

These operating instructions apply for:



Group 1

NTS 100/01
NTS 75/01
NTS 50/01
NTS 70/02
NTS 54/02
NTS 50/04
NTS 21/04
NTS 50/08

Group 2

NTS 50/10
NTS 30/10
NTS 50/15
NTS 50/20
NTS 30/20
NTS 24/20
NTS 50/40
NTS 20/40



Important note:

Before use of the pneumatic linear vibrators series NTS read this operating instruction carefully and store afterwards.

Netter GmbH does not assume liability for damage to property and persons if the product has been technically modified or if the notes and regulations of these operating instructions have not been observed.

This documentation is copyrighted. All rights, e.g. for translation into other languages, reprinting and copying of these operating instructions or parts hereof remain strictly reserved.

Table of Contents





| | | |
|-----------|------------------------------|-----------|
| 1 | GENERAL NOTES | 3 |
| 2 | TECHNICAL DATA | 3 |
| 3 | DESIGN AND FUNCTION | 6 |
| 4 | SAFETY | 7 |
| 5 | TRANSPORT AND STORAGE | 8 |
| 6 | INSTALLATION | 8 |
| 7 | START-UP / OPERATION | 12 |
| 8 | SERVICE, MAINTENANCE | 14 |
| 9 | TROUBLESHOOTING | 15 |
| 10 | SPARE PARTS | 15 |
| 11 | APPENDIX | 16 |
| | 11.1 Accessories | 16 |
| | 11.2 Disposal | 16 |
| | 11.3 Enclosures | 16 |

Scope of delivery:



Check the packing for possible shipping damage.
 If the packing is damaged check the contents for completeness and possible damage.
 In case of damage inform the transport agent. Compare the scope of supply with the delivery note.

In these operating instructions the following information and danger symbols are used.

| | | | |
|---|---|---|------------------------------|
|  | Notes on important processes |  | Warning of a danger source |
|  | Important note on processes to be especially observed |  | Environmental waste disposal |

1 General notes

Pneumatic linear vibrators of series NTS are partly completed machineries and comply with the EC-machine regulation 2006/42/EG. In particular, standards DIN EN ISO 12100, part 1 and 2 have been observed.

The vibrators generate directed linear vibrations or shaking movements.

General areas of application are: loosening, conveying, compacting as well as separating of bulk materials and reducing of friction.

NTS - vibrators are used to empty bunkers, to drive conveyor troughs, sieves and vibrating tables.

Applications in the food industry as well as in wet environments are also possible, when complying with the operating instructions of the operating company.

The drive medium is compressed air or nitrogen.

NTS vibrators may be operated in dusty or wet environments.

Operation without silencer should be avoided in order to protect the environment against high noise.

2 Technical Data



Drive medium:

Clean (5 µm filter) compressed air or nitrogen

Unfiltered air or nitrogen will cause damage to the vibrators.

Operating pressure:

2 bar to 6 bar*

Operating pressures must not be exceeded or fallen short of

Ambient temperature:

5°C to 60° C*

Operating temperatures must not be exceeded or fallen short of.

Lubrication:

If advised by application engineers of Netter GmbH and in compliance with locally specified conditions, vibrators of group 1 may be operated without oil. (Exception 1: In case of freeze-dried air and under extreme ambient conditions, Exception 2: NTS 21/04).

Units of group 2 and the NTS 21/04 must only be operated with lubricated compressed air or lubricated nitrogen.

*) Higher operating pressures and temperatures are only permitted after consultation and written confirmation by application engineers of Netter GmbH.

| Type | Housing material | Working moment | | | Nominal frequency | | | Linear force | | | Air consumption | Noise level |
|-------------|------------------|----------------|--------|--------|----------------------|-------|-------|--------------|--------|--------|-----------------|---------------|
| | | [cmkg] | | | [min ⁻¹] | | | [N] | | | [l/min] | [dB(A)] |
| | | 2 bar | 4 bar | 6 bar | 2 bar | 4 bar | 6 bar | 2 bar | 4 bar | 6 bar | 2 bar – 6 bar | 2 bar – 6 bar |
| NTS 100/01* | AL | 0,33 | 0,43 | 0,41 | 3.920 | 4.640 | 5.840 | 281 | 513 | 764 | 33 – 181 | 68 – 80 |
| NTS 75/01* | AL | 1,01 | 1,31 | 1,44 | 2.848 | 3.596 | 4.038 | 451 | 934 | 1.291 | 99 – 442 | 67 – 81 |
| NTS 50/01* | AL | 2,18 | 2,62 | 2,66 | 1.924 | 2.408 | 2.825 | 442 | 834 | 1.164 | 88 – 416 | 76 – 84 |
| NTS 70/02* | AL | 2,81 | 2,77 | 3,04 | 2.096 | 2.808 | 3.336 | 676 | 1.186 | 1.847 | 128 – 564 | 76 – 87 |
| NTS 54/02* | AL | 4,54 | 5,51 | 5,07 | 1.730 | 2.064 | 2.544 | 745 | 1.288 | 1.800 | 152 – 698 | 80 – 89 |
| NTS 50/04* | AL | 7,90 | 9,80 | 9,70 | 1.920 | 2.296 | 2.672 | 1.591 | 2.844 | 3.789 | 271 – 977 | 77 – 86 |
| NTS 21/04 | AL | 34,90 | 45,90 | 49,10 | 941 | 1.156 | 1.334 | 1.694 | 3.362 | 4.786 | 225 – 718 | 73 – 83 |
| NTS 50/08* | AL | 11,30 | 15,30 | 17,00 | 1.977 | 2.331 | 2.669 | 2.426 | 4.555 | 6.642 | 216 – 803 | 81 – 90 |
| NTS 50/10 | GG | 14,50 | 17,90 | 18,90 | 1.983 | 2.392 | 2.809 | 3.128 | 5.626 | 8.174 | 454 – 1.647 | 82 – 92 |
| NTS 30/10 | GG | 50,00 | 80,00 | 96,00 | 840 | 1.044 | 1.300 | 1.940 | 4.780 | 8.900 | 312 – 1.438 | 75 – 85 |
| NTS 50/15 | GG | 25,00 | 32,70 | 35,80 | 1.830 | 2.209 | 2.464 | 4.589 | 8.754 | 11.922 | 726 – 2.108 | 81 – 91 |
| NTS 50/20 | GG | 24,70 | 34,20 | 37,30 | 1.823 | 2.252 | 2.591 | 4.511 | 9.527 | 13.737 | 887 – 2.491 | 81 – 92 |
| NTS 30/20 | GG | 57,30 | 84,80 | 92,60 | 1.227 | 1.528 | 1.759 | 4.727 | 10.852 | 15.693 | 551 – 2.014 | 78 – 88 |
| NTS 24/20 | GG | 94,20 | 126,60 | 144,80 | 936 | 1.176 | 1.388 | 4.515 | 9.596 | 15.290 | 642 – 2.083 | 75 – 80 |
| NTS 50/40 | GG | 72,50 | 93,00 | 99,50 | 1.335 | 1.617 | 1.920 | 7.090 | 13.333 | 20.114 | 994 – 3.296 | 80 – 92 |
| NTS 20/40 | GG | 218,90 | 286,70 | 302,30 | 827 | 985 | 1.147 | 8.227 | 15.239 | 21.808 | 1.340 – 4.252 | 77 – 89 |

