Ohmics

AUTOMATED POWER QUALITY ANALYSIS

Power Quality Report

IEEE 519-1992 and 519-2014 · IEEE 1159-2009 · IEEE 1453-2015 · ANSI C84.1

Prepared for	Customer B
Job	PQ-01 sample
Recordings	Customer B service, Utility A.xsb: ProVision platform 31, 2023-07-11 09:35 to 2023-07-13 08:59
Meter location (as stated)	Service entrance
Single-line diagram	Not provided
Short-circuit current (ISC) at the PCC	Unknown
Maximum demand current (IL)	From the recording

No engineer reviewed this report. Software produced it from the uploaded meter files and released it automatically. Check each conclusion before acting on it; none of them is an engineering determination.

This is an automated analysis of a power quality recording, not an engineering determination.

The results apply published limits (IEEE Std 519-1992 and 519-2014, IEEE Std 1159, IEEE Std 1453 and ANSI C84.1) to the values decoded from the uploaded meter files. They depend on how the meter was connected and set up, on where it was placed, and on the short-circuit and demand values provided. IEEE 519 limits apply at the point of common coupling. Statements about which side of the meter a disturbance most likely came from are inferences from the data, not findings of fault. Decisions about equipment, utility service or mitigation should be made by a qualified engineer.

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CONCLUSIONS AND RECOMMENDATIONS

Findings and Recommendations

No single-line diagram was provided, so the location of the point of common coupling (PCC) was not specified and the stated meter location (service entrance) could not be confirmed. IEEE 519 limits apply at the PCC. The results below are reported as measured and may not represent conditions at the PCC.

Overall conclusion

Within limit	Measured values are within the limits of ANSI C84.1 at the service entrance (as stated) for every item assessed.
Exceeds limit	Measured values exceed the limits of IEEE 519-2014 at the service entrance (as stated) for: Current TDD. Because the meter was not at a confirmed PCC, this is a statement about the measurement point, not a determination at the PCC.
Exceeds limit	Measured values exceed the limits of IEEE 519-1992 at the service entrance (as stated) for: Current TDD. Because the meter was not at a confirmed PCC, this is a statement about the measurement point, not a determination at the PCC.
Within limit	Measured values are within the limits of IEEE 1453-2015 at the service entrance (as stated) for every item assessed.

Customer B service, Utility A.xsb: Exceeds: Current TDD (IEEE 519-2014); Current TDD (IEEE 519-1992). 6 items within limits. Not assessed: Background voltage THD (load off), Flicker Plt. Recorded over 47.4 hours (shorter than the week the standards assess).

Interpretation

Written by an AI model from the computed results in this report. Every number in it was checked against those results. It does not change any result.

Over 47.4 hours at the service entrance, voltage quality was within the limits assessed: voltage THD 95th percentile 2.01 % against the 8 % IEEE 519-2014 Table 1 limit, Pst 95th percentile 0.84 against the IEEE 1453-2015 compatibility level of 1, and steady-state voltage inside ANSI C84.1 Range B. Current distortion was high: TDD 95th percentile 13.6 % is above the IEEE 519-2014 Table 2 limits in every ISC/IL row. 21 rms events were recorded and none fell outside the ITIC curve.

The results do not explain the reported tripping or resetting: all 21 recorded events, including 2 sustained interruptions and 1 temporary interruption, fell inside the ITIC curve, and 18 events sit in the first or last 2 minutes of the recording. A longer recording with trip times logged at the affected equipment would be needed.

Possible explanations

1. Undetermined: the trips may occur on a branch circuit or panel downstream of the service meter, where disturbances would not appear in a service-entrance recording. (findings 2, 7; PQ-E-01)
2. Consistent with harmonic-producing load in the facility: TDD 95th percentile 13.6 % and maximum 1-hour 20.7 % are above the IEEE 519-2014 Table 2 limits in every ISC/IL row, while voltage THD stayed low. (finding 1; PQ-I-01; PQ-H-01)
3. Cannot be ruled out without wiring verification: the 18 instantaneous swells to about 114 % of nominal, all with 0.01 s duration and clustered at the end of the recording, may be connection artifacts rather than supply events. (finding 7; PQ-E-01)
4. Cannot be ruled out without a longer record: sensitive equipment may respond to the sustained and temporary interruptions recorded, even though none fell outside the ITIC curve. (finding 7; PQ-E-01)

Suggested next steps

1. Record for at least one full week at the service entrance and, in parallel, at the panel feeding the equipment that trips. The 47.4-hour record captured no event outside ITIC; concurrent downstream monitoring locates the disturbance.
2. Log the date and time of each trip or reset and compare against the event list. Time correlation is the direct way to connect equipment behaviour to recorded disturbances.
3. Obtain a single-line diagram, the available short-circuit current at the PCC, and the actual IL. TDD limits apply at the PCC; IL was taken as 152 A from this recording rather than provided.
4. Verify the meter connection and retest harmonics after the setup issue noted between 2023-07-12 13:08 and 2023-07-13 08:59. Harmonic data from that period was excluded, so the harmonic picture is incomplete.

