

UKZ CORE SPECIFICATION v1.0

Deterministic Integer-Based Time System for Distributed and Autonomous Systems

1. Purpose

UKZ defines a monotonic, integer-based time representation optimized for deterministic systems, sensor fusion, and distributed architectures. It is not intended as a human-facing calendar or civil time system.

2. Time Definition

Time is represented as an integer value $T_{ukz} \in \mathbb{Z}$. Each increment corresponds to a fixed tick duration Δt (e.g., 1 ms).

3. Mapping to Physical Time

$T_{ukz} = \text{floor}((t_{\text{real}} - t_0) / \Delta t)$, where t_{real} is physical time (e.g., UTC/TAI) and t_0 is a fixed epoch.

4. Core Properties

Monotonic (strictly increasing). Deterministic (no leap seconds or discontinuities). Integer-based (no floating point errors).

5. Bit Representation

Recommended: 64-bit integer. Supports millisecond resolution for ~584 million years. 32-bit and 48-bit variants possible for constrained systems.

6. Synchronization

UKZ relies on external synchronization sources (e.g., NTP, PTP, or space communication systems). Drift is corrected via offset adjustment without time discontinuities.

7. System Usage

All events are timestamped as (data, T_{ukz}). Time differences are computed using integer subtraction, ensuring exact Δt calculation.

8. Autonomous Systems Integration

UKZ provides a unified time index for sensor fusion and state estimation. State updates use Δt derived directly from UKZ ticks, eliminating interpolation errors.

9. Limitations

UKZ is not designed for human-readable time, calendars, or time zones. It is a technical system for computation and synchronization.

10. Conclusion

UKZ establishes a deterministic, globally consistent time base suitable for embedded systems, cloud infrastructure, and autonomous platforms.