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Ingenuity for life

Motion control Overview

Driving the digital enterprise

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[siemens.com/sinamics](https://www.siemens.com/sinamics)

Typical Motion Control Applications

Continuous motion

Basic Medium High

Dis Medium High

SIMATIC / SIMOTION

SINAMICS

SIMOTICS GP, SD, FD **V20**

SIMOGEAR 1FG1 **G120x**

SIMOTICS 1PH8 **G120D**

SIMOTICS S 1FK7, 1FT7 **G110M**

SIMOTICS T 1FW3, 1FW6 **V90**

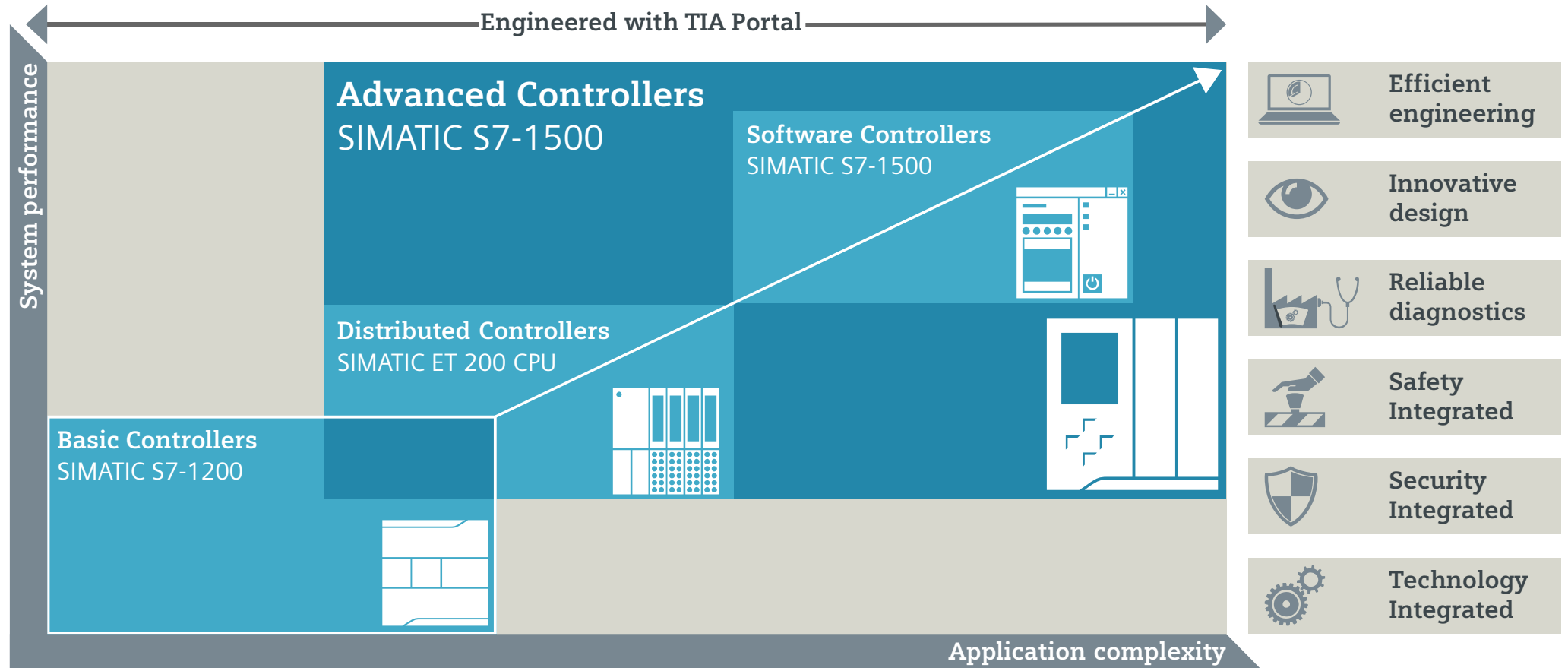
SIMOTICS L 1FN3 **S210**

S120

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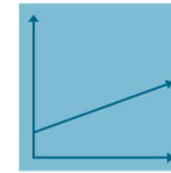
The SIMATIC Controllers Portfolio

Always the right controller – plus integrated added value!

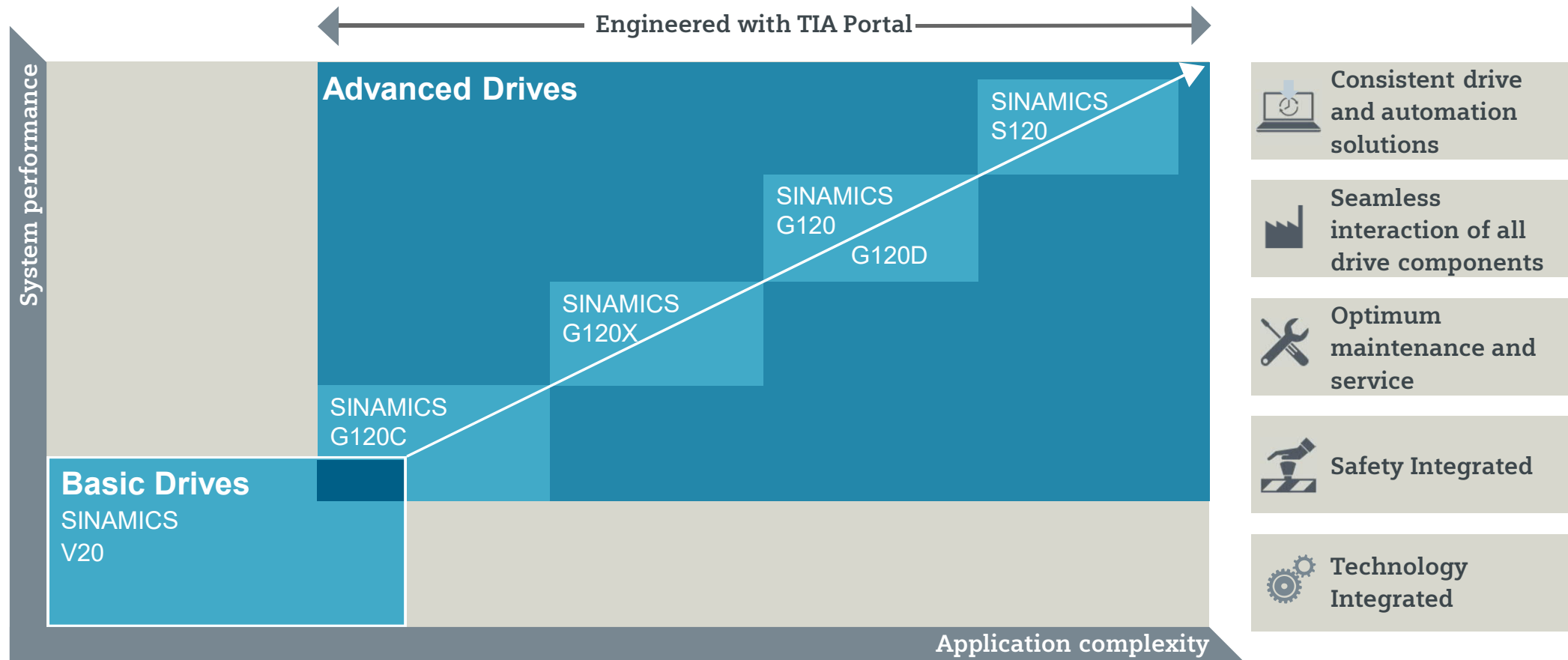


The SINAMICS Drives Portfolio for „Continuous Motion“

Always the right drive – plus integrated added value



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SINAMICS V20 – Making the choice easy for you



