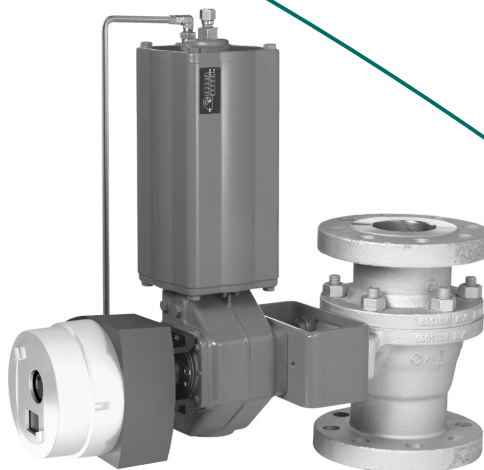


NELES SWITCHGUARD™ INTELLIGENT ON/OFF VALVE CONTROLLER

Neles SwitchGuard™ SG9000 is a top class intelligent on/off valve controller designed to operate on any valve actuator. Unique embedded diagnostic features are Integrated into its design and enables users to guarantee the availability of their switching valves in demanding processes. SwitchGuard can be easily fitted to the actuator and its controlled pneumatic capacity replaces any solenoid valve providing a simple, reliable interface with the process control system. Diagnostic information is presented in easily understandable way using FDT technology, such as Metso FieldCare™, to enable planned maintenance of potentially failing valve assemblies before they have chance to impact on the process.



KEY FEATURES

- Reliable and robust design
- The rugged cover protects the unit from environmental hazards and external abuse
- Ease of use
- Language selection: English, German and French
- Local / remote operation
- Expandable architecture
- Advanced device diagnostics including
 - Self-diagnostics
 - Online diagnostics
 - Performance diagnostics
- Speed control for switching
- HART communication

Options

- Full stainless steel enclosure (SG9300)
- High pneumatic capacity (SG9200)
- Integrated limit switches
- Position transmitter
- U/I converter to support binary control

Total cost of ownership

- Low energy and air consumption
- Future proof design allows further options at a reduced cost
- Optimised spares program. Reduced number of spares

Designed to switch

- Several pre-selected opening and closing profiles
 - Opening and closing can be configured separately
 - Minimised pressure impacts in piping
- Excellent speed control performance
- Highly reliable pneumatics unit
- Wide pneumatics capacity

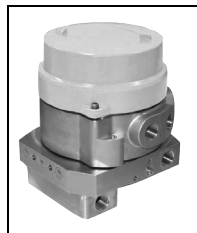
Easy installation and configuration

- Same unit for linear and rotary valves, double and single-acting actuators
- Simple calibration and configuration
 - Using Local User Interface (LUI)
 - Using Metso FieldCare software in a remote location
- Low power design enables installation to all common control systems

Open solution

- Metso is committed to delivering products that freely interface with software and hardware from a variety of manufacturers; and, the Neles SwitchGuard is no exception. This open architecture allows the SwitchGuard to be integrated with other field devices and systems.
- FDT and EDD based multi-vendor support configuration
- Support files for SG9000H are available from our internet page, at <http://www.metso.com/valves> - choose link download center

Stainless steel version



Neles SwitchGuard SG9300 Stainless Steel version, a new addition to the SwitchGuard family of safety valve controllers, is manufactured in a stainless steel housing and developed for use in corrosive environments.

Easy to maintain

- Modular design with maintenance components
- Alterable pneumatics module
- Fewer maintainable components than in a traditional instrumentation solution
- Visibility of the whole valve package

Mounting

- Can be mounted on single and double acting pneumatic actuators
- Can be mounted on both rotary and linear valves
- Extensive selection of mounting kits for 3rd party actuators

Product reliability

- Designed to operate in harsh environmental conditions
 - Rugged modular design
 - Excellent temperature characteristics
 - Vibration and impact tolerant
 - IP66 enclosure
 - Full stainless steel enclosure (SG9300)
 - Protected against humidity
- Maintenance free operation
 - Resistant to dirty air
 - Wear resistant and sealed components
 - Contactless position measurement

Predictive maintenance

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

TECHNICAL DESCRIPTION

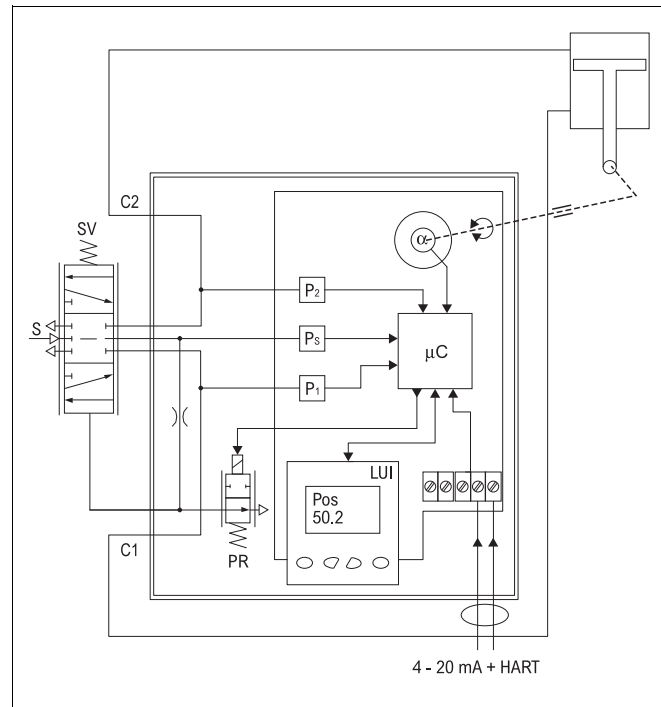
The SwitchGuard is a 4–20 mA loop-powered microcontroller-based intelligent on/off valve controller. Binary 24 VDC signal can be used via optional U/I converter. The SwitchGuard operates even at 3.6 mA input signal and communicates via HART. The device contains a Local User Interface enabling local configuration. A PC with FieldCare software can be connected to the SwitchGuard itself or to the control loop.

The powerful 32-bit microcontroller controls the valve position. The measurements include:

- Input signal
- Valve position with contactless sensor
- Actuator pressures, 2 independent measurements
- Supply pressure
- Device temperature

Advanced self-diagnostics guarantees that all measurements operate correctly. Failure of one measurement does not cause the valve to fail if the input signal and position measurements are operating correctly. After connections of electric signal and pneumatic supply the micro controller (μ C) reads the input signal, position sensor (α) and pressure sensors (Ps, P1, P2). A difference between setpoint according to stroke curve and position sensor (α) measurement is detected by the control algorithm inside the μ C. The μ C calculates a new value for prestage (PR) coil current based on this information.

Changed current to the PR changes the pilot pressure to the spool valve. Reduced pilot pressure moves the spool and the actuator pressures change accordingly. The spool opens the flow to the driving side of the double diaphragm actuator and opens the flow out from the other side of the actuator. The increasing pressure will move the diaphragm piston. The actuator and feedback shaft rotate clockwise.