Limits of this data

1. Recording covers 47.4 hours, shorter than the week IEEE 519-2014 and IEEE 1453-2015 assess, so all percentiles cover only that period.
2. No single-line diagram was provided; the PCC was not specified and the stated service-entrance meter location could not be confirmed.
3. Voltage THD read above 25 % for a long block on 2023-07-12 to 2023-07-13 while rms voltage was normal; those harmonic readings were excluded as a likely meter setup problem.
4. The load never dropped below 1.0 A, so utility background distortion cannot be separated from the facility contribution; Plt and individual current harmonics were not assessable.

What passes and what fails

Check	Standard	Customer B service, Utility A.xsb
Steady-state voltage	ANSI C84.1	Within Range B
Voltage THD	IEEE 519-2014	Within
Voltage THD	IEEE 519-1992	Within
Voltage individual harmonics	IEEE 519-2014	Within
Background voltage THD (load off)	IEEE 519	Not assessable
Current TDD	IEEE 519-2014	Exceeds in every ISC/IL row
Current TDD	IEEE 519-1992	Exceeds in every ISC/IL row
Flicker Pst	IEEE 1453-2015	Within
Flicker Plt	IEEE 1453-2015	Not assessable
Events against the ITIC curve	ITIC / IEEE 1159	All inside



Summary

1 recording was analyzed against IEEE 519 (1992 and 2014), IEEE 1159, IEEE 1453 and ANSI C84.1. 3 findings need attention; the rest are within the limits or for information.

Recommendations

1. Find the loads drawing the harmonic current (drives, rectifiers, chargers), and confirm IL from 12 months of billing demand.
2. Provide a single-line diagram marked with the meter location and the point of common coupling.
3. Range B is acceptable but should be limited in extent and frequency. Note when the excursions occur and compare with load or utility switching.

Findings

SIGNIFICANT · Customer B service, Utility A.xsb

1. Short-circuit ratio unknown: TDD result by ISC/IL row

The available short-circuit current at the PCC was not provided, so the short-circuit ratio (ISC/IL) is unknown. IL was not provided, so 152 A (the highest 15-minute demand in this recording) was used. TDD 95th percentile (10-minute values) was 13.6 %. The tables show the result for each row. TDD is above the IEEE 519-2014 Table 2 limits in every row, so the result does not depend on the short-circuit current.

Next step: Find the loads drawing the harmonic current (drives, rectifiers, chargers), and confirm IL from 12 months of billing demand.

Possible sources

- Six-pulse drives (VFDs) without input reactors
- Rectifiers, battery chargers, UPS units and welders
- Many single-phase electronic loads, which add triplen harmonics in the neutral

Options to evaluate

- AC line reactors (3 to 5 %) or DC link chokes on drives
- 12- or 18-pulse, or active-front-end, drives for the largest units
- An active harmonic filter at the main switchboard, sized from the measured spectrum
- Passive tuned filters where one harmonic dominates
- Check transformer and neutral loading (K-factor) while the harmonics remain

OBSERVATION

2. PCC not specified and meter location not confirmed

No single-line diagram or meter location was provided, so the results are reported as measured at the meter (see the PCC note at the top of the findings).

Next step: Provide a single-line diagram marked with the meter location and the point of common coupling.

OBSERVATION · Customer B service, Utility A.xsb

3. Voltage outside ANSI C84.1 Range A for part of the recording

Ten-minute average voltage ranged from 100.4 % to 105.2 % of the 120 V nominal. It was outside Range A (95–105 %) for 3.4 % of the recording and stayed inside Range B.

Next step: Range B is acceptable but should be limited in extent and frequency. Note when the excursions occur and compare with load or utility switching.

Possible sources

- Service transformer tap or utility regulator set high
- Power factor capacitors left on at light load
- Little load on the feeder at night or on weekends

Options to evaluate

- Ask the utility to check the transformer tap and regulator settings
- Switch power factor capacitors with load, or use automatic capacitor control
- Confirm the nominal voltage setting on the meter

INFORMATION · Customer B service, Utility A.xsb

4. Voltage distortion within IEEE 519

Voltage THD 95th percentile (10-minute values) was 2.01 %. The limit is 8 % under IEEE 519-2014 Table 1 and 5 % under IEEE 519-1992 Table 11.1. The recording is 47.4 hours, shorter than the week IEEE 519-2014 and IEEE 1453 assess, so these values cover the period recorded.

Next step: No action indicated by this recording for voltage distortion.

INFORMATION · Customer B service, Utility A.xsb

5. The load was not turned off during the recording

The facility current never dropped below 1.0 A while the supply was on, so the utility's background voltage distortion cannot be separated from the facility's contribution in this recording.

Next step: To measure background distortion at the PCC, record for at least an hour with the facility load switched off (main breaker open on the load side of the meter) while the utility supply stays on.

