

# Neles™ NDX™ intelligent valve controller, compact model

Neles NDX compact model is the next generation intelligent valve controller. It is optimized for single acting actuators and all type of control valves in all industry areas. It guarantees end product quality in all operating conditions with incomparable performance, advanced diagnostics, and years of reliable service. The NDX is a future-proof investment with life-time support for asset management.



## Total cost of ownership

- Fast and reliable installation process
- Low energy and air consumption
- Easy to use diagnostics simplify determining when valve maintenance is required
- Inherent high air capacity eliminates additional instrumentation
- One positioner that fits to all control valves; small and big, rotary and linear, single acting
- Available for intrinsically safe applications

## Key features

- Reliable and robust design
- Industry leading pneumatic capacity
- Benchmark control performance
- Simple and fastest installation and commissioning
- Local / remote operation
- Wide language support
- Expandable architecture
- HART Protocol rev. 7 as standard
- Diagnostics available in every unit
- Self-diagnostics
- Online diagnostics
- History trends
- Communication diagnostics
- Extended off-line test capabilities
- Worldwide support for hazardous area approvals

## Options

- Internal position transmitter
- Gauge block

## Minimized process variability

- Linearization of the valve flow characteristics
- Excellent dynamic and static control performance
- Fast response to control signal change
- Accurate internal measurements



## Easy installation and configuration

- Simple / fast configuration and calibration using one of the following:
  - Standard Local User Interface (LUI) accessible without opening the device cover
    - LUI can be rotated according to mounting position
  - Distributed Control System (DCS) asset management program
- Backwards compatible with retrofit kits for easy replacement of Neles NE700 and ND9000 positioners
- Easy retro-fit to an extensive list of 3rd party control valves
- Installation to all common control systems

## Open solution

- Neles is committed to delivering products that freely interface with software and hardware from a variety of manufacturers; NDX is no exception. This open architecture allows the NDX to be integrated with other field devices to give an unprecedented level of controllability.
- FDT and EDD based multi-vendor support configuration
- Support files for NDX are available from [www.neles.com/NDX](http://www.neles.com/NDX)

## NDX mounting on actuators and valves

- Supports all single acting pneumatic actuators
- Both rotary and linear valves
- Guided startup and automatic/manual calibration

## Product reliability

- Designed to operate in harsh environmental conditions
- Rugged modular design
- Excellent temperature characteristics
- Vibration and impact tolerant
- IP66 enclosure
- Protected against humidity
- Resistant to dirty air
- Wear resistant and sealed components
- Fully contactless and maintenance free position measurement

## Predictive maintenance

- Easy access to collected data with any FDT/DTM software and drivers
- Intelligent diagnostics analysis to visualize control valve health and performance
- Patented on-line valve signature
- Logical trend and histogram collection
- Diagnostics collected continuously while the process is running
- Extensive set of off-line tests with accurate key figure calculations
- Clear notifications with on-line alarms

