

# Intelligent safety solenoid with PST

## Neles™ ValvGuard™ VG9000

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 DeviceCare. 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 (rev 6 or 7)
- 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

- Valmet 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.neles.com/VG9000>

## 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. 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 standard or SIL certified position transmitter
- Integrated SIL certified 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 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
- Minimum maintenance requirements
- Wear resistant and sealed components
- Contactless position measurement

## Predictive maintenance

- Easy access to collected data with Neles Valve Manager
- Logical trend collection
- Information collected on service conditions
- Fast notifications with on-line alarms

## 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 DeviceCare 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 ( $\mu$ C). Information from the various sensors is used for the operation.

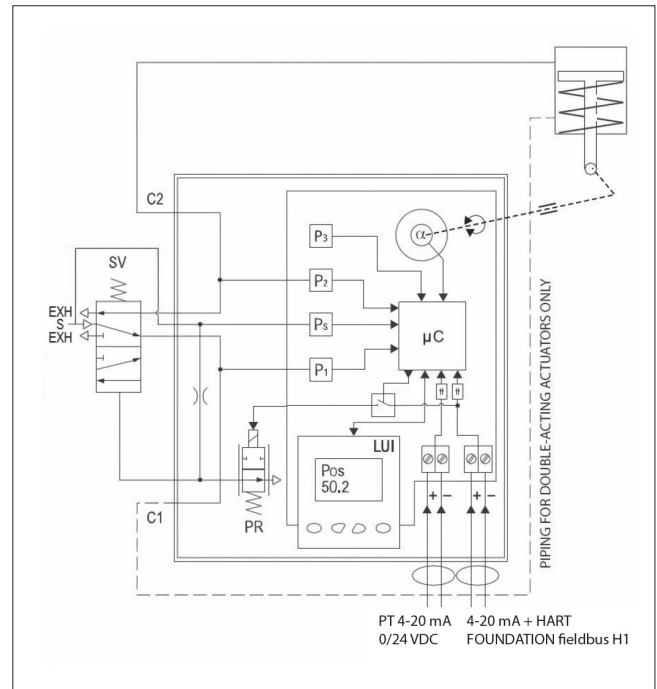


Fig. 1. The principle of operation

**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. Optional firmware version is available for 20 mA trip functionality for safety backup purposes if needed. That “20 mA to trip” functionality shall be defined with Y-code in the device type coding (see page 11-12 (How to order)).

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 Nm³/h / 4.1 scfm (Cv = 0.06)
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

Consumption with 4 bar / 60 psi supply (VG9000H\_P):  
 0.25 Nm³/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\_L3):

0.0–7.7 mA (trip state,  
diagnostics not available)  
7.7–10.0 mA (trip state,  
diagnostics available)  
10.0–16.0 mA (hysteresis range)  
16.0–22.0 mA (normal state,  
diagnostics available)

Signal details (VG9000H\_P):

0.0–3.7 mA (de-energized state;  
diagnostics not available)  
3.7–10.0 mA (normal state,  
diagnostics available)  
10.1–22.0 mA (normal state,  
diagnostics available, PST and  
calibration available)  
NOTE: If “20 mA to trip”  
functionality has been defined by  
Y-code definition in type coding  
sign 7, then input signal 20 mA or  
above will trip the valve.

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)  
(not SIL certified)  
See type coding for SIL certified  
position transmitter (T01) details

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: &lt;0.05 % FS

Temperature effect: &lt;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: Ro = 285 Ω

**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

Neles ValvGuard VG9000 is certified by TÜV Rheinland. VG9000H and VG9000F are of Type A and have Safety Capability of SC 3 acc. to IEC 61508. Accordingly they can be used in applications up to SIL 3 acc. to IEC 61508 and IEC 61511-1.

VG9000H\_P does not adversely affect the safety function of a connected ESD solenoid valve. It can therefore be used in safety related systems to enable PST to improve the diagnostics coverage.

## Electromagnetic protection

Electromagnetic compatibility

Emission acc. to EN 61000-6-4

Immunity acc. to EN 61000-6-2

## CE marking

EMC 2004/108/EC

ATEX 2014/34/EU

## Interoperability

FDT/DTM

HART

FF

VG9000 DTM certified by FDT group

DD registered by FieldComm Group

DD registered by FieldComm Group

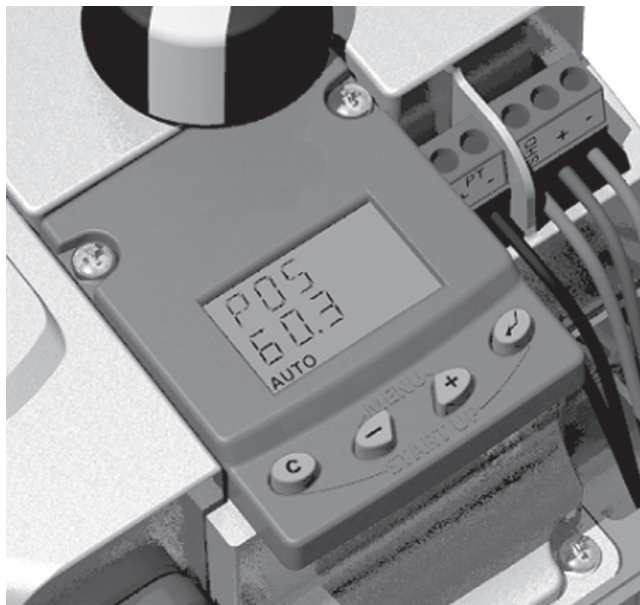


Fig. 2. Local User Interface enables real time awareness of device parameters.

