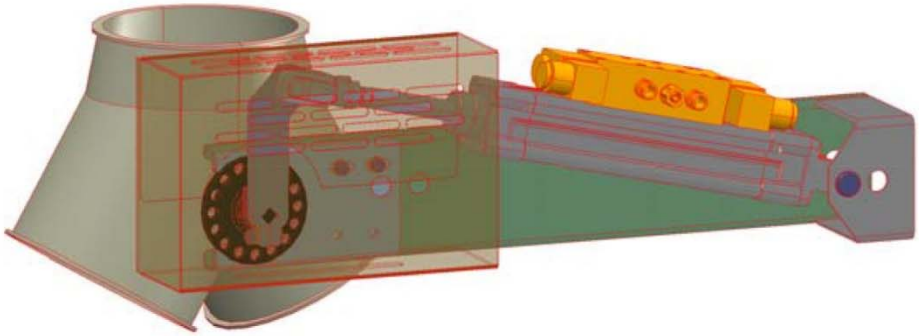
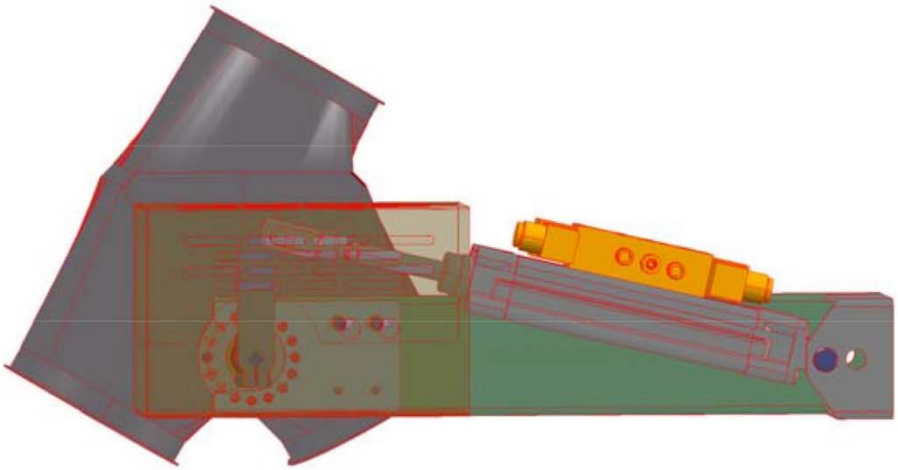
Formula Air
Supporting your performance





PNEUMATIC DIVERTERS

Maintenance manual

TABLE OF CONTENTS

1. Important notes

- *Adherence to the operating manual is a prerequisite for trouble-free operation and for the acceptance of warranty claims.*
- *Therefore, read the operating manual first before putting the diverter into operation.*
- *The operating manual contains important notes regarding service. Therefore, keep it with your documents.*
- *Pay attention to the notes in the individual chapters of the operating manual.*

2.Safety instructions

2.1. Qualification and training of personnel

The operating, maintenance and inspection personnel must have the appropriate qualifications for the respective type of work.

The operating company must ensure that the contents of the operating manual are fully understood by the personnel.

If necessary the requisite knowledge is to be imparted by training. This can be done by the manufacturer/supplier on behalf of the operating company if desired.

The area of responsibility, competence and supervision of the personnel must be precisely defined by the operating company. Young persons may only be employed under the supervision of an expert.

***NOTE** : Depending upon conditions and equipment, the following accident prevention regulations and standards are to be observed by the operating company.*

Regulations of the German Employer's Liability Insurance Association

- *BGV C 12 Accident prevention regulations for silos and bunkers Available: from the responsible accident insurer*

Regional regulations for safety and accident prevention Standards

- *DIN EN 12100-1, DIN EN 12100-2 Safety of machinery*
- *DIN EN 13857 Safety distances to prevent danger zones being reached by the upper limbs*
- *EN 60204 – 1 Electrical equipment of machines*
- *Regionally applicable standards*

2.2. Hazards associated with disregard of the safety instructions

Disregarding the safety instructions can lead to the endangerment of personnel, the environment and the machine.

Disregarding the safety instructions can lead to the loss of all claims for compensation for damages. Disregard can result in the following hazards, for example:

- *failure of important functions of the diverter or the system*
- *failure of prescribed methods of service or maintenance*
- *endangerment of persons due to electrical, mechanical, chemical and biochemical influences*
- *endangerment of the environment due to the leakage of hazardous substances.*

2.3. Safety-conscious working

The following knowledge is a prerequisite for safety-conscious working:

- knowledge of the safety instructions listed in the manual
- knowledge of the existing national accident prevention regulations
- knowledge of the local and the operating company's own internal work, factory and safety regulations.

