

NELES

Product school

Intelligent valve controllers overview
Welcome and thank you for attending this session

In session features

Practicalities – submit questions

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▼ Questions

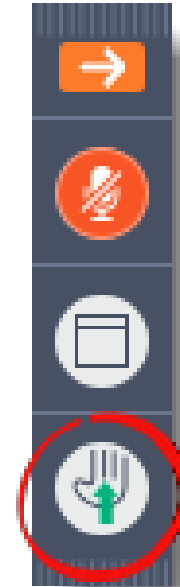
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Send

Webinar Housekeeping

Webinar ID: 608-865-371

 GoToWebinar



- Name
 - Mark Buzzell
- Brief Bio
 - I've been with Neles since 2007.
Most of this time as technical support and then product management for the Neles intelligent valve controllers.
Recent addition of pneumatic rotary actuators to my product management responsibility.
- Position
 - Product Manager – Valve Controls and Actuation



Training Objectives

Valve Controllers

This training will **cover**:

- Features and benefits of the following Neles intelligent valve controllers
 - NE/NP700, ND9000, NDX, VG9000, & SG9000

This training will **not cover**:

- How to install, operate, and maintain the products.
- The following products/brands are not covered:
 - StoneL, Valvcon™
 - fdtCONTAINER / DTMs



Valve Controller Types

Control (Modulating)			On/off		
Pneumatic 3-15psi	Electro- pneumatic 4-20mA	Digital positioners	Solenoid	Solenoid + limit switch	PST device
					
1960's	1970's	1990's	1910's	2000's	2000's

Neles Valve Control Portfolio

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Control

Intelligent w/
standard
diagnostics



NDX

All control applications
Hazardous area requirements
Communication & diagnostics

Intelligent w/
advanced
diagnostics



ND9000

Analog
electro-
pneumatic



NE700

Basic control applications
No hazardous area requirements
No communication or diagnostics

Analog
pneumatic
3-15psi



NP700

On/off

Limit
switch



Quartz

Eclipse

Hawkeye

All applications
w/ position
feedback

Standard
SOV + LS



Axiom

All on/off
applications
with switches

Intelligent
SOV + LS



SwitchGuard

Critical on/off
applications
with diagnostics

Safety
ESD & ESV



ValvGuard

ESD/ESV on/off
applications
with SIL / PST



fdtCONTAINER 4

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Positioner Basics

Positioner Types

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- Analog Positioners

- Pneumatic (i.e. NP700)

- Position is controlled by a 3-15psi signal typically from an external I/P converter.

- Electro-pneumatic (i.e. NE700)

- Position is controlled by a 4-20mA signal from the control system.

- Analog positioners are proportional only control

- Uses beams, levers, springs, cams...
 - Less accurate and vibration resistant than a digital positioner. Time consuming manual calibration.

- Digital Positioners (i.e. ND9000 / NDX)

- Position is controlled by a 4-20mA or digital/fieldbus signal.

- More accurate control with automatic calibration and diagnostics to help find problems with the positioner, valve, and even loop tuning.

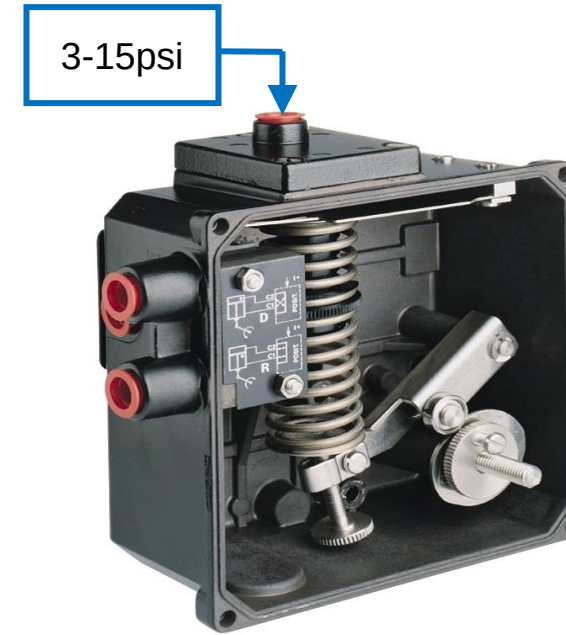


NP700

Pneumatic Valve Positioner

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- Operates on a pneumatic 3-15 psi signal
 - Standard split range: 0-100%, 0-50% and 50-100%
- One model for double or single-acting actuators
- Available for rotary and linear valves
- Field-reversible changeover piece allows the direction of operation to be changed.
- Explosion proof version available, NP70_/B1 (direct mounted I/P converter)
- When to specify:
 - The customer requests a pneumatic positioner
 - There is only pneumatic control signal available (w/ external I/P converter)
 - Generally, requires re-wiring to bring the 4-20mA wires from the I/P to the positioner if converting to a NE/ND
 - The customer requests an electro-pneumatic positioner but requires explosion-proof approvals (N/A w/ NE700). Always consider an ND9000 or NDX in this case.

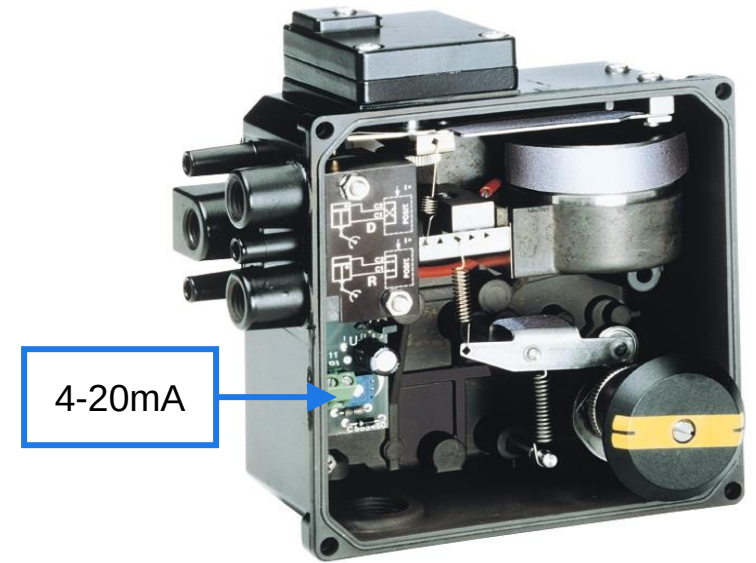


NE700

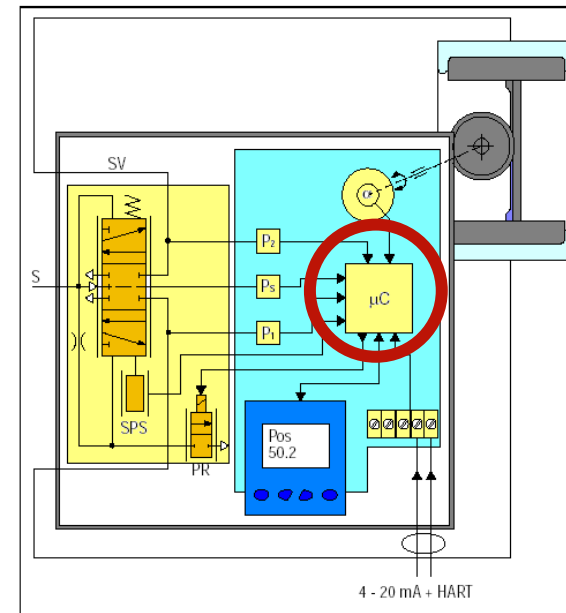
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Electro-Pneumatic Valve Positioner

- Operates on a milliamp signal (4-20mA or 0-20mA)
 - Standard split range: 0-100%, 0-50% and 50-100%
- One model for double or single-acting actuators
- Available for rotary and linear valves
- Field-reversible changeover piece allows the direction of operation to be changed.
- When to specify:
 - The customer requests an electro-pneumatic “dumb” positioner without hazardous area approvals, fieldbus communication, or internal diagnostics.
 - Generally, we should push the ND9/NDX series. For a small initial price increase it saves time during commissioning, improves control, and adds in valuable diagnostics to improve troubleshooting/maintenance. Plus, the ND9/NDX series has a lower temperature range (-40°F vs -13°F) and a better enclosure rating (IP66 vs IP54) as standard.

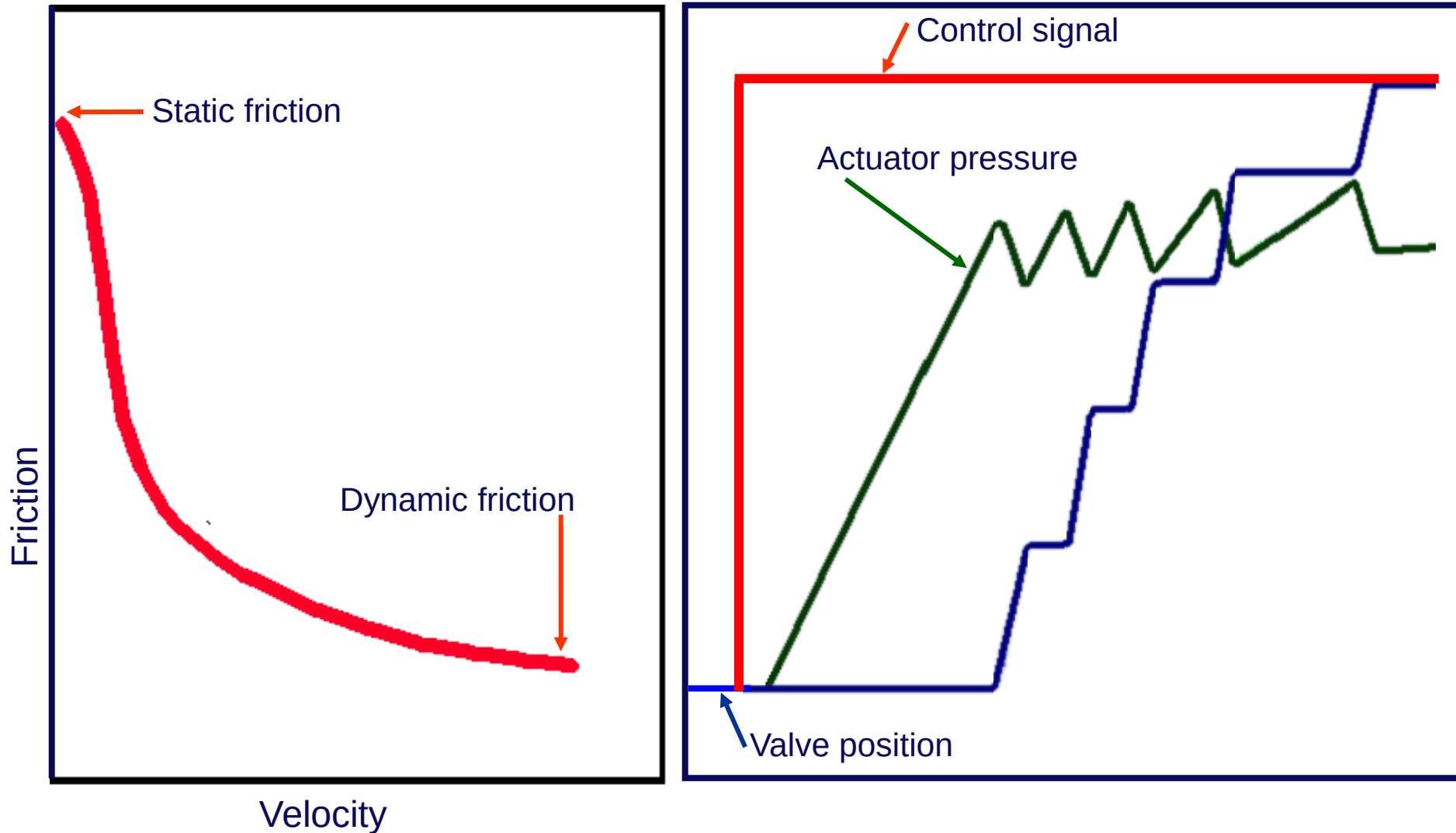


- Analog positioners have proportional only control
 - The positioner will not correct for any offset after the initial movement
- Digital positioners have advanced control algorithms
 - Based on detailed mathematical study of control valve dynamics.
 - Algorithms eliminate error and learn static friction levels to send a pressure “boost” to break static friction quickly



$$\begin{aligned} & \left[m_{\text{red}} \cdot \frac{dx}{d\psi} + J \cdot b(\psi, \mu) \right] \cdot \frac{d^2\psi}{dt^2} + m_{\text{red}} \cdot \frac{d^2x}{d\psi^2} \cdot \left(\frac{d\psi}{dt} \right)^2 \\ & + \left[f_m \cdot \frac{dx}{d\psi} + f_v \cdot b(\psi, \mu) \right] \cdot \frac{d\psi}{dt} \\ & + \text{sign}\left(\frac{d\psi}{dt}\right) \cdot b(\psi, \mu) \cdot M_{v\mu}(\psi, \mu, \Delta p) \\ & + b(\psi, \mu) \cdot M_d(\psi, \Delta p) - F_m(P_A P_B) = 0 \end{aligned}$$

