

IEC 61000-4-30 compliance and ION meters

This technical note outlines the compliance of PowerLogic™ meters with the International Electrotechnical Commission's IEC 61000-4-30 (4-30) standard. It is intended for personnel with knowledge of power quality and power quality standards.

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Additional information

Go to www.se.com and search for:

- your meter's user manual for configuration and operating instructions.
- your meter's installation sheet for installation and basic setup instructions.
- the *ION Reference* document for further information about the ION architecture and detailed ION module descriptions.
- the *ION Device Template* for information on the configuration of ION modules in your meter's default template.

Refer to EcoStruxure™ Power Monitoring Expert documents to generate 4-30 reports.

Contact your local sales representative for details on available third-party test lab certifications for your device.

Go to www.iec.ch and search for IEC 61000-4-30 for a complete description of the 4-30 standard.

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IEC 61000-4-30 overview

The 4-30 standard defines methods for measurement and interpretation of power quality parameters in 50/60 Hz AC power supply systems. It also describes measurement methods to obtain reliable, repeatable and comparable results using any compliant meter.

Power quality parameters

The power quality parameters considered in the 4-30 standard are:

- Power frequency.
- Magnitude of the supply voltage and current.
- Flicker.
- Supply voltage dips and swells.
- Voltage interruptions.
- Transient voltages.
- Supply voltage and current unbalance.
- Voltage and current harmonics.
- Voltage and current interharmonics.
- Mains signalling voltage on the supply voltage.
- Rapid Voltage Change (RVC).
- Underdeviation and overdeviation.

Classes of measurement

The 4-30 standard defines three classes of performance for each measured parameter.

Class A

Class A performance is used in applications that require precise measurements, such as verification of standards compliance or energy-settlement contracts. Parameter measurements performed using two separate Class A meters measuring the same signals, will produce matching results within the specified margin of uncertainty for that parameter.

Class S

Class S performance is used in statistical applications such as surveys or power quality assessments, possibly with a limited subset of parameters. Class S uses equivalent measurement intervals as Class A, but the Class S processing requirements are lower.

Class B

Class B performance is defined to avoid making any existing instrument designs obsolete.

Flagging concept

During a voltage dip, swell, or interruption, measurements of other power quality parameters may produce unreliable results.

The flagging concept avoids counting a single event more than once in different parameters, for example, counting a single dip as both a dip and frequency variation. A flagged measurement indicates that the aggregated value might be unreliable.

Flagging is only triggered by supply voltage dips, swells and interruptions.

Flagging applies to Class A and Class S devices during the measurement of:

- Power frequency.
- Magnitude of the supply voltage.
- Flicker.
- Supply voltage unbalance.
- Voltage harmonics.
- Voltage interharmonics.
- Mains signalling.
- Underdeviation and overdeviation.

NOTE: 4-30 flagging is disabled while the meter is powered down. If the meter is powered down, all flagged measurements and corresponding aggregated values for the active 4-30 reporting interval will be lost.

ION implementation of 4-30

Meter ¹	Firmware version	IEC 61000-4-30 compliance
ION9000	all	Class A, Edition 3
ION8800A	370 or later	Class A, Edition 3
	340 to 362	Class A, Edition 2
	330 to 334	Class A, Edition 1
ION8800B	370 or later	Class S, Edition 3
	340 to 362	Class S, Edition 2
ION8650A	4.30.0 or later	Class A, Edition 3
	400 to 4.21.2	Class A, Edition 2
ION8650B	4.30.0 or later	Class S, Edition 3
	400 to 4.21.2	Class S, Edition 2
ION7650	410 and later	Class A, Edition 3
	355 to 401	Class A, Edition 2
	330 to 353	Class A, Edition 1
ION7400	2.1.0 or later	Class S, Edition 3
	1.4.3 or earlier	Class S, Edition 2
PM8000	2.1.0 or later	Class S, Edition 3
	1.4.3 or earlier	Class S, Edition 2

NOTE: All 4-30 compliant ION meters require installation of the corresponding power quality version of the meter template. For example, ION9000 firmware version 2.1.0 requires the ION9000 v2.1.0 PQ template.

1. ION8650C and ION8800C meters do not support 4–30 functionality.

ION 4-30 measurement performance

Measurement uncertainty and measuring range are defined for each power quality parameter based on the class of measurement.

