Metso’s Neles SwitchGuard™ SG9000 is a top class intelligent on/off valve controller designed to operate on any valve actuator. Unique embedded diagnostic features are integrated in its design and enable users to guarantee the availability of their switching valves in demanding processes. SwitchGuard can be easily fitted to the actuator and its controlled pneumatic capacity replaces any solenoid valve, providing a simple and reliable interface with the process control system. Diagnostic information is presented in easily understandable way using FDT technology, such as Metso DeviceCare™, to enable planned maintenance of potentially failing valve assemblies before they have chance to impact on the process.

**KEY FEATURES**

- Reliable and robust design
- The rugged cover protects the unit from environmental hazards and external abuse
- Ease of use
- Language selection: English, German and French
- Local / remote operation
- Expandable architecture
- Advanced device diagnostics including
  - Self-diagnostics
  - Online diagnostics
  - Performance diagnostics
- Speed control for switching
- HART communication

**Options**

- Full stainless steel enclosure (SG9300)
- High pneumatic capacity (SG9200)
- Integrated limit switches
- Position transmitter
- U/I converter to support binary control

**Total cost of ownership**

- Low energy and air consumption
- Future proof design allows further options at a reduced cost
- Optimised spares program. Reduced number of spares

**Designed to switch**

- Several pre-selected opening and closing profiles
- Opening and closing can be configured separately
- Minimised pressure impacts in piping
- Excellent speed control performance
- Highly reliable pneumatics unit
- Wide pneumatics capacity

**Easy installation and configuration**

- Same unit for linear and rotary valves, double and single-acting actuators
- Simple fast calibration and configuration
  - using Local User Interface (LUI)
  - using DTM / EDD in a remote location
  - using Distributed Control System (DCS) asset management tools
- Low power design enables installation to all common control systems

**Open solution**

- Metso is committed to delivering products that freely interface with software and hardware from a variety of manufacturers and Neles SwitchGuard is no exception. This open architecture allows the SwitchGuard to be integrated with other field devices and systems.
- FDT and EDD based multi-vendor support configuration
- Support files for SG9000H are available from our internet page, at http://www.metso.com/valves - choose the link: download center

**Stainless steel version**

Neles SwitchGuard SG9300 Stainless Steel version, a new addition to the SwitchGuard family of safety valve controllers, is manufactured in a stainless steel housing and developed for use in corrosive environments.
**Easy to maintain**
- Modular design with maintenance components
- Alterable pneumatics module
- Fewer components to maintain than in a traditional instrumentation solution
- Visibility of the whole valve package

**Mounting**
- Can be mounted on single and double acting pneumatic actuators
- Can be mounted on both rotary and linear valves
- Extensive selection of mounting kits for 3rd party actuators

**Product reliability**
- Designed to operate in harsh environmental conditions
- Rugged modular design
- Excellent temperature characteristics
- Vibration and impact tolerant
- IP66 enclosure
- Full stainless steel enclosure (SG9300)
- Protected against humidity
- Maintenance free operation
- Resistant to dirty air
- Wear resistant and sealed components
- Contactless position measurement

**Predictive maintenance**
- Easy access to collected data with Metso DTM
- Logical trend collection
- Information collected on service conditions
- Fast notifications with on-line alarms
- Condition monitoring tool available

**TECHNICAL DESCRIPTION**

The SwitchGuard is a 4–20 mA loop-powered microcontroller-based intelligent on/off valve controller. The binary 24 VDC signal can be used via optional U/I converter. SwitchGuard operates even with a 3.6 mA input signal and communicates via HART. The device contains a Local User Interface enabling local configuration. A PC with FDT/DTM software can be connected to the SwitchGuard itself or to the control loop.

