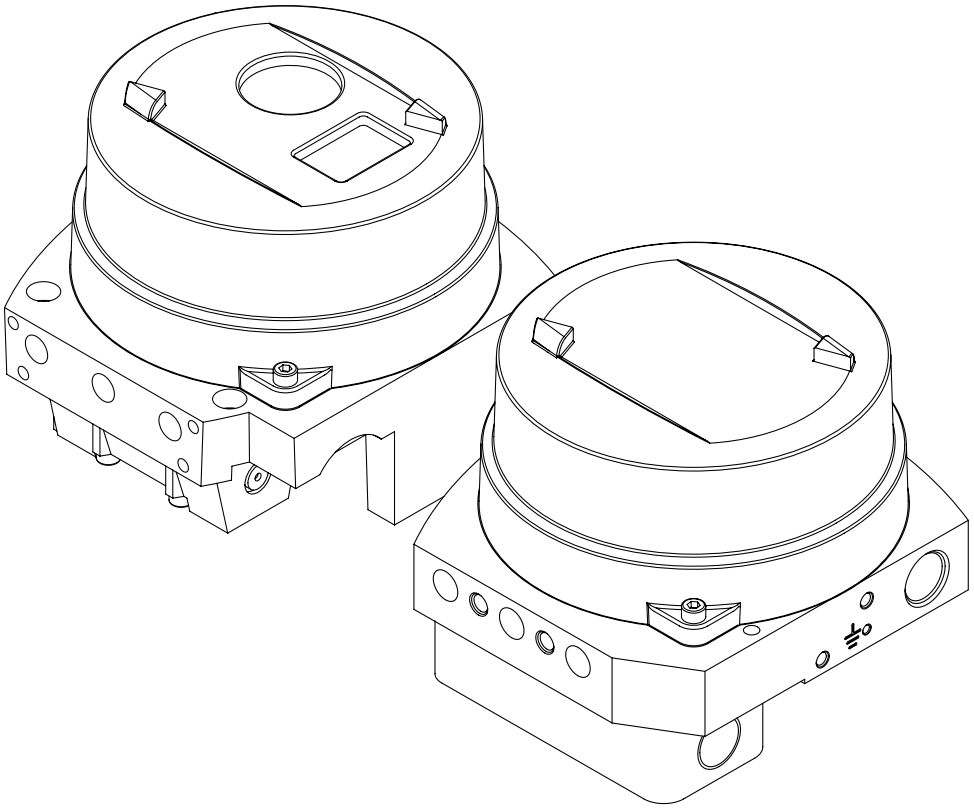
Neles™ ValvGuard™

VG9000H

Rev. 2.5

Installation, maintenance and operating instructions



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READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.

If you require additional assistance, please contact the manufacturer or manufacturer's representative.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1. NELES VALVGUARD VG9000H INTELLIGENT SAFETY SOLENOID WITH HART COMMUNICATION

1.1 General

This manual incorporates Installation, Maintenance and Operation Instructions for the Neles ValvGuard VG9000H. The VG9000H may be used with either cylinder or diaphragm type pneumatic actuators for rotary or linear valves.

NOTE:
The valve controller shall be installed and operated only by qualified personnel familiar with process equipment.
The selection and use of the ValvGuard 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 ValvGuard.
If you are uncertain about the use of the controller or its suitability for your intended use, please contact local Valmet office for more information.

1.2 Technical description of VG9000H

Neles ValvGuard VG9000H is a 4–20 mA loop-powered microcontroller-based intelligent safety solenoid and partial stroke test device with HART communication. Device is suitable to be used in safety related application up to and including SIL 3 acc. to IEC 61508.

See Safety Manual for functional safety figures and other safety related details.

NOTE:
HART communication can be used for informational purposes, but is not safety certified for diagnostic annunciation.

The device safety position is 6.0 mA or below. When VG9_L3 version is used, the safety position is 10.0 mA or below. The device stays alive even at 3.7 mA input signal (at 7.7 mA when VG9_L3 is used) and communicates via HART. Optional Remote Communication Interface RCI9H2 is required if the safety system output is binary (DO) 24 V DC. See separate RCI9H2 technical bulletin (9RCI21EN) for detailed instructions.

NOTE:
RCI9H2 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- (S), actuator- (C1, C2) and exhaust (EXH) 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 Neles Valve Manager™ software together with any other FDT frame 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.

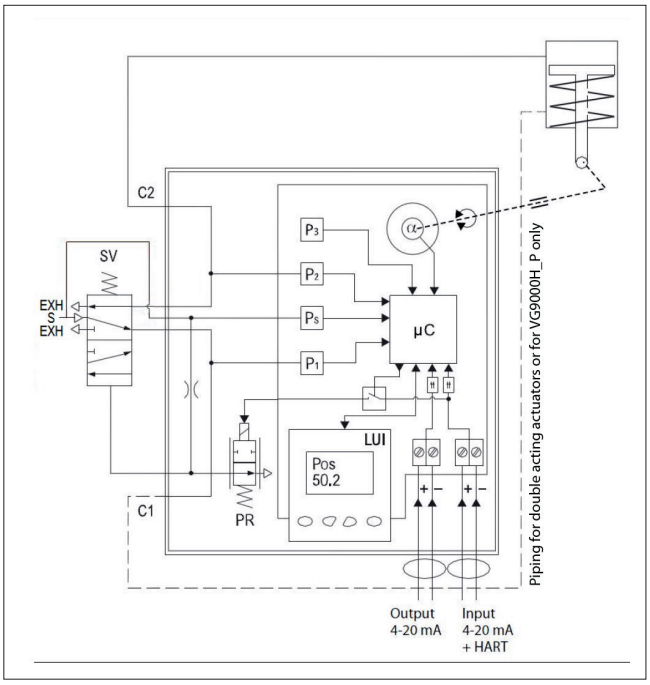


Fig. 1 The principle of operation

Technical description of VG9000H_P

NOTE:
VG9000H_P version has fundamentally different functionality to other VG9000H versions. This version can be identified by the green cover.

Neles ValvGuard 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.

The prestage valve of the device is coil operated flapper valve (normally open). 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.

The device stays alive even at 3.7 mA input signal and communicates via HART. 4 mA is a normal state of the device. When input signal is 10 mA and above, PST and travel calibration are possible. The valve cannot be driven from the normal position by any input signal. Thus the safety action needs to be done with an additional solenoid valve.

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.

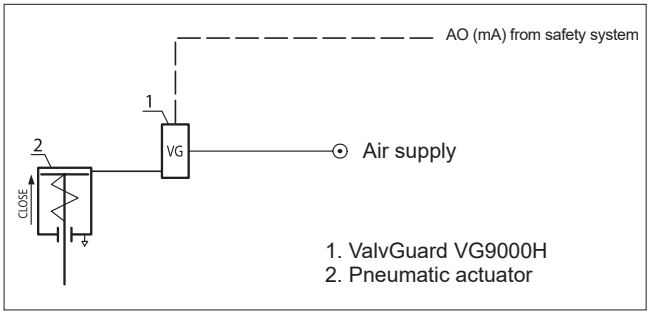


Fig. 2 General wiring principle of VG9000H

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

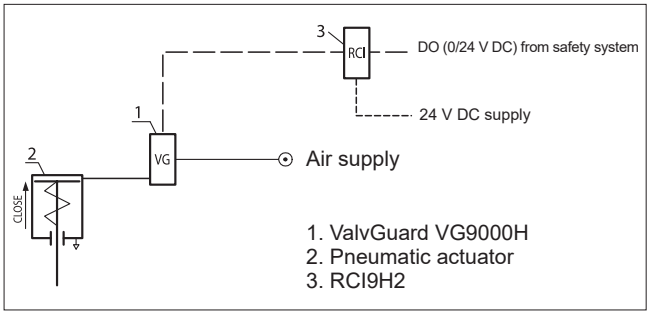


Fig. 3 VG9000H wiring principle with RCI unit

There is also a Local Control Panel option (LCP9H_). It can be used together with VG9000H or VG9000H with RCI unit. See Fig. 4. for the wiring principles with Local Control Panel.

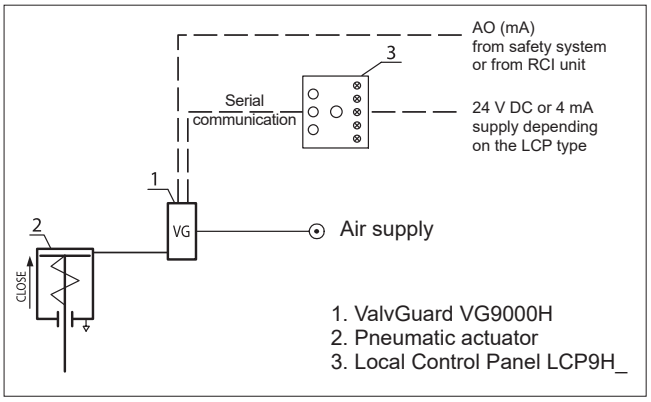


Fig. 4 VG9000H wiring with Local Control Panel

See Section 3.5 for wiring details. See LCP manual (7LCP9H70en) for further LCP details. See RCI bulletin (9RCI21en) for further RCI details.

VG9000H_P must be used together with an additional solenoid valve (SOV). See Fig. 5 for the general wiring principle.

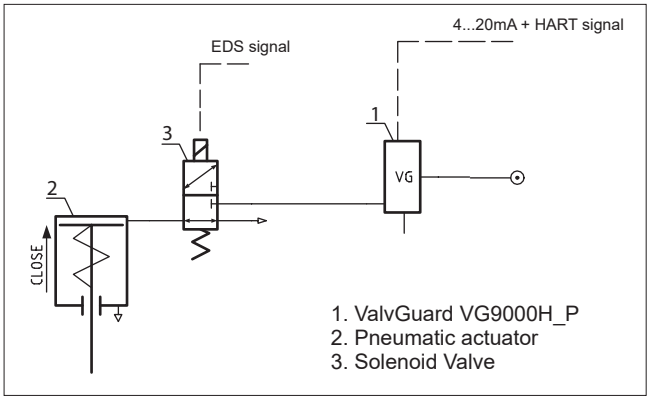


Fig. 5 VG9000H_P wiring with additional solenoid valve

1.4 Markings

The ValvGuard is equipped with an identification plate (Fig. 6).

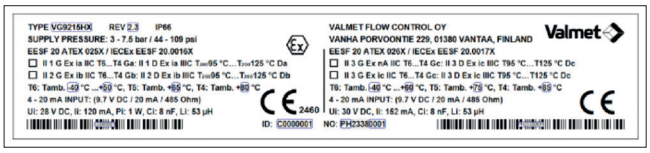


Fig. 6 Example of identification plates

Identification plate markings include:

- Type designation of the ValvGuard
- 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: PH13011234 = controller, year 2013, week 1, consecutive number 1234.

Ex NOTE:
Some models may have two identification plates if there is a double approval.
When the device is installed to an Ex i or Ex d area, remove the identification plate which is not valid.
If the device is installed as Ex d, it can't be installed as Ex i even if the identification plate would be changed.

1.5 Technical specifications

Ex NOTE:
This manual contains technical specifications for several types of the ValvGuard. 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.

VG9000H INTELLIGENT SAFETY SOLENOID

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:

-40°...+85 °C / -40° to +185 °F

Influence of temperature on valve position:

< 0.5 % / 10 °C

Influence of vibration on valve position

No effect when measured inpulse
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

Environment as required by IEC 61010-1: Outdoor / wet location

Altitude as required by IEC 61010-1 when exceeding a.c. voltage levels 33 V r.m.s., 46,7 V peak or is 70 V d.c. voltage level with limit switch options: 2000m

Operating environment with cover closed: Pollution degree 4

Installation or maintenance with controlled environment

Relative humidity: Operating humidity 0 … 100 %RH

Enclosure

Material (VG92_):	Epoxy coated anodised aluminium alloy, glass window (excluding E2)	
Material (VG93_):	Stainless steel (316 or equivalent), glass window as an option	

Mechanical position indicator and LUI visible through the main cover (VG92_)

Protection class:	IP66, NEMA 4X	
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 or 1/2" NPT (VG9_U_ or VG9_E2_)	

Weight:	VG921_	3.0 kg / 6.6 lb
	VG9235	4.6 kg / 10.1 lb
	VG9237	5.0 kg / 11 lb
	VG931_	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

Spool material:	Hard anodized aluminium with special teflon coating
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 / 18 °F below minimum temperature isrecommended)
Oil class:	3 (or <1 ppm)
Supply media:	Air, nitrogen
Humidity:	Class 1 (dew point 10 °C / 18 °F below minimum temperature is recommended)
Oil class:	3 (or <1 ppm)

Capacity with 4 bar / 60 psi supply:

VG9_12	7 Nm^3/h / 4.1 scfm (Cv = 0.06)
VG9_15	90 Nm^3/h / 53 scfm (Cv = 0.7)
VG9235	380 Nm^3/h / 223 scfm (Cv = 3.2)
VG9237	feed 380 Nm^3/h / 223 scfm (Cv = 3.2) exhaust 700 Nm^3/h / 412 scfm (Cv = 6.4)

Consumption with 4 bar / 60 psi supply (VG9000H):

actuator pressurized 0.22 Nm^3/h / 0.13 scfm,
actuator vented 0.25 Nm^3/h / 0.15 scfm

Consumption with 4 bar / 60 psi supply (VG9000H_P):

0.25 Nm^3/h / 0.15 scfm

Electronics (input)

Electrical connections:	0.25–2.5 mm^2
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)

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)
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 35 mA

Electronics (output)

Usage:	Position transmitter (T) / device status output (S)
Electrical connections:	0.25–2.5 mm^2
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

NOTE:
See chapter 8.1.3.5 for SIL certified position transmitter (T01) details. See Safety Manual for functional safety information.

LCP9H interface

Electrical connections: 0.25–2.5 mm^2

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 TUV Rheinland.
	Position transmitter option (T01) up to and including SIL 2.
	For device variant specific SIL certification coverage and exceptions see chapter 15 Type Coding.

Electromagnetic protection

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

Applicable directives

	2014/30/EU (EMC)
	2014/34/EU (ATEX)

Interoperability

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

APPROVALS

Certificate	Approval	Electrical values
ATEX		
VG9_X (ATEX) EESF 20 ATEX 025X EN IEC 60079-0:2018, EN60079-11:2012	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	Input: Ui ≤ 28 V, Ii ≤ 120 mA, Pi ≤ 1.0 W, Ci ≤ 9.6 nF, Li ≤ 53 µH PT: Ui ≤ 28 V, Ii ≤ 120 mA, Pi ≤ 1.0 W, Ci ≤ 8 nF, Li ≤ 53 µH LCP: Ui ≤ 10 V, Ii ≤ 100 mA, Pi ≤ 0.25W, Ci ≤ 5 nF, Li ≤ 1 µH
VG9_X (ATEX) 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...T4 Gc II 3 D Ex ic IIIC T95 °C...T125 °C Dc	Input: Ui ≤ 30 V Ii ≤ 153 mA Pi ≤ n/a (device limits itself) Ci < 9,6 nF Li < 53 µH PT: Ui ≤ 30 V Ii ≤ 152 mA Pi ≤ n/a (device limits itself) Ci < 8 nF Li < 53 µH LCP: Ui ≤ 15 V Ii ≤ 1350 mA Pi ≤ n/a (device limits itself) Ci < 5 nF Li < 1 µH
VG9_E6_ SIRA 11ATEX1006 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 IP66	Input: Ui ≤ 30 V, Pi ≤ 1080 mW PT: Ui ≤ 30 V, Ii ≤ 20 mA, Pi ≤ 1050 mW
IECEx		
VG9_X IECEx EESF 20.0016X IEC 60079-0:2017. IEC 60079-11: 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	Input: Ui ≤ 28 V, Ii ≤ 120 mA, Pi ≤ 1.0 W, Ci ≤ 9.6 nF, Li ≤ 53 µH PT: Ui ≤ 28 V, Ii ≤ 120 mA, Pi ≤ 1.0 W, Li ≤ 53 µH, Ci ≤ 8 nF LCP: Ui ≤ 10 V, Ii ≤ 100 mA, Pi ≤ 0.25W, Ci ≤ 5 nF, Li ≤ 1 µH
VG9_X IECEx EESF 20.0017X IEC 60079-0:2017, IEC 60079-11:2011, IEC 60079-15:2010	Ex ic IIC T6...T4 Gc Ex nA IIC T6...T4 Gc Ex ic IIIC T95 °C...T125 °C Dc	Input: Ui ≤ 30 V PT: Ui ≤ 30 V LCP: Ui ≤ 15 V
VG9_E6_ 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 IP66	Input: Ui ≤ 30 V, Pi ≤ 1080 mW PT: Ui ≤ 30 V, Ii ≤ 20 mA, Pi ≤ 1050 mW
INMETRO		
VG9_Z_ Pending NCC 12.0797 X ABNT NBR IEC 60079-0:2013 Versão corrigida em 2016 ABNT NBR IEC 60079-11:2013 Versão corrigida em 2017 NCC 12.0798 X ABNT NBR IEC 60079-0:2013 Versão corrigida em 2016 ABNT NBR IEC 60079-11:2013 Versão corrigida em 2017 ABNT NBR IEC 60079-15:2012	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 Ex ic IIC T6...T4 Gc Ex nA IIC T6...T4 Gc Ex ic IIIC T95 °C...T125 °C Dc	Input: Ui ≤ 28 V, Ii ≤ 120 mA, Pi ≤ 1.0 W, Ci ≤ 9.6 nF, Li ≤ 53 µH PT: Ui ≤ 28 V, Ii ≤ 120 mA, Pi ≤ 1.0 W, Li ≤ 53 µH, Ci ≤ 8 nF LCP: Ui ≤ 10 V, Ii ≤ 100 mA, Pi ≤ 0.25W, Ci ≤ 5 nF, Li ≤ 1 µH
VG9_E5_ NCC 12.0795 X ABNT NBR IEC 60079-0:2013 versão corrigida em 2016 ABNT NBR IEC 60079-1:2016 ABNT NBR IEC 60079-31:2014	Ex db IIC T6...T4 Gb Ex tb IIIC T80 °C... T105 °C Db IP66	Input: Ui ≤ 30 V, Pi ≤ 1080 mW PT: Ui ≤ 30 V, Ii ≤ 20 mA, Pi ≤ 1050 mW
cCSAus		
VG9_E2_ CSA 1980091	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	Input: Ui ≤ 32 V
VG9_HU_ CSA 70043951	Class I, Div 1, Groups A, B, C, and D; T4/T5/T6 Ex ia IIC T4/T5/T6 Ga Class I, Zone 0 AEx ia IIC T4/T5/T6 Ga	Input: Ui (Vmax) = 28 V, Ii (Imax) = 120 mA, Pi = 1.0 W, Ci = 9.6 nF, Li = 53 µH PT: Ui (Vmax) = 28 V, Ii (Imax) = 120 mA, Pi = 1.0 W, Ci = 8 nF, Li = 53 µH
VG9_HU2 CSA 80025300	Ex nA IIC T4/T5/T6 Gc Class I, Division 2, Groups A,B,C,D AEx nA IIC T4/T5/T6 Gc Class I, Division 2, Groups A,B,C,D	Input Ui: Ui = 30V, Ii = 152mA, Pi = n/a (device limits itself) PT: Ui: Ui = 30V, Ii = 152mA, Pi = n/a (device limits itself) LCP: Ui: Ui = 15V, Ii = 1350mA, Pi = n/a (device limits itself)

1.6 Recycling and disposal

Most ValvGuard parts can be recycled if sorted according to material.

Most parts have material marking. A material list is supplied with the ValvGuard. In addition, separate recycling and disposal instructions are available from the manufacturer.

A ValvGuard may also be returned to the manufacturer for recycling and disposal. There will be a charge for this.

1.7 Safety precautions

Ex i WARNING:
Installation conductors must be rated greater than 83 °C

CAUTION:
Opening the cover of VG9000H field device enclosure is allowed for authorized and trained persons only!
Misuse of powered VG9000H field device may cause a dangerous situation.

CAUTION:
Cover should be opened only in dry places, not when the device is vulnerable to e.g. salt water.

CAUTION:
Do not exceed the permitted values!
Exceeding the permitted values marked on the ValvGuard 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!
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.
Do not rely on the pressure gauge readings alone to verify that the controller is not pressurized! Compare to local user interface reading or additional gauge.

CAUTION:
The pneumatic exhaust may cause high noise levels exceeding 85 dB. Use hearing protection when in proximity.

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.

WARNING:
Do not use oxygen as a driving medium!

NOTE:
This equipment was tested considering a 200 mm thickness of dust layer, according to item 5.3.2.3.2 of ABNT NBR IEC 60079-0.

Ex 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.

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

Ex WARNING:
Electrostatic charge hazard!
The pointer and display windows are non-conductive. Clean with a damp cloth only!

Ex WARNING:
Electrostatic charge hazard!
The paint of the device can enable charging of the metal parts by high voltage sources. Do not install the device in proximity of high voltage sources!

Ex i WARNING:
Ensure that the complete installation and wiring is intrinsically safe before operating the device!

Ex i WARNING:
Do not operate the device with electronics cover (part 39) removed!
Electromagnetic immunity is reduced, valve may stroke. Ex i: intrinsic safety may be impaired.

Ex i WARNING:
For intrinsically safe applications, the equipment must be connected via a certified Zener barrier placed outside the hazardous area!

Ex d NOTE:
Only persons familiar with Ex d explosion protection are allowed to work with the device. Special attention has to be paid to careful handling and closing of the cover.

Ex d WARNING:
Do not open the cover when an explosive atmosphere may be present!

Ex d WARNING
Do not use a combustible gas (such as natural gas) as a driving medium.

Ex d WARNING:
Any unused conduit entry shall be plugged with an Ex d rated plug.

Ex d and Ex n WARNING:
Use a cable gland with suitable Ex d and Ex n certification. For ambient temperature over 70 °C / 158 °F use a heat resistant cable and cable gland suitable for at least 90 °C / 194 °F.

ELECTRICAL SAFETY WARNING:
Certain limit switches may use dangerous voltages up to 250 V AC. Take appropriate precautions when working on the device. Use fuses for limit switch installations with 50 V AC / 75 V DC or higher.

WARNING:
Some valve controller feedback linkages pose a risk of finger injury. Prevent access of unqualified personnel to the installation. Take precautions when working on the unit.

NOTE:
Avoid earthing a welding machine in close proximity to an ValvGuard.
Damage to the equipment may result.

CAUTION:
Make sure that the ventilation output of the housing is not blocked!
This can prevent the safety function of the device.

CAUTION:
Rebooting and offline tests can be initiated remotely through the DTM, causing unexpected valve movement

2. TRANSPORTATION, RECEPTION AND STORAGE

WARNING:
Do not use the positioner as a lifting point!
Do not lift a valve assembly or positioner-actuator assembly from the positioner or from the positioner mounting bracket. The bracket attachment may fail leading to serious injury and damage.

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

WARNING:
Some positioner - actuator linkages may cause severe injury to fingers or hands when the actuator operates.

3.1 General

NOTE:
The enclosure of ValvGuard 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 ValvGuard 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 ValvGuard or other electrical instrumentation, our warranty is not valid.

NOTE:
Recommended mounting fastener torques:
M8: 20 Nm
M6: 8.0 Nm
M5: 6.0 Nm (iron actuator threads)
M5 4.8 Nm (aluminium actuator threads)

If the ValvGuard is supplied with valve and actuator, the tubes are mounted and the ValvGuard adjusted in accordance with the customer’s specifications.

The controller is equipped for connection according to VDI/VDE 3845.

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

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

3.2 Mounting on Neles 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. 7.

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).

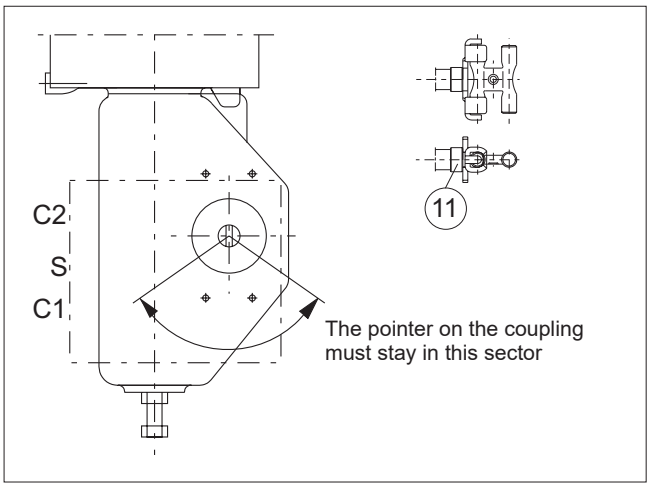


Fig. 7 Mounting on Neles actuator with VDI/VDE mounting face

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 Mounting and installation of VG9300

NOTE:
These instructions are only for the mounting and installation of VG9300, i.e. stainless steel version of VG9000H.