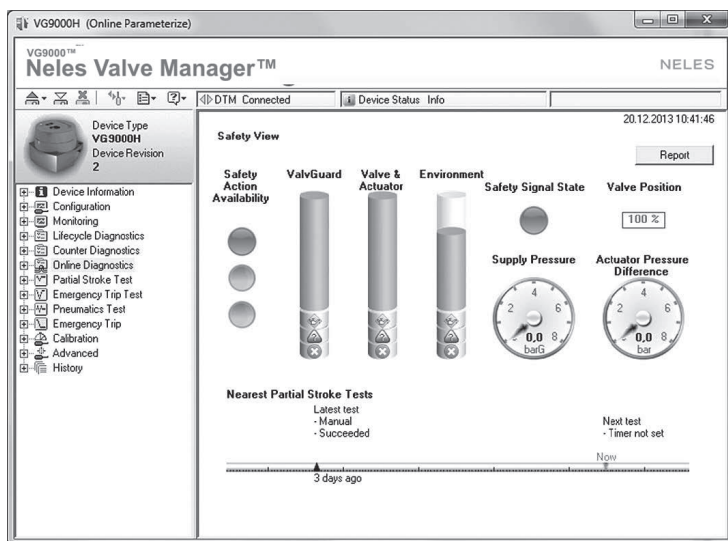


Fig. 3. Configuration and diagnostics are easy to do with Neles Valve Manager™, graphical user interface.

## Approvals and electrical values, VG9000H

Certificate	Approval	Electrical values
<b>ATEX</b>		
<b>VG9_X</b> EESF 20 ATEX 025X EN IEC 60079-0:2018, EN 60079-11:2012	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: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i \leq 8,0 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ 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> EESF 20 ATEX 026X EN IEC 60079-0:2018, EN 60079-11:2012, 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 11ATEX1006X  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 EESF 20.0016X IEC 60079-0:2017, IEC 60079-0:2011	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: $U_i \leq 28 \text{ V}$ , $I_i \leq 120 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i \leq 8,0 \text{ nF}$ , $L_i \leq 53 \mu\text{H}$ 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> EESF 20 ATEX 026X EN IEC 60079-0:2018, EN 60079-11:2012, EN 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 60079-1:2007-04, 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: $U_i \leq 30 \text{ V}$ , $I_i \leq 20 \text{ mA}$ , $P_i \leq 1050 \text{ mW}$

## Approvals and electrical values, VG9000F

Certificate	Approval	Electrical values
<b>ATEX</b>		
<b>VG9_X</b> EESF 20 ATEX 027X EN IEC 60079-0:2018, EN 60079-11:2012	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: $U_i \leq 28 \text{ V}$ , $I_i \leq 150 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i < 15 \text{ nF}$ , $L_i < 220 \mu\text{H}$ FF signal: $U_i \leq 24 \text{ V}$ , $I_i \leq 380 \text{ mA}$ , $P_i \leq 5.32 \text{ W}$ , $C_i < 5 \text{ nF}$ , $L_i < 10 \mu\text{H}$  Device conforms to the FISCO field device according to the standard IEC60079-11.
<b>VG9_X</b> EESF 20 ATEX 029X EN IEC 60079-0:2018, 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: $U_i \leq 28 \text{ V}$ , $I_i \leq 150 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i < 15 \text{ nF}$ , $L_i < 220 \mu\text{H}$ FF signal: $U_i \leq 24 \text{ V}$ , $I_i \leq 380 \text{ mA}$ , $P_i \leq 5.32 \text{ W}$ , $C_i < 5 \text{ nF}$ , $L_i < 10 \mu\text{H}$ 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> IECEX EESF 20.0018X IEC 60079-0:2017, IEC 60079-0:2011	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: $U_i \leq 28 \text{ V}$ , $I_i \leq 150 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i < 15 \text{ nF}$ , $L_i < 220 \mu\text{H}$ FF signal: $U_i \leq 24 \text{ V}$ , $I_i \leq 380 \text{ mA}$ , $P_i \leq 5.32 \text{ W}$ , $C_i < 5 \text{ nF}$ , $L_i < 10 \mu\text{H}$ Device conforms to the FISCO field device according to the standard IEC60079-11.
<b>VG9_X</b> IECEX EESF 20.0019X IEC 60079-0:2017, IEC 60079-11:2011, IEC 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: $U_i \leq 28 \text{ V}$ , $I_i \leq 150 \text{ mA}$ , $P_i \leq 1.0 \text{ W}$ , $C_i < 15 \text{ nF}$ , $L_i < 220 \mu\text{H}$ FF signal: $U_i \leq 24 \text{ V}$ , $I_i \leq 380 \text{ mA}$ , $P_i \leq 5.32 \text{ W}$ , $C_i < 5 \text{ nF}$ , $L_i < 10 \mu\text{H}$ Device conforms to the FISCO field device according to the standard IEC60079-11.