The powerful 32-bit microcontroller controls the valve position. The measurements include:
- Input signal
- Valve position with contactless sensor
- Actuator pressures, 2 independent measurements
- Supply pressure
- Device temperature

Advanced self-diagnostics guarantees that all measurements operate correctly. Failure of one measurement does not cause the valve to fail if the input signal and position measurements are operating correctly. After connections of electric signal and pneumatic supply, the micro controller (μC) reads the input signal, position sensor (α) and pressure sensors (Ps, P1, P2). A difference between setpoint according to the stroke curve and position sensor (α) measurement is detected by the control algorithm inside the μC. The μC calculates a new value for prestige (PR) coil current based on this information.

The changed current to the PR changes the pilot pressure to the spool valve. Reduced pilot pressure moves the spool and the actuator pressures change accordingly. The spool opens the flow to the driving side of the double diaphragm actuator and opens the flow out from the other side of the actuator. The increasing pressure will move the diaphragm piston. The actuator and feedback shaft rotate clockwise.
**NELES® SWITCHGUARD™ INTELLIGENT ON/OFF VALVE CONTROLLER**

**TECHNICAL SPECIFICATIONS**

**Neles SwitchGuard**

**General**
Loop powered, no external power supply required.
Suitable for rotary and linear valves.
Actuator connections in accordance with VDI/VDE 3845 and IEC 60534-6 standards.
Action: Double or single acting
Travel range: Linear: 10–120 mm
Rotary: 45–95°
Measurement range 110° with freely rotating feedback shaft

**Environmental influence**
Standard temperature range: -40° – +60 °C / -40° – +140 °F

**Enclosure**
Material: Anodised aluminum alloy and glass window (SG92_, not E2)
Protection class: IP66, NEMA 4X
Pneumatic ports: SG921_ 1/4 NPT
SG9235 1/2 NPT
SG9237 1 NPT (1/2 NPT supply)
Conduit entry thread: M20 x 1.5
Weight: SG921_ 3.0 kg / 6.6 lbs
SG9235 4.6 kg / 10.1 lbs
SG9237 5.0 kg / 11 lbs
Limit switches +1.0 kg / 2.2 lbs
Mechanical and digital position indicator visible through the main cover (SG92_, not E2).

**Pneumatics**
Supply pressure: 3–8 bar / 44–116 psi
Air quality: According to ISO 8573-1:2001
Solid particles: Class 7
Humidity: Class 1
(dew point 10 °C/50 °F below minimum temperature is recommended)
Oil class: 3 (or <1 ppm)
Capacity with 4 bar / 60 psi supply:
SG9212 7 Nm³ /h / 4.1 scfm (Cv = 0.06)
SG9215 90 Nm³ /h / 53 scfm (Cv = 0.7)
SG9235 380 Nm³ /h / 223 scfm (Cv = 3.2)
SG9237 feed 380 Nm³/h /223 scfm (Cv = 3.2)
exhaust 700 Nm³/h / 412 scfm (Cv = 6.4)
Consumption with 4 bar / 60 psi supply:
actuator pressurized 0.22 Nm³ /h / 0.13 scfm,
actuator vented 0.25 Nm³ /h / 0.15 scfm

**Electronics**
Electrical connection: max. 2.5 mm²
HART
Supply power: Loop powered, 4-20 mA
Minimum signal: 3.6 mA
Current max : 23 mA
Load voltage: up to 9.5 V DC / 20 mA
(corresponding 475 Ω.)
Voltage: max. 30 V DC
Polarity protection: -30 V DC
Over current protection: active over 35 mA
Max power dissipation: 1.05 W
with position transmitter 1.74 W

**Position transmitter (optional)**
Output signal: 4–20 mA (galvanic isolation; 600 V DC)
Supply voltage: 12 - 30 V DC
Resolution: 16 bit / 0.244 μA
Linearity: <0.05 % FS
Temperature effect: <0.35 % FS
External load: max 0–780 Ω
max 0–690 Ω for intrinsically safe

**Local User Interface (LUI) functions**
- Local control of the valve
- Monitoring of valve position, input signal, temperature, supply and actuator pressure difference
- Guided start-up function
- LUI may be locked remotely to prevent unauthorised access
- Automatic travel calibration
- Tuning
- Parameter selection
- Language selection: English, German and French
- Alarm and warning state indications
- Latest event view
# APPROVALS AND ELECTRICAL VALUES

