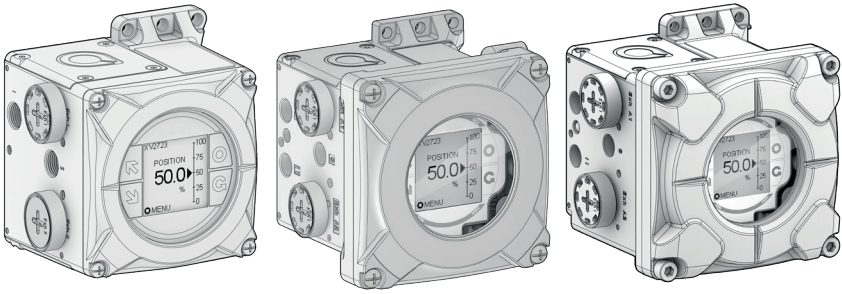
NDX

Intelligent valve controller

Quick Guide

For your safety

Read these instructions first!



For more information go to our website
to view the different language versions,
complete manual and installation videos:
www.valmet.com/ndx

INFO

SAVE THESE INSTRUCTIONS FOR LATER USE!

Before you begin

The complete manual provides information about the safe handling, installation, commissioning, operation, troubleshooting, maintenance and replacement of the intelligent valve controller. This quick guide does not contain all detailed information on every possible aspect of installation, operation or maintenance.

If you are uncertain about the use of the controller or its suitability for your intended use or just if you require additional assistance, please contact Valmet or our local representative.

Addresses and phone numbers are printed on the back cover.

See also **www.valmet.com/ndx** for the latest documentation.

Do not install, operate or maintain this intelligent valve controller without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all contents of this user guide, including all safety cautions and warnings. It is also important to be authorized by the plant operator before operating the intelligent valve controller.

Note, that there are additional safety regulations which are plant and/or hazardous area related, those are not covered in this manual.

WARRANTY

Get more information on our website: www.valmet.com/ndx

Neles™ NDX Intelligent Valve Controller Technical Description

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 or double acting, direct or reverse
Travel range:	Linear (standard): 5-120 mm / 0.2-4.7 in Linear (long range): 120-220 mm / 4.7-8.6 in Rotary: 30-160 degrees
Temperature Range:	-40° – +85 °C / -40° – +185 °F LUI usable range: -25° - +65 °C
Protection class:	IP66, NEMA 4X, IP67 during storage/transport

Pneumatics

Pneumatic ports:	
Supply air:	1/4 NPT, G1/4 with additional block
Actuator:	1/4 NPT, G1/4 with additional block
Exhausts:	2 or 3 pcs. 3/8 NPT, G3/8 with additional block
Supply Pressure:	1.4–8 bar / 20–116 psi (single acting) 2.0–8 bar / 29–116 psi (double acting)
Supply Media:	Air, nitrogen, sweet natural gas[2]
Air Capacity[1]:	80 Nm^3/h / 47.1 scfm
Air Consumption in steady state position[1]:	0.1 Nm^3/h / 0.06 scfm

[1] rated at 4 bar / 60 PSI supply pressure

[2] If natural gas is collected from the exhaust, make sure there are no back-pressure in the exhaust side. This applies also to so called re-breather application where the exhaust is piped to the actuator spring side.

Powering and connectivity

Cable Entry:	2 pcs. 1/2 NPT (M20 with adapter)
	HART Protocol rev. 6 / 7 (7 as default) Loop powered, 4-20 mA
Min. signal:	3.8 mA
Min. control signal:	3.95 mA
Impedance at 20 mA:	485 ohm

Markings

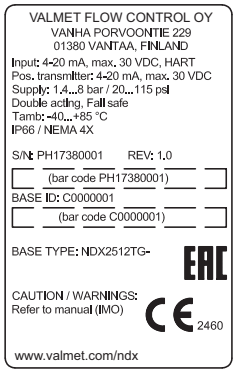
Identification plate markings include:

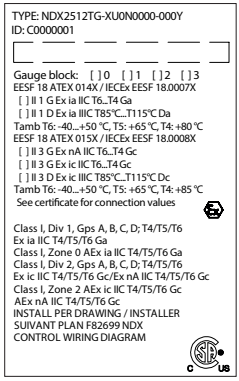
- Contact details of the manufacturer
- Input signal (voltage range)
- Transmitter input signal (voltage range)
- Supply pressure range
- Output
- Enclosure type
- Manufacturing serial number TTYYWWNNNN*)
- Build number
- H/C-code
- Type code (7 signs)
- Gauge block options
- CE mark

Approval plate markings include:

- Type code (15 signs)
- C-code
- Approvals (max. two)
- Operational temperature
- Input values

*) Manufacturing serial number explained:
TT= device and factory sign
YY= year of manufacturing
WW = week of manufacturing
NNNN = consecutive number
Example:
PH15360001 = controller, year 2015, week 36, consecutive number 1





Tools

Following tools are needed for the product installation:

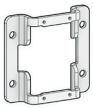
13 mm and 21/22 mm (linear) 8 mm and 24 mm (rotary)	5 mm 6 mm 10 mm	PH2	3 mm 8 mm

INSTALLATION TO NELES GLOBE

MODEL VD25

MODEL VD37

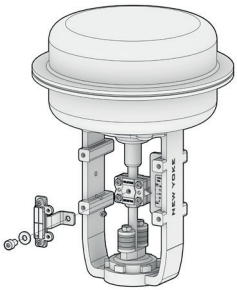
MODEL VD29

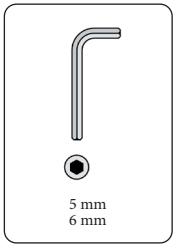


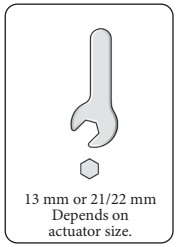
MODEL VD48 AND 55

INSTALLATION TO NELES GLOBE (VD29)

1. Mount the magnet holder with magnet to the actuator coupler, tighten the fixing screw.

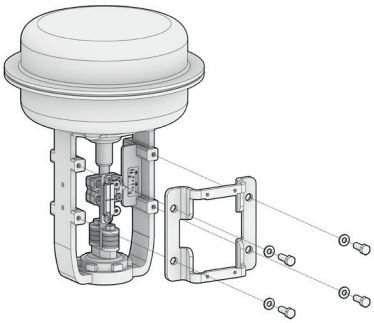






NOTE
Similar mounting steps apply also with other Neles Globe actuator sizes.