Mounting bracket

- Make sure the mounting bracket is suitable for the weight of the device. See detailed weight information in Section 1.5.
- Three extra M8 mounting holes exist in the standard mounting face of the housing for additional support. See dimension drawings for VG9300 in pages 42-43 (Chapter 12). The use of this extra support is mandatory in addition to the standard mounting face.
- There are also two 6.5 mm holes for additional support when needed. See dimension drawings for VG9300 in Chapter 12.

Pipeline support

- Due to the extra weight of stainless steel version and/or possible heavy vibration, make sure there are proper supports in the pipeline to hold the weight of the valve assembly.

Spool valve protective cover

- The spool valve protective cover (454) has 2 pcs. of 1/2” NPT threaded openings.
- Openings allow an adequate exhaust capacity and breathing of the spool valve.
- Openings have breathers (456) installed, but they can be replaced with protective piping if needed and when necessary.
- If VG is installed vertically, it is recommended to replace the breather with protective piping in the opening pointing upwards.

NOTE:
Breathers should not be plugged or restricted.

Exhaust adapter

- The exhaust adapter (8) has a 1/2” NPT threaded opening.
- Opening allows an excess air to be released from the housing and to prevent overpressurization.
- Exhaust adapter has a breather (456) installed, but it can be replaced with protective piping if needed and when necessary.
- Opening in the exhaust adapter shall not be plugged!

Protective piping

- Piping of the spool valve cover and/or exhaust adapter shall be done in cases where it is assumed that water can go inside the spool valve cover or into the exhaust adapter in spite of breathers.
- Piping shall be done so that the blowing of the exhaust air is downwards and to prevent water to go inside the protective cover or the exhaust adapter.
- Minimum inside diameter of the piping is 13 mm.
- Exhaust adapter piping shall not be connected to the spool valve cover piping!

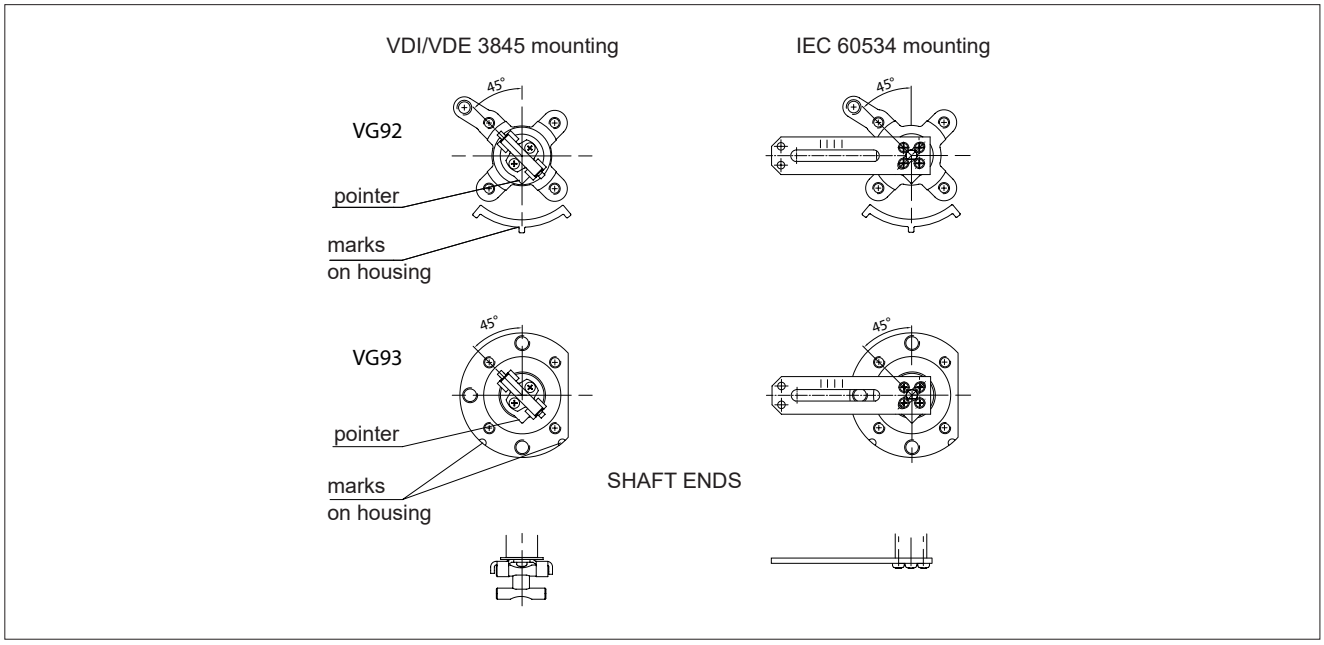


Fig. 8 Shaft coupling alternatives

3.5 Piping

WARNING:
Do not exceed the maximum supply pressure of the actuator!
A filter regulator is not a safety device! Adjust the network pressure below the maximum pressure of all actuators or use pressures relief valves.

Table 3 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. Supply air and actuator conduit sizes can be seen also in figure 9 below.

CAUTION:
The stroking times mentioned in Table 3 are trendsetting. 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.

NOTE:
When opening/closing times are defined in the Table 3, the specified spool valve size can be used with that actuator size. If there is '-' sign in the table or if smaller actuators than shown in the table are used, please contact Valmet.

NOTE:
When faster speeds are needed than shown in the table, QEV or volume booster can be used. Bypass valve is mandatory with volume boosters and QEV. Contact Valmet for separate instrumentation diagrams and instructions. Also, if any other pneumatics components are required in the setup with ValvGuard, please contact Valmet for further instructions..

NOTE:
When QEV or volume booster is used, VG with standard spool valve (VG9_15_) is required.

Connect the air supply to S. Connect C1 and C2 to the actuator, see Fig. 10. C1 must be plugged if single-acting actuator.

NOTE:
When VG9000H_P type is used the actuator piping is reversed! C2 must be plugged if single-acting actuator.

Liquid sealants, such as Loctite 577 are recommended for the pipe threads.

CAUTION:
An excess of sealant may result in faulty operation of the controller by contaminating pneumatic components.
Do not use sealing tape. Tape particles may cause faulty operation.
Ensure that the air piping is clean and that the return air from the actuator is clean.
When a pneumatic connector is removed, clean threads carefully from dry sealant particles before mounting the connector back.
Do not exceed torque of 30 Nm/22 lbf ft when fitting 1/4" NPT connectors to C1, C2 and S (VG921_).

NOTE:
A ValvGuard mounted on a spring actuator must be connected only as single-acting. See Fig. 10.

The air supply must be clean, dry and oil-free instrument air, see Section 1.5.

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.

CAUTION:
Restricting the air exhaust will cause incorrect operation and may prevent valve safety action.
If an exhaust adapter is used, use full size piping corresponding to the exhaust adapter connection.
To use exhaust to flush the actuator spring chamber ('rebreathing'): Do not connect directly. Contact Valmet for instructions.
If ValvGuard is equipped with an exhaust adapter for connecting the exhaust air to the actuator spring side or elsewhere, please see the chapter 3.4 for protective piping and contact Valmet for further instructions.

Table 1 Spring rates

Actuator type	Spring rate (bar/psi)
B1JK	3 / 43
B1J	4.2 / 61
B1JV	5.5 / 80
QPX_B	2.8 / 41
QPX_C	4.1 / 60
QPX_D	5.5 / 80
Adjust regulator pressure to a level that is max 1 bar (14.5 psi) + spring rate.	

NOTE:
Always use a filter regulator for single acting actuators.
It is recommended to use a filter regulator for all actuators for additional protection from debris in the air.

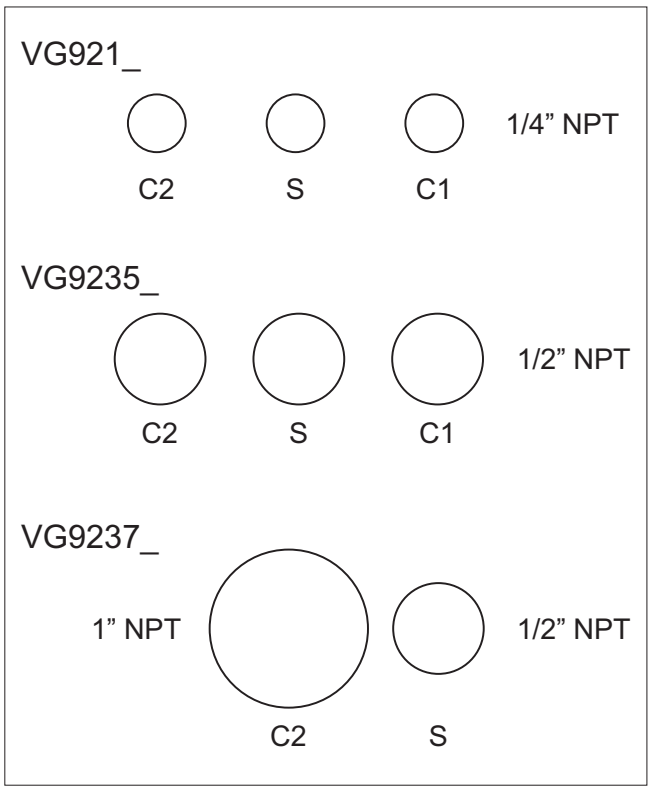


Fig. 9 Air supply and actuator conduits

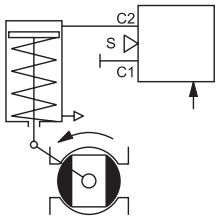
Table 2 Piping and stroke times

Actuator				VG_12_ Supply 1/4" NPT Actuator 1/4" NPT			VG_15_ Supply 1/4" NPT Actuator 1/4" NPT			VG_35_ Supply 1/2" NPT Actuator 1/2" NPT			VG_37_ (Single acting only) Supply 1/2" NPT Actuator 1" NPT		
B1C	**Stroke vol. dm^3 / in^3**		**NPT**	**Piping**	**Open (s)**	**Close (s)**	**Piping**	**Open (s)**	**Close (s)**	**Piping**	**Open (s)**	**Close (s)**	**Piping**	**Open (s)**	**Close (s)**
40	43	2624	3/4	-	-	-	10 mm or 3/8"	19	19	16 mm or 5/8"	4.9	5.6	-	-	-
50	84	5126	1	-	-	-	10 mm or 3/8"	38	38	16 mm or 5/8"	9.6	11	-	-	-
60	121	7380	1	-	-	-	10 mm or 3/8"	54	54	16 mm or 5/8"	14	16	-	-	-
75	189	11500	1	-	-	-	10 mm or 3/8"	85	85	16 mm or 5/8"	22	25	-	-	-
502	195	11900	1	-	-	-	10 mm or 3/8"	87	87	16 mm or 5/8"	22	25	-	-	-
602	282	17200	1	-	-	-	10 mm or 3/8"	126	126	16 mm or 5/8"	32	37	-	-	-
752	441	26900	1	-	-	-	10 mm or 3/8"	197	197	16 mm or 5/8"	50	57	-	-	-
B1J B1JA	**Stroke vol. dm^3 / in^3**		**NPT**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**
6	0.47	28.3	3/8	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-	-	-	-
8	0.9	55	3/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	0.5	1.0	-	-	-	-	-	-
10	1.8	110	3/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	0.7	1.4	-	-	-	-	-	-
12	3.6	220	1/2	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	1.2	2.7	16 mm or 5/8"	See Note 1	See Note 1	-	-	-
16	6.7	409	1/2	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	3.2	4.8	16 mm or 5/8"	0.7	1.3	25 mm or 1"	See Note 1	See Note 1
20	13	793	3/4	-	-	-	10 mm or 3/8"	4.6	9.3	16 mm or 5/8"	2.5	3.0	25 mm or 1"	See Note 1	See Note 1
25	27	2048	3/4	-	-	-	10 mm or 3/8"	8.9	18	16 mm or 5/8"	2.9	5.4	25 mm or 1"	2.5	2.9
32	53	3234	1	-	-	-	10 mm or 3/8"	15	38	16 mm or 5/8"	4.9	11	25 mm or 1"	4.3	5.3
40	97	5919	1	-	-	-	10 mm or 3/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1	25 mm or 1"	See Note 1	See Note 1
322	106	6468	1	-	-	-	10 mm or 3/8"	31	77	16 mm or 5/8"	9.8	21	25 mm or 1"	8.5	11
QPX	**Stroke vol. dm^3 / in^3**		**NPT**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**
1	0.62	38	3/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
2	1.08	66	3/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
3	2.18	133	3/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
4	4.34	265	3/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
5	8.7	531	3/8	-	-	-	10 mm or 3/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1
VPVL	**Stroke vol. dm^3 / in^3**		**NPT**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**	**Piping**	**Air (s)**	**Spring (s)**
300	0.44	27.1	1/4	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-	-	-	-
350	0.72	43.8	1/4	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
400	0.92	56	1/4	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
450	1.5	89	1/4	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
500	1.9	116	1/4	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
550	2.6	156	1/4	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	-	-	-	-	-	-
600	3.5	217	1/4	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1	-	-	-
650	6.0	364	1/8	10 mm or 3/8"	See Note 1	See Note 1	10 mm or 3/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1	-	-	-
700	8.7	528	1/2	-	-	-	10 mm or 3/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1	25 mm or 1"	See Note 1	See Note 1
800	15	917	1/2	-	-	-	1 mm or 3/8"	See Note 1	See Note 1	16 mm or 5/8"	See Note 1	See Note 1	25 mm or 1"	Seem Note 1	See Note 1

Note 1: Times to be defined later

"-" means not applicable

SINGLE-ACTING ACTUATOR, SPRING TO CLOSE

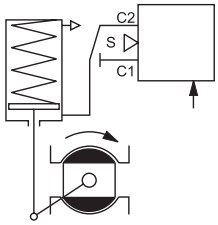


1. Self closing

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

NOTE: Valve shown in trip position

SINGLE-ACTING ACTUATOR, SPRING TO OPEN

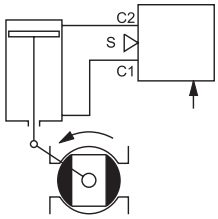


2. Self opening

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

NOTE: Valve shown in trip position

DOUBLE-ACTING ACTUATOR

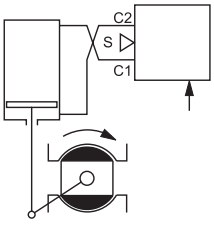


3. Self closing

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

NOTE: Valve shown in trip position

DOUBLE-ACTING ACTUATOR, REVERSED PIPING

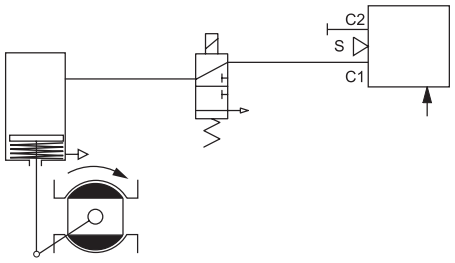


4. Self opening

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

NOTE: Valve shown in trip position

Fig. 10 Operation directions, air connections and assembly related parameters for VG9000H

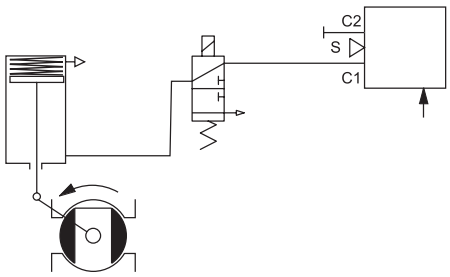


SINGLE-ACTING ACTUATOR, SPRING TO CLOSE

1. Self closing

   Default setting:
   ATYP = 1-A
   PFA = OPE
   VTYP according to valve typ

NOTE: SOV shown in energized condition, valve in normal position

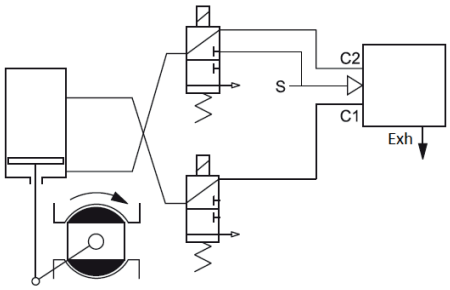


SINGLE-ACTING ACTUATOR, SPRING TO OPEN

2. Self opening

   Default setting:
   ATYP = 1-A
   PFA = CLO
   VTYP according to valve type

NOTE: SOV shown in energized condition, valve in normal position

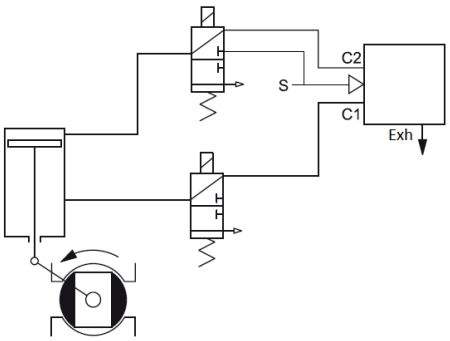


DOUBLE-ACTING ACTUATOR

3. Self closing

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

NOTE: SOV shown in energized condition, valve in normal position



DOUBLE-ACTING ACTUATORR

4. Self opening

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

NOTE: SOV shown in energized condition, valve in normal position

Fig. 11 Operation directions, air connections and assembly related parameters for VG9000H_P

3.6 Electrical connections

Ex i NOTE:
When installing the device, mark the applied hazardous area installation method by ticking the applicable box in the product identification plate when applicable.
A device previously installed in any other protection mode than intrinsically safe (Ex i) shall never be re-installed as Ex i.

CAUTION:
Free wires or strands may cause a short circuit and valve movement.
Use ferrules to terminate the wires. Leave no free wires or a free cable shield. It is recommended to cut the cable shield to where the insulation ends

NOTE:
The Valve Controller can be earthed using the external earthing terminal. Earthing can be done with 1 or 2 stranded wires with cross sections of 4 mm² with ferrule, 6 mm² without ferrule or with one 10 mm² stranded wire if the strands are divided on both sides of the screw.

The VG9000H 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 or 1/2" NPT cable gland. Additional conduit entries are available with extension housing or junction box. See type coding for details.

Connect the conductors to the terminal strip as shown in Fig. 12. It is recommended that the earthing of the input cable shield be carried out from the DCS end only.

Cable shall be one or more single-twisted pair shielded or multiple-twisted pair with overall shield. Single and multiple pair may be combined in a given network provided all current input devices associated with multiple pairs of the same cable shall be located nominally at one end of the multi-pair cable. Unshielded cable may be used if it is demonstrated that ambient noise or crosstalk does not affect communication or functions of the safety valve controller.

The (optional) position transmitter / status output is connected to 2-pole terminal PT as shown in Fig. 12. The position transmitter / status output needs an external power supply. The VG9000H and the position transmitter / status output circuits are galvanically isolated and withstand a 30 V DC voltage.

For SIL certified position transmitter, please see Sections 8, 11.1 and 11.6.

WARNING:
Do not short circuit the HART connection pins! The valve controller will lose electric supply and the valve will stroke

NOTE:
The VG9000H equals a load of 485 Ω in the current loop.

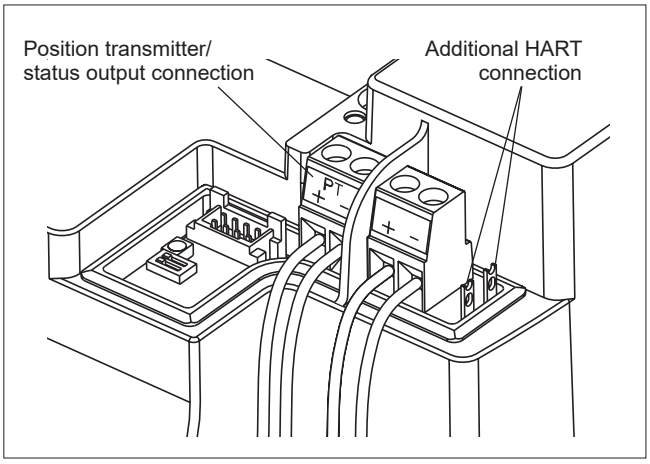


Fig. 12 Prewired terminals in the circuit board

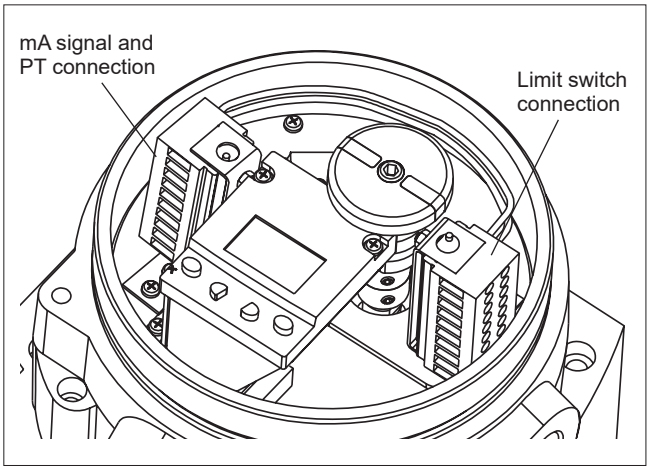


Fig. 13 Wiring terminals when the extension housing is used

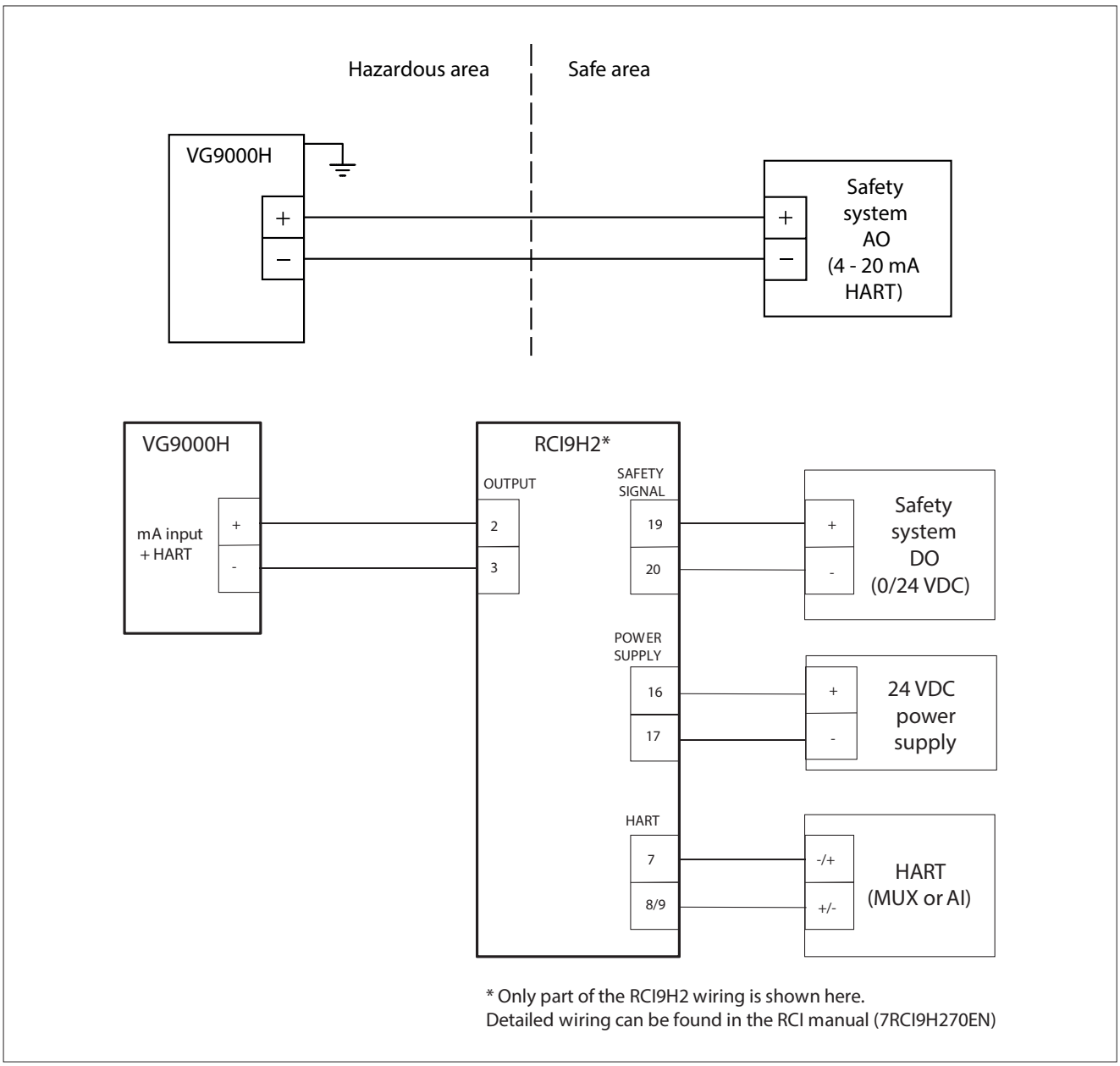


Fig. 14 VG9000H electrical connections with and without RCI9H2. See Section 11.6. for other installations.