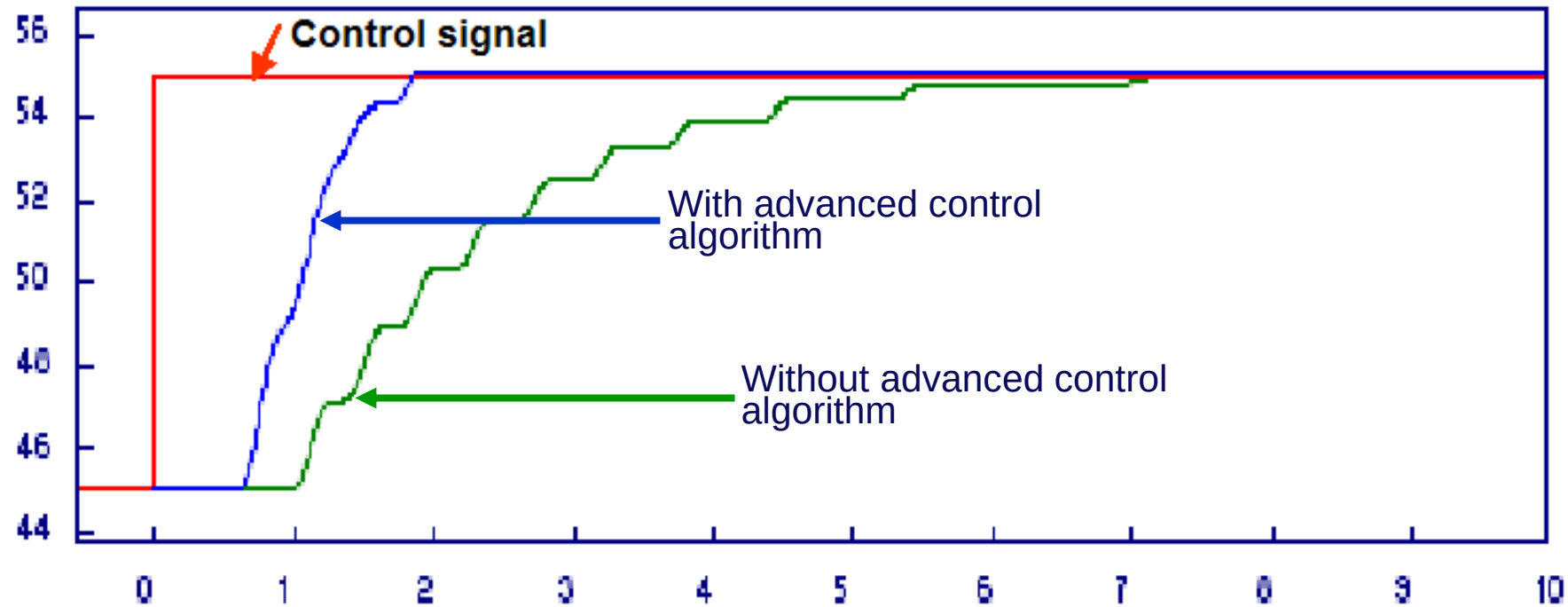
Valve Nonlinearities Due to Friction



Advanced Control Algorithm

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Reduces dead time and overall response time



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Common Design Features

Neles Intelligent Valve Controllers

Designed for Difficult Environments

Neles Intelligent Valve Controllers



Robust enclosures and materials

Feature	ND9	NDX	VG9	SG9
Enclosure: Aluminum w/ plastic cover	✓	✓		
Enclosure: Flameproof aluminum	✓	✓	✓	✓
Enclosure: Flameproof stainless	✓		✓	✓
Enclosure: Stainless w/ plastic cover	✓			
IP 66 / NEMA 4X rated	✓	✓	✓	✓
Rated from -40..+185°F as standard	✓ -53°C opt.	✓	✓	✓

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Challenge

Corrosive environments

Extreme temperatures

Solution

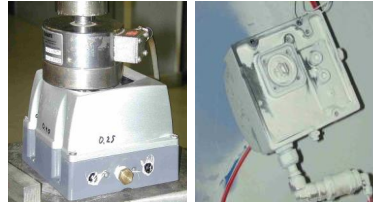
Robust enclosures and materials

Designed for Reliability

Neles Intelligent Valve Controllers

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Robust design



Feature	ND9	NDX	VG9	SG9
Electronics protected against water	Black lacquer	Fully potted	Black lacquer	Black lacquer
Contactless position sensing	Hall effect	Magnetic	Hall effect	Hall effect
Comprehensive internal diagnostics	✓	✓	✓	✓
High vibration tolerance	✓	✓	✓	✓
Extensive field experience	✓	✓	✓	✓

Challenge

Unplanned shutdowns

High cost of maintenance or replacement positioners

Solution

Robust design

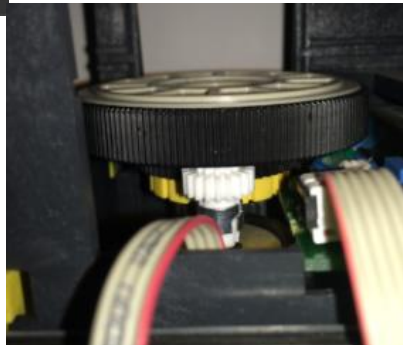
Designed for Reliability

Neles Intelligent Valve Controllers

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Competitive analysis:

- No coatings on electronics
- Contacting position sensors with plastic gears



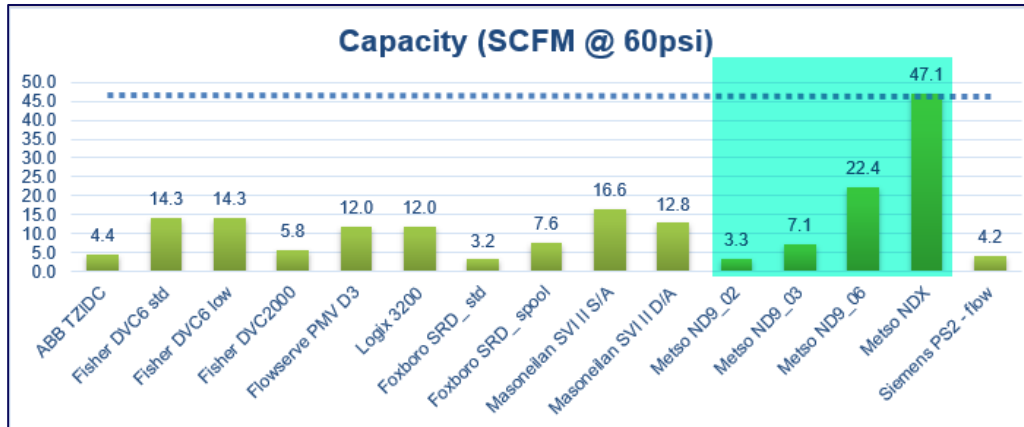
Designed for High Pneumatics Capacity

Neles Intelligent Valve Controllers

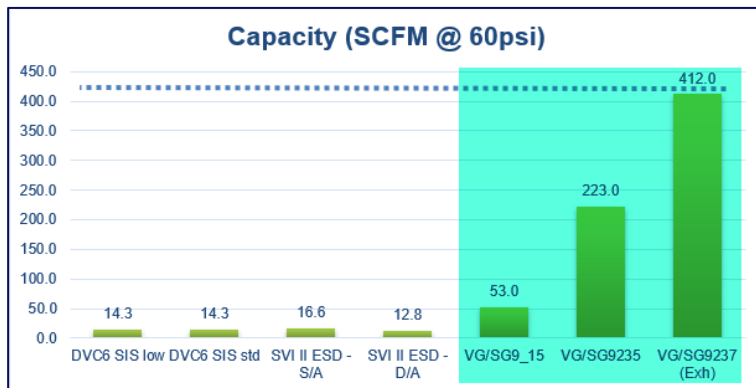
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High capacity options

Control
Positioners



PST
Devices



Challenge

Additional costs for VBs and QEVs

Complexity for tuning control with extra instrumentation

Solution

Multiple high capacity options

Designed as an All in One Package

Neles Intelligent Valve Controllers

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Integrated Feedback Options

- Integrated limit switches
 - StoneL™ SST & Namur dual modules
 - Inductive proximity switches
 - Mechanical micro switches
- Integrated 4-20mA position transmitter
- Digital position feedback through the fieldbus



Challenge

Complex tandem mounting brackets for position feedback

Solution

Integrated feedback options

Designed for Simple Configuration

Neles Intelligent Valve Controllers

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Local user interface

Feature	ND9	NDX	VG9	SG9
Standard local user interface	✓	✓	✓	✓
LCD display size (sq inches)	0.38	2.60	0.38	0.38
Multiple language options	3	11	3	3
Buttons usable with the cover off/on	Off	Off/on	Off	Off
Display can be rotated		✓		
Usable with a handheld or remotely	✓	✓	✓	✓



Challenge

Complicated
commissioning

Additional hardware
required for configuration

Solution

Local user interface

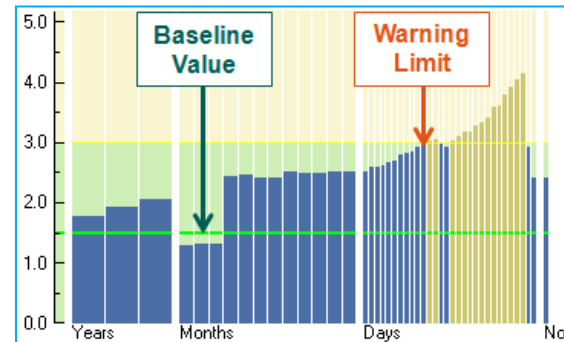
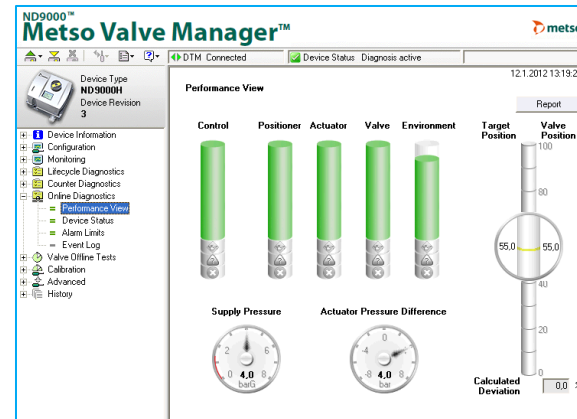
Designed for visibility into your valves

Neles Intelligent Valve Controllers

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Advanced diagnostics

- Integral pressure sensors and advanced diagnostics as standard
- User friendly metrics for valve assembly and trouble shooting guide
- Diagnostics automatically stored in onboard memory



