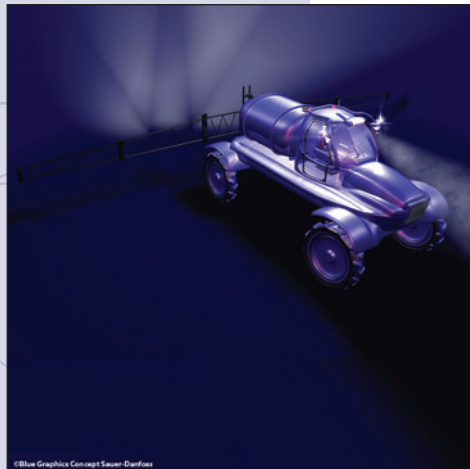


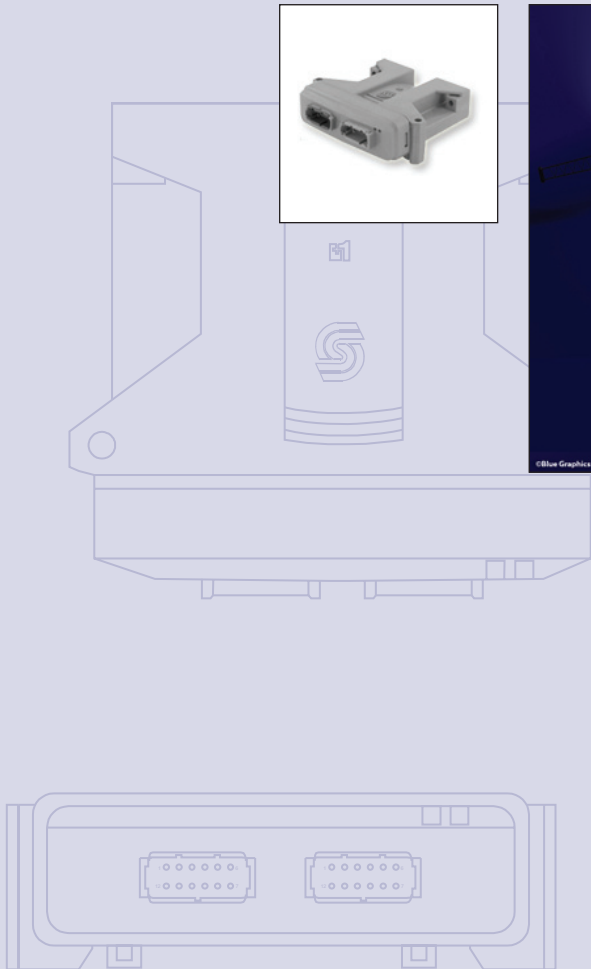


Anti Spin Control Subsystem Application

System Description



©Blue Graphics Concept Sauer-Danfoss



Revision History

Table of Revisions

Date	Page	Changed	Rev
August 2011	7	Updated wiring diagram	BA
August 2011	11—13, 19	Updated screen captures, added anti spin valve	AB
July 2011		Initial release	AA

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About this Document

This document provides general information about the Anti Spin Control (ASC) Subsystem Application (SSA) software for use with Sauer-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 Sauer-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 Sauer-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, pages 8 and 9.

OEM Responsibility

The manufacturer of a machine or vehicle using PLUS+1 electronic controls is responsible for correctly applying and configuring PLUS+1 products. Sauer-Danfoss recommends that the OEM perform a system-level Failure Mode Effects Analysis (FMEA).

