RealAppleIQ™

Apple-Shaped Impact & Handling Sensor

Instrument Use & Limitations Policy

Including Recommended Operating Procedure

! IMPORTANT — READ BEFORE USE

This document defines what this instrument is designed to withstand. Use outside these limits will cause permanent damage and will void all warranty and support obligations. Real Instruments Limited is the only party authorised to open, repair, or service this instrument.

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1. Purpose of This Document

The RealAppleIQ™ is a precision measurement instrument. Like the real apple it is designed to represent, it has physical limits. This document exists for one primary reason: to make those limits clear, in plain language, with real-world examples, so that any operator, manager, or decision-maker can immediately understand whether the instrument has been used correctly — without the need for an independent technical authority, expert witness, or specialist laboratory.

Where a warranty claim or dispute arises, this document — combined with the instrument's recorded data and run logs — provides a self-contained basis for resolution. The apple damage comparisons used throughout are intentional: they ground every limit in a physical outcome that anyone working in the apple industry can observe, recognise, and relate to.

This document forms part of the agreement between Real Instruments Limited and the Customer. It must be read, signed, and retained alongside the Sales Contract and EULA before the instrument is used.

2. Definitions

Term	Meaning
Instrument	The RealAppleIQ™ apple-shaped multi sensor instrument, including firmware and supplied accessories.
Operator	Any person authorised by the Customer to handle or use the Instrument.
Customer	The organisation or individual named in the Sales Contract.

Term	Meaning
Real Instruments Limited	The manufacturer, designer, and sole authorised repairer of the Instrument.
Design Limit	The maximum condition the Instrument is engineered to withstand without damage.
Warranty Void Event	Any use, exposure, or action that exceeds a Design Limit, as listed in Section 6.
Measurement Data	Impacts, forces, and timing data recorded during a measurement run.
RealUserIQ™	The companion software used to configure and run measurement sessions.
RealBruiseIQ™	The companion bruise susceptibility instrument whose data may be loaded into RealDataIQ™ to predict bruise severity.

3. What the Instrument Is Designed For

The RealAppleIQ™ is designed to travel through apple handling cool chains from picking, transport, packhouse lines, bin tippers, flumes, graders, and storage facilities — in the same way a real apple does. It is sized, weighted, and constructed to represent a commercial apple, and its sensors are calibrated to record the forces that cause mechanical damage in real fruit.

It is not designed to survive conditions that would destroy a real apple. This is a deliberate design principle, not a limitation. An instrument that could survive a 2-metre drop onto concrete would not accurately represent the vulnerability of the fruit it is measuring.

The clearest way to understand the instrument's limits is to ask: would a real apple survive this? In most cases, if the answer is no — the instrument will not survive it either, and use in those conditions is outside the scope of this document, the warranty, and all support obligations.

4. Battery & Power

The RealAppleIQ™ is powered by internal rechargeable lithium-ion cells. The battery system is sealed at manufacture and is not user-serviceable.

4.1 Battery Specification

Battery type	Rechargeable lithium-ion cells (internal, sealed).
Total capacity	1700 mAh (may change to be less)
Charging	Via supplied USB-C cable and charger. Charge fully before any extended session.
Design life	Approximately 5 years with correct care, retaining approximately 80% of original capacity at that point.
End-of-life indicator	Battery health is displayed in RealUserIQ™. When capacity drops below usable level contact Real Instruments limited.
Operating temperature	Charge and store within the instrument's rated temperature range. Do not charge in cold store or sub-zero environments.

4.2 Caring for the Battery

The 5-year design life is achievable with correct care. The main causes of premature battery degradation are storing the instrument flat for extended periods and exposing it to sustained heat.

- Selecting storage mode in RealUserIQ™ will automatically adjust the battery charge for optimal life when the unit will not be used for extended periods.
- Avoid storing the instrument fully discharged. A fully flat lithium cell suffers permanent capacity loss that cannot be recovered.
- Store at room temperature. Cool store temperatures (0–4 °C) during storage — as opposed to use — will gradually reduce battery performance over time.
- Check battery health in RealUserIQ™ as part of the monthly maintenance routine.

> ⚠ **Battery health affects measurement reliability.**
> A degraded battery may reduce the instrument's available run time, increasing the risk of the instrument losing power mid-session. A session that ends early due to flat battery produces incomplete data. Check charge before every session.