2.4. Safety instructions for the operating company and for the operating personnel

- A contact protection protects against moving parts only as long as it is in its intended location.
- Never remove protection devices as long as the components are moving or even just switched on.
- Personal protective equipment is to be worn for the protection of health.
- Wash your hands thoroughly before eating and drinking due to the risk of infection.
- Consult a doctor immediately in the case of injuries, accidents or skin irritations.

2.5. Safety instructions for maintenance, inspection and assembly work

All maintenance, inspection and assembly work is to be carried out by authorized and qualified technical personnel only.

Note: Work may only be carried out on the diverter when it is at a standstill. Stopping the diverter:

- *Interrupt the supply of product to the diverter.*

***Note**: Wear the appropriate protective equipment. Clean the interior of the diverter before working on it. Check the functions after the work is concluded.*

2.5.1. General safety instructions for assembly, inspection and maintenance work

- When carrying out maintenance work in the interior of the *diverter*, all connection openings should be covered such that they are safe to step on. This avoids injuries to persons and also prevents foreign bodies falling into the pipeline.
- No protection devices may be modified, removed or their function impaired.
- Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can lead to injuries to persons and damage to property.
- Converting or modifying the *diverter* are permitted only after consulting the manufacturer. Correspondence regarding this must be exclusively in writing.

3. Transport

Examine the delivery immediately upon receipt for any transport damages. The manufacturer or the transport company is to be informed immediately of any such damage. You may not be able to put a damaged ***diverter*** into operation. Depending upon the number of items, the ***diverter*** are supplied loose or in a packing carton. In-house transport to the storage place or to the final installation place can take place using a fork-lift truck, a pallet truck or manually.

4. Storage

In the case of long-term storage, please check whether the housing shows any signs of damage and that all moving parts fulfil their functions. Please observe the storage conditions specified in the following table in the case of long-term storage.

Storage conditions:

Climatic zone	Packaging 1)	Storage place	Storage period
Moderate (Europe, USA, Canada, China and Russia with the exception of tropical regions)	Packed in container with desiccant and humidity indicator, sealed in foil.	Roofed over, protected against rain and snow, free of vibrations	Max. 3 years with regular examination of packaging and humidity indicator (relative humidity < 50%)
	Open	Roofed over and closed at constant temperature and air humidity (5 °C to 60 °C, < 50% relative humidity). No sudden fluctuations in temperature. No aggressive vapors and no vibrations.	2 years and longer with regular inspection. Check for cleanliness and mechanical damage when inspecting. Check the integrity of the anti-corrosion coating.
Tropical (Asia, Africa, Central and South America, Australia and New Zealand, with the exception of the moderate regions)	Packed in container with desiccant and humidity indicator, sealed in foil	Roofed over, protected against rain, free of vibrations.	Max. 3 years with regular examination of packaging and humidity indicator (relative humidity < 50 %)
	Open	Roofed over and closed at constant temperature and air humidity (5 °C to 60 °C, < 50% relative humidity). No sudden fluctuations in temperature. No aggressive vapors and no vibrations. Protection against insect damage.	2 years and longer with regular inspection. Check for cleanliness and mechanical damage when inspecting Check the integrity of the anti-corrosion coating.

1) The packing must be performed by an experienced company using packaging material expressly qualified for the application.

5. Intended use

The diverter is intended for the diversion of bulk materials in granular or powder form with a residual humidity of 15 %. These consist of non-conductive dusts in a conveying pipe with a Kst value up to 160 bar m/sec.

The standard diverter sin round and rectangular versions are not suitable for pneumatic conveying or for the conveying of seeds. There must be neither vacuum nor positive pressure in the conveying pipe. The only exceptions to this are the modular two-way valves, in which there may be a positive pressure of 0.1 bar.

Diverters are only to be used in closed rooms.

The component is considered to be safe if all connections in the system are made correctly. The flap position may only be changed when the flow of product is interrupted. They are to be used only in the installation position illustrated on page 12.