INFORMATION · Customer B service, Utility A.xsb

6. Flicker within IEEE 1453

Pst 95th percentile was 0.84 (highest 1.70). Plt was not available; it needs at least 2 hours of data. The compatibility levels are Pst 1 and Plt 0.8. The recording is 47.4 hours, shorter than the week IEEE 519-2014 and IEEE 1453 assess, so these values cover the period recorded.

Next step: No action indicated by this recording for flicker.

INFORMATION · Customer B service, Utility A.xsb

7. Voltage events recorded

21 rms events were recorded. Categories (IEEE 1159 Table 2): 3.1 Sustained interruption 2; 2.3.1 Temporary interruption 1; 2.1.2 Instantaneous swell 18. The most severe reached 114 % of nominal on phase B. 0 fell outside the ITIC curve.

Next step: Compare the event times with any equipment trips or resets reported at the site.

Data notes

Customer B service, Utility A.xsb: ProVision Hookup type value 0 is not decoded; wiring 'split-phase' inferred from 2 live voltage channel(s) (ch1=A, ch2=B) and ch3=N (near-zero voltage, carries neutral current).

Customer B service, Utility A.xsb: Outage records have Channel 0, taken to mean all live phases; residual voltage is not recorded.

Customer B service, Utility A.xsb: ProVision stores meter-local clock times; they are read as UTC here, so absolute times are offset by the meter time zone.

Customer B service, Utility A.xsb: Leading zero readings (meter start-up) are set to missing; zeros later in a trace (outages) are kept. A harmonic that reads zero from the start is kept as zero beyond the start-up length.

Customer B service, Utility A.xsb: Pst is stripchart measure 11 (steps about every 10 min with min = avg = max); the code is inferred from the data, not named in the file.

Customer B service, Utility A.xsb: Stripchart measure 13 (clipped at 655.35, likely instantaneous flicker level) and the EventRecord (Status 0/128), FlickerRecord (level-index counts, no Pst values), Waveform, Histogram, SignificantChange and Energy records are not mapped.

Customer B service, Utility A.xsb: The recording is shorter than 7 days, so weekly percentiles cover only the 47.4 hours recorded.

Customer B service, Utility A.xsb: The meter logged every 5 s, so its values stand in for the 3-second values IEEE 519-2014 uses.

Customer B service, Utility A.xsb: 19103 logging interval(s) held a sag, swell or interruption. The 108 ten-minute window(s) containing them are left out of the steady-state statistics, as IEC 61000-4-30 flagging does, and reported as events instead.

Customer B service, Utility A.xsb: Voltage THD read above 25 % for 14302 interval(s) between 2023-07-12 13:08 and 2023-07-13 08:59 (meter time) while rms voltage was normal. That is not physically plausible on a utility supply and points to a meter setup or measurement problem, so all harmonic readings from that period (voltage and current) are left out of the harmonic results. Check how the meter was connected for that period.

Customer B service, Utility A.xsb: This meter stores current harmonics in whole amps, which is too coarse to test the individual-order limits (as low as 1 % of IL), so those are not assessed. TDD uses the current THD computed by the meter.

Customer B service, Utility A.xsb: 341 event record(s) overlapped another record on the same phase (for example a dip and the interruption inside it) and were merged, so each disturbance is counted once.

Customer B service, Utility A.xsb: 18 of the recorded events fall in the first or last 2 minutes of the recording, when the meter is usually being connected or removed. They may be connection artifacts rather than supply events.

Terms used

PCC	Point of common coupling: the point on the utility system nearest the customer where another customer is or could be served. IEEE 519 limits apply there.
ISC	Available short-circuit current at the PCC.
IL	Maximum demand load current at the PCC: the average of the maximum demand currents for the preceding 12 months.
THD	Total harmonic distortion: harmonic content as a percent of the fundamental flowing at that moment.
TDD	Total demand distortion: harmonic current as a percent of IL. IEEE 519 current limits are in TDD.
Pst / Plt	Short-term (10-minute) and long-term (2-hour) flicker severity, IEEE 1453.
ITIC	The Information Technology Industry Council voltage tolerance curve for equipment ride-through.
Range A / B	ANSI C84.1 voltage ranges. Range A is the design range; Range B is acceptable but should be limited in extent, frequency and duration.
NEMA unbalance	Maximum deviation from the average of the three phase voltages, as a percent of that average.

MEASUREMENT

Customer B service, Utility A.xsb

Item	Value
Meter	ProVision platform 31
Nominal voltage	120 V line-to-neutral, 240 V line-to-line
Wiring	split-phase
Recording	2023-07-11 09:35 to 2023-07-13 08:59 (meter time), 47.4 hours, logged every 5 s
Assessment period	Shorter than a week: percentiles cover the period recorded

What this file contained

Only the quantities in the file are assessed. Anything not provided is reported as not assessed, not as a failure.

