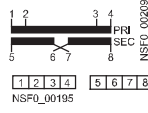
Single-Phase Transformers


4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

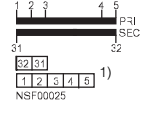
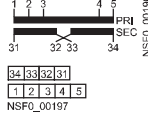
Schematics


With one input voltage

Circuit diagrams and terminal assignments ¹⁾	Rated input voltage U_{1N}	Rated output voltage U_{2N}	Connections					
			Primary			Secondary		
	V	V	Transformer-type	U_{1N}	$U_{1N} + 5\%$	$U_{1N} - 5\%$	U_{2N}	Circuit terminals
 4AM ($\leq 2.5\text{ kVA}$)	$U_{1N} \pm 5\%$	U_{2N}	4AM23 to 4AM65	1-3	1-4	1-2	31-32	--
 4AT (4 kVA ... 16 kVA)	$U_{1N} \pm 5\%$	U_{2N}	4AT30 to 4AT45	1-3	1-4	2-3	5-6	--
 4AM32 to 4AM65 ($\leq 2.5\text{ kVA}$)	$U_{1N} \pm 5\%$	2×115	4AM32 to 4AM65	1-3	1-4	1-2	230 V: 31-34 ²⁾ 115 V: 31-34 ²⁾	32-33 31-32; 33-34
 4AT30 to 4AT39 (4 kVA ... 10 kVA)	$U_{1N} \pm 5\%$	2×115	4AT30 to 4AT39	1-3	1-4	2-3	230 V: 5-8 115 V: 5-8	6-7 5-6; 7-8

1) For Cage Clamp terminals, the ground connection is routed to the terminal. The order of terminal assignments then changes as follows . 2) Terminals 31-34 are duplicated in the Cage Clamp version.

For European voltages

Circuit diagrams and terminal assignments ¹⁾	Rated input voltage U_{1N}	Rated output voltage U_{2N}	Connections					
			Primary			Secondary		
	V	V	Transformer-type	Connections		Connections U_{2N}	Circuit terminals	
 4AM32 to 4AM65 ($\leq 2.5\text{ kVA}$)	$400/230 \pm 15$	24	4AM32 to 4AM65	U_{1N} 400 V: 2-5 230 V: 2-4	$U_{1N} + 15\text{ V}$ 1-5 1-4	$U_{1N} - 15\text{ V}$ 3-5 3-4	24 V: 31-32 42 V: 31-32	-- --
 4AM32 to 4AM65 ($\leq 2.5\text{ kVA}$)	$400/230 \pm 15$	2×115	4AM32 to 4AM65, 4AT30 to 4AT39	U_{1N} 400 V: 2-5 230 V: 2-4	$U_{1N} + 15\text{ V}$ 1-5 1-4	$U_{1N} - 15\text{ V}$ 3-5 3-4	230 V: 31-34 ²⁾ 115 V: 31-34 ²⁾	32-33 31-32; 33-34

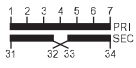

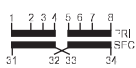

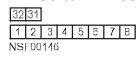
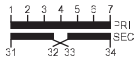

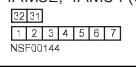
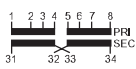

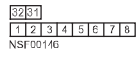
1) For Cage Clamp terminals, the ground connection is routed to the terminal. The order of terminal assignments then changes as follows . 2) Terminals 31-34 are duplicated in the Cage Clamp version.

Single-Phase Transformers

4AM, 4AT Safety, Isolation, Control and Mains Transformers

General data

Multi-voltage version

Circuit diagrams and terminal assignments	Rated input voltage U_{1N}	Rated output voltage U_{2N}	Connections and circuit terminals					
			Primary Rated voltage V	Connections	Circuit terminals	Secondary Rated voltage V	Connections	Circuit terminals
 <p>4AM32, 4AM34 (0.063 kVA; 0.1 kVA)</p> <p>NSF00143</p>	550-525-500-480-460-440-415-400-380-230-208	2 × 115	550 525 500 480 460 440 415 400	1-7 2-7 3-7 1-6 2-6 3-6 1-5 2-5	--	230 115	31-34	32-33 31-32; 33-34
 <p>4AM32, 4AM34 (0.063 kVA; 0.1 kVA)</p> <p>NSF00144</p>		24	380 230 208	3-5 2-4 3-4		24	31-32	--
 <p>4AM38 to 4AM65 (0.16 kVA ... 2.5 kVA)</p> <p>NSF00145b</p> <p>4AT30 to 4AT39 (4 kVA ... 10 kVA)</p> <p>NSF0_00147a</p>	550-525-500-480-460-440-415-400-380-230-208	2 × 115	550 525 500 480 460 440 415 400 380 230 208	1-8 4-5 3-5 2-5 2-5 4-6 3-6 3-7 2-6 2-7 1-6; 4-8 1-7; 3-8		230 115	31-34	32-33 31-32; 33-34
 <p>4AM38 to 4AM65 (0.16 kVA ... 2.5 kVA)</p> <p>NSF00146</p>		24				24	31-32	--
 <p>4AM38 to 4AM65 (0.16 kVA ... 2.5 kVA)</p> <p>NSF00146</p>		42				42	31-32	--
 <p>4AM32, 4AM34 (0.063 kVA; 0.1 kVA)</p> <p>NSF00142</p>	600-575-550-525-500-480-460-440-415-400-240-230	2 × 115	600 575 550 525 500 480 460 440 415 400 240 230	1-7 2-7 3-7 1-6 2-6 3-6 1-5 2-5 3-5 3-5 1-4 2-4	--	230 115	31-34	32-33 31-32; 33-34
 <p>4AM32, 4AM34 (0.063 kVA; 0.1 kVA)</p> <p>NSF00144</p>		24	415 400 240 230	3-5 3-5 1-4 2-4		24	31-32	--
 <p>4AM32, 4AM34 (0.063 kVA; 0.1 kVA)</p> <p>NSF00144</p>		42				42	31-32	--
 <p>4AM38 to 4AM65 (0.16 kVA ... 2.5 kVA)</p> <p>NSF00145c</p> <p>4AT30 to 4AT39 (4 kVA ... 10 kVA)</p> <p>NSF0_00147a</p>	600-575-550-525-500-480-460-440-415-400-240-230	2 × 115	600 575 550 525 500 480 460 440 415 400 240 230	1-8 4-5 4-6 4-7 3-5 3-6 3-7 3-7 2-5 2-6 2-7 1-7; 3-8 1-7; 3-8		230 115	31-34	32-33 31-32; 33-34
 <p>4AM38 to 4AM65 (0.16 kVA ... 2.5 kVA)</p> <p>NSF00146</p>		24				24	31-32	--
 <p>4AM38 to 4AM65 (0.16 kVA ... 2.5 kVA)</p> <p>NSF00146</p>		42				24	31-32	--

Single-Phase Transformers

4BT Power Transformers

General data

Overview

4BT.. transformers

With the right transformer, the right voltage will be available whatever the conditions.

Our transformers are the right choice for each application: They work reliably, safely and worldwide under a wide range of different conditions.

The 4BT single-phase power transformers can be configured as matching, auto- or converter transformers according to DIN VDE 0532-6 with selectable input and output voltages.

Our transformers provide optimal protection through high permissible ambient temperatures of up to 55 °C.

Design

Standards

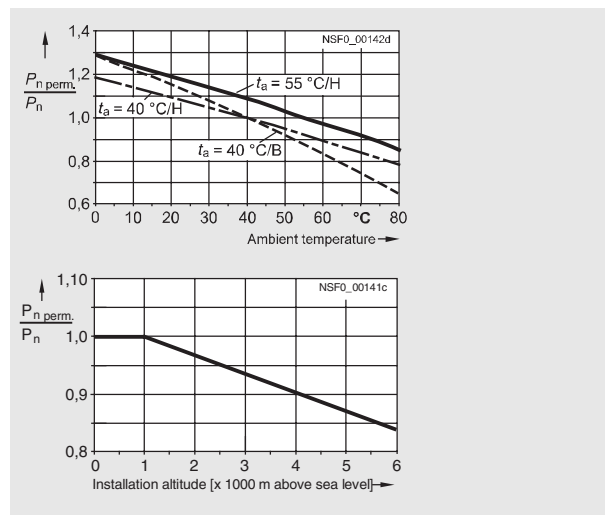
DIN VDE 0532-6

Rated output P_n at high ambient temperature – the reference for thermal load capacity

Reference conditions under which the transformers have the rated power P_n stated in the tables:

- Continuous operation P_n
- Frequency AC 50 Hz ... 60 Hz
- Degree of protection IP00
- Installation altitude up to 1000 m above sea level and
- Ambient temperature t_a , type-dependent 40 °C or 55 °C.

Other installation and operating conditions than this will affect the permissible continuous load capacity. In the case of the 4BT transformers, for example, with a low ambient temperature of 40 °C instead of 55 °C, an increase in load of 8 % is possible (see load characteristics).



Load characteristics: Permissible transformer continuous load in relation to the ambient temperature and the installation altitude

Design

Standard version

All 4BT transformers are supplied for screw mounting on a mounting plate.

Connections

Screw terminal

The 4BT transformers are supplied for rated currents up to 81 A in the standard design with screw terminals.

For higher currents, the transformers are supplied with flat connections or with threaded pins.

Enclosure mounting

4BT transformers are also available in protective enclosures of the degree of protection IP20 and IP23.

Required specifications for requests and orders for 4BT transformers with selectable voltages

Rated power P_n (output division with separate SEC windings, $P_n = P_1 + P_2$, throughput rating = load rating for autotransformers), PRI and SEC voltages, frequency, vector group, degree of protection (power reduction with degrees of protection other than IP00), Order No. stem.

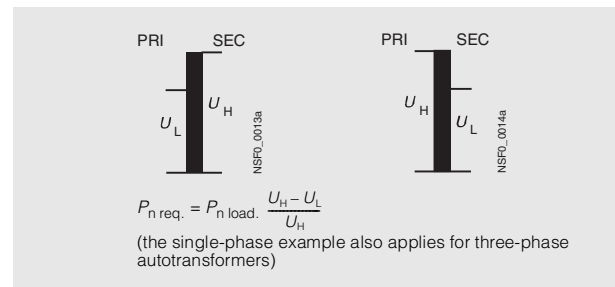
The Order No. stem is added to the Order No. for delivery.

Example:

Single-phase transformer with selectable voltages 160 kVA
 PRI 415 V \pm 5 %, SEC 115 V,
 Frequency 50 Hz ... 60 Hz,
 Degree of protection IP00,
 Shield winding,
 Order No. stem 4BT62 1.

4BT autotransformers:

Determine the type rating P_n req.



Step-up transformer (figure on the left) and step-down transformer (figure on the right)

Thermistor transformer protection for 4BT power transformers

The windings of the power transformers can be protected from impermissible overheating by means of thermistor transformer protection. PTC thermistors are used which are wound into each shank of the transformer and connected in series. The rated response temperature is slightly above the limit temperature for continuous operation.

Possible versions:

- Warning
- Shutdown
- Warning and shutdown

The connections for the temperature sensor are routed to terminals, two terminals each for warning and disconnection.

The 3RN tripping units are not included in the transformer scope of supply, for the relevant selection and ordering data see chapter "Monitoring and Control Devices -> Monitoring Relays -> Thermistor Motor Protection" in the Catalog LV 1.

Single-Phase Transformers

4BT Power Transformers

General data

Technical specifications

Transformers	Type	4BT
• Version		UI core
• Performance range (with IP00)	kVA	> 16 ... 250
• Approvals		csus
Voltage range	V	≤ 1000 (up to 3.6 kV on request)
• Approvals for USA, Canada	V	≤ 600
Rated frequency	Hz	50 ... 60
Thermal class		H
• Acc. to UL/CSA		Class 180
Ambient conditions		Protection against harmful ambient conditions: Complete impregnation in polyester resin Climate-proof for mounting in rooms with an external climate to DIN 50010
Rated ambient temperature		
• At rated output	°C	55
• Maximum value (after reduced output depending on load characteristics, (see "Design"))	°C	80
• Minimum value	°C	-25
Relative air humidity		
• Average up to	%	80
• Maximum value for 30 days/year	%	95
• At 40 °C occasionally	%	100
Safety class		I
Degree of protection		
• Without enclosure		IP00
• With protective enclosure (according to "Selection and Ordering Data", see Catalog LV 1)		IP20 or IP23
• Version		IP20, IP23: steel enclosure coated with epoxy resin, color gray RAL 7032
Installation height		Up to 1000 m above sea level (above this, derating is necessary)
Protective devices		
• Internal		Can be designed with thermistor transformer protection for warning or disconnection, or warning and disconnection, see "Design".
• External		The transformers can be protected against short-circuits and overload on the primary and secondary with circuit-breakers. For reliable protection against short-circuits and touch, the cables between the output terminals of the transformer and the load must have a negligible line impedance. For more details see DIN VDE 0100 (Erection of low-voltage systems) Part 410, Part 520 (particularly section 525) and part 610. On request
Connection technique		The permissible conductor cross-sections are assigned to the specified terminal types.
• Terminal arrangement		Refer to DIN VDE 0298-4 and EN 60204 (VDE 0113-1) for the permissible conductor cross-sections for the specified current according to the installation type.
• For terminal designs and connectable cross-sections (see "Project Planning Aids")		Other terminal sizes than standard versions on request.
Mounting position		The permissible mounting position for each version is shown in the "Project Planning Aids".

Further technical specifications can be found on the Internet at <http://www.siemens.com/sidac>

Single-Phase Transformers

4BT Power Transformers

General data

Operating characteristics

- According to DIN VDE 0532-6
- $t_a = 55 \text{ °C/H}$

Transformer	Rated power P_n 50 Hz ... 60 Hz 1000 m above sea level Degree of protection IP00	Core size	Voltage rise in no-load opera- tion (operating temperature)	Voltage drop on rated load ¹⁾	Short-circuit voltage ¹⁾	Efficiency
Type	kVA		u_A approx. %	u_R approx. %	u_Z approx. %	η approx. %
4BT45 0	18	UI 240/107	2.7	2.6	2.7	97
4BT47 0	20	UI 240/137	2.6	2.5	2.5	97
4BT47 1	22.5	UI 240/137	2.3	2.2	2.5	97
4BT47 2	25	UI 240/137	2.1	2	2.1	97
4BT51 0	28	UIS 265/107	4.3	4.1	4.8	95
4BT52 0	31.5	UIS 265/120	3.9	3.8	4.4	96
4BT53 0	35.5	UIS 265/135	3.6	3.5	4.1	96
4BT54 0	40	UIS 305/125	3.7	3.5	3.9	96
4BT54 1	45	UIS 305/125	3.3	3.2	3.8	96
4BT55 0	50	UIS 305/140	3.1	2.9	3.5	97
4BT56 0	63	UIS 305/160	2.5	2.5	3.2	97
4BT58 1	80	UIS 370/150	3.1	3	3.9	97
4BT59 0	100	UIS 370/170	2.6	2.5	3.7	97
4BT60 1	125	UIS 370/195	2.1	2.1	3.6	97
4BT62 1	160	UIS 455/175	2.1	2	3.7	98
4BT63 0	200	UIS 455/200	1.7	1.7	3.7	98
4BT65 0	250	UIS 455/260	1.5	1.5	3	98

Higher ratings and other conditions on request.