TECHNICAL SPECIFICATIONS

Neles SwitchGuard

General

Loop powered, no external power supply required.
 Suitable for rotary and linear valves.
 Actuator connections in accordance with VDI/VDE 3845 and IEC 60534-6 standards.
 Action: Double or single acting
 Travel range: Linear: 10–120 mm
 Rotary: 45–95°
 Measurement range 110° with freely rotating feedback shaft

Environmental influence

Standard temperature range: -20° – +85 °C / -4° – +185 °F
 Optional temperature range: -40° – +60 °C / -40° – +140 °F

Enclosure

Material: Anodised aluminium alloy and glass window
 Protection class: IP66, NEMA 4X
 Pneumatic ports: SG921_ 1/4 NPT
 SG9235 1/2 NPT
 SG9237 1 NPT (1/2 NPT supply)
 Conduit entry thread: M20 x 1.5
 Weight: SG921_ 3.0 kg / 6.6 lbs
 SG9235 4.6 kg / 10.1 lbs
 SG9237 5.0 kg / 11 lbs
 Limit switches +1.0 kg / 2.2 lbs
 Mechanical and digital position indicator visible through the main cover.

Pneumatics

Supply pressure: 3–8 bar / 44–116 psi
 Air quality: According to ISO 8573-1:2001
 Solid particles: Class 7
 Humidity: Class 1
 (dew point 10 °C/50 °F below minimum temperature is recommended)
 Oil class: 3 (or <1 ppm)
 Capacity with 4 bar / 60 psi supply:
 SG9212 7 Nm³ /h / 4.1 scfm (Cv = 0.06)
 SG9215 90 Nm³ /h / 53 scfm (Cv = 0.7)
 SG9235 380 Nm³ /h / 223 scfm (Cv = 3.2)
 SG9237 feed 380 Nm³ /h / 223 scfm (Cv = 3.2)
 exhaust 700 Nm³ /h / 412 scfm (Cv = 6.4)
 Consumption with 4 bar / 60 psi supply:
 actuator pressurized 0.22 Nm³ /h / 0.13 scfm,
 actuator vented 0.25 Nm³ /h / 0.15 scfm

Electronics

Electrical connection: max. 2.5 mm²
 HART
 Supply power: Loop powered, 4–20 mA
 Minimum signal: 3.6 mA
 Current max : 23 mA
 Load voltage: up to 9.5 V DC / 20 mA (corresponding 475 Ω.)
 Voltage: max. 30 V DC
 Polarity protection: -30 V DC
 Over current protection: active over 35 mA
 Max power dissipation: 1.05 W
 with position transmitter 1.74 W
 Ex d IIC T3/T4: Ui ≤ 30 V
 Pi ≤ 1080 mW
 Ex ia IIC T4/T5/T6: Ui ≤ 28 V
 li ≤ 120 mA
 Pi ≤ 1 W
 Ci ≤ 22 nF
 Li ≤ 53 μH
 Ex nA IIC T4/T5/T6: Ui ≤ 30 V
 li ≤ 152 mA
 Ex nL IIC T4/T5/T6: Ui ≤ 28 V
 li ≤ 152 mA
 Ci ≤ 22 nF
 Li ≤ 53 uH

Position transmitter (optional)

Output signal: 4–20 mA (galvanic isolation; 600 V DC)
 Supply voltage: 12 - 30 V DC
 Resolution: 16 bit / 0.244 μA
 Linearity: <0.05 % FS
 Temperature effect: <0.35 % FS
 External load: max 0–780 Ω
 max 0–690 Ω for intrinsically safe
 Ex ia IIC T4/T5/T6: Ui ≤ 28 V
 li ≤ 120 mA
 Pi ≤ 1 W
 Ci ≤ 22 nF
 Li ≤ 53 μH
 Ex nA IIC T4/T5/T6: Ui ≤ 30 V
 li ≤ 152 mA
 Ex nL IIC T4/T5/T6: Ui ≤ 28 V
 li ≤ 152 mA
 Ci ≤ 22 nF
 Li ≤ 53 uH
 Ex d IIC T3/T4: Ui ≤ 30 V
 Pi ≤ 1080 mW

Local User Interface (LUI) functions

- Local control of the valve
- Monitoring of valve position, input signal, temperature, supply and actuator pressure difference
- Guided start-up function
- LUI may be locked remotely to prevent unauthorised access
- Automatic travel calibration
- Tuning
- Parameter selection
- Language selection: English, German and French
- Alarm and warning state indications
- Latest event view

APPROVALS

Intrinsically safe and non incendive

- IECEX**
- Ex ia IIC T4/T5/T6 Ga
IEC 60079-0, IEC 60079-11, IEC 60079-26
 - Ex ia IIC T4/T5/T6 Gb
IEC 60079-0, IEC 60079-11
 - Ex nA IIC T4/T5/T6 Gc
Ex nL IIC T4/T5/T6 Gc
IEC 60079-0, IEC 60079-15
 - Ex tD A20 IP66 T90 °C
 - Ex tD A21 IP66 T90 °C
 - Ex tD A22 IP66 T90 °C
IEC 60079-0, IEC 61241-1

- ATEX**
- II 1 G Ex ia IIC T4/T5/T6 Ga
EN 60079-0, EN 60079-11, EN 60070-26
 - II 2 G Ex ia IIC T4/T5/T6 Gb
EN 60079-0, EN 60079-11
 - II 3 G Ex nA IIC T4/T5/T6 Gc
II 3 G Ex nL IIC T4/T5/T6 Gc
EN 60079-0, EN 60079-15
 - II 1 D Ex tD A20 IP66 T90 °C
 - II 2 D Ex tD A21 IP66 T90 °C
 - II 3 D Ex tD A22 IP66 T90 °C
EN 60079-0, EN 61241-0, EN 61241-1

- FM**
- IS Class I, Division 1, Groups A, B, C, D, T4/T5/T6
 - IS Class I, Zone 0, AEx ia, IIC T4/T5/T6
 - NI Class I, Division 1, Groups A, B, C, D, T4/T5/T6
 - NI Class I, Zone 2, Ex nA IIC, T4/T5/T6
Class 3600, Class 3610, Class 3611,
Class 3810, ANSI/NEMA 250

Flameproof and explosion proof

- IECEX**
- Ex d IIC T5 Gb (Ta -40° C or -25° C to +85° C)
 - Ex d IIC T6 Gb (Ta -40° C or -25° C to +70° C)
 - IEC 60079-0, IEC 60079-1

- ATEX**
- II 2G
 - Ex d IIC T5 Gb (Ta -40° C or -25° C to +85° C)
 - Ex d IIC T6 Gb (Ta -40° C or -25° C to +70° C)
 - EN 60079-0, EN 60079-1