4. LOCAL USER INTERFACE (LUI)

CAUTION:
When not working with the controller, always keep the device cover shut to prevent unintended access.

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.

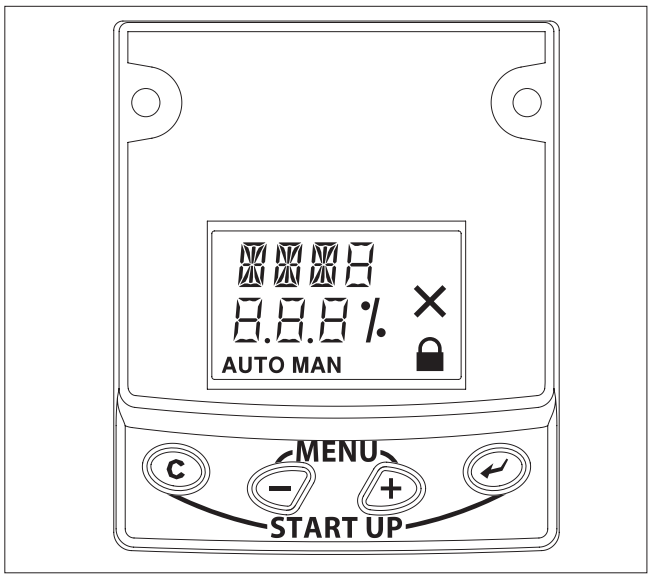


Fig. 15 Local user interface (LUI)

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 4 identifies the default unit and also optional unit of the measurement.

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

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.

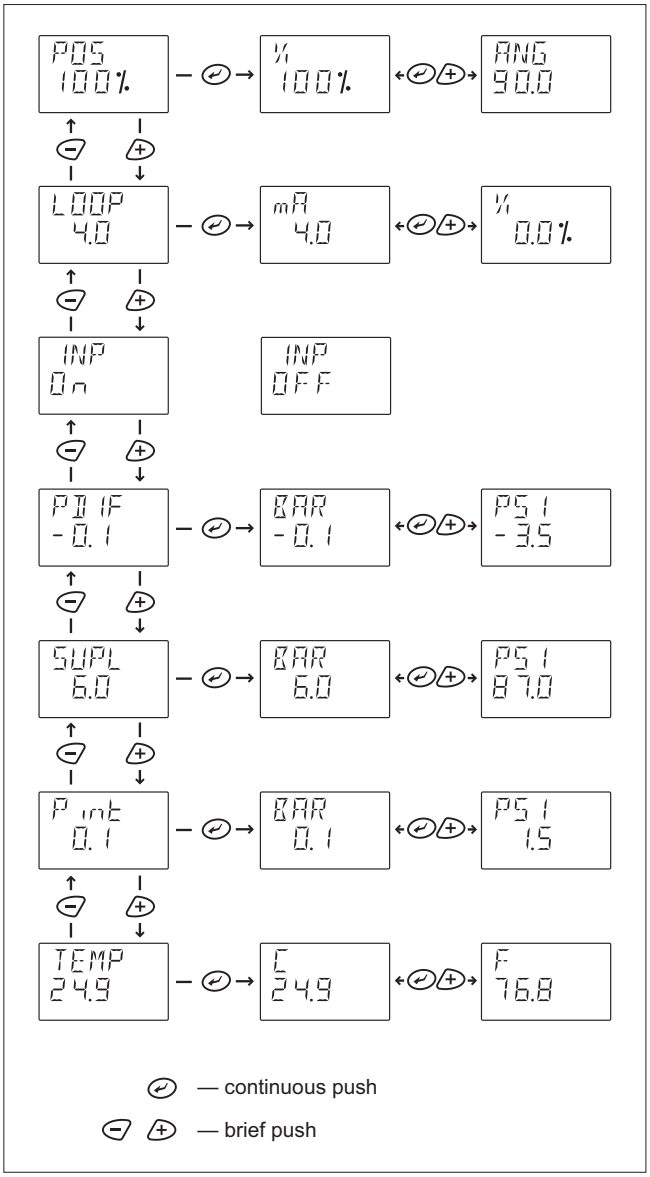


Fig. 16 Measurement monitoring and unit change

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.

NOTE: When VG9000 is used together with loop powered LCP, the input signal value shown in the LUI varies by a few tenth of a milliamp.

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 (PinE) 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 ⓒ and ⓔ keys simultaneously.

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

Actuator type	ATYP
Valve type	VTYP
Positioner fail action	PFA
Extra pneumatics instrumentation	EXTI
Actuator size	ACTS
Spool valve type	STYP
HART version	HARTI
Automatic travel calibration	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 ⓒ button. Cancelling of operation returns user interface view one level up in menu hierarchy.

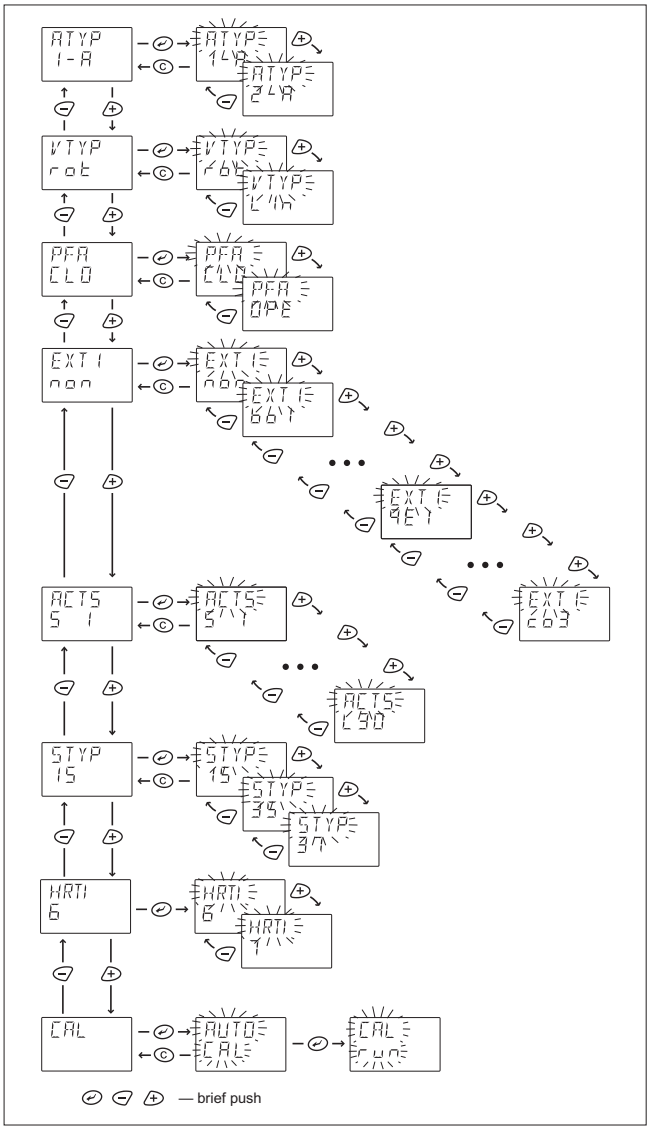


Fig. 17 Guided start-up

CAUTION:
Changing the critical parameters (the parameters set in the guided startup) may cause faulty operation and unanticipated stroking of the valve. Damage to the process and injury may result.
Changing the critical parameters remotely through DTM or EDD is not recommended. Note that the download all function in the DTM may change critical parameters!

4.3 Configuration menu

The local user interface is organised in a menu structure. To enter the menus press ⊕ and ⊖ simultaneously in the measurement monitoring view panel. To move to the next or previous selection by pressing ⊕ or ⊖ accordingly (see Fig. 18.)

4.4 Configuration parameters

WARNING:
Wrong configuration parameters may cause unexpected stroking of the valve. Do not change configuration parameters with the process running

When PAR is on the display you may enter the configuration menu by pressing the ⏎ 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 ⏎ 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.

Actuator type, ATYP

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

- After selecting ATYP on the display, press the ⏎ key to enter the edit state and ATYP starts to blink.
- Select between two values 1-A or 2-A using the ⊕ and ⊖ keys. The value 1-A indicates a single acting actuator and 2-A a double acting actuator.
- To conclude press the ⏎ key when the desired value is shown on the display.

Valve type, 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 VTYP display.

- After selecting VTYP on the display, press the ⏎ key to enter the edit state and the VTYP starts to blink.
- Select between two values rot or Lin using the ⊕ and ⊖ keys. The value rot indicates a rotary valve and Lin a linear valve.

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

Positioner fail action, PFA

This section describes the function of the actuator.

Set value according to Fig. 10 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. 10 for correct settings.

- Once PFA is displayed, press the ⏎ key to enter the edit state and the PFA will start blinking.
- You may select between two values by pressing the ⊕ or ⊖ key. The CLO value indicates that the valve ought to be closed in fail action situations. The OPE value indicates the valve to be opened in fail action situations.
- After the desired value is displayed, press the key ⏎ to conclude the operation.

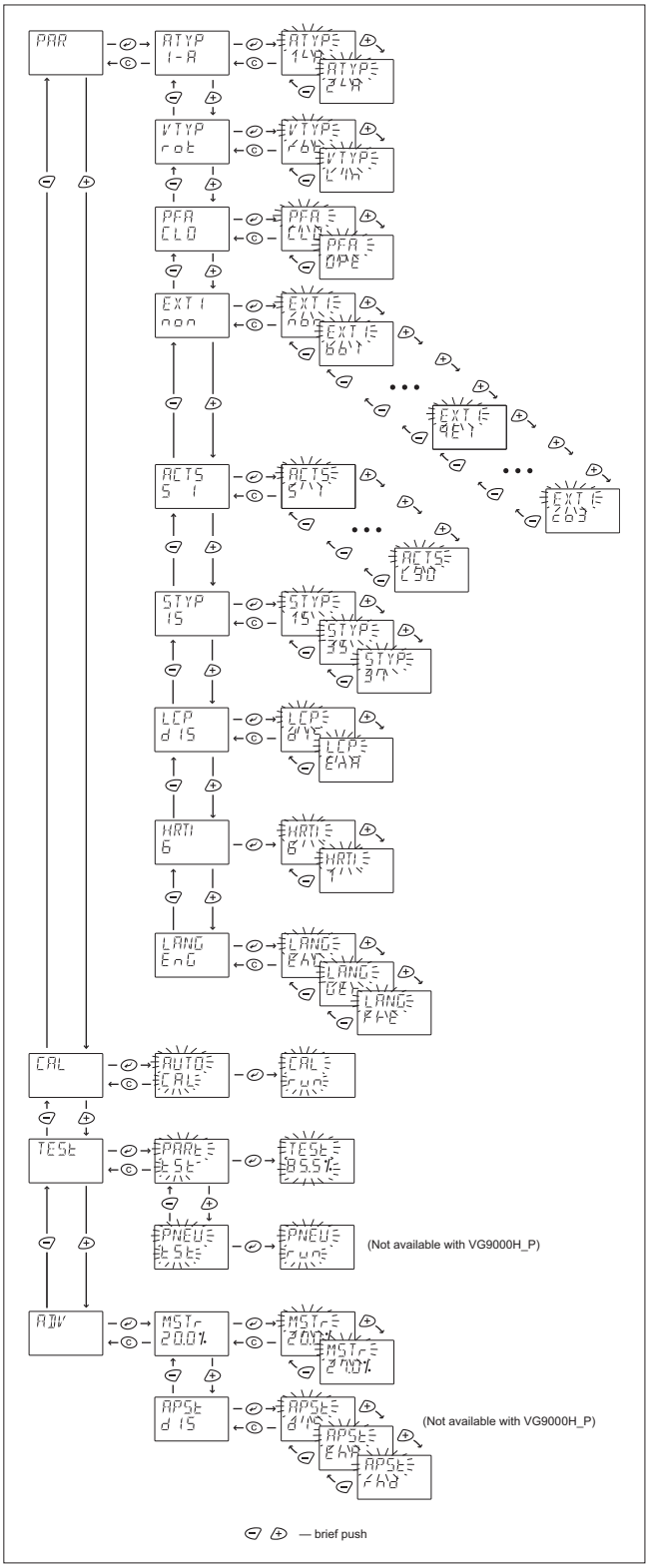


Fig. 18 Configuration.

Extra pneumatics instrumentation, EXTI

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

- After selecting EXTI on the display, press the ⏎ key to enter the edit state and EXTI 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 3 Selecting extra pneumatics instrumentation parameters

Instrumentation type	Parameter (EXTI)
Volume booster (VB)	Booster type 1 (bo1)
Quick exhaust (QEV)	Quick exhaust 1 (QE1)
Combination of VB and QEV	Combination type 1 (co1)

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

NOTE:
When QEV or volume booster is used, VG with standard spool valve (VG_15_) is required.

Actuator size, ACTS

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 ACTS on the display, press the ↵ key to enter the edit state and ACTS 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 = B1J12-16 (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.

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.
- After selecting STYP on the display, press the ↵ key to enter the edit state and STYP starts to blink.
- Select between the following values:
  15 = VG9_12 or VG9_15
  35 = VG9235
  37 = VG9237
  Use the ⊕ and ⊖ keys to change the value.
- To conclude press the ↵ key when the desired value is shown on the display.

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 dIS or EnA using the ⊕ and ⊖ keys.
- To conclude press the ↵ key when the desired value is shown on the display.

HART version

- Select if device is used as HART 6 or HART 7 device by using the ⊕ and ⊖ keys.
- To conclude press the [enter] key when the desired value is shown on the display.
- As default device is HART 7 device.
- Device needs to be rebooted after change

Language selection, LANG

- Select between three languages EnG, GEr or FrE (English, German or French) using the ⊕ and ⊖ keys.
- To conclude press the ↵ 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.
Remote calibration using the DTM or EDD is possible but for safety not recommended .

Select CAL from the menu by using ⊕ or ⊖ keys and press the ↵ key.

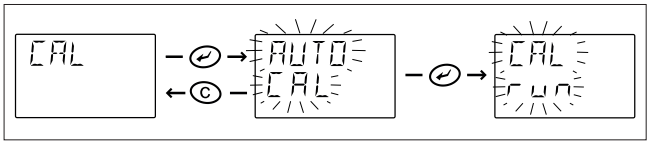


Fig. 19 Calibration selection

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 succesfully before the calibration.

During calibration process a blinking text "CAL run" will be show on the display. If calibration ends successfully, a text "CALIBRATION SUCCESSFUL" will be shown. Calibration can be cancelled with the ⓒ 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).

Position Transmitter Direction

Devices equipped with an integrated position transmitter have the option to configure the transmitter signal. A common practice is that transmitter output is 4 mA when valve is closed and 20 mA when fully open. The position transmitter direction and signal direction parameters are connected and if signal direction parameter “DIR” is set to “CLO”, the position transmitter signal direction should be set respectively, i.e. “Reverse”. The default setting for the parameter is “Normal Direction” which corresponds the default signal direction setting “OPE”. Parameter setting is available in the frame application software.

4.6 Testing, TEST

- Select between two tests Partial Stroke Test (PART tSt) or Pneumatics test (PNEU tSt).
- To conclude press the ✓ key when the desired value is shown on the display.

Partial Stroke Test, PART tSt

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 (MStr) described in Section 4.7. Advance parameters.

- Select PART tSt from the menu by using + or − keys and press the ✓ key.
- Test can be cancelled by pressing ⓒ.

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:
When double acting actuator is used, DTM or other HART user interface is needed to set 'Actuator Low Limit Pressure' -parameter to negative value, e.g. -2. Also, breakaway pressure low limit value needs to be changed to 0.

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.
With the VG9000H_P version the pneumatics test will be run always before the partial stroke test. Pneumatics test timeout parameter is valid also in this case.

NOTE:
PST size total value cannot be smaller than 3%. If randomized test has been selected (available via HART), make sure the PST stroke size is more than 3% bigger than randomizer value.

Pneumatics test, PNEU tSt

NOTE:
Pneumatics test will check the pneumatics function of the device by moving the spool valve only and not moving the actuator or the valve.

Pneumatics test can be run from here.

- Select PNEU tSt from the menu by using + or − keys and press the ✓ key.
- Test can be cancelled by pressing ⓒ.

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.

NOTE:
Separate pneumatics test is not available in VG9000H_P version. It will be run automatically always before the partial stroke test.

4.7 Advance parameters

Manual Stroke Size, MStr

Targeted manual partial stroke test size. Range is 3.0–100 %. In VG9000H_P version the range is 3.0-50%.

- Once MStr is displayed, press the ✓ key to enter the edit state and the MStr will start blinking.
- Select values by pressing the + or − key. Holding down + or − key will start scrolling the value show on the display faster.
- After the desired value is displayed, press the key ✓ to conclude the operation.

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

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.

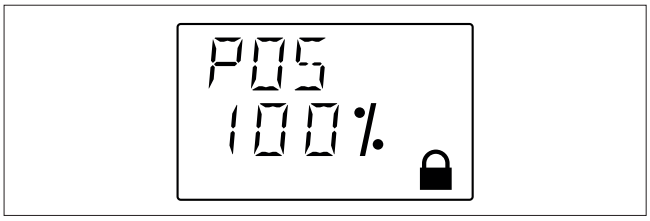


Fig. 20 LUI locked

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 ✕ to be shown on the display. In Warning state, the ✕ symbol is steady.

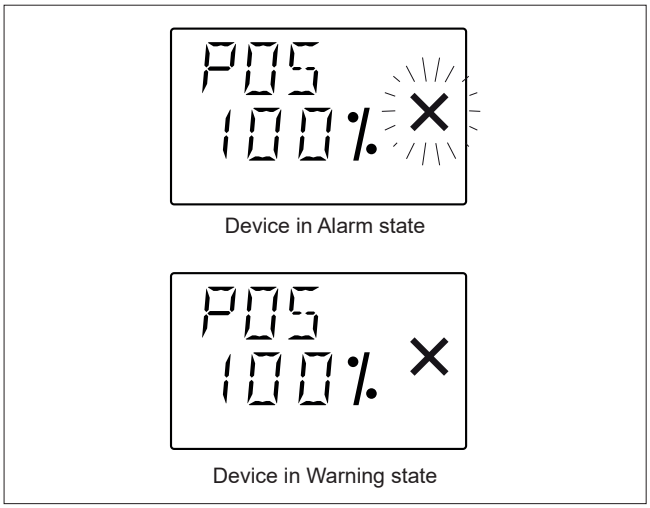


Fig. 21 Alarm and Warning states

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.

For the list of events see Chapter 6.

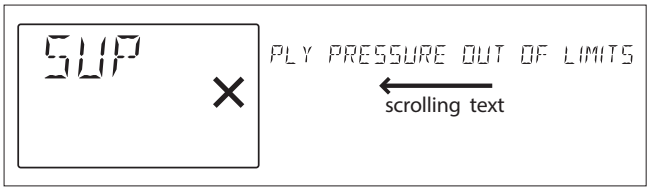


Fig. 22 Online alarm or warning state message

HART Communication active

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

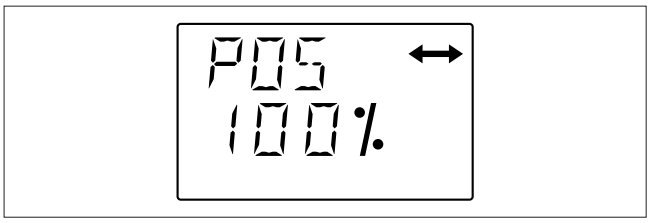


Fig. 23 HART communication activated

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, see Fig 21.

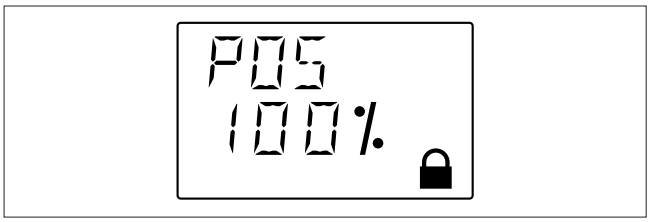


Fig. 24 Device write protected

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).

Burst mode control

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

Burst mode command

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

- 1: Read 1st dynamic variable
- 2: Read loop current and percent of range
- 3: Read dynamic variables and loop current
- 9: Read device variables with status
- 33: Read device variables
- 48: Read additional device status

Burst variables

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

Burst update period

Update period of burst message when Burst Trigger mode Continuous is used or Trigger level is exceeded in Burst Trigger modes Rising or Falling.

Burst trigger settings

These settings configures the trigger that forces publishing of the burst message. Different Trigger Modes allow the device to be configured to defer the publishing of the Burst message beyond the Burst Update Period. In all cases, the Burst message is triggered when the Maximum Update Period time exceeded. The trigger source depends on used Burst Command and is 1st Dynamic Variable (CMDs 1,2), 1st Burst Variable (CMDs 9, 33) or Percent of Range (CMD 2).

5. MAINTENANCE

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

Although these devices are designed to work under severe conditions, proper preventive maintenance can help to prevent unplanned downtime. More detailed maintenance and inspection interval can be specified together with your local Valmet experts.

Ex d NOTE:
Maintenance of the parts of the flameproof enclosure is not allowed!
Device type VG9_E6_:
Housing (2), Cover (100), Shaft assembly (11), Limit switch housing (300).

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

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 VG9000H 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 VG9000H, 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 counter-clockwise 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.

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).

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.

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 prestage mounting plate (400) and press the prestage into place. Make sure the nozzle is guided into the O-ring properly. The screws guide the prestage 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.

Restricted and standard capacities

Restricted capacity means the spool valve option 12 and standard capacity means the spool valve option 15 in VG type coding. See type coding in the machine plate for details.

Removal

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

- Before removing the spool valve assembly in VG931_, the spool valve cover (454) needs to be removed. Unscrew the M4 screws (4 pcs.).
- Working from the bottom side of the ValvGuard, unscrew the M5 screws (4 pcs.). Remove the spool valve (420) with gasket (63). Do not remove the spool valve adapter plate (421).

Installation

- Mount the spool valve (420) to the housing, and tighten the four M5 screws evenly.
- Mount the spool valve cover (454) (only in VG931_).Tighten the four M4 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.

High capacity

High capacity spool valve means the spool valve options 35 or 37 in VG type coding. See type coding in the machine plate for details.

Removal

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

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.

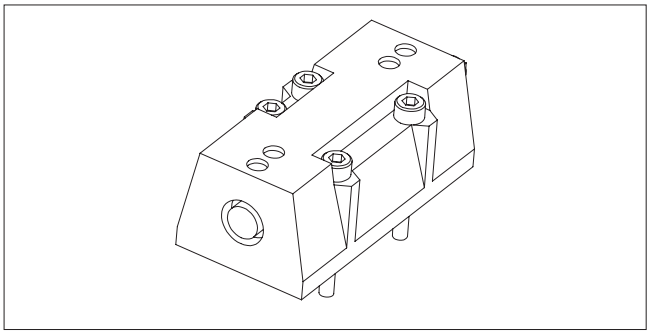


Fig. 25 Spool valve assembly

5.4 Communication circuit board

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

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.

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 ValvGuard to the actuator.

Ex 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.

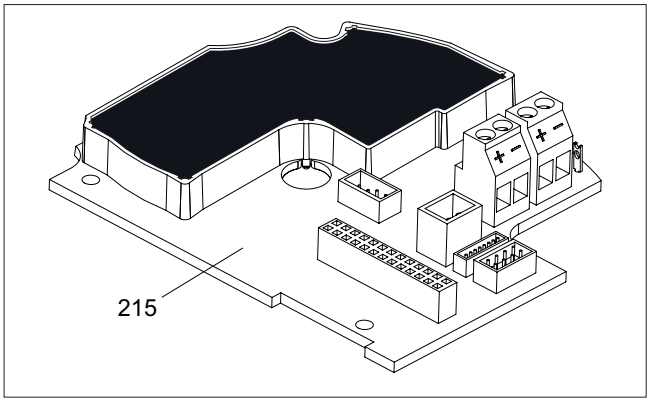


Fig. 26 Communication board

6. MESSAGES

These messages may appear in the local user interface.

NOTE:
Parameter limits can only be changed via HART.
See DTM manual for setting the parameter limits.