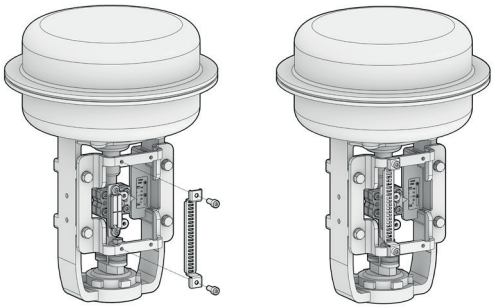
2. Mount the bracket to the actuator, leaving the screws loose.



NOTE
The bracket can be rotated 180° or flipped front/backside. If the bracket is flipped the magnet needs to be flipped correspondingly.
If needed, check the magnet installation tolerances from the picture in chapter Installation to any actuator.

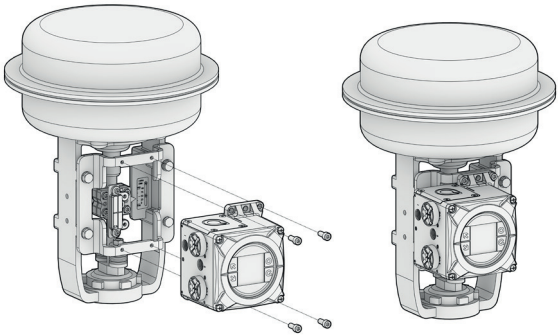
LINEAR MOUNTING

3. Attach the magnet alignment tool to the magnet. Adjust the position of the bracket so that the magnet slides smoothly in the magnet alignment tool groove and tighten the magnet alignment tool fixing bolts.



4. Tighten the bracket screws. Remove the magnet alignment tool.

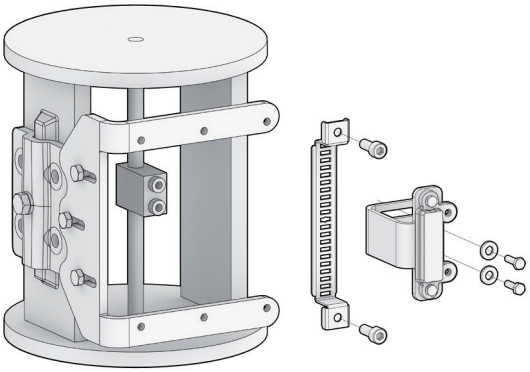
5. Mount the NDX to the bracket.

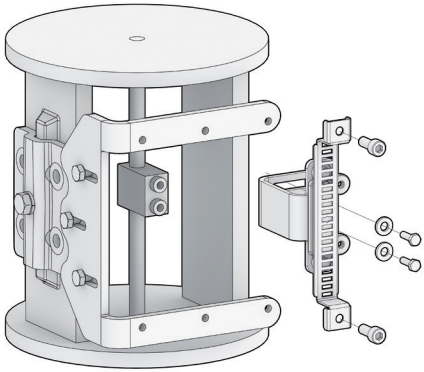


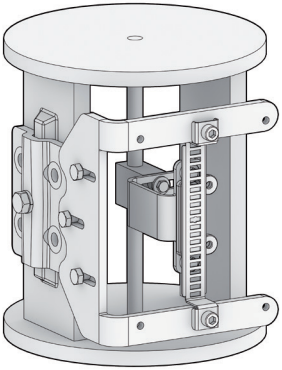
INSTALLATION TO IEC MOUNTING FACE

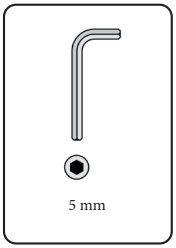
There are mounting brackets available which are designed for actuators with IEC 60534-6 interface.
Mounting kit includes additional accessories which makes device installation really easy.

1. Mount the IEC bracket to the actuator, leaving the screws loose.
2. Mount the magnet alignment tool to the magnet bracket.
3. Mount the magnet bracket to the actuator coupler, leaving the screws loose.
4. Attach the magnet alignment tool to the center holes on the IEC bracket.





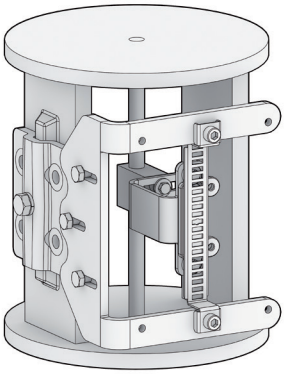


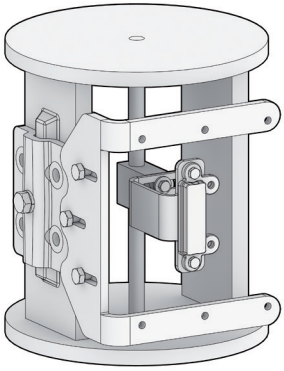


NOTE
Other tools are dependent on the actuator which the NDX is installed upon.

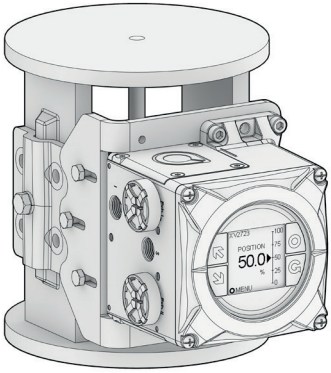
LINEAR MOUNTING

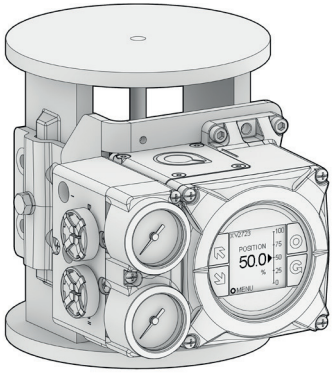
5. Adjust the position of the magnet bracket (and the IEC bracket) so that the magnet slides smoothly in the magnet alignment tool groove.
6. Tighten the magnet bracket screws.
7. When the magnet moves smoothly in the magnet alignment tool, that automatically defines the correct alignment and distance from the device position sensor. Tighten the IEC bracket to the actuator and remove the magnet alignment tool.