Easy to install

Easy to use

Easy to save money



SINAMICS V20
The cost-effective, reliable and easy-to-use inverter for basic applications

SINAMICS V20 Overview



Power Range: 0.12 kW – 30kW
Voltage Range: 1AC 230V / 3AC 400V
Control Mode: V/f, V²/f, FCC

Easy to install

- Compact size , push-through and side by side possible
- USS and MODBUS on terminals
- EMC filtered variant and IT network support

Easy to use

- Parameter loading without power supply
- Application and connection macros
- “Keep on running mode” for uninterrupted operation
- Wider voltage range, temperature range, advanced cooling design and coated PCB increase robustness

Easy to save money

- ECO mode on V/f, V²/f
- Hibernation mode
- Solar pump function integrated.
- Energy consumption display

Made by Siemens - Designed and assembled under German quality guidelines and long-term drive experience

SINAMICS G120C



The compact and versatile converter with optimum functionality

This compact standard drive defines new standards in its class regarding its frame size, fast commissioning times, extremely simple operation, high degree of service friendliness and integrated functionality. Applications include conveyor belts, mixers, extruders, pumps, fans, compressors and basic handling machines.



Features

- Compact device
- Highest power density of its class
- Safety Integrated: STO
- Power range: 0.55 kW – 132 kW
- Simple commissioning and maintenance
- Communication options: PROFINET, PROFIBUS DP, CANopen, USS/Modbus RTU
- With BOP-2 or IOP operator panel



SINAMICS G120 C Top-Highlights Overview



Function	Description
Robustness	<ul style="list-style-type: none"> ▶ Robust, compact system for demanding ambient conditions
Energy Efficient	<ul style="list-style-type: none"> ▶ Cost reduction through energy-saving functions like ECO-mode and PROFenergy, reduction of electrical operating costs
Convenient handling	<ul style="list-style-type: none"> ▶ Uncomplicated assembly, product operation and convenient commissioning
Safety Integrated	<ul style="list-style-type: none"> ▶ Easier machine acceptance due to standard-conforming functions
Integration in automation	<ul style="list-style-type: none"> ▶ Convenient and direct integration in automation

SINAMICS G120X

The specialized solution for Pump & Fan applications

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Seamless drive system **up to 630 kW/ 700 HP** and **wide protection** levels



Simple setup and optimized user interface



Robust design enables operation at **harsh environments**



EMC compliant and **long cable lengths** without output chokes



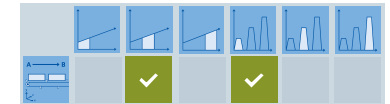
Integrated safety STO SIL 3 Hardware

SINAMICS G120D



The specialist for demanding, distributed applications with positioning capability

The distributed converter in a high degree of protection (IP65) has a low-profile, is compact, and as a result of its metal enclosure is very rugged; this makes it the ideal solution for demanding conveyor-related applications in the industrial landscape.



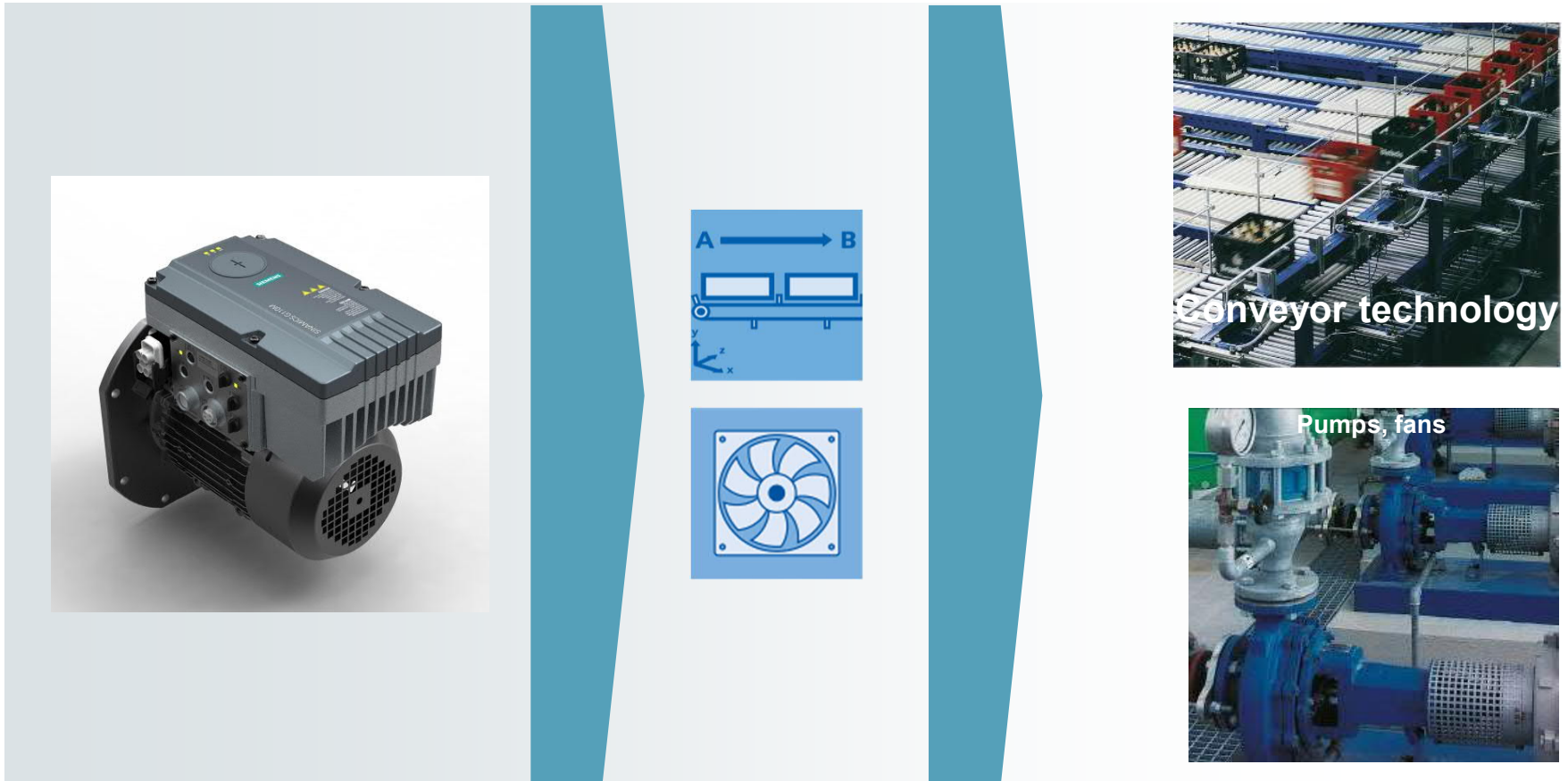
Features

- Power range from 0.75 – 7.5 kW
- Energy efficient thanks to energy recovery and low harmonics
- Safety Integrated: STO, SS1 and SLS without encoder
- Only a few electronics have to be stocked as a result of its modularity
- Interchangeable MMC memory card
- Communication via PROFIBUS, PROFINET and PROFI-safe
- Integrated in Totally Integrated Automation