NOTE: ION meters exceed the standard requirements.

Class A measurement performance (Indoor(I), Fixed(F), $U_{din} = 230$ VAC) Edition 3

Parameter	Measuring range	Uncertainty
4.6 Clock Uncertainty ²	N/A	50 Hz: +/- 20 ms 60 Hz: +/- 16.7 ms Non-sync: +/- 1 s / 24-h
5.1 Power Frequency	50 Hz: 42.5 to 57.5 Hz 60 Hz: 51 to 69 Hz	+/- 0.01 Hz
5.2 Magnitude of Supply Voltage	10 to 150% of U_{din}	+/- 0.1% of U_{din}
5.3 Flicker	0.2 to 10 P_{st}	5% or 0.05 P_{st} , whichever is greater
5.4 Supply Voltage Dips & Swells	N/A	Amplitude +/- 0.2% of U_{din} Duration +/- 1 cycle
5.5 Voltage Interruptions	N/A	Duration +/- 1 cycle
5.7 Supply Voltage Unbalance	U_2 (0.5 to 5)% U_0 (0.5 to 5)%	+/- 0.15%
5.8 Voltage Harmonics	Up to 50 th order 10% to 200% of IEC 61000-2-4 Class 3	IEC 61000-4-7 Class 1 $U_m \geq 1\%$ U_{nom} : +/- 5% U_m $U_m < 1\%$ U_{nom} : +/- 0.05% U_{nom}
5.9 Voltage Interharmonics	Up to 50 th order 10% to 200% of IEC 61000-2-4 Class 3	IEC 61000-4-7 Class 2 $U_m \geq 1\%$ U_{nom} : +/- 5% U_m $U_m < 1\%$ U_{nom} : +/- 0.05% U_{nom}
5.10 Mains Signaling Voltage	Up to 3 kHz 0 to 15% of U_{din}	(1 to 3)% U_{din} : +/- 0.15% (3 to 15)% U_{din} : +/- 5%
5.11 Rapid Voltage Changes	N/A	Amplitude +/- 0.2% U_{din} Duration +/- 1 cycle
5.12 Underdeviation and Overdeviation	10 to 150% of U_{din}	+/- 0.1% U_{din}
5.13.2 Current Magnitude	Specified Crest factor of 3	1% of reading for (10 to 100) % of I_n
5.13.4 Current Harmonics	Up to 50 th order	IEC 61000-4-7 Class 1 $I_m \geq 1\%$ I_{nom} : +/- 5% I_m $I_m < 1\%$ I_{nom} : +/- 0.05% I_{nom}
5.13.5 Current Interharmonics	Up to 50 th order	IEC 61000-4-7 Class 1 $I_m \geq 3\%$ I_{nom} : +/- 5% I_m $I_m < 3\%$ I_{nom} : +/- 0.15% I_{nom}
5.13.6 Current Unbalance	I_2 (0.5 to 5)% I_0 (0.5 to 5)%	+/- 0.15%

2. GPS synchronization is required on all devices for Clock Uncertainty compliance.

Class S measurement performance (Indoor(I), Fixed(F), $U_{din} = 230$ VAC) Edition 3

Parameter	Measuring range	Uncertainty
4.6 Clock Uncertainty	N/A	+/- 5 s / 24-h
5.1 Power Frequency	50 Hz: 42.5 to 57.5 Hz 60 Hz: 51 to 69 Hz	+/- 0.05 Hz
5.2 Magnitude of Supply Voltage	10 to 150% of U_{din}	+/- 0.5% of U_{din}
5.3 Flicker ³	0.2 to 10 P_{st}	5% or 0.05 P_{st} , whichever is greater
5.4 Supply Voltage Dips & Swells	N/A	Amplitude +/- 0.2% of U_{din} Duration +/- 1 cycle
5.5 Voltage Interruptions	N/A	Duration +/- 1 cycle
5.7 Supply Voltage Unbalance	U_2 (0.5 to 5)% U_0 (0.5 to 5)%	+/- 0.15%
5.8 Voltage Harmonics	Up to 40 th order 10% to 100% of IEC 61000-2-4 Class 3	IEC 61000-4-7 Class II $U_m \geq 3\% U_{nom}$: +/- 5% U_m $U_m < 3\% U_{nom}$: +/- 0.15% U_{nom}
5.10 Mains Signaling Voltage ³	Up to 3 kHz 0 to 15% of U_{din}	(1 to 3)% U_{din} : +/- 0.15% (3 to 15)% U_{din} : +/- 5%
5.12 Underdeviation and Overdeviation ³	10 to 150% of U_{din}	+/- 0.5% of U_{din}
5.13.2 Current Magnitude	Specified Crest factor of 3	2% of reading for (10 to 100) % of I_n
5.13.4 Current Harmonics	Up to 40 th order	IEC 61000-4-7 Class II $I_m \geq 10\% I_{nom}$: +/- 5% I_m $I_m < 10\% I_{nom}$: +/- 0.5% I_{nom}
5.13.6 Current Unbalance	I_2 (0.5 to 5)% I_0 (0.5 to 5)%	+/- 0.15%