### Other hazardous area approvals

CCOE / PESO, GOST R, KOSHA, NEPSI, CCC, ITRI,  
cCSAus, Inmetro

Contact Valmet for certificate details

### SIL certification

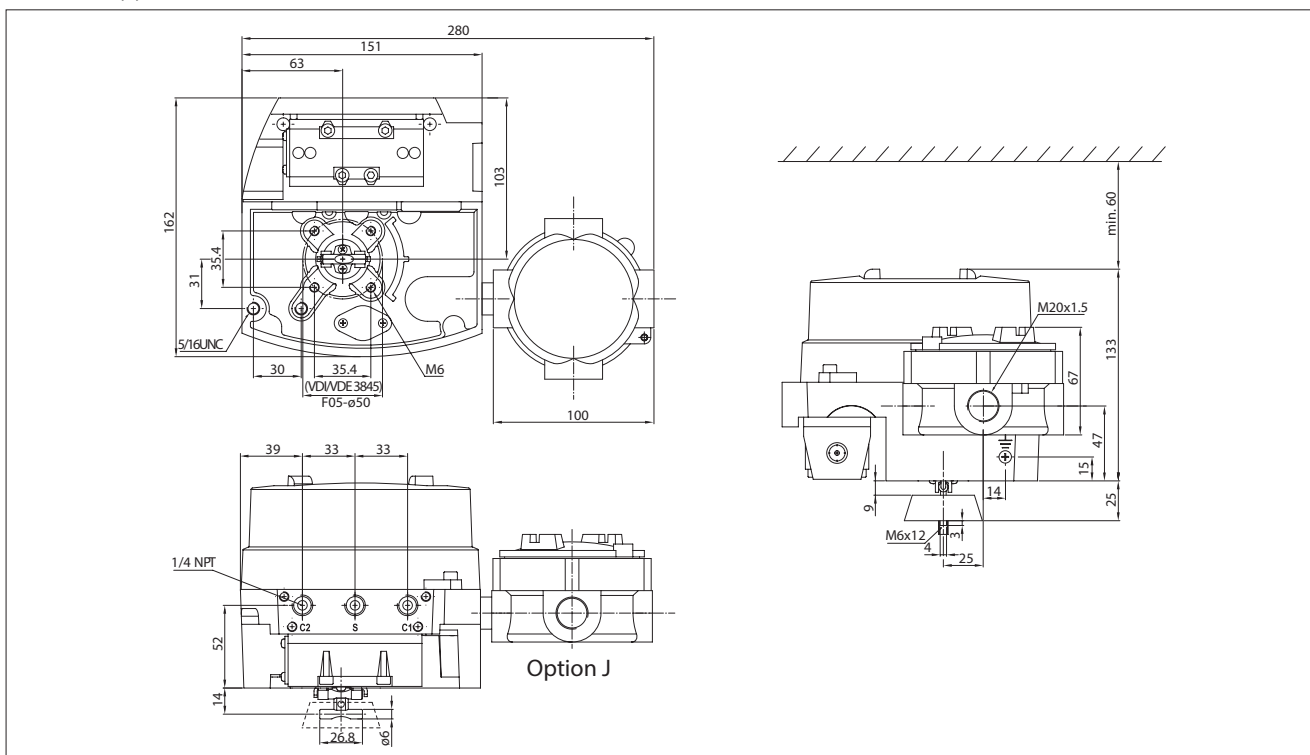
IEC 61508 compliant up to and including SIL 3 by TUV  
Rheinland.

Position transmitter option (T01) up to and including SIL 2.

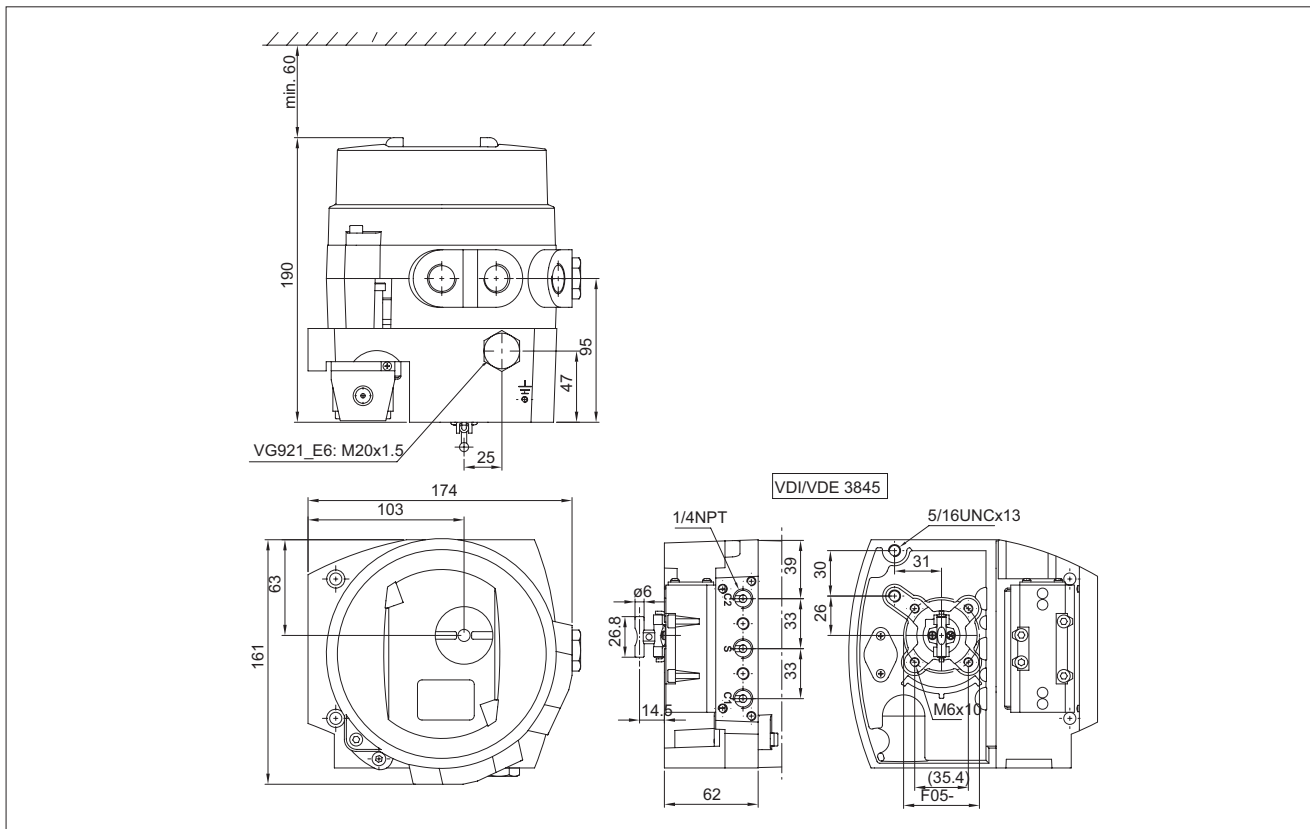
For device variant specific SIL certification coverage and  
exceptions see type coding.