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Approval</th>
<th>Electrical values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATEX</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SG X</td>
<td>VTT 09 ATEX 033X</td>
<td></td>
</tr>
<tr>
<td><strong>SG X</strong></td>
<td>VTT 09 ATEX 034X</td>
<td></td>
</tr>
<tr>
<td><strong>SG E6</strong></td>
<td>SIRA 11ATEX1006X</td>
<td></td>
</tr>
<tr>
<td><strong>IECEx</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SG X</td>
<td>IECEx VTT 10.0004X</td>
<td></td>
</tr>
<tr>
<td><strong>SG X</strong></td>
<td>IECEx VTT 10.0005X</td>
<td></td>
</tr>
<tr>
<td><strong>SG E6</strong></td>
<td>IECEx SIR 11.0001X</td>
<td></td>
</tr>
<tr>
<td><strong>INMETRO</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SG Z</td>
<td>NCC 12.0793 X</td>
<td></td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-0:2008 versão corrigida 2011</td>
<td>Ex ia IIC T6...T4 Ga</td>
<td>Input: U≤ 28 V, I≤ 120 mA, Pi ≤ 1.0 W, Ci ≤ 22 nF, Li ≤ 53 μH  PT: U≤ 28 V, I≤ 120 mA, Pi ≤ 1.0 W, Li ≤ 53 μH, Ci ≤ 22 nF</td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-11:2009</td>
<td>Ex ia IIC T6...T4 Gb</td>
<td></td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-26:2008 versão corrigida 2009</td>
<td>Ex ia IIC T6...T4 Ga</td>
<td></td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-27:2010</td>
<td>Ex ia IIC T6...T4 Gb</td>
<td></td>
</tr>
<tr>
<td><strong>SG Z</strong></td>
<td>NCC 12.0794X</td>
<td></td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-0:2008 versão corrigida 2011</td>
<td>Ex ia IIC T6...T4 Gc</td>
<td>Input: U≤ 30 V, I≤ 152 mA  PT: U≤ 30 V, I≤ 152 mA</td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-11:2009</td>
<td>Ex ia IIC T6...T4 Gc</td>
<td></td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-15:2010</td>
<td>Ex ia IIC T6...T4 Gc</td>
<td></td>
</tr>
<tr>
<td><strong>SG E5</strong></td>
<td>NCC 12.0796 X</td>
<td></td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-0:2008 versão corrigida 2011</td>
<td>Ex ib IIC T6...T4 Gb</td>
<td>Ex ib IIC T6...T4 Gb</td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-11:2009 versão corrigida 2011</td>
<td>Ex ib IIC T6...T4 Gb</td>
<td>Ex ib IIC T6...T4 Gb</td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-31:2011</td>
<td>Ex ib IIC T6...T4 Gb</td>
<td>Ex ib IIC T6...T4 Gb</td>
</tr>
<tr>
<td>ABNT NBR IEC 60079-31:2009</td>
<td>Ex ib IIC T6...T4 Gb</td>
<td>Ex ib IIC T6...T4 Gb</td>
</tr>
<tr>
<td><strong>CCAus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SG B2</td>
<td>CS 1980091</td>
<td></td>
</tr>
<tr>
<td>Class IIa, Div 1, Groups E, F, G</td>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
</tr>
<tr>
<td>Class IIIa, T4...T6, Enclosure type 4X</td>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6...T4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex ex d IIC T6...T4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6...T4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS Class I, Zone 0, AEx ia, IIC/T4/T5/T6</td>
<td>IS</td>
<td></td>
</tr>
<tr>
<td>Class IIIa, T4...T6, Enclosure type 4X</td>
<td>IS</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6...T4</td>
<td>IS</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6...T4</td>
<td>IS</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6...T4</td>
<td>IS</td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 152 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 22 nF, Li ≤ 53 μH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output: Umax = 28 V, Imax = 120 mA, Pi = 1 W, Ci = 22 nF, Li = 53 μH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 22 nF, Li ≤ 53 μH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT: U≤ 30 V, I≤ 22 nF, Li ≤ 53 μH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output: Umax = 28 V, Imax = 120 mA, Pi = 1 W, Ci = 22 nF, Li = 53 μH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other hazardous area approval