Challenge

Lost or lower quality production

Expertise needed for diagnostic evaluation

No full asset management system

Solution

Advanced diagnostics

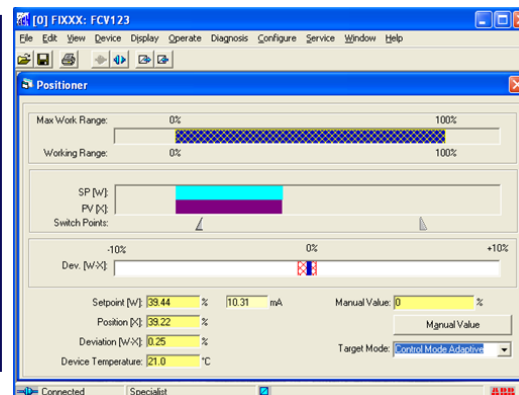
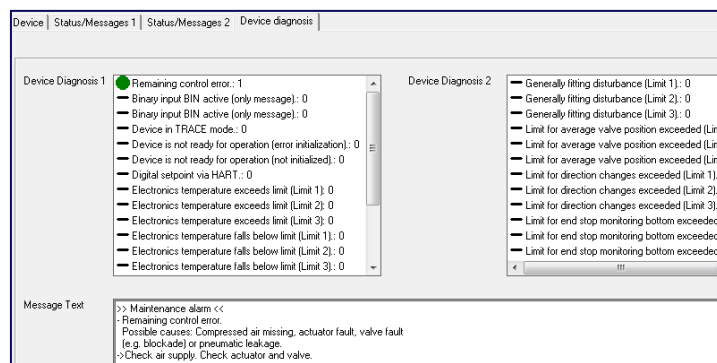
Designed for visibility into your valves

Neles Intelligent Valve Controllers

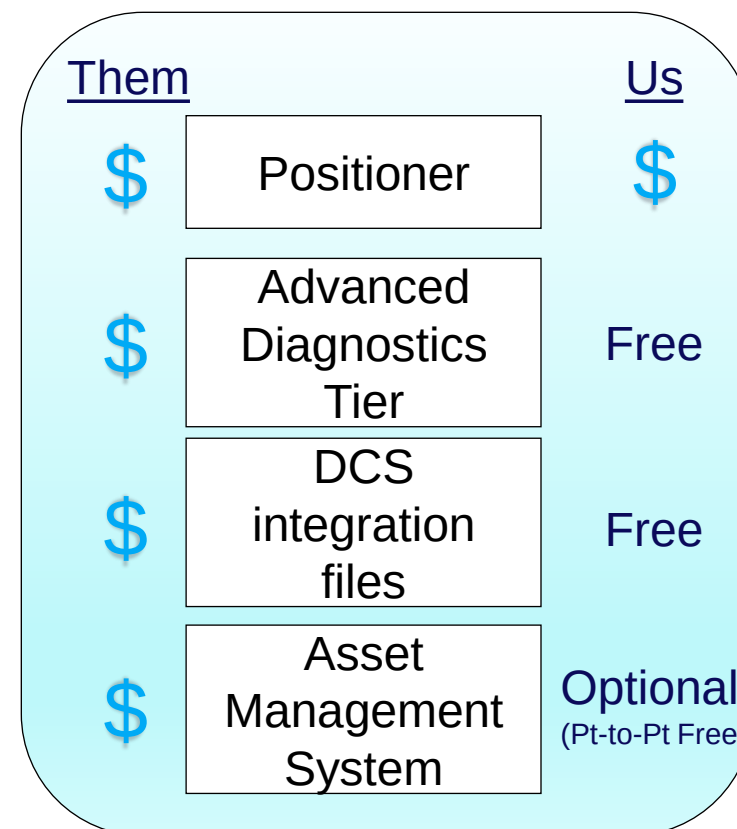
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Competitive analysis:

- No pressure sensors
- Very basic diagnostics
- Extra \$ for advanced diagnostics tiers
- Full asset management system required (no local storage)



Basic diagnostic features only



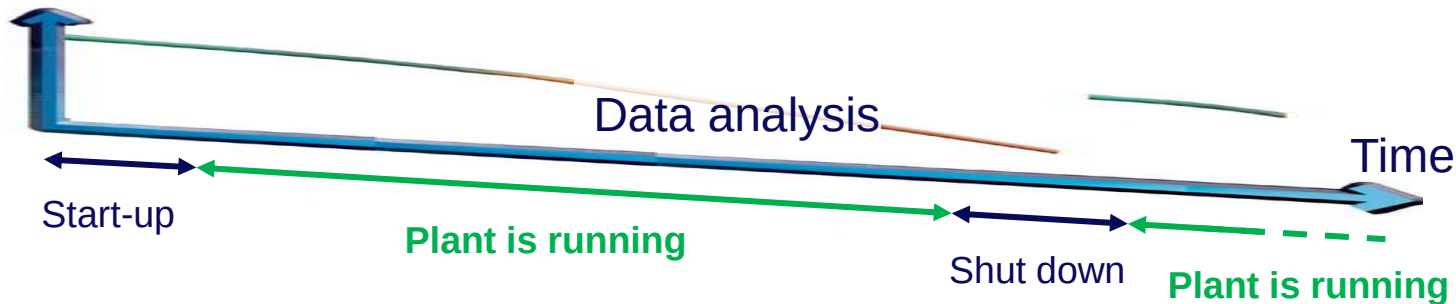
Designed for improved shutdown planning

Neles Intelligent Valve Controllers

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Advanced diagnostics while the plant is running

- Valve performance assessed during run-time
- No extra work during start-up / shut-down
- Diagnostic data automatically stored onboard



Challenge

Short shut-downs

Wasted time / \$ repairing good valves

Parts not available during shutdown

Solution

Advanced diagnostics while the plant is running

Designed for Simple System Integration

Neles Intelligent Valve Controllers

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FREE point to point asset management software

- Available field device communication protocols:

Protocol	ND9	NDX	VG9	SG9
HART protocol revision	6/7	6/7	6	6
Foundation Fieldbus H1	✓		✓	
Profibus PA	✓			

- Support for systems using EDDL (Electronic device description language) and FDT / DTM (Field Device Tool / Device Type Manager)
 - Including: ABB, AVM, Emerson AMS, Honeywell FDM, Siemens PDM, Rockwell Asset Centre, Yokogawa PRM...
- FREE support file download for all Neles devices
 - <https://www.neles.com/valves-services/valve-software>



Challenge

Various control systems and protocols in use

High costs of integration files

Solution

Open standards for DCS & AMS integration

Designed for Simple Device Configuration

Neles Intelligent Valve Controllers

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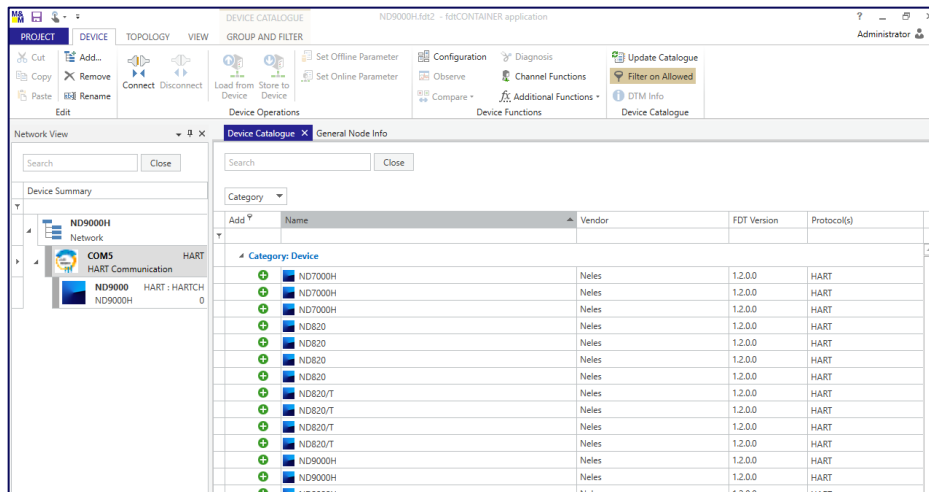
- FREE point to point asset management software, fdtCONTAINER, and FREE device drivers / DTMs
 - <https://www.neles.com/valves-services/valve-software>
- High speed device communication for fast configuration / diagnostics (NDX only)

Challenge

High costs of asset management software for access to advanced configuration / diagnostics

Solution

FREE point-to-point asset management software



USB 4-20mA Source (H139981)

Designed for Hazardous Areas

Neles Intelligent Valve Controllers

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Hazardous area coverage for around the world

		ND9000	VG9000	SG9000	NDX
	Europe (ATEX)	✓	✓	✓	✓
	International (IECEx)	✓	✓	✓	✓
	North America (cCSAus)	✓	✓	✓	
	Brazil (Inmetro)	✓	✓	✓	
	China (NEPSI)	✓	✓	✓	✓
	India (CCOE/PESO)	✓	✓	✓	✓
	Korea (KOSHA)	✓	✓	✓	✓
	Russia (TR CU / GOST R)	✓	✓	✓	
	South Africa (SABS)	✓	✓	✓	✓

Challenge

Various hazardous area standards around the world

Solution

Coverage for around the world

Designed for use on 3rd party actuators

Neles Intelligent Valve Controllers

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- Hundreds of mounting set designs for use on thousands of rotary and linear actuators
- Neles linkage book update to include the “universal kit” which can be used with any Neles positioner but requires the use of a rotary driver set or a “complete kit” which includes all parts.
- Note: rotary driver sets are no longer automatically included with the positioner. You must do one of the following:

1. Order the driver set separately (i.e., MA0145848)
2. Order the driver set with the positioner (i.e., DS02)
3. Order the driver set as part of the “complete” mounting kit.

	N_700	9000 Series	NDX
DRIVER SET*			
All Rotary Actuators	378258	MA0145848	H142751

DS02	Driver set for ND92/93/94 on actuators with VDI/VDE 3845 attachment face. Set includes the 1/4NPT plug for single acting actuators. The driver set should also be applied with all ND with gauge blocks A3, A3B, A5, A7 or A10.
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Positioner to Rotary Actuator Linkage Kits				
	Universal kits requiring an additional driver set			Complete kits with all driver parts included
	N_700	9000 Series	NDX	N_700 9000 Series NDX
B-SERIES				
B1 U6-11/	378589	378589	H036898	H141553

- New website for mounting kit selection

neles.mountingkitsonline.com

Challenge

Many valve actuator types used within a plant

Solution

Mounting kits for use on many valve actuators

Application Suitability Guidelines

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Neles Valve Controllers

	ND9000	NDX	NE700	NP700	SG9000	VG9000	Axiom
Application Type	Control	Control	Basic control	Basic control	On/off - high cycle, process critical	SIL rated ESD/ESV with PST requirement	On/off - general
Control Signal / Comms	4-20mA HART, FF, or Profibus PA	4-20mA HART	4-20mA	3-15PSI (NP72_) 4-20mA (NP70_)	4-20mA HART or AC/DC with U/I converter	FF, 4-20mA HART, or 24VDC with RCI9H	8..250VDC / 20..250VAC, FF, Modbus, DeviceNet, AS-I, 4-20mA HART, Bluetooth
Diagnostics	Advanced with HART, FF, or PA	Standard with HART	None	None	Advanced with HART, FF, or PA	Advanced with HART, FF, or PA	Basic with AS-I / DeviceNet or Advanced with HART
Housing Type	Standard Aluminum/316 SS, Explosion-proof Aluminum /316 SS	Standard Aluminum, Explosion-proof Aluminum	Standard Aluminum	Standard Aluminum, Standard Aluminum + Explosion-proof I/P	Explosion-proof Aluminum / 316 SS	Explosion-proof Aluminum / 316 SS	Standard (Aluminum/Lexan), Explosion-proof Aluminum or 316 SS
Hazardous Area Approval	Exi/n & Exd: cCSAus, ATEX, IECEx, GOST, KOSHA, CCOE, NEPSI, JIS, INMETRO	Exi/n: ATEX/IECEX, cCSAus Ex d: ATEX/IECEX	None	Exd w/ NP70_ only	Exi/n & Exd: cCSAus, ATEX, IECEx, GOST, KOSHA, CCOE, NEPSI, JIS, INMETRO	Exi/n & Exd: cCSAus, ATEX, IECEx, GOST, KOSHA, CCOE, NEPSI, JIS, INMETRO	Exi/n & Exd: cFMus, ATEX, IECEx, GOST, CCOE, KOSHA, INMETRO
SIL Approvals	SIL 2	SIL 2	None	None	None	SIL 3	SIL 2

