

One Control SP

One Control SP surge protection system

Part of the large Siemens Energy Compressor Train One Control family

[siemens-energy.com](https://www.siemens-energy.com)



General information

Surges pose a risk to every turbocompressor. Even when the surge limit control system settings are perfect, surges can occur for a variety of reasons, such as instrumentation faults, limited cooling capacity or contamination, particularly after an extended period of operation. A pressure surge occurs when the flow of gas through the compressor fails. This can result in increased forces within the compressor which may ultimately cause damage to the compressor.

The One Control SP surge protection system is an autonomous module (based on Simatic S7 components) that reliably detects surges on the basis of signal gradients. This protection measure therefore relies on a different operating principle than surge limit control and may also use different measurement signals. The surge protection unit is a small separate PLC device with an I/O interface that contains the Siemens Energy surge protection algorithm.

Surge protection

The surge protection application protects the machine from damage caused by repeated surge events. Surge cycles are often accompanied by flow reversals and major fluctuations in process variables. For this reason, two surge protection versions of One Control SP are available:

- A stand-alone version with its own hardware, as an independent unit for a process stage
- Alternatively, a software module for integration into the One Control unit control system.

Application

We supply One Control SP as standard for compressor trains whose compressor control system is not included in our scope of delivery. For oxygen compressors, an independent surge protection system is required, so it is supplied in the form of an additional protection unit.

The SIMATIC S7 surge protection device is used in critical applications to ensure that the machine is protected from damage caused by repeated surge events. One Control SP is an autonomous module for a process stage. It is customized by Siemens Energy commissioning engineers on site to suit the particular process.

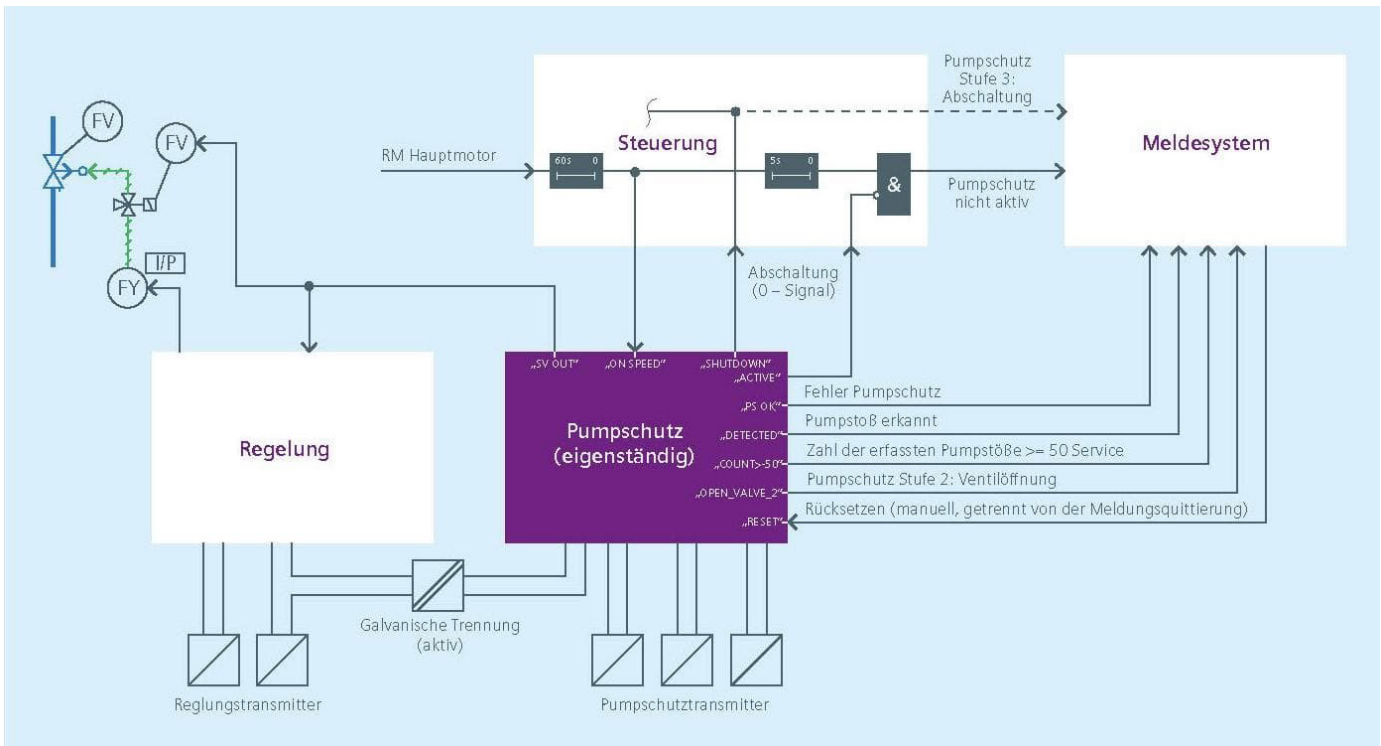
One Control SP reliably detects surges based on signal gradients. This protection measure therefore relies on a different operating principle than surge limit control and may also use different measurement signals.