Calculation of heat dissipation P_V

$$P_V = \frac{P_n (100 - \eta)}{\eta} \text{ [kW]}$$

1) Winding reference temperature: 115 °C.

Single-Phase Transformers

4AX22, 4AX23 Safety Transformers

Resin-enclosed

Overview



4AX22 12 (figure on the left) and 4AX22 14 (figure on the right)



4AX23 11

The 4AX22 and 4AX23 safety transformers are resin-enclosed.

- Safety class II (for other safety transformers, see [Safety, Isolation, Control and Mains Transformers](#))
- Vector group li0
- Conditionally short-circuit proof
- $t_a = 40 \text{ °C/E}$

4AX22 portable version

- Highly rugged
- Degree of protection IP44
- EN 61558-2-9
-

4AX23 stationary version

- Degree of protection IP65
- EN 61558-2-6
-



Design

The 4AX22 and 4AX23 single-phase safety transformers are fully resin-enclosed.

4AX22 portable version

These devices are characterized by extreme ruggedness.

There is a connecting cable with a vulcanized power plug on the input side. The secondary connection can be fitted with one or two CEE socket outlets in accordance with the rating. The output plugs are supplied loose with the safety transformer.

A primary fuse that can be replaced from the outside protects against short-circuit and overload. The carrying handle makes it easy to move the unit around. The transformer is equipped with rubber feet that prevent slipping and absorb shocks.

4AX23 stationary version

The device contains one cable gland each with strain relief for the input and for the output.

A primary fuse that can be replaced protects against short-circuit and overload. Mounting holes in the enclosure make mounting easy.

The safety transformers can be supplied in a special version with a CEE socket outlet. This reduces the degree of protection from IP65 to IP44. The output plug is supplied loose with the safety transformer.

Technical specifications

Type	4AX22	4AX23
• Version	Resin-enclosed, portable	Resin-enclosed, stationary
• Performance range (with IP00)	kVA 0.1 ... 1	0.1 ... 1
Voltage range	V ≤ 230	
Rated frequency	Hz 50 ... 60	
Thermal class	E	
Ambient conditions	For external climate to DIN 50010	
Rated ambient temperature		
• At rated output	°C +40	
• Maximum value	°C +60	
• Minimum value	°C -25	
Safety class	II	
Degree of protection	IP44	IP65
Installation height	Up to 1000 m above sea level	
Protective devices, internal	Fuse links: G up to 5 A, D01 up to 16 A	G up to 6.3 A, D01 up to 16 A
Connection technique	See "Selection and Ordering Data" in Catalog LV 1	
Mounting position	Any position	

Single-Phase Transformers

4AX24 Isolation Transformers




Resin-enclosed

Overview



4AX24 13

The 4AX24 portable isolation transformers are completely resin-enclosed.

- EN 61558-2-4
-   
- $t_a = 40 \text{ °C/E}$
- Degree of protection IP44
- Safety class II (for other safety transformers, see safety, isolation, control and mains transformers)
- Vector group li0
- Conditionally short-circuit proof



Design

The 4AX24 single-phase isolation transformers are completely resin-enclosed.

There is a connecting cable with a vulcanized rubber plug on the input side. The secondary connection is designed as a two-pole socket outlet with a flap cover (without grounding contact).

A primary fuse that can be replaced from the outside protects against short-circuit and overload.

The carrying handle makes it easy to move the unit around. The transformer is equipped with rubber feet that prevent slipping and absorb shocks.

Technical specifications

Type	4AX24	
• Version	Resin-enclosed, portable	
• Performance range (with IP00)	kVA	0.16 ... 2.5
Voltage range	V	≤ 230
Rated frequency	Hz	50 ... 60
Thermal class	E	
Ambient conditions	For external climate to DIN 50010	
Rated ambient temperature		
• At rated output	°C	+40
• Maximum value	°C	+60
• Minimum value	°C	-25
Safety class	II	
Degree of protection	IP44	
Installation height	Up to 1000 m above sea level	
Protective devices, internal	Fuse links: G up to 10 A, D01 up to 16 A	
Connection technique	See "Selection and Ordering Data" in Catalog LV 1	
Mounting position	Any position	

Single-Phase Transformers

4AT Isolation Transformers

For supply of medical premises

Overview

- According to EN 61558-2-15
- Safety class I
- With static shield between the primary and secondary winding with insulated connection
- With thermistor transformer protection for warning of thermal overload¹⁾
- With central tap for insulation monitoring
- Short-circuit voltage $u_2 \leq 3 \%$,
- No-load supply current $i_0 \leq 3 \%$, max. inrush current $12 \times I_{1N}$

1) 3RN tripping units for PTC sensors must be ordered separately, see the Chapter "Monitoring and Control Devices".



4AT special design for medical premises

Technical specifications

Transformers	Type	4AT
• Version		UI core
• Performance range (with IP00)	kVA	> 2.5 ... 8
Voltage range	V	230
Rated frequency	Hz	50 ... 60
Thermal class		H
Ambient conditions		Protection against harmful ambient conditions: Complete impregnation in polyester resin Climate-proof for mounting in rooms with an external climate to DIN 50010
Rated ambient temperature		
• At rated output	°C	55
Relative air humidity		
• Average up to	%	80
• Maximum value for 30 days/year	%	95
• At 40 °C occasionally	%	100
Safety class		I
Degree of protection		
• Without enclosure		IP00
• With protective enclosure (according to "Selection and Ordering Data", see Catalog LV 1)		IP23
• Version		IP23: steel enclosure coated with epoxy resin, color gray RAL 7032
Installation height		Up to 1000 m above sea level (above this, derating is necessary)
Protective devices		
• Internal		With thermistor transformer protection for warning
• External		The transformers have to be protected against short-circuits on the secondary side with circuit-breakers (see "Selection and ordering data" in the Catalog LV 1). For reliable protection against short-circuits and touch, the cables between the output terminals of the transformer and the load must have a negligible line impedance. For more details see DIN VDE 0100 (Erection of low-voltage systems) Part 410, Part 520 (particularly section 525) and part 610. Specified protective devices (see "Selection and Ordering Data" in Catalog LV 1)
Connection technique		The permissible conductor cross-sections are assigned to the specified terminal types.
• Terminal arrangement		Refer to DIN VDE 0298-4 and EN 60204 (VDE 0113-1) for the permissible conductor cross-sections for the specified current according to the installation type.
Mounting position		Any position

Further technical specifications can be found on the Internet at <http://www.siemens.com/sidac>.

Schematics

Circuit diagram and terminal assignment	Rated input voltage U_{1N}	Rated output voltage U_{2N}	Connections and circuit terminals	
			Primary	Secondary
	V	V	Transformer-type 4AT	U_{1N} 1-2
	230	230		U_{2N} 3-5

Insulation monitoring: terminal 4
PTC sensors: terminal 10-11
Shield winding: PE terminal (insulated)

Single-Phase Transformers

4FL, 4FK Voltage Regulators

4FL voltage regulators, transformer-type

Overview



4FL

- According to DIN VDE 0660 Part 500
- Degree of protection IP21
- **CE**
- $t_a = 40\text{ °C/E}$

Design

The transformer-type voltage regulator supplies electrical loads with a constant voltage despite mains variations.

The advantage of a voltage regulator with an autotransformer is proportional changing of the sinewave, i.e. the voltage regulator is characterized in that the rms value, mean value and the peak value are held at constant ratios.

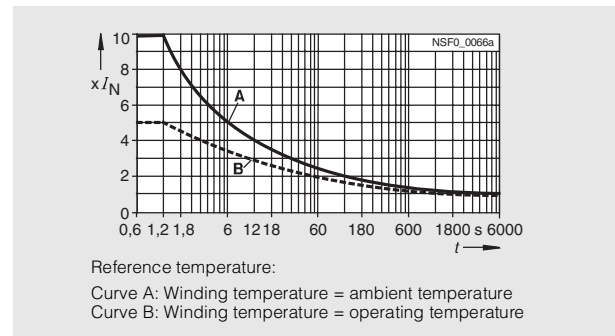
A perfect rms value is required, for example, by loads for which the loading is determined by the thermal limits. Strongly capacitive loads in DC units respond to the mean value. A slightly capacitive load is, however, influenced by the peak value. These factors are, however, only guaranteed for sinusoidal AC voltages and this can only be achieved easily by means of an autotransformer.

Voltage regulators stabilize the supply voltage U_1 regardless of the frequency and power factor to the rated value of the output voltage U_{2N} within the set control accuracy ($\pm 1\%$ of U_{2N}). The correcting time from the upper or lower limit to the rated value is between 1.5 s and 2.5 s. The curve shape of the supplied voltage is not changed.

The output voltage U_2 is compared in the electronic step controller with a set reference voltage. In the event of a deviation in voltage greater than the set response value, the electronic step controller compensates the deviation with an accuracy of $\pm 1\%$ using a servo motor and adjustable moving contact on the variable transformer.

Transformer-type voltage regulators:

- Are galvanically connected to the supply system
- Can be overloaded temporarily (see characteristic)
- Can be installed in a sheet-steel enclosure to IP21 complete with any additional components
- Have an efficiency of between 95 % and 98 %
- Are not maintenance-free
- For the values for control range and control deviation, see "Selection and Ordering Data" in Catalog LV 1.



Overload capability (guide values)

Ambient conditions

4FL transformer-type voltage regulators are climate proof for mounting in rooms with an internal climate according to DIN 50010.

Limit values:

- Ambient temperature at
 - rated output, $+40\text{ °C}$,
 - minimum -25 °C .
- Relative air humidity
 - at 40 °C up to 85 %,
 - annual average up to 65 %,
 - condensation not permitted.

Short-circuit and overload protection

Transformer-type voltage regulators must be protected with gL/gG fuses on the primary side against damage caused by short-circuits. The fuse rated current must be determined according to the highest primary current (present with the lowest input voltage). Overload and short-circuit protective devices according to the rated load current must be provided on the output side. An overload relay is integrated in the control circuit, the trip contacts (break or make) must be connected on a switch that automatically disconnects the transformer voltage regulator from the mains in the event of a fault.

Single-Phase Transformers

4FL, 4FK Voltage Regulators

4FK voltage regulators, magnetic-type

Overview



4FK31 to 4FK34 (figure on the left) and 4FK35 to 4FK38 (figure on the right)

- According to DIN EN 61558-2-12
- With sinusoidal output voltage
- Settling time 40 ms
- **CE**
- $t_a = 40\text{ °C}$



Design

The correcting time for the voltage regulators is about 40 ms, whereby they can bridge mains voltage interruptions of up to half a sine wave. The stabilizing effect is based on a tuned anti-resonant circuit with an iron-core reactor that is forced into saturation (see schematics). This iron-core reactor is responsible for the distorted output voltage (harmonic distortion from 3 % to 4 %). Depending on the anti-resonant circuit, magnetic-type voltage regulators are frequency

Voltage regulators are designed for resistive loads and harmonized. If the load has a power factor that lies outside the specification, the output voltage will be reduced for an inductive load and increased for a capacitive load. Inductive loads can be compensated by using appropriate compensation capacitors. It is also possible to construct voltage regulators that are adapted to a different power factor.

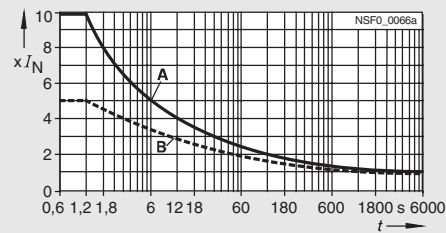
Magnetic-type voltage regulators have outputs that are short-circuit proof, i.e. when the outputs are short-circuited, the current rises to 1.3 to 1.5 times the value. The input current only changes insignificantly. Due to this characteristic, a voltage regulator cannot rupture a fuse. The load can be protected by a motor protection switch at the output that is set to rated current. Magnetic-type voltage regulators have, as a result of the high inductance in the iron core, inrush currents between 10 times and 30 times the rated current. For this reason, a slow-acting line fuse should be used at the input.

The characteristics of magnetic-type voltage regulators can be summarized as follows:

- Settling of mains voltage variations.
- Maintaining the output voltage at a constant value despite load variations.
- Electrical isolation of the output voltage from the input voltage, transformation of the input voltage to the required output voltage.
- Limitation of the output current in the event of an overload or short-circuit to approximately 1.3 or 1.6 $\times I_n$ (see current/voltage characteristic), short-circuit resistant.
- Filtering of high-frequency faults (attenuation of 35 dB up to 100 kHz) and suppression of voltage spikes. Filtering of distorted input voltages, harmonic distortion factor of the output from 3 % to 4 % at rated load.
- Maintenance-free

- No moving parts
- Bridges mains voltage interruptions of up to half a sine wave
- Due to the anti-resonant circuit, magnetic-type voltage regulators are frequency-dependent

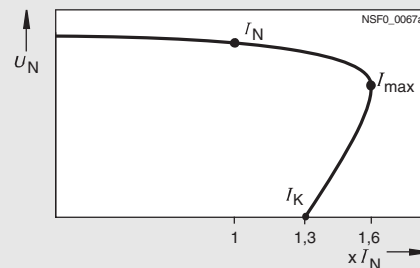
It must be taken into account that the operating temperature and the noise generation is higher for a magnetic-type voltage regulator than for an isolation transformer.



Reference temperature:

Curve A: Winding temperature = ambient temperature
Curve B: Winding temperature = operating temperature

Overload capability (guide values)



Current/voltage characteristic

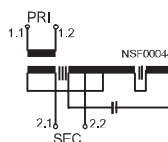
Ambient conditions

4FK magnetic-type voltage regulators are climate proof for mounting in rooms with an internal climate according to DIN 50010.

Limit values:

- Ambient temperature at
 - rated output +40 °C,
 - minimum -25 °C.
- Relative air humidity
 - at 40 °C up to 100 %
 - annual average up to 85 %
 - condensation not permitted.

