TECHNICAL GUIDE

EN

MODULYS XM

50 to 250 + 50 kW
Redundant Modular UPS

ULTIMATE

Fault tolerant power
without compromise

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1. OBJECTIVES

The purpose of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

For detailed information, see the installation and operating manual.

2. ARCHITECTURE

2.1. Range and Flexibility

Modulys XM is a modular, scalable and redundant UPS system based on plug-in and hot-swap power modules.

The modularity enables power scalability by simply plugging one or more additional modules into the existing system (up to 6 modules per system).

The modularity also enables redundancy, which is an essential feature to ensure UPS system fault tolerance. The redundant configuration can be set from N+1 up to N+R.

2.1.1. FLEXIBLE RATED POWER

POWER MODULES						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50

(1) No Power redundancy

2.1.2. FLEXIBLE SHORT-CIRCUIT PERFORMANCE

SYSTEM CONFIGURATIONS		
	Standard	High Short-circuit
System description	Short-circuit safety performance according to IEC/EN62040-1 requirements	- Extra-rugged system for enhanced short-circuit safety performance (beyond IEC/EN 62040-1 requirements) - Ready for +1 extra Bypass Module (option) for higher Bypass short-circuit capability
Number of Bypass Modules	1	1 + 1(1)
Number of Power Modules	1 → 6	1 → 6

(1) Extra Bypass

See § 2.2.1.

2.1.3. FLEXIBLE CABLING

The standard solution and high short-circuit solution have bottom cabling configuration.

As an option they can also accept top cabling and mixed top-bottom cabling.

2.1.4. FLEXIBLE GROUNDING COMPATIBILITY

Compatible with any grounding system: TN-S, TN-C, TT, IT.

2.2. Flexible back-up time

Various extended back-up times are possible by using: (1) a modular battery cabinet; (2) a high-capacity battery cabinet.

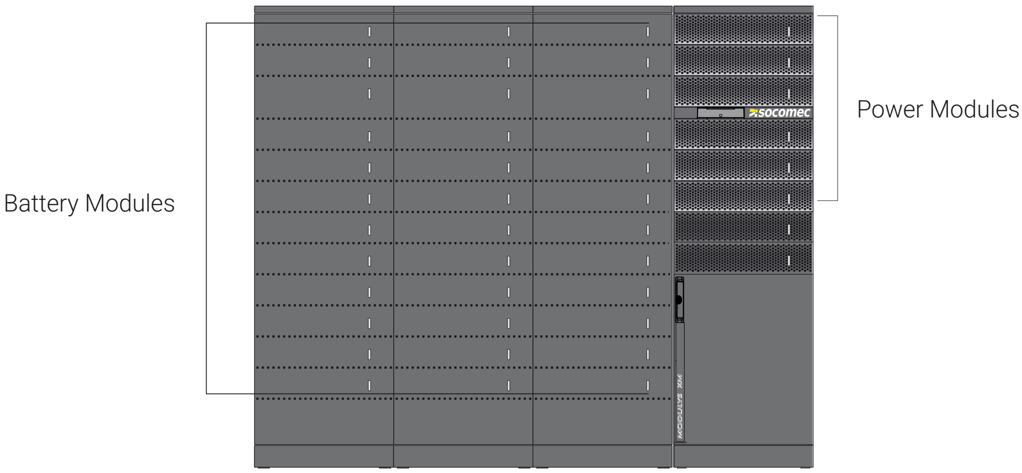
Each battery pack has an acid-proof container designed to prevent damage in the event of acid leakage.

Each Power Module has a powerful embedded battery charger able to provide up to 20 A.

2.2.1. Modular hot-swap battery cabinet - medium capacity

The modular battery system is based on vertical and horizontal modularity thanks to independent battery strings connected in parallel, each one made up of hot-swap long life battery packs.

Each battery string has its own independent protection device and its own independent switch for fast and safe maintenance.



DIMENSIONS AND WEIGHT																																				
	Number of 9 Ah Modular hot-swap battery cabinets 9 Ah - medium capacity																																			
	1												2												3											
	Number of battery strings																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Height (mm)	1990																																			
Depth (mm)	950																																			
Width (mm)	810												1620												2430											
Weight (kg)	384	508	632	756	880	1004	1128	1252	1376	1500	1624	1748	2132	2256	2380	2504	2628	2752	2876	3000	3124	3248	3372	3496	3880	4004	4128	4252	4376	4500	4624	4748	4872	4996	5120	5244

Vertical modularity using a modular battery cabinet with hot-swap battery boxes provides scalable power back-up with up to 12 battery strings per cabinet.

