

PM175 Power Quality Compatibility with IEC61000

The standards: IEC61000-4-30:2008 and IEC61000-4-7:2002

PM175 device V_{din} =220V, 50 Hz

NN	Parameter	Compatibility of class A	Notes
1	Measurement aggregation over time intervals - 10/12 cycles -150/180 cycles -10 min - 2 hours	Yes, for parameters - Supply voltage, - harmonics, - interharmonics, - unbalance	
2	Real time clock (RTC) uncertainty should be 1 s per 24 h period	Yes, RTC uncertainty less than 1 s per 24 h period	
3	Flagging concept should be applicable during measurement of power frequency, voltage magnitude, flicker, supply voltage unbalance, voltage harmonics, voltage interharmonics, main signalling parameters	Yes, flagging is triggered by dips, swells, interruptions	
4	Supply voltage magnitude accuracy	Yes, uncertainty less than $\pm 0,1\%$ of U_{din} , over the range of 5 % ~ 150 % of U_{din} for L-N voltages	$\pm 0,1\%$ of U_{din} , over the range of 10 % ~ 150 % of U_{din} .
5	Power frequency aggregation over time interval - 10 s	Yes	
6	Power frequency accuracy	Yes	± 10 mHz over the measuring ranges 42,5 Hz ~ 57,5 Hz / 51 Hz ~ 69 Hz
7	Flicker aggregation over time intervals Pst 1 up to 10 min Plt 2 hours	Yes	
8	Flicker accuracy	No $\pm 5\%$ is met over the measuring range of 0,4 ~ 10 Pst.	$\pm 5\%$ required by IEC 61000-4-15 shall be met over the measuring range of 0,2 ~ 10 Pst.
9	Supply voltage dip, swell and interruption measurement – rms, update time ½ cycle	Yes	Duration of events is measured with aggregation for different phases
10	Accuracy of rms supply voltage dips swells and interruptions	Yes	$\pm 0,2\%$ of U_{din}
11	Accuracy of supply voltage dips swells and interruptions duration	Yes	Duration of events plus 1 cycle
12	Voltage unbalance accuracy	No , $\pm 0,15\%$ for u_0 and $\pm 0,2$ for u_2	$\pm 0,15\%$ for both u_2 and u_0 in the range 1 % to 5 % of U_1
13	Harmonic and interharmonic subgrouping	Yes	It shall be used to determine a 10/12-cycle gapless harmonic subgroup Measurement, IEC 61000-4-7 class 1.
14	Individual voltage harmonic accuracy Harmonic measurements shall be made	No , It is noise 0.1-0.15% at	5% U_m if voltage $U_m \geq \pm 1\% U_{nom}$,

NN	Parameter	Compatibility of class A	Notes
	at least up to the 50th order	sinusoidal voltage, without harmonics The required accuracy will be at 50% of class 3 compatibility level	0,05% U_{nom} if $U_m < 1\% U_{nom}$ The measuring range shall be 10 % to 200 % of class 3 compatibility level in IEC 61000-2-4.
15	Individual voltage interharmonic accuracy	Meter hasn't registers for Individual interharmonics The accuracy see for THD interharmonics	– “ –
16	Voltage THD accuracy	No, It is noise 0.6% at sinusoidal voltage, without harmonics The required accuracy will be at 50% of class 3 compatibility level	5% U_m if voltage $U_m \geq \pm 1\% U_{nom}$
17	Voltage THD interharmonic accuracy Harmonic measurements shall be made at least up to the 50th order	– “ –	– “ –

Note. Voltage unbalance (negative and zero sequence) should be calculated with 2 digits after point.
The maximum uncertainty shall be the levels specified in IEC 61000-4-7 class I.
The measuring range shall be 10 % to 200 % of class 3 compatibility level in IEC 61000-2-4

Table 2— Range of compatibility level of THD according IEC 61000-2-4

Parameter	THD according IEC61000-2-4	Minimal value	Maximal value
THD	10%	1%*	20%

Table 3— Range of compatibility level for odd harmonics (exceed multiple 3) according IEC 61000-2-4

Number of harmonics	HD according IEC61000-2-4	Minimal value	Maximal value
5	8	0.8	16
7	7	0.7	14
11	5	0.5	10
13	4.5	0.45	9
17	4	0.4	8
19	4	0.4	8
23	3.5	0.35	7
25	3.5	0.35	7
29	3.1	0.31	6.2
31	3	0.3	6
35	2.8	0.28	5.6
37	2.7	0.27	5.4
41	2.6	0.26	5.2
43	2.5	0.25	5
47	2.4	0.24	4.8
49	2.4	0.24	4.8

Table 4— Range of compatibility level for harmonics multiple 3 according IEC 61000-2-4

Number of harmonics	HD according .IEC61000-2-4	Minimal value	Maximal value
3	6	0.6	12
9	2.5	0.25	5
15	2	0.2	4
21	1.75	0.18	3.5
27	1	0.1	2
33	1	0.1	2
39	1	0.1	2
45	1	0.1	2

Table 5— Range of compatibility level for even harmonics according IEC 61000-2-4

Number of harmonics	HD according .IEC61000-2-4	Minimal value	Maximal value
2	3	0.3	6
4	1.5	0.15	3
6	1	0.1	2
8	1	0.1	2
10	1	0.1	2
>10	1	0.1	2