8. Mount the device to the IEC bracket.





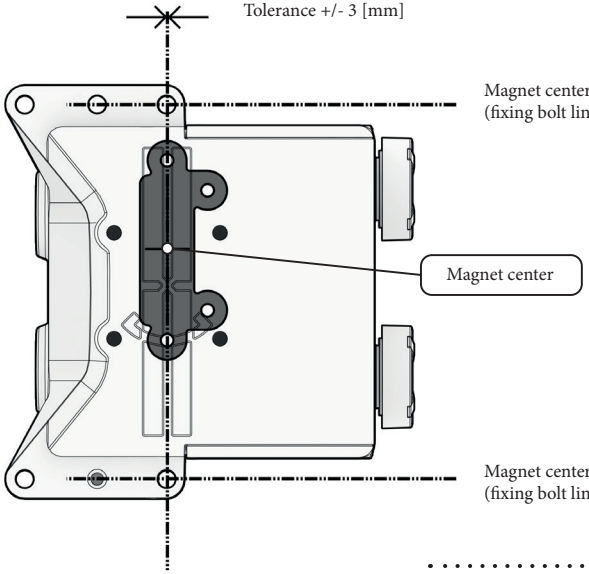
INSTALLATION TO ANY LINEAR ACTUATOR

NDX can be easily installed to any linear actuator when following installation rules are followed. In order to guarantee the best possible position measurement accuracy, NDX and position feedback magnet must be positioned according the following guidelines.

When installing the device to any other actuator model make sure that the following tolerances are followed with magnet mounting.

1. Magnet shall be centered within +/- 3 mm tolerance as shown in the picture.
2. Magnet center shall never exceed the magnet center travel limits shown in the picture.

NOTE
Use only Valmet original magnets.
Bracket and fixing bolt material should have low magnetic permeability (e.g. AISI316 or aluminium).

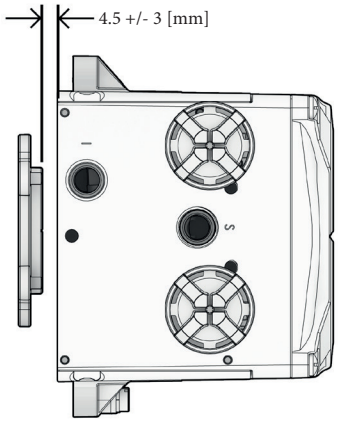


NOTE
Always ensure that the magnet center stays within magnet center travel limits on the complete operation range of the valve.

NOTE
Shorter actuator stroke allows more freedom for alignment of the magnet and NDX in actuator stroke direction. Magnet position does not affect the measurement accuracy as long as the magnet center stays within the magnet center travel limits for whole travel range.

LINEAR MOUNTING

3. The distance between the magnet and the device bottom shall be 4.5 mm with +/- 3 mm tolerance (1.5…7.5 mm).



4. Check that following magnet alignment requirements are not exceeded.

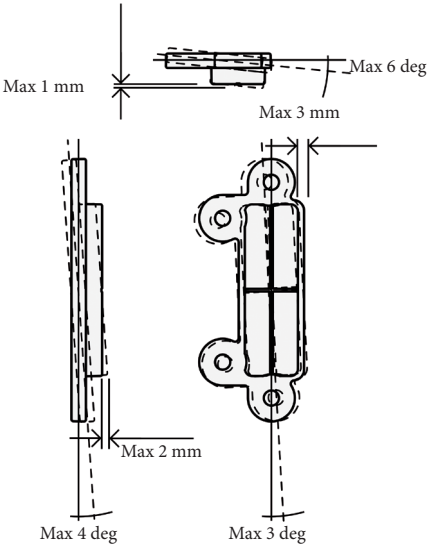
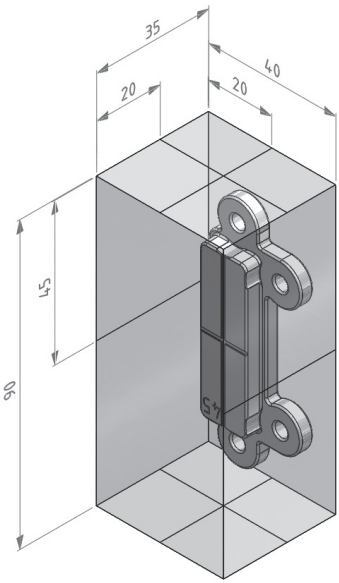


Figure below shows the exclusion zone. There is no material limitation outside the exclusion zone, but to guarantee the optimal performance do not use any magnetic material inside the zone. Inside the exclusion zone but close to the ”walls” AISI 304 and any austenitic steel can be used.



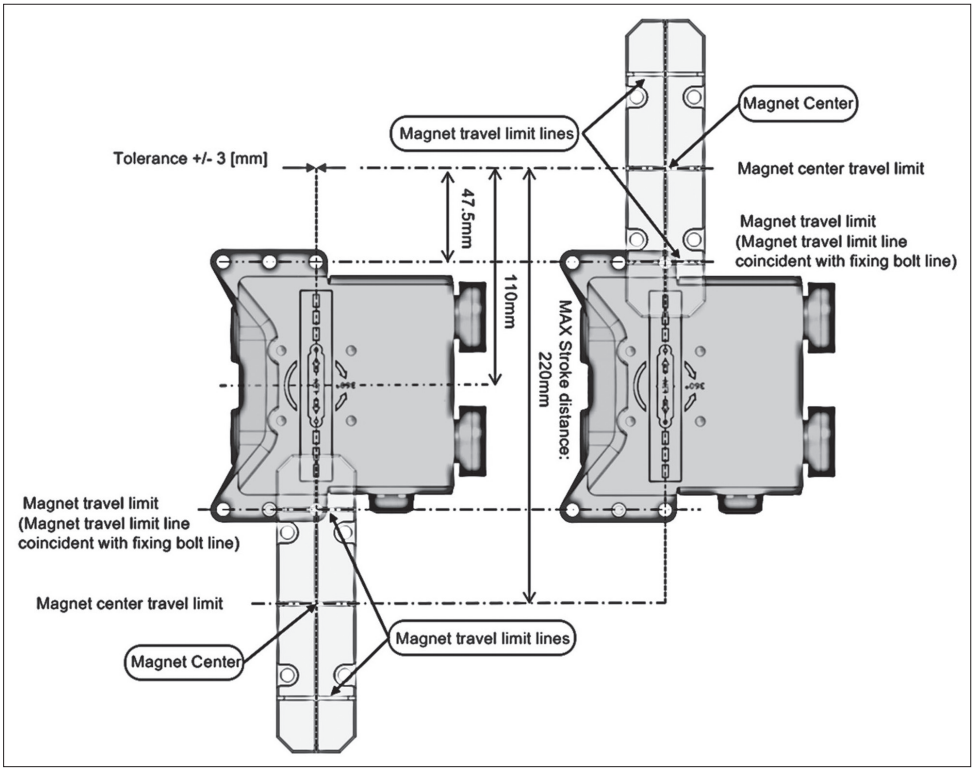
INSTALLATION OF LONGSTROKE MAGNET

NDX with long stroke magnet can be installed to a linear actuator with a stroke distance between 120-220mm. Long stroke adaptation has a different position feedback magnet than standard stroke (5-120mm). NDX and the long stoke position feedback magnet must be positioned according to the following guidelines.

