Neles ValvGuard™
VG9200H
Rev. 1.0
Installation, Maintenance and Operating Instructions
READ THESE INSTRUCTIONS FIRST!

These instructions provide information about the safe handling and operation of the intelligent safety valve controller. If you require additional assistance, please contact the manufacturer or manufacturer's representative. Addresses and phone numbers are printed on the back cover.

SAVE THESE INSTRUCTIONS!
1 VG9200H VALVGUARD INTELLIGENT SAFETY VALVE CONTROLLER WITH HART COMMUNICATION

1.1 General
This manual incorporates Installation, Maintenance and Operation Instructions for the Metso’s Neles ValvGuard VG9000H safety valve controller. The VG9200H may be used with either cylinder or diaphragm type pneumatic actuators for rotary or linear valves.

NOTE:
The selection and use of the valve controller in a specific application requires close consideration of detailed aspects. Due to the nature of the product, this manual cannot cover all the likely situations that may occur when installing, using or servicing the valve controller. If you are uncertain about the use of the controller or its suitability for your intended use, please contact Metso’s Automation business for more information.

1.2 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 safety position is 6.0 mA or below. The device stays alive even at 3.7 mA input signal and communicates via HART. Optional RCI9H unit is required if the safety system output is binary (DO) 24 V DC. See separate RCI9H manual (P+F; KFD2-RCI-Ex1) for detailed instructions.

NOTE:
RCI9H includes the Ex-isolator, so there is no need for separate Ex-isolator in intrinsically safe installations.

Main components of ValvGuard are spool valve (SV), prestage unit (PR) and micro controller (µC). Spool valve and prestage unit are the only components, which takes part of the safety action. Spool valve controls the main airflow between supply-, actuator- and exhaust connections. The spool is operated by spring force to fail safe position and by pneumatic force generated by the prestage valve to the normal position. The prestage valve is coil operated flapper valve (normally open). Coil of the prestage is energized with the safety control part and it is controlled by the micro controller. Micro controller cannot prevent the safety action. Pressure sensors (Px) and position sensor (α) are used to getting the measurements for controlling the PST and other tests. Measurements from the sensors are used for the device diagnostics.

The VG9000H contains a Local User Interface enabling local configuration. A PC with 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, 2 independent measurements
- Supply pressure
- Device temperature
- Housing pressure

Advanced self-diagnostics guarantees that all measurements operate correctly. Failure of any measurement does not cause the valve to go to fail-safe position. 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 and P3). This information is used to run the partial stroke tests and other tests.

NOTE:
Micro controller is only able to control the prestage if safety control part is energized. Micro controller can never prevent the safety action to happen since safety action is the same as there’s no voltage in the safety control part.

Fig. 1 The principle of operation
1.3 System architecture

VG9000H can be connected directly to safety system analog output module (AO, 4-20 mA). See Fig. 2 for the general wiring principle.

![Fig. 2 General wiring principle of VG9000H](image)

VG9000H can also be connected to safety system digital output module (DO, 0/24 V DC) via RCI9H unit. See Fig. 3 for the wiring principle with RCI9H.

![Fig. 3 VG9000H wiring principle with RCI9H](image)

There is also a Local Control Panel option (LCP9H). It can be used together with VG900H or VG9000H with RCI9H. See Fig. 4 for the wiring principles with LCP9H.

![Fig. 4 VG9000H wiring with LCP9H](image)

See Chapter 3.5 for wiring details. See LCP9H manual (7LCP9H70en) for further LCP9H details. See RCI9H datasheet (P+F; KFD2-RCI-Ex1 manual) for further RCI9H details.

1.4 Markings

The VG9000H safety valve controller is equipped with an identification plate sticker (Fig. 5).

![Identification plate](image)

Identification plate markings from top to bottom include:

- Type designation of the safety controller
- Enclosure class
- Revision number
- Input signal (voltage range)
- Input resistance
- Maximum supply voltage
- Supply pressure range
- Operational temperature
- CE mark
- Manufacturing serial number (TTYYWWNNNN*)

*) Manufacturing serial number explained:

- **TT**: device and factory sign
- **YY**: year of manufacturing
- **WW**: week of manufacturing
- **NNNN**: consecutive number

Example: PH10011234 = controller, year 2010, week 1, consecutive number 1234.
1.5 Technical specifications

**ATEX NOTE:**
This manual contains technical specifications for several types of the VG9200H valve controller. If in doubt, refer to the type approval certificate of the respective version.
The certificate is delivered with the field device and is also available from the manufacturer.

**VG9200H SAFETY VALVE CONTROLLER**

**General**
Loop powered, no external power supply required.
Suitable for rotary and sliding-stem 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
No effect when measured impulse 2g 5–150 Hz, 1g 150–300 Hz, 0.5g 300–2000 Hz.
No effect on PST if max. response 4g measured at housing.
No unintended valve movements if max. response 15g measured at housing

**Enclosure**
Material: Anodised aluminium alloy and glass window
Protection class: IP66, NEMA 4X

**Pneumatic ports:**
- VG9210 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:
- VG921_ 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
Output 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: 0.25–2.5 mm²
Supply power: Loop powered, 4–20 mA
Signal range: 3.7–22 mA
Signal details:
- 0.0–3.7 mA (safety state, diagnostics not available)
- 3.7–6.0 mA (safety state, diagnostics available)
- 6.0–16.0 mA (hysteresis range)
- 16.0–20.0 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

ATEX approval is valid under these conditions

**Position transmitter (optional)**
Output signal:
- 4–20 mA (galvanic isolation; 600 V DC)
  (fault modes indicated by levels 3.5 and 22 mA)
Supply voltage:
- 12–30 V
Resolution:
- 16 bit / 0.244 µA
Linearity:
- <0.05 % FS
Temperature effect:
- <0.35 % FS
External load:
- max 0–780 Ω

Ex d IIC T5/T6:
- Ui ≤ 30 V
- li ≤ 20 mA
- Pi ≤ 1050 mW

Ex d IIC T5/T6 Gb:
- Ui ≤ 28 V
- li ≤ 120 mA
- Pi ≤ 1 W
- Ci ≤ 8 nF
- Li ≤ 53 µH

Ex nA nL IIC T4/T5/T6 Gc:
- Ui ≤ 30 V
- li ≤ 152 mA
Local user interface functions

- Monitoring of valve position, temperature, supply pressure, actuator pressure difference housing pressure, input signal and safety signal status
- Guided start-up function
- LUI may be locked remotely to prevent unauthorised access
- Calibration
- Parameter selection
- Testing
- Language selection
- Alarm and warning state indications
- Latest event view

See chapter 4 for details of LUI functions.

APPROVALS

Safety
- SIL IEC 61508 compliant up to and including SIL 3 by TÜV

Intrinsically safe and non incendive

ATEX / IECEx
- I 1 G Ex ia IIC T4/T5/T6 Ga
- I 2 G Ex ia IIC T4/T5/T6 Gb
- I 3 G Ex nA nL IIC T4/T5/T6 Gc

(Flameproof and explosion proof

ATEX / IECEx
- II 2 G Ex d IIC T5/T6 Gb

(Electromagnetic protection

- Electromagnetic compatibility
- Emission acc. to EN 61000-6-4 (2001) and FCC 47 CFR PART 15,
- SUBPART B, CLASS B (1994)
- Immunity acc. to EN 61000-6-2 (2001)

CE marking
- 89/336/EEC
- Electromagnetic compatibility
- 94/9/EC
- ATEX

Interoperability

FDT/DTM VG9000H DTM certified by FDT group
HART DD registered by HCF

1.7 Safety precautions

CAUTION:
Opening the cover of VG9200H field device enclosure is allowed for authorized and trained persons only! Misuse of powered VG9200H field device may cause a dangerous situation.

CAUTION:
Do not exceed the permitted values!
Exceeding the permitted values marked on the valve controller may cause damage to the controller and to equipment attached to the controller and could lead to uncontrolled pressure release in the worst case. Damage to the equipment and personal injury may result.

CAUTION:
Do not remove or dismantle a pressurized controller!
Removing or dismantling a pressurized prestage or spool valve of an ValvGuard leads to uncontrolled pressure release. Always shut off the supply air and release the pressure from the pipelines and equipment before removing or dismantling the controller. Otherwise personal injury and damage to equipment may result.

WARNING:
Make sure the enclosure exhaust port will not be clogged!
It may prevent the device to do the safety action.

CAUTION:
Make sure that during the maintenance or commissioning when the device cover is open, water does not go inside the enclosure.

WARNING:
During calibration and tuning the valve operates between open and closed positions. Make sure that the operation does not endanger people or processes!

WARNING:
Do not operate the device with the cover removed!
Electromagnetic immunity is reduced, valve may stroke.