These technical data are reference values and may vary in dependence on the application, further data on request.

*) oil free operation possible

Noise level:

The noise level is mainly determined by the mounting surface (e.g. sheet metal) the vibrator is mounted on. Depending on type (with silencer) and an air pressure of 6 bar the noise level is 80-85 dB(A), it is less if the air pressure is reduced. Sheet metal without noise insulation amplifies the noise level.

Duration of operation:

Long operating periods change the performance data (wear).

Please observe when choosing:

Linear vibrators of type NTS are available in two different designs.

Group 1:

Housing made of aluminium, hard-coated, cover made of plastic, installed starting spring for horizontal or slightly inclined installation. (Exception: NTS 21/04 without starting spring).

If advised by application engineers of Netter GmbH and in compliance with locally specified conditions, these vibrators may be operated without oil. (Exception: NTS 21/04).

Group 2:

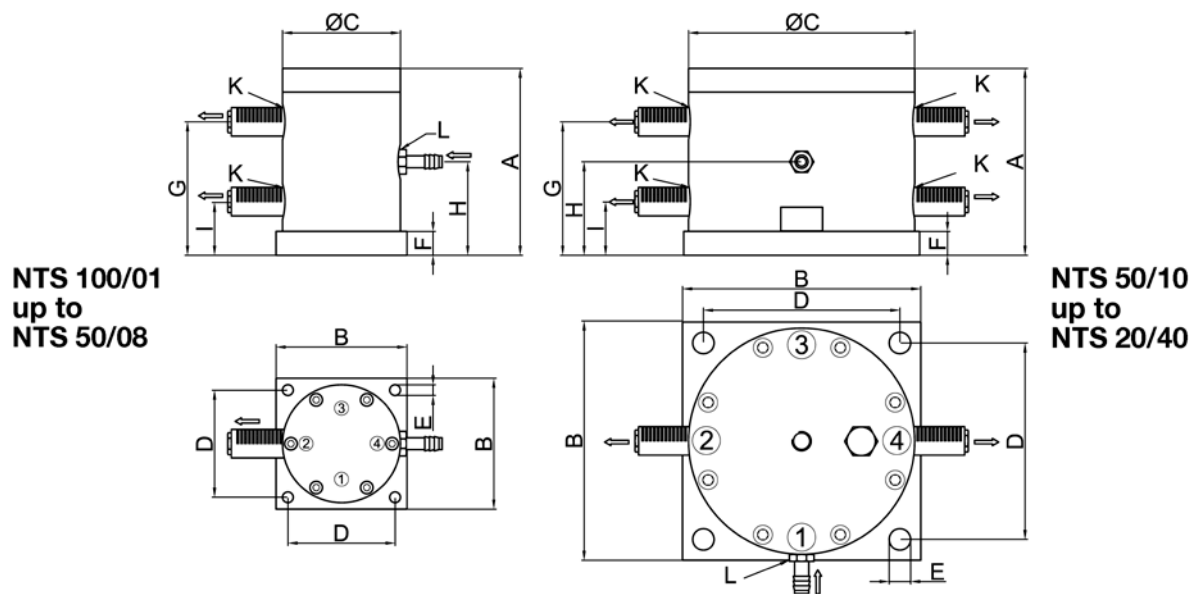
Housing made of steel or continuous casting, surface treated, base plate made of steel. Connection for starting impulse.

These vibrators and the NTS 21/04 must only be operated with lubricated compressed air or lubricated nitrogen.

Operation of NTS vibrators requires the installation of a 3/2-way valve to ensure problem-free starting. This valve also ensures immediate stopping when switching off. At temperatures ≤ 10 °C higher starting pressures (more than 2 bar) may be required.