Schematics



Single-Phase Transformers

Project planning aids

Dimensional drawings

4AM, 4AT safety, isolation, control and mains transformers < 16 kVA

4AM safety, isolation, control and mains transformers < 16 kVA and

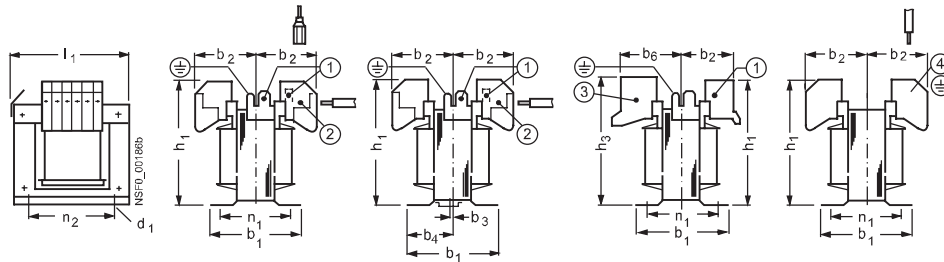
4AM safety, isolation, control and mains transformers and autotransformers with selectable voltages < 16 kVA

4AM23 to 4AM26
4AM43 to 4AM65
for any mounting position, standard version

4AM32 to 4AM40
for any mounting position, standard version (with integrated standard mounting rail fixing)

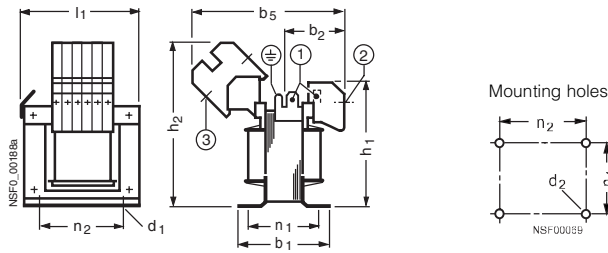
4AM23 to 4AM65
for any mounting position, version with 10 mm² terminal up to 44 A

4AM23 to 4AM65
for any mounting position, version with Cage Clamp terminals, as standard version, but b₂ + 2 mm, cable entry from above



4AM23 to 4AM65

for any mounting position, with terminals ≤ 60 A by means of terminal strip



① Flat connector DIN 46224-A 6.3-0.8

② Screw terminal

24 A:
solid 0.5 mm² ... 6 mm²
finely stranded 0.5 mm² ... 4 mm²

③ Screw terminal

44 A:
solid 1.0 mm² ... 16 mm²,
finely stranded 1.0 mm² ... 10 mm²

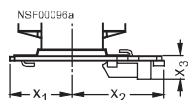
60 A:
solid 1.0 mm² ... 16 mm²,
stranded 10 mm² ... 25 mm²,
finely stranded 2.5 mm² ... 16 mm²

④ Cage Clamp terminal (also ground connection)

24 A:
solid 0.08 mm² ... 4 mm²,
finely stranded 0.08 mm² ... 4 mm²

Type	Rated power kVA ¹⁾	Designation according to DIN 41302	b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	d ₁	d ₂	h ₁	h ₂	h ₃	l ₁	n ₁	n ₂	Max. number of terminals per side		
																	24 A	44 A	60 A
4AM23	0.025	EI 60/20	50	39	--	--	102	53	3.6 × 6	M3	75	104	86	62	39	44	5	4	4
4AM26	0.04	EI 66/22	56	40	--	--	104	54	4.5 × 8	M4	79	108	90	68	42	50	5	4	4
4AM32	0.063	EI 84/28	76	45	2	34	112	59	4.8 × 8	M4	98	127	108	86	64	64	7	4	4
4AM34	0.1	EI 84/42	76	51	2	34	126	65	4.8 × 8	M4	98	127	108	86	64	64	7	4	4
4AM38	0.16	EI 96/44	102	52	5	44	128	66	5.8 × 9.3	M5	106	135	117	98	86	84	8	6	6
4AM40	0.25	EI 96/58	102	59	5	44	142	73	5.8 × 9.3	M5	106	135	117	98	86	84	8	6	6
4AM43	0.315	EI 105/60	103	60	--	--	143	74	5.8 × 12	M5	111	140	122	107	86	80.5	8	6	6
4AM46	0.4	EI 120/52	102	57	--	--	137	71	5.8 × 12	M5	121	150	132	122	87	90	10	6	6
4AM48	0.5	EI 120/72	123	67	--	--	157	81	5.8 × 12	M5	121	150	132	122	103	90	10	6	6
4AM52	0.63	EI 150N/48	111	55	--	--	134	69	7 × 15	M6	144	173	155	152	90	122	14	10	8
4AM55	0.8	EI 150N/65	128	63	--	--	152	77	7 × 15	M6	144	173	155	152	106	122	14	10	8
4AM57	1	EI 150N/90	154	66	--	--	176	90	7 × 15	M6	144	173	155	152	134	122	14	10	8
4AM61	1.6	EI 174/82	155	69	--	--	165	83	7 × 15	M6	164	192	175	176	126	145	16	10	10
4AM64	2	EI 174/102	177	79	--	--	185	93	7 × 15	M6	164	192	175	176	146	145	16	10	10
4AM65	2.5	EI 192/110	188	88	--	--	203	102	9 × 16	M8	180	208	191	194	164	160	16	10	10

Standard rail mounting for 4AM transformers in a special design with a preassembled adapter plate



4AM32, 4AM34, 4AM38 and 4AM40 transformers are supplied as standard for both screw-fixing and with integrated standard rail mounting.

Type	x ₁ max.	x ₂ max.	x ₃	Standard mounting rail mm
4AM23	b ₁ /2+2	b ₁ /2+21	9	35 × 7.5
4AM26	b ₁ /2+5	b ₁ /2+21	9	35 × 7.5
4AM43	b ₁ /2+3	b ₁ /2+8	15	35 × 15
4AM46 to 4AM48	b ₁ /2+3	b ₁ /2+3	15	35 × 15

1) The rated output is only applicable to transformers with separate windings (not to autotransformers).

Single-Phase Transformers

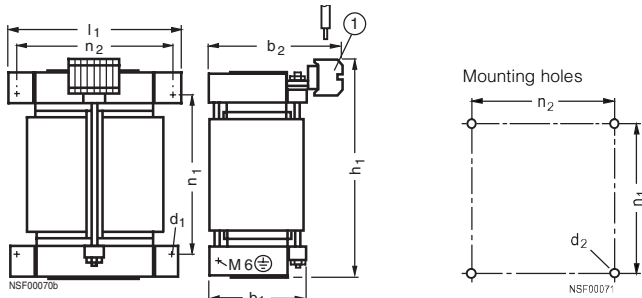
Project planning aids

4AM, 4AT safety, isolation, control and mains transformers < 16 kVA (continued)

4AT safety, isolation, control and mains transformers < 16 kVA and 4AT safety, isolation, control and mains transformers and autotransformers with selectable voltages < 16 kVA

4AT30 to 4AT43

for any mounting position



Permissible permanent load for 4AT36 and 4AT39 for arrangement on horizontal surfaces:

$$0.95 \cdot P_n \text{ at } t_a = 55^\circ\text{C}$$

$$P_n \text{ at } t_a = 45^\circ\text{C}$$

① Screw terminal

18 A:
solid 0.5 mm² ... 6 mm²
finely stranded 1.5 mm² ... 4 mm²

23 A:
solid 0.75 mm² ... 10 mm²,
finely stranded 1.5 mm² ... 6 mm²

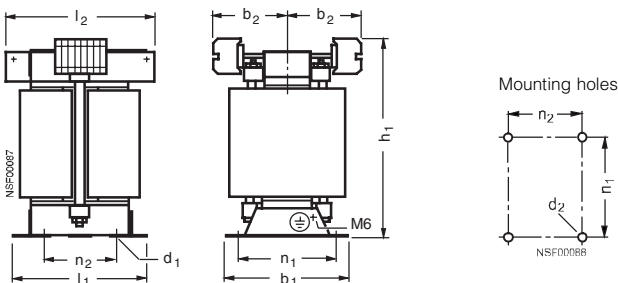
43 A:
solid 1.0 mm² ... 16 mm²,
stranded 10 mm² ... 25 mm²,
finely stranded 2.5 mm² ... 16 mm²

81 A:
solid 4.0 mm² ... 16 mm²,
stranded 10 mm² ... 50 mm²,
finely stranded 6 mm² ... 35 mm²

Type	Rated power kVA ¹⁾	Designation according to DIN 41302	b ₁	b ₂	d ₁	d ₂	h ₁	l ₁	n ₁	n ₂	Max. number of terminals per side			
											18 A	23 A	43 A	81 A
4AT30	4	UI 150/75	147	205	9 × 14	M8	263	214	200	190	20	23	13	8
4AT36	5; 6.3	UI 180/75	180	238	9 × 14	M8	315	244	240	220	24	22	16	10
4AT39	8; 10	UI 210/70	185	243	11 × 16	M10	365	285	280	260	29	26	19	11
4AT43	12.5; 14	UI 240/80	195	253	11 × 16	M10	415	325	320	290	33	33	22	13

4AT30 to 4AT43

for arrangement on horizontal surfaces, special constructions can only be supplied for transformers with selectable data



Screw terminal

18 A:
solid 0.5 mm² ... 6 mm²
finely stranded 1.5 mm² ... 4 mm²

23 A:
solid 0.75 mm² ... 10 mm²,
finely stranded 1.5 mm² ... 6 mm²

43 A:
solid 1.0 mm² ... 16 mm²,
stranded 10 mm² ... 25 mm²,
finely stranded 2.5 mm² ... 16 mm²

81 A:
solid 4.0 mm² ... 16 mm²,
stranded 10 mm² ... 50 mm²,
finely stranded 6 mm² ... 35 mm²

Type	Rated power kVA ¹⁾	Designation according to DIN 41302	b ₁ max.	b ₂ min.	b ₂ max.	d ₁	d ₂	h ₁ max.	l ₁	l ₂ max.	n ₁	n ₂	Max. number of terminals per side			
													18 A	23 A	43 A	81 A
4AT30	4	UI 150/75	155	109	117	10 × 18	M8	270	164	200	118	124	20	18	13	8
4AT36	5; 6.3	UI 180/75	169	114	122	10 × 18	M8	320	194	240	138	144	24	22	16	10
4AT39	8; 10	UI 210/70	174	111	119	12 × 18	M10	370	226	280	141	176	29	26	19	11
4AT43	12.5; 14	UI 240/80	194	116	124	15 × 22	M12	420	256	310	155	196	33	30	22	13

1) The rated output is only applicable to transformers with separate windings (not to autotransformers).

Single-Phase Transformers

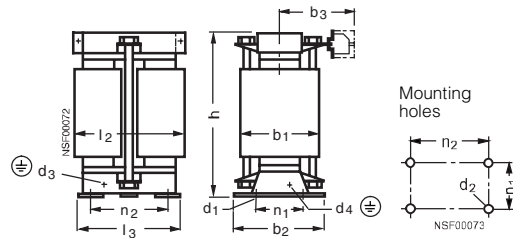
Project planning aids

**4AT safety, isolation, control and mains transformers ≤ 16 kVA,
4BT power transformers ≥ 18 kVA**

**4AT safety, isolation, control and mains transformers and autotransformers with selectable voltages ≤ 16 kVA
4BT power transformers and autotransformers with selectable voltages ≥ 18 kVA**

4AT45 and 4BT

for arrangement on horizontal surfaces



Terminal		Screw terminal for cross-section			Current carrying capacity A
Type	Size	Solid mm ²	Stranded mm ²	Finely stranded mm ²	
8WA1 011-1DG11	4	0.5 ... 6	--	1.5 ... 4	18
8WA1 011-1DH11	6	0.75 ... 10	--	1.5 ... 6	23
8WA1 204	16	1 ... 16	10 ... 25	2.5 ... 16	43
8WA1 205	35	4 ... 16	10 ... 50	6 ... 35	81

For transformers > 81 A, see Flat-type and threaded pin terminals on page 10/26.

Type	Rated power kVA ¹⁾	Type size according to DIN 41302	b ₁	b ₂	b ₃ ± 3 for terminal size				d ₁	d ₂	d ₃	d ₄	h	l ₂	l ₃	n ₁	n ₂	Max. number of terminals for terminal size			
					(4)	6	16	35										4	6	16	35

4AT safety, isolation, control and mains transformers and autotransformers with selectable voltages ≤ 16 kVA

4AT45	16	UI 240/107	221	221	126	134	146	15 × 22	M12	--	M6	420	320	256	182	196	33	30	22	13
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4BT power transformers and autotransformers with selectable voltages ≥ 18 kVA

4BT45	18	UI 240/107	230	221	152	163	174	15	M12	--	M6	420	310	256	182	196	33	30	22	13
4BT47	20; 22.5; 25	UI 240/137	260	251	172	178	190	15	M12	--	M6	420	310	256	212	196	33	30	22	13
4BT51	28	UIS 265/107	267	207	147	155	167	12.5	M10	M12	--	515	370	285	170	225	--	36	26	16
4BT52	31.5	UIS 265/120	280	220	153	161	173	12.5	M10	M12	--	515	370	285	183	225	--	36	26	16
4BT53	35.5	UIS 265/135	295	235	161	169	181	12.5	M10	M12	--	515	370	285	198	225	--	36	26	16
4BT54	45	UIS 305/125	295	245	166	174	186	15	M12	M12	--	585	420	330	198	260	--	36	26	16
4BT55	50	UIS 305/140	310	260	173	181	193	15	M12	M12	--	585	420	330	213	260	--	36	26	16
4BT56	63	UIS 305/160	330	280	183	191	203	15	M12	M12	--	585	420	330	233	260	--	36	26	16
4BT58	80	UIS 370/150	330	290	180	188	200	15	M12	M12	--	665	520	400	241	320	--	46	32	20
4BT59	100	UIS 370/170	350	310	190	198	210	15	M12	M12	--	665	520	400	261	320	--	46	32	20
4BT60	125	UIS 370/195	375	335	203	211	223	15	M12	M12	--	665	520	400	286	320	--	46	32	20
4BT62	160	UIS 455/175	405	315	193	201	213	21	M16	M12	--	760	650	495	261	395	--	56	40	24
4BT63	200	UIS 455/200	430	340	205	213	225	21	M16	M12	--	760	650	495	298	395	--	56	40	24
4BT65	250	UIS 455/260	490	400	235	243	255	21	M16	M12	--	760	650	495	353	395	--	56	40	24

1) The rated output is only applicable to transformers with separate windings (not to autotransformers).

