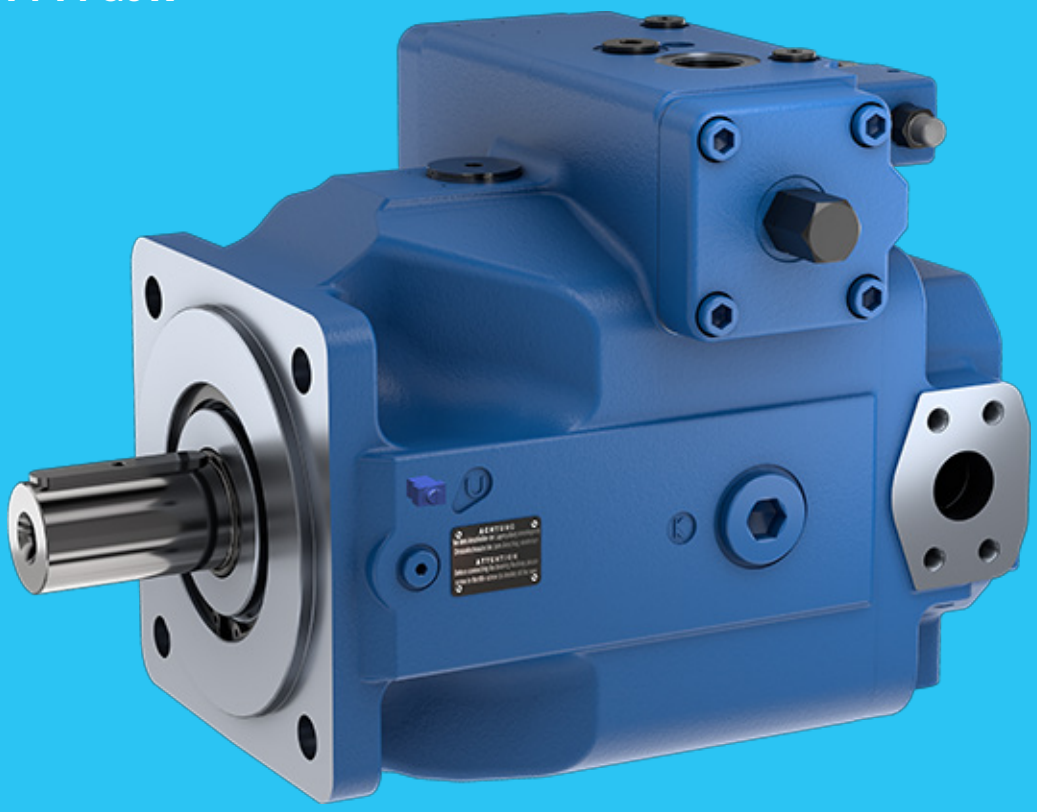
rexroth
A Bosch Company

Operating instructions
according to ATEX directive
2014/34/EU

Axial piston variable pump

A4VSO series 10, 11, and 30

for explosive areas
II 2G Ex h IIC T4-T1 Gb X and
II 3G Ex h IIC T4-T1 Gc X



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What you need to know about these operating instructions

The complete operating instructions according to ATEX Directive 2014/34/EU for the axial piston variable pump A4VSO ATEX for potentially explosive areas consists of the following two parts:

Part I	Product-specific and general instructions	RE 92050-01-X-B1/2025.04.15	76 pages
Part II	Data sheet A4VSO series 10, 11, and 30	RE 92050-01-X-B2/2025.04.15	48 pages

The Declaration of Conformity can be found on the next-to-last page.

DE: Die Inbetriebnahme dieses Produkts darf erst dann erfolgen, wenn Sie diese Betriebsanleitung in einer für Sie verständlichen Sprachversion vorliegen und den Inhalt verstanden haben. Ist dies nicht der Fall, wenden Sie sich bitte an Ihren Bosch Rexroth Ansprechpartner oder die zuständige Servicestelle. Diese finden Sie auch unter www.boschrexroth.com.

EN: This product may only be commissioned if these operating instructions are available to you in a language version that you can understand and if you have understood its content. If this is not the case, please contact your Bosch Rexroth contact partner or the responsible service point. You can also find them under www.boschrexroth.com.