Display message	Description
ACTUATOR FULL STROKES COUNTER LIMIT EXCEEDED	Generated when actuator full stroke count exceeds the warning limit.
CALIBRATION CANCELLED	Generated when activated calibration routine is cancelled, by user or other process.
CALIBRATION FAILED	Generated when activated position, current, pressure or position transmitter calibration process failed.
CALIBRATION FAILED - ALARM STATE ACTIVE	Generated if alarm state becomes active during calibration process.
CALIBRATION FAILED - CALIBRATION ALREADY ACTIVE	Generated if another calibration process is active and a new request for calibration is done.
CALIBRATION FAILED - EMERGENCY TRIP ACTIVE	Generated if calibration process is called when Emergency Trip is active.
CALIBRATION FAILED - TOO LOW SUPPLY	Generated if supply pressure drop is detected during calibration process.
CALIBRATION START FAILED	Generated when calibration routine can not be started.
CALIBRATION START FAILED - MA LOOP CURRENT TOO LOW	Generated if the input signal is less than 8mA when starting the calibration. Valid for VG900H_P only.
CALIBRATION SUCCESSFUL	Generated when activated position, current, pressure or position transmitter calibration process ended successfully.
CALIBRATION TIMEOUT	Generated when calibration routine has lasted too long time.
CONTINUED WATCHDOG RESET	Generated when too many consecutive internal resets has been generated.
CONTINUED WATCHDOG RESET	Generated when software has lost the control, and internal watchdog generates reset.
EMERGENCY TRIP ACTIVATED	Generated when Emergency Trip has been activated.
ETT CLOSING TIME TOO HIGH	Generated if ETT closing time was detected too slow.
ETT OPENING TIME TOO HIGH	Generated if ETT opening time was detected too slow.
FACTORY DEFAULTS ACTIVATED	Generated every time when parameters are loaded with factory settings.
FACTORY SETTINGS CREATE FAILURE DETECTED	Generated when factory settings creation fails.
FACTORY SETTINGS RESTORE FAILURE DETECTED	Generated when factory settings restoration fails, i.e. current parameter set can not be loaded with factory settings.
HOUSING PRESSURE LIMIT ECXCEEDED	Generated when housing pressure is larger than user definable limit.
LOOP CURRENT LOW LIMIT EXCEEDED	This event is generated if loop current drops below user configurable limit. Detection has also a latch time parameter.
none	Generated if comparator proof test fails.
none	Generated if FET #1 proof test fails.
none	Generated if FET #2 proof test fails.
PNEUMATICS FAILURE DETECTED	Generated when actuator pressure difference does not change even it should. This detection has a latch time parameter.
POSITION SENSOR FAILURE DETECTED	Generated when position sensor defect detected.
POSITION SENSOR RANGE TOO SMALL	Generated during calibration when position sensor range is too narrow, i.e. there is not enough dynamics in those measurements.
POSITION TRANSMITTER NOT ACTIVATED	Generated when communication with position transmitter / status output is lost.
PRESSURE SENSOR 1 FAILURE DETECTED	Generated when pressure sensor #1 defect detected.
PRESSURE SENSOR 2 FAILURE DETECTED	Generated when pressure sensor #2 defect detected.
PRESSURE SENSOR 3 FAILURE DETECTED	Generated when pressure sensor #3 defect detected.
PST BREAKAWAY PRESSURE TREND HIGH LIMIT EXCEEDED	Generated when PST breakaway pressure trend high limit is exceeded.
PST BREAKAWAY PRESSURE TREND LOW LIMIT EXCEEDED	Generated when PST breakaway pressure trend low limit is exceeded.
PST COUNTER LIMIT EXCEEDED	Generated when PST (automatic or manual) count exceeds the warning limit.
PST LOAD FACTOR TREND HIGH LIMIT EXCEEDED	Generated when PST loadfactor trend high limit is exceeded.
PST LOAD FACTOR TREND LOW LIMIT EXCEEDED	Generated when PST loadfactor trend low limit is exceeded.
SETPOINT SENSOR FAILURE DETECTED	Generated when setpoint sensor defect detected.
SPOOL VALVE STUCK DETECTED	Generated if no spool movement was detected during pneumatics test. This could be caused by: 1. broken prestage unit 2. jammed spool valve 3. leakages in pipings
STATISTICS DATABASE ERROR DETECTED	Generated when statistics database write fails.
SUPPLY PRESSURE LIMIT EXCEEDED	Generated when supply pressure is out of warning limits. This detection has also a latch time parameter.
SUPPLY PRESSURE TREND LIMIT EXCEEDED	Generated if supply pressure trend low or high limit is exceeded.
TEMPERATURE LIMIT EXCEEDED	Generated when temperature is out of warning limits. This detection has also a latch time parameter.
TEMPERATURE TREND LIMIT EXCEEDED	Generated if temperature trend low or high limit is exceeded.
TEST CANCELLED	Generated when activated automatic or manual PST, Emergency Trip Test or pneumatics test is cancelled.
TEST DONE	Generated when activated automatic or manual PST, Emergency Trip Test or pneumatics test ended successfully.
TEST DONE	Generated when activated pneumatic test ended successfully.
TEST FAILED	Generated when requested automatic or manual PST, Emergency Trip Test or pneumatics test ended abnormally.
TEST OVERSHOOT DETECTED	This event is generated after manual or automatic PST if valve moves more than defined in user configurable parameter.
TEST PRESSURE DROP DETECTED	This event is generated during manual or automatic PST with single acting actuators only if actuator pressure drops below user configurable limit.
TEST START FAILED	Scheduled PST start was failed due to: 1. testing disabled 2. device in alarm state (only in automatic PST) 3. no supply pressure 4. trip detected 5. other test or calibration active
TEST START FAILED	ETT or pneumatics test start was failed due to: 1. testing disabled 2. device in alarm state 3. no supply pressure 4. trip detected 5. other test or calibration active
TEST START FAILED - DEVICE IN ALARM STATE	Generated if any test, excluding MAN PST, was requested and alarm state activated before request.
TEST START FAILED - INVALID START POSITION	Generated if test start position was not normal operation position (= other than safety position)
TEST START FAILED - MA LOOP CURRENT TOO LOW	Generated if the input signal is less than 6mA when starting the PST. Valid for VG900H_P only.
TEST START FAILED - TEST DISABLED MODE	Generated if one of following is met: 1. Scheduled Pneumatics test was requested, but Pneumatics testing was disabled. 2. ETT was requested, but key was not entered.
TEST TIMEOUT DETECTED	Generated if test-specific time for test execution was expired. Warning time is not included to time-out time.
TOTAL OPERATION TIME COUNTER LIMIT EXCEEDED	Generated when total operating time exceeds the warning limit.
UNINTENDED VALVE MOVEMENT DETECTED	Generated when unintended valve movement is detected.
VALVE CLOSE STUCK DETECTED	Generated if valve stays at closed position though it shouldn't.
VALVE FULL STROKES COUNTER LIMIT EXCEEDED	Generated when valve full stroke count exceeds the warning limit.
VALVE INTERMEDIATE STUCK DETECTED	Generated if valve stays at intermediate position (between open and closed position) though it shouldn't.
VALVE OPEN STUCK DETECTED	Generated if valve stays at open position though it shouldn't.
WRITE PROTECTION DISABLED	Generated when Total Write Protection has been removed.
WRITE PROTECTION ENABLED	Generated when Total Write Protection has been activated.

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 PFA incorrectly selected
- Check the coupling alignment with the pointer, see Fig. 7.
- The actuator or valve did not move or was stuck during calibration
- Supply pressure too low
- Spool valve dirty

8. VG9_H/D_, VG9_H/R_, VG9_H/I_, VG9_H/K_, VG9_H/T01 (WITH LIMIT SWITCHES OR SIL PT)

8.1 Introduction

NOTE:
External circuits connected to limit switches must be wired according to local electrical safety regulations. Limit switch and wiring ratings are defined in the limit switch identification plate and in Table 9.
The positioner cabling and limit switches must be protected with a fuse or a circuit breaker if the current is not limited by the connected equipment. Fuse or circuit breaker selection needs to be based on limit switch ratings (table 9) and field cabling selected according to local electrical safety regulations. The circuit breaker can be either 2-pole (on both positive and negative/ground) or 1-pole (positive wires). You can also replace the circuit breaker with a cartridge fuse with T (slow acting) tripping characteristics.

General description

VG9000H can be equipped with limit switches or external SIL certified position transmitter. VG9000H/D__ has a Dual Module sensor with two inductive proximity switches, VG9000H/R_ has two reed type proximity switches, VG9000H/I__ has two inductive proximity switches, VG9000H/K2_ has two microswitches and VG9000H/K4_ has four microswitches. VG9000H/T01 has SIL certified position transmitter. Limit switches and position transmitter are used for electrical position indication of the valves.

The switching points for limit switches may be chosen freely.

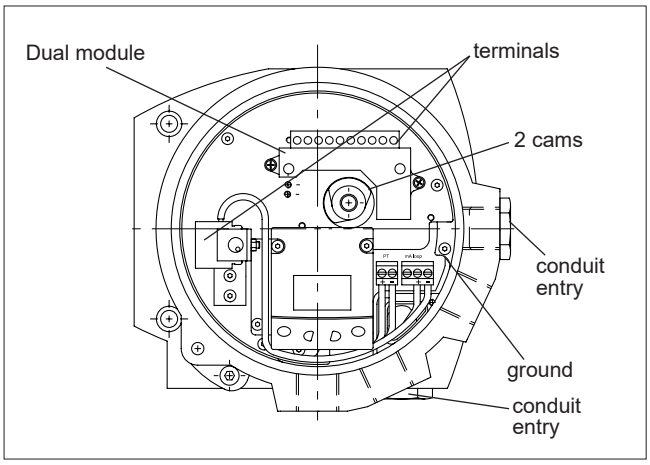


Fig. 27 VG9_H/D_ layout

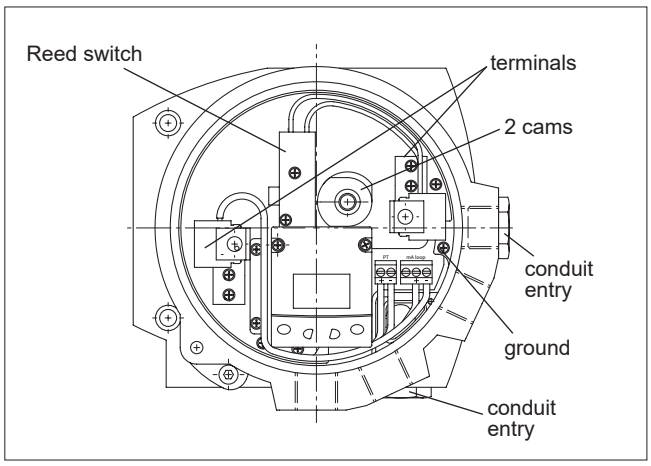


Fig. 28 VG9_H/R_ layout

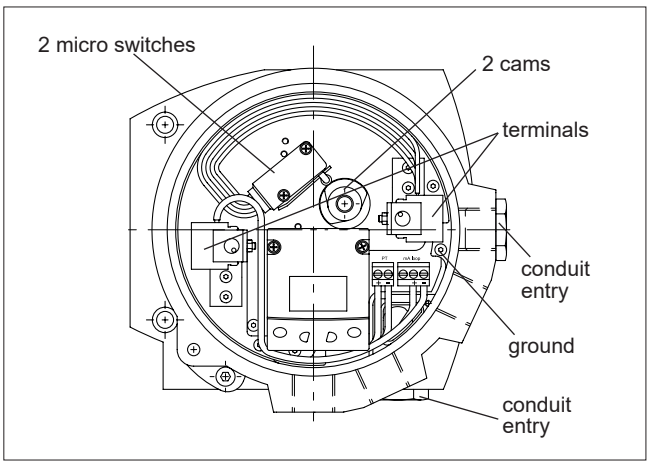


Fig. 31 VG9_H/K2_ layout

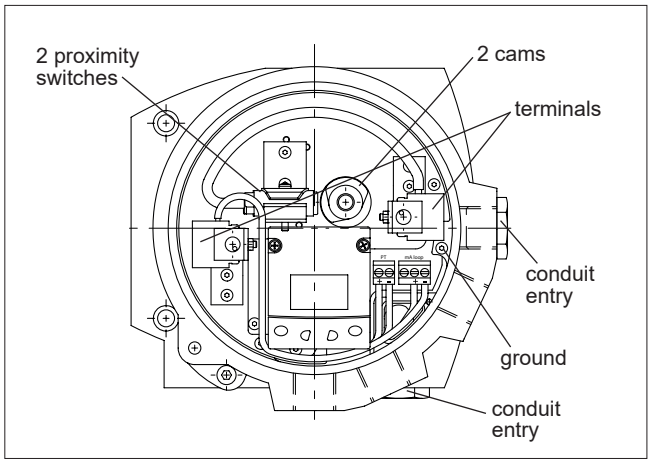


Fig. 29 VG9_H/I_ (I02, I09, I32, I56) layout

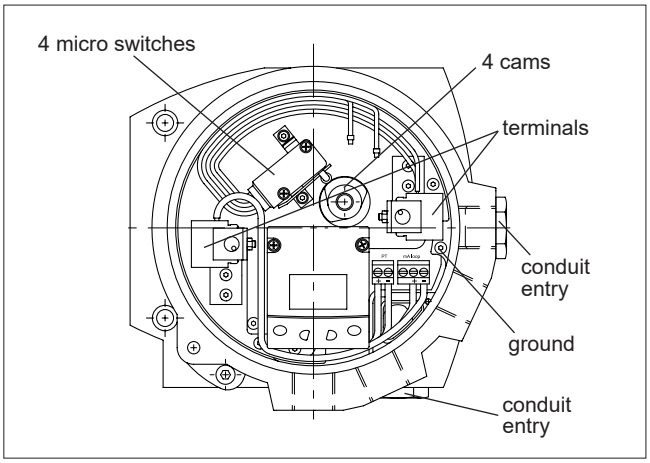


Fig. 32 VG9_H/K4_ layout

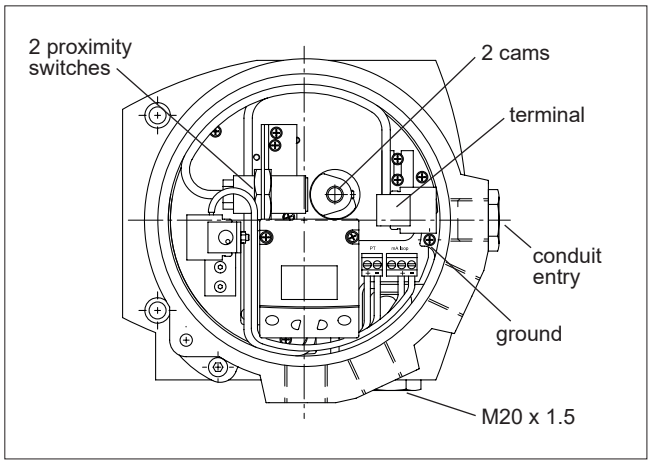


Fig. 30 VG9_H/I45 layout

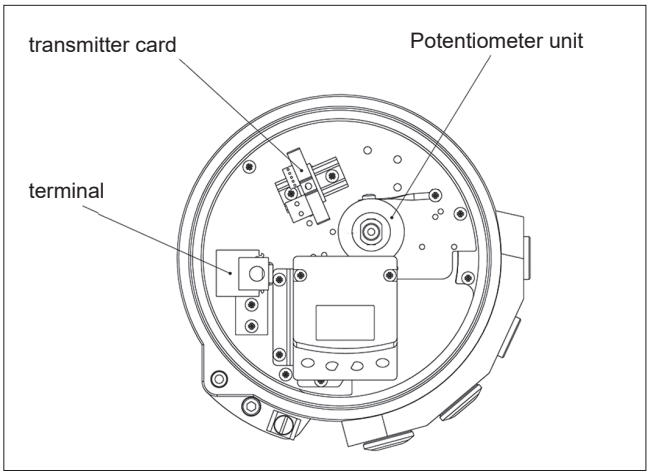


Fig. 33 VG9_/T01 layout

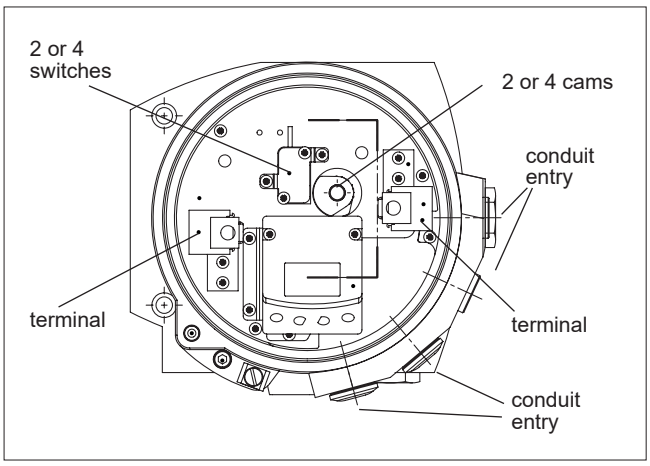


Fig. 34 VG9_/I57 and _/I58 layout.

Detailed connection diagrams are shown in Section 11.6.

Markings

The limit switch is provided with an identification plate, see Fig. 35. Identification plate markings include:

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

The type designation is described in Chapter 15.

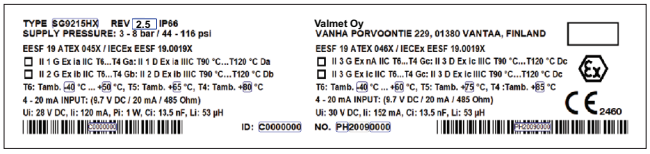


Fig. 35 Example of identification plate

Technical specifications

VG9_/R_

Reed switch type:	Valmet MaxxGuard G	(01)
	Valmet MaxxGuard M	(02)
	Valmet MaxxGuard H	(04)
Type:	SPDT	(01, 02, 04)
	Passive, intrinsically safe	(02, 04)
Electrical rating:	300 mA / 24 V DC	(01, 02)
	200 mA / 125 V AC	(01)
	3 A / 240 V	(04)
Max. voltage drop:	0.1 V at 10 mA	
	0.5 V at 100 mA	
Contact:	Rhodium	
Number of switches:	2	(01, 02)
SIL:	Usable up to SIL3 acc. to IEC61508	

VG9_H/I_

Proximity switch:	Inductive, diameter 8–18 mm	
	Sensing range 2 mm	(02, 09, 56, 57, 58)
	3 mm	(45)
	P+F NJ2-12GK-SN	(02)
	P+F NCB2-12GM35-N0	(09)
	P+F NJ3-18GK-S1N	(45)
	ifm IFC2002-ARKG/UP	(56)
	P+F NJ2-V3-N	(57, 58)
Electrical values:	According to switch type	
Switch accuracy:	< 1°	
Number of switches:	2	(02, 09, 45, 56, 57)
	4	(58)
SIL:	Usable up to SIL3 acc. to IEC61508	(02, 45)
	Usable up to SIL2 acc. to IEC 61508	(09, 57, 58)

VG9_H/K_

Microswitch type:	OMRON D2VW-5	(25 or 45)
	OMRON D2VW-01 (gold-plated contacts) Protection class IP67	(26 or 46)
Resistive load:	3A: 250 V AC	(25 or 45)
	5A: 30 V DC	
	0.4A: 125 V DC	
	100 mA: 30 V DC / 125 V AC	(26 or 46)
Switch accuracy:	< 2°	
Number of switches:	2	(25 or 26)
	4	(45 or 46)

VG9_/T01

Output:	4-20 mA
Voltage range:	10 to 40 VDC
Recommended voltage:	24 VDC, 50 mA min.
Max Load:	700 ohm @ 24VDC
Span:	Adjustable from 20° to 355°
Max Linearity Error:	+-0.35°
SIL:	Usable up to SIL 2 acc. to IEC61508

Electric data and ambient temperatures

See the certificates.

8.2 Installing limit switches on ValvGuard

- If the ValvGuard 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 ValvGuard. 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 bushings (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.

VG9_/D_ or VG9_/I_: Observe the functioning of the proximity switch; activated when the active face is either covered or free.

CAUTION:
Place a high voltage warning label on the device if limit switches are connected to 50 V AC or 75 V DC or more.

8.4 Adjustment of limit switches

CAUTION:
Misadjustment of the limit swiches or failure to tighten the switch mounting screws may result in a dangerous condition, depending on how the switch signals are used.

The pointer (109) need not be removed for adjustment.

When the limit switch is ordered together with the valve and the actuator, the 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.

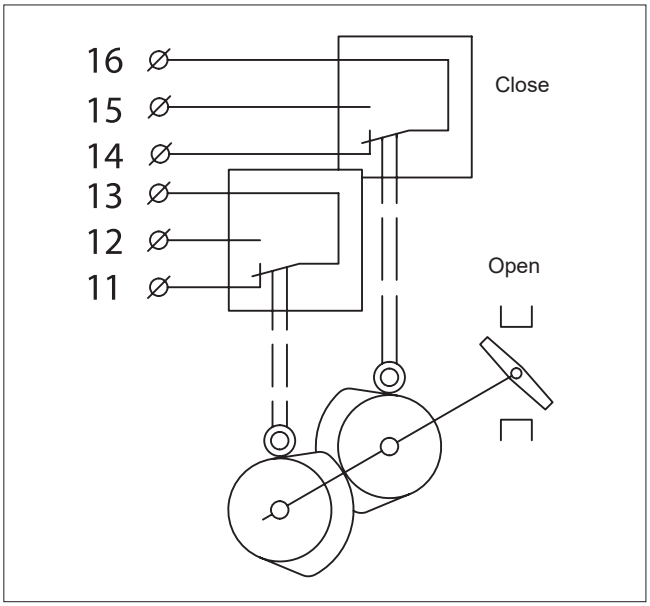


Fig. 36 Limit switch adjustment, 2 switches

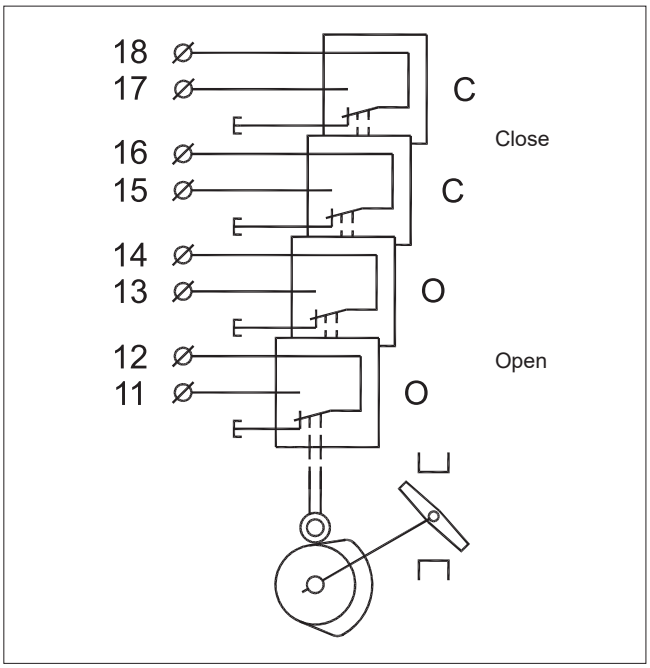


Fig. 37 Limit switch adjustment, 4 switches

- **VG9_/D_ or VG9_/I_:** Use the LED indicator or a separate measuring instrument as an aid.
- After re-installation of the actuator, first adjust its mechanical limits according to the valve, then the ValvGuard, and finally the limit switch.
- When adjustment is completed, turn the pointer (109) so that the yellow line is parallel with the valve closure member.

8.5 Position transmitter (T01) calibration instructions

CAUTION:
Misadjustment of the potentiometer or failure to tighten the set screw may result in a dangerous condition, depending on how the PT signal is used.

The position transmitter (T01) needs to be calibrated according to the valve operation direction; clockwise (CW) to open or counter clockwise (CCW) to open. The calibration is carried out once VG9000 is connected to the actuator and the valve is in closed position (when using rising signal to open configuration). For correct calibration of the position transmitter follow these instructions:

- Loosen the potentiometer set screw located on the potentiometer outer surface and disconnect the potentiometer cable plug from the transmitter board terminal pins.
- Adjust the potentiometer unit to correct angle by rotating the inner section of the potentiometer (smaller diameter cylindrical part on top side of the potentiometer unit). The correct angle depends on the valve operation orientation; CCW or CW to open (see Fig. 38). The centerline mark on the potentiometer side helps aligning the potentiometer for initial position. Make sure that the valve and axis stay stationary in closed position when adjusting the potentiometer orientation.
- For closed position the resistance value of the potentiometer should be adjusted between 400-600 ohms. Measure the resistance by connecting an ohm meter to terminal connector at potentiometer cable. For CW to open applications measure the resistance between the yellow and red leads, for CCW to open applications measure the resistance between green and red leads.
- Once you have the potentiometer inner section aligned to correct resistance value, tighten the potentiometer set screw to connect the potentiometer firmly to the valve controller axis. Verify that the resistance values stays between 400-600 ohms after the tightening.
- The potentiometer cable can now be connected back to the transmitter board terminal pins. The positioning of the terminal plug is done according to valve operation orientation (see Fig. 39). The plug must always be aligned to one end or the other of the five pin terminal on the transmitter board.
- Connect DC power to the correct positive and negative terminals in the terminal strip (see chapter 11.6 for wiring details).
- Make sure the valve is stationary in closed position and adjust the zero trimpot to give 4 mA output.
- Operate the valve to desired open position.
- Make sure the valve is stationery in open position and adjust the span trimpot to give 20 mA output. The zero and span adjustments are non-interactive.