ATEX WARNING:
The locking screw (part 107) of the cover is essential to explosion protection.
The cover has to be locked in place for Ex d protection. The screw grounds the cover to the housing.

ATEX WARNING:
Spark hazard!
Protect the aluminium housing and cover from impacts.

ATEX WARNING:
Electrostatic charge hazard!
The pointer and display windows are non-conductive.
Clean with a damp cloth only!
The safety controller is a sophisticated instrument, handle it with care.

- Check the controller for any damage that may have occurred during transportation.
- Store the controller preferably indoors, keep it away from rain and dust.
- Do not unpack the device until installing it.
- Do not drop or knock the controller.
- Keep the flow ports and cable glands plugged until installing.
- Follow instructions elsewhere in this manual.

### 3 MOUNTING

#### 3.1 General

**NOTE:**
The enclosure of ValvGuard safety valve controller meets the IP66 protection class according to EN 60529. Cable entry needs to be plugged according to IP66 and it is not allowed to mount the valve controller in a position where the cable entry is pointing upwards. Based on good mounting practice, the recommended mounting position is electrical connections placed downwards. This recommendation is shown in our mounting position coding for control valves. If these requirements are not fulfilled, and the cable gland is leaking and the leakage is damaging valve controller or other electrical instrumentation, our warranty is not valid.

If the ValvGuard is supplied with valve and actuator, the tubes are mounted and the ValvGuard adjusted in accordance with the customer’s specifications. If the controller is ordered separately, the mounting parts for the assembly must be ordered at the same time.

Sample order: (B1CU13)-Z-VG9235HE1

The controller is equipped for connection according to VDI/VDE 3845. Also the old Neles mounting face is supported (Z beam) but not recommended for high vibration environments.

Shaft coupling alternatives for the controller for Metso actuators are shown in Fig. 7.

For mounting parts for Metso actuators, see 11.3 - 11.5.

#### 3.2 Mounting on Metso actuators with VDI/VDE mounting face

See figures in Section 11.3.

- Mount the H-shaped coupling (47) to the shaft. Apply the thread-locking compound to the screw (48) and tighten firmly.
- Remove all protective plastic plugs from the pneumatic connections.
- BJ and other single acting actuators: mount a metal plug (53) with sealant to the C1 connection.
- Set the direction arrow of the actuator in the direction of the valve closure member and attach the ear (2) to the indicator cover in the position shown in Section 11.3. Secure the screw of the ear using e.g. Loctite and tighten firmly.
- Attach the bracket (1) to the ValvGuard.
- Attach the bracket (1) to the actuator. The shaft coupling of the ValvGuard must fit into the ear (2) so that the pointer is located in the position shown in Fig.3.

**NOTE:**
Special care must be taken that the shaft position has been set according to marking in VG9000H housing and the pointer in the shaft. Also make sure that the positioner fail action parameter (PFA) is set correctly (Section 4.4.3).
3.3 Mounting on linear actuator with IEC 60534 mounting face

See figure in Section 11.5

- Attach the feedback arm with spacer to the controller shaft. Note the position of the pointer on the shaft as in 11.5. Apply thread locking compound to the screws and tighten firmly. Attach the spring to the feedback arm as shown in Section 11.5.
- Mount the controller mounting bracket loosely to the yoke of the actuator.
- Remove all plastic plugs from all actuator connections (3 pcs.).
- Mount the controller loosely to the mounting bracket guiding the pin on the actuator stem to the slot of the feedback arm.
- Align the bracket and the controller with the actuator stem and adjust their position so that the feedback arm is approximately at a 90° angle to the actuator stem (in the mid-stroke position).
- Tighten the controller mounting bracket screws.
- Adjust the distance of the controller to the pin on the actuator stem so that the pin stays in the lever slot at full stroke. Ensure also that the maximum angle of the lever does not exceed 45° in either direction. Maximum allowed travel of the lever is shown in Section 11.5. Best control performance is achieved when the feedback lever utilises the maximum allowed angle (±45° from horizontal position). The whole range should be at least 45°.
- Make sure that the controller is in right angle and tighten all the mounting bolts.
- Ensure that the controller complies with previous steps. Check that the actuator pin does not touch the controller case throughout the entire stroke of the actuator. If the actuator pin is too long it may be cut to size.
- Apply grease (Molykote or equivalent) to the contact surfaces of the actuator pin and the feedback arm to reduce wear.

NOTE:
Special care must be taken that the shaft position has been set according to marking in VG9000H housing and the pointer in the shaft. Also make sure that the positioner fail action parameter (PFA) is set correctly (Section 4.4.3).

3.4 Piping

CAUTION:
Do not exceed the permitted supply pressure of the ValvGuard!

Table 2 provides the recommended tube sizes in accordance with actuator sizes. Tube sizes are the minimum values allowed. For supply air choose a tube one size bigger.

CAUTION:
The stroking times mentioned in Table 2 are trend-setting. They are measured with 5 bar supply air pressure with actuator only and without a valve. They may vary significantly due to different factors such as, but not limited to, pressure difference of the valve, the stiction of the actuator, supply air pressure, the capacity of the supply air system and the dimensions of the supply air pipeline.
Connect the air supply to S. Connect C1 and C2 to the actuator, see Fig. 5. C1 must be plugged if single-acting actuator.

**NOTE:**

An excess of sealant may result in faulty operation of the controller.

Sealing tape is not recommended.

Do not exceed torque of 30 Nm/22 lbf ft when fitting 1/4” NPT connectors to C1, C2 and S (VG921_). Ensure that the air piping is clean.

**NOTE:**

A valve controller mounted on a spring actuator must be connected only as single-acting. See Fig. 5.

The air supply must be clean, dry and oil-free instrument air, see Section 1.4.

### Table 1 Spring rates

<table>
<thead>
<tr>
<th>Actuator type</th>
<th>Spring rate (bar/psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1JK</td>
<td>3 / 43</td>
</tr>
<tr>
<td>B1J</td>
<td>4.2 / 61</td>
</tr>
<tr>
<td>B1JV</td>
<td>5.5 / 80</td>
</tr>
<tr>
<td>QPX_A</td>
<td>1.4 / 20</td>
</tr>
<tr>
<td>QPX_B</td>
<td>2.8 / 41</td>
</tr>
<tr>
<td>QPX_C</td>
<td>4.1 / 60</td>
</tr>
<tr>
<td>QPX_D</td>
<td>5.5 / 80</td>
</tr>
</tbody>
</table>

Adjust regulator pressure to a level that is max 1 bar (14.5 psi) + spring rate.

### Table 2 Piping and stroke times

<table>
<thead>
<tr>
<th>Actuator</th>
<th>VG_15_ Supply 1/4&quot; NPT Actuator 1/4&quot; NPT</th>
<th>VG_35_ Supply 1/2&quot; NPT Actuator 1/2&quot; NPT</th>
<th>VG_37_ (Single acting only) Supply 1/2&quot; NPT Actuator 1&quot; NPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>43 2624 3/4 10 mm or 3/8&quot; 19 19 16 mm or 5/8&quot; 4.9 5.6 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>84 5126 1 10 mm or 3/8&quot; 38 38 16 mm or 5/8&quot; 9.6 11 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>121 7380 1 10 mm or 3/8&quot; 54 54 16 mm or 5/8&quot; 14 16 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>169 11500 1 10 mm or 3/8&quot; 85 85 16 mm or 5/8&quot; 22 25 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>502</td>
<td>195 11900 1 10 mm or 3/8&quot; 87 87 16 mm or 5/8&quot; 22 25 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>282 17200 1 10 mm or 3/8&quot; 126 126 16 mm or 5/8&quot; 32 37 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>752</td>
<td>441 26900 1 10 mm or 3/8&quot; 197 197 16 mm or 5/8&quot; 50 57 - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1JA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.9 55 3/8 10 mm or 3/8&quot; 0.5 1.0 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1.8 110 3/8 10 mm or 3/8&quot; 0.7 1.4 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3.6 220 1/2 10 mm or 3/8&quot; 1.2 2.7 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>6.7 409 1/2 10 mm or 3/8&quot; 3.2 4.8 16 mm or 5/8&quot; 0.7 1.3 - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>13 793 3/4 10 mm or 3/8&quot; 4.6 9.3 16 mm or 5/8&quot; 1.4 2.6 - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>27 2048 3/4 10 mm or 3/8&quot; 8.9 18 16 mm or 5/8&quot; 2.9 5.4 25 mm or 1&quot; 2.5 2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>53 3234 1 10 mm or 3/8&quot; 15 38 16 mm or 5/8&quot; 4.9 11 25 mm or 1&quot; 4.3 5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>322</td>
<td>106 6468 1 10 mm or 3/8&quot; 31 77 16 mm or 5/8&quot; 9.8 21 25 mm or 1&quot; 8.5 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QPX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.62 38 3/8 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.08 66 3/8 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.16 133 3/8 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4.34 265 3/8 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VPVL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>350</td>
<td>0.7 43.8 1/4 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>0.9 56 1/4 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>1.5 89 1/4 10 mm or 3/8&quot; See Note 1 See Note 1 - - - - - -</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CAUTION:**

The air supply system must be of sufficient size and capacity to ensure that at maximum flow during valve movement the pressure at the ValvGuard must not fall below 3 bar. Also note that if the air supply system allows the pressure at the ValvGuard to fall below the actuator minimum supply pressure during valve movement the stroke speed will be affected.

