



Giesecke+Devrient  
Creating Confidence

# Expanding Possibilities.

Advanced Currency Management



[www.gi-de.com](http://www.gi-de.com)



# Securing values in a connected world.

In a world that is becoming faster and more complex every day, a trusted partner is the key for a secure future.

This is why G+D is engineering trust to secure the essential values of the world. With passion and precision, we create customized security technologies and solutions for reliable protection of highly critical sectors in four major playing fields:



- Secure **payment** transactions in physical, electronic and digital form
- **Connectivity** solutions for mobile devices and the Internet of Things
- **Identities** and authentication of persons and objects
- **Digital infrastructures**, systems, networks and confidential data

## Ahead of time since 1852.

With over 160 years of experience in establishing trust, we are well positioned to support you on the way into the future. Together with you, we create new and visionary possibilities in the field of payment.

For us, trust does not mean relying on the well-established, but developing new, innovative solutions that enable a wide and future-proof range of services and solutions.

## Engineering trust in public currency.

We rethink solutions together with our customers and put them into practice with the right and proven products at the highest engineering level.

From designing, printing and processing state-of-the-art banknotes to G+D Filia®, our solution for central bank digital currency (CBDC) – when it comes to public currency, Advanced Currency Management delivers physical and digital customer-oriented end-to-end solutions.

And that is how we create confidence in the entire currency cycle.

»Cash is a vital part of modern life.«

# Shaping the future of currency.

The payments landscape today is diversifying from cash and cards to digital payments. Trusted currency today is cash – and soon CBDC.

While the latter two are commercial offerings, cash and the still new concept of a digital central bank currency are public goods that are accessible to everyone and must meet special requirements.

And just as the new digital solution is gaining in importance every day, cash has lost none of its significance: on average, 80% of all payment transactions worldwide are made in cash, and there are currently around 620 billion banknotes in circulation globally. For years to come, cash will remain the world's number one means of payment.

## Cash is the secure basis for consumer payments.

The stability of a currency is based on trust, and billions of people place their confidence in the value and authenticity of their banknotes. With our unique skills, we create innovative and secure foundations for cash transactions – from counterfeit-proof security features to the highly efficient processing of banknotes, all the way to reliable banknote destruction.

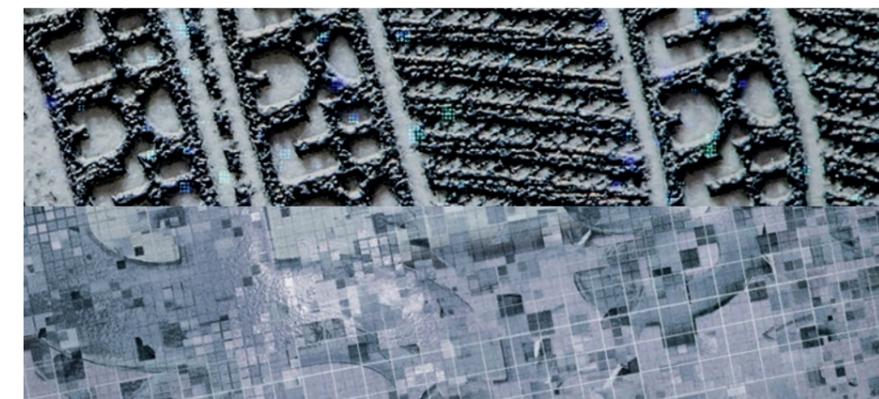
Mastering a world that is changing at an ever-increasing pace is a question of new ideas – and of technologies you can trust. It means turning large-scale transfor-

mations, such as digitalization, IOT, Big Data and intelligent automation, into real long-term prosperity and growth.

## Turning challenges into opportunities.

As a technology leader in the industry, we embrace change – finding new ways to progress in currency creation and management, and expanding the possibilities for all players in the cash cycle. To do this, we use our know-how to support initiatives for regulated payment instruments and means that aim to provide a safe, convenient, cost-efficient and secure user experience.