4.3 Battery Safety

The lithium cells inside the RealAppleIQ™ are sealed at manufacture and are not user-accessible.

- Do not attempt to open, puncture, short-circuit, or expose the instrument to conditions that could damage the battery cells.
- Do not expose the instrument to sustained heat above 40 °C or direct sunlight for extended periods. Excessive heat is the leading cause of lithium cell degradation.
- If the instrument shows signs of swelling, unusual heat, or leakage, do not use it. Contact Real Instruments Limited immediately.
- At end of life, dispose of the instrument through an approved electronic waste or battery recycling facility in accordance with local regulations. Do not place in general waste.

4.4 Warranty & Battery

The battery is covered by the standard one-year warranty against defects in materials and workmanship. Normal capacity reduction over the rated 5-year life is not a defect. If the battery fails to hold charge within the first year under normal use conditions, contact Real Instruments Limited.

5. Design Limits & Real Apple Damage Comparisons

Each limit below is expressed alongside a practical apple damage comparison. These comparisons are based on published post-harvest research and industry observations of bruise formation in commercial apple varieties under comparable conditions. They are included so that any operator can immediately assess whether a given situation is within the instrument's design parameters, without technical expertise.

Reference images for each comparison are available in the RealAppleIQ_Drop_Limit_Reference document, published separately by Real Instruments Limited, and on the company website.

5.1 Drop & Impact Limits

The RealAppleIQ™ has three defined drop levels, all measured against a rigid surface — concrete, steel plate, stone, or any surface with negligible give: within design parameters up to 200 mm, at the rated limit up to 400 mm, and a Warranty Void Event at greater than 400 mm.

All drop limits are defined against a rigid surface — concrete, steel plate, stone, or any surface with negligible give. Drops onto surfaces with significant give (soil, foam matting, grass) at the same height are less severe, but Real Instruments Limited makes no warranty commitment for drops onto undefined or variable surfaces regardless of height. Bruise diameter figures below are indicative and will be confirmed following controlled drop testing. If in doubt after any drop, run a health check in RealUserIQ™ before the next session.

Scenario	Effect on a real apple	Effect on the Instrument	Status
Up to 200 mm drop onto a rigid surface	Significant bruise likely in all varieties. Diameter TBC — to be confirmed following controlled drop testing.	Within design parameters.	**OK**
200 to 400 mm drop onto a rigid surface	Significant bruise and some structural damage expected in all varieties. Diameter TBC.	At the rated limit. Inspect and run health check before reuse.	**LIMIT**
Greater than 400 mm drop onto a rigid surface	Significant bruise and structural damage expected in all varieties. Diameter TBC.	Permanent internal sensor damage highly probable. Warranty void.	**VOID**

✕ CRITICAL

Warranty Void: Drop onto a Rigid Surface greater than 400 mm. A drop onto concrete, steel, stone, or equivalent from greater than 400 mm is a Warranty Void Event. A real apple dropped 400 mm onto concrete will possibly sustain severe damage — far beyond any commercially acceptable threshold. The instrument is not designed to survive conditions that would cause this level of damage to real fruit.

⚠ Recovery after any drop

If the instrument has been dropped, inspect it carefully before reuse. Run a RealUserIQ™ health check. If the health check fails or readings appear inconsistent, stop use immediately and contact Real Instruments Limited. Do not attempt to open or inspect the instrument internally — see Section 8.

5.2 Crush Force Limits

On a packing line, apples experience compression forces from rollers, brushes, and contact with other fruit. In bin handling apples experience crush forces at the bottom of the bin. The RealAppleIQ™ is designed to withstand crush forces representative of normal line handling. It is not designed to be placed under static loads such as the weight of a full fruit bin.