Table 1 Spring rates

Table 2 Piping and stroke times

Note 1: To be defined later
SINGLE-ACTING ACTUATOR, SPRING TO CLOSE

1. Self closing

Default setting:
ATYP = 1-A
PFA = CLO (must be in the spring direction)
VTYP according to valve type

SINGLE-ACTING ACTUATOR, SPRING TO OPEN

2. Self opening

Default setting:
ATYP = 1-A
PFA = OPE (must be in the spring direction)
VTYP according to valve type

DOUBLE-ACTING ACTUATOR

3. Self closing

Default setting:
ATYP = 2-A
PFA = CLO
VTYP according to valve type

DOUBLE-ACTING ACTUATOR, REVERSED PIPING

4. Self opening

Default setting:
ATYP = 2-A
PFA = OPE
VTYP according to valve type

Fig. 8 Operation directions, air connections and assembly related parameters


3.5 Electrical connections

The VG9200H is powered by a 4–20 mA current loop from the safety system that also functions as a carrier to the HART communication.

The input signal cable is led through a M20 x 1.5 cable gland. Connect the conductors to the terminal strip as shown in Fig. 6. It is recommended that the earthing of the input cable shield be carried out from the DCS end only.

The (optional) position transmitter is connected to 2-pole terminal PT as shown in Fig. 6. The position transmitter needs an external power supply. The VG9200H and the position transmitter circuits are galvanically isolated and withstand a 30 V DC voltage.

Please note following before mounting the cover of the valve controller:

- Attach the LUI (223) cabling to the sticker on the reverse side of the LUI. Check that the cabling does not get squeezed by the electronics cover (39) or the device cover (100).
- Check using a feeler gauge that the clearance between the position indicator (109) and the electronics cover is 1 mm.

**NOTE:**
The VG9200H equals a load of 485 Ω in the current loop.

See Section 11.6 for other installations.
4 LOCAL USER INTERFACE (LUI)

The local user interface may be used to monitor the device behaviour as well as configuring and commissioning the controller during installation and normal operation. The local user interface consists of two row LCD and four button keypad interface. There are also custom graphical characters for special conditions.

4.1 Measurement monitoring

When the device is powered, it enters the measurement monitoring view. The following measurements may be viewed from the display. The Table 3 identifies the default unit and also optional unit of the measurement.

Table 3 Default / optional units of measurements

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Default unit</th>
<th>Optional unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve position (POS)</td>
<td>Percentage (%) of full scale</td>
<td>Angle (ANG), where 0% refers to 0 (degree)</td>
</tr>
<tr>
<td>Input signal (LOOP)</td>
<td>mA</td>
<td>%</td>
</tr>
<tr>
<td>Safety input signal (INP)</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>Actuator pressure difference (PDIF)</td>
<td>bar (BAR)</td>
<td>psi (PSI)</td>
</tr>
<tr>
<td>Housing pressure (Pint)</td>
<td>bar (BAR)</td>
<td>psi (PSI)</td>
</tr>
<tr>
<td>Supply pressure (SUPL)</td>
<td>bar (BAR)</td>
<td>psi (PSI)</td>
</tr>
<tr>
<td>Device temperature (TEMP)</td>
<td>°Celsius (C)</td>
<td>°Fahrenheit (F)</td>
</tr>
</tbody>
</table>

If the unit selection is altered via HART to US units, the pressure default unit will automatically be changed to psi and temperature unit to Fahrenheit. The active unit may be changed by pressing the key constantly. The display shows the current unit selection on the top row of the display. You may change the selection by pressing or while keeping the key pressed down. When the buttons are released the current selection will be activated.

If the device has been idle for 1 hour, and there is no user activity on the local user interface, the measurements will start scrolling on the display. This enables the user to view all the measurements through the window of the main cover.

![Local user interface (LUI)](image)

Fig. 12 Local user interface (LUI)

Fig. 13 Measurement monitoring and unit change

Valve position (POS) shows the valve travel position in percentage (%) of full scale. Optional unit is angle.

Input signal (LOOP) shows the input signal value in mA.

Safety input signal (INP) shows if the mA signal is below trip state threshold 6.0 mA (OFF) or in the normal level, above 16.0 mA (ON). Between 6.0 and 16.0 mA it can be either ON or OFF depending on the direction of the signal change.

Actuator pressure difference (PDIF) shows the actuator pressure in single acting actuators or pressure difference in double acting actuators in bars (BAR). Optional unit is psi (PSI).

Housing pressure (Pint) shows the pressure inside the enclosure in bars (BAR). Optional unit is psi (PSI). Too high housing pressure may prevent VG9000 to perform the safety action. There is alarm limit for this. It is set for 0.2 bar as default.

Supply pressure (SUPL) shows the air supply pressure value in bars (BAR). Optional unit is psi (PSI).

Device temperature (TEMP) shows the temperature inside the device in degree Celsius (C). Optional unit is degree Fahrenheit (F).
4.2 Guided start-up

Guided startup offers a fast view of the most critical parameters of the ValvGuard controller, actuator, and valve configuration. After verifying the parameters the valve travel calibration is recommended. The guided start-up is entered by pressing the \( \textcircled{1} \) and \( \textcircled{2} \) keys simultaneously.

The configuration parameters are listed in following order, see explanation from 4.4:

- **Actuator type** \( \text{ATYP} \)
- **Valve type** \( \text{VTYP} \)
- **Positioner fail action** \( \text{PFA} \)
- **Extra pneumatics instrumentation** \( \text{EXTI} \)
- **Actuator size** \( \text{ACTS} \)
- **Spool valve type** \( \text{STYP} \)
- **Automatic travel calibration** \( \text{CAL} \)

If you modify any of the parameters you will also need to calibrate the device. See 4.5 for detailed description.

**NOTE:**
You may cancel any action by pressing the \( \textcircled{0} \) button. Cancelling of operation returns user interface view one level up in menu hierarchy.

\[ \begin{align*}
\text{ATYP} & \quad 1 \rightarrow \text{A} \\
\text{VTYP} & \quad \text{rot} \\
\text{PFA} & \quad \text{CLO} \\
\text{EXTI} & \quad \text{CAL} \\
\text{ACTS} & \quad 5 \rightarrow 1 \\
\text{STYP} & \quad 15 \\
\text{CRL} & \quad \text{CRL} \\
\end{align*} \]

Fig. 14 Guided start-up

4.3 Configuration menu

The local user interface is organised in a menu structure. To enter the menus press \( \textcircled{1} \) and \( \textcircled{2} \) simultaneously in the measurement monitoring view panel. To move to the next or previous selection by pressing \( \textcircled{1} \) or \( \textcircled{2} \) accordingly (see Fig. 12.)

4.4 Configuration parameters

When \( \text{PAR} \) is on the display you may enter the configuration menu by pressing the \( \textcircled{2} \) key. In this menu the most important configuration and signal modification parameters are viewable. You may view the current value and edit them by pressing the \( \textcircled{2} \) key at the relevant parameter. The name of the parameter will appear on the upper row of the display and the current value is on the lower row. Default parameters and parameter ranges can be seen in table in Chapter 13.

**NOTE:**
Default values can be restored by using DTM.

4.4.1 Actuator type, \( \text{ATYP} \)

In order to optimise the control performance the device needs to be informed about the actuator type.

- After selecting \( \text{ATYP} \) on the display, press the \( \textcircled{2} \) key to enter the edit state and \( \text{ATYP} \) starts to blink.
- Select between two values \( \leftrightarrow \text{A} \) or \( \leftrightarrow \text{A} \) using the \( \textcircled{1} \) and \( \textcircled{2} \) keys. The value \( \leftrightarrow \text{A} \) indicates a single acting actuator and \( \leftrightarrow \text{A} \) a double acting actuator.
- To conclude press the \( \textcircled{2} \) key when the desired value is shown on the display.

4.4.2 Valve type, \( \text{VTYP} \)

To compensate for nonlinearity of the position feedback caused by the actuator linkage mechanism of a linear control valve, the appropriate selection must be made on the \( \text{VTYP} \) display.

