DEVELCO

Technology Development Partner

Experts in

Electronics • Embedded Software
Wireless Communication • Internet of Things IoT

Develco - Your External Technology Development Partner

Develco is an experienced and independent development house offering a full-service concept with focus on Product Development and Production Management.
When outsourcing your R&D projects to Develco we act as your external Technology Development Partner. Develco is responsible for the process with development of new technological product solutions to your company and production management of the new products.
After completion of development projects your company will receive all IP rights and complete documentation on the finished products.

Product Development

Develco's core competences are development of product solutions based on high-speed micro-processors, power supplies, power electronics, embedded software, wireless communication, and Internet of Things IoT.

Develco has developed products within various fields such as data collection, wireless communication, Internet of Things IoT, motor control, energy management, industrial controllers, and remote controls. Since 1989, Develco has developed technology products for industrial customers with their own product range, public institutions, and Start-Up companies.

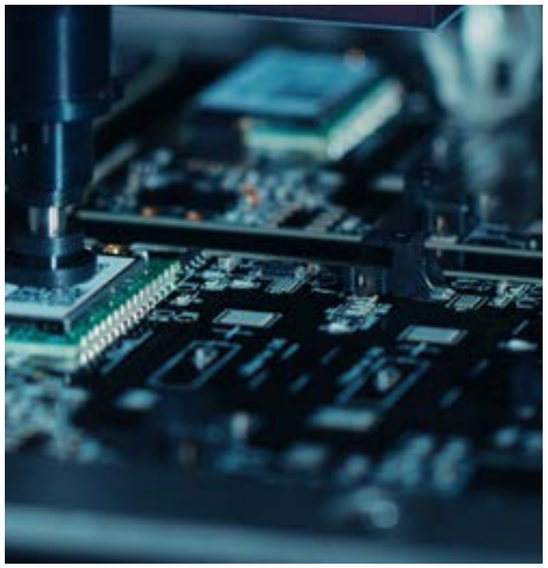
Our product development expertise comprises:
- Hardware
- Embedded Software
- Mechanics
- Design for Manufacturing
- Documentation, Test, and Approvals

Production Management

After a completed development project Develco offers manufacturing and production management of your product. We are responsible for production start-up, production management, and delivery of finished products.

Develco has strong competences within hardware, embedded software, and mechanics as well as a deep process knowledge of electronics production. We handle New Product Introduction (NPI) efficiently and bring finished products into production.

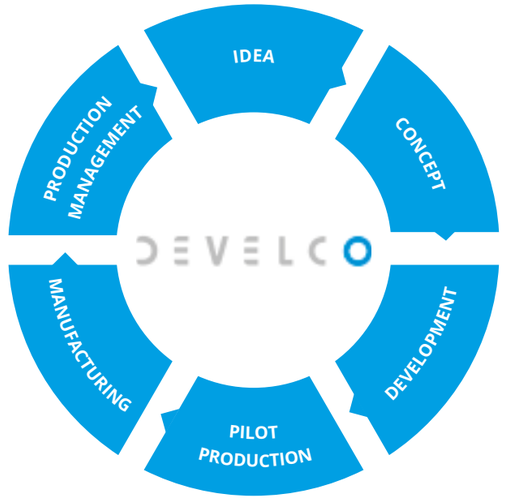
Our production management expertise comprises:
- Co-operation with Electronic Manufacturing Services EMS
- Production Documentation to EMS
- Control and Contingency Plan
- Test Planning and Coverage
- Quality Assurance
- Box Build
- Shipping



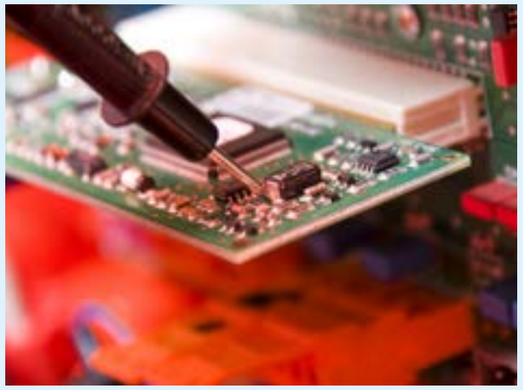
Develco Project Model for Product Development

