Designers Manual

Haldex Single Air Drier
DESIGNER’S MANUAL
Haldex Single Air Drier

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Introduction

Haldex Designers Manual for Single Air Drier is a document including requirements and guidance for design of applications and the installation of Haldex Single Air Drier in commercial vehicle applications.

To ensure safe operation and to achieve optimum lifetime of the product it is of utmost importance that the installation of the Haldex Single Air Drier complies with this manual.

The standard Haldex Single Air Drier is a product which contain a desiccant cartridge a base and a valve unit.

The compressed air enters the air drier via the base. The desiccant cartridge will treat the compressed air by reducing contaminants such as water, oil and particles. The standard valve unit containing a governor valve and an unloading valve controls the sequences.

Before installation of the Haldex Single Air Drier in a new vehicle type an Installation Check List should be completed and sent to Haldex. With this information Haldex will be able to suggest the best possible solution for the vehicle.
Air drying procedure / performance

Procedure
*Details mentioned refer to page 10 and 11.*

**Fig 1** The compressed and contaminated air enters the air drier via port IN at base, and is led into the desiccant cartridge. The desiccant cartridge is a Multi Treatment Cartridge, in which the compressed air is cleaned in several steps.

Firstly the contaminated air passes through an inlet filter, which traps drops and solid particles.

The air then passes through several buffer layers of desiccant, which remove water and oil molecules. During the passage through the buffer layers the dew point will be lowered. Finally, the compressed air passes through an outlet filter which traps residual dust particles.

The treated compressed air is led to the system via port 21. In a standard installation a purge tank will be charged via port 22. This air is used for regenerating the desiccant.

When using the regeneration valve, air for regeneration is taken from the system reservoir.

**Fig 2** When the system cut out pressure level is reached the integrated governor (or a signal from an external governor via port 4) will open the unloading valve.

The air drier will now be depressurised and air from the purge tank (or system reservoir if using the regeneration valve) will run backwards through the desiccant cartridge and carry the trapped contaminants to the atmosphere via the unloading valve and the silencer.
SAE standard J2384 "Air Dryer Test Procedure".
Haldex single air drier is tested according to this standard which includes the following extracted moments.

5. Air Dryer Test Procedures

5.1 Air Dryer Operation
5.2 Air Dryer Performance
5.3 Air Dryer Leakage
5.4 Environmental Test
5.5 Durability Test
5.6 Corrosion Resistance Test
5.7 Overpressure Test
5.8 Vibration Test

Performance
Reference to SAE standard J2384, moment 5.2

The performance test in SAE standard J2384 is made at app 8,5 bar system pressure. Due to the fact that many vehicle manufacturer use a higher system pressure, Haldex single air drier has also been tested at 12,0 bar system pressure. Note: Other from the pressure, the conditions are the same in both tests.

Volume of air, which can be treated per load cycle at 8,5 bar system pressure to a dew point depression of 17°C: 260 std l.

Volume of air, which can be treated per load cycle at 12,0 bar system pressure to a dew point depression of 17°C: 450 std l.

The air drying performance and actual dew point depression is dependant on several parameters, humidity, ambient temperature, inlet air temperature, duty cycle (actual on load time together with average flow rate) and regeneration cycle / volume.
Requirements for Haldex Single Air Drier

Air

Air flow
Maximum inlet airflow: 1000 std l/min. (when higher airflow is required, consult Haldex)
Maximum airflow resistance at 12 bar and 1000 std l/min: 0.2 bar.

Air pressure
Maximum operating pressure: 13 bar.
Cut-out pressure: 7 - 13 bar.
Pressure range: 0.6 - 2.0 bar.
When large single cylinder compressors are used a ping tank is recommended to reduce pressure peaks.

Air temperature
Inlet air temperature: +5°C - +65°C. Temperatures above +65°C will decrease drying performance.
Ambient temperature: -40°C - +80°C.

Compressor and air system
As a guideline the air system should be designed so that the duty cycle (compressor on load time divided by engine on time) under normal conditions does not exceed 50%. The compressor should be designed to (under normal conditions) charge the air system from cut-in to cut-out pressure in between 20 - 90 sec.

Nevertheless the duty cycle itself does not provide enough information to determine the air drier requirements. The actual on load time together with average flow rate is more appropriate.

Oil lubricated piston compressors, are forwarding three major contaminants into the air drier, solids (dust), water, and oil. These contaminants have an influence on each other.

Dust particles coagulate in the presence of oil and / or water to form larger particles, oil and water emulsify, and are sometimes deposited or condensed in the pipe / air dryer.
Efforts should be taken to minimise the presence of these contaminants.
Regeneration

A fully completed regeneration cycle following each cut out is essential to maintain a high air drying performance. This will last for 20 - 30 sec, depended on purge volume.

The purge volume is determined by the air consumption and the air system pressure. There are two ways to achieve regenerating air, either with a purge tank or a regeneration valve.

Purge tank

The diagram in figure 1 can be used for preliminary choice of regeneration tank size, (final installation should always be confirmed by Haldex).

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Fig 2

Regeneration valve

When using a regeneration valve, there will be no purge tank. Instead, the air used for regeneration will be taken from the air system. An inlet check valve comes together with the regeneration valve, this to avoid drainage of the air system through the compressor.

There are four sizes of the regeneration valve available, depending on total system volume and cut - out pressure.

The diagram in figure 2 can be used for preliminary choice of regeneration valve, (final installation should always be confirmed by Haldex).
Installation

Installation shall follow SAE standard J2383.

The following information is extracted from SAE J2383.

