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SERVERS



DATA CENTRES



TELECOMMUNICATIONS DEVICES



E-BUSINESS (Servers Farms, ISP/ASP/POP)



INDUSTRIAL PROCESSES



INDUSTRIAL PLCS



ELECTRO-MEDICAL DEVICES



EMERGENCY DEVICES (Lights/Alarms)



Specialist Power Systems

# Master VDC *Uninterruptible Power Supply*

100-500kVA modules  
Three-phase/Three-phase  
Flywheel UPS



## Highlights

- High efficiency
- High power factor
- Scalable power
- Modular system
- Fault tolerant
- Clean power
- Zero batteries
- Small footprint
- Low TCO
- Scalable runtimes
- Low maintenance
- 20 year design-life Flywheel
- Frictionless magnetic bearings



Master MHF series is a scaleable UPS system incorporating a **VDC** or **VDC-XE** flywheel. The UPS is ideal for ECO targeted datacentres looking to achieve the lowest possible PUE ratios and highest operational resilience. The UPS provides a number of advantages over more traditional battery enabled systems including: up to 99% efficiency, a compact footprint (up to 50% reduction), lower Total Cost of Ownership (TCO) and almost instantaneous recharge time.

A single flywheel module provides sufficient runtime for the start-up of a local standby generator with the UPS providing an uninterruptible source of clean, stable power. The entire system can be scaled for resilient power (N+x) and runtime through the parallel operation of additional UPS and/or flywheel modules, (and a small battery pack if required, for additional resilience).

In a standard configuration (1xUPS and

1xflywheel), the runtime available from the flywheel is more than sufficient to allow the UPS to ride through short duration breaks in mains power. If an additional extended runtime battery is installed, the flywheel engages first to protect the battery from life-degrading discharges.

- **Clean power:** an eco friendly, battery free uninterruptible power system.
- **High efficiency:** 0.99pf input with a high operating efficiency (online 95% or ECO mode: 99%)
- **Fault tolerant design:** IGBT-based with a transformer-isolated UPS assembly providing robust protection and a fault-tolerant design.
- **Future-proof power:** system expansion options for power and runtime available.
- **Long operating life:** 20 year design life for the flywheel component compared to 7 years for a typical battery.
- **Low service costs:** easy to install and maintain (frictionless bearings).
- **Containerised option:** ideal for use with a standby generator, and in modular datacentres or remote installations.