Application Suitability Guidelines

Neles Valve Controllers

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	ND9000	NDX	NE700	NP700	SG9000	VG9000	Axiom
Air Capacity¹	SCFM: 3.3, 7.1, 22.4 Cv: 0.05, 0.11, 0.34	SCFM: 47.1 Cv: 0.7	SCFM: 7.0, 10.4, 18.6 Cv: 0.11, 0.16, 0.28	SCFM: 7.0, 10.4, 18.6 Cv: 0.11, 0.16, 0.28	SCFM: 4, 53, 223, 223/412 Cv: 0.06, 0.7, 3.2, 3.2/6.4	SCFM: 4, 53, 223, 223/412 Cv: 0.06, 0.7, 3.2, 3.2/6.4	SCFM: 53, 86 Cv: 0.7, 1.2
Air Consumption¹	SCFM: 0.35...0.6	SCFM: 0.06	SCFM: 0.4...1.2	SCFM: 0.2...1	SCFM: 0.13...0.15	SCFM: 0.13...0.15	SCFM: 0
Pneumatic Ports	G1/4 or 1/4" NPT	1/4" NPT	1/4" or 3/8" NPT	1/4" or 3/8" NPT	1/4", 1/2", 1" NPT	1/4", 1/2", 1" NPT	1/4" or 3/8" NPT
Enclosure Protection	Standard: IP66	Standard: IP66	Standard: IP54, Optional: IP65	Standard: IP54, Optional: IP65	Standard: IP66	Standard: IP66	Standard: IP67
Supply Pressure	20..115 PSI	20...115 PSI	20..115 PSI	20..140 PSI	44..116 PSI	44..109 PSI	40..120 PSI
Temperature	Standard: -40...+185°F Cold Temp: -63...+185°F	Standard: -40...+185°F	Standard: -13...+185°F High Temp: 14...+248°F	Standard: -40...+194°F High Temp: 14...+248°F	Standard: -40...+185°F	Standard: -40...+185°F	Standard: 0...+122°F Extended: -40...+176°F 1.2 Cv: 14...+122°F
Cycle Life	Continuous control	Continuous control	Continuous control	Continuous control	Spool valve rated to 20 million cycles	Spool valve rated to 10 million cycles	Spool valve rated to 1 million cycles
Visual Position Indication	LCD display + beacon indicator in the cover	Large LCD display	Flat indicator in the cover	Flat indicator in the cover	LCD display + flat indicator in the cover	LCD display + flat indicator in the cover	Beacon Indicator + Open/Closed LED
Position Feedback	4-20mA transmitter, Fieldbus, Proximity / Mechanical Switches	4-20mA transmitter, NAMUR switches (up to 2pcs)	Quartz w/ top mount linkage	Quartz w/ top mount linkage	4-20mA transmitter, Fieldbus, Proximity / Mechanical Switches	4-20mA transmitter, Fieldbus, Proximity / Mechanical Switches	4-20mA transmitter, Fieldbus, Proximity Switches
Calibration	Automatic, manual, 1-point	Automatic, manual, 1- point	Mechanically set zero and span	Mechanically set zero and span	Automatic, manual	Automatic, manual	Push Button switch settings

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ND9000

Intelligent Valve Controller - Overview

May 18, 2021

RESTRICTED

Designed for Difficult Environments

ND9000

Robust enclosures and materials

- 4 enclosure options: standard / flameproof **aluminum**, and **stainless-steel** standard / flameproof
- IP66 / NEMA 4X rated
 - IP54 w/ cover opened
- **Extreme cold version for -53°C (-63°F) [-40°F/°C as standard]**
- **Remote mount option**



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Challenge

Corrosive environments

Extreme temperatures

Solution

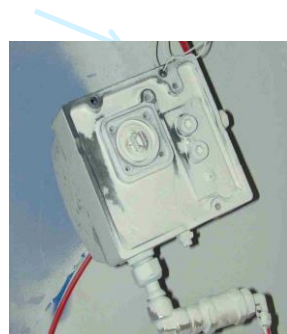
Robust enclosures and materials

Designed for Reliability

ND9000

Robust design

- **Double lacquer** coated circuit boards
- **Contactless** position sensor
- **DLC coated** spool valve
- Comprehensive **diagnostics** on internal components
- Extensive field experience



Flooded & still works!

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Challenge

Unplanned shutdowns

High cost of maintenance
or replacement positioners

Solution

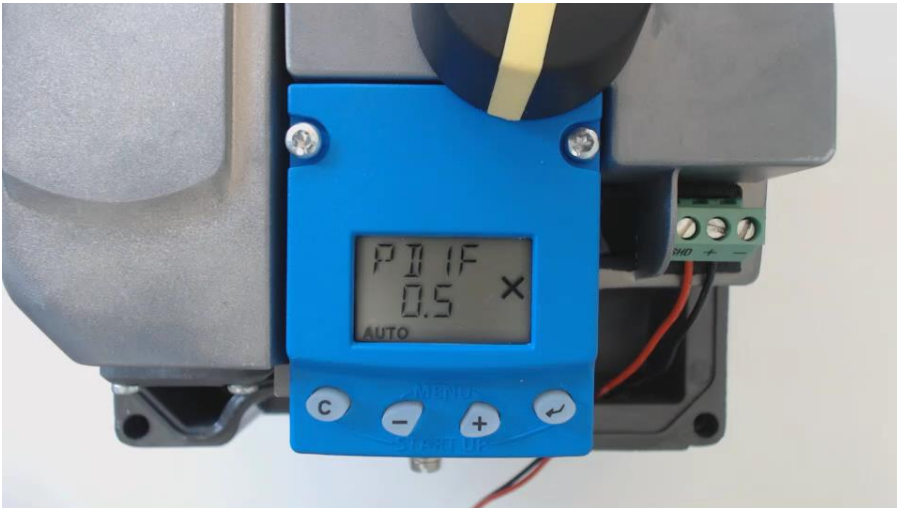
Robust design

Designed for simple configuration

ND9000

Local User Interface

- Easy to use LUI as standard
 - Key messages in text (3 languages)
- Guided start-up function from LUI; set 4 parameters, start auto calibration, and the valve assembly is ready for use!



Optional but not required

Challenge

Complicated commissioning

Additional hardware required for configuration

Solution

Local user interface

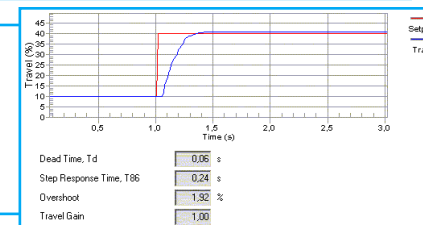
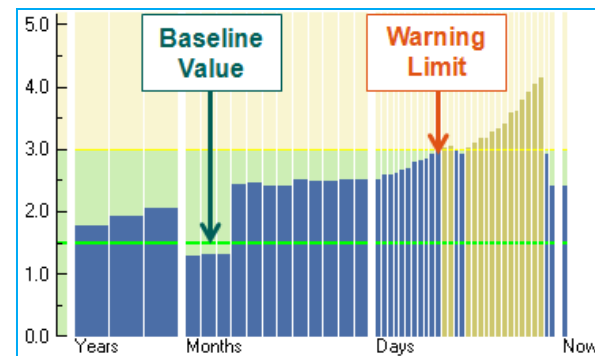
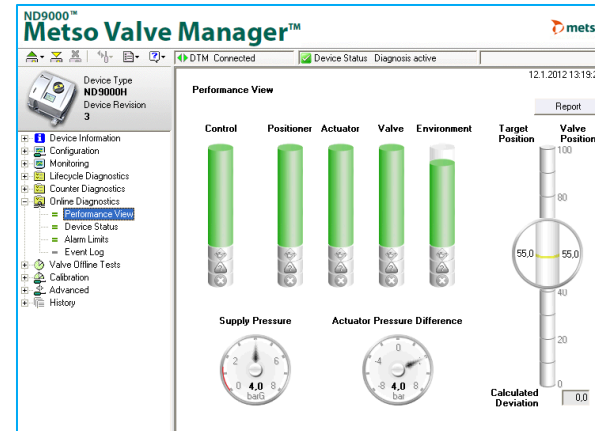
Designed for visibility into your valves

ND9000

NELES

Advanced Diagnostics

- Performance view / Report
- Lifecycle diagnostic trends (9)
- Counters (9) / Counter trends (4)
- Offline tests (4) / Test comparison
- Online valve signature
- Device status (48) / Alerts
- Online monitoring
- Event log (8,000)



Challenge

Lost production

Decreased performance

No full asset management system

Solution

Advanced diagnostics

NELES

- **Load for Opening** trend shows an eroded valve seat



Designed for visibility into your valves

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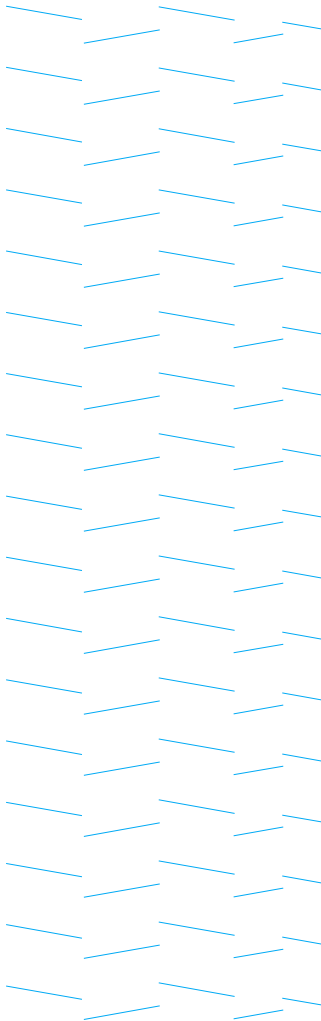
Example 2 - Actuator Leak

- **Problem**

- Leak is developing in the actuator or tubing
- Positioner compensates for the small leak by sending more air to the actuator.

- **Control system diagnostics**

- Once the actuator leak becomes more than the positioner can compensate for the process will be affected and process alarms will be activated



Designed for visibility into your valves

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Example 2 - Actuator Leak

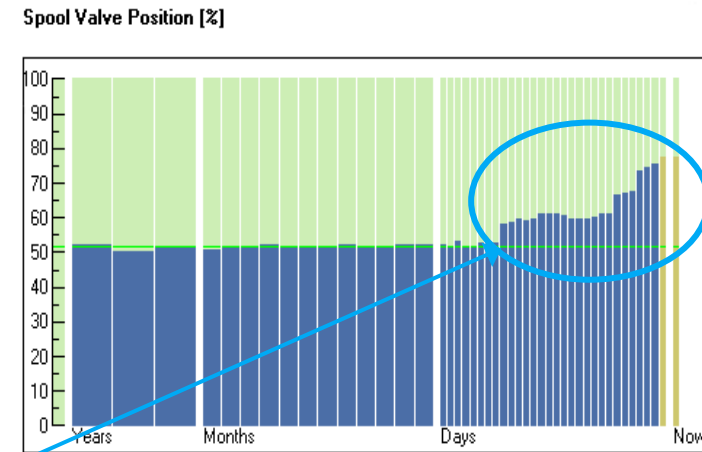
Different smart positioner diagnostic levels:

- **1st generation offline testing**

- Once actuator leak becomes more than the positioner can compensate for a deviation alarm will be activated since it can no longer follow the setpoint.

- **2nd generation online diagnostics**

- Trending clearly shows the change in pneumatics output to compensate for the leak. Some knowledge is required to know what this diagnostic means and what actions need to be taken.



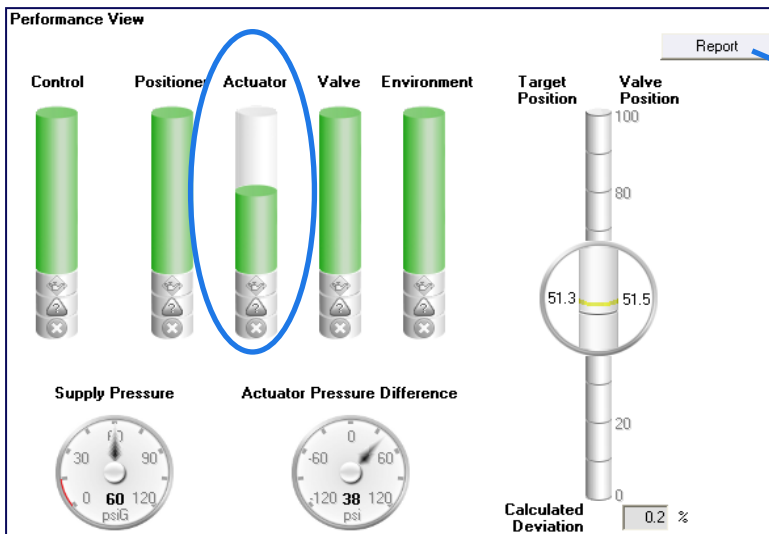
Designed for visibility into your valves

NELES

Example 2 - Actuator Leak

Different smart positioner diagnostic levels:

- **3rd generation simplified online diagnostics**
 - Diagnostics are broken down into key indexes and clearly show a problem developing with the actuator. A clear description is given describing the problem and recommended actions.