Develco is responsible for product development of your technological product throughout the product life cycle from the initial product idea to the finished product and on to production management after completion of the development process. Develco develops product solutions according to a well proven stage gate model through the following phases:
- Idea
- Concept
- Development
- Pilot Production
- Manufacturing
- Production Management

When your product idea has been developed into a new, finished, and exciting technological product solution, the product is ready for mass production. In addition, Develco takes responsibility for the production management of your new product, if your company does not have process knowledge of electronics production.



Competences



Develco has strong competences within a wide rang of technologies including electronics, motor controls, sensors, embedded software, mechanical integration, connectivity, wireless communication, communication protocols, proprietary solutions, Internet of Things IoT, gateways and more.

With the increased digitization many industrial customers, municipalities, and public institutions demand intelligent product solutions for the company and the society.

As a Technology Development Partner Develco guides your company to the IoT world and Industry 4.0 and offers End-to-End IoT solutions comprising the entire process from data to value.

Wireless Communication

Develco provides a solid expert knowledge about the best type of connection to different situations.

Based on your business case with various factors such as range, data volume, environment, usage patterns, speed, network, roaming etc. Develco recommends either a wired or a wireless connection.

Develco tailors the choice of sensor technology and wireless communication protocol to your new digital products for data transmission to the Cloud.

Print & Apply Controller for Innovative Marking Solutions

PRODUCT FACTS
- CPU STM32 Cortex® M3
- Digital input/output 24V/0.5A
- Motordriver
- Analogue input for current and voltage 0-5V/0-20mA
- Ethernet communication 10base-t/100base-tx
- SPI for future communication to EtherCAT, PROFINET
- I²C for future communication to PROFIBUS

CUSTOMER STATEMENT

"HM Systems is market leader in Denmark and experts within tailor-made labelling solutions for many industries among others the food industry, the pharmaceutical industry, and the nonfood industry. The company has supplied and installed labelling machines in 60 countries. Develco's positive mention of earlier cases was crucial when HM Systems was to choose an external development partner for the development of the all-round controller for all labelling solutions instead of the current 15 versions", says COO Jørgen Seeberg, HM Systems. *"The co-operation with Develco worked really well and was based on mutual trust. With the new print we have fewer components and one solution for every need. The Print & Apply controller is programmable, functions as a PLC controller and meets the latest standards in connection with Industry 4.0. On the controller we have mounted a panel with graphical user interface for display of label insertion and a Cloud solution with network so that we can easily connect with all labelling machines in all countries"*, continues Jørgen Seeberg.

HM Systems had many different controllers/control systems for their tailor-made special solutions for labelling machines. Therefore, they needed to develop one flexible control system handling everything for the many machine types in HM System's labelling solutions.

In constructive co-operation with HM Systems Develco wrote the requirements specification for the new versatile controller. Afterwards the product development with the design of the electronics for the controller started. The controller includes several subcomponents to make it an all-round and complete controller for all HM Systems labelling solutions. In addition Develco has developed driver and test software so that the customer's own system can be moved and adapted to the controller in the customer-specific labelling solution. The control system controls the printer and labelling machine attaching labels on the customer's packings. In order to prevent stops in printing and labelling, the digital output is protected against overcurrent and short circuits, and the controller is protected against electrical noise (EMC).

ClinoStar™ - High-Tech Incubator for Functional 3D Cell Culture

PRODUCT FACTS
- 6 brushless DC motors with motor control
- 6 cameras with 5 mega pixel resolution
- Communication via WiFi and Ethernet
- Precise regulation of temperature and CO^2 level via embedded sensors
- UV-C beacon for disinfection of reactor
- High Cybersecurity with encrypted data
- UL and CE approval