- After selecting \( \text{VTYP} \) on the display, press the \( \textcircled{2} \) key to enter the edit state and \( \text{VTYP} \) starts to blink.
- Select between two values \( \text{rot} \) or \( \text{LIn} \) using the \( \textcircled{1} \) and \( \textcircled{2} \) keys. The value \( \text{rot} \) indicates a rotary valve and \( \text{LIn} \) a linear valve.
- To conclude press the \( \textcircled{2} \) key when the desired value is shown on the display.

4.4.3 Positioner fail action, \( \text{PFA} \)

This section describes the function of the actuator.

Set value according to Fig. 5 for double acting actuators. Generally set value according to the valve fail safe position. For single acting actuators set value in the spring direction. This action will also take place when the controller software discovers a fatal device failure. See Fig. 5 for correct settings.

- Once \( \text{PFA} \) is displayed, press the \( \textcircled{2} \) key to enter the edit state and the \( \text{PFA} \) will start blinking.
- You may select between two values by pressing the \( \textcircled{1} \) or \( \textcircled{2} \) key. The \( \text{CLO} \) value indicates that the valve ought to be closed in fail action situations.
The OPE value indicates the valve to be opened in failure action situations.

After the desired value is displayed, press the key to conclude the operation.

4.4.4 Extra pneumatics instrumentation, EXT I

In order to optimise the control performance the device needs to be informed about the extra pneumatics instrumentation, if any.

After selecting EXT I on the display, press the key to enter the edit state and EXT I starts to blink.

Select between the following values:

- **non** = no external instrumentation
- **bo1** = booster type 1
- **bo2** = booster type 2
- **bo3** = booster type 3
- **qE1** = quick exhaust type 1
- **qE2** = quick exhaust type 2
- **qE3** = quick exhaust type 3
- **co1** = combination type 1
- **co2** = combination type 2
- **co3** = combination type 3

Use the and keys to change the value.

To conclude press the key when the desired value is shown on the display.

NOTE: If nothing else is defined, please select type 1 in any class.

Select parameters as follows:

<table>
<thead>
<tr>
<th>Instrumentation type</th>
<th>Parameter (EXT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume booster (VB)</td>
<td>Booster type 1 (bo1)</td>
</tr>
<tr>
<td>Quick exhaust (QEV)</td>
<td>Quick exhaust 1 (qE1)</td>
</tr>
<tr>
<td>Combination of VB and QEV</td>
<td>Combination type 1 (co1)</td>
</tr>
</tbody>
</table>

NOTE: Bypass valve is mandatory with volume boosters and QEV. Contact Metso for separate instrumentation diagrams and instructions.

NOTE: When QEV or volume booster is used, VG with small spool valve (VG_15) is required.

4.4.5 Actuator size, ACT S

This parameter defines the actuator size.

CAUTION: It is important to select the correct actuator size because this parameter is used in device control. Erroneous value may cause instability.

- Look at e.g. the type code on the machine plate in the Neles B1-series actuators to check the size. If 3rd party actuator is used, please check the actuator stroke volume.
- After selecting ACT S on the display, press the key to enter the edit state and ACT S starts to blink.
- Select between the following values:
  - **S 1** = Neles B1J8 actuator (or stroke volume <1 dm3 / <61 in3)
  - **S 3** = B1J10 (1–3 dm3 / 61–183 in3)
  - **S10** = B1J16 (3–10 dm3 / 183–610 in3)
  - **S30** = B1J20–25 (10–30 dm3 / 610–1831 in3)
  - **L30** = B1C40–, B1J32– (>30 dm3 / >1831 in3)

Use the and keys to change the value.

To conclude press the key when the desired value is shown on the display.

4.4.6 Spool type, STYP

This parameter defines the spool type and size in VG9000H.

CAUTION: It is important to select the correct spool type because this parameter is used in device control. Erroneous value may cause instability.

- Look at the machine plate in the device to check the typecode.
To conclude press the \( \text{C} \) key to enter the edit state and \( \text{STYP} \) starts to blink.

- Select between the following values:
  \( \text{iS} = \text{VG9215} \)
  \( \text{35} = \text{VG9235} \)
  \( \text{37} = \text{VG9237} \)

- Use the \( \text{C} \) and \( \text{C} \) keys to change the value.
- To conclude press the \( \text{C} \) key when the desired value is shown on the display.

### 4.4.7 Local Control Panel, LCP

Selection if Local Control Panel (LCP9H) is connected and enabled (EnA) or not connected and disabled (diS).

- Select between two options \( \text{EnS} \) or \( \text{EnA} \) using the \( \text{S} \) and \( \text{C} \) keys.
- To conclude press the \( \text{C} \) key when the desired value is shown on the display.

### 4.4.8 Language selection, LANG

- Select between three languages \( \text{EnG}, \text{GeR} \) or \( \text{FrE} \) (English, German or French) using the \( \text{G} \) and \( \text{C} \) keys.
- To conclude press the \( \text{C} \) key when the desired value is shown on the display.

### 4.5 Valve travel calibration

**WARNING:**

Automatic calibration drives the valve against the mechanical open and closed travel limits of the valve-actuator assembly and a tuning procedure is performed. Make sure that these procedures can be safely executed.

Select \( \text{CAL} \) from the menu by using \( \text{S} \) or \( \text{C} \) keys and press the \( \text{C} \) key.

![Fig. 16 Calibration selection](image)

**4.5.1 AUTO CAL calibration function**

**NOTE:**

- Valve position needs to be in the normal operating position, supply pressure needs to be in valid range, no supply pressure drop is allowed and any test cannot be active when calibration is started.
- Pneumatics test needs to be performed successfully before the calibration.

During calibration process a blinking text "CAL run" will be shown on the display. If calibration ends successfully, a text "CALIBRATION SUCCESSFUL" will be shown. Calibration can be cancelled with the \( \text{C} \) key, which will show a text "CALIBRATION CANCELLED". If calibration fails, the reason will be shown, eg. "CALIBRATION START FAILED", "POSITION SENSOR RANGE TOO SMALL", "CALIBRATION TIMEOUT" or "CALIBRATION FAILED". After calibration the device will return to the main menu (measurement monitoring).

**4.6 Testing, TEST**

- Select between two tests Partial Stroke Test (\( \text{PARt} \text{L} \text{S} \text{L} \)) or Pneumatics test (\( \text{PNEU} \text{L} \text{S} \text{L} \)).
- To conclude press the \( \text{C} \) key when the desired value is shown on the display.

**4.6.1 Partial Stroke Test, \( \text{PARt} \text{L} \text{S} \text{L} \)**

**WARNING:**

Partial Stroke Test moves the valve according to the stroke size and speed parameters set. Make sure that this procedure can be safely executed.

Partial stroke test can be run from here. Partial stroke test will be run according to the stroke size (\( \text{MSTr} \)) described in Section 4.7. Advance parameters.

- Select \( \text{PARt} \text{L} \text{S} \text{L} \) from the menu by using \( \text{S} \) or \( \text{C} \) keys and press the \( \text{C} \) key.
- Test can be cancelled by pressing \( \text{C} \).

**NOTE:**

Valve position needs to be in the normal operating position, supply pressure needs to be in valid range, no supply pressure drop is allowed and any other test or calibration cannot be active when testing is started.

**NOTE:**

Pneumatics test (Section 4.6.2.) will be run automatically before the partial stroke test in some cases, e.g. when supply pressure has changed. Pneumatics test timeout parameter is valid also in this case.

**4.6.2 Pneumatics test, \( \text{PNEU} \text{L} \text{S} \text{L} \)**

Pneumatics test can be run from here.

- Select \( \text{PNEU} \text{L} \text{S} \text{L} \) from the menu by using \( \text{S} \) or \( \text{C} \) keys and press the \( \text{C} \) key.
- This will check the pneumatics function of the device by moving the spool valve only and not moving the actuator or the valve.
- Test can be cancelled by pressing \( \text{C} \).

**NOTE:**

Valve position needs to be in the normal operating position, supply pressure needs to be in valid range and any other test or calibration cannot be active when testing is started.

**NOTE:**

Pneumatics test timeout parameter is 600 s. The value cannot be changed.

### 4.7 Advance parameters

#### 4.7.1 Manual Stroke Size, \( \text{MSTr} \)

Targeted manual partial stroke test size. Range is 3.0–100 %.

- Once \( \text{MSTr} \) is displayed, press the \( \text{C} \) key to enter the edit state and the \( \text{MSTr} \) will start blinking.
- Select values by pressing the \( \text{S} \) or \( \text{C} \) key. Holding down \( \text{S} \) or \( \text{C} \) key will start scrolling the value show on the display faster.
- After the desired value is displayed, press the key \( \text{C} \) to conclude the operation.
4.7.2 Automatic Partial Stroke Test, APSt
Selection if automatic partial stroke test is disabled (dis), enabled (EnA) or enabled with randomized range (rnd).
- Select between three options dis, EnA or rnd using the + and - keys.
- To conclude press the ? key when the desired value is shown on the display.

