

System overview

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SINAMICS V90 basic servo drive system

Overview

SINAMICS V90 servo drive system



The performance-optimized, user-friendly servo drive system comprises a SINAMICS V90 servo drive and a SIMOTICS S-1FL6 servomotor. There are eight different servo drive frame sizes and seven motor shaft heights for operation on single and three-phase line supplies with power ratings ranging from 0.05 to 7.0 kW, to realize a wide range of applications, with the focus on dynamic motion and processing - for example positioning, transporting and winding.

In addition to operation in the TIA Portal (as of version V14) with the SIMATIC 1500 T-CPU Advanced Controller, the servo drive system is also suitable for use with the SIMATIC S7-1500 Advanced Controller and the SIMATIC S7-1200 Basic Controller.

Benefits

Cost-effective - many integrated functions to reduce machine costs

Integrated control modes

Pulse train input position control mode (PTI), internal position control mode (IPos) with traversing block or Modbus, speed control mode and torque control are all integrated in the SINAMICS V90.

The drive has various integrated control modes to address a wide range of applications.

Integrated PROFINET – the industrial Ethernet standard for automation

SINAMICS V90 PROFINET version features PROFINET, enabling real-time transmission of user/process data and diagnostic data with a single cable.

This solution offers wide-ranging functions with reduced complexity.

Integrated positioning function

- Positioning function is integrated in the drive. Target positions and respective speeds can be stored in the drive during commissioning or changed via communication.
- Absolute or relative positioning
- Rotary or linear axes
- Referencing in the drive

Point-to-point positioning possible using a PLC without positioning functionality.

Integrated braking resistor for all frame sizes and max. motor power ≥ 0.2 kW

All frame sizes with max. motor power ≥ 0.2 kW have an integrated braking resistor to dissipate the regenerative power for fast braking.

Most applications can be realized without an additional braking resistor.

Integrated holding brake switch (SINAMICS V90, 400 V version)

Integrated holding brake switch - the brake can be directly connected to the drive if a motor with holding brake is used.

Holding brake can be connected without requiring an external relay (only for SINAMICS V90, 400 V version).

Easy to use - Simple tuning and quick commissioning

Easy servo tuning and machine optimization

The system can be automatically optimized using the auto tuning function and automatic suppression of machine resonances.

Simply plug & play, no in-depth servo know-how required.

Easy commissioning using the SINAMICS V-ASSISTANT engineering tool

Graphic user interface guides the user when setting application-specific parameters; intuitive drive and motor status check; integrated trace and measuring functionality.

SINAMICS V-ASSISTANT makes commissioning and diagnostics quick and easy.

www.siemens.com/sinamics-v-assistant

Simple connection to a control system

- Two-channel pulse train for position setpoint, one exclusively for 5 V differential (RS422 standard), one for 24 V single ended signal (for pulse train version)
- Standard RS485 interface supports USS and Modbus RTU (pulse train version)
- Industrial Ethernet standard PROFINET with PROFIdrive (PROFINET version)

Standard interface makes it easy to connect the drive with PLCs and motion controller.

Easy, all from a single source

- Predefined drive/motor bundles and accessories, easy to select
- Tested with SIMATIC PLC/HMI and ready-to-run application examples for connecting a SINAMICS V90 drive to a controller
- Different application examples can be downloaded free of charge from the Online Support Portal

Parameter cloning

SINAMICS V90 servo drives are equipped with a standard SD card slot (400 V version) and a Micro SD card slot (200 V version), so that parameter settings can be easily transferred between drive devices.

Efficient commissioning of machine series.

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Benefits

Extended warranty

For SINAMICS V90, Siemens offers an optional extension of warranty up to 5½ years via Service Protect:

- Free for the first 6 months after registering the product at: <https://myregistration.siemens.com>
- Subject to a charge for a further 3 or 5 years

For further information, go to:

<https://support.industry.siemens.com/cs/ww/en/sc/4842>

Concerning standard warranty please ask your partner at Siemens. Your partner can be found in our Personal Contacts Database at:

www.siemens.com/automation-contact

Identification link according to IEC 61406 for SINAMICS V90

The ID link contains the article and serial number of the product. As a QR code, it replaces the previous data matrix code on the nameplate and takes you with the URL directly to a product information page on the internet with access to the technical documentation, data sheet, certificates, FAQs, product notifications, and catalogs. Paper package inserts become superfluous since the information is available electronically directly via the QR code, even years later. In this way, we are making a valuable contribution to the preservation of our environment. You don't need an additional app. Simply scan the QR code with your smartphone or tablet. According to IEC 61406, the QR code of an ID link is marked with a frame and a triangle at the bottom right.