Scenario	Effect on a real apple	Effect on the Instrument	Status
Roller or brush contact at normal line speed	Normal handling — no bruise if within susceptibility threshold for the variety.	Within design parameters.	**OK**
Compression from adjacent fruit at the bottom of an apple bin	Medium surface pressure, can produce out-of-grade bruise.	Within design parameters.	**OK**
Static load: placed under a partly filled bin	Severe compression bruise, deformation. These forces would crush an apple.	Risk of permanent deformation and sensor damage. Warranty void.	**VOID**
Static load: full fruit bin placed on top	Fruit would be crushed flat. Total commercial loss.	Instrument will be permanently destroyed. Warranty void.	**VOID**

✕ CRITICAL

Warranty Void: Excess Static Load. The instrument must never be placed beneath a loaded fruit bin, on a conveyor where it may become trapped under weight, or in any position where sustained crush force beyond normal line contact may occur. A real apple placed under a half-filled 300 kg bin would sustain catastrophic structural damage — the instrument will suffer equivalent permanent damage.

5.3 Water & Liquid Immersion

The RealAppleIQ™ is designed for use in standard wet packhouse environments, including water flumes used in apple flotation and grading. It is rated for submersion in clean fresh water to a depth of 1 metre for a maximum duration of 10 minutes.

Scenario	Effect on a real apple	Effect on the Instrument	Status
Standard flume — fresh water, normal depth, normal transit time	Normal handling. No bruise from water contact.	Within design parameters.	**OK**

Scenario	Effect on a real apple	Effect on the Instrument	Status
Immersion to 1 m depth for up to 10 minutes in fresh water	Apple floats normally. No damage.	At rated limit. Inspect after extended use.	LIMIT
Spray apple washers	Spray pressures below levels that damage apple skin.	At rated limit. Inspect after extended use.	LIMIT
Immersion deeper than 1 m or longer than 10 minutes	Apple is unaffected — fruit is not pressure-sensitive to water depth. The instrument is.	Seal failure risk. Water ingress will cause permanent damage. Warranty void.	VOID
Immersion in chlorinated wash water (above food-grade concentration)	Apple skin may absorb chemicals but is not physically damaged.	Chemical damage to seals and internal components. Warranty void.	VOID
Immersion in acidic solution (pH below 5.0)	Apple skin will begin to break down with prolonged exposure.	Seal and component corrosion. Permanent damage. Warranty void.	VOID
Immersion in alkaline solution (pH above 9.0)	Apple skin discolouration and softening with prolonged exposure.	Seal and component corrosion. Permanent damage. Warranty void.	VOID
High-pressure apple washers	Spray pressures high enough to damage apple skin.	Seal failure under pressure. Water ingress likely. Warranty void.	VOID

✕ CRITICAL

Warranty Void: Incorrect Liquid Exposure. The instrument is only rated for clean fresh water within the stated depth and time limits. Immersion in any cleaning chemical, sanitiser, acidic solution, caustic solution, or water outside the food-grade pH range (5.0–9.0) will cause permanent damage and void all warranty. If you are unsure of the water chemistry in your system, test it before placing the instrument in the flume.

5.4 Vacuum Exposure

Some apple bin-filling systems use wet vacuum technology to draw fruit and water into bins. The RealAppleIQ™ sensor is rated for use in water-filled handling systems operating at up to 500 mm water head (approximately 5 kPa / 0.05 bar). This covers the full range of commercially available submersion bin fillers operating under normal conditions. It is not rated for use in systems applying vacuum or pressure beyond this level. Vacuum pressures beyond this rated limit will compromise the instrument's seals.

Scenario	Effect on a real apple	Effect on the Instrument	Status
Normal wet vacuum bin filler within rated tolerance	Apple handled normally. No damage from vacuum itself.	Within design parameters if within rated vacuum limit.	OK
Pneumatic vacuum pick-and-place system	Restricted to vacuum levels that do not mark or damage apples.	Within design parameters if within rated vacuum limit.	OK
High-draw industrial vacuum beyond rated tolerance	Apple would experience surface deformation and possible bruising under extreme vacuum.	Seal failure. Water ingress. Permanent internal damage. Warranty void.	VOID

> ⚠ **Vacuum Systems: Consult Before Use**
>
> If your facility uses a vacuum-assisted bin-filling or handling system, contact Real Instruments Limited before using the RealAppleIQ™ in that system. We will confirm whether the system is within the instrument's rated vacuum tolerance of 500 mm water head. Do not assume compatibility.

6. Summary: Warranty Void Events

The following table summarises all conditions that constitute a Warranty Void Event. If any of these have occurred, the instrument must be returned to Real Instruments Limited for assessment before reuse. Do not attempt to repair or open the instrument.