Electromagnetic protection

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

CE marking

89/336/EEC
Electromagnetic compatibility

94/9/EC

ATEX
SG9000 DTM certified by FDT group
DD and EDD registered by HCF

**FDT/DTM
HART**



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

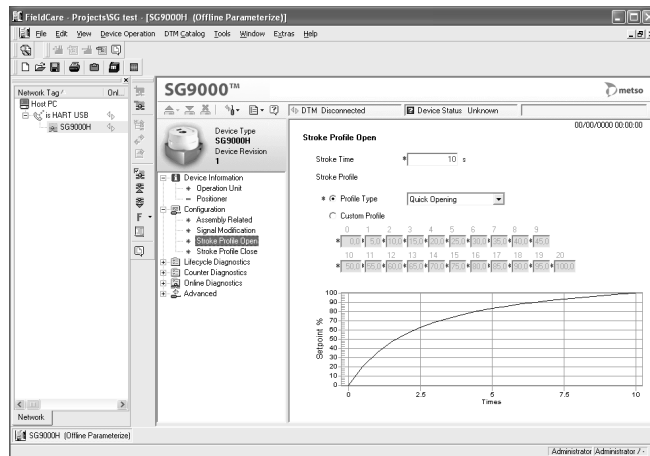
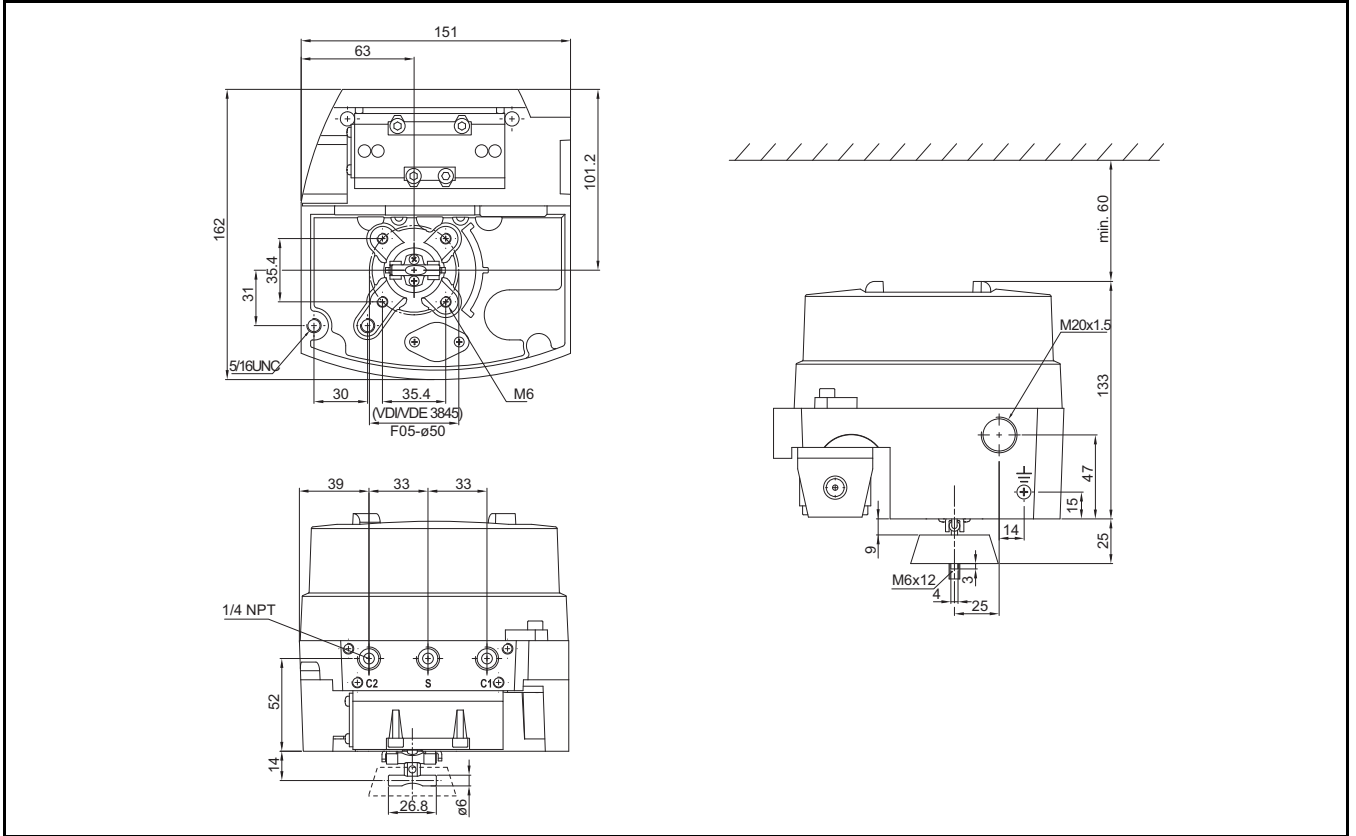


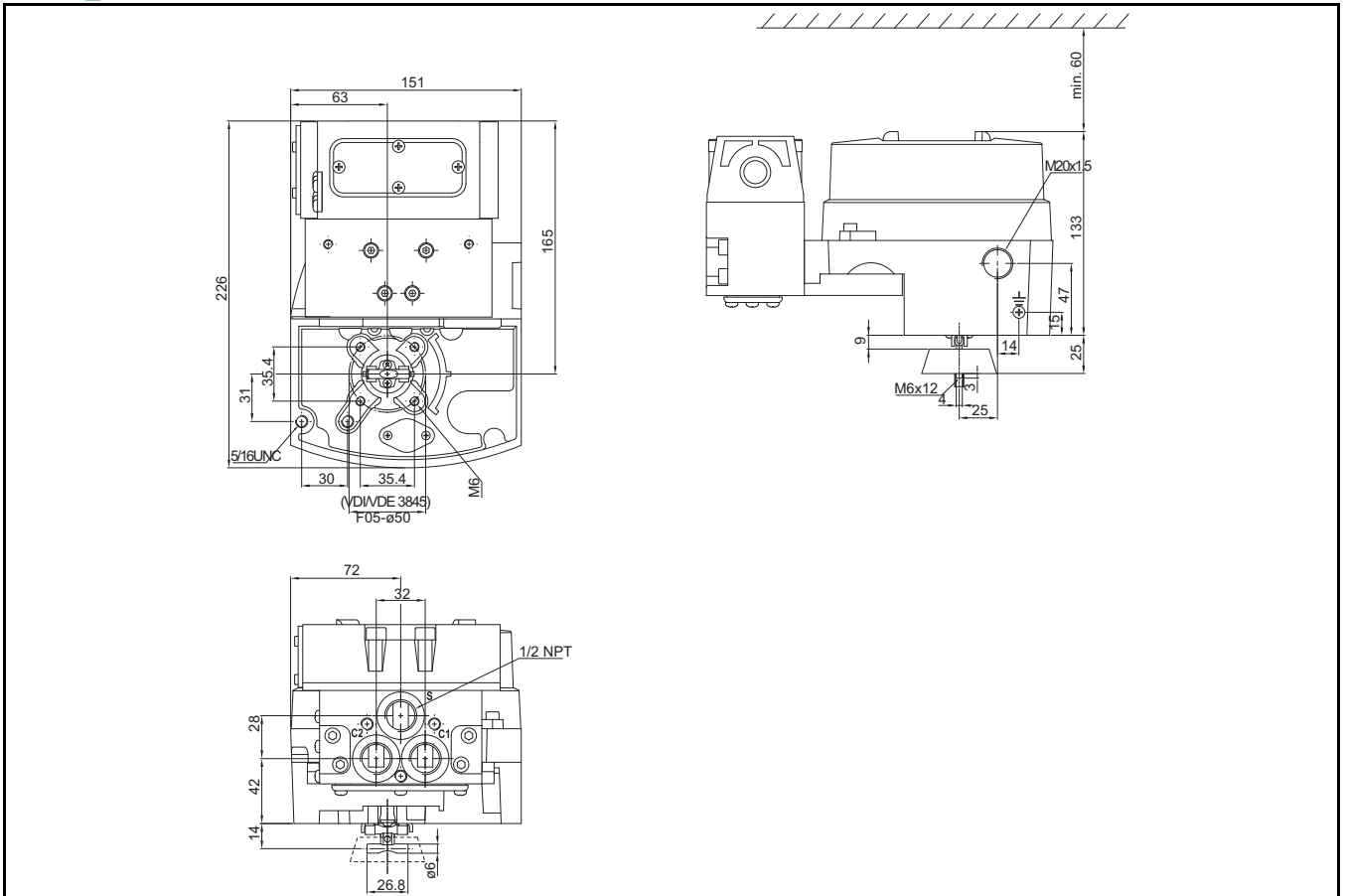
Fig. 2. Configuration is easy to do with DTM, graphical user interface. E.g. pre-selected profiles for opening and closing enable fast and easy stroke setup.