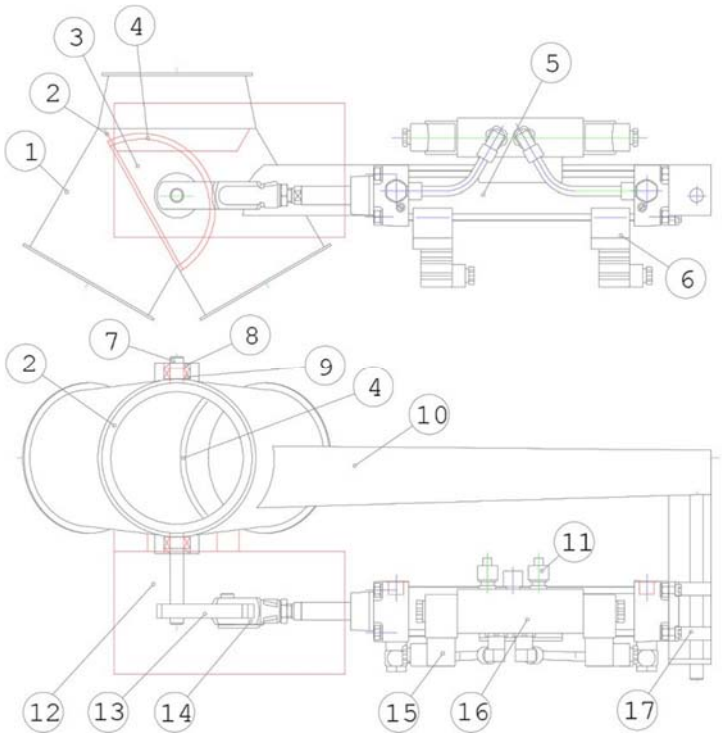
6. Structure of the diverter

The diverter can be manufactured in different versions and types of construction.

Types of construction:

- Diverter, symmetrical, with outlet angles 45° and 60°
- Diverter, asymmetrical, with outlet angles 45° and 60°Housing versions:

6.1. Description of the assembly



Body station

1 Outlet (product outlet)

2 Inlet (product entrance)

3 Flap with/without seal

4 Collar

Drive station

5 Piston cylinder

6 Limit position switch

7 Drive shaft

8 Shaft seal

9 Roller bearing

10 Cylinder mounting

11 Silencer

12 Protective cylinder cover

13 Drive lever

14 Clevis

15 Valve coil

16 5/2-way solenoid valve

17 Swivel mounting

6.2. Assembly functions

The flap is arranged inside the housing and closes around the collar, so that the product flows reliably into the desired outlet.

The silicone seal optionally mounted on the flap provides for the dustproof sealing of the cavity between the housing and the collar (two-way valve with seal only).

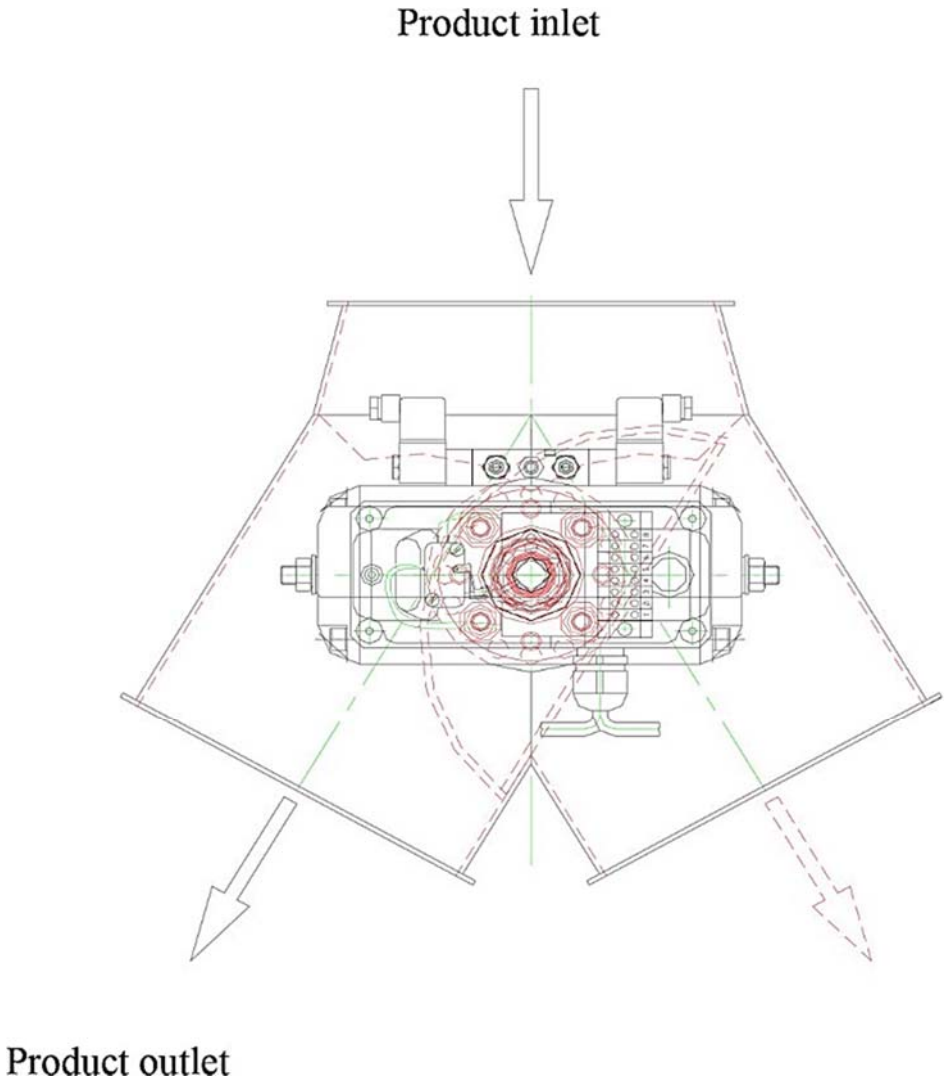
The cylinder unit is attached to the housing by a mounting. It swivels the flap via the lever to the desired outlet. The retraction and extension of the cylinder pistons are controlled via the valve.

