

Documentation WAREX order no.: 140212

# WAREX<sup>®</sup> VALVE

Industrial Valves

for Fluids and Bulk Materials

**KONFORMITÄTSERKLÄRUNG**

Declaration of Conformity / Declaration de Conformite  
**Gemäß Richtlinie 94/9/EG**  
as defined by Directive 94/9/ EC / suivant directive 94/9 C.E.

**Der Hersteller** **Warex Valve GmbH,**  
The manufacturer **Stauverbrink 2**  
Le fabricant **D-48308 Senden**

**erklärt hiermit, daß das Gerät:**

herewith we declare that the Equipment / déclare par la présente que l'appareil

**Gegenstand: Absperrklappen / Gerät**  
Subject / Objet:

Typ: **DKZ 103 <APS>**  
Type:

Abmessung: **DN 300**  
Dimension:

Auftragsnummer: **140212 – Schenck Process GmbH**  
Ident-No. / No de commande

**in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht**  
corresponds to following pertinent regulations in the delivered implementation

dans l'exécution livrée, correspond aux prescriptions respectives

**Richtlinie 94/9/EG**

Directive 94/9/EC / Directive 94/9/C.E.

**Name und Anschrift der benannten Stelle, welche die Kontrolle durchgeführt hat:**  
Engaged notified bodies / Nom et adresse de l'organisme notifié qui a effectué le contrôle

**DEKRA EXAM GmbH**  
**Dinnendahlstraße 9**  
**44809 Bochum**

**Kennummer / Identification-No. / Numéro d'indentification : 0158**

**Nr. der EG-Baumusterprüfbescheinigung: BVS 03 ATEX H 024 X**  
No. of EC-Certifikation / Numéro du certificat d'examen de type C.E.

**Angewandte Normen : EN 13463-1, EN 13463-5, EN 1127-1**

References of Harmonised Standards / Normes appliquées

**Verweis auf mitgeltende EG-Richtlinien:**

Other applied EC-Directives / Référence aux autres directives C.E. applicables:

**Maschinenrichtlinie ist erfüllt, siehe Herstellererklärung**

Machine guideline is fulfilled, sees manufacturer declaration

La directive Machines a été exécutée, voir la déclaration de conformité C.E. du fabricant

**Ort Datum: 48308 Senden, 23.11.2010**  
Location and date / Lieu et date

  
\_\_\_\_\_  
Andreas Reusch / Geschäftsführung / Direction

# *Dokumentation / Documentation*

## *Zwischenbau-Absperrklappe / butterfly-valve*

***type: DKZ 103 <APS>***

*zum Einklemmen zwischen Flansche nach / for mounting between flanges, drilled in acc. to: DIN2501 – PN10*

- für Medium / for medium: Schüttgut / bulk goods*
- Eigenschaften / characteristics: rieselfähig, chemisch neutral, nicht zum Anbacken neigend / dry, chemical not aggressiv, not sticky*
- Betr. –Druck / operat. pressure: drucklos / pressureless*
- Ausl. –Druck / design pressure: < 0,5 bar*
- Betr.-Temp. / operat. temp.: 0° C ... + 60° C*
- Umgeb. –Temp. / ambient. temp.: 0° C ... + 50° C*
  
- Kennzeichnung / indication : CE 158*
- Kategorien / category: II 1 / 3 D c*
- druckstoßfest (nicht zünddurchschlagsicher) bis / shock (not flameproof) up: 10 bar*
  
- Gehäusewerkstoff / body of: Silumin*
- Gehäuse mit Anschluss für Erdung/ housing with connection for grounding*
- Klappenscheibenwerkstoff / disc of: 1.4301*
- Dichtung / sealing element: Buna CB schwarz / black - elektr. leitfähig / conductive*

-----**Pos. 1**-----

***Ihre Material-Nr. / your mat.-no.: V062713.B04***

- Nennweite / size: DN 300***
- Maßblatt / outline draw.: 0305292M... (ähnlich / similar)*
- elektro. pneum. Steuerung : 000331b*
  
- mit aufgeb. pneum. Antrieb / pneum. Actuator, type: AT 220. DR*
- 5/2 Wege Magnetventil, / solenoid valve, type: Herion, 2623077.3046*
- Signalgeber im Gehäuse / signal devices in the housing, type: P&F, SC 3,5 NO*
  
- Vakuumpumpe / Vacuum pump: L14*

***WAREX- Auftragsnummer / order-no : 140212***

# WAREX VALVE GmbH

## “ATEX 1” Installation and Maintenance Manual

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Installation, operating and maintenance instructions according to 94/9/EG (“ATEX”) for Warex butterfly valves of the series DKZ(E) 101, 103, 105, 110 and DKF 102

### General

This operating manual is intended to enable the proper installation and trouble-free operation of the butterfly valves (especially in accordance with DIN EN 13463-1). Therefore, you must read and observe these installation instructions.

Failure to comply with these instructions can result in danger to life and limb and damage to the system, which can cause the manufacturer’s guarantee to become invalid.

All work on the butterfly valve must be performed by trained and experienced personnel. Only suitable tools should be used and the personnel should be equipped with any necessary protective clothing.

If the valve is not used immediately, it should be stored with the valve disk slightly open in the original package in a clean, dry room.

The valves are custom-designed for a specific purpose (see Warex order or cover sheet) and therefore may be used only for the intended purpose described therein. In accordance with these requirements, the valve is also labeled pursuant to 97/23/EG and 94/9/EG. Important structural elements of the valve and their function must be inspected at regular intervals.

### Protective systems / devices in accordance with 94/9/EG

Protective systems consist of **2 butterfly valves of the <GS> series (surge-proof and flame puncture proof), an intermediate container and a control unit with the EC type inspected actuator**, which ensures that at least one valve is closed. The intermediate container must be designed in accordance with DIN 14460.

In order to enable proper operation and to ensure explosion-proof uncoupling, one butterfly valve must always be closed.

There are two types of systems: ignition puncture proof devices (butterfly valves of the <GS> series) included as part of a protective system (in which the control unit is considered separately) and complete systems including type inspected controls.

For the operation as a protective system, the respective operating manuals for the controls must be observed as well.

For protective systems, the pneumatic multiturn actuators must be double-acting and the solenoid valves must be spring-return, closed and currentless. In addition, the category of the devices used for zone distribution must correspond to the ambient conditions.

Only when they are closed and the seal of the valve disc is intact are the butterfly valves in the series DKZ 103 GS DN50 – 500 and DKZ 110 GS DN50 – 300 (in accordance with ATEX H023 and H004) resistant to ignition explosion of propane/air mixtures, gas/air mixtures and hybrid mixtures with similar explosive processes to propane/air mixtures, or resistant to explosion of organic dusts in dust explosion classes St1 and St2. Furthermore, when closed, the protective systems using series DK 103 GS butterfly valves are also resistant to ignition explosions of aluminium dust/air mixtures and to those metallic dust/air mixtures with dust in dust explosion class St3 (KSt<sub>2</sub> ≤ 500) with similar explosive processes to aluminium dust/air mixtures. Both series can resist an explosion pressure of 10 bar.

Automated butterfly valves must be connected with an end position indicator so that the closed condition can be determined with certainty.

They are suitable for ambient temperatures from –20 to +60°C.

For coarse-grained products such as granulates, the tight sealing of the valve may be hindered. In this case, the valves cannot be used as a protective system, if the productless closing of the butterfly valve cannot be ensured at all times.

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Caution – aluminum housings must never be in direct contact with zone 0 + 20.

For metal sealing butterfly valves the minimum closing times (see tables) must be maintained – danger of sparks!

DN	50	65	80	100	125	150	200	250	300	400	500
Min. allowable closing time in sec.	0.04	0.05	0.06	0.08	0.10	0.12	0.16	0.20	0.24	0.31	0.39

DN	600	700	800	900	1000	1200	1400	1600	1800	2000	
Min. allowable closing time in sec.	0.47	0.55	0.63	0.71	0.79	0.94	1.10	1.26	1.41	1.57	

## Flange connection

The dimensions of the Warex butterfly valves are such that they can be clamped between all standard DIN and ANSI flanges. If the valve is used as an end element instead of an intermediate element, then it must be possible to let off the medium without danger. The dimensions of flanges and flange screw connections must comply with the operating instructions. Please note, however, that butterfly valves designed for a specific flange size will not fit other flanges. Make sure that the flanges are parallel, of good workmanship, have undamaged surfaces and are connected in stress-free condition. For the design of the flange, see the sketch at the end of these instructions.

The use of flange seals is **not** allowed for valves with rubber flange coatings. Flange gaskets are used only for metal valve seals.

## Installation

Before installation, the valve must be checked for proper functioning. Especially the sealing lips for the flange seal must be in perfect condition.

Installed manual transmissions, electric and pneumatic actuators should be checked for smooth running; never use force!!

Furthermore, make sure that the butterfly valve matches the required specification. The sleeve, valve disk and shafts must be sufficiently stable for the flow medium. The indicated pressure and temperature limits must be above the operational conditions.

Warex centric butterfly valves are suitable for both directions of flow; the seal and flow characteristics are not affected by the direction.

For use in explosive areas, the valve and the measurement and control equipment must be classified according to 94/9/EG for external (environment) and internal (pipe).

The valve housing must always be grounded (for potential equalization, see drawing 1007914 Mb). The bypass resistance must have a value of  $< 10^6 \Omega$  compared with the ground.

Before installation, the pipe must be expanded using a suitable tool – never misuse the valve for this purpose.

For vertical installation, the butterfly valve must be installed with horizontal shafts, especially in the case of larger nominal diameters. Closing the lower valve disk half in the direction of flow produces a self-cleaning effect.

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For vertical installation, after correct alignment of the valve in the pipe, the lower half of the flange connection screws must be inserted first.

If there is no rubber flange coating, both flange gaskets must be coated with graphite and inserted between the flange. The valve and any flange gaskets must be aligned central to the pipe cross section and clamped into place by slightly tightening the lower flange connection screws.

Insert the remaining flange connection screws and tighten crosswise in order to prevent misalignment or twisting of the housing.

Avoid welding in the flange area after the valve has been installed. The heat caused by welding will inevitably damage the seal.

For outdoor use, make sure that electric components are not directly exposed to weather – it may be necessary to install a guard.

After installation, the butterfly valve must be checked for proper functioning.

## Actuator

Depending on the model, the valve can be actuated by a hand lever, a manual transmission, a pneumatic multiturn actuator or an electric actuator.

Valves delivered with an actuator from the factory are precisely adjusted and should not be re-adjusted as long as the valve functions properly.

After removal and reinstallation of the actuator, the actuator setting must be checked and corrected, if necessary. Pneumatically controlled butterfly valves should be set “nearly dead center” or “slightly ahead” (approx. 1°) (with the exception of APS valves – use dead center setting), to enable easier opening and to ensure proper sealing in case of wear.

The following applies to all valves:

Clockwise = valve closed

Counter-clockwise = valve open

Depending on the medium (especially fluids) the butterfly valves must be opened and closed slowly, in order to prevent pressure surges (knocks) in the pipe system and any ensuing damages.

## Maintenance

Other than regular inspections, additional maintenance of the butterfly valves, such as lubrication, is not necessary – for special instructions, see Wearing parts. For valves with a shaft seal using gland packing, the latter should be inspected regularly (see also Glands).

For maintenance of the actuators, see the maintenance instructions of the respective manufacturer. For **protective systems**, the following points must be inspected regularly:

Wear of seal	1x per month* (see explanation)
Check of “End position – CLOSED” of the valve disk (see Actuator for more information)	1x per month

\*The seal should be checked once each month for signs of wear or washout and replaced, if necessary. If there are no signs of wear here over an extended period, then the inspection can be performed at greater intervals, at the discretion of the operating authority. In case of excessive wear, on the other hand, the inspections should be performed more frequently. In order to prevent interruptions due to age or fatigue, the seal should be replaced no later than after 2 years of operation.

Especially in protective systems, wear of the seal can diminish the flame puncture resistance. Failure to comply with this regulation means danger to life and limb and can also damage the system. Especially after a malfunction, the protective system and, in particular, the sealing sleeve must be checked for damage.

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## **Glands**

Valves for hot gases (temperature above 200°C), glands are used for the shaft seals instead of O-rings.

Leaks in the gland packing can generally be eliminated by resetting the gland screws. If this is not possible, the gland packing must be replaced. Excessive re-adjustment should be avoided.

## **Wearing parts**

The primary wearing part of a butterfly valve is the sealing sleeve. Depending on the use, regular inspections for wear are necessary (crucial for use as pipe end valve or in protective systems).

Especially in protective systems, wear of the seal can diminish the flame puncture resistance. Failure to comply with this regulation means danger to life and limb and can also damage the system.

The user can easily replace removable seal elements; vulcanized sleeves can be replaced only in the factory.

Especially in protective systems the sealing sleeve must be inspected after a malfunction and replaced, if necessary.

Complete seal and wearing part sets are available for pneumatic multiturn actuators.

Use only original replacement parts.

## **Replacing the seal**

Assuming the valve has been removed, proceed as follows:

1. After disassembly of the actuator, the actuator shaft and the bearing journal, the valve disk is free and can be removed from the housing. Check the disk for damage on the entire circumference (the permissible dimension can be found in the drawing or ask the manufacturer)!
2. Now, beginning at the collar, press the sealing sleeve out of the guide grooves and remove it from the housing. Here also check the housing for damage!
3. When inserting a new sleeve, make sure that the collar of the sleeve clearly locks into the housing grooves.
4. Check whether the O-ring seal of the actuator shaft is intact and replace, if necessary.
5. After assembly of the valve (in reverse order, see No. 1), check the butterfly valve for proper functioning, in particular the actuator adjustment (see Drive chapter).

## **Technical function**

The butterfly valves are designed as intermediate flange valves with a centric or eccentric valve disk with bearings.

The stable housing is cast in one piece; only stainless steel housings are welded.

The housing lining and rubber flange coating have a one-piece design, whether they are vulcanized or removable. The rubber flange coating is designed so that a complete seal in the opening area and at the flange connections, in addition to proper functioning of the valve, is guaranteed only without an additional flange gasket.

## **Disassembly:**

Before disassembly, approval must be obtained from the responsible works management (depending on local regulations). It is important that the pipes be de-pressurized, or in the case of hazardous media, that they are emptied and rinsed with suitable means.

Before installation or removal and before performing any work on the butterfly valve, the electric power and compressed air must be shut down by authorized personnel, for safety reasons.

Removal from the pipes is possible only with the valve disk closed.

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## **Safety instructions / dangers:**

Before working on the butterfly valve, the pipes must be de-pressurized.

Important: Never place your hand or other parts of your body into an open butterfly valve that has not been released of energy (electric power + compressed air). This is extremely important especially during cleaning.

The butterfly valves' maximum surface temperature corresponds to the temperature of the materials conveyed. The ignition temperatures of the gases surrounding the butterfly valves must comply with the temperature classes stated in the operation manual. The equipment is to be classified into temperature class T6 for a temperature of the materials conveyed of up to 68 °C, into temperature class T5 for up to 80 °C, into temperature class T4 for up to 108 °C and into temperature class T3 for a temperature of the medium of up to 160 °C. The admissible ignition- and glowing temperatures of the dusts surrounding the butterfly valves must be adhered to as stated in the operation manual. The ignition temperature of dispersed dusts must at least amount to the 1,5 – fold of the temperature of the materials conveyed, and the glowing temperature of dusts deposited on the valves (the maximum dust layer thickness may be 5mm) must at least exceed the temperature of the materials conveyed by 75 K.

Especially dust deposits on the surfaces must be removed at regular intervals.

Use of the valve at product temperatures above +50° can cause the valve housing to become extremely hot. Protective measures must be taken to prevent burns to the skin. Especially for valves with manual actuators, the operating personnel must be protected, e.g. by wearing protective gloves.

Coated valve disks must have a surface resistance of =  $10^9$  Ω (measured at 23 °C and 50% rel. humidity). If dusts with a minimum ignition energy (measured with induction) of = 3 mJ or explosive gases, vapors or fog flow through the valve, then the seals used must have a surface resistance of =  $10^9$  Ω ( measured at 23°C and 50% rel. humidity). For gases of category IIC, the valve disk must be grounded directly.

The interior of the butterfly valves must never have an insulating surface. In all devices, externally applied chargeable layers and/or non-conductive layers must not be greater than 2mm for gases and vapors of group II A and II B, and not greater than 0.2 mm for gases and vapors of group II C.

In addition, provisions must be made to exclude blockage of the valve (which cancels the ignition puncture resistance) or spark formation due to foreign bodies. The connection of electric components must comply with the electric power data and may be performed only by authorized and trained personnel.



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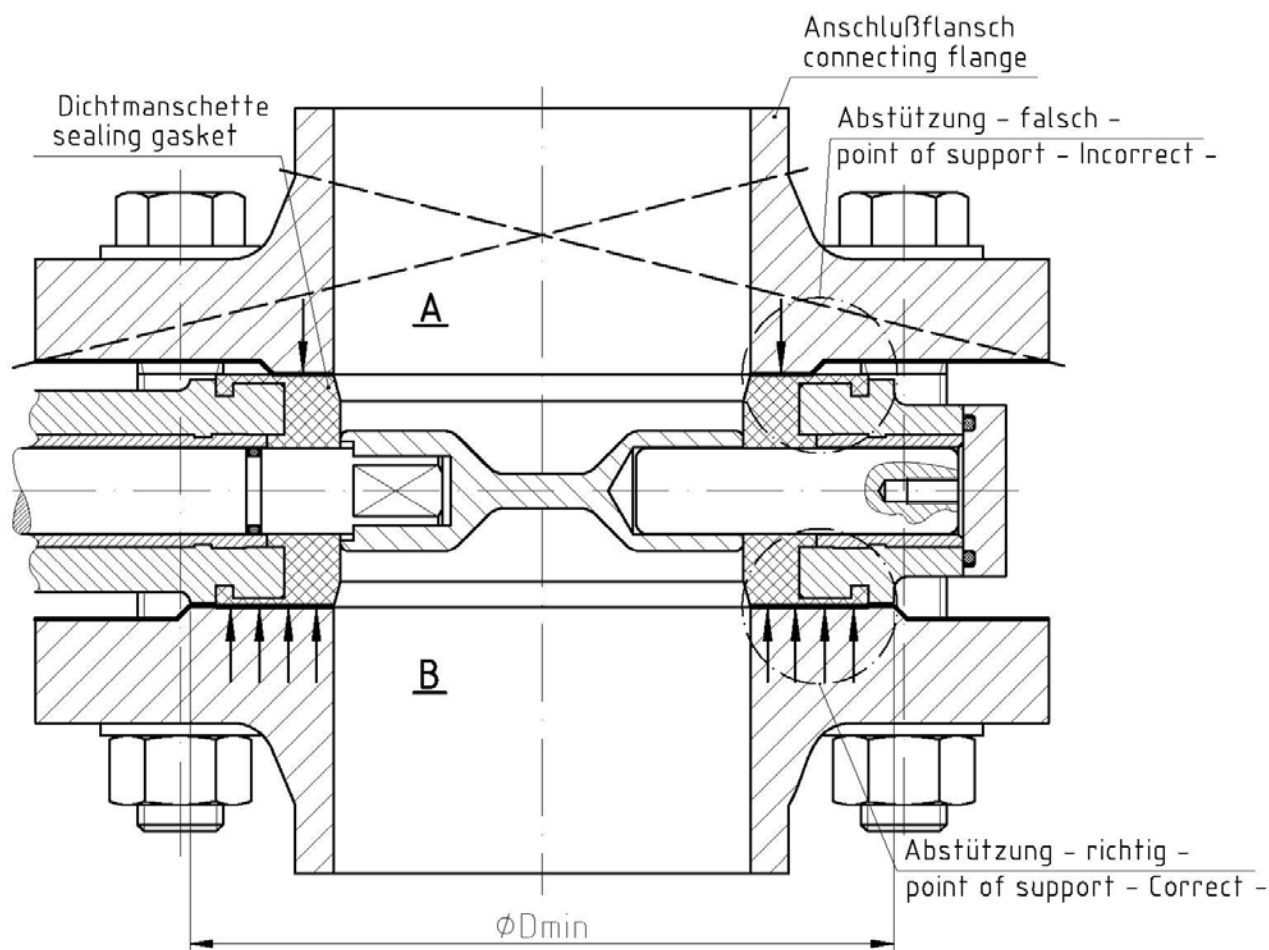
## Dimensions of the connection flange:

Figure **A** shows the incorrect shape of the connection flange.

The bolt force is supported by the sealing sleeve of the butterfly valve.

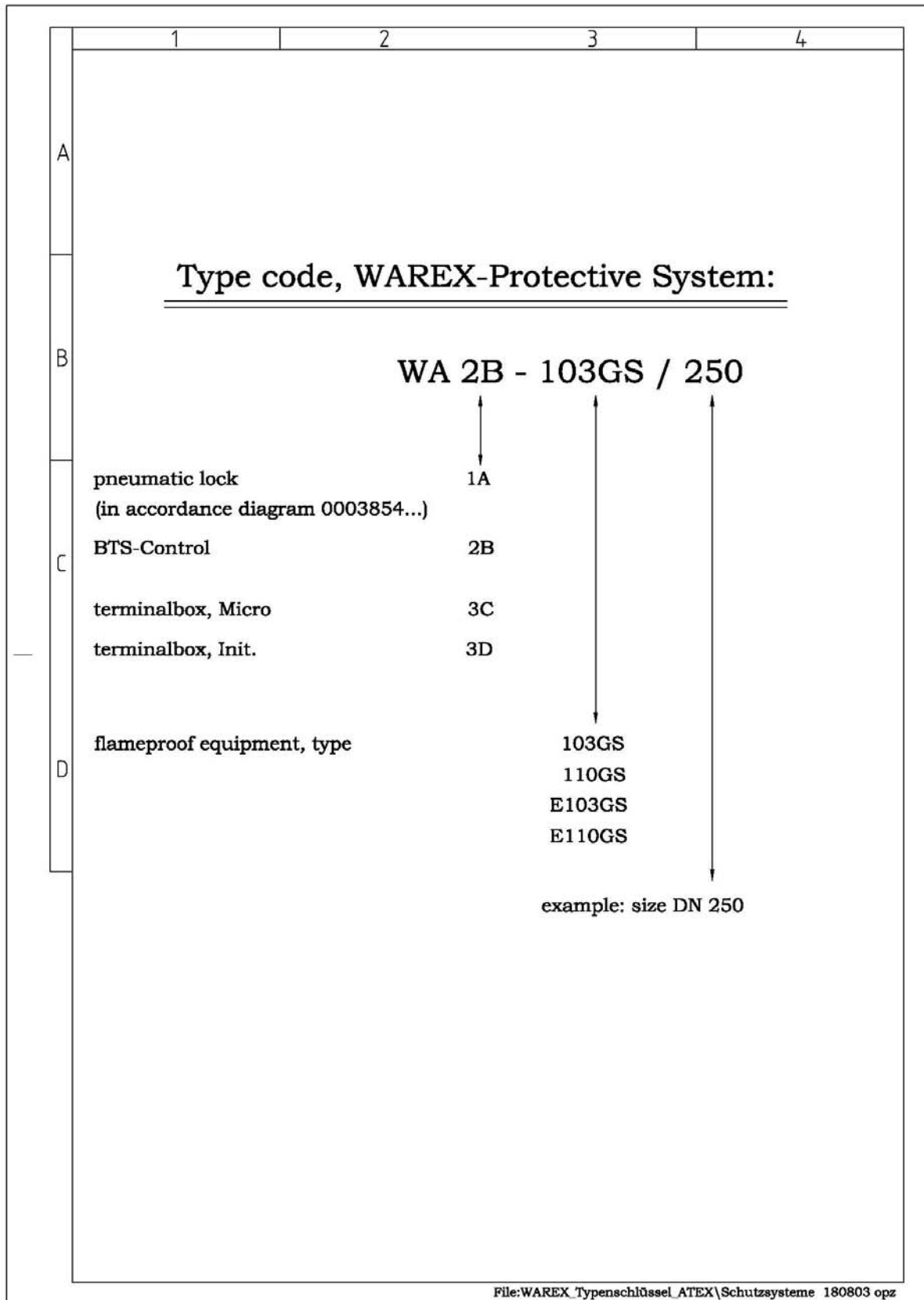
Figure **B** illustrates the correct form of the connection flange.