During a surge test, all events are monitored and the surge behavior is recorded. This makes it possible to configure the protection algorithm such that only actual surges result in tripping during later operation.

The availability of the process is not affected. Surges pose a risk to every compressor.

Even when the surge limit control system settings are perfect, surges can occur for a variety of reasons, such as instrumentation faults, limited cooling capacity or contamination, particularly after an extended period of operation.

One Control SP is based on a standardized, proven program module. The module acquires and processes up to four analog input signals of the process stage to be protected.



Integration of surge protection system of the stand-alone type into the overall control system (schematic drawing)

Mode of operation

The mode of operation differs from that of a control system. Whereas the control system defines a boundary line in the compressor map and prevents it from being exceeded by constantly regulating the opening of the surge limit control valve, the surge protection system responds in the event of real surge events. Surges are detected due to the large signal changes over time that accompany this event. The evaluation of the registered surges is performed in three stages: alarm annunciation, full rapid opening of the surge limit control valve and, if necessary, shutdown of the compressor.

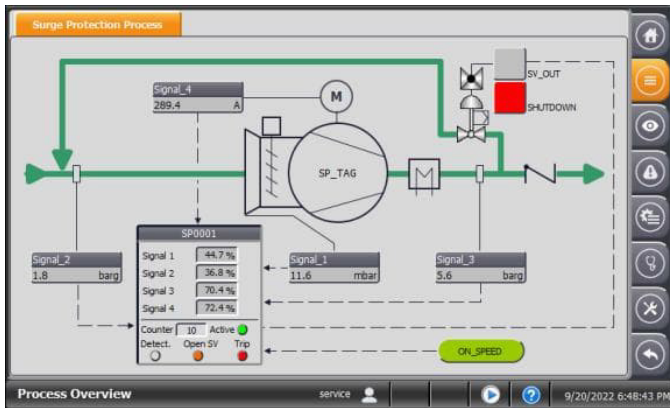
Surge protection and availability

False tripping and failure of the surge protection device reduce the availability of the compressor. In order to prevent false tripping (while still ensuring reliable tripping of the device when a surge event occurs), it is important that the optimal measuring point for this purpose is monitored.

Up to 4 signals can be evaluated with the One Control SP surge protection device for this reason. If several signals are applied, the signal that is optimally suited for this purpose is used. These signals can relate to the following measurements:

- Discharge pressure
- Suction pressure
- Motor current
- Differential pressure at a flow measuring point
- Suction or discharge pressures between the individual compressor stages
- Suction temperature

To further increase availability, a 2-out-of-3 version of the surge protection system can also be supplied as an option.



Process overview

Additional options

The stand-alone One Control SP surge protection module can be equipped with various options. The following applications are available as options:

- HMI device with the following features:
 - Trend view for surge event analysis (up to max. 10 surges)
 - Alarm view
 - Long-term archiving
 - Hardware diagnostics without an additional programming device
 - Remote control (Sm@rtClient)
 - Process view
 - Signal simulation feature
 - Operation
 - Reset feature
- DCS Modbus TCP/IP, OPC-UA
- Sm@rtClient

The following applications are provided with the DCS connection option:

- Alarm view
- Hardware diagnostics
- Remote control (Sm@rtClient)
- Process view
- Signal simulation feature
- Operation
- Reset feature

