Neles ValvGuard™ VG9000H is a new generation safety valve controller and partial stroke test device for emergency shutdown (ESD) or emergency venting (ESV) valves. It's unique and advanced functions and features are specially designed for emergency valve controllers. Together with HART communication it offers unbeatable value for our customers with increased efficiency, reliability and safety.

VG9000H is IEC 61508 compliant up to SIL 3. Based on the automatic partial stroke testing (PST) and other diagnostics data, VG9000H increases safety and plant safety targets can be reached more economically than with traditional solutions. Also, unnecessary and expensive manual testing can be avoided. This increases safety and can simultaneously create major cost savings at a plant.

VG9000H is operated by 4-20mA signal and the diagnostics part of the safety valve controller can be alive all the time. This is a true user benefit and gives maximum availability of the diagnostics information. VG9000H is thus capable to record emergency trips with graph and keyfigures related to it. The availability of the safety valves is maximized through unique diagnostics features, directly integrated into device functionality. Diagnostic information is presented in easily understandable form by using graphical FDT/DTM user interface, such as Metso FieldCare™. This enables the predictive maintenance of potentially failing valve assemblies before they have chance to impact on the process.

**KEY FEATURES**

- Valve and self tests
- Partial stroke test (automatic or manual)
- Self test for internal electronics and pneumatics
- Emergency trip test
- High pneumatic capacity eliminates the need of additional instrumentation in most cases
- Device is powered during the trip and can collect diagnostics information
- Easy of use local / remote operation
- Advanced device diagnostics including
  - Self-diagnostics
  - Online diagnostics
  - Performance diagnostics
- HART communication

**Open solution**

- Metso is committed to delivering products that freely interface with software and hardware from a variety of manufacturers. This open architecture allows the ValvGuard to be integrated with other field devices and systems.
- FDT based multi-vendor support configuration
- The different support files for VG9000H are available in the internet, at http://www.metso.com/valves

**TÜV Certificate**

Neles ValvGuard VG9000H is TÜV approved to be used in safety applications up to and including safety integrity level 3 (SIL 3).
Options
- High pneumatic capacity
- Remote Communication Interface (RCI9H) for 24 VDC retrofit installations. (See type coding for RCI9H option)
- Integrated limit switches
- Local Control Panel (LCP9H). (See type coding for LCP9H option)
- Language selection: English, German and French

Lower total cost of ownership
- Automised valve testing and testing documentation
- Low energy and air consumption
- Future proof design allows further options at a reduced cost

Easy installation and configuration
- Same unit for linear and rotary valves, double and single-acting actuators
- Simple calibration and configuration
  - Using local user interface
  - Using Metso FieldCare or any FDT compliant software in a remote location

Easy to maintain
- Optimised spares program. Reduced number of spares
- Fewer maintainable components than in a traditional instrumentation solution
- Ability to attach options to mechanics later
- Visibility to the safety valve operation

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
  - Protected against humidity
  - Full 316 stainless steel version available, see technical bulletin 9VG93H20EN
- Maintenance free operation
  - Resistant to dirty air
  - Wear resistant and sealed components
  - Contactless position measurement

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

TECHNICAL DESCRIPTION
Neles ValvGuard VG9000H is a 4-20 mA loop-powered microcontroller-based intelligent safety valve controller and partial stroke test device with HART communication. The device stays alive even at 3.7 mA input signal and communicates via HART. Optional RCI unit is required if the safety system output is binary (DO) 24 V DC.

The device contains a Local User Interface enabling local configuration. A PC with Metso FieldCare software can be used for advanced configuration and diagnostics. The powerful 32-bit microcontroller controls the valve position during partial stroke and other special testing. The measurements include:
- Input signal
- Valve position with contactless sensor
- Actuator pressures, two independent measurements
- Supply pressure
- Device temperature

Advanced self-diagnostics ensures that all measurements operate correctly. Failure of any measurement does not cause the valve to go to fail-safe position.

Operating principle of VG9000H is based on pneumatic solenoid valve (SV) and prestage (PR) which is controlled by microcontroller (μC). Information from the various sensors is used for the operation.