## Dimensions (mm)

### VG921\_(J)

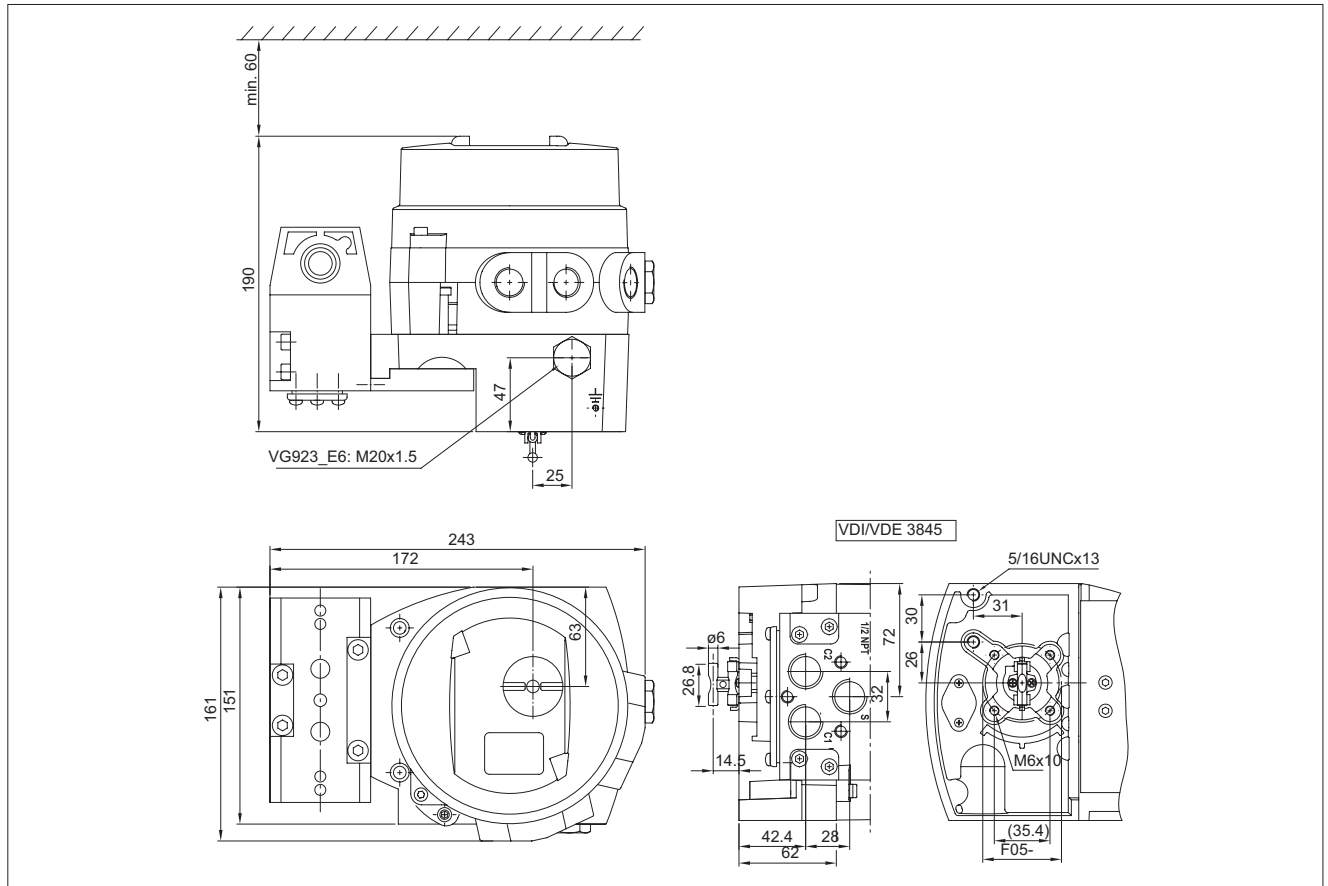


### VG921\_/I\_, /K\_, /D\_ or VG921\_L