Single-Phase Transformers

Project planning aids

Protective enclosure with 4AM, 4AT safety, isolation, control and mains transformers ≤ 16 kVA, for degree of protection IP23 and IP54

Mounting positions

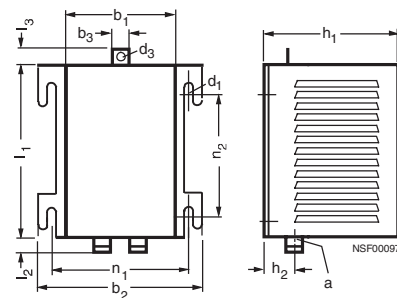
Type	Mounting position	Degree of protection	
		IP23	IP54
4AM, 4AT30 to 4AT43	Horizontal		x
	Vertical	x	x

x permissible

Sheet-steel enclosure, epoxy-resin coated, for degree of protection IP23 and IP54¹⁾

Siemens

4AM, 4AT



Type	a	b ₁	b ₂	b ₃	d ₁	d ₃	h ₁	h ₂	l ₁	l ₂	l ₃	n ₁	n ₂
4AM23 to 4AM34	2 × M25	112	149	--	5.8	--	135	35	155	35	--	137	125
4AM38 to 4AM57	2 × M25	187	224	--	5.8	--	230	42	245	35	--	212	200
4AM61 to 4AM65, 4AT30, 4AT36	2 × M32	305	351	--	9	--	330	56	395	45	--	333	335
4AT39, 4AT43 ¹⁾	2 × M32	395	460	50	13	35	465	60	555	45	50	430	480

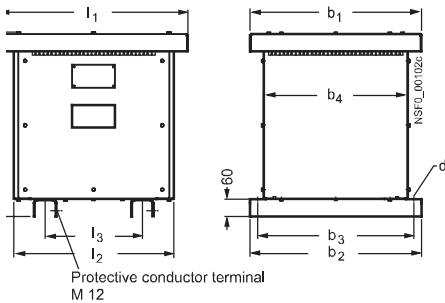
1) The 4AT43 transformers are available only with degree of protection IP23.

Protective enclosure with dry transformers > 16 kVA, for degree of protection IP20 and IP23

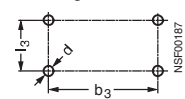
Sheet-steel enclosure, epoxy-resin coated

4AT45, 4BT

for arrangement on horizontal surfaces



Mounting holes



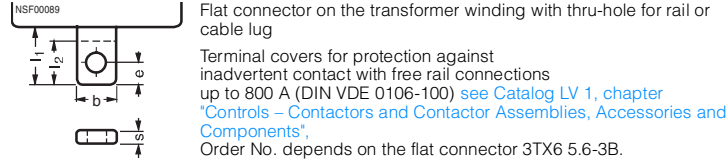
Type	b ₁	b ₂	b ₃	b ₄	h ₁	d	l ₁	l ₂	l ₃
4AT45, 4BT45 and 4BT47	600	600	570	507	645	15	660	560	340
4BT51 to 4BT53	600	600	570	507	735	15	660	560	316
4BT54 to 4BT56	600	600	570	507	825	15	900	800	465
4BT58 to 4BT60	730	730	696	637	905	19	1220	1120	630
4BT62 to 4BT65	900	900	858	807	1005	21	1220	1120	720

Single-Phase Transformers

Project planning aids

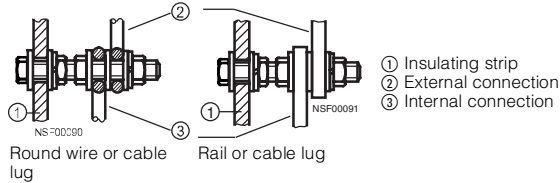
Flat-type and threaded pin terminals

Flat connector with thru-hole



Type	Terminal size	b = l ₂	With hole for screw	e	l ₁	s
4AM, 4AT, 4BT	A					
100	16	M6	8	25	2.5	
200	20	M8	10	30	3	
400	25	M10	12.5	35	5	
630	30	M10	15	40	6	
800	30	M12	15	40	8	
1000	40	M12	20	50	8	

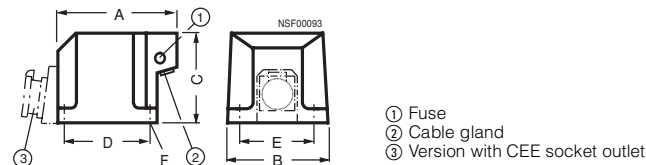
Threaded pins on insulating strip



Type	Terminal size	Threaded pin	For conductor cross-sections mm ²
4AT, 4BT	A		
200	M8	≤ 50	
315	M10	≤ 120	
500	M12	≤ 300	

4AX22, 4AX23 safety transformers, resin-enclosed, 4AX24 isolation transformers, resin-enclosed

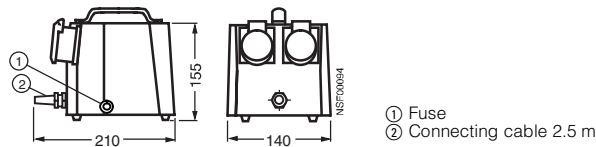
4AX23 10 to 4AX23 16 Safety transformer, stationary, for mounting in any position, suitable for construction sites



Type	P _n kVA	A	B	C	D	E	F
4AX23 10	0.1	115	130	100	64	115	5
4AX23 11	0.16	145	145	125	84	125	5
4AX23 13	0.25	168	145	125	108	125	5
4AX23 14	0.4	180	176	152	103	151	6
4AX23 15	0.63	200	176	152	120	151	6
4AX23 16	1	220	210	175	137	178	6

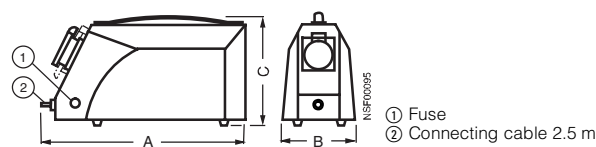
4AX22 12

Safety transformer, portable, with 2 CEE socket outlets, suitable for construction sites



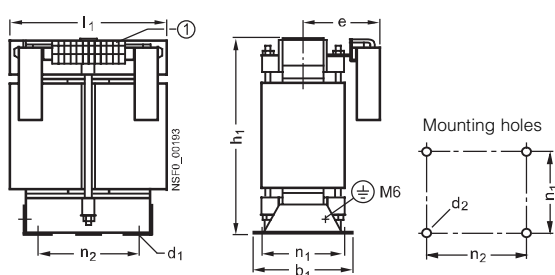
Safety and isolation transformer, portable, suitable for construction sites

4AX22 10 to 4AX22 16 with CEE socket outlets 4AX24 11 to 4AX24 18 with 1 SCHUKO socket outlet



Type	Type	P _n kVA	A	B	C
Safety transformer	Isolation transformer				
4AX22 10	--	0.1	235	95	115
--	4AX24 11	0.16	235	95	115
--	4AX24 13	0.25	280	100	150
4AX22 14	4AX24 14	0.4	280	115	150
4AX22 15	4AX24 15	0.63	280	130	150
4AX22 16	4AX24 16	1	340	140	200
--	4AX24 17	1.6	340	160	200
--	4AX24 18	2.5	340	190	200

4AT isolation transformers for the supply of medical premises



Type	P _n kVA	Designation to DIN 41302	b ₁	d ₁	d ₂	e	h ₁ max.	l ₁	n ₁	n ₂
4AT30	2.5	UI 150/75	155	10 x 18	M8	133	270	200	118	124
4AT36	3.15; 4	UI 180/75	169	10 x 18	M8	142	310	240	138	144
4AT39	5; 6.3	UI 210/70	174	12 x 18	M10	143	370	270	141	176
4AT43	8	UI 240/80	194	15 x 22	M10	148	415	300	155	196

① Screw terminal:
solid 1.0 mm² ... 16 mm²,
stranded 10 mm² ... 25 mm²,
finely stranded 2.5 mm² ... 16 mm²

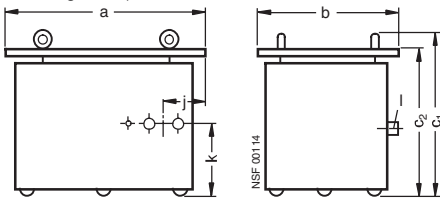
Single-Phase Transformers

Project planning aids

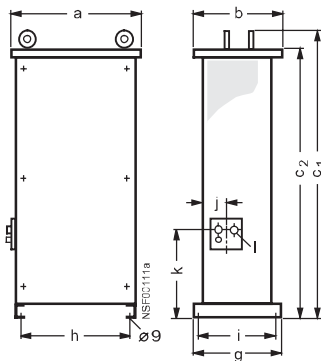
4FL, 4FK voltage regulators

4FL voltage regulators, transformer-type

4FL, degree of protection IP21



Type	a	b	c ₁	c ₂	j	k	l
4FL10 ... 4FL14, 4FL16, 4FL17, 4FL20 ... 4FL22, 4FL24, 4FL26, 4FL29	490	360	--	430	140	70	M25
4FL25, 4FL27, 4FL28, 4FL30 10, 4FL33, 4FL37	700	500	560	510	145	260	M50

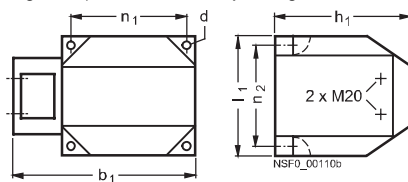


Type	a	b	c ₁	c ₂	g	h	l	j	k	l
4FL30 20, 4FL34 4FL41	505	380	1065	1010	380	360	360	120	395	M50
4FL39, 4FL44, 4FL48	720	470	1355	1290	470	450	450	250	440	M63

4FK voltage regulators, magnetic-type

4FK31 to 4FK34,

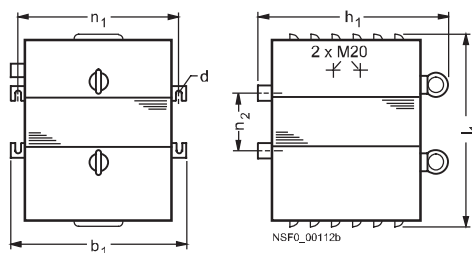
degree of protection IP65, any arrangement



Type	Rated power kVA	b ₁	d	h ₁	l ₁	n ₁	n ₂
4FK31	0.12	250	5	160	120	162	100
4FK32	0.25	305	5	170	140	200	118
4FK33	0.5	305	5	180	155	200	134
4FK34	0.75	320	6	185	185	198	166
4FK35	1	265	9	325	330	240	83
4FK36	1.5	265	9	325	345	240	96
4FK37	2	265	9	325	370	240	122
4FK38	2.5	265	9	325	415	240	167

4FK35 to 4FK38,

degree of protection IP20, any arrangement



4FK39 to 4FK44 (3.15 kVA ... 10 kVA) not shown
degree of protection IP21, horizontal arrangement, H x W x D (mm):
750 x 580 x 510

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Overview

4AP./4AU. transformers

With the right transformer, the right voltage will be available whatever the conditions.

Our transformers are the right choice for each application: They work reliably, safely and worldwide under a wide range of different conditions.

The transformers are configured in user-friendly combinations as isolation, control and mains transformers according to EN 61558-2-4, -2-2, -2-1, or as safety, control and mains transformers according to EN 61558-2-6, -2-2, -2-1, or as autotransformers according to EN 61558-2-13 with selectable input and output voltages.

Note: Mains transformers with ≤ 50 V on the output side are, in the case of SIRIUS transformers, always designed as safety transformers.

Our transformers offer optimal protection through high permissible ambient temperatures up to 40 °C or 55 °C, a high short-time rating in the case of control transformers, fuseless construction and due to its safety standard "Safety inside" EN 61558.

Design

Standards

EN 61558-2-6, -2-4, -2-2, -2-1, -2-13

The standard EN 61558 with the VDE classification VDE 0570 is the European edition of the international standard IEC 61558 (Safety of power transformers, power supply units and similar) and has completely replaced the previous standards VDE 0550 and VDE 0551.

Some of the transformers are subject to more stringent manufacturing and testing conditions in view of these changes.

Transformers for general applications always have double or reinforced insulation with SELV voltages (can be touched, maximum 50 V AC and 120 V DC), i.e. these transformers are exclusively safety isolation transformers.

Furthermore, all transformers are supplied with information on the protective elements with which they are protected against short-circuit and overload.

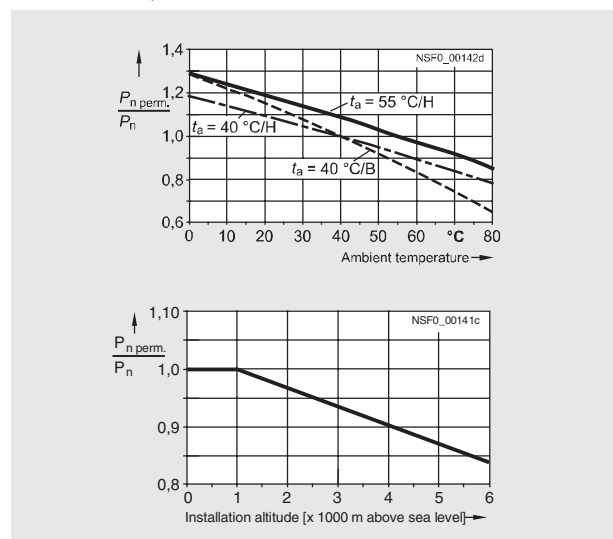
The SIRIUS transformer series contains the combined features of safety, isolation and control or mains transformers, i.e. one transformer for (virtually) all applications. SIRIUS transformers comply with the highest requirements (and with regard to safety the most stringent requirements) of the transformer versions contained in this catalog. A SIRIUS transformer is the right one whatever the application.

Rated power P_n at high ambient temperature – the reference for thermal load capacity

Reference conditions under which the transformers have the rated power P_n stated in the tables:

- Continuous operation P_n
- Frequency AC 50 Hz ... 60 Hz
- Degree of protection IP00
- Installation altitude up to 1000 m above sea level and
- Ambient temperature t_a , type-dependent 40 °C or 55 °C.

Other installation and operating conditions than this will affect the permissible continuous load capacity. In the case of the 4AP transformers, for example, with a low ambient temperature of 30 °C an increase in load of 8 % is possible (see load characteristics).



Load characteristics: Permissible transformer continuous load in relation to the ambient temperature and the installation altitude

Short-time rating P_{short} of control transformers – the characteristic variable for the dynamic capacity

The most important selection criterion for control transformers is their short-time rating P_{short} .

This is required for switching on electromagnetic loads, e.g. contactors with high making current in relation to the holding current. According to EN 61558-2-2 "Special requirements for control transformers" the output voltage with this load should not drop more than 5 % in relation to the rated voltage in order to ensure safe switching.

Depending on their application, control transformers 4AP and 4AU ≤ 16 kVA are optimized for high short-time ratings with comparatively low ratings and thus small size.

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Low inrush current – primary-side short-circuit and overload protection with standard circuit-breakers

4AP and 4AU three-phase transformers in the rating range ≤ 16 kVA are matched to protective devices that reliably protect the transformers in the event of short-circuits or overloads.

Standard 3RV and 3VF circuit-breakers offer optimum protection. In this way the transformers are protected on the primary side against both short-circuits and overload, without the possibility of nuisance tripping on startup. The low inrush current, the short-circuit current and the thermal load capacity on overload are matched to the tripping characteristics of the circuit-breakers.

It is also possible to protect the transformers on the secondary side against short-circuits and overloads with circuit-breakers or miniature circuit-breakers with C characteristics.