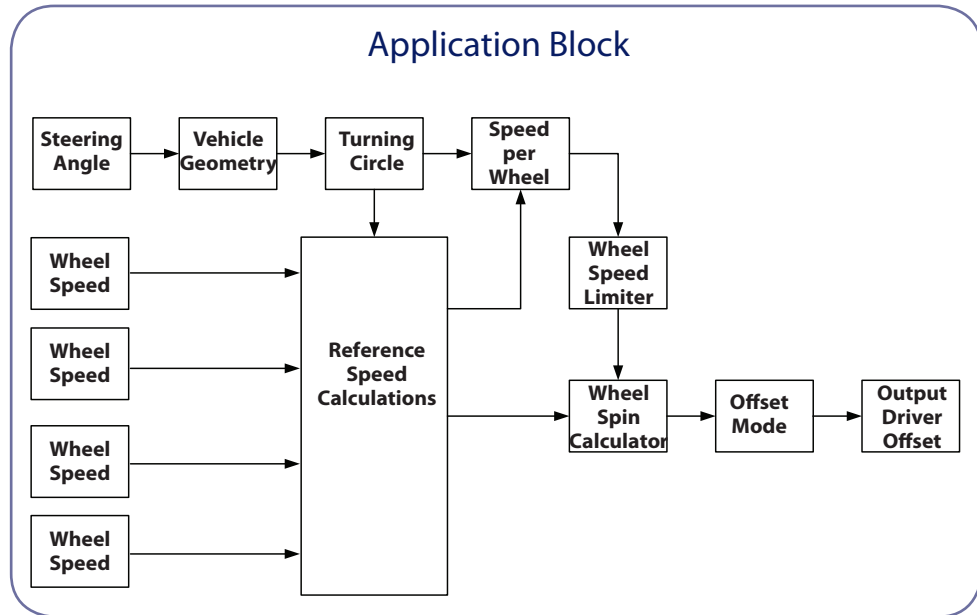
You can find additional information about OEM responsibilities in the *PLUS+1 Controller Family Technical Information, 520L0719* and *Recommended System Start-up Procedures Technical Information, 11010667*.

Overview

Concept and Function

The ASC SSA is designed for use with hydraulically propelled vehicles incorporating single pump in conjunction with multiple motors. The sub-system application software includes: an Application Block, Plug-in features and a sample application.

User-programmable Anti Spin Control Subsystem Application



P200 076

Benefits

The ASC SSA is a control system solution ready to be tailored to a vehicle's propel system requirement. The software is made up of validated component software blocks that reduce vehicle testing time, provide responsive control and reduced project risk.