The bolt force is supported by the sealing surface of the connection flange on the housing of the valve.

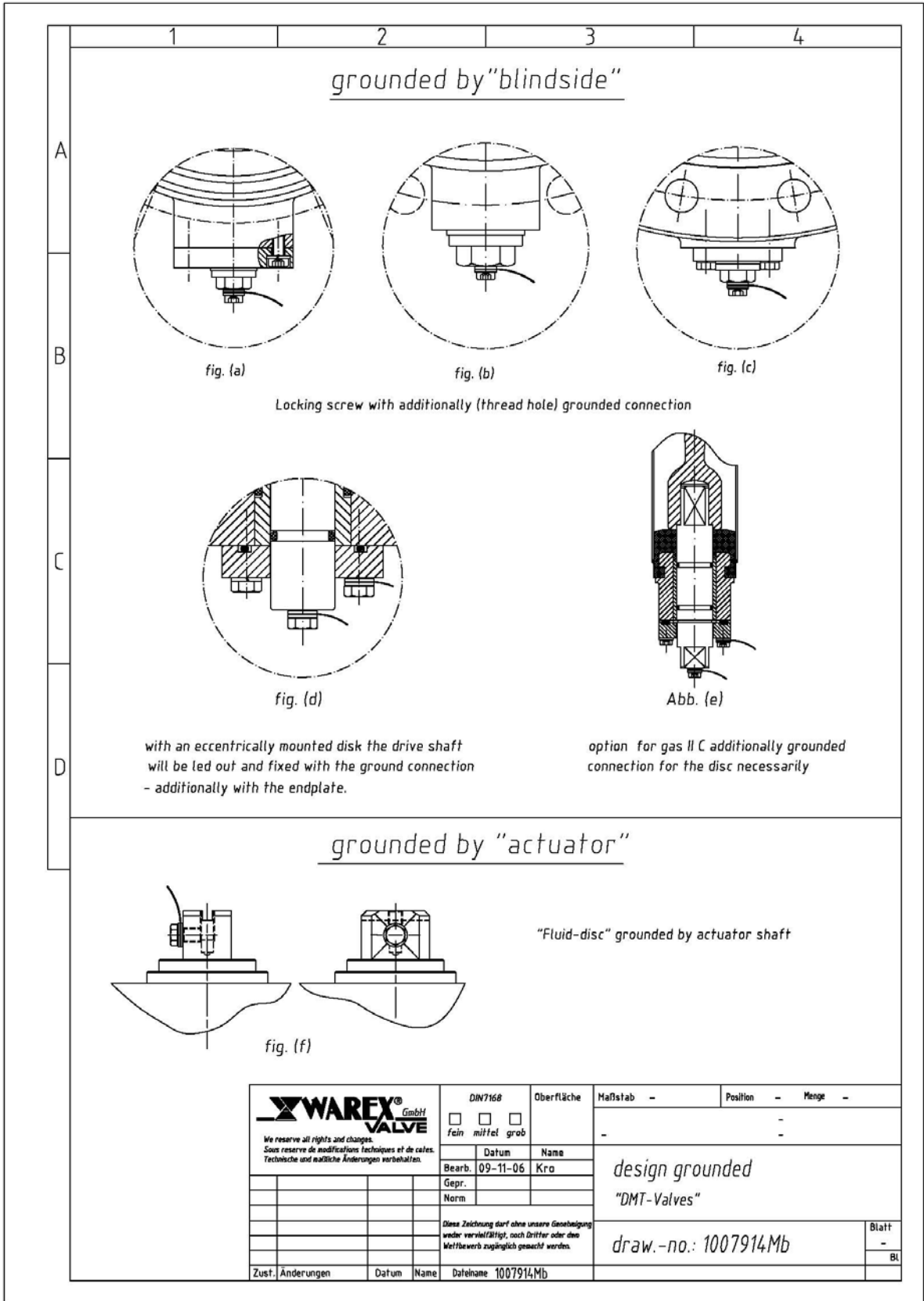


DN	50	65	80	100	125	150	200	250	300	350	400	500	600	700	800	900	1000	1100	1200
$\phi D_{min}$	102	122	138	158	188	212	268	320	370	430	482	585	685	800	905	1005	1110	1180	1330

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# EC-Type Examination Certificate

## - Directive 94/9/EC -

Equipment and protective systems intended for use  
in potentially explosive atmospheres

### BVS 03 ATEX H 024 X

- (4) **Equipment:** Butterfly valves of type series DKZ 103  
Butterfly valves of type series DKZ 103 APS  
Butterfly valves of type series DKZ 110  
Butterfly valves of type series DKZ 110 APS
- (5) **Manufacturer:** Warex Valve GmbH
- (6) **Address:** Stauverbrink 2  
48308 Senden  
Germany
- (7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.
- (8) The certification body of Deutsche Montan Technologie GmbH certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in the test and assessment reports BVS PP 1100/311c/02 EG and BVS PP 1100/311d/02 EG.
- (9) The Essential Health and Safety Requirements are assured by compliance with:  
EN 1127-1:1997-10, Potentially explosive atmosphere, Explosion protection, Part 1: Basic principles and methodology,  
EN 13463-1:2002-04, Non-electrical equipment for use in potentially explosive areas, Part 1: Basic principles and requirements,  
EN 13463-1 Correction 1:2003-06, Corrections of EN 13463-1:2002-04 and  
prEN 13463-5:2002-08, Non-electrical equipment for use in potentially explosive areas, Part 5: Protection by constructional safety.
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC.  
Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

- ⊕ II 1/1 GD c -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/2 GD c -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/3 GD c -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/1 GD c IIB -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/2 GD c IIB -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/3 GD c IIB -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/1 D c -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/2 D c -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$  or
- ⊕ II 1/3 D c -  $-20\text{ °C} \leq T_a \leq +60\text{ °C}$

### Deutsche Montan Technologie GmbH

Bochum, dated 3 November 2003

Signed: Dr Jockers

\_\_\_\_\_  
Certification body

Signed: Dr Wörsdörfer

\_\_\_\_\_  
Special services unit

(13) Appendix to

(14) **EC-Type Examination Certificate**

**BVS 03 ATEX H 024 X**

(15) 15.1 Subject and Type

Butterfly valves of type series DKZ 103  
 Butterfly valves of type series DKZ 110

Butterfly valves of type series DKZ 103 APS  
 Butterfly valves of type series DKZ 110 APS

15.2 Description

The butterfly valves of type series DKZ 103, DKZ 110, DKZ 103 APS and DKZ 110 APS are employed to shut off, throttle and regulate gases, liquids, dusts and solids in pipelines and containers. They are placed in between two flanges and bolted into this flange joint. The butterfly valves consist of a ring-shaped body that can be sealed with a rotating disk bedded on an axis. The sealing surfaces in between the disk and the body as well as the flange surfaces are equipped with elastomer gaskets. The elastomer gaskets of the butterfly valves of type series DKZ 103 APS and DKZ 110 APS can be loaded with compressed air, so that the closed disk makes for a firm sealing of the valve. The butterfly valves may be equipped with various drives and controls or may also be manually operated.

15.3 Parameters

Ratings:

DN 1400, DN 1200, DN 1100, DN 1000,  
 DN 900, DN 800, DN 700, DN 600, DN 500, DN 450, DN 400,  
 DN 350, DN 300, DN 250, DN 200, DN 150, DN 125, DN 100,  
 DN 80, DN 65, DN 50

Ambient temperature:

- 20 °C to + 60 °C

(16) Test and Assessment Report

BVS PP 1100/311c/02 EG, as of 3 November 2003  
 BVS PP 1100/311d/02 EG, as of 3 November 2003

(17) Special Conditions for Safe Use

⊕ II 1/1 GD c	⊕ II 1/2 GD c	⊕ II 1/3 GD c
The total amount of Al, Mg, Ti and Zr in the materials used may not exceed 10 %, the total amount of Mg, Ti, Zr may not exceed 7,5 % by weight.	The amount of magnesium in the materials used may not exceed 7,5 % by weight.	-
The gaskets used must have a surface resistance of $\leq 10^9 \Omega$ .		
Externally applied, chargeable coatings and/or non-conductive coatings may not exceed a thickness of 0,2 mm.		
Coated disks must have a surface resistance of $\leq 10^9 \Omega$ .		
The butterfly valves' interior may not have an isolating finish.		
The body, the disks and the butterfly valves' shafts must be grounded. The bleeder must have a value of $< 10^6 \Omega$ to earth.		
The butterfly valves' maximum surface temperature corresponds to the temperature of the materials conveyed. The ignition temperatures of the gases surrounding the butterfly valves must comply with the temperature classes stated in the operation manual. The equipment is to be classified into temperature class T6 for a temperature of the materials conveyed of up to 68 °C, into temperature class T5 for up to 80 °C, into temperature class T4 for up to 108 °C and into temperature class T3 for a temperature of the medium of up to 160 °C. The admissible ignition- and glowing temperatures of the dusts surrounding the butterfly valves must be adhered to as stated in the operation manual. The ignition temperature of dispersed dusts must at least amount to the 1,5-fold of the temperature of the materials conveyed, and the glowing temperature of dusts deposited on the valves (the maximum dust layer thickness may be 5 mm) must at least exceed the temperature of the materials conveyed by 75 K.		


⊕ II 1/1 GD c IIB	⊕ II 1/2 GD c IIB	⊕ II 1/3 GD c IIB
The total amount of Al, Mg, Ti and Zr in the materials used may not exceed 10 %, the total amount of Mg, Ti, Zr may not exceed 7,5 % by weight.	The amount of magnesium in the materials used may not exceed 7,5 % by weight.	-
The gaskets used must have a surface resistance of $\leq 10^9 \Omega$ .		
Externally applied, chargeable coatings and/or non-conductive coatings may not exceed a thickness of 2 mm.		
Coated disks must have a surface resistance of $\leq 10^9 \Omega$ .		
The butterfly valves' interior may not have an isolating finish.		
The body, the disks and the butterfly valves' shafts must be grounded. The bleeder must have a value of $< 10^6 \Omega$ to earth.		
The butterfly valves' maximum surface temperature corresponds to the temperature of the materials conveyed. The ignition temperatures of the gases surrounding the butterfly valves must comply with the temperature classes stated in the operation manual. The equipment is to be classified into temperature class T6 for a temperature of the materials conveyed of up to 68 °C, into temperature class T5 for up to 80 °C, into temperature class T4 for up to 108 °C and into temperature class T3 for a temperature of the medium of up to 160 °C. The admissible ignition- and glowing temperatures of the dusts surrounding the butterfly valves must be adhered to as stated in the operation manual. The ignition temperature of dispersed dusts must at least amount to the 1,5-fold of the temperature of the materials conveyed, and the glowing temperature of dusts deposited on the valves (the maximum dust layer thickness may be 5 mm) must at least exceed the temperature of the materials conveyed by 75 K.		

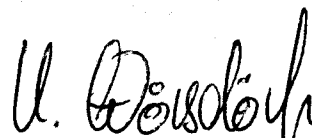
⊕ II 1/1 D c	⊕ II 1/2 D c	⊕ II 1/3 D c
The total amount of Al, Mg, Ti and Zr in the materials used may not exceed 10 %, the total amount of Mg, Ti, Zr may not exceed 7,5 % by weight.	The amount of magnesium in the materials used may not exceed 7,5 % by weight.	-
The gaskets used must have a minimum thickness of 10 mm or a surface resistance of $\leq 10^9 \Omega$ . For dusts with a minimum ignition energy of $\leq 3$ mJ, the gaskets must always have a surface resistance of $\leq 10^9 \Omega$ .		
Coated disks must have a surface resistance of $\leq 10^9 \Omega$ .		
The butterfly valves' interior may not have an isolating finish.		
The body, the disks and the butterfly valves' shafts must be grounded. The bleeder must have a value of $< 10^6 \Omega$ to earth.		
The butterfly valves' maximum surface temperature corresponds to the temperature of the materials conveyed. The admissible ignition- and glowing temperatures of the dusts surrounding the butterfly valves must be adhered to as stated in the operation manual. The ignition temperature of dispersed dusts must at least amount to the 1,5-fold of the temperature of the materials conveyed, and the glowing temperature of dusts deposited on the valves (the maximum dust layer thickness may be 5 mm) must at least exceed the temperature of the materials conveyed by 75 K.		

We confirm the correctness of the translation from the German original.  
In the case of arbitration only the German wording shall be valid and binding.

44809 Bochum, Germany, 29 October 2004  
1100/311/02 BVS-Sim/Sa

EXAM BBG Prüf- und Zertifizier GmbH

  
Certification body

  
Special services unit



## Zwischenflanschklappe Typ DKZ 103 <APS<sup>®</sup>> \*

Absperrklappe mit pneumatisch beaufschlagter Dichtmanschette  
hier mit pneumatischem Drehantrieb



\* Air Pressure Sealing<sup>®</sup>

Bei dieser Absperrklappe wird die Manschette nach dem Schließen der Klappe mit Druckluft an die Klappenscheibe angedrückt (statische Abdichtung). Insofern bietet sich als Antrieb für eine APS-Klappe ein doppelt-, oder einfachwirkender pneumatischer Antrieb förmlich an.

Diese Absperrklappe ist mit einem pneumatischen Drehantrieb der Firma Air Torque dargestellt, wahlweise sind auch Antriebe anderer Hersteller, entsprechend den Kundenvorgaben und Werksnormen der Anwender lieferbar, deren Anschluss nach DIN/ISO 5211 erfolgt (siehe auch unsere Preisliste).

With this model the sleeve is pressed on to the valve disk by means of compressed air after the valve has closed (static seal). So, a single or double-acting pneumatic drive is ideal as an actuator for an APS valve. This shut-off valve is shown with a pneumatic actuator from Air Torque, but on request we can supply actuators from other manufacturers, in accordance with customer specifications and the factory norms of the end user. Connection as per DIN/ISO 5211 (see also our price list).

---

Nennweitenbereich DN 50 - 1000

Betriebstemperatur - 40°C bis + 200°C

Differenzdruck bis 6 bar

Manschette austauschbar oder  
fest einvulkanisiert

Range of Nominal Widths DN 50 - 1000

Operating Temperature - 40°C to + 200°C

Differential Pressure up to 6 bar

Sleeve detachable or galvanised

# Zwischenflanschklappe Typ DKZ 103

## Allgemeine Informationen zur Baureihe DKZ 103

Bei der Absperrklappe Baureihe 103 handelt es sich um eine dichtschießende Zwischenflanschklappe für Flansche nach DIN 2501.

Es wird absolute Dichtheit nach DIN 3230 B0 Leckrate 1 gewährleistet.

Das Gehäuse ist einteilig, die Dichtmanschette ist fest in die Armatur einvulkanisiert. Für die Nennweiten DN 50 bis DN 600 ist auch die Verwendung einer auswechselbaren Manschette möglich.

Die Absperrklappe ist sowohl für feste und flüssige wie auch gasförmige Medien geeignet, Temperaturbereiche von -40 bis +200°C. Für Heißgase mit Temperaturen über 200°C ist diese Baureihe als Drosselklappe in metallisch dichtender Version erhältlich.

### Merkmale der Warex-Klappe

- Wartungsfreie Ausführung
- Gehäuse mit hoher Eigentragsfähigkeit
- Zentrisch gelagerte-strömungsgünstig ausgebildete Klappenscheibe, mit spezieller Wellenverbindung gewährleisten absolute Dichtheit in beide Durchflußrichtungen
- Dichtungen mit seitlichem Überstand und zusätzlicher Dichtleiste gewährleisten vollkommene Abdichtung zwischen Flanschen ohne zusätzliche Flanschdichtungen
- Robuste Ausführung
- Wellenende und Armaturenkopf ausgebildet zum Aufbau der verschiedensten Antriebsmöglichkeiten, Schnittstellen nach DIN/ISO 5211

### Materialspezifikationen:

Gehäuse	Silumin, GG25, GGG 40, Edelstahlgehäuse
Klappenscheibe	Edelstahl, GGG, PVDF, beschichtet, geschl. + poliert
Manschette	Perbunan, NBR, Hypalon, EPDM, Viton, Silikon, u.a.
Wellen+Zapfen	Edelstahl
Buchse	MS, PTFE
O-Ringe	Perbunan, Viton

## General Information on the DKZ 103 Series

Series 103 is a tight-seal interposed flange valve for flanges as per DIN 2501.

The valves are absolutely air-tight in line with DIN 3230 BO Leak Rate 1.

The housing is one-piece, and the sealing sleeve comes in two designs - detachable or fixed (galvanised).

The shut-off valve is suitable for solid, liquid and gaseous media and the temperature range is from -40 to +200°C.

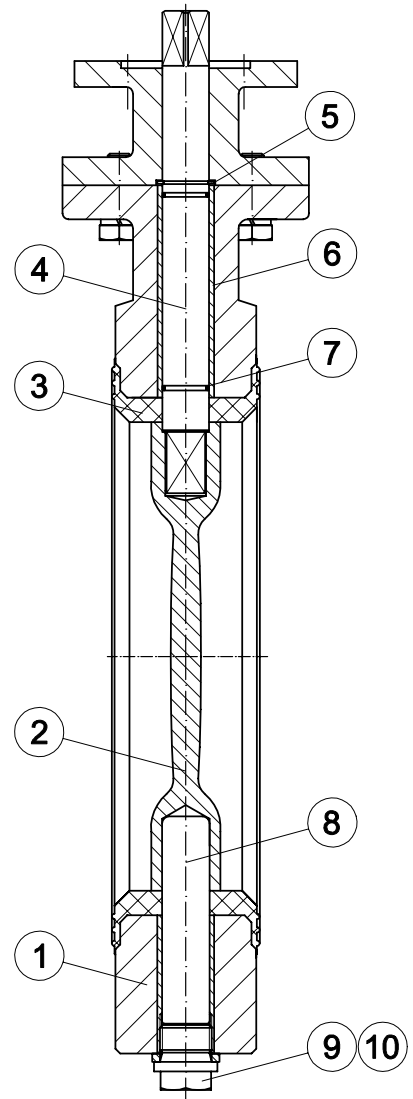
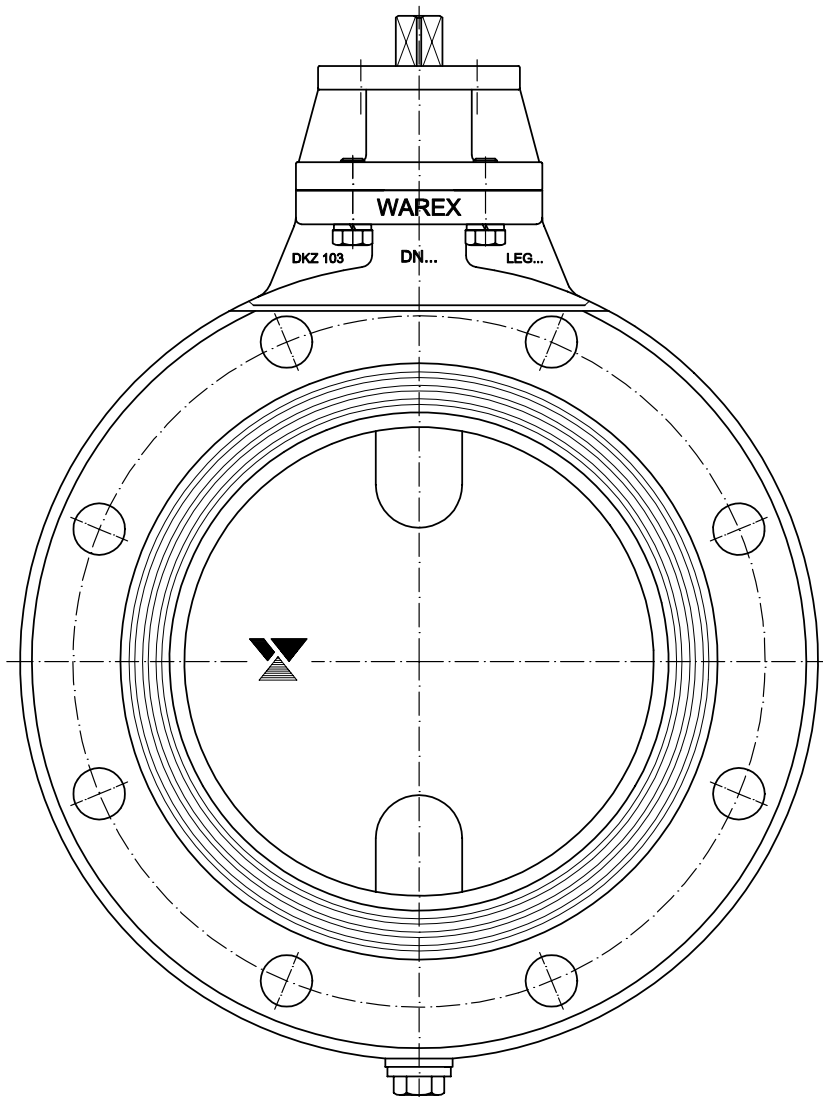
This series is also available as a throttle valve (metal seal closure) for hot gases with a temperature over 200°C.

### Features of the Warex Valve

- maintenance-free design
- largely self-supporting housing
- centrally-positioned valve disk designed to promote a good flow, with special shaft connection, giving an absolute seal in both directions of flow.
- seals with lateral overlap and an additional sealing rim give a perfect seal between the flanges without any extra flange seals.
- sturdy construction
- The shaft end and the armature head are designed to fit to a wide range of drives. Interfaces as per DIN/ISO 5211

### Materials Specifications

Housing	Silumin (Wilmil), GG25, GGG40, stainless steel
Valve Disk	stainless steel, GGG, PVDF, laminated, ground and polished
Sleeve	Buna N, NBR, Hypalone, EPDM, Vitone, Silicone, amongst others
Shafts and Lugs	stainless steel
Stuffing Box	MS, PTFE
O Rings	Buna N, Vitone



**Pos.**

1	Gehäuse
2	Klappenscheibe
3	Dichtmanschette
4	Klappenwelle
5	Sicherungsring
6	Führungsbuchse
7	O-Ring
8	Lagerzapfen
9	Verschlusschraube
10	Dichtung

**Item**

1	Body
2	Valve Disc
3	Sleeve
4	Shaft
5	Rings for shafts
6	Bearing bush
7	O-Rings
8	Bearing pin
9	Locking Screw
10	Sealing ring

# WAREX-VALVE GmbH

## Betriebshinweise für zentrische APS – Klappen

### Funktionsbeschreibung / Ansteuerung:

Jede APS- Klappe wird bevor sie das Werk verläßt auf Ihre Funktion und Dichtheit geprüft. Bei dieser Prüfung wird der erforderliche Spanndruck für die jeweilige Dichtmanschette festgelegt, abgestimmt auf den vom Kunden vorgegebenen Differenzdruck. Der ermittelte Spanndruck ist von dem **an der Armatur angebrachten Etikett abzulesen**.

Die Manschette darf **keinesfalls direkt, ohne Druckminderer**, welcher auf den werkseitig vorgegebenen Spanndruck eingestellt ist, an die Luft- bzw. Stickstoffversorgung angeschlossen werden.

Die konstruktive Gestaltung der Dichtmanschette gestattet es, daß der Spanndruck der APS-Dichtmanschetten, bei hohem Differenzdruck deutlich unter diesem liegen kann. So kann beispielsweise ein Spanndruck von 3 bar bei einem Differenzdruck von 6 bar schon ausreichend sein. Eine allgemeine Aussage ist hierbei leider nicht möglich.