Dimensions:



| Type | A | B | C | D | Ø E | F | G | H | I | K | L | Air Ex- | Air | Air Ex- | Housing | Piston | Total |
|------------|------|------|------|------|------|------|------|------|------|---------|--------|---------|---------|---------|---------|--------|-------|
| | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | Air Ex- | Air | haust | Supply* | haust** | [kg] | [kg] | [kg] |
| | | | | | | | | | | haust | Supply | Side | ∠° | ∠° | | | |
| NTS 100/01 | 89 | Ø 69 | 69 | - | M | 20 | 65,5 | 48,5 | 31,5 | G1/4 | G1/4 | 3 | | | 0,64 | 0,36 | 1,0 |
| NTS 75/01 | 115 | 90 | 80 | 72 | 9,0 | 20 | 81 | 60 | 38 | G1/4 | G1/4 | 2 | | | 1,1 | 0,8 | 1,9 |
| NTS 50/01 | 155 | 90 | 80 | 72 | 9,0 | 20 | 121 | 80 | 40 | G1/4 | G1/4 | 2 | | | 1,5 | 1,4 | 2,9 |
| NTS 70/02 | 130 | 110 | 100 | 90 | 9,0 | 20 | 91 | 65 | 39 | G3/8 | G3/8 | 2 | | | 1,9 | 1,2 | 3,1 |
| NTS 54/02 | 157 | 110 | 100 | 90 | 9,0 | 20 | 112 | 79 | 45 | G3/8 | G3/8 | 2 | | | 2,3 | 1,6 | 3,9 |
| NTS 50/04 | 157 | 150 | 139 | 124 | 13 | 20 | 113 | 79 | 44 | G3/8 | G3/8 | 2 | | | 4,0 | 4,3 | 8,3 |
| NTS 21/04 | 330 | 150 | 139 | 124 | 13 | 20 | 280 | 165 | 49 | G3/8 | G3/8 | 2 + 4 | | | 8,5 | 12,5 | 21 |
| NTS 50/08 | 173 | 200 | 170 | 165 | 17 | 30 | 125 | 92 | 58 | G3/8 | G3/8 | 2 + 4 | | | 9,0 | 7,1 | 16,1 |
| NTS 50/10 | 157 | 200 | 190 | 165 | 18 | 20 | 112 | 79 | 45 | G3/8 | G1/2 | 2 + 4 | 0 | 90 | 20 | 9,0 | 29 |
| NTS 30/10 | 340 | 200 | 190 | 165 | 18 | 20 | 289 | 170 | 52 | G3/8 | G1/2 | 2 + 4 | 0 | 90 | 41 | 25 | 66 |
| NTS 50/15 | 185 | 230 | 220 | 190 | 22 | 30 | 134 | 95 | 56 | G3/8 | G3/4 | 1 - 4 | 0 | 30 | 32 | 15 | 47 |
| NTS 50/20 | 190 | 250 | 250 | 210 | 22 | 30 | 134 | 95 | 57 | G3/8 | G3/4 | 1 - 4 | 22,5 | 22,5 | 42 | 19 | 61 |
| NTS 30/20 | 278 | 250 | 250 | 210 | 22 | 30 | 218 | 139 | 61 | G3/8 | G3/4 | 1 - 4 | 45 | 45 | 54 | 37 | 91 |
| NTS 24/20 | 360 | 250 | 250 | 210 | 22 | 30 | 298 | 180 | 62 | G3/8 | G3/4 | 1 - 4 | | | 68 | 54 | 122 |
| NTS 50/40 | 266 | 320 | 320 | 260 | 26 | 40 | 194 | 133 | 72 | G1/2 | G 1 | 1 - 4 | 20 | 20 | 89 | 52 | 141 |
| NTS 20/40 | 470 | 320 | 320 | 260 | 25 | 40 | 392 | 235 | 78 | G1/2 | G 1 | 1 - 4 | | | 134 | 125 | 259 |

* From size NTS 50/10 upwards the inlet supply port L is moved up to max. 45°.

** From size NTS 50/10 upwards the exhaust supply port K is moved up to max. 90°.

3 Design and function

Vibration is generated by a freely oscillating, automatically reversing piston. Both masses, the piston on the one side and the mass fastened to the housing on the other, thereby vibrate against each other in proportion to their total weights.

Compressed air or nitrogen enters through port **1** into the housing and is alternately guided through a groove and the pilot bores in piston **3** into the air chambers **9** and **10**. The changing pressure in these chambers drives the piston.

