

## NELES® VALVGUARD VG9000 INTELLIGENT SAFETY SOLENOID

Metso's Neles ValvGuard VG9000 is a new generation intelligent safety solenoid with partial stroke testing features. It can be used both with emergency shutdown (ESD) and emergency venting (ESV) valves. Its unique and advanced functions and features are specially designed for safety applications. Together with HART & FOUNDATION fieldbus communication it offers unbeatable value for our customers with increased efficiency, reliability and safety.

VG9000 is IEC 61508 compliant up to SIL 3, certified by TÜV Rheinland. Based on the automatic partial stroke testing (PST) and other diagnostics data, VG9000 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. VG9000 HART version is operated by 4-20 mA signal and the diagnostics part of the device can be alive all the time. VG9000 FOUNDATION fieldbus version communication is done via the bus. Safety part is isolated from the fieldbus part and is powered with the separate binary 24 V DC signal. This is a true user benefit and gives maximum availability of the diagnostics information. VG9000 is thus capable to record emergency trips with graph and key figures related to it. The availability of the safety valves is maximized through unique diagnostics features, directly integrated into the device functionality. Diagnostic information is presented in an easily understandable form using a 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
- FOUNDATION fieldbus communication

### TÜV Certificate

Neles ValvGuard VG9000 is TÜV Rheinland certified according to IEC61508 to be used in safety applications up to and including safety integrity level 3 (SIL 3).

### Designed for harsh environments

Neles ValvGuard VG9000 is developed for use in harsh environments with epoxy coated anodised aluminum as standard material for the whole enclosure. Even the most corrosive environments can be handled with our full 316 stainless steel enclosure.



### 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 and EDD based multi-vendor support configuration
- Support files for VG9000 are available from our internet page, at <http://www.metso.com/vg9000> - choose Link to valve related software

### VG9000 with option P (Partial stroke test device)

When ValvGuard is used only for partial stroke testing and an additional solenoid valve is used for controlling the fail-safe action, VG9000 with P-option is an optimum choice. VG9000H\_P partial stroke test device provides excellent protection against the spurious trips. Even an electric failure or a cable break does not create an unwanted trip as the valve remains in the normal position even when ValvGuard is de-energized.

ValvGuard VG9000 with P-option is available with HART communication and the device is powered by analog 4 to 20 mA signal. VG9000H with P-option will give additional security against unauthorized usage by disabling all the testing, if input signal from the DCS is below 8 mA and also prevents an accidental calibration, if the signal is below 12 mA.

### Options

- Full stainless steel enclosure (VG9300)
- High pneumatic capacity (VG923\_)
- Integrated limit switches
- External junction box for wiring
- Version for partial stroke test only (VG9000H\_P). Safety valves fail-safe action to be controlled via separate solenoid valve
- Remote Communication Interface (RCI9H2) for VG9000H 24 VDC retrofit installations. (See type coding for RCI9H2 option and technical bulletin 9RCI21EN for all technical details)
- Local Control Panel (LCP9H) for VG9000H. (See type coding for LCP9H option)



**Lower total cost of ownership**

- Automated 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**

- Optimized spares program. Reduced number of spares
- Fewer components to maintain than in a traditional instrumentation solution
- Ability to attach options to mechanics
- 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
  - Epoxy coated anodised aluminum or full stainless steel enclosure
  - Rugged modular design
  - Excellent temperature characteristics
  - Vibration and impact tolerant
  - IP66 enclosure
  - 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 FieldCare software
  - Logical trend collection
  - Information collected on service conditions
  - Fast notifications with on-line alarms
  - Condition monitoring tool available

**VG9000F in FOUNDATION fieldbus networks**

- Approved interoperability
- Host interoperability ensured
- FOUNDATION fieldbus ITK version 6 certified
- Unique communication diagnostics
- Digital communication via the FOUNDATION fieldbus includes not only the diagnostics, but also the position feedback signal from the position sensor.
- Back up LAS functionality available
- Multipurpose functionality
- Open and close information directly available via the FOUNDATION fieldbus
- Open and close detection is based on either position measurement (soft limit switch) or optional internal limit switch information

**TECHNICAL DESCRIPTION**

Neles ValvGuard VG9000 is a 4-20 mA loop-powered microcontroller-based intelligent safety solenoid with partial stroke testing and 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.

Neles ValvGuard VG9000F is a microcontroller-based intelligent safety solenoid with partial stroke testing and FOUNDATION fieldbus communication. In addition to FOUNDATION fieldbus there is also a separate binary 24 V DC signal. It is isolated from the fieldbus and powers the safety part.

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 (VG9000H)
- Safety signal (VG9000F)
- Valve position with contactless sensor
- Actuator pressures, two independent measurements
- Supply pressure
- Device temperature
- Housing pressure

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 VG9000 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.

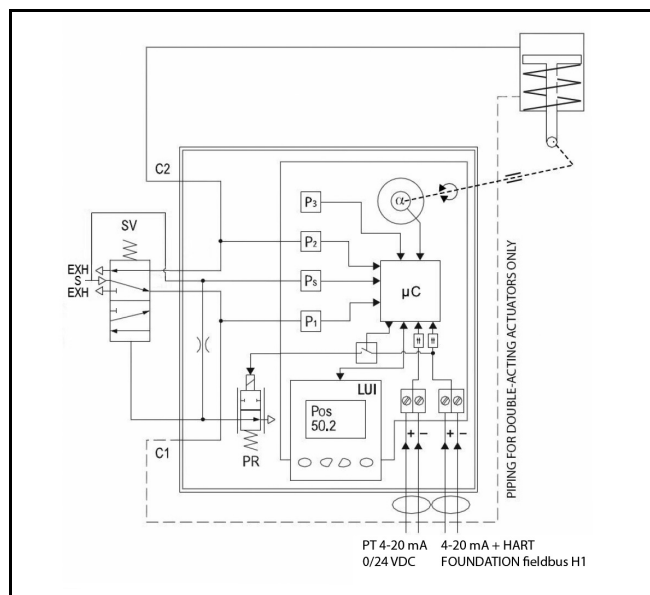


Fig. 1 The principle of operation

**Technical description of VG9000H with option P**

VG9000H\_P version has fundamentally different functionality to other VG9000H versions. This version can be identified by the green cover instead of a standard red cover.

VG9000H with P-option (VG9000H\_P) is a 4-20 mA loop-powered microcontroller-based partial stroke test device with HART communication. This device is for partial stroke test (PST) only and MUST be used together with an additional solenoid valve for the safety action.

Coil of the prestage is normally de-energized and it is controlled by the micro controller for testing and calibration. Signal failure does not affect to the valve position.

## TECHNICAL SPECIFICATIONS

### Neles ValvGuard VG9000H & VG9000F

#### General

VG9000H: Loop powered 4 - 20 mA, no external power supply required.

VG9000F: FOUNDATION fieldbus powered diagnostics, 24 VDC power from safety system for the safety part.

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° to +85 °C / -40° to +185 °F

Influence of temperature on valve position:

< 0,5 % / 10 °K

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: Epoxy coated anodised aluminum alloy and glass window (VG92\_, not E2) or full 316 stainless steel enclosure (VG93\_)

Protection class: IP66, NEMA 4X  
 Mechanical position indicator and LUI visible through the main cover (VG92\_, not E2)

Pneumatic ports: VG9\_1\_ 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  
 VG9315 9.0 kg / 19.8 lb  
 VG92\_ with extension housing plus 1.0 kg / 2.2 lb  
 VG93\_ with extension housing plus 3.0 kg / 6.6 lb

#### 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 6  
 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:

VG9212 7 Nm<sup>3</sup>/h / 4.1 scfm (Cv = 0.06)  
 VG9215 90 Nm<sup>3</sup>/h / 53 scfm (Cv = 0.7)  
 VG9235 380 Nm<sup>3</sup>/h / 223 scfm (Cv = 3.2)

VG9237 feed 380 Nm<sup>3</sup>/h / 223 scfm (Cv = 3.2)  
 exhaust 700 Nm<sup>3</sup>/h / 412 scfm (Cv = 6.4)

Consumption with 4 bar/60 psi supply:

actuator pressurized 0.22 Nm<sup>3</sup>/h / 0.13 scfm,  
 actuator vented 0.25 Nm<sup>3</sup>/h / 0.15 scfm

Consumption with 4 bar / 60 psi supply (VG9000H\_P):  
 0.25 Nm<sup>3</sup>/h / 0.15 scfm

#### VG9000H electronics (input)

Electrical connections: 0.25–2.5 mm<sup>2</sup>

Supply power: Loop powered, 4–20 mA

Signal range: 3.7–22 mA

Signal details (VG9000H):

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; diagnostics available)  
 16.0–22.0 mA (normal state; diagnostics available)

Signal details (VG9000H\_P):

0.0–3.7 mA (de-energized state; diagnostics not available)  
 3.7–6.0 mA (normal state; diagnostics available)  
 6.0–8.0 mA (normal state; PST and diagnostics available)  
 8.0–22.0 mA (normal state; PST, calibration and diagnostics available)