Note: The specified primary-side circuit-breakers are for protecting the primary side of transformers in the event of short-circuits and overload on the secondary side. In the event of a possible short-circuit on the feeder lines between the protective device and the primary side of the transformer, the rated short-circuit breaking capacity of the circuit-breaker must be taken into account with regard to the maximum possible prospective short-circuit current at the place of installation. For these device assignments, see the tables in the "Technical Specifications".

Design

All 4AP and 4AU three-phase transformers are supplied for screw-fixing on a mounting plate.

Connections

The 4AP transformers up to a rated current of 60 A and the 4AU transformers up to a rated current of 43 A in the standard version are supplied with screw terminals.

For higher currents, the transformers are supplied with flat connections or with threaded pins.

Enclosure mounting

4AP and 4AU transformers are also available in protective enclosures of the degree of protection IP23 and IP54.

Required specifications for requests and orders for 4AP and 4AU transformers with selectable voltages

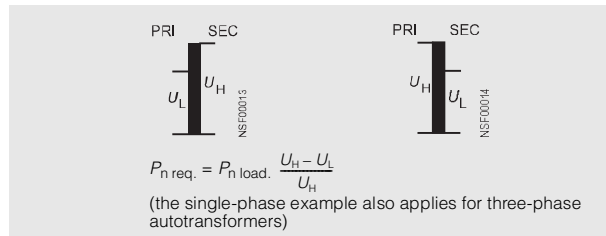
Rated power P_n (output division with separate SEC windings, $P_n = P_1 + P_2$, throughput rating = load rating for autotransformers), PRI and SEC voltages, frequency, vector group, degree of protection (power reduction with degrees of protection other than IP00), Order No. stem.

The Order No. stem is added to the Order No. for delivery.

Example:

Three-phase transformer with selectable voltages 16 kVA
 PRI 415 V \pm 5 %, SEC 115 V,
 Frequency 50 Hz ... 60 Hz,
 Degree of protection IP00, shield winding,
 Order No. stem 4AU39 3

4AP and 4AU autotransformers: Determine the type rating P_n req.



Step-up transformer (figure on the left) and step-down transformer (figure on the right)

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Technical specifications

Transformers	Type	4AP	4AU
<ul style="list-style-type: none"> Version Performance range (with IP00) Approvals 	kVA	0.16 ... 5	> 5 ... 16
Voltage range	V	≤ 690	
<ul style="list-style-type: none"> Approvals for USA, Canada 	V	≤ 600	
Rated frequency	Hz	50 ... 60	
Thermal class		B	H
<ul style="list-style-type: none"> According to UL/CSA 		Class 130	Class 180
Ambient conditions	Protection against harmful ambient conditions: Complete impregnation in polyester resin Climate-proof for mounting in rooms with an external climate to DIN 50010		
Rated ambient temperature			
<ul style="list-style-type: none"> At rated output 	°C	40	55
<ul style="list-style-type: none"> Maximum value (after reduced output depending on load characteristics, (see "Design")) 	°C	80	
<ul style="list-style-type: none"> Minimum value 	°C	-25	
Relative air humidity			
<ul style="list-style-type: none"> Average up to 	%	80	
<ul style="list-style-type: none"> Maximum value for 30 days/year 	%	95	
<ul style="list-style-type: none"> At 40 °C occasionally 	%	100	
Safety class		I	
Degree of protection			
<ul style="list-style-type: none"> Without enclosure 		IP00	
<ul style="list-style-type: none"> With protective enclosure (according to "Selection and Ordering Data", see Catalog LV 1) 		IP23 or IP54	
<ul style="list-style-type: none"> Version 		IP23, IP54: steel enclosure coated with epoxy resin, color gray RAL 7032	
Installation height		Up to 1000 m above sea level (above this, derating is necessary)	
Protective devices			
<ul style="list-style-type: none"> External 		The transformers can be protected on the primary and secondary side against short-circuits and overload by means of circuit-breakers. For reliable protection against short-circuits, overload and touch, the cables between the output terminals of the transformer and the load must have a negligible line impedance. For more details see DIN VDE 0100 (Erection of low-voltage systems) Part 410, Part 520 (particularly section 525) and part 610. Assigned protective devices (see "Technical Specifications")	
Connection technique		The permissible conductor cross-sections are assigned to the specified terminal types.	
<ul style="list-style-type: none"> Terminal arrangement (see "Schematics") 		Refer to DIN VDE 0298-4 and EN 60204 (VDE 0113-1) for the permissible conductor cross-sections for the specified current according to the installation type.	
<ul style="list-style-type: none"> For terminal designs and connectable cross-sections (see "Project Planning Aids") 		Other terminal sizes than standard versions on request.	
Mounting position		The permissible mounting position for each version is shown in the "Project Planning Aids".	

Further technical specifications can be found on the Internet at <http://www.siemens.com/sidac>.

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Rated outputs at different ambient temperatures

- With galvanically isolated windings
- Degree of protection IP00
- According to EN 61558, **CE**

Transformer	Rated power P_n	Permissible transformer load depending on the ambient temperature							
		$t_a = 60\text{ °C}$	$t_a = 55\text{ °C}$	$t_a = 50\text{ °C}$	$t_a = 45\text{ °C}$	$t_a = 40\text{ °C}$	$t_a = 35\text{ °C}$	$t_a = 30\text{ °C}$	$t_a = 25\text{ °C}$
Type	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA
4AP17 4	0.16	0.134	0.141	0.147	0.154	0.160	0.166	0.173	0.178
4AP18 4	0.25	0.210	0.220	0.230	0.240	0.250	0.260	0.270	0.278
4AP19 4	0.4	0.336	0.352	0.368	0.384	0.400	0.416	0.432	0.444
4AP20 4	0.63	0.529	0.554	0.580	0.605	0.630	0.655	0.680	0.699
4AP21 4	1	0.840	0.880	0.920	0.960	1	1.04	1.08	1.11
4AP25 4	1.6	1.34	1.41	1.47	1.54	1.60	1.66	1.73	1.78
4AP27 4	2.5	2.10	2.20	2.30	2.40	2.50	2.60	2.70	2.78
4AP30 4	4	3.36	3.52	3.68	3.84	4	4.16	4.32	4.44
4AP30 5	5	4.20	4.40	4.60	4.80	5.00	5.20	5.40	5.55
4AU30 3	6.3	6.11	6.30	6.49	6.68	6.93	7.12	7.31	7.50
4AU36 1	8	7.76	8	8.24	8.48	8.80	9.04	9.28	9.52
4AU36 3	10	9.70	10	10.3	10.6	11	11.3	11.6	11.9
4AU39 1	12.5	12.1	12.5	12.9	13.3	13.8	14.1	14.5	14.9
4AU39 3	16	15.5	16	16.5	17	17.6	18.1	18.6	19

Operating characteristics

- According to EN 61558-2-6, EN 61558-2-4, EN 61558-2-1

Transformer	Rated power P_n 50 Hz ... 60 Hz 1000 m above seal level Degree of protection IP00	Core size	Voltage rise in no-load operation (operating temperature)	Voltage drop on rated load ¹⁾	Short-circuit voltage ¹⁾	Efficiency
Type	kVA					
4AP: $t_a = 40\text{ °C/B}$						
4AP17 4	0.16	3UI 60/30	13.3	10.1	10.1	85
4AP18 4	0.25	3UI 75/25	11.7	8.9	9	87
4AP19 4	0.4	3UI 75/40	11.8	8.5	8.5	87
4AP20 4	0.63	3UI 90/30	9.3	6.8	6.8	89
4AP21 4	1	3UI 90/50	6.4	4.8	4.8	92
4AP25 4	1.6	3UI 114/62	4.9	3.6	3.6	93
4AP27 4	2.5	3UI 132/70	4.5	3.4	3.4	94
4AP30 4	4	3UI 150/75	3.5	2.6	2.7	95
4AP30 5	5	3UI 150/75	2.8	2.1	2.2	96
4AU: $t_a = 55\text{ °C/H}$						
4AU30 3	6.3	3UI 150/75	3.8	2.6	2.6	96
4AU36 1	8	3UI 180/75	5.1	3.6	3.6	94
4AU36 3	10	3UI 180/75	4.1	2.9	3	95
4AU39 1	12.5	3UI 210/70	4.1	2.9	3.1	95
4AU39 3	16	3UI 210/70	3.2	2.3	2.8	96

Higher ratings and other conditions on request.

Calculation of heat dissipation P_V

$$P_V = \frac{P_n (100 - \eta)}{\eta} \text{ [kW]}$$

1) Winding reference temperature: 20 °C.

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Primary-side short-circuit and overload protection with motor starter protectors

Transformer	Rated power P_n	Motor starter protector version: Motor protection	Rated input voltage U_{1N} in V																				
			Type	kVA	Type	520	500	480	460	440	420	400	380	360	300	288	277	265	254	242	230	220	208
4AP17 4	0.16	3RV10 11-□□□10 Setting value in A	0DA	0DA	0EA	0EA	0EA	0EA	0EA	0EA	0EA	0EA	0FA	0GA	0GA	0GA	0HA	0HA	0HA	0HA	0HA	0HA	0HA
4AP18 4	0.25	3RV10 11-□□□10 Setting value in A	0FA	0FA	0FA	0FA	0FA	0FA	0GA	0GA	0GA	0HA	0JA	0JA	0JA	0JA	0KA	0KA	0KA	0KA	0KA	0KA	0KA
4AP19 4	0.4	3RV10 11-□□□10 Setting value in A	0HA	0HA	0JA	0JA	0JA	0JA	0JA	0JA	0JA	0KA	1AA	1AA	1AA	1AA	1BA	1BA	1BA	1BA	1BA	1BA	1BA
4AP20 4	0.63	3RV10 11-□□□10 Setting value in A	0KA	0KA	1AA	1AA	1AA	1AA	1AA	1AA	1AA	1BA	1CA	1CA	1CA	1CA	1CA	1CA	1CA	1CA	1DA	1DA	1DA
4AP21 4	1	3RV10 11-□□□10 Setting value in A	1BA	1BA	1CA	1CA	1CA	1CA	1CA	1CA	1CA	1DA	1EA	1EA	1EA	1EA	1EA	1EA	1EA	1EA	1EA	1FA	1FA
4AP25 4	1.6	3RV10 11-□□□10 Setting value in A	1DA	1DA	1EA	1EA	1EA	1EA	1EA	1EA	1FA	1FA	1GA	1GA	1GA	1GA	1GA	1GA	1GA	1HA	1HA	1HA	1HA
4AP27 4	2.5	3RV10 11-□□□10 Setting value in A	1FA	1FA	1FA	1GA	1GA	1GA	1GA	1HA	1HA	1JA	1JA	1JA	1JA	1JA	1JA	1JA	1JA	1JA	1JA	1KA	1KA
4AP30 4	4	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1HA	1HA	1HA	1JA	1JA	1JA	1JA	1JA	1KA	--	--	--	--	--	--	--	--	--	--	--	--
4AP30 5	5	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	--	--	--	--	--	--	--	--	4AA	4AA	4AA	4AA	4AA	4AA	4AA	4AA	4AA	4AA	4AA	4AA	
4AU30 3	6.3	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1KA	1KA	1KA	1KA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4AU36 1	8	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4AA	4AA	4AA	4AA	4AA	4BA	4BA	4BA	4BA	4CA	4CA	4CA	4CA	4CA	4DA	4DA	4DA	4DA	4DA	--	--
4AU36 3	10	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4BA	4BA	4BA	4BA	4CA	4CA	4CA	4CA	4CA	4DA	4DA	4DA	4DA	4DA	4DA	4DA	4DA	4DA	4DA	4DA	4DA
4AU39 1	12.5	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4CA	4CA	4CA	4CA	4DA	4DA	4DA	4DA	4DA	--	--	--	--	--	--	--	--	--	--	--	--
4AU39 3	16	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4DA	4DA	4DA	4DA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Secondary-side short-circuit and overload protection with motor starter protector or miniature circuit-breaker

Trans- former	Rated power P_n	Motor starter protector version: Motor protection	Rated output voltage U_{2N} in V		Trans- former	Rated power P_n	Miniature circuit-breaker	Rated output voltage U_{2N} in V	
			400	230				400	230
Type	kVA	Type			Type	kVA	Type		
4AP17 4	0.16	3RV10 11-□□□10 Setting value in A	0DA 0.27	0FA 0.5	4AP17 4	0.16	5SX2 □□□-7 Current value in A	--	--
4AP18 4	0.25	3RV10 11-□□□10 Setting value in A	0FA 0.42	0HA 0.75	4AP18 4	0.25	5SX2 □□□-7 Current value in A	--	--
4AP19 4	0.4	3RV10 11-□□□10 Setting value in A	0HA 0.7	0KA 1.2	4AP19 4	0.4	5SX2 □□□-7 Current value in A	--	--
4AP20 4	0.63	3RV10 11-□□□10 Setting value in A	0KA 1.1	1BA 1.9	4AP20 4	0.63	5SX2 □□□-7 Current value in A	101 1	--
4AP21 4	1	3RV10 11-□□□10 Setting value in A	1BA 1.7	1DA 3	4AP21 4	1	5SX2 □□□-7 Current value in A	115 1.6	103 3
4AP25 4	1.6	3RV10 11-□□□10 Setting value in A	1DA 2.7	1FA 5	4AP25 4	1.6	5SX2 □□□-7 Current value in A	--	--
4AP27 4	2.5	3RV10 11-□□□10 Setting value in A	1FA 4.2	1HA 7.5	4AP27 4	2.5	5SX2 □□□-7 Current value in A	104 4	--
4AP30 4	4	3RV10 11-□□□10 Setting value in A	1HA 6.7	1KA 12	4AP30 4	4	5SX2 □□□-7 Current value in A	--	--
4AP30 5	5	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1JA -- 8.5	-- 4AA 15	4AP30 5	5	5SX2 □□□-7 Current value in A	108 8	--
4AU30 3	6.3	3RV10 11-□□□10 3RV10 21-□□□10 Setting value in A	1KA -- 11	-- 4BA 19	4AU30 3	6.3	5SX2 □□□-7 Current value in A	110 10	--
4AU36 1	8	3RV10 21-□□□10 Setting value in A	4AA 14	4DA 24	4AU36 1	8	5SX2 □□□-7 Current value in A	113 13	--
4AU36 3	10	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4BA -- 17	-- 4EA 29	4AU36 3	10	5SX2 □□□-7 Current value in A	116 16	--
4AU39 1	12.5	3RV10 21-□□□10 3RV10 31-□□□10 Setting value in A	4CA -- 21	-- 4FA 37	4AU39 1	12.5	5SX2 □□□-7 Current value in A	120 20	--
4AU39 3	16	3RV10 31-□□□10 Setting value in A	4EA 27	4HA 47	4AU39 3	16	5SX2 □□□-7 Current value in A	-- --	--

Short-time rating of control transformers $P_{short.}^{1)} = f(p.f.)$ for $U_2 = 0.95 \times U_{2N}$

Trans- former	Rated power P_n	Short-time rating $P_{short.}^{1)}$ with										Voltage rise in no-load operation (operating temperature)	Voltage drop on rated load (at 20 °C)	Short-circuit voltage (at 20 °C)
		p.f. = 0.1	p.f. = 0.2	p.f. = 0.3	p.f. = 0.4	p.f. = 0.5	p.f. = 0.6	p.f. = 0.7	p.f. = 0.8	p.f. = 0.9	p.f. = 1			
Type	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	kVA	u_A %	u_R %	u_Z %
4AP20 4	0.63	4.5	3.3	2.6	2.1	1.8	1.6	1.4	1.3	1.2	1.1	9.3	6.8	6.8
4AP21 4	1	9.3	6.5	5	4.1	3.5	3	2.7	2.4	2.2	2.1	6.4	4.8	4.8
4AP25 4	1.6	21	14	10	8.3	6.9	5.9	5.2	4.7	4.2	3.9	4.9	3.6	3.6
4AP27 4	2.5	37	24	17	14	11	9.9	8.7	7.8	7	6.5	4.5	3.4	3.4
4AP30 4	4	60	40	30	24	20	18	16	14	13	12	3.5	2.6	2.7
4AU30 3	6.3	64.5	48.5	39	32.5	28	25	22.5	20.5	19	18.5	3.5	2.6	2.6
4AU36 1	8	83	58.5	45	37	31.5	27.5	24	22	20	19	5.1	3.6	3.6
4AU36 3	10	80.5	63	52	44	39	35	31.5	29	27.5	27	4.1	2.9	3
4AU39 1	12.5	104	80.5	66	56	49	44	39.5	36	34.5	34	4.1	2.9	3.1
4AU39 3	16	85	74	66	60	55	51.5	48.5	46.5	46	51	3.2	2.3	2.8

1) $P_{short.}$ applies to up to 300 contactor operations per hour.