When installing the device to any other actuator model make sure that the following tolerances are followed with magnet mounting.

1. Magnet shall be centered within +/- 3mm tolerance as shown in the picture.
2. Magnet travel limit marks on magnet body shall never exceed the

NOTE
Use only Valmet original magnets. Bracket and fixing bolt material should have low magnetic permeability (e.g. AISI316 or aluminium).

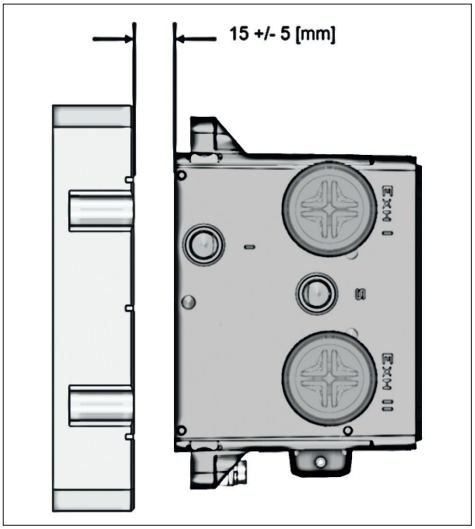


NOTE
The magnet must be aligned with the actuator shaft.

NOTE
Magnet body in the picture is faced upside down to give a better picture.

LINEAR MOUNTING

3. The distance between the magnet and the device bottom shall be 15 +/- 5 mm tolerance (10…20 mm). See fig 26.



4. Check that following magnet alignment requirements are not exceeded. See fig 27.

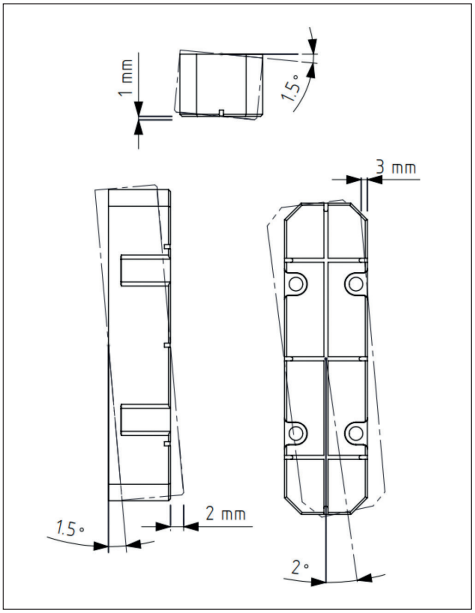
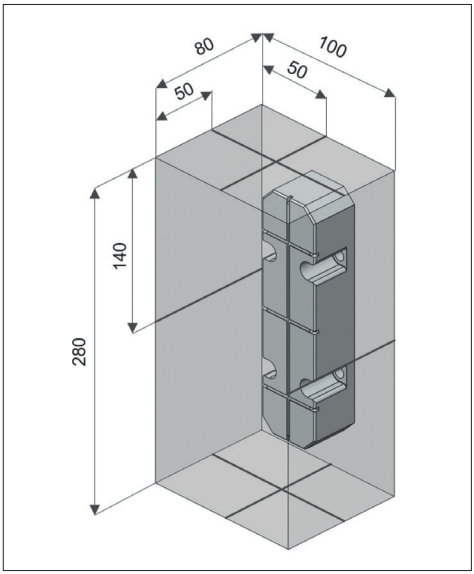


Figure 28 shows the exclusion zone. There is no material limitation outside the exclusion zone, but to guarantee the optimal performance do not use any magnetic material inside the zone. Inside the exclusion zone but close to the" walls" AISI 304 and any austenitic steel can be used.

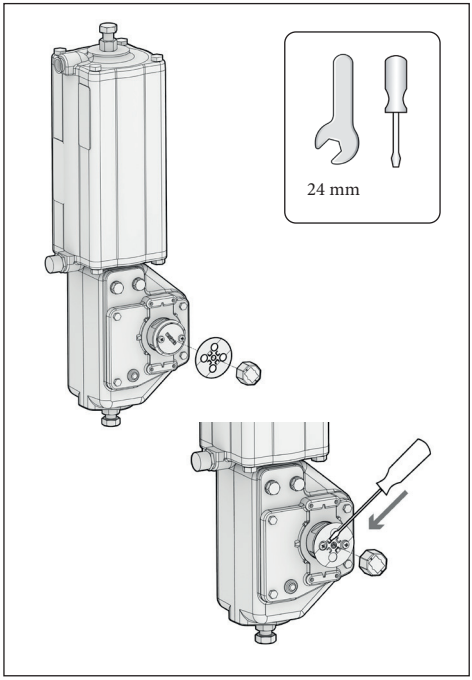


Rotary mounting is designed according to VDI/VDE 3845 interface.