![Fig. 1 The principle of operation](image-url)
TECHNICAL SPECIFICATIONS
Neles ValvGuard VG9000H

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:
-20° to +85 °C / -4° to +185 °F
Influence of vibration on valve position:
under 2g 5–150 Hz,
1g 150–300 Hz, 0.5g 300–2000 Hz
Open and closed position: no effect

Enclosure
Material: Anodised aluminium alloy and glass window
Protection class: IP66, NEMA 4X
Pneumatic ports:
VG9215 1/4 NPT
VG9235 1/2 NPT
VG9237 1 NPT (1/2 NPT supply) (single acting only)
Conduit entry thread: M20 x 1.5
Weight:
VG9215 3.0 kg / 6.6 lb
VG9235 4.6 kg / 10.1 lb
VG9237 5.0 kg / 11 lb
limit switch options plus 1.0 kg / 2.2 lb
Mechanical and digital position indicator visible through the main cover

Pneumatics
Supply pressure: 3.0–7.5 bar / 44–109 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:
VG9215 90 Nm³/h / 53 scfm (Cv = 0.7)
VG9235 380 Nm³/h / 223 scfm (Cv = 3.2)
VG9237 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 connections: 0.25 mm² ... 2.5 mm²
Supply power: Loop powered, 4–20 mA
Signal range: 3.7–22 mA
Signal details:
0.0–3.7 mA (trip state, diagnostics NOT available)
3.7–6.0 mA (trip state, diagnostics available)
6.0–16.0 mA (hysteresis range)
16.0–22.0 mA (normal state)
Load voltage:
up to 9.7 V DC/20 mA
(corresponding 485 Ω.)
Voltage:
max 30 V DC
Polarity protection: -30 V DC
Over current protection: active over 36 mA
Ex ia IIC T4/T5/T6 Ga: Ui ≤ 28 V
Li ≤ 120 mA
Pi ≤ 1 W
Ci ≤ 9.6 nF
Li ≤ 53 μH
Ex nA nL IIC T4/T5/T6 Gc: Ui ≤ 30 V
Li ≤ 152 mA
Ex d IIC T5/T6 Gb: Ui ≤ 30 V
Pi ≤ 1080 mW

Local user interface functions
- Monitoring of valve position, temperature, supply pressure, actuator pressure difference, input signal and safety signal status
- Guided start-up function
- LUI may be locked remotely to prevent unauthorised access
- Automatic travel calibration
- Parameter selection
- Language selection
- Alarm and warning state indications
- Latest event view
APPROVALS

TÜV
IEC 61508 compliant up to SIL 3

Flameproof and explosion proof
ATEX & IECEx
II 2 G Ex d IIC T5/T6 Gb

Intrinsically safe and non incendive
ATEX & IECEx
II 1 G Ex ia IIC T4/T5/T6 Ga
II 2 G Ex ia IIC T4/T5/T6 Gb
II 3 G Ex nA nL IIC T4/T5/T6 Gc

Electromagnetic protection
Electromagnetic compatibility
EN 61000-4-2...4-6, 4-8

CE marking
89/336/EC and 94/68/EC
Electromagnetic compatibility
94/9/EC
ATEX

FDT/DTM
VG9000H DTM certified by FDT group

HART
DD and EDDL registered by HCF

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

Fig. 2. Configuration and diagnostics are easy to do with DTM, graphical user interface.
### HOW TO ORDER

#### NELES VALVGUARD VG9000H

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>VG</td>
<td>Series</td>
<td>ENCLOSURE</td>
<td>SPOOL VALVE</td>
<td>COMMUNICATION / INPUT SIGNAL RANGE</td>
<td>APPROVALS FOR HAZARDOUS AREAS</td>
<td>OPTIONS OF SAFETY VALVE CONTROLLER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>15</td>
<td>H</td>
<td>E6</td>
<td>I</td>
<td>102</td>
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</table>

*) Slash shall always be marked in places shown above.

### PRODUCT GROUP

**VG**

Neles ValvGuard VG9000H, Intelligent Safety Valve Controller. TÜV SIL 3 certified according to IEC 61508.