## Technical description

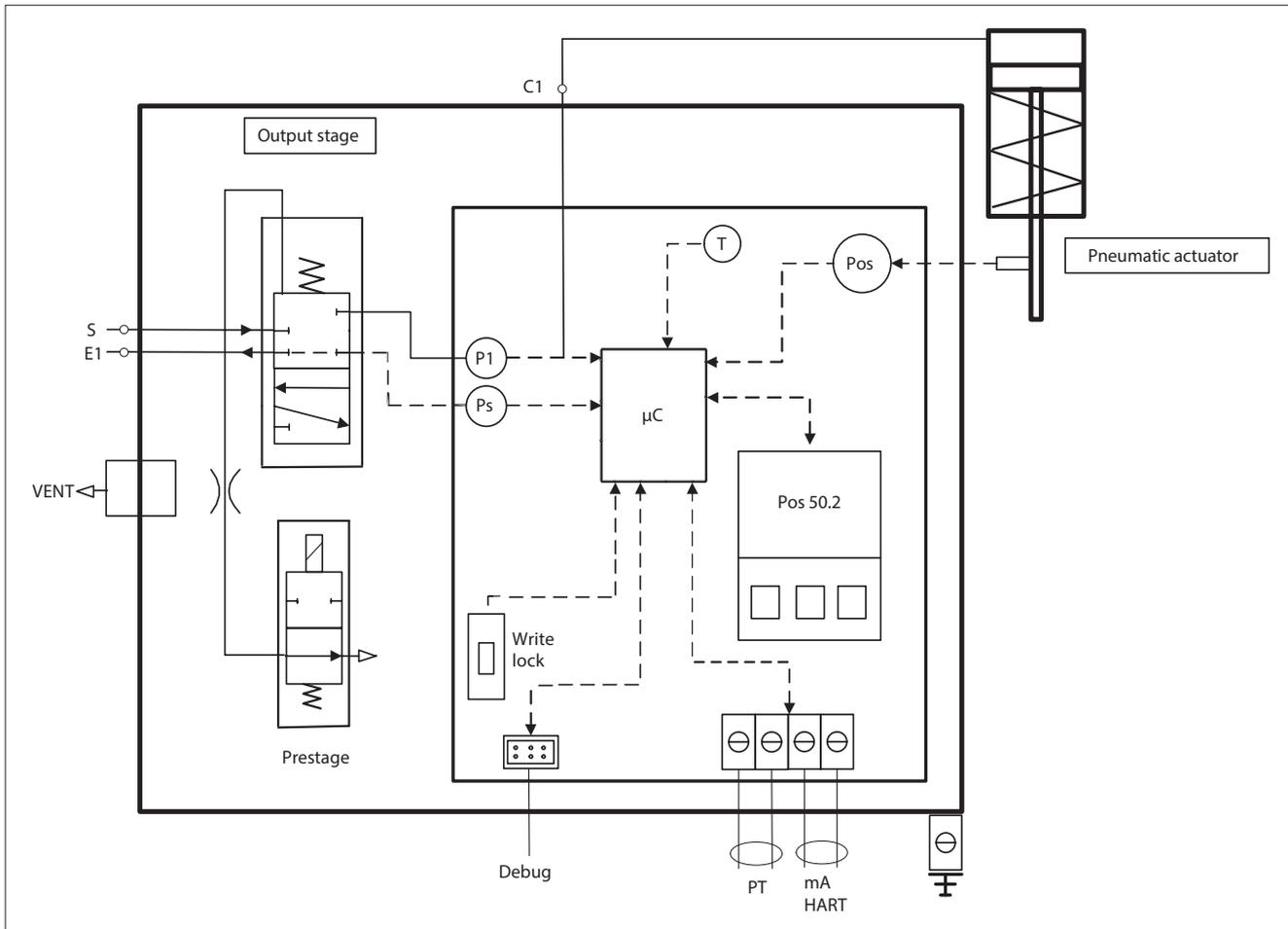
The NDX is a 4–20 mA powered microcontroller based intelligent valve controller. The device contains a local user interface enabling configuration and operation without opening the device cover. Configuration and operation can also be made remotely by PC with asset management software connected to the control loop via HART communication.

After connections of electric signal and pneumatic supply, the micro controller continuously reads measurements:

- Input signal
- Valve position with contactless sensor
- Actuator pressure
- Supply pressure
- Device temperature

Advanced self-diagnostics guarantee that all measurements operate correctly.

Powerful microcontroller calculates a control signal for I/P converter. I/P converter (prestage) controls the operating pressure to the pneumatic relay (output stage). Pneumatic relay moves and actuator pressure changes accordingly. The changing actuator pressure moves the control valve. The position sensor measures the valve movement. The control algorithm modulates the I/P converter control signal until the control valve position is according to the input signal.



## Technical specifications NDX intelligent valve controller

### General

Loop powered 4-20 mA, no external power supply required.  
 Suitable for linear and rotary valves. Actuator connections in accordance with VDI/VDE 3845 and IEC 60534-6 standards.  
 Action: Single acting, direct or reverse  
 Travel range: Linear: 5-120 mm / 0.2-4.7 in  
 220 mm / 8.5 in  
 Rotary: 30-160 degrees

### Environmental influence

Standard temperature range:  
 - 40° - +85 °C / -40° - +185 °F  
 Influence of temperature on valve position:  
 Rotary: 0.5 % / 10 °C  
 Linear: 0.1 mm / 10 °C  
 LUI usable range: - 30° - +60 °C  
 Temperature cycling/Dry heat:  
 Acc. to IEC 60068-2-2  
 Humidity Limits: Acc. to IEC 61514-2  
 Magnetic Fields: Negligible at 30 A/m  
 Acc. to IEC 61000-4-8  
 Vibration: Tested acc. to ANSI/ISA-75.13.01-2013

