TECHNICAL DATA

Type AS		60	80	120	160	200
UPS rated output (cos φ = 0,8)	kVA	60	80	120	160	200
Rectifier input data						
Rated current without battery charging	A	84	109	156	207	255
Rated output power without batt. charging	kVA	58	75	108	143	177
Max. current at highrate batt. charging	A	96	127	186	246	306
Max. output power	kVA	67	88	129	170	212
Power factor cos φ (typical)		≥ 0,97				
Rated voltage		3/N 400 V ± 15%				
Rated frequency		50 Hz ± 5%				
Required fuse protection Diazed/NH Type GL	A	125	160	200	250	315
Current harmonic distortion		≤ 5%				
Starting time incl. precharge		30 s				
Link circuit - battery						
Recommended number of cells			192		2 x 198	
max. DC current	A	162	215	318	2 x 203	2 x 253
Rated batt. charging current of 10min-battery	A	4	6	10	2 x 12	2 x 14
max. battery charging current	A	26	34	52	2 x 33	2 x 42
Charging current pre-setting						
– normal	A	I_{10}				
– high rate	A	I_5				
Continuos charging voltage	V/Cell	2,23 – 2,3				
Equalising charging voltage	V/Cell	2,4				
Discharge voltage	V/Cell	1,65				
Voltage tolerance		± 1%				
Residual ripple		≤ 1%				
Charging characteristic		DIN 41773				
Inverter output data						
Rated active power (cos φ = 1)	kW	48	64	96	128	160
Rated current (cos φ = 0.8)	A	87	116	173	231	289
Rated current (cos φ = 1)	A	70	92	139	185	231
Rated voltage		3/N 400 V ± 5% adjustable				
Rated frequency		50 Hz				
Voltage tolerance						
– static		± 1%				
– 50% unbalanced load		± 1%				
– 100% unbalanced load		± 3%				
– dynamic with 100% load change		< 5%				
Settling time		< 10 ms				
Angular deviation						
– symmetrical load		< 1°				
– 50% unbalanced load		< 2°				
– 100% unbalanced load		< 3°				
Frequency tolerance						
– line commutation		± 1%				
– self commutation		± 0,1 %				

AS 60-200KVA

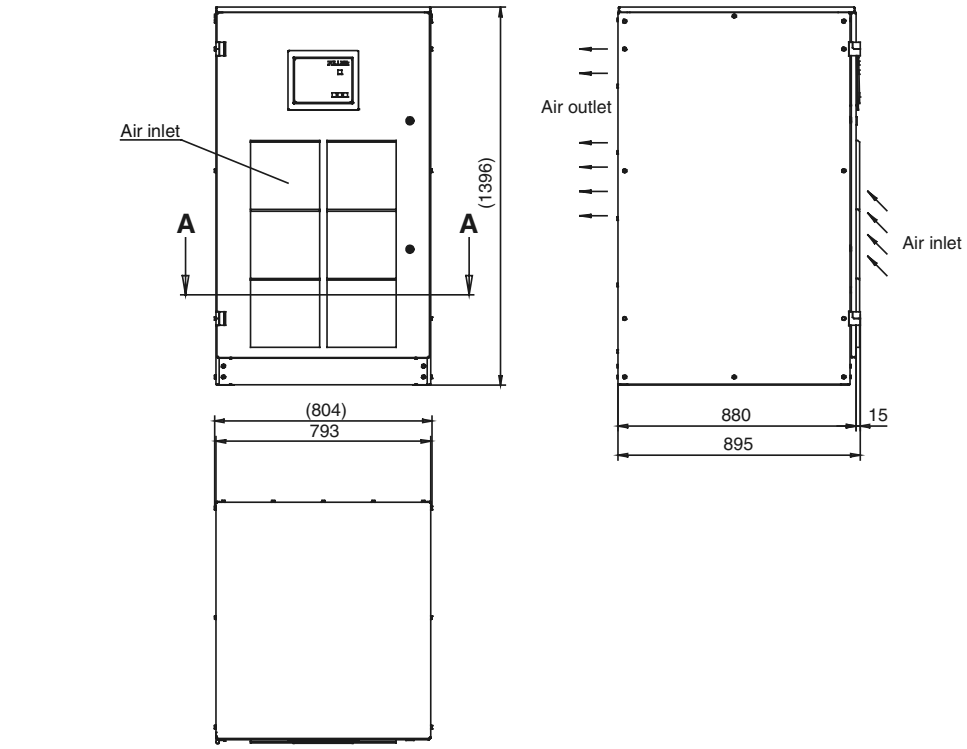
Type AS		60	80	120	160	200
UPS rated output (cos φ = 0,8)	kVA	60	80	120	160	200
Distortion factor (EN 50091-1)						
– linear load				< 1%		
– non linear load				< 5%		
Crestfactor				≥ 3		
Overload						
– 3ph				150 % 30 s, 125 % 10 min		
– 1ph				220 % 30 s, 180 % 10 min		
Short-circuit characteristics						
– 3ph				200 % 20 ms, 150 % 3 s		
– 1ph				350 % 20 ms, 260 % 3 s		
Inverter efficiency with rated load				98 %		
Automatic Bypass						
Rated voltage				400 V		
Rated frequency				50 Hz		
Overload capacity						
– 10 min				150 %		
– 100 ms				1000 %		
Inverter/Bypass changeover time						
– inverter fault				2 ms		
– overload or man. operation				0 ms		
Bypass/Inverter changeover time				0 ms		
Required fuse protection Diazed/NH Type GL	A	100	125	200	250	315
General Data						
Overall efficiency						
– 100% load	%	91	92	92	92	92
– 75% load	%					
– 50% load	%					
– 25% load	%					
Power dissipation						
– 100% load	kW	4,75	5,6	8,5	10,3	13
– 75% load	kW					
– 50% load	kW					
– 25% load	kW					
Air rate required	m^3/h	2000	2000	2500	2500	2500
Noise level at a distance of 1m				67 dB(A)		
Permiss. ambient temperature				0 – 40°C daily average ≤ 35°C		
Relative humidity				5 % - 95 % without condensation		
Installation altitude				<1000 m above mean sea level without power reduction		
Humidity class				DIN/IEC 721 2-1-09/86		
Protection type				IP 21 (DIN/VDE 0470 part 11/92 IEC 529)		
Insulation group				DIN/VDE 0110, Overvoltage category 2, Fouling factor 2		
Radio interference level				EN 50091-2 Standard class A		
Dimensions						
– width			804		993	
– depth			895		815	
– height			1400		1802	
Weight	kg	ca. 900	ca. 900	ca. 1100	ca. 850	ca. 850
Floor loading	kg/m^2			see section 0		