The drive shaft of the flap has a roller bearing and is sealed with a shaft seal. As a result, no dust can escape from the pipe and dust deposits in the area of the shaft bearing are prevented.

The flap position is detected via the two non-contact limit switches.

6.3. Method of operation of the diverter

The bulk material is fed into the diverter in free fall vertically or at an angle. It is then diverted into the desired outlet via the flap.



7. Operating and maintenance manual

7.1. Installation and assembly

The diverter may only be installed in closed rooms. An outdoor installation is only possible if the diverter is provided with a weatherproof protective coating.

All components must be adapted according to the requirements in the factory for operating temperatures below -15 °C or above 50 °C.

The following points are to be observed when installing:

- Ensure adequate suspension or support.
- The continuative piping must be installed and suspended without stress.
- Diverters are to be installed only in the intended installation position.

7.2. Commissioning

An appropriate controller must be present before commissioning.

It is essential to observe the following instructions regarding the controller:

All necessary control cables are to be connected in accordance with the terminal diagram in the appendix. If necessary, readjust the limit position switches/limit switches during operation.

Ensure that sufficient operating pressure (min. 6 bar) is available.

Following the installation and the electrical connection, a test run is to be performed with a function check.

7.3. Inspection and maintenance

The length of the service life of the diverter can be influenced by the following maintenance intervals:

Time interval	What needs to be done?
Every 1000 hours of machine operation, but at least ever y three months	• Check the pneumatic system for leaks • Visual inspection of the seals for damage. • If existing, check the limit switches, readjust if necessary.
Depending on operating conditions, but after 1 year at the latest	• Check roller bearing and shaft seal. • Check the flap
Varies (depending on external influences and on the characteristics of the conveying product)	• Check interior of housing, clean if necessary. • Check product-guiding parts for wear • Repair or renew surface and anti-corrosion coatings • Exchange the cylinder seals • Exchange the roller bearing and shaft seal

INSTRUCTION FOR ALL INSPECTION AND MAINTENANCE WORK:

Interrupt the product supply to the diverter, switch off the drive of the machinery and secure it against unintentional restarting of the machinery.