DIMENSIONS (mm)

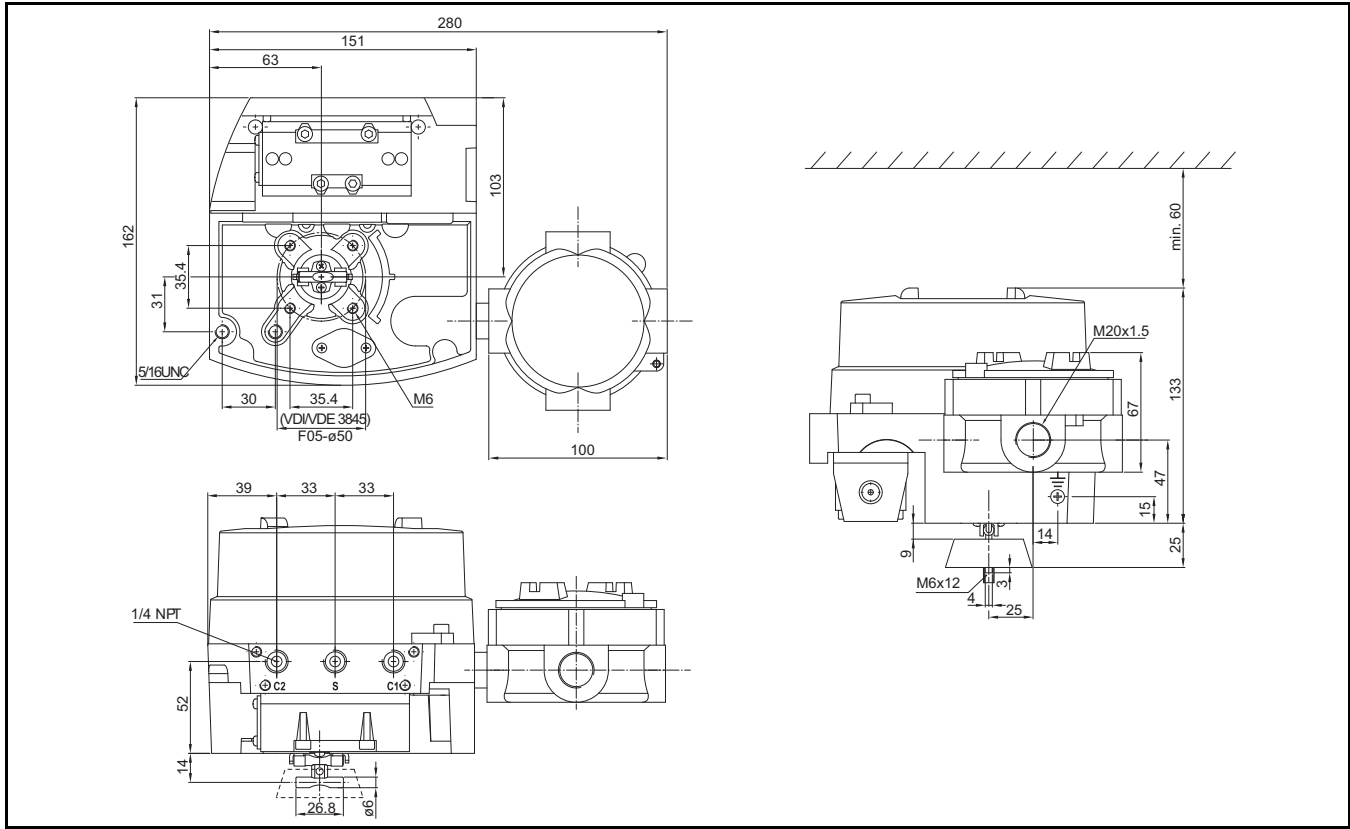
SG921_



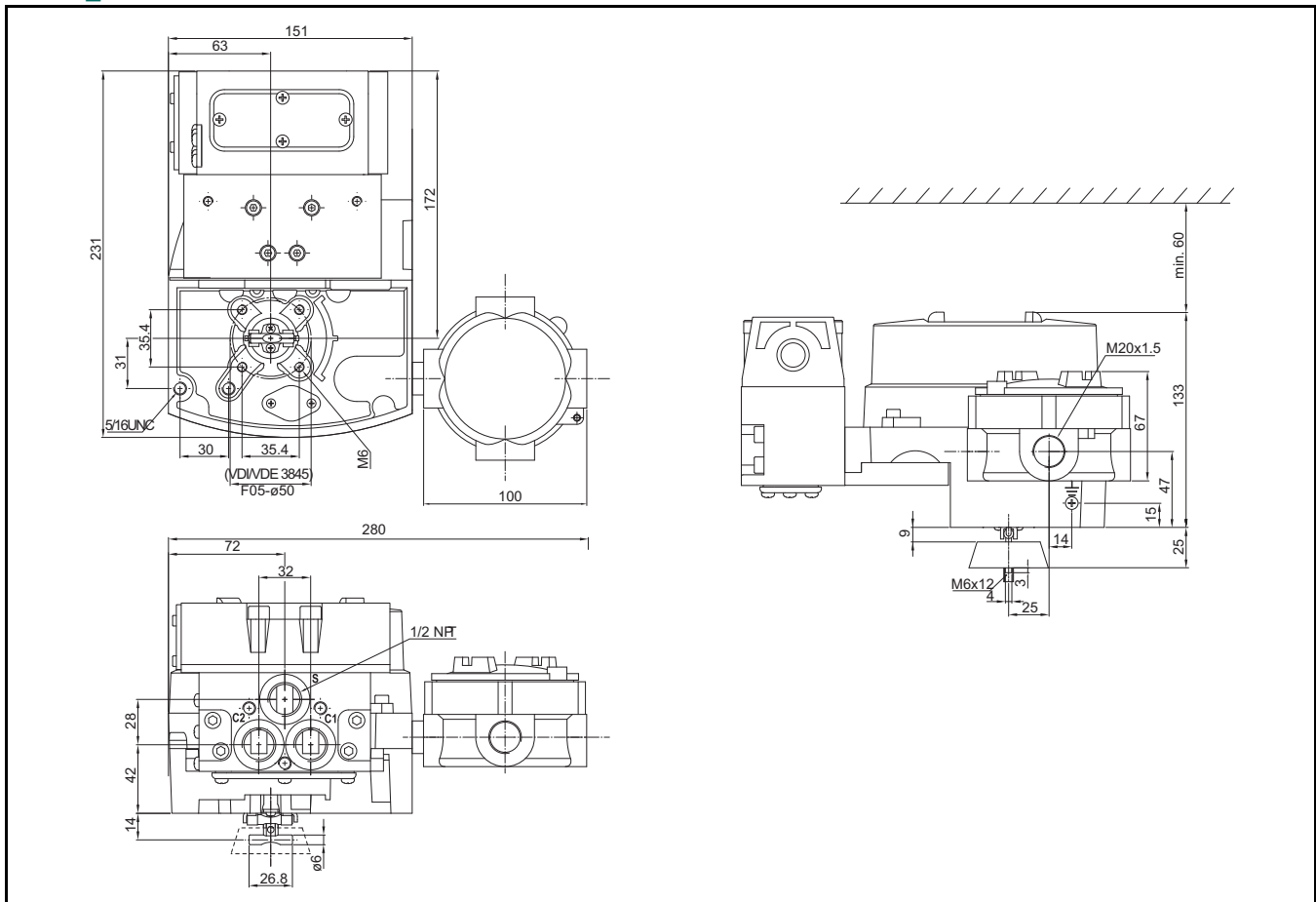
