

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

Holder of Certificate: **Atmoce Holding B.V.**

Singel 250
1016 AB Amsterdam
THE NETHERLANDS

Product: **PV inverter
Microinverter**

Model(s): **MI-360, MI-380, MI-400, MI-425, MI-450, MI-500,
MI-525, MI-550, MI-575, MI-600, MI-625**

Parameters: See next pages.

Applicable standards: EN 50549-1:2019
EN 50549-10:2022

This Certificate of Conformity confirms the compliance with the above listed standards on a voluntary basis. It refers only to the sample submitted to TÜV SÜD Product Service GmbH and does not certify the quality or safety of the serial products. It was issued according to TÜV SÜD Product Service certification program Photovoltaics and Grid Integration. For details see: www.tuvsud.com/ps-cert

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(Kai Zhao)

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

Parameters:

Model Name	MI-360	MI-380	MI-400
PV Input Parameters			
PV Max. Input Voltage	60 Vd.c.		
PV MPPT Range	16-60 Vd.c.		
Max. Input Continuous Current	16 Ad.c.		
Max. Input Short-circuit Current	20 Ad.c.		
A.C. Output Parameters			
Output Nominal Voltage	1/N ~ 230 V		
Output Nominal Frequency	50 Hz		
Max. Output Continuous Power	360 W	380 W	400 W
Max. Output Continuous Current	1.64 Aa.c	1.73 Aa.c.	1.83 Aa.c.
Power Factor	0.8(leading)-0.8(lagging)		

Model Name	MI-425	MI-450	MI-500
PV Input Parameters			
PV Max. Input Voltage	60 Vd.c.		
PV MPPT Range	16-60 Vd.c.		
Max. Input Continuous Current	16 Ad.c.		
Max. Input Short-circuit Current	20 Ad.c.		
A.C. Output Parameters			
Output Nominal Voltage	1/N ~ 230 V		
Output Nominal Frequency	50 Hz		
Max. Output Continuous Power	425 W	450 W	500 W
Max. Output Continuous Current	1.94 Aa.c	2.05 Aa.c.	2.28 Aa.c.
Power Factor	0.8(leading)-0.8(lagging)		

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

Model Name	MI-525	MI-550	MI-575
PV Input Parameters			
PV Max. Input Voltage	60 Vd.c.		
PV MPPT Range	16-60 Vd.c.		
Max. Input Continuous Current	16 Ad.c.		
Max. Input Short-circuit Current	20 Ad.c.		
A.C. Output Parameters			
Output Nominal Voltage	1/N ~ 230 V		
Output Nominal Frequency	50 Hz		
Max. Output Continuous Power	525 W	550 W	575 W
Max. Output Continuous Current	2.40 Aa.c	2.51 Aa.c.	2.63 Aa.c.
Power Factor	0.8(leading)-0.8(lagging)		

Model Name	MI-600	MI-625
PV Input Parameters		
PV Max. Input Voltage	60 Vd.c.	
PV MPPT Range	16-60 Vd.c.	
Max. Input Continuous Current	16 Ad.c.	
Max. Input Short-circuit Current	20 Ad.c.	
A.C. Output Parameters		
Output Nominal Voltage	1/N ~ 230 V	
Output Nominal Frequency	50 Hz	
Max. Output Continuous Power	600 W	625 W
Max. Output Continuous Current	2.72 Aa.c	2.72 Aa.c
Power Factor	0.8(leading)-0.8(lagging)	

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

Evaluated protection function and operational capabilities

Clause(s) / subclause(s) of EN 50549-1:2019	Applicable clause(s) / subclause (s) of this document	Remarks, optional modes and constraints	Verdict
4.4.2 Operating frequency range	5.2.1 Frequency operating range	--	Pass
4.4.3 Minimal requirement for active power delivery at underfrequency	5.2.1 Frequency operating range	--	Pass
4.4.4 Continuous operating voltage range	5.2.2 Voltage operating range	--	Pass
4.5.2 Rate of change of frequency (ROCOF) immunity	5.3.1 Immunity to disturbances – Rated of change of frequency (ROCOF)	--	Pass
4.5.3.2 Generating plant with nonsynchronous generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.4 Over-voltage ride through (OVRT)	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.6.1 Power response to overfrequency	5.4 Active response to frequency deviation	--	Pass
4.6.2 Power response to underfrequency	5.4 Active response to frequency deviation	--	Pass
4.7.2.2 Voltage support by reactive power, Capabilities	5.5.1 Power capabilities assessment	--	Pass
4.7.2.3 Voltage support by reactive power, Control modes	5.5.2 Voltage support by reactive power - test to determine the reactive power control modes	Q setp. Q(U) Cos φ setp. Cos φ (P)	Pass
4.7.2.3.2 Set point control modes	5.5.2.3 Verification procedure for set point control	Q setp. Cos φ setp.	Pass
4.7.2.3.3 Voltage related control modes	5.5.2.5 Verification procedure for power related control modes for reactive power	Q(U)	Pass
4.7.2.3.4 Power related control mode	5.5.2.5 Verification procedure for power related control modes for reactive power	Cos φ (P)	Pass
4.7.3 Voltage related active power reduction	5.6 Voltage related active power reduction - P(U)	P(U)	Pass
4.7.4.2.2 Zero current mode for converter connected generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.9.3 Requirements on voltage and frequency protection	5.8.3 Verification procedure for generating plants to be connected to a LV distribution network	--	Pass