Our expertise and experience make us a trustworthy partner for all players in the currency cycle, from central banks and printworks worldwide to commercial banks, CiTs and casinos. Our Advanced Currency Management solutions are customizable, adaptive, flexible and ready for the challenges of the digital age.



# Thinking further than from end to end.

With Advanced Currency Management, we offer a portfolio of innovative solutions and services along the entire currency cycle that are seamlessly integrated and already take other areas into account.

This makes working across the divisions of the currency cycle easier and more efficient for all stakeholders. From the design, production and processing of banknotes to new opportunities and solutions such as CBDC – we not only keep our eye on the big picture, we also look beyond it.

Whether it's for a central or commercial bank, casino or cash service provider, we develop adaptable solutions for all players in the currency cycle. To our partners, Advanced Currency Management means complete peace of mind.



»With us, the currency industry has a trusted partner.«



# Expanding possibilities with Advanced Currency Management.

Discover holistic and customized solutions for every player in the currency cycle.

With Advanced Currency Management, we offer end-to-end solutions for the entire currency cycle. Our solutions are interlinked and constantly refined, making much more possible for every player in the currency cycle: from more efficiency, flexibility and adaptability, to more sustainability and security. Discover how our solutions portfolio can expand your possibilities.





# Harmonizing tradition and future in the smallest space.

Across an area of just 1,100 km<sup>2</sup>, more than seven million people make Hong Kong a place where its tradition and future come together. This is what the new Hong Kong dollar uniquely reflects, showing the modern building of Standard Chartered Bank on the front, while presenting artists from the historic Chinese opera on the back.

## Handcraft meets high-tech.

It was a challenge to balance the banknote's timeless design with its state-of-the-art security features. The security features had to be eye-catching and at the same time an integrated part of the design. After all, a banknote is a national calling card – a small work of art that reflects the identity and culture of a country. The project was unconventional, as each of the three issuing banks has

its own banknote design. However, the security elements are identical for all of them. For example, the most advanced security feature, the Galaxy<sup>®</sup> security thread, displays a stylized musical instrument from the traditional Chinese opera, while the sophisticated watermark shows the Bauhinia orchid, the national flower of Hong Kong.

»Every banknote tells a story. We're ready to write yours.«



## The beauty of security.

The attractive and eye-catching Galaxy<sup>®</sup> effect enhances the security of the product in the cash cycle, while its magnetic functionality adds another strong barrier against counterfeiting. It is synchronized with a printed Spark<sup>®</sup> feature in color change and movement.

But it's not just people in shops and streets who love their new money – it also inspired experts who awarded it "Best New Series" in 2018. Design excellence from concept to launch ensures that we bring a visually dynamic design together with superior production capabilities to craft a product that can be easily identified both by people and machines.

Find out more



# Adding beauty to security.

The Galaxy® security thread is a quantum leap in visual dynamics: The combination of color shift with 3D and vibrant movement effects makes it an exceptionally attractive solution, perfect for easy and intuitive authentication. The large motifs attract attention from any viewing angle – so there's always maximum security from every point of view.

Galaxy® offers full 360° authentication. The three optically variable effects combined in this thread – 3D motifs, dynamic effects and color shift – are visible from any angle. This is made possible by the millions of micro-mirrors arranged at nanoscale dimensions, bringing the banknote to life. This complexity prevents counterfeiters from imitating the optical effects.

## A dimension of security and design.

Galaxy® enables individual designs which are not only visually appealing but also highly secure.



» The next big thing in security: millions of micro-mirrors on one square centimeter.«

We further reinforce barriers against counterfeiters through the use of eye-catching effects such as RollingStar® security threads. These combine micro-mirror technology with multiple metallic thin film layers at the nanoscale. This technology creates a dynamic color shift when the banknote is tilted, while our varifeye® ColourChange windowed foil solution causes a motif to be displayed as brilliant blue in transmitted light and premium gold in direct light. In each case, micro-mirrors and thin film technology together ensure one-of-a-kind anti-counterfeiting security.