BG: Пускането в експлоатация на този продукт може да се извърши едва тогава, когато разполагате с това упътване за употреба в разбираема за Вас версия на езика и сте разбрали неговото съдържание. Ако това не е така, обърнете се към Вашия партньор Bosch Rexroth или към компетентен сервиз. Ще го намерите в www.boschrexroth.com.

CS: Tento výrobek smí být uveden do provozu jedině tehdy, máte-li k dispozici tento návod k obsluze v pro vás srozumitelné jazykové verzi a rozumíte celému jeho obsahu. Pokud tomu tak není, obraťte se na svou kontaktní osobu u firmy Bosch Rexroth nebo na příslušné servisní středisko. To naleznete také na internetové adrese www.boschrexroth.com.

DA: Dette produkt må først tages i brug, når du har modtaget og læst driftsvejledningen på et for dig forståeligt sprog og har forstået indholdet. Hvis det ikke er tilfældet, bedes du kontakte din kontaktperson hos Bosch Rexroth eller den ansvarlige kundeserviceafdeling. Den kan du finde på hjemmesiden www.boschrexroth.com.

EL: Το προϊόν επιτρέπεται να τεθεί σε λειτουργία μόνο εάν διαθέτετε τις παρούσες οδηγίες χρήσης σε κατανοητή γλώσσα και εφόσον έχετε κατανοήσει το περιεχόμενό τους. Εάν δεν πληρούνται αυτές οι προϋποθέσεις, απευθυνθείτε στους κατά τόπους αντιπροσώπους της Bosch Rexroth ή σε κάποιο εξουσιοδοτημένο σέρβις. Για τα σχετικά στοιχεία επισκεφτείτε την ιστοσελίδα www.boschrexroth.com.

ES: La puesta en servicio de este producto únicamente podrá realizarse cuando disponga de las instrucciones de servicio en un idioma que entienda y haya entendido su contenido. En caso contrario, diríjase a su persona de contacto de Bosch Rexroth o al servicio técnico competente, que podrá encontrar también en la dirección www.boschrexroth.com.

ET: Toodet tohib kasutada ainult siis, kui teil on olemas teie jaoks arusaadavas keeles kasutusjuhend ja te saate sellesisust aru. Kui see nii ei ole, pöörduge oma Bosch Rexrothi esindaja või vastava teeninduse poole. Nende kontaktandmed leiate aadressilt www.boschrexroth.com.

FI: Älä ota tuotetta käyttöön ennen kuin olet saanut käyttöohjeen omalla kielelläsi ja ymmärrät sen sisällön. Ota muussa tapauksessa yhteyttä Bosch Rexroth -yhteyshenkilöösi tai valtuutettuun huoltoliikkeeseen. Yhteystiedot löydät osoitteesta www.boschrexroth.com.

FR: Ce produit ne doit être mis en service que lorsque vous disposez des présentes instructions de service en une version linguistique que vous comprenez e que vous avez compris son contenu. Si cela n‘est pas le cas, veuillez vous adresser à votre interlocuteur Bosch Rexroth ou au service compétent. Vous trouvez les coordonnées également sur le site www.boschrexroth.com.

HU: Ennek a terméknek az üzembe helyezése csak akkor történhet meg, ha ez a kezelési útmutató rendelkezésre áll az Ön számára érthető egyik nyelven, és megértette annak tartalmát. Egyéb esetben forduljon a Bosch Rexroth kapcsolattartójához vagy az illetékes szervizhez. Ezeket is megtalálja az alábbi címen: www.boschrexroth.com.

IT: La messa in servizio di questo prodotto può essere eseguita solo se si dispone del presente manuale d‘uso in una lingua conosciuta e se ne è stato compreso il contenuto. In caso contrario rivolgersi al referente Bosch Rexroth o al punto di assistenza competente. Questi sono anche riportati sul sito www.boschrexroth.com.

LT: Pradėti naudoti šį produktą leidžiama tik turint šią vartotojo instrukciją Jums suprantama kalba ir jei supratote jos turinį. Jei instrukcijos nesuprantate, prašome kreiptis į savo Bosch Rexroth konsultantą arba atsakingą aptarnavimo tarnybą. Informaciją apie juos rasite adresu www.boschrexroth.com.