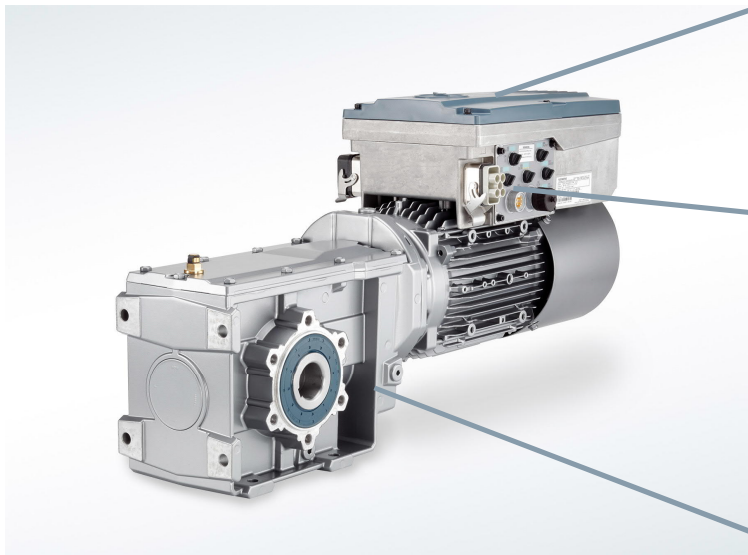
SINAMICS G110M – the inverter mounted on a motor for distributed applications

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System overview SINAMICS G110M on SIMOGEAR

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Power Modules

- 0.37 – 4kW, 380 – 500V - 10% / +6%
- Integrated electronic brake control
- Integrated motor protection



Control Unit

- USS / Modbus, PROFIBUS, PROFINET / Ethernet IP, AS-i (available soon)
- STO via F-DI or PROFIsafe
- 4 DI, 2 DO, 2 AI (can also be used as DI) for internal functions or as distributed I/O for the PLC
- Commissioning using DIP switch, memory card, IOP or parameterizing tool STARTER / Startdrive



SIMOGEAR geared motor

- Comprehensive portfolio
- Compatible with the market standard
- SINAMICS G110M can be selected as SIMOGEAR ordering option



The simple-to-commission inverter – that can also do a lot more

System overview SINAMICS G110M on SIMOTICS GP

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Power Modules

- 0.37 – 4kW, 380 – 500V - 10% / +6%
- Integrated electronic brake control
- Integrated motor protection



Control Unit

- USS, PROFIBUS, PROFINET, AS-i (available soon)
- STO via F-DI or PROFIsafe
- 4 DI, 2 DO, 2 AI (can also be used as DI) for internal functions or as distributed I/O for the PLC
- Commissioning using DIP switch, memory card, IOP or parameterizing tool STARTER / Startdrive



SIMOTICS GP

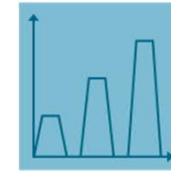
- Can be combined with 1LA and 1LE motors that have a terminal box at the NDE
- SINAMICS G110M as ordering option of SIMOTICS GP to be available soon



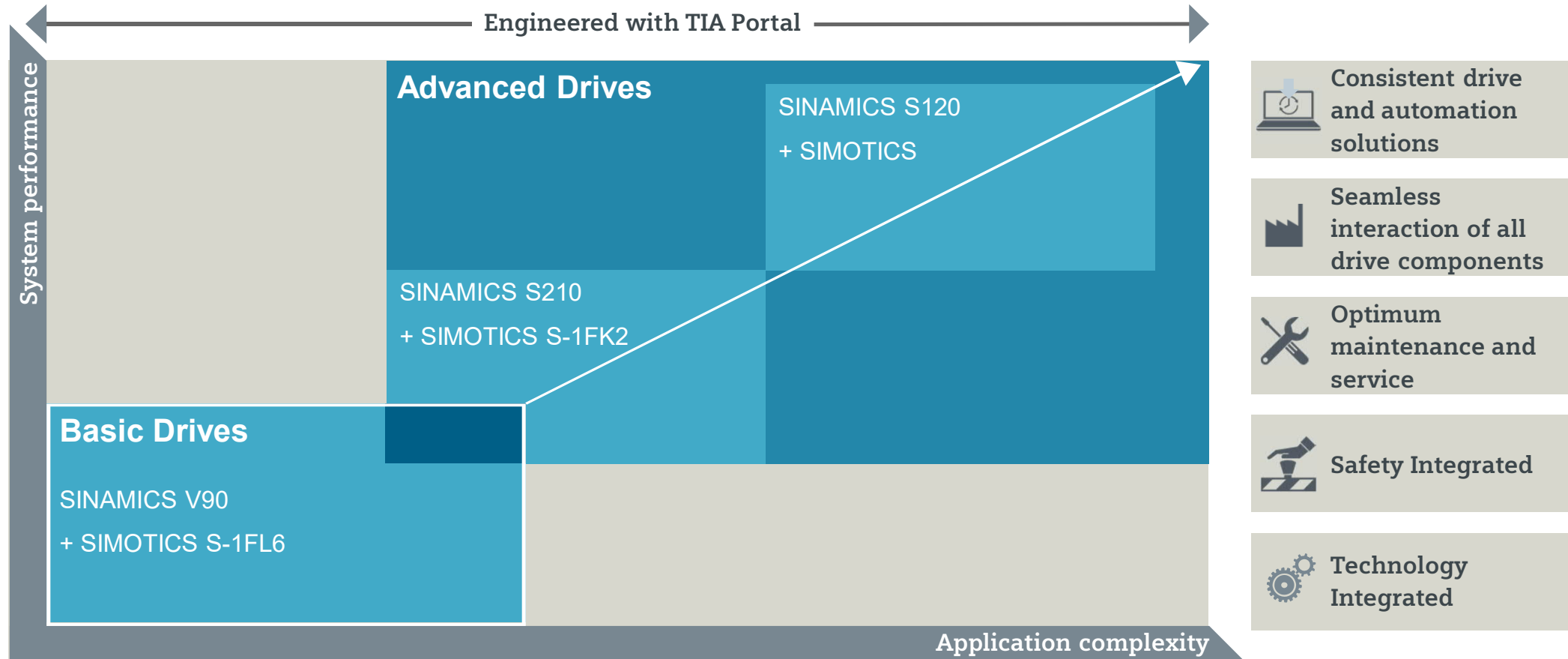
The simple-to-commission inverter – that can also do a lot more

The SINAMICS Drives Portfolio for „Discontinuous Motion“

Always the right drive – plus integrated added value



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SINAMICS S120



The flexible, modular drive system for sophisticated and demanding applications

The modular converter system with different types of construction to address high performance and motion control tasks in single and multi-axis applications involving synchronous and induction motors.