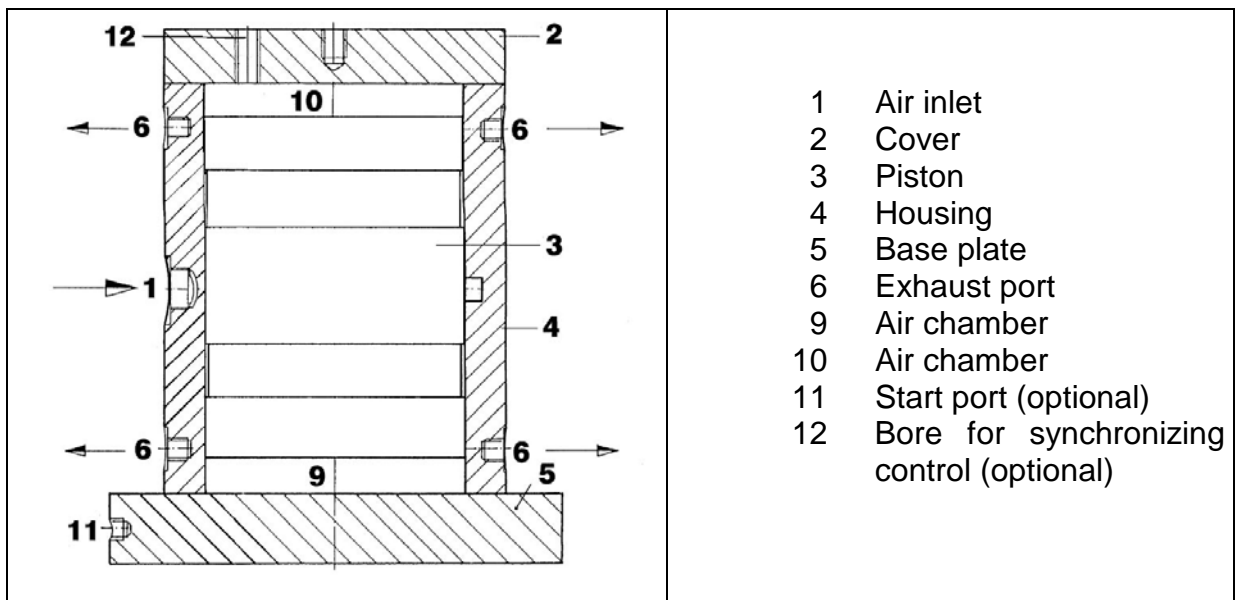
The presently depressurized chamber is ventilated through the openings **6**. Once the piston passes past these openings the air can no longer escape – leaving an air cushion. This prevents a hard impact and initiates an additional impulse, to the linear force.

If a lower vibration amplitude is required, simply throttle the exhaust air flow.

If a lower frequency is required, just throttle the air supply, e.g. by means of a pressure regulator.

The illustration shows a piston position which may occur in case of horizontal mounting. In this position the vibrator will not start. For this reason units of group 2 have a port **11** in the base plate **5**, so that the piston **3** can be moved to the start position by applying a short pressure shock. This requires an additional 2/2-way valve.

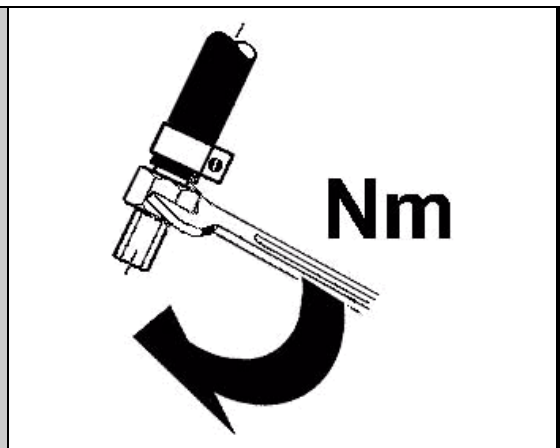
Units of group 1 are equipped with a starting spring between base plate **5** and piston **3** (Exception: NTS 21/04 without starting spring).



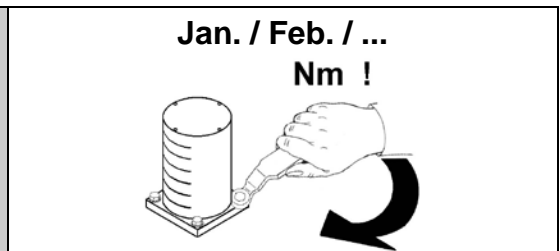
4 Safety



NTS vibrators work with compressed air or nitrogen.
 Make sure the compressed air or nitrogen supply is switched off during installation.
 Disconnect the supply lines (quick coupling) before starting other work on vibrators and supply lines.
 Before starting operation all hoses must be tightly connected.
 A pressurized hose coming loose can cause severe injury.



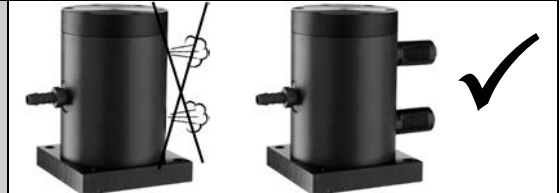
Vibrator as well as part of the structure can detach because of vibration. Falling parts can cause damage to persons and material.
 Screw retention components and/or Loctite or similar must be used.



Screw connections must be checked and, if necessary, retightened after 1 hour of operation and then controlled at regular intervals (normally each month).
 In critical installation situations the unit must be secured with a steel rope.



Silencer:
 Operation without silencer should be avoided in order to protect the environment against high noise values.



Technical changes to the equipment may effect the characteristics of the vibrators or even damage the units and cause the rejection of any warranty claims.



Permissible operating conditions:

Operating pressure:

2 bar to 6 bar*

Operating pressures must not be exceeded or fallen short of.

Ambient temperature:

5°C to 60° C*

Operating temperatures must not be exceeded or fallen short of.

Lubrication:

If advised by application engineers of Netter GmbH and in compliance with locally specified conditions, vibrators of group 1 may be operated without oil. (Exception 1: In case of freeze-dried air and under extreme ambient conditions, Exception 2: NTS 21/04).

Units of group 2 and the NTS 21/04 must only be operated with lubricated compressed air or lubricated nitrogen.

*) Higher operating pressures and temperatures are only permitted after consultation and written confirmation by application engineers of Netter GmbH.

