Compressed-air geared motors
1AM, 1UP, 2AM, 4AM, 6AM,
NL22, NL32, NL42
with gearboxes P62, P81 and P120
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1. Important instructions

It is essential that you follow the safety instructions and warnings contained here!

**Impending danger.**
Possible consequences: Death or serious injury

**Dangerous situation.**
Possible consequences: Slight or minor injuries

**Damaging situation**
Possible consequences: Damage to the drive unit or the surrounding area

**Important instructions on the prevention of explosions**

Application tips and useful information

Adherence to the operating instructions is an essential prerequisite for fault-free operation and for any guarantee claims to be met. For that reason you should first read the operating instructions, before working with the motor! The operating instructions contain important notes on service; it should therefore be stored close to the motor.

**Disposal**

(please adhere to the current regulations):
Sections of housing, toothed gearwheels and bearings are to be disposed of as steel scrap. This also applies to cast iron parts, provided that there is no separate collection.
2. Safety instructions

2.1 General safety instructions
in normal operation (not intrinsically safe EX operation) and when operated in
the intrinsically safe EX area.

Preliminary remark

Read these instructions carefully before using the geared motor for the first
time. Please also take into account the supplementary safety instructions in
the individual chapters of these operating instructions.

The geared motors have moving parts and possibly hot surfaces during and after
operation.

All work connected with installation, making connections, commissioning,
maintenance and servicing must be carried out by qualified technical staff.
Improper use, installation or operation may lead to serious personal injury and
damage to property.

Handling compressed air

- Wear safety glasses.
- Do not loiter in the immediate vicinity of the stream of compressed air.
- Do not operate the equipment with other gases or liquids.
- Do not operate the equipment with higher pressures than that recommended for
  your model.
- Damage may be incurred if the machine is operated at higher speeds than those
  recommended

Intended use

These geared motors are intended for the generation of rotary motion in industrial
installations. They comply with the relevant standards and regulations, and satisfy
the requirements of directive 94/9/EC (ATEX). Technical data and details of
permissible conditions can be found in this documentation.
It is essential that you adhere to all the details.

2.2 Additional safety instructions for use in the intrinsically safe EX area

Combustible gas mixtures or dust concentrations in combination with hot and
moving parts may cause serious or mortal injury.

Installation, connections, commissioning and all maintenance and repair work on the
geared motor must only be carried out by qualified technical staff, taking into account

- these instructions
- the warning and instruction plates on the geared motor.
- all other planning documents, commissioning instructions and circuit diagrams
  associated with the drive unit.
- the provisions and requirements specific to the plant
- the currently valid national/regional regulations (protection against explosion,
safety, accident prevention)
Safety instructions

**Intended use**
These geared motors are intended for the generation of rotary motion in industrial installations and must only be used as specified in the technical documentation, and in accordance with the details on the nameplate. They comply with the relevant standards and regulations, and satisfy the requirements of directive 94/9/EC (ATEX). They are not permitted to be used for braking.

**2.3 Checklists**

**Before commissioning**
This checklist contains all the actions that *are to be undertaken before commissioning* a geared motor in accordance with ATEX100a in the intrinsically safe EX area.

<table>
<thead>
<tr>
<th>Check before commissioning in the intrinsically safe EX area</th>
<th>Checked</th>
<th>Information in chapter...</th>
</tr>
</thead>
</table>
| Do the following details on the nameplate of the geared motor match the permissible intrinsically safe EX area on site:  
  - Equipment group  
  - EX category  
  - EX zone  
  - temperature class  
  - Maximum surface temperature |         | 3.4                       |
| Has it been ensured that there are no atmospheres, oils, acids, gases, vapours or radiation that may cause an explosion present when the geared motor is being fitted? |         | 5.1                       |
| Is the ambient temperature being maintained in accordance with the technical data? |         | 3.1                       |
| Has it been ensured that the geared motors are adequately ventilated and that there is no external influx of heat (e.g. via couplings)? The cooling air must not exceed a temperature of 40°C. |         | 4.4                       |
| Have all the drive elements to be fitted ATEX approval? |         | 4.3                       |

**During commissioning**
This checklist contains all the actions that *are to be undertaken during commissioning* of a geared motor in accordance with ATEX100a in the intrinsically safe EX area.

<table>
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<tbody>
<tr>
<td>After approx. 2 hours in operation, measure the surface temperature. A temperature of 95°C must not be exceeded. If the temperature is over 95°C, stop the drive unit immediately and contact SPECKEN-DRUMAG!</td>
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</table>
Design

3. Design

3.1 General technical data

Preliminary remark  Data on power and air consumption, as well as connector dimensions can be found in our “Compressed-Air Motors” catalogue.