Three-Phase Transformers

4AP, 4AU Safety, Isolation, Control and Mains Transformers

General data

Schematics

In two-voltage version

Circuit diagrams and terminal assignments	Rated input voltage	Rated output voltage	Connections and circuit terminals		
	U_{1N}	U_{2N}	Rated voltage	Connections	Circuit terminals ¹⁾
	V	V	V		
<p>Vector group IIIiii0</p> <p>4AP17 to 4AP30</p> <p>NSF00036</p> <p>2U1 2U2 2V1 2V2 2W1 2W2</p> <p>NSF00037</p> <p>1U1 1U3 1U2 1V1 1V3 1V2 1W1 1W3 1W2</p>	Υ 500-400/ Δ 289-230	Υ 400/ Δ 230	Primary 500 400 289 230	1U1-1V1-1W1 1U2-1V2-1W2 1U3-1V3-1W3 1U1-1W2, 1V1-1U2, 1W1-1V2 1U1-1W3, 1V1-1U3, 1W1-1V3	
				Secondary	
<p>4AU30 to 4AU39</p> <p>NSF00038a</p> <p>2U1 2U2 2V1 2V2 2W1 2W2</p> <p>NSF00037</p> <p>1U1 1U3 1U2 1V1 1V3 1V2 1W1 1W3 1W2</p>			400 230	2U1-2V1-2W1 2U2-2V2-2W2 2U1-2W2, 2V1-2U2, 2W1-2W2	

Multi-voltage version

Circuit diagrams and terminal assignments	Rated input voltage	Rated output voltage	Connections and circuit terminals		
	U_{1N}	U_{2N}	Rated voltage	Connections	Circuit terminals ¹⁾
	V	V	V		
<p>Vector group IIIiii0</p> <p>4AP20 to 4AP30</p> <p>NSF00038a</p> <p>2U1 2U2 2V1 2V2 2W1 2W2</p> <p>NSF00041</p> <p>1U1 1U3 1U4 1U5 1U8 1U2 1V1 1V3 1V4 1V5 1V6 1V2 1W1 1W3 1W4 1W5 1W6 1W2</p>	Υ 520-500- 480-460- 440-420- 400-380- 360/ Δ 300-289- 277-266- 254-240- 230-220- 208	Υ 400/ Δ 230	Primary 520 500 480 460 440 420 400 380 360	1U1-1V1-1W1 1U2-1V2-1W2 1U1-1V1-1W1 1U6-1V6-1W6 1U1-1V1-1W1 1U5-1V5-1W5 1U3-1V3-1W3 1U2-1V2-1W2 1U3-1V3-1W3 1U6-1V6-1W6 1U3-1V3-1W3 1U5-1V5-1W5 1U4-1V4-1W4 1U2-1V2-1W2 1U4-1V4-1W4 1U6-1V6-1W6 1U4-1V4-1W4 1U5-1V5-1W5	
				Secondary	
<p>4AU30 to 4AU39</p> <p>NSF00042a</p> <p>2U1 2U2 2V1 2V2 2W1 2W2</p> <p>NSF00041</p> <p>1U1 1U3 1U2 1U5 1U8 1U4 1U2 1V1 1V3 1V4 1V5 1V6 1V2 1W1 1W3 1W4 1W5 1W6 1W2</p>			300 289 277 266 254 240 230 220 208	1U1-1V1-1W1 1U2-1V1, 1V2-1W1, 1W2-1U1 1U1-1V1-1W1 1U6-1V1, 1V6-1W1, 1W6-1U1 1U1-1V1-1W1 1U5-1V1, 1V5-1W1, 1W5-1U1 1U3-1V3-1W3 1U2-1V3, 1V2-1W3, 1W2-1U3 1U3-1V3-1W3 1U6-1V3, 1V6-1W3, 1W6-1U3 1U3-1V3-1W3 1U5-1V3, 1V5-1W3, 1W5-1U3 1U4-1V4-1W4 1U2-1V4, 1V2-1W4, 1W2-1U4 1U4-1V4-1W4 1U6-1V4, 1V6-1W4, 1W6-1U4 1U4-1V4-1W4 1U5-1V4, 1V5-1W4, 1W5-1U4	

1) Υ/Δ jumpers are not included in the scope of supply.

Three-Phase Transformers

4BU Power Transformers

General data

Overview

4BU.. transformers

With the right transformer, the right voltage will be available at any conditions.

Our transformers are the right choice for each application: They work reliably, safely and worldwide under a wide range of different conditions.

4BU three-phase power transformers

- Are available as matching transformers with one input/output voltage according to DIN VDE 0532-6
- And can be configured as matching, auto- or converter transformers according to DIN VDE 0532-6 with selectable input and output voltages.

Our transformers provide optimal protection through high permissible ambient temperatures of up to 40 °C or 55 °C.

Design

Standards

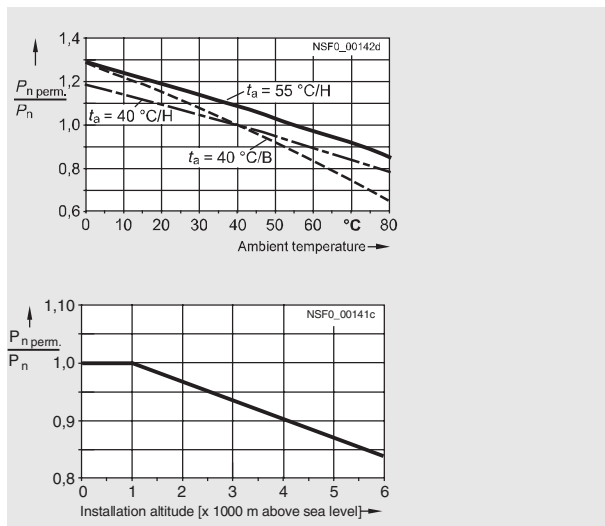
DIN VDE 0532-6

Rated power P_n at high ambient temperature – the reference for thermal load capacity

Reference conditions under which the transformers have the rated power P_n stated in the tables:

- Continuous operation P_n
- Frequency AC 50 Hz ... 60 Hz
- Degree of protection IP00
- Installation altitude up to 1000 m above sea level and
- Ambient temperature t_a , type-dependent 40 °C or 55 °C.

Other installation and operating conditions than this will affect the permissible continuous load capacity. In the case of the 4BU transformers, for example, with a low ambient temperature of 40 °C instead of 55 °C, an increase in load of 8 % is possible (see load characteristics).



Load characteristics: Permissible transformer continuous load in relation to the ambient temperature and the installation altitude

Design

All 4BU three-phase power transformers are supplied for screw mounting on a mounting plate.

Connections

The 4BU transformers are supplied for rated currents up to 81 A in the standard design with screw terminals.

For higher currents, the transformers are supplied with flat connections or with threaded pins.

Enclosure mounting

4BU transformers are also available in protective enclosures with degree of protection IP20 and IP23.

Required specifications for requests and orders for 4BU transformers with selectable voltages

Rated power P_n (output division with separate SEC windings, $P_n = P_1 + P_2$, throughput rating = load rating for autotransformers), PRI and SEC voltages, frequency, vector group, degree of protection (power reduction with degrees of protection other than IP00), Order No. stem.

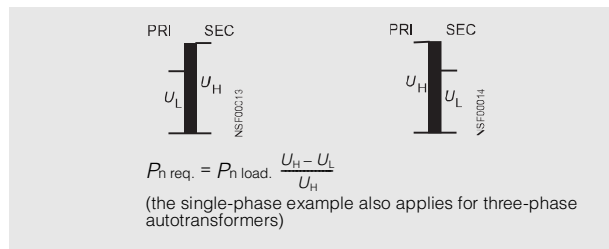
The Order No. stem is added to the Order No. for delivery.

Example:

Three-phase power transformer 180 kVA
 PRI 415 V \pm 5%, SEC 115 V,
 frequency 50 Hz ... 60 Hz,
 degree of protection IP00, shield winding,
 Order No. stem 4BU60 32 (without UL), 4BU60 33 (with **cULus**)

4BU autotransformers:

Determine the type rating P_n req.



Step-up transformer (figure on the left) and step-down transformer (figure on the right)

Thermistor transformer protection for 4BU power transformers

The windings of the power transformers can be protected from impermissible overheating by means of thermistor transformer protection. PTC thermistors are used which are wound into each shank of the transformer and connected in series. The rated response temperature is slightly above the limit temperature for continuous operation.

Possible versions:

- Warning
- Shutdown
- Warning and shutdown

The connections for the temperature sensor are routed to terminals, two terminals each for warning and disconnection.

The 3RN tripping units are not included in the transformer scope of supply, for the relevant selection and ordering data see the chapter "Monitoring and Control Devices -> Monitoring Relays -> Thermistor Motor Protection" in the Catalog LV 1.

Three-Phase Transformers

4BU Power Transformers

General data

Technical specifications

Transformers	Type	4BU
<ul style="list-style-type: none"> Version Performance range (with IP00) Approvals 	kVA	3UI core > 16 ... 400 (up to 2000 kVA on request) cTUs optional
Voltage range	V	≤ 1000 (up to 3.6 kV on request)
<ul style="list-style-type: none"> Approvals for USA, Canada 	V	≤ 600
Rated frequency	Hz	50 ... 60
Thermal class		H
<ul style="list-style-type: none"> According to UL/CSA 		Class 180
Ambient conditions		Protection against harmful ambient conditions: Complete impregnation in polyester resin Climate-proof for mounting in rooms with an external climate to DIN 50010
Rated ambient temperature		
<ul style="list-style-type: none"> At rated output Maximum value (after reduced output depending on load characteristics, (see "Design")) Minimum value 	°C	40 and optionally 55 80 -25
Relative air humidity		
<ul style="list-style-type: none"> Average up to Maximum value for 30 days/year At 40 °C occasionally 	%	80 95 100
Safety class		I
Degree of protection		
<ul style="list-style-type: none"> Without protective enclosure With protective enclosure (according to "Selection and Ordering Data", see Catalog LV 1) Version 		IP00 IP20 or IP23 IP20, IP23: steel enclosure coated with epoxy resin, color gray RAL 7032
Installation height		Up to 1000 m above sea level (above this, derating is necessary)
Protective devices		
<ul style="list-style-type: none"> Internal External 		Can be designed with thermistor transformer protection for warning or disconnection or warning and disconnection, see "Design" The transformers can be protected on the primary and secondary side against short-circuits and overload by means of circuit-breakers. For reliable protection against short-circuits, overload and touch, the cables between the output terminals of the transformer and the load must have a negligible line impedance. For more details see DIN VDE 0100 (Erection of low-voltage systems) Part 410, Part 520 (particularly section 525) and part 610. On request
Connection technique		The permissible conductor cross-sections are assigned to the specified terminal types.
<ul style="list-style-type: none"> Terminal arrangement For terminal designs and connectable cross-sections (see "Project Planning Aids") 		Refer to DIN VDE 0298-4 and EN 60204 (VDE 0113-1) for the permissible conductor cross-sections for the specified current according to the installation type. Other terminal sizes than standard versions on request.
Mounting position		The permissible mounting position for each version is shown in the "Project Planning Aids".

Further technical specifications can be found on the Internet at <http://www.siemens.com/sidac>.