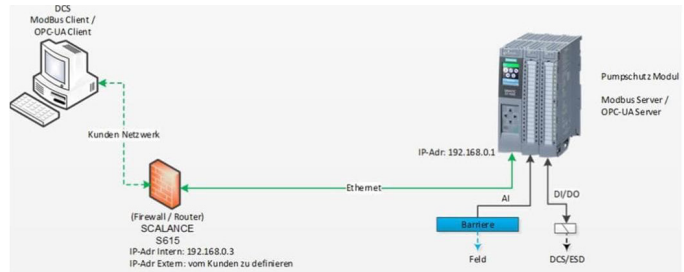
Network topology

The figure below shows the network topologies of the different options of the One Control SP module that are available.

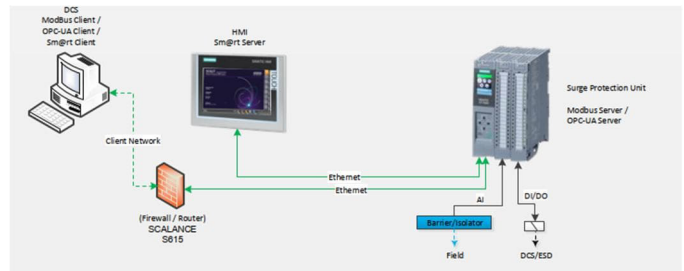


Option 1: Stand-alone

Option 2: With HMI



Option 3: With DCS-Modbus TCP/IP, OPC-UA



Option 4: With HMI & DCS-Modbus TCP/IP, OPC-UA, Sm@rtClient

Diagnostic features for service

In addition to the number, time and date of the last 400 surges, the measured values of the connected sensors for the last 10 events are also recorded. This allows the service technician to conduct more detailed diagnostics so that problems can be eliminated quickly.



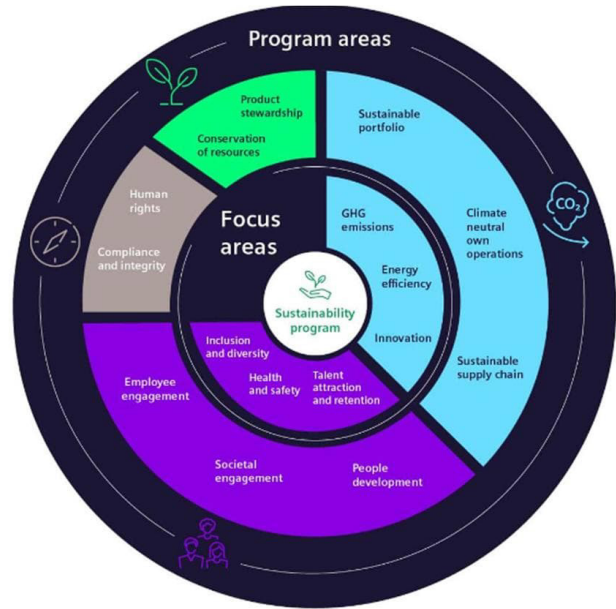
Surge event

On the way ahead – sustainability for future generations

Sustainability lies at the heart of our corporate strategy. It allows us to drive future growth, improve prosperity and increase our resilience. We are a preferred partner for our stakeholders and for shapers of the global energy turnaround.

Our sustainability program is aligned with our corporate purpose of supplying society with energy and at the same time contributes to the United Nations Sustainable Development Goals. This program steers our activities so that we can concentrate on the most important issues that help us to fulfill our mission to help our customers transition to a more sustainable world.

Our divisions, regional units and central functions work together to implement the program. We measure our progress against our goals and strategic KPIs.



Published by
Siemens Energy Global GmbH & Co. KG
Transformation of Industry
Siemenspromenade 9
91058 Erlangen
Germany

Published by
Siemens Energy, Inc.
Transformation of Industry
4400 N Alafaya Trail
Orlando, FL 32826
USA

© Siemens Energy, 2025
Siemens Energy is a trademark licensed by Siemens AG.

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract. All product designations may be trademarks or product names of Siemens Energy Global GmbH & CO. KG or other companies whose use by third parties for their own purposes could violate the rights of the owners.