		✓			✓
		✓			✓
		✓			✓
	✓	✓		✓	✓

Features

- Power range: 0.12 kW – 5700 kW
- Servo /vector control, V/f control
- Integrated safety and positioning functions
- Freely configurable logic and closed-loop control functions
- Additional motion control functions in conjunction with SIMOTION or SINUMERIK
- High degree of scalability, flexibility, combinability
- Energy efficiency as a result of the energy recovery capability and/or DC link
- PROFIBUS /PROFINET /CANopen interface
- Different cooling types:
air, liquid and cold plate cooling









SINAMICS S120 - different formats optimized for single and multi-axis applications



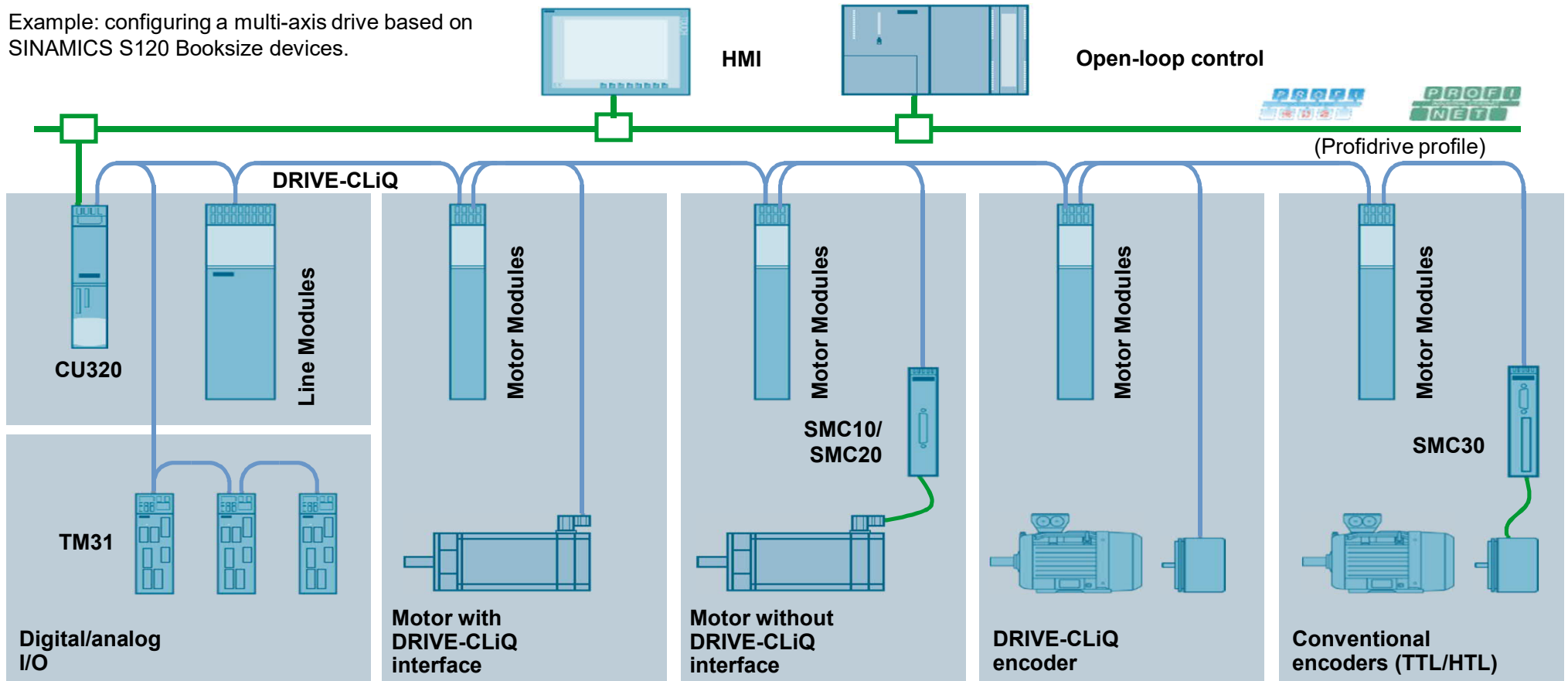
SINAMICS S120 – description

Modular drive system for demanding single-axis and multi-axis applications

AC/DC-unit for single-axis use		DC/AC-system for multi-axis use			
Blocksize	Chassis	Booksize Compact	Booksize	Chassis	Cabinet Modules
					
0,12 – 90 kW	110 – 250 kW	0.9 – 9,7 kW	1,6 – 107 kW	75 – 5700 kW	1,6 – 5700 kW

SINAMICS S120 - scalability through modularity

Example: configuring a multi-axis drive based on SINAMICS S120 Booksize devices.



The background of the entire page is a perspective view of a large industrial warehouse with high ceilings and rows of metal shelving units filled with cardboard boxes. Overlaid on this scene are several digital and technical elements. In the upper left, there is a semi-transparent blue panel containing a schematic diagram of an electrical control system. This diagram includes a motor symbol labeled 'MOT', a terminal block labeled 'E', and a power supply unit labeled 'SM X900'. To the right of this panel, a 3D wireframe model of a Siemens motor is shown, with a blue glow emanating from it. In the center of the image, there is a vertical column of binary code (0s and 1s) and a grid pattern, suggesting a digital or data-driven environment. The Siemens logo and tagline are positioned in the upper right corner.

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Digitalization in Motion control

Driving the digital enterprise

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Digitalization is the next level to yield productivity within process industries



Computing power
Connectivity
Sensors
Cloud computing
Data analysis ...



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Digitalization



Next level of productivity



Automation



Siemens as experienced partner for Automation and Electrification



Electrification



Pioneer for Digitalization in industry

Time



Generating customer benefits is our key priority industry trends



Efficiency



- Resource and energy efficiency
- Condition monitoring and predictive maintenance
- Increasing uptime

Flexibility



- Improved customization options
- Seamless provision of digital product data
- Integrated Engineering

Quality



- Closed-loop quality
- Traceability

Time-to-market



- Fast innovation
- More complex products
- Lifecycle Management

Security



HSSE – Health & Safety | Environment | Regulations/Standard | ...

Digital Enterprise is our portfolio of solutions for the digital transformation – in both discrete industry and process industry



Digital Enterprise

Process Industries

Discrete Industries

Product design

Process and plant design

Engineering

Operation

Services

Product design

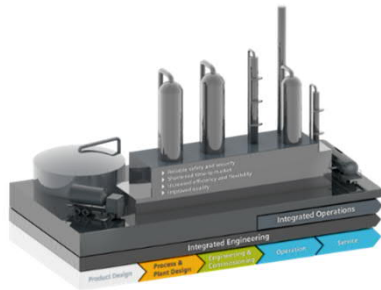
Production planning

Production engineering

Production execution

Services

Industrial Software and Automation for process industries



Industrial Communication



Industrial Software and Automation for discrete industries



Industrial Security



Industrial Services



Digital Enterprise Suite

Digitalization of the field level

Drive technology as a gateway to digitalization

MindApps

Internal or third-party applications for transforming data into knowledge



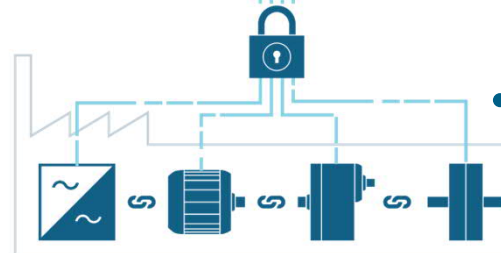
MindSphere

MindSphere

Data transferred to MindSphere or third-party clouds to generate knowledge

MindConnect

Connection to MindSphere via MindConnect



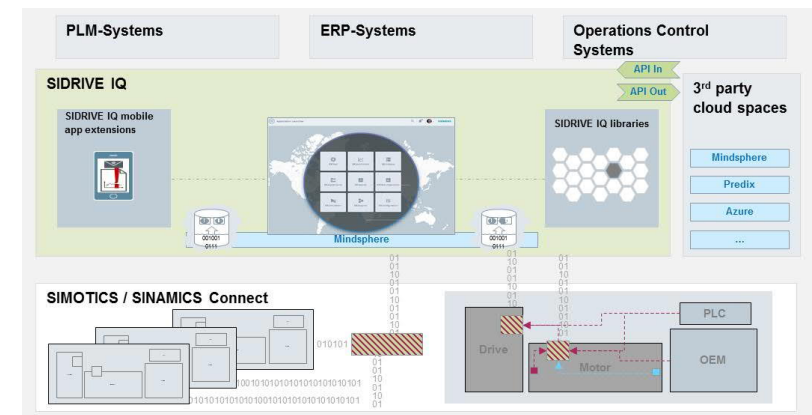
Drives and motors

Integration of drives and motors using engineering tools throughout the machine building cycle