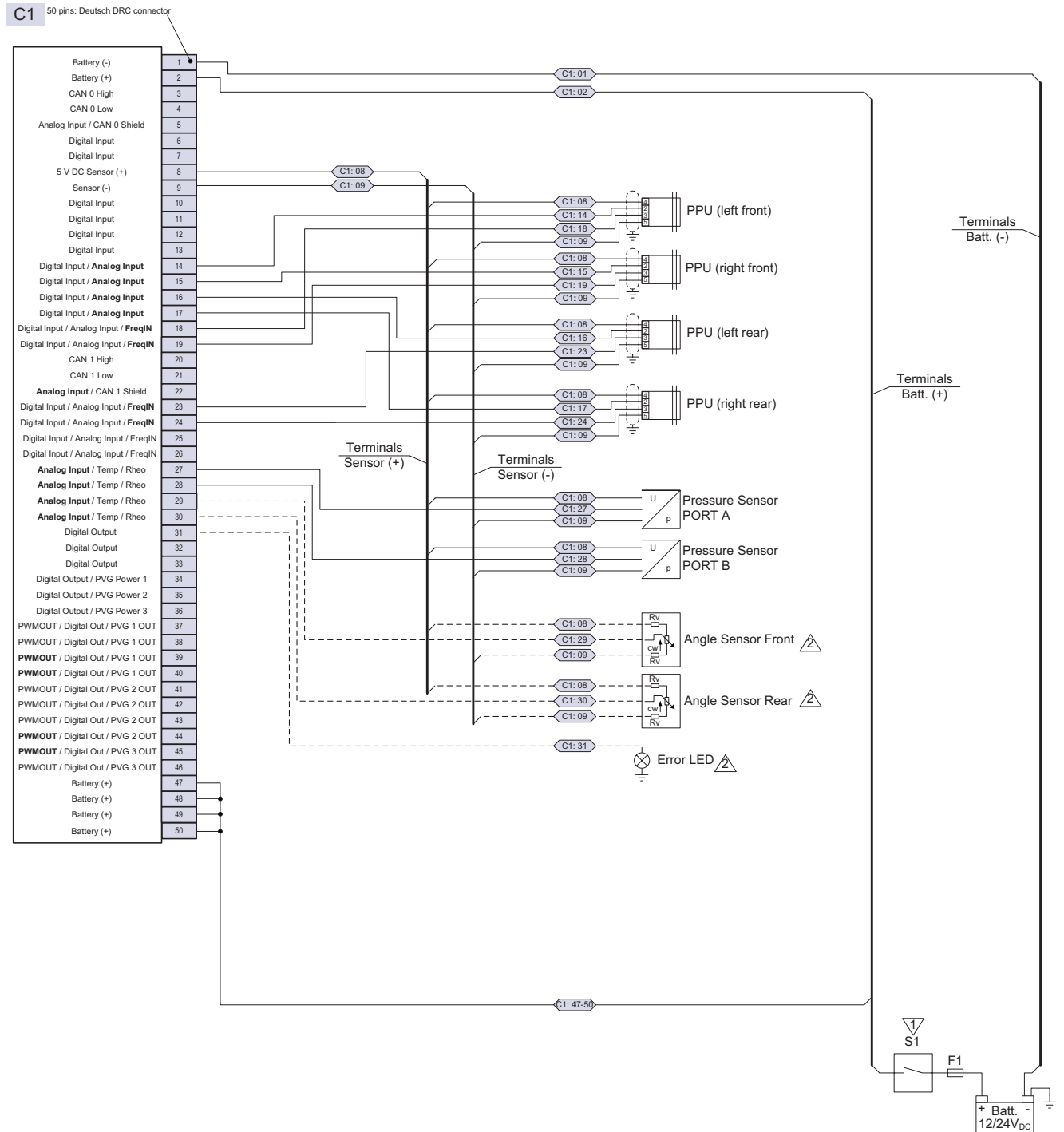
Developers can modify the GUIDE graphical application code. PLUS+1 Compliant products, such as sensors, pumps and motors, that are represented by functional software blocks, can be dragged, dropped and connected to modify the SSA to accommodate ASC system configurations that differ from the sample application. In addition, completely custom solutions may be developed in GUIDE.

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.

System Application Wiring Diagram

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.



Enter provided Sauer-Danfoss documents order numbers in search feature online at:
www.sauer-danfoss.com

PLUS+1 Software Development Tools

PLUS+1 GUIDE Data Sheet	520L0708
PLUS+1 GUIDE User Manual	10100824
PLUS+1 GUIDE Service Tool User Manual	520L0899
CG150 CAN/USB Gateway Interface Communicator Data Sheet	520L0945

Subsystem Application

The application software files are listed under *Application File*, page 14.

System Description	L1106431
Data Sheet	L1106107
Recommended Machine Electronic Control System Start Up Procedures	11010667
Subsystem Application Service Tool User Manual	70055034
Subsystem Application I/O Mapping User Manual	70054663
Application Block User Manual	70047311
Steering Plug-in GUIDE Programming User Manual	70047346
Machine State Plug-in User Manual	70047347

Electronic Product

PLUS+1 Microcontrollers and Displays

PLUS+1 Controller Family Technical Information	520L0719
DP2XX Graphical Display Family Technical Information	L1026202
DP200 Series Graphical Terminals Technical Information	11023625
DP250 Series PLUS+1 Mobile Machine Displays Data Sheet	L1026137
DP600 Series Graphical Terminals Technical Information	520L0699

Sensors

MBS2250 Heavy Duty Pressure Transmitter (SAE Thread Version)	11005452
MBS2250 Heavy-Duty Pressure Transmitter (DIN Thread Version)	520L0801
KPP Pulse Pickup (PPU) Technical Information	11029257