Eine weitere unabdingbare Voraussetzung für einen störungsfreien Betrieb ist, daß die Dichtmanschette erst mit einer zeitlichen Verzögerung von ca. 0,5 bis 2 sec **nach** dem Schließen (nach Erhalt des Signal des Endschalters für Stellung ZU) der Klappe mit Druckluft beaufschlagt wird, und damit sichergestellt ist, daß die Klappenscheibe die Stellung "ZU" erreicht hat bevor die Dichtmanschette an diese angepreßt wird - und eine statische Abdichtung erfolgt. Gleiches gilt für den Öffnungsvorgang - hier sollte die Dichtmanschette über einen Zeitraum von ca. 2 -3 sec vor dem Öffnen der Klappe entlüftet werden.

Achtung, bei Einsatz im Vakuumbereich reicht eine normale Entlüftung der Dichtmanschette keinesfalls aus, hier muß der Dichtmanschette die Luft mit Hilfe einer Vakuumpumpe entzogen werden bzw. die Entlüftung der Klappe sollte an das zentrale Vakuumnetz angeschlossen werden.

Wir empfehlen strikte Einhaltung dieser Betriebshinweise, da bei Nichtbeachtung sämtliche Gewährleistungsansprüche erlöschen.

Eine Möglichkeit diese wichtigen Parameter für einen störungsfreien Betrieb der APS-Klappen zu gewährleisten ist beispielsweise die pneum. Ansteuerung gemäß Zeichnungs-Nr. 000331a. Hier hat die elektrische Ansteuerung der Ventile nach o. a. Beschreibung zu erfolgen. Alternativ ist eine elektropneum. Steuerung gemäß Zeichnungsnummer 0003564, 0003475d bzw. 0003784b (bei Belüftung mit Stickstoff) lieferbar – hier sind die erforderlichen Verzögerungszeiten in der Steuerung integriert, so daß die Ansteuerung der <APS>-Klappe identisch mit einer „normalen“ Absperrklappe ist.

### Druckluftversorgung:

Die Luftversorgung sollte mit trockener gefilterter Druckluft oder falls erforderlich (bitte prüfen) mit Stickstoff erfolgen, da bei Ausfall der Dichtung die Luft in den Innenraum entweichen kann.

### Sicherheitshinweise:

Der Ein- bzw. Ausbau bzw. sämtliche Arbeiten an der Absperrklappe sind aus Sicherheitsgründen nur durch autorisiertes / geschultes Personal durchzuführen. Der Rohrstrang ist drucklos zu schalten, die Strom- und Druckluftversorgung von autorisiertem Personal stillzulegen.

Diese Betriebshinweise dienen als Ergänzung der bestehenden Einbau und Wartungsanleitung für Warex Absperrklappen.

### Standzeiten:

Um eine maximale Standzeit bei schwierigen Produkten und hohen Differenzdrücken (Einlaufklappe für Drucksendegefäß) zu erreichen ist es empfehlenswert das Absperr- und das Dichtsystem mittels einer „einfachen“ Vorabsperrklappe zu trennen und zusätzlich einen Produktabweiser oberhalb der geöffneten Klappenscheibe zu installieren.

### Function / Positioning of the Elements:

All APS valves are tested for function and tightness of seal before they leave the factory. The gripping pressure required for the sealing sleeve is calculated and set in accordance with the differential pressure given by the customer. This gripping pressure is **recorded on the label on the armature**. Therefore, when ordering an APS valve, please make sure you give the differential pressure.

In general we can say: "the gripping pressure should be as little as possible but as much as necessary".

The sleeve should **never be attached directly to an air supply for a pneumatic drive without a pressure reducer** (at the factory-set gripping pressure).

Even with a high differential pressure, the design of the sealing sleeve allows you to have a relatively low gripping pressure. For example, a gripping pressure of 3 bar may be sufficient for a differential pressure of 6 bar. We cannot give you any hard and fast rules for this, because the values depend on the nominal widths of the valves, the composition of the elastomers and the media, and so each individual system has to be calculated separately.

Another pre-requisite for a perfect functioning is a delay switch, i.e. the sleeve must be pressurised with compressed air 0,5 - 2 seconds after the valve has closed (after the signal of the limit switch). In this way, you can be sure that the valve disk is closed ("ZU") before the sleeve is pressed down on to it. This ensures a static seal. The same thing is true in reverse, i.e. when opening the valve.

The sealing element relaxes again approximately 2 seconds before the valve disk is opened and is ideally supported by a vacuum dispenser. The sealing elastomer therefore retains its elasticity over a lengthy period. A vacuum dispenser is also required if the shut-off valve is used with a vacuum. Particularly in the high vacuum range the ventilation of the seal collar should be done via a vacuum system present at the customer.

We would urge you to keep very strictly to this procedure, because failure to do so will result in all guarantees becoming null and void.

One way of making sure that these important parameters are kept to, so as to ensure perfect functioning of your APS valve, is to use one of our operating systems for example see drawing 000331a. Here you have to switch the both solenoid valves by a PLC-Control as above described.

Alternatively, control systems as per drawing 0003534, 0003475d or 0003784b (by nitrogen) can be supplied. Here, the required delay times are integrated into the control system so that the positioning of the <APS> valve is identical with that of a "normal" shut-off valve.

### Air Supply:

The compressed air supply should be via dry filtered compressed air or if necessary (please check) via nitrogen – because by a failure of the sealing element the air could get inside.

### Safety Instructions:

Installation and removal and carrying out all work on the shut-off valves should be done only by fully authorised / trained personnel. For safety reasons, before removing or installing, or performing any work on the shut-off valve, the electricity and pneumatic air supply are to be shut down.

It is vital that the pipes are depressurised.

These operating instructions are in addition to the existing installation and maintenance manual for Warex shut-off valves.

### Lifetime of wear parts:

To reach a maximum lifetime by handling difficult products with high differential pressure (e.g. inlet valve of a vessel for pneumatic conveying) it could be helpful to open and close the valve without product and to install a deflector above the open disk.

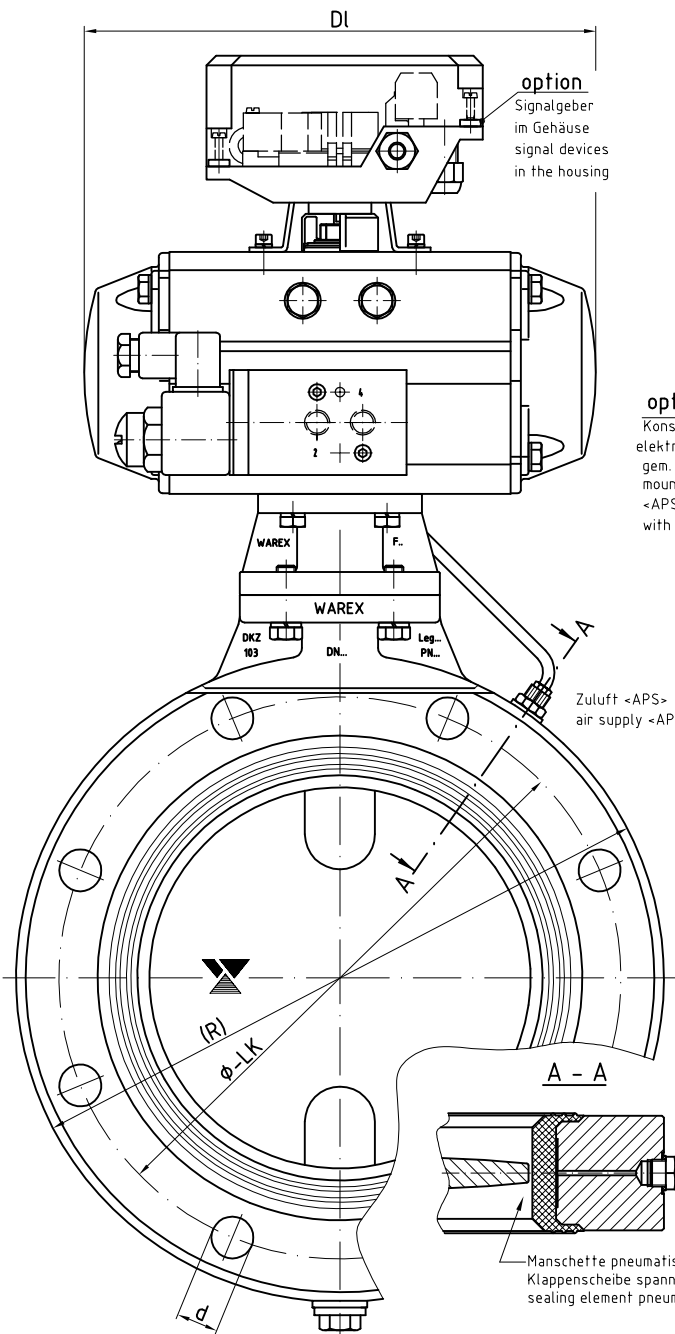
Flanschenanschlußmaße (flange connection)												
DN	ND6			ND10			ND16			ANSI 150lb/sq.in.		
	φ-LK	Bohrungen hø	φd	φ-LK	Bohrungen hø	φd	φ-LK	Bohrungen hø	φd	φ-LK	Bohrungen hø	φd
50	110	4	14	125	4	18	125	4	18	120.6	4	19
65	130	4	14	145	4	18	145	4	18	139.7	4	19
80	150	4	18	160	8	18	160	8	18	152.4	4	19
100	170	4	18	180	8	18	180	8	18	190.5	8	19
125	200	8	18	210	8	18	210	8	18	215.9	8	22.2
150	225	8	18	240	8	22	240	8	22	241.3	8	22.2
200	280	8	18	295	8	22	295	12	22	298.4	8	22.2
250	335	12	18	350	12	22	355	12	26	361.9	12	25.4
300	395	12	22	400	12	22	410	12	26	431.8	12	25.4
350	445	12	22	460	16	22	470	16	26	476.2	12	28.6
400	495	16	22	515	16	26	525	16	30	539.7	16	28.6
500	600	20	22	620	20	26	650	20	33	635	20	31.7
600	705	20	26	725	20	30	770	20	36	749.3	20	34.9
700	810	24	26	840	24	30	840	24	36	-	-	-
800	920	24	30	950	24	33	950	24	39	-	-	-
900	1020	24	30	1050	28	33	1050	28	39	-	-	-
1000	1120	28	30	1160	28	36	1170	28	42	-	-	-

DN	A	B	h	H	(R)	L	L1	DI	Db	Antrieb actuator
50	110	85	38	421	165	39	41	158,5	83	AT 30..
65	118	88	38	432	185	39	41	158,5	83	AT 30..
80	125	95	38	446	200	39	41	158,5	83	AT 30..
80	125	95	38	463	200	39	41	210,5	94,5	AT 60..
100	135	105	38	466	220	39	41	158,5	83	AT 30..
100	135	105	38	483	220	39	41	210,5	94,5	AT 60..
* 125	163	146	53	567	250	56	58	210,5	94,5	AT 60..
150	175	159	53	592	285	56	58	210,5	94,5	AT 60..
150	175	159	53	605	285	56	58	247,5	106,3	AT 100..
200	200	185	53	668	340	54	56	268,5	123	AT 150..
200	200	185	53	696	340	54	56	315	141	AT 220..
250	249	207	15	729	395	68	70	315	141	AT 220..
300	273	237	15	795	445	78	80	345	151,5	AT 300..
350	304	270	15	879	505	78	80	408,5	171,5	AT 450..
400	330	302	15	956	565	102	104	437,5	187	AT 600..
450	400	337	15	1061	615	102	104	437,5	187	AT 600..
500	433	365	15	1122	670	110	113	437,5	187	AT 600..
600	493	420	15	1306	780	110	115	543	222	AT 1200..
* 700	554	486	15	1433	895	130	135	543	222	AT 1200..
* 800	610	535	15	1623	1015	130	135	684	329,5	AT 3000..
* 900	656	590	15	1724	1115	130	138	684	329,5	AT 3000..
* 1000	694	644	28	1829	1230	140	148	684	329,5	AT 3000..

\* vulk. Ausführung

We reserve all rights and changes

	Stauverbrink 2 D-48308 Senden Tel.: +49(0)2536/9958-0 Fax: +49(0)2536/9958-29	Maßstab Position Menge
	DN50 - DN1000 Absperfkappe (butterfly valve), type DKZ103-APS Antrieb (actuator), type: AT ... DA	Blatt
b Änderungswahlkarte 24.04.02 opz a vult. Ausführung 08.05.00 opz	Datum Name Bearb. 09.04.1999 Baing Gepr. Norm	Blatt
Zust. Änderung Datum Name 0305292mb.dwg	0305292mb.dwg	Blatt



option  
Konsole für:  
elektr.-pneum. Ansteuerung  
gem. Schaltplanvariante  
mounting bracket for  
<APS> control in accordance  
with circuit diagram

option  
Wellenlagerung  
in Buchsen  
bearing bush

Manschette pneumatisch gegen  
Klappenscheibe spannbare <APS>  
sealing element pneumatically pressed tight <APS>

**Achtung!** Manschette nur bei geschlossener Klappenscheibe mit Druckluft beaufschlagen. Das Öffnen und Schließen muß drucklos erfolgen, da sonst die Manschette zerstört werden kann.

**Attention!** The supply of the air pressure sealing only by closed valve! The opening and closing may not happen under pressure. Otherwise the sealing will be destroyed!



## Pneumatic part turn actuators with interesting innovations The 4th Generation

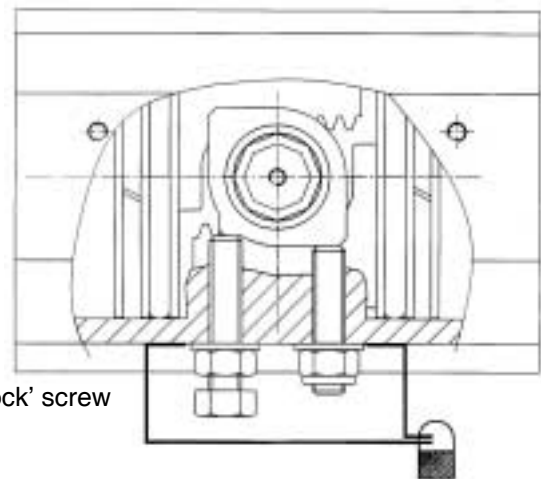
The actuators 4th Generation of are characterized through multiple technical improvements, interesting innovations and where developed in view of the newest completion for the ISO 5211.



Pictures: The new shape in 'New Edges' design.

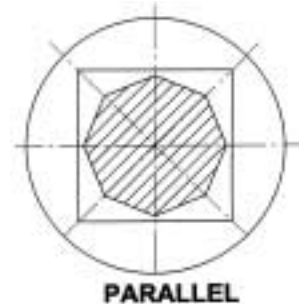
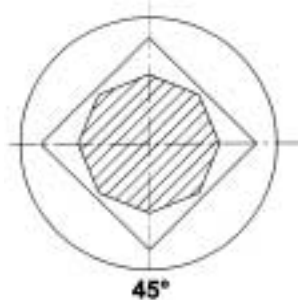
### The travel stop adjustments

The adjustment of both travel stops will be done on the external adjustment-screws, over the octi-cam system. This new design now allows an easy 'block and lock' possibility of the actuator, with use of a longer screw in one of the both travel stops (picture r.). All adjustments are practicable without disassembling of the actuator.



### Square diagonal or parallel

A more flexible construction is obtained through the possibility of free adjustment of the drive-shaft in 45°-steps (square on the bottom).



With a turn of the drive shaft the requested position can be realized. For correct position indication the plug of the indicator (drive shaft top) is designed as an octagon, so the position indicator also can be mounted in 45°-steps.



### The Advantages of the 4th Generation

#### Multifunction-indicator

- adjustment in 45°-steps possible
- prepared for double proximity sensor
- variable plug system

#### Body

- anticorrosion coating A-B-C-D-E-P
- DIN/ISO 5211, VDI/VDE 3845, NAMUR
- New Edge design

#### Piston guiding

- 3-way guiding
- optimized bearing surface
- serial application up to 150 °C

#### Spring cartridge

- safe mounting, here compressed and guided
- spring force through variation adjustable
- corrosion protected with Epoxy

#### Piston

- corrosion-resistant
- backlash-free transmission through involute curve
- milling cutted tooth profile for high working life

#### End cap

- anticorrosion coating A-B-C-D-E-P
- handsome shape, compact
- New Edge design

#### External stroke adjustment

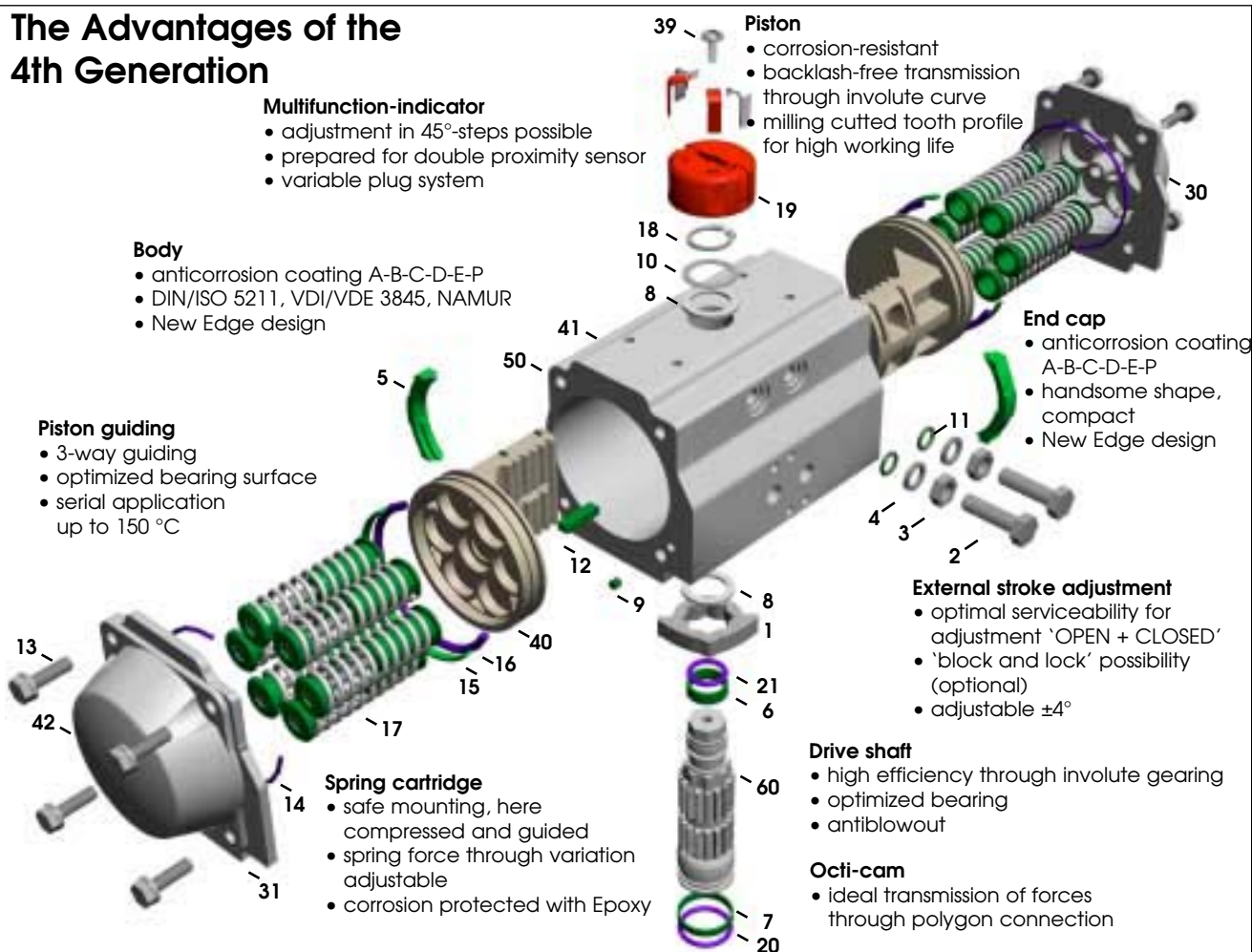
- optimal serviceability for adjustment 'OPEN + CLOSED'
- 'block and lock' possibility (optional)
- adjustable  $\pm 4^\circ$

#### Drive shaft

- high efficiency through involute gearing
- optimized bearing
- antiblowout

#### Octi-cam

- ideal transmission of forces through polygon connection

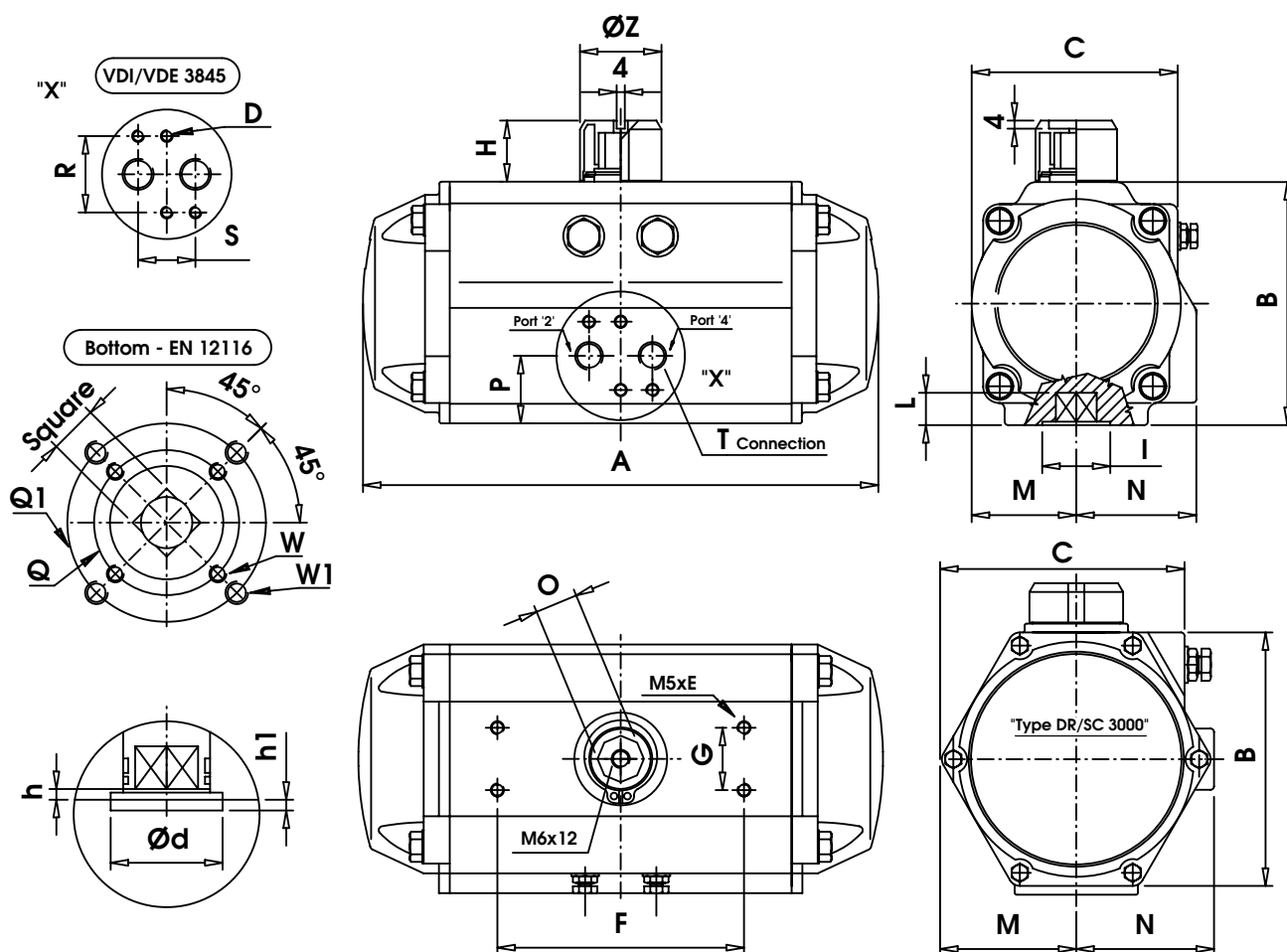


Pos.	Pcs	Part Description	Material	Specification	Protection
01	1	Octi-Cam (Stop Arrangement)	1.4021/GS400-15 <sup>(1)</sup>	EN 10088-3/ISO 1083 <sup>(1)</sup>	
02	2	Stop Cap Screw	B8 Cl.2	ASTMA193	
03	2	Washer (Stop Cap Screw)	A2	ISO 3506	
04	2	Nut (Stop Cap Screw)	A2-70	ISO 3506	
05*	2	Bearing (Piston Back)	PPA	Amodel ET1001HS	
06*	1	Bearing (Pinion Top)	PA46	Stanyl/TW300	
07*	1	Bearing (Pinion Bottom)	PA46	Stanyl/TW300	
08*	2	Thrust Bearing (Pinion)	PPA	Amodel ET1001HS	
09*	2	Plug (Transfer Port)	NBR	NBR 70Shore	
10	1	Thrust Washer (Pinion)	1.4301	EN 10088-3	
11*	2	O' Ring (Stop Cap Screw Seal)	NBR	NBR 70Shore	
12	2	Piston Guide	PPA+45%GF	Amodel AS1145	
13	8/12/16 <sup>(2)</sup>	Cap Screw (End Cap)	A-70	ISO 3506	
14*	2	O' Ring (End Cap)	NBR	NBR 70Shore	
15*	2	Bearing (Piston Head)	PPA	Amodel ET1001HS	
16*	2	O' Ring (Piston)	NBR	NBR 70Shore	
17	min.4/max.12	Spring (Cartridge)	SiCr Spring Alloy Steel	DIN 17223 Teil 2	Epoxy coated
18	1	Spring Clip (Pinion)	C75	DIN 17223	ENP
19	1	Position Indicator	PP+30%GF	Hostalen PPN VP7790 GV 2/30	
20*	1	O' Ring (Pinion Bottom)	NBR	NBR 70Shore	
21*	1	O' Ring (Pinion Top)	NBR	NBR 70Shore	
30	1 <sup>(3)</sup>	Right End Cap	GD-AISI8.5Cu3.5Fe	UNI 5075	A, B, C, D, E, P
31	1 <sup>(3)</sup>	Left End Cap	GD-AISI8.5Cu3.5Fe	UNI 5075	A, B, C, D, E, P
39	1	Cap Screw (Indicator)	A2-70	ISO 3506	
40	2	Pistons	GD-AISI8.5Cu3.5Fe	UNI 5075	anodized
41	1	Identification Label	Polyester Aluminium		
42	2	Label (End Cap)	Polyester Aluminium		
43	1	Spigot	Alloy6082	ASTM B221	Alodur
50	1	Body	Alloy6083	ASTM B221	A, B, C, D, E, P
60	1	Drive Shaft	A105	ASTMA105	ENP