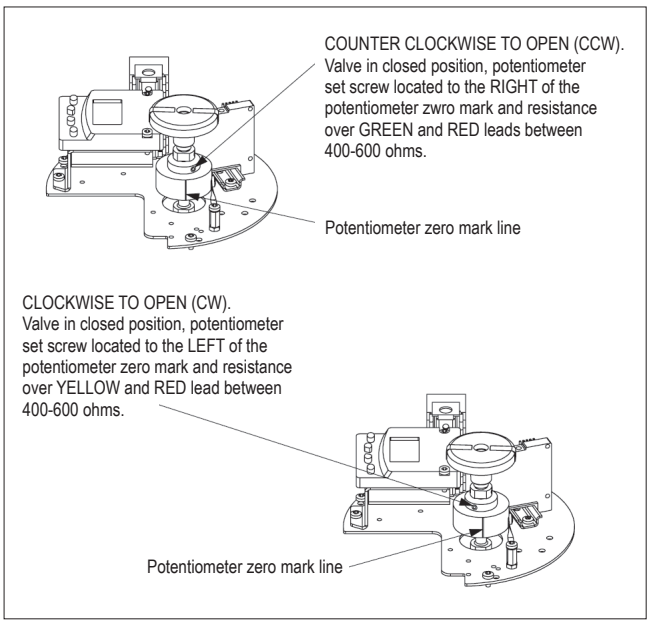


Fig. 38 Potentiometer operation.

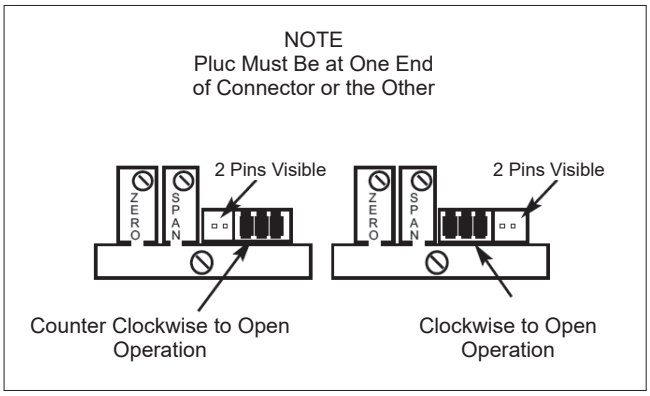


Fig. 39 Plug setting for transmitter operation.

8.6 Removal of the limit switches and position transmitter for accessing the ValvGuard

- Remove the cover (100) and the pointer (109).
- Loosen the screws (314) in the cam disks (313) and remove the cam disks and bushings (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 ValvGuard as applicable.
- Re-install the limit switch according to 8.2 and check the adjustment according to 8.4.

Ex 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 ValvGuard.

8.7 Circuit diagrams

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

8.8 Maintenance

Regular maintenance of the limit switch is not necessary.

9. TOOLS

Following tools are needed for the product installation and service:

- Flat screwdriver
  - 0.5 x 3.0 x 75 mm
- Torx screwdriver
  - T10
  - 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.

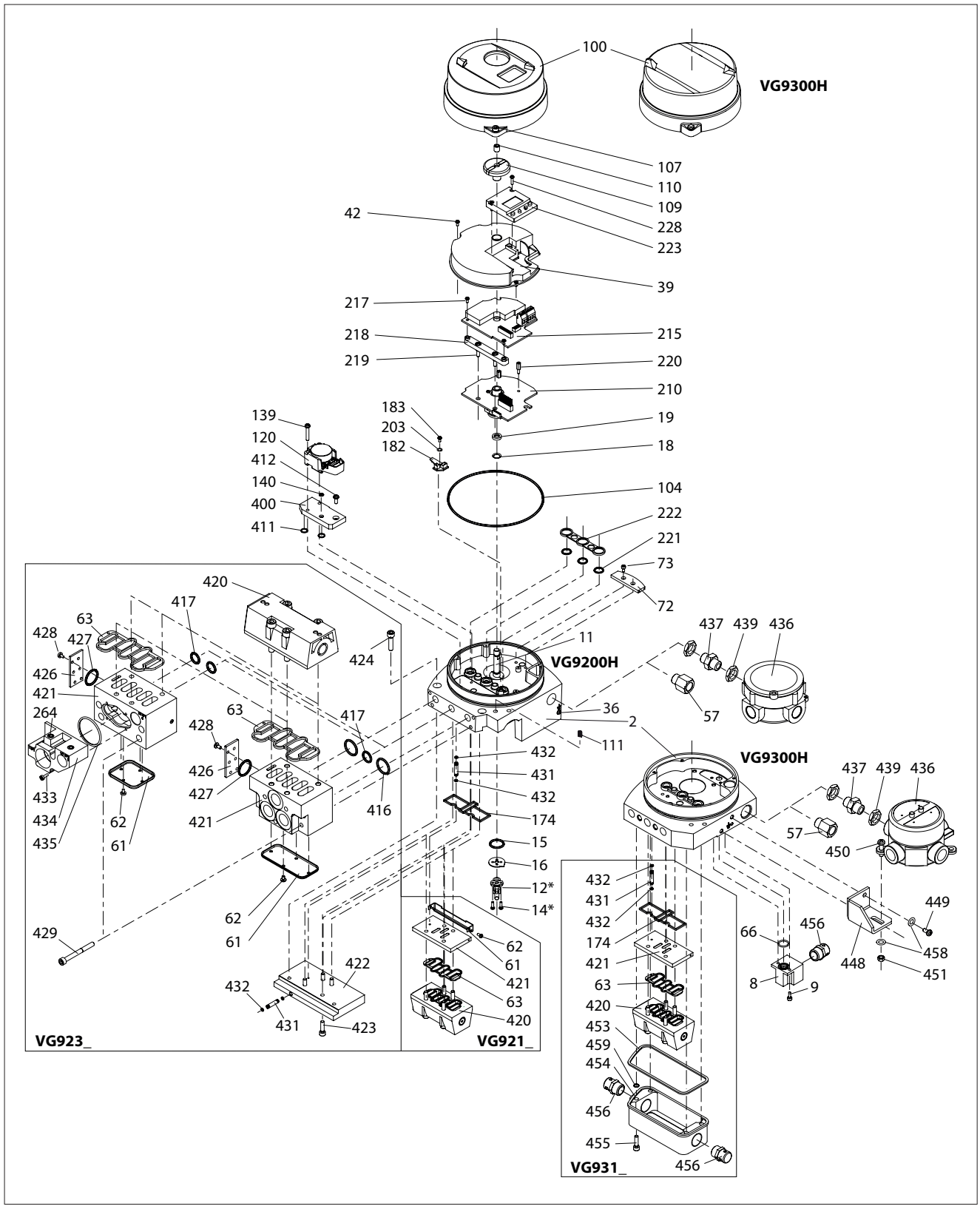
When ordering spare parts, always include the following information:

- 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

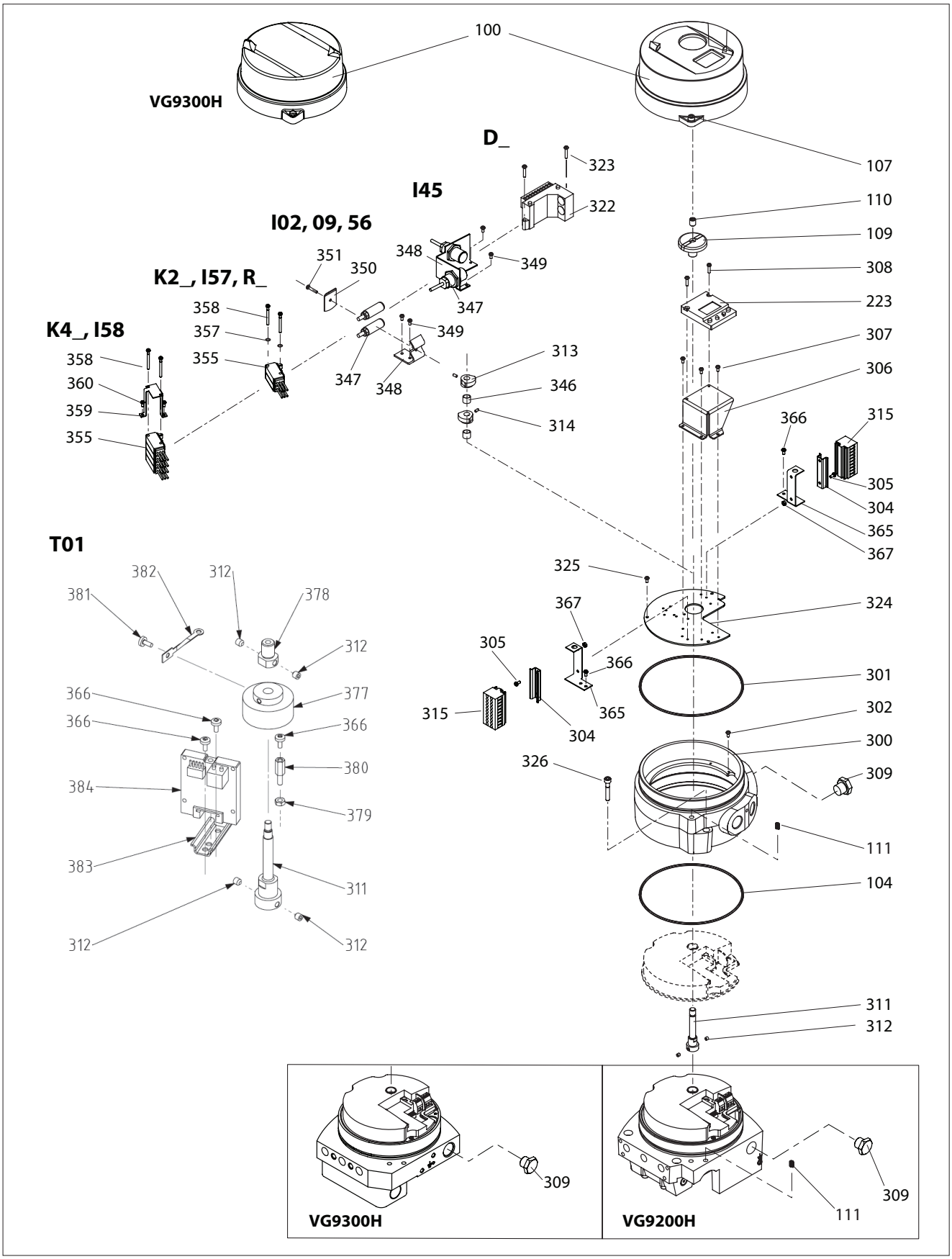
11.1 Exploded view and parts list, VG9000H



Item	Qty	Description	
2	1	Housing	
8	1	Exhaust adapter	
9	1	Screw	
11	1	Shaft assembly	
15	1	O-ring	
16	1	Washer	
18	1	Wave spring	
19	1	Bushing	
36	1	Grounding screw	
39	1	Protection cover	
42	3	Screw	
57	1	Conduit entry adapter	
61	1	Exhaust cover	
62	2	Screw (VG921_)	
	4	Screw (VG923_)	
63	1	Gasket	
66	1	O-ring	
72	1	Cooling plate	
73	2	Screw	
100	1	Cover (VG9000H red, VG9000H_P green)	
104	1	O-ring	
107	1	Screw	
109	1	Pointer	
110	1	Stop screw	
111	1	Spring	
120	1	Prestage unit	
139	2	Screw	
140	1	O-ring	
174	1	Gasket	
182	1	Prestage board	
183	1	Screw	
210	1	Controller circuit board	
215	1	Communication circuit board	
217	4	Screw	
218	1	Support	
219	2	Screw	
220	2	Threaded spacer	
221	3	O-ring	
222	1	Insulation part	
223	1	Local User Interface (LUI)	
228	2	Screw	
264	2	Plug	
400	1	Adapter plate	
411	2	O-ring	
412	1	Screw	
416	2	O-ring	
417	1	O-ring	
420	1	Spool valve	
421	1	Adapter plate	
422	1	Adapter plate	
423	4	Screw	
424	2	Screw	
426	1	Plate	
427	1	O-ring	
428	6	Screw	
429	4	Screw	
431	2	Connection pipe	
432	4	O-ring	
433	4	Screw	
434	1	Gauge block	
435	1	O-ring	
436	1	Connection box	
437	1	Nipple	
439	2	Nut	
448	1	Bracket	
449	2	Screw	
450	1	Screw	
451	1	Hexagon nut	
453	1	Gasket	
454	1	Protection cover	
455	4	Screw	
456	2 or 3	Breather	
458	3	Washer	
459	4	O-ring	

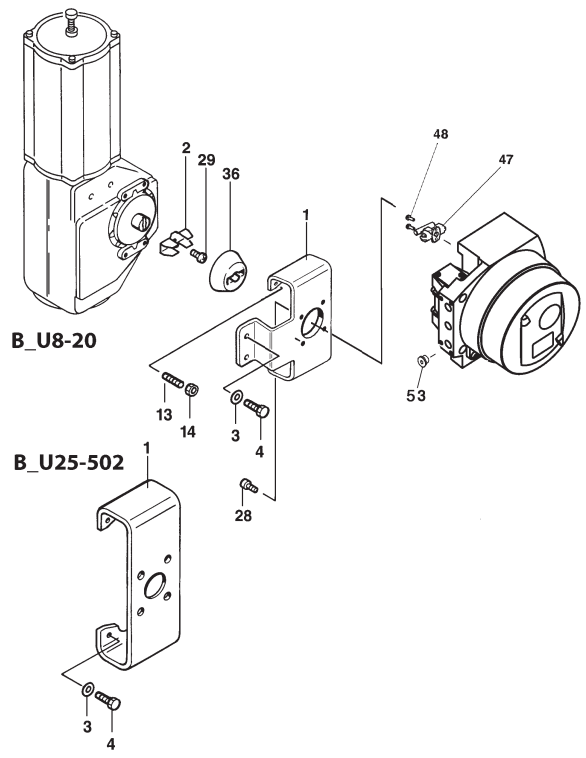
AVAILABLE SPARE PART SETS:
- LUI (Local User Interface)
- Pointer
- Cover
- Limit switches
- Breather

11.2 Exploded view and parts list, VG9_/D_, VG9_/R_, VG9_/I_, VG9_/K_, VG9_/T01



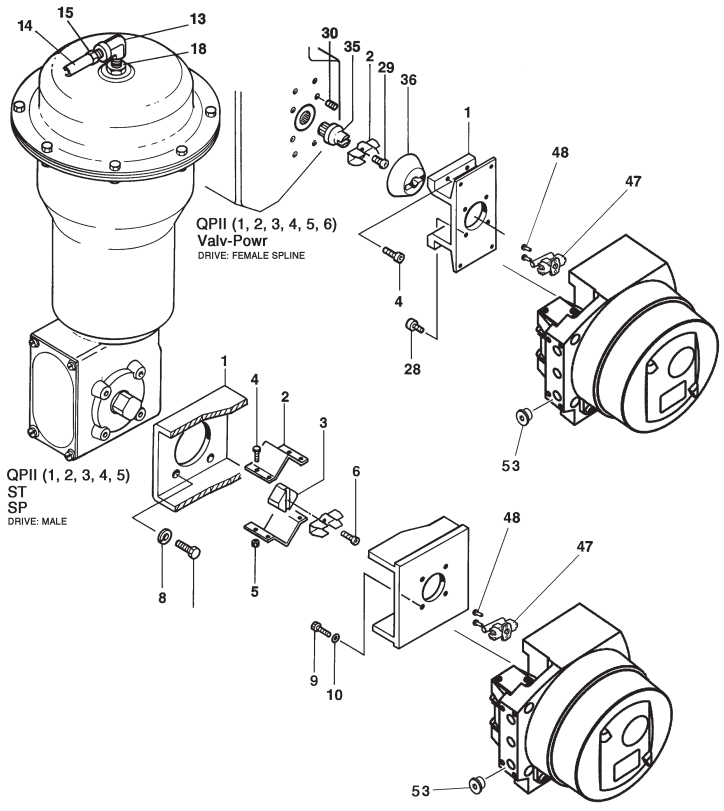
Item	Qty	Description	
100	1	Cover	
107	1	Screw	
109	1	Pointer	
110	1	Stop screw	
111	2	Spring	
223	1	Local user interface (LUI)	
300	1	Housing	
301	1	O-ring	
302	1	Screw	
304	2	Bracket	
305	4	Screw	
306	1	Bracket	
307	3	Screw	
308	2	Screw	
309	2	Plug	
311	1	Extension shaft	
312	2 or 4	Screw	
313	2 or 4	Cam disc	
314	2 or 4	Screw	
315	2	Terminal block	
322	1	Proximity switch	
323	2	Screw	
324	1	Base plate	
325	2	Screw	
326	1	Screw	
346	1 or 2	Bushing	
347	2	Proximity switch	
348	1	Fixing plate	
349	2	Screw	
350	1	Washer	
351	1	Screw	
355	2 or 4	Microswitch	
357	2	Spring washer	
358	2	Screw	
359	1	Support band	
360	2	Screw	
365	2	Bracket	
366	4 or 6	Screw	
367	4	Hex nut	
377	1	Potentiometer unit	
378	1	Visual indicator adapter	
379	1	Nut	
380	1	Bracket mounting screw	
381	1	Screw	
382	1	Potentiometer bracket	
383	1	PT card bracket	
384	1	Position transmitter card	
449	2	Screw	
450	1	Screw	
451	1	Hexagon nut	

11.3 Mounting parts for Neles B_U-series actuators



Item	Qty	Description
1	1	Mounting bracket
2	1	Ear
3	2	Washer
4	2	Screw
13	4	Screw
14	4	Hexagon nut
28	4	Screw
29	1	Screw
36	1	Couplings jacket
47	1	Coupler socket
48	2	Screw
53	1	Plug (BJ actuators only)

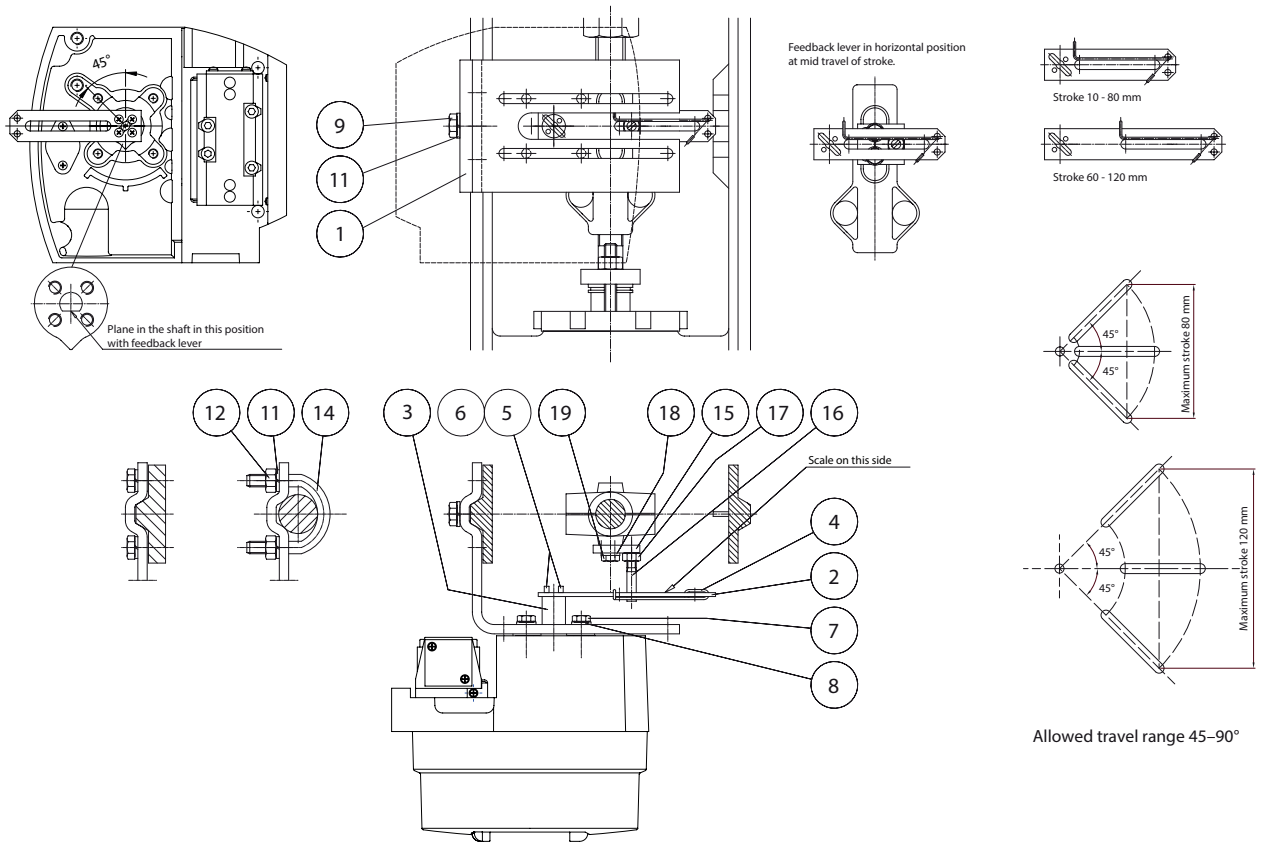
11.4 Mounting parts for Quadra-Powr® actuators



Item	Qty	Description
1	1	Mounting bracket
2	1	Ear
4	4	Screw
28	4	Screw
29	1	Screw
30	4	Screw
35	1	Adapter plug (QP II 1/S- 6/S only)
35	1	Adapter plate (QP II 2B/K thr. 6_/K)
36	1	Couplings jacket
47	1	Coupler socket
48	2	Screw
53	1	Plug

Item	Qty	Description
1	1	Mounting bracket
2	2	Coupling half
3	1	Adapter
4	4	Screw
5	4	Hex nut
6	1	Screw
7	4	Screw
8	4	Washer
9	4	Screw
10	4	Washer
47	1	Coupler socket
48	2	Screw
53	1	Plug

11.5 Mounting parts for linear actuators

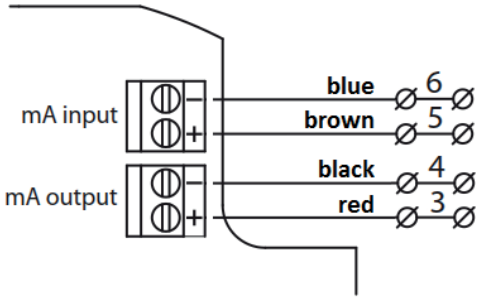


Item	Qty	Description
1	1	Bracket
2	1	Feedback lever
3	1	Filling piece
4	1	Clearance remove spring
5	4	Cross rec head screw
6	4	Washer
7	4	Hexagon screw
8	4	Washer
9	4	Hexagon screw
11	4	Spring washer
12	2	Hexagon nut
14	2	Clamp
15	1	Fixing plate
16	1	Special screw
17	1	Hexagon nut
18	2	Washer
19	2	Hexagon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

11.6 Connection diagrams

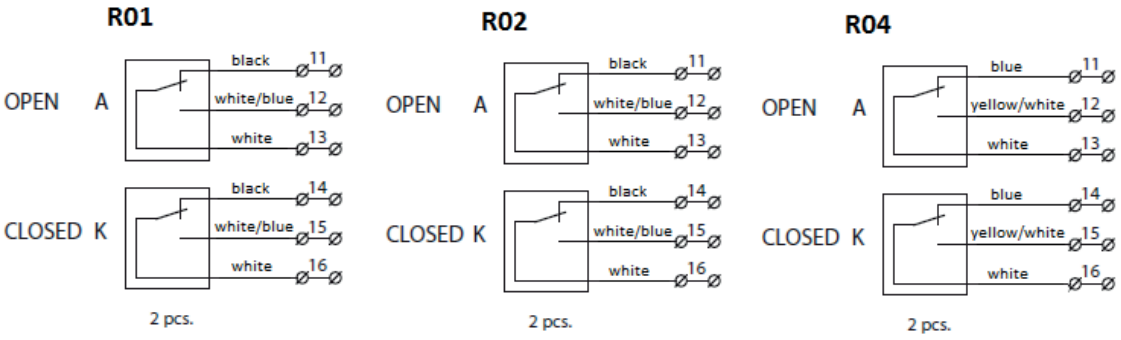
See Section 8.1.3 for additional limit switch data.

mA input and output (position transmitter / device status output) signal connections



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

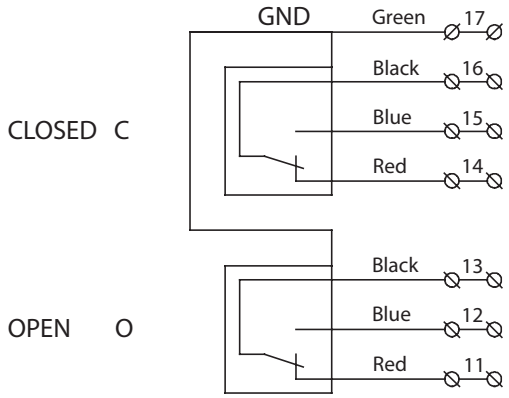
VG9_H/R01, R02, R04



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.