How can we make your currency more secure? We are looking forward to developing the optimum solution with you.



Latest security feature technology, from advanced to highly advanced:

- Cylinder mould watermarks
- Security features
- Security foils and patches
- Secure windows
- Machine-readable security features
- High-security printing

Find out more



# Quality is measured by the challenge.

The life of a banknote is tough: It has to cope with a wide variety of climatic conditions such as heat, cold or humidity; it goes from hand to hand, from wallet to wallet, and sometimes finds itself accidentally in a washing machine. And it must be quickly and easily verifiable. The production of banknotes that meet these challenges as well as the individual needs of the respective country requires close cooperation between all the crafts – from the design of the banknote and security elements to the production of the substrate and printing.

Because every country has different requirements for its banknotes, we find unique features and solutions for each of our customers. One example is the secure window in the 50 rial note from Oman, which gives the note immediate visual appeal while also enabling unambiguous authentication.

The 50 rial note combines sophisticated design with a state-of-the-art security feature: the varifeye® ColourChange Patch, which is a transparent window with a striking gold-to-blue color change, for instant verification on the front and the back.



**Solutions from standard to customized, including yours.**

»Is 160,000,000,000 printed banknotes enough proof?«

For our customer countries' wealth and safety we pushed the limits of cooperation between design and paper, as well as foil and print production. Our next game changer in wear and tear application is Hybrid ADDvance® – a cotton-core composite, protected by an extremely thin anti-soiling foil on both sides. This composite gives that familiar cotton-like touch people love to trust.

**Outstanding quality for everyday payments.**

We have been printing banknotes for more than 160 years, and our expertise is reflected in each and every note. We look forward to developing the best solution for your country's currency, too, no matter what the challenges may be.



**Banknote production – everything you need:**

- Banknote design
- Security features
- Substrates
- Banknote printing
- Banknote finishing
- Consumables
- Paper, foil and printing plants

Find out more





» Sustainability from cotton to crush.«

# Let's make every banknote greener!

There are currently around 620 billion banknotes in circulation worldwide, and some 170 billion are reprinted every year to replace worn ones and to meet growth demands. That's a huge pile of money. Producing, transporting, managing and finally destroying it takes a great deal of energy and resources. As a paper and foil location, Louisenthal's energy and water consumption is particularly high. For this reason, the issue of sustainability is very important to us. We want our assessment to be realistic, and that's why we optimize lifetime maximizing durability with our LongLife™ and Hybrid ADDvance® technology.

What's more, we are also pioneers in terms of the production line: Our new packaging system Ready2Press™ removes all plastic and saves effort because reams no longer have to be unwrapped before being fed into the printing press. We question every step: Which measures are working well already? And where do we want to improve?



## Louisenthal – sustainable since 1880.

When it comes to controlling water pollution, we follow some of the strictest rules in the world. These are challenges that we are glad to accept – and in fact we often go beyond what is required by law. We invest large sums in minimizing our impact. Over the last decade and a half we have already spent EUR 15 million on sustainability projects and fully intend to continue on this course.

-  **40%** less water used than in 2010
-  **24%** homemade electricity
-  **1.5 GWh** saved each year thanks to our cooling system

No one would dream of setting up a water-intensive industry in the middle of a drinking water catchment area. However, there has been a paper factory in Louisenthal, near Munich, since 1880, dealing with sustainability matters long before they became top of the agenda. We like to be ahead of the curve, so we acquired the entire Louisenthal paper mill in 1964 and included environmental protection and sustainability in all of our processes. This was long before we were subject to strict European regulations and German energy policies.