5 Transport and Storage



Check the packing for possible shipping damage.
If the packing is damaged check the contents for completeness and possible damage. In case of damage inform the transport agent. Compare the scope of supply with the delivery note.

The units are packed ready for installation.

The name plate is fixed on the vibrator.
If lubricated compressed air or nitrogen are required, the unit is delivered with a corresponding note next to the air inlet port.

If not specified differently, accessories and additional components (grommet, silencer) will be supplied unmounted.
Special transport conditions are not specified.

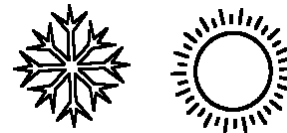
The units should be stored in a dry and clean environment.

Linear vibrators of type NTS must be oiled before being returned for storage (squirt machine oil into the air inlet port and actuate the vibrator for a short while).

On oil-free versions cleaning of the unit is recommended (dismantle, if necessary wipe off deposits with oil, wipe clean, reassemble).



The storage temperature may be between -40°C and +120 °C. (This does not concern the operating temperature, see **chapter 4 SAFETY, "Permissible Operating Conditions"**).



6 Installation



During installation please comply strictly with the safety regulations in chapter 4 and the accident prevention instructions!

Make sure the compressed air supply is switched off during installation or when working on vibrator and air supply lines.



Mounting the vibrator:

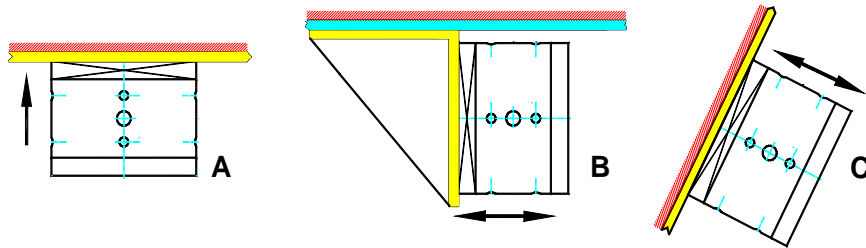
The housing of the linear vibrator must be bolted to the mass to be vibrated. The mounting surfaces must be absolutely even ($\pm 0.1\text{mm}$ flatness tolerance), so that the vibrator has full area contact and warping of the housing is avoided when tightening the fastening screws. The surfaces should

also be free of any paint residues and weld penetrations. Tensions in the housing may cause mechanical damage.

The unit generates directed vibrations. The working moment of the freely oscillating piston determines the amplitude.



In critical installation situations the unit must be secured with clamp and steel rope.



The illustrations show possible applications:

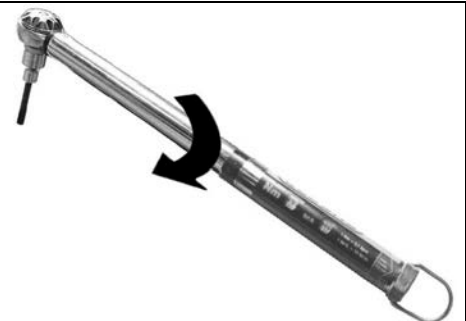
- A** on vibrating tables for compaction, testing etc.
- B** under tables, on filters etc. for shaking
- C** on bunkers for emptying, on vibrating troughs and sieves



As a protection against loosening use self-locking screws and nuts, self-locking lock washers (no spring rings) or use a liquid screw retention agent, e.g. Loctite 270.



The tightening torques can be taken from the following table. Higher tightening torques may cause fracture of screws or tearing of threads. Inadequate screw connections may cause loosening of units by vibration. This can cause damage to persons and material!



Recommended average tightening torques for property class 8.8 screws (screws as delivered, without additional lubrication):

| Type | Thread | Tightening torque |
|------------|--------|-------------------|
| NTS 100/01 | M 12 | 30 Nm |
| NTS 75/01 | M 8 | 25 Nm |
| NTS 50/01 | M 8 | 25 Nm |
| NTS 70/02 | M 8 | 25 Nm |
| NTS 54/02 | M 8 | 25 Nm |
| NTS 50/04 | M 12 | 87 Nm |
| NTS 21/04 | M 12 | 87 Nm |
| NTS 50/08 | M 16 | 215 Nm |
| NTS 50/10 | M 16 | 215 Nm |
| NTS 30/10 | M 16 | 215 Nm |
| NTS 50/30 | M 16 | 215 Nm |
| NTS 50/20 | M 20 | 430 Nm |
| NTS 30/20 | M 20 | 430 Nm |
| NTS 24/20 | M 20 | 430 Nm |
| NTS 50/40 | M 24 | 740 Nm |
| NTS 20/40 | M 24 | 740 Nm |

Use a torque wrench and tighten the screws in a crosswise pattern.

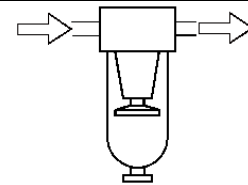


Retightening:

Screw connections must be checked and, if necessary, retightened after 1 hour of operation (after initial start-up) and then at regular intervals (normally each month).



When using compressed air or nitrogen as drive medium, it must be clean (filtered). Unfiltered air leads to excessive wear, clogging of the silencer and complete damage of the vibrator (seizure of piston). The compressed air or nitrogen supply must be reliably fastened.



≤ 5 µm
filter recommended



Please observe already during installation:
The permissible temperature range must not be exceeded or fallen short of during operation, see **Chapt. 4 „Safety – Permissible Operating Conditions“**.
Versions for other temperature ranges on request.