Quantity	In this file	Note
RMS voltage	Provided	
RMS current	Provided	
Frequency	Not provided	
Voltage THD	Provided	
Current THD	Provided	
Voltage harmonics by order	Provided	
Current harmonics by order	Provided	
Voltage unbalance	Not provided	
Current unbalance	Not provided	
Flicker Pst	Provided	
Flicker Plt	Not provided	
Sag, swell and interruption events	Provided	
Active power and power factor	Not provided	
Neutral-to-ground voltage	Provided	
Waveform captures and high-speed transients	Not provided	not analyzed in this version

Results against the limits

Parameter	Standard	Limit	Measured	Status
Steady-state voltage (10-min averages), service	ANSI C84.1 Range A / B	A 95–105 %, B 91.7–105.8 %	100.4–105.2 % of 120 V (outside Range A 3.4 % of the time)	Within limit
Voltage THD	IEEE 519-2014 Table 1	8 % (95th pct, 10-min); 12 % (99th pct, 3-s, daily)	95th pct 2.01 %; daily 99th pct 3-s 3.98 %	Within limit
Voltage THD	IEEE 519-1992 Table 11.1	5 % (over 1 h); 7.5 % (short periods)	max 1-h 2.66 %; max 10-min 3.68 %	Within limit
Voltage individual harmonics (95th pct, 10-min)	IEEE 519-2014 Table 1	5 %	highest h3 at 1.51 %	Within limit
Background voltage THD with the load off	IEEE 519-2014 Table 1 / IEEE 519-1992 Table 11.1	8 % / 5 %	Load never off	Not assessable
Current TDD	IEEE 519-2014 Table 2 / IEEE 519-1992 Table 10.3	Depends on ISC/IL	95th pct 13.6 %; max 1-h 20.7 %	Not assessable
Flicker Pst (95th pct)	IEEE 1453-2015 (LV compatibility levels, 95 %)	1	0.84 (max 1.70)	Within limit
Flicker Plt (95th pct)	IEEE 1453-2015 (LV compatibility levels, 95 %)	0.8	n/a	Not assessable
RMS events (sags, swells, interruptions)	IEEE 1159 Table 2; ITIC curve	Information	21 events, 0 outside ITIC	Information
Neutral-to-ground voltage	Information		avg 0.10 V, max 1.50 V	Information

Voltage

RMS voltage

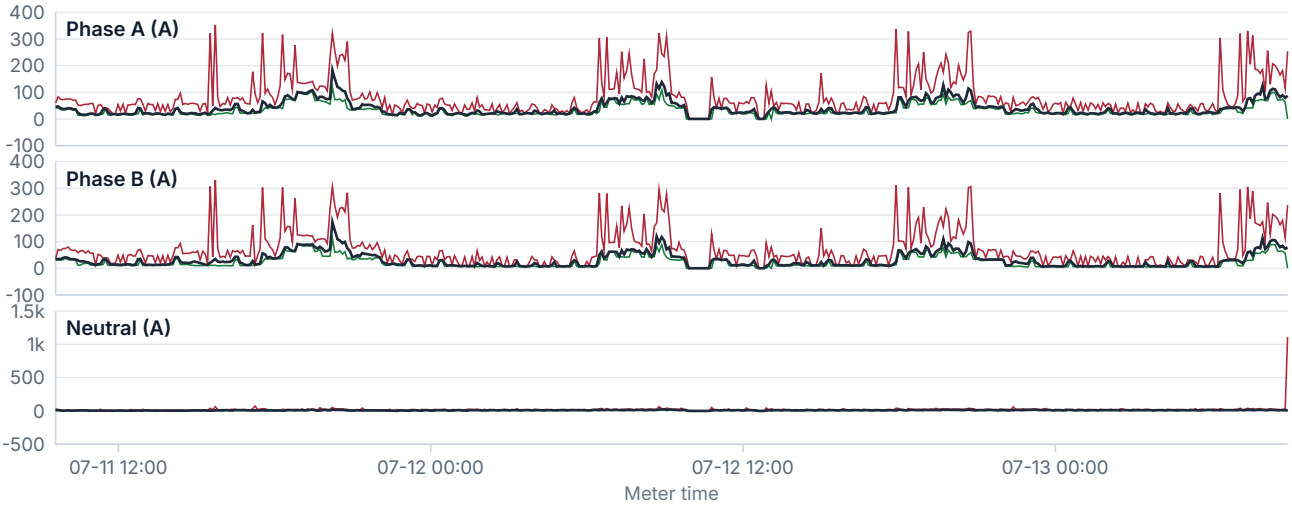
Shaded: ANSI C84.1 Range A (114 to 126 V). Range B is 110 to 127 V.