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

#### VG9000H electronics (output)

Usage: Position transmitter (T) / device status output (S)

Electrical connections: 0.25–2.5 mm<sup>2</sup>

Output signal: Defined by type code option T or S

T: 4–20 mA = 0–100 % position  
 S: 4 mA = OK  
 5 mA = Pneumatics test  
 6 mA = PST test  
 7 mA = ETT test  
 8 mA = Warning  
 10 mA = Alarm  
 12 mA = Safety position requested by LCP  
 Fault modes indicated by levels 3.5 and 22 mA  
 Galvanic isolation 600 V DC

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

#### LCP9H interface

Electrical connections: 0.25–2.5 mm<sup>2</sup>

**VG9000F safety signal (Binary input)**

Connections: 24 VDC: '+' and '-'  
 Min voltage: 11 V DC  
 Max output resistance:  $R_o = 285 \Omega$

**VG9000F FOUNDATION fieldbus**

Connections: H1: '+' and '-'  
 Power supply: taken from bus  
 Bus voltage: 9 to 32 V DC, reverse polarity protection  
 Max basic current: 14.2 mA  
 Operating current: 20.7 mA  
 Fault current (FDE): 6.3 mA

**VG9000F FOUNDATION fieldbus function block execution times**

MDO 15 ms  
 MDI 15 ms  
 AI 20 ms

**Local user interface functions**

- Monitoring of valve position, temperature, supply pressure, actuator pressure difference, input signal, safety signal status and device usage option (VG9000F)
- Guided start-up function
- LUI may be locked remotely to prevent unauthorised access
- Automatic travel calibration
- Parameter selection
- Testing
- Language selection: English, German and French
- Alarm and warning state indications
- Latest event view

**Safety**

IEC 61508 compliant up to and including SIL 3 by TÜV Rheinland (not applicable to VG9000H\_P)

**Electromagnetic protection**

Electromagnetic compatibility  
 Emission acc. to EN 61000-6-4  
 Immunity acc. to EN 61000-6-2

**CE marking**

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

**Interoperability**

VG9000 DTM certified by FDT group  
 DD registered by HCF  
 DD registered by FOUNDATION fieldbus

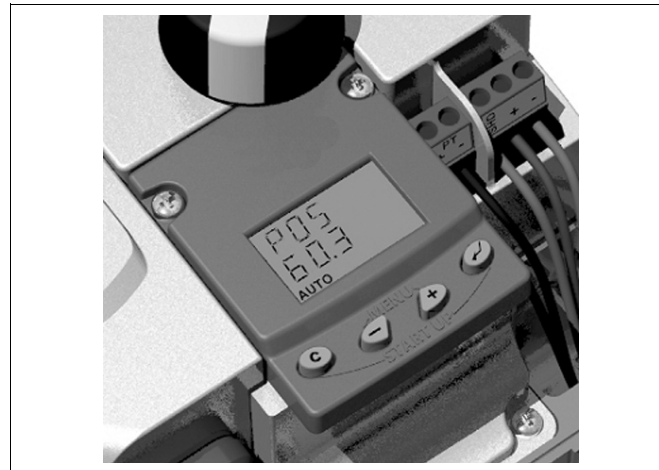


Fig. 2. Local User Interface enables real time awareness of device parameters.

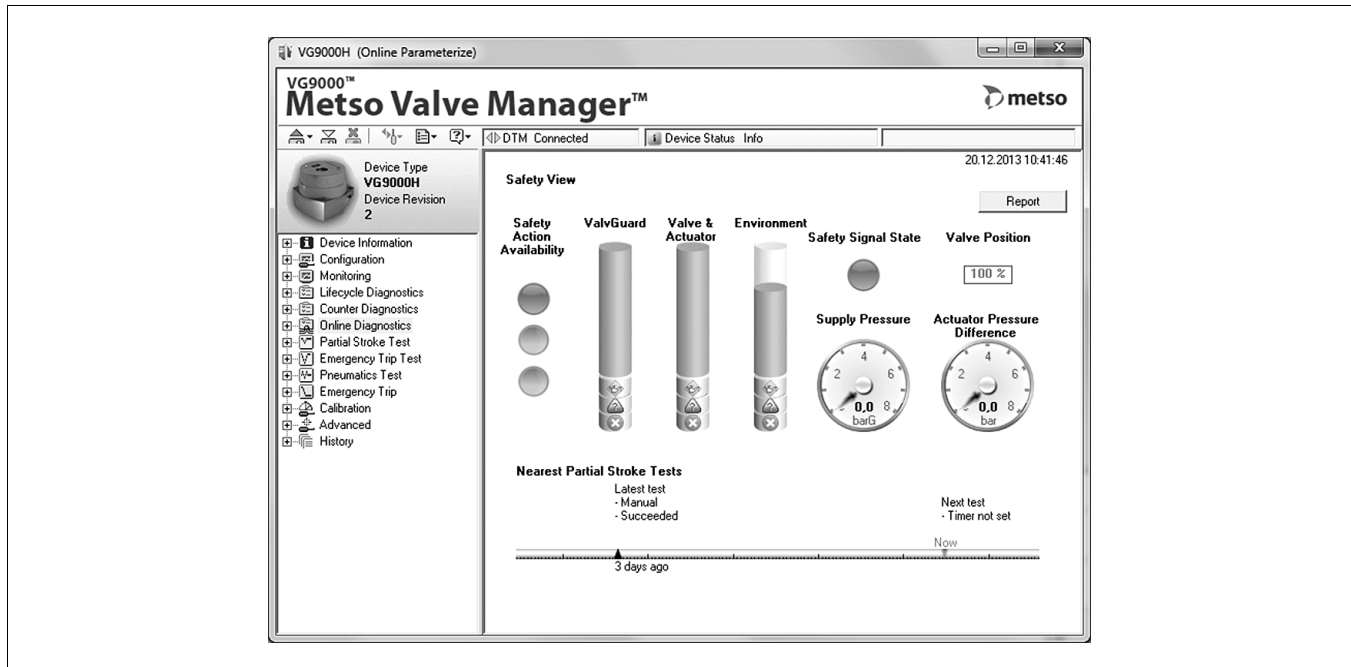


Fig. 3. Configuration and diagnostics are easy to do with Metso Valve Manager™, graphical user interface.