Performance Report					
Supply Pressure	60.0	psiG	Valve Position	51.5	%
Actuator Pressure Difference	38.0	psi	Target Position	51.3	%
			Calculated Deviation	0.2 %	
Actuator	Possible pneumatic leakage.				
Check the 'Spool Valve Position' trend. Pneumatic leakage can be seen when the trend level has increased or decreased.					

Design Features

ND9000

NELES

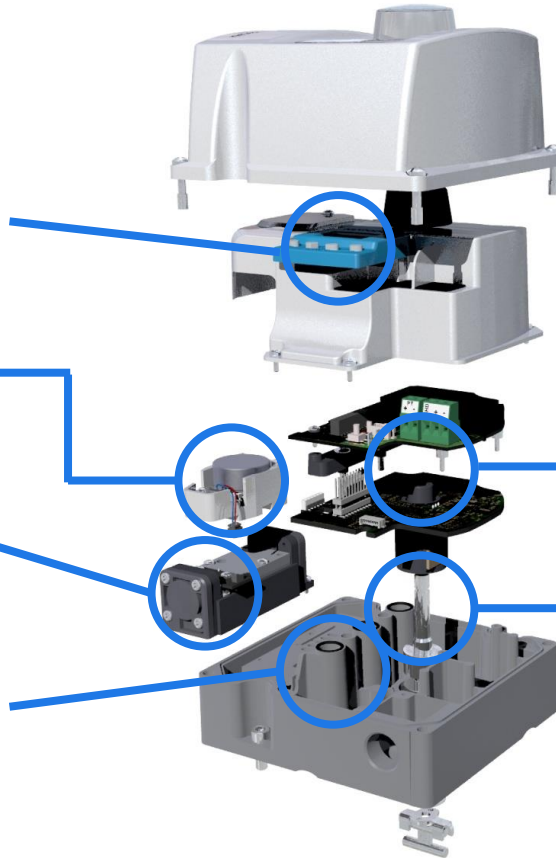
Features

Standard local user interface
and visual indicator

Single flapper w/ excellent
vibration tolerance

DLC coated spool valve
for wear resistance

Accurate pressure sensing
for smooth control and
advanced diagnostics



Double black lacquering to
protect electrical components

Contactless position sensor
w/ freely rotating shaft

ND9

- **Prestage coil cut errors** (potential in devices from April 2019 – Nov 2020)
 - There was a problem where the ND9 can have **false prestage cut errors**. The prestage functions normally so the position control is not affected but you will see these errors in the event log. The issue is related to the calibration of the voltage level used for the diagnostics.
 - A new DTM version is being released in June 2021 to allow re-calibration of the prestage.
 - This works for HART devices only. If there is an issue with an FF/PA device, then we need to use a special programming device to update the calibration.

ND9000

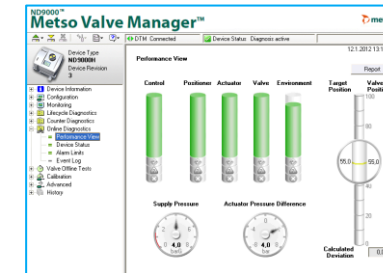
- **Simulation Control Mode aka “Pressure fallback”** (Patent Pending US 2019/0390691)
 - Starting in all ND9’s manufactured after April 2021 (FW 2.0, serial number PH2114_).
 - ND9 will automatically change to a simulated position measurement if the position sensor fails.
 - Activated on errors “Position sensor out of range” and “Position sensor failure”.
 - Control is maintained despite the missing position measurement. Position is estimated based on actuator pressure.
 - Position sensor failures are extremely rare with the internal position sensor. The risk for failure is increased with the remote mount version since the external sensor can fail or the sensor cable can break.
- **New LUI Parameter option FCNT (Failure Control).**
 - Option 0 = no action (default)
 - Option 1 = pressure control, cut-offs enabled. Transmitter output = 3.5mA to indicate failed position sensor
 - Option 2 = pressure control, cut-offs disabled. Transmitter output = 3.5mA to indicate failed position sensor.
 - Option 3 = Simulated position measurement active. Transmitter output follows the simulated position approximation

Neles ND9000

NELES

Features That Address Customer's Challenges

- Accurate control capabilities
- Easy configuration / calibration
- Durable, long-lasting components
- High cycle life and longer service intervals
- Easy service and maintenance
- Easy assembly and automation



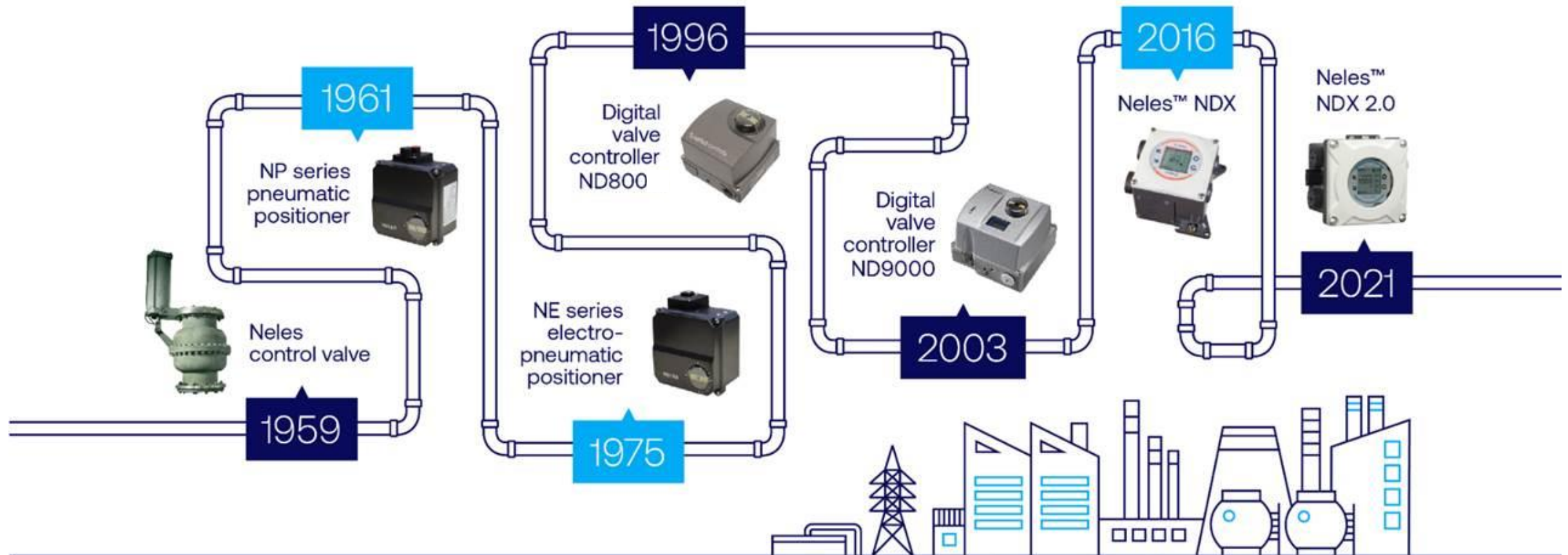
NELES

NDX

Intelligent Valve Controller - Overview

Neles NDX

Extension to our wide valve controller portfolio

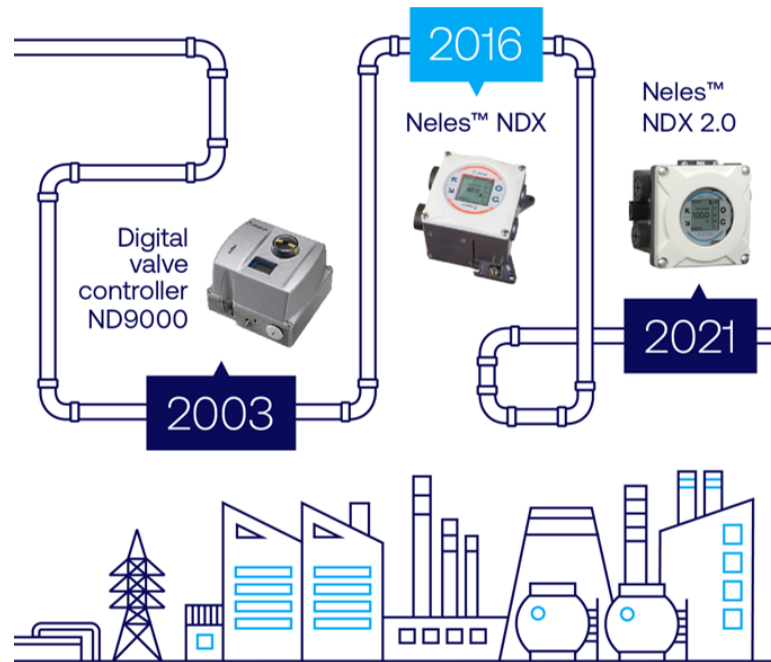


Reliability and performance with 60 years of valve controlling experience

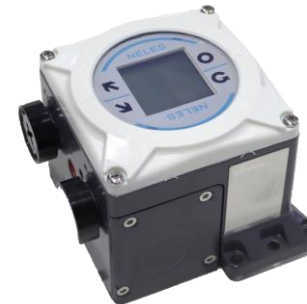
Next version of NDX platform

NELES

Compact and Standard



- Compact platform released in 2016
- Optimized for globe valves and single acting actuators
- 2.0 Standard platform release in 2021
- Offers the flexibility to cover most valve control needs with one solution



PRODUCT HOLD is active

• N.A. Release

- NDX compact single acting only housing
 - Planned for June 2021. Parts are on order now to refurbish our inventory for re-launch.
- NDX standard/explosion proof housing
 - Planned for late 2021 once the approvals are available and stock is on order.
 - Will include new “Premium” diagnostics level.

