System Description

Subsystem Application
Anti Spin Control
## Revision history

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<th>Date</th>
<th>Changed</th>
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<tr>
<td>May 2016</td>
<td>Replaced screen images for system overview and vehicle geometry; Updated to Engineering Tomorrow design</td>
<td>0301</td>
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<td>August 2014</td>
<td>Danfoss layout</td>
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<td>August 2011</td>
<td>Updated wiring diagram</td>
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<tr>
<td>August 2011</td>
<td>Updated screen captures, added anti spin valve</td>
<td>AB</td>
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<tr>
<td>July 2011</td>
<td>First edition</td>
<td>AA</td>
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Overview

About this document

This document provides general information about the ASC SSA Subsystem Application (SSA) software for use with Danfoss PLUS+1® microcontrollers and associated hydraulic and electronic products. In addition, it is a reference tool for vehicle OEM design, engineering, and service personnel.

SSA software puts 40 years of Danfoss mobile machinery propel system experience at your fingertips. It is a fully worked out application software example, enabling faster time-to-market and improved performance and functionality for both new machine designs and model variants. PLUS+1® GUIDE programmability allows developers to modify the SSA according to their individual vehicle requirements.

For control system developers programming in GUIDE, this document along with relevant software files, user manuals, and other documents is included in the Application File posted on the Danfoss web site for easy customer access and download.

This document is one of several sources of technical information for the control system. Additional sources of technical information for the control system are listed under Referenced documentation on page 7.

OEM responsibility

The OEM of a machine or vehicle in which Danfoss products are installed has the full responsibility for all consequences that might occur. Danfoss has no responsibility for any consequences, direct or indirect, caused by failures or malfunctions.

- Danfoss has no responsibility for any accidents caused by incorrectly mounted or maintained equipment.
- Danfoss does not assume any responsibility for Danfoss products being incorrectly applied or the system being programmed in a manner that jeopardizes safety.
- All safety critical systems shall include an emergency stop to switch off the main supply voltage for the outputs of the electronic control system. All safety critical components shall be installed in such a way that the main supply voltage can be switched off at any time. The emergency stop must be easily accessible to the operator.
Overview

Concept and function

The Anti Spin Control Subsystem Application (ASC SSA) is designed for use with hydraulically propelled vehicles incorporating single pump in conjunction with multiple motors. The subsystem application software includes: an Application Block, Plug-in features, and a sample application.

User-programmable Anti Spin Control Subsystem Application

Benefits

The ASC SSA is a fully integrated, dual path control system solution that's ready to be tailored to your vehicle requirements. The software is made up of validated component software blocks that greatly reduce vehicle testing time, provide responsive control and reduced project risk.

The graphical application code can be modified with GUIDE, using PLUS+1® Compliant products, such as sensors, pumps and motors.

These PLUS+1® Compliant products are represented by functional software blocks. These blocks can be dragged, dropped and connected to modify the ASC SSA to accommodate vehicle characteristics that are different from those of the example application.

Compliance blocks that are pre-programmed for CAN communication between joysticks and PLUS+1® controllers are particularly easy to modify within the application.

Advanced control features and flexibility of plug-in design provide state of the art system performance.

Pre-configured service screens are provided to set up the software and adjust parameters.
The ASC SSA example application has been designed to operate on the PLUS+1® MC050-012 microcontroller, but the ASC SSA can be modified to run on other PLUS+1® application hardware modules.

ASC SSA example application diagram
### System Description

#### ASC SSA

#### Referenced documentation

Comprehensive technical literature online at powersolutions.danfoss.com

#### PLUS+1° software development tools

<table>
<thead>
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<tr>
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<td>10100824</td>
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<td>520L0899</td>
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<tr>
<td>CG150 CAN/USB Gateway Interface Communicator Data Sheet</td>
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#### Subsystem application

The application software files are listed under Application file on page 11.

<table>
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<td>Application Block User Manual</td>
<td>70047311</td>
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<td>Steering Plug-in GUIDE Programming User Manual</td>
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<td>Machine State Plug-in User Manual</td>
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#### Electronic product

PLUS+1° microcontrollers and displays

<table>
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<tr>
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<td>DP2XX Graphical Display Family Technical Information</td>
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<td>DP200 Series Graphical Terminals Technical Information</td>
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<td>DP250 Series PLUS+1 Mobile Machine Displays Data Sheet</td>
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<td>DP600 Series Graphical Terminals Technical Information</td>
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Sensors

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<td>MBS2250 Heavy Duty Pressure Transmitter (SAE Thread Version) Data Sheet</td>
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#### Hydraulic product

High power axial piston pumps with electronic displacement control

<table>
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<tr>
<td>H1 Axial Piston Pump, Size 078, Single Technical Information</td>
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<td>H1 Axial Piston Pump, Size 115/130, Single Technical Information</td>
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<td>H1 Axial Piston Pump, Size 147/165, Single Technical Information</td>
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**Referenced documentation**