AS 60-200KVA

Type	AS	60	80	120	160	200
UPS rated output (cos φ = 0,8)	kVA	60	80	120	160	200
Paint finish		RAL 7035 textured				
Cable connection		from bottom				

Specifications complied with:
DIN/VDE 0100
DIN/VDE 0103
DIN/VDE 106 part 1 IEC 536
DIN/VDE 0110 01/89
DIN/VDE 0160
DIN/VDE 470 part 1 11/92 IEC 529
DIN/VDE 0510 part 2 10/97
DIN/VDE 0558 part 5 09/88 IEC 146-4
DIN/VDE 0558 part 6 04/92 IEC 146-5
DIN EN 50091-1, VDE 0558 part 510
DIN EN 50091-1-1, VDE 0558 part 511
DIN EN 50091-2, VDE 0558 part 520
DIN/IEC 721-2-1-09/86
Protection against electric shock after VBG 4
DIN 41772
DIN 45635 part 1 04/84
IEC 801
Battery: DIN/VDE 0510 part 2 07/86

Dimensions



Sectional A - A

(also shown space requirement)

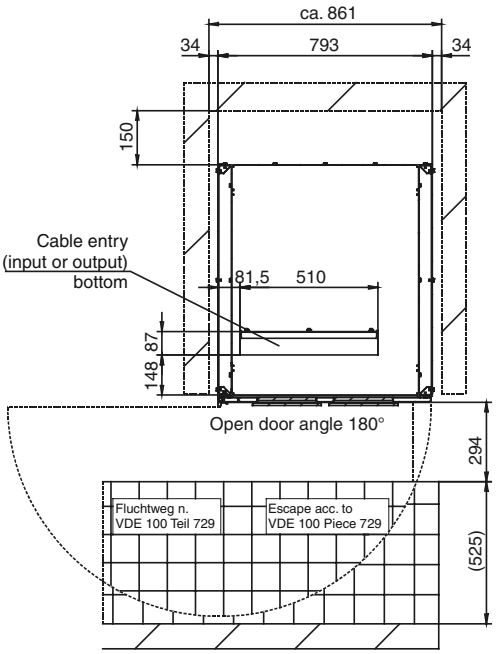
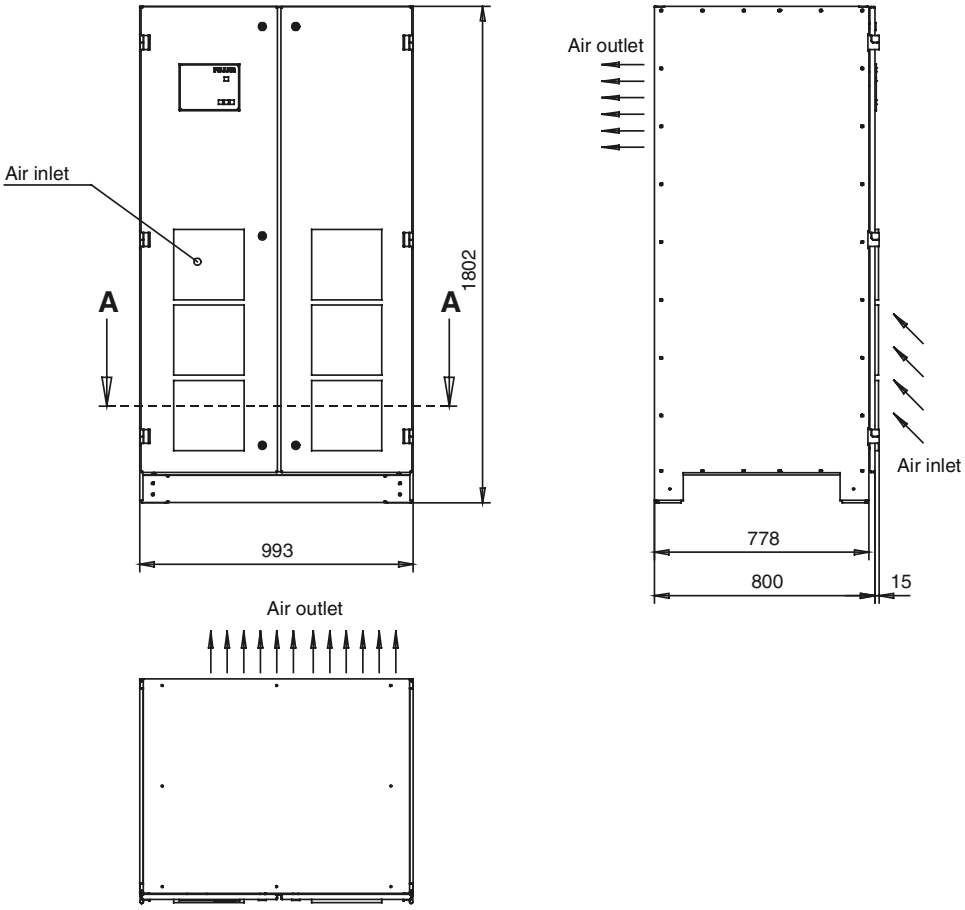
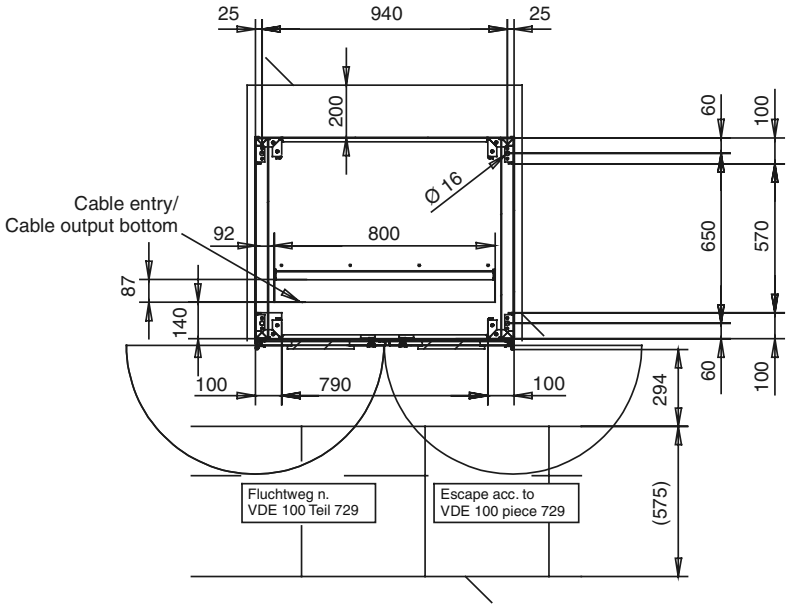