Three-Phase Transformers

4BU Power Transformers

General data

Operating characteristics

- According to DIN VDE 0532-6
- $t_a = 40 \text{ °C/H}$

Transformer Type	Rated power P_n 50 Hz ... 60 Hz 1000 m above sea level Degree of protection IP00 kVA	Core size	Voltage rise in no-load operation (operating temperature)	Voltage drop on rated load ¹⁾	Short-circuit voltage ¹⁾	Efficiency
			u_A approx. %	u_R approx. %	u_Z approx. %	η approx. %
			4BU.. .2/4BU.. .3 ²⁾	4BU.. .2/4BU.. .3 ²⁾	4BU.. .2/4BU.. .3 ²⁾	4BU.. .2/4BU.. .3 ²⁾
4BU43 3.	18	3UI 230/80	4.2/4.0	3.9/3.7	4.0/3.8	95
4BU43 4.	20	3UI 230/80	3.8/3.6	3.5/3.4	3.7/3.5	96
4BU43 5.	22.5	3UI 230/80	3.4/3.2	3.1/3.0	3.4	96
4BU45 3.	25	3UI 230/107	3.3/3.1	3.0/2.9	3.1/3.0	96
4BU45 4.	28	3UI 230/107	2.9/2.8	2.7/2.6	2.9/2.8	96
4BU47 3.	31.5	3UI 230/137	2.7/2.6	2.5/2.4	2.6/2.5	96/97
4BU47 4.	35.5	3UI 230/137	2.4/2.3	2.2	2.4/2.3	97
4BU47 5.	40	3UI 230/137	2.1/2.0	2.0/1.9	2.3/2.2	97
4BU52 3.	45	3UIS 220/120	3.4/3.2	3.1/3.0	3.9/3.8	96
4BU53 3.	50	3UIS 220/135	3.1/2.9	2.8/2.7	3.5	96/97
4BU53 4.	56	3UIS 220/135	2.7/2.6	2.5/2.4	3.6/3.5	97
4BU54 3.	63	3UIS 305/125	4.0/3.9	3.7/3.6	4.3/4.2	95/96
4BU54 4.	71	3UIS 305/125	3.6/3.4	3.3/3.2	4.2	96
4BU55 3.	80	3UIS 305/140	3.3/3.1	3.0/2.9	3.9	96
4BU56 3.	91	3UIS 305/160	3.0/2.9	2.8/2.7	3.6	96/97
4BU56 4.	100	3UIS 305/160	2.7/2.6	2.5	3.7	97
4BU58 3.	112	3UIS 395/150	4.4/4.2	4.0/3.9	4.9/4.8	95
4BU58 4.	125	3UIS 395/150	3.9/3.8	3.6/3.5	4.9/4.8	96
4BU58 5.	140	3UIS 395/150	3.5/3.4	3.2/3.1	5.1/5.0	96
4BU59 3.	160	3UIS 395/170	3.2/3.1	3.0/2.9	4.7	96
4BU60 3.	180	3UIS 395/195	3.0/2.9	2.8/2.7	4.3/4.2	97
4BU62 3.	200	3UIS 455/175	2.8/2.6	2.6/2.5	3.8/3.7	97
4BU62 4.	225	3UIS 455/175	2.4/2.3	2.3/2.2	4.0	97
4BU62 5.	250	3UIS 455/175	2.2/2.1	2.1/2.0	4.5	97
4BU63 3.	280	3UIS 455/200	2.1/2.0	1.9	4.0/4.5	97/98
4BU63 4.	315	3UIS 455/200	1.8/1.7	1.7	4.7	98
4BU64 3.	355	3UIS 455/230	1.7/1.6	1.6/1.5	4.2/4.3	98
4BU65 3.	400	3UIS 455/260	1.6/1.5	1.5/1.4	4.0/4.3	98

Higher ratings and other conditions on request.

Calculation of heat dissipation P_V

$$P_V = \frac{P_n (100 - \eta)}{\eta} \text{ [kW]}$$

1) Winding reference temperature: 115 °C.

2) 4BU.. .2 with **CE**; 4BU.. .3 with **CE** and **CE** approval.

Three-Phase Transformers

4BU Power Transformers

General data

Schematics

Circuit diagrams and terminal assignments	Rated input voltage	Rated output voltage	Connections and circuit terminals		
	U_{1N}	U_{2N}	Rated voltage	Connections	Circuit terminals
	V	V	V		
Vector group Dyn5					
<p>Up to 81 A: terminals <small>1U1 1V1 1W1 2U2 2V2 2W2 2N</small> <small>NSFO_00200</small></p> <p>> 81 A flat connectors, see Project Planning Aids <small>1U1 1V1 1W1 2U2 2V2 2W2 2N</small> <small>NSFO_00201</small></p>	Δ 480 Δ 440 Δ 400	Υ 400 Υ 208	Primary 480 1U1-1V1-1W1 -- 440 1U1-1V1-1W1 400 1U1-1V1-1W1 Secondary 400 2U2-2V2-2W2 -- 208 2U2-2V2-2W2		
	Vector group Dyn5 $\pm 5\%$				
<p>Up to 81 A: terminals <small>1U3 1U4 1U2 1V1 1V3 1V4 1V2 1W1 1W3 1W4 1W2 1U1 1U1 2U2 2V2 2W2 2N</small> <small>NSFO_00202</small></p> <p>> 81 A flat connectors, see Project Planning Aids <small>1U3 1U4 1U2 1V1 1V3 1V4 1V2 1W1 1W3 1W4 1W2 1U1 1U1 2U2 2V2 2W2 2N</small> <small>NSFO_00203</small></p>	Δ 504-480-456 Δ 462-440-418 Δ 420-400-380	Υ 400 Υ 208	Primary 504 1U1-1V1-1W1 1U2-1V1; 1V2-1W1; 1W2-1U1 480 1U4-1V1; 1V4-1W1; 1W4-1U1 456 1U3-1V1; 1V3-1W1; 1W3-1U1 462 1U1-1V1-1W1 1U2-1V1; 1V2-1W1; 1W2-1U1 440 1U4-1V1; 1V4-1W1; 1W4-1U1 418 1U3-1V1; 1V3-1W1; 1W3-1U1 420 1U1-1V1-1W1 1U2-1V1; 1V2-1W1; 1W2-1U1 400 1U4-1V1; 1V4-1W1; 1W4-1U1 380 1U3-1V1; 1V3-1W1; 1W3-1U1 Secondary 400 2U2-2V2-2W2 -- 208 2U2-2V2-2W2		
	Vector group Yyn0				
<p>Up to 81 A: terminals <small>1U1 1V1 1W1 2U1 2V1 2W1 2N</small> <small>NSFO_00204</small></p> <p>> 81 A flat connectors, see Project Planning Aids <small>1U1 1V1 1W1 2U1 2V1 2W1 2N</small> <small>NSFO_00205</small></p>	Υ 480 Υ 440 Υ 400	Υ 400 Υ 208	Primary 480 1U1-1V1-1W1 -- 440 1U1-1V1-1W1 400 1U1-1V1-1W1 Secondary 400 2U1-2V1-2W1 -- 208 2U1-2V1-2W1		
	Vector group Yyn0 $\pm 5\%$				
<p>Up to 81 A: terminals <small>1U1 1U3 1U4 1V1 1V3 1V4 1V2 1W1 1W3 1W4 2U1 2V1 2W1 2N</small> <small>NSFO_00206</small></p> <p>> 81 A flat connectors, see Project Planning Aids <small>1U1 1U3 1U4 1V1 1V3 1V4 1V2 1W1 1W3 1W4 2U1 2V1 2W1 2N</small> <small>NSFO_00207</small></p>	Υ 504-480-456 Υ 462-440-418 Υ 420-400-380	Υ 400 Υ 208	Primary 504 1U1-1V1-1W1 -- 480 1U3-1V3-1W3 456 1U4-1V4-1W4 462 1U1-1V1-1W1 440 1U3-1V3-1W3 418 1U4-1V4-1W4 420 1U1-1V1-1W1 400 1U3-1V3-1W3 380 1U4-1V4-1W4 Secondary 400 2U1-2V1-2W1 -- 208 2U1-2V1-2W1		



1) Yyn0; according to DIN VDE 0532 single-phase loading is permissible only up to 10 % of the rated current of a phase.

Three-Phase Transformers

4AP, 4AU Autotransformers

For matching purposes according to
EN 61558-2-13

Overview

- Shared input and output windings without electrical isolation
- Enable the voltage matching of electrical loads
- Designed for continuous operation (100 % duty ratio)
- Vector group YNa0
- 4AP: $t_a = 50 \text{ }^\circ\text{C}$ (T50/B), 4AU: $t_a = 55 \text{ }^\circ\text{C}$ (T55/H)
-  



4AP (figure on the left) and 4AU (figure on the right)

Technical specifications

Maximum rated output power P_n at different rated input voltages (degree of protection IP00)

With this version of the 4A... 2-8HA20-2XA0 autotransformers, higher ratings than the quoted ratings can be found in the following table depending on the input voltage.

Transformer	Output power P_n at input voltage				
	480 V	460 V	440 V	415 V	380 V
Type	kVA	kVA	kVA	kVA	kVA
4AP21 42-8HA20-2XA0	5	5.8	6.3	6.8	6.8
4AP25 52-8HA20-2XA0	9.1	10.5	11.4	12.3	12.3
4AP27 42-8HA20-2XA0	12.5	14.4	15.6	16.9	15.8
4AP27 52-8HA20-2XA0	16	18.4	20	21.6	20.3
4AP30 52-8HA20-2XA0	22.5	25.9	28.1	30.4	30.4
4AU30 32-8HA20-2XA0	31.5	36.2	39.4	42.5	42.5
4AU36 32-8HA20-2XA0	50	57.5	62.5	59.5	54.5

Primary-side short-circuit and overload protection with motor starter protectors

The otherwise customary consideration of the inrush voltage plays a subordinate role for an autotransformer. For this reason it is possible to proceed as follows when selecting the circuit-breakers:

Example:

Type 4AP27
Connection PRI $U_{1N} = 480 \text{ V}$

$$I_{1N} = \frac{P_n \text{ load}}{U_{1N} \times \sqrt{3}}$$

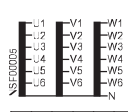
$$I_{1N} = \frac{15000 \text{ VA}}{480 \text{ V} \times \sqrt{3}} \times 1.1 = 19.9 \text{ A}$$

The circuit-breaker resulting for this PRI current I_{1N} can be selected.

Motor starter protector:
3RV10 21-4CA10
Setting value 20 A

For other motor starter protectors see Catalog LV 1, chapter "Protection Equipment".

Schematics

Circuit diagrams and terminal assignments	Rated voltage U_N for type	Connection														
	4A□□□ □2-8HA20-2X.0	<table border="1"> <tr> <td>4□□□□ □2-8JT10-2X.0</td> <td></td> </tr> <tr> <td>480</td> <td>U1-V1-W1</td> </tr> <tr> <td>460</td> <td>U2-V2-W2</td> </tr> <tr> <td>440</td> <td>U3-V3-W3</td> </tr> <tr> <td>415</td> <td>U4-V4-W4</td> </tr> <tr> <td>400 (380)¹⁾</td> <td>U5-V5-W5</td> </tr> <tr> <td>380</td> <td>U6-V6-W6</td> </tr> </table>	4□□□□ □2-8JT10-2X.0		480	U1-V1-W1	460	U2-V2-W2	440	U3-V3-W3	415	U4-V4-W4	400 (380) ¹⁾	U5-V5-W5	380	U6-V6-W6
	4□□□□ □2-8JT10-2X.0															
	480		U1-V1-W1													
	460		U2-V2-W2													
	440		U3-V3-W3													
	415		U4-V4-W4													
	400 (380) ¹⁾		U5-V5-W5													
380	U6-V6-W6															
V	V															
480	480															
460	460															
440	440															
415	415															
400 (380) ¹⁾	400 (380) ¹⁾															
380	230 (220) ¹⁾															

1) Operating with 380 V AC three-phase at the input terminals results in an output voltage of 220 V AC three-phase.

Three-Phase Transformers

4FL Voltage Regulators

4FL voltage regulators, transformer-type

Overview



4FL

- According to DIN EN 60439-1
- Degree of protection IP21
- **CE**
- $t_a = 40\text{ °C/E}$

Design

The transformer-type voltage regulator supplies electrical loads with a constant voltage despite mains variations.

The advantage of a voltage regulator with an autotransformer is proportional changing of the sinewave, i.e. the voltage regulator is characterized in that the rms value, mean value and the peak value are held at constant ratios.

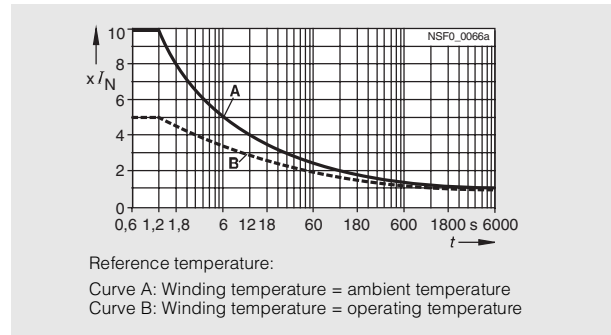
A perfect rms value is required, for example, by loads for which the loading is determined by the thermal limits. Strongly capacitive loads in DC units respond to the mean value. A slightly capacitive load is, however, influenced by the peak value. These factors are, however, only guaranteed for sinusoidal AC voltages and this can only be achieved easily by means of an autotransformer.

Voltage regulators stabilize the supply voltage U_1 regardless of the frequency and power factor to the rated value of output voltage U_{2N} within the set control accuracy ($\pm 1\%$ of U_{2N}). The correcting time from the upper or lower limit to the rated value is between 1.5 s and 2.5 s. The curve shape of the supplied voltage is not changed.

The output voltage U_2 is compared in the electronic step controller with a set reference voltage. In the event of a deviation in voltage greater than the set response value, the electronic step controller compensates the deviation with an accuracy of $\pm 1\%$ using a servo motor and adjustable moving contact on the variable transformer.

Transformer-type voltage regulators:

- Are galvanically connected to the supply system
- Can be overloaded temporarily ([see characteristic](#))
- Can be installed in a sheet-steel enclosure to IP21 complete with any additional components
- Have an efficiency of between 95 % and 98 %
- Are not maintenance-free
- For the values for control range and control deviation, [see "Selection and Ordering Data" in Catalog LV 1](#).
- For symmetrical mains voltage: The voltage deviation is only monitored on one conductor and set for all three conductors.
- For asymmetrical mains voltage: the voltage deviation is monitored on each conductor and set individually for each conductor.
- The neutral conductor 1N must be connected. If no neutral conductor is present on the mains side, a neutral grounding transformer is required (on request).



Overload capability (guide values)

Ambient conditions

4FL transformer-type voltage regulators are climate proof for mounting in rooms with an internal climate according to DIN 50010.

Limit values:

- Ambient temperature at
 - rated output +40 °C,
 - minimum -25 °C.
- Relative humidity
 - at 40 °C up to 85 %,
 - annual average up to 65 %
 - condensation not permitted.

Short-circuit and overload protection

Transformer-type voltage regulators must be protected with gL/gG fuses on the primary side against damage caused by short-circuits. The fuse rated current must be determined according to the highest primary current (present with the lowest input voltage). Overload and short-circuit protective devices according to the rated load current must be provided on the output side. An overload relay is integrated in the control circuit, the trip contacts (break or make) must be connected on a switch that automatically disconnects the transformer voltage regulator from the mains in the event of a fault.