### High power axial piston pumps with electronic displacement control (continued)

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<tr>
<td>H1 Axial Piston Pump, Size 115/130, 147/165, ISL Integrated Speed Limitation Technical Information</td>
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<td>Series 90 Axial Piston Pumps Technical Information</td>
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### High power variable displacement motors

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<tr>
<td>H1B Bent Axis Variable Displacement Motors, Size 060/080/110 Technical Information</td>
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<td>Series 51, Series 51-1 Bent Axis Variable Displacement Motors Technical Information</td>
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<tr>
<td>Series 90 Axial Piston Motors Technical Information</td>
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### Medium power variable axial piston pumps with electronic displacement control

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<tr>
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<td>H1 Axial Piston Pump, Size 045/053 Single Technical Information</td>
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<td>H1 Axial Piston Pumps, Single and Tandem Basic Information</td>
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### Medium power variable displacement motors

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<tr>
<td>L and K Frame Variable Motors Technical Information</td>
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<tr>
<td>Series 40 Axial Piston Motors Technical Information</td>
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System Description
ASC SSA

Control system

System development tools

PLUS+1® GUIDE (Graphical User Integrated Development Environment) is a desktop software development tool used to create and customize application software to specific vehicle requirements. GUIDE’s graphical editor allows easy development or modification of example applications by system engineers without formal software development training.

Components and application blocks can be dragged from the component selector and dropped onto the programming workspace for time-saving system design in the PLUS+1® GUIDE environment, generating downloadable applications for all programmable PLUS+1® controllers and displays.

PLUS+1® Service Tool uses the CG150 Interface Communicator for programming PLUS+1® controllers via CAN bus from a computer. Additionally, the PLUS+1® Service Tool features data logging capabilities with oscilloscope and bar graph displays used for diagnostics and tuning. Graphical design features allow development of specialized service screens to support applications created in PLUS+1® GUIDE.

The CG150 CAN/USB Gateway Interface Communicator serves as the interface between PLUS+1® modules on the vehicle CAN network and a laptop USB port.

Application hardware

The SSA software may only be loaded onto keyed PLUS+1® application hardware. If the application hardware key matches the Danfoss application software key the service tool permits the download to the target application hardware.

Danfoss application key number is: 10106603
See product data sheet for controllers assembly part numbers.

Software details

GUIDE-programmable

PLUS+1® GUIDE programmable application software blocks. Graphical application code contained in the PLUS+1® GUIDE programmable pages of the SSA can be modified by the user to tailor the application to the specific needs of the vehicle or PLUS+1® controllers that are different from the example provided by Danfoss.

Application block

The software application block assesses the wheel speed with consideration to vehicle geometry and steer angle, wheel slip is identified and a corresponding output command signal is generated for integration with the propel hardware and/or software configuration. The application block supports manual enabling/disabling, operating tolerances for minimum motor speed, maximum motor speed and steer angle.

Plug-ins

The Application Block accepts optional plug-in modules. Plug-ins provide design flexibility by allowing enhanced features or performance. They may be used or deleted to conserve code space. Basic dual path control functionality is preserved by replacing plug-ins with jumpers.

• Plug-in Steering_PI Page
Control system

- **Steering** plug-in converts vehicle geometry to values understood by the application block. Two and four wheel Ackerman steering geometry support is included, custom solutions may be created and utilize socket.

- **Plug-in MachineState_PI Page**
  - **Machine State** plug-in assesses command relative to propel conditions to establish an appropriate anti-spin operation. The plug-in utilizes pressure signals to determine slip wheel relative to vehicle acceleration or deceleration.

**I/O mapping**

- **Input_Mapping** page connects hardware input signals to appropriate software signals used within the ASC application block and plug-ins.
- **Output_Mapping** page connects the output command to physical hardware.
- **Parameters** page applies configuration values for the anti spin operation.
- **Diagnostic** page provides checkpoint visibility for the subsystem application.

**Input mapping, output mapping, parameters, diagnostic**

**Downloading SSA software**

PLUS+1® GUIDE license holders may visit the Danfoss web site, download the application file, and install the enclosed software and documentation on their hard drive.
Control system

- The application file contents are downloaded to your computer by clicking on the SSA exe.zip link, clicking through the user acceptance agreement and installing the contents in the folder you specify on your hard drive.

Application file

Application file for SSA software products contains all SSA graphical source code files, all required service screens software files, and all software product documentation and user manuals associated with the SSA. The software product documentation and user manuals (PDF) files are listed under Referenced documentation on page 7: Subsystem application.