→ **What we achieved in 2019:**

- Louisenthal plant**
  - 122.2 tons of CO<sub>2</sub> emissions per EUR million revenue (scope 1 and scope 2)\*
  - 40.0% own water recycling and reused capability
- Königstein plant**
  - 270.7 tons of CO<sub>2</sub> emissions per EUR million revenue (scope 1 and scope 2)
  - 57.6% own water recycling and reused capability

\*Emission categories according to the Greenhouse Gas Protocol

Find out more



## What would banknotes be without numbers?

When it comes to cash, the rule for numbers is actually quite straightforward: the higher, the better. But if you take a closer look, you will find quite different numbers, where even the smallest ones are interesting.



are cut down to make our banknotes.

# 1,000

## YEARS OF BANKNOTES

The first paper money was issued in 1024 in China.

# 20,000

## TONS OF BANKNOTE SUBSTRATE

are produced by G+D every year.

# 1-4,000,000

## MICRO-MIRRORS

per square centimeter are responsible for the effects in our Galaxy® security threads.

# 6,000,000,000

## BANKNOTES

are printed by G+D every year.

# 37,500 KILOMETERS

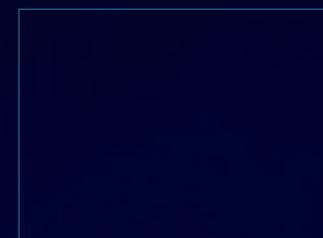
How high a stack of all the banknotes currently in circulation in the world would reach. Roughly at the level of the satellites in geostationary orbit.



# 150,000

## BANKNOTES

processed per hour by our BPS® X9 – the world record.



# 33 x 45

## MILLIMETERS

was the smallest banknote in the world, the Romanian 10 bani bill.

# 0.000038

## EUROS

is how many euros you get in exchange for 1 dong of the Socialist Republic of Vietnam.

# 15,000,000 m<sup>2</sup>

## OF SECURITY FOIL

are produced by us every year.

# 1

## ATM

is located in the Antarctic. More than

# 3,000,000

can be found a little further north.

# Thinking outside the box and beyond.

In 1956 logistics were reinvented: For the first time large standardized boxes were used for transport by truck and ship – and this was the birth of the ISO container. Our NotaTracc® trays may not be as large as these containers, but they are packed with big ideas and offer multiple advantages for the entire cash cycle, making them a benchmark in cash logistics. These trays mean that the days of transporting banknotes in cartons, disposable plastic safe bags or bare are numbered.

## A tiny container with impressive results.

NotaTracc® represents the crucial solution for greater automation, efficiency, sustainability and security in cash cycle and cash centers. This brings the vision of cash processing without manual intervention a great deal closer – reducing cost, increasing efficiency and supporting sustainability.



With its high degree of automation, NotaTracc® enables employees to use their time productively and effectively. This keeps the human mind where it belongs: focused on the process, super-

vising the banknote processing system and keeping it running. The NotaTracc® trays support intralogistics such as transport and storage or even logistics within the cash cycle. In this way, cash-in-transit companies and other partners in the cash cycle significantly reduce handling efforts, making this a compact solution with high impact.