8. Operational errors

If you should require the assistance of our customer service or our technical advice, we kindly ask you to supply the following data:

- *Our order confirmation number*
- *Serial number*
- *Type and extent of the malfunction*
- *Time and attendant circumstances of the malfunction*
- *Suspected cause*

8.1. Malfunction of the diverter

Malfunction	Possible cause	Remedial action
Flap cannot be changed over	A Product adhering in the diverter B Bearings defective or shaft/flap seized up C Operating pressure interrupted or low D Cylinder/valve defective E Product column in the diverter F Shaft broken off G Error in the controller	A Dismantle and clean the diverter B Replace all bearings, align the shaft/flap C Check the operating pressure D Replace the cylinder/valve E Remove the product column F Replace the diverter G Check the controller
Low flow rate or conveying interrupted	A diverter or pipelines blocked B Shut-off devices in the system defective	A Locate and eliminate the blockage B Check the shut-off device
The diverter leaks	A Product jam in the diverter B Wrong installation position C Product deposits on the sealing surfaces D Flap seal defective E Flap worn F Collar worn *1	A Reduce the flow rate B Correct the installation position C Dismantle and clean the diverter D Replace the seal *2 E Repair the flap, replace if necessary F Repair the collar, replace if necessary

**1) round diverter only*

**2) rectangular diverter only. The seal in the round diverter is not exchangeable.*

9. Technical description of components

Pneumatic cylinder *)

Make : Bosch-Rexroth
Series : PRA
Version : double-acting, with adjustable end position cushioning and magnetic piston, non-contact signal delivery
Standar d: ISO 6431, VDMA 24562, NFE 49-003-1
Permitted medium : compressed air, oiled or oil-free
Operating pressure: Pmax. 10 bar
Operating temperature : -20 °C to +80 °C
Part numbers for diverter : DN 80 – DN 300: 0822 121 006

5/2-way solenoid valve *)

Make : Bosch-Rexroth
Model : Diap hragm poppet valve
Operating voltage : 220/230 V, 50/60 Hz or 24 V DC
Protection class : IP 65 according to DIN VDE 0470
Part number : 230 V AC: 572 741 5280; 24 V DC: 572 741 0220
Operating temperature: -15 °C to +50 °C

Magnetic field switch *)

Make : Bosch-Rexroth
Type of contact : Reed
Operating voltage : 12 - 240 V AC or 12 - 60 V DC
Max. switching current : AC/DC 0.13 A
Part number : 0830 100 606
Operating temperature : -20 °C to +80 °C

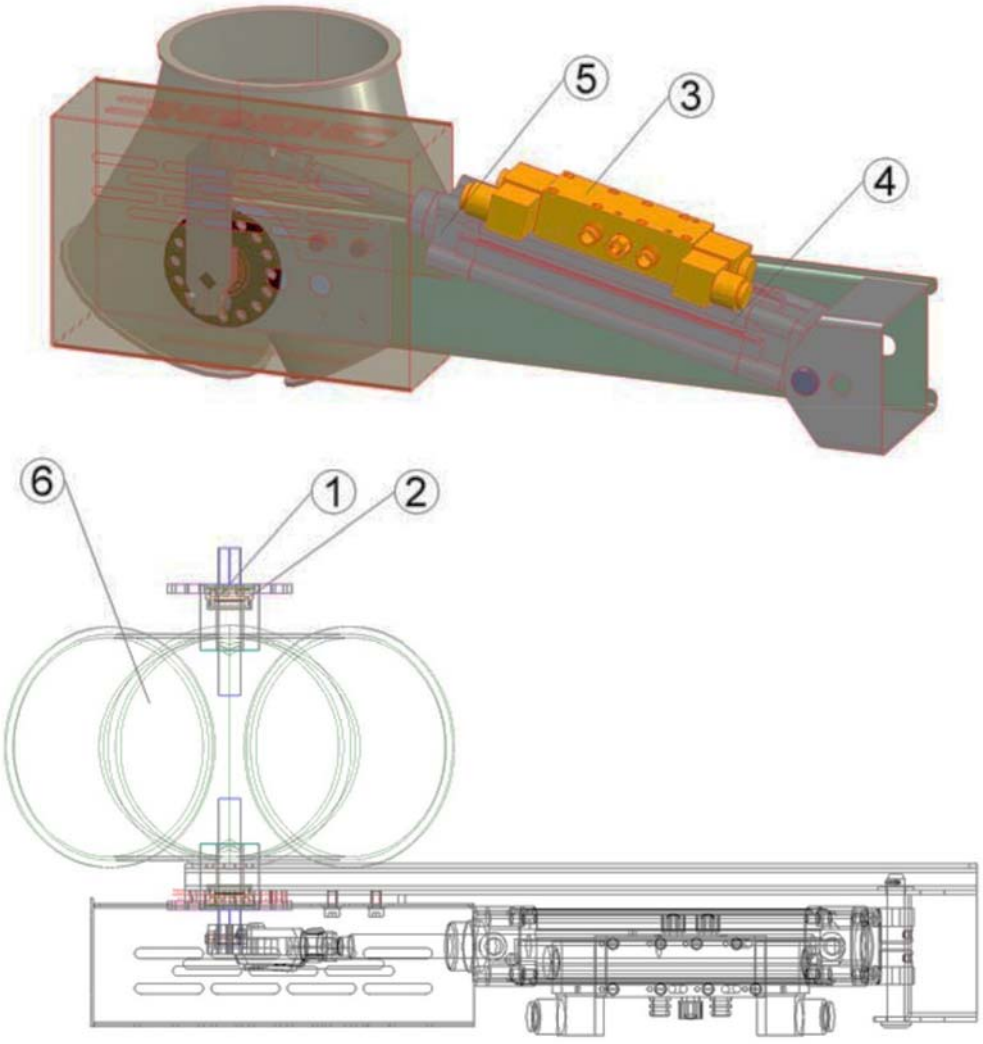
Coil *)