Void Event	Apple Damage Equivalent
Drop onto a rigid surface at greater than 400 mm	*Severe bruise guaranteed. High risk of skin break. Diameter TBC following drop testing.*
Static load from full fruit bin or equivalent	*Total crush bruising across contact surface. Commercial total loss.*
Water submersion beyond 1 m depth or 10 minutes	*No apple equivalent — fruit is unaffected. Instrument seals are not.*
Immersion in any liquid other than fresh water	*Chemical burn to apple skin with caustic or acidic solutions.*
Liquid pH below 5.0 or above 9.0	*Skin breakdown, softening, and chemical bruising in real fruit.*
High-pressure water spray on any surface	*Surface impact bruising from high-pressure contact.*
Vacuum beyond rated tolerance (500 mm water head)	*Surface deformation and bruising under extreme vacuum.*
Battery depleted — instrument stored or used with flat battery	*No apple equivalent. Silent loss of measurement capability and accelerated cell degradation.*
Opening, disassembling, or modifying the instrument	*Equivalent to cutting open the apple — cannot be reversed.*
Repair attempted by any party other than Real Instruments Limited	*Equivalent to attempting to 'unbruise' a fruit — not possible.*

7. Permitted Uses

The RealAppleIQ™ is designed and warranted for use in the following contexts:

- Measuring impact forces in orchard, apple packhouse handling systems, including bin tippers, conveyors, graders, sizers, and cool store filling operations.
- Water flume and flotation systems using clean fresh water within the rated depth and time limits.
- Vacuum-assisted wet bin-filling systems within the rated vacuum tolerance — confirm with Real Instruments Limited before first use.
- Measurement review using RealDataIQ™ with RealBruiseIQ™ susceptibility data loaded for predictive bruise analysis.
- Sessions with synchronised video recording via RealUserIQ™ software.
- Commercial quality assessments, export audits, operator training, and dispute resolution, provided the operating procedure in Section 10 is followed.

8. Instrument Integrity: No Unauthorised Opening or Repair

The RealAppleIQ™ is manufactured as a sealed precision unit. Its calibration, sensor alignment, and waterproofing are dependent on the integrity of that sealed construction.

✕ CRITICAL

CRITICAL: Real Instruments Limited is the only party authorised to open, disassemble, rework, or repair this instrument. Opening the instrument by any other party — for any reason, including inspection after damage — will immediately and permanently void all warranty and support obligations. This applies regardless of whether the opening causes further damage. The sealed construction cannot be restored to original specification by any other party. If you believe the instrument has been damaged, contact Real Instruments Limited immediately. Do not open it.

This requirement exists because:

- The instrument's waterproofing relies on factory-sealed joints and components that cannot be resealed to original specification in the field.
- Internal sensor calibration is set at manufacture and cannot be independently verified or reset without factory equipment.
- Any evidence of unauthorised opening — including tool marks, broken seals, or disturbed internal components — will be noted in any warranty assessment and will result in immediate rejection of the claim.

9. Warranty

A one-year warranty applies to the RealAppleIQ™ from the date of purchase, covering defects in materials and workmanship under normal use conditions as defined in this document. Full warranty terms are set out in the Sales Contract.

- The warranty does not cover damage resulting from any of the Warranty Void Events listed in Section 6.
- The warranty covers the battery against manufacturing defects for one year. Normal capacity reduction over the rated 5-year life is not a defect.
- The warranty does not cover damage caused by opening or attempting to repair the instrument (see Section 8).
- To make a warranty claim, follow the process in Section 11.

This section provides a brief summary for reference. The Sales Contract contains the full warranty terms and governs in the event of any inconsistency.

10. Recommended Operating Procedure

Following this procedure ensures that the instrument is used correctly, that results are accurate and repeatable, and that the instrument's warranty remains valid.

10.1 Before Each Session

- Visually inspect the instrument for cracks, deformation, or damage. If any is found, do not use — contact Real Instruments Limited.
- Confirm battery charge in RealUserIQ™. Charge fully before extended sessions.
- Run the health check in RealUserIQ™. If the health check fails, do not use the instrument.
- Confirm firmware version is current.
- Record session metadata: operator, date, location, variety, size grade, maturity estimate, and water chemistry if applicable, in the description dialogue box.
- Confirm water chemistry is within the permitted range (pH 5.0–9.0, clean fresh water only) if the instrument will be used in a flume.