Air supply line:

The pressure drop increases with the hose length. The nominal widths in the table apply for hose lengths of up to 3 m. Longer supply lines need bigger cross-sections.

Air discharge line:

Exhaust air can be discharged through a hose.
If full power of the linear vibrator is required, the air discharge hose must have a bigger cross-section than the air supply hose. The free end should be fitted with a silencer.

Minimum cross-sections for valves and hoses:

| Type | Connection threads | Hose size | 3/2-way valve (size) | |
|------------|--------------------|-----------|----------------------|---------|
| NTS 100/01 | G 1/4 | DN 10 | G 1/4 | DN 6 |
| NTS 75/01 | G 1/4 | DN 10 | G 1/4 | DN 6 |
| NTS 50/01 | G 1/4 | DN 10 | G 1/4 | DN 6 |
| NTS 70/02 | G 3/8 | DN 12 | G 1/4-3/8 | DN 7 |
| NTS 54/02 | G 3/8 | DN 12 | G 1/4-3/8 | DN 7 |
| NTS 50/04 | G 3/8 | DN 12 | G 3/8-1/2 | DN 9-12 |
| NTS 21/04 | G 3/8 | DN 12 | G 3/8-1/2 | DN 9-12 |
| NTS 50/08 | G 3/8 | DN 12 | G 3/8-1/2 | DN 9-12 |
| NTS 50/10 | G 1/2 | DN 13 | G 1/2 | DN 12 |
| NTS 30/10 | G 1/2 | DN 13 | G 1/2 | DN 12 |
| NTS 50/15 | G 3/4 | DN 19 | G 3/4 | DN 19 |
| NTS 50/20 | G 3/4 | DN 19 | G 3/4 | DN 19 |
| NTS 30/20 | G 3/4 | DN 19 | G 3/4 | DN 19 |
| NTS 24/20 | G 3/4 | DN 19 | G 3/4 | DN 19 |
| NTS 50/40 | G 1 | DN 25 | G 1 | DN 25 |
| NTS 20/40 | G 1 | DN 25 | G 1 | DN 25 |

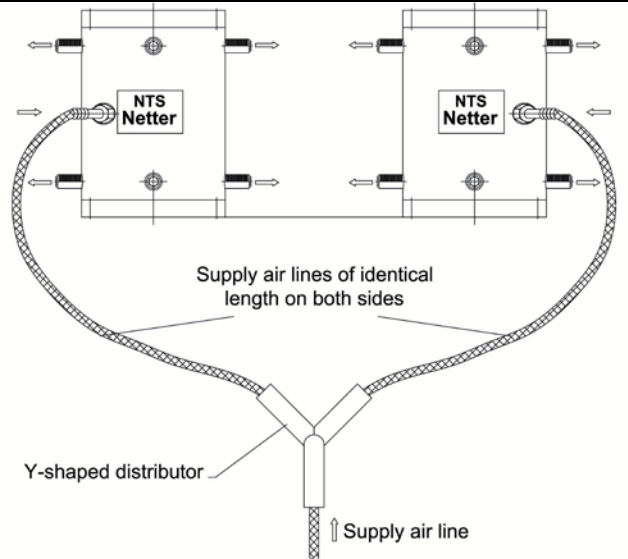


Do not use fittings with threads longer than specified (e.g. no tubes with male thread). The housing may thereby be deformed – the piston will seize.
Make sure that no Teflon tape will enter into the unit. This would cause seizure. The first two windings of the thread should remain free!
The base plate must have full contact. Otherwise the housing may warp and the unit will not start.

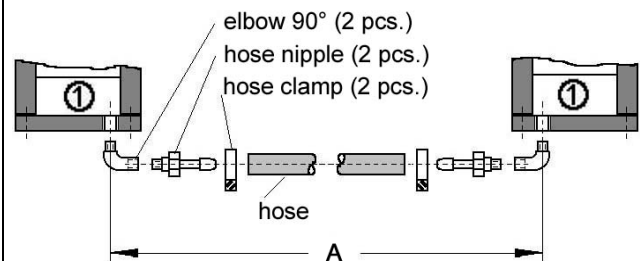


Synchronized operation of 2 or more vibrators is possible when using a coupling set. Vibrators from NTS 50/10 upwards already have the necessary bore in the cover or it can be added by simply changing the cover.

Synchronized operation: For operation of two vibrators the air supply line must be connected to both vibrators via a Y-shape distributor. Here it is absolutely necessary that the lengths and cross-sections between Y-shaped distributor and vibrators are absolutely identical. Connection of both air chambers ① on one piston rod side is accomplished by a coupling kit, which enables synchronized operation of the piston vibrators. In order to ensure synchronized operation, the hose connection (incl. elbows and grommets) must have a predetermined nominal width and hose length. Please be aware that the use of longer hoses causes a higher air consumption and that this may adversely affect synchronized operation. The synchronization line should therefore be designed as short as possible ($A = 0.2$ to 2 m, depending on vibrator type). During synchronized operation the connecting hose becomes extremely hot, this requires the use of an appropriate high temperature hose.



Coupling set for synchronization of 2 NTS



Checklist for installation

- 1) Install the unit. Lock the fastening screws crosswise.
- 2) Consider the expected operating temperature.
- 3) Install service unit (filter, if necessary regulator), valve, supply line.
- 4) Have fastening screws been locked? Check!
Has information on hose length and nominal width been observed?