Hydraulic Product

High Power Axial Piston Pumps with Electronic Displacement Control

H1 Axial Piston Pump, Size 078, Single Technical Information	11062169
H1 Axial Piston Pump, Size 089/100, Single Technical Information	11069970
H1 Axial Piston Pump, Size 115/130, Single Technical Information	11063346
H1 Axial Piston Pump, Size 147/165, Single Technical Information	11063347
H1 Axial Piston Pump, Size 115/130, 147/165, ISL Integrated Speed Limitation Technical Information	11053026
Series 90 Axial Piston Pumps Technical Information	520L0603

High Power Variable Displacement Motors

H1B Bent Axis Variable Displacement Motors, Size 060/080/110 Technical Information	11037153
Series 51, Series 51-1 Bent Axis Variable Displacement Motors Technical Information	520L0440
Series 90 Axial Piston Motors Technical Information	520L0604

Medium Power Variable Axial Piston Pumps with EDC

H1 Axial Piston Pump, Size 045/053 Tandem Technical Information	11063345
H1 Axial Piston Pump, Size 045/053 Single Technical Information	11063344
H1 Axial Piston Pumps, Single and Tandem Basic Information	11062168

Medium Power Variable Displacement Motors

L and K Frame Variable Motors Technical Information	520L0627
Series 40 Axial Piston Motors Technical Information	520L0636

System Development Tools



PC with Sauer-Danfoss PLUS+1 GUIDE.
Gateway supported by Service Tool program.
PLUS+1 compliant module.

F101 908

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 microcontrollers and displays.

PLUS+1 Service Tool uses the CG150 Interface Communicator for programming PLUS+1 microcontrollers via CAN bus from a computer. Additionally, the 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 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 ASC SSA software may only be loaded onto keyed PLUS+1 application hardware. If the application hardware key matches the Sauer-Danfoss application software key the service tool permits the download to the target application hardware.

Sauer-Danfoss application key number is: 10106603

Software Details

GUIDE-programmable Application Software Blocks

Graphical application code contained in the GUIDE-programmable pages of the ASC SSA can be modified by the user to tailor the application to the specific needs of the vehicle or PLUS+1 microcontrollers that are different from the example provided by Sauer-Danfoss. The following pages are accessible to developers:

Application Block

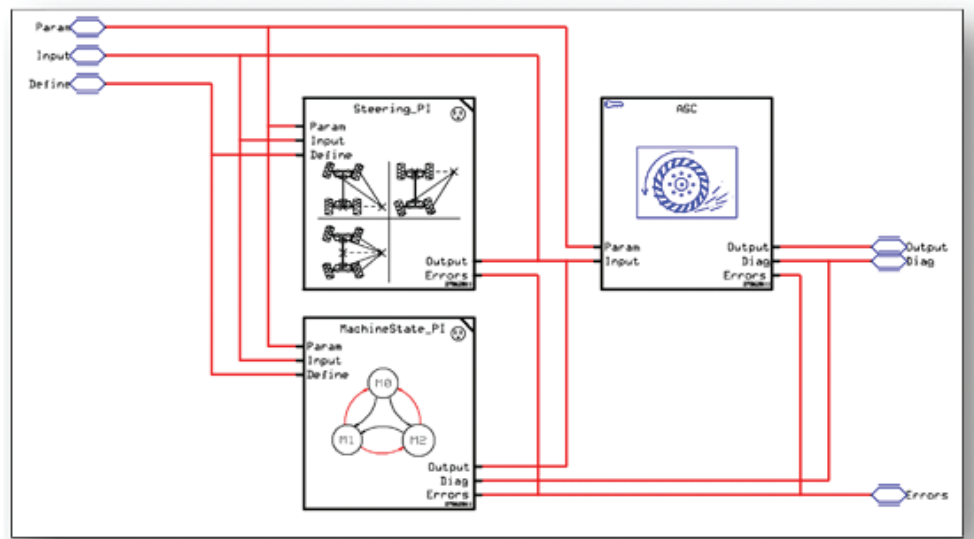
The software Application Block assesses the wheel speed with consideration to vehicle geometry and steer angle, wheel slip is identified and a corresponding output command signal is generated for integration with the propel hardware and /or software configuration. The application block supports manual 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**
 - 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.