Operating pressure  Maximum operating pressure: 7 bar  /  Models 1UP and NL: 5.6 bar

Temperature range  Ambient temperature in normal operation (non-EX area):  +1 °C to +80 °C

Compressed air temperature  Ambient temperature in the intrinsically safe EX area):  +1 °C to +40 °C

The temperature of the compressed air fed must not exceed the ambient temperature.

3.2 Specific technical data

<table>
<thead>
<tr>
<th>Model**</th>
<th>Compressed air connector</th>
<th>Number of vanes</th>
<th>Gearbox ratio</th>
<th>Permissible speed range [min⁻¹]</th>
<th>Max. permissible torque (gearbox) [Nm]</th>
<th>Torque range *) ( \Delta p=5.6 \text{ bar} ) [Nm]</th>
<th>Radial load [N]</th>
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## Operating instructions for compressed-air geared motors

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<td>14.9</td>
</tr>
<tr>
<td>6 AM-NRV-7A-P120.7</td>
<td>1/2</td>
<td>4</td>
<td>7</td>
<td>45-450</td>
<td>50</td>
<td>33.5-26.5</td>
<td>600</td>
<td>120</td>
<td>14.9</td>
</tr>
<tr>
<td>6 AM-NRV-7A-P120.14</td>
<td>1/2</td>
<td>4</td>
<td>14</td>
<td>22-218</td>
<td>150</td>
<td>64.0-50.0</td>
<td>900</td>
<td>180</td>
<td>17.3</td>
</tr>
<tr>
<td>6 AM-NRV-7A-P120.25</td>
<td>1/2</td>
<td>4</td>
<td>25</td>
<td>12-119</td>
<td>150</td>
<td>117-91.0</td>
<td>900</td>
<td>180</td>
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<tr>
<td>NL22-NCC-1-P62.14</td>
<td>1/8 NPT</td>
<td>4</td>
<td>14</td>
<td>73-291</td>
<td>25</td>
<td>2.7-2.0</td>
<td>360</td>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>NL22-NCC-1-P62.25</td>
<td>1/8 NPT</td>
<td>4</td>
<td>25</td>
<td>40-159</td>
<td>25</td>
<td>5.0-3.6</td>
<td>360</td>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>NL22-NCC-1-P62.46</td>
<td>1/8 NPT</td>
<td>4</td>
<td>46</td>
<td>22-88</td>
<td>25</td>
<td>9.2-6.6</td>
<td>360</td>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>NL22-NCW-2-P62.14</td>
<td>1/8 NPT</td>
<td>4</td>
<td>14</td>
<td>73-291</td>
<td>25</td>
<td>2.7-2.1</td>
<td>360</td>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>NL22-NCW-2-P62.25</td>
<td>1/8 NPT</td>
<td>4</td>
<td>25</td>
<td>40-159</td>
<td>25</td>
<td>5.0-3.7</td>
<td>360</td>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>NL22-NCW-2-P62.46</td>
<td>1/8 NPT</td>
<td>4</td>
<td>46</td>
<td>22-88</td>
<td>25</td>
<td>9.2-6.7</td>
<td>360</td>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>NL32-NCC-1-P62.7</td>
<td>1/4 NPT</td>
<td>4</td>
<td>7</td>
<td>45-296</td>
<td>8</td>
<td>7.9-4.7</td>
<td>240</td>
<td>50</td>
<td>5.1</td>
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<td>NL32-NCC-1-P81.5</td>
<td>1/4 NPT</td>
<td>4</td>
<td>5</td>
<td>63-414</td>
<td>20</td>
<td>5.6-3.3</td>
<td>400</td>
<td>80</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Notes on the technical data: *) in the case of operating factor 1.6 **) Add <F> to the model designation for the design with flange
3.3 Basic design of the compressed-air motor

3.4 Design of compressed-air motor

1. Housing
2. Drive bearing cover
3. End bearing cover
4. Rotor
5. Vanes
6. Ball bearings
7. Shaft seal
8. End cap
9. Bolts
3.5 Design of planetary gear (1 to 3-stage)

1. Bearing flange
2. Power output shaft
3. Planet carrier
4. Planet wheel
5. Gearbox housing
6. Driving pinion
7. Starting disc
8. Flange cover
9. Flat packing
10. Ball bearings
11. Retaining ring
12. Retaining ring
13. Washer
14. Planet wheel studs
15. Bolt
16. Washer
17. Feather key