### Electromagnetic protection

Emission acc. to IEC 61000-6-4  
 Immunity acc. to EN 61000-6-2

### Enclosure

Housing material: Epoxy coated anodized aluminum alloy, EN1706 AC - AlSi12 (b), copper free, Cu content max 0.4 %  
 Cover material: Compact - polycarbonate  
 Magnet holder: Glass fiber reinforced polyamide, PA66GF20  
 Protection class: IP66, NEMA 4X  
 IP67 for storage and transport  
 Pneumatic ports:  
 Supply air: 1/4 NPT, G1/4 with additional block  
 Actuator: 1/4 NPT, G1/4 with additional block  
 Exhausts: 3/8 NPT, G3/8 with additional block  
 Cable entry: 2 pcs. 1/2 NPT (M20 with adapter)  
 Weight: 2.0 kg / 4.4 lbs (Compact)

### Pneumatics

Supply pressure: 1.4–8 bar / 20–116 psi (single acting)  
 2–8 bar / 29–116 psi (double acting)  
 Supply media: Air, nitrogen, sweet natural gas  
 Effect of supply pressure on valve position:  
 < 0.1 % at 10 % difference in inlet pressure  
 Air quality: Acc. to ISO 8573-1  
 Solid particles: Class 7 (40 µm filtration)  
 Humidity: Class 1 (at minimum dew point 10 °C/ 18 °F below minimum temperature is required)  
 Oil class: 3 (or < 1 ppm)  
 Air capacity<sup>1</sup>: 80 Nm<sup>3</sup> / h / 47.1 scfm  
 Air consumption in steady state position<sup>1</sup>:  
 0.1 Nm<sup>3</sup>/h / 0.06 scfm

<sup>1</sup> rated at 4 bar / 60 PSI supply pressure

### Electronics

HART Protocol rev. 7 as standard  
 Supply power: Loop powered, 4–20 mA  
 Min. signal: 3.8 mA  
 Min. control signal: 3.95 mA  
 Current max: 120 mA  
 Load voltage: 9.7 VDC at 20 mA  
 9.0 VDC at 4 mA  
 Impedance at 20mA: 485 Ω  
 Maximum voltage: 30 VDC  
 Rev. polarity protection: -30 VDC  
 Over current protection: active over 35 mA  
 Wire size: 0.5-2.5 mm<sup>2</sup> (14-20 AWG)

### Performance with moderate constant-load actuators

Dead band: ≤ 0.2 %  
 Hysteresis: < 0.5 %  
 Linearity error: < 0.5 %  
 Repeatability: < 0.2 %

### Local User Interface (LUI) functions

Accessible with the cover installed.

- PIN code lock to prevent unauthorized / unintended access with the cover installed or permanently (if configured)
- Guided-startup wizard
- Language selection; English, Chinese, Spanish, Italian, French, Korean, German, Turkish, Dutch, Portuguese, Japanese (pending)
- Calibration: Automatic / Manual / 1-Point
- 3-point measurement linearization
- Configuration of the control valve
  - Actuator type & valve type
  - Valve dead angle
  - Safety cut-off range
  - Input signal direction
  - Positioner fail action
- Monitoring of valve position, target position, input signal, temperature, supply and actuator pressure
- Manual control of the valve from Local User Interface

Note: LUI usable temperature range is -30° to +60 °C

### Position transmitter (optional)

Output signal: 4–20 mA (galvanic isolation; 600 VDC)  
 Supply voltage: 12–30 VDC  
 Linearity: < 0.05 % FS  
 Temperature effect: < 0.35 % FS  
 Failsafe output: 3.5 mA or 22.5 mA  
 Maximum external load: 690 Ω for I.S.  
 Ex ia IIC T6 Ui ≤ 28 V