4.8 Special displays

4.8.1 User interface locked
In order to prevent unauthorised access, the Local User Interface may be locked. In this mode measurements may be viewed but configurations and calibrations are prohibited. You may lock and unlock the device only via HART. When the Local User Interface is locked the lock symbol will be activated on the display.

4.8.2 Alarm or warning state
All failure conditions and statuses in VG9000H can be individually configured to three different classes: Alarm, Warning or Info, or they can be ignored. This configuration can be done with DTM (see separate DTM manual). Alarm state causes a blinking X to be shown on the display. In Warning state, the X symbol is steady.

4.8.3 Viewing of latest event
You may view the latest event by pressing the + and - keys simultaneously in the measurement monitoring view. The message is scrolled on the top row of the display twice. You may stop the scrolling by pressing the ? key. By pressing the ? key, the message will disappear.

4.8.4 HART Communication active
When double arrow symbol is indicated, HART communication is activated to device.

4.8.5 Write protection
The VG9000H can be write protected via HART. When device is write protected, following actions are prevented:
- all calibrations
- configuration parameter changes

When device is write protected, following actions are allowed:
- read events
- read statistics
- read parameters
- test start
  - man/auto PST
  - man/auto Pneumatics test
  - ETT, if correct keying exists*
  - internal safety diagnostics test
* Keying means that the passcode has been entered.

When the HART write protection is on, the lock symbol will be activated on the display.
4.9 HART burst mode

In burst mode, a device can send a HART reply repeatedly without repeated command. This can be used for sending e.g. device status information.

NOTE:
Burst mode can only be set and configured remotely via HART (DTM).

4.9.1 Burst mode control

Set burst mode control parameter to On for activating the burst mode. Default is Off.

4.9.2 Burst mode command

The command number sent in burst mode in HART communication. Allowed commands are as follows:

- 3: Read dynamic variables and loop current
- 9: Read device variables with status
- 33: Read device variables
- 169: Read short status

4.9.3 1st, 2nd, 3rd and 4th burst variable codes

Following device variables can be selected to the burst variables:

- Valve position
- Input signal
- Safety signal state
- Actuator pressure difference
- Supply pressure
- Housing pressure
- Device temperature

5 MAINTENANCE

Ex d NOTE:
Maintenance of the parts of the flameproof enclosure is not allowed!
Device type VG9200H_E6:
Housing (2), Cover (100), Shaft assembly (11), Limit switch housing (300).

NOTE:
VG9000 maintenance can be done by Metso certified service personnel only.

The maintenance requirements of the ValvGuard valve controller depend on the service conditions, for instance, the quality of instrument air. Under normal service conditions there is no requirement for regular maintenance.

When maintaining the ValvGuard ensure that the supply air is shut off and pressure is released. In the following text the numbers in brackets ( ) correspond to the part numbers in the exploded view as shown in Chapter 11, unless otherwise stated.

The ValvGuard VG9200H includes the following modules: prestage unit (120), spool valve (420), communication circuit board and controller circuit board with position and pressure sensors (210).

The spool valve is located on the bottom side of the device while the other modules are located below the cover (100). In the event of failure the whole module must be changed. The module retrofit must be assembled in a clean, dry environment. On reassembly apply a thread-locking compound (for instance, Loctite 243) and tighten the screws firmly.

NOTE: Whenever any maintenance operations have been done for the VG9200H, the device should be calibrated.

5.1 Opening and closing of the cover

- Open VG9000H cover (100) by opening the M4 screw (107) first until it is not anymore attached to the housing (2). Then turn the cover counterclockwise until it can be removed.
- Close the cover (100) in reverse order. Mount it first on top of the housing (2) and then turn it clockwise until threads are tight and the screw (107) is facing the spring (111) in the housing (2). Tighten the M4 screw (107).

5.2 Prestage

NOTE:
Prestage cannot be changed in the field.

NOTE:
The prestage and adapted plate must be handled carefully. In particular the moving parts of the prestage should not be touched when the inner cover (39) is not in place. Make sure the prestage and adapter plate are kept clean during the maintenance.

5.2.1 Removal

- Loosen the M8 stop screw (110) in the position indicator (109) and turn the position indicator from the shaft (11). Remove the inner cover (39) attached with M3 screws (42, 3 pcs.).
- Unplug the prestage wire connector from the connector board (182). Unscrew the M4 screws (139, 2 pcs.) and lift up the prestage unit (120). Remove the O-ring (140).

5.2.2 Adapter plate removal

- Remove the screw (412) and remove the adapter plate. Adapter plate is only needed to be removed when replaced with new one.

5.2.3 Installation

- Install the new adapter plate, if it has been removed. Make sure the O-rings (411) are properly installed. Tighten the screw (412).
- Place a new O-ring (140) into the groove in the prestige mounting plate (400) and press the prestige into place. Make sure the nozzle is guided into the O-ring properly. The screws guide the prestige body into the correct position. Tighten the screws (139) evenly.
Push the prestage 2-pole wire connector into the socket on the connector board (182). The wire connector can only be fitted in the correct position. Replace the inner cover (39) and tighten the M3 screws.

5.3 Spool valve

NOTE: Spool valve cannot be changed in the field.

NOTE: If the maintenance operations are needed for the spool valve, it is advised to replace the whole spool valve assembly with a spare unit.

5.3.1 Standard capacity

Standard capacity means the spool valve option 15 in VG9215. See type coding in the machine plate for details.

5.3.1.1 Removal

For spool valve removal it is usually necessary to unmount the valve controller from the actuator.

Working from the bottom side of the valve controller, unscrew the M5 screws (4 pcs.). Remove the spool valve (420) with gasket (63). Do not remove the spool valve adapter plate (421).

5.3.1.2 Installation

Mount the spool valve (420) to the housing, and tighten the four M5 screws evenly.

NOTE: If adapter plate (421) is lifted away from its place, special attention must be paid to ensure that gasket (174) and pipe (431) are properly attached to the housing. O-rings of the pipe must be handled carefully in order to avoid breakage.

5.3.2 High capacity

Standard capacity spool valve means the spool valve options 35 or 37 in VG9235 or VG9237. See type coding in the machine plate for details.

5.3.2.1 Removal

Unscrew the M5 screws (4 pcs.). Remove the spool valve (420) with gasket from the mounting block (421).

5.3.2.2 Installation

Ensure that the gasket (63) is properly located in the grooves in the bottom of the spool valve. Mount the spool valve (420) to the mounting block (421), and tighten the four M5 screws evenly.

5.4 Communication circuit board

NOTE: Communication circuit board cannot be changed in the field.

5.4.1 Removal

Loosen the M8 stop screw (110) in the position indicator (109) and turn the position indicator from the shaft (11). Remove the inner cover (39) attached with M3 screws (42, 3 pcs.). Remove the M3 screws (217, 4 pcs.). Hold the sides of the circuit board and lift it directly upwards and outwards. Handle the board carefully, touching only the sides.

NOTE: Ground yourself on the body of the device before touching the circuit board.

5.4.2 Installation

Mount the new communication circuit board carefully.

Locate the pins with the matching connector on the board. Tighten the M3 screws (217) evenly.

Install the inner cover (39).

Mount the position indicator (109) on the shaft and tighten the M8 stop screw (110) temporarily. The final orientation and locking of the position indicator should be done after installation of the valve controller to the actuator.

ATEX WARNING: Grounding of the circuit board is essential to explosion protection.

The board is grounded to the housing by the mounting screw next to the terminal blocks.
### 6. MESSAGES

These messages may appear in the local user interface.