3.6 Nameplate, model designation

Nameplate (example)

<table>
<thead>
<tr>
<th>Customer number</th>
<th>121715</th>
<th>Order number</th>
<th>472725</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1UP-NRV-10-P62.51</td>
<td>Model designation</td>
<td></td>
</tr>
<tr>
<td>Article number</td>
<td></td>
<td>Production week and year</td>
<td></td>
</tr>
</tbody>
</table>

Key:

<table>
<thead>
<tr>
<th>II</th>
<th>Equipment group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Equipment category 2</td>
</tr>
<tr>
<td>G</td>
<td>For gas atmospheres</td>
</tr>
<tr>
<td>C</td>
<td>Safety of construction</td>
</tr>
<tr>
<td>T4</td>
<td>Temperature class (135 °C)</td>
</tr>
<tr>
<td>X</td>
<td>Range of ambient temperature (s. technical data)</td>
</tr>
</tbody>
</table>

Model designation (example)

1UP-NRV-10 - P62 - 51

- Gear ratio
- Gearbox size
- Motor model
4. Installation

4.1 Before you start

The geared motor must only be installed if

- the details on the nameplate of the geared motor match the permissible EX application area on site (equipment group, category, zone, temperature class, maximum surface temperature
- the geared motor is undamaged
- it has been ensured that there are no atmospheres, oils, acids, gases, vapours or radiation that may cause an explosion present during installation

4.2 Preliminary work

Drive shafts and flange surfaces must be thoroughly cleaned of anticorrosives, contamination etc. (using commercially available solvents). Do not permit solvents to penetrate to the bearing seals - they will be damaged!

4.3 Installation instructions

- The installation position of the geared motor can be chosen at will if there is a maintenance unit included upstream
- In the case of non-reversing geared motors, the direction of rotation - clockwise or anti-clockwise - can be seen on the drive shaft
- Please use only attachment elements of the required sizes
- Use only the existing attachment holes in order to fix the device in place
- Handle all rotating parts with particular care
- Only driven elements with ATEX approval may be used.
- Under no circumstances should you force pulleys, couplings, pinions etc. onto the end of the shaft by hitting them with a hammer (damage to bearings, housing and shaft!)
- Unscrew the cap or disc facing the end of the shaft, so that the centred shaft end is exposed. The shaft can be supported under a press and in that way the pulley or coupling can be pulled onto the shaft.
- A puller device is required for disassembly
- When pulleys are used please ensure that the tension in the belt is correct (according to manufacturer's specification).
- Only belts with adequate electrical resistance $< 10^9 \Omega$ must be used.
- If the motor shaft is directly connected to the component to be driven without a coupling, you must ensure that that radial offset (centrifugal errors) and any effect of axial forces (tension or pressure) are excluded.
- Under no circumstances should you exceed the permissible radial and axial forces on the shaft (s. Chapter 3.2)
You will simplify assembly if you first lubricate or briefly warm the drive element (to 80-100 °C).

Drive elements such as pulleys, couplings etc. must be covered by a guard.

### 4.4 Installation in an environment where there is a risk of explosion

When installing the geared motor in an environment where there is a risk of explosion, please ensure that you follow the safety instruction in chapter 2.2!

The geared motors that are protected against explosion meet the design regulations of equipment group II, category 2G (EX atmosphere gas). They are intended for use in zones 1 and 2.

**Ambient temperature**
Geared motors in category II2G must only be used at temperatures between +1 °C and +40 °C.

**In the case of ambient temperatures that do not comply, you must contact SPECKEN-DRUMAG!**

**Temperature class / Surface temperature**
Geared motors in category II2G (EX atmosphere gas) are approved for temperature class T4. This corresponds to a maximum surface temperature of 135 °C.

**Protection category**
All geared motors comply with protection category IP54 in accordance with EN 60529.

**Ambient conditions**
You must ensure that the geared motors are adequately ventilated and there is no external influx of heat (e.g. via couplings).

**Power output and torque**
Adherence to output torque and the permissible transverse and axial forces must be assured.

**Braking operation**
The geared motors must not be used for braking in the EX area. Braking operation is an operating state in which the motor is driven by an externally applied torque in the opposite direction to the one prescribed for air input.
4.5 Pneumatic Installation

For lengths of less than two metres between the main supply pipe and the machine you should use connecting pipes of the nominal diameter of the connector to the machine, and for lengths over two metres, pipes that are one size larger than the nominal diameter.