With their globally unique identifiers, Siemens products are ready for Industry 4.0.

The ID serves as a connection to the administration shell with which modules of the digital twin can be provided.

Further documentation, such as the operating instructions, is available free on the internet at:

www.siemens.com/sinamics-v90/documentation

Application

Application examples

SINAMICS V90 servo drive system			
200 V ... 240 V 1 AC/3 AC		380 V ... 480 V 3 AC	
<u>Low Inertia</u> for high dynamic performance		<u>High Inertia</u> for smooth operational performance	
Electronic assembly industry, for example	• Pick and place machine • Stencil cutting machine • PCB assembly machine • IC handling machine • Chip sorting machine • Bonding machine	Metal forming machinery, for example	• Punching machine • Engraving machine • Edging press
Converting/printing industry, for example	• Labeling machine • Slitter machine • Laminating/coating machine • Screen printing machine	Converting/printing industry, for example	• Winders • Slitter machine • Laminating/coating machine • Screen printing machine • Wire drawing machine
Packaging industry, for example	• Filling and sealing machine • Blister machine (pharmaceutical packaging) • Bag packing machine	Packaging industry, for example	• Filling machine • Blister machine (pharmaceutical packaging) • Bag packing machine
Material handling machinery, for example	• Automatic palletizers	Material handling machinery, for example	• Storage and warehouse systems • Conveyor systems

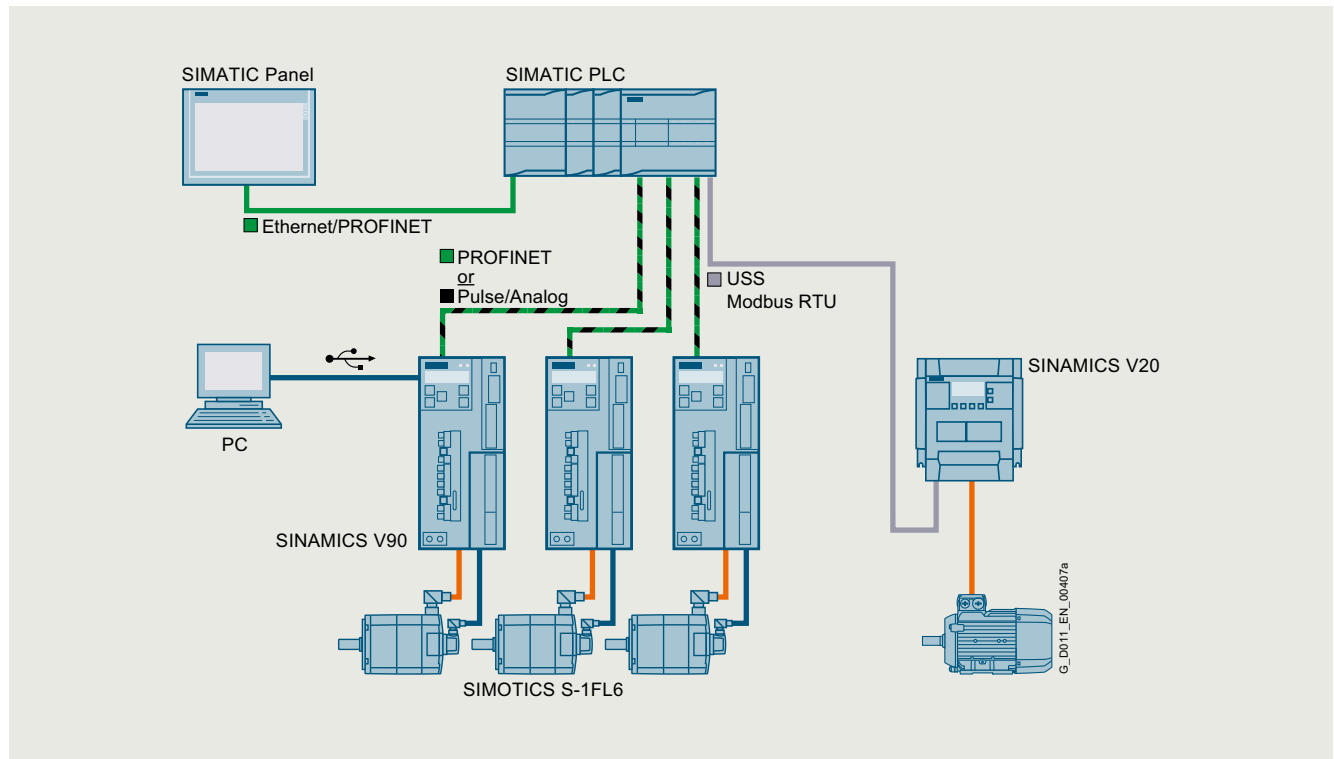
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Design