<table>
<thead>
<tr>
<th>Display message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTUATOR FULL STROKES COUNTER LIMIT EXCEEDED</td>
<td>Generated when actuator full stroke count exceeds the warning limit.</td>
</tr>
<tr>
<td>CALIBRATION CANCELLED</td>
<td>Generated when calibration routine is cancelled, by user or other process.</td>
</tr>
<tr>
<td>CALIBRATION FAILED</td>
<td>Generated when calibration process failed.</td>
</tr>
<tr>
<td>CALIBRATION FAILED - ALARM STATE ACTIVE</td>
<td>Generated if alarm state becomes active during calibration process.</td>
</tr>
<tr>
<td>CALIBRATION FAILED - CALIBRATION ALREADY ACTIVE</td>
<td>Generated if another calibration process is active and a new request for calibration is done.</td>
</tr>
<tr>
<td>CALIBRATION FAILED - EMERGENCY TRIP ACTIVE</td>
<td>Generated if calibration process is called when Emergency Trip is active.</td>
</tr>
<tr>
<td>CALIBRATION FAILED - TOO LOW SUPPLY</td>
<td>Generated if supply pressure is too low during calibration process.</td>
</tr>
<tr>
<td>CALIBRATION START FAILED</td>
<td>Generated when calibration routine can not be started.</td>
</tr>
<tr>
<td>CALIBRATION SUCCESSFUL</td>
<td>Generated when calibration process was completed successfully.</td>
</tr>
<tr>
<td>CALIBRATION TIMEOUT</td>
<td>Generated when calibration routine has lasted too long.</td>
</tr>
<tr>
<td>CONTINUED WATCHDOG RESET</td>
<td>Generated when too many consecutive internal resets have been generated.</td>
</tr>
<tr>
<td>CONTINUED WATCHDOG RESET</td>
<td>Generated when software has lost the control, and internal watchdog generates reset.</td>
</tr>
<tr>
<td>EMERGENCY TRIP ACTIVATED</td>
<td>Generated when Emergency Trip has been activated.</td>
</tr>
<tr>
<td>ETT CLOSING TIME TOO HIGH</td>
<td>Generated if ETT closing time was detected too slow.</td>
</tr>
<tr>
<td>ETT OPENING TIME TOO HIGH</td>
<td>Generated if ETT opening time was detected too slow.</td>
</tr>
<tr>
<td>FACTORY DEFAULTS ACTIVATED</td>
<td>Generated every time when parameters are loaded with factory settings.</td>
</tr>
<tr>
<td>FACTORY SETTINGS CREATE FAILURE DETECTED</td>
<td>Generated when factory settings creation fails.</td>
</tr>
<tr>
<td>FACTORY SETTINGS RESTORE FAILURE DETECTED</td>
<td>Generated when factory settings restoration fails, i.e. current parameter set can not be loaded with factory settings.</td>
</tr>
<tr>
<td>HOUSING PRESSURE LIMIT EXCEEDED</td>
<td>Generated when housing pressure is too high.</td>
</tr>
<tr>
<td>LOOP CURRENT LOW LIMIT EXCEEDED</td>
<td>This event is generated if loop current drops below user configurable limit. Detection has also a latch time parameter.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if comparator proof test fails.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if FET #1 proof test fails.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if FET #2 proof test fails.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if comparator proof test fails.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if FET #1 proof test fails.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if FET #2 proof test fails.</td>
</tr>
<tr>
<td>none</td>
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</tr>
<tr>
<td>none</td>
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<tr>
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</tr>
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</tr>
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<td>none</td>
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</tr>
<tr>
<td>none</td>
<td>Generated if comparator proof test fails.</td>
</tr>
<tr>
<td>none</td>
<td>Generated if FET #1 proof test fails.</td>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
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</tr>
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<tr>
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<tr>
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<td>Generated if FET #1 proof test fails.</td>
</tr>
</tbody>
</table>
7 TROUBLE SHOOTING

Mechanical/electrical defects

1. Any request to change the valve position has no affect to the position
   - Spool valve sticks
   - Incorrect configuration parameters
   - Actuator and/or valve jammed
   - Signal wires incorrectly connected, no value on display
   - Circuit boards are defective
   - Calibration has not been carried out
   - Prestage is defective
   - Spool mounted backwards into spool valve
   - Supply pressure too low

2. Inaccurate positioning
   - Too high actuator load
   - Supply pressure too low
   - Pressure sensors are defective
   - Actuator leakage
   - Spool valve dirty

3. Overshooting or positioning too slow
   - Supply air tube too small or supply air filter dirty
   - Valve sticks
   - Check leakages in tubes between controller and actuator
   - Check leakages in mechanical stop screws
   - Spool valve dirty

4. Error during valve travel calibration
   - The parameter setting $PFR$ incorrectly selected
   - Check the coupling alignment with the pointer, see Fig. 4.
   - The actuator or valve did not move or was stuck during calibration
   - Supply pressure too low
   - Spool valve dirty
8 VG92_H/K_, VG92_H/I__, VG92_H/D__ (WITH LIMIT SWITCHES)

8.1 Introduction

8.1.1 General description

VG9200H can be equipped with limit switches. VG9200H/K2_ has two microswitches, VG9200H/K4_ has four microswitches, VG9200H/I__ has two inductive proximity switches, and VG9200H/D__ has a Dual Module sensor with two inductive proximity switches. Limit switches are used for electrical position indication of the valves and other devices.

The switching points may be chosen freely.

8.1.2 Markings

The limit switch is provided with an identification plate sticker, see Fig. 29. Identification plate markings from top to bottom are:

- Type designation
- Electrical values
- Temperature range
- Enclosure class
- Conduit entry
- Manufacturing serial number

The type designation is described in Chapter 15.
8.1.3 Technical specifications

8.1.3.1 VG92_H/K_

Microswitch type: OMRON D2VW-5 (K25 or K45)
OMRON D2VW-01 (K26 or K46) (gold-plated contacts)
Protection class IP67

Resistive load:
- 3A: 250 V AC (K25 or K45)
- 5A: 30 V DC
- 0.4A: 125 V DC
- 100 mA: 30 V DC / 125 V AC (K26 or K46)

Switch accuracy: < 2°

Number of switches: 2 (K25 or K26), 4 (K45 or K46)

Protection class of cover:
- IP66 (DIN 40050, IEC 60529)

Conduit entry: M20 x 1.5

Ambient temperature:
- -20° to +80 °C / -4° to +176 °F

Weight: Approx. 1.0 kg / 2.2 lb (limit switches only)

8.1.3.2 VG92_H/I_

Proximity switch: Inductive, diameter 8–18 mm

Sensing range:
- 2 mm (02, 09, 56)
- 3 mm (45)

Protection class:
- IP68 (02, 09, 45)
- IP67 (56)

Switch types:
- P+F NJ2-12GK-SN (02)
- P+F NCB2-12GM35-N0 (09)
- P+F NJ3-18GK-S1N (45)
- ifm IFC2002-ARKG/UP (56)
- Other switch types on special order

Electrical values:
- According to switch type

Switch accuracy: < 1°

Number of switches: 2

Protection class of housing:
- IP66 (DIN 40050, IEC 60529)

SIL:
- Usable up to SIL3 acc. to IEC61508 (02, 45)
- Usable up to SIL2 acc. to IEC 61508 (09)

Conduit entry: M20 x 1.5

Ambient temperature:
- -20° to +51 °C / -4° to +124 °F (02)
- -20° to +85 °C / -4° to +185 °F (09, 45)
- -20° to +80 °C / +176 °F (56)

Weight: Approx. 1.0 kg / 2.2 lb (limit switches only)

8.1.3.3 VG92_H/D_

Proximity switch: Inductive, Dual Module
- 2 sensors,
- Normally Open (D33),
- Normally Closed (D44)

Electrical values:
- SST Dual Module (D33)

Indications:
- Target on sensor = LED off
- Target off sensor = LED on

Operating voltage: 8–125 V DC; 24–125 V AC

Maximum voltage drop:
- 6.5 V / 10 mA
- 7.0 V / 100 mA

Current ratings:
- Max inrush: 2.0 A / 125 V DC / V AC
- Max continuous: 0.3 A / 125 V DC / V AC
- Minimum on current: 2.0 mA
- Leakage current:
  - <0.15 mA with DC voltage
  - <0.25 mA with AC voltage

Namur Dual Module (D44)

Indications:
- Target on sensor = LED off
- Target off sensor = LED on

Operating voltage: 6–29 V DC

Current ratings:
- Target on (LED off) <1.0 mA
- Target off (LED on) >3.0 mA

Must use intrinsically safe repeater barrier.

Namur sensors conform to DIN 19234 standard.

Number of switches: 2

Protection class of housing:
- IP66 (DIN 40050, IEC 60529)

Conduit entry: M20 x 1.5

Ambient temperature:
- -20° to +80 °C / -4° to +176 °F

Weight: Approx. 1.0 kg / 2.2 lb (limit switches only)

8.2 Installing VG92_H/K_, VG92_H/I_ or VG92_H/D_ on a valve controller

The limit switch may be installed on an existing valve controller:

- If the valve controller is already mounted on an actuator/valve assembly, operate the actuator into the closed or open position.
- Remove the cover (100), the pointer (109), the LUI (223) and electronics cover (39).
- Turn the shaft (311) onto the shaft (11). Fasten the screw (312) using a locking agent such as Loctite.
- Mount the electronics cover (39) and the limit switch housing (300) on the valve controller. Lock the housing in place with screw (326). Install the base plate (324) with the limit switches and connector block into the limit switch housing. Fasten the base plate with screws (325), 3 pcs.
- Install the cam discs (313) and spacers (346) to the shaft.
- Mount the LUI (223) on the holder (306).
- Replace the plastic plugs with metal ones in conduit entries which will not be used.
- Mount the pointer (109) on the shaft (311). Adjust the limit switch according to 8.4.
8.3 Electrical connections
Before connecting the power, make sure that the electrical specifications and the wiring meet the installation conditions. See the diagrams in 11.6. Refer to the information on the identification plate.