Fig. 1 APOSTAR 60 – 120 kVA Dimensions and space requirements



A-A
(also showing the space requirement)



Aperture angle of the doors 180°
Doors can be unhinged with an aperture angle of more then 90°

Fig. 2 APOSTAR 160 – 200 kVA Dimensions and space requirements

Baseframe

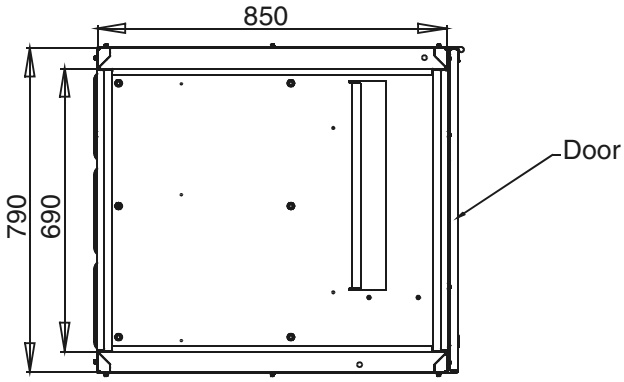


Fig. 3 APOSTAR 60 – 120 kVA baseframe

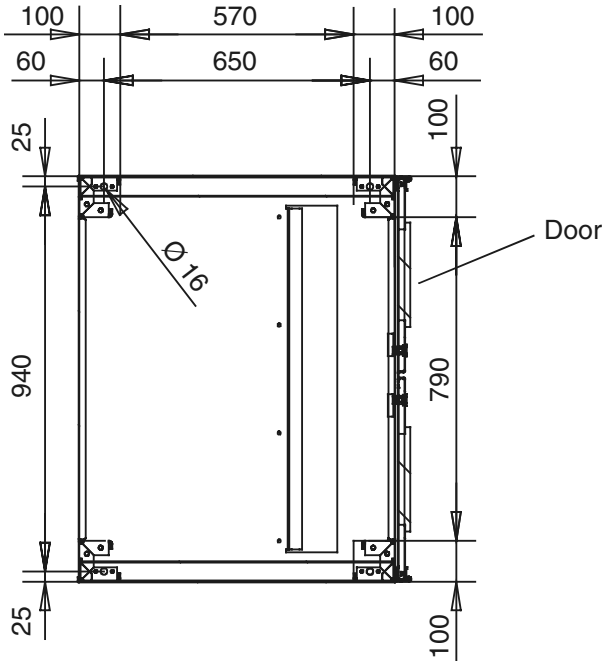


Fig. 4 APOSTAR 160 – 200 kVA baseframe

INSTALLATION AND CONNECTIONS

Installation notes

Goods inwards inspection

Final inspection ensures satisfactory mechanical and electrical condition before that APOSTAR leaves the factory. Immediately after the equipment arrives, please check whether any freight damage has occurred and if necessary, bring this to the attention of the freight operator. In no circumstances put a damaged APOSTAR into service before your have consulted us!

Transportation

If required, the APOSTAR and the battery cubicles can be moved by means of a fork-lift or lift truck. Moving by crane should only be used in exceptional circumstances and only after consulting us. Ensure that the equipment is only transported upright and not tilted or turned over. Always avoid sharp impacts. Where possible leave the equipment in its original packing when moving it. This provides the best possible protection against damage.

Storage

The equipment should be stored in a dry, well-ventilated room that is free of aggressive materials. Where possible, the original packing should not be removed during storage. In no circumstances must the APOSTAR be left stacked or stored outside!