4.4 Air Drier Installation Guidelines

4.4.1 Mounting position

4.4.1.1 The air drier should be mounted in a location with sufficient space around it to facilitate service and to provide visual access for periodic inspection.

4.4.1.2 The air drier should be mounted out of direct tire or wheel road splash or protected from splash.

4.4.1.3 The air drier, including mounting brackets, lines, and fittings, should be mounted in a protected location such that minor mechanical damage to the vehicle will not damage the air system integrity.

4.4.1.4 The air drier must be mounted with the exhaust port downward.

4.4.1.5 The air drier should be mounted to avoid excessive heat sources.

4.4.1.6 The air drier must be mounted rigid enough to avoid vibration which could damage the desiccant or drier.

4.5 Lines and Fittings

4.5.1 Air lines

4.5.1.1 To prevent moisture accumulation, the compressor discharge line should slope continuously downhill from the compressor to the drier without any dips which exceed 1/2 the line diameter. If this is not possible, the line should run vertically straight upward at the compressor to a height that will permit a downhill sloping run to the drier.

4.5.1.2 The compressor discharge line size, length, and material must be such that the inlet temperature is typically no more than 71°C or no less than 25°C above low ambient (i.e., if ambient is -40°C, the drier inlet temperature must be above -15°C). Lower drier inlet temperature should be avoided to minimize the risk of freeze-up in the discharge line or drier inlet fitting. Higher drier inlet temperature should be avoided to minimize the risk of heat damage to the drier seal and/or to avoid loss of drying performance.

4.5.2 Fittings

4.5.2.1 The use of restrictive fittings in the compressor discharge line should be avoided. These fittings impede the airflow and contribute to increased freezing potential. Avoid the use of 90° elbows, where possible.

Additional installation demands to SAE J2383.

1.1 Mounting position

1.1.1 The air drier must not incline in any direction more than 15°.

1.1.2 The air drier must have at least 10 mm free space above the cartridge tower in order to ensure serviceability.

1.1.3 The mounting pattern must be as figure below.

1.2 Lines and fittings

1.2.1 In order to prevent water accumulation in the regeneration tank, the line between air drier and tank should be connected to the lowest connecting port in the tank, and the line should (if possible) slope continuously downhill from the tank to the air drier.

\[ A = 72 \, \text{mm} \]
\[ B = 105 \, \text{mm} \]
\[ C = 52.5 \, \text{mm} \]
\[ \varnothing = 13 \, \text{mm} \]
Service and maintenance

All mentioned details below are to be checked when changing cartridge.

Standard parts

No in ( ) refer to Fig at page 11.

Cartridge (1)

The air drier is equipped with a patented, exchangeable cartridge. The cartridge is not refillable. Cartridge change interval is very much dependant on operational conditions.

The following is therefore only a suggested change interval for general installations.

City buses, 1 year or 50 000 km, inter city buses and trucks, 1-2 years.

Base (2)

The base contains a perforated screen plate (3), the base and screen plate must be checked and cleaned from eventual oil and carbon etc. forwarded from the compressor.

Valve unit (4)

The valve unit contains a governor valve (5) and unloading valve (6). The valve unit is not serviceable. The air pressure can be adjusted within a certain range on the governor valve.

Outlet check valve (7)

The outlet check valve needs cleaning or replacing if it is dirty or worn.

Silencer unit (8)

The silencer unit needs cleaning or replacing if clogged by unloading contaminants or road dirt.

Option parts

Regeneration valve

The regeneration valve is not serviceable. The inlet check valve which is included should be replaced when changing cartridge.

Integrated drainage connection.

This detail replaces the silencer unit and should be cleaned if clogged by unloading contaminants.
Models

No in ( ) refer to Fig at page 11.

The basic air drier model, contain a base (2) with a steel canister (9) covered desiccant cartridge (1), an outlet check valve (7), and a valve unit (4) which includes unloading valve (6), governor valve (5) and a silencer unit (8).

The following selections are to be made in the Installation Check List.

None optional selections
- Threads in ports and attachment points.
- Cut out / cut in pressure levels.

Optional selections
- Valve-unit without integrated governor valve.
- Integrated safety valve.
- Integrated regeneration valve.
- Integrated turbo protection valve.
- Depot valve.
- Auxiliary inlet / outlet port 4.
- Integrated drainage hose connection.
- Integrated heater element with thermostat.

Identification

Identification of the air dryer is made from the stamped digits on the base side.

Example:

```
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Haldex part/type no.
Haldex serial no: year 2000 - week 25 - 12.0 bar. 0704 individual no.

Specifications

- Working pressure: Max 13 bar.
- Maximum input airflow: 1000std l/min.
- Maximum inclination: 15°.
- Ambient temperature: -40°C - +80°C.
- Inlet air temperature: +5°C - +65°C.
- Weight: 6.0 kg.
Dimensions

- Port 4 (Governor)
  - M12 x 1.5
  - 1/4"NPTF
  - Voss 8

- Port 22 (regeneration reservoir)
  - M12 x 1.5
  - 1/4"NPTF
  - Voss 8

- Port 1, 21 (inlet, outlet)
  - M22 x 1.5
  - 1/2"NPTF
  - Voss 12

- Silencer
- Regeneration valve
- Chassi fitting (x3)
  - M12 x 1.5
  - M12 x 1.75
  - UNC 1/2"
  - Pin screw M12
Part overview
Haldex is an innovator in vehicle technology and supplies proprietary products for trucks, cars and industrial vehicles on a global basis. Haldex is listed on the Stockholm Stock Exchange and has annual sales exceeding 6 billion SEK with 4,250 employees worldwide.