Make : Bosch-Rexroth
Series : C01, Form A
Electrical connection : EN 175301-803, plug
Operating voltage : 230 V AC or 24 V DC
Power consumption : 6 W at 230 V AC, 2.1 W at 24 V DC
Protection class : IP 65
Operating temperature : -15 °C to +50 °C
Part number : 220/230 V, 50/60 Hz : 542 845 7082, 24 V DC : 542 050 7022

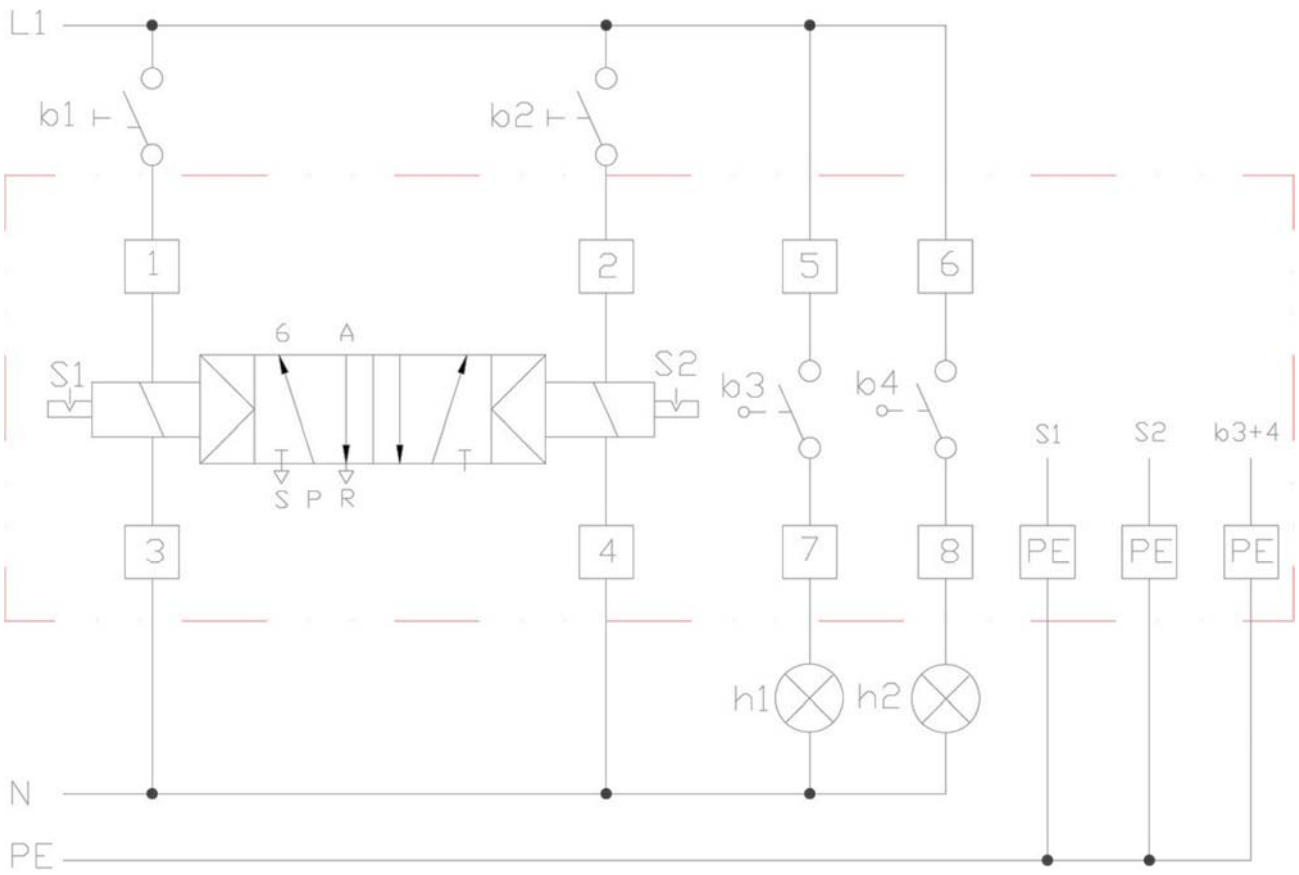
*) In the case of deviating attached parts, please refer to the technical data in the acceptance protocol and in the respective manufacturer's technical data sheets.