\*Spare Part

<sup>(1)</sup> AISI420 Type DR/DL, SC/SO 15-150; GS400-15 Type DR/DL, SC/SO 220-4000 <sup>(3)</sup> Type DR/DL, SC/SO 600-3000 End Caps are symmetric

<sup>(2)</sup> 8 pcs. Type DR/DL, SC/SO 15-1200; 12 pcs. Typ DR/DL, SC/SO 3000



Type	15	30	60	100	150	220	300	450	600	900	1200	2000	3000	5000 <sup>1)</sup>
	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC	DR/SC
ISO Flange*	F03/04	F04/05	F05/07	F05/07	F07/10	F07/10	F07/10	F10/12	F10/12	F14	F14	F16	F16	
Square	11	14	14	17	17	22	22	27	27	36	36	46	46	
T-ISO228	1/8"	1/8"	1/8"	1/8"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	3/8"	1/2"	
A	140,5	158,5	210,5	247,5	268,5	315	345	408,5	437,5	487	543	621	684	
B	69	85	102	115	127	145	157	177	196	220,5	245	298,5	330	
C	59	72	84,5	97,5	111	127	136	156,5	169	190,7	213	251	298,5	
D	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M6x10	M6x10	
E	4	8	8	8	8	8	8	8	8	8	8	8	8	
F	80	80	80	80	80	80	80	80	80	130	130	130	130	
G	30	30	30	30	30	30	30	30	30	30	30	30	30	
H	20	20	20	20	20	30	30	30	30	50	50	50	50	
I	30	35	35	55	55	70	70	85	85	100	100	130	130	
L <sub>min</sub>	12	16	16	19	19	24	24	29	29	38	38	48	48	
M	29	36	42,5	49,5	56	64	69,5	80	88	99	110	131	163,5	
N	41,5	47	52	56,8	67	77	82	91,5	99	105	112	131	166	
O	11	11	19	19	19	27	27	27	27	42	42	42	42	
P	26,5	30	30,5	32,5	37,5	42,5	45	47	52	58	62	78,5	165	
Q*	36	42	<b>50</b>	50	<b>70</b>	70	70	102	102	140	140	165	165	
Q1*	<b>42</b>	<b>50</b>	70	<b>70</b>	102	<b>102</b>	<b>102</b>	<b>125</b>	<b>125</b>	-*	-*	-*	-*	
R	32	32	32	32	32	32	32	32	32	32	32	45	45	
S	24	24	24	24	24	24	24	24	24	24	24	40	40	
W*	M5	M5	<b>M6</b>	M6	<b>M8</b>	M8	M8	M10	M10	M16	M16	M20	M20	
W1*	<b>M5</b>	<b>M6</b>	M8	<b>M8</b>	M10	<b>M10</b>	<b>M10</b>	<b>M12</b>	<b>M12</b>	-*	-*	-*	-*	
ø d f8 (A)	30	35	35	55	55	70	70	85	85	100	100	130	130	
h1 max. (A)	2	3	3	3	3	3	3	3	3	4	4	5	5	
h min.	0,5	0,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	2	2	2,5	2,5	
ø Z	40	40	40	40	40	56/65	56/65	65	65	80/115	80/115	115	115	

\* Protection C, D, E, P only one Flange (extra bold printed), (A) on Request, <sup>1)</sup> Time of delivery on request all dimensions in mm





#### CONTENENTS

- 1) GENERAL
- 2) SAFETY NOTICE
- 3) WORKING CONDITIONS AND TECHNICAL DATA
- 4) OPERATING FUNCTION AND DIRECTION OF ROTATION
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- 6) MAINTENANCE INSTRUCTION
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#### 1) GENERAL

This instruction manual contains important information regarding the installation, operation, maintenance and storage for rack and pinion pneumatic actuators. Please read these instructions carefully and save them for future reference. It is important that only properly trained personnel disassemble/assemble the actuator.

#### 2) SAFETY NOTICE

- It is important that the actuator should only be used within pressure limits indicated in our technical specifications.
- Operating the actuator over pressure limits will damage internal parts as well as cause damage to the housing.
- Operating the actuator over temperature limits will damage internal and external components (disassembly of spring return actuator may become dangerous).
- Operating the actuator in corrosive environments with incorrect protection may damage the internal and external parts.
- Do not disassemble individual spring cartridges. Disassembly may result in personal injury. For further information contact
- Isolate all air lines and make sure that actuator air connection is vented before installation or servicing of the actuator.
- Do not remove end caps or disassemble the actuator while the actuator is pressurised.
- Before installing onto a valve make sure that the rotation of the valve and the actuator are the same and that the position indicator orientation is also correct.
- If the actuator is incorporated in a system or used within safety devices or circuits, the customer shall ensure that the national and local safety laws and regulations are observed.

#### 3) WORKING CONDITIONS AND TECHNICAL DATA

##### • Operating media:

Dry or lubricated air or inert/non-corrosive gases provided they are compatible with internal actuator parts and lubricant. The operating media must have a dew point equal to  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) or at least  $10^{\circ}\text{C}$  below the ambient temperature. The maximum particle size must not exceed  $30\ \mu\text{m}$ .

##### • Supply pressure:

The maximum supply pressure is 8 Bar (116 PSI).

Generally for Double Acting and Spring Return actuator the supply pressure is: from 2.5 Bar (36 PSI) minimum to 8 Bar (116 PSI) maximum.

##### • Operating Temperature:

Standard product from  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) to  $+80^{\circ}\text{C}$  ( $+176^{\circ}\text{F}$ ).

Low temperature LT actuator with silicon "O" rings from  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ) to  $+80^{\circ}\text{C}$  ( $+176^{\circ}\text{F}$ ).

High temperature HT actuator with FPM "O" rings from  $-15^{\circ}\text{C}$  ( $+5^{\circ}\text{F}$ ) to  $+150^{\circ}\text{C}$  ( $+300^{\circ}\text{F}$ )

Caution: For low and high temperature service, special grease is required. Please contact

for each application. High and low temperature will vary the output torque of the actuator.



- Operating Time:

See Technical Data Sheet.

Caution: The operating speeds depend on several factors such as: supply pressure/supply capacity (i.e. pipe diameter/flow capacity or pneumatic accessory), valve type, valve torque and characteristics, what safety factor is to be applied, frequency of operation and temperature.

- Stroke:

The stroke for                                    actuators are as follows (See technical data):

Standard construction: 90° rotation with stroke adjustment at 0° and 90° + or – 4°

Type Y 120° stroke: 120° rotation with stroke adjustment at 0° and 120° + or – 4°

Type X 180° stroke: 180° rotation with stroke adjustment at 0° and 180° + or – 4°

- Lubrication:

The actuators are factory lubricated for the life of the actuator in normal working conditions.

The standard lubricant is suitable for use from -20°C (-4°F) to +80°C (+176° F). For low (LT) and high (HT) temperature service, where special grease is required please contact

Recommended                                    actuator lubricants for standard working conditions:

- Kluber Unigear LA02
- Esso (Exxon) Beacon EP2
- Fina Marson EP L2
- Shell Alvania EP2
- Mobilux EP2

- Construction:

Rack and pinion actuator design suitable for both indoor or outdoor installations.

- Protection and Corrosion resistance:

Ensure actuators are supplied with corrosion protections for normal environments. For severe duties select the protection required for corrosion protection. See technical data sheet before installing actuators.

- Actuator designation and Marking:

The actuator type, size, operating pressure, output torque, direction of rotation, orientation of failure mode, operating temperature and drive type are determined by actuator designation.

   actuators are supplied with a label showing all of this information: type, model (including protection and if applicable the LT or HT for operating temperature), stroke, maximum permissible supply pressure, direction of rotation, output torque, ancillary attachment, pressure connection, valve actuator attachment and serial number.

#### 4) OPERATING FUNCTION AND DIRECTION OF ROTATION

The actuator is a pneumatic operator for remote actuation of valves. The operation (90° – 120° or 180° rotation) may be connected by different methods:

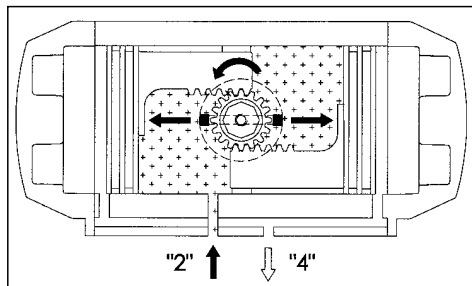
- Direct mounting of solenoid valves (5/2 for double acting, 3/2 for spring return) to pressure connections 2 and 4.
- Screwed connection (to pressure connections 2 and 4) with air lines from separate control cabinet.

The standard rotation is clockwise to close, counter-clockwise rotation is obtained when port 2 is pressurised. For actuator marked LF the rotation is counter-clockwise to close, clockwise rotation is obtained when port 2 is pressurised.

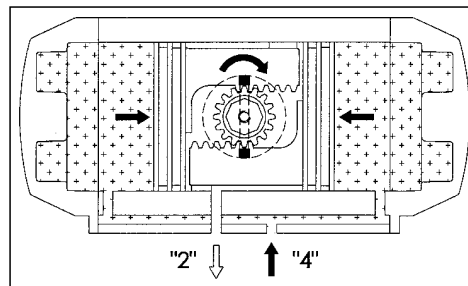


#### • Double Acting operation function (standard rotation) Top View

Air supplied to Port 2 forces the pistons apart and toward end positions, with exhaust air exiting at Port 4, a counter clockwise rotation is obtained.

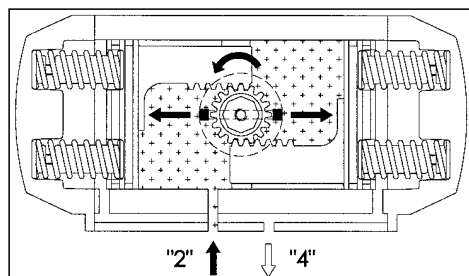


Air supplied to Port 4 forces the pistons together with exhaust air exiting at port 2, a clockwise rotation is obtained.

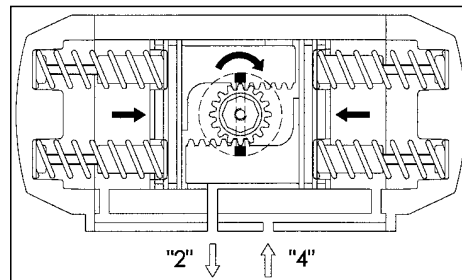


#### • Single Acting operation function (standard rotation) Top View

Air supplied to Port 2 forces the pistons apart and toward end positions, compressing the springs with exhaust air existing at Port 4, a counter clockwise rotation is obtained.



On loss of air pressure (air or electric failure) at Port 2 allow the springs to force the pistons to the centre position with exhaust air exiting at Port 2, a clockwise rotation is obtained.



### 5) ACTUATOR INSTALLATION INSTRUCTIONS

The AT actuator is a pneumatic device for the remote operation of industrial valves. The AT actuator will operate through 90°, the option is available for 120° or 180° of rotation permitting the opening and closing of many types of 1/4 turn valves.

All the necessary technical information to install the actuator correctly and safely onto a valve i.e. Dimensions, Output torque, Air volume, Stroke Adjustment, Operating time, Operating temperature, Direction of rotation and Weight is stated clearly on the Actuator label, in the catalogue and technical data sheets. Please read this technical information carefully before proceeding with the actuator installation.

#### 5.1) **Important Safety Notice :**

- The actuator must not be pressurized at any time during installation as injury may result.
- The utmost cleanliness is required during air supply connection to the actuator i.e. the connecting pipe thread, fittings and seals must be clean and dirt-free.
- When fitting accessories onto the actuator assemble them in such a way that the top of the drive shaft is easily accessible should manual operation of the actuator be required.
- Before fitting onto the valve make sure that the actuator / valve are correctly orientated, depending upon which direction of rotation is required.



#### 5.2) Controls and connections, Figure A :

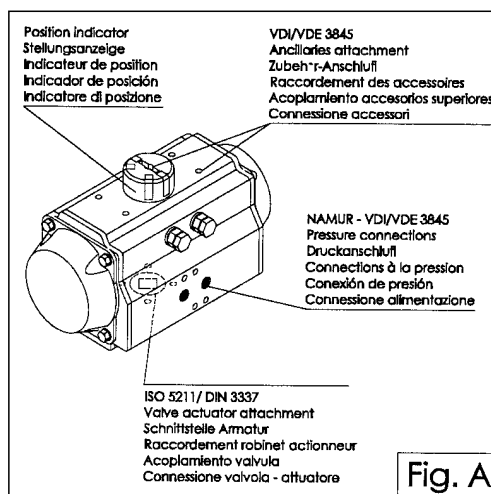


Fig. A

#### 5.3) Assembly of accessories : Solenoid valves and Switchboxes Figure B :

- Solenoid valve mounting:

Before mounting a Solenoid valve ensure that the actuator is in its normal position (closed position) pistons together :

- For Standard assembly and rotation (Clockwise to close): the groove on the indicator 2 must be diagonal to the longitudinal axis of the actuator in the closed position.

Fit the solenoid valve 4 onto the actuator 3 using the screws provided (max. tightening torque see the table below).

- Switchbox mounting:

Fit the switchbox and bracket 1 onto the actuator 3, using four screws provided (max. tightening torque see the table below).

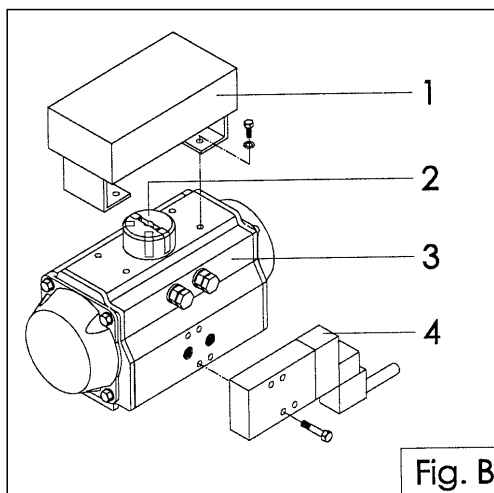


Fig. B

#### Tightening torque table:

M..	Nm
M5	5 -> 6
M6	10 -> 11
M8	23 -> 25
M10	48 -> 52
M12	82 -> 86
M14	132 -> 138
M16	200 -> 210
M20	390 -> 410
M24	675 -> 705



#### 5.4) Assembly of Valve Figure C:

Before proceeding with the assembly of a valve onto an actuator be sure that the actuator operates in the desired direction of rotation and both actuator / valve are correctly orientated. Important : When using a spring return actuator for a fail safe operation, ensure that when air or electricity failure occurs the direction of rotation is correct for your application.

Fit the valve 5 onto the actuator 3. Ensure that the actuator is in normal position (closed position). There are two types of valve assembly onto the actuator :

- Direct-mount : Fit the square of the valve 5 directly into the square of the actuator 3 and bolt together through the valve ISO pad (max. tightening torque see table above).
- Bracket-mount : Mounting with a bracket 6 and coupling 7, the bracket is bolted to the actuator / valve to join them together and the coupling is used to connect the actuator output drive to the valve stem (max. tightening torque see table).

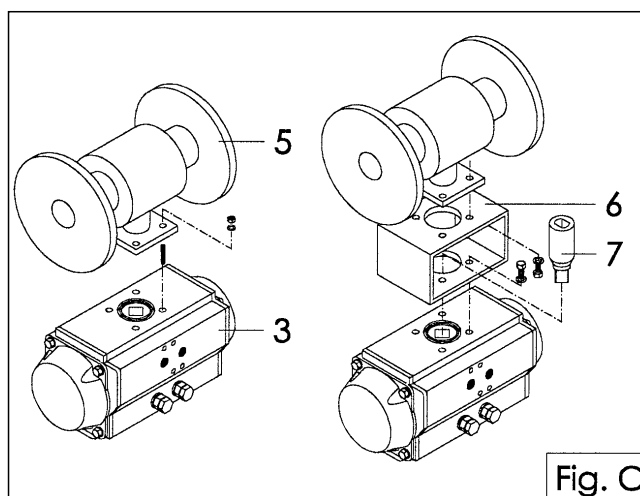


Fig. C

#### 5.4.1) Mounting alternatives :

5.4.2) Valve mounting with Actuator Type STANDARD (Clockwise to close) Figure D :

5.4.3) Valve mounting with Actuator Type LF (Clockwise to open) Figure E :

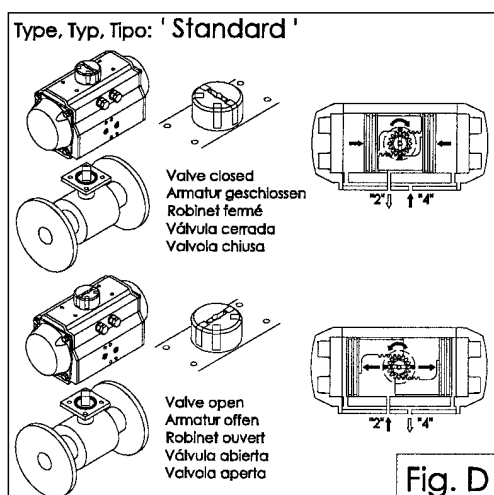


Fig. D

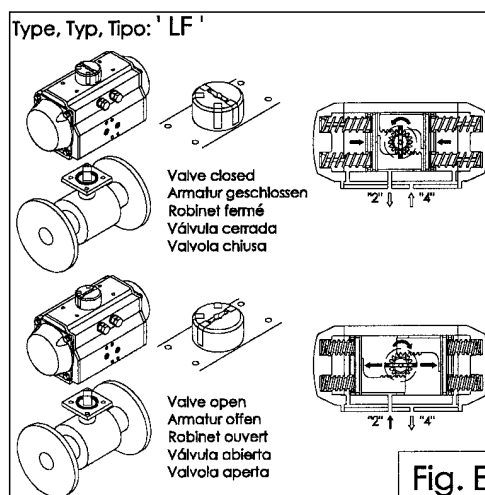


Fig. E



#### 6) MAINTENANCE INSTRUCTION

With the information given below, provides the end user with all the required information necessary for maintenance. Under normal operating conditions the actuator requires only periodic observation to ensure proper adjustment.

Rebuilding of the actuators is allowed only to the personnel of or to personnel which are properly instructed. By contravention the guarantees expires!

Spare kits for maintenance are available to replace all seals and bearings (Soft components listed in table) that may be necessary between 500,000 and 1,000,000 cycles depending on operating and/or environmental conditions.