Choice of installation site

The APOSTAR is not designed for mounting against a wall, i.e. a clearance of at least 150 mm should be left to the wall. The following criteria should be observed when selecting the installation site:

a. Floor loading capacity
The weight of the equipment is distributed over a relatively small area; care must therefore be taken to en-sure that the floor loading capacity is adequate. The exact value can be obtained from the table below. If necessary, the support area can be increased by interposing a suitable load distribution rack. Please consult your architect, the clerk of works or us if you require assistance.

Type	Floor loading capacity	Compressive loads per unit area per feet
AS 60 kVA	0,128 kg/cm^2	1,26 kg/cm^2
AS 80 kVA	0,128 kg/cm^2	1,26 kg/cm^2
AS 120 kVA	0,157 kg/cm^2	1,55 kg/cm^2
AS 160 kVA	0,11 kg/cm^2	front: 3,5 kg/cm^2 / back: 7 kg/cm^2
AS 200 kVA	0,11 kg/cm^2	front: 3,5 kg/cm^2 / back: 7 kg/cm^2

b. Baseframe

The necessary dimensions for constructing a base-frame, if required, can be found in Fig. 3 - Fig. 4.

c. Space requirements

As already stated, the APOSTAR cannot be installed with the rear side against a wall. A clearance of at least 150 mm should be left. About a metre clearance should be left in front of the unit to provide unimpeded access to the cubicle. Local or general safety regulations, e.g. escape routes as per VDE 0100, part 729, should also be observed. A clearance of at least 40 cm should be left above the APOSTAR to allow the warm air to be freely exhausted. In no circumstances must the air inlet and air outlet be covered or blocked.

d. Installation altitude, temperature and humidity

The APOSTAR is designed for an installation altitude of up to 1000 metres above mean sea level, an ambient temperature of 0 to 40°C (daily average ≤ 35°C) and a relative humidity of up to 90 %. The optimum temperature is around 20°C. Please consult us if planning an installation above 1000 metres. Please ensure that any existing air-conditioning plant meets these conditions and is also able to remove the unit's dissipated heat. Details are shown in the technical data. The cooling air must always be free of aggressive agents.

Battery – general notes

As special equipment for the APOSTAR UPS, PILLER supplies battery sets for bridging mains failure periods.
If the system power and required back-up time allow, the sealed lead-acid batteries are built into a cubicle that is matched to the UPS cubicle and can be in-stalled immediately next to it. But a more remote installation is also possible. Please discuss your special requirements with us.
The optimum ambient temperature for the batteries is 20 °C. Temperatures considerably higher than this shorten the service life of the batteries.
If open batteries are used, a specially-equipped battery room must be provided. This must meet the various safety requirements. Contact your appropriate local authority for further details. A battery installation should also meet DIN VDE 0510 procedures.
Please note that batteries have only a limited storage life. Please contact us or the battery manufacturer if you intend storing the battery sets for more than a few days.

WARNING

The battery sets for the APOSTAR system are charged up when delivered. Improper handling can cause injuries or damage. When connecting the battery sets ensure that the connecting terminals are "dead", e.g. by opening the fuse-disconnector. Check that the circuit is dead before making connections.

Electrical connections

General

Connections for the APOSTAR are provided by terminal strips located in the lower third of the cubicle. The cables can be brought up to the cubicle from all four sides and led in through the bottom of the cubicle. A false floor in the installation room is not necessary. The tables and drawings hereafter indicate the cable connection points and the cable dimensions according to DIN VDE 0298.

IMPORTANT You must ensure that the phases of the a.c. connections (clockwise rotating field) and the polarity of the battery connections are correct, as incorrect connections can cause damage to the equipment.

Terminal assignment and cable sizes

NOTE 1. The battery cables should not be longer than 15 m; the voltage drop not more than 1.5 %. Please consult us if you are unable to meet these requirements. Page 20 shows the recommended cable types. When determining the cable lengths bear in mind that about 0.50 m of cable is required inside the cubicle.

2. In the event of a fault in the UPS set, e.g. short-circuit, the input fuse of the unit must trip before the mains fuse since only then is transfer to the bypass mode possible without a break. Diazed/l.v.h.r.c. type GL fuses should therefore be used as mains fuses. The minimum fuse rating can be obtained from the table hereafter.

UPS-power (kVA)	Fuse (A)	
	Mains 1	Mains 2
60	125	100
80	160	125
120	200	200
160	250	250
200	315	315

The table hereafter shows the power cables required for the APOSTAR UPS according to DIN VDE 298.
Maximum currents and power cables
Temperature factor: 35 °C = 0,94
Cable tray with free air circulation, spacing = cable diameter d

UPS-Type	Mains 1 L1-L3, N, PE[1]	Mains 2 L1-L3, N, PE	Output L1-L3, N, PE[2]	Battery +/-[3]
60	96 A 1 x NYCWY 4 x 35RM/16	87 A each 1 x NYCWY 4 x 35RM/16		162 A 1 x NYY-0 4 x 16RE
80	127 A 1 x NYCWY 4 x 50SM/25	115 A each 1 x NYCWY 4 x 50SM/16		215 A 1 x NYY-0 4 x 25RE
120	186 A 1 x NYCWY 4 x 95SM/50	173 A each 1 x NYCWY 4 x 95SM/50		318 A 1 x NYY-0 4 x 50SM
160	246 A 1 x NYCWY 4 x 120	231 A each 1 x NYCWY 4 x 120		2 x 203 A 2 x NYY-0 4 x 50SM
200	306 A 2 x NYCWY 4 x 70	289 A each 2 x NYCWY 4 x 50		2 x 253 A 2 x NYY-0 4 x 50SM

The following table should be noted when laying parallel cables:
Temperature factor: 35 °C = 0,94;
Cable installation factor: 3 cables in parallel = 0,8; total = 0,752

Cross-section (mm^2)	Loadability incl. factor 0,752 in A			
	Multi-conductor cable		Single-conductor cable	
	DC	AC	DC	AC
10	49	45	59	49
16	67	60	79	67
25	89	78	105	89
35	109	98	131	109
50	132	119	159	132
70	168	152	202	168
95	204	183	249	204
120	236	212	290	236
150	271	243	332	271

The protective earth and N connection of the UPS should be provided by both infeeds so that the cables have full redundancy.
For symmetry, when possible and if permitted, 3-core cable type NYCWY (full cross-sectional sheath) and a separate protective conductor should be used.