10. Spare parts

Part Nr.	Denomination	Quantity
1	Shaft seal	2
2	Roller bearing	2
3	valve	1
4	Piston cylinder	1
5	Seal packing for cylinder	1
6	Flap seal (rectangular diverter)	1



11. Terminal diagram



* b1= button way 1
* b2= button way 2

S1 = pulse solenoid valve magnet 1
S2= pulse solenoid valve magnet 2

b3= limit position switch way 1
b4= limit position switch way 2
*h1= indicator lamp way 1
*h2= indicator lamp way 2

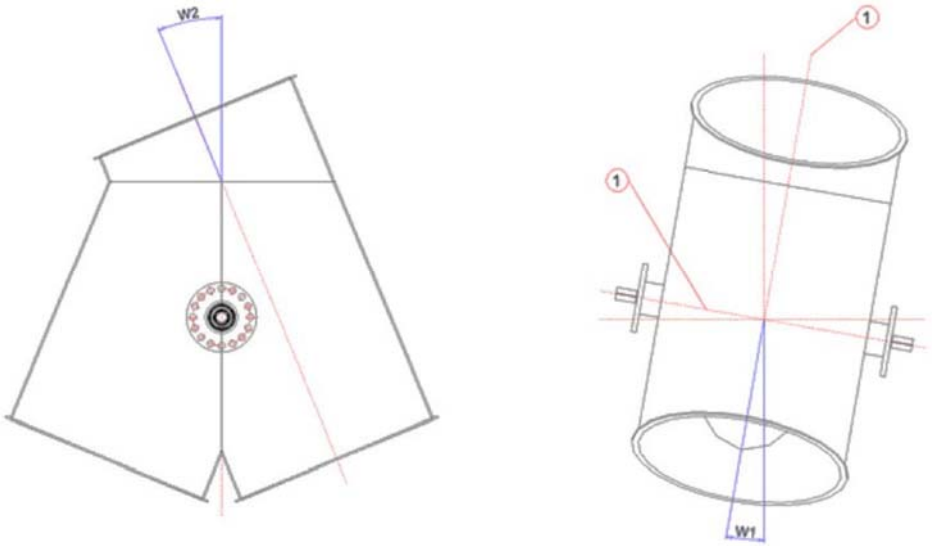
*= not located on the device, belongs to the switchbox

The limit switch settings must be checked by the customer.

Installation position *Asymmetrical diverter :*

1 = part axis

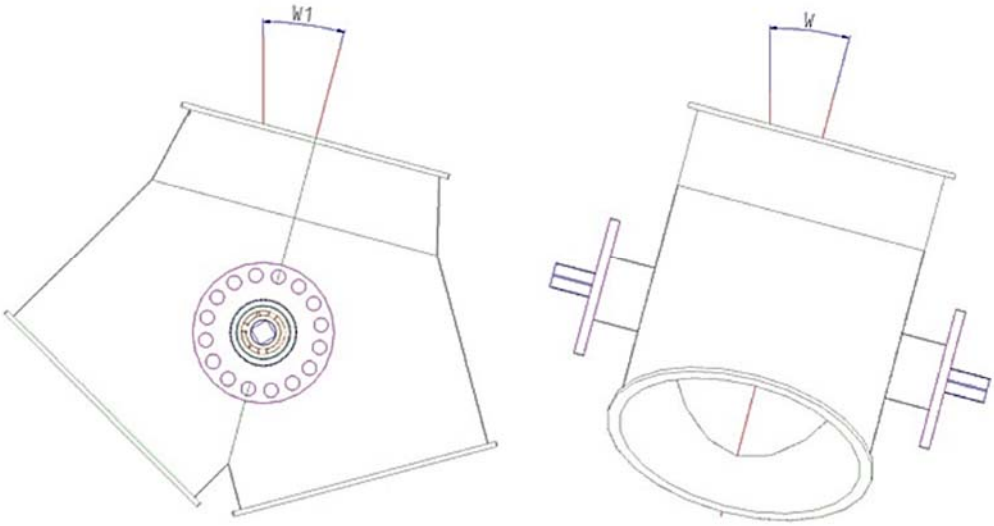
Ideal installation position: W2 = 30° for 60°-two-way valve, W2 = 22,5° for 45°-two-way valve; W1 = 0
Permissible installation position for W1 and W2: +/- 5°