The Application file for the ASC SSA includes the following software files:

<table>
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<tr>
<th>Software Name</th>
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<td>Subsystem Application Software</td>
<td>.P1P</td>
<td>11081276</td>
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<tr>
<td>Application Block Software</td>
<td>.SCS</td>
<td>11096901</td>
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<tr>
<td>Steering Plug-in Software</td>
<td>.SCS</td>
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<tr>
<td>Release Notes</td>
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Vehicle Geometry screen

Service Tool configurability. The Vehicle Geometry screen is used to configure the physical dimensions and steering mechanism.

Vehicle Geometry screen and Diagnostic Navigator
Control system

System Overview screen

Service Tool configurability. The System Overview screen consolidates the most important about the system, links provide access to additional detail.

System Overview screen and Diagnostic Navigator
Related products

Electronic product details

PLUS+1® microcontrollers

- High speed DSP technology to process even the most complex applications
- CAN-based communications for state-of-the-art control performance
- 256K internal flash memory is recommended

PLUS+1® expansion modules

- Expand control system capabilities with CAN-based Input/Output modules
- 12 and 24 pin housings with five possible configurations
- Stackable design for optimum mounting flexibility

DP200 and DP250 displays

- Cost effective alternative to existing analogue gauges
- DP200 high-resolution monochrome displays fit every budget without compromising performance
- DP250 high resolution color TFT (240x320 pixels, 15-bit color) displays are viewable in a wide range of lighting conditions
- Options featuring front USB 2.0 port for easy connection to PC-based service and diagnostic tools, extended I/O for improved input design flexibility, real-time clock, and display heater
- Customize the look and feel of engine monitoring and performance messages with Engine Information Center (EIC) application software
  - Read and display engine operation and performance messages which are transmitted by the engine control module over a J1939 CANbus
  - Supports fifty engine and machine performance variables on up to four screens with up to four variables per screen
  - Soft keys at the front of the display provide the operator with easy navigation through diagnostic and engine information
Related products

DP600 display

- Transflective TFT and DSTN, LCD display technologies, high resolution display, antiglare screen, and sensor controlled backlighting
- CAN, RS-232 and USB interfaces
- Additional inputs for an external navigation button, which enables you to maneuver through all terminal functions

MBS pressure sensors

- Available in seven sizes ranging from 2.5 bar to 600 bar [362 psi to 8,702 psi], load pressure is 10 to 20 times the measuring range
- Temperature compensated, linearized, and laser calibrated
- Available with DIN or UNF thread

KPP pulse pickup speed sensors

- Outputs a digital pulse signal in response to the speed of a permanently magnetized speed ring on the motor’s cylinder block or shaft
- Ideal for low-speed measurement
- For rugged outdoor, mobile, speed-sensing applications that do not allow contact with the rotating shaft
Hydraulic product details

H1 axial piston variable pumps

- Optimized for electrohydraulic control
- Designed for improved operating efficiencies
- Designed for short length and compact installation

Series 90 high power axial variable piston pumps

- 7 different displacements
- Pressures up to 480 bar [6962 psi]

H1 medium power integral tandem axial piston pumps

- 2 integral tandem displacements
- Optimized for electrohydraulic control
Related products

**S42 medium power variable pumps**

- Pressures up to 415 bar [6019 psi]
- Integral loop flushing

**H1B bent axis variable displacement motors**

- Zero degree motor angle capability
- Electric 2-position or electric proportional control
- Higher corner HP/package size ratio

**Series 51 bent axis variable displacement motors**

- Large displacement ratio (5:1)
- Compact and lightweight
- Pressures up to 480 bar [6962 psi]

**Series 90 high power axial piston motors**

- Two-position motor
- Short installed length
Related products

**L and K frame medium power motors**
- Cartridge and SAE mounts available
- Variable motor with 3.4:1 working displacement ratio
- 5 displacements in one compact package

**Series 40 medium power motors**
- Short installed length
- Pressures up to 345 bar [5000 psi]

**Low speed high torque motors**
- High efficiency
- Long life under extreme operating conditions
- Smooth running over entire speed range

**Anti spin control valve**
- Easy to service
- Flexibility
Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electronic components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market. Building on our extensive applications expertise, we work closely with our customers to ensure exceptional performance for a broad range of off-highway vehicles.

We help OEMs around the world speed up system development, reduce costs and bring vehicles to market faster.

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Wherever off-highway vehicles are at work, so is Danfoss. We offer expert worldwide support for our customers, ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide comprehensive global service for all of our components.

Please contact the Danfoss Power Solution representative nearest you.

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www.comatrol.com

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Turolla
www.turollaocg.com

Hydro-Gear
www.hydro-gear.com

Daikin-Sauer-Danfoss
www.daikin-sauer-danfoss.com

Products we offer:
- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1® GUIDE
- Proportional Valves
- Sensors
- Steering
- Transit Mixer Drives

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