• Local User Interface (LUI)

- Re-designed - more info on next slide

• Gauge Block

- Re-designed so one gauge block can be used with all housing versions plus new gasket design with raised edges to improve sealing

• Firmware now up to v3.2

- 48 • V3.1 and up required for the new LUI

N.A. Release
June - July 2021

Compact
5. sign '0'
NDX1510_



Al base, composite cover
Single acting
Ex i, Ex n
Optional PT
Advanced Diagnostics

NA approvals
est June 2021

NDX 2.0 - N.A. Release
late 2021

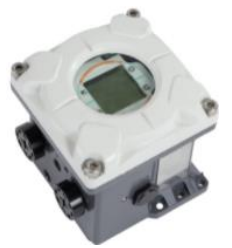
Standard
5. sign '1'
NDX_511_



Al base, composite cover
Single & double acting
Ex i
Optional PT & Dos
Premium Diagnostics

NA approvals
est Fall 2021

**Flameproof /
Explosion proof**
5. Sign '2'
NDX_512_



Al base & cover
Single & double acting
Ex i, Ex d
Optional PT & Dos
Premium Diagnostics

Status Update

- Local User Interface re-design details
 - Issue: ACF bonded LCD display connector and potting incompatibility
 - Solution: Re-design so that there is no potting near the ACF connector.
 - Verification: Environmental aging tests for 12 weeks
 - Harshest condition: +85°C / 85 %RH Medium conditions: +65°C and dry air
 - Temperature shock: -40°C to +85°C Vibration testing at 10 G
 - Functional testing (-40°C ... +85°C) at 3rd party laboratory for the whole NDX device
 - UV aging based on ISO 4892-2 standard for the LUI and NDX cover
 - Continuous re-qualification testing during production
 - Increased testing and verification through the whole supply chain
 - Usability improvements
 - Improved contrast for the display and improved button sensitivity
 - Improved visibility of the buttons and change to Neles branding
- Requires the NDX to have FW v3.1 or higher



Designed for difficult environments

NDX

Robust enclosures and materials

- 3 enclosure options: compact, standard, and flameproof aluminum enclosures
- IP66 / NEMA 4X
- Remote mount option pending



NELES

Challenge

Corrosive environments

Extreme temperatures

Solution

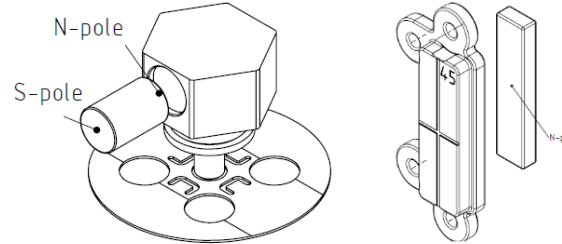
Robust enclosures and materials

Designed for reliability

NDX

Robust design

- Fully **encapsulated** electronics
- Fully **contactless** magnetic position sensor
 - No wearing mechanical linkages
- **40 μm** air filtration rating
- Standard **tapped exhaust** port can be used as a re-breather



NELES

Challenge

Unplanned shutdowns

High cost of maintenance
or replacement positioners

Solution

Robust design

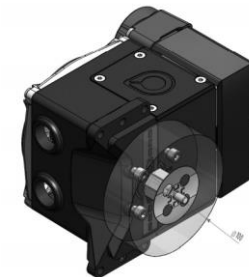
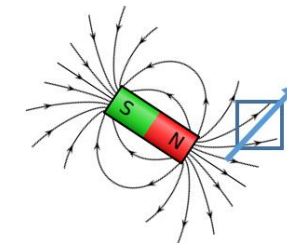
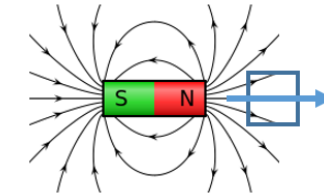
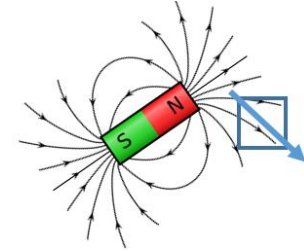
Contactless Position Measurement

NDX

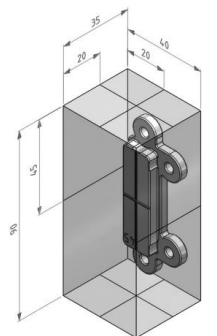
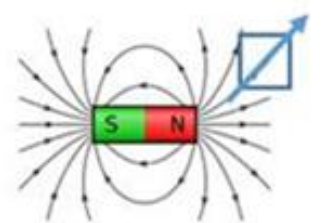
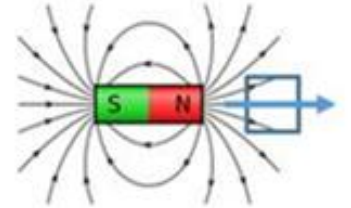
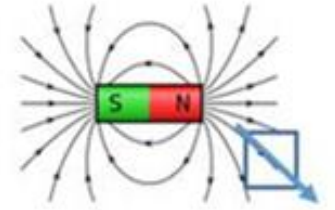
- Strong neodymium magnet that is brought close to the NDX magnetic field direction sensor.
 - The magnet is hermetically sealed inside of a casing
 - The sensor senses the direction of the magnetic field and the sensor's output is varied according to the magnetic field direction
 - The same principle is used with rotary magnets but in that case the magnet does not travel past the sensor but rotates on top of it.
 - To ensure there is no interference to the position measuring, no magnetic material is allowed to be in the proximity of the position feedback magnet.
- 52 • **Mounting kits of stainless steel or aluminum must be used.**

NELES

Rotary



Linear



Designed for simple configuration

NDX

NELES

Local user interface

- Large LCD display with capacitive buttons
 - Usable through the cover
- Full text w/ guided startup in 10+ languages
- Can be digitally rotated based on installation orientation



Optional but not required

Challenge

Complicated commissioning
Additional hardware required
for configuration

Solution

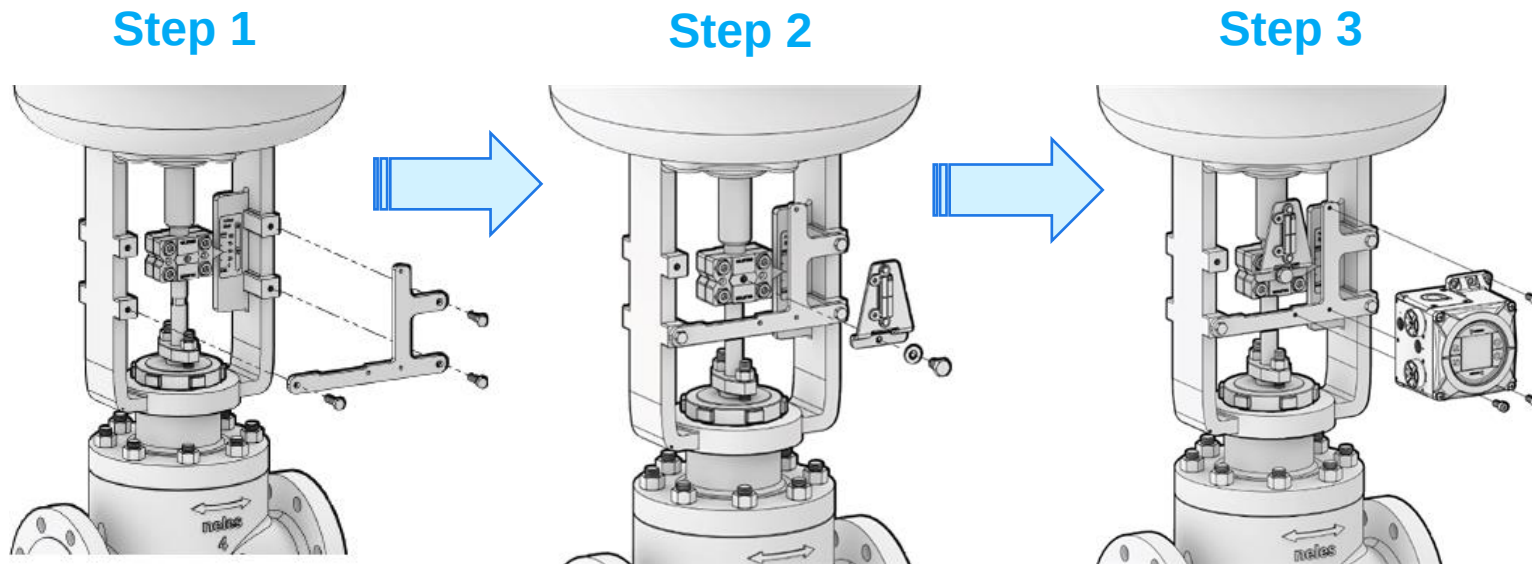
Local user interface

Designed for simple mounting (linear)

NDX

NELES

Mounting in 3 easy steps



Challenge

Complicated commissioning

Failed calibrations

Solution

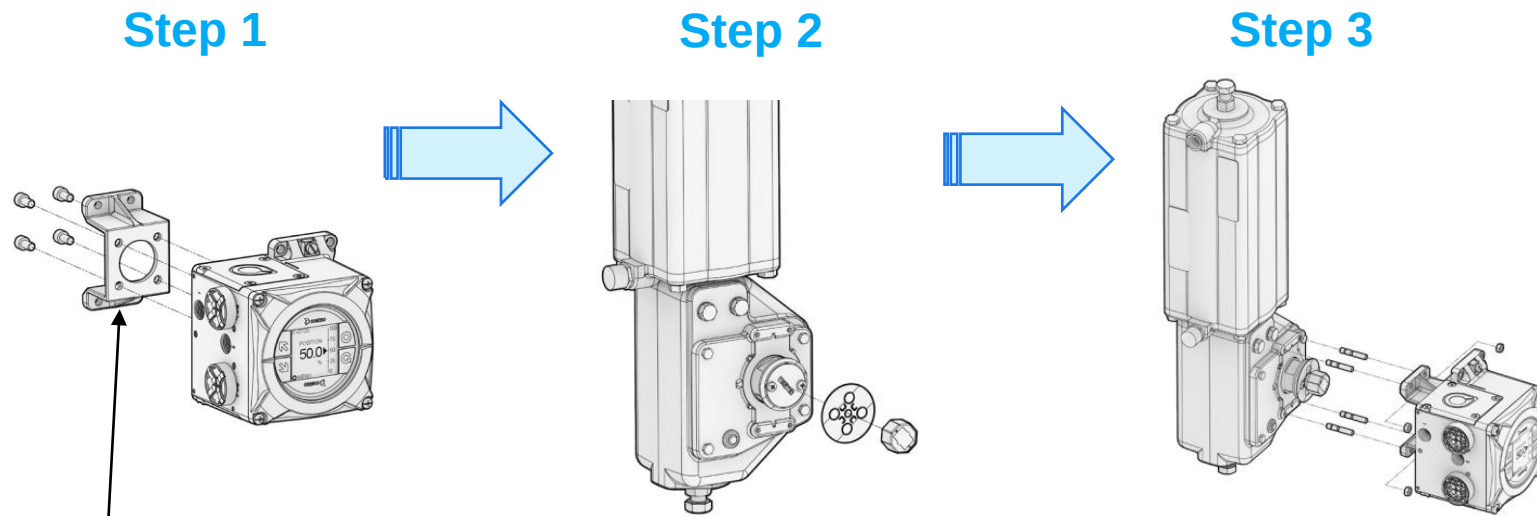
Mounting in 3 easy steps

Designed for simple mounting (rotary)

NDX

NELES

Mounting in 3 easy steps



Note: Carbon steel brackets
are not recommended

Challenge

Complicated commissioning

Failed calibrations

Limited orientations

Solution

Mounting in 3 easy steps

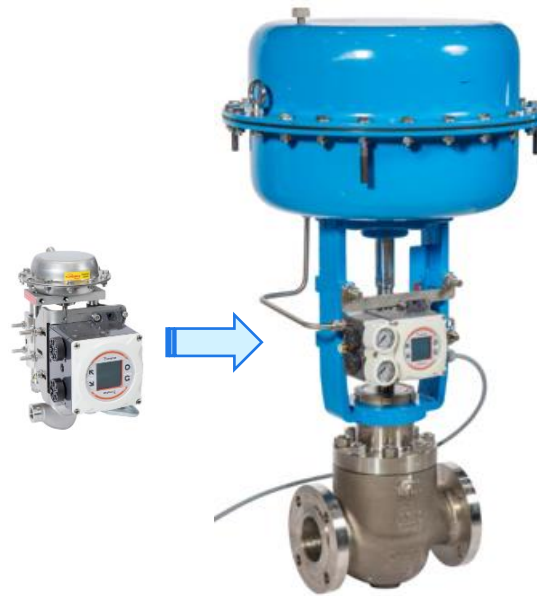
Designed for high capacity

NDX

NELES

Large capacity with low consumption

- Capacity: 47 SCFM
 - 10x > piezo; 2x > ND9_06;
- Consumption: 0.06 SCFM
 - 0.04 scfm > piezo; 1/10th ND9_06
- Eliminates the need for most volume boosters or QEVs
- One capacity for all actuators