System topology



Function

Optimized servo performance - quick, smooth and precise positioning

Advanced one-button tuning and real-time auto tuning

Control loop parameters are optimized automatically. One-button tuning can be used when commissioning.

This allows machines to achieve a high dynamic performance and smooth operation in a wide range of applications.

Automatic suppression of machine resonances

When this function is activated the drive identifies mechanical resonance frequencies and automatically suppresses these using a filter. Vibration and noise during operation are reduced. This ensures a high dynamic response of the machine while decreasing machine vibration levels.

Sufficient encoder resolution and high data transfer rates

The encoder is available up to 21-bit resolution (approx. 2.1 million pulses per motor rotation).

Fast data transfer:

- Signaling rate up to 1 MHz (pulse train version)
- 100 Mbit/s transfer rate (PROFINET version)

This allows machines to achieve a high positioning accuracy with low speed ripple.

Optimized system performance

Fast acceleration and braking while maintaining smooth operation to ensure high machine productivity.

- 300 % overload capability of drive and motor
- Low motor torque ripple
- Motor and drive are perfectly harmonized

Reliable operation - Robust design and safe choice

Suitable for harsh environments

- Wide range of line voltages
 - 200 V ... 240 V 1 AC/3 AC (-15 %/+10 %)
 - 380 V ... 480 V 3 AC, (-15 %/+10 %)
- Coated PCB increases robustness of the drive to cope with harsh environments
- Motor is equipped with high-quality bearings

High degree of motor protection

- SIMOTICS S-1FL6 servomotors have degree of protection IP65 as standard
- Oil seal at shaft end as standard
- High-quality metal motor connector (SIMOTICS S-1FL6 High Inertia servomotors)

Integrated safety function STO (safe torque off)

The STO function is a standard feature of all SINAMICS V90 servo drives. This function prevents the motor from moving unexpectedly and complies with safety standard SIL 2 according to EN 61508 resp. PL d, Cat 3 according to EN ISO 13849. This safety functionality can be realized without additional components (activation only via terminals of SINAMICS V90, not supported via PROFINET/PROFIsafe).

Complete motion control solutions from Siemens

SINAMICS V90 System and SIMATIC – Siemens offers comprehensive solutions from a single source for general motion control applications with different SINAMICS application examples.

Siemens application examples comprise the following:

- Ready-to-run application examples including wiring diagram and parameter description
- Sample configuration to connect SINAMICS V90 drives to the appropriate SIMATIC controller – this includes hardware and software, a corresponding wiring example, installation instructions for the S7 project provided, drive parameterization and an HMI sample project

Benefits for the customer:

- An operational project is configured properly
- A motor is quickly made operational
- Basis for a customer-specific configuration
- TIA advantages are optimally leveraged

Can be downloaded free of charge via the Online Support Portal:

www.siemens.com/sinamics-applications

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Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS V90 basic servo drive system:

SINAMICS Selector app

Mobile selection guide for frequency converters

Siemens has developed the SINAMICS Selector app as a practical tool for finding article numbers for your SINAMICS converters in the power range from 0.1 kW to 630 kW quickly and easily.

Whether for SINAMICS V20, SINAMICS V90, SINAMICS G120C, SINAMICS G120P, SINAMICS G120X, SINAMICS G120, SINAMICS G220, SINAMICS S200 or SINAMICS S210: The app will provide you with the correct article numbers conveniently.

How does it work?

Simply select your application, the frequency converter you require, the rated power and device options as well as the necessary accessories.

Then you can save your selection and send it by email. Your pre-selection is the basis for an order specification with the dealer/Siemens.