Horizontal modularity provides very high and scalable back-up.

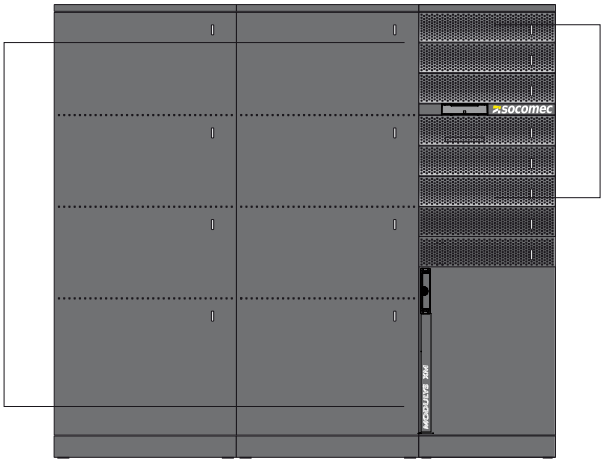
A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR HOT-SWAP BATTERY CABINET
BACK UP TIMES IN MINUTES @ 75% OF RATED LOAD

Number of Power Modules						1	2	3	4	5	6
N+1 redundant System Power (kW)						50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Number of Modular battery cabinets	1	Number of strings	2	Cumulative Ah	18	5,5	5,5				
			3		27	10,8	10,8				
			4		36	15,4	15,4	5,5			
			5		45	18,6	18,6	8,1			
			6		54	23,7	23,7	10,8	5,5		
			7		63	31	31	13,2	7,3		
			8		72	36	36	15,4	9,1	5,5	
			9		81	42	42	17,2	10,8	6,9	
			10		90	48	48	18,6	12,3	8,1	5,5
			11		99	55	55	21	14	9,5	6,7
			12		108	62	62	23,7	15,4	10,8	7,6
	2		13		117	69	69	27,4	16,6	11,9	8,7
			14		126	74	74	31	17,7	13,2	9,8
			15		135	79	79	34	18,6	14,3	10,8
			16		144	86	86	36	20,1	15,4	11,7
			17		153	93	93	39	22	16,3	12,7
			18		162	99	99	42	23,7	17,2	13,6
			19		171	104	104	45	26,2	17,9	14,5
			20		180	112	112	48	28,5	18,6	15,4
			21		189	119	119	51	31	19,7	16,1
			22		198	127	127	55	33	21	16,8
			23		207	133	133	59	35	22,4	17,5
			24		216	140	140	62	36	23,7	18,1
	3		25		225	146	146	66	38	25,6	18,6
			26		234	151	151	69	40	27,4	19,4
			27		243	158	158	72	42	29,1	20,5
			28		252	166	166	74	44	31	21,6
			29		261	173	173	77	46	32	22,6
			30		270	181	181	79	48	34	23,7
			31		279	188	188	83	50	35	25,2
			32		288	196	196	86	52	36	26,7
			33		297	202	202	89	55	38	28,1
			34		306	212	212	93	58	39	29,4
			35		315	221	221	96	60	40	31
			36		324	229	229	99	62	42	32

(1) No Power redundancy

2.2.2. Modular battery cabinet - high capacity



DIMENSIONS AND WEIGHT		
Number of Strings	0	1
Height (mm)	1990	
Depth (mm)	890	
Width (mm)	810	
Weight (kg)	220	1792

High-capacity modular battery cabinets are designed for long back-up times (BUT) with higher power.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR BATTERY CABINET BACK-UP TIMES IN MINUTES @75% OF RATED LOAD											
Number of Power Modules						1	2	3	4	5	6
N+1 redundant System Power (kW)						50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Number of battery cabinets	1	Number of battery strings	1	Cumulative Ah	92	49	49	19.8	0	0	0
	2		2		184	115	115	49	29.1	19.8	14.3
	3		3		276	184	184	82	49	34	25.3
	4		4		368	255	255	115	71	49	37
	5		5		460	329	329	148	93	66	49
	6		6		552	407	407	184	115	82	62

(1) No Power redundancy

3. SPECIFICATIONS

3.1. Installation parameters

DIMENSIONS AND WEIGHT						
Number of Power Modules	1	2	3	4	5	6
Height (mm)	1990					
Depth (mm)	890					
Width (mm)	600					
Weight (kg)	289	325	361	397	433	469