#### 6.1) Drawing with itemised component and recommended spare parts

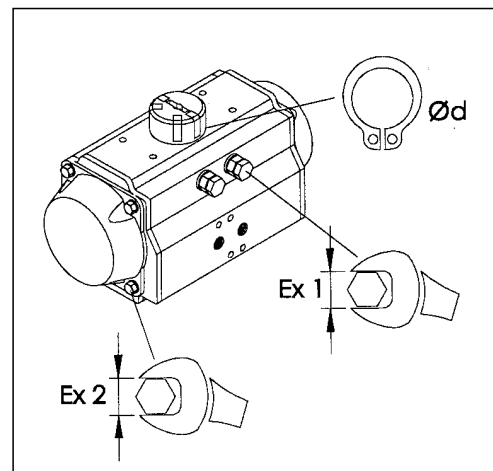
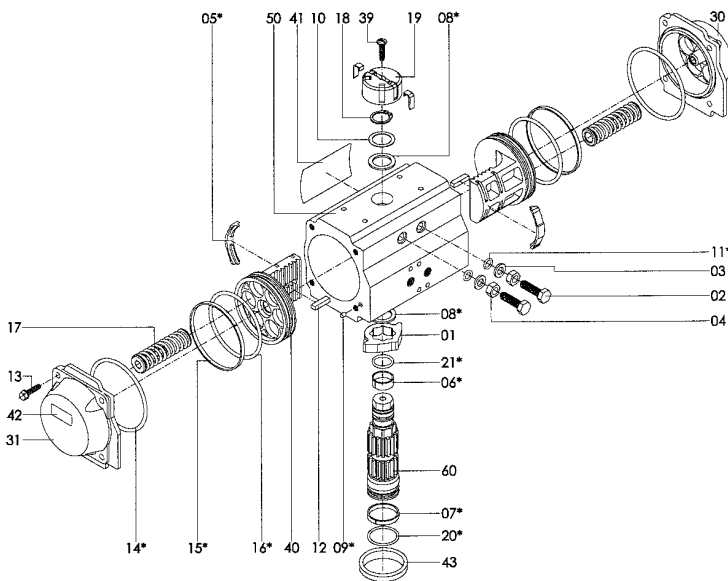
Pos.	Pcs	Part Description	Material	Specification	Protection
01	1	Octi-Cam (Stop Arrangement)	1.4021/GS400-15 <sup>(1)</sup>	EN 10088-3/ISO 1083 <sup>(1)</sup>	
02	2	Stop Cap Screw	B8 Cl.2	ASTMA193	
03	2	Washer (Stop Cap Screw)	A2	ISO 3506	
04	2	Nut (Stop Cap Screw)	A2-70	ISO 3506	
05*	2	Bearing (Piston Back)	PPA	Amodel ET1001HS	
06*	1	Bearing (Pinion Top)	PA46	StanylTW300	
07*	1	Bearing (Pinion Bottom)	PA46	StanylTW300	
08*	2	Thrust Bearing (Pinion)	PPA	Amodel ET1001HS	
09*	2	Plug (Transfer Part)	NBR	NBR 70Shore	
10	1	Thrust Washer (Pinion)	1.4301	EN 10088-3	
11*	2	O' Ring (Stop Cap Screw Seal)	NBR	NBR 70Shore	
12	2	Piston Guide	PPA+45%GF	Amodel AS1145	
13	8/12/16 <sup>(2)</sup>	Cap Screw (End Cap)	A'-70	ISO 3506	
14*	2	O' Ring (End Cap)	NBR	NBR 70Shore	
15*	2	Bearing (Piston Head)	PPA	Amodel ET1001HS	
16*	2	O' Ring (Piston)	NBR	NBR 70Shore	
17	min.4/max.12	Spring (Cartridge)	SiCr Spring Alloy Steel	DIN 17223 Part 2	Epoxy coated
18	1	Spring Clip (Pinion)	C75	DIN 17223	ENP
19	1	Position Indicator	PP+30%GF	Hostalen PPN VP7790 GV 2/30	
20*	1	O' Ring (Pinion Bottom)	NBR	NBR 70Shore	
21*	1	O' Ring (Pinion Top)	NBR	NBR 70Shore	
30	1 <sup>(3)</sup>	Right End Cap	GD-AISI8.5Cu3.5Fe	UNI 5075	A, B, C, D, E, P
31	1 <sup>(3)</sup>	Left End Cap	GD-AISI8.5Cu3.5Fe	UNI 5075	A, B, C, D, E, P
39	1	Cap Screw (Indicator)	A2-70	ISO 3506	
40	2	Pistons	GD-AISI8.5Cu3.5Fe	UNI 5075	anodized
41	1	Identification Label	Polyester Aluminium		
42	2	Label (End Cap)	Polyester Aluminium		
43	1	Spigot	Alloy6082	ASTM B221	Alodur
50	1	Body	Alloy6083	ASTM B221	A, B, C, D, E, P
60	1	Drive Shaft	Al105	ASTMA105	ENP

\*Spare Part <sup>(1)</sup> AIS420 Type DR/DL, SC/SO 15-150; GS400-15 Type DR/DL, SC/SO 220-4000

<sup>(2)</sup> 8 pcs. Type DR/DL, SC/SO 15-1200; 12 pcs. Typ DR/DL, SC/SO 3000

<sup>(3)</sup> Type DR/DL, SC/SO 600-3000 End Caps are symmetric

	EX1 mm	EX2 mm	ø d mm
DR/SC 0015	10	8	14
DR/SC 0030	10	10	16
DR/SC 0060	13	10	22
DR/SC 0100	13	10	25
DR/SC 0150	17	13	26
DR/SC 0220	19	13	36
DR/SC 0300	19	17	38
DR/SC 0450	22	17	45
DR/SC 0600	22	19	48
DR/SC 0900	24	19	52
DR/SC 1200	30	22	58
DR/SC 2000	30	24	68
DR/SC 3000	36	22	80
DR/SC 5000			





#### 6.2) Disassembly

When disassembly of actuator is required for maintenance, firstly remove the actuator from the valve. Before performing any disassembly operations it is important to verify that the actuator is not pressurised. Always use caution and double check that the ports 2 and 4 are vented and are free from any accessory and/or device. When the actuator is a spring return unit, make sure that the actuator is in the failed position before disassembling.

A) Removal of position indicator (Part No. 19), figure 01:

- Remove cap screw (39) if fitted
- Lift position indicator (19) off shaft, it may be necessary to pry gently with a screwdriver.

B) Removal of stop cap screws (Part No. 02), figure 02:

- Remove both stop cap screws together with nut (04) and washer (03)
- Remove stop screw O-rings (11) and discard if replacing all soft parts.

C) End Caps disassembly (Part No 30 right and 31 left) For model DR/SR900 to DR/SC3000 the 2 end caps (30) are symmetric, figure 03:

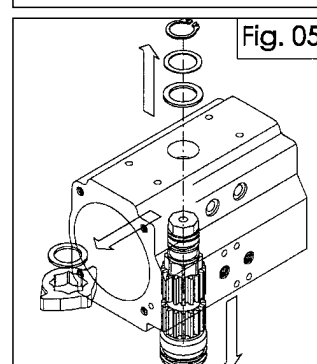
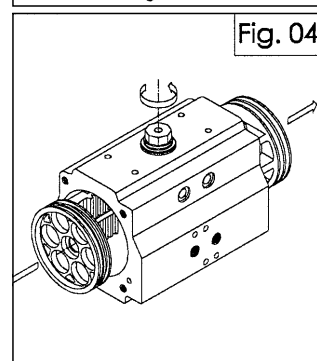
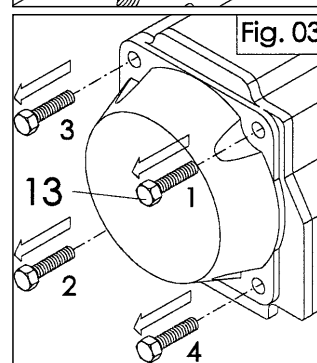
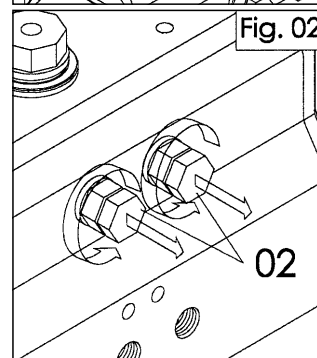
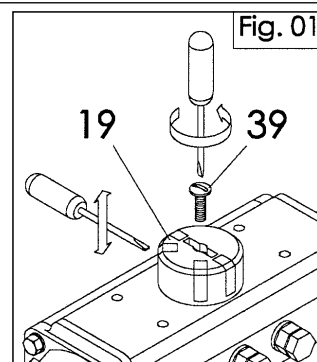
- Remove cap screw (End cap 13) in the sequence shown in the figure 03. Caution: when disassembling a spring return actuator, the end cap (30 and 31) should be loose after unscrewing end cap bolts (13) 4-5 turns. If there is still force on the end cap after 4-5 turns of the end cap bolts, this may indicate a damaged spring cartridge and any further disassembly should be discontinued. Further disassembly of the end caps may result in injury. Return actuator to AIR TORQUE for further maintenance.
- For spring return actuators, always remove spring cartridge.
- Remove end cap O-rings (14) and discard if replacing all soft components.

D) Pistons disassembly (Part No. 40), figure 04:

- Holding the body (50) in a vice or similar device, rotate the drive shaft (60) until the pistons (40) are released.
- Caution: Air pressure should not be used to remove the pistons from the body.
- Remove piston 'O' rings (16) using a small screwdriver; remove the piston back (05) and piston head (15) bearings. Discard bearings when replacing all soft components.

E) Pinion shaft disassembling (Part No 60), figure 05:

- Remove spring clip (18) carefully, using nap-ring pliers, remove external thrust bearing (08) and thrust washer (10).
- Apply downward force to top of drive shaft (60) until it is partially out of the bottom of the body when it is possible to remove the octi-cam (01) and internal thrust bearing (08), then push the pinion (60) completely out of the bottom of the body. If pinion does not remove freely gently tap the top of the shaft with a plastic mallet.
- Remove top and bottom pinion bearings (06) and (07) and top and bottom pinion O-rings (21) and (22).
- Discard bearings (06) and (07), internal and external thrust washer (08) and O-rings (21) and (22) if replacing all soft components.





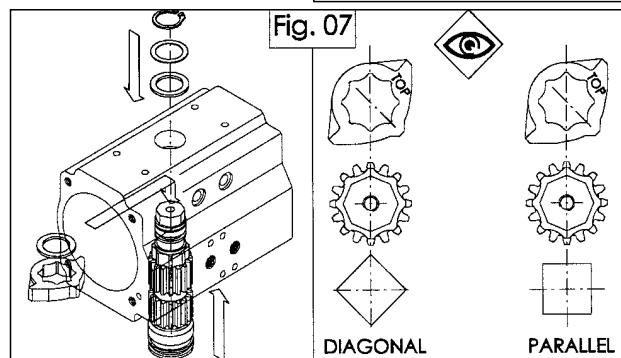
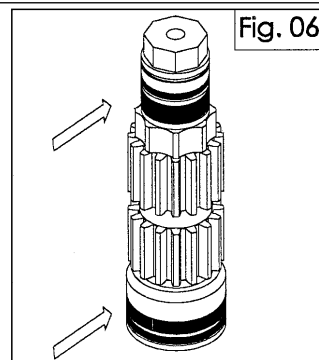
When all component are disassembled, those not being replaced should be properly cleaned and inspected for wear prior to being greased and re-assembled.

#### 6.3) Assembly :

Prior to assembly, ensure all components are perfectly clean and free from damage. Please see point 3 for recommended lubricants.

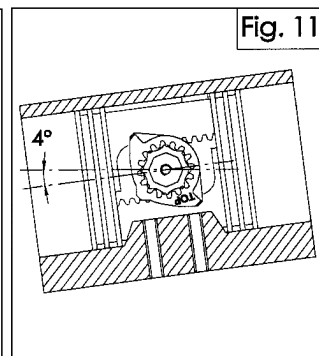
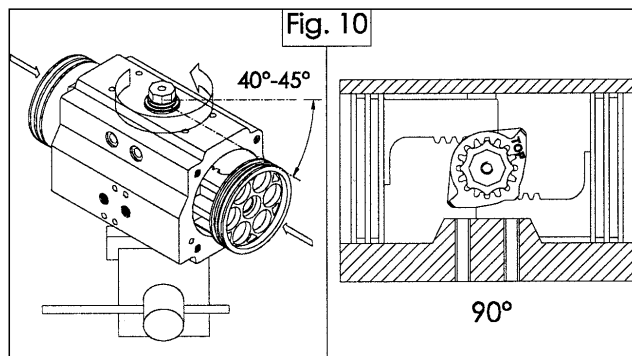
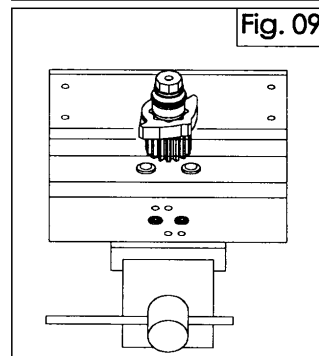
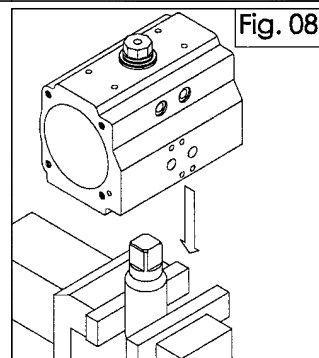
#### A) Drive shaft assembly (Part No. 60), figures 06 and 07:

- Install top and bottom pinion bearings (06) and (07) and top and bottom pinion O-rings (21) and (22) onto the shaft.
- Grease the outside surface of the drive shaft on top and bottom as shown in figure 06.
- Insert partially the drive shaft (60) in the body (50), install octi-cam (01) in the correct position as shown in figure 07 related to the bottom and top of the drive shaft and the rotation of the actuator when energised and install internal thrust bearing (08). Insert completely the drive shaft in the body.
- Fit external thrust bearing (08), thrust washer (10) and then external circlip (18) using snap ring pliers.



#### B) Pistons assembly (Part No. 40), figures 08, 09, 10 and 11:

- Install piston O-rings (16), the Piston skirt (05) and piston head (15) bearings.
- Grease the internal surface of the body (50) and the piston (40) rack teeth.
- Hold the body (50) in a horizontal position by inserting the top of the shaft into a vice or the bottom of the shaft connection into a male drive fitted in a vice as shown in figure 08.
- Ensure that the octi-cam is in the right position as shown in figure 09.
- For standard rotation assembly (clockwise to close) rotate the body (50) about 40-45° counter-clockwise from bottom view or clockwise from top view depending on which way the shaft has been linked as shown in figure 10.
- Press the two pistons (40) simultaneously inside the body (50) until the pistons are engaged and rotate the body clockwise from bottom view or counter clockwise from top view until the stroke is completed.
- Ensure that when the pistons are inserted that they both mesh at the same time. Check fully closed and open positions as shown in figure 11.

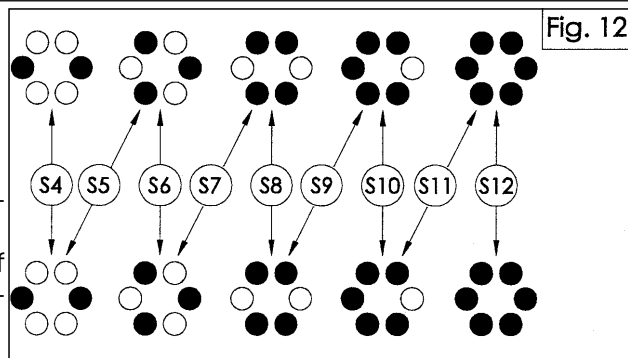




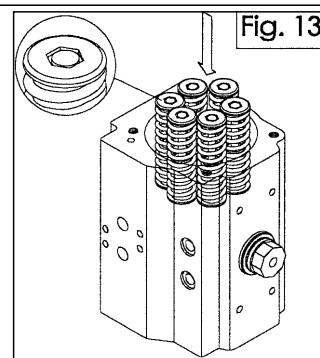


C) End cap (part 30 right and 31 left) and spring cartridge (17) assembly (For model DR/SC2000 to DR/SC3000 the 2 end caps 30 are symmetric), figures 12, 13 and 14:

- Lubricate the body.
- For spring return actuator insert the proper quantity of spring cartridge according to the pattern shown in figure 12 (referring to the total number of springs). Insert spring cartridge (17) as shown in figure 13.

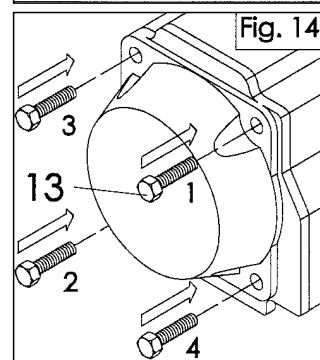


- Fit end cap O-ring seal (14) into the groove in the end cap, on both end caps.
- Fit end caps onto the body (50), verifying that the O-ring remains in the groove.
- Insert all the cap screws (13) and tighten each only partially. Complete tightening by following the sequence indicated in figure 14.



D) Assembly of stop cap screws (Parts 02), and stroke adjustment figure 15:

- Insert on both the stop cap screw (02), the nut (04), the washer (03), and the O-ring in (11)
- Fit the stop cap screw (02) in the body.

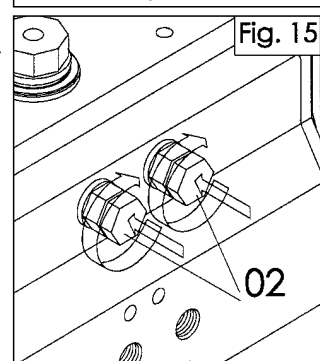


Stroke adjustment for standard rotation actuator (Clockwise to close):

- 0° (Close) position stroke adjustment with actuator in close position, screw or unscrew the right (from top view) stop cap screw (02) until the desired stop position is achieved. Then tighten the stop adjustment nut (04) to lock it in place
- 90° (open) position stroke adjustment with actuator in open position, screw or unscrew the left (from top view) stop cap screw (02) until the desired stop position is achieved, then tighten the stop adjustment nut (04) and lock it in place.

E) Assembly of position indicator (Parts No 19 and 39), figure 16:

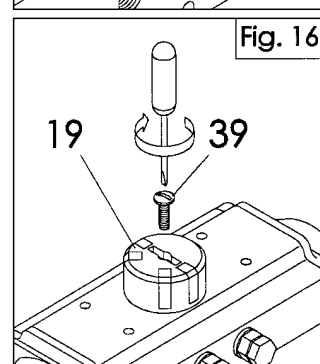
- Fit position indicator (19) on the shaft verifying that it indicates the correct actuator position.
- Then fit cap screw (39) where fitted.



## 7) STORAGE INSTRUCTIONS

If the actuators are not for immediate use, the following precaution must be taken for storage :

- Store in a dry environment at ambient temperature.
- It is recommended that the actuator be stored in its original box.
- Do not remove the plastic plugs on air supply ports.





### Protection and Serviceability

Representation	Type	Part and Protection				suitable for
		Body	End Caps	Drive Shaft	Pistons	
	<b>A</b>	ALODUR	Chromatized and Polyester Coated	Carbon Steel ENP	Normal Anodized	General service
<b>Coating Colour</b>	30 - 35 µm bright S.S.	80 - 90 µm S.S. Ral 9007	25 - 30 µm	15 - 20 µm black		
	<b>B</b>	ALODUR + PTFE coating	Chromatized and Polyester Coated	Carbon Steel ENP	Normal Anodized	General service Acids or basic solutions in low concentration
<b>Coating Colour</b>	30-35/25-30 µm light grey	80 - 90 µm S.S. Ral 9007	25 - 30 µm	15 - 20 µm black		
	<b>C</b>	ENP + Polyester coated	Chromatized and Polyester Coated	Carbon Steel ENP	Normal Anodized	chemical Industrie, Caustic Soda in low concentr.
<b>Coating Colour</b>	25-30/30 µm bright S.S.	80 - 90 µm S.S. Ral 9007	25 - 30 µm	15 - 20 µm black		
	<b>D</b>	ALODUR + PTFE coating	Chromatized and PTFE coating	Carbon Steel ENP	Normal Anodized	aggressive environment acid or basic solutions
<b>Coating Colour</b>	30-35/25-30 µm light grey	80 - 90 µm light grey	25 - 30 µm	15 - 20 µm black		
	<b>E</b>	ALODUR + PTFE coating	Chromatized and PTFE coating	Stainless Steel	Normal Anodized	acid or basic solution, seawater
<b>Coating Colour</b>	30-35/25-30 µm grey	80 - 90 µm grey	15 - 20 µm black			
	<b>P</b>	ALODUR	Resin impregnated + Hard anodized	Carbon Steel ENP	Normal Anodized	Process-industrie, solvent
<b>Coating Colour</b>	30-35 µm bright S.S.	30 - 35 µm bright S.S.	25 - 30 µm	15 - 20 µm black		

DR/SC5000 only available in protection A or P.

### Conditions of usage

Air supply	Temperature range	max. press.	Turning range ±4° adjustable
lubricated, dry air, non-corrosive media	-20°C to +80°C, other temp. on req.	8 bar	90°

DR	Output torque for double acting												
	2,5bar	3bar	3,5bar	4bar	4,2 bar	4,5bar	5bar	5,5bar	6bar	6,5bar	7bar	7,5bar	8bar
6	3,0	3,6	4,2	4,8	5,1	5,4	6,1	6,7	7,3	7,9	8,5	9,1	9,7
15	8,3	10	11,6	13,3	14	15	16,6	18,3	19,9	21,6	23,3	24,9	26,6
30	14,7	17,6	20,5	23,5	24,6	26,4	29,3	32	35,2	38,1	41	44	46,9
60	29,1	34,9	40,7	46,5	48,9	52,4	58,2	64	69,8	75,6	81,4	87,3	93,1
100	45,8	54,9	64,1	73,2	76,9	82,4	91,5	101	110	120	128	138	146
150	66,5	79,8	93,1	106	112	120	133	146	160	173	186	199	213
220	107	129	150	172	181	193	215	236	258	279	301	322	344
300	138	166	194	222	233	249	277	305	332	360	388	415	443
450	217	261	304	348	365	391	435	478	522	565	609	652	696
600	284	340	397	454	477	511	567	624	681	737	794	851	908
900	383	459	536	613	643	689	766	842	919	996	1072	1149	1225
1200	532	638	745	851	893	957	1064	1170	1276	1383	1489	1595	1702
2000	893	1072	1251	1430	1501	1608	1787	1966	2144	2318	2502	2684	2859
3000	1297	1556	1815	2075	2179	2334	2594	2853	3112	3372	3631	3890	4150
5000	2252	2703	3153	3604	3784	4054	4504	4955	5405	5855	6306		