CUSTOMER STATEMENT

"Being a part of CelVivo's network, the choice of Technology Development Partner naturally fell on Develco. For CelVivo, the co-operation with Develco has been a very good match between cell biology and technology. The collaboration has been based on trust, responsibility, and the best decisions with ongoing preparation of requirements specifications throughout the development process. CelVivo wanted a rapid product development and market introduction of ClinoStar™. And at Develco, there has not been a long way from idea to action and development of the best and cost-effective solutions. Develco has been involved in the entire process with ClinoStar™ from the first product idea to product development and on to production management of ClinoStar™, for which Develco is also responsible. After the introduction of ClinoStar™ CelVivo is one of the leading suppliers of systems for 3D functional cell culture. We can only recommend Develco as a responsible development partner with a rapid and sharp project management of both product development and production management", says Søren Alnøe, COO at CelVivo.

Based on their own successful prototype the two founders of the biotech company CelVivo, both with a solid research background from different universities, wanted to develop a more holistic solution with an integrated clinostat-based incubator that in one integrated unit creates the possibility to work with cells which can regain their in vivo physiological features and thereby behave as in human beings.

CelVivo's high-tech and user-friendly CO^2 incubator ClinoStar™ is with precise motor control and climate regulation enabling functional 3D cell culture that can be used for tests of medicines and other research at universities and research laboratories. ClinoStar™ consists of 6 independent motors for controlling the 6 bioreactors called ClinoReactors. CelVivo has developed the unique ClinoReactor ensuring the optimal growth conditions for cells. Develco has developed electronics, hardware, and embedded software for ClinoStar™ in close co-operation with Cuva, which has developed the mechanics for the incubator, and Iterator IT, which has developed an intuitive App for remote control of up to 50 ClinoStar™ and configuration of the process in the incubator. CelVivo delivers ClinoStar™ together with a Samsung tablet installed with the App.

When ClinoReactor is rotated via one of the 6 motors in ClinoStar™ a state is achieved where the cells "float" in the cell medium and can be cultured long enough for them to achieve their in vivo state. ClinoStar™ is not only cell culture in 3D; *"functional cells in 3D"* are created.

A ClinoStar™ has 6 reactor holders in which a ClinoReactor can be placed. The rotation is ensured by brushless DC motors, for which Develco has developed the motor control for precise control of the individual speeds of rotation of the reactor holders via the tablet. The speed of rotation of the reactors depends on the type of cells to be grown in the reactors and how far the cells are in the growth process. In the door of ClinoStar™ 6 cameras are placed and via the tablet the cameras follow the development of the cells in each of the 6 reactors during the cell culture. It is important to keep the door of the incubator closed to control the temperature and the CO^2 level for optimal 3D cell culture and to minimize the risk of infection.

The app on the tablet takes photos and videos of the cell culture via the 6 cameras in the door of the incubator and shows the temperature and the CO^2 level measured via the installed sensors in ClinoStar™. A fan is installed in the chamber to ensure a homogeneous growth environment, just as an UV-C beacon can disinfect ClinoStar™ to achieve a cleaner environment for 3D cell culture.

iDOL 63 Cloud Gateway - Smart Farming with Data to the Cloud

PRODUCT FACTS

- ARM® Cortex® -M7, 2Mbyte FLASH and 512 kbyte SRAM
- Data Storage; 16Mbyte SDRAM, 8Mbyte FLASH and 32GByte SD-card
- 10/100 MB Ethernet
- Power over Ethernet, PoE 802.3 AT type 2
- 8 fully protected configurable Analog/Digital Inputs, with > 0.5% accuracy
- NFC via NDEF data format
- Secure connection to Azure using TLS and device specific certificates
- MQTT message protocol

CUSTOMER STATEMENT

"dol-sensors is one of the leading manufacturers of climate sensors for chicken and pig farms with thousands of sensors installed in +80 countries with the purpose to produce the best chickens and pigs. We needed a fast and easy Cloud Gateway that can be used by a single farmer and on large farms. The gateway must display all climate data from the farm on one screen: light, temperature, humidity, CO^2, ammonia and more. Develco has developed hardware platform, architecture and IoT solution making data available outside the farm. The match between dol-sensors, SKOV and Develco has been absolutely perfect for us. Develco is an experienced and proactive development partner. We have been confident that the development project was completed as agreed, while we could concentrate on our core business. The good co-operation has characterized the entire project with development and design at dol-sensors and start-up of production at SKOV", says Product Manager Bo Fredborg at dol-sensors.