RATED CURRENT AND MAX CURRENT						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Rated rectifier input current (A) (EN 62040-1)	75	75	150	226	301	376
Maximum rectifier input current (A) (EN 62040-3)	90	180	270	360	450	450
Nominal Inverter output current (A)	72	72	144	217	289	361
Maximum bypass input current (A) (EN 62040-3)	398					
Maximum battery current (A)	114	228	342	456	570	684

(1) No Power redundancy

COOLING							
Number of Power Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Maximum air flow	(m3/h)	600	1200	1800	2400	3000	3600
Power Dissipation under nominal conditions(2)	(W)	2240	1920	3950	6080	8110	10680
	(kcal/h)	1920	1650	3390	5220	6970	9180
	(BTU/h)	7640	6550	13470	20740	27670	36440
Power Dissipation (maximum) under worst-case conditions(3)	(W)	2580	2140	4390	6910	9430	12060
	(kcal/h)	2220	1840	3780	5950	8110	10370
	(BTU/h)	8810	7310	14980	23580	32180	41160

(1) No Power redundancy
(2) Nominal input voltage and rated output active power (PF=1)
(3) Low input voltage, battery recharge and rated output active power (PF=1)

ACOUSTIC NOISE						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Acoustic noise at 1m (dBA) (2)	50	49	50	55	56	57

(1) No Power redundancy
(2) At 70% nominal load.

3.2. Electrical characteristics

3.2.1. Electrical characteristics independent OF the number of modules

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20/-15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70 Hz
Power factor	> 0.99(1)
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in / Soft-start (selectable parameters)

(1) Pout ≥ 50% of nominal Power.

ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50 / 60
Bypass frequency tolerance	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50 / 60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 400 380 / 400 / 415 selectable
Output voltage tolerance (V)	±1%
Rated output frequency (Hz)	50 / 60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7:1
Total output voltage distortion (THDv)	≤ 1% (Ph / Ph); ≤ 2% (Ph / N) (@: Pn, Resistive load)

ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24(1)

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

(1) Consult us

ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORTCIRCUIT			
Solution type		Standard	High Short-circuit (*)
Number of Bypass Modules		1	1 + 1(1)
Number of Power Modules		1 → 6	
Bypass overload (A)	Nominal	362	362
	Continuous	398	398
	10'	453	453
	1'	543	543
	1"	634	634
Bypass Max short-circuit current ITSM (A)		15000	28000
Bypass I^2t (A^2s)		1125000	3920000

(1) Extra Bypass Module (option) for higher Bypass short-circuit capability

ELECTRICAL CHARACTERISTICS - SYSTEM SHORTCIRCUIT SAFETY PERFORMANCE		
Solution type	Standard	High Short-circuit (*)
Number of Bypass Modules	1	1 or 1 + 1(1)
Number of Power Modules	1 → 6	
Short-circuit current withstand (Icw)	10 kA	25 kA up to 50 kA(2)
Conditional short-circuit current (Icc)		65 kA

(1) Extra Bypass Module (option) for higher Bypass short-circuit capability (2) option - contact us

(*) High short-circuit solution:
- Extra-rugged system for enhanced short-circuit saferty performance (beyond IEC/EN 62040-1 requirements)
- Ready for +1 extra Bypass Module (option) for higher Bypass short-circuit capability

3.2.2. Electrical characteristics dependent on the number of modules

ELECTRICAL CHARACTERISTICS - INVERTER OVERLOAD AND SHORT-CIRCUIT							
Number of Power Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Inverter overload (kW)(2)	10 min	62.5	125	187	250	312	312
	5 min	66	132	198	264	330	330
	1 min	75	150	225	300	375	375
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	195	390	585	780	975	1170
	40 to 100 ms	162	324	486	648	810	972

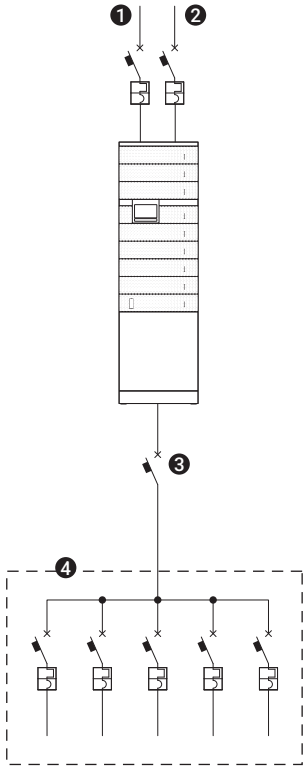
(1) No Power redundancy
(2) Conditions: Initial Pout ≤ 80% Pn, Vin nominal

ELECTRICAL CHARACTERISTICS - BATTERY CHARGER MAX CURRENT						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Maximum Current (A)	20	40	60	80	100	120

(1) No power redundancy

3.3. Recommended protection

3.3.1. System from 50 to 250 + 50 kVA



Key

1. Input mains magneto-thermal switch
2. Auxiliary mains magneto-thermal switch
3. System shutdown switch
4. Distribution

The installation and system should comply with national plant regulations.