### SERIES CODE

**9**

Series 9000 Intelligent safety valve controller with universal shaft and attachment face according to standard VDI/VDE 3845. Relevant shaft adapter included in mounting kits. *) When safety valve controllers are separate deliveries, shaft adapter kit is supplied.

### ENCLOSURE

**2**

Standard IP66 / NEMA 4X enclosure. Standard temperature range -20 to +85 °C / -4 to +185 °F. 1 pcs M20x1.5 conduit entry.

### SPOOL VALVE CONNECTIONS

<table>
<thead>
<tr>
<th>15</th>
<th>35</th>
<th>37</th>
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</thead>
<tbody>
<tr>
<td>Standard capacity Stroke volume of actuator &lt; 13 dm³</td>
<td>High capacity Stroke volume of actuator &gt; 13 dm³</td>
<td>Extended capacity For single acting actuators</td>
</tr>
<tr>
<td>S, C1, C2 = 1/4 NPT</td>
<td>S, C1, C2 = 1/2 NPT</td>
<td>S = 1/2 NPT, C2 = 1 NPT</td>
</tr>
</tbody>
</table>

### COMMUNICATION / INPUT SIGNAL RANGE

**H**

4-20 mA, HART communication.

### APPROVALS FOR HAZARDOUS AREAS

**N**

No approvals for hazardous areas.

### OPTIONS OF SAFETY VALVE CONTROLLER

#### 7. sign

- **VG9_H_T** only:
  - Internal 2-wire (passive) position transmitter.
  - Analog position feedback signal, output 4-20 mA, supply voltage 12 - 30 VDC, external load resistance 0 – 780 Ω.
  - **VG9_HX1T** and **VG9_HX2T**: $U_i \leq 28 V$, $I_i \leq 120 mA$, $P_i \leq 1.0 W$, $V_i \leq 53 m\Omega$, $C_i \leq 8 n\Omega$.
  - **VG9_HX3T**: $U_i \leq 30 V$, $I_i \leq 152 mA$, $P_{max} = device limits itself$.
  - **VG9_HE6T**: $U_i \leq 30 V$, $P_{max} = device limits itself$, external load resistance 0 – 780 Ω.

**NOTE:** Only 1 pcs M20x1.5 conduit entry in the standard enclosure, use 7. sign “J” or “L1” if additional conduit entries are required.

#### 8. sign

- **J**
  - External junction box for all 4-20 mA wirings, including position transmitter, if applicable. Junction box is located in the standard enclosure, 2 pcs M20x1.5 conduit entry.
  - **NOTE:** This option must be selected if both 7. sign “L” (for Local Control Panel LCP9H) and 8. sign (limit switches) are selected.

- **L1**
  - Extension housing with additional conduit entries, 2 pcs M20x1.5.
  - Applicable to Position Transmitter, 7. sign “T”, if additional conduit entry is required.
  - Not applicable to 7. sign “J”, “L2” or limit switches (8.sign).

- **L2**
  - Extension housing with additional conduit entries, 2 pcs M20x1.5 for Local Control Panel (LCP9H).
  - Not applicable to 7. sign “L1”.
  - **NOTE:** 7. sign “J” needs to be selected also if limit switches are specified.
  - Local Control Panels LCP9H need to be specified separately!

- **Y**
  - Special construction, to be specified.

### HOW TO ORDER

- **VG 9 2 15 H E6**
  - **I02**

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### OPTIONS OF LIMIT SWITCHES