SG923_



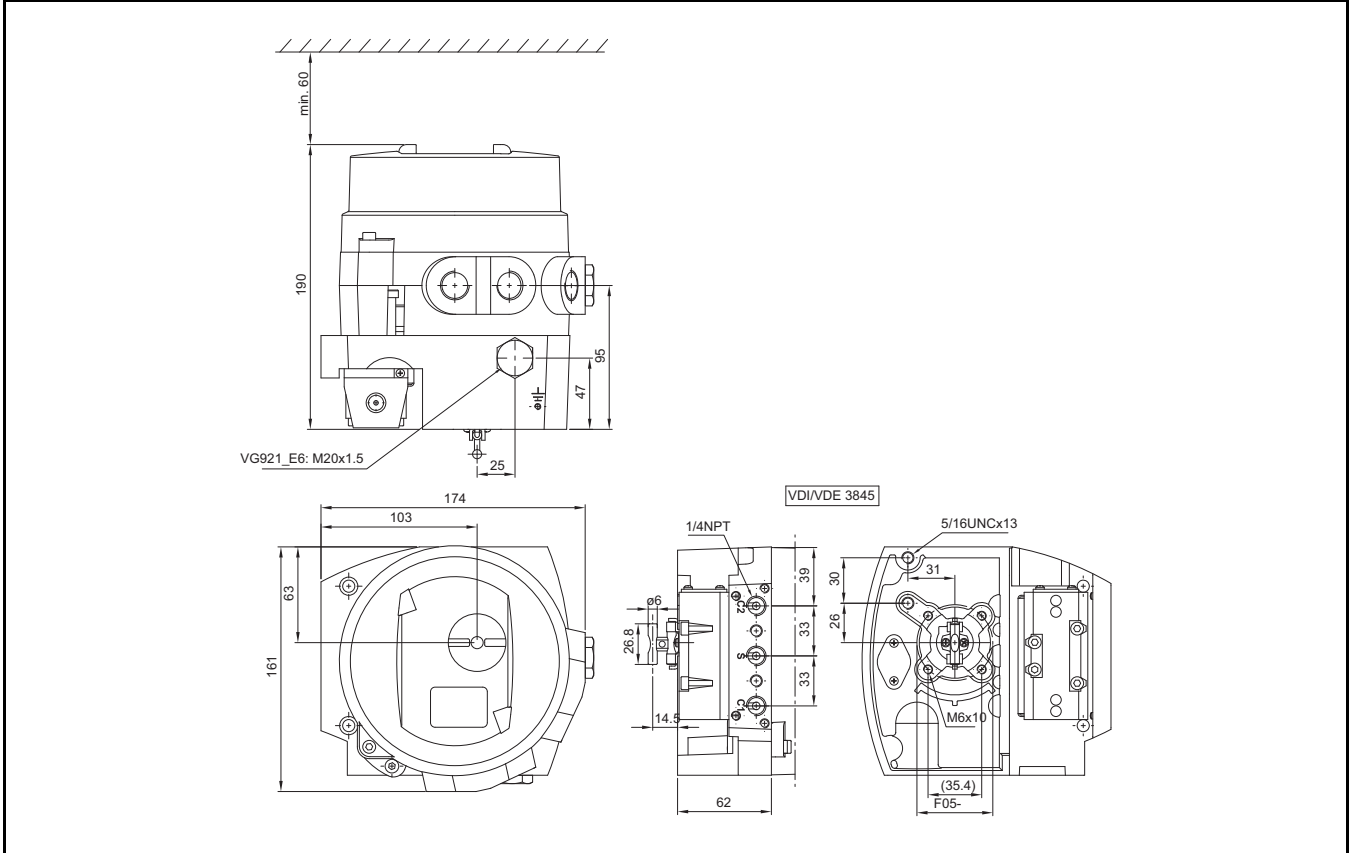
SG921_J



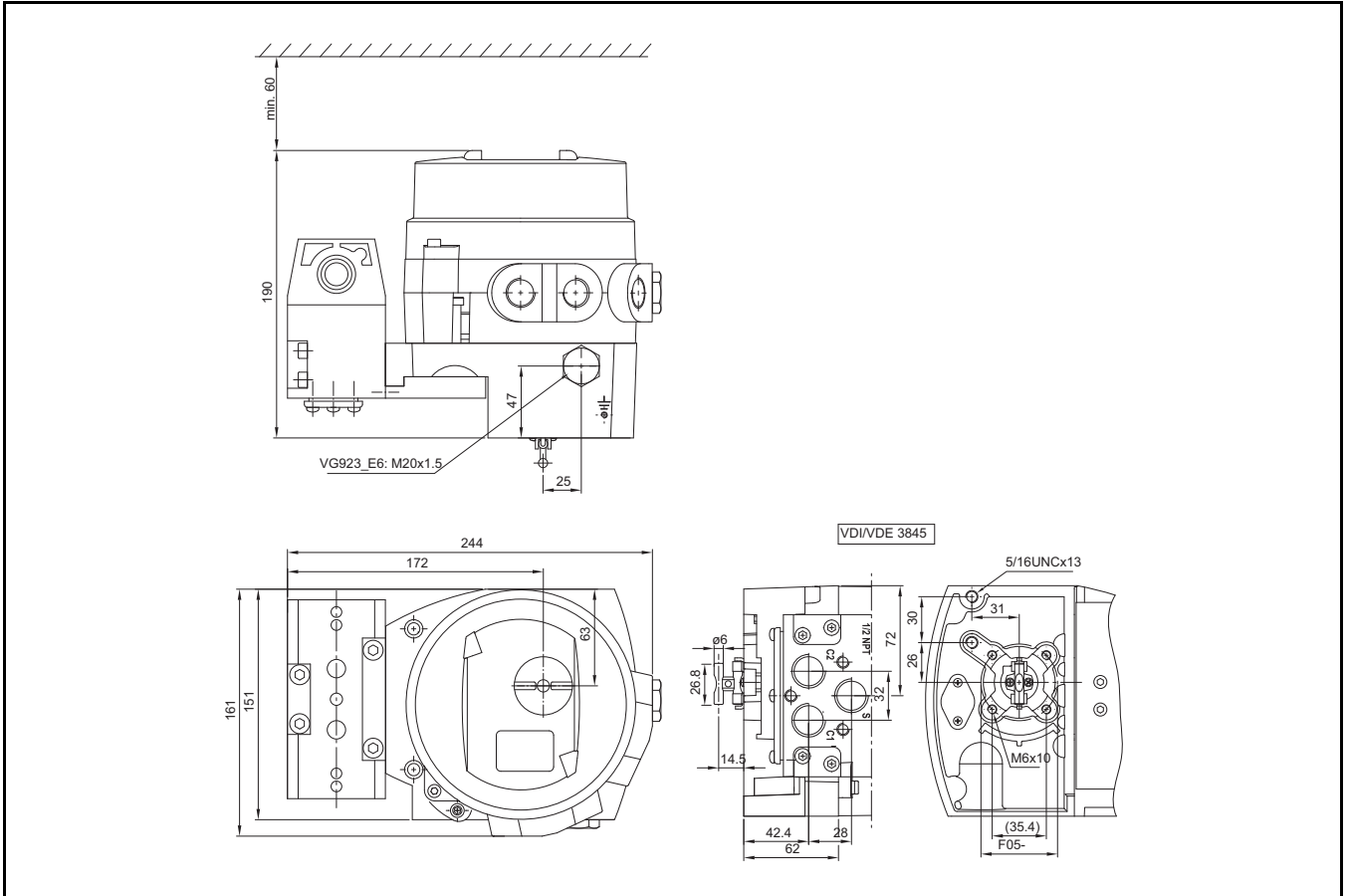