[1] In case of large capacity batteries and/or high-rate charging option, please consult us about the cable layout.
[2] With only one network input, the same cable cross-section as used for Mains 1 should be selected for the output.
[3] In any case all battery cubicles or racks must be grounded.

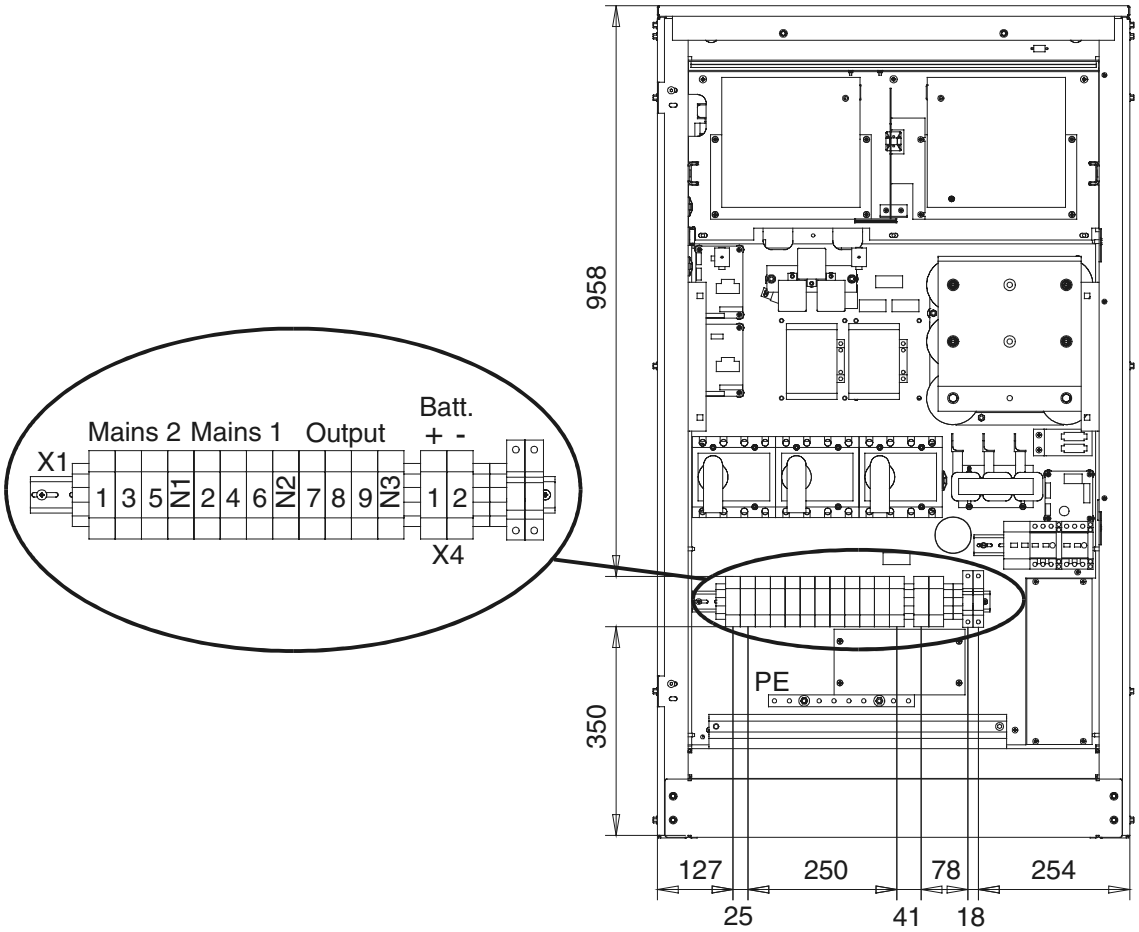


Fig. 5 Cabinet terminal arrangement APOSTAR 60 - 80kVA

Terminal X1	2	UPS-Input (Mains 1)	L1
	4	UPS-Input (Mains 1)	L2
	6	UPS-Input (Mains 1)	L3
	N	UPS-Input (Mains 1)	N2
Terminal X1	1	Bypass-Input (Mains 2)	L1
	3	Bypass-Input (Mains 2)	L2
	5	Bypass-Input (Mains 2)	L3
	N	Bypass-Input (Mains 2)	N1
Terminal X1	7	UPS-Output	L1
	8	UPS-Output	L2
	9	UPS-Output	L3
	N	UPS-Output	N3
Terminal X4	1	Battery-Input	+
	2	Battery-Input	–