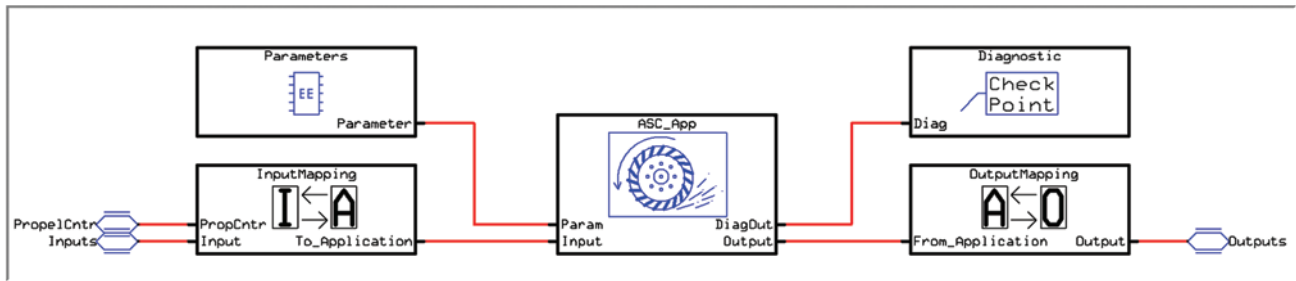
I/O Mapping



F200 016

Software Details (continued)

- **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.



F200 017

Software Details (continued)

Diagnostic Navigator

Name	Value	Status
ASC SubSystemApplication		
Documents		
ECU List		
Log Functions		
Parameter Functions		
System Status		
Set All Defaults		
System Overview		
Inputs		
Input Steering PI		
Vehicle Geometry		
Front Angle S		
Rear Angle S		
Input State Machine I		
Direction Detectic		
Pressure Sensor f		
Pressure Sensor f		
Input Core		
Wheel Speeds		
PPU Setting F		
PPU Setting F		
PPU Setting F		
PPU Setting F		
Proneel Setpnnts		

Service Tool Configurability

Used to configure the physical dimensions and steering mechanism.

Vehicle Geometry

Steering System: No Steering

Front Axle width: 0 mm

Front Axle Sensor: No Sensor

Wheel base: 0 mm

Rear Axle width: 0 mm

Rear Axle Sensor: No Sensor

Ident-No.: SW-Version:

F200 018

Diagnostic Navigator

Name	Value	Status
ASC SubSystemApplication		
Documents		
ECU List		
Log Functions		
Parameter Functions		
System Status		
Set All Defaults		
System Overview		
Inputs		
Input Steering PI		
Vehicle Geometry		
Front Angle S		
Rear Angle S		
Input State Machine I		
Direction Detectic		
Pressure Sensor f		
Pressure Sensor f		
Input Core		
Wheel Speeds		
PPU Setting F		
PPU Setting F		
PPU Setting F		
PPU Setting F		
Proneel Setpnnts		

Consolidates the most important about the system, links provided access to additional detail.