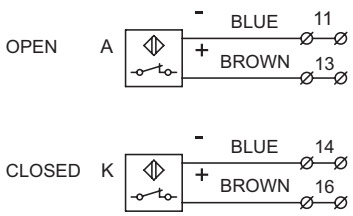
See Section 8.1.3.2 for electrical ratings.

VG9_H/R35

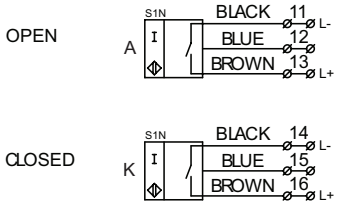


Connection diagram shows limit switch when actuator is in intermediate position.
Switch C (upper) is activated at the closed limit of the travel and switch O (lower) at the open limit.

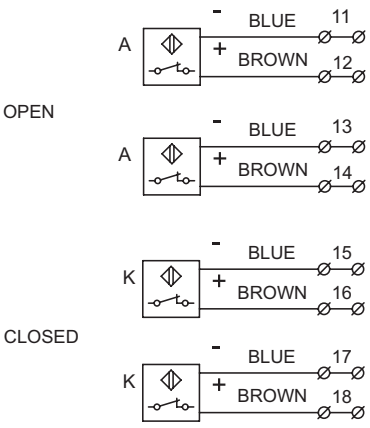
VG9_H/I02, I09, I57



VG9_H/I45



VG9_H/I58

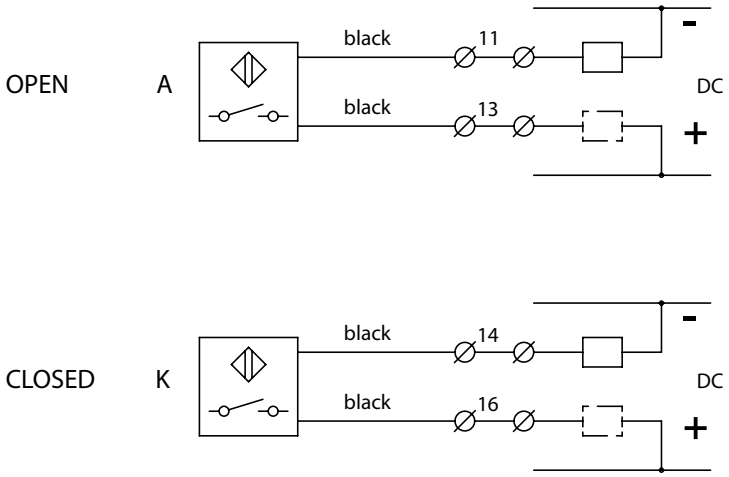


Factory adjustment:

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.

VG9_H/I56

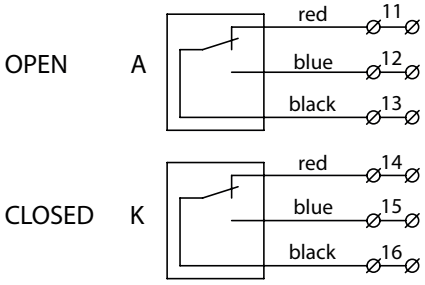


Factory adjustment:

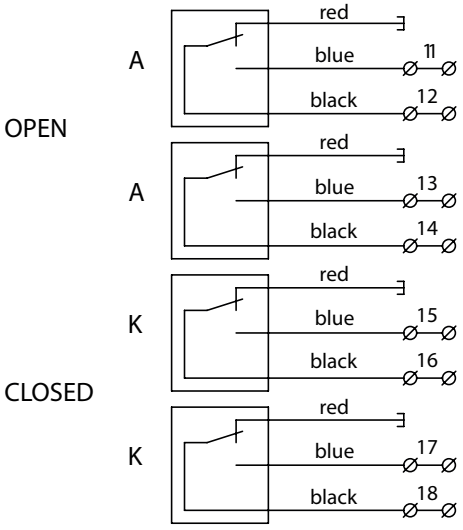
Active faces of proximity switches are free when actuator is in intermediate position.
Active face A (upper switch) becomes covered at open limit of travel and face K (lower switch) at closed limit.
Function can be inverted on site by re-adjusting the cam discs.

Connections: Load can be connected to + or -.

VG9_H/K25, K26, K45, K46



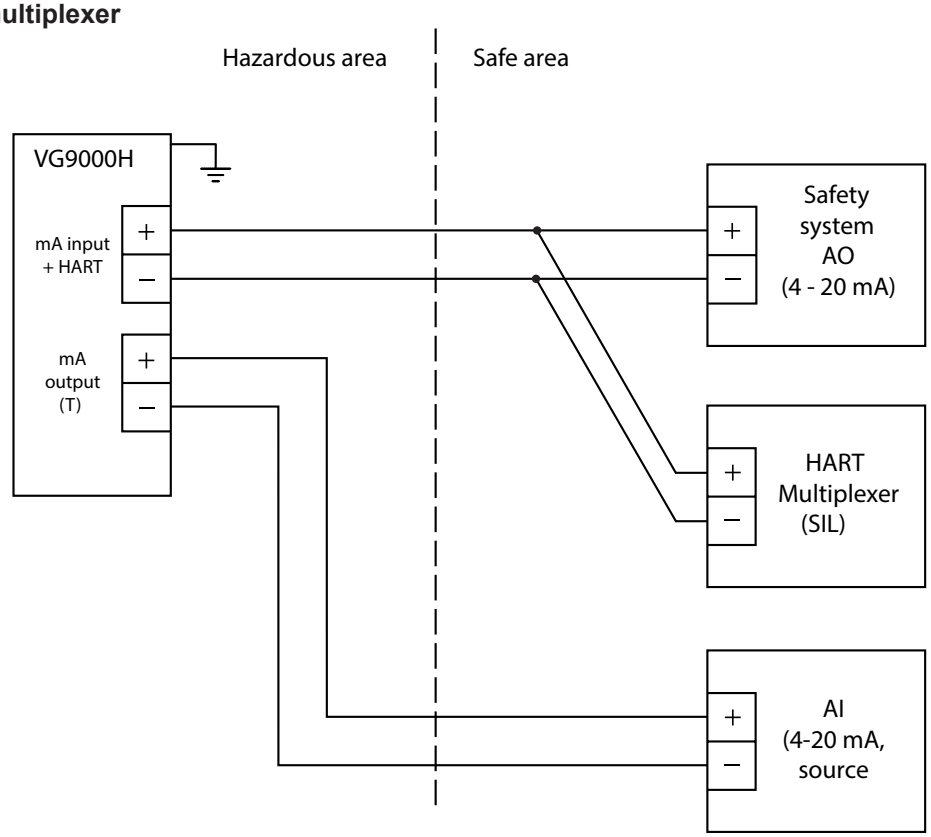
2 pcs.



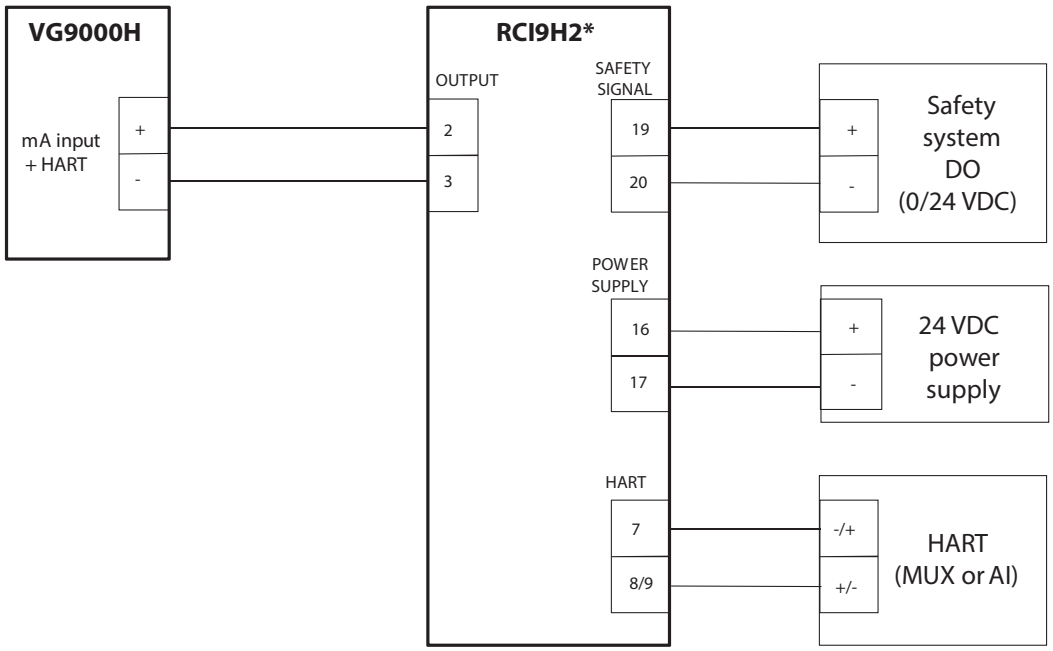
4 pcs.

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.

AO, HART multiplexer

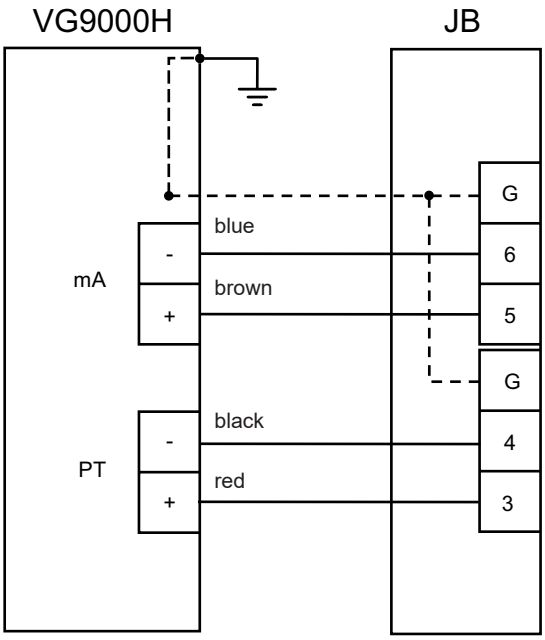


DO, RCI, HART AI

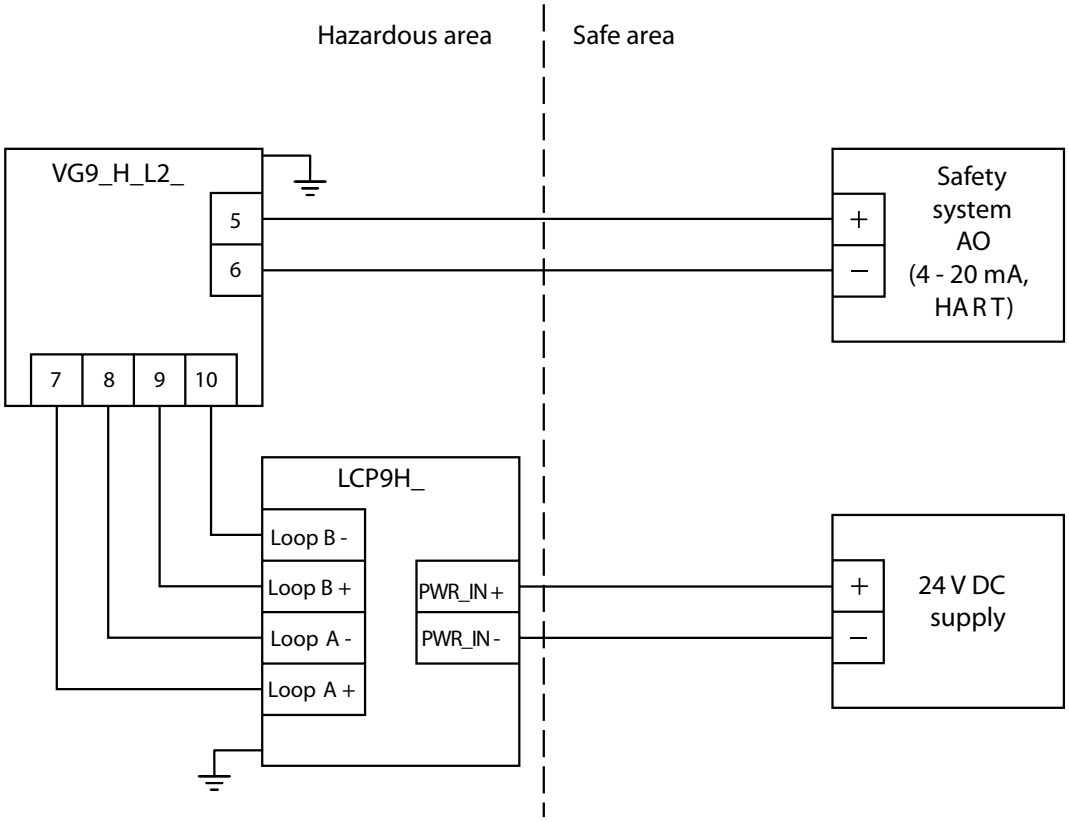


* Only part of the RCI9H2 wiring is shown here.
Detailed wiring can be found in the RCI manual (7RCI9H270EN)

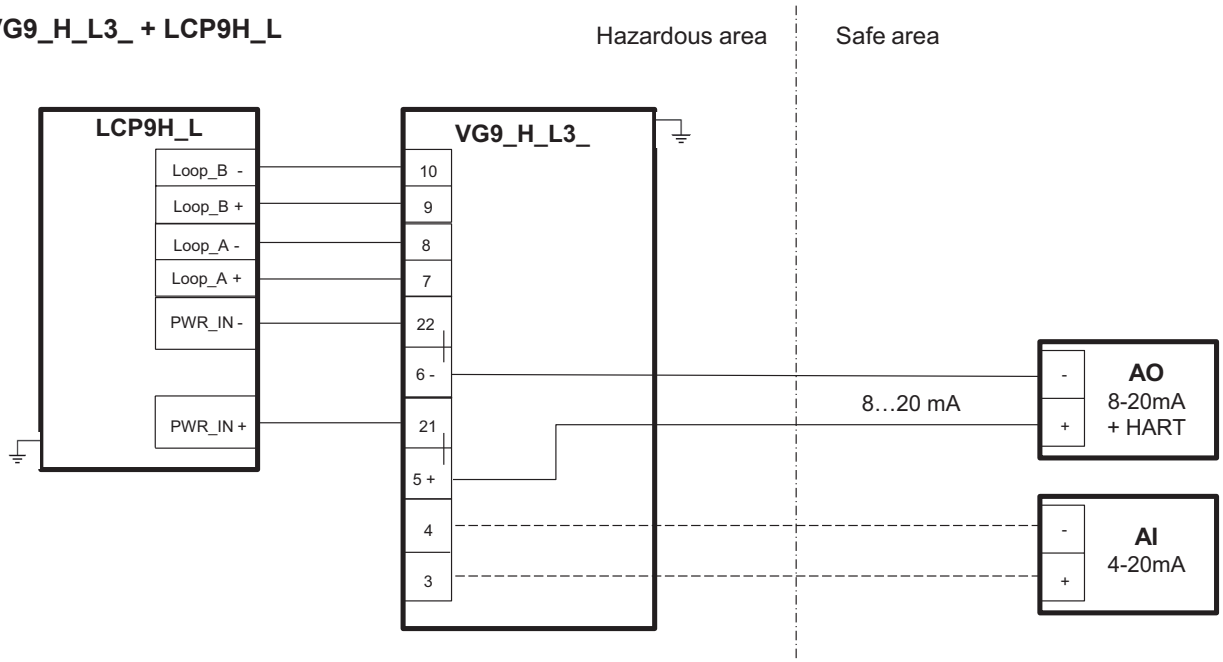
VG9_H_J



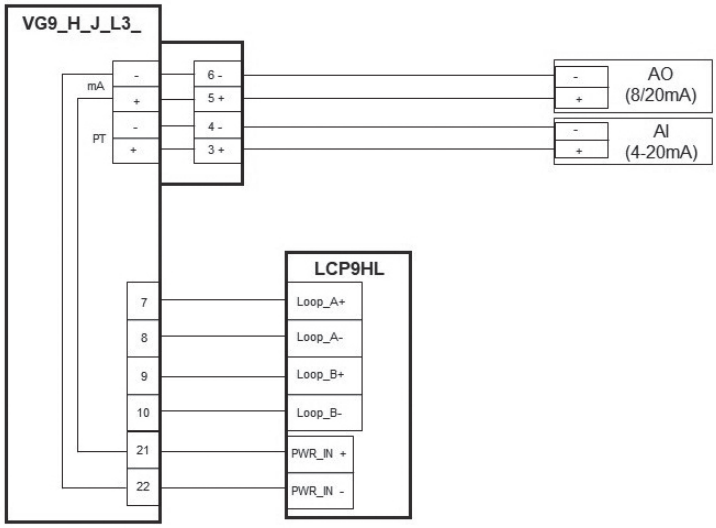
VG9_H_L2_ + LCP9H_



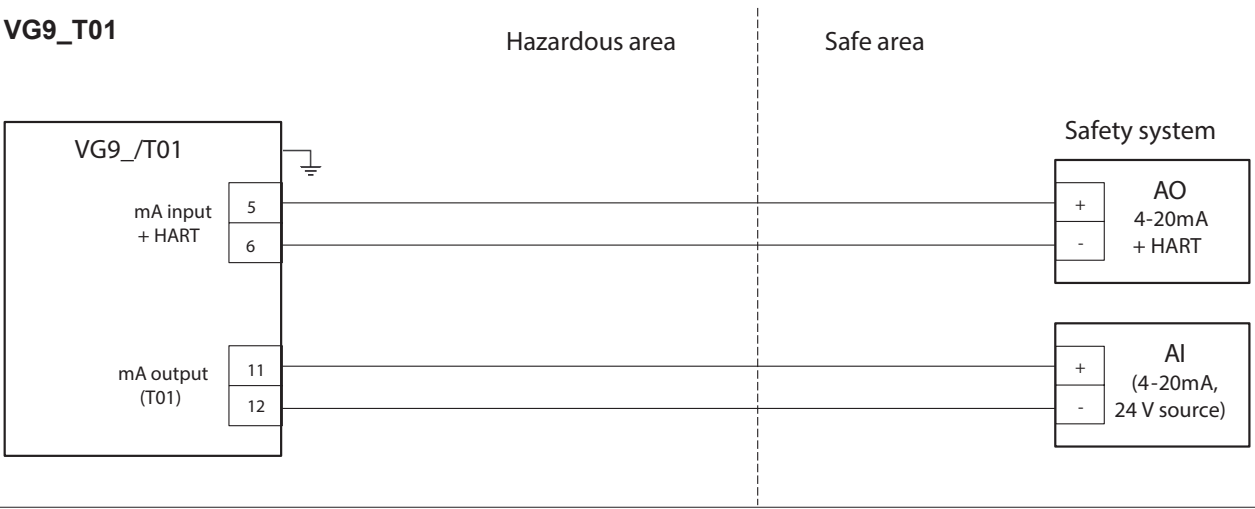
VG9_H_L3_ + LCP9H_L



VG9_H_J_L3_ + LCP9HL

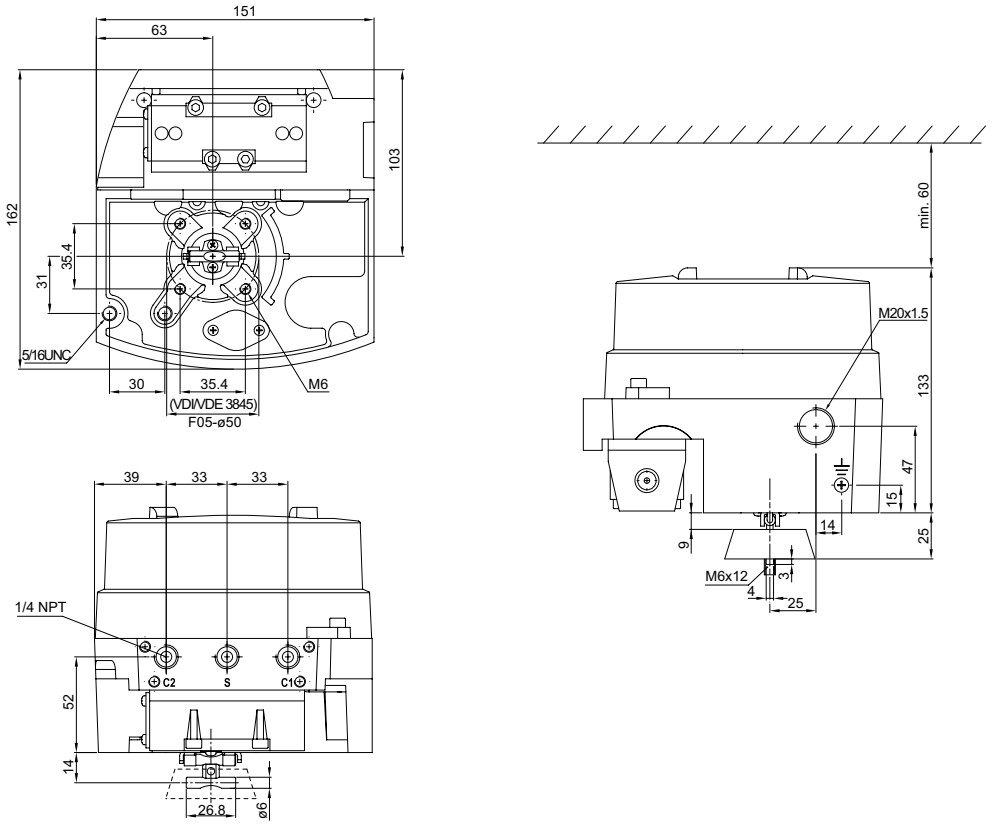


VG9_T01

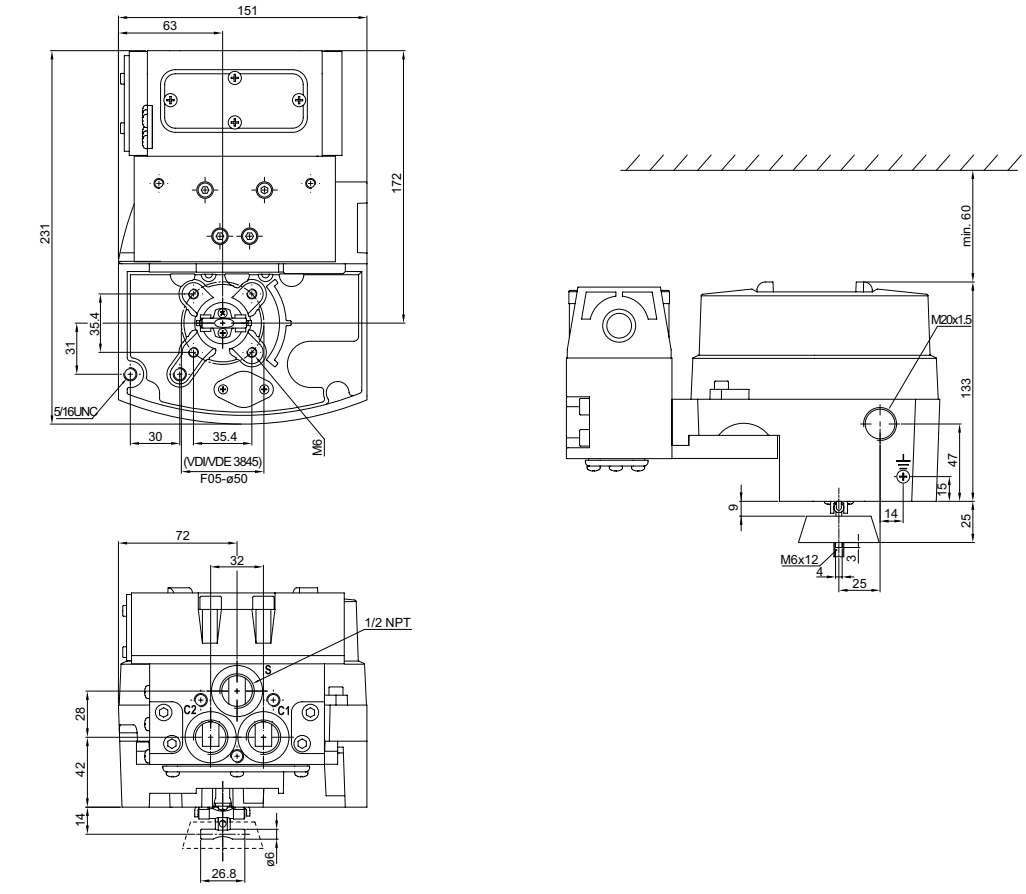


12. DIMENSIONS

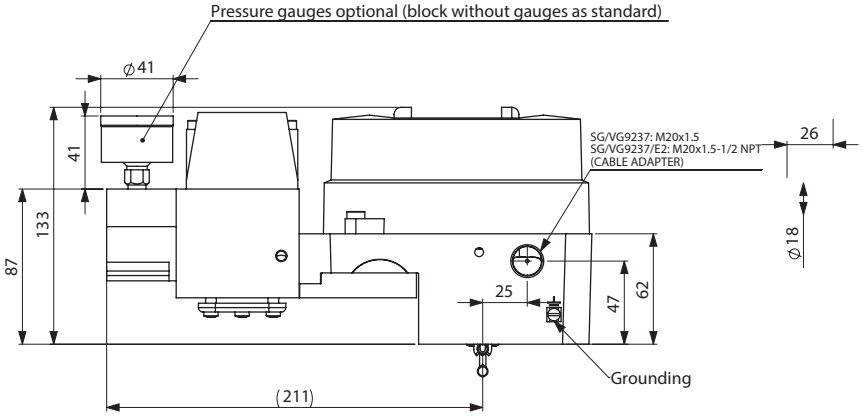
VG921_

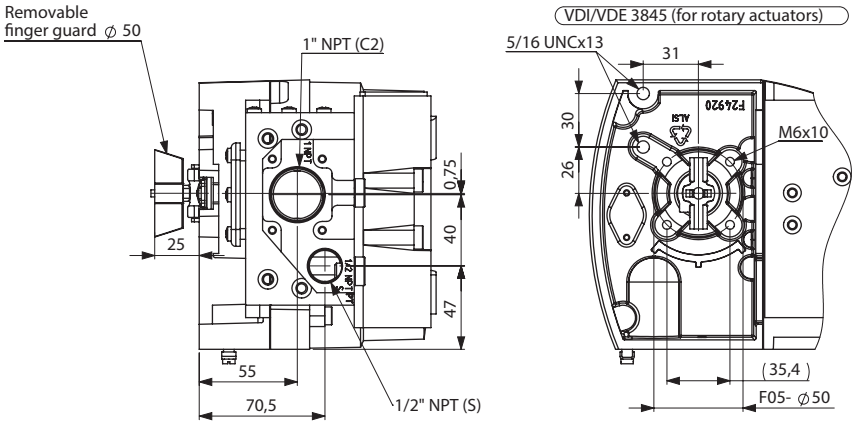


VG9235_



VG9237_





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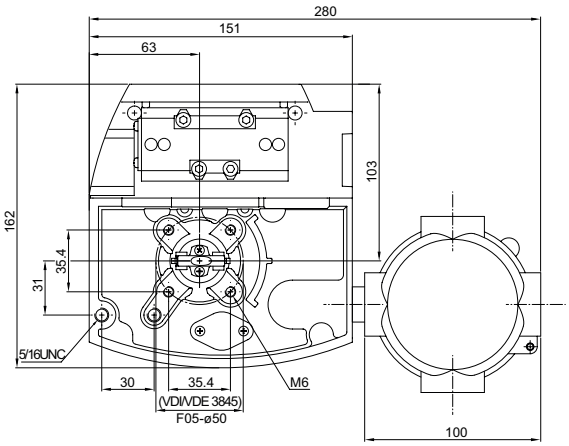