Challenge

Additional costs for VBs and QEVs

Complexity for tuning control with extra instrumentation

High air consumption

Solution

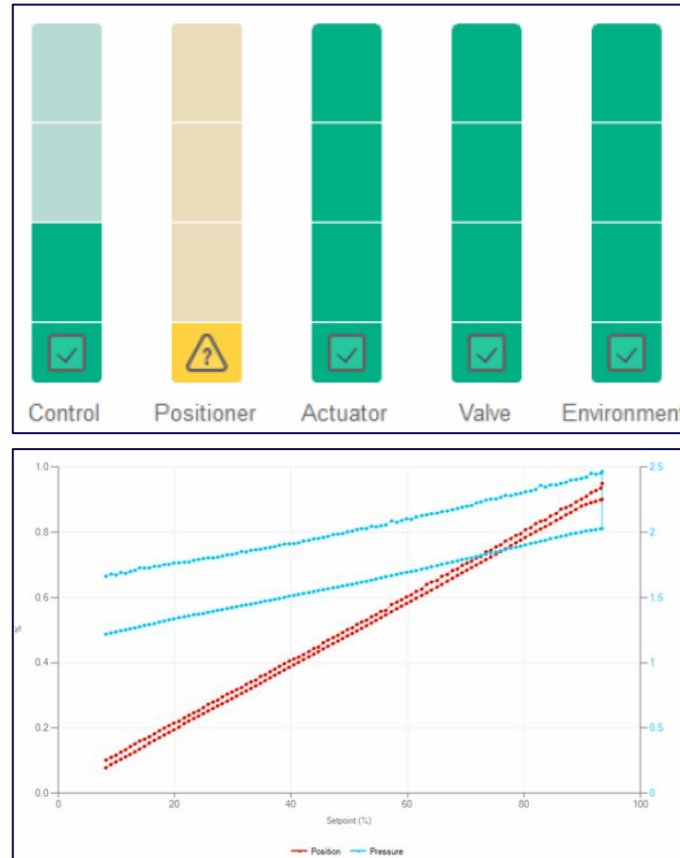
Large capacity with low consumption

Designed for visibility into your valves

NDX

Advanced diagnostics

- Performance View
- Trends & histogram (2)
- Counters (9)
- Offline Tests (4)
- Online valve signature
- Online monitoring
- Event log



NELES

Challenge

Lost production

Decreased performance

No full asset management system

Solution

Advanced diagnostics

Design Features

NDX

NELES

Features

Fully encapsulated electrical components w/ pressure and temperature sensors

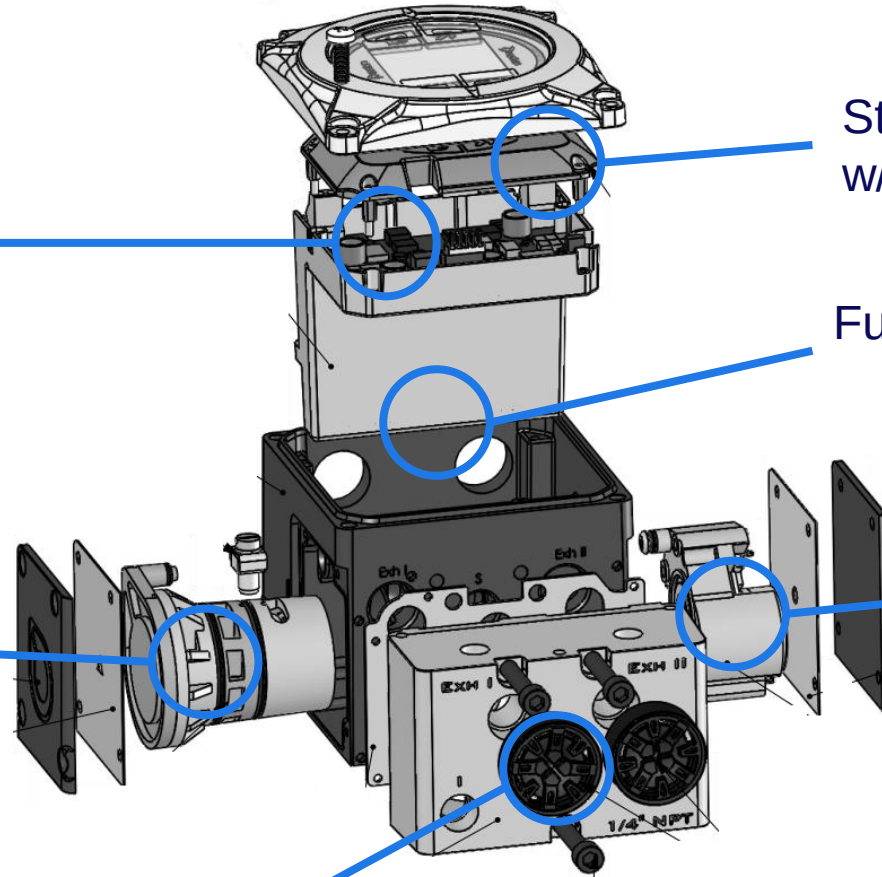
High capacity, low consumption pneumatics rated to 40 micron

Threaded exhaust ports for re-breather or to venting away exhaust gas

Standard local user interface w/ capacitive buttons

Fully non-contacting position sensing

Single flapper w/ excellent vibration tolerance



When to use the ND9000

Selection Criteria

- Advanced diagnostics for predictive maintenance
- Explosion proof approvals
- Integrated limit switches – cam activated mechanical or proximity
- Foundation Fieldbus or Profibus PA communication
- Stainless steel housing
- Extreme cold temperatures (-63F / -52C)
- Remote mount position sensor



When to use the NDX

Selection Criteria

- Ideal for linear spring return actuators
- High air capacity for fast stroke times (47.1 SCFM / ~0.7 Cv)
- Low steady state air consumption (<0.06 SCFM)
- Users who prefer relay-based pneumatics over spool valve designs
- Fully non-contacting position sensing (i.e. no H-clip or lever arm)
- Non-approved or low energy wiring requirements
- Re-breather for spring return actuators
- Tapped exhaust port for capturing or venting away exhaust gases

NELES



Main technical features - NDX vs ND9

NELES

	NDX “Standard”	NDX “Compact”	ND9000
Position Measurement	Magnetic sensor	Magnetic sensor	Hall effect sensor
Pneumatics	Single or double acting relay	Single acting relay	Spool valve
Air Capacity (scfm)	47,1	47,1	3.3 / 7.0 / 22.4
Air Consumption (scfm)	0,06	0,06	0.35 / 0.35 / 0.60
Air Filtration	40 um	40 um	5 um
Housing	Aluminum; Ex i / Ex d	Aluminum; Ex i	Aluminum / stainless; Exi / Ex d
Pneumatic Threads	¼” NPT (opt. G1/4)	¼” NPT (opt. G1/4)	G1/4 (opt. ¼” NPT)
Electrical Threads	2 x ½” NPT (opt. M20x1.5)	2 x ½” NPT (opt. M20x1.5)	M20x1.5 (opt. ½” NPT)
Communication - HART	HART 6/7 (Default = 7)	HART 6/7 (Default = 7)	HART 6/7 (Default = 6)
Communication - FF	Pending	N/A	Yes
Communication - PA	Pending	N/A	Yes
Local User Interface	Text/graphic (10 languages), touch buttons through the cover	Text/graphic (10 languages), touch buttons through the cover	Segment LCD (3 languages), push buttons inside the housing
Diagnostics	Advanced or Premium	Advanced	Premium
Temperature Range	-40..+85°C	-40..+85°C	-40..+85°C (opt. -53°C)
Position transmitter	Optional (3.5/22.5mA fault current)	Optional (3.5/22.5mA fault current)	Optional (3.5mA fault current)
Digital Outputs (Namur)	Optional: 1 or 2 switches configurable (position or status)	N/A	Optional: 2 position switches
Fault Tolerant Control	Pending	Pending	Yes

Neles NDX

NELES

Features That Address Customer's Challenges

- Optimized for linear globe valves
- Fast to install and configure/calibrate
- Fully contactless magnetic position sensing
- One unit for all actuator sizes without extra instrumentation
- Supply air savings with low consumption and 40-micron air requirement
- Onboard intelligent diagnostics



NELES

ValvGuard VG9000

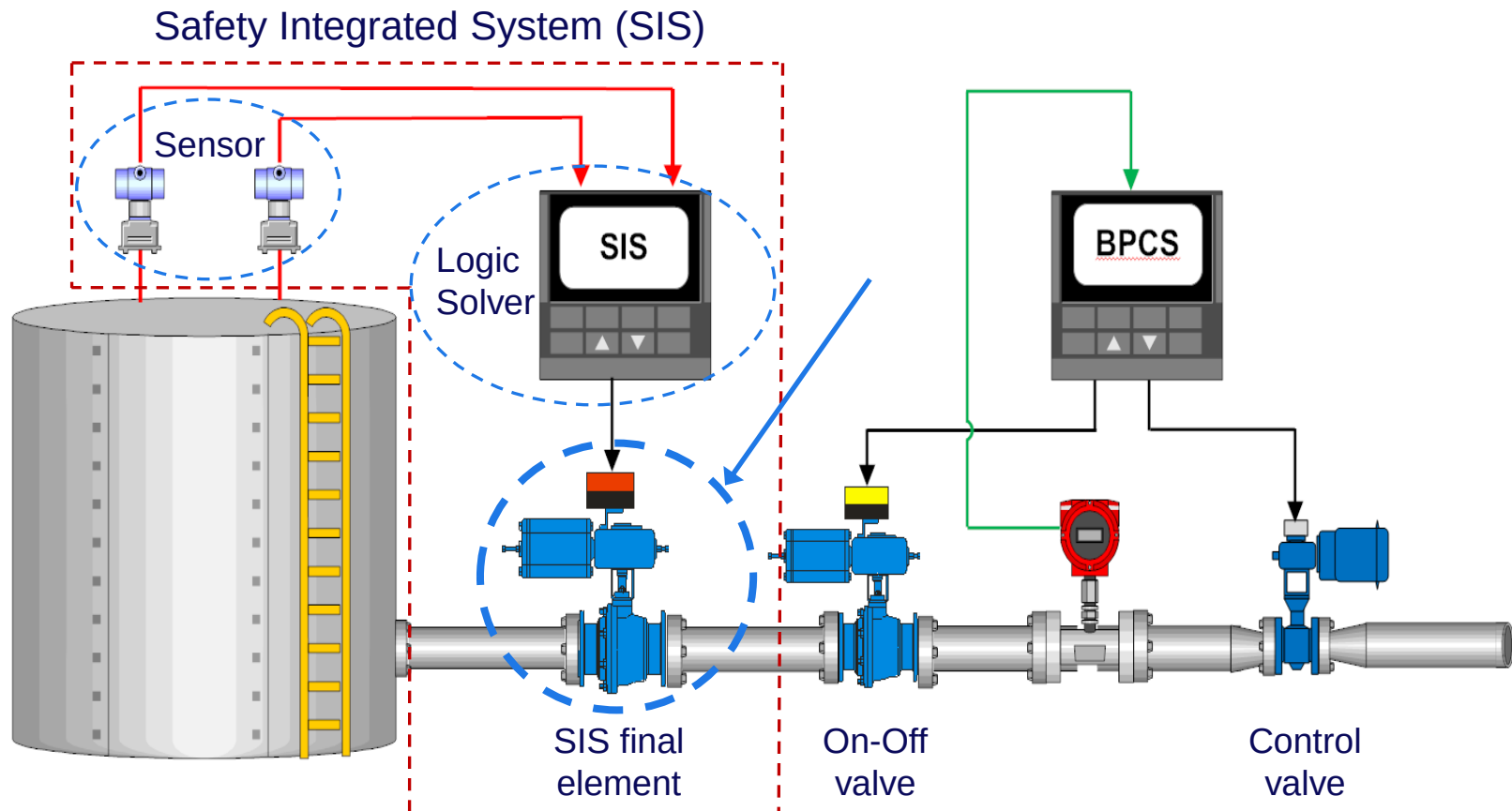
Intelligent Safety Valve Controller - Overview

Designed For Safety Applications

VG9000

NELES

SIL 3 Certified VG9000 + Valves & Actuators



Challenge

Safety instrumented systems (SIS)