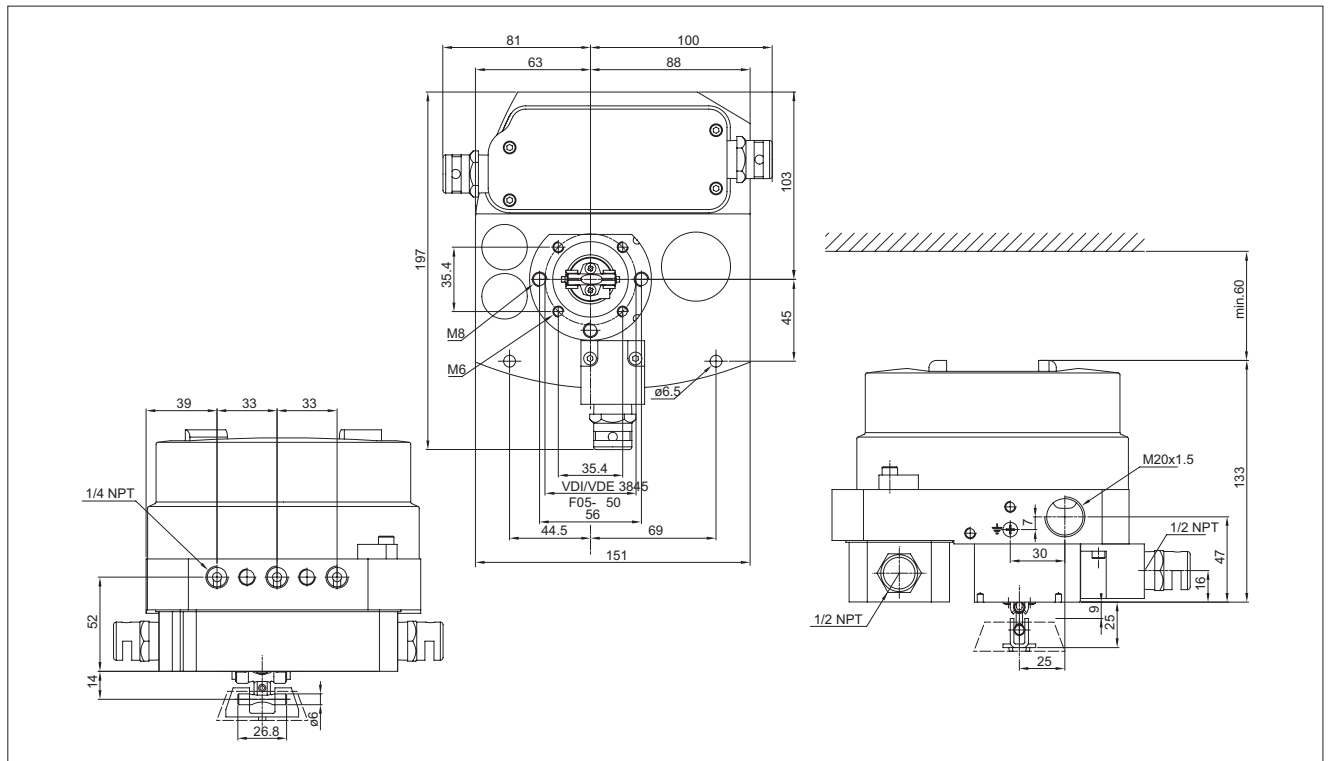




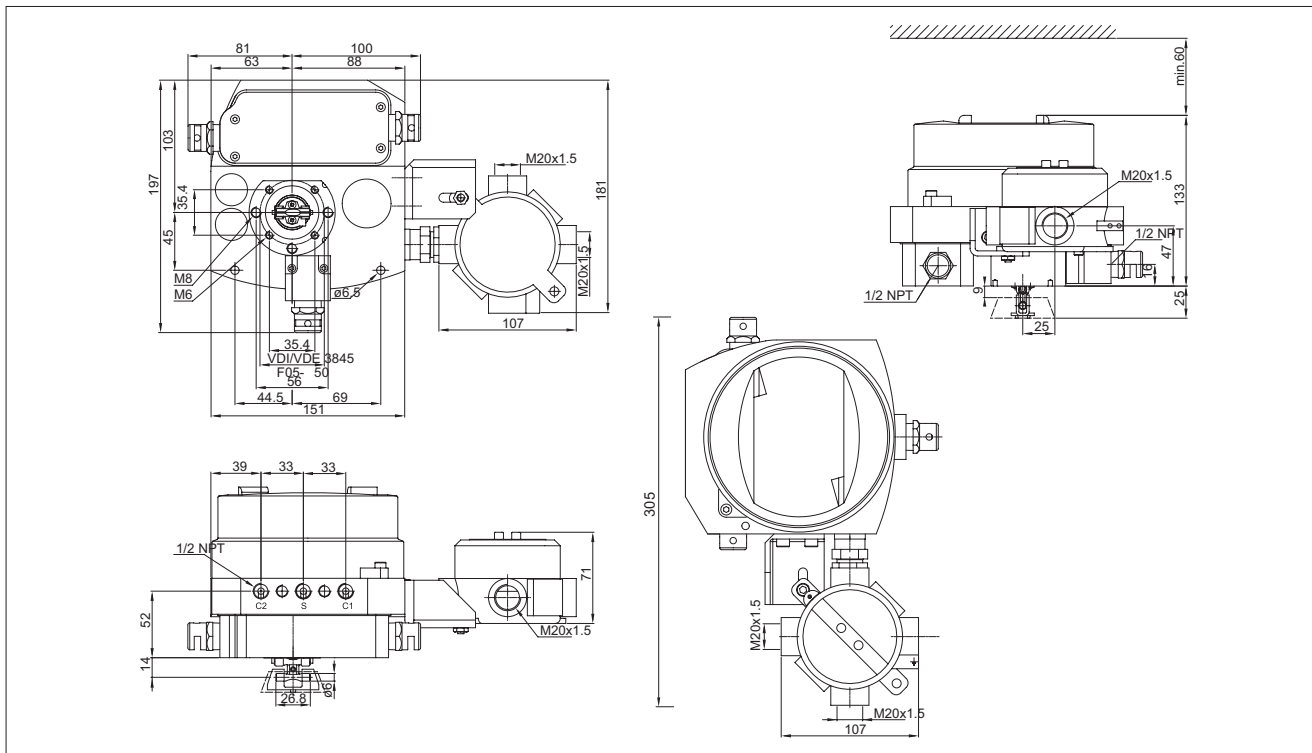
# VG923\_/I\_ , /K\_ , /D\_ or VG923\_L\_



