

How the Digital Calibration Certificate (DCC) Will Transform Custody Transfer

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1 INTRODUCTION

Just as the MP3 format revolutionized digital music distribution, the Digital Calibration Certificate (DCC) is set to transform metrology, especially in custody transfer, where accuracy and trust are critical.

Custody transfer requires precise measurement of physical quantities in highly regulated environments. However, a widening gap between digitalized process industries and the slower-moving calibration sector is leading to inefficiencies, productivity loss, and quality issues. The DCC addresses this by enabling calibration results to be stored and shared electronically in a standardized, consistent, authenticated, and encrypted format. It's the breakthrough the custody transfer field has been waiting for.

2 FROM ANALOG TO DIGITAL: BIRTH OF THE DCC

The initiative to develop the DCC gained momentum after the 2020 DCC conference, which led to the formation of working groups focused on establishing a universal exchange format for the metrology sector. This marked a significant shift away from analog, paper-based certificates.

Despite the high volume of calibrations in industries such as pharmaceuticals, energy, and manufacturing, initial engagement from industry players was limited. To bridge this gap, Germany's national metrology institute – Physikalisch-Technische Bundesanstalt (PTB) – invited Beamex, a global leader in calibration solutions, to contribute to the development of the DCC.

To ensure the DCC meets real-world needs, Beamex brought over 50 years of practical insight into the discussion, especially in high-stakes industries like nuclear energy, where caution and paper-based processes still dominate.

2.1 Addressing Industry Concerns

Thanks to technologies such as TLS 1.3 encryption and PKI-based digital signatures, secure digital document exchange is now as safe as, or even safer than, traditional paper-based methods. However, valid concerns remain, particularly around data ownership, access, and system integration. Common questions include:

- Should external parties be allowed to send digital documents directly into our systems?
- How are those documents authenticated?
- Who owns the calibration record?
- Where is it stored, and how can it be accessed or trusted?

These concerns are valid, but they shouldn't prevent progress. The pharmaceutical industry, with its rigorous regulatory requirements, provides a compelling example. Many companies have already adopted internal digital systems that enable employees to perform calibrations, track KPIs, and ensure compliance – all digitally.

Previously, custody transfer trust relied on on-site audits, signed paper certificates, and manual reconciliation. Today, that trust can be built digitally through the DCC. After a calibration is completed, the laboratory generates a DCC file using XML (Extensible Markup

Language), a globally accepted format. This file is delivered to the customer and can be used immediately across systems.

2.2 How The DCC Builds Trust

A DCC goes far beyond a simple digital PDF – it's a secure, tamper-evident document that can be verified for authenticity and integrity. Unlike paper certificates, which can be lost or altered, DCCs provide built-in traceability, eliminating the need for manual approvals. This transforms calibration workflows far beyond just flow measurement.

Because DCCs are machine-readable, they enable direct communication between calibration instruments and enterprise systems. This removes the need for manual data entry, unlocking capabilities such as powerful analytics, digital twin development, and real-time quality monitoring.

The benefits are wide-reaching:

- Greater efficiency
- Improved safety
- Reduced costs
- New business opportunities

Yet a key challenge remains: many vendors still issue paper certificates. This creates information silos, leading to duplicate data handling. The DCC solves this by enabling direct digital delivery from vendor to customer systems, reducing errors, streamlining operations, and supporting a unified calibration data strategy.

Blockchain can further enhance trust. While the certificate itself isn't stored on the blockchain, metadata such as issuer, timestamp, and storage location can be. This creates a tamper-evident audit trail, preserving trust and traceability even if a document is lost or destroyed.

2.3 The Road Ahead With The DCC

As digital data exchange between organizations becomes more common, market-driven structures will emerge to support the DCC standard. Beamex is already preparing for this shift by integrating DCC capabilities into its industrial offerings. The first commercially available solution is expected to be available by the end of 2025.

While organizations can develop DCC capabilities in-house, doing so requires significant investment and ongoing maintenance. Beamex provides a ready-to-integrate solution that accelerates adoption and reduces complexity.

If your lab systems already generate digital calibration data, you can begin converting to DCC today. Comprehensive documentation is available; however, remember that your customers also need systems that can read and interpret the DCC format, just as a digital music file requires a compatible player.

Paper-based calibration is becoming obsolete. The shift to digital has already begun, and with DCC, your organization can lead the way.