You will find the free downloads for Android and for iOS at the following link:

www.siemens.com/sinamics-selector

DriveSim Designer (firmware V1.04.03 or higher)

DriveSim Designer provides easy-to-use models for PROFIdrive-enabled SINAMICS converters, so you can create a digital twin of your drive.

More information is provided on the internet at:

www.siemens.com/drive-virtualization

Siemens Product Configurator

The Siemens Product Configurator helps you to configure the optimum drive technology products for a number of applications – starting with gear units, motors, converters as well as the associated options and components and ending with controllers, software licenses and connection systems.

The Siemens Product Configurator can be used on the internet without requiring any installation. The Siemens Product Configurator can be found in SiePortal at the following address: www.siemens.com/spc

SINAMICS V-ASSISTANT – Easy-to-use engineering tool for commissioning and diagnostics

A PC with installed SINAMICS V-ASSISTANT software tool can be connected to SINAMICS V90 via standard USB port or from V1.07.00 via PROFINET port (for SINAMICS V90 PROFINET version only). It is used for setting parameters, test operation, troubleshooting – and has powerful monitoring functions.

SINAMICS V-ASSISTANT can be downloaded free of charge from the SINAMICS V90 internet page:

www.siemens.com/sinamics-v90

You can find further information about the SINAMICS V-ASSISTANT in the Engineering tools section.

Technical specifications

General technical specifications

SINAMICS V90 servo drive system 200 V ... 240 V 1 AC/3 AC Low Inertia for high dynamic performance

SINAMICS V90 servo drive	
Line supply and power	200 V ... 240 V 1 AC (–15 % / +10 %), 0.05 kW ... 0.75 kW 200 V ... 240 V 3 AC (–15 % / +10 %), 0.05 kW ... 2 kW
Control mode Pulse train (PTI) version	Positioning with pulse train, internal positioning, speed, torque, fast PTI
Control mode PROFINET (PN) version	Speed control, basic positioner control (EPOS)
Degree of protection	IP20
SIMOTICS S-1FL6 servomotors	
Shaft height	20, 30, 40, 50
Rated torque	0.16 ... 6.37 Nm
Rated speed	3000 r/min
Max. speed	5000 r/min
Encoder	- Incremental encoder TTL 2500 S/R¹⁾; - Absolute encoder 21-bit single-turn - Absolute encoder 20-bit single-turn + 12-bit multi-turn
Degree of protection	IP65, natural cooling

SINAMICS V90 servo drive system 380 V ... 480 V 3 AC High Inertia for smooth operational performance

SINAMICS V90 servo drive	
Line supply and power	380 V ... 480 V 3 AC (–15 % / +10 %), 0.4 kW ... 7 kW
Control mode Pulse train (PTI) version	Positioning with pulse train, internal positioning, speed, torque, fast PTI
Control mode PROFINET (PN) version	Speed control, basic positioner control (EPOS)
Degree of protection	IP20
SIMOTICS S-1FL6 servomotors	
Shaft height	45, 65, 90
Rated torque	1.27 ... 33.40 Nm
Rated speed	2000 r/min / 3000 r/min
Max. speed	4000 r/min
Encoder	- Incremental encoder TTL 2500 S/R; - Absolute encoder 20-bit single-turn + 12-bit multi-turn
Degree of protection	IP65, natural cooling

More information

Detailed information on SINAMICS V90, the latest technical documentation (brochures, dimension drawings, certificates, manuals and operating instructions) is available on the internet at: www.siemens.com/sinamics-v90

In addition, the Siemens Product Configurator can be used on the internet. The Siemens Product Configurator can be found in SiePortal at the following address: www.siemens.com/spc

¹⁾ For very low speed, high accuracy or high dynamic application TTL encoder is not recommended.

Integration

Pulse train version (PTI)

- RS485 interface for Modbus RTU/USS to communicate with a PLC

PROFINET version (PN)

- 2 RJ45 connectors for PROFINET communication with a PLC

Status indicator

- RDY indicates servo ready/alarm state
- COM indicates communication with PC

Integrated operator panel

- 6 digits, 7-segment LED
- 5 buttons

High-quality connectors

Braking resistor

- If the internal braking resistor is not sufficient, disconnect DCP and R2, then connect DCP and R1 with an external braking resistor