7 Start-up / Operation

Start-up of the vibrators can be performed immediately after the correct installation.

At temperatures $\leq 10^{\circ}\text{C}$ higher starting pressures (more than 2 bar) may be required. A start-up control starts the unit with approx. 5 bar and then reduces the pressure to 2 bar.

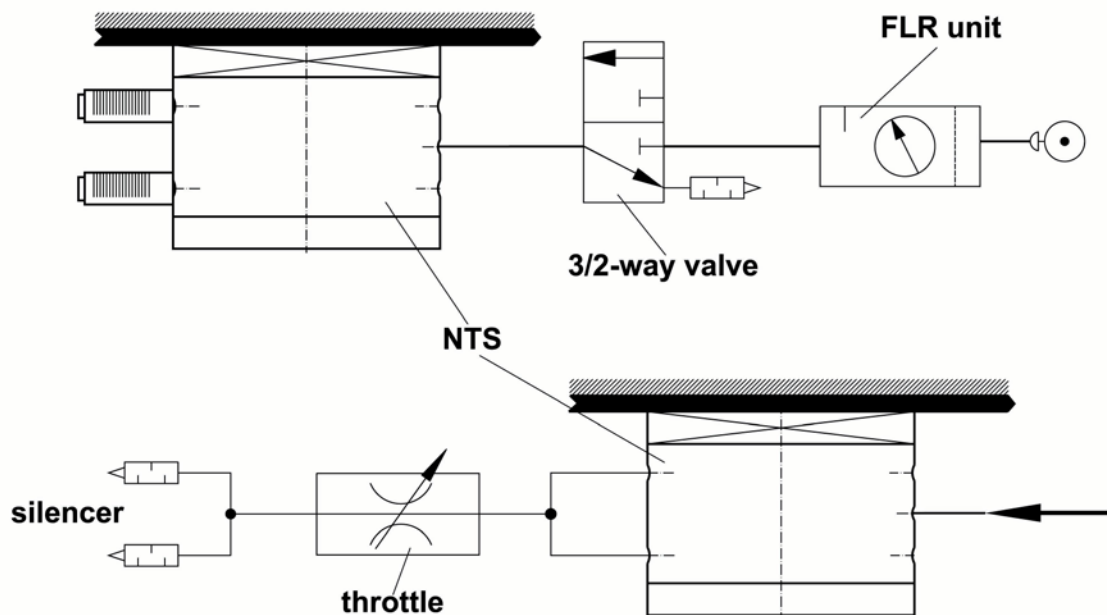
The frequency can be adjusted or regulated with the pressure regulator on the service unit. Use a 3/2-way valve!

The amplitude can be regulated with a throttle installed in the exhaust air outlet.

Attention: Reduced cross-sections (observe DN) already throttle.

Standard installation

Special plans on request



If lubricated compressed air or nitrogen is mandatory for the NTS (housing group 2, orange or stainless steel housing and the NTS 21/04):

Fill the oil-mist lubricator with acid-free and resin-free pneumatic oil, ISO viscosity class according to DIN 51519, VG 5 to VG 15.

Please consider the operating temperature:

In case of temperatures higher than 150°C (special versions) please contact Netter GmbH.

| | | | |
|------------|---|------|-----------|
| NTS 100/01 | - | 2-3 | drops/min |
| NTS 75/01 | - | 2-3 | drops/min |
| NTS 50/01 | - | 2-3 | drops/min |
| NTS 70/01 | - | 2-3 | drops/min |
| NTS 54/01 | - | 3-4 | drops/min |
| NTS 50/04 | - | 4-5 | drops/min |
| NTS 21/04 | - | 5-6 | drops/min |
| NTS 50/08 | - | 5-6 | drops/min |
| NTS 50/10 | - | 5-6 | drops/min |
| NTS 30/10 | - | 5-6 | drops/min |
| NTS 50/15 | - | 5-6 | drops/min |
| NTS 50/20 | - | 5-6 | drops/min |
| NTS 30/20 | - | 5-6 | drops/min |
| NTS 24/20 | - | 5-6 | drops/min |
| NTS 50/40 | - | 9-12 | drops/min |
| NTS 20/40 | - | 9-12 | drops/min |



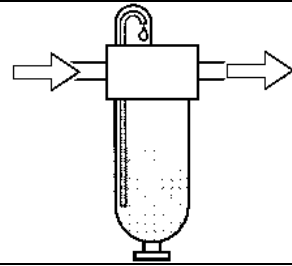
ATTENTION:

Adjust number of drops while unit is running.

Only after the adjustment and correct function of the lubricator the unit is ready for operation.



When using freeze-dried air and under extreme ambient conditions the installation of an upstream lubricator is required.



Operation with very short stop intervals



In case of operation with very short stop intervals (≈ 2 s.), it is possible that the linear vibrator does not start immediately. The reason for this is that the time is too short for the piston to be pushed into the end-position by the spring (units group 1), or by gravitational force (units group 2). Special versions are available for such applications.

Regulating the amplitude:

The amplitude can be regulated by throttling the exhaust air (installation of a throttle in the discharge port).

With this the linear force can be reduced.

The frequency remains almost constant.

Recommendation: Reduce the amplitude only down to approx. 50%. Below this value starting problems may occur.

Regulating the frequency:

The frequency can be reduced by throttling the air pressure at the inlet port of the NTS.

This also reduces the linear force.

The amplitude remains almost constant.

At constant main pressure the pressure can be reduced by a throttle, but more precisely by a pressure regulator.