Red = maximum, black = average, green = minimum in each interval



RMS current

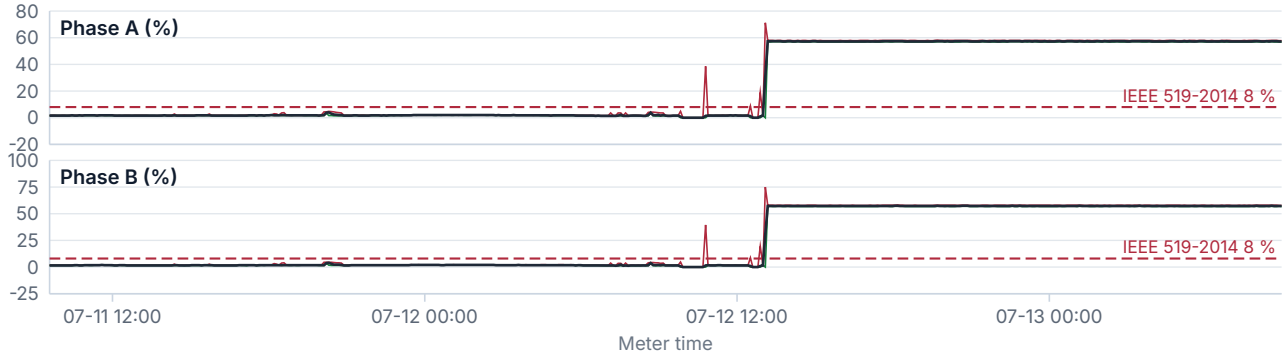
Red = maximum, black = average, green = minimum in each interval



Harmonics

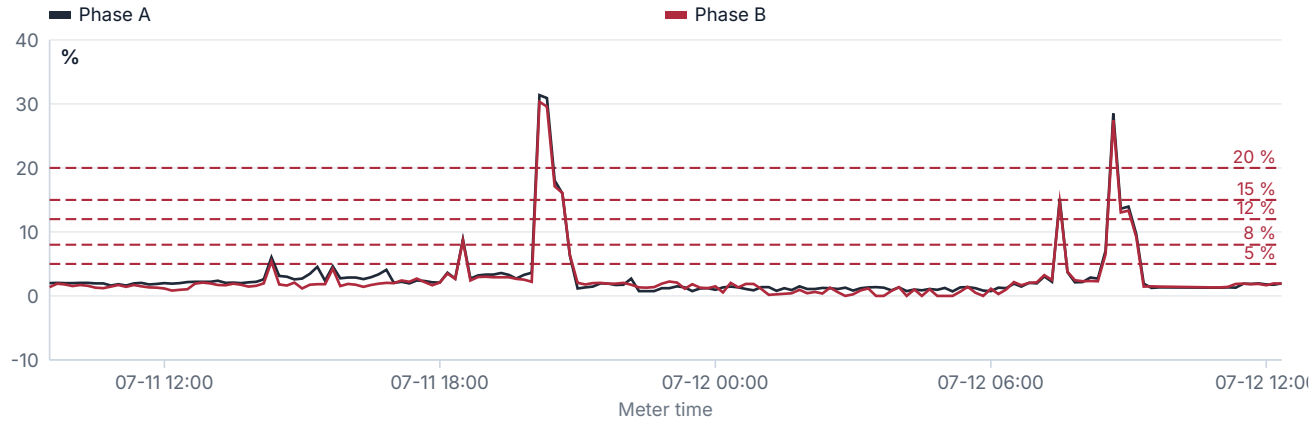
Voltage THD

Red = maximum, black = average, green = minimum in each interval



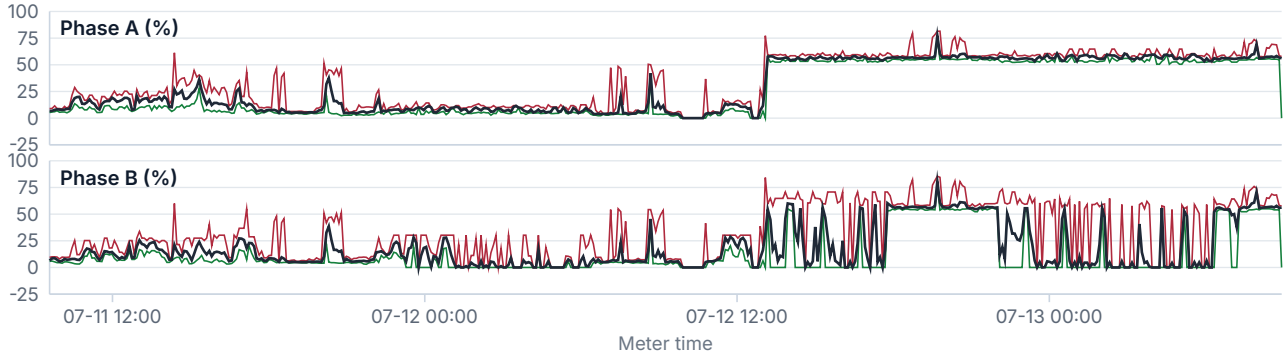
Current TDD (10-minute values, % of IL)

IL 152 A (from this recording). Dashed: the TDD limit of each ISC/IL row.