## Approvals and electrical values

Approval	EC Type examination	Electrical values
II 1 G Ex ia IIC T6...T4 Ga II 1 D Ex ia IIIC T <sub>200</sub> 85 °C...T <sub>200</sub> 115 °C Da IP 66  II 2 G Ex ib IIC T6...T4 Gb II 2 D Ex ib IIIC T <sub>200</sub> 85 °C...T <sub>200</sub> 115 °C Db IP 66	EESF 21 ATEX 018X EN 60079-0:2018 EN 60079-11:2012	Input: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH. PT loop: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH, external load resistance 0–690 Ω
II 3 G Ex ec IIC T6...T4 Gc II 3 G Ex ic IIC T6...T4 Gc II 3 D Ex ic IIIC T85 °C...T115 °C Dc IP 66	EESF 21 ATEX 019X EN 60079-0:2018 EN 60079-11:2012 EN 60079-7:2015/A1:2018	Input: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH. PT loop: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH, external load resistance 0–690 Ω
Ex ia IIC T6...T4 Ga Ex ia IIIC T <sub>200</sub> 85 °C...T <sub>200</sub> 115 °C Da IP 66  Ex ib IIC T6...T4 Gb Ex ib IIIC T <sub>200</sub> 85 °C...T <sub>200</sub> 115 °C Db IP 66	IECEx EESF 21.0014X IEC 60079-0:2017 IEC 60079-11: 2011	Input: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH. PT loop: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH, external load resistance 0–690 Ω
Ex ec IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Ex ic IIIC T85 °C...T115 °C Dc IP 66	IECEx EESF 21.0014X IEC 60079-0:2017 IEC 60079-11: 2011 IEC 60079-7:2017	Input: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH. PT loop: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1 W, C <sub>i</sub> ≤ 3.7 nF, L <sub>i</sub> ≤ 10.9 μH, external load resistance 0–690 Ω

Approval	CSA certificate number	Electrical values
Class I, Division 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 Class I, Division 2, Groups A, B, C, and D; T4/ T5/T6 Ex ic IIC T4/T5/T6 Gc Class I, Zone 2 AEx ic IIC T4/T5/T6 Gc	70030683  CSA C22.2 No. 0-M91 CSA C22.2 No. 60079-0:15 CSA C22.2 No. 60079-11:14 UL 60079-0:13 UL 60079-11:13 CAN/CSA 61010-1-12 ANSI/UL 61010-1-2012	Input: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1.0 W, C <sub>i</sub> ≤ 22 nF, L <sub>i</sub> ≤ 100 μH PT loop: U <sub>i</sub> ≤ 28 V, I <sub>i</sub> ≤ 120 mA, P <sub>i</sub> ≤ 1.0 W, C <sub>i</sub> ≤ 22 nF, L <sub>i</sub> ≤ 100 μH
Class I, Division 2, Groups A, B, C, and D; T4/ T5/T6 Ex nA IIC T4/T5/T6 Gc Class I, Zone 2 AEx nA IIC T4/T5/T6 Gc	ANSI/UL 61010-1-2012 CSA C22.2 No. 213-17/ UL 121201 CAN/CSA-C22.2 No. 60079- 15:16 UL 60079-15:13	Input: U <sub>i</sub> ≤ 28 V PT loop: U <sub>i</sub> ≤ 28 V