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

4.9.4 Means to detect island situation	5.8.6 Islanding detection	Active methods tested with a resonant circuit according to EN 62116	Pass
4.10.2 Automatic reconnection after tripping	5.9.3 Automatic reconnection after tripping	--	Pass
4.10.3 Starting to generate electrical power	5.9.4 Starting to generate electrical power	--	Pass
4.11.1 Ceasing active power	5.10 Active power reduction on set point	--	Pass
4.11.2 Reduction of active power on set point	5.10 Active power reduction on set point	--	Pass
4.12 Remote information exchange	5.11 Remote information exchange	Standardized communication protocol not provided by manufacturer	N/A
4.13 single fault tolerance of interface protection system and interface switch	5.12 Requirements regarding single fault tolerance of interface protection system and interface switch	Interface protection system and interface switch shall be realized as a dedicated device at final installation	N/A

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

Evaluated parameter and parameter range

Specific technical requirement (e.g. grid codes)		EN 50549-1:2019		
Clause(s) / subclause(s) of EN 50549-1:2019	Parameter	Remarks/ additional information	Configurable value range	Default value
4.4.2 Operating frequency range	47.0 – 47.5 Hz Duration	--	0 – 20 s	Unlimited with protection setting only
	47.5 – 48.5 Hz Duration	--	30 – 90 min	Unlimited with protection setting only
	48.5 – 49.0 Hz Duration	--	30 – 90 min	Unlimited
	49.0 – 51.0 Hz Duration	--	not configurable	Unlimited
	51.0 – 51.5 Hz Duration	--	30 – 90 min	Unlimited with protection setting only
	51.5 – 52 Hz Duration	--	0 – 15 min	Unlimited with protection setting only
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	--	not configurable	N/A
	Maximum reduction rate	--	not configurable	N/A
4.4.4 Continuous operating voltage range	Upper limit	--	not configurable	110%Un
	Lower limit	--	not configurable	85%Un
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms)	--	not configurable	non-synchronous generating technology: 2 Hz/s
4.5.3.2 Under-voltage ride through (UVRT) Generating plant with non-synchronous generating technology	Maximum power resumption time	--	not configurable	1 s
	Voltage-Time-Diagram	See figure 6 of EN 50549-1:2019	Time [s]	U [p.u.]
				0.0 0.05
				0.25 0.05
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	not configurable See figure 8 of EN 50549-1:2019	Time [s]	U [p.u.]
				0.0 1.25
				0.1 1.25
				0.1 1.20
				5.0 1.20
				5.0 1.15
				60 1.15
				60 1.10
4.6.1 Power response to overfrequency	Threshold frequency f_1	--	50.2 Hz – 52 Hz	50.2 Hz
	Droop	--	2 % – 12 %	2 %
	Power reference	--	P_M P_{max}	P_M
	Intentional delay	--	0 – 2 s	2s
	Deactivation threshold f_{stop}	--	50.0 Hz – f_1	51.05Hz
	Deactivation time	--	0 – 600 s	600