## Master VDC: UPS module specifications

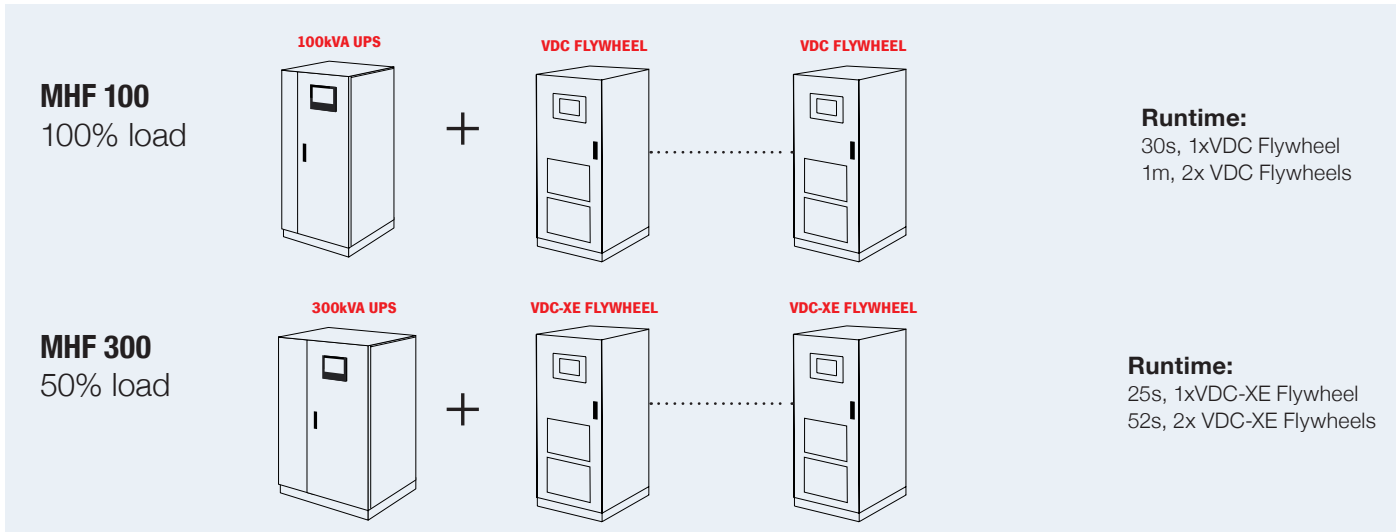
MODELS	MHF 100	MHF 120	MHF 160	MHF 200	MHF 250	MHF 300	MHF 400	MHF 500	
<b>POWER</b>	100	120	160	200	250	300	400	500	
<b>INPUT</b>									
Nominal voltage	380 - 400 - 415 Vac Three-phase								
Frequency	45 ÷ 65 Hz								
Power factor	> 0.99								
Harmonic current distortion	<3% THDi								
Soft start	0 ÷ 100% in 30" (selectable)								
Frequency tolerance	± 2% (selectable from ± 1% to ± 5% from front panel)								
Standard equipment provided standard	Back Feed protection; separable bypass line								
<b>BATTERIES</b>									
Type	open lead acid and VRLA AGM / GEL; NiCd.								
Ripple current	Zero								
Charge voltage compensation	-0.5 Vx°C								
<b>OUTPUT</b>									
Nominal power (kVA)	100	120	160	200	250	300	400	500	
Active power (kW)	90	108	144	180	225	270	360	450	
Number of phases	3 + N								
Nominal voltage	380 - 400 - 415 Vac Three-phase + N								
Static stability	± 1%								
Dynamic stability	± 5% in 10 ms								
Voltage distortion	< 1% with linear load / < 3% with non-linear load								
Crest factor (Ipeak/Irms)	3:1								
Frequency stability on battery	0.05%								
Frequency	50 or 60 Hz (selectable)								
Overload	110% for 60'; 125% for 10'; 150% for 1'								
<b>INFO FOR INSTALLATION</b>									
Weight (kg)	656	700	800	910	1000	1400	1700	2100	
Dimensions (hwd) (mm)	1900 x 800 x 850		1900 x 1000 x 850			1900 x 1500 x 1000		1900 x 2100 x 1000	
Remote signals	volt-free contacts (configurable)								
Remote controls	ESD and bypass (configurable)								
Communication	Double RS232 + remote contacts + 2 slots for communications interface								
Ambient temperature	0°C / +40°C								
Relative humidity	< 95% non-condensing								
Colour	Dark grey RAL 7016								
Noise level (1 m)	63 ÷ 68 dBA					70 ÷ 72 dBA		70 dBA	
Protection level	IP20 (others upon request)								
Smart Active Output	up to 99%								
Regulations	Safety: EN 62040-1-1 (directive 2006/95/EC); EMC: EN 62040-2 (directive 2004/108/EC)								
Classification according to IEC 62040-3	(Voltage Frequency Independent) VFI - SS - 111								

## Master VDC: Flywheel module specifications

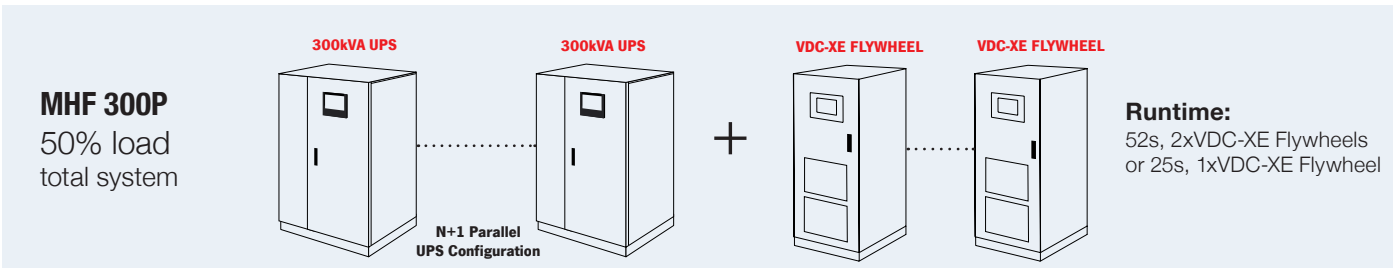
MODELS	VDC	VDC-XE
<b>POWER</b>		
Max Power	215 kW	300 kW
Max Energy Storage	3000kWsec@100kW	4000kWsec@100kW
Flywheel rotation speed	from 18500 to 36000 rpm	from 14500 to 36750 rpm
<b>INPUT</b>		
Input Voltage	400-600 Vdc	
Recharge Rate	15-50 A Adjustable for application	
Efficiency	99.2% at max. power	99.4% at max. power
<b>OUTPUT</b>		
Voltage Discharge	400-520 Vdc Adjustable for application	
Voltage Regulation	+/- 1%	
DC Ripple	≤ 2%	
<b>INFO FOR INSTALLATION</b>		
Operating Temperature	-20°C / +40°C	
Humidity	95% non-condensing	
Colour	Dark grey RAL 7016	
Noise level	≤ 68dBA a 1 m	
Dimensions (hwd) (mm)	1872 x 762 x 762	
Weight (kg)	705	
Protection level	IP 20	
Regulations	EMC EN 61000-6-4:2001; EMC EN 61000-6-2:2001; Safety EN 60204-1; Directives: 2004/108/EC; 98/37/EC	