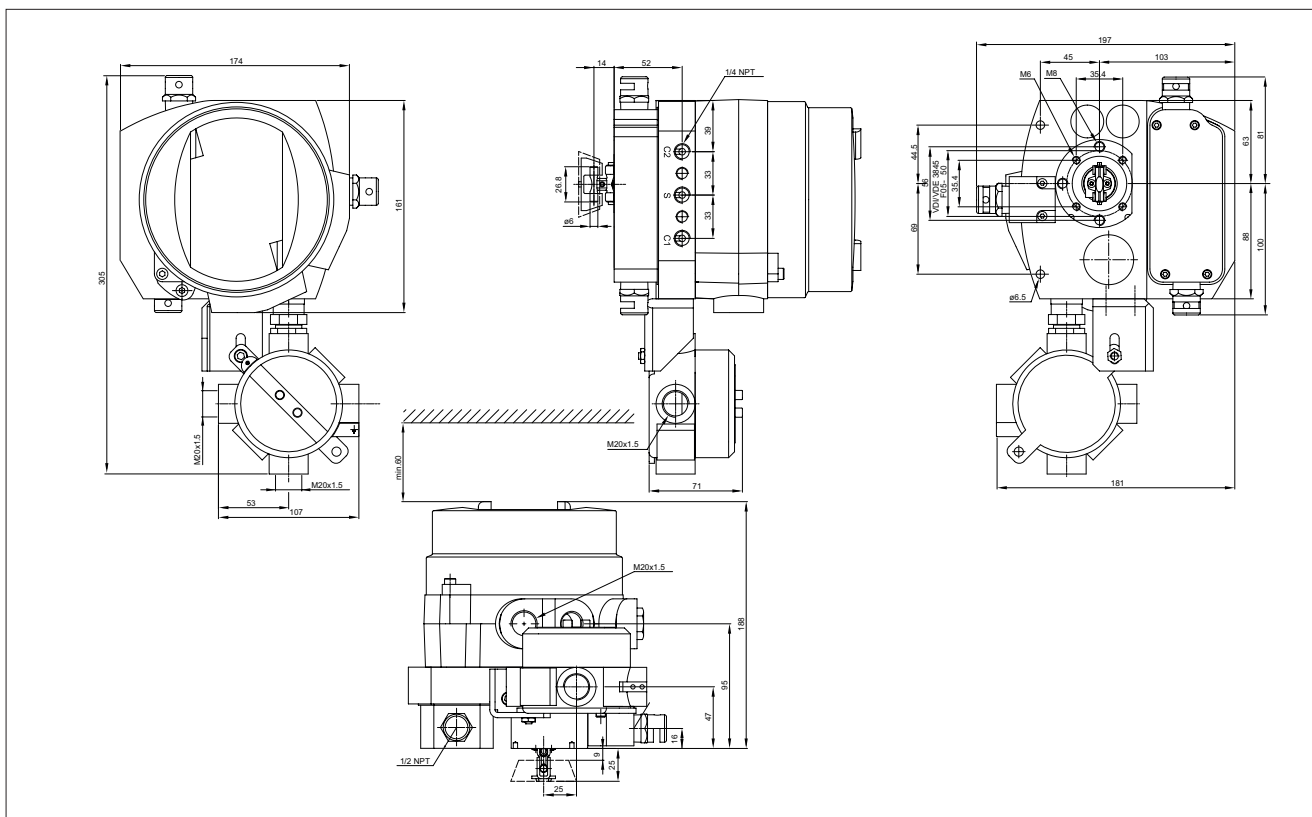
# VG931\_



## 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	T	/	I02	

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

1. sign	PRODUCT GROUP	
VG	Neles ValvGuard VG9000, 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 °C to +85 °C / -40 °C 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. Glass window available as an option (use 7. sign "Y").	
4. sign	SPOOL VALVE	CONNECTIONS
12	Restricted capacity Stroke volume of actuator 0.3 - 6.7 dm³	S, C1, C2 = 1/4 NPT
15	Standard capacity Stroke volume of actuator > 0.6 dm³	S, C1, C2 = 1/4 NPT
35	High capacity Stroke volume of actuator > 3.5 dm³ 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 dm³ Not applicable to 3. sign "3" or 7. sign "P"	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	<b>ATEX and IECEx certifications:</b> 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: < +80 °C; T5 or T110 °C: < +65 °C; T6 or T95 °C: < +50 °C. 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: < +85 °C; T5 or T110 °C: < +75 °C; T6 or T95 °C: < +60 °C. Available with or without limit switches. See 9. sign for available options.	
X7	<b>TR CU (Russian) certification:</b> 0Ex ia IIC T6...T4 Ga X / Ex ia IIIC T95 °C...T125 °C Da X 0Ex ia IIC T6...T4 Ga X / Ex ta IIIC T95 °C...T125 °C Da X 1Ex ib IIC T6...T4 Gb X / Ex ib IIIC T95 °C...T125 °C Db X 1Ex ib IIC T6...T4 Gb X / Ex tb IIIC T95 °C...T125 °C Db X 2Ex nA IIC T6...T4 Gc X / Ex ic IIIC T95 °C...T125 °C Dc X 2Ex nA IIC T6...T4 Gc X / Ex tc IIIC T95 °C...T125 °C Dc X 2Ex ic IIC T6...T4 Gc X / Ex ic IIIC T95 °C...T125 °C Dc X 2Ex ic IIC T6...T4 Gc X / Ex tc IIIC T95 °C...T125 °C Dc X Temperature range: Ta according to separate table (see certificate). Available with or without limit switches. See 9. sign for available options.	
X8	<b>CCC (Chinese) certification:</b> Ex ia IIC T4~T6 Ga Ex iaD 20 T95/T110/T125 Ex ib IIC T4~T6 Gb Ex ibD 21 T95/T110/T125 Ex ic IIC T4~T6 Gc Ex icD 22 T95/T110/T125 Ex nA IIC T4~T6 Gc Available with or without limit switches. See 9. sign for available options.	