VG9200/I or VG9200/D: Observe the functioning of the proximity switch; activated when the active face is either covered or free.

8.4 Adjustment
The pointer (109) need not be removed for adjustment. When the limit switch is ordered together with the valve and the actuator, the valve controller switches are factory-adjusted. The limits may be adjusted by altering the position of the cam discs (313) on the shaft. The lower switch is activated at the closed limit and the upper switch at the open limit.

- With the actuator in the open or closed position, locate the switching point by turning the cam disc so that the switch state changes approx. 5°–6° before the limit.

8.5 Removal of the limit switches

VG92_H/K_ , VG92_H/I_ or VG92_H/D for accessing the valve controller

- Remove the cover (100) and the pointer (109).
- Loosen the screws (314) in the cam disks (313) and remove the cam disks and spacers (346) from the shaft.
- Remove the LUI cabling from the circuit board. Disconnect and remove all cabling which enters the limit switch housing (300).
- Remove screws (325), 3 pcs and lift out the limit switch base plate (324) complete with switches, LUI and connector block.
- Open screw (326) and turn the limit switch housing (300) from the positioner housing.
- Remove the electronics cover (39).
- Proceed with the valve controller as applicable.
- Re-install the limit switch according to 8.2 and check the adjustment according to 8.4.

ATEX WARNING:
The locking screw of the limit switch housing (Part 326) is essential to explosion protection.
The limit switch housing has to be locked in place for Ex d protection. The screw grounds the limit switch housing to the housing of the valve controller.

8.6 Circuit diagrams

The internal circuitry of the limit switch is shown in the connection diagrams in 11.6.

8.7 Maintenance
Regular maintenance of the limit switch is not necessary.

9 TOOLS

Following tools are needed for the product installation and service:

- Flat screwdriver
- 2.0 x 060 mm
- Torx screwdriver
- T20
- Hexagon screwdrivers
- 3 mm
- 6 mm

10 ORDERING SPARE PARTS

Spare parts are delivered as modules. The modules available are indicated in 11.1.

When ordering spare parts, always include the following information:

- type code, sales order number, serial number
- number of the parts list, part number, name of the part and quantity required

This information can be found from the identification plate or documents.
11 DRAWINGS AND PARTS LISTS

11.1 Exploded view and parts list, VG9200H
<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Description</th>
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<tr>
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<tr>
<td>16</td>
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<td>Washer</td>
</tr>
<tr>
<td>18</td>
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<td>Wave spring</td>
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<tr>
<td>19</td>
<td>1</td>
<td>Bushing</td>
</tr>
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<td>Grounding screw</td>
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<td>Protection cover</td>
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</tr>
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**AVAILABLE SPARE PART SETS:**
- LUI (Local User Interface)
- Pointer
- Cover
- Limit switches
11.2 Exploded view and parts list, VG9200H/K, VG9200H/I, VG9200H/D
<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Description</th>
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<td>Pointer</td>
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<td>Stop screw</td>
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<td>Local user interface (LUI)</td>
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<td>309</td>
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<td>Screw</td>
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<td>326</td>
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</tr>
<tr>
<td>437</td>
<td>1</td>
<td>Nipple</td>
</tr>
</tbody>
</table>
11.3 Mounting parts for Metso actuators with VDI/VDE mounting face

11.4 Mounting parts for Quadra-Powr® actuators
11.5 Mounting parts for linear actuators

Item | Qty | Description
--- | --- | ---
1 | 1 | Bracket
2 | 1 | Feedback lever
3 | 1 | Filling piece
4 | 1 | Clearance remove spring
5 | 4 | Cross rec head screw
6 | 4 | Washer
7 | 4 | Hexagon screw
8 | 4 | Washer
9 | 4 | Hexagon screw
11 | 4 | Spring washer
12 | 2 | Hexagon nut
14 | 2 | Clamp
15 | 1 | Fixing plate
16 | 1 | Special screw
17 | 1 | Hexagon nut
18 | 2 | Washer
19 | 2 | Hexagon screw
54 | 2 | Plug
11.6 Connection diagrams

See Section 8.1.3 for additional limit switch data.

mA signal and Position Transmitter (optional) connections

![Diagram of mA input signal and Position Transmitter connections]

Note: Terminal numbers are valid only when extension housing or junction box are used.

Factory adjustment:
Active faces of proximity switches are covered when actuator is in intermediate position.
Active face A (upper switch) becomes free at open limit of travel and face K (lower switch) at closed limit.

Function can be inverted on site by re-adjusting the cam discs.

Sensing distance 2...4 mm, depending on type of switch
Supply voltage 8 V DC (Ri 1 kΩ)
Current consumption
active face free, > 3 mA
active face covered, < 1 mA

PROXIMITY SWITCH

Intrinsically safe II 1 G Ex ia IIC T6.

Voltage (Ui), current (Ii), power (Pi), inductance (Li) and capacitance (Ci) according to certificate of switch, see table below.

Table 1.

<table>
<thead>
<tr>
<th>Metso type code</th>
<th>Manufacturer of switch</th>
<th>Type of switch</th>
<th>ATEX certification</th>
<th>IECEx certification</th>
<th>Ui (V)</th>
<th>Ii (mA)</th>
<th>Pi (mW)</th>
<th>Li (µH)</th>
<th>Ci (nF)</th>
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<tbody>
<tr>
<td>I02</td>
<td>Pepperl+Fuchs</td>
<td>NJ2-120K-SN</td>
<td>II 2 G Ex ia IIC T6</td>
<td>N/A</td>
<td>16</td>
<td>52</td>
<td>169</td>
<td>150</td>
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<td>I09</td>
<td>Pepperl+Fuchs</td>
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<td>52</td>
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<td>100</td>
<td>90</td>
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<td>I45</td>
<td>Pepperl+Fuchs</td>
<td>NJ2-160K-S1N</td>
<td>II 2 G Ex ia IIC T6</td>
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<td>16</td>
<td>52</td>
<td>184</td>
<td>200</td>
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<td>Y a)</td>
<td>Turck</td>
<td>BI2-P12-Y7A/S97</td>
<td>II 2 G Ex ia IIC T6</td>
<td>IECEx KEM 60-0039X</td>
<td>20</td>
<td>20</td>
<td>200</td>
<td>150</td>
<td>150</td>
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<tr>
<td>Y b) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>c)</td>
</tr>
</tbody>
</table>

Note:
   a) Y always to be specified.
   b) Y always to be specified.
   c) ATEX / IECEx certified Ex ia switches. Values according to switch type.
Factory adjustment:
Active faces of proximity switches are free when actuator is in intermediate position. Active face A (upper switch) becomes covered at the open limit of the travel and face K (lower switch) at the closed limit.

Function can be inverted on site by re-adjusting the cam discs.

Connections: Load can be connected to + or -.

PROXIMITY SWITCH

ifm electronic IFC2002-ARKG/UP
2-wire type
Sensing distance 2 mm
Rated voltage U = 10 - 36 V DC
Output current < 150 mA
  active face covered, LED on
Quiescent current < 0,6 mA
  active face free
Ambient temperature -20 ... +80 °C / -4 ... +176 °F
**VG92_H/D33**

Connections SOL1, SOL2, SOL PWR1 and SOLPWR2 are not used.

- **TOP SW NO**: Positive connection for top switch
- **TOP SW C**: Negative connection for top switch
- **BTM SW NO**: Positive connection for bottom switch
- **BTM SW C**: Negative connection for bottom switch

See Section 8.1.3.4 for electrical ratings.

**VG92_H/D44**

Connections SOL1, SOL2, SOL PWR1 and SOLPWR2 are not used.

- **TOP SW +**: Positive connection for top switch
- **TOP SW -**: Negative connection for top switch
- **BTM SW +**: Positive connection for bottom switch
- **BTM SW -**: Negative connection for bottom switch

See Section 8.1.3.4 for electrical ratings.
Connection diagram shows limit switch when actuator is in intermediate position. Switch A (upper) is activated at the open limit of the travel and switch K (lower) at the closed limit.