## Compact solution, high impact.

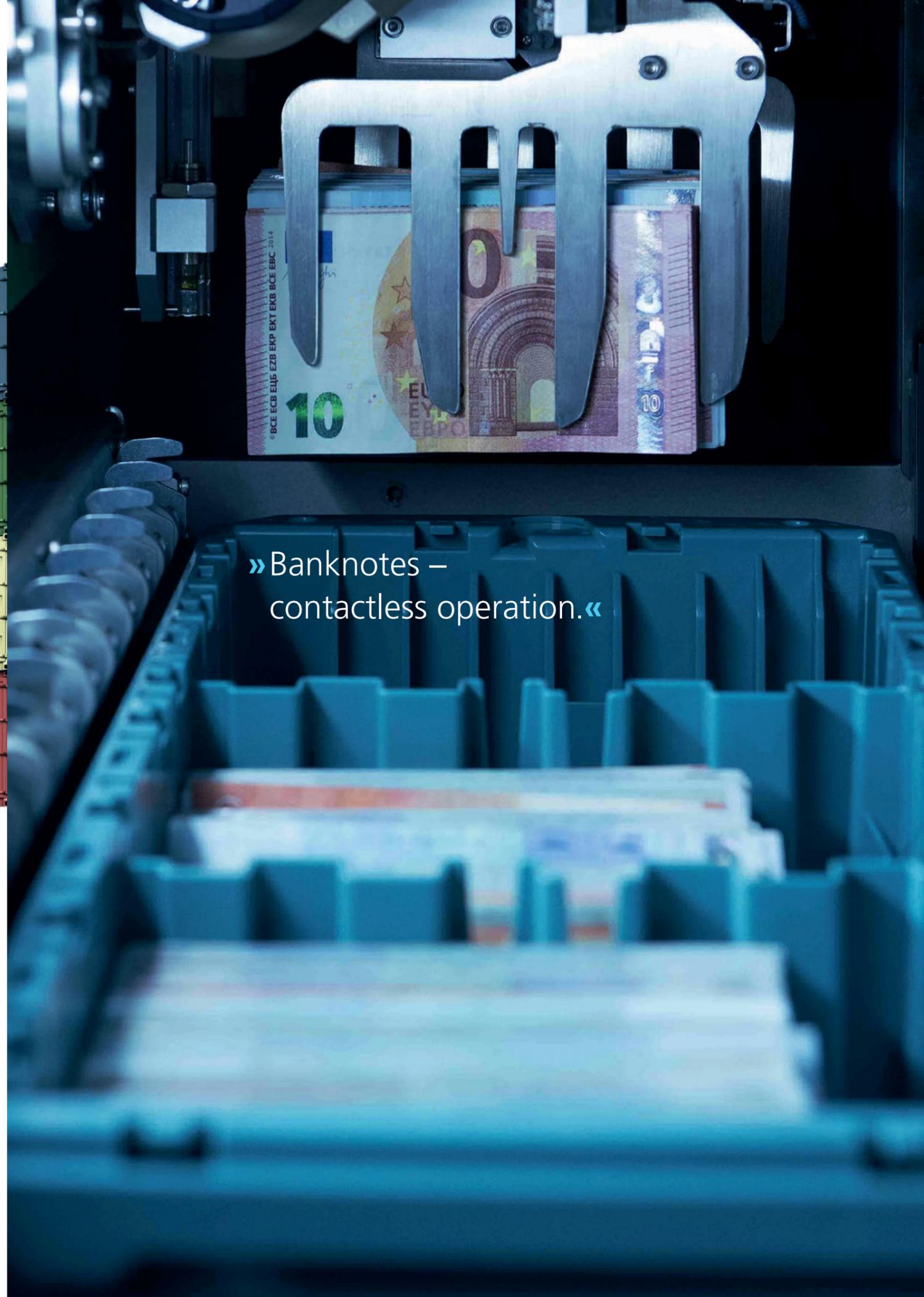
With responsible consultancy, NotaTracc® increases the performance of cash centers and the cash cycle, raising BPS's uptime and optimizing logistics, hand in hand with sustainability and security, from commissioning to flawless operation, over the course of many years.



Automatic success:

- NotaTracc®
- NotaPack®

Find out more



» Banknotes – contactless operation.«



»From A to Z  
with 0 and 1.«

# Running the entire cash cycle with one software suite.

When it comes to increasing efficiency by connecting and optimizing the whole cash cycle, software is the key. Whether central banks want to better manage banknotes, commercial banks want to improve visibility on outsourced cash processing, or cash-in-transit companies want to develop new business models, we have the end-to-end software solutions to meet their needs.