# Master VDC Configurations

## Modularity



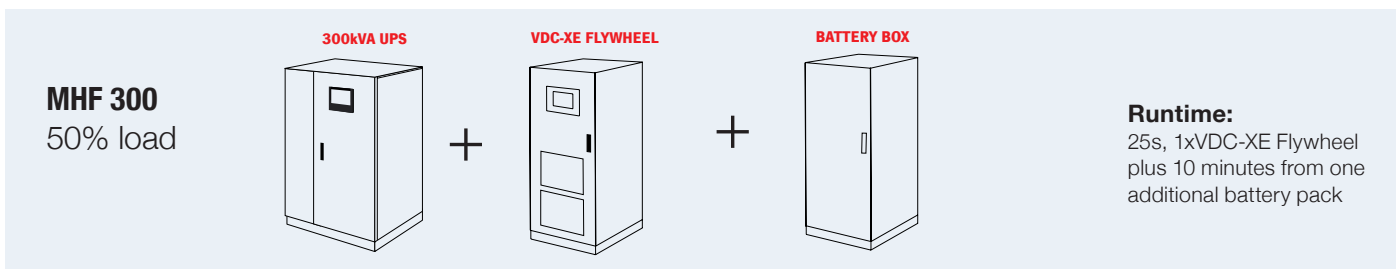
## Redundancy (parallel n+1 configuration)



## Additional Runtime Resilience and Optional Battery Packs

The flywheel solution is ideal for sites which experience frequent short duration breaks in mains power. It is designed for a high charge/discharge rate; without degradation and has a 20 year design life. For further runtime resilience, additional sealed lead acid battery packs can be installed with the Master VDC system. When the mains power supply fails, the flywheel provides the initial source of DC power to the UPS inverter. The additional battery pack supports the UPS inverter as the flywheel approaches a

user-settable discharge limit. In this configuration, the flywheel protects the battery from the initial on-demand backup requirement, prevents 'battery hardening' and helps to extend the working life of the battery pack. This configuration is useful for sites with or without a generator who want the added resilience of a traditional UPS battery pack. The battery set simply provides additional runtime for longer duration breaks in mains power than can be covered by the flywheel.



## Dimensions (mm)



## Master VDC (Flywheel only) Runtimes\*

VDC 215kW		MHF 100	MHF 120	MHF 160	MHF 200	MHF 250	MHF 300	MHF 400	MHF 500
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	100%	30	22	13	7	-	-	-	-
2		60	50	37	29	20	14	7	-
3		89	74	55	44	35	29	18	11
4		118	98	73	58	46	39	29	19
5		147	123	92	73	58	48	36	29
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	75%	41	34	22	15	9	-	-	-
2		80	66	50	39	31	24	14	8
3		119	99	74	59	47	39	29	20
4		157	131	98	78	62	52	39	31
5		197	164	123	98	78	65	48	39
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	50%	62	51	38	30	21	15	7	-
2		120	100	75	60	47	39	29	20
3		179	149	112	89	71	59	44	35
4		263	197	147	118	94	78	58	46
5		295	246	184	147	118	98	73	58
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	25%	29	101	76	60	48	40	29	16
2		263	196	147	118	94	78	58	46
3		350	292	219	175	140	116	87	69
4		461	385	289	231	185	154	115	92
5		576	481	361	289	231	192	144	115

VDC-XE 300kW		MHF 100	MHF 120	MHF 160	MHF 200	MHF 250	MHF 300	MHF 400	MHF 500
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	100%	40	33	22	15	9	5	-	-
2		79	65	49	39	30	24	14	8
3		118	98	73	58	46	38	28	20
4		156	129	97	77	61	51	38	30
5		195	162	121	97	77	60	48	38
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	75%	54	45	33	25	17	11	5	-
2		106	88	65	52	41	34	24	16
3		157	131	98	78	62	51	38	30
4		208	173	129	103	82	68	51	40
5		260	217	162	129	103	86	64	51
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	50%	82	68	51	40	32	25	11	5
2		159	132	99	79	63	52	39	30
3		237	197	147	118	94	78	58	46
4		313	260	195	156	124	103	77	61
5		391	326	244	195	156	129	97	77
NO OF FLYWHEELS	POWER	100	120	160	200	250	300	400	500
1	25%	39	135	101	80	64	53	39	26
2		313	260	195	156	124	103	77	61
3		465	387	290	232	185	154	115	92
4		614	511	383	306	245	204	152	122
5		767	639	479	383	306	255	191	152

All calculations based on 0.9pf and 94% efficiency for 100%, 75% and 50% load, and 92% efficiency for 25% load, with no additional battery pack