Electrical characteristics:

OMRON D2VW-5 (K_5):
- 3 A - 250 V AC, 0.4 A - 125 V DC,
- 5 A - 30 V DC

OMRON D2VW-01, gold plated contacts (K_6):
- 100 mA - 30 V DC / 125 V AC

Ambient temperature -20 ... +80 °C / -4 ... +176 °F
AO, HART multiplexer

Hazardous area | Safe area
---|---
VG9000H

Safety system AO (4 - 20 mA)

HART Multiplexer (SIL)

---

DO, RCI, HART AI (sink)

Hazardous area | Safe area
---|---
VG9000H

RCI9H

Supply

Safety system DO (0/24 V DC)

AI (HART)

Sink

24 V DC supply
VG9_H_J

VG9000H

mA
+
-
PT
+
-

JB

G
6
5
4
3
G

LPC9H

Hazardous area       Safe area

VG9000H

+    +
-    -

Loop B -
Loop B +
Loop A -
Loop A +
PWR_IN +
PWR_IN -

789

LCP9H

Safety system
AO
(4 - 20 mA, HART)

PWR_IN+
PWR_IN-

24 V DC supply
### 13 CONFIGURATION PARAMETERS

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Values</th>
<th>Default value</th>
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</thead>
<tbody>
<tr>
<td>Actuator Type (Atyp)</td>
<td>Single acting actuator (1-A)</td>
<td>1-A</td>
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<tr>
<td></td>
<td>Double acting actuator (2-A)</td>
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</tr>
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<td>Valve Type (Vtyp)</td>
<td>Rotary (Rot)</td>
<td>rot</td>
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<td></td>
<td>Linear (Lin)</td>
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<tr>
<td>Positioner Fail Action (PFA)</td>
<td>Close (CLO)</td>
<td>Open (OPE)</td>
</tr>
<tr>
<td>Extra Pneumatics Instrumentation (EXTI)</td>
<td>non = none</td>
<td>bo1 = Volume Booster type 1</td>
</tr>
<tr>
<td></td>
<td>bo2 = Volume Booster type 2</td>
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</tr>
<tr>
<td></td>
<td>bo3 = Volume Booster type 3</td>
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</tr>
<tr>
<td></td>
<td>qE1 = Quick Exhaust type 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>qE2 = Quick Exhaust type 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>qE3 = Quick Exhaust type 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>co1 = Combination type 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>co2 = Combination type 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>co3 = Combination type 3</td>
<td></td>
</tr>
<tr>
<td>Actuator size (ACTS)</td>
<td>S 1 = B1J8 (&lt;1 dm³ / &lt;61 in³)</td>
<td>S 1</td>
</tr>
<tr>
<td></td>
<td>S 3 = B1J10 (1-3 dm³ / 61-183 in³)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S10 = B1J16 (3-10 dm³ / 183-610 in³)</td>
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<td></td>
<td>S30 = B1J20-25 (10-30 dm³ / 610-1831 in³)</td>
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<tr>
<td></td>
<td>L30 = B1C40-, B1J32- (&gt;30 dm³ / &gt;1831 in³)</td>
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<td>Spool Type (STYP)</td>
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<td>35 = VG9235</td>
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<td></td>
<td>37 = VG9237</td>
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<tr>
<td>Automatic Partial Stroke Test (APSt)</td>
<td>dis = auto PST disabled</td>
<td>EnA = auto PST enabled</td>
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<td>rnd = auto PST enabled with randomized range</td>
<td>diS</td>
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<tr>
<td>Manual Partial Stroke Test Size (MStr)</td>
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<td>10.0 %</td>
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<td>German (GEr)</td>
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<td>French (FrE)</td>
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</tr>
<tr>
<td>Local Control Panel (LCP)</td>
<td>Enabled (EnA)</td>
<td>Disabled (diS)</td>
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EC DECLARATION OF CONFORMITY

Manufacturer:
Metso Automation Oy
00811 Helsinki
Finland

Product: Intelligent Safety Valve Controller Neles ValvGuard VG9000-series

Approvals:

<table>
<thead>
<tr>
<th>Type</th>
<th>Approval</th>
<th>EC Type examination Certificate</th>
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<tbody>
<tr>
<td>VG92_F_E6</td>
<td>ATEX II 2 G Ex d IIC T5/T6 Gb</td>
<td>ZELM 07 ATEX 0342 X</td>
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<td>VG92_H_E6</td>
<td>ATEX II 2 G Ex d IIC T5/T6 Gb</td>
<td>ZELM 07 ATEX 0342 X</td>
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<td>VG92_H_X1</td>
<td>ATEX II 1 G Ex ia IIC T4/T5/T6 Ga</td>
<td>KEMA 10 ATEX0125 X</td>
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<td>VG92_H_X2</td>
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<td>VG92_H_X3</td>
<td>ATEX III 3 G Ex na nL IIC T4/T5/T6 Gc</td>
<td>KEMA 10 ATEX0126</td>
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Applicable directives:
EMC 89/336/EC and 93/68/EC Electrical components
ATEX 94/9/EC Electrical and non-electrical components

As the products within our sole responsibility of design and manufacture may be used as parts or components in machinery and are not alone performing functions as described in Article 6(2) in the Machinery Directive (2006/42/EC), we declare that our product(s) to which this Declaration of Conformity relates must NOT be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive.

The product above is manufactured in compliance with the applicable European directives and technical specifications/standards.

Protection from e.g. static electricity caused by the process or connected equipment must be considered by the user (EN 60079-14 §6).

The product do not possess any residual risk according to hazard analyses made under the applicable directives providing that the procedures stated by the Installation, Operation and Maintenance manual are followed and the product is used under conditions mentioned in the technical specifications.

Manufacturer's certificates:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ATEX 94/9/EC Annex IV</td>
<td>DNV 0575</td>
<td>DNV-2006-OSL-ATEX-0260Q</td>
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</tbody>
</table>

Helsinki 15 June 2010

Ralf Liljestrand, Quality Manager
Authorized person of the manufacturer within the European Community
**15 TYPE CODING**

**VALVGUARD VG9200H**

1. **PRODUCT GROUP**
   - VG: Neles Valguard VG92000H, Intelligent Safety Valve Controller. TÜV SIL 3 certified according to IEC 61508.

2. **SERIES CODE**
   - Series 9200 intelligent safety valve controller with universal shaft and attachment face according to standard VDI/VE 3845. Relevant shaft adapter included in mounting kit. When safety valve controllers are separate deliveries, shaft adapter kit is supplied.

3. **ENCLOSURE**
   - Standard IP66 / NEMA 4X enclosure.
   - Standard temperature range -20° to +85 °C / -4° to +185 °F
   - 1 pc. M20 x 1.5 conduit entry.

4. **SPOOL VALVE CONNECTIONS**
   - Standard capacity.
   - Stroke volume of actuator < 13 dm³.
   - Single acting actuators.

5. **COMMUNICATION / INPUT SIGNAL RANGE**
   - 4-20 mA, HART communication.

6. **APPROVALS FOR HAZARDOUS AREAS**
   - No approvals for hazardous areas.

   **ATEX and IECEx certifications:**
   - II 1 G Ex ia IIC T6
   - Temperature range: T6: -20° to +65 °C / -4° to +149 °F
   - Not applicable to 7. sign "N" or "X1".

7. **OPTIONS OF VALVE CONTROLLER**
   - Industrial 2-wire (passive) position transmitter. Analog position feedback signal, output 4-20 mA, supply voltage 12-30 V DC.
   - External junction box for 10-30 mA wirings, including position transmitter, if applicable. Junction box is located in the standard enclosure.

8. **LIMIT SWITCH TYPE**
   - IP 66 / NEMA 4X enclosure.
   - Extension housing with additional conduit entries, 4 pcs. M20 x 1.5

   - Inductive proximity switches, 2 pcs.

   **PRODUCT GROUP**
   - IP 66 / NEMA 4X enclosure.

   **SPOOL VALVE CONNECTIONS**
   - Standard temperature range -20° to +85 °C / -4° to +185 °F
   - 1 pc. M20 x 1.5 conduit entry.

   **COMMUNICATION / INPUT SIGNAL RANGE**
   - 4-20 mA, HART communication.

   **APPROVALS FOR HAZARDOUS AREAS**
   - No approvals for hazardous areas.

   **ATEX and IECEx certifications:**
   - II 1 G Ex ia IIC T6
   - Temperature range: T6: -20° to +65 °C / -4° to +149 °F
   - Not applicable to 7. sign "N" or "X1".

   **OPTIONS OF VALVE CONTROLLER**
   - Industrial 2-wire (passive) position transmitter. Analog position feedback signal, output 4-20 mA, supply voltage 12-30 V DC.
   - External junction box for 10-30 mA wirings, including position transmitter, if applicable. Junction box is located in the standard enclosure.

   **LIMIT SWITCH TYPE**
   - Extension housing with additional conduit entries, 4 pcs. M20 x 1.5

   - Inductive proximity switches, 2 pcs.