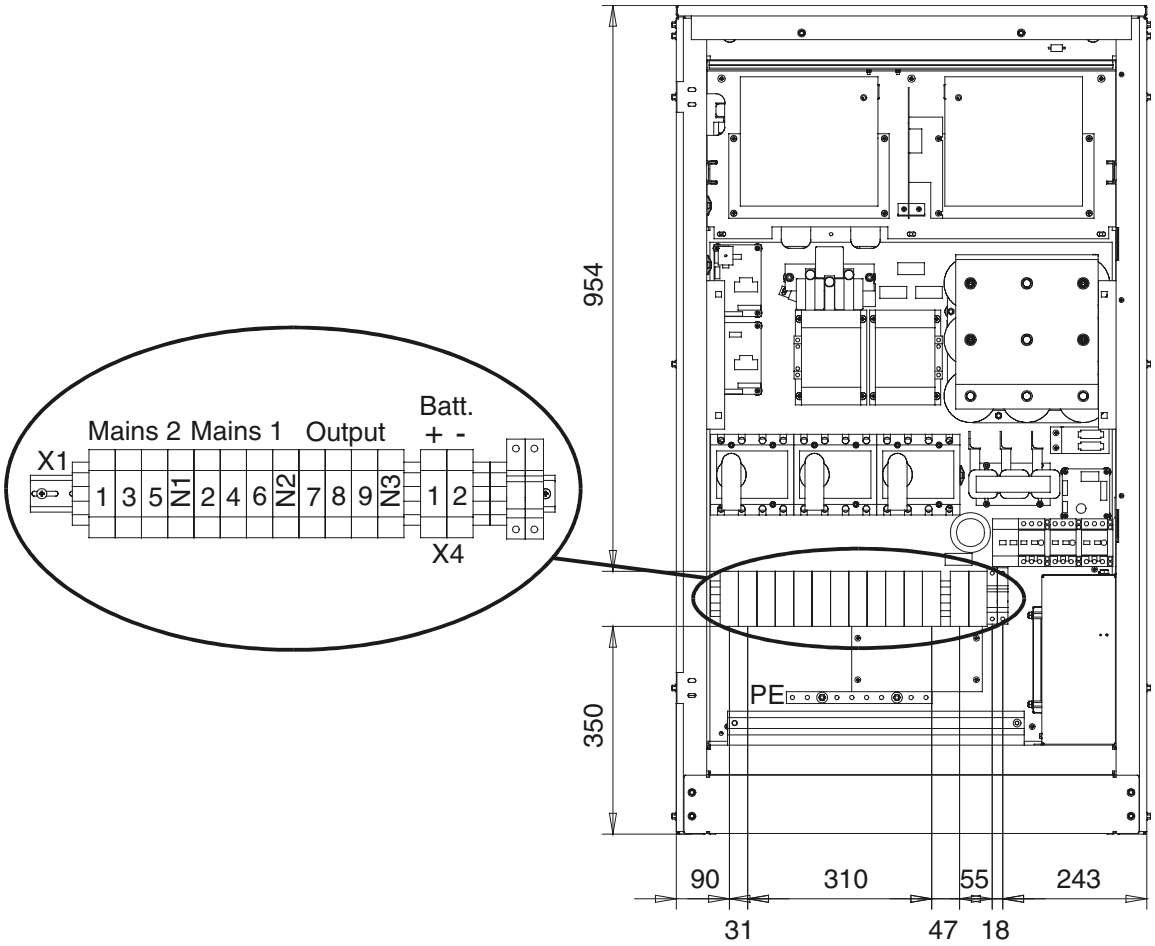


Fig. 6 Cabinet terminal arrangement APOSTAR 120kVA

Terminal X1	2	UPS-Input (Mains 1)	L1
	4	UPS-Input (Mains 1)	L2
	6	UPS-Input (Mains 1)	L3
	N	UPS-Input (Mains 1)	N2
Terminal X1	1	Bypass-Input (Mains 2)	L1
	3	Bypass-Input (Mains 2)	L2
	5	Bypass-Input (Mains 2)	L3
	N	Bypass-Input (Mains 2)	N1
Terminal X1	7	UPS-Output	L1
	8	UPS-Output	L2
	9	UPS-Output	L3
	N	UPS-Output	N3
Terminal X4	1	Battery-Input	+
	2	Battery-Input	–