## APPROVALS AND ELECTRICAL VALUES, VG9000H

Certificate	Approval	Electrical values
<b>ATEX</b>		
<b>VG9_X</b> VTT 14 ATEX 043X EN 60079-0: 2012, EN 60079-11:2012, EN 60079-26:2007	II 1 G Ex ia IIC T6...T4 Ga II 1 D Ex ia IIIC T95 °C...T125 °C Da  II 2 G Ex ib IIC T6...T6 Gb II 2 D Ex ib IIIC T95 °C...T125 °C Db	Input: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i \leq 9.6 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ PT: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $L_i \leq 53 \mu\text{H}$ , $C_i \leq 8 \text{ nF}$ LCP: $U_i \leq 10 \text{ V}$ , $I_i \leq 100 \text{ mA}$ , $P_i \leq 0.25\text{W}$ , $C_i \leq 5 \text{ nF}$ , $L_i \leq 1 \mu\text{H}$
<b>VG9_X</b> VTT 14 ATEX 044X EN 60079-0: 2012, EN 60079-15: 2010	II 3 G Ex nA IIC T6...T4 Gc  II 3 G Ex ic IIC T6...T6 Gc II 3 D Ex ic IIIC T95 °C...T125 °C Dc	Input: $U_i \leq 30 \text{ V}$ PT: $U_i \leq 30 \text{ V}$ LCP: $U_i \leq 15 \text{ V}$
<b>VG9_E6</b> SIRA 11 ATEX 1006  EN 60079-0:2012, EN 60079-1:2007, EN 60079-31:2009	II 2 G Ex d IIC T6...T4 Gb II 2 D Ex tb IIIC T80 °C...T105 °C Db	Input: $U_i \leq 30 \text{ V}$ , $P_i \leq 1080 \text{ mW}$ PT: $U_i \leq 30 \text{ V}$ , $I_i \leq 20 \text{ mA}$ , $P_i \leq 1050 \text{ mW}$
<b>IECEx</b>		
<b>VG9_X</b> IECEx VTT 14.0005X IEC 60079-0: 2011, IEC 60079-11: 2011, IEC 60079-26: 2006	Ex ia IIC T6...T4 Ga Ex ia IIIC T95 °C...T125 °C Da  Ex ib IIC T6...T6 Gb Ex ib IIIC T95 °C...T125 °C Db	Input: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i \leq 9.6 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ PT: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $L_i \leq 53 \mu\text{H}$ , $C_i \leq 8 \text{ nF}$ LCP: $U_i \leq 10 \text{ V}$ , $I_i \leq 100 \text{ mA}$ , $P_i \leq 0.25\text{W}$ , $C_i \leq 5 \text{ nF}$ , $L_i \leq 1 \mu\text{H}$
<b>VG9_X</b> IECEx VTT 14.0006X IEC 60079-0: 2011, IEC 60079-15: 2010	Ex ic IIC T6...T6 Gc Ex nA IIC T6...T4 Gc Ex ic IIIC T95 °C...T125 °C Dc	Input: $U_i \leq 30 \text{ V}$ PT: $U_i \leq 30 \text{ V}$ LCP: $U_i \leq 15 \text{ V}$
<b>VG9_E6</b> IECEx SIR 11.0001X  IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2008	Ex d IIC T6...T4 Gb Ex tb IIIC T80 °C...T105 °C Db	Input: $U_i \leq 30 \text{ V}$ , $P_i \leq 1080 \text{ mW}$ PT: $U_i \leq 30 \text{ V}$ , $I_i \leq 20 \text{ mA}$ , $P_i \leq 1050 \text{ mW}$
<b>INMETRO</b>		
<b>VG9_Z1_ , VG9_Z2_</b> NCC 12.0797 X  ABNT NBR IEC 60079-0:2008 ABNT NBR IEC 60079-11:2009 ABNT NBR IEC 60079-26:2008	Ex ia IIC T6...T4 Ga Ex ia IIC T6...T4 Gb	Input: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i \leq 9.6 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ PT: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $L_i \leq 53 \mu\text{H}$ , $C_i \leq 8 \text{ nF}$ LCP: $U_i \leq 10 \text{ V}$ , $I_i \leq 100 \text{ mA}$ , $P_i \leq 0.25\text{W}$ , $C_i \leq 5 \text{ nF}$ , $L_i \leq 1 \mu\text{H}$
<b>VG9_Z3_</b> NCC 12.0798  ABNT NBR IEC 60079-0:2008 versão corrigida 2011 ABNT NBR IEC 60079-11:2009 ABNT NBR IEC 60079-15:2010 ABNT NBR IEC 60529:2009	Ex ic nA IIC T6...T4 Gc	Input: $U_i \leq 30 \text{ V}$ , $I_i \leq 152 \text{ mA}$ , $C_i \leq 9.6 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ PT: $U_i \leq 30 \text{ V}$ , $I_i \leq 152 \text{ mA}$ , $C_i \leq 8 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ LCP: $U_i \leq 15 \text{ V}$ , $I_i \leq 1.35 \text{ A}$ , $C_i < 5 \text{ nF}$ , $L_i < 1 \mu\text{H}$
<b>VG9_E5_</b> NCC 12.0796 X  ABNT NBR IEC 60079-0:2008 versão corrigida 2011 ABNT NBR IEC 60079-1:2009 versão corrigida 2011 ABNT NBR IEC 60079-31:2011 ABNT NBR IEC 60529:2009	Ex d IIC Gb T5 Gb	Input: $U_i \leq 30 \text{ V}$ , $P_i \leq 1080 \text{ mW}$ PT: $U_i \leq 30 \text{ V}$ , $I_i \leq 20 \text{ mA}$ , $P_i \leq 1050 \text{ mW}$
<b>cCSAus</b>		
<b>VG9_U</b> CSA 70043951	IS Class I, Division 1, Groups A, B, C, and D; T4/T5/T6 Ex ia IIC T4/T5/T6 Ga IS Class I, Zone 0 AEx ia IIC T4/T5/T6 Ga	Input: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i = 1.0 \text{ W}$ , $C_i = 9.6 \text{ nF}$ , $L_i = 53 \mu\text{H}$ Output: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i = 1.0 \text{ W}$ , $C_i = 8 \text{ nF}$ , $L_i = 53 \mu\text{H}$
<b>VG9_E2_</b> CSA 1980091	Class I, Div 1, Groups B, C, D Class II, Div 1, Groups E, F, G Class III; T4...T6, Enclosure type 4X Ex d IIC T6...T4 AEx d IIC T6...T4 Ex tb IIIC T100 °C IP66 AEx tb IIIC T100 °C IP66	Input: $U_i \leq 30 \text{ V}$ PT: $U_i \leq 30 \text{ V}$