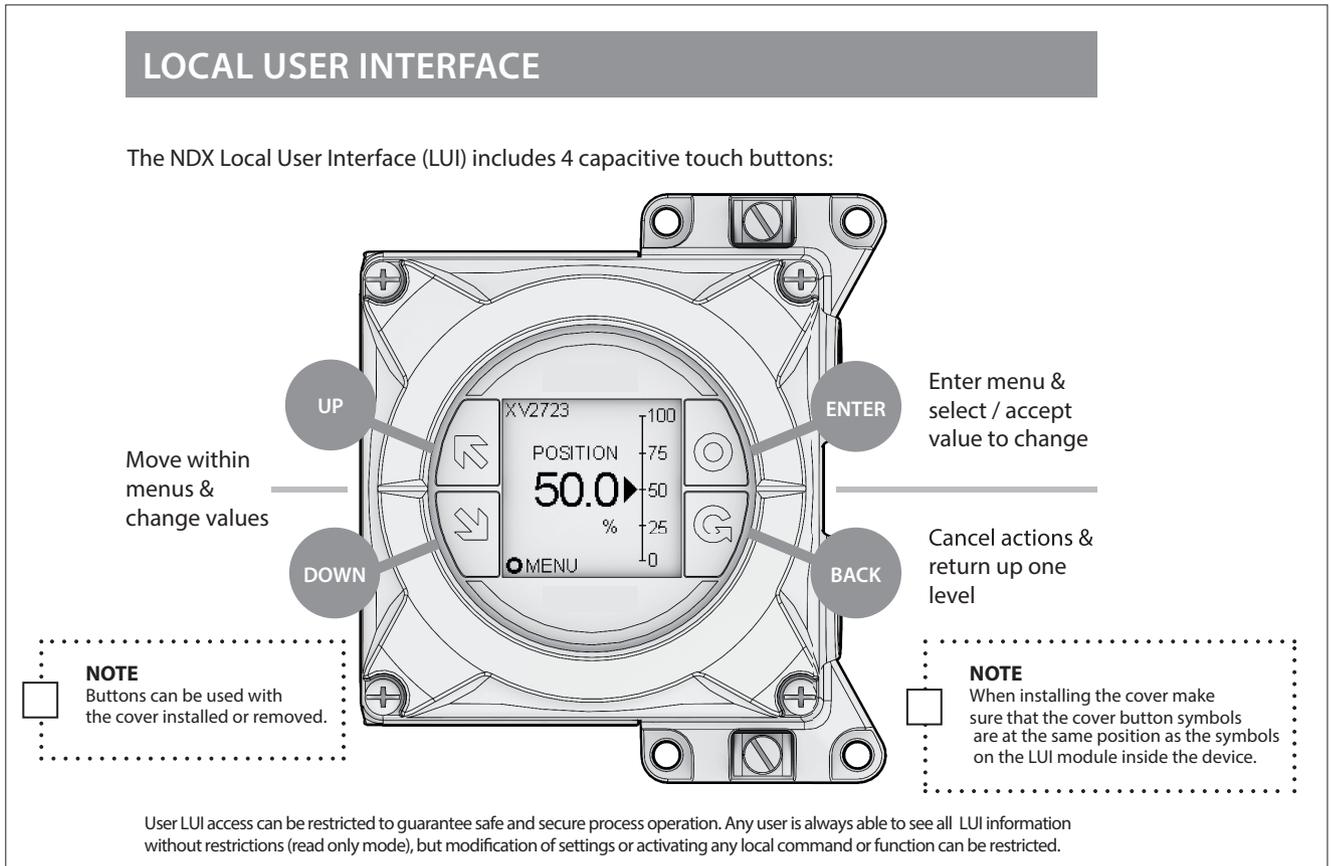


Fig. 1. Local User Interface (LUI) enables easy parameterization and calibration without opening device cover. It also gives real time awareness of control parameters in the device at a glance.