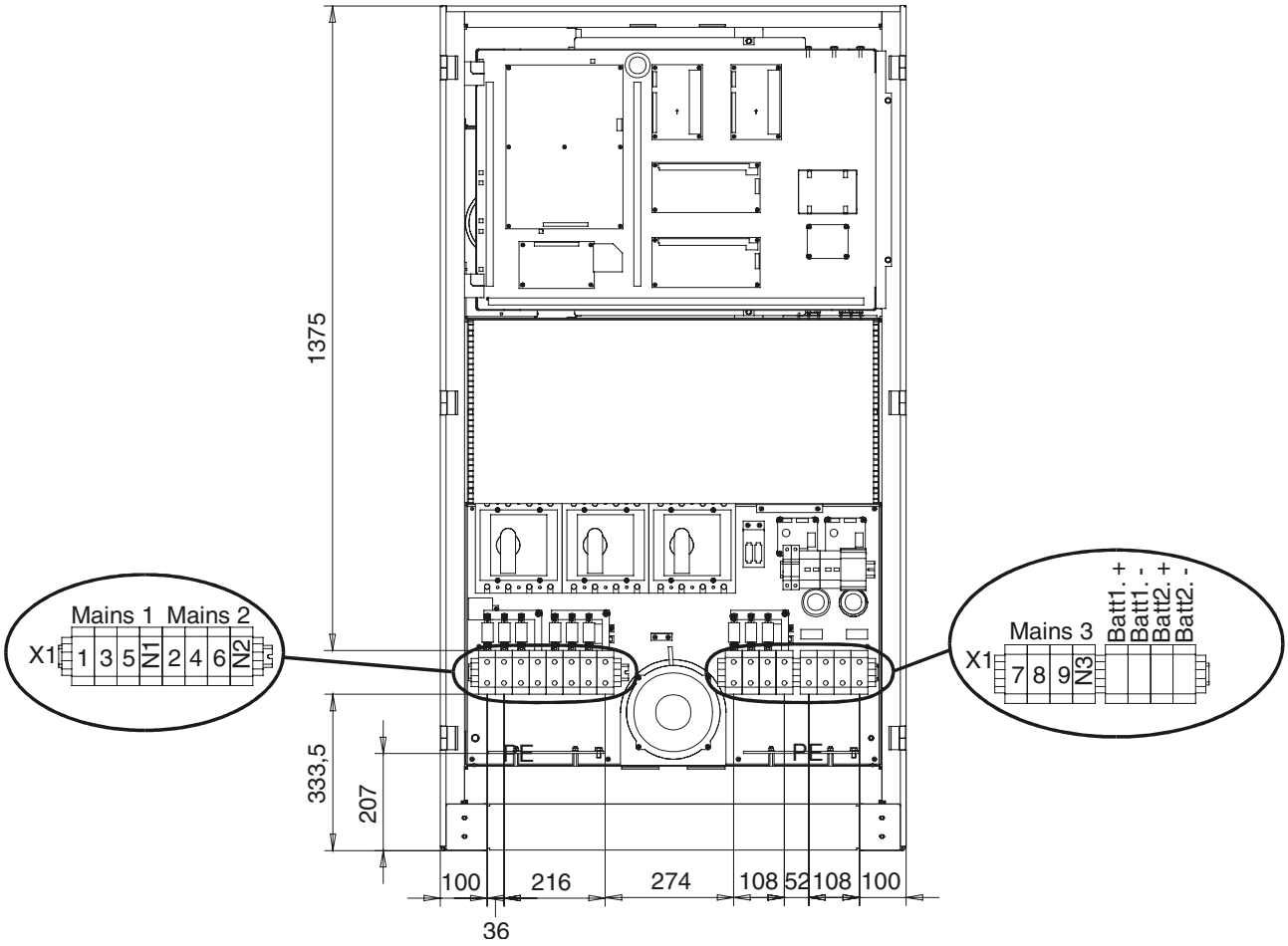


Fig. 7 Cabinet terminal arrangement APOSTAR 160 – 200 kVA

Terminal X1	2	UPS-Input (Mains 1)	L1
	4	UPS-Input (Mains 1)	L2
	6	UPS-Input (Mains 1)	L3
	N	UPS-Input (Mains 1)	N2
Terminal X1	1	Bypass-Input (Mains 2)	L1
	3	Bypass-Input (Mains 2)	L2
	5	Bypass-Input (Mains 2)	L3
	N	Bypass-Input (Mains 2)	N1
Terminal X1	7	UPS-Output	L1
	8	UPS-Output	L2
	9	UPS-Output	L3
	N	UPS-Output	N3
Terminal X4	1	Battery-Input	+
	2	Battery-Input	–

Terminal types and dimensions

The conductor cross-sections of the UPS terminals (box terminals or cable lugs) are shown in the following table.

UPS-Type / Cable type		60 kVA		80 kVA		120 - 200 kVA	
		rigid	flexible	rigid	flexible	rigid	flexible
min.	mm^2	25	35	35	50	70	70
max.	mm^2	95	95	150	150	240	240
stripping the cables	mm	30		38		38	

Neutral conductor and PE conductor connections

The PE connections and the N-connections of the external manual bypass are attached to the corresponding copper bars by means of M8 screws.

Connection for external operation and monitoring

Customer interface card, terminal strip X1

Terminal strip X1 is used by the customer to match the UPS to his own electronic installation, such as UPS-blocked circuit, remote control signals and Diesel stand-by generating set.

UPS blocked/Off

If an external contact is to be added, then the links between EPOint X1.1 and EPOext X1.2 should be removed and replaced by an N/C contact of the external UPS-blocked button.

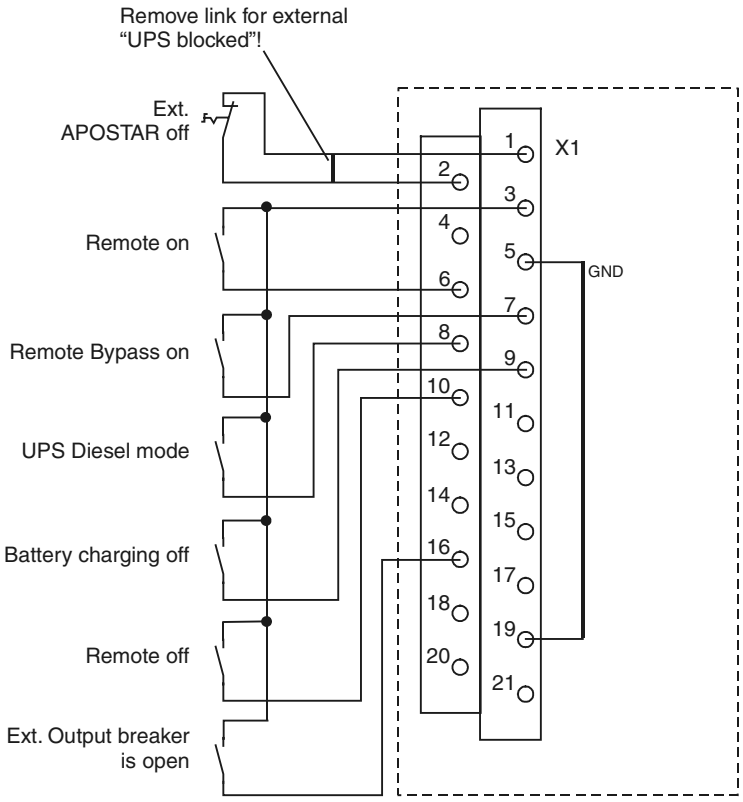


Fig. 8 Terminal strip A230 X1

External manual bypass

General

Two variants are available for the UPS installation. The standard version, in which the manual bypass (bypass contactor) is built into the set, and an extended version in which an additional, external manual bypass can be supplied. This is located, along with additional necessary isolators, in a separate adjacent cubicle.
The decisive advantage of this extended version is that the UPS cubicle can be completely isolated, thus allowing the necessary maintenance and repair operations to be carried out safely in the UPS cubicle, without having to interrupt the supply to the load.