### Other hazardous area approvals

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

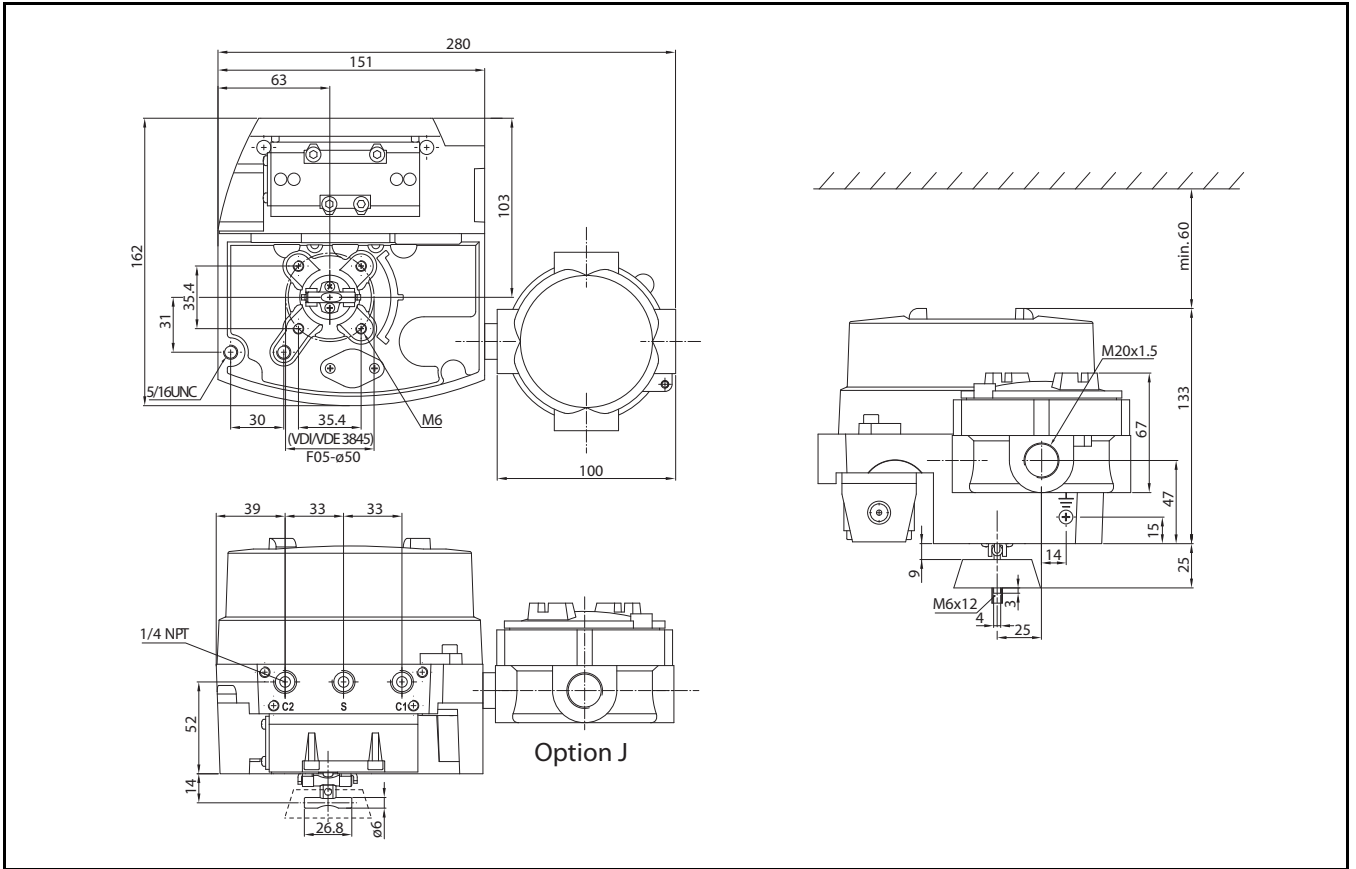


**APPROVALS AND ELECTRICAL VALUES, VG9000F**

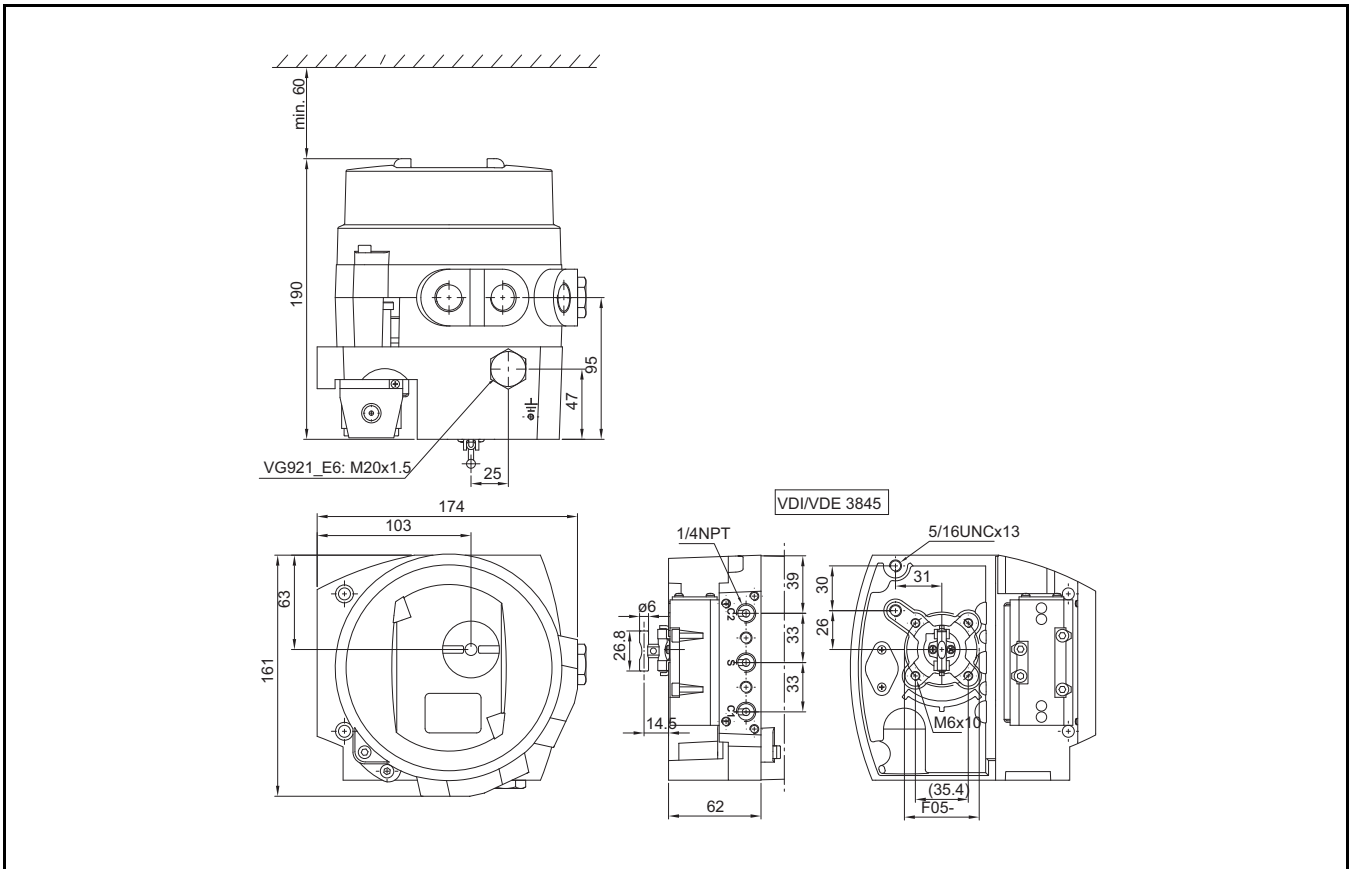
Certificate	Approval	Electrical values
<b>ATEX</b>		
<b>VG9_X</b> VTT 14 ATEX 074X  EN 60079-0: 2012, EN 60079-11: 2012, EN 60079-26: 2007	II 1 G Ex ia IIC T6...T4 Ga II 1 D Ex ia IIIC T95 °C...T125 °C Da II 2 G Ex ib IIC T6...T4 Gb II 2 D Ex ib IIIC T95 °C...T125 °C Db	Safety signal: $U_i \leq 28\text{ V}$ , $I_i \leq 150\text{ mA}$ , $P_i \leq 1.0\text{ W}$ , $C_i < 15\text{ nF}$ , $L_i < 220\text{ }\mu\text{H}$ FF signal: $U_i \leq 24\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$ , $C_i < 5\text{ nF}$ , $L_i < 10\text{ }\mu\text{H}$ Device conforms to the FISCO field device according to the standard IEC60079-11.
<b>VG9_X</b> VTT 14 ATEX 075X  EN 60079-0: 2012, EN 60079-11: 2012, EN 60079-15: 2010	II 3 G Ex nA IIC T6...T4 Gc II 3 G Ex ic IIC T6...T4 Gc II 3 D Ex ic IIIC T95 °C...T125 °C Dc	Safety signal: $U_i \leq 28\text{ V}$ , $I_i \leq 150\text{ mA}$ , $P_i \leq 1.0\text{ W}$ , $C_i < 15\text{ nF}$ , $L_i < 220\text{ }\mu\text{H}$ FF signal: $U_i \leq 24\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$ , $C_i < 5\text{ nF}$ , $L_i < 10\text{ }\mu\text{H}$ Device conforms to the FISCO field device according to the standard IEC60079-11.
<b>VG9_E6</b> SIRA 11 ATEX 1006  EN 60079-0:2012, EN 60079-1:2007, EN 60079-31:2009	II 2 G Ex d IIC T6...T4 Gb II 2 D Ex tb IIIC T80 °C...T105 °C Db	Safety signal: $U_i \leq 28\text{ V}$ , $P_i \leq 1.0\text{ W}$ FF signal: $U_i \leq 32\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$
<b>IECEX</b>		
<b>VG9_X</b> VTT 14.0015X  IEC 60079-0: 2011, IEC 60079-11: 2011, IEC 60079-15: 2010, IEC 60079-26: 2006	Ex ia IIC T6...T4 Ga Ex ia IIIC T95 °C...T125 °C Da Ex ib IIC T6...T4 Gb Ex ib IIIC T95 °C...T125 °C Db	Safety signal: $U_i \leq 28\text{ V}$ , $I_i \leq 150\text{ mA}$ , $P_i \leq 1.0\text{ W}$ , $C_i < 15\text{ nF}$ , $L_i < 220\text{ }\mu\text{H}$ FF signal: $U_i \leq 24\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$ , $C_i < 5\text{ nF}$ , $L_i < 10\text{ }\mu\text{H}$ Device conforms to the FISCO field device according to the standard IEC60079-11.
<b>VG9_X</b> IECEX VTT 14 0016X  EN 60079-0: 2012, EN 60079-11: 2012, EN 60079-15: 2010	Ex nA IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Ex ic IIIC T95 °C...T125 °C Dc	Safety signal: $U_i \leq 28\text{ V}$ , $I_i \leq 150\text{ mA}$ , $P_i \leq 1.0\text{ W}$ , $C_i < 15\text{ nF}$ , $L_i < 220\text{ }\mu\text{H}$ FF signal: $U_i \leq 24\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$ , $C_i < 5\text{ nF}$ , $L_i < 10\text{ }\mu\text{H}$ Device conforms to the FISCO field device according to the standard IEC60079-11.
<b>VG9_E6</b> IECEX SIR 11.0001X  IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2008	Ex d IIC T6...T4 Gb Ex tb IIIC T80 °C...T105 °C Db	Safety signal: $U_i \leq 28\text{ V}$ , $P_i \leq 1.0\text{ W}$ FF signal: $U_i \leq 32\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$
<b>INMETRO</b>		
<b>VG9_E5</b> NCC 12.0796 X  ABNT NBR IEC 60079-0:2008 versão corrigida 2011 ABNT NBR IEC 60079-1:2009 versão corrigida 2011 ABNT NBR IEC 60079-31:2011 ABNT NBR IEC 60529:2009	Ex d IIC Gb T5 Gb	Safety signal: $U_i \leq 28\text{ V}$ , $P_i \leq 1.0\text{ W}$ FF signal: $U_i \leq 32\text{ V}$ , $I_i \leq 380\text{ mA}$ , $P_i \leq 5.32\text{ W}$
<b>cCSAus</b>		
<b>VG9_E2</b> CSA 1980091	Class I, Div 1, Groups B, C, D Class II, Div 1, Groups E, F, G Class III; T4...T6, Enclosure type 4X Ex d IIC T6...T4 AEx d IIC T6...T4 Ex tb IIIC T100 °C IP66 AEx tb IIIC T100 °C IP66	Safety signal: $U_i \leq 28\text{ V}$ FF signal: $U_i \leq 32\text{ V}$