Class A measurement performance ($U_{din} = 230$ VAC) Edition 1 and 2

Parameter	Range	Accuracy
5.1 Power Frequency	50 Hz: 42.5 to 57.5 Hz 60 Hz: 51 to 69 Hz	+/- 0.01 Hz
5.2 Magnitude of Supply Voltage	1 to 200% of U_{din} (Edition 1) 10 to 150% of U_{din} (Edition 2)	+/- 0.1% of U_{din}
5.3 Flicker	0 to 20 P_{st} (Edition 1) 0.2 to 10 P_{st} (Edition 2)	5% of reading
5.4 Supply Voltage Dips & Swells	10 to 200% of U_{din}	Amplitude +/- 0.2% of U_{din} Duration +/- 1 cycle
5.5 Voltage Interruptions	< 10% of U_{din}	Amplitude +/- 0.2% of U_{din} Duration +/- 1 cycle
5.7 Supply Voltage Unbalance	0 to 5%	+/- 0.15%
5.8 Voltage Harmonics	2 times the limit from IEC 61000-2-4 Class 3 up to the 50th harmonic	IEC 61000-4-7 Class I Method $U_{sg,h}$
5.9 Voltage Interharmonics	2 times the limit from IEC 61000-2-4 Class 3 up to the 50th harmonic	IEC 61000-4-7 Class I Method $U_{sg,h}$

3. Not available on all Class S devices.

Class A measurement performance ($U_{din} = 230 \text{ VAC}$) Edition 1 and 2 (Continued)

Parameter	Range	Accuracy
5.10 Mains Signaling Voltage	Up to 3 kHz 0 to 15% of U_{din}	1 to 3% of U_{din} , +/- 0.15% of U_{din} ; 3 to 15% of U_{din} , +/- 5% of measured value
5.12 Underdeviation and Overdeviation	1 to 200% of U_{din} (Edition 1) 10 to 150% of U_{din} (Edition2)	+/- 0.1% of U_{din}

Class S measurement performance ($U_{din} = 230 \text{ VAC}$) Edition 2

Parameter	Measuring range	Uncertainty
5.1 Power Frequency	50 Hz: 42.5 to 57.5 Hz 60 Hz: 51 to 69 Hz	+/- 0.05 Hz
5.2 Magnitude of Supply Voltage	10 to 150% of U_{din}	+/- 0.5% of U_{din}
5.3 Flicker ⁴	0.2 to 10 P_{st}	+/- 5% of reading
5.4 Supply Voltage Dips & Swells	10 to 200% of U_{din}	Amplitude +/- 0.2% of U_{din} Duration +/- 1 cycle
5.5 Voltage Interruptions	N/A	Duration +/- 1 cycle
5.7 Supply Voltage Unbalance	U_2 (0.5 to 5)% U_0 (0.5 to 5)%	+/- 0.15%
5.8 Voltage Harmonics	10 to 100% the limit from IEC 61000-2-4 Class 3, calculated up to the 40 th harmonic	Twice IEC 61000-4-7 Class II
5.10 Mains Signaling Voltage ⁴	0 to 15% of U_{din}	1 to 3% of U_{din} , +/- 0.15% of U_{din} ; 3 to 15% of U_{din} , +/- 5% of measured value
5.12 Underdeviation and Overdeviation ⁴	10 to 150% of U_{din}	+/- 0.5% of U_{din}

4. Not available on all Class S devices.