1. Description
IVAC-Cylinder
(Integrated Valve Actuator)
- Complete electropneumatic drive with integrated multipole male connector M12, 8-pin.
- Smooth design without grooves
- Sealed profile barrel with internal tie rods
- Food-safe grease/lubricant
- Double acting pneumatic cylinder conforming to ISO 15552
- Adjustable cushioning and speed regulation as standard
- Integrated 5/2 or 5/3 valve with different functions
- Optional integrated reed switch or inductive switch for adjustable end position sensing

2. Technical Data
2.1 General
Medium: Compressed air, filtered, lubricated or non-lubricated
Particles size: Class 7, ISO 8573-1 (dated 2001)
Humidity and water content:
Air supply must be dry. Corresponding to the application and working conditions the air must be dry enough to avoid condensate. The pressure dew point must be minimum 15°C under the application and working conditions.
Oil: Class 4, ISO 8573-1 (dated 2001)
Operating pressure: 2 to 8 bar
Operating temperature:
-5°C to +50°C
Grease/lubricant: Suitable for food products according to USDA-H1 and drinking water according to German KTW recommendations
Protection class: IP 67

2.2 Without sensors
Type: P*A/882000/../M0/..

2.3 With integrated sensors
The sensors integrated in the profile barrel are connected to the VCM via a circuit board and are energised through the M12 male plug. The signal of the sensors is displayed by 2 yellow LEDs on the VCM.

2.3.1 Adjustable End Position Sensing
Types: ../M3/.. reed switch (LSU)
../M4/.. inductive switch (EAP)
The sensors are pre-adjusted for end position sensing and can be moved by customer within the adjustment range:

<table>
<thead>
<tr>
<th>Cylinder stroke</th>
<th>Adjustment range</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-79 mm</td>
<td>20 mm</td>
</tr>
<tr>
<td>80-1000 mm</td>
<td>50 mm</td>
</tr>
</tbody>
</table>

2.4 Valve variants
Glandless spool valve

<table>
<thead>
<tr>
<th>Cylinder type</th>
<th>Valve symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>.../M1R/..</td>
<td></td>
</tr>
<tr>
<td>.../M1E/..</td>
<td></td>
</tr>
<tr>
<td>.../M1B/..</td>
<td></td>
</tr>
<tr>
<td>.../M1A/..</td>
<td></td>
</tr>
<tr>
<td>.../M1C/..</td>
<td></td>
</tr>
</tbody>
</table>

The centre position (all ports blocked) for type P.A/882000/M1A/.. at intermediate positions is only suitable for short stops only.

2.5 VCM Variants
The control of the cylinder and transmission of signals are carried out via the valve control module (VCM).

3. Safety
Whenever this symbol appears in the following text passage, it indicates possible dangers to cause personal injuries or damage of the IVAC-Cylinder.
The IVAC-Cylinder is a technically advanced product designed to be operationally reliable. However, there may be a risk of danger if:
- the unit is operated, installed or maintained improperly or by unskilled personnel.
- the unit is used in an application for which is not designed for.
- the advice of legal requirements, the safety and the mounting instructions are not followed.
Anyone responsible for the installation, operation or maintenance of the IVAC-Cylinder must get familiarised with these instructions, especially those relating to safety. Customers are advised to ensure that such personnel fully understand these instructions.
Installation and removal of the IVAC-Cylinder must only be done by skilled and authorised personnel.
Operations that impair function or safety of the IVAC-Cylinder must be avoided.
The IVAC-Cylinder should only be used within the operating parameters given in the technical data for this product. NORGREN cannot be held responsible for any damage caused by misuse.

When installing, removing or maintaining the unit, ensure that the power supplies are first disconnected. When servicing the IVAC-Cylinder, it is recommended that the unit be removed from the area of danger.

When connecting, adjusting or servicing the unit, ensure that inadvertent operation by the operator or any other person is possible. Additional drillings, threads or build-ons that are not offered as accessories are forbidden without prior consultation with NORGREN. Should the cylinder be used in any hostile environment such as abrasive dust, aggressive vapours or fluids, the permission from NORGREN has to be obtained before the units can be used.

All safety regulations and all regulations for prevention of accidents in the operating range are equally valid.

4. Unpacking and Checking

Carefully unpack the unit without using any sharp or pointed instrument. Check that the IVAC-Cylinder has not suffered from any damage during delivery. If you find any damage, please report it to us immediately.

When the unit is likely to be stored for a longer period of time, please ensure that:
- it is stored in a dry and dust protected place in original packaging.
- it is protected from aggressive media.
- avoid severe temperature fluctuations.
- Storage temperature: -20°C to +70°C

5. Installation

Any existing power supply must be disconnected before the installation of the IVAC-Cylinder.

For mounting of the cylinders, only the tap holes at the front and rear end and the piston rod threads shall be used!

Please use the NORGREN mountings conforming to ISO 15552.