In the case of applications with one direction of rotation, a silencer should be fitted to the air outlet. This is part of the equipment supplied.

In the case of a reversible machine that can be operated in both directions, a four-way valve can be used. In this case the valve is connected to both connectors on the machine, and the silencer is fitted to the air outlet or valve connector.

Remove the plastic covers from the connectors. Keep the covers in a safe place in case you want to decommission the machine at a later date and put it into storage (see also "Decommissioning and Storage")

Set the air input to "Off".

Do not use a jubilee clip to seal the threaded pipe connection.

The air feed to the motor must be filtered. We recommend a filter grade of 5 microns.

The maintenance unit, the directional control valve and the volume controller must be selected according to the air consumption of the motor, and not according to the size of the connections to the motor. Calculate the pipe cross-sections so that the pressure loss between the maintenance unit and the motor is less than 0.5 bar.

The compressed-air motors must be lubricated.

Exception: Non-lubricated motors NL...

Fill the oil reservoir of the lubricator to the prescribed oil level. As a lubricant you should use acid-free, easily atomisable proprietary oils with a viscosity of 200 mm²/s.

Before you connect the compressed air connector to the machine you should first clean out the pipe by blowing air through it at low pressure, in order to remove any particles of dirt from the pipe. When doing so you must wear safety glasses and not get in the way of the jet of air.

4.6 Adjustments

Filtration and lubrication

A filter, controller and lubricator (not supplied) of a suitable size are to be fitted to the compressed air pipe at a distance of 1-2 metres from the machine.

Lubricator adjustment

Adjust the lubricator so that one drop of oil is delivered for every 1.5 - 2 m³ of air throughput. No adjustments are possible to the machine. (not for Non-lubricated motors NL…)

Speed control

If the speed is to be controlled, a valve must be included to control the flow of air (pressure regulator, ball valve etc.)
5. Commissioning

5.1 Commissioning

Before commissioning the geared motor you should ensure that all the components that carry air are correctly connected.

Do not loiter in the immediate vicinity of the stream of compressed air.

Set the air input to "ON".

Adjust the pressure or the flow as necessary to achieve the required speed or the required torque.

Adjust the lubricator as described in chapter 4.6.

(Exception: Non-lubricated motors NL...)

Check the oil level once a day and top up with oil if necessary.

(Exception: Non-lubricated motors NL...)

5.2 Measuring the surface temperature (only when used in the EX area)

The details of maximum surface temperature on the nameplate are based on measurements taken under normal ambient and installation conditions. Even minimal changes to these conditions (such as confined installation conditions) may have a significant influence on temperature.

Measuring surface temperature

When the geared motor is being commissioned it is essential to carry out a measurement of the surface temperature under maximum load. This measurement can be carried out using commercially available temperature measuring equipment. The surface temperature is to be measured on the flange cover, item 8, of the gearbox (see chapter 1.3). Maximum temperature is reached after approx. 2 hours, and must not exceed 95 °C. If the surface temperature is higher than that, the geared motor must be stopped immediately. In this event you must contact SPECKEN DRUMAG.
6. Maintenance and Repair

6.1 Maintenance

**Lifetime lubrication**
With adequate lubrication the compressed-air motor (exception: Non-lubricated motors NL...) operates practically maintenance-free. The gearbox is lubricated for life. The gearbox should be checked for noises and/or increased play in the bearings at regular intervals.

**Wear**
After 2000-6000 hours or 1 year the gearbox is to be disassembled and checked for wear. If necessary, exchange parts.

Clean the filters in the maintenance unit regularly when in operation, and empty any condensation.

Check the oil level in the lubricator at regular intervals and top up if necessary.

**Bearing replacement**
When operating in the EX area, the ball bearings must be replaced after the following period of operation at latest, in order ensure continuing low operating temperatures.

<table>
<thead>
<tr>
<th>Gearbox size</th>
<th>Bearing change after</th>
</tr>
</thead>
<tbody>
<tr>
<td>P62</td>
<td>10000 h</td>
</tr>
<tr>
<td>P81</td>
<td>20000 h</td>
</tr>
<tr>
<td>P120</td>
<td>24000 h</td>
</tr>
</tbody>
</table>

**Loss of power**
If the motor is not running perfectly after being in operation for a longer period, this is usually attributable to resinous oil residues that are impeding the free movement of the blades in the rotor slots. In this case it is appropriate to rinse out the motor with paraffin.