## Connecting the cash cycle.

Our software allows all players in the cash cycle, from printworks to cash service providers, to digitally integrate all aspects of the cash cycle and connect people, systems, processes and hardware. With configurable modules for a high level of adaptability, our software suite fits your ever-changing business needs. It enables you to leverage the full potential of the latest available technologies,

resources and data, while minimizing costs, improving your competitive position and achieving your business objectives.

Our suite of software products is continuously improved through the creation of innovative features, and allows for seamless integration into existing IT infrastructures.

Even the smartest software can't predict the future – but with the help of machine learning, our forecasting solutions can forecast long-term cashpoint and cash center volumes. This enables you to calculate, compare and plan scenarios by cash center site or region, or for your entire operation.



Forecasting of cash usage dramatically improves order management as well as resource and treasury, making strategic decision-making more data-driven. The benefits for you? Lower costs, higher efficiency and greater market share, all with a single software suite.

**Our forecast:  
decreasing cost  
of cash.**



### Why customers choose our software:

- Based on global cash industry and IT best practices
- Fit for purpose: modular adaptable software suite
- Seamlessly connecting people, systems, data, processes and hardware
- Fully integrated cash supply chain processes

Find out more



# Great comes in every size.

The cash center plays a central role in the cash cycle – and G+D technologies play an important role at over 5,000 cash centers worldwide. Our scalable cash cycle solutions offer greater efficiency and security for cash centers of all sizes – and go far beyond the cash center itself.

## Egypt: a vision becomes a turnkey solution.

The Central Bank of Egypt has commissioned us with planning and building an integrated plant for the production and processing of banknotes in Egypt's new administrative capital. The project includes security infrastructure, cash storage and circulation, cutting-edge IT and logistics, as well as the setting up of

further regional cash centers. Once complete, the plant will cover the majority of the country's banknote printing and processing capacity – thereby supporting Egypt in the smart automation of the cash cycle and in further enhancing banknote security.



An elegant frontage houses a high-performance plant: the visionary cash center east of Cairo.

The BPS® M7 is at the heart of G+D Currency Technology's "High-Speed World."



## Today's innovation is tomorrow's standard.

Our solutions are scalable for any cash center. From central to commercial banks, casinos, retail and companies that transport money: Wherever tailored solutions are needed to suit specific requirements, G+D will find a way.

We analyze existing cash centers, increase their efficiency, reduce operating costs and maximize security. We develop, design, implement and outsource – and even manage your cash center. No matter what you want, we create the right solution for you. And if it doesn't exist yet, we'll develop it together.

→  
45 years of experience for  
the future of your cash center:

- Business process outsourcing
- Cash cycle analysis
- Process optimization
- Brownfield and greenfield solutions
- Modular range, tailor-made and expandable
- Managed cash centers / outsourcing
- Comprehensive service offering

Find out more



» Benchmark is  
our trademark.«





» Always there for you: our 1,400 highly qualified service experts.«

# Finding solutions – even before the problem occurs.

130 countries around the globe trust in our service. Based on this broad experience under hugely diverse circulation conditions, our analysis and prediction makes your solution smarter, whatever form business takes.

## The best service is the one you don't have to call for.

With our comprehensive service portfolio, we support our customers to ensure optimum performance of their systems.

In addition to the current remote service offer, we are working on the use of data analytics and big data – turning the smart maintenance vision into a forward-looking solution. This enables us to minimize unscheduled service at the customer's site. We will set up a central decision platform to intelligently plan maintenance schedules and prevent downtime by using historical machine and service repair data from the field.



## Service that offers anything you need and nothing you don't.

From planning to monitoring ongoing operation, we offer premium support from a single source, throughout every phase of the product life cycle. Individual, connected and scalable – that's the approach we take to all of our products and solutions, and also our service.

More than ...



→  
What else can we do for you?