Installation position Symmetrical diverter :

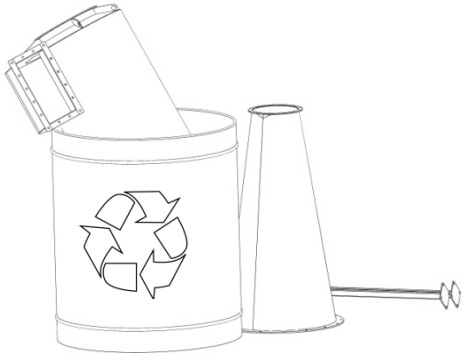
Ideal installation position: W1 = W = 0

Permissible installation position for W1 and W: +/- 5° All axes with inclination correspond to the part axes.



12. Dismantling and recycling

When dismantling a unit, be sure to keep in mind the following important information :
As the unit is dismantled, set aside all still functioning parts in order to re-use them on another unit.
You should always separate the different materials depending on their type : iron, rubber, oils, greases, etc…
Recyclable parts must be disposed of in the appropriate containers or brought to a local recycling company.
The rubbish must be collected in special containers with appropriate labels and disposed of in compliance with the national laws and/or local legislations in force.
CAUTION! *It is strictly forbidden to dispose of toxic wastes in municipal sewerage and drain systems. This concerns all oils, greases, and other toxic materials in liquid or solid form.*



13. Contact

For spare parts please contact Formula Air Group.

Formula Air
The Netherlands
Bosscheweg 36
SX 5741 Beek en Donk
The Netherlands
Tel: +31 (0) 45 492 15 45
Fax: +31 (0) 492 45 15 99

info-nl@formula-air.com
view Google Map

Formula Air
Belgium
Rue des Dizeaux 4
1360 Perwez
Belgium
Tel: +32 (0) 81 23 45 71
Fax: +32 (0) 81 23 45 79

info-be@formula-air.com
view Google Map

Formula Air
Baltic
Televizorių G.20
LT-78137 Šiauliai
Lithuania
Tel: +370 41 54 04 82
Fax: +370 41 54 05 50

info-lt@formula-air.com
view Google Map

Formula Air
France
Zac de la Carrière Doree
BP 105, 59310 Orchies
France
Tel: +33 (0) 320 61 20 40
Fax: +33 (0) 320 61 20 45

info-fr-nord@formula-air.com
view Google Map

Formula Air
Est Agence France
2, rue Armand Bloch
25200 Montbeliard
France
Tel. +33 (0) 381 91 70 71
Fax +33 (0) 381 31 08 76

info-fr-est@formula-air.com
view Google Map

Formula Air
France Agence Ouest
19a rue Deshoulières
44000 Nantes
France
Tel. +33 (0) 251 89 90 75
Fax +33 (0) 251 89 94 06

info-fr-ouest@formula-air.com
view Google Map

Formula Air
France Agence Sud
Chemin de Peyrecave
09600 Regat
France
Tel: +33 561 66 79 70
Fax: +33 567 07 01 09

info-fr-sud@formula-air.com
view Google Map

Air Formula
Russia
Нижний Новгород
Россия
Tel: +7 (499) 609 23 54
Fax: +7 (831) 277 85 38

info-ru@formula-air.com
View Google Map

Formula Air
Vietnam
33, Lot 2, Den Lu 1
Hoang Mai District, Hanoi,
Vietnam
Tel: +84 (4) 38 62 68 01
Fax: +84 (4) 38 62 96 63

info@vinaduct.com
www.vinaduct.com
View Google Map

NOTE : All drawings and references contained within this manual are non-contractual and are subject to change without prior notice at the discretion of the Formula Air group and its partners.