Shield plate

- Easy shield connection to cables and improved EMC behavior

Standard mini USB socket

- To connect a PC with engineering

SD card slot

- To copy parameters
- Standard SD card slot (SINAMICS V90, 400 V version)
- Micro SD card slot (SINAMICS V90, 200 V version)

Safe Torque Off

- Motor holding brake (only SINAMICS V90, 400 V version)

Control/status interface

Pulse train version (PTI)
Setpoint interface

- 50 pins
- Pulse train input
- Encoder emulation pulse output
- DI/DO, AI/AO
- Motor holding brake¹⁾ (only SINAMICS V90, 200 V version)

PROFINET version (PN)
I/O interface

- 20 pins
- DI/DO
- Motor holding brake¹⁾ (only SINAMICS V90, 200 V version)

Motor encoder connector

¹⁾ Motor holding brake signal (only SINAMICS V90, 200 V version). The SINAMICS V90, 200 V version requires an external relay to connect the motor holding brake.

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SIMOTICS S-1FL6, High Inertia

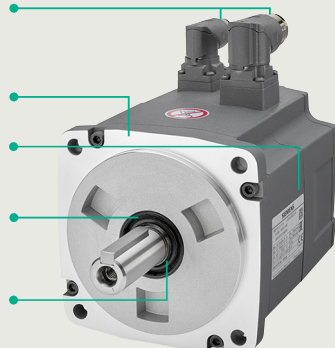
High-quality metal connector

IP65 degree of protection standard for all motors

High-quality bearings

High-wear-resistant oil seal material

Shaft sleeve protection



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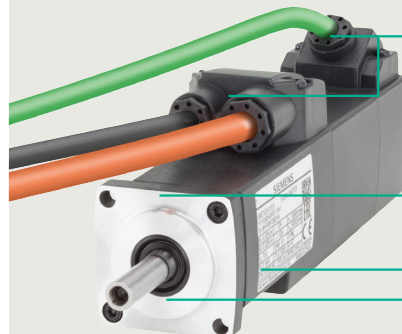
SIMOTICS S-1FL6, Low Inertia

Compact cable connection

IP65 degree of protection standard for all motors

High-quality bearings

High-wear-resistant oil seal material



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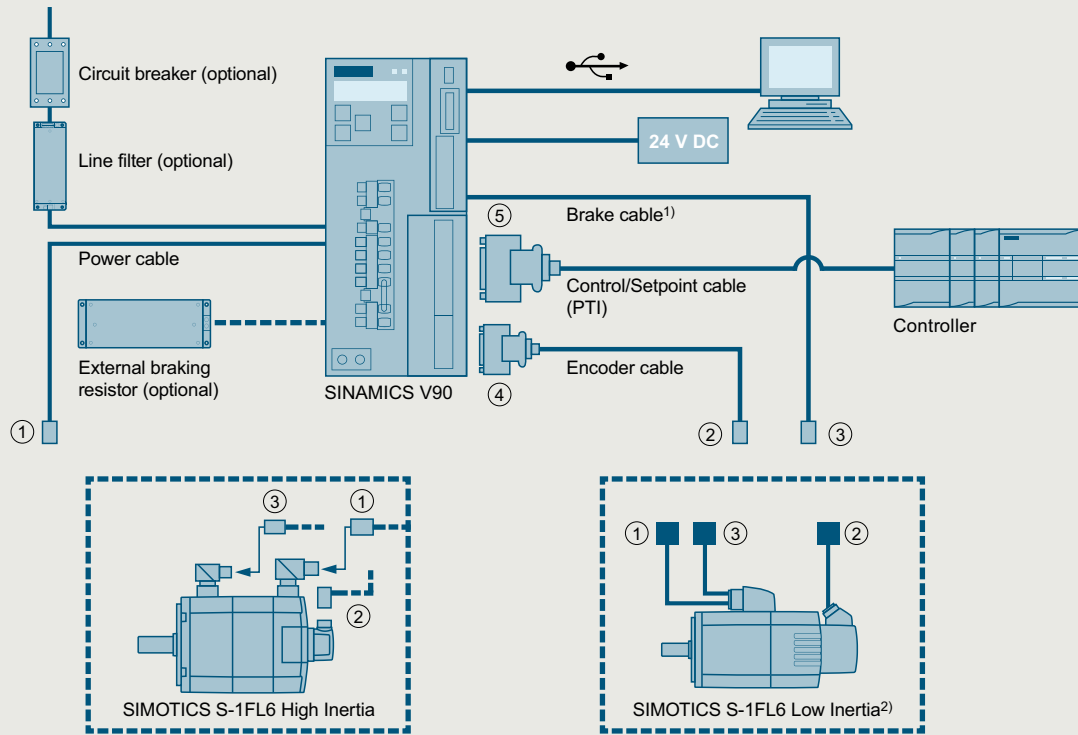
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Integration