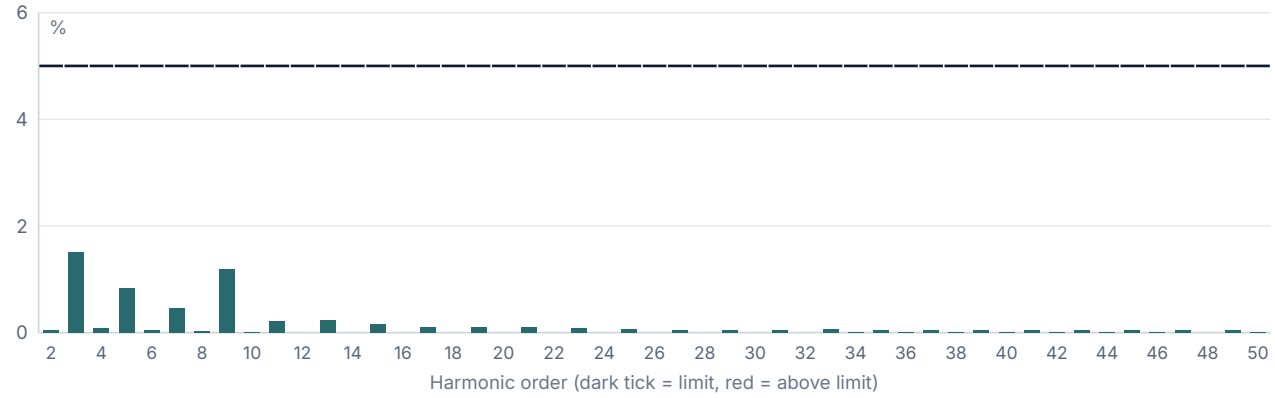
Current THD (% of the current at that moment, for comparison only)

Red = maximum, black = average, green = minimum in each interval



Voltage harmonics, 95th percentile of 10-minute values

Worst phase, % of fundamental. Tick: IEEE 519-2014 individual limit.



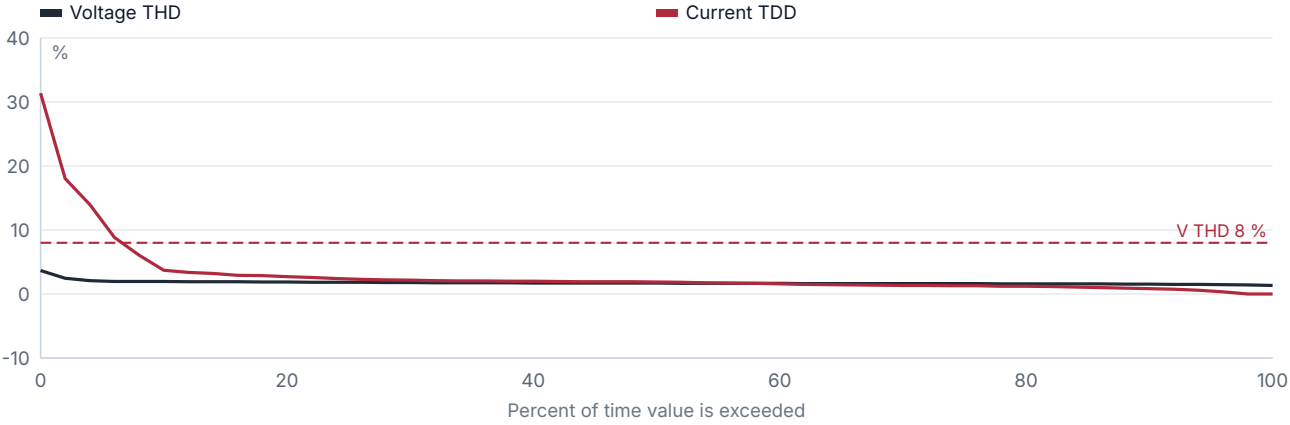
Current harmonics, 95th percentile of 10-minute values

Worst phase, % of IL. ISC/IL unknown, so no limit is drawn.



How often distortion exceeded each level

x: percent of 10-minute intervals above the value



Current distortion by short-circuit ratio

ISC/IL is unknown. Each row shows whether the measured TDD is within the limit for that row. Once the utility provides the available fault current, read the row for ISC divided by IL. IL is 152 A; the highest 15-minute demand in the recording was 152 A. Cells show measured / limit, % of IL.