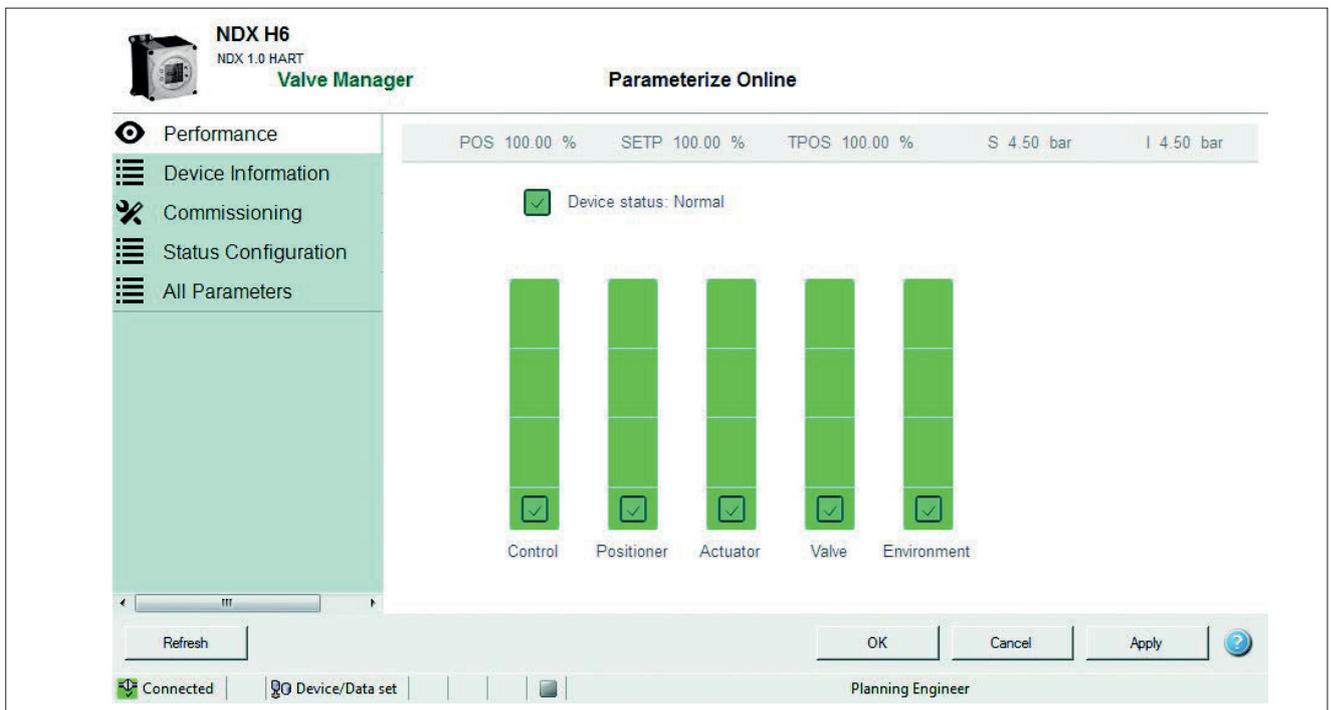
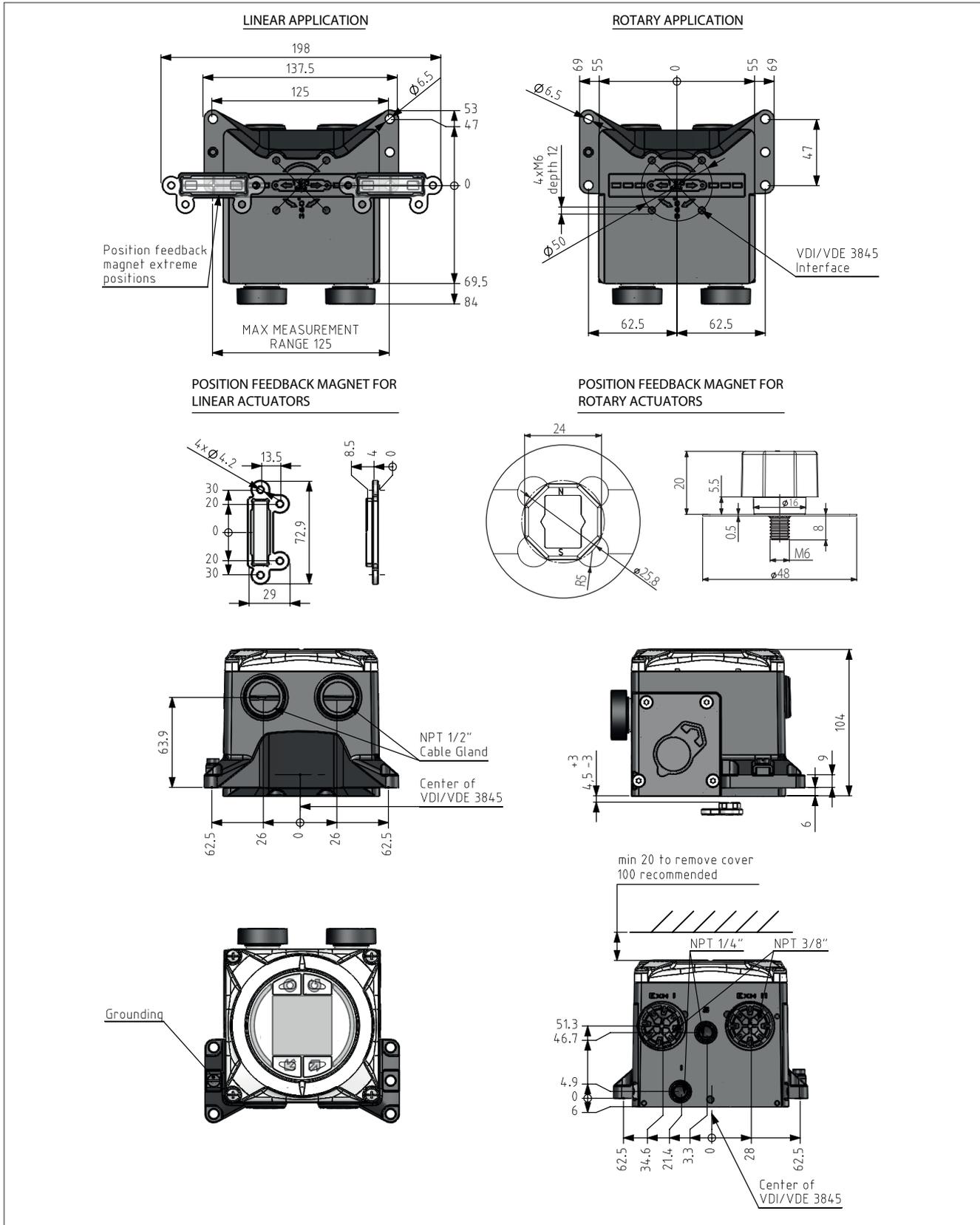