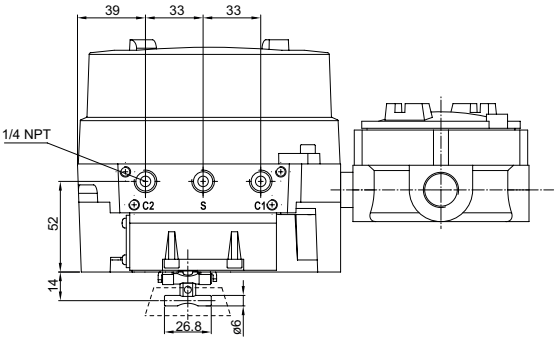

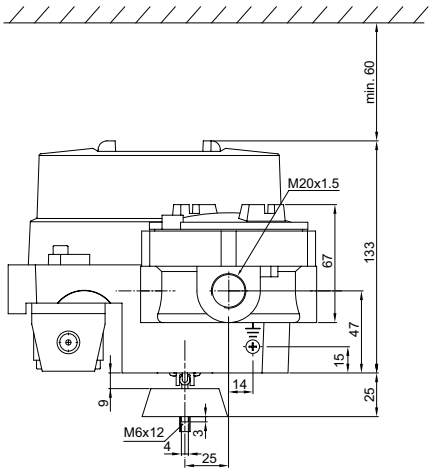

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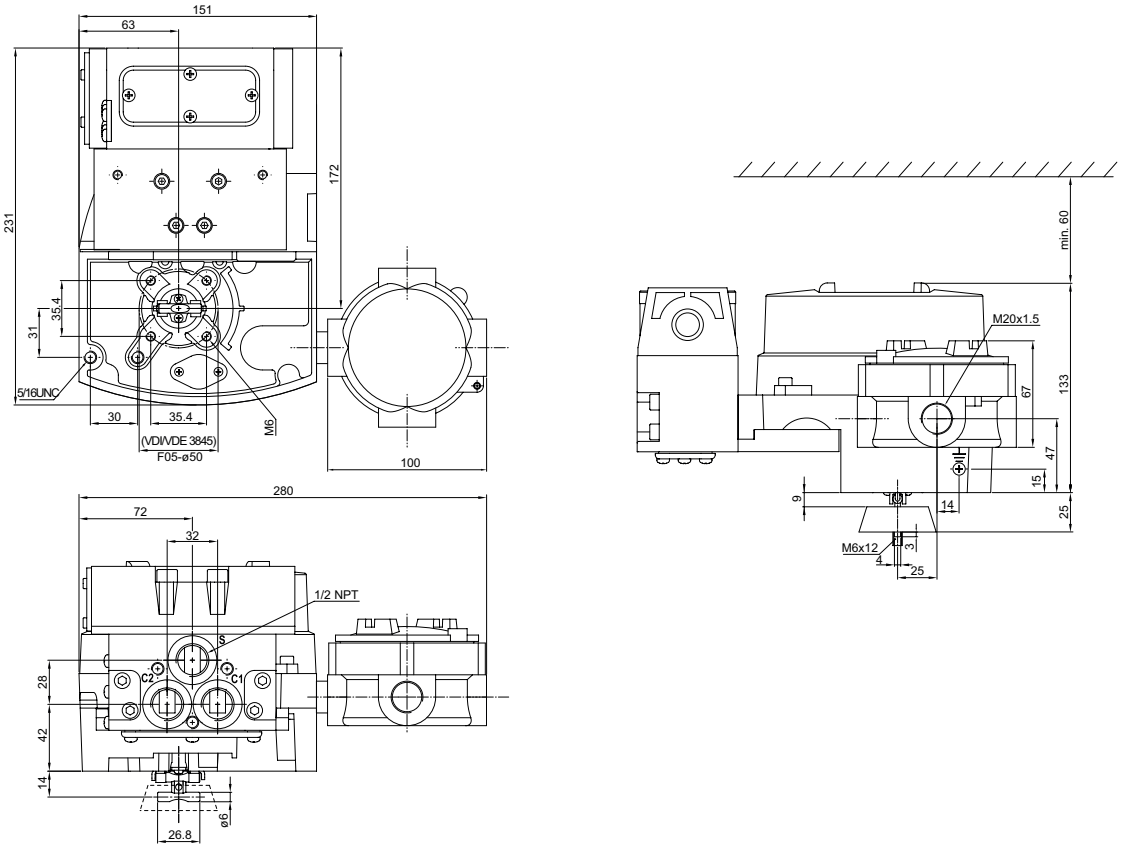
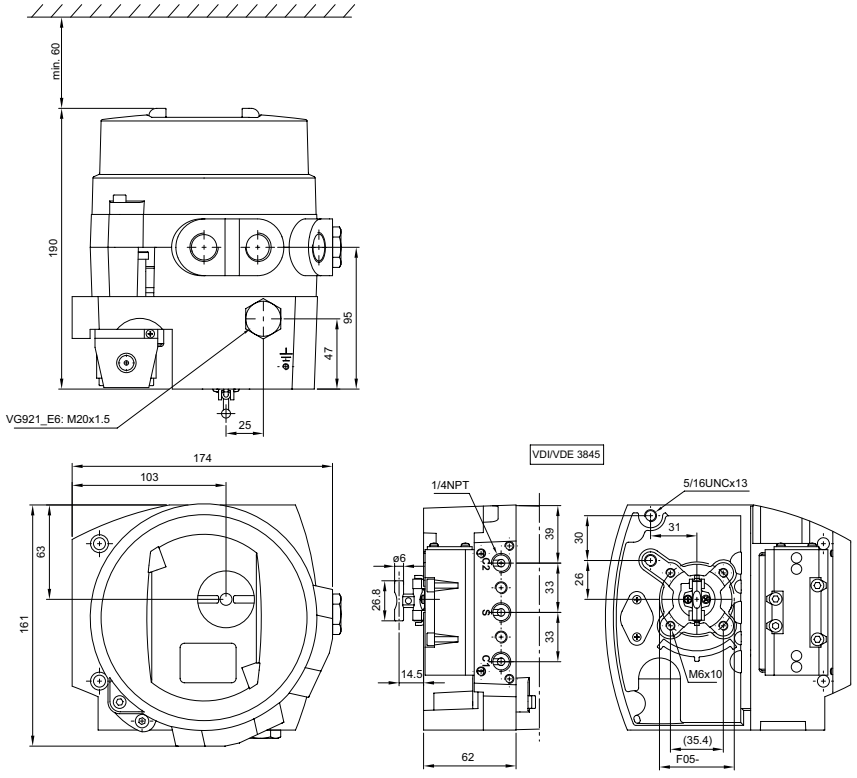


VG921_/_ or VG921_L_



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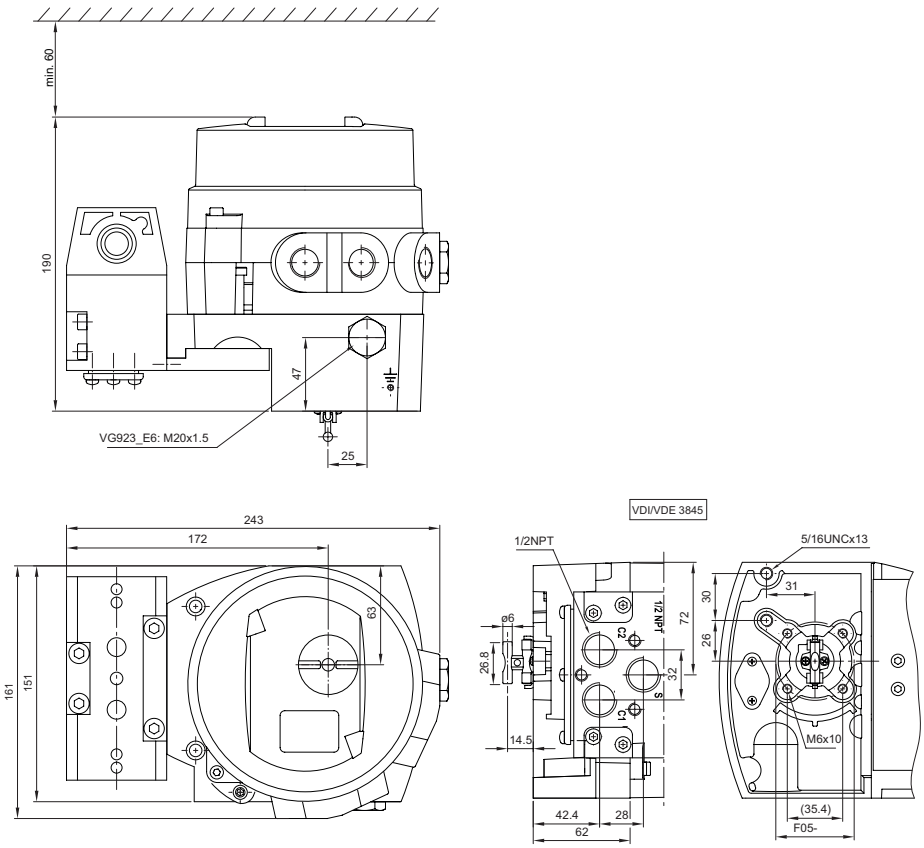

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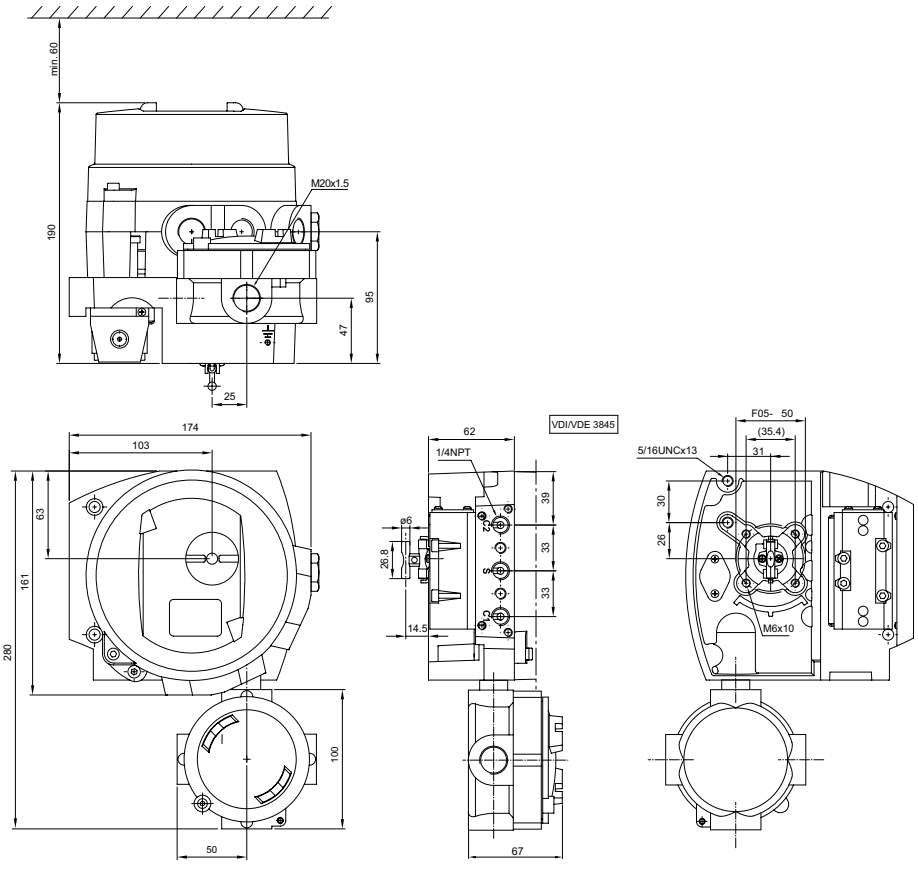

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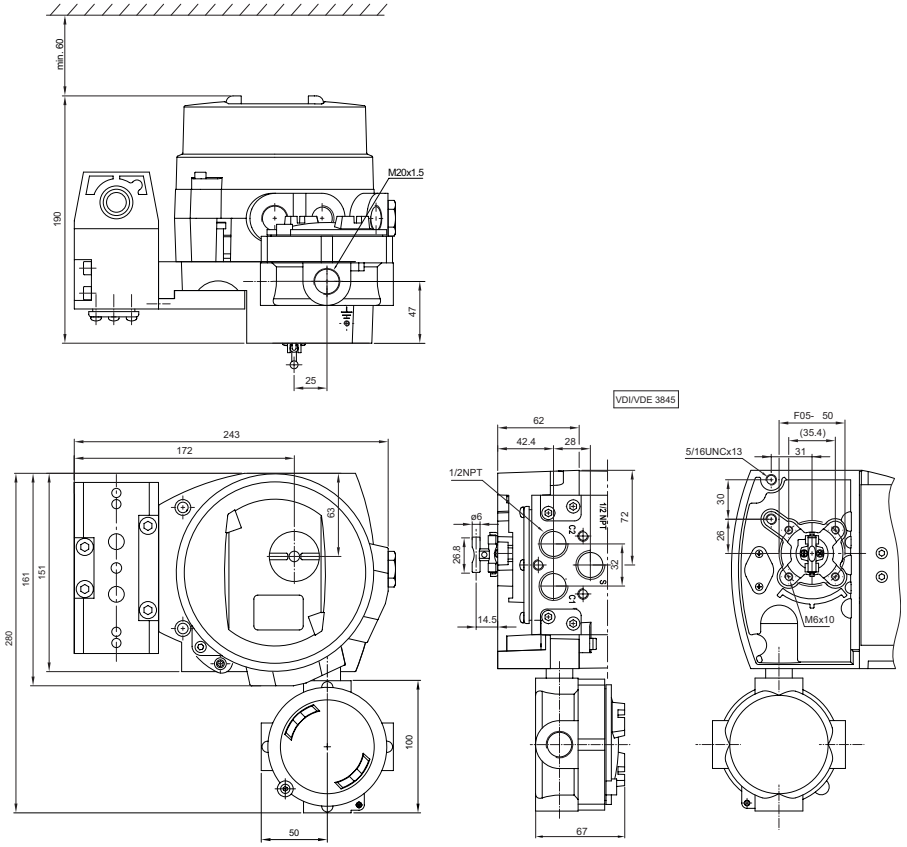
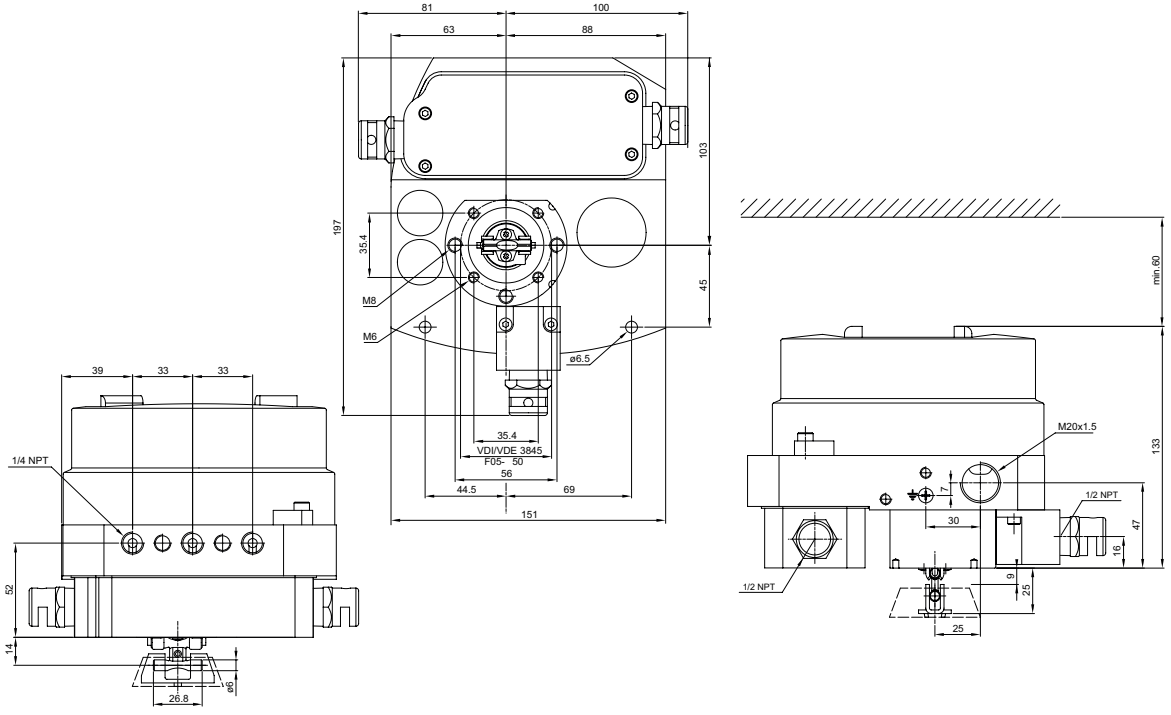
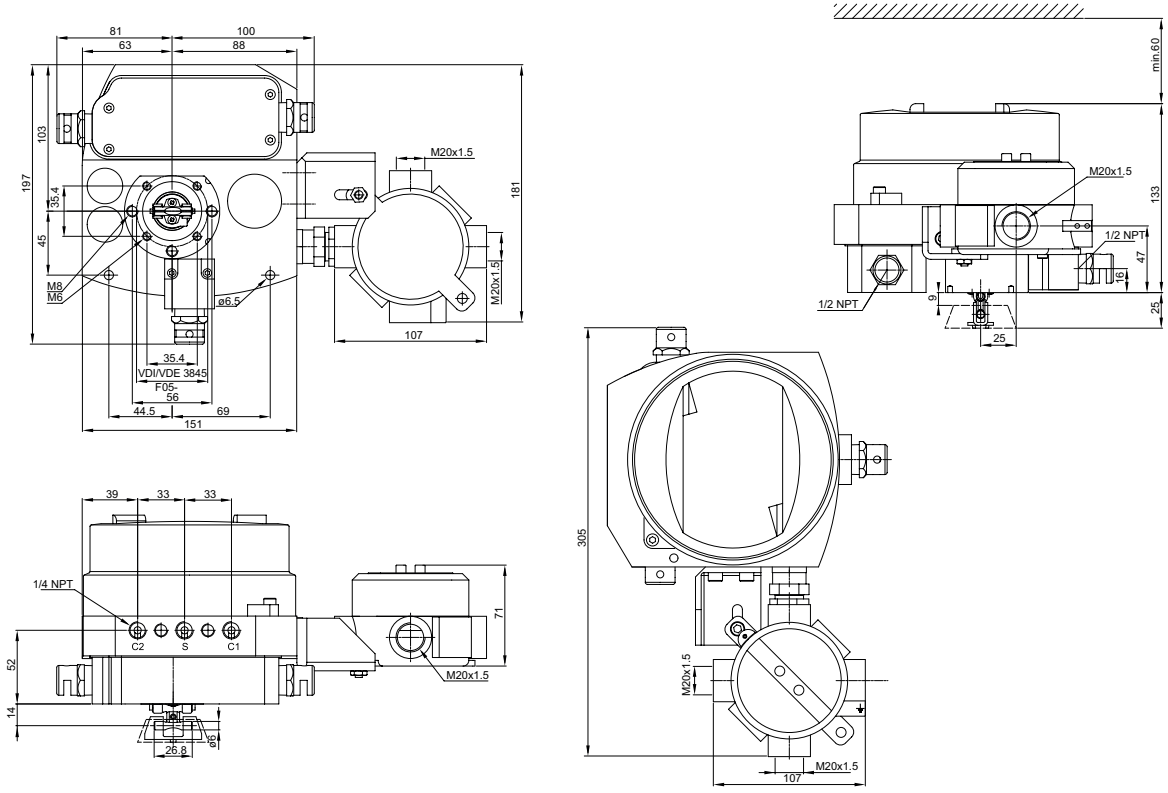