The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.

SYSTEM CABLES - MAX SECTION		
Number of Modules		1 → 6
Rectifier terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Bypass terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Battery terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Output terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150

M10 terminals

Tightening torque 20 Nm

Maximum cross-section is determined by the size of the terminals.

As specified in EN 62040-3 Appendix 3 (Non-Linear Load Reference), in the event of three-phase non-linear loads connected downstream of the UPS, the neutral current on the load can be 1.5 - 2 times higher than the phase current. This should be taken into account when estimating the correct size of output and auxiliary neutral cables.

RECOMMENDED PROTECTION DEVICES - RECTIFIER							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Circuit breaker with Im ≤ 10 x In (A)	Minimum	100	200	320	400	450	450
	Maximum	450	450	450	450	450	450

(1) No Power redundancy

(2) Caution! Residual Current Detection (RCD) can only be used with a common input and auxiliary mains (configuration not recommended). It must be placed upstream of the connection between input mains and auxiliary mains. Use type B four-pole selective (S) residual current detectors. Load leakage currents are to be added to those generated by the UPS and short current peaks may occur during transitory phases (power failures and power returns). If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the ground current leakage with the UPS installed and operational with the definitive load, to prevent the RCD tripping.

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The system can accept the maximum value of protection, regardless of the number of modules installed, in order to enable future scalability, while the minimum value depends on the size of the power cables in the installation. A protection value of less than the maximum shall be used when the mains network structure cannot support the full power load, and shall be chosen between the minimum and maximum values (as per the table above) according to mains network design.

Rectifier protection should be taken into account in the event of separate inputs; when the auxiliary mains and rectifier inputs are combined (common input), the general input protection rating should be higher than both (auxiliary mains or rectifier).

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Circuit breaker with Im ≤ 10 x In (A)	Minimum	100	200	320	400	400	400
	Maximum	450	450	450	450	450	450

(1) No Power redundancy

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The conditional short circuit current (Icc) according to IEC 62040-1 is 65KA rms, provided that the UPS is protected by a MCCB with adequate breaking capability and current-limiting capability under short-circuit conditions. Contact us for detailed information.

RECOMMENDED PROTECTION DEVICES - UPSTREAM RESIDUAL CURRENT DETECTION CIRCUIT BREAKER							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Residual Current Detection (A)	Minimum	0.5					

(1) No Power redundancy

An RCD is not necessary when the UPS is installed on a TN-S system. RCDs are not allowed on TN-C systems. If an RCD is required, a B type should be used.

Caution! Use four-pole selective (S) residual current detectors (RCDs). Load leakage currents are to be added to those generated by the UPS and short current peaks may occur during transitory phases (power failures and power returns). If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the ground current leakage with the UPS installed and operating with the definitive load, so as to prevent tripping of the RCD switch.

OUTPUT SELECTIVITY ON BATTERY MODE (AUX MAINS NOT PRESENT)							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Circuit breaker with Im ≤ 5 x In (A)	Maximum	25	50	80	100	125	125
Circuit breaker with Im ≤ 10 x In (A)	Maximum	13	25	40	50	63	80

(1) No Power redundancy

4. REFERENCE STANDARDS AND DIRECTIVES

4.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force. In particular, the equipment is fully compliant with all European Directives concerning CE marking.

2006/95/EC

Council Directive 2006/95/EC, dated 16 February 2007, on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

2004/108/EC

On the approximation of the laws of the Member States relating to electromagnetic compatibility.

4.2. Standards

STANDARD	
Safety	EN / IEC 62040-1 - AS 62040-1
EMC	EN / IEC 62040-2 - AS 62040-2
Product certification	IECEE CB Scheme
Performance	EN / IEC 62040-3 - AS 62040-3
Product marks	CE - RCM(1) - EAC(1) - CMIM(1) - UKCA(1)
Protective class	Protective Class I
Protection level	IP20

(1) Depends on the production site. Consult the data plate on the equipment

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

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