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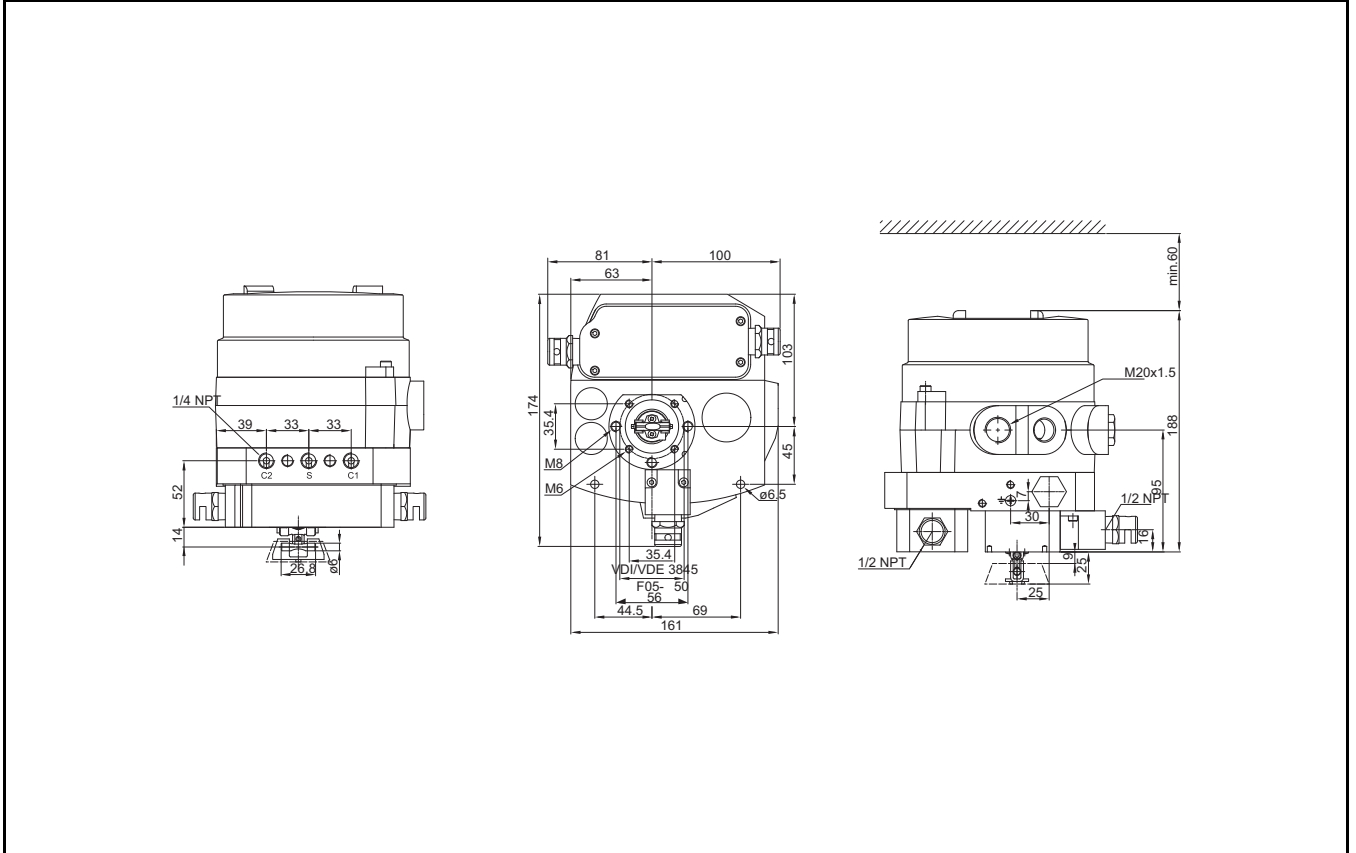
SG921_ with limit switches