<table>
<thead>
<tr>
<th>8. sign</th>
<th>LIMIT SWITCH TYPE</th>
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</table>
| I02     | P+F; NJ2-12GK-SN, 2-way type, DC; > 3 mA; < 1 mA, intrinsically safe according to ATEX II 1 G Ex ia IIC T6. Temperature range -20 – +45 °C / -4 – +115 °F. Usable up to SIL3 acc. to IEC61508. Not applicable to 6. sign “N” or “X”.
| I09     | P+F; NC82-12GM3S-N0, 2-way type, DC; > 3 mA; < 1 mA, intrinsically safe according to ATEX II 2 G Ex ia IIC T6. Temperature range -20 – +45 °C / -4 – +115 °F. Usable up to SIL2 acc. to IEC61508. Not applicable to 6. sign “N” or “X”.
| I45     | P+F; NJ3-18GK-S1N, 3-way type, DC; > 3 mA; < 1 mA, intrinsically safe according to ATEX II 1 G Ex ia IIC T6. Temperature range -20 – +45 °C / -4 – +115 °F. Usable up to SIL2 acc. to IEC61508. Not applicable to 6. sign “N” or “X”.
| I56     | NIPFC002-ARRGUP, 2-way type, DC; 150 mA, 10 - 36 V DC, leakage current < 0.6 mA. Temperature range -20 – +150 °C / -4 – +302 °F. Not applicable to 6. sign “X”.
| D33     | SST Sensor Dual Module, NO, 8-125 V DC / 24 - 125 V AC, Temperature range -20 – +42 °C / -4 – +110 °F. Not applicable to 6. sign “X”.
| D44     | Namur Sensor Dual Module, 6 – 29 VDC, > 3 mA; < 1 mA. Temperature range -20 – +42 °C / -4 – +110 °F. Not applicable to 6. sign “X”.
| K25     | 4 pcs, OMRON DZW2-W5, 3 A – 250 V AC, 0.4 A – 125 V DC, 5 A – 30 V DC. Not applicable to 6. sign “X”.
| K26     | 2 pcs, OMRON DZW2-W1, gold plated contacts, 100 mA - 30 V DC / 125 V AC. Not applicable to 6. sign “X”.
| K45     | 4 pcs, OMRON DZW2-W5, 3 A – 250 V AC, 0.4 A – 125 V DC, 5 A – 30 V DC. Not applicable to 6. sign “X”.
| K46     | 4 pcs, OMRON DZW2-W1, gold plated contacts, 100 mA - 30 V DC / 125 V AC. Not applicable to 6. sign “X”.

### OPTIONS OF LIMIT SWITCHES

<table>
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<tr>
<th>9. sign</th>
<th>OPTIONS OF LIMIT SWITCHES</th>
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<tr>
<td>Y</td>
<td>Special construction, to be specified.</td>
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</table>

### OPTIONAL DEVICES FOR VG9000H

- **RCI9H**
  - RCI, Remote Communication Interface. P+F; KFD2-RCI-
  - Exida SIL 3 certified according to IEC61508. Input 0/24 VDC. Output 4/20mA + HART Power supply 19-30 VDC, < 50mA. Temperature range -20 to +60 °C / -4 to +140 °F includes integrated isolated barrier for intrinsic safe applications.
  - **ATEX certifications:** II 2 G Ex ia IIC T6.
  - **IECEx certifications:** [Zone 0] [Ex ia] IIC.
  - **NOTE:** This device is only needed if 4-20mA is NOT available from the safety system to VG9000H. See separate technical bulletin for further details.

- **LCP9H** or **LCP9HW**
  - Local Control Panel. Power consumption 400 mW. Power supply 11-30 VDC, < 50mA. Temperature range -20 to +65 °C / -4 to +149 °F.
  - **NOTE:** Lockable buttons in both versions. Open/close button removed in version LCP9HW.
  - **ATEX and IECEx certifications:** II 2 G Ex ia IIC T4/T5/T6. Ul ≤ 25.2 V, Pi ≤ 150 mA, Ci ≤ 30 nF, Li ≤ 252 μH. Temperature range: T4; -20 – +65 °C, T5; -20 – +65 °C, T6; -20 – +50 °C.
  - **7. sign “L2” needs to be selected in VG9000H type coding.**
  - **NOTE:** This device is only needed if special local control is required for VG9000H. Local control includes e.g. manual reset, PST testing and local status LED indications. See **LCP9H manual** (I7LCP9H72en) for further details.

### Additional accessories:
- Contact local Metso office for filter regulator, conduit entry nipples, cable glands, pressure gauges etc.

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  - **China,** 19/F, the Exchange Beijing, No. 118, Jiaoniu Lu Yi, Chaoyang Dist, 100022 Beijing, China.
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  - www.metso.com/automation

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