SIDRIVE IQ – our value proposition

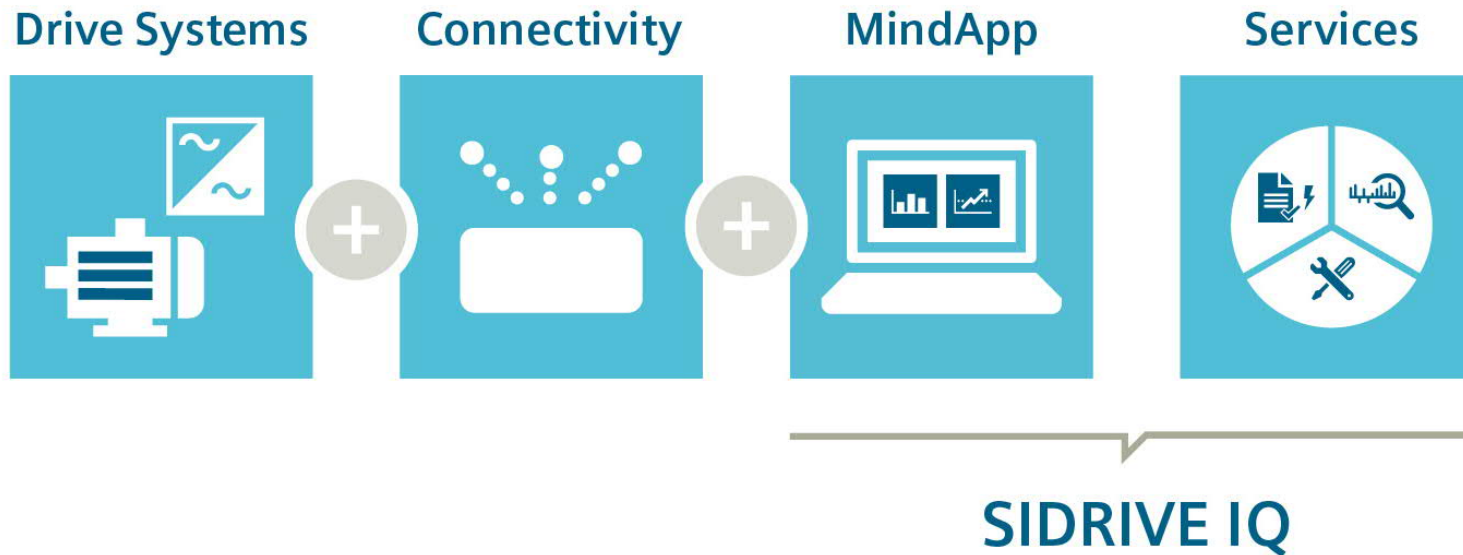
What is SIDRIVE IQ?

- SIDRIVE IQ is our IOT digitalization offering for drive systems.
- SIDRIVE IQ is based on connected Drive Systems from Siemens.
- Intelligent Drive systems deliver enhanced value in productivity, reliability and serviceability to our customers.
- SIDRIVE IQ leverages advancements in IoT, sensing, cloud computing, analytics, domain competence and cyber security to deliver innovation throughout our customers value chain.
- This will be completed with the predefined services packages addressing specific customer needs.



SIDRIVE IQ – the IOT digitalization offering for drive systems along the life cycle

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- SIDRIVE IQ provides added value for our customers in terms of productivity, reliability and serviceability
- SIDRIVE IQ is based on interconnected Siemens drive systems
- This innovative approach is complemented by predefined service packages addressing special customer needs



Drive Systems

Connectivity



IQ
Ready



SIDRIVE IQ
Services

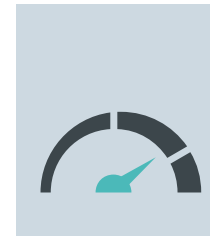
SIDRIVE IQ – solves fundamental problems of our customers

Customer's drivers and targets

Our answers based on SIDRIVE IQ



Enhancing availability ...



... through less unscheduled downtimes

- Detecting diverging operating behavior or conditions at an early stage
- Identifying anomalies in operating data

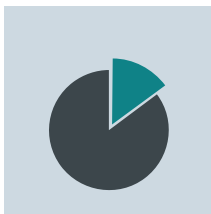


Faster problem solving ...

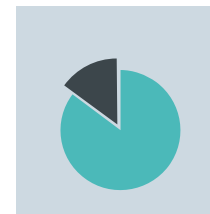


... through improved cause analysis

- Precise, directly accessible operating history
- Quick access to experts for detailed analysis



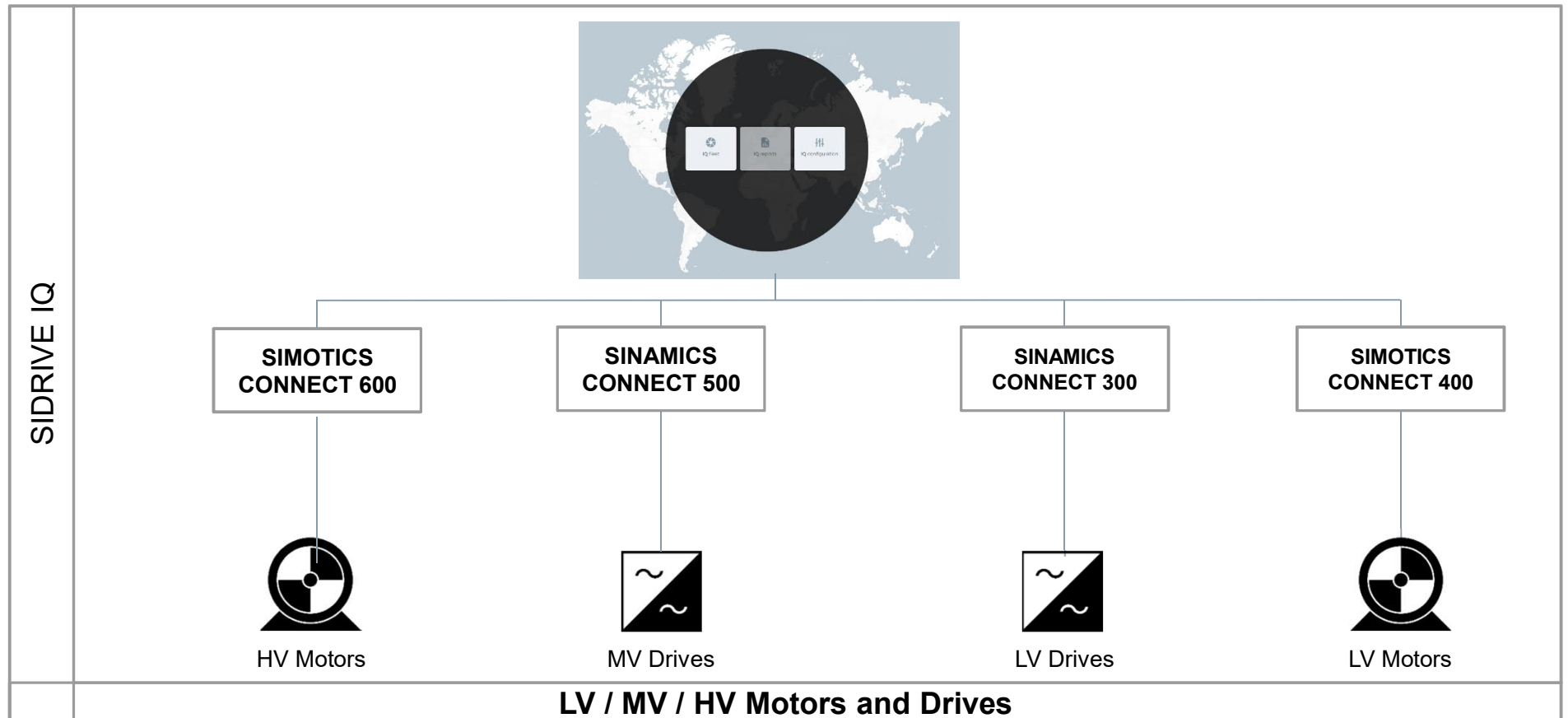
Enhancing productivity ...