Installation and connections

The auxiliary cabinet for the external manual bypass is placed immediately to the right or the left of the UPS cabinet. To do this, remove the right-manual side panel of the UPS cabinet. This is used as the side panel of the auxiliary cabinet.
Lead the cables through the openings in the bottom of both cabinets and attach them to the corresponding terminals in the UPS cabinet.

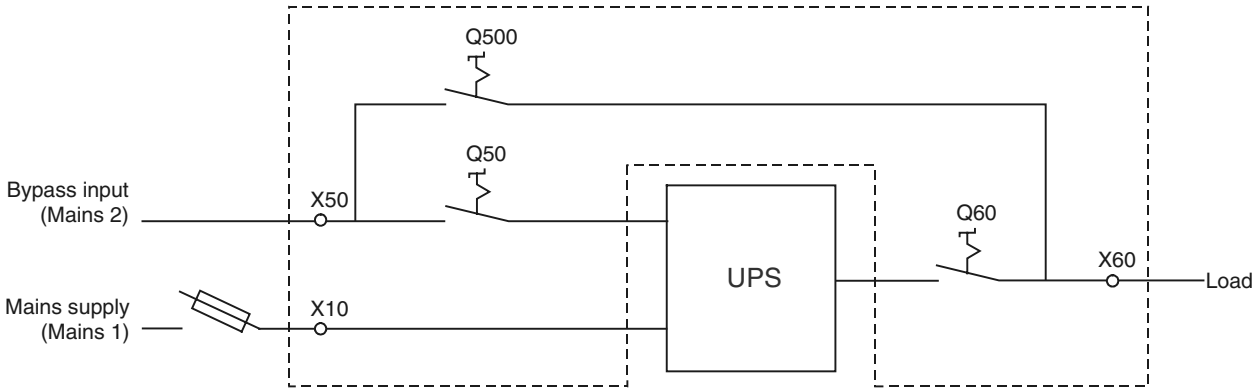


Fig. 9 External manual bypass

Battery cabinet connections

When several battery cabinets are interconnected, one battery set can be housed in several cabinets (series connection) or several sets can be connected in parallel to increase the capacity.

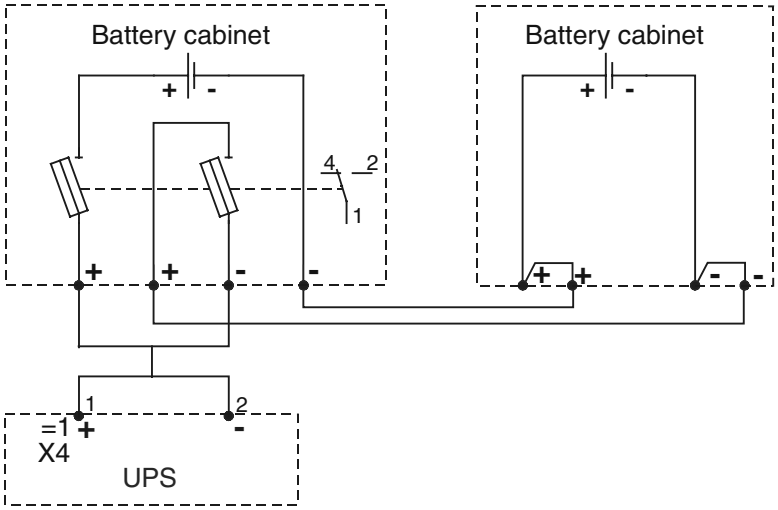


Fig. 10 Battery cabinets connected in series

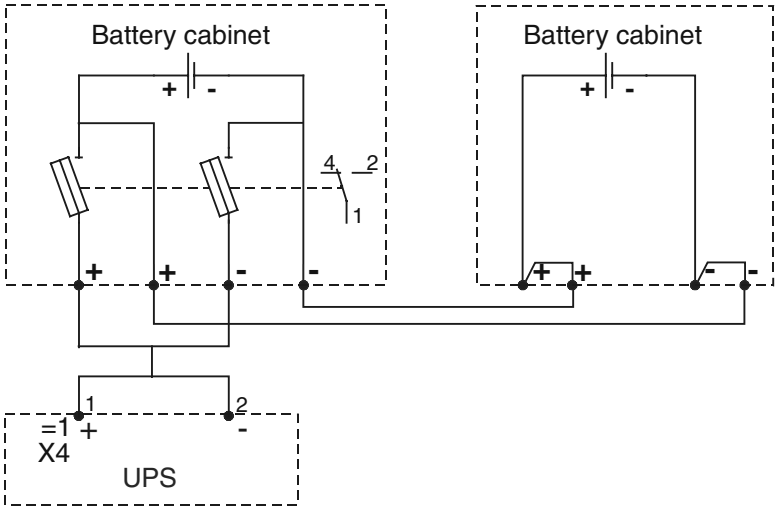


Fig. 11 Battery cabinets connected in parallel