INSTALLATION TO NELES B-SERIES ACTUATORS - MAGNET MOUNTING

- Mounting set includes mechanical position indicator. It can be used if there is no position indicator in the actuator.
- Place position indicator plate to the correct position so that it correspond to the valve position.
- Lock position indicator plate with screw driver so that it can't turn by bending locking tabs.
- Mount magnet to the actuator

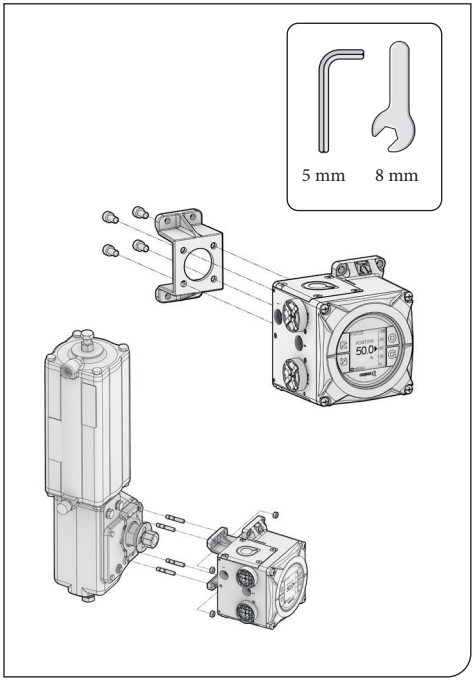
It is recommended to use thread locking to prevent magnet loosening under heavy vibration. Thread locking should be low or medium strength, e.g. Loctite 243. Magnet will be tightened as tight as 4 Nm, operation point of view magnet can be in any position so that there is no adjustment needed.



INSTALLATION TO NELES B-SERIES ACTUATORS - BRACKET MOUNTING

For Neles B-series actuators there are few different mounting brackets, depends on actuator size. This example shows NDX mounting to Neles BJ6 actuator. For other sizes bracket types vary a little, but main steps are the same. When mounting NDX to the Neles actuators, there is no mechanical adjustment needed.

- Mount bracket to the NDX
- Mount bracket to the actuator



ROTARY MOUNTING

INSTALLATION TO ANY ROTARY ACTUATOR

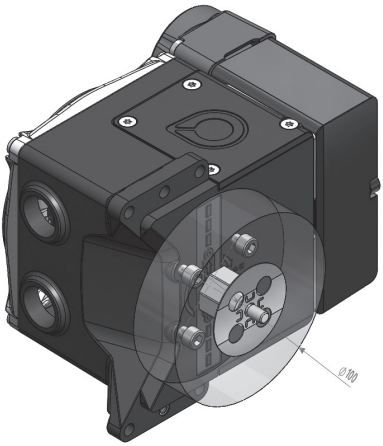
NDX can be easily installed to any rotary actuator when the following installation rules are followed. In order to guarantee the best possible position measurement accuracy, NDX and position feedback magnet must be positioned according to the following guidelines.

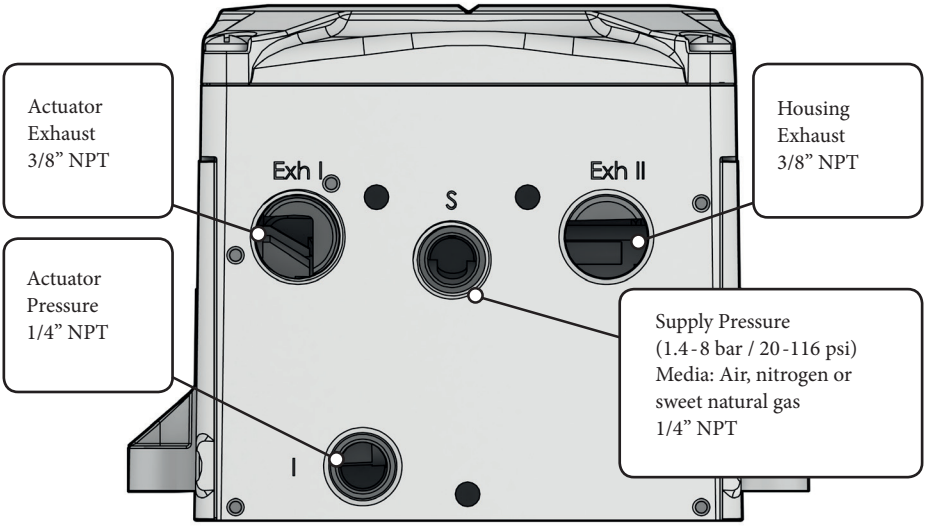
NOTE
Use only Valmet original magnets. Bracket and fixing bolt material should have low magnetic permeability (e.g. AISI316 or aluminium).

Aim for small mechanical clearance, but avoid contact. there shall be max 5 mm gap between the magnet and NDX. Tilt is not critical. Aim for zero eccentricity. Polarity of the magnet is irrelevant.

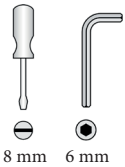
Figure at right shows the exclusion zone. There is no material limitation outside the exclusion zone, but to guarantee the optimal performance do not use any magnetic material inside the zone. Inside the exclusion zone but close to the ”walls”

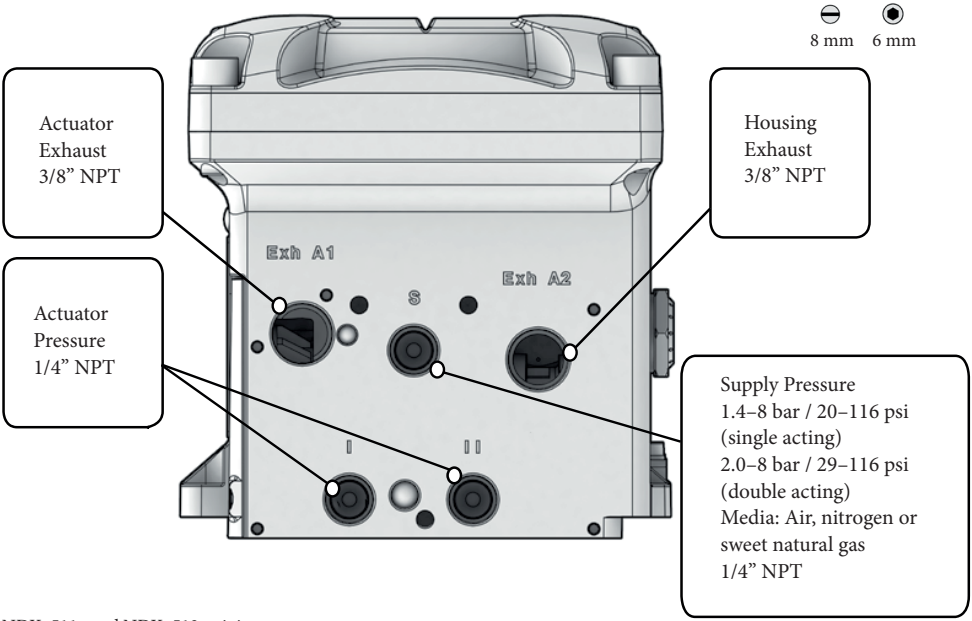
AISI 304 and any austenitic steel can be used.