5.1 Pneumatic Connection

The air supply has to be connected to port 1 (see illustration). Port 3 is the exhaust of the cylinder.

The exhaust port shall not be left open!

For noise protection, please use an appropriate silencer or drain the exhaust air off by tubing.

At the bottom of the rear end cover are two additional ports which are connected to the valve chambers (2) and (4) of the main valve. Depending on the integrated valve variant (see chapter 2.4) and the current switch position, the connections are either blocked under operating pressure or unpressurised (connected to the exhaust).

You have the option to connect a conventional cylinder to the ports.

5.2 Electrical Installation

All electrical connections on the IVAC-Cylinder have to be carried out via the M12 plug. Remove the protective cap only immediately before the connection is carried out.

5.2.1 Multipole Connection of VCM

Pin configuration of M12x1 plug

1. Not used
2. +24 V ± 10% valve 2 (instroke)
3. 0 V valves
4. +24 V ± 10% valve 1 (outstroke)
5. +24 V ± 10% sensors
6. Signal sensor 2 (instroke)
7. 0 V sensors
8. Signal sensor 1 (outstroke)
### 5.2.2 Connecting Cable for VCM

The following 8-pin NORGREN cables can be connected to the VCM:

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>Straight Connector</th>
<th>Angular Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>M/P74581/2</td>
<td>M/P74582/2</td>
</tr>
<tr>
<td>5 m</td>
<td>M/P74581/5</td>
<td>M/P74582/5</td>
</tr>
<tr>
<td>10 m</td>
<td>M/P74581/10</td>
<td>M/P74582/10</td>
</tr>
</tbody>
</table>

or the NORGREN Y-Cable M/P74589, where the M12 male plug 8-pole is split into two M12 male plugs 4-pole.

Please note also the attached instruction manual of the sensors!

### 6. Commissioning

#### 6.1 Oiled Compressed Air

Once the IVAC-Cylinder is operated using oiled compressed air, oil mist lubricant must always be used subsequently. However, too much oil may lead to malfunction. Please observe details under 2.1.

#### 6.2 Pneumatic Setting

Before the setting can be done, a cover screw and a cover have to be removed from the cylinder.

- **Remove the cover screw above the cushion screw**
- **Tightening torque**
  - Ø32-Ø100
  - 1.8-2.2 Nm

- **Plug is under no circumstances to be opened!**
- **Loosen the M3 screws and remove the cover**
- **Tightening torque**
  - 0.9-1.1 Nm

**Before you pressurise the IVAC-Cylinder, close both cushion screws and speed control screws** (see illustration on page 6) clock-wise and open again half a rotation anti-clockwise.

**Leave the danger area before you pressurise the cylinder and make sure that no other person is within this area!**

**Pressurise the cylinder slowly!**

Make sure that the operation of the cylinder does not cause any collision!

Operate the IVAC-Cylinder now and adjust the speed control screws for the desired instroke and outstroke speed.

Attention! The maximum speed can be limited when the supply tube is too small or when unsuitable silencers are used.

Further adjustment of the cushioning should only be done after the operational load is applied onto the cylinder.

Open the cushion screws anti-clockwise step by step. The adjustment of the cushioning is optimal when the cylinder is slowed down steadily during its movement to the end position and softly comes to a full stop.

If the cylinder is slowed down abruptly before it reaches the end position and then only comes slowly to a full stop, the cushion screw should be opened slightly anti-clockwise.

If the cylinder is slowed down moderately before it reaches the end position and makes a hard stop, the cushion screw should be tightened clockwise.

In the case where the load or the speed of the cylinder has been changed, the cushioning has to be readjusted.

After the pneumatic setting, the cover screws and the cover have to be mounted again.

(see illustrations under 6.2)

**Attention: Observe the tightening torques!**

#### 6.3 Electrical Commissioning

The function of the IVAC-Cylinder can be monitored by means of the LED display.

**Configuration of the diagnosis LEDs:**

<table>
<thead>
<tr>
<th>LED</th>
<th>LED Illuminates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor◄ (yellow)</td>
<td>Cylinder in outstroke position and sensor activated</td>
</tr>
<tr>
<td>Sensor► (yellow)</td>
<td>Cylinder in instroke position and sensor activated</td>
</tr>
<tr>
<td>Valve► (green)</td>
<td>Voltage applied on valve for cylinder instroke</td>
</tr>
<tr>
<td>Valve◄ (green)</td>
<td>Voltage applied on valve for cylinder outstroke</td>
</tr>
</tbody>
</table>

**Meaning of the diagnosis LEDs:**

- Sensor◄ (yellow): Cylinder in outstroke position and sensor activated
- Sensor► (yellow): Cylinder in instroke position and sensor activated
- Valve► (green): Voltage applied on valve for cylinder instroke
- Valve◄ (green): Voltage applied on valve for cylinder outstroke

#### 6.4 Setting of Sensors

Types P*A/882000/…/M3/… P*A/882000/…/M4/…

The sensors of the IVAC-Cylinder with adjustable end position are pre-adjusted for end position sensing. If you are using the whole cylinder stroke, then no further adjustment of the sensors is required.