6. sign	APPROVALS FOR HAZARDOUS AREAS	
U	<b>cCSAus certification:</b> 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. Applicable to 5. sign "H". Not applicable to 7. sign "L2" or "L3" Available with or without limit switches. See 9. sign for available options.	
U2	<b>cCSAus certification:</b> Ex nA IIC T4/T5/T6 Gc or AEx nA IIC T4/T5/T6 Gc Class I, Division 2, Groups A,B,C,D Temperature range: T4: ≤ +85°C; T5: ≤ +75°C; T6: ≤ +60°C. Applicable to 5. sign "H". Not available with limit switches.	
Z	<b>INMETRO certification:</b> 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 Temperature range: T4 or T125 °C: -40 °C...+80 °C; T5 or T110 °C: ≤ +65 °C; T6 or T95 °C: ≤ +50 °C. Ex ic IIC T6...T4 Gc Ex nA IIC T6...T4 Gc Ex ic IIIC T95 °C...T125 °C Dc Temperature range: T4 or T125 °C: -40 °C...+85 °C; T5 or T110 °C: ≤ +75 °C; T6 or T95 °C: ≤ +60 °C. Applicable to 5. sign "H" Available with or without limit switches. See 9. sign for available options.	
E2	<b>cCSAus certification:</b> Class I, Div 1, Groups B, C, D; Class II, Div 1, Groups E, F, G; Class III; T6...T4, 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 T4: -40 °C to +85 °C; T5: < +75 °C; T6: < +60 °C. 1/2" NPT conduit entries. No glass window. Available with or without limit switches. See 9. sign for available options.	
E5	<b>INMETRO certification:</b> 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. See 9. sign for available options.	
E6	<b>ATEX and IECEx certifications:</b> II 2 GD Ex d IIC T6...T4 Gb Ex tb IIIC T80°C...T105°C Db Temperature range: Ta according to separate table (see certificate). Available with or without limit switches. See 9. sign for available options.	
E7	<b>TR CU (Russian) certification:</b> 1Ex d IIC T6...T4 Gb X / Ex tb IIIC T80°C...T105°C Db X Temperature range: Ta according to separate table (see certificate). Available with or without limit switches. See 9. sign for available options.	
E8	<b>CCC (Chinese) certification:</b> Ex d IIC T4~T6 Gb Ex tD A21 IP66 T80°C/T95°C/T105°C Available with or without limit switches. See 9. sign for available options.	

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". <b>w:</b> This output is not SIL certified. For SIL certified PT option use 8. sign "T01"	
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" <b>NOTE:</b> This output is not SIL certified.	

7. sign	OPTIONS
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. Not applicable to 4. sign "37" or 7. sign "S". Applicable to 5. sign "H" and 6. sign "X", "U", "U2" and "E6" (other approvals pending). <b>NOTE:</b> SIL approved, does not adversely affect the safety function. <b>NOTE:</b> If "20 mA to trip" functionality is required, that needs to be defined in 7. sign Y.
J	External junction box, 2 pcs M20x1.5 conduit entries. <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" or "L3". <b>NOTE:</b> This option needs to be selected if both 7. sign "L2" (for Local Control Panel LCP9H_) and 8. sign (limit switches or position transmitter T01) 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, 4 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", "L3" or limit switches (8.sign).
L2	Extension housing with additional conduit entries and terminal strip for externally powered Local Control Panel (LCP9H_), 4 pcs M20x1.5. Applicable to 5. sign "H". Not applicable to 6. sign "X8" or 7. sign "L1" or "L3". <b>NOTE:</b> 7. sign "J" needs to be selected, if 8. sign (limit switches or position transmitter T01) is specified. <b>NOTE:</b> Local Control Panel LCP9H_ need to be ordered separately! <b>NOTE:</b> W version of LCP9H_ should be selected with 7. sign "P"
L3	Extension housing with additional conduit entries and terminal strip for loop powered Local Control Panel (LCP9H_L), 4 pcs M20x1.5. Not applicable to 6. sign "X8" or 7. sign "J", "L1" or "L2". <b>NOTE:</b> Local Control Panel LCP9H_L needs to be ordered separately! <b>NOTE:</b> W version of LCP9H_L should be selected with 7. sign "P"
Y	Special construction, to be specified.

8. sign	LIMIT SWITCHES & POSITION TRANSMITTERS
	Extension housing with additional conduit entries, 4 pcs M20x1.5 (1/2" NPT when 6. sign is U, U2 or E2) <b>Position transmitters</b> SIL certified 2-wire (passive) position transmitter. Usable up to SIL2 acc. to IEC61508. Analog position feedback signal, output 4-20 mA, supply voltage 12 - 30 VDC, external load resistance 0 - 700 Ω. Potentiometer Contelec GL60, transmitter electronics Neles. Temperature range -40 to +85 °C / -40 to +185 °F. Not applicable to 6. sign "U", "U2" or "E7". Not available with limit switches.
T01	<b>Inductive proximity sensors, 2 pcs.</b>
D33	<b>Obsolete</b> Select R01 option instead.
D44	<b>Obsolete</b> Select replacement from other NAMUR switch options, e.g. I02.
I02	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 Ga. Temperature range -40 to +85 °C / -40 to +185 °F. Usable up to SIL3 acc. to IEC61508. <b>NOTE:</b> 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 "U2"
I09	P+F; NCB2-12GM35-N0, 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. Not applicable to 6. sign "U2"
I45	P+F; NJ3-18GK-S1N, 2-wire type, DC; > 3 mA; < 1 mA, NAMUR NO. 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 SIL3 acc. to IEC61508. <b>NOTE:</b> In safety-related applications the sensor must be operated with a qualified failsafe interface, such as P+F KFD2-SH-EX1. Not applicable to 6. sign "U2"
I57	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. Not applicable to 6. sign "U2"
I58	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. Not applicable to 6. sign "U2"