IEEE 519-2014 Table 2

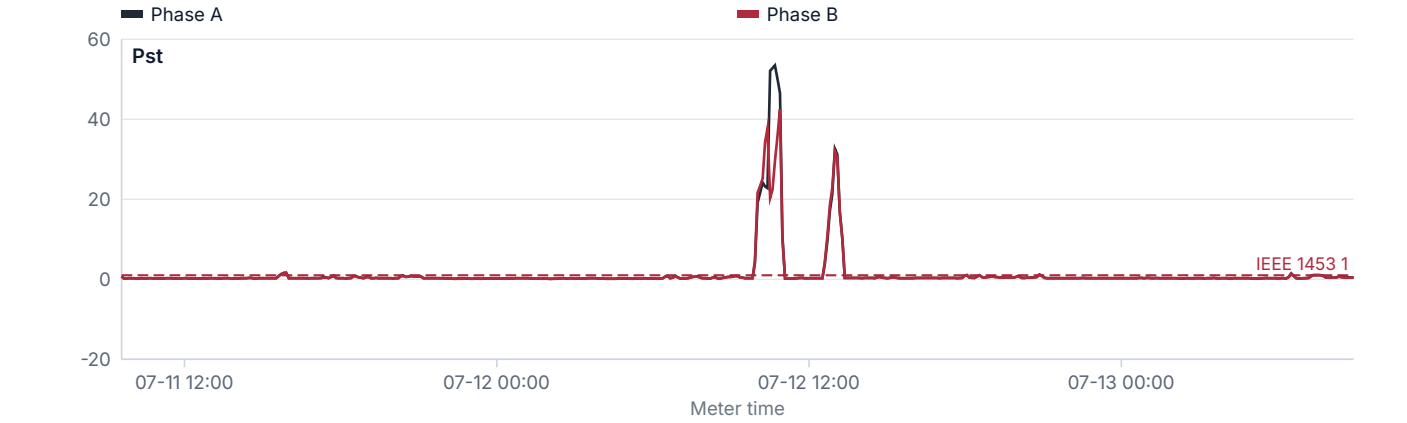
ISC/IL row	TDD limit	Weekly 95th pct, 10-min	Weekly 99th pct, 10-min	Daily 99th pct, 3-s	Result
Below 20	5 %	13.65 / 5.0	30.92 / 7.5	35.17 / 10.0	Exceeds
20 to 50	8 %	13.65 / 8.0	30.92 / 12.0	35.17 / 16.0	Exceeds
50 to 100	12 %	13.65 / 12.0	30.92 / 18.0	35.17 / 24.0	Exceeds
100 to 1000	15 %	13.65 / 15.0	30.92 / 22.5	35.17 / 30.0	Exceeds
Above 1000	20 %	13.65 / 20.0	30.92 / 30.0	35.17 / 40.0	Exceeds

IEEE 519-1992 Table 10.3 (limits for conditions over 1 hour; 1.5 times for short periods)

ISC/IL row	TDD limit	Highest 1-hour value	Highest 10-min value (short periods, 1.5x)	Result
Below 20	5 %	20.72 / 5.0	31.38 / 7.5	Exceeds
20 to 50	8 %	20.72 / 8.0	31.38 / 12.0	Exceeds
50 to 100	12 %	20.72 / 12.0	31.38 / 18.0	Exceeds
100 to 1000	15 %	20.72 / 15.0	31.38 / 22.5	Exceeds
Above 1000	20 %	20.72 / 20.0	31.38 / 30.0	Exceeds

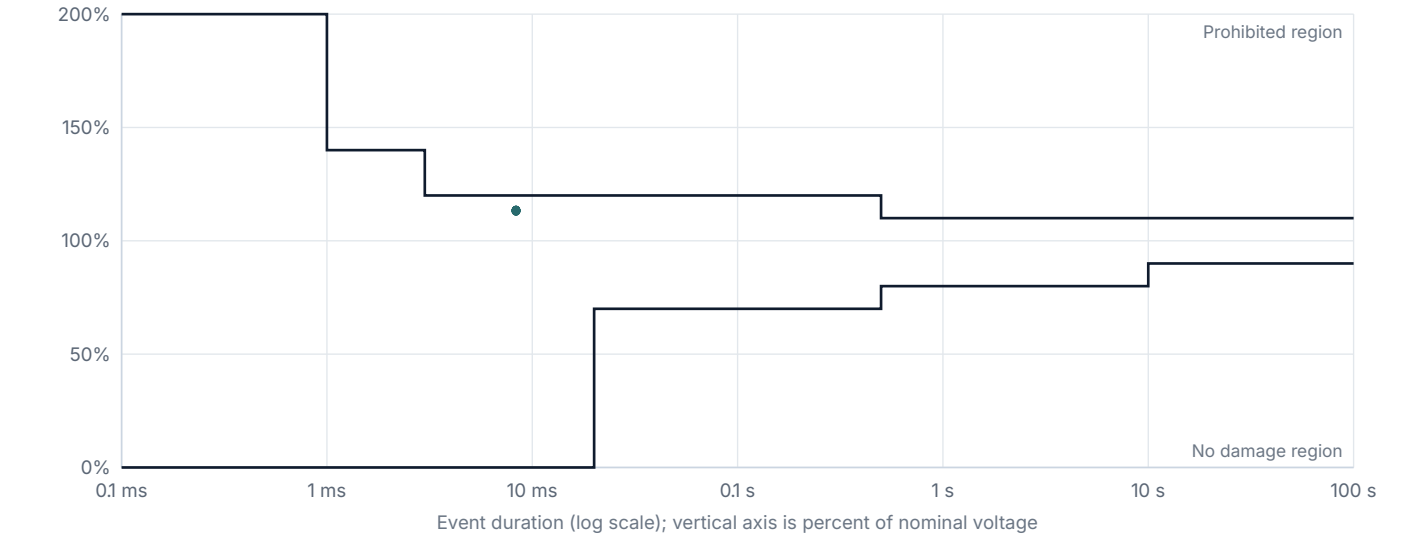
Flicker, events and power

Short-term flicker Pst



Events on the ITIC curve

0 of 18 plotted events fall outside the curve.