... through optimized operations and maintenance planning

- Availability-oriented
- Transparent drive system state data

SIDRIVE IQ for low and high voltage motors and drives

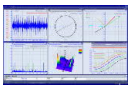


Portfolio positioning of LD motor CONNECT-ivity SIMOTICS CONNECT 400 vs. SIMOTICS CONNECT 600



Data depth & quality (Costs)

High-end Condition Monitoring Systems



Smart Products / Transparency

SIMOTICS CONNECT 400

SIMOTICS CONNECT 600

Precise condition monitoring, prediction and optimization enabler for medium-size to large drive systems and drive trains

Fleet management enabler for all products / systems and **basic condition monitoring** for small motors

Power rating / range



LV motors
e.g. SIMOTICS GP/ SD



HV motors
e.g. H-modyn



Quantity motors sold

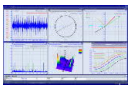
Unit complexity / criticality

Portfolio positioning of LD motor CONNECT-ivity SIMOTICS CONNECT 400 vs. SIMOTICS CONNECT 600



Data depth & quality (Costs)

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Smart Products / Transparency

SIMOTICS CONNECT 400

SIMOTICS CONNECT 600

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Fleet management enabler for all products / systems and **basic condition monitoring** for small motors

Power rating / range



LV motors
e.g. SIMOTICS GP/ SD



HV motors
e.g. H-modyn



Quantity motors sold

Unit complexity / criticality

SIMOTICS CONNECT 400 hardware information

- For DOL (direct-on-line) motor operation only
- Size 125 x 76 x 29 mm
- Housing material: Durethan / Lexan
- Degree of protection: IP54
- Operating temperature -40° C ... +80° C
- Wireless connectivity (BLE, Wi-Fi)
- Status LED, commissioning via mobile app
- Battery operated (exchangeable battery pack w/ battery lifetime up to 2 years)
- Direct, secure and automated data transfer to MindSphere (transmission interval adjustable: 1/h ... 1/48h)
- Sensors included: vibration, temperature, magnetic field (data measuring interval adjustable: 1/min ... 1/h)
- Cost-neutral, factory-mounted and pre-configured standard feature for 1LE5.0 motors

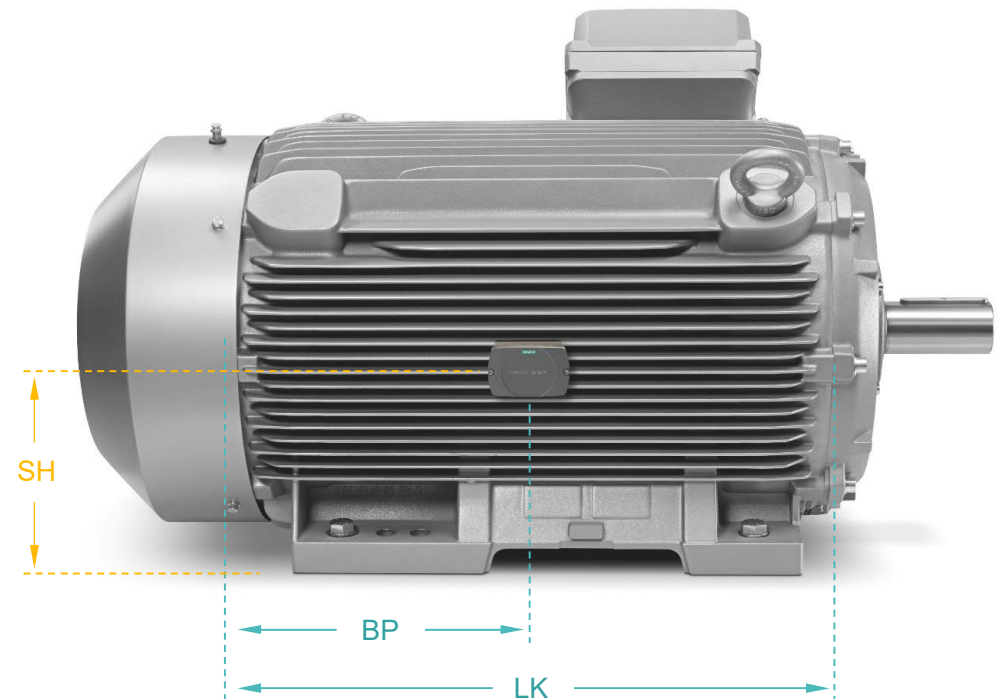


SIMOTICS CONNECT 400 default mounting position for SIMOTICS SD (1LE5x0x) motors

- The SIMOTICS CONNECT 400 mounting position depends on two variables:
 - LK: Length of cast iron housing (without end shields / fan cover)
 - SH: Motor shaft height
- The **mounting height equals the motor shaft height** in order to guarantee an optimized magnetic field measuring.
- The horizontal mounting position **BP equals the length between the NDE end shield and the center of the box.** (in case of option H08 – terminal box on NDE side – BP equals the distance between DE end shield and the center of the box)

→ BP values for 1LE5 motors depending on the variable LK are defined in the following table. *

1LE5 SH 315 / 355	
LK [mm]	BP [mm]
630	315
780	400
≥860	600



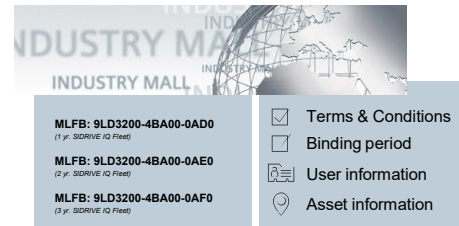
SIMOTICS CONNECT 400 commissioning process (preparation of MindSphere Onboarding)



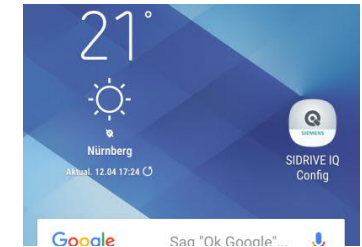
Delivery of motor with SIMOTICS CONNECT 400

Transport regulations:

Due to dangerous goods regulations the **battery plug must be unplugged during transport** at all time and needs to be **connected before usage**.
The motor with SIMOTICS CONNECT 400 is a dangerous good and will be labeled acc. to UN3091.