**DIMENSIONS (mm)**

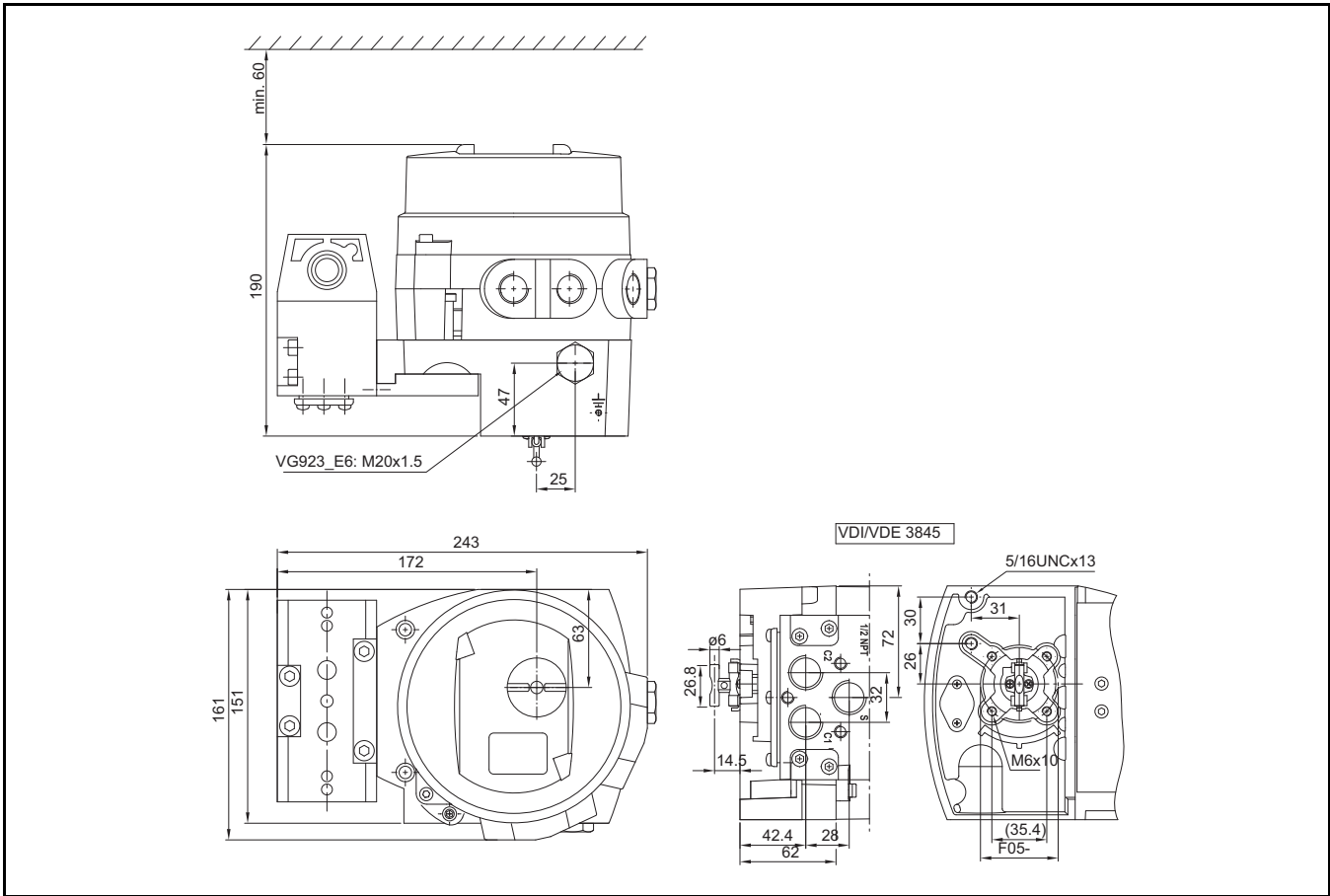
**VG921\_(J)\_**



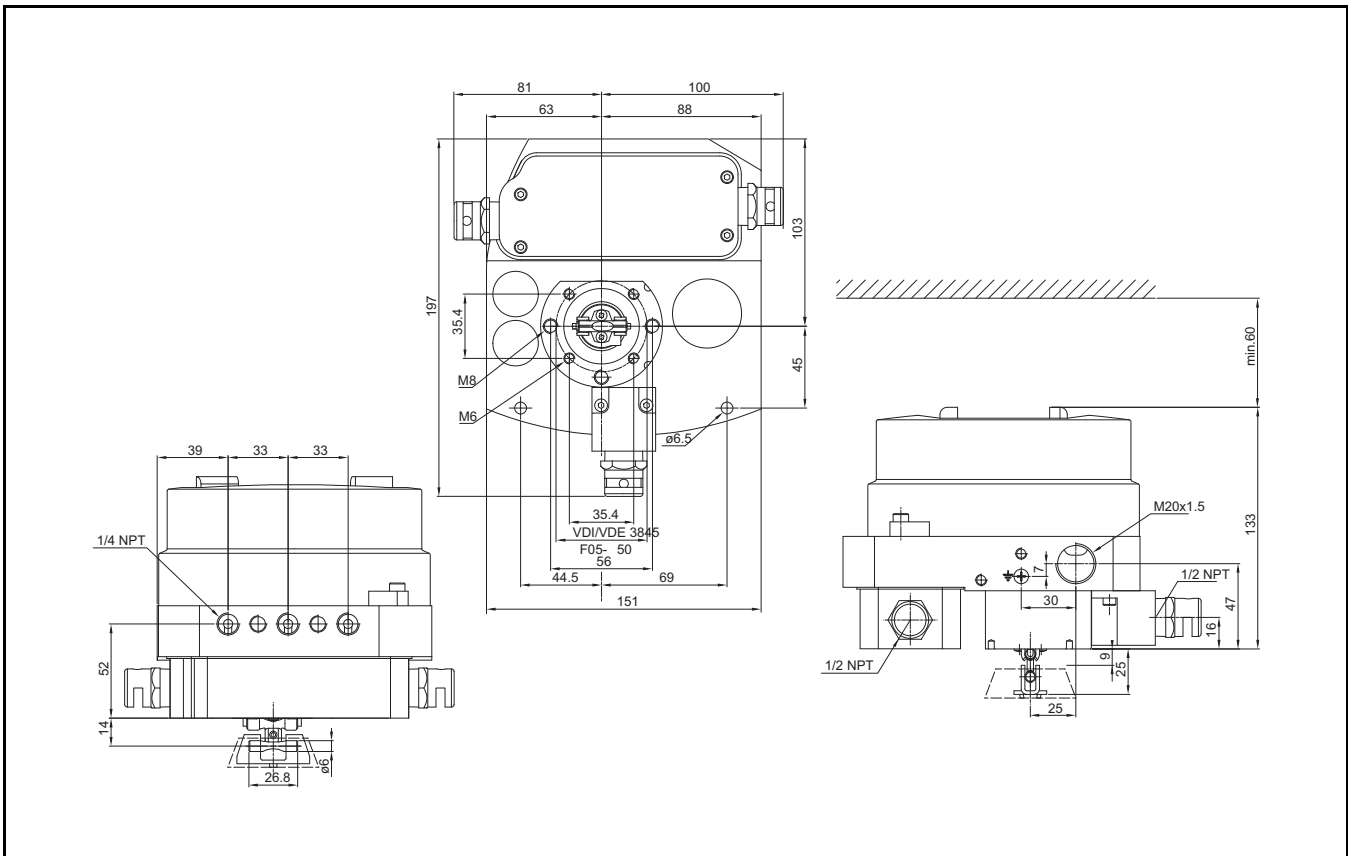
**VG921\_/I\_/ /K\_/ /D\_ or VG921\_L\_**