Fig. 2. The Performance View of the Neles Valve Manager graphically displays indexes of the valve, actuator and positioner, as well as indexes of control performance and the application environment. Report will show explanations of the status of each component and guidelines for recommended actions.

## Dimensions

### NDX1510\_





## How to order intelligent valve controller NDX

<b>1. sign</b>																				<b>PRODUCT GROUP</b> Intelligent Valve Controller Series NDX Compact Model				
<b>2. sign</b> 1																				<b>PNEUMATIC ACTION</b> Single Acting				
<b>3. sign</b> 5																				<b>PNEUMATIC CAPACITY</b> Normal Capacity (80 Nm <sup>3</sup> /h)				
<b>4. sign</b> 1																				<b>FAIL ACTION</b> Fail safe				
<b>5. sign</b> 0																				<b>ENCLOSURE</b> <b>IP66 / NEMA 4X. 1/2 NPT conduit entry, 2 pcs</b> Compact - Epoxy coated anodized aluminum housing with polycarbonate cover. Applicable to 2. sign "1"				
<b>6. sign</b> H T																				<b>COMMUNICATION / INPUT SIGNAL RANGE</b> 4-20 mA with HART communication 4-20 mA with HART + PT Internal 2-wire (passive) position transmitter. Analog position feedback signal, output 4-20 mA, supply voltage 12 - 30 V DC				
<b>7. sign</b> G																				<b>TEMPERATURE RANGE</b> General: -40 ... +85 °C / -40 ... +185 °F				
<b>8. sign</b> -																				<b>SHALL ALWAYS BE HYPHEN OR SLASH</b> Default option				
<b>9. sign</b> N X																				<b>APPROVALS FOR HAZARDOUS AREAS 1</b> If approvals are selected for both signs 9. and 10., keep the order shown below, e.g. XC type shall be selected instead of CX type. If there is no need for dual approval, sign 9. or 10. shall be N.  No approval ATEX and IECEx certifications: II 1 G Ex ia IIC T6...T4 Ga II 1 D Ex ia IIIC T <sub>200</sub> 85 °C...T <sub>200</sub> 115 °C Da IP66 II 2 G Ex ib IIC T6...T4 Gb II 2 D Ex ib IIIC T <sub>200</sub> 85 °C...T <sub>200</sub> 115 °C Db IP66 T4 or T115: -40°C...+80°C; T5 or T100: -40°C...+65°C; T6 or T85: -40°C...+50°C II 3 G Ex ic IIC T6...T4 Gc II 3 G Ex ec IIC T6...T4 Gc II 3 D Ex ic IIIC T85 °C...T115 °C Dc IP66 T4 or T115: -40°C...+85°C; T5 or T100: -40°C...+65°C; T6 or T85: -40°C...+50°C				
<b>NDX</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>0</b>	<b>H</b>	<b>G</b>	<b>-</b>	<b>X</b>	<b>N</b>	<b>0</b>	<b>N</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>SAMPLE MODEL CODE (char = 21)</b>			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20					



## Additional accessories

CONDUIT ENTRY NIPPLES	
CE10	M20x1,5 conduit entry nipples Brass 1/2NPT / M20x1,5 (H5407)
CE52	M20x1,5 conduit entry nipples AlMgSi1 Anodized 1/2NPT / M20x1,5 (H140515)