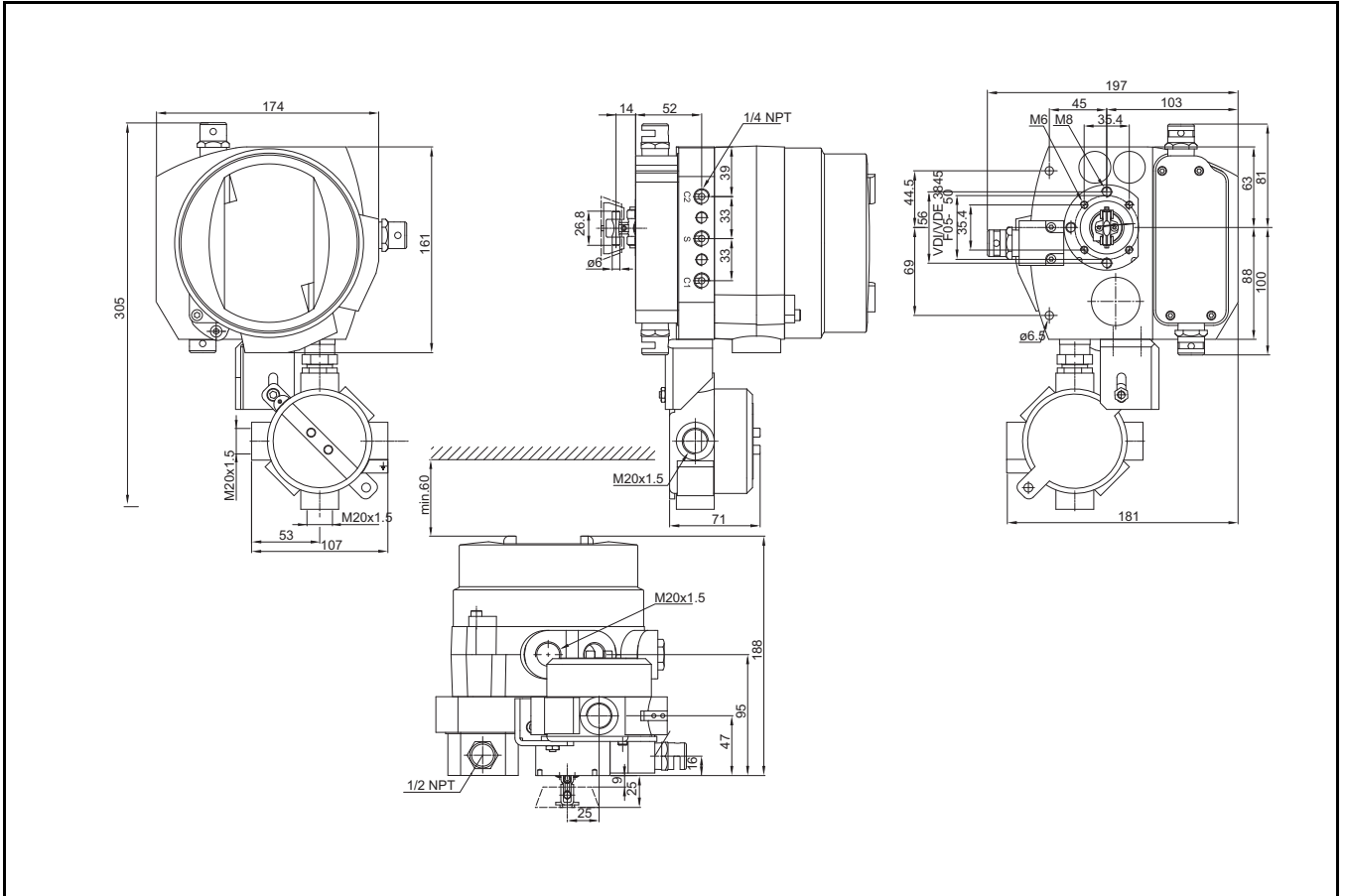
SG923_ with limit switches



SG931_ with limit switches



SG931_J with limit switches



HOW TO ORDER

Neles SwitchGuard

1.	2.	3.	4.	5.	6.	7.	*)	8.	9.
SG	9	2	15	H	X2		/	102	

1.	PRODUCT GROUP
SG	Neles SwitchGuard SG9000, Intelligent On/Off Valve Controller

2.	SERIES CODE
9	Series 9000 Intelligent on/off valve controller with universal shaft and attachment face according to standard VDI/VDE 3845. Relevant shaft adapter included in mounting kits. When valve controllers are separate deliveries, shaft adapter kit is supplied.

3.	ENCLOSURE
	Standard temperature range -20° to +85 °C / -4° to +185 °F. M20 x 1.5 conduit entry.
2	Standard anodized aluminium enclosure, IP66 / NEMA 4X.
3	Stainless steel enclosure, IP66 / NEMA 4X.

4.	SPOOL VALVE	CONNECTIONS
12	Restricted capacity. Stroke volume of actuator 0.3 - 4.3 dm ³	S, C1, C2 = 1/4 NPT
15	Standard capacity. Stroke volume of actuator > 0.6 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".	S = 1/2 NPT, C2 = 1 NPT

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

6.	APPROVALS FOR HAZARDOUS AREAS
N	No approvals for hazardous areas. M20x1.5 conduit entry.
X1	ATEX and IECEx certifications: II 1 G, Ex ia IIC T4/T5/T6 Ga II 1 D, Ex tD A20 IP66 T90°C Ui < 28 V, li < 120 mA, Pi < 1 W, Li = 53 µH, Ci = 22 nF. Temperature range: T4: -40° to +80 °C / -40° to +176 °F; T5: < +65 °C / < +149 °F; T6: < +50 °C / < +122 °F. Not available with limit switches. Ex tD certification is not available with 7. sign "M".
X2	ATEX and IECEx certifications: II 2 G, Ex ia IIC T4/T5/T6 Gb II 2 D, Ex tD A21 IP66 T90°C Ui = 28 V, li = 120 mA, Pi = 1 W, Li = 53 µH, Ci = 22 nF. Temperature range: T4: -40° to +80 °C / -40° to +176 °F; T5: < +65 °C / +149 °F; T6: < +50 °C / +122 °F. Only available with ATEX and IECEx certified inductive limit switches. Ex tD certification is not available with 7. sign "M".
X3	ATEX and IECEx certifications: II 3 G, Ex nA IIC T4/T5/T6 Gc II 3 D, Ex tD A22 IP66 T90°C No Zener Barrier needed. Ui = 30 V, Pmax = device limits itself. Temperature range: T4: -40° to +85 °C / -40° to +185 °F; T5: < +75 °C / +167 °F; T6: < +60 °C / +140 °F. Available without limit switches or with ATEX or IECEx certified inductive limit switches. Ex tD certification is not available with 7. sign "M".
X4	ATEX and IECEx certifications: II 3 G, Ex nL IIC T4/T5/T6 Gc II 3 D, Ex tD A22 IP66 T90°C No Zener Barrier needed. Ui = 30 V, li < 152 mA, Li = 53 µH, Ci = 22 nF, Pmax = device limits itself. Temperature range: T4: -40° to +85 °C / -40° to +185 °F; T5: < +75 °C / +167 °F; T6: < +60 °C / +140 °F. Available without limit switches or with ATEX or IECEx certified inductive limit switches. Ex tD certification is not available with 7. sign "M".