Three-Phase Transformers

Project planning aids

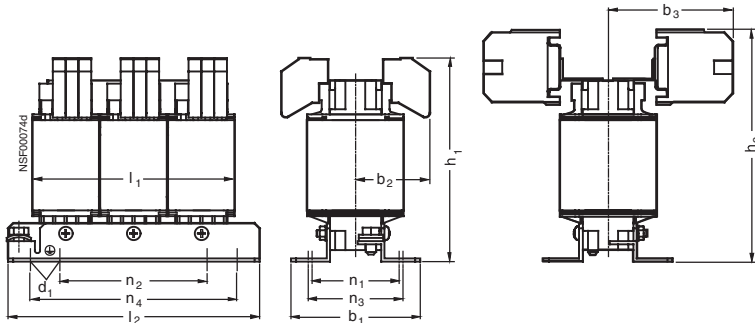
Dimensional drawings

4AP, 4AU safety, isolation, control and mains transformers ≤ 16 kVA

4AP safety, isolation, control and mains transformers and 4AP safety, isolation, control and mains transformers and autotransformers with selectable voltages ≤ 16 kVA

4AP17 to 4AP25

for any mounting position,
fixing dimensions according to EN 60852-4 and DIN 41308-4



Screw terminal
(flat connector DIN 46244-A 6.3-0.8)

24 A:
solid 0.5 mm² ... 6 mm²
finely stranded 0.5 mm² ... 4 mm²

Screw terminal

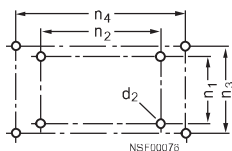
32 A:
solid 0.75 mm² ... 10 mm²,
finely stranded 1.5 mm² ... 6 mm²

44 A:
solid 1 mm² ... 16 mm²,
finely stranded 1 mm² ... 10 mm²

60 A:
solid 1 mm² ... 16 mm²,
stranded 10 mm² ... 25 mm²,
finely stranded 2.5 mm² ... 16 mm²

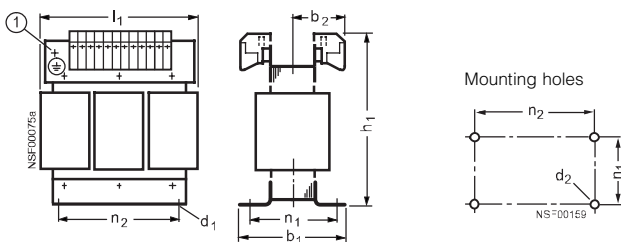
>60 A:
Flat connectors
(see page 10/43)

Mounting holes



4AP27 and 4AP30

for any mounting position



① M6 grounding screw

Type	Rated power kVA ¹⁾	Designation according to DIN 41302	b ₁	b ₂ max.	b ₃	d ₁	d ₂	h ₁ max.	h ₂	l ₁	l ₂	Mounting according to DIN 41308-4				Mounting according to EN 60852-4				Max. number of terminals per side			
												n ₁	n ₂	n ₃	n ₄	24 A	32 A	44 A	60 A				
4AP17	0.16	3UI 60/30	76	58	76	4.8 × 9	M4	130	143	122	148	47	90	58	136	12	12	6	9				
4AP18	0.25	3UI 75/25	73	56	73	5.8 × 11	M5	152	168	156	178	49	113	53	166	15	16	6	12				
4AP19	0.4	3UI 75/40	88	64	81	5.8 × 11	M5	152	168	156	178	64	113	68	166	15	16	6	12				
4AP20	0.63	3UI 90/30	99	59	76	7 × 12	M6	172	193	182	219	56	136	69	201	21	19	12	15				
4AP21	1	3UI 90/50	119	69	86	7 × 12	M6	172	193	182	219	76	136	89	201	21	19	12	15				
4AP25	1.6	3UI 114/62	131	76	92	7 × 12	M6	208	234	229	267	94	176	102	249	27	22	18	19				
4AP27	2.5	3UI 132/70	133	103	--	10 × 18	M8	242	--	264	--	101	200	--	--	27	21	--	15				
4AP30	4; 5	3UI 150/75	148	105	--	10 × 18	M8	271	--	300	--	118	224	--	--	27	21	--	15				

1) The rated output is only applicable to transformers with separate windings
(not for autotransformers).

Three-Phase Transformers

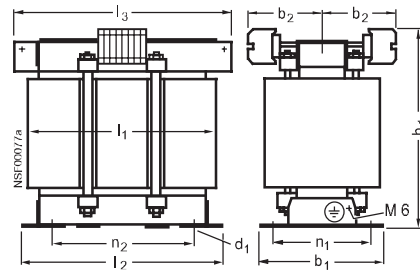
Project planning aids

4AP, 4AU safety, isolation, control and mains transformers ≤ 16 kVA (continued)

4AU safety, isolation, control and mains transformers and

4AU safety, isolation, control and mains transformers and autotransformers with selectable voltages ≤ 16 kVA

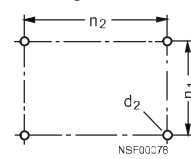
4AU30 to 4AU39 for any mounting position



Permissible permanent load for 4AU36 and 4AU39 for arrangement on vertical surfaces:
 $0.95 \cdot P_n$ at $t_a = 55^\circ\text{C}$
 P_n at $t_a = 45^\circ\text{C}$

Type	Rated power kVA ¹⁾	Designation according to DIN 41302	b ₁	b ₂	d ₁	d ₂	h ₁	l ₁	l ₂	l ₃	n ₁	n ₂	Max. number of terminals per side			
													18 A	23 A	43 A	81 A
4AU30	6.3	3UI 150/75	155	129	10 × 18	M8	270	300	264	310	118	224	35	31	23	14
4AU36	8; 10	3UI 180/75	169	134	10 × 18	M8	320	360	314	360	138	264	43	38	28	17
4AU39	12.5; 16	3UI 210/70	174	131	12 × 18	M10	370	420	366	410	141	316	50	45	33	20

Mounting holes



Screw terminal

18 A:
 solid 0.5 mm² ... 6 mm²
 finely stranded 1.5 mm² ... 4 mm²

23 A:
 solid 0.75 mm² ... 10 mm²,
 finely stranded 1.5 mm² ... 6 mm²

43 A:
 solid 1 mm² ... 16 mm²,
 stranded 10 mm² ... 25 mm²,
 finely stranded 2.5 mm² ... 16 mm²

81 A:
 solid or stranded
 4 mm² ... 16 mm²

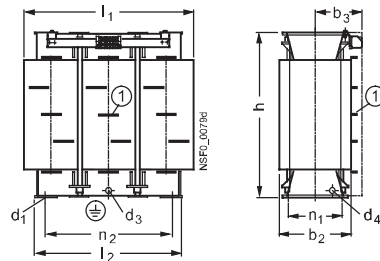
> 81 A:
 flat connectors
 (see page 10/43)

4BU power transformers > 16 kVA

4BU matching transformers and transformers with selectable voltages > 16 kVA

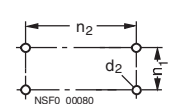
4BU

for arrangement on horizontal surfaces



Terminal size	Screw terminal for cross-section			Current carrying capacity $t_a = 40^\circ\text{C}$ A	Current carrying capacity $t_a = 55^\circ\text{C}$ A
	Solid mm ²	Stranded mm ²	Finely stranded mm ²		
4	0.5 ... 6	–	1.5 ... 4	24	18
6	2.5 ... 10	–	1.5 ... 6	32	23
16	1.5 ... 16	10 ... 25	4 ... 16	60	43
35	10 ... 16	10 ... 50	10 ... 35	114	81

Mounting holes



① Schematic representation of the flat connectors

For transformers > 81 A/114, see Flat-type and threaded pin terminals on page 10/43.

Type	Rated power kVA ¹⁾	Type size according to DIN 41302	b ₁	b ₂	b ₃ ± 3 for terminal size				d ₁	d ₂	d ₃	d ₄	h	l ₁	l ₂	n ₁	n ₂	Max. number of terminals for terminal size			
					4	6	16	35										4	6	16	35
4BU43	18; 20; 22.5	3UI 230/80	203	194	153	157	160	170	15	M12	–	M6	422	450	400	155	340	44	36	24	18
4BU45	25; 28	3UI 230/107	230	221	162	166	169	179	15	M12	–	M6	422	450	400	182	340	44	36	24	18
4BU47	31.5; 35.5; 40	3UI 230/137	260	251	182	186	189	199	15	M12	–	M6	422	450	400	212	340	44	36	24	18
4BU52	45	3UIS 220/120	295	225	169	173	176	186	12.5	M10	M12	–	512	420	382	183	316	–	35	23	17
4BU53	50; 56	3UIS 220/135	310	240	176	180	183	193	12.5	M10	M12	–	512	420	382	198	316	–	35	23	17
4BU54	63; 71	3UIS 305/125	265	240	176	180	183	193	15	M12	M12	–	602	630	537	198	465	–	52	35	26
4BU55	80	3UIS 305/140	280	255	184	188	191	201	15	M12	M12	–	602	630	537	213	465	–	52	35	26
4BU56	91; 100	3UIS 305/160	300	275	194	198	201	211	15	M12	M12	–	602	630	537	233	465	–	52	35	26
4BU58	112; 125; 140	3UIS 395/150	315	269	191	195	198	208	15	M12	M12	–	686	855	712	227	630	–	70	45	35
4BU59	160	3UIS 395/170	335	289	201	205	208	218	15	M12	M12	–	686	855	712	247	630	–	70	45	35
4BU60	180	3UIS 395/195	360	314	213	217	220	230	15	M12	M12	–	686	855	712	272	630	–	70	45	35
4BU62	200; 225; 250	3UIS 455/175	360	305	209	213	216	226	21	M16	M12	–	780	975	812	256	720	–	70	45	35
4BU63	280; 315	3UIS 455/200	385	330	221	225	228	238	21	M16	M12	–	780	975	812	281	720	–	70	45	35
4BU64	355	3UIS 455/230	415	360	236	240	243	253	21	M16	M12	–	780	975	812	311	720	–	70	45	35
4BU65	400	3UIS 455/260	445	390	248	252	255	265	21	M16	M12	–	780	975	812	341	720	–	70	45	35

1) The rated output is only applicable to transformers with separate windings (not for autotransformers).

Three-Phase Transformers

Project planning aids

Protective enclosure with 4AP, 4AU safety, isolation, control and mains transformers ≤ 16 kVA, for degree of protection IP23 and IP54

Mounting positions

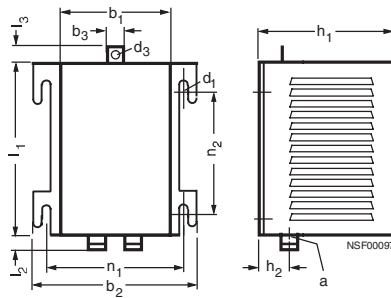
Type	Mounting position	Degree of protection	
		IP23	IP54
4AP, 4AU	Horizontal		x
	Vertical	x	x

x permissible

Sheet-steel enclosure, epoxy-resin coated, for degree of protection IP23 and IP54

NSF00097

4AP, 4AU



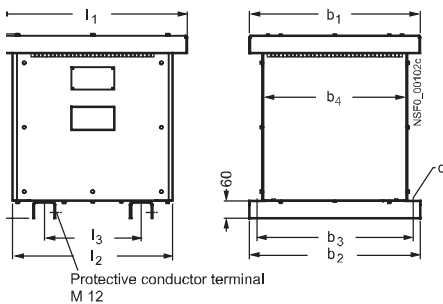
Type	a	b ₁	b ₂	b ₃	d ₁	d ₃	h ₁	h ₂	l ₁	l ₂	l ₃	n ₁	n ₂
4AP17 to 4AP19	2 x M25	187	224	--	5.8	--	230	42	245	35	--	212	200
4AP20 to 4AP30, 4AU30	2 x M32	305	351	--	9	--	330	56	395	45	--	333	335
4AU36, 4AU39	2 x M32	395	460	50	13	35	465	60	555	45	50	430	480

Protective enclosure with dry transformers > 16 kVA, for degree of protection IP20 and IP23

Sheet-steel enclosure, epoxy-resin coated

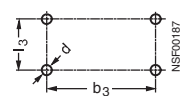
4BU

for arrangement on horizontal surfaces



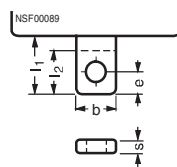
Type	b ₁	b ₂	b ₃	b ₄	h ₁	d	l ₁	l ₂	l ₃
4BU43 to 4BU47	600	600	570	507	645	15	660	560	340
4BU52 to 4BU53	600	600	570	507	735	15	660	560	316
4BU54 to 4BU56	600	600	570	507	825	15	900	800	465
4BU58 to 4BU60	730	730	696	637	905	19	1220	1120	630
4BU62 to 4BU65	900	900	858	807	1005	19	1220	1120	720

Mounting holes



Flat-type and threaded pin terminals

Flat connector with thru-hole

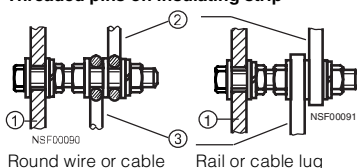


Flat connector on the transformer winding with thru-hole for rail or cable lug

Terminal covers for protection against inadvertent contact with free rail connections up to 800 A (DIN VDE 0106-100) see [Catalog LV 1, chapter "Controls – Contactors and Contactor Assemblies, Accessories and Components"](#).
Order No. depends on the flat connector 3TX6 5.6-3B.

Type	Terminal size	b = l ₂	With hole for screw	e	l ₁	s
4AP, 4AU, 4BU	100	16	M6	8	25	2.5
	200	20	M8	10	30	3
	400	25	M10	12.5	35	5
	630	30	M10	15	40	6
	800	30	M12	15	40	8
	1000	40	M12	20	50	8

Threaded pins on insulating strip



Round wire or cable lug

Rail or cable lug

- ① Insulating strip
- ② External connection
- ③ Internal connection

Type	Terminal size	Threaded pin	For conductor cross-sections mm ²
4AU, 4BU	200	M8	≤ 50
	315	M10	≤ 120
	500	M12	≤ 300

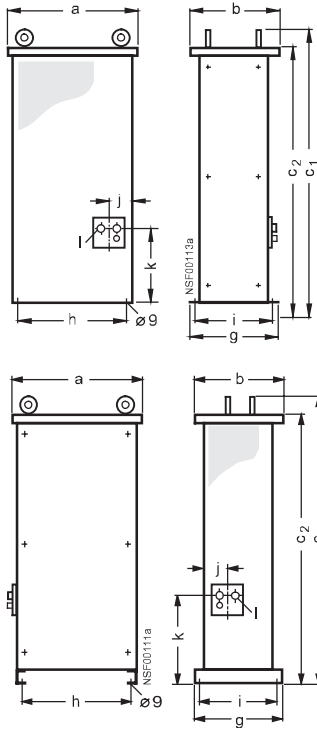
Three-Phase Transformers

Project planning aids

4FL voltage regulators

4FL voltage regulators, transformer-type

4FL, degree of protection IP21



Type	a	b	c ₁	c ₂	g	h	l	j	k	l
4FL45 2, 4FL47 4FL50, 4FL51, 4FL52, 4FL53	730	500	1615	1550	480	640	460	155	500	M50 M63

Type	a	b	c ₁	c ₂	g	h	l	j	k	l
4FL15, 4FL18, 4FL19, 4FL23, 4FL24, 4FL25, 4FL28 4FL31, 4FL32, 4FL33, 4FL35, 4FL38 4FL43	505	380	1065	1010	380	360	360	120	395	M25 M32
4FL36, 4FL37 4FL40, 4FL42 4FL45, 4FL46, 4FL49	720	470	1355	1290	470	450	450	140	440	M40 M32 M40 M50