CCOE / PESO Ex d, Ex ia
GOST R Ex d, Ex ia
KOSHA Ex ia, Ex nA
NEPSI Ex d, Ex ia

Electromagnetic protection

Electromagnetic compatibility
Emission acc. to EN 61000-6-4 (2007)
and FCC 47 CFR PART 15,
SUBPART B, CLASS B (2002)
Immunity acc. to EN 61000-6-2 (2005)

CE marking

89/336/EEC
Electromagnetic compatibility
94/9/EC
ATEX

Fig. 1. Local User Interface (LUI) enables real time awareness of device parameters.

Fig. 2. Configuration is easy to do with DTM, graphical user interface. E.g. pre-selected profiles for opening and closing enable fast and easy stroke setup.
DIMENSIONS (mm)

SG921_J

Option J

1/4 NPT

M6x12

M20x1.5

F05-ø50 (VDI/VDE 3845)

SG923
SG923 with limit switches

SG931
SG931_J with limit switches

Option J
ENabcdefg
### ADDITIONAL ACCESSORIES

#### FILTER REGULATORS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG9215</td>
<td>Filter regulator for supply air. Filter size 5 μm. Pressure gauge, scale bar/psi/kPa, basic material brass, nickel plated, housing stainless steel, glycerine filled. Temperature range -40...+82 °C / -40...+180 °F. K option includes a thread nipple 1/4&quot;NPT to 1/4&quot;NPT which is suitable with SG9200 &amp; SG9300 option A3 (1/4NPT AIR CONNECTION). A large capacity filter regulator (not K) must be used for actuator bigger than BC 40 and BJ 32. Installation with mounting bracket. Use large capacity filter regulator also with SG923_. A large capacity filter regulator (not K) must be used for actuator bigger than BC 40 and BJ 32. Installation with mounting bracket.</td>
</tr>
</tbody>
</table>

#### CABLE GLANDS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG5</td>
<td>M20 x 1,5 for Neles limit switches, SG92_N_ (code H6870 grey/plastic, IP66)</td>
</tr>
<tr>
<td>CG6</td>
<td>M20 x 1,5 blue/plastic, IP66, Ex e</td>
</tr>
</tbody>
</table>

#### CABLE GLANDS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20 x 1,5 for Neles limit switches, SG92_N_ (code H6870 grey/plastic, IP66)</td>
<td></td>
</tr>
<tr>
<td>M20 x 1,5 blue/plastic, IP66, Ex e</td>
<td></td>
</tr>
</tbody>
</table>

#### PRESSURE GAUGES AND CONNECTION BLOCKS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3</td>
<td>Pressure gauges with connections 1/4 NPT (S, C1, C2) for VG921_. AISI 304, glycerine filled. Temperature range 40...+85 °C / 40...+185 °F. Pneumatic connection block, material AlSiMg, anodized grey.</td>
</tr>
<tr>
<td>A7</td>
<td>Pressure gauges with connections 1/4 NPT for VG93_. AISI 316</td>
</tr>
<tr>
<td>A8</td>
<td>Pressure gauges with connections 1/2&quot; NPT (S, C1, C2) for VG9235_. AISI 304</td>
</tr>
<tr>
<td>A9</td>
<td>Pressure gauges with connections 1/2&quot; NPT (S) and 1&quot; NPT (C2) for VG9237_. AISI 304</td>
</tr>
<tr>
<td>A10</td>
<td>Pressure gauges with connections 1/4 NPT for SG93_. AISI 316, pressure gauges for severe off-shore use, safety glass window.</td>
</tr>
</tbody>
</table>