NDX1510_ piping





NDX_511_ and NDX_512_ piping

PNEUMATICS PIPING

NOTE
Remove all temporary transportation plugs with 8 mm flat-head screwdriver.

NOTE
Placement and distances between exhaust and pressure channels are different than without the pressure gauge block. See Dimension drawings for details.

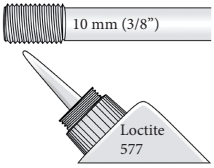
NOTE
When NDX2_ is used with single acting actuator, the pneumatic port II needs to be plugged. Install steel plug with 6 mm hexagon wrench.

NOTE
Exhaust covers are different for Exh I and Exh II and shall not be mixed. Make sure that they are reinstalled to right exhaust port if removed. (Figure page 11 above.)

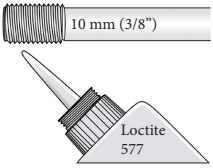
NOTE
When mounting the pneumatic connectors, the exhaust cover may need to be removed temporarily. Mount the exhaust cover back when the pneumatic connectors are mounted.
Do not leave device without exhaust cover. Water and dirt may get into the device.

SUGGESTED PIPING SIZE

Supply Pressure (S)
All actuator types and sizes



Actuator Pressure (I and II)
All actuator types and sizes



NOTE
It is recommended to use 10 mm (3/8") (inside diameter) supply air and actuator pressure piping.

NOTE
In double acting device only port I can be used with single acting actuator.

NOTE
If electrical input signal is lost, the actuator port I is exhausted (0 pressure) and actuator port II goes to supply pressure.

NOTE
When mounting the pneumatic connectors, the exhaust cover may need to be removed temporarily. Mount the exhaust cover back when the pneumatic connectors are mounted.
Do not leave device without exhaust cover. Water and dirt may get into the device.

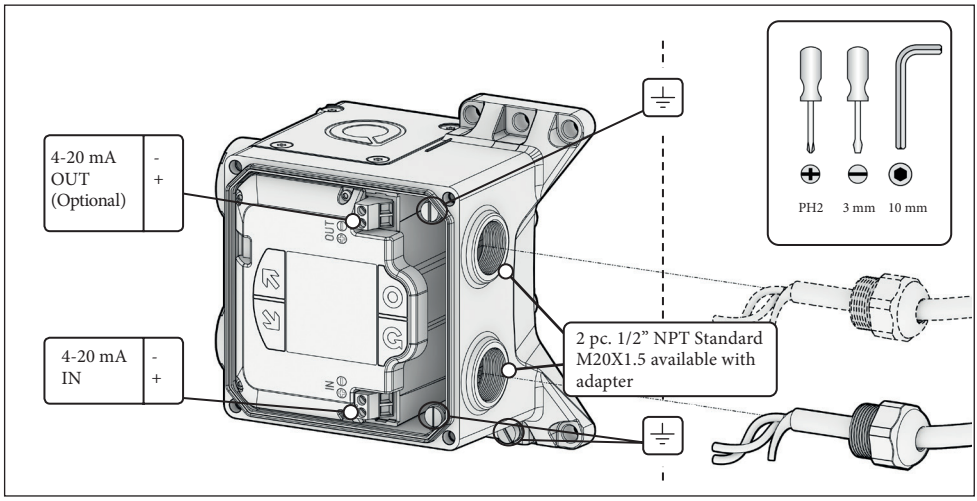
NOTE
Exhaust covers are different for Exh I and Exh II and shall not be mixed. Make sure that they are reinstalled to right exhaust port if removed. See Installation, Maintenance and Operating instructions for details if needed.

NOTE
Check valve on supply pressure port (S) is used on double acting version of NDX (NDX2_) only.
Check valve on supply pressure port (S) is in use with double acting actuators only.

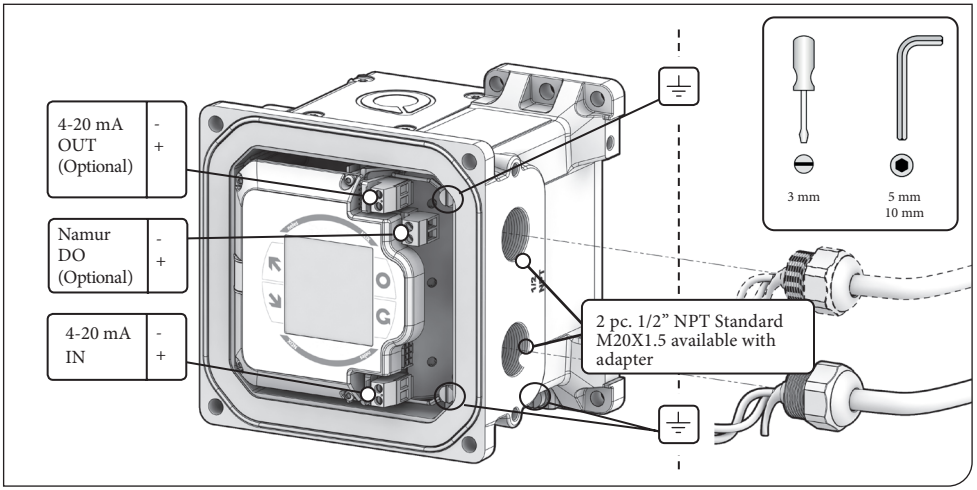
CAUTION
If double acting version of NDX (NDX2_) is installed on single acting actuator, the check valve must be removed.

NOTE
Liquid sealant such as Loctite 577 is recommended. Excess sealant may result in faulty operation. Sealing tape is not recommended. Ensure that the air piping is clean. When pneumatic connector is removed from the housing and reinstalled, make sure the old sealant is removed and threads are clean. Otherwise the dry old sealant might go to pneumatic components and affect the controllability or damage the device.