For dol-sensors, Develco has designed and developed hardware and embedded software for the iDOL 63 Cloud Gateway/IoT Enabler implemented with software protocols for integration with the Cloud. Develco has been working together with the NPI and PTA departments at SKOV A/S (dol-sensors) about the production maturation phase of the IoT Enabler.

Project Manager Erik Refsgaard at Develco says: *"dol-sensors came with the overall specifications to their gateway for smart farming. Throughout the entire design and development process we have had a close co-operation and a constructive dialogue with dol-sensors about the intelligent iDOL 63 Cloud Gateway which must communicate data to the Cloud. Develco has digitized the analog sensors and connected the gateway to Microsoft Azure. For the IoT Enabler we have used the leading IoT protocol MQTT message protocol. All inputs in the gateway are generic and configurable via the Cloud or via NFC communication from e.g. a Smartphone. The iDOL 63 Cloud Gateway has an SD card storing all data in case of temporary disconnection from the Cloud, from where the software can also be updated. For dol-sensors, data security has been of high priority, and consequently all gateways have individual certificates encrypting the sensitive data from the farms via HTTPS".*

Wireless Meter Grid - Frederiksberg Smart City

The Municipality of Frederiksberg has become a smart city collecting household consumption data sent to a cloud solution for analysis of Big Data and optimization of energy consumption.

Frederiksberg Forsyning delivers water, heating and electricity to the Municipality of Frederiksberg and has more than 1000 gateways suspended in the street lightning and connected wirelessly to heat and water meters in the individual households. The gateways are PoE connected to a network of Access points to cover collection points for consumption data. This provides Frederiksberg Forsyning access to real-time data allowing for better and more precise regulation of district heating and water supply and savings in operating expenses. The smart city solution in Frederiksberg Municipality has a positive impact on the environment and contributes to sustainability.

Develco has developed both advanced application-level software implemented in a multi wireless platform enabled gateway and an outdoor use enclosure for the electronics. The application-level software enables the gateway to relay meter data from domestic meters to a Cloud service. The software supports configuration of the gateway by the Cloud service through a proprietary communication protocol designed and specified by Develco using the MQTT transport layer. For maintenance and update Develco has developed an autonomous and secure software update mechanism for the gateway, thereby making it possible to extend and correct the functionality of the gateway after initial deployment. Finally, Develco has managed production setup and is responsible for production and logistics.

PRODUCT FACTS

- Wireless M-Bus
- WLAN
- MQTT protocol handling
- PoE (Power over Ethernet)
- Linux platform

CUSTOMER STATEMENT

"Develco has been a highly qualified sparring partner in connection with the choice of wireless technology, which is a difficult context-dependent decision. So, we have had Develco to develop a solution that matches our needs", says Project Manager, Digitization Peter Daugbjerg Sørensen at Frederiksberg Forsyning.

2.4 GHz LoRa Communication for The Drones4Energy Project

Develco participates in the 3 years research project aimed at developing a collaborative, autonomous and continuously operating drone system together with University of Southern Denmark, Fraunhofer, Geopartner Inspections, Sciences Ventures Denmark, and Aarhus University and with support from Innovation Fund Denmark.

The challenge in electricity supply is the present inspection of several thousand kilometers of overhead cables once a year either by drones or by helicopters resulting in limitations of the flying time, inspection accuracy, and coverage area. The purpose of the Drones4Energy project is to ensure a more stable electricity supply from energy companies and utilities with the correct maintenance of the power grid. Develco's contribution to the project is the development of a wireless inter-drone communication system.

Develco has developed a robust wireless inter-drone communication technology based on a communication module supporting wireless mesh using 2.4 GHz LoRa which is ideal for long range data transmissions in harsh wireless environments. A team of 4 drones will communicate with each other and exchange data in a reliable way, as the communication module has a separate microcontroller with advanced software supporting encrypted message exchange and thus meeting the important cybersecurity demands in our digitized world.