Example of layout DR900 at 5,5bar air supply -> 842Nm output torque



### Output torque for spring return

SC	F/S	2,5bar		3bar		3,5bar		4bar		4,2bar		Federm.	F/S	4,2bar		4,5bar		5bar		5,5bar		6bar		8bar		Federm.				
		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°	0°			
		4,9 3,4		6,6 5,1		8,3 6,8		9,9 8,4		10,6 9,1		4,9 3		8,6 6,2		9,6 7,2		11,2 8,8		12,9 10,5		14,6 12,1		20,5 17,8		7,8 5,4				
15	2/3	4,3	2,5	5,9	4,1	7,6	5,8	9,3	7,4	9,9	8,1	5,8	4	7,9	5,2	8,9	6,2	10,6	7,8	12,2	9,5	13,9	11,2	20,5	17,8	8,8	6,1			
	3	5,3 3,1		6,9	4,8	8,6	6,5	9,2	7,1	6,8	4,7	5/6	8,2 5,2		9,9	6,9	11,5	8,5	13,2	10,2	19,8	16,8	9,7	6,7	19,2 15,9		10,7	7,4		
	3/4			6,2	3,8	7,9	5,5	8,6	6,2	7,8	5,4	6			9,2	5,9	10,9	7,6	12,5	9,2	20,2	16,6	11,9	8,2	18,5	14,9	11,7	8,1		
	4			7,2	4,5	7,9	5,2	8,8	6,1	8,8	6,1	5/6			10,2	6,6	11,9	8,2	13,5	9	20,2	16,6	11,9	8,2	18,5	14,9	11,7	8,1		
	4/5			8,3	6,8	9,9	8,4	10,6	9,1	4,9	3	6			15,7	11,1	17,5	12,9	20,4	15,8	23,4	18,7	26,3	21,7	36,9	31,9	13,5	9		
30	2/3	9,1	6,2	12	9,2	15	12,1	17,9	15	19,1	16,2	8,4	6	15,7	11,1	17,5	12,9	20,4	15,8	23,4	18,7	26,3	21,7	36,9	31,9	13,5	9			
	3	8	4,5	10,9	7,5	13,9	10,4	16,8	13,3	18	14,5	10,1	7	15	9,4	16,4	11,2	19,3	14,1	22,3	17,1	25,2	20	36,9	31,9	13,5	9			
	3/4			9,8	5,8	12,8	8,7	15,7	11,6	16,9	12,8	11,8	7,8			15,3	9,5	18,2	12,4	21,1	15,4	24,1	18,3	35,8	30	16,9	11,1			
	4			11,6	7	14,6	10	15,7	11,1	13,5	9	5/6			17,1	10,8	20	13,7	23	16,6	34,7	28,3	18,6	12	33,6	26,7	20,2	13,3		
	4/5			13,5	8,3	14,6	9,4	15,2	10	13,5	9	6			18,9	12	21,9	14,9	33,6	26,7	20,2	13,3	33,6	26,7	20,2	13,3				
60	2/3	18	11,8	23,8	17,6	29,7	23,4	35,5	29,2	37,8	31,6	17,3	11,1	31,2	21,2	34,7	24,7	40,5	30,5	46,3	36,3	52,1	42,1	73,2	61,9	27,7	17,7			
	3	15,8	8,3	21,6	14,1	27,5	19,9	33,3	25,8	35,6	28,1	20,8	13,3	29	17,7	32,5	21,2	38,3	27	44,1	32,8	49,9	38,6	73,2	61,9	31,2	19,9			
	3/4			19,4	10,7	25,2	16,5	31,1	22,3	33,4	24,6	24,2	15,5	5			30,2	17,7	36,1	23,6	41,9	29,4	47,7	35,2	71	58,5	34,6	22,1		
	4			23	13	28,8	18,8	31,2	21,2	27,7	17,7	27,7	17,7	5/6			33,8	20,1	39,7	25,9	45,5	31,7	68,7	55	38,1	24,3	66,5 51,5		41,5	26,5
	4/5			26,2	15,4	29	17,7	31,2	19,9	31,2	19,9	31,2	19,9	6			37,5	22,4	43,3	28,3	56,7	31,4	65,8	40,5	102	77,1	69,3	44	46,2	29,3
100	2/3	27,4	16,9	36,6	26	45,7	35,2	54,9	44,3	58,5	48	28,9	18,3	47,5	30,7	53	36,2	62,2	45,3	71,3	54,5	80,5	63,6	113	94,5	52	33			
	3	23,8	11,1	32,9	20,3	42,1	29,4	51,2	38,6	54,9	42,2	34,7	22	43,9	24,9	49,4	30,4	58,5	39,5	67,7	48,7	76,8	57,8	110	88,7	57,8	36,7			
	3/4			29,2	14,5	38,4	23,6	47,5	32,8	51,2	36,4	40,4	25,7	5			45,7	24,6	54,8	33,8	64	42,9	73,1	52,1	110	88,7	57,8	36,7		
	4			34,7	17,9	43,9	27	47,5	30,7	46,2	29,3	46,2	29,3	5/6			51,2	28	60,3	37,1	69,5	46,3	80,5	63,6	106	82,9	63,5	40,3		
	4/5			40,2	21,2	43,9	24,9	52	33	52	33	52	33	6			56,7	31,4	65,8	40,5	85,4	51,7	99	65	152	118	94,5	60,8		
150	2/3	41,1	27,1	54,4	40,4	67,7	53,7	81	67	86,3	72,3	39,4	25,3	71,1	48,7	79,1	56,6	92,4	69,9	106	83,2	119	96,5	167	142	70,9	45,6			
	3	36,1	19,2	49,4	32,5	62,7	45,8	76	59,1	81,3	64,4	47,3	30,4	66	40,8	74	48,8	87,3	62,1	101	75,3	113,9	88,6	162	134	78,8	50,7			
	3/4			44,3	24,6	57,6	37,9	70,9	51,2	76,2	56,5	55,1	35,5	5			69	40,9	82,3	54,2	95,6	67,5	109	80,8	157	126	86,7	55,7		
	4			52,5	30	65,8	43,3	71,1	48,7	63	40,5	63	40,5	5/6			77,2	46,3	90,5	59,6	104	72,9	124	91,2	157	126	86,7	55,7		
	4/5			60,8	35,5	66,1	40,8	70,9	45,6	70,9	45,6	70,9	45,6	6			85,4	51,7	99	65	152	118	94,5	60,8						
220	2/3	66,5	41,9	87,9	63,4	109	84,9	131	106	140	115	65,5	41	115	75,7	128	88,6	149	110	171	132	192	153	270	226	118	73,8			
	3	58,3	28,8	79,7	50,3	101	71,8	123	93,3	131	102	78,6	49,2	107	62,6	120	75,5	141	97	163	118	184	140	262	213	131	82			
	3/4			71,5	37,2	93	59	115	80,2	123	88,8	91,7	57,4	5			111	62	133	83,9	154	105	176	127	262	213	131	82		
	4			84,8	45,6	106	67,1	115	75,7	105	65,6	105	65,6	5/6			125	71	146	92,3	168	114	254	200	144	90,2	245 187		157	98,4
	4/5			98,1	54	107	62,6	118	73,8	118	73,8	118	73,8	6			138	79	159	101	192	153	270	226	118	73,8				
300	2/3	86	56,1	114	83,8	141	111	169	139	180	150	82,4	52,5	149	101	165	117	193	145	221	173	248	201	349	295	148	94,5			
	3	75,5	39,6	103	67,3	131	95	159	123	170	134	98,9	63	138	84,3	155	101	182	129	210	156	238	184	338	278	165	105			
	3/4			93	50,8	120	78,5	148	106	159	117	115	73,5	5			144	84	172	112	200	140	227	168	338	278	165	105		
	4			110	62	138	89,7	149	101	132	84	132	84	5/6			161	96	189	123	217	151	328	262	181	116	317 245		198	126
	4/5			127	73,3	138	84,3	148	94,5	148	94,5	148	94,5	6			179	107	206	135	317	245	317	245	198	126				
450	2/3	135	88,6	179	132	222	176	265	219	283	236	129	82,4	233	159	260	185	303	229	347	272	390	316	547	464	232	148			
	3	119	63	162	106	206	150	249	193	266	211	155	99	217	133	243	159	287	203	330	246	374	290	531	438	258	165			
	3/4			146	80	189	124	233	167	250	185	180	115	5			227	134	270	177	314	221	357	264	531	438	258	165		
	4			173	98	216	142	233	159	206	132	206	132	5/6			254	151	297	195	341	238	515	412	283	181	498 386		309	198
	4/5			200	116	217	133	232	148	232	148	232	148	6			281	169	324	213	324	213	498	386	309	198				
600	2/3	171	118	228	174	285	231	342	288	364	310	166	112	297	211	331	245	388	302	444	358	501	415	706	609	299	202			
	3	149	84	206	141	262	198	319	255	342	277	199	135	275	178	309	212	365	268	422	325	479	382	683	575	332	224			
	3/4			183	108	240	165	297	221	319	244	233	157	5			286	178	343	235	400	292	456	349	661	542	365	247		
	4			218	131	274	188	297	211	266	180	266	180	5/6			320	202	377	259	434	315	561	434	661	542	365	247		
	4/5			252	155	275	178	299	202	299	202	299	202	6			355	225	411	282	411	282	638	509	399	269				
900	2/3	225	146	301	223	378	299	455	376	485																				



### Air Consumption of the AT-Actuators, with Turning Range 90°, in m<sup>3</sup>/Stroke

Actuator		Control Pressure p <sub>e</sub> in bar									
		2,5	3	3,5	4	4,5	5	5,5	6	7	8
00006	DR	0,00018	0,00020	0,00023	0,00025	0,00028	0,00030	0,00033	0,00035	0,00040	0,00045
	SC	0,00007	0,00008	0,00009	0,00010	0,00011	0,00012	0,00013	0,00014	0,00016	0,00018
00015	DR	0,00084	0,00096	0,00108	0,00120	0,00132	0,00144	0,00156	0,00168	0,00192	0,00216
	SC	0,00032	0,00036	0,00041	0,00045	0,00050	0,00054	0,00059	0,00063	0,00072	0,00081
00030	DR	0,00147	0,00168	0,00189	0,00210	0,00231	0,00252	0,00273	0,00294	0,00336	0,00378
	SC	0,00056	0,00064	0,00072	0,00080	0,00088	0,00096	0,00104	0,00112	0,00128	0,00144
00060	DR	0,00280	0,00320	0,00360	0,00400	0,00440	0,00480	0,00520	0,00560	0,00640	0,00720
	SC	0,00109	0,00124	0,00140	0,00155	0,00171	0,00186	0,00202	0,00217	0,00248	0,00279
00100	DR	0,00452	0,00516	0,00581	0,00645	0,00710	0,00774	0,00839	0,00903	0,01032	0,01161
	SC	0,00179	0,00204	0,00230	0,00255	0,00281	0,00306	0,00332	0,00357	0,00408	0,00459
00150	DR	0,00637	0,00728	0,00819	0,00910	0,01001	0,01092	0,01183	0,01274	0,01456	0,01638
	SC	0,00249	0,00284	0,00320	0,00355	0,00391	0,00426	0,00462	0,00497	0,00568	0,00639
00220	DR	0,01047	0,01196	0,01346	0,01495	0,01645	0,01794	0,01944	0,02093	0,02392	0,02691
	SC	0,00417	0,00476	0,00536	0,00595	0,00655	0,00714	0,00774	0,00833	0,00952	0,01071
00300	DR	0,01358	0,01552	0,01746	0,01940	0,02134	0,02328	0,02522	0,02716	0,03104	0,03492
	SC	0,00539	0,00616	0,00693	0,00770	0,00847	0,00924	0,01001	0,01078	0,01232	0,01386
00450	DR	0,02167	0,02476	0,02786	0,03095	0,03405	0,03714	0,04024	0,04333	0,04952	0,05571
	SC	0,00844	0,00964	0,01085	0,01205	0,01326	0,01446	0,01567	0,01687	0,01928	0,02169
00600	DR	0,02821	0,03224	0,03627	0,04030	0,04433	0,04836	0,05239	0,05642	0,06448	0,07254
	SC	0,01099	0,01256	0,01413	0,01570	0,01727	0,01884	0,02041	0,02198	0,02512	0,02826
00900	DR	0,03903	0,04460	0,05018	0,05575	0,06133	0,06690	0,07248	0,07805	0,08920	0,10035
	SC	0,01491	0,01704	0,01917	0,02130	0,02343	0,02556	0,02769	0,02982	0,03408	0,03834
01200	DR	0,05390	0,06160	0,06930	0,07700	0,08470	0,09240	0,10010	0,10780	0,12320	0,13860
	SC	0,02079	0,02376	0,02673	0,02970	0,03267	0,03564	0,03861	0,04158	0,04752	0,05346
02000	DR	0,08820	0,10080	0,11340	0,12600	0,13860	0,15120	0,16380	0,17640	0,20160	0,22680
	SC	0,03500	0,04000	0,04500	0,05000	0,05500	0,06000	0,06500	0,07000	0,08000	0,09000
03000	DR	0,12558	0,14352	0,16146	0,17940	0,19734	0,21528	0,23322	0,25116	0,28704	0,32292
	SC	0,05075	0,05800	0,06525	0,07250	0,07975	0,08700	0,09425	0,10150	0,11600	0,13050
05000	DR	0,22750	0,26000	0,29250	0,32500	0,35750	0,39000	0,42250	0,45500	0,52000	0,58500
	SC	0,08750	0,10000	0,11250	0,12500	0,13750	0,15000	0,16250	0,17500	0,20000	0,22500

### Air Consumption of the AT-Actuators, with Turning Range 90°, in Litre/Stroke

Actuator		Control Pressure p <sub>e</sub> in bar									
		2,5	3	3,5	4	4,5	5	5,5	6	7	8
00006	DR	0,18	0,20	0,23	0,25	0,28	0,30	0,33	0,35	0,40	0,45
	SC	0,07	0,08	0,09	0,10	0,11	0,12	0,13	0,14	0,16	0,18
00015	DR	0,84	0,96	1,08	1,20	1,32	1,44	1,56	1,68	1,92	2,16
	SC	0,32	0,36	0,41	0,45	0,50	0,54	0,59	0,63	0,72	0,81
00030	DR	1,47	1,68	1,89	2,10	2,31	2,52	2,73	2,94	3,36	3,78
	SC	0,56	0,64	0,72	0,80	0,88	0,96	1,04	1,12	1,28	1,44
00060	DR	2,80	3,20	3,60	4,00	4,40	4,80	5,20	5,60	6,40	7,20
	SC	1,09	1,24	1,40	1,55	1,71	1,86	2,02	2,17	2,48	2,79
00100	DR	4,52	5,16	5,81	6,45	7,10	7,74	8,39	9,03	10,32	11,61
	SC	1,79	2,04	2,30	2,55	2,81	3,06	3,32	3,57	4,08	4,59
00150	DR	6,37	7,28	8,19	9,10	10,01	10,92	11,83	12,74	14,56	16,38
	SC	2,49	2,84	3,20	3,55	3,91	4,26	4,62	4,97	5,68	6,39
00220	DR	10,47	11,96	13,46	14,95	16,45	17,94	19,44	20,93	23,92	26,91
	SC	4,17	4,76	5,36	5,95	6,55	7,14	7,74	8,33	9,52	10,71
00300	DR	13,58	15,52	17,46	19,40	21,34	23,28	25,22	27,16	31,04	34,92
	SC	5,39	6,16	6,93	7,70	8,47	9,24	10,01	10,78	12,32	13,86
00450	DR	21,67	24,76	27,86	30,95	34,05	37,14	40,24	43,33	49,52	55,71
	SC	8,44	9,64	10,85	12,05	13,26	14,46	15,67	16,87	19,28	21,69
00600	DR	28,21	32,24	36,27	40,30	44,33	48,36	52,39	56,42	64,48	72,54
	SC	10,99	12,56	14,13	15,70	17,27	18,84	20,41	21,98	25,12	28,26
00900	DR	39,03	44,60	50,18	55,75	61,33	66,90	72,48	78,05	89,20	100,35
	SC	14,91	17,04	19,17	21,30	23,43	25,56	27,69	29,82	34,08	38,34
01200	DR	53,90	61,60	69,30	77,00	84,70	92,40	100,10	107,80	123,20	138,60
	SC	20,79	23,76	26,73	29,70	32,67	35,64	38,61	41,58	47,52	53,46
02000	DR	88,20	100,80	113,40	126,00	138,60	151,20	163,80	176,40	201,60	226,80
	SC	35,00	40,00	45,00	50,00	55,00	60,00	65,00	70,00	80,00	90,00
03000	DR	125,58	143,52	161,46	179,40	197,34	215,28	233,22	251,16	287,04	322,92
	SC	50,75	58,00	65,25	72,50	79,75	87,00	94,25	101,50	116,00	130,50
05000	DR	227,50	260,00	292,50	325,00	357,50	390,00	422,50	455,00	520,00	585,00
	SC	87,50	100,00	112,50	125,00	137,50	150,00	162,50	175,00	200,00	225,00

Calculation:

$Q = n \cdot V \cdot (p_e + p_{amb}) / p_{amb}$ ; Q = air consumption; n = Cycles; p<sub>e</sub> = control pressure; p<sub>amb</sub> = air pressure

Definition Stroke:

DR -> 1 stroke corresponds to 1 x OPEN (0°-90°) and 1 x CLOSE (90°-0°)

SC -> 1 stroke corresponds to 1 x OPEN (0°-90°); CLOSE (90°-0°) with springs

Umrechnung:

1L <=> 0,001 m<sup>3</sup>

**3/2, 4/2 and 5/2 Directional control valves**  
**Modular NAMUR design**  
**Actuation: electromagnetic**  
**Indirectly controlled spool valves**  
**Port size: G 1/4**

- For single and double operated actuators**
- Standard manual override with detent**
- Compact design**
- High flow rate**
- Simple design of soft spool seal system**
- Maintenance-free**
- Easily interchangeable solenoid system**
- Exhaust air recirculation**
- The solenoids are ATEX approved**  
(see solenoids page 2)
- Valves and solenoids are ATEX approved**



### Technical data

- Medium:
  - Solenoid valve for filtered, lubricated \*1) or non-lubricated air
- Operation:
  - Solenoid, indirectly controlled
- Flow direction:
  - Fixed
- Mounting position:
  - Optional, preferably with solenoid on top
- Nominal size:
  - 6
- Port size:
  - G 1/4
- Electrical connection:
  - See solenoid table
- Operating pressure:
  - 2 to 8 bar
- Temperature:
  - 10 ... 50°C
  - Please consult our technical service for use below +2°C. If installed in the open protect all connections against the penetration of moisture!

### Materials:

- Housing: Aluminium
- Pilot flange: Plastic
- Seat seal: NBR (Perbunan)

\*1) Oil recommendation: Shell Hydrol DO 32, Esso Febis (as of July 1992) or comparable oils with DVI values < 8 (DIN 53521) and ISO viscosity class 32-46 (DIN 51519).

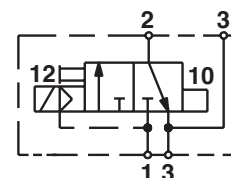
### Ordering information

3/2 directional control valve, connection G 1/4, solenoid 24 V DC, protection class IP65  
**Part No.: 8010777.3036.024.00**  
**Connector: 0570275**

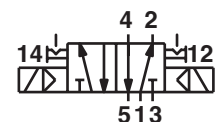
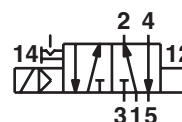
### Connections

See data sheet N/UK 7.7.002

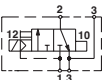
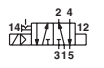
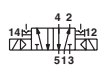
3/2



5/2

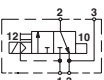
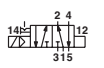


## General information

Symbol	Type*	Port size		Actuation	Nominal size	Operating pressure (bar)	kv-value (Cv (US) ▼ kv x 1,2)	Weight (kg)	Dimensions Nr.
		1, 3 (5)	2 (4)						
	8010777	G 1/4	Flange	Solenoid indirectly controlled	6	2 ... 8	1,2	0,4	1
	2623077	G 1/4	Flange	Solenoid indirectly controlled	6	2 ... 8	1,2	0,55	2
	2623177	G 1/4	Flange	2 x Solenoid indirectly controlled	6	2 ... 8	1,2	0,9	3





\* When ordering please indicate solenoid, voltage and current type (frequency).  
Port 3 not throttleable.

## 3/2- or 5/2 way function (Conversion Instruction see page 6)

Symbol	Type*	Port size		Actuation	Nominal size	Operating pressure (bar)	kv-value (Cv (US) ▼ kv x 1,2)	Weight (kg)	Dimensions Nr.
		1, 3 (5)	2 (4)						
	2623079	G 1/4	Flange	Solenoid indirectly controlled	6	2 ... 8	1,2	0,4	4
	2623179	G 1/4	Flange	2 x Solenoid indirectly controlled	6	2 ... 8	1,2	0,9	5

\* When ordering please indicate solenoid, voltage and current type (frequency).  
Port 3 not throttleable.

## Solenoid actuators

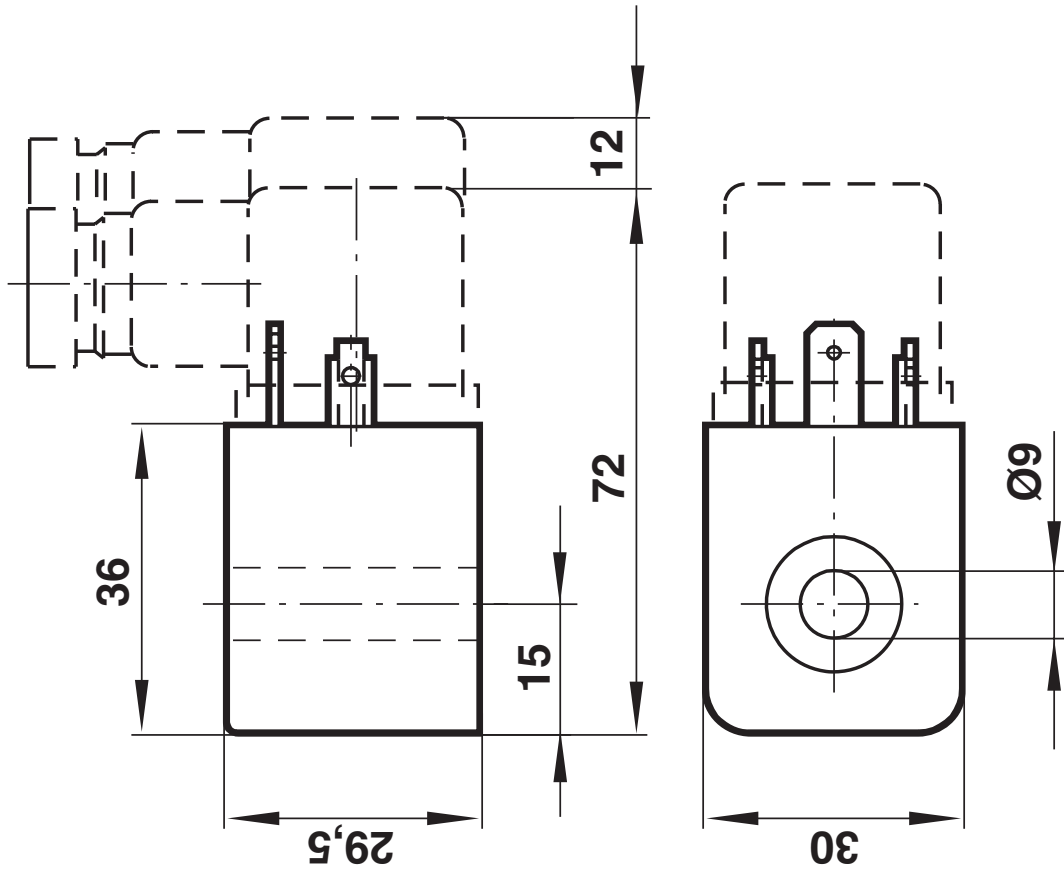
	Type	Power consumption		Ex Protection Categorie	Protection class	Temperature Ambient Fluid (°C)	Weight (kg)	Dimensions No.	Circuit diagram No.
		24 V DC (W)	230 V AC (VA)						
	3036	1,6	3,5	-	IP 65 (with connector) DIN EN 175301-803 Form A *6)	-40 ... +50	0,090	5	1
	3046	2	-	II3G II3D	EEx nA II T5 IP65 T 95°C with connector DIN EN 175301-803 Form A	-15 ... +50	0,300	5	1
	3047	-	4,0	II3G II3D	EEx nA II T5 IP65 T 95°C with connector DIN EN 175301-803 Form A	-15 ... +50	0,300	5	8
	3062 *3)	2,7	-	II2G	EEx m II T5 Stranded wire, 3 m long	-20 ... +50	0,300	6	1
	3063 *3)	-	2,1	II2G	EEx m II T5 Stranded wire, 3 m long	-20 ... +50	0,300	6	8
	3071	2,7	-	-	IP 66 Connection M12x1 DIN EN 60947-5-2	-10 ... +50	0,110	7	8

Standard voltages 24 V DC, 230 V AC. Other voltages on request.  
For intrinsically safe circuits, protection class EEx ia IIC T6

\*3) Certificate of Conformity PTB No. PTB 03 ATEX 2015X

\*6) Connector is not indicated in delivery; Required connector 0570275

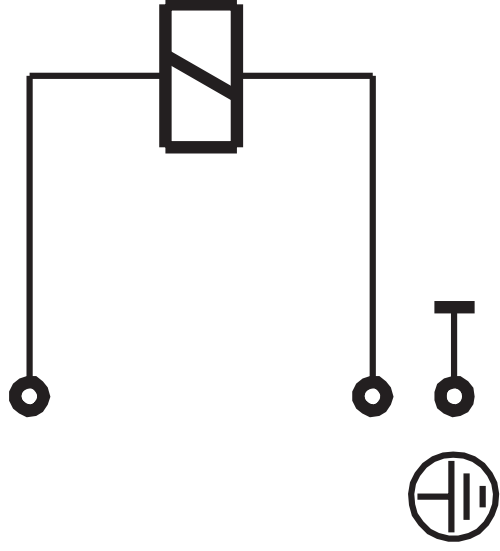
5





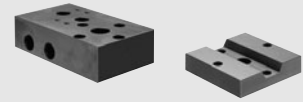



# Circuit diagrams

①



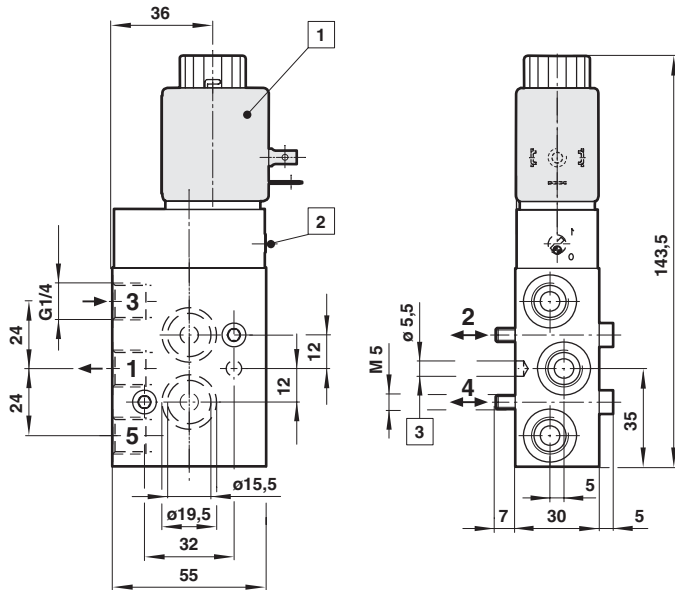
## Accessories

Silencer	Connectors	Flange plate	Yoke
			
0014600 (G1/4) *1)	0570275 Form A 0680003 Form B	0612790 NAMUR sigle connection plate 0612791 NAMUR rip use in combination with 0612790 (Alu)	0540593