When other end positions are required, for instance when the cylinder stroke is restricted by external stops, then the position of the sensors has to be readjusted. Remove the cover screw with a wrench of size 11.

Move the piston rod and the magnet to the desired position in order to adjust the sensor. To shift the sensor, use a screwdriver with the size of 3.5 to 4.5 mm. Shift the sensor from the end section towards the middle of the barrel until the LED illuminates and followed by another slight distance of approximately 2 mm. Repeat the same procedure, if necessary, for the second sensor.

Finally, the cover screws must be reassembled with the seal!
and the clip and carefully fastened (tightening torque: 1.8-2.2 Nm), so that they seal completely. Otherwise the protection class is no longer guaranteed.

7. Maintenance
7.1 Lubrication
The IVAC-Cylinder has been lubricated with grease during assembly. Oil lubrication is not absolutely necessary, however it extends the lifetime of the seals (see 2.1). If a lubricator is used, it should be placed near the cylinder.

Insufficient lubrication can result in so-called „stick-slip“-effects.

7.2 Cleaning
Materials, surfaces and sealing of the IVAC-Cylinder are specially designed for simple cleaning.
We recommend cleaning the IVAC-Cylinder with a foam cleaner. The following cleaning agents were tested on the IVAC-Cylinder and released:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Cleaning agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henkel-Ecolab</td>
<td>P3-topax 12</td>
</tr>
<tr>
<td>Henkel-Ecolab</td>
<td>P3-topax 17</td>
</tr>
<tr>
<td>Henkel-Ecolab</td>
<td>P3-topax 91</td>
</tr>
<tr>
<td>Henkel-Ecolab</td>
<td>P3-topax 99</td>
</tr>
<tr>
<td>Henkel-Ecolab</td>
<td>P3-topactive LA</td>
</tr>
</tbody>
</table>

7.3 Wear and Spare Parts
In order to order the correct parts, you have to observe the specifications on the label of the cylinder!
The assembly instruction M/P74523 is included in the wear and spare part kits.

7.3.1 Wear Parts
The wear parts kit includes all seals and the parts of the actuator which are subject to extensive wear.

7.3.2 Spare Parts for Sensors
The sensors of the IVAC-Cylinder can be replaced. In this case, you need the spare parts for sensors:
(2 magnet switches with accessories)

<table>
<thead>
<tr>
<th>Cylinder type</th>
<th>Spare parts for sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.A/882.../…/M3/..</td>
<td>PRQA/882000/M3/LSU</td>
</tr>
<tr>
<td>P.A/882.../…/M4/..</td>
<td>PRQA/882000/M4/EAP</td>
</tr>
</tbody>
</table>

7.3.3 Spare Parts for VCM
There are 3 versions of spare parts for the VCM. (see chapter 2.5)

<table>
<thead>
<tr>
<th>Cylinder type</th>
<th>Spare parts for VCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.A/882.../…/R.../..</td>
<td>PRQA/882000/MIR/VCM</td>
</tr>
<tr>
<td>P.A/882.../…/E.../..</td>
<td>PRQA/882000/MIE/VCM</td>
</tr>
<tr>
<td>P.A/882.../…/A.../..</td>
<td>PRQA/882000/MIB/VCM</td>
</tr>
</tbody>
</table>

8. Error Analysis

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder does not move</td>
<td>No compressed air supplied</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>Operating pressure too low</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>Air supply and exhaust have been mixed up</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>Speed control screw totally closed</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>No electrical connection or incorrect wiring</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>No voltage supply</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td>Cylinder moves too slow</td>
<td>Speed control screw closed too much</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>The diameter of the tubing is too small</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>Unsuitable silencer used</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td></td>
<td>Cylinder worn out</td>
<td>replace wear parts (siehe 7.3.1)</td>
</tr>
<tr>
<td>Cylinder does not reach end position</td>
<td>Cushion screw is totally closed</td>
<td>open anticlockwise</td>
</tr>
<tr>
<td>No signal from sensor</td>
<td>Sensor at incorrect position</td>
<td>shift (see 6.4)</td>
</tr>
<tr>
<td></td>
<td>No voltage supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No electrical connection or incorrect wiring</td>
<td>(see 5.2.1)</td>
</tr>
<tr>
<td></td>
<td>Sensor defect</td>
<td>replace sensor (see 7.3.2)</td>
</tr>
</tbody>
</table>

9. Technical Service
If you need further support regarding the use of the IVAC-Cylinder, please use the following address and contact numbers:

Norgren GmbH
Postfach 11 20, 46515 Alpen
Bruckstraße 93, 46519 Alpen
Telephone: 0049(0)28 02/49-0
Fax: 0049(0)28 02/49-356