**VG923\_I\_ /K\_ /D\_ or VG923\_L**

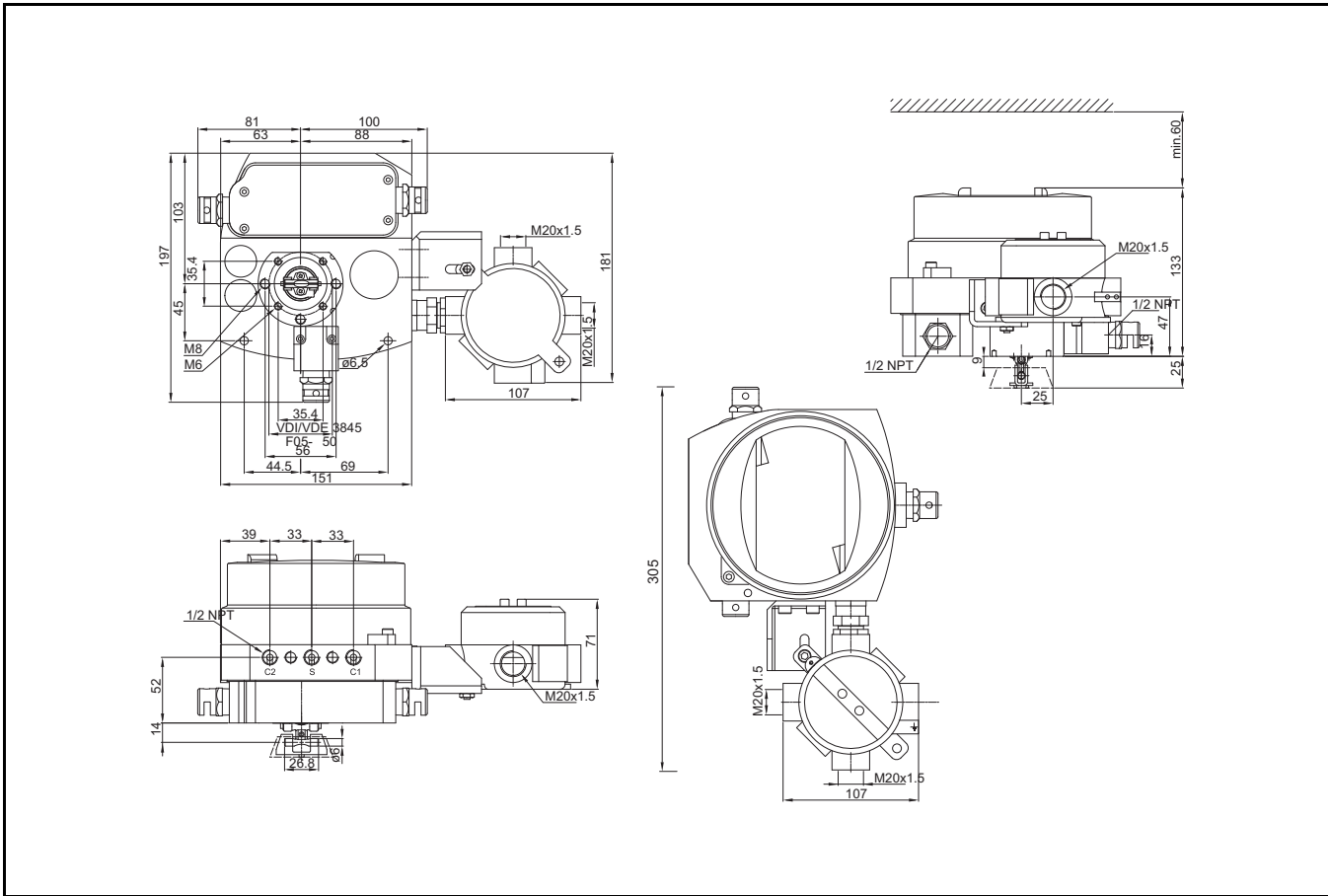


**VG931\_**

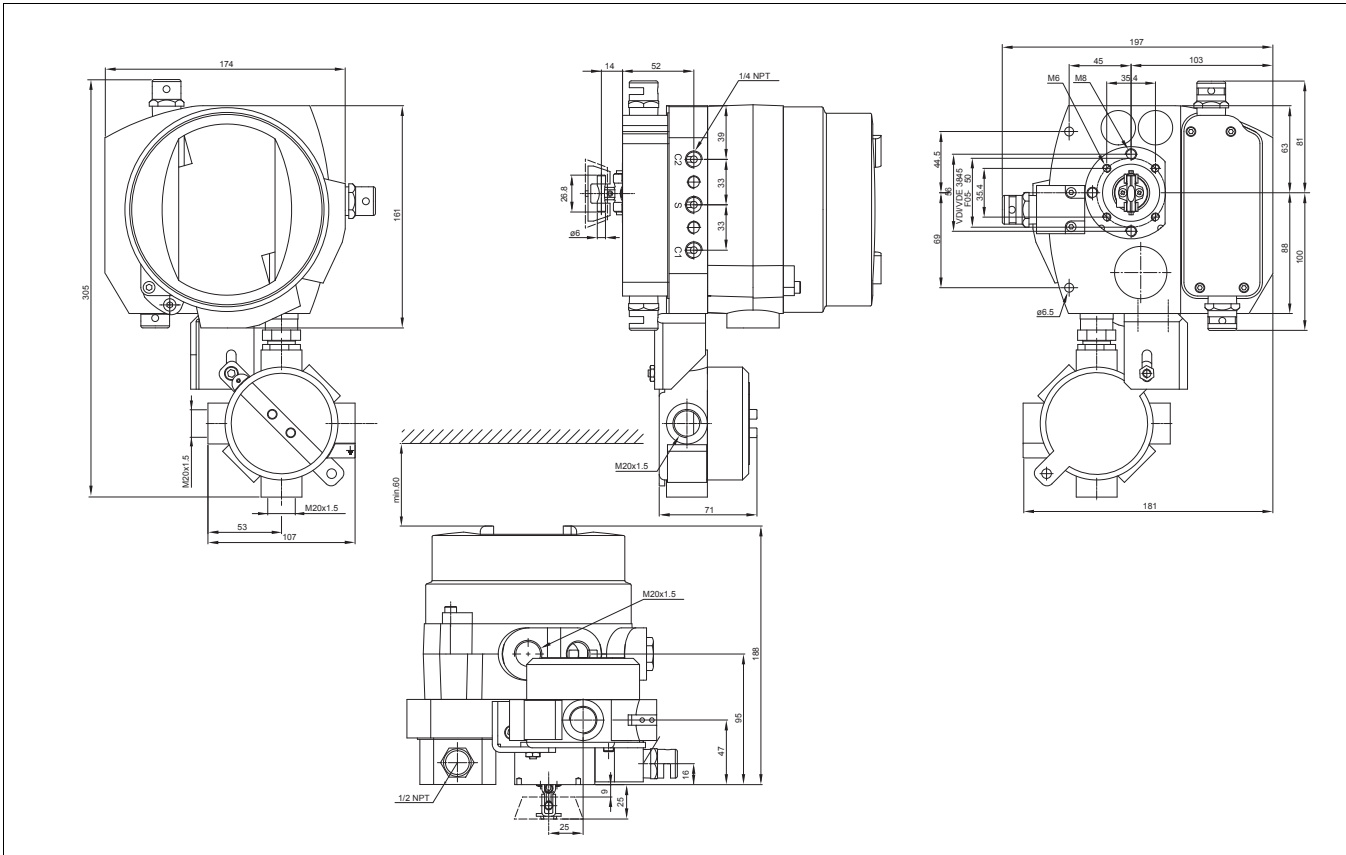




**VG931\_J**



**VG931\_ with extension housing**



## HOW TO ORDER

### NELES VALVGUARD VG9000

1.	2.	3.	4.	5.	6.	7.	8.	9.
VG	9	2	15	H	E6	/	D33	

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

1. sign	PRODUCT GROUP
VG	<b>Neles ValvGuard VG9000</b> , intelligent safety solenoid. TÜV Rheinland SIL 3 certified according to IEC 61508.

2. sign	SERIES CODE
9	Series 9000 intelligent safety solenoid with universal shaft and attachment face according to standard VDI/VDE 3845. Relevant shaft adapter included in mounting kits. When VG9000 is separate delivery, shaft adapter kit needs to be ordered separately (see type coding for accessories).

3. sign	ENCLOSURE
	IP66 / NEMA 4X. Standard temperature range -40° to +85 °C / -40° to +185 °F. M20 x 1.5 conduit entry; 1 pcs (VG9_H), 2 pcs (VG9_F) in extension housing.
2	Standard epoxy coated anodized aluminum enclosure.
3	Full 316 stainless steel enclosure, no glass window.

4. sign	SPOOL VALVE	CONNECTIONS
12	Restricted capacity Stroke volume of actuator 0.3 - 6.7 dm <sup>3</sup>	S, C1, C2 = 1/4 NPT
15	Standard capacity Stroke volume of actuator > 0.6 dm <sup>3</sup>	S, C1, C2 = 1/4 NPT
35	High capacity Stroke volume of actuator > 3.5 dm <sup>3</sup> Not applicable to 3. sign "3"	S, C1, C2 = 1/2 NPT
37	Extended capacity, for single acting actuators. Stroke volume of actuator > 6.5 dm <sup>3</sup> Not applicable to 3. sign "3"	S = 1/2 NPT, C2 = 1 NPT

5. sign	COMMUNICATION / INPUT SIGNAL RANGE
H	4-20 mA, HART communication.
F	FOUNDATION fieldbus, physical layer according to IEC 61158-2.

6. sign	APPROVALS FOR HAZARDOUS AREAS
X	<p><b>ATEX and IECEx</b> certifications:</p> <p>II 1 G Ex ia IIC T6...T4 Ga                      II 1 D Ex ia IIIC T95 °C...T125 °C Da                      II 2 G Ex ib IIC T6...T4 Gb                      II 2 D Ex ib IIIC T95 °C...T125 °C Db                      Temperature range: T4 or T125 °C: &lt; +80 °C; T5 or T110 °C: &lt; +65 °C; T6 or T95 °C: &lt; +50 °C.</p> <p>II 3 G Ex nA IIC T6...T4 Gc                      II 3 G Ex ic IIC T6...T4 Gc                      II 3 D Ex ic IIIC T95 °C...T125 °C Dc                      Temperature range: T4 or T125 °C: &lt; +85 °C; T5 or T110 °C: &lt; +75 °C; T6 or T95 °C: &lt; +60 °C.</p> <p>Available without limit switches or with certified inductive limit switches.</p>
U	<p><b>cCSAus</b> certifications:</p> <p>IS Class I, Division 1, Groups A, B, C, and D; T4/T5/T6                      Ex ia IIC T4/T5/T6 Ga                      IS Class I, Zone 0 AEx ia IIC T4/T5/T6 Ga                      Temperature range: T4: ≤ +80 °C; T5: ≤ +65 °C; T6: ≤ +50 °C.</p> <p>Available without limit switches or with certified inductive limit switches.</p>
Z1	<p><b>INMETRO</b> certification:</p> <p>Ex ia IIC T6...T4 Ga                      T4: -40° to +80°C; T5: &lt; +65 °C; T6: &lt; +50 °C.                      Applicable to 5. sign "H"                      Not available with limit switches.</p>