CABLE GLANDS	
CG51	1/2NPT for NDX (H142731, grey/plastic)
CG8	1/2NPT for NDX (code H6813, blue/plastic)

PRESSURE GAUGES AND CONNECTION BLOCKS	
Pressure gauges in modules GB01, GB03: scale 0-12 bar/psi/kPa (bar/psi/ kg/cm <sup>2</sup> ), AISI304 housing, polycarbonate lens, oil filled. Temperature range -55...+85 °C / -67...+185 °F. Material of pneumatic connection block is AlSiMg, painted grey in blocks GB01, GB02, GB03	
GB01	Two pressure gauges with connections 1/4 NPT (S, C2). Use with NDX compact housing (NDX1510_). Gauges AISI304, block AlSiMg. H158769
GB02	Connection block module without gauges. Converts NDX pneumatic connections to G1/4. Use with NDX compact housing (NDX1510_). H158770
GB03	Two pressure gauges with connections G1/4 (S, C2). Converts also NDX connections to G1/4. Use with NDX compact housing (NDX1510_). Gauges AISI304, block AlSiMg. H158771

DRIVER SETS FOR ACTUATORS	
DS51	Feedback set for NDX on linear actuators. Includes the magnet and a carrier for the magnet. For stroke lengths up to 120 mm. (H137410)
DS52	Feedback set (driver set) for NDX on VDI actuators. Includes the magnet and parts needed for attachment to actuator shaft. (H142751).

MOUNTING SETS for NDX / Linear Neles VD series actuators	
Mounting sets between the NDX valve controllers and linear Neles VD series actuators, including bracket and feedback system.	
MS51	Neles VD 25, stroke length 20 mm. AISI 316. (H134414)
MS52	Neles VD 29, stroke length 20-40 mm. AISI 316. (H134388)
MS53	Neles VD 37, stroke length 20-50 mm. AISI 316. (H134392)
MS54	Neles VD 48/55_R, stroke length 40-80 mm. AISI 316. (H134368)

3RD PARTY MOUNTING SETS for NDX / Linear actuators	
Mounting sets between the NDX valve controllers and 3rd party linear actuators, including bracket and feedback system.	
MS61	Mounting set for NDX / linear actuators, attachment face according to IEC 60534-6, stroke length 10-120 mm. AISI316. (H134584)
MS62	Masoneilan 37/38 actuators, sizes 9...15. AISI316. (H138350)
MS63	Masoneilan 87/88 actuators, sizes 6...23. Stroke length 12-64 mm. AISI316. (H134156)
MS64	Fisher 657/667 sizes 30...34, stroke length 19-29 mm. AISI316. (H134202)
MS65	Fisher 657/667 sizes 40...50, stroke length 38-51 mm. AISI316. (H138348)
MS66	Fisher 657/667 sizes 70...87, stroke length 76-102 mm. AISI316. (H138349)

3RD PARTY MOUNTING SETS for NDX / Rotary actuators	
Mounting sets between the NDX valve controllers and rotary actuators, including bracket and feedback system.	
MS81	Mounting set for rotary actuators with VDI/VDE 3845 attachment face, also Neles B-series actuators B1CU/B1JU 6...20. Attachment dimensions 80X30-20 (VDI1). (H141553)
MS82	Mounting set for rotary actuators with VDI/VDE 3845 attachment face. Attachment dimensions 80X30-30 (VDI 2). (H141561)
MS83	Mounting set for rotary actuators with VDI/VDE 3845 attachment face, also Neles B-series actuators B1CU/B1JU 25...502. Attachment dimensions 130X30-30 (VDI3). (H141563)
MS84	Mounting set for rotary actuators with VDI/VDE 3845 attachment face. Attachment dimensions 130X30-50 (VDI 4). (H141562)

IMOs for NDX	
NDX delivery includes the Quick Guide only. The IMO is available in electronic format via <a href="http://www.neles.com/ndx">www.neles.com/ndx</a> . If a printed IMO is required with the delivery, use the following.	
IM01	NDX IMO English. 7NDX71_EN. (H137441)
IM02	NDX IMO Chinese. 7NDX71_ZH. (H143226)



**Valmet Flow Control Oy**

Vanha Porvoontie 229, 01380 Vantaa, Finland.

Tel. +358 10 417 5000.

[www.valmet.com/flowcontrol](http://www.valmet.com/flowcontrol)

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