ELECTRICAL INSTALLATION



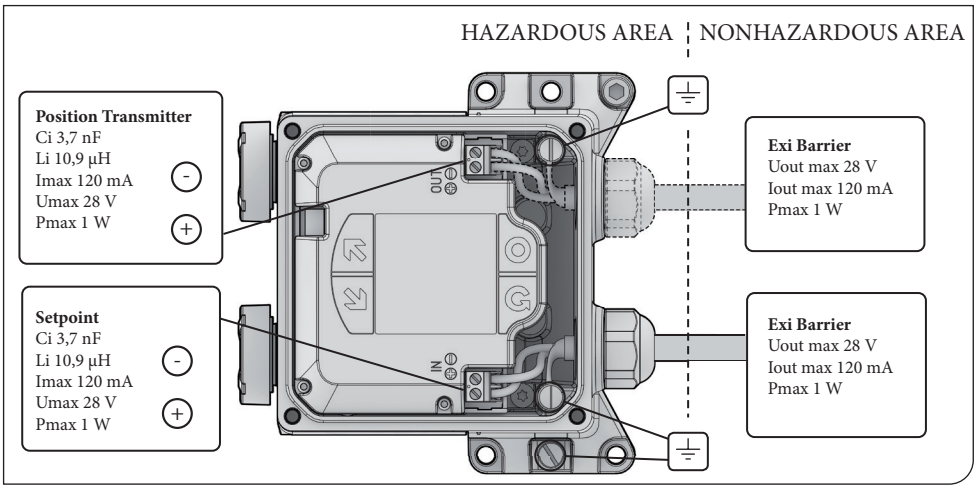
Connector	Function	Power Source	Min. Power	Impedance	Other
IN	Setpoint / HART	4-20 mA Loop Power	3.8 mA, 9.7 VDC	485 Ω at 20 mA	
OUT	Position Transmitter	External 12 ... 30 VDC		780 Ω max, 690 Ω for I.S.	Fail safe output is 3.5 mA or 22,5 mA



Wiring of NDX_511_ and NDX_512_

NOTE
Remove temporary cable gland plugs with 10 mm hexagon wrench.

ELECTRICAL INSTALLATION



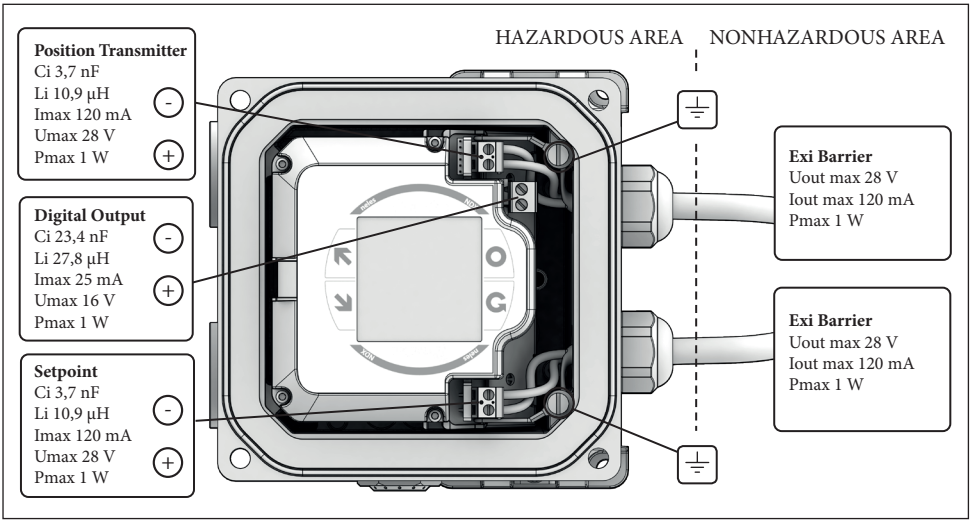
Input values for NDX150

NOTE
It is recommended that grounding of the input cable be carried out from one end only.

NOTE
If device is installed to Ex d area, it can't be installed to Ex i area anymore.

NOTE
Tightening torque for the wiring terminal screws shall be 0.4-0.6 Nm.

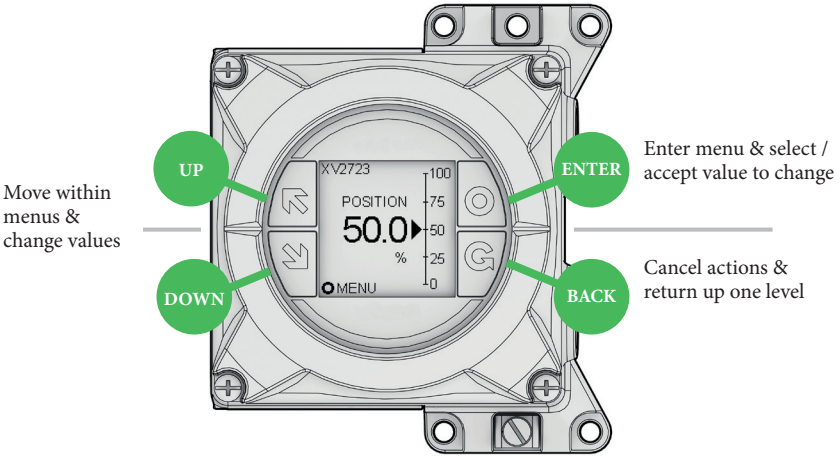
Recommended Wire Type: Shielded twisted pair with a max conductor size of 2.5 mm^2 / 14 AWG.



Input values for NDX_511_ and NDX_512_

LOCAL USER INTERFACE

The NDX Local User Interface (LUI) includes 4 capacitive touch buttons:



NOTE
Buttons can be used with the cover installed or removed.

NOTE (NDX1510_)
When installing the cover make sure that the cover button symbols are at the same position as the symbols on the LUI module inside the device.

NOTE
Device needs to be configured and calibrated before it is switched to automatic control mode. Follow the instructions on the LUI first screen and proceed to guided start-up.

NOTE (NDX_511_ and NDX_512_)
When installing the cover check inside to define it's correct position. The magnet in the cover shall be on the wiring terminal side.

LUI - User access control

1. Cover lock (factory default)
2. PIN lock
3. Cover & PIN lock

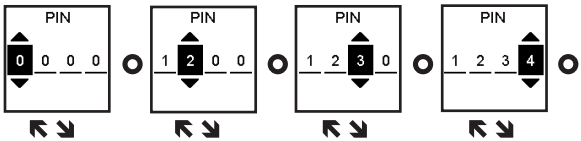
When Cover lock is enabled, detaching the main cover will unlock LUI for editing. When the cover is re-attached, LUI is again locked to read only mode.

When PIN lock is enabled, PIN code is required to unlock editing mode. PIN lock automatically re-locks after one minute of inactivity and at the same time LUI returns to monitoring view.