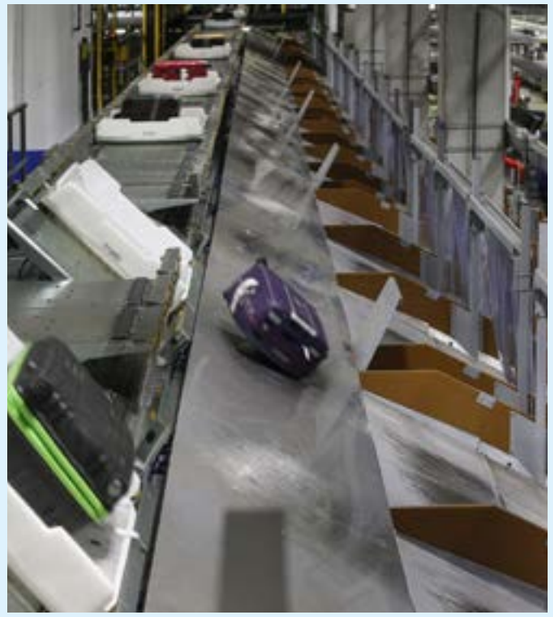
The drones receive weather data in order to fly only in good weather for inspection of the power cables. The camera on the drones can zoom in and take high quality pictures of leakages and breakages of the powerline cables. With intelligent image processing the drones can detect faults at an early stage to avoid more serious faults or breakdown of the power grid.

The drones connect themselves to the high voltage cables and charge their batteries so that they can continuously inspect the power cables and detect malfunctions on the distribution system. With the wireless inter-drone LoRa communication system developed by Develco the drones can connect to the internet and give powerline operators the possibility to receive inspection data of the power grid accurately, frequently, and autonomously.

PRODUCT FACTS

- 2.4 GHz radio
- Modulation: LoRa®, FLRC, (G)FSK
- Range more than 6 km with a data rate of 20,3 Kb/s
- ARM® Cortex® -M3, 128 kbyte FLASH and 32 kbyte SRAM
- High receiver sensitivity for increased robustness and long-range communication
- Raspberry Pi HAT compatible
- No duty cycle restrictions
- USB interface
- Host controller interface for easy configuration and control
- Support for AES encrypted message exchange
- Bootloader

Upgrade of Electronic Control Unit for Sorting Systems



CUSTOMER STATEMENT

BEUMER Group's wishes for technological change were fulfilled and the Director R & D Ulrik Steen Hansen comments on the development work as follows: *"In BEUMER Group, we are very pleased with the project. The development team from Develco has worked very professionally and dedicated and the results fully meet our expectations"*.
In a group perspective, standardization and compatibility with previous system solutions are valuable both economically and in quality terms. Recycling of elements in the development process is - all else being equal - contributing to reducing sources of error, and the use of fewer components in the entire Group reduces maintenance and storage costs. In an era with much focus on *"sustainability"* it is important not to forget the benefits of continuity and standardization, and the BEUMER Group project illustrates the benefits of such efficiency awareness.

BEUMER Group (formerly Crisplant) has a leading position in the global market for luggage handling and sorting facilities in airports and parcel centers. With an update of motor control platform, Develco has helped improving the technological platform of BEUMER Group and ensuring quality and large-scale economy in the Group.

BEUMER Group is a success story in Danish business. The development has not been without challenges, and it gives proof of the fact that a good and sustained business strategy as well as technological development are crucial to global competitiveness. Develco has been a co-operation partner for many years on the electronic side. Back in the early 1990s, Develco helped improving concept development and development of hardware and software for the S2000 Sorter Control Unit, which had groundbreaking technology in fieldbus and distributed intelligence. At that time, there were actually no word for fieldbus at all. The sorting system is currently running in thousands of airports and warehouses and has continuously been updated by Develco.