6. sign	APPROVALS FOR HAZARDOUS AREAS
Z2	<p><b>INMETRO</b> certification:</p> <p>Ex ia IIC T6...T4 Gb                      T4: -40° to +80 °C; T5: &lt; +65 °C; T6: &lt; +50 °C.                      Applicable to 5. sign "H"                      Only available with ATEX or IECEx certified inductive limit switches.</p>
Z3	<p><b>INMETRO</b> certification:</p> <p>Ex ic nA IIC T6...T4 Gc                      T4: -40° to +85 °C; T5: &lt; +75 °C; T6: &lt; +60 °C.                      Applicable to 5. sign "H"                      Available without limit switches or with ATEX or IECEx certified inductive limit switches.</p>
E2	<p><b>cCSAus</b> certification:</p> <p>Class I, Div 1, Groups B, C, D; Class II, Div 1, Groups E, F, G; Class III; T6...T4, Enclosure type 4X</p> <p>Ex d IIC T6...T4                      AEx d IIC T6...T4                      Ex tb IIIC T100 °C IP66                      AEx tb IIIC T100 °C IP66</p> <p>T4: -40 °C to +85 °C; T5: &lt;+75 °C; T6: &lt;+60 °C.                      Available with or without limit switches.                      1/2" NPT conduit entries. No glass window.</p>
E5	<p><b>INMETRO</b> certification:</p> <p>Ex d IIC T5 Gb (-40 °C or -25 °C Ta +85 °C)                      Ex d IIC T6 Gb (-40 °C or -25 °C Ta +70 °C)                      Available with or without limit switches.</p>
E6	<p><b>ATEX and IECEx</b> certifications:</p> <p>II 2 GD                      Ex d IIC T6...T4 Gb                      Ex tb IIIC T80 °C...T105 °C Db</p> <p>Temperature range: Ta according to separate table (see VG9000 IMO 7VG9H70EN).                      Available with or without limit switches.</p>

7. sign	OPTIONS
	Several options can be selected, but the order shown below needs to be maintained.
T	Internal 2-wire (passive) position transmitter output. Analog position feedback signal, output 4-20 mA, supply voltage 12 - 30 VDC, external load resistance 0 – 780 Ω Not applicable to 5. sign "F" or 7. sign "S".
S	Internal 2-wire (passive) device status output. Analog device status feedback signal, output 4-20mA. Output mA value is based on the device status, supply voltage 12 - 30 VDC, external load resistance 0 – 780 Ω Not applicable to 5. sign "F" or 7. sign "T" or "P".
P	For partial stroke test (PST) only. To be used together with additional solenoid valve for safety action. 4 mA normal state, signal failure does not affect to the valve position. Applicable to 5. sign "H" and 6. sign "E6" (other approvals pending). Not applicable to 7. sign "S".
J	External junction box, 2 pcs M20x1.5 conduit entry. <b>VG9_H_J:</b> Junction box for all 4-20 mA wirings, including position transmitter, if applicable. Junction box is attached to the standard enclosure. Not applicable to 7. sign "L1" <b>NOTE:</b> This option must be selected if both 7. sign "L2" (for Local Control Panel LCP9H) and 8. sign (limit switches) are specified. <b>VG9_F_J:</b> Junction box for FF and 24 VDC wiring. Junction box is attached to the standard enclosure. If limit switches (8. sign) are not specified, extension housing is excluded.
L1	Extension housing with additional conduit entries, 2 pcs M20x1.5. Applicable to 5. sign "H" and 7. sign "T" or "S", 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 and terminal strip for Local Control Panel (LCP9H_), 2 pcs M20x1.5. Applicable to 5. sign "H". Not applicable to 7. sign "L1". <b>NOTE:</b> 7. sign "J" must be selected, if 8. sign (limit switches) is specified. <b>NOTE:</b> Local Control Panel LCP9H_ needs to be ordered separately! <b>NOTE:</b> W version of LCP needs to be selected with 7. sign "P"
Y	Special construction, to be specified.

8. sign	LIMIT SWITCH TYPE
	Extension housing with additional conduit entries, 4 pcs M20x1.5
	<b>Inductive proximity sensors, 2 pcs.</b>
D33	Metso; SST Sensor Dual Module, NO, 8-125 VDC / 24 - 125 VAC Temperature range -40 to +80 °C / -40 to +176 °F. Usable up to SIL3 acc. to IEC61508. Applicable to 6. sign "E2", "E5" or "E6".
D44	Metso; Namur Sensor Dual Module, 6 - 29 VDC, > 3 mA; < 1 mA, NAMUR NC. Temperature range -40 to +80 °C / -40 to +176 °F. Usable up to SIL3 acc. to IEC61508. Applicable to 6. sign "E2", "E5" or "E6".
102	P+F; NJ2-12GK-SN, 2-wire type, DC; > 3 mA; < 1 mA, NAMUR NC. Intrinsically safe according to ATEX II 1 G Ex ia IIC T6. Temperature range -40 to +85 °C / -40 to +185 °F. Usable up to SIL3 acc. to IEC61508. NOTE: In safety-related applications the sensor must be operated with a qualified fail safe interface, such as P+F KFD2-SH-EX1. Not applicable to 6. sign "Z1".
109	P+F; NCB2-12GM35-N0, 2-wire type, DC; > 3 mA; < 1 mA, NAMUR NC. Intrinsically safe according to ATEX II 2 G Ex ia IIC T6. Temperature range -25 to +85 °C / -13 to +185 °F. Usable up to SIL2 acc. to IEC1508. Not applicable to 6. sign "Z1"
145	P+F; NJ3-18GK-S1N, 3-wire type, DC; > 3 mA; < 1 mA, NAMUR NO. Intrinsically safe according to ATEX II 1 G Ex ia IIC T6. Temperature range -25 to +85 °C / -13 to +185 °F. Usable up to SIL3 acc. to IEC61508. NOTE: In safety-related applications the sensor must be operated with a qualified fail safe interface, such as P+F KFD2-SH-EX1. Not applicable to 6. sign "Z1".
156	ifm; IFC2002-ARKG/UP, 2-wire type, DC; 150 mA, 10 - 36 V DC, leakage current < 0.6 mA. Temperature range -40 to +80 °C / -40 to +176 °F. Applicable to 6. sign "E2", "E5" or "E6".
157	P+F; NJ2-V3-N, 2-wire type, DC; > 3 mA; < 1 mA, NAMUR NC. Intrinsically safe according to ATEX II 1 G Ex ia IIC T6 Ga. Temperature range -25 to +85 °C / -13 to +185 °F. Usable up to SIL2 acc. to IEC61508. Applicable to 6. sign "X" or "U".
158	4 pcs, P+F; NJ2-V3-N, 2-wire type, DC; > 3 mA; < 1 mA, NAMUR NC. Intrinsically safe according to ATEX II 1 G Ex ia IIC T6 Ga. Temperature range -25 to +85 °C / -13 to +185 °F. Usable up to SIL2 acc. to IEC61508. Applicable to 6. sign "X" or "U".
	<b>Reed Type Proximity Switches, 2 pcs.</b>
R01	Metso; Maxx-Guard G, SPDT, 300 mA, 24 VDC; 200 mA, 125 VAC Temperature range -40...+80 °C / -40...+176 °F. Usable up to SIL 3 acc. to IEC61508. Applicable to 6. sign "E5" or "E6".
R02	Metso; Maxx-Guard M, Reed, SPDT, passive, intrinsically safe, 300 mA, 24 VDC Temperature range -40...+80°C / -40...+176 °F. Usable up to SIL 3 acc. to IEC61508. Applicable to 6. sign "X".
R04	Metso; Maxx-Guard H, Reed, SPDT, Vmax 240 V, Imax 3A, Pmax 100W Temperature range -40...+80°C / -40...+176 °F. Usable up to SIL 3 acc. to IEC61508. Applicable to 6. sign "E6".
R35	Topworx; GO35, Leverless, SPDT, 3 A, 24 VDC; 0.5 A, 125 VDC; 4 A, 120 VAC; 2 A, 240 VAC Temperature range -40...+85 °C / -40...+185 °F. Applicable to 6. sign "E6".
	<b>Mechanical micro switches</b> Temperature range -40 to +85 °C / -40 to +185 °F
K25	2 pcs, OMRON D2VW-5L2A-1MS, SPDT, 3 A - 250 V AC, 0.4 A - 125 V DC, 5 A - 30 V DC. Applicable to 6. sign "E2", "E5" or "E6".
K26	2 pcs, OMRON D2VW-01L2A-1MS, gold plated contacts, SPDT, 100 mA - 30 V DC / 125 V AC. Applicable to 6. sign "E2", "E5" or "E6".
K45	4 pcs, OMRON D2VW-5L2A-1MS, SPDT, 3 A - 250 V AC, 0.4 A - 125 V DC, 5 A - 30 V DC. Applicable to 6. sign "E2", "E5" or "E6".
K46	4 pcs, OMRON D2VW-01L2A-1MS, gold plated contacts, SPDT, 100 mA - 30 V DC / 125 V AC. Applicable to 6. sign "E2", "E5" or "E6".
	<b>Bus powered mechanical micro switches</b> Temperature range -40 to +85 °C / -40 to +185 °F
B06	2 pcs, OMRON D2VW-01L2A-1MS, gold plated contacts, SPDT; FOUNDATION fieldbus powered, no external power needed. Applicable to 5. sign "F" and 6. sign "E2", "E5" or "E6".