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

	t_{stop}			
	Acceptance of staged disconnection	--	yes no	no
4.6.2 Power response to underfrequency	Threshold frequency f_1	--	49.8 Hz – 46 Hz	49.8 Hz
	Droop	--	2 – 12 %	2 %
	Power reference	--	$P_M P_{max}$	P_{max}
	Intentional delay	--	0 – 2 s	2 s
4.7.2.2 Voltage support by reactive power – Capabilities	Active factor / Reactive power (%Pd) range overexcited	--	0.8 – 1 / 60 % P_n – 0	1
	Active factor / Reactive power (%Pd) range underexcited	--	0.8 – 1 / 60 % P_n – 0	1
4.7.2.3 Voltage support by reactive power – Control modes	Enabled control mode	--	Q setp. Q(U) Cos φ setp. Cos φ (P)	Q set point.
4.7.2.3.2 Voltage support by reactive power – Setpoint control modes	Q setpoint and excitation	--	0 – 60 % P_n	0
	cos φ setpoint and excitation	--	-0.8, ..., +0.8	1
4.7.2.3.3 Voltage support by reactive power – Voltage related control modes	Characteristic curve – Q (U)	--	--	Indicate default characteristic
	Point a	--	50% U_n – 100% U_n	93 % U_n
	Point b	--	50% U_n – 100% U_n	94 % U_n
	Point c	--	100% U_n – 115% U_n	106% U_n
	Point d	--	100% U_n – 117% U_n	108 % U_n
	Min. reactive power	--	0 – 60 %Pd ($Q_{max under}$)	60 %Pd
	Max. reactive power	--	0 – 60 %Pd ($Q_{max over}$)	60 %Pd
	Time constant	--	3 s – 60 s	3.33 s
	Min cos φ	--	0.0 – 1	Deactivated
	Lock in power	--	0 % – 20 %	20%
	Lock out power	--	0 % – 20 %	5%
4.7.2.3.4 Voltage support by reactive power – Power related control mode	Characteristic Curve – Cos φ (P) Curve –Q(P)	--	--	Indicate default characteristic
	Point a	--	0 – 100% P_n / PF: -0.8, ..., +0.8	0% P_n /PF=-1
	Point b	--	0 – 100% P_n / PF: -0.8, ..., +0.8	50% P_n /PF=-1
	Point c	--	0 – 100% P_n / PF: -0.8, ..., +0.8	100% P_n /PF=-0.95
	Point d	--	0 – 100% P_n / PF: -0.8, ..., +0.8	N/A
	Cos φ	--	-0.8, ..., +0.8	0.8
	Time constant	--	3 s – 60 s	3.33 s
	Lock in voltage	--	105 % U_n	deactivated
	Lock out voltage	--	100 % U_n	deactivated
4.7.3 Voltage related active power reduction	Characteristic curve - P (U)	--	--	Indicate default characteristic
	Point a	--	0 – 100% P_n / U:100-125% U_n	100 % / 230V
	Point b	--	0 – 100% P_n / U:100-125% U_n	100 % / 253V

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

			U:100-125%Un	
	Point c	--	0 – 100%Pn/ U:100-125%Un	0/264.5V
	Point d	--	0 – 100%Pn/ U:100-125%Un	--
	Time constant	--	3 s – 60 s	3.33 s
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	--	enable disable	disabled
	Static voltage range overvoltage	--	100 % Un – 120 % Un	120 %Un
	Static voltage range undervoltage	--	20 % Un – 100 % Un	85 %Un
4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW. kVA]	--	16 A – 250 kVA	Interface protection system and interface switch was integrated in a dedicated device of model MC100-L, MR100-S or MR100- T.
	Undervoltage threshold stage 1	--	0.2 Un – 1 Un	0.65Un
	Undervoltage operate time stage 1	--	0.1 s – 100 s	30s
	Undervoltage threshold stage 2	--	0.2 Un – 1 Un	0.45Un
	Undervoltage operate time stage 2	--	0.1 s – 5 s	1.5s
	Overvoltage threshold stage 1	--	1.0 Un – 1.2 Un	1.12Un
	Overvoltage operate time stage 1	--	0.1 s – 100 s	30s
	Overvoltage threshold stage 2	--	1.0 Un – 1.3 Un	1.3Un
	Overvoltage operate time stage 2	--	0.1 s – 5 s	0.1s
	Overvoltage threshold 10 min mean protection	--	1.0 Un – 1.15 Un	1.1Un
	Underfrequency threshold stage 1	--	47.0 Hz– 50.0 Hz	48 Hz
	Underfrequency operate time stage 1	--	0.1 s – 100 s	30s
	Underfrequency threshold stage 2	--	47.0 Hz – 50.0 Hz	47 Hz
	Underfrequency operate time stage 2	--	0.1 s – 5 s	0.1s
	Overfrequency threshold stage 1	--	50.0 Hz – 52.0 Hz	51.5 Hz
	Overfrequency operate time stage 1	--	0.1 s – 100 s	30s
	Overfrequency threshold stage 2	--	50.0 Hz – 52.0 Hz	52 Hz
	Overfrequency operate time stage	--	0.1 s – 5 s	0.1s

Certificate of Conformity

No. ESY 126875 0021 Rev. 00

	2			
4.10.2 Automatic reconnection after tripping	Lower frequency	--	47.0 Hz – 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz – 52.0 Hz	50.2 Hz
	Lower voltage	--	50 %U _n – 100 %U _n	85 %U _n
	Upper voltage	--	100 %U _n – 120 %U _n	110 %U _n
	Observation time	--	10 s – 600 s	60 s
	Active power increase gradient	--	5% – 3000%/min	10 %P _n /min
4.10.3 Starting to generate electrical power	Lower frequency	--	47.0 Hz – 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz – 52.0 Hz	50.1 Hz
	Lower voltage	--	50 %U _n – 100 %U _n	85 %U _n
	Upper voltage	--	100 %U _n – 120 %U _n	110 %U _n
	Observation time	--	10 s – 600 s	60 s
	Active power increase gradient	--	5% – 3000 %/min	disabled
4.11.1 Ceasing active power	Activation option	--	e.g. digital input	
4.11.2 Reduction of active power on set point	Activation option	--	e.g. digital input	
4.12 Remote information exchange	Available communication standards	--	Standardized communication protocol not provided by manufacturer	