SIL requirements

Partial stroke testing

Solution

SIL 3 Certified VG9000 +
valves & actuators

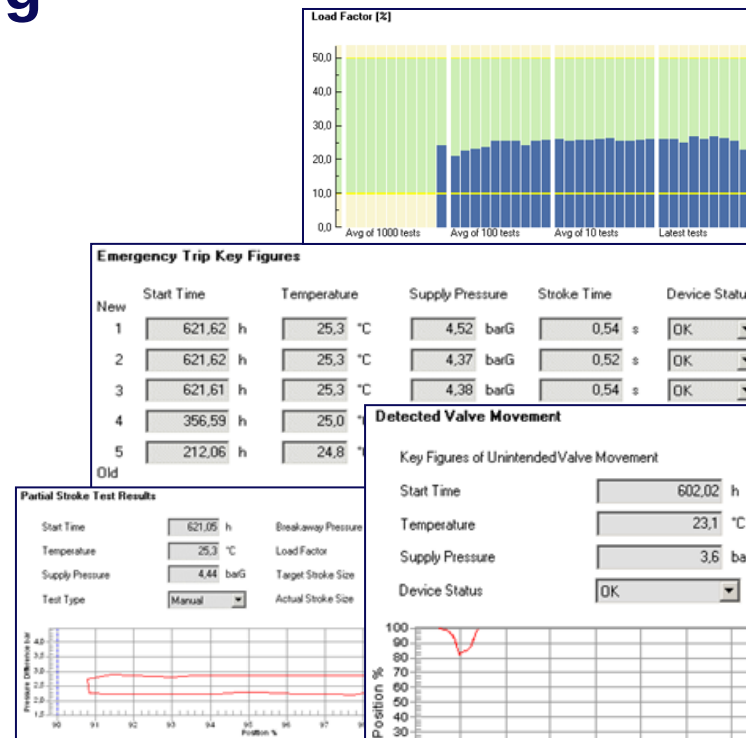
Designed for Safety Valve Testing

VG9000

NELES

Test while the process is running

- Internal pneumatics test
 - Test the pneumatics without moving the valve
- Partial stroke test
 - See next slide
- Emergency trip test
 - Test the emergency action and log stroke times
- Logging of emergency trips



Challenge

Safety valves typically never move

Verification of stroke times

Documentation of trips and tests

Solution

Test while the process is running

Designed for Partial Stroke Testing

VG9000

NELES

Accurate PST control w/ overshoot protection

- Slow controlled PST testing
- Automated or manually initiated tests
- Diagnostics to determine health of the valve and ability of the valve to perform its safety action



Partial Stroke Test Starting

Challenge

No room for bypass valves

Unreliable PST testing

Solution

Accurate PST control w/
overshoot protection

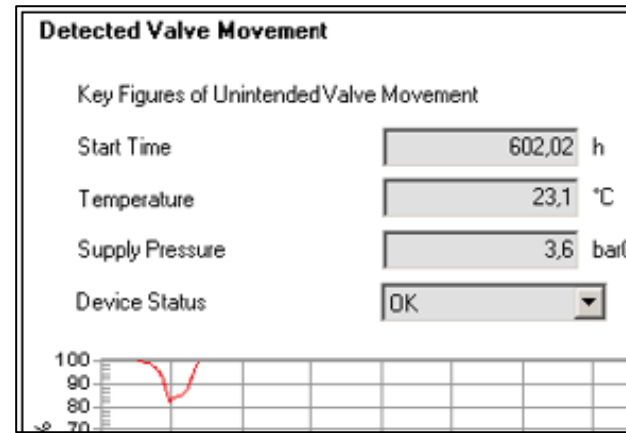
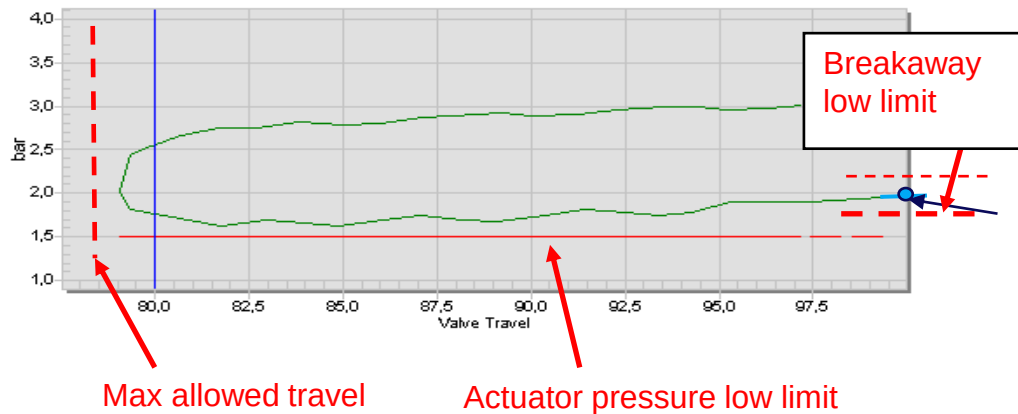
Designed to Prevent Spurious Trips

VG9000

Accurate PST control w/ overshoot protection

- 3 ways to prevent spurious trips during testing
- **Detected Valve Movement** diagnostic to determine the reason for a trip during operation

Valve travel vs actuator pressure during PST



Challenge

No room for bypass valves

Unreliable PST testing

Spurious trips

Solution

Accurate PST control w/
overshoot protection

Design Features

VG9000

NELES

Features

- ❑ Standard local user interface and visual indicator
- ❑ Single flapper w/ excellent vibration tolerance
- ❑ High capacity spool valve eliminates extra instrumentation (up to 6.4Cv)



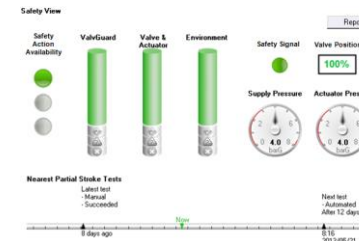
- ❑ Double black lacquering to protect electrical components
- ❑ Accurate pressure sensing for smooth control and advanced diagnostics
- ❑ Integrated transmitter and or limit switches
- ❑ Contactless position sensor w/ freely rotating shaft

Neles VG9000

NELES

Features That Address Customer's Challenges

- Optimized testing of ESD/ESV valves
- Fast to install and configure/calibrate
- Contactless position sensing
- High capacity without extra instrumentation
- Onboard intelligent diagnostics specifically designed for safety valves



NELES

SwitchGuard SG9000

Intelligent On/Off Valve Controller - Overview

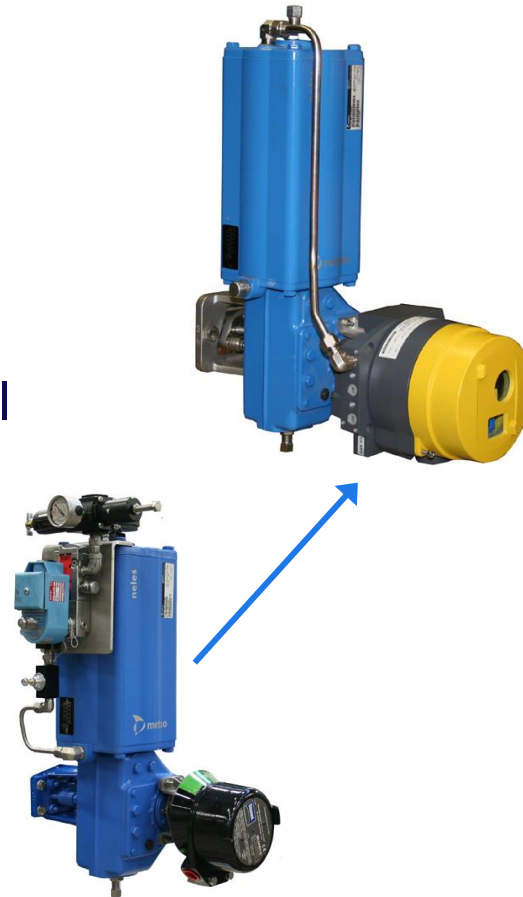
Designed as an All In One On/Off Solution

SG9000

NELES

Most on/off applications covered by one unit

- High pneumatics capacity (6.4 Cv)
 - No extra pneumatic components
- Intelligent speed control
 - Program the desired stroke speeds
 - Select a stroke profile, i.e. quick opening, equal percent...
- Integrated limit switches (12 types)
 - No tandem mounting



Challenge

Speed control

Additional costs for VBs and QEVs

Solution

Most on/off applications covered by one unit

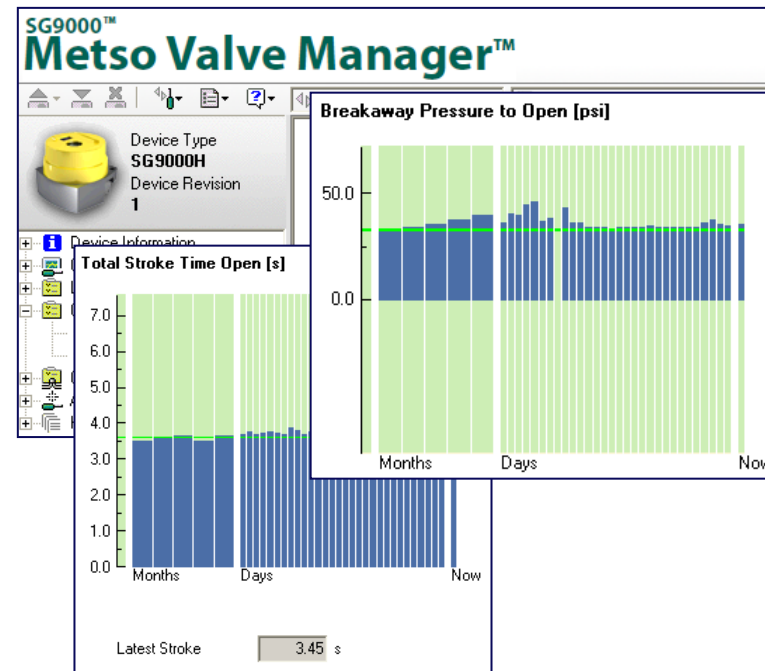
Designed For Visibility into On/Off Valves

SG9000

NELES

Diagnostics specifically for on/off valves

- Historical diagnostics:
 - Stroke time / deviation
 - Spool valve reaction time
 - Valve reaction time and breakaway pressure
 - Supply pressure / temp
 - Stroke count
 - Total operation time
 - Event log (last 8,000)



Challenge

Health monitoring for on/off valves

High cycle or water hammer

On/Off valve predictive maintenance

Solution

Diagnostics specifically for on/off valves

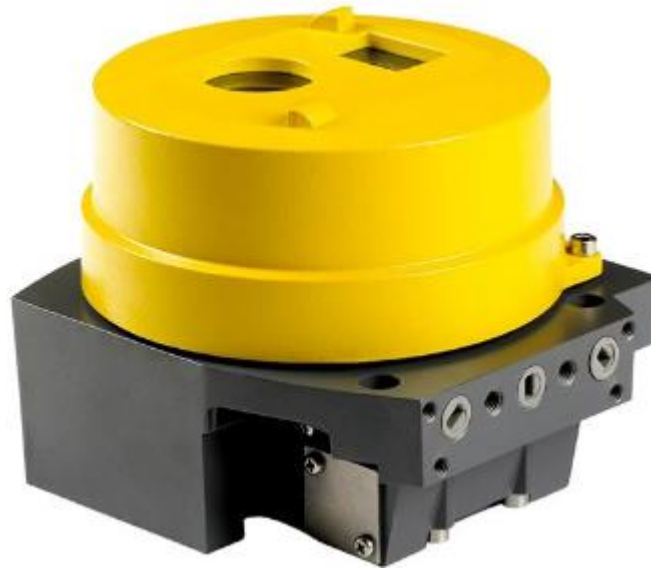
Design Features

SG9000

NELES

Features

- ❑ Standard local user interface and visual indicator
- ❑ Single flapper w/ excellent vibration tolerance
- ❑ High capacity spool valve eliminates extra instrumentation



- ❑ Double black lacquering to protect electrical components
- ❑ Accurate pressure sensing for smooth control and advanced diagnostics
- ❑ Contactless position sensor w/ freely rotating shaft

Neles SwitchGuard SG9000

NELES

Features That Address Customer's Challenges

- Simplified on/off valve instrumentation
 - High pneumatics capacity eliminates extra instrumentation
- Intelligent speed control with configurable stroke times and profiles (both directions)
- Simple configuration and calibration
- Visibility into your valve performance w/ diagnostics designed for on/off valves
 - Predictive maintenance beyond control valves



Contact us

- Product Manager
 - Mark.Buzzell@neles.com
- Applications Engineering
 - apps.engineering@neles.com
- Area Sales Managers map
 - Link to [map](#)

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Reinventing reliability

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