Most severe events (21 of 21)

Start (meter time)	IEEE 1159 category	Phases	Magnitude	Duration	ITIC
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside

Start (meter time)	IEEE 1159 category	Phases	Magnitude	Duration	ITIC
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	114 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	B	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-13 08:59	2.1.2 Instantaneous swell	A	113 %	8 ms	Inside
2023-07-12 09:52	3.1 Sustained interruption	AB	n/a	3337.0 s	
2023-07-12 12:34	3.1 Sustained interruption	AB	n/a	1268.0 s	
2023-07-12 13:07	2.3.1 Temporary interruption	AB	n/a	45.0 s	

Data notes for this measurement

ProVision Hookup type value 0 is not decoded; wiring 'split-phase' inferred from 2 live voltage channel(s) (ch1=A, ch2=B) and ch3=N (near-zero voltage, carries neutral current).

Outage records have Channel 0, taken to mean all live phases; residual voltage is not recorded.

ProVision stores meter-local clock times; they are read as UTC here, so absolute times are offset by the meter time zone.

Leading zero readings (meter start-up) are set to missing; zeros later in a trace (outages) are kept. A harmonic that reads zero from the start is kept as zero beyond the start-up length.

Pst is stripchart measure 11 (steps about every 10 min with min = avg = max); the code is inferred from the data, not named in the file.

Stripchart measure 13 (clipped at 655.35, likely instantaneous flicker level) and the EventRecord (Status 0/128), FlickerRecord (level-index counts, no Pst values), Waveform, Histogram, SignificantChange and Energy records are not mapped.

The recording is shorter than 7 days, so weekly percentiles cover only the 47.4 hours recorded.

The meter logged every 5 s, so its values stand in for the 3-second values IEEE 519-2014 uses.

19103 logging interval(s) held a sag, swell or interruption. The 108 ten-minute window(s) containing them are left out of the steady-state statistics, as IEC 61000-4-30 flagging does, and reported as events instead.

Voltage THD read above 25 % for 14302 interval(s) between 2023-07-12 13:08 and 2023-07-13 08:59 (meter time) while rms voltage was normal. That is not physically plausible on a utility supply and points to a meter setup or measurement problem, so all harmonic readings from that period (voltage and current) are left out of the harmonic results. Check how the meter was connected for that period.

This meter stores current harmonics in whole amps, which is too coarse to test the individual-order limits (as low as 1 % of IL), so those are not assessed. TDD uses the current THD computed by the meter.

341 event record(s) overlapped another record on the same phase (for example a dip and the interruption inside it) and were merged, so each disturbance is counted once.

18 of the recorded events fall in the first or last 2 minutes of the recording, when the meter is usually being connected or removed. They may be connection artifacts rather than supply events.

METHODS AND REFERENCES

Methods

Data: raw meter files are decoded by software, and every limit check is computed in code. An AI model is used in two places only: to transcribe a meter software PDF report when one is uploaded instead of the raw file, and to write the Interpretation section from the computed results, with every number in it checked against them. No AI model changes a computed value. Intervals holding a sag, swell or interruption are left out of the steady-state statistics, as IEC 61000-4-30 flagging does, and reported as events.

Voltage: 10-minute averages against ANSI C84.1 Range A and B, service ranges for a meter at the service, utilization ranges for a meter downstream.

Harmonics, IEEE 519-2014: 10-minute values (rms of the logged values) for the weekly 95th and 99th percentiles, 3-second values for the daily 99th percentile when the meter logged fast enough. Current distortion is TDD: harmonic current (orders 2 to 50) divided by IL.

Harmonics, IEEE 519-1992: the highest 1-hour value against the table limit, which applies to conditions lasting more than an hour, and the highest 10-minute value against 1.5 times it for short periods.

IL: as provided, else derived from the stated peak demand, else the highest 15-minute demand current in the recording. IEEE 519 defines IL as the average of the 12 monthly maximum demands.

Flicker: 95th percentile of 10-minute Pst and of Plt against IEEE 1453-2015 compatibility levels (low voltage) or planning levels (medium and high voltage).

Events: classified by IEEE 1159-2009 Table 2 and plotted on the ITIC curve.

Source checks: voltage steps that move opposite to current steps at the meter, and voltage THD that rises with the facility's current, point to the facility side. These are inferences from the data, stated as likely.

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