- G+D® visual support
- Machine health monitoring
- Real-time analysis
- Connectivity, remote troubleshooting
- Digital knowledge database

Find out more



» Our vision:  
enabling  
payment for  
everyone,  
everywhere.«

# Cash is evolving into the digital age.

**Cash is the most trusted payment method – for good reason. It is universally accessible, resilient and protects privacy. However, it is not available via digital means. Central bank digital currency (CBDC) is a public form of money provided by the government for the digital world – a form of payment that is safe, secure, trusted and available to everyone. It represents a step towards our vision of enabling payment for everyone, everywhere.**

Today's electronic payment landscape is diverse, however most payment services require a subscription, a bank account or impose high fees, as they are driven by the economic interests of private companies. Additionally, only few solutions cover all relevant use cases, which include point-of-sale payments, online shopping and person-to-person payments, both remotely or face-to-face, with or without a network connection.

Only a digital currency issued by the central bank can provide a public form of digital money that is truly inclusive, by being universally accepted, resilient and free from social and economic barriers.

G+D has been conducting extensive research and development into CBDC for many years. In doing so, we have gained a deep understanding of the requirements and necessary design criteria for a CBDC from both a consumer and central bank perspective.

Our research has shown that a digital currency should be treated as a complement to cash, offering additional features to connect it to the digital world. G+D followed this vision with G+D Filia®, our CBDC solution.



#### Benefits of a central bank digital currency:

- **Universal usage** – a means of payment that can be used by everyone, everywhere
- **Financial inclusion** – giving unbanked people the opportunity to participate in the digital economy
- **Data privacy** – a CBDC solution protects user's privacy while still fulfilling government compliance requirements
- **Low costs** – unlike many digital payment options, CBDC does not incur any hidden costs for users



CBDCs raise the prospect of transferring funds, for example, from smart card to smart card or device, without a middleman.

Find out more



# Moving into a future with trusted digital payments.

**A CBDC needs to balance anonymity and transparency in order to be widely accepted. At the same time, it must also comply with regulatory requirements in order to prevent illicit activities. It needs to be highly secure and resilient, while providing universal access as legal tender.**

At G+D, we combine an unparalleled expertise in public and private payments, ranging from end-to-end cash cycle solutions to building highly secure digital infrastructures for payment.

The result is a CBDC solution that supports all players along the digital cash cycle: G+D Filia®. In our hybrid deployment model of a value-based CBDC solution, a data file minted by a central bank represents monetary value and is distributed according to the contemporary cash cycle, through commercial banks or other financial institutions. It can be accessed and utilized through smartphones, smart cards, smartwatches and other forms of wallets. It does not require a bank account or the disclosure of private data, no consumer fees apply – and it is easy to use.

Our CBDC solution allows payment service providers to integrate it into their offering as part of a larger payment system. This encourages new business models and fosters innovation and growth, while also ensuring continuity in the financial system.

G+D Filia® is a new generation of an efficient, resilient, non-exclusive means of payment. By guaranteeing safe and convenient payment, now and in the future, our CBDC solution complements our offering for public money.



**The G+D Filia® approach comes with a number of unique benefits:**

- Secure, consecutive offline payments, irrespective of access to a network connection or electricity
- Flexible balance of privacy and transparency by strictly separating information, access and systems
- The highest level of security, through a strict disconnection of CBDC creation and transaction processes
- A superior level of resilience due to a design without a single point of failure

»Our guiding principle: transferring the characteristics of cash into the digital world.«





**Giesecke+Devrient**  
Creating Confidence

**Giesecke+Devrient Currency Technology GmbH**

Prinzregentenstrasse 159  
P.O. Box 800729

81607 Munich, Germany  
Phone: +49-89-41190  
Web: [www.gi-de.com/ct](http://www.gi-de.com/ct)

© Giesecke+Devrient Currency Technology GmbH,  
2021 Subject to change without notice.



Find more information  
on our website:

[www.gi-de.com](http://www.gi-de.com)