In BEUMER Group, it was decided that power supplies with higher operating voltage should be used. Develco got the task to make the necessary upgrade of an existing Brushless DC (BLDC) motor control platform while ensuring that the platform is backward compatible. In the specific project, there was a need for changes to both software and hardware, which also enabled an increased capability of the conveyor belts. To ensure product lifetime as much as possible, a life cycle analysis has been conducted so that components that were close to end-of-life (EOL) were identified and replaced. The developed solution is mechanically compatible with the previous printed circuit board (PCB) and can be used for all types of sorters supplied by BEUMER Group. Develco's long-standing collaboration with BEUMER Group and knowledge of their products made it possible to complete the task despite a very tight schedule.

Based on the close co-operative relationship with BEUMER Group, CEO Jakob Bjerre explains: *"We have been involved in development tasks for BEUMER Group and the former Crisplant for more than 25 years and are now also responsible for production of their electronic components. This background, of course, provides a good ballast as to competency, and this was also needed because of system and time constraints. Develco's philosophy is to solve the customer's problem and avoid creating new ones. We must provide solutions that ensure continuity and durability in relation to the customer's existing general system. This is completely in harmony with BEUMER Group's wishes for the greatest possible compatibility."*

Quality Assurance

When co-operating with Develco as a Technology Development Partner you can expect the highest quality in the development process of your new product idea. We continuously strive for improving our development methods to ensure the highest quality and meet the specified requirements. We develop your new products with functionality and durability according to the agreed specifications and conditions with your company. Design for Manufacturing is of paramount importance to Develco to ensure the best quality in the production process and low production costs.

Safety in electrical and electronic products is an important factor in technological product development. Develco develops technology solutions ready for safety approvals within various product directives and the recognized CE mark.

Develco has an ISO 9001:2015 certified quality management system, which is a common tool for all employees for supporting continuous improvement in quality, efficient management, and focus on creating customers values.

Corporate Social Responsibility CSR

As a company, Develco recognizes and accepts its social responsibility. We have elaborated a CSR policy, in which we commit ourselves to act responsibly in society. We pay attention to human rights, social conditions, working conditions, environment, and climate. In addition, Develco focuses on sustainability and co-operates only with suppliers with an elaborated CSR policy. Develco develops future sustainable technological product solutions for industrial companies and the society. As a member of Elretur Develco takes responsibility for the environment and contributes to more recycling and reuse of electrical and electronic waste.

Develco follows the 10 principles issued by UN Global Compact, which is a global initiative established in 1999. At the same time, Develco requires all subcontractors to live up to the 10 principles issued by UN Global Compact. The purpose of UN Global Compact is to involve private companies in solving the social and environmental challenges which the global world is facing. UN Global Compact is the world's largest voluntary network for companies wishing to be involved in Corporate Social Responsibility CSR. At Develco CSR is an integrated part of the day-to-day management.

Develco as Technology Development Partner

Co-operation

Develco is both a flexible Technology Development Partner and a professional co-operation partner. We have an ongoing and constructive communication and dialogue with your company during the entire development process. Our highly qualified engineers and project managers are dedicated to developing and realizing your new exciting product ideas.

Technology Competences

Before the initial development meeting with your company Develco has studied your business and the needs for developing new technological product solutions. Our commitment to the development process results in new technological product solutions giving your company a competitive advantage in your market with fierce competition.