**Release all pressure from the motor.**

Unscrew both pipes or the silencer from the motor and pour a few drops of paraffin into the inlet, then turn the shaft by hand for a few minutes in both directions. Repeat this process, then connect the air pipe, and at low pressure (approx. 0.5 bar) and low speed, start up the motor.

**Protect your face and eyes!**

**Cleaning the silencer**
Dismantle the silencer and clean the felt filter. When air emerges that is free of paraffin mist, lubricate the motor with 3 or 4 drops of oil. Check also the maintenance unit. If the motor is still not delivering full power you should repeat the process, or it may be due for overhaul.

6.2 Repair

**Vane wear**
With regular maintenance the wear to moving parts is minimal.

**Lubricated motors:** It is only necessary to replace the vanes and ball bearings in the motor after between 5,000 and 8,000 hours in operation. This also depends on the speed at which the motor is run, the air pressure and lubrication.

**Non-lubricated motors:** It is necessary to replace the vanes after between 2,500 and 5,000 hours in operation. This also depends on the speed at which the motor is run, the air pressure and quality of air (purity, humidity).

If you intend to carry out the repair yourself, order a repair kit for the motor. It contains all the parts that can be replaced.

We recommend that you should send in the motors for repair to our factory. We have all the necessary tools for disassembly, all the original spare parts and the experts to set the motor with all the correct clearances following the repair. Performance, efficiency and service life all depend crucially on the clearances.
6.3 Decommissioning and Storage

Switch the compressed air feed to "OFF".

**Release all pressure from the motor.**

Disconnect the motor from the compressed air pipe.

Disconnect the geared motor from the machine to which it is fitted.

Remove the silencer element.

Blow clean, dry air at low pressure into the inlet of the machine.

Pour a few drops of oil into the inlet and turn the shaft by hand to distribute the oil.

Fit the plastic covers to the connectors.

The machine can now be stored until it is next used.

6.4 Faults on the geared motor

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque too low</td>
<td>Dirt or foreign bodies</td>
<td>Check and clean</td>
</tr>
<tr>
<td>Speed too low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor will not run</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor becomes hot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor runs, becoming slower in operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corrosion inside the motor</td>
<td>Check and clean</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Faulty mating</td>
<td>Refit the motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air pressure too low</td>
<td>Increase pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hose diameter to small</td>
<td>Fit bigger hoses</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restricted exhaust</td>
<td>Check and repair</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal components seized</td>
<td>Dismantle and repair</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Compressor too small /</td>
<td>Provide greater volume of air</td>
</tr>
<tr>
<td></td>
<td>inadequate air supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air supply too far away from the motor</td>
<td>Optimise installation</td>
</tr>
</tbody>
</table>
Konformitätserklärung

Declaration of Conformity

(im Sinne der Richtlinie 94/9/EG, Anhang VIII)
(according to EC Directive 94/9/EC, Appendix VIII)

DRUMAG GmbH erklärt in alleiniger Verantwortung, dass die Druckluft-Getriebemotoren der Baureihen 1AM, 1UP, 2AM, 4AM, 6AM, NL22 mit Getrieben P62, P81 und P120, der Kategorie 2G, auf die sich diese Erklärung bezieht, übereinstimmen mit der

declares in sole responsibility that the Air-gear motors types 1AM, 1UP, 2AM, 4AM, 6AM, NL22 with gears type P62, P81 und P120 in category 2G that are subject to this declaration are meeting the requirements set forth in

Direktive 94/9/EC

Angewandte Normen /
Applicable standards:
DIN EN 1127-1:2008-02, DIN EN 13463-1:2003-06,
DIN EN 13463-5:2004-03
Die Produkte sind mit folgender Kennzeichnung versehen:
The products are marked with the following characteristics:

EX II 2G c T4-X

DRUMAG GmbH hinterlegt die gemäß 94/9/EG Anhang VIII geforderten Unterlagen bei
benannter Stelle:
TÜV Product Service GmbH, EU-Kennnummer 0123
EG-Bescheinigung Nr. EX9 1304 50296 004

DRUMAG GmbH will archive the documents required according to 94/9/EC at the following location:
TÜV Product Service GmbH, EC-Code 0123
EC-Certificate No. EX9 1304 50296 004

DRUMAG GmbH

Bad Säckingen, den 10.04.2008

Ort und Datum der Ausstellung
Place and date of issue

U. Ziegler
Funktion: Geschäftsführung U. Ziegler
Function: Managing director U. Ziegler

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