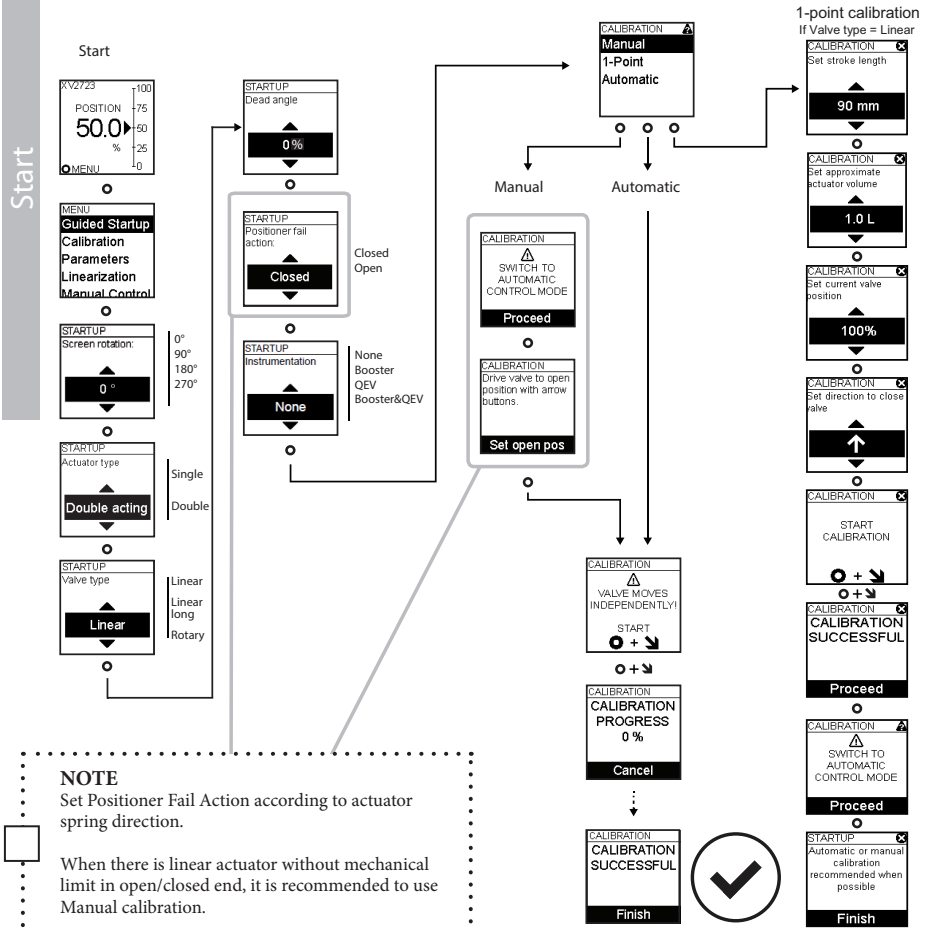
If both Cover and PIN lock are active, user must first detach the cover and after that enter the PIN code to enable the editing mode. One minute of inactivity enables PIN lock and re-attaching the cover locks the Cover lock.

As factory setting default, device has Cover lock active and PIN lock non-active. Default PIN code is 1234.

Different lock settings can be configured in DTM. See detailed instructions in full Installation, Maintenance and Operating instructions.



GUIDED START-UP



NOTE
Set Positioner Fail Action according to actuator spring direction.

When there is linear actuator without mechanical limit in open/closed end, it is recommended to use Manual calibration.

WARNING
Make sure that the valve movement does not endager people or processes before running calibration!

WARNING
Device needs to be in fail safe position when 1-point calibration is used.

SAFETY PRECAUTIONS

NOTE
Avoid grounding a welding machine in close proximity to a valve controller. Damage to the equipment may result.

CAUTION
Do not exceed the permitted values!
Exceeding the permitted values marked on the valve controller 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!
Removing or dismantling pressurized pneumatic components of a valve controller leads to uncontrolled pressure release. 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.

WARNING
During automatic or manual calibration 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 cover removed!
- Environmental influence (water, dust etc.)

Ex WARNING
Electrostatic charge hazard!
The cover is non-conductive.
Clean with a damp cloth only!
Spark hazard!
Protect the aluminum housing from impacts and friction!

Ex d WARNING (NDX Exd version)
Do not open the device when energized!
Explosion protection is lost.

Ex d WARNING (NDX Exd version)
After de-energizing, delay one minute before opening!

Ex d WARNING (NDX Exd version)
Tightening torque for the housing cover screws is 15Nm.

Ex WARNING
For use in the presence of combustible dust.
- Ignition protection relies on the enclosure. Protect the cover of the valve controller from impacts.
- When temperature is higher than 70 °C / 158 °F the temperature rating of the cable shall be higher than the ambient temperature.
- Device shall not be subjected to a prolific charge generating mechanism.
- Accumulation of dust shall be avoided!

Intrinsic Safety (Ex i) WARNING
- Ensure that the complete installation and wiring is intrinsically safe before operating the device!
- The equipment must be connected via a certified Zener barrier placed outside the hazardous area.
- Temperature rating of selected connection cable shall be greater than 83 ˚C.

Ex n WARNING
At an ambient temperature ≥ +70 °C / 158 °F, the temperature rating of selected connection cable shall be in accordance with the maximum ambient temperature range. Selected cable gland shall not invalidate the type of protection.

Ex d WARNING (NDX Ex d version)
Cover and housing and their flange surfaces are Ex d critical parts. Extra caution needs to be taken when handling them. If there are scratches in flange surfaces or if the cover is dropped, the cover and/or device needs to be changed.

Ex NOTE
Follow the standards EN/IEC 60079-14 when installing the equipment and and EN/IEC 60079-25 when connecting Ex i interfaces.

TRANSPORTATION AND STORAGE

The valve controller is a sophisticated instrument and it shall be handled with care. Products must be stored in a clean, dry environment.

Device is delivered in IP67 packaging for storage and transportation.

- Check the controller for any damage that may have occurred during transportation.
- Store the uninstalled 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.
- For complete instructions manual see website: www.valmet.com/ndx

RECYCLING AND DISPOSAL

Most valve controller parts can be recycled if sorted according to material. Most parts have material marking. A material list is supplied with the valve controller. In addition, separate recycling and disposal instructions are available from the manufacturer. A valve controller may also be returned to manufacturer.

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