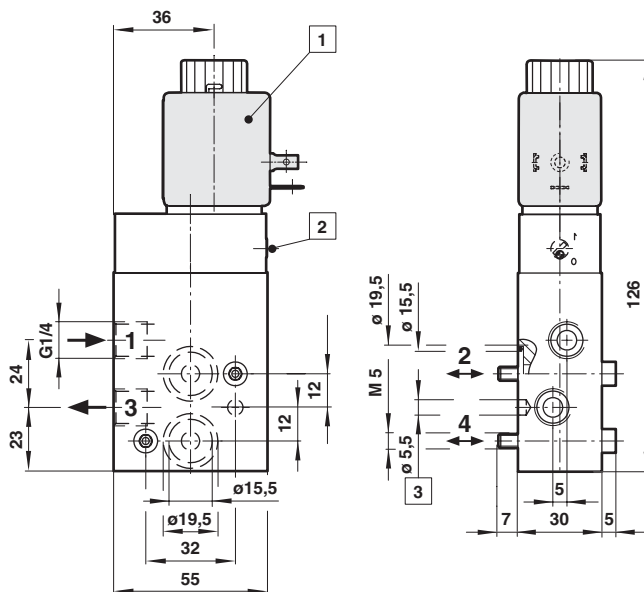
\*1) For indoors use

## Basic dimensions for valves

①



②

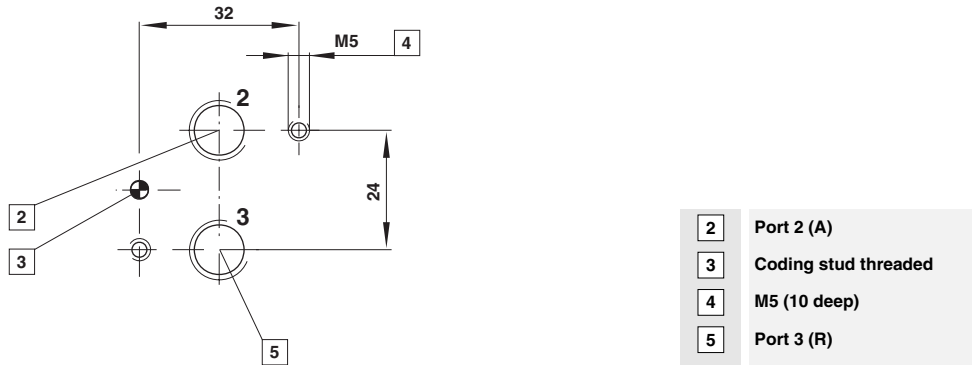


- 1 Solenoid 90° turnable
- 2 Manual override

### Circuit diagrams

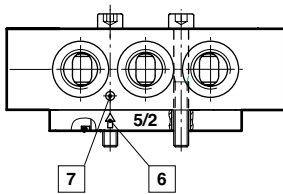


### NAMUR hole pattern

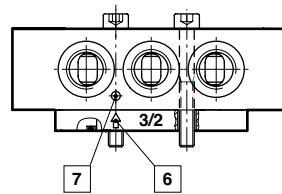


### Conversion instructions of 5/2 into 3/2 way function

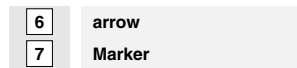
#### 5/2 way function (original mode of supply)



#### 3/2 way function



3/2 resp. 5/2 way function can be achieved just by swapping enclosed adaptor plates. Make sure Marker and Arrow do match as shown on above drawing. Original mode of supply: 5/2 function.



### Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under 'Technical Data'. Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult NORGREN. Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes. The system designer is warned to consider the failure modes of all component parts used in fluid power

systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.

**System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.**

System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products where applicable.



### Devices

Solenoids with plug connector according to DIN EN 175301-803 can be used as actuating solenoids for valves with solenoid end sleeve diameter 9 mm.

Refer to the following table for the solenoid specifications.

### Explosion protection

The valve actuating solenoids can be used

- in Zone 2 areas at risk of gas explosion. They comply with Category II3G and have ignition protection class EEx nA II T5.
- in Zone 22 areas with inflammable dust. They comply with Category II3D and have protection class IP 65. Maximum surface temperature is  $T = 95\text{ }^{\circ}\text{C}$ .

### Installation

It is imperative that the appropriate Ex regulations are observed during installation, maintenance or repair, in particular EN 60079-14 and EN 50281-1-2.

Electrical installation must be carried out under additional observation of all respective national regulations (in Germany, VDE 0100) by a qualified electrician or under the supervision thereof.

Before installation, the specifications of the device identification are to be compared with the intended operating conditions to ensure proper usage.

### Usage, assembly, commissioning, maintenance

Valve actuating solenoids are electrical components. They cannot be used without the associated valve. Valve-solenoid combinations are generally supplied fully assembled and tested. When replacing/changing solenoids, it must be ensured that the combination is approved with a Norgren-Herion valve and that the solenoid is properly fixed to the valve. The solenoid can be clamped when positioned offset by  $90^{\circ}$ ; the permissible tightening torque for the fixing nut is 0.5 Nm.

The solenoids are maintenance-free. If faults or failures with an unknown cause occur during operation, the solenoids must be replaced. Defective coils or other electrical or electronic components cannot be repaired or replaced.

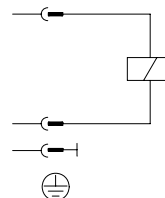
Obviously damaged solenoids must not be installed or must be replaced.

Solenoids must not be used as a lever arm.

Special protective measures are required if the solenoids are subjected to particular kinds of extreme loads.

### Electrical connection

*Circuit diagram (DC and AC)*



The solenoids are fitted with a tested plug connector complying with DIN EN 175 301-803 with special closure (M3 Allen key required). The cable is connected to the screw terminals after removing the socket insert. It is not necessary to observe the polarity. The protective conductor must always be connected.

The terminals are designed for cross-sections up to  $1.5\text{ mm}^2$ .

Only the supplied cable sockets may be used. The device loses the Ex approval if other cable sockets are used.

After connecting, the plug must be carefully refitted to the solenoid to ensure protection class IP65; this also applies to the cable gland in the plug, which is suitable for cable diameters from 4.5 to 11 mm..

**With all solenoids, please note that plugs must not be disconnected while live!**

### Operation

100% duty is allowed even under the most unfavourable permissible operating conditions.

It must be ensured that neither the maximum permitted ambient and fluid temperatures nor the limit rating (max. 10% overvoltage) are exceeded during operation. The solenoid may need to be protected against overloading. To avoid breaking voltage peaks, which can cause damage to the system, the user must provide suitable means of protection.

The surface of the solenoid can become very hot in permanent operation. Note: Danger of injury if touched!

### Technical data for solenoids

Solenoid Order No.		Wattage	Rated voltage	Rated current	Ambient temp.
3046 and TM 1702-AT	DC	2 W	24 V	90 mA	-15...+50 °C
3047 and TM 1746-AT	AC	4.0 VA	110 V 50Hz	36 mA	-15...+50 °C
		3.1 VA	110 V 60Hz	28 mA	
		4.0 VA	120 V 60 Hz	33 mA	
3047 and TM 1748-AT	AC	4.1 VA	230 V 50 Hz	18 mA	-15...+50 °C
		3.1 VA	230 V 60 Hz	14 mA	
		3.5 VA	240 V 60 Hz	15 mA	

### CE mark

The CE mark is not a quality feature; it is intended for the respective authorities.

In order to enable unrestricted traffic of goods within the EU, the European Council has issued common directives for the European market which set forth the minimum requirements for safety and protection of health. The CE mark confirms that products comply with these directives, i.e. conform with the respective and, in particular, harmonised standards.

Notes on Directive 94/9/EC (Explosion protection directive ATEX):

The solenoids meet the relevant requirements of the directive. The EU Declaration of Conformity is attached.

Notes on Directive 73/23/EEC (Low Voltage Directive):

The solenoids were developed, designed and constructed in compliance with the DIN VDE 0580 standard "Electromagnetic devices". The requirements of the low voltage directive, which is valid for rated voltages of 50 to 1,000 volts (AC) and from 75 to 1,500 volts (DC), are therefore also fulfilled.

Notes on Directive 89/336/EEC (EMC directive):

Electrical solenoids as drive elements for valves do not represent independently operating devices as defined by the EMC Directive and are only utilised by specialist companies or installed into a machine. Commissioning is prohibited until it has been established that the complete machine or system complies with the regulations of the EMC directive.

## EC - Declaration of Conformity

In accordance with Directive 94/9/EC

---

This is to declare that the

Equipment: Valve Solenoids  
Model Series: 3046 bzw. TM1702-AT, 3047 bzw. 1748-AT, 3213...3219, 3713...3719,  
3813...3819

is in conformity with the provisions of the Directive 94/9/EC for use in potentially explosive atmospheres.

### Referenced normative documents:

EN 50 014:1997	General requirements
EN 50 021:1999	Type of protection „n“
EN 50281-1-1:1998	Protection by enclosure
EN 13463-1:2001	Non-electrical equipment, basics

### Marking:



II 3 GD

EEx nA II T4	IP65	T 95°C
EEx nA II T4	IP65	T100°C resp. 110°C resp. 120°C resp. 130°C
EEx nA II T5	IP65	T85°C resp. 90°C

The above mentioned valve solenoids can be used in combination with the following valve series in accordance with our data sheets in zones 2 and 22:


24011xx, 25003xx, 2622xxx, 2623xxx, 2636xxx, 801xxxx, 802xxxx, 95xxxxx, 96xxxxx,  
971x0xx, 971xxx5, 98xxxx5.


Those valves as non-electrical apparatus are not marked additionally as they do not contain a potential ignition source and do therefor not comply under the ATEX directive. It is to pay attention that no flammable fluids are allowed; maximum surface temperature of the non-electrical part depends on the fluid and the ambient temperature and must be below the ignition temperature.

### EC Certificate for quality system:

EX3 03 07 11122 009  
issued by TÜV Product Service GmbH,  
D-80339 München (Notified Body No. 0123)

Fellbach, November 2003

  
ppa. / Theo Paulus  
(Theo Paulus)  
Technical Director Germany

  
i.V.  
(Dieter Maisch)  
Authorized Representative

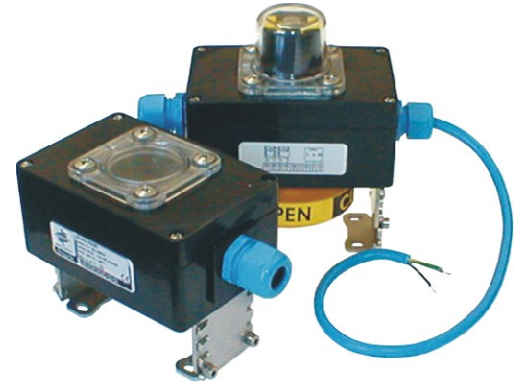
**Beschreibung**  
Description / Descrizione

- Kompakte Endschalterbox aus Vestamid schwarz, Deckel aus Vestamid schwarz mit transparentem Sichtfenster
- Schutzart Gehäuse IP65 nach DIN 40050
- Verschraubung schwarz oder blau M20x1,5 (für Kabel Ø 6-12mm)
- Montagebrücke, höhen- und weitenverstellbar, aus Edelstahl 1.4301 (Sonderbohrbilder und Wellenhöhen auf Anfrage bzw z. T. Lagerware)
- Dichtungen aus EPDM und NBR, Schrauben aus Edelstahl 1.4301
- Welle aus Edelstahl 1.4305

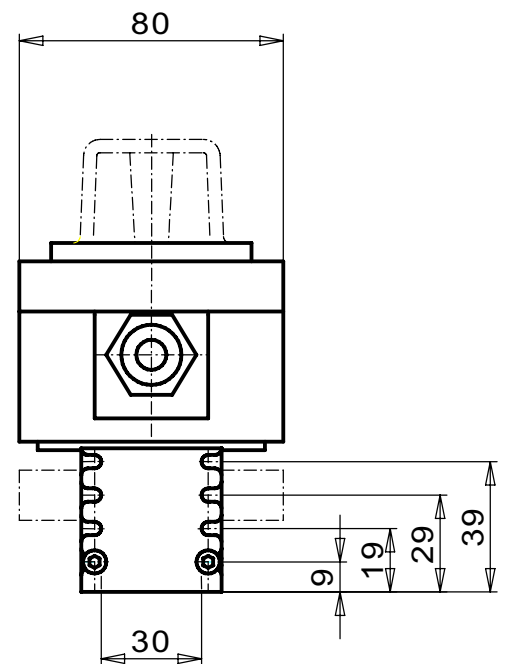
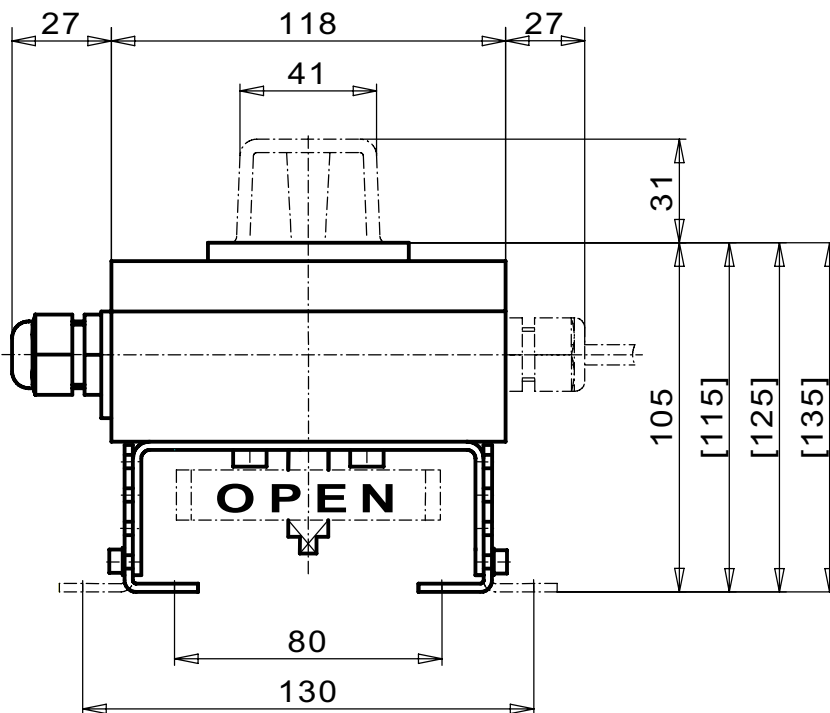
- Compact limit-switch box made of vestamid black, cover made of vestamid black with transparent window
- Enclosure housing IP65 according to DIN 40050
- Cable gland blue M20x1,5 (for cable Ø 6-12mm)
- Sealings are made of EPDM and NBR, screws are made of AISI 304
- Mounting bracket, adjustable in height and length, is made of AISI 304 (special hole-spacings or stem heights on request and partly in stock)
- Stem is made of stainless steel AISI 303

- Box finecorsa in vestamide nero, coperchio e di vestamide nero con finestra trasparente
- Grado di protezione box IP65 secondo norme DIN 40050
- Pressacavo blu M20x1,5 (per cavo Ø 6-12mm)
- Bracket di montaggio regolabile in altezza e lunghezza, in AISI 304 (Foratura e altezza speciale sono a richiesta e in alcuni casi già disponibili)
- Guarnizioni in EPDM e NBR, viti sono in acciaio inox AISI 304
- Perno in acciaio inox AISI 303

**Model EBV**



**Maßzeichnung**  
Dimensions / Dimensioni



# Eigensichere induktive Schlitzinitiatoren

Intrinsic safe inductive slot type sensors

Sensori induttivi a tipo slot a sicurezza intrinseca

P + F SC3,5-NO  II2G EEx ia IIC T6

**EB2S-129-ia**

**EBA2S-129-ia**

**EBV2S-129-ia**

**Model EB2S-129-ia**



**Model EBA2S-129-ia**

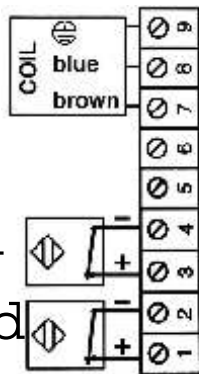


**Model EBV2S-129-ia**



## Anschlußbild

Connection / Connessione



## 3D-Anzeige

3D-Indicator / Indicatore-3D



## AUF/ZU- Anzeige

O-C Indicator / Indicatore O-C



Nur für Art.: EBA / EBP / EBV  
Only for art.: EBA / EBP / EBV  
Solo per art.: EBA / EBP / EBV

## Technische Daten

Technical features / Dati tecnici

Endschalterfabrikat	Producer switch	Marca finecorsa	P + F
Endschaltertyp	Switch type	Tipo finecorsa	SC3,5-NO BLAU
Spannung	Voltage	Voltaggio	8V DC
Messplatte erfasst	Switch on	Finecorsa azionato	1mA
Messpl. nicht erfasst	Switch off	Finecorsa non azionato	3mA
Schaltfrequenz	Frequency	Frequenza	3000Hz
Anzeige	Output indicator	Indicazione	LED (gelb / yellow / giallo)
EMV / NAMUR	EMC / NAMUR	EMC / NAMUR	IEC / EN 60947-5-2 - DIN EN 60947-5-6
Schutzart Schalter	Enclosure switch	Protezione finecorsa	IP67 - DIN 40050
Temperatur	Temperature	Temperatura	-25°C --- +100°C

## Artikelnummern

Code numbers / Numero codice

Beschreibung	Description	Descrizione	<b>Endschalterboxen mit 2 eigensicheren induktiven Schlitzinitiatoren, inkl. Montagebrücke</b> Limit switch boxes with 2 intrinsic safe inductive slot type sensors, incl. mounting bracket Box contenente 2 sensori induttivi a tipo slot a sicurezza intrinseca, incl. bracket di montaggio			
Bohrbild Antrieb	Hole spacing act.	Foratura attuatore	<b>80x30mm</b>	80x30mm	130x30mm	130x30mm
Wellenhöhe Anr.	Stem height act.	Altezza perno att.	<b>20mm</b>	30mm	20mm	30mm
Bestellnummer	Code number	Numero codice	<b>EB2S803020-129-ia</b>	<b>EBA2S803020-129-ia</b>	<b>EBV2S803020-129-ia</b>	





# EG-Konformitätserklärung

## EC Declaration of conformity

EUROTEC Antriebszubehör GmbH

Fallenbrunnen 3/6  
D-88045 Friedrichshafen  
Telefon: 0049 7541 3841-38  
Telefax: 0049 7541 3841-41

Die EG-Konformitätserklärung  
gilt für folgende Geräte der  
Produktfamilie:

The EC Declaration of  
conformity applies to units of  
the product family:

### Endschalterboxen mit induktiven Näherungsschaltern Limit switch boxes with inductive proximity switches

EB\_I \_\_\_\_\_ -ia ; EBA\_I \_\_\_\_\_ -ia; EBV\_I \_\_\_\_\_ -ia  
EB\_S \_\_\_\_\_ -ia; EBA\_S \_\_\_\_\_ -ia; EBV\_S \_\_\_\_\_ -ia  
EBAS\_I \_\_\_\_\_ -ia; EBA1D \_\_\_\_\_ -ia; EBV1D \_\_\_\_\_ -ia

Wir bestätigen die Übereinstimmung  
mit den grundlegenden Anforderungen  
der europäischen Richtlinie:

The basic requirements fulfill  
the European guidelines:

### ATEX 94/9/EG

### ATEX 94/9/EC

Geräte und Schutzsysteme zur  
bestimmungsgemäßen Verwendung  
in explosionsgefährdeten Bereichen

Equipment and Protective Systems  
intended for Use in Potentially  
Explosive Atmospheres

### Gruppe / group II Kategorie / category 2

CE  II2G/D T6

Folgende harmonisierte Norm(en)  
wurden angewandt:

The following harmonised standard(s)  
were applied:

EN1127-1

EN13463-1

Benannte Stelle zu Aufbewahrung:

Notified body retaining the Technical file:

### KEMA Headoffice

Utrechtseweg 310 , NL-6812 AR Arnhem, The Netherlands  
P.O.Box: 9035, NL-6800 ET Arnhem, The Netherlands

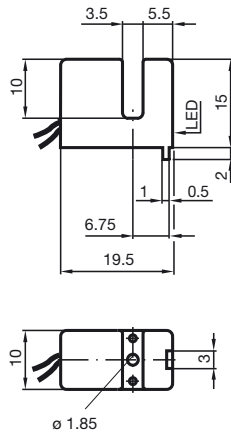
Friedrichshafen, den 10.12.2003

(Ort und Datum der Ausstellung)  
(Place and date of issue)

Knut Berge

(Name und Unterschrift)  
(Name and signature)

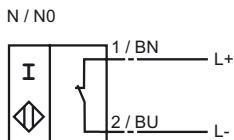
Comfort series  
 3.5 mm slot width  
 Usable up to SIL 2 acc. to  
 IEC 61508



CE 0102

General specifications	
Switching element function	NAMUR NC
Slot width	3,5 mm
Depth of immersion (lateral)	5 ... 7 typ. 6 mm
Installation	
Nominal ratings	
Nominal voltage $U_o$	8 V
Operating voltage $U_B$	5 ... 25 V
Switching frequency $f$	0 ... 3000 Hz
Hysteresis $H$	0,21 ... 0,4 mm
Design data	
Current consumption	
Measuring plate not detected	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA
Indication of the switching state	LED, yellow
Standard conformity	
EMC in accordance with	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)
Ambient conditions	
Ambient temperature	-25 ... 100 °C (248 ... 373 K)
Mechanical specifications	
Connection type	0.5 m, PVC - flexible lead
Core cross-section	0.14 mm <sup>2</sup>
Housing material	PBT
Protection degree	IP67
General information	
Use in the hazardous area	see instruction manuals
Category	1G; 2G; 3G; 1D; 3D

### Connection type:



## ATEX 1G

Instruction

Device category 1G

Directive conformity

Standard conformity

CE symbol

Ex-identification

EC-Type Examination Certificate

Appropriate type

Effective internal capacitance  $C_i$

Effective internal inductance  $L_i$

Cable length

Explosion group IIC

General

Highest permissible ambient temperature

Installation, Commissioning

Maintenance

Special conditions

Protection from mechanical danger

## Manual electrical apparatus for hazardous areas

BR for use in hazardous areas with gas, vapour and mist

94/9/EG

EN 50014:1997; EN 50020:1994; EN 50284:1999

Ignition protection "Intrinsic safety"

Use is restricted to the following stated conditions

CE 0102

Ex II 1G EEx ia IIC T6

PTB 99 ATEX 2219 X

SC3,5...-N0...

$\leq 150$  nF ; a cable length of 10 m is considered.

$\leq 150$   $\mu$ H ; a cable length of 10 m is considered.

Dangerous electrostatic charges on the fixed connection cable must be taken into account for lengths equal to and exceeding the following values:

30 cm

The apparatus has to be operated according to the appropriate data in the data sheet and in this instruction manual. The EU prototype test certificate must be observed. The special conditions must be adhered to!