Checklist for commissioning:

- 1) Check hose connections before opening the compressed air supply.
- 2). Adjust the desired frequency on the pressure regulator.
- 3). Adjust the desired amplitude by throttling the exhaust air.
- 4). Adjust the lubricator, if existing.



The fastening screws for the vibrator must be retightened or checked after 1 operating hour.

8 Service, Maintenance



When servicing the unit please observe the safety regulations in chapter 4.



Retightening:

Screw connections must be checked and, if necessary, retightened after 1 hour of operation (after initial start-up) and then at regular intervals (normally each month). On this occasion the specified torque must be observed (see chapter 6).



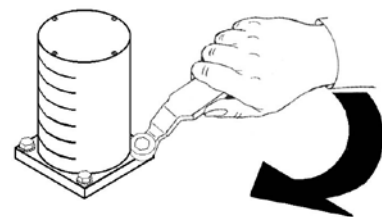
Before starting inspection or service work shut off the compressed air or nitrogen supply and secure it against unintended activation!



Check fastening of vibrator, air connection incl. upstream service unit and silencer – preferably at monthly intervals.

Jan. / Feb. / ...

Nm !



Mist lubricator:

With a lubricator connected in series make sure that it works as specified (contents diminishing? number of drops/h?). Top up oil.

Filter:

Empty the filter when required, clean the filter insert (wash out).

Cleaning

All NTS vibrators can be externally cleaned with pressure water, as long as the exhaust air is discharged through a hose or the exhaust opening is closed. Pressure water must not enter through the silencer into the piston chamber.

Contamination

Especially on oil free operated units (NTS of group 1) a film may form, which slows the vibrator down.

If this is noticed (power drop, possible stand-still) the unit must be opened and cleaned inside. The film must be cleaned off with an oiled cloth from the inside of the housing and from the piston.

Further notes can be found in chapter 9 „Troubleshooting“.

The maintenance intervals mainly depend on the purity of the compressed air or nitrogen.

9 Troubleshooting

| Fault | Possible cause | Remedy |
|------------------------------|--|---|
| No starting | Silencer | Clean the silencer |
| | Air supply | Check pressure on unit! Pressure high enough? Check valve. A 3/2-way valve is strictly required, so that the supply line to the unit is ventilated. |
| | Cover loose | A leaking cover will cause standstill of the vibrator Tighten the screws. |
| | Line cross-sections too small | Observe minimum cross-sections, see specifications under „Installation“ |
| | Line between valve and NTS too long | Causes slow starting and possible standstill of piston in central position. If necessary, install a pilot-controlled 3/2-way air valve in front of the vibrator |
| | Exhaust air excessively throttled | Open the throttle further. Check silencer (sufficient air flow?). |
| | Grommet has too long thread | This may deform the housing (if this has already happened, return the unit to Netter GmbH!). |
| Spanning due to installation | Check whether the contact surface is even. | |
| Rattling | Screws loose | Check the fastening screws |
| Power drop | No lubrication | Check function of lubricator if lubricated compressed air is specified. |
| | Unit soiled | Dismantle, remove dirt film. |
| | Wear | Check unit and piston for visible wear (if wear is found return the unit to Netter GmbH!). See also note in chapter 10 „Spare parts“. |
| | Design: | Check size of unit. Has the size been chosen correctly? |
| | Pressure too low | Check the pressure at the inlet of the unit (!) during operation. If necessary increase the pressure. Line cross-sections OK? |

10 Spare Parts

When ordering spare parts please give the following details:

1. **Type of unit**
2. **Description of spare part**
3. **Required quantity**



Please note: Piston and housing are matched to each other and can only be delivered together.

In order to assure compliance with the technical performance data synchronously operated vibrators should always be replaced together. If this is neglected, the new vibrator will adapt its power to the weaker vibrator.

11 Appendix

11.1 Accessories

The following accessories are available for linear vibrators of type NTS (on request):

| Description | Remark |
|----------------------------|--|
| Hose material and fittings | For supply and discharge of compressed air or nitrogen in various qualities and dimensions. |
| 3/2-way valves | For electric, pneumatic and manual control |
| Throttle valves | For amplitude control, manually adjustable or pneumatically controllable (for remote control) |
| Service units | Filter, regulator, lubricator or filter + regulator (for non-lubricated NTS) |
| Duty/pause controls | Electric or pneumatic for interval operation |
| Brackets | For quick removal of vibrators on containers |
| Large silencers | For combined exhaust air discharge (for group 2) |
| Special designs: | For extreme temperature ranges, for non-lubricated operation, in stainless steel version, with technical data as required and many more. Further information on request. |

11.2 Disposal

Depending on the material, the parts must be disposed of according to official regulations.

Material specifications:

All parts of these vibrators are suitable for recycling

- Black coated housing: ⇒ Aluminium
- Cover: ⇒ Plastic (POM)
- Piston: ⇒ Steel
- Screws: ⇒ Stainless steel
- Orange painted housing: ⇒ Grey cast iron
- Piston and screws for cast iron housing: ⇒ Steel

Special units (also non-lubricated units for other temperatures):

Material on request (e.g. stainless steel, bronze etc.)



All units can be disposed of through Netter GmbH.
The current disposal prices are available on request.

11.3 Enclosures

Enclosure(s):

Declaration of manufacturer



Further information available on request:

Leaflet No. 25 (NTS), control plans for automatic starting of units of group 2 with horizontal installation, starting controls for starting with reduced pressure, recommendations for the construction of discharge troughs with NTS vibrators etc.