Table 6— Range of compatibility level for interharmonics according IEC 61000-2-4

Number of harmonics	Frequency at Fn =50 Hz	HD according .IEC61000-2-4	Minimal value	Maximal value
<11	<550	2.5	0.25	5
11- 13	550-650	2.25	0.23	4.5
13-17	650-850	2	0.2	4
17-19	850-950	2	0.2	4
19-23	950-1150	1.75	0.18	3.5
23- 25	1150-1250	1.5	0.15	3
> 25	1250-2500	1	0.1	2

Accuracy requirements

NN	Parameter	Accuracy requirements	
		IEC61000-4-30:2008	IEC61000-4-30:2003
1	RTC	1 cycle	1 cycle
2	Frequency Range accuracy	42.5 - 57.5 Hz or 51 - 69 Hz ± 0.01 Hz	N/A ± 0.01 Hz
3	Supply voltage Range accuracy	10% -150% V _{din} ± 0.1 V _{din}	N/A ± 0.1 V _{din}
4	Flicker Range accuracy	0.2 –10 Pst $\pm 5\%$	the manufacturer shall determine the range of the magnitude of voltage changes $\pm 5\%$
5	Residual and swell voltage magnitudes accuracy	± 0.2 V _{din}	± 0.2 V _{din}
6	Voltage unbalance Range accuracy	1% - 5% $\pm 0.15\%$	1% - 5% $\pm 0.15\%$
7	Harmonics Heist number Range accuracy	At least 50 10% - 200% of class 3 IEC61000-2-4 ± 0.05 V _{din} if $V_h < 1\%V_{din}$ and $\pm 5\%V_h$ if $V_h > 1\%V_{din}$	N/A 10% - 200% of class 3 IEC61000-2-4 ± 0.05 V _{din} if $V_h < 1\%V_{din}$ and $\pm 5\%V_h$ if $V_h > 1\%V_{din}$
8	Intraharmonics Heist number Range accuracy	At least 50 10% - 200% of class 3 IEC61000-2-4 ± 0.05 V _{din} if $V_h < 1\%V_{din}$ and $\pm 5\%V_h$ if $V_h > 1\%V_{din}$	N/A 10% - 200% of class 3 IEC61000-2-4 ± 0.05 V _{din} if $V_h < 1\%V_{din}$ and $\pm 5\%V_h$ if $V_h > 1\%V_{din}$

Range of influence quantities and steady-state verification

Range of influence quantities

The measurement of a specific characteristic can be adversely affected by the application of a disturbing influence (influence quantity) on the electrical input signal. For example, the measurement of supply voltage unbalance might be adversely affected if the voltage waveform is at the same time subject to a harmonic disturbance.

The result of a parameter measurement shall be within the specified measurement uncertainty given in Clause 5 when all other parameters are within their influence quantity range, given in the Table 1.

Table 1 – Influence quantity range

Section and parameter	Class	Influence quantity range	
		IEC61000-4-30:2008	IEC61000-4-30:2003
5.1 Frequency	A	42,5 Hz ~ 57,5 Hz, 51 Hz ~ 69 Hz	42,5 Hz – 57,5 Hz for 50 Hz systems 51 Hz – 69 Hz for 60 Hz systems
	S	42,5 Hz ~ 57,5 Hz, 51 Hz ~ 69 Hz	-
	B	42,5 Hz ~ 57,5 Hz, 51 Hz ~ 69 Hz	42,5 Hz – 57,5 Hz, for 50 Hz systems 51 Hz – 69 Hz, for 60 Hz systems
5.2 Magnitude of the supply	A	10 % ~ 200 % U_{din}	0 % – 200 % of U_{din}
	S	10 % ~ 150 % U_{din}	-
	B	10 % ~ 150 % U_{din}	0 % – 150 % of U_{din}
5.3 Flicker	A	0 – 20 Pst	0 – 20 Pst
	S	0 – 10 Pst	-
	B	N/A	N/A
5.4 Dips and swells	A	N/A	
	S	N/A	-
	B	N/A	
5.5 Interruptions	A	N/A	
	S	N/A	-
	B	N/A	
5.7 Unbalance	A	0 % ~ 5 % u_2 , 0 % ~ 5 % u_0	0 % – 5 %
	S	0 % ~ 5 % u_2	-
	B	SBM	0 % – 5 %
5.8 Voltage harmonics	A	200 % of class 3 of IEC 61000-2-4	Twice the values in IEC 61000-2-4, class 3
	S	200 % of class 3 of IEC 61000	-
	B	200 % of class 3 of IEC 61000	Twice the values in IEC 61000-2-4, class 3
5.9 Voltage interharmonics	A	200 % of class 3 of IEC 61000	Twice the values in IEC 61000-2-4, class 3
	S	200 % of class 3 of IEC 61000	-
	B	200 % of class 3 of IEC 61000	Twice the values in IEC 61000-2-4, class 3
5.10 Mains signalling voltage	A	0 % ~ 15 % U_{din}	0 % – 9 % of U_{din}
	S	0 % ~ 15 % U_{din}	-
	B	0 % ~ 15 % U_{din}	0 % – 9 % of U_{din}
5.12 Under/overdeviation	A	N/A	N/A
	S	N/A	-
	B	N/A	N/A
Transient voltages IEC 61180	A	6 kV peak	N/A
	S	N/R	-
	B	N/R	N/A
Fast transients IEC 61000-4-4	A	4 kV peak	N/A
	S	N/R	-
	B	N/R	N/A

SBM = Specified by manufacturer

N/R = no requirement

N/A = not applicable