System connection diagram for SINAMICS V90 pulse train version



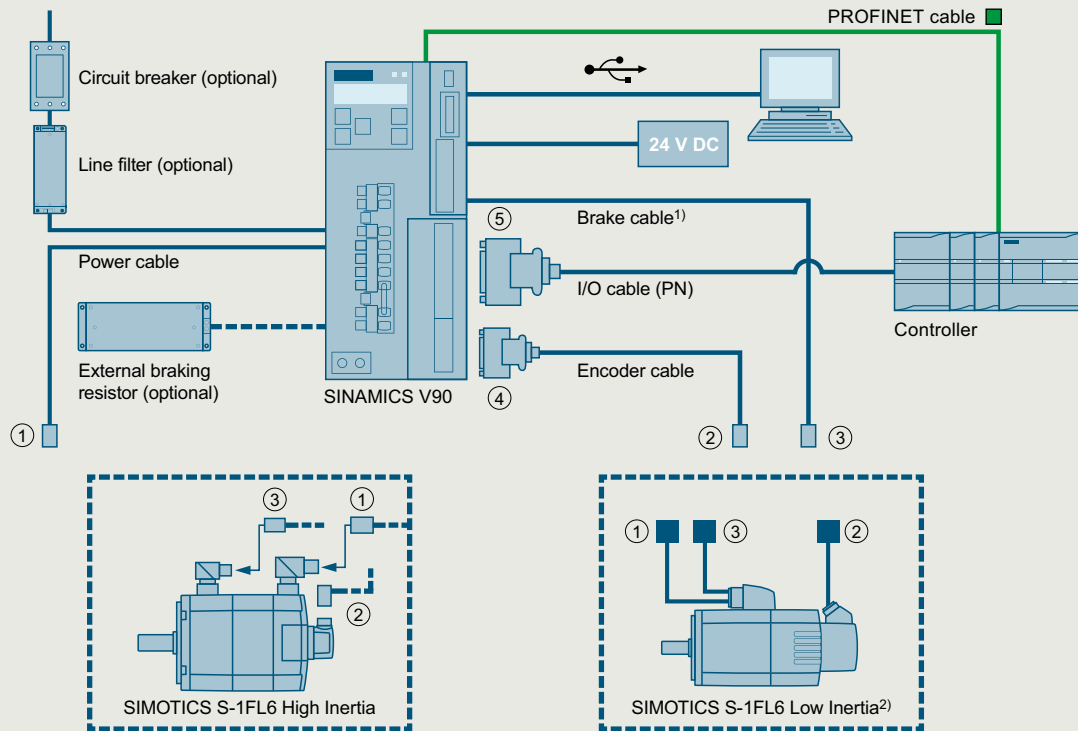
¹⁾ Brake cable connection shown here is for SINAMICS V90 400 V version only. The SINAMICS V90 200 V version requires an external relay to connect the motor brake cable. The relay has to be connected via the setpoint cable for the SINAMICS V90 pulse train version. For more information, refer to the SINAMICS V90 operating instructions.

²⁾ SIMOTICS S-1FL6 Low Inertia servomotors in shaft heights 20/30/40 use outlet connection concept with pre-mounted cable end and plastic connection plug-in system.

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Integration

System connection diagram for SINAMICS V90 PROFINET version



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- ¹⁾ Brake cable connection shown here is for SINAMICS V90 400 V version only. The SINAMICS V90 200 V version requires an external relay to connect the motor brake cable. The relay has to be connected via I/O cable for the SINAMICS V90 PROFINET version. For more information, refer to the SINAMICS V90 operating instructions.
- ²⁾ SIMOTICS S-1FL6 Low Inertia servomotors in shaft heights 20/30/40 use outlet connection concept with pre-mounted cable end and plastic connection plug-in system.

- ① Power connector (motor side)
- ② Encoder connector (motor side)
- ③ Brake connector (motor side)
- ④ Encoder connector (drive side)
- ⑤ I/O connector