Flexibility

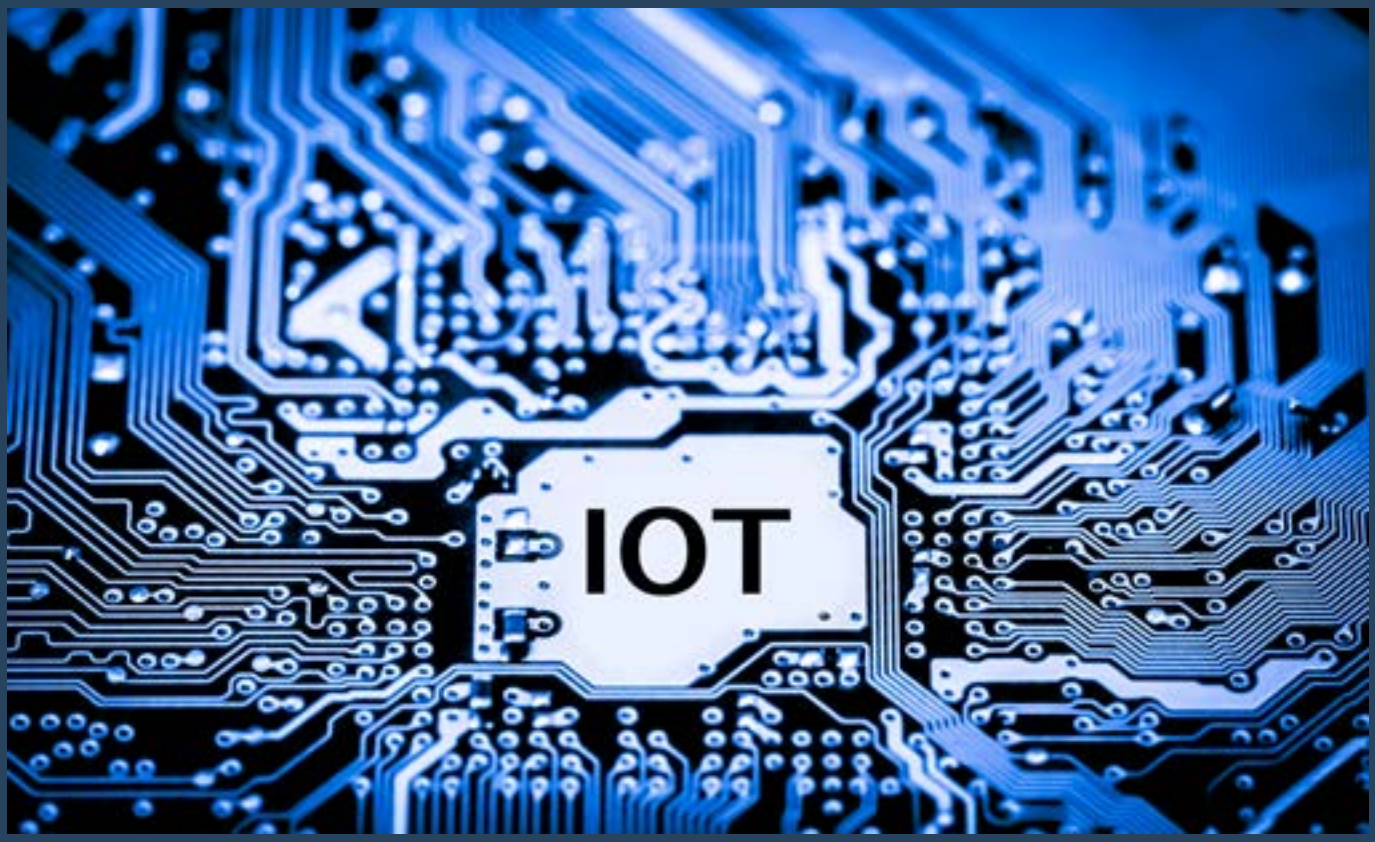
Develco manages your development projects with a high degree of flexibility. In the development process we can always customize your solutions with specific product features according to your wishes for the final product solutions.

Project Management

Our project management is structured and manages the development process either according to your company's development model or Develco's own stage gate model. Develco finalizes your development project according to agreed plans and conditions. We are very aware that time to market for a new product solution is an important factor in transparent markets with high competition. When you choose Develco as a Technology Development Partner for new products to your company, you get one permanent project manager associated with your development project. The project manager has the responsibility for ensuring progress and continuity in the project throughout the development process.

Responsibility

Develco is your flexible, creative, and competent development partner and takes responsibility for the entire development process from the initial product idea to supplies of your final new product solution. We build strong relations to our customers based on responsibility and trust. With your choice of Develco as your Technology Development Partner you can focus on your core business, while we focus on the development of your new digital products.



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Develco A/S
Olof Palmes Allé 40
DK-8200 Aarhus N
Denmark
t: +45 87 400 300
e: info@develco.dk
develco.dk