	OPTIONAL DEVICES FOR VG9000H
	<b>Remote Communication Interface with Status Relays</b> TÜV Rheinland SIL 3 certified according to IEC61508. Safety input: 0/24/48 VDC; Output: 4/20 mA + HART; Power supply: 24/48 VDC Temperature range: -20 to +60 °C IP20  Includes integrated isolated barrier for intrinsic safe applications. ATEX certification: II (1) G [Ex ia Ga] IIC IECEx certification: [Ex ia Ga] IIC  <b>NOTE:</b> RCI9H2 is needed if 4/20mA is NOT available from the safety system to VG9000H.
RCI9H2	
	<b>Local Control Panel (LCP)</b>  Versions for Ex ia/ic/nL: LCP9H, LCP9HW. Stainless steel 316L, IP66. Versions for Ex d: LCP9HE, LCP9HEW. Anodized aluminum, IP65.  All versions include LEDs, Manual Reset and PST buttons. Trip button removed in W versions. Buttons are lockable in all versions. Power consumption 400 mW. Power supply 11-30 V DC, 50mA  <b>ATEX and IECEx certifications:</b> <b>LCP9H, LCP9HW:</b> (Use with VG9_HX_ versions only) II 2 G Ex ia IIC T4/T5/T6 Gb Temperature range: T4; -20° to +65 °C, T5; < +65 °C, T6; < +50 °C.  II 3 G Ex ic IIC T4/T5/T6 Gc II 3 G Ex nL IIC T4/T5/T6 Gc Temperature range: T4; -20° to +65 °C, T5; < +65 °C, T6; < +60 °C.  <b>LCP9EH, LCP9HEW:</b> (Use with VG9_HE6_ versions only): II 2 GD Ex d IIB + H2 T6 Gb Ex tb IIIC T85° C Db IP65 Ta -20° to +55 °C <b>NOTE:</b> Includes sunshade  <b>INMETRO certifications:</b> <b>LCP9H, LCP9HW:</b> (Use with VG9_HZ_ versions only) II 2 G Ex ia IIC T4/T5/T6 Gb Temperature range: T4; -20° to +65 °C, T5; < +65 °C, T6; < +50 °C. II 3 G Ex ic IIC T4/T5/T6 Gc and II 3 G Ex nL IIC T4/T5/T6 Gc. Temperature range: T4; -20° to +65 °C, T5; < +65 °C, T6; < +60 °C.  <b>LCP9HE, LCP9HEW:</b> (Use with VG9_HE5_ versions only) II 2 GD Ex d IIB + H2 T6 Gb Ex tb IIIC T85° C Db IP65 Ta -20° to +55 °C  <b>NOTE:</b> 7. sign "L2" needs to be selected in VG9000H type coding for additional conduit entries and terminal strip.
LCP9H_	

## ADDITIONAL ACCESSORIES

-- □	FILTER REGULATORS
K	<p><b>VG9215</b> 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 °C... +82 °C / -40 °F... +180 °F.</p> <p>K option includes a thread nipple 1/4"NPT to 1/4"NPT which is suitable with VG9200 &amp; VG9300 option A3 (1/4 NPT AIR CONNECTION)</p> <p>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 VG923_.</p>
K2	<p><b>VG9300</b> Stainless steel (AISI 316) filter regulator for supply air. Filter size 5 µm. Pressure gauge, scale bar/psi/kpa/kg/cm2 ,silicone oil, AISI 316, Temperature range -40 °C... +80 °C / -40 °F... +176 °F.</p>

-- □	CONDUIT ENTRY NIPPLES
CE09	1/2 NPT conduit entry nipples Brass M20x1,5 / 1/2 NPT, E xd approved Code: K0148
CE19	1/2 NPT conduit entry nipples stainless steel M20x1.5 / 1/2 NPT, E xd approved Code: H7599

-- □	CABLE GLANDS
CG6	M20 x 1,5 blue/plastic, IP66, Ex e

-- □	PRESSURE GAUGES AND CONNECTION BLOCKS
	<p>Pressure gauges other than module A10: scale bar/psi/kPa (bar/psi/ kg/cm2 ), AISI304 housing, polycarbonate lens, oil filled. Temperature range -40...+85 °C / -40...+185 °F. Material of pneumatic connection block is AlSiMg, anodized grey in gauge block A3. In blocks A7 and A10 the block material is stainless steel AISI316.</p>
A3	Pressure gauges with connections 1/4 NPT (S, C1, C2) for VG921_.. Gauges AISI304, block AlSiMg.
A7	Pressure gauges with connections 1/4 NPT (S, C1, C2) for VG93_.. Gauges AISI316, block AISI316.
A8	Pressure gauges with connections 1/2 NPT (S, C1, C2) for VG9235_.. Gauges AISI304, block AlSiMg.
A9	Pressure gauges with connections 1/2 NPT (S) and 1" NPT (C2) for VG9237_.. Gauges AISI304, block AlSiMg.
A10	Pressure gauges with connections 1/4 NPT for VG93_.. Gauges AISI316L for severe off-shore use, with safety glass window. Block AISI316.

DRIVER SETS FOR ROTARY ACTUATORS	
	<p>Driver sets including the needed parts when assembling VG9000 on Neles B -series actuators with VDI/VDE 3845 or Neles attachment face or QP actuators. Select the correct driver set according to the actuator and the pneumatic connections of valve controller or gauge block when applicable. <b>Note!</b> Earlier the driver set was delivered with bare shaft positioners as default. This practice is no longer valid, the needed driver set must be ordered as an accessory.</p>
DS02	Driver set for VG9_12, VG9_15 on B1J, B1C and QPx actuators (VDI mounting face). H116181. Set includes the 1/4NPT plug for single acting actuators. The driver set should also be applied with all VG with gauge blocks A3, A7 or A10.
DS03	Driver set for VG9235 and VG9237 on B1J, B1C and QPx actuators (VDI mounting face). H116182. Set includes the 1/2NPT plug for single acting actuators. The driver set can also be applied with VG with gauge block A8.

3RD PARTY MOUNTING SETS / Rotary actuators	
	<p>Mounting sets between the VG9000 and rotary actuators, including bracket and feedback system. <b>Note!</b> Sets are including the 1/4" pneumatic plugs needed when used with single acting actuators.</p>
MS21	Mouting set for rotary actuators with VDI/VDE 3845 attachment face. Attachment dimensions 80X30-20. (H036898)
MS22	Mouting set for rotary actuators with VDI/VDE 3845 attachment face. Attachment dimensions 80X30-30. (H074705)
MS23	Mouting set for rotary actuators with VDI/VDE 3845 attachment face. Attachment dimensions 130X30-30. (H036899)
MS24	Mouting set for rotary actuators with VDI/VDE 3845 attachment face. Attachment dimensions 130X30-50. (H074708)

PNEUMATIC PLUGS	
	<p>Pneumatic plugs for blocking the unused VG9000 pneumatic actuator port when in single acting use. <b>Note!</b> Choose the correct plug according to VG9000 or gauge block applied. <b>Note2!</b> Driver sets (DS_) for rotary actuators include a plug.</p>
PP02	1/4NPT plug. Stainless steel. VG921_.. VG931_.. VG9000 with gauge blocks A3, A7 or A10.
PP03	1/2NPT plug. Stainless steel. VG9235. VG9000 with gauge block A8.

Subject to change without prior notice.

### Metso Flow Control Inc.

**Europe,** Vanha Porvoontie 229, P.O. Box 304, FI-01301 VANTAA, Finland.  
Tel. +358 20 483 150. Fax +358 20 483 151

**North America,** 44 Bowditch Drive, P.O. Box 8044, Shrewsbury, MA 01545, USA.  
Tel. +1 508 852 0200. Fax +1 508 852 8172

**South America,** Av. Independência, 2500- Iporanga, 18087-101, Sorocaba-São Paulo, Brazil.  
Tel. +55 15 2102 9700. Fax +55 15 2102 9748/49

**Asia Pacific,** Haw Par Centre #06-01, 180 Clemenceau Avenue, Singapore 239922.  
Tel. +65 6511 1011. Fax +65 6250 0830

**China,** 11/F, China Youth Plaza, No.19 North Rd of East 3rd Ring Rd, Chaoyang District, Beijing 100020, China. Tel. +86 10 6566 6600. Fax +86 10 6566 2583.

**Middle East,** Roundabout 8, Unit AB-07, P.O. Box 17175, Jebel Ali Freezone, Dubai, United Arab Emirates. Tel. +971 4 883 6974. Fax +971 4 883 6836

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