8. sign	LIMIT SWITCHES & POSITION TRANSMITTERS
	<b>Reed or leverless type proximity switches, 2 pcs.</b>
R01	Neles; Maxx-Guard G, Reed, SPDT, 300 mA, 24 VDC; 200 mA, 125 VAC Temperature range -40 to +80 °C / -40 to +176 °F. Usable up to SIL 3 acc. to IEC61508. Applicable to 6. sign "E2", "E5", "E6", "E7" or "E8"
R02	Neles; Maxx-Guard M, Reed, SPDT, passive, intrinsically safe, 300 mA, 24 VDC Temperature range -40 to +80 °C / -40 to +176 °F. Usable up to SIL 3 acc. to IEC61508. Not applicable to 6. sign "U" or "U2"
R04	Neles; Maxx-Guard H, Reed, SPDT, Vmax 240 V, Imax 3A, Pmax 100W Temperature range -40 to +80 °C / -40 to +176 °F. Usable up to SIL 3 acc. to IEC61508. Applicable to 6. sign "E2", "E5", "E6", "E7" or "E8".
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 to +85 °C / -40 to +185 °F. Applicable to 6. sign "E5", "E6", "E7" or "E8". <b>NOTE:</b> Not for general use, only for projects with product management approval.
	<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", "E6", "E7" or "E8"
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", "E6", "E7" or "E8"
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", "E6", "E7" or "E8"
	<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", "E6", "E7" or "E8"

NOTE: These following optional devices for VG9000H need to be ordered separately. They are not part of VG9000 type coding.

-	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.
RCI9H2	<b>ATEX certification:</b> II (1) G [Ex ia Ga] IIC <b>IECEx certification:</b> [Ex ia Ga] IIC CCC certification: [Ex ia Ga] IIC <b>NOTE:</b> RCI9H2 is needed if 4/20mA is NOT available from the safety system to VG9000H.

## Type Coding

1.	2.	3.	4.	5.	6.
LCP	9	H	E	-	L

1. sign	PRODUCT GROUP
LCP	<b>Local Control Panel</b> For local control with Neles ValvGuard VG9000. All versions include LEDs, Manual Reset and PST buttons. Buttons are lockable in all versions.

2. sign	SERIES CODE
9	Suitable for Neles ValvGuard VG9000

3. sign	COMMUNICATION
H	Suitable for VG9000 HART communication version. Four wire serial communication between VG9000 and LCP.

4. sign	APPROVALS FOR HAZARDOUS AREAS
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Enclosure IP66 and stainless steel 316L if not otherwise mentioned.

-	<u>ATEX and IECEx certifications:</u>  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 T6...T4 Gc Temperature range: T4; -20° to +65 °C, T5; < +65 °C, T6; < +60 °C.  II 2 G Ex eb mb [ib] IIC T6...T4 Gb Temperature range: T4; -20° to +65 °C, T5; < +63 °C, T6; < +48 °C  ITRI (Taiwan) certifications are pending.  <b>NOTE:</b> Additional Y-code at the end of the LCP9H_ type coding, e.g. LCP9HY, means following: Y = Special construction, to be specified. Does not affect the certification. For example, different button texts.
U2	<u>cCSAus certification (PENDING):</u>  Ex nA IIC T4/T5/T6 Gc or AEx nA IIC T4/T5/T6 Gc Class I, Division 2, Groups A, B, C, D
E	Enclosure material anodized aluminum.  <u>ATEX and IECEx certifications:</u> Ex d IIB + H2 T6 Gb Ex tb IIIC T85°C Db IP66 Ta -20° to +65 °C  <u>INMETRO (DNV) certifications:</u> Ex d IIB + H2 T6 Gb Ex tb IIIC T85°C Db IP66 Ta -20° to +65 °C  <u>ITRI (Taiwan) certifications:</u> Ex d IIB + H2 T6 Gb Ex tb IIIC T85°C Db

5. sign	OPTIONS
-	None
W	LCP is provided without Close (trip) button

6. sign	SUPPLY POWER
-	<b>24 VDC externally powered</b> Power consumption 400 mW. Power supply 11-30 V DC, 50mA <b>NOTE:</b> 7. sign L2 needs to be selected for VG9000 type code option.
L	<b>Loop powered</b> Power taken from VG9000H input signal, 4 mA. <b>NOTE:</b> Minimum 8 mA is required for VG9000 input signal. 7. sign L3 needs to be selected for VG9000 type code option.



## 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 In blocks A7, A10 and A11 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.
A3B	Two pressure gauges with connections 1/4 NPT (S, C2). Use with VG9215_ in single acting use only. 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.
A11	Pressure gauges with connections 1/2" NPT (S, C1, C2) for VG9235_.. Gauges AISI316, block AISI316.

-- □	PRESSURE GAUGES AND CONNECTION BLOCKS
<p>Pressure gauges in modules D3, D3B: scale 0-12 bar/psi/kPa (bar/psi/ kg/cm²), AISI304 housing, polycarbonate lens Non-oil filled, dry gauges. Temperature range -50...+85 °C / -58...+185 °F. Material of pneumatic connection block is AlSiMg, anodized black.</p>	
D3	Pressure gauges with connections 1/4 NPT (S, C1, C2). Use with VG9215_.. Gauges AISI304, block AlSiMg.
D3B	Two pressure gauges with connections 1/4 NPT (S, C2). Use with VG9215_ in single acting use only. Gauges AISI304, block AlSiMg

-- □	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 bareshaft 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.



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