The temperature ranges, according to temperature class, are given in the EU prototype test certificate. Note: Use the temperature table for category 1 !!! The 20 % reduction in accordance with EN 1127-1 has already been applied to the temperature table for category 1.

Laws and/or regulations and standards governing the use or intended usage goal must be observed.

The intrinsic safety is only assured in connection with an appropriate related apparatus and according to the proof of intrinsic safety.

The associated apparatus must satisfy the requirements of category ia.

Due to the possible danger of ignition, which can arise due to faults and/or transient currents in the equipotential bonding system, galvanic isolation of the power supply and signal circuit is preferable. Associated apparatus without electrical isolation must only be used if the appropriate requirements of IEC 60079-14 are met.

No changes can be made to apparatus, which are operated in hazardous areas. Repairs to these apparatus are not possible.

The sensor must not be mechanically damaged.

When used in the temperature range below  $-20^{\circ}\text{C}$  the sensor should be protected from knocks by the provision of an additional housing.

## ATEX 2G

Instruction

### Device category 2G

Directive conformity

Standard conformity

CE symbol

Ex-identification

EC-Type Examination Certificate

Appropriate type

Effective internal capacitance  $C_i$

Effective internal inductance  $L_i$

General

Highest permissible ambient temperature

Installation, Commissioning

Maintenance

Special conditions

Protection from mechanical danger

## Manual electrical apparatus for hazardous areas

for use in hazardous areas with gas, vapour and mist  
94/9/EG

EN 50014:1997, EN 50020:1994

Ignition protection "Intrinsic safety"

Use is restricted to the following stated conditions

CE 0102

Ex II 1G EEx ia IIC T6

PTB 99 ATEX 2219 X

SC3,5...-N0...

$\leq 150$  nF ; a cable length of 10 m is considered.

$\leq 150$   $\mu$ H ; a cable length of 10 m is considered.

The apparatus has to be operated according to the appropriate data in the data sheet and in this instruction manual. The EU prototype test certificate must be observed. The special conditions must be adhered to!

The temperature ranges, according to temperature class, are given in the EU prototype test certificate.

Laws and/or regulations and standards governing the use or intended usage goal must be observed. The intrinsic safety is only assured in connection with an appropriate related apparatus and according to the proof of intrinsic safety.

No changes can be made to apparatus, which are operated in hazardous areas. Repairs to these apparatus are not possible.

The sensor must not be mechanically damaged.

When used in the temperature range below  $-20^{\circ}\text{C}$  the sensor should be protected from knocks by the provision of an additional housing.

## ATEX 1D

Instruction

### Device category 1D

Directive conformity

Standard conformity

CE symbol

Ex-identification

EC-Type Examination Certificate

Appropriate type

Effective internal capacitance  $C_i$

Effective internal inductance  $L_i$

General

Maximum housing surface temperature

Installation, Commissioning

Maintenance

Special conditions

Electrostatic charging

## Manual electrical apparatus for hazardous areas

for use in hazardous areas with combustible dust

94/9/EG

IEC 61241-11:2002: draft; prEN61241-0:2002

type of protection intrinsic safety "iD"

Use is restricted to the following stated conditions

CE 0102

Ex II 1D Ex iaD 20 T 108 °C

ZELM 03 ATEX 0128 X

SC3,5...-N0...

≤ 150 nF ; a cable length of 10 m is considered.

≤ 150 μH ; a cable length of 10 m is considered.

The apparatus has to be operated according to the appropriate data in the data sheet and in this instruction manual.

The EU prototype test certificate must be observed.

The special conditions must be adhered to!

The maximum surface temperature of the housing is given in the EC-Type Examination Certificate.

Laws and/or regulations and standards governing the use or intended usage goal must be observed.

The intrinsic safety is only assured in connection with an appropriate related apparatus and according to the proof of intrinsic safety.

The associated apparatus must satisfy at least the requirements of category ia IIB or iaD. Because of the possibility of the danger of ignition, which can arise due to faults and/or transient currents in the equipotential bonding system, galvanic isolation in the power supply and signal circuits is preferable. Associated apparatus without electrical isolation must only be used if the appropriate requirements of IEC 60079-14 are met.

The intrinsically safe circuit has to be protected against influences due to lightning.

When used in the isolating wall between Zone 20 and Zone 21 or Zone 21 und Zone 22 the sensor must not be exposed to any mechanical danger and must be sealed in such a way, that the protective function of the isolating wall is not impaired. The applicable directives and standards must be observed.

No changes can be made to apparatus, which are operated in hazardous areas. Repairs to these apparatus are not possible.

The connection cables are to be laid in accordance with EN 50281-1-2 and must not normally be subjected to chaffing during use.

# WAREX VALVE GmbH

## ATEX 3D

Instruction

### Device category 3D

Directive conformity

Standard conformity

CE symbol

Ex-identification

General

Installation, Commissioning

Maintenance

Special conditions

Minimum series resistance  $R_V$

Maximum operating voltage  $U_{Bmax}$

Maximum heating (Temperature rise)

at  $U_{Bmax}=9\text{ V}$ ,  $R_V=562\ \Omega$

using an amplifier in accordance with EN 60947-5-6

Protection from mechanical danger

Protection of the connection cable

## Manual electrical apparatus for hazardous areas

for use in hazardous areas with non-conducting combustible dust

94/9/EG

EN 50281-1-1

Protection via housing

Use is restricted to the following stated conditions

CE 0102

Ex II 3D IP67 T 112 °C X

The apparatus has to be operated according to the appropriate data in the data sheet and in this instruction manual.

The data stated in the data sheet are restricted by this operating instruction! The special conditions must be adhered to!

Laws and/or regulations and standards governing the use or intended usage goal must be observed.

No changes can be made to apparatus, which are operated in hazardous areas. Repairs to these apparatus are not possible.

A minimum series resistance  $R_V$  is to be provided between the power supply voltage and the proximity switch in accordance with the following list. This can also be assured by using a switch amplifier.

The maximum permissible operating voltage  $U_{Bmax}$  must be restricted to the values given in the following list. Tolerances are not permitted.

Values can be obtained from the following list, depending on the max. operating voltage  $U_b$  max and the minimum series resistance  $R_V$ .

12 °C

12 °C

The sensor must not be mechanically damaged.

The connection cable must be prevented from being subjected to tension and torsional loading.

## ATEX 3G (nL)

Instruction

## Device category 3G (nL)

Directive conformity

Standard conformity

CE symbol

Ex-identification

Effective internal capacitance  $C_i$

Effective internal inductance  $L_i$

General

Installation, Commissioning

Maintenance

[Fett]Special conditions

Maximum permissible ambient temperature  $T_{Umax}$  at  $U_i = 20 V$

for  $P_i=34 mW$ ,  $I_i=25 mA$ , T6

for  $P_i=34 mW$ ,  $I_i=25 mA$ , T5

for  $P_i=34 mW$ ,  $I_i=25 mA$ , T4-T1

for  $P_i=64 mW$ ,  $I_i=25 mA$ , T6

for  $P_i=64 mW$ ,  $I_i=25 mA$ , T5

for  $P_i=64 mW$ ,  $I_i=25 mA$ , T4-T1

for  $P_i=169 mW$ ,  $I_i=52 mA$ , T6

for  $P_i=169 mW$ ,  $I_i=52 mA$ , T5

for  $P_i=169 mW$ ,  $I_i=52 mA$ , T4-T1

for  $P_i=242 mW$ ,  $I_i=76 mA$ , T6

for  $P_i=242 mW$ ,  $I_i=76 mA$ , T5

for  $P_i=242 mW$ ,  $I_i=76 mA$ , T4-T1

Protection from mechanical danger

Connection parts

## Manual electrical apparatus for hazardous areas

for use in hazardous areas with gas, vapour and mist

94/9/EG

EN 50021:2000 Ignition protection category "n"

Use is restricted to the following stated conditions

CE 0102

II 3G EEx nL IIC T6 X

$\leq 150 nF$  ; a cable length of 10 m is considered.

$\leq 150 \mu H$  ; a cable length of 10 m is considered.

The apparatus has to be operated according to the appropriate data in the data sheet and in this instruction manual. The data stated in the data sheet are restricted by this operating instruction! The special conditions must be observed!

Laws and/or regulations and standards governing the use or intended usage goal must be observed. The sensor must only be operated with an energy-limited circuit, which satisfies the requirements of IEC 60079-15. The explosion group complies with the connected, supplying, power limiting circuit.

No changes can be made to apparatus, which are operated in hazardous areas. Repairs to these apparatus are not possible.

66 °C

81 °C

100 °C

66 °C

81 °C

100 °C

45 °C

60 °C

89 °C

30 °C

45 °C

74 °C

The sensor must not be mechanically damaged.

When used in the temperature range below -20°C the sensor should be protected from knocks by the provision of an additional housing.

The connection parts are to be installed, such that a minimum protection class of IP20 is achieved, in accordance with IEC 60529.



(1) **EC-TYPE-EXAMINATION CERTIFICATE**  
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

**PTB 99 ATEX 2219 X**



(4) Equipment: Slot-type initiators types SJ... and SC...

(5) Manufacturer: Pepperl + Fuchs GmbH

(6) Address: D-68307 Mannheim

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 99-29175.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:  
**EN 50014:1997** **EN 50020:1994**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

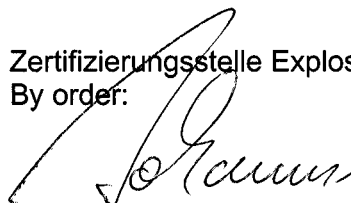
(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:

 **II 2 G EEx ia IIC T6**

Zertifizierungsstelle Explosionsschutz  
By order:

Braunschweig, December 22, 1999

  
Dr.-Ing. U. Johannsmeyer  
Regierungsdirektor





(13)

## SCHEDULE

(14)

### EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X

(15) Description of equipment

The slot-type initiators of types SJ... and SC... are used to convert displacements into electrical signals.

The slot-type initiators may be operated with intrinsically safe circuits certified for categories and explosion groups [EEx ia] IIC or IIB resp. [EEx ib] IIC or IIB. The category as well as the explosion group of the intrinsically safe slot-type initiators depends on the connected supplying intrinsically safe circuit.

#### Electrical data

Evaluation and

supply circuit..... type of protection Intrinsic Safety EEx ia IIC/IIB  
 ..... resp. EEx ib IIC/IIB

only for connection to certified intrinsically safe circuits

Maximum values:

type 1	type 2	type 3	type 4
$U_i = 16 \text{ V}$	$U_i = 16 \text{ V}$	$U_i = 16 \text{ V}$	$U_i = 16 \text{ V}$
$I_i = 25 \text{ mA}$	$I_i = 25 \text{ mA}$	$I_i = 52 \text{ mA}$	$I_i = 76 \text{ mA}$
$P_i = 34 \text{ mW}$	$P_i = 64 \text{ mW}$	$P_i = 169 \text{ mW}$	$P_i = 242 \text{ mW}$

The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type initiators are shown in the table:

types	C <sub>i</sub> [nF]	L <sub>i</sub> [µH]	type 1			type 2			type 3			type 4		
			maximum permissible ambient temperature in °C for application in temperature class											
			T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1
SC2-N0...	150	150	72	87	100	65	80	100	40	55	75	23	38	54
SC3,5-N0-Y...	150	150	72	87	100	65	80	100	40	55	75	23	38	54
SC3,5...-N0...	150	150	73	88	100	66	81	100	45	60	89	30	45	74
SJ1,8-N-Y...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ2,2-N...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ2-N...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ3,5-...-N...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ3,5-H...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ5-...-N...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ5-K...	50	550	72	87	100	66	81	100	42	57	82	26	41	63
SJ10-N...	50	1000	72	87	100	66	81	100	42	57	82	26	41	63
SJ15-N...	150	1200	72	87	100	66	81	100	42	57	82	26	41	63
SJ30-N...	150	1250	72	87	100	66	81	100	42	57	82	26	41	63

(16) Test report PTB Ex 99-29175

(17) Special conditions for safe use

1. For the application within a temperature range of -60°C to -20 °C the slot-type initiators of types SJ... and SC... must be protected against damage due to impact by mounting into an additional housing.
2. The connection facilities of the slot-type initiators of types SJ... and SC... shall be installed as such that at least a degree of protection of IP20 according to IEC-publication 60529:1989 is met.
3. The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type initiators is shown in the table given under item (15) of this EC-type-examination certificate..
4. Inadmissible electrostatic charge of the plastic housing of the slot-type initiators of type SJ30-N..., has to be avoided (warning label on the device ).

(18) Essential health and safety requirements

Met by the standards mentioned above

Zertifizierungsstelle Explosionsschutz  
By order:

Dr.-Ing. U. Johannsmeyer  
Regierungsdirektor



Braunschweig, August 10, 1999

sheet 3/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

## 1. SUPPLEMENT

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X

(Translation)

Equipment: Slot-type initiators, types SJ... and SC...

Marking:  II 2 G EEx ia IIC T6

Manufacturer: Pepperl + Fuchs GmbH

Address: Königsberger Allee 87, 68307 Mannheim, Germany

### Description of supplements and modifications

The slot-type initiators of type series SJ... and SC... listed below may in future also be used in hazardous areas where equipment of category-1 is required.

The modifications exclusively concern the „Electrical data“ (change of maximum permissible ambient temperatures for application as category-1 equipment, reduction of the intrinsically safe evaluation and supply circuit to category ia) as well as the marking of the slot-type initiators listed below.

SC2-N0...	SJ5-...-N...
SC3,5-N0-Y...	SJ5-K...
SC3,5-...-N0...	SJ10-N...
SJ2-N...	SJ15-N...
SJ3,5-...-N...	SJ30-N...

For application as category-1 equipment the marking of the slot-type initiators listed above will be in the future:

 II 1 G EEx ia IIC T6

The „Special conditions“ are also valid for application as category-1 equipment without changes.

## 1. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X

Electrical data

Evaluation and supply circuit

type of protection Intrinsic Safety EEx ia IIC/IIB  
 only for connection to certified intrinsically safe circuits  
 Maximum values:

type 1	type 2	type 3	type 4
$U_i = 16 \text{ V}$	$U_i = 16 \text{ V}$	$U_i = 16 \text{ V}$	$U_i = 16 \text{ V}$
$I_i = 25 \text{ mA}$	$I_i = 25 \text{ mA}$	$I_i = 52 \text{ mA}$	$I_i = 76 \text{ mA}$
$P_i = 34 \text{ mW}$	$P_i = 64 \text{ mW}$	$P_i = 169 \text{ mW}$	$P_i = 242 \text{ mW}$

The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type initiators are shown in the following table:

types	$C_i$ [nF]	$L_i$ [μH]	maximum permissible ambient temperature in °C for application in temperature class											
			type 1			type 2			type 3			type 4		
			T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1
SC2-N0...	150	150	55	67	95	48	60	88	23	35	63	6	18	46
SC3,5-N0-Y...	150	150	55	67	95	48	60	88	23	35	63	6	18	46
SC3,5...-N0...	150	150	56	68	96	49	61	89	28	40	68	13	25	53
SJ2-N...	30	100	56	68	96	49	61	89	28	40	68	13	25	53
SJ3,5...-N...	50	250	56	68	96	49	61	89	28	40	68	13	25	53
SJ5...-N...	50	250	56	68	96	49	61	89	28	40	68	13	25	53
SJ5-K...	50	550	55	67	95	48	60	88	25	37	65	9	21	49
SJ10-N...	50	1000	55	67	95	48	60	88	25	37	65	9	21	49
SJ15-N...	150	1200	55	67	95	48	60	88	25	37	65	9	21	49
SJ30-N...	150	1250	55	67	95	48	60	88	25	37	65	9	21	49

Test report: PTB Ex 03-23133

Zertifizierungsstelle Explosionschutz  
 By order:

Dr.-Ing. U. Johannsmeyer  
 Regierungsdirektor



Braunschweig, October 29, 2003

## L14



- ▶ Large vacuum flows
- ▶ Small size and low weight
- ▶ Good for handling porous materials or if leakage is present

Supplied with push-in hose connector for compressed air (for pumps with connection plate B).  
 Supplied with push-in hose connector for compressed air and external through-flow silencer (for pumps with connection plate C).

### TECHNICAL DATA

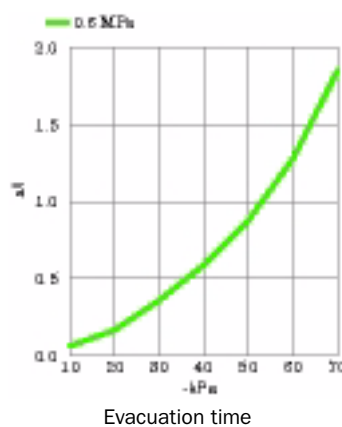
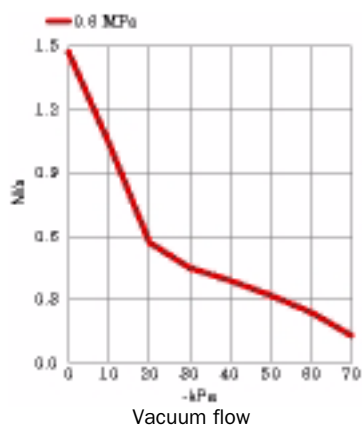
Description	Unit	Value
Feed pressure, max.	MPa	0.7
Noise level	dBA	57–68
Temperature range	°C	-20–80
Weight	g	35–60
Material		Al, ABS, PA, POM, SS, NBR

### VACUUM FLOW

Feed pressure MPa	Air consumption NI/s	Vacuum flow (NI/s) at different vacuum levels (-kPa)										Max vacuum -kPa
		0	10	20	30	40	50	60	70	80	90	
0.60	0.98	1.5	1.0	0.57	0.45	0.39	0.32	0.24	0.13	–	–	75

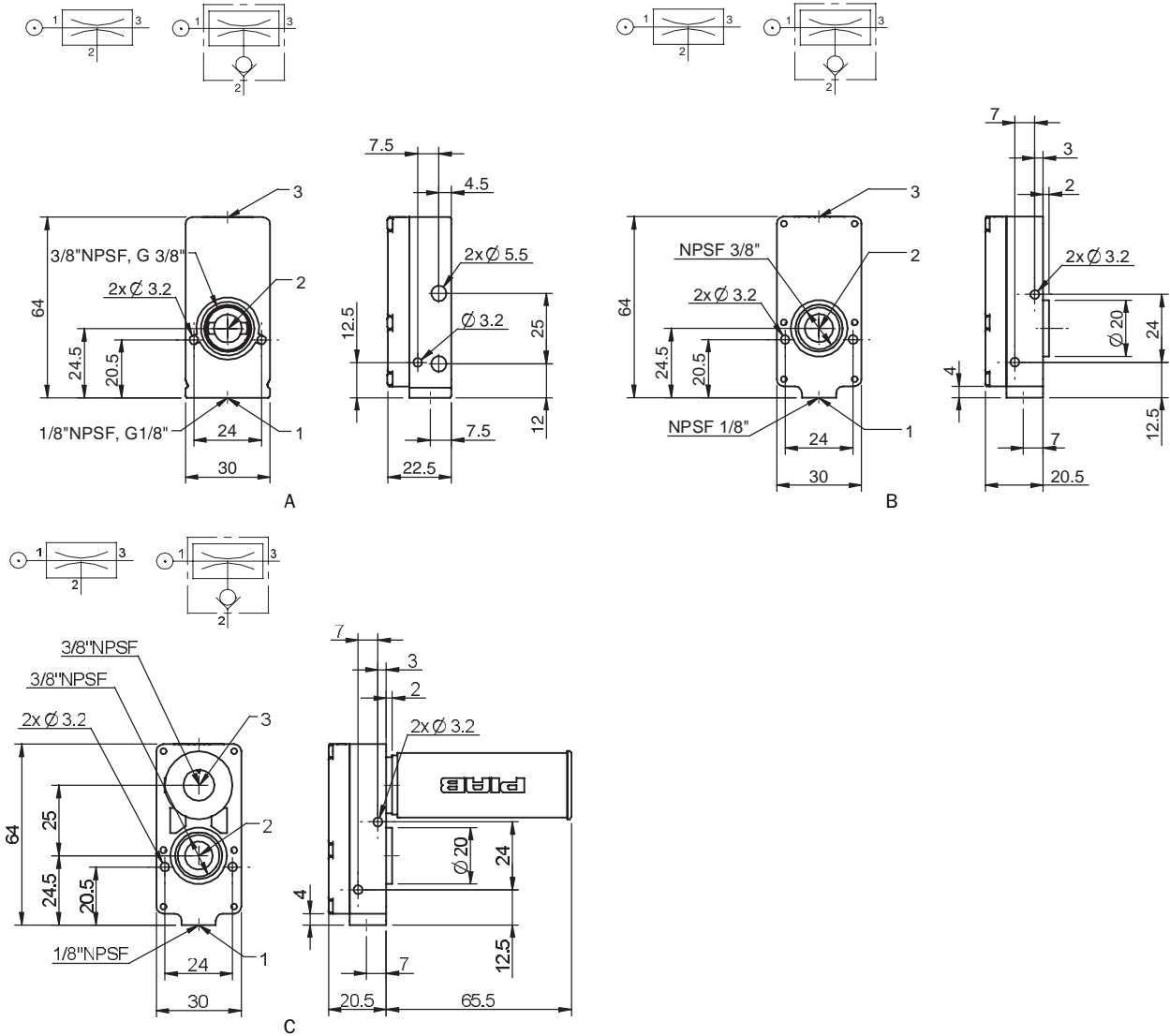
### EVACUATION TIME

Feed pressure MPa	Air consumption NI/s	Evacuation time (s/l) to reach different vacuum levels (-kPa)										Max vacuum -kPa
		10	20	30	40	50	60	70	80	90		
0.60	0.98	0.064	0.17	0.36	0.59	0.88	1.3	1.8	–	–	75	



## ORDERING INFORMATION

Description	Art. No.
A Vacuum pump MINI L14, conn. B1, NBR sealings	0102831
A Vacuum pump MINI L14, conn. B1, NBR sealings, non-return valve	0102832
B Vacuum pump MINI L14, conn. B, NBR sealings	0103055
B Vacuum pump MINI L14, conn. B, NBR sealings, non-return valve	0103056
C Vacuum pump MINI L14, conn. C, NBR sealings	0102743
C Vacuum pump MINI L14, conn. C, NBR sealings, non-return valve	0102744



Vacuum pumps  
MINI

## ORDERING INFORMATION, ACCESSORIES

Description	Art. No.
Sealing kit MINI 5–28, NBR sealings	3201097
Sealing kit MINI 5–28, Viton® sealings	3201097V
Sealing kit MINI 5–28, EPDM sealings	3201097E

Kits include flap valves, gaskets and compressed-air filters.

**EC Declaration of incorporation**  
as defined by the EC Machinery Directive 2006/42/EC

The Manufacturer: **WAREX VALVE GmbH**  
**Stauverbrink 2**  
**48308 Senden**

Hereby declares:

that the construction series of the balanced disc stop valves DKZ(E) 101, 103, 105, 110 and DKF 102 that are supplied by us, are suitable when manually operated, and also when operated by electrical or pneumatic actuators for installation in systems and for attachment to containers in the designs supplied by us.

The commissioning of the balanced disc stop valves is forbidden for such time until it has been determined that the system/machine into which the balanced disc stop valve is to be installed meets the applicable directives.

The following (harmonised) standards were applied:

DIN EN ISO 12100	Safety of machinery - General principles for design risk assessment and risk reduction
DIN EN 558	Industrial valves – dimensions of valves
DIN EN 12266-2	Industrial valves – testing of valves, test procedures and acceptance criteria, mandatory requirements
DIN EN 12570	Industrial valves – methods for sizing the operating element

Name of the person responsible for documentation: Siegfried Opzondek

Address of the person responsible for documentation: see address of the manufacturer:

WAREX VALVE GmbH

48308 Senden, February 2010

  
Jörg Schneider  
(Managing Director)