6.	APPROVALS FOR HAZARDOUS AREAS
E6	ATEX and IECEx certifications: II 2 G Ex d IIC T5/T6 Gb Ui ≤ 30 V Temperature range: T5: Ta -40 °C or -25 °C to +85 °C / -40 °F or -13 °F to +185 °F T6: Ta -40 °C or -25 °C to +70 °C / -40 °F or -13 °F to +158 °F. Available with or without limit switches.
U1	FM certifications: IS Class I, Division 1, Groups A, B, C, D, T4/T5/T6 IS Class I, Zone 0, AEx ia, IIC T4/T5/T6 Ui ≤ 28 V, li ≤ 120 mA, Pi ≤ 1 W, Li = 53 µH, Ci = 22 nF. Temperature range: T4: -40° to +80 °C / -40° to +176 °F; T5: < +65 °C / +149 °F; T6: < +50 °C / +122 °F. Not available with limit switches.
U2	FM certifications: NI Class I, Division 1, Groups A, B, C, D, T4/T5/T6 NI Class I, Zone 2, Ex nA IIC, T4/T5/T6 No Zener Barrier needed. Ui ≤ 30 V, Pmax = device limits itself, external load resistance 0-780 Ω Temperature range: T4: -40° to +85 °C / -40° to +185 °F; T5: < +70 °C / +158 °F; T6: < +55 °C / +131 °F. Not available with limit switches

7.	OPTIONS OF ON/OFF VALVE CONTROLLER
T	Internal 2-wire (passive) position transmitter. Analog position feedback signal, output 4-20 mA, supply voltage 12-30 V DC, external load resistance 0-780 Ω. SG9_X1T and SG9_X2T: Ui < 28 V, li < 120 mA, Pi < 1 W, Li = 53 µH, Ci = 22 nF, external load resistance 0-690 Ω. SG9_X3T: Ui = 30 V, Pmax = device limits itself, external load resistance 0-780 Ω. SG9_E6T: Ui = 30 V, Pmax = device limits itself, external load resistance 0-780 Ω. SG92_U1T: Ui ≤ 28 V, li ≤ 120 mA, Pi ≤ 1 W, Li = 53 µH, Ci = 22 nF, external load resistance 0-780 Ω. SG92_U2T: Ui = 30 V, Pmax = device limits itself, external load resistance 0-780 Ω.
C	Low temperature. Temperature range: -40° to +60 °C / -40° to +140 °F.
J	External junction box for all 4-20 mA wirings, including position transmitter, if applicable. Junction box is located in the standard enclosure, 2 pcs. M20 x 1.5 conduit entry.
M	Special corrosion resistant finish. External aluminium surfaces protected by hard anodizing with PTFE. Coating thickness 20 µm. Not painted. Not applicable to 3. sign "3". Not available with Ex tD certification
Y	Special construction, to be specified.

8.	LIMIT SWITCH TYPE
	IP 66 / NEMA 4X enclosure. Extension housing with additional conduit entries, max 4 pcs. M20 x 1.5.
	Inductive proximity switches
102	P+F; NJ2-12GK-SN, 2-wire type, DC; > 3 mA; < 1 mA. NAMUR NC Intrinsically safe according to ATEX II 2 G Ex ia IIC T6. Temperature range: -40° to +85 °C / -40° to +185 °F. Applicable to 6. sign "X2", "X3", "X4" or "E6"
109	P+F; NCB2-12GM35-N0, 2-wire type, DC; > 3 mA; < 1 mA. NAMUR NC Intrinsically safe according to ATEX II 2 G EEx ia IIC T6. Minimum temperature: -25° to +85 °C / -13° to +185 °F. Applicable to 6. sign "X2", "X3", "X4" or "E6".
132	Omron; E2E-X2Y1; 2-wire type; AC; <100 mA; 24-240 V AC. Temperature range: -40° to +85 °C / -40° to +185 °F. Applicable to 6. sign "E6".
145	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. Temperature range: -25° to +85 °C / -13° to +185 °F. Applicable to 6. sign "X2", "X3", "X4" or "E6".
156	ifm IFC2002-ARKG/UP; 2-wire type, DC; 150 mA, 10-36 V DC, leakage current < 0.6 mA. Temperature range: -25° to +80 °C / -13° to +176 °F. Applicable to 6. sign "E6".

8.	LIMIT SWITCH TYPE
D33	SST Sensor Dual Module, NO, 8–125 V DC / 24–125 V AC Temperature range: -40° to +80 °C / -40° to +176 °F. Applicable to 6. sign "E6".
D44	Namur Sensor Dual Module, 6–29 V DC, > 3 mA; < 1 mA. Temperature range: -40° to +80 °C / -40° to +176 °F. Applicable to 6. sign "E6".
	Reed Type Proximity Switches , 2 pcs. Temperature range -40° to +85 °C / -40° to +185 °F
R01	Stonel; Maxx-Guard G, SPDT, 300 mA, 24 V DC; 200 mA, 125 V AC Applicable to 6. sign "E6".
	Mechanical micro switches Temperature range -40° to +85 °C / -40° to +185 °F.
K25	2 pcs. D2VW-5L2A-1MS; 3 A – 250 V AC, 0.4 A – 125 V DC, 5 A – 30 V DC. M20 x 1.5 conduit entry (2 pcs.). Applicable to 6. sign "E6".
K26	2 pcs. D2VW-01L2A-1MS; gold plated contacts, 100 mA – 30 V DC / 125 V AC. M20 x 1.5 conduit entry (2 pcs.). Applicable to 6. sign "E6".
K45	4 pcs. D2VW-5L2A-1MS; 3 A – 250 V AC, 0.4 A – 125 V DC, 5 A – 30 V DC. M20 x 1.5 conduit entry (4 pcs.). Applicable to 6. sign "E6".
K46	4 pcs. D2VW-01L2A-1MS; gold plated contacts, 100 mA – 30 V DC / 125 V AC. M20 x 1.5 conduit entry (4 pcs.). Applicable to 6. sign "E6".

9.	OPTIONS
Y	Special construction, to be specified

	ACCESSORIES
U24	U/I Converter, P+F KFDX-DCV. DC Input. Input voltage 10 mV to 100 V DC. Power/Supply: 9–30 V DC. Power Consumption: ≤ 1.5 W.
U48	U/I Converter, P+F KFDX-DCV. DC Input. Input voltage 10 mV to 100 V DC. Power/Supply: 9–30 V DC. Power Consumption: ≤ 1.5 W.

Subject to change without prior notice.

Metso Automation Inc.

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

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

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

Asia Pacific, 20 Kallang Avenue, Lobby B, #06-00, PICO Creative Centre, Singapore 339411, Singapore.
Tel. +65 6511 1011. Fax +65 6250 0830

China, 19/F, the Exchange Beijing, No. 118, Jianguo Lu Yi, Chaoyang Dist, 100022 Beijing, China.
Tel. +86-10-6566-6600. Fax +86-10-6566-2575

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

www.metso.com/valves