System Overview

Core Input

Wheel Speed

FL: 0 mm/s

FR: 0 mm/s

RL: 0 mm/s

RR: 0 mm/s

Propel Setpoint

FL: 0 %/1000

FR: 0 %/1000

RL: 0 %/1000

RR: 0 %/1000

ASC Core

Radius

FL: 0 mm

FR: 0 mm

RL: 0 mm

RR: 0 mm

Relative Speed

FL: 0 mm/s

FR: 0 mm/s

RL: 0 mm/s

RR: 0 mm/s

Tolerances

FL: 0 %/1000

FR: 0 %/1000

RL: 0 %/1000

RR: 0 %/1000

Wheel Slip

FL: 0 %/1000

FR: 0 %/1000

RL: 0 %/1000

RR: 0 %/1000

Reference Radius

FL: 0 mm

Reference Speed

0 km/h

0 mm/s

Output

Propel Setpoint

Motor to 0°

FL: 0 %/1000

FR: 0 %/1000

RL: 0 %/1000

RR: 0 %/1000

Pump Inching

Mode: Disabled

0 %/1000

Errors

Code: 0 0

ASC/ABS Function

Status: Off

Input Plugin

Input Steering

No Steering

Front Angle: 0 0.01°

Rear Angle: 0 0.01°

Input StateMachine

Press. A: 0 0.1 Bar

Press. B: 0 0.1 Bar

Machine: Neutral

Steering Plugin

Steer Angle Valid

FL: 0 0.01°

FR: 0 0.01°

RL: 0 0.01°

RR: 0 0.01°

State Machine Plugin

Machine Moving Dir: Neutral

Machine Accel: Continuous

Control Mode: Slowest Wheel

Parameter Mode: Slowest Wheel

Ident-No.: SW-Version:

F200 019

Software Details (continued)

Downloading SSA Software

PLUS+1 GUIDE license holders may visit the Sauer-Danfoss web site, download the Application File, and install the enclosed software and documentation on their hard drive.

- The Application File is located online for customer downloading at this location: <http://www.sauer-danfoss.com/Products/MobileElectronics/PLUS1GUIDE/PLUS1GUIDEDownloads/ApplicationSoftware>.
- The Application File contents are downloaded to your computer by clicking on the SSA .exe 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: Subsystem Application*, page 8.

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

Software Installer Executable	11081276_v*
Subsystem Application Software	11081276
Application Block Software	11096901
Steering Plug-in Software	11096922
Machine State Plug-in Software	11096923
Release Notes (*.PDF file)	— —

Electronic Product Details



F101 879

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.



F101 878

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.



F500 036

DP200 and DP250 Displays

- Cost effective alternative to existing analogue gages.
- 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 CAN bus.
 - 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.



F301 609

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.



F101 920

MBS Pressure Sensors

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

Electronic Product Details
(continued)



F101 881

KPP Pulse Pickup Speed Sensor

- 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



F301 389

H1 Axial Piston Variable Pumps

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



F301 346

Series 90 High Power Axial Variable Piston Pumps

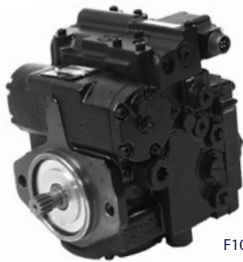
- 7 different displacements.
- Pressures up to 480 bar [6962 psi].



F301 384

H1 Medium Power Integral Tandem Axial Piston Pumps

- 2 integral tandem displacements.
- Optimized for electrohydraulic control.



F101 922

S42 Medium Power Variable Pumps

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



F301 602

H1B Bent Axis Variable Displacement Motors

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

**Hydraulic Product Detail
(continued)**



F301 559

Series 51 Bent Axis Variable Displacement Motors

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



F301 343

Series 90 High Power Axial Piston Motors

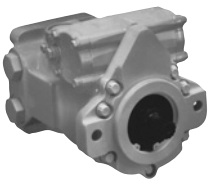
- Two-position motor.
- Short installed length.



F301 351

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.



F101 923

Series 40 Medium Power Motors

- Short installed length.
- Pressures up to 345 bar [5000 psi].



F301 220

Low speed high torque motors

- High efficiency.
- Long life under extreme operating conditions.
- Smooth running over entire speed range.



Anti Spin Control Subsystem Application
System Description
Related Products

**Hydraulic Product Detail
(continued)**



F200 019

Anti Spin Control Valve

- Easy to service.
- Flexibility.



- 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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