10.2 During the Session

- Start the session in RealUserIQ™ and confirm the instrument is recording before placing it in the handling system.
- Place the instrument at the intended start point of the system. Use a three-finger fruit retrieval tool or similar if placing the instrument into or retrieving it from machinery — do not reach into moving equipment.
- Allow the instrument to travel through the full section of the system being measured.
- Retrieve the instrument at the designated exit point.

- End the session in RealUserIQ™ immediately after retrieval.
- Inspect the instrument for damage before any repeat run.

10.3 After Each Session

- Rinse the instrument with clean fresh water if it has been in a wet environment.
- Dry with a soft cloth. Do not use high-pressure air or heat.
- Charge the instrument if battery level is below 50%.
- Store in the protective case provided.

11. Dispute Resolution & Warranty Claims

This document is designed so that the facts of any warranty dispute can be established clearly, quickly, and without the need for an independent technical expert or specialist laboratory. The following process applies:

- The Customer submits the instrument and a completed Session Log to Real Instruments Limited, noting the circumstances of the claimed fault.
- The customer sends the unit in its protective case by tracked courier back to Real Instruments Limited.
- Real Instruments Limited will inspect the instrument and compare the reported use conditions against the Design Limits in Section 5.
- Where the reported or evident conditions match a Warranty Void Event in Section 6, the warranty claim will be declined and a written explanation provided, referencing the specific limit and the corresponding apple damage comparison.
- Where the fault appears to have occurred within normal use parameters, Real Instruments Limited will repair or replace the instrument in accordance with the warranty terms in the Sales Contract.
- Where the cause is unclear, Real Instruments Limited may request additional information including RealUserIQ™ session data, water chemistry records, and operator sign-off records from this document.

Session data recorded by RealUserIQ™ includes timestamps, impact force records, and operational parameters. This data may be used by Real Instruments Limited as part of any warranty assessment. Operators are encouraged to maintain complete session logs for all formal measurement runs.

12. Reference Standards

Results produced under this operating procedure are referenced against:

- Primary benchmark: Direct bruise formation in real apple fruit (same variety, size, and maturity as the fruit being handled), assessed against published reference images. Results can be replicated by any competent operator without specialist equipment.
- UNECE Standard FFV-50: Fresh apples and pears — bruise tolerance and defect classification by grade.
- EU Regulation (EU) No 543/2011 (as applicable): Marketing standards for fruit, bruise-related defect thresholds.
- OECD Guidance on Objective Tests: Measurement of firmness and bruise susceptibility.
- ISO 7558: Produce handling — general principles.

13. Maintenance Schedule

Frequency	Task	Responsibility
Before each session	Visual inspection, health check, battery charge check.	Operator
After each session	Rinse with clean fresh water if used in wet environment. Dry with soft cloth. Charge if battery below 50%.	Operator
Monthly	Full inspection, case condition, health check in RealUserIQ™.	Operator

Frequency	Task	Responsibility
Annually recommended	Factory calibration and service check.	Operator / Real Instruments Limited
After any drop or impact event	Run health check before reusing. Return to Real Instruments Limited if health check fails.	Operator / Real Instruments Limited
After any suspect liquid exposure	Return to Real Instruments Limited for seal assessment before reuse.	Real Instruments Limited
Battery end of life (approx. 5 years or below usable)	Contact Real Instruments Limited for instrument replacement.	Real Instruments Limited

14. Operator Acknowledgement & Sign-Off

By signing below, the Operator confirms that they have read and understood this document in full, understand the instrument's design limits and the consequences of exceeding them, and agree to use the RealAppleIQ™ only within the conditions described.

A signed copy of this form must be returned to Real Instruments Limited or the authorised distributor before the instrument is used in any commercial or formal measurement context. The Customer must retain a copy for a minimum of five years.

Operator Full Name:	
Organisation / Company:	
Role / Position:	
Instrument Serial Number:	
Date of Sign-Off:	
Training Completion Date:	
Operator Signature:	
Supervisor / Witness Name:	
Supervisor / Witness Signature:	

Real Instruments Limited — www.realinstruments.com — For warranty and support enquiries contact your authorised distributor or Real Instruments Limited directly.