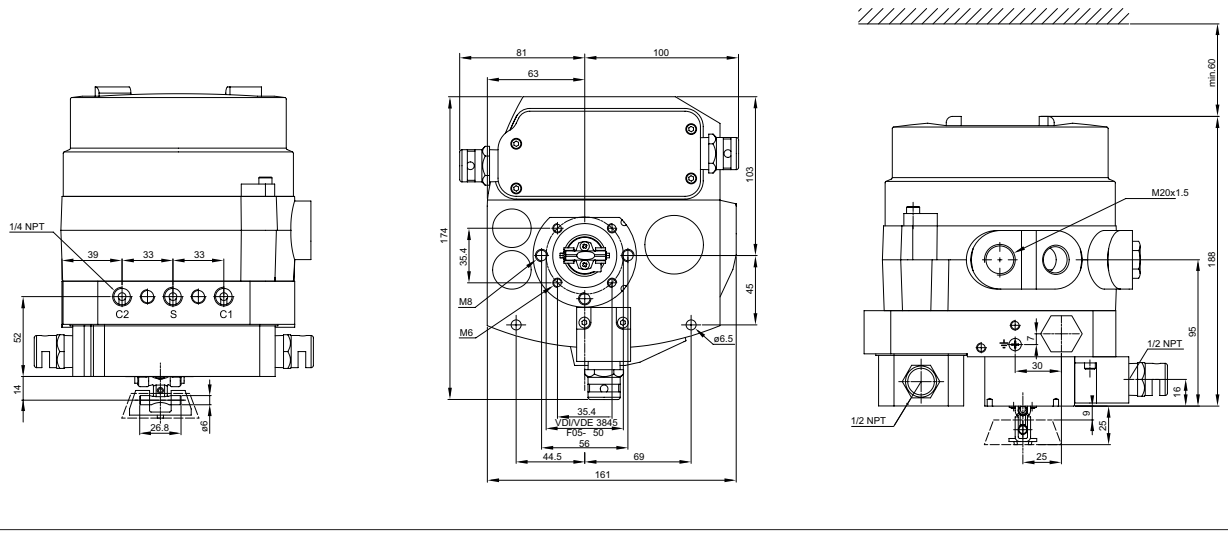
VG931_



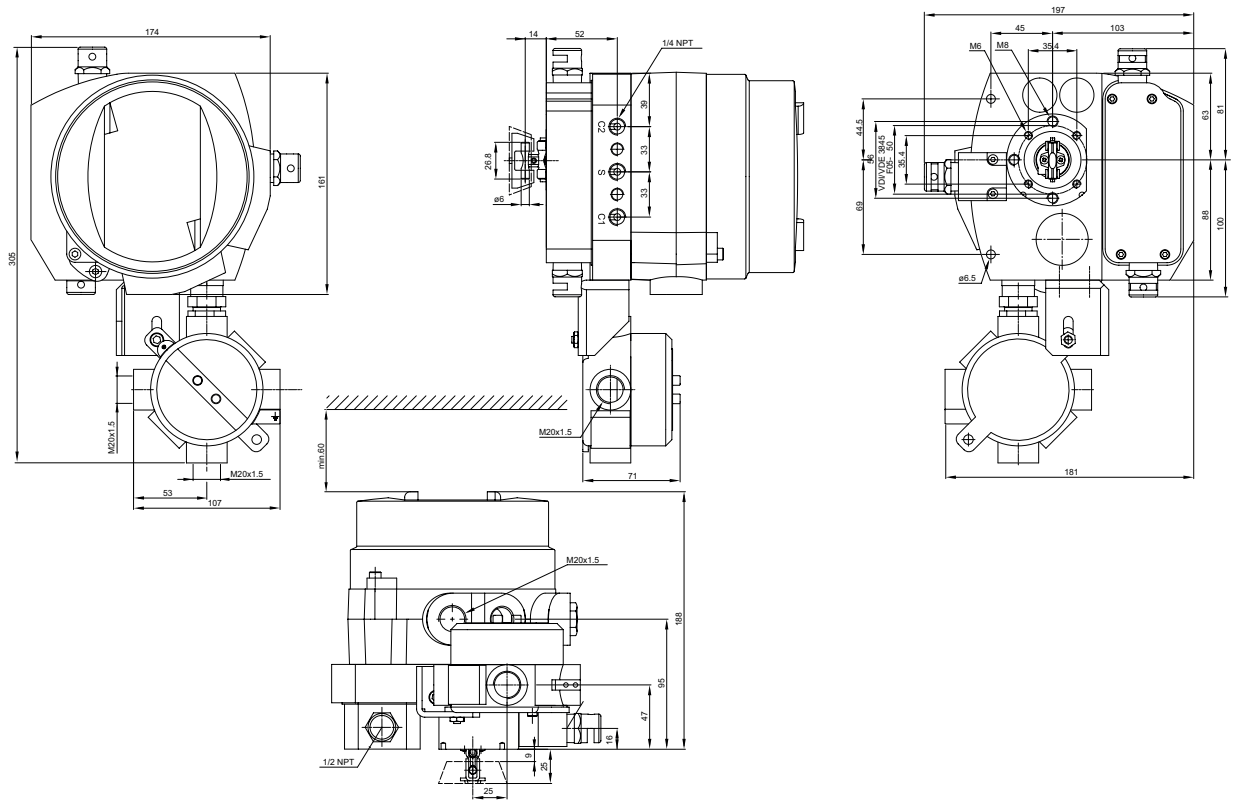
VG931_J_



VG931_/_ or VG931_L_



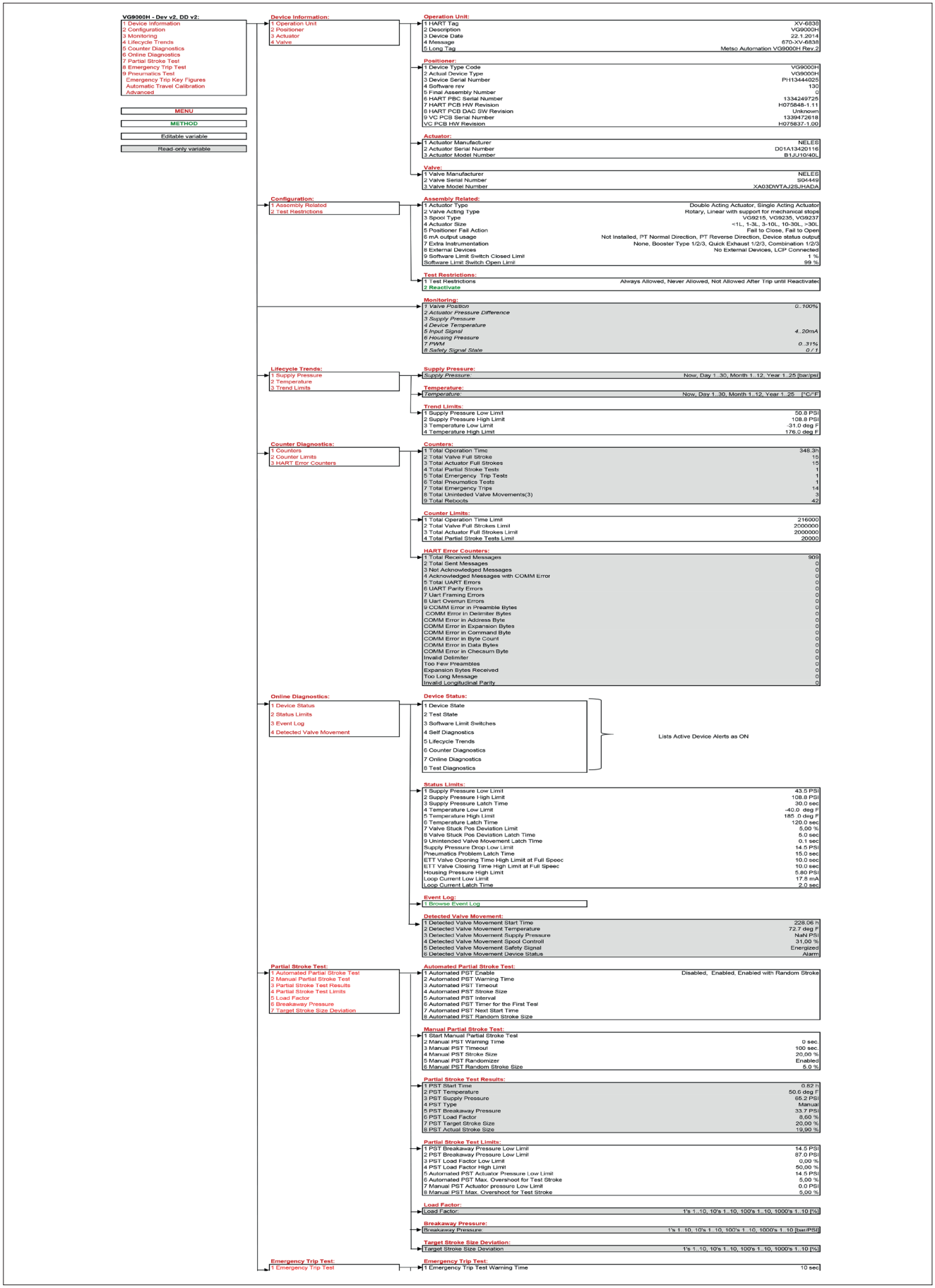
VG931_J_/_ or VG921_JL_

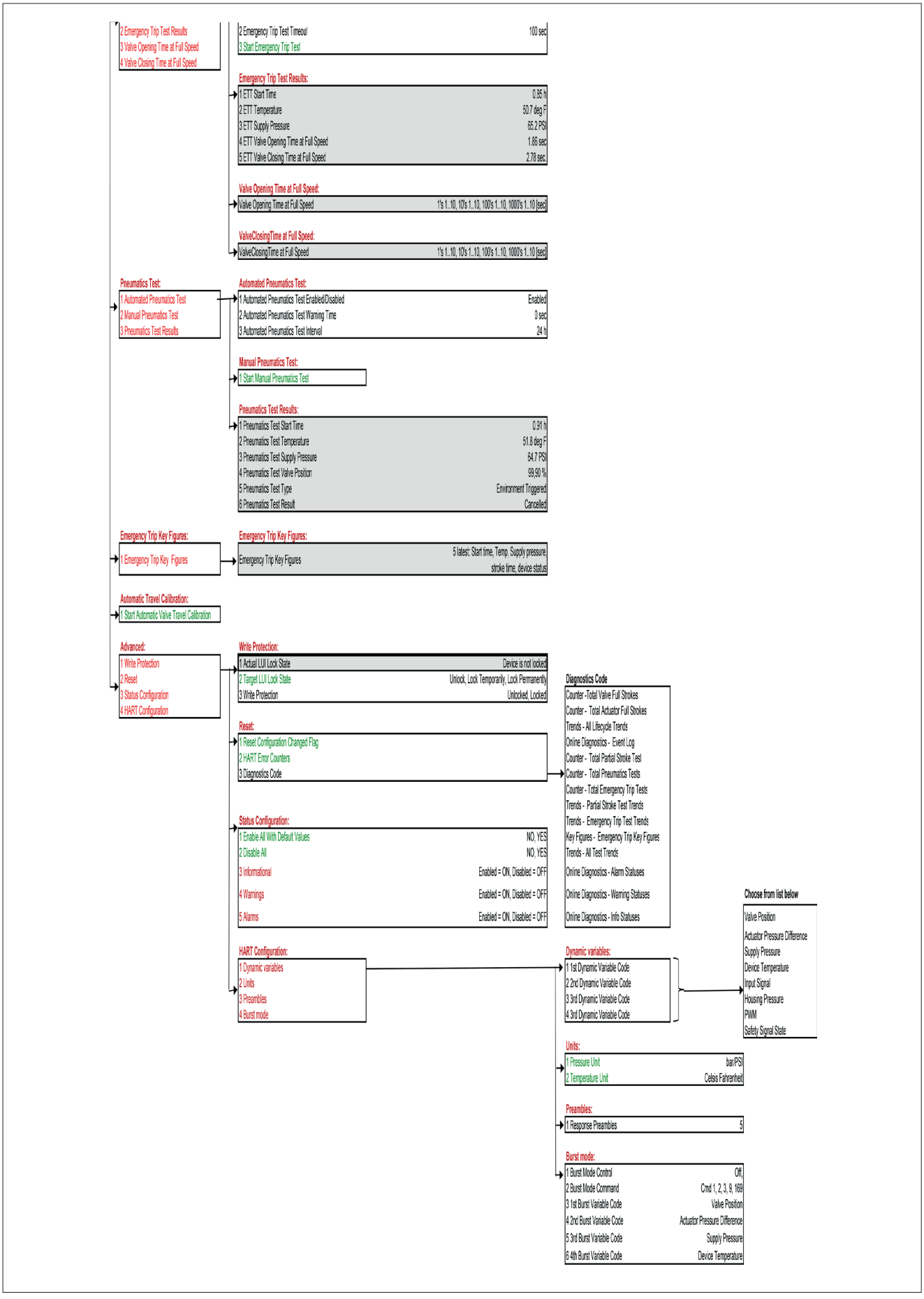


13. CONFIGURATION PARAMETERS

Parameter Name	Values	Default value
Actuator Type (Atyp)	Single acting actuator (1-A) Double acting actuator (2-A) NOTE: See 4.6.1. Partial Stroke Test	1-A
Valve Type (Vtyp)	Rotary (rot) Linear (Lin)	rot
Positioner Fail Action (PFA)	Close (CLO) Open (OPE)	CLO
Extra Pneumatics Instrumentation (EXTI)	non = none bo1 = Volume Booster type 1 bo2 = Volume Booster type 2 bo3 = Volume 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	non
Actuator size (ACTS)	S 1 = B1J8 (<1 dm^3 / <61 in^3) S 3 = B1J10 (1-3 dm^3 / 61-183 in^3) S10 = B1J12-16 (3-10 dm^3 / 183-610 in^3) S30 = B1J20-25 (10-30 dm^3 / 610-1831 in^3) L30 = B1C40-, B1J32- (>30 dm^3 / ^{3}1831 in^3)	S 1
Hart version (HARTI)	6 = HART 6 7 = HART 7	7
Spool type (STYP)	15 = VG9_12 or VG9_15 35 = VG9235 37 = VG9237	15
Automatic Partial Stroke Test (APSt) (Not available with VG9000H_P)	dIS = auto PST disabled EnA = auto PST enabled rnd = auto PST enabled with randomized range	dIS
Manual Partial Stroke Test Size (MSTr)	3.0 - 100.0	10.0 %
Language (LANG)	English (EnG) German (GEr) French (FrE)	EnG
Local Control Panel (LCP)	Enabled (EnA) Disabled (dIS)	dIS

14. HART DD MENU




2 Emergency Trip Test Results
3 Valve Opening Time at Full Speed
4 Valve Closing Time at Full Speed
2 Emergency Trip Test Timeout 100 sec
3 Start Emergency Trip Test
Emergency Trip Test Results:
1 ETT Start Time 0.85 h
2 ETT Temperature 50.7 deg F
3 ETT Supply Pressure 65.2 PSI
4 ETT Valve Opening Time at Full Speed 1.86 sec
5 ETT Valve Closing Time at Full Speed 2.78 sec
Valve Opening Time at Full Speed:
Valve Opening Time at Full Speed 1's 1..10, 10's 1..10, 100's 1..10, 1000's 1..10 [sec]
ValveClosingTime at Full Speed:
ValveClosingTime at Full Speed 1's 1..10, 10's 1..10, 100's 1..10, 1000's 1..10 [sec]
Pneumatics Test:
1 Automated Pneumatics Test
2 Manual Pneumatics Test
3 Pneumatics Test Results
Automated Pneumatics Test:
1 Automated Pneumatics Test Enabled/Disabled Enabled
2 Automated Pneumatics Test Warning Time 0 sec
3 Automated Pneumatics Test Interval 24 h
Manual Pneumatics Test:
1 Start Manual Pneumatics Test
Pneumatics Test Results:
1 Pneumatics Test Start Time 0.91 h
2 Pneumatics Test Temperature 51.8 deg F
3 Pneumatics Test Supply Pressure 64.7 PSI
4 Pneumatics Test Valve Position 99,90 %
5 Pneumatics Test Type Environment Triggered
6 Pneumatics Test Result Cancelled
Emergency Trip Key Figures:
1 Emergency Trip Key Figures
Emergency Trip Key Figures:
Emergency Trip Key Figures 5 latest: Start time, Temp. Supply pressure stroke time, device status
Automatic Travel Calibration:
1 Start Automatic Valve Travel Calibration
Advanced:
1 Write Protection
2 Reset
3 Status Configuration
4 HART Configuration
Write Protection:
1 Actual LUI Lock State Device is not locked
2 Target LUI Lock State Unlock, Lock Temporarily, Lock Permanently
3 Write Protection Unlocked, Locked
Reset:
1 Reset Configuration Changed Flag
2 HART Error Counters
3 Diagnostics Code
Diagnostics Code
Counter -Total Valve Full Strokes
Counter - Total Actuator Full Strokes
Trends - All Lifecycle Trends
Online Diagnostics - Event Log
Counter - Total Partial Stroke Test
Counter - Total Pneumatics Tests
Counter - Total Emergency Trip Tests
Trends - Partial Stroke Test Trends
Trends - Emergency Trip Test Trends
Key Figures - Emergency Trip Key Figures
Trends - All Test Trends
Online Diagnostics - Alarm Statuses
Online Diagnostics - Warning Statuses
Online Diagnostics - Info Statuses
Status Configuration:
1 Enable All With Default Values NO, YES
2 Disable All NO, YES
3 Informational Enabled = ON, Disabled = OFF
4 Warnings Enabled = ON, Disabled = OFF
5 Alarms Enabled = ON, Disabled = OFF
HART Configuration:
1 Dynamic variables
2 Units
3 Preambles
4 Burst mode
Dynamic variables:
1 1st Dynamic Variable Code
2 2nd Dynamic Variable Code
3 3rd Dynamic Variable Code
4 3rd Dynamic Variable Code
Choose from list below
Valve Position
Actuator Pressure Difference
Supply Pressure
Device Temperature
Input Signal
Housing Pressure
PWM
Safety Signal State
Units:
1 Pressure Unit bar/PSI
2 Temperature Unit Celsis Fahrenheit
Preambles:
1 Response Preambles 5
Burst mode:
1 Burst Mode Control Off
2 Burst Mode Command Cmd 1, 2, 3, 9, 169
3 1st Burst Variable Code Valve Position
4 2nd Burst Variable Code Actuator Pressure Difference
5 3rd Burst Variable Code Supply Pressure
6 4th Burst Variable Code Device Temperature

15. EU DECLARATION OF CONFORMITY

EU Declaration of Conformity

Manufacturer:
Valmet Flow Control Oy
Vanha Porvoontie 229
01380 Vantaa
Finland

Product: **Intelligent Safety Solenoid Neles ValvGuard VG9000-series**

Approvals:

Type	Approval	EC Type examination Certificate
VG9_HX_/_ (ATEX)	ATEX II 1 G Ex ia IIC T6...T4 Ga ATEX II 1 D Ex ia IIIC T95 °C...T125 °C Da ATEX II 2 G Ex ib IIC T6...T4 Gb ATEX II 2 D Ex ib IIIC T95 °C...T125 °C Db ATEX II 3 G Ex nA IIC T6...T4 Gc ATEX II 3 G Ex ic IIC T6...T4 Gc ATEX II 3 D Ex ic IIIC T95 °C...T125 °C Dc	EESF 20 ATEX 025X EN IEC 60079-0:2018, EN60079-11:2012 EESF 20 ATEX 026X EN IEC 60079-0:2018, EN 60079-11:2012, EN 60079-15:2010
VG9_FX_/_ (ATEX)	ATEX II 1 G Ex ia IIC T6...T4 Ga ATEX II 1 D Ex ia IIIC T95 °C...T125 °C Da ATEX II 2 G Ex ib IIC T6...T4 Gb ATEX II 2 D Ex ib IIIC T95 °C...T125 °C Db ATEX II 3 G Ex nA IIC T6...T4 Gc ATEX II 3 G Ex ic IIC T6...T4 Gc ATEX II 3 D Ex ic IIIC T95 °C...T125 °C Dc	EESF 20 ATEX 027X EN IEC 60079-0:2018, EN 60079-11:2012 EESF 20 ATEX 029X EN IEC 60079-0:2018, EN 60079-11:2012, EN 60079-15: 2010
VG9_E6_/_ VG9_E7_/_	ATEX II 2 G Ex d IIC T6...T4 Gb ATEX II 2 D Ex tb IIIC T80 °C...T105 °C Db IP66	SIRA 11ATEX1006X EN 60079-0:2012, EN 60079-1:2007, EN 60079-31:2009

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

Applicable directives:

EMC 2004/108/EC	Electrical
ATEX 2014/34/EU	Approved and Ex marked types

ATEX Notified Bodies for EC Type Examination Certificates:

CSA (Notified body number 2813)
CSA Group Netherlands B.V.
Utrechtseweg 310,
6812 AR, Arnhem,
Netherlands

EESF (Notified body number 0537)
Eurofins Electric & Electronics Finland Oy
Kivimiehentie 4
FI-02150 Espoo
Finland

Notified bodies for Quality Assurance:

ISO 9001:2015	LRQA	10531829
ATEX 2014/34/EU Annex IV	Presafe 2460	Presafe 18 ATEX 91983Q

Det Norske Veritas AS (Presafe Notified Body number 2460)
Veritasveien 1
1322 Høvik, Oslo
Norway

Vantaa 27th September 2024

Janne Jussila, Quality Manager
Authorized person of the manufacturer within the European Community and UK

16. TYPE CODING

NELES VALVGUARD VG9000								
1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**		**8.**
VG	9	2	15	H	E6		/	R01

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

1. sign	PRODUCT GROUP
VG	Neles ValvGuard VG9000, intelligent safety solenoid with partial stroke testing. 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 aluminium 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 dm^3	S, C1, C2 = 1/4 NPT
15	Standard capacity Stroke volume of actuator > 0.^{3} dm^3	S, C1, C2 = 1/4 NPT
35	High capacity Stroke volume of actuator > 3.5 dm^3 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^3 Not applicable to 3. sign "3" or 7. sign "P"	S = 1/2 NPT, C2 = 1 NPT

5. sign	COMMUNICATION / INPUT SIGNAL
H	4-20 mA, HART communication.

6. sign	APPROVALS FOR HAZARDOUS AREAS
X	**ATEX and IECEx certifications:** 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	**TR CU (Russian) certification:** 0Ex ia IIC T6...T4 Ga X / Ex ia IIIC T90 °C...T120 °C Da X 0Ex ia IIC T6...T4 Ga X / Ex ta IIIC T90 °C...T120 °C Da X 1Ex ib IIC T6...T4 Gb X/ Ex ib IIIC T90 °C...T120 °C Db X 1Ex ib IIC T6...T4 Gb X/ Ex tb IIIC T90 °C...T120 °C Db X 2Ex nA IIC T6...T4 Gc X / Ex ic IIIC T90 °C...T120 °C Dc X 2Ex nA IIC T6...T4 Gc X / Ex tc IIIC T90 °C...T120 °C Dc X 2Ex ic IIC T6...T4 Gc X/ Ex ic IIIC T90 °C...T120 °C Dc X 2Ex ic IIC T6...T4 Gc X/ Ex tc IIIC T90 °C...T120 °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	**CCC (Chinese) certification:** 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.
U	**cCSAus certification:** 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: -40° to +80 °C; T5: ≤+65 °C; T6: ≤ +50 °C Applicable to 5. sign "H". Not applicable to 7. sign "L2" or "L3" Available without limit switches. See 9. sign for available options.

6. sign	APPROVALS FOR HAZARDOUS AREAS
U2	**cCSAus certification:** 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	**INMETRO certification:** 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	**cCSAus certification:** 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° 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	**INMETRO certification:** Ex db IIC T6...T4 Gb Ex tb IIIC T80 °C... T105 °C Db IP66 Available with or without limit switches. See 9. sign for available options.
E6	**ATEX and IECEx certifications:** II 2 GD Ex d IIC T6...T4 Gb Ex tb IIIC T80 °C...T105 °C Db IP66 Temperature range: Ta according to separate table (see certificate). Available with or without limit switches. See 9. sign for available options.
E7	**ATEX and IECEx certifications with Russian machine plate:** 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	**CCC (Chinese) certification:** 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". **NOTE:** This option 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 4-20 mA. 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". **NOTE:** This option is not SIL certified.
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" Not applicable 6. sign "E2" (approval pending) **NOTE:** SIL approved, does not adversely affect the safety function.
J	External junction box, 2 pcs M20x1.5 conduit entries. **VG9_H_J_:** 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" **NOTE:** 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. **VG9_F_J_:** 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 6. sign "E7" 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.th sign "X8" or "E7" and 7. sign "L1" or "L3". **NOTE:** 7. sign "J" needs to be selected, if 8. sign (limit switches or position transmitter T01) is specified. **NOTE:** Local Control Panel LCP9H_ need to be ordered separately! **NOTE:** 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. Applicable to 5. sign "H". Not applicable to 6.th sign "X8", "E2" or "E7" and 7. sign "J", "L1 or L2". **NOTE:** Local Control Panel LCP9H_L needs to be ordered separately! **NOTE:** 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)
	Position transmitters
T01	**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 W. Potentiometer Contelec GL60, transmitter electronics Valmet. Temperature range -40 to +85 °C / -40 to +185 °F. Not applicable to 6. sign "U", "U2" or "E2". Not available with limit switches.
	Inductive proximity sensors, 2 pcs.
D33	Obsolete Select R01 option instead.
D44	Obsolete 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. **NOTE:** 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"
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 IEC1508. 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. **NOTE:** 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"

9. sign	LIMIT SWITCHES & POSITION TRANSMITTERS
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"
	Reed or leverless type proximity switches, 2 pcs.
R01	Valmet Maxx-Guard G, Reed, 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 "E2", "E5", "E6", "E7" or "E8"
R02	Valmet 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. Not applicable to 6. sign "U" or "U2"
R04	Valmet Maxx-Guard H, Reed, SPDT, V_{max} 240 V, I_{max} 3A, P_{max} 100W Temperature range -40...+80°C / -40...+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...+85°C / -40...+185 °F. Applicable to 6. sign "E2", "E5", "E6", "E7" or "E8". **NOTE:** Not for general use, only for projects with product management approval.
	Mechanical micro switches 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", "E6", "E7" or "E8".
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".
	Bus powered mechanical micro switches 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".

-	OPTIONAL DEVICES FOR VG9000H
RCI9H2	Remote Communication Interface with Status Relays 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 **CCC** certification: [Ex ia Ga] IIC **NOTE:** RCI9H2 is needed if 4/20mA is NOT available from the safety system to VG9000H.

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