Ordering of SIDRIVE IQ via iMall
(in a 2nd step via MindSphere directly)



Download Config App
(Release in Google Play Store: July 2018)



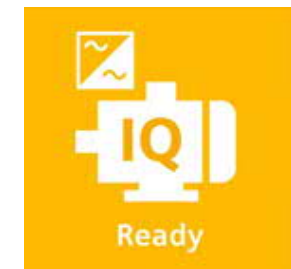
Open CONNECT 400
housing cover



Connect battery plug



Close SIMOTICS CONNECT 400



Ready for SIDRIVE IQ

Data flow from SIMOTICS CONNECT 400 thru MindSphere to SIDRIVE IQ and correlated data security aspects



Siemens (Large Drives)
Provides data security for hardware incl. data sending process (TLS / WPA2)



SIMOTICS CONNECT 400

Customer provides data security during data upstream, e.g. correct setup of Wi-Fi infrastructure



Raw data transmission process via Wi-Fi

Data analysis and storage in MindSphere-based SIDRIVE IQ MindApp

KPI visualization via browser-based SIDRIVE IQ MindApp (html5-format)

SIDRIVE IQ

- Data storage and hosting
- Algorithms and visualization
- User administration

Siemens (MindSphere) provides data security during data analyzing, storage and visualization process (also see MindSphere Security Concept)



Customer

- Improved performance
- Increased uptime
- Improved serviceability

SINAMICS CONNECT 300

MindSphere connectivity for SINAMICS drives



Feature / Function

- Connecting SINAMICS **V20**, **G120** and **Micromaster 4** drives w/o H/W or S/W changes
- Point to point data transfer **outside fieldbus**
- **Connecting up to 8 drives** at a time
- Ease of use: **Plug and Play** commissioning

Benefit

- Connecting M2 and M3 drives to MindSphere w/o S7-parameter services.
- Addressing also machine users and their brown-field installations.
- Keeping data traffic off fieldbus
- Scaling effects to allow for cost efficient connection also of low budget drives.
- Minimizing commissioning efforts to connect drives to cloud

SINAMICS CONNECT 300 based on MindConnect IOT2040

SINAMICS CONNECT 300

13 predefined Parameter, Array of the last 8 failures

ID	Active	Description	Sample Cycle
1	<input checked="" type="checkbox"/>	Displays filtered DC-link voltage	5
2	<input checked="" type="checkbox"/>	Displays filtered [rms] voltage applied to motor	5
3	<input checked="" type="checkbox"/>	Displays (mechanical) shaft power	5
4	<input checked="" type="checkbox"/>	Displays calculated rotor speed based on r0021	5
5	<input checked="" type="checkbox"/>	Displays electrical torque	5
6	<input checked="" type="checkbox"/>	Displays electrical energy used by inverter since display was last reset	5
7	<input checked="" type="checkbox"/>	Displays rated inverter current	5
8	<input checked="" type="checkbox"/>	Nominal motor current from rating plate	5

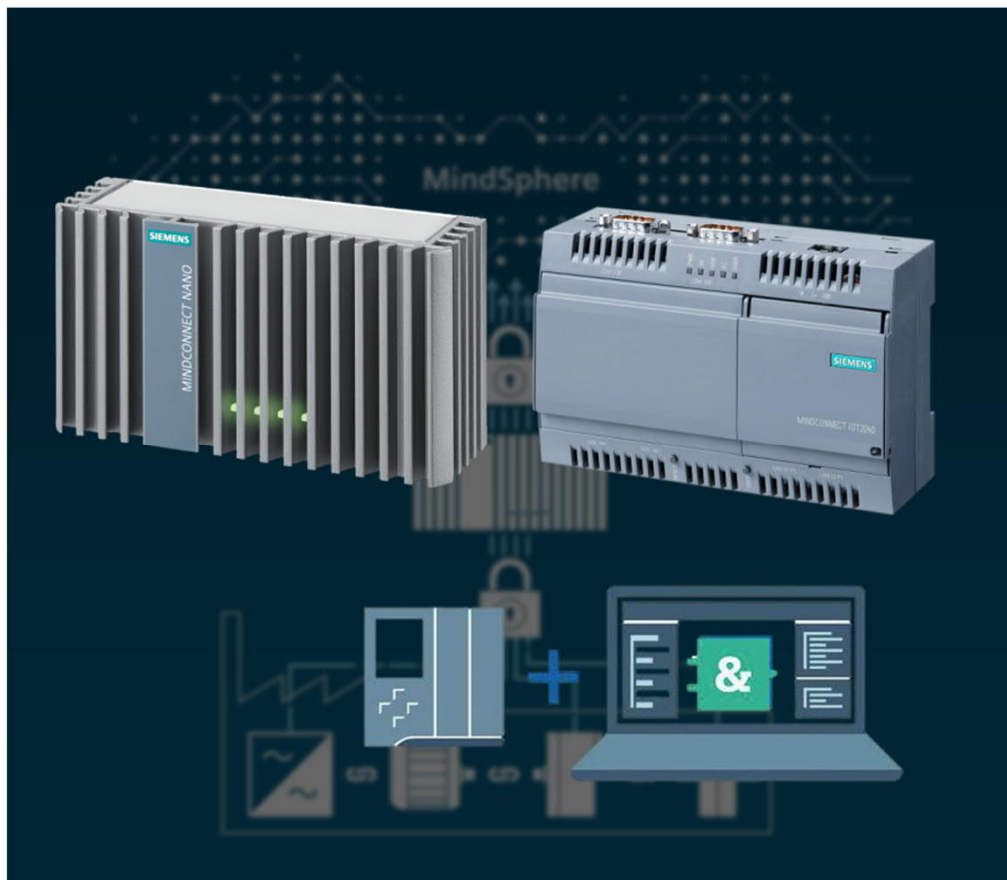
Default Close Save

ID	Active	Description	Sample Cycle
6	<input checked="" type="checkbox"/>	Displays electrical energy used by inverter since display was last reset	5
7	<input checked="" type="checkbox"/>	Displays rated inverter current	5
8	<input checked="" type="checkbox"/>	Nominal motor current from rating plate	5
9	<input checked="" type="checkbox"/>	Displays actual inverter state	5
10	<input checked="" type="checkbox"/>	Displays version number of installed firmware	5
11	<input checked="" type="checkbox"/>	Displays torque-generating current component	5
12	<input checked="" type="checkbox"/>	Heat sink temperature	5
13	<input checked="" type="checkbox"/>	Recent fault trip	5

Default Close Save

- In the first step, 20 predefined parameters are available and activated by default. Of course, these can also be deselected and the sampling time is variable (max. 1s). NOTE: Parameter 11 is not available for V20.
- Further parameters can also be selected in the future.

Available solutions besides SINAMICS CONNECT 300



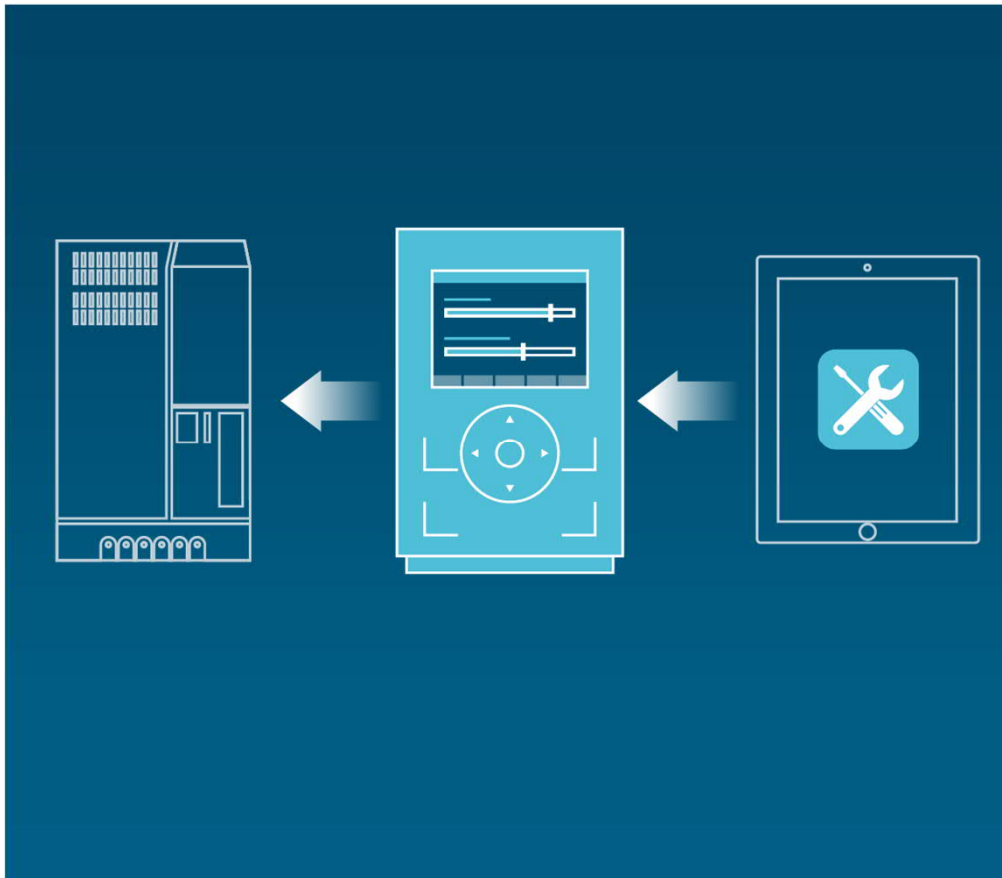
Solution

- **MindConnect Nano:** pre-installed IPC, data extraction via S7 parameter services, supports various protocols for encrypted data transfer to MindSphere.
- **MindConnect IoT2040:** Standalone device, data extraction via S7 parameter services, supports various protocols for encrypted data transfer to MindSphere.
- **MindConnect FB 1500:** Function block for SIMATIC S7-1500 CPUs, supports various protocols for encrypted data transfer to MindSphere.

Benefits

- Data delivery for cloud based applications and services. Enable data analysis to optimize assets and provide appropriate services.

Straightforward user interface thanks to IOP-2



Solution

- Intelligent operation panel for local control, monitoring, commissioning, diagnosis, and service of SINAMICS converters
- Graphical display for displaying status values such as pressure or flow as bar graphs
- Membrane keyboard with IP55 protection rating
- Upload of additional features, languages, and wizards
- Expanded support functionality

Benefits

- High degree of user friendliness, intuitive operation and navigation
- Protection against internal dust deposits and against water jets
- Flexibly adaptable and always up to date
- Fast commissioning saves engineering time
- Fast access to product-specific documents and information as well as contact to customer support (Industry Online Support App) via mobile devices (tablets, smartphones)

Straightforward user interface thanks to IOP-2



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- Intelligent operation panel for local control, monitoring, commissioning, diagnosis, and service of SINAMICS converters
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Smart access for wireless commissioning, diagnosis, and service



Solution

- Web server-based operation unit for mobile commissioning, diagnosis, and service of SINAMICS converters
- Simply plug onto the SINAMICS converter
- Wireless connection to mobile devices (smartphone, tablet, laptop)
- Fast setup thanks to Web server function

Benefits

- Quick and easy serial commissioning of frequency converters
- Monitoring of important converter data
- Easy converter maintenance

Smart access for wireless commissioning, diagnosis, and service

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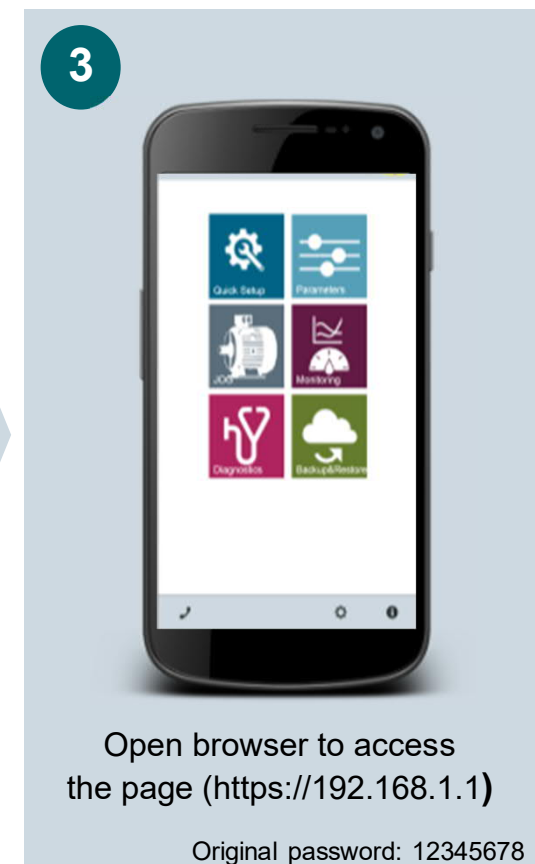
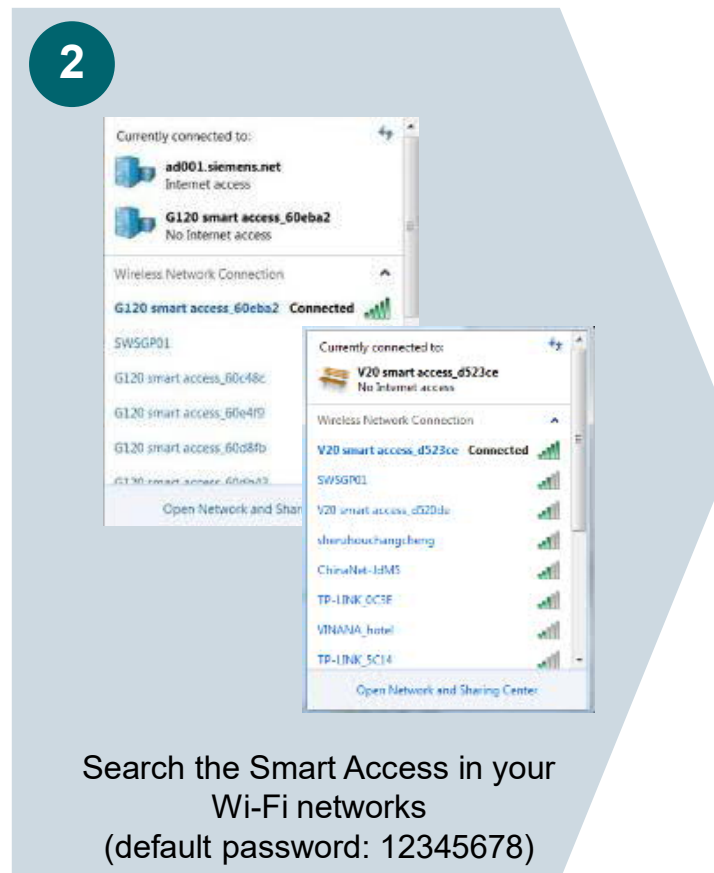
Benefits

- Quick and easy serial commissioning of frequency converters
- Monitoring of important converter data
- Easy converter maintenance

SINAMICS Smart Access Module

-Connect your device in less than one minute

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4*

A step 4 for password changing is mandatory for the 1st access

Thank you for your attention.

SIEMENS
Ingenuity for life



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Technical Consultant

DI MC GMC

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M: 0904258799

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