LV: Šīs ierīces ekspluatāciju drīkst sākt tikai tad, ja šī ekspluatācijas instrukcija Jums ir pieejama kādā jums saprotamā valodā un Jūs esatizpratis tās saturu. Pretējā gadījumā lūdzam vērsties pie attiecīgās „Bosch Rexroth“ kontaktpersonas vai kompetentā servisa dienestā. Nepieciešamā informācija ir pieejama arī mūsu mājas lapā internetā www.boschrexroth.com

NL: U mag het product pas in bedrijf stellen, als deze bedieningshandleiding voor u beschikbaar is in een voor u begrijpelijke taal en als u de inhoud daarvan begrepen heeft. Is dit niet het geval, neem dan a.u.b. contact op met uw Bosch Rexroth contactpersoon of de servicepartner. Deze vindt u ook op www.boschrexroth.com.

NO: Dette produktet må ikke tas i bruk før du har mottatt denne bruksanvisningen på et språk som du forstår, og du har forstått innholdet. Hvis dette ikke er tilfellet, ta kontakt med din kontaktperson hos Bosch Rexroth eller den ansvarlige kundeserviceavdelingen. Disse finner du også på www.boschrexroth.com.

PL: Przed uruchomieniem niniejszego produktu należy zapoznać się z instrukcją obsługi w Państwa wersji językowej. W przypadku, gdy nie dołączono instrukcji w danym języku, należy zwrócić się z zapytaniem do osoby kontaktowej Bosch Rexroth lub do odpowiedniego punktu obsługi. Listę takich punktów można znaleźć na stronie www.boschrexroth.com.

PT: A colocação deste produto em funcionamento pode ser efetuada apenas se o manual de instruções estiver disponível em um idioma compreensível para você e se você tiver compreendido o conteúdo do mesmo. Se esse não for o caso, entre em contato com o seu representante da Bosch Rexroth ou com a assistência técnica. Encontre-os em www.boschrexroth.com

RO: Aveți voie să puneți în funcțiune acest produs, doar după ce ați primit acest manual de utilizare într-o versiune de limbă inteligibilă pentru dumneavoastră şi ați înțeles conținutul său. Dacă aceste condiții nu sunt îndeplinite, adresați-vă persoanei dumneavoastră de contact de la Bosch Rexroth sau la service-ul Bosch Rexroth competent. Găsiți aceste service-uri la www.boschrexroth.com

RU: Ввод в эксплуатацию данного продукта разрешен только после того, как руководство по эксплуатации будет получено Вами на русском языке и полностью понято. Если у Вас нет руководства по эксплуатации, обратитесь, пожалуйста, к ответственному за Ваш регион представителю Bosch Rexroth или в соответствующий сервисный центр. Оно также находится на сайте www.boschrexroth.com.

SK: Tento výrobok sa smie uviesť do prevádzky až vtedy, keď ste dostali tento návod na prevádzku k dispozícii v pre vás zrozumiteľnej jazykovej mutácii a obsahu ste porozumeli. V opačnom prípade sa, prosím, obráťte na vašu kontaktnú osobu v Bosch Rexroth alebo na zodpovedné servisné miesto. Nájdete ich tiež na www.boschrexroth.com.

SL: Z uporabo tega izdelka lahko pričnete šele, ko ste prebrali ta navodila za uporabo v vam razumljivem jeziku in razumeli njihovo vsebino. Če navodila za uporabo niso na voljo v vašem jeziku, vas prosimo, da se obrnete na kontaktno osebo podjetja Bosch Rexroth oz. pooblaščeni servis. Te lahko najdete tudi na www.boschrexroth.com.

SV: Denna produkt får inte tas i drift förrän du har mottagit en bruksanvisning på ett språk som du förstår och sedan har läst och förstått innehållet i. Om detta inte är fallet ber vi dig kontakta din kontaktperson på Bosch Rexroth eller ansvarig kundservice. Dessa hittar du också på www.boschrexroth.com.

ZH: 使用该产品前，请您确保已拥有一份您所熟悉语言版本的使用说明书并已理解其内容。如果尚未拥有，请向博世力士乐合作伙伴或相关服务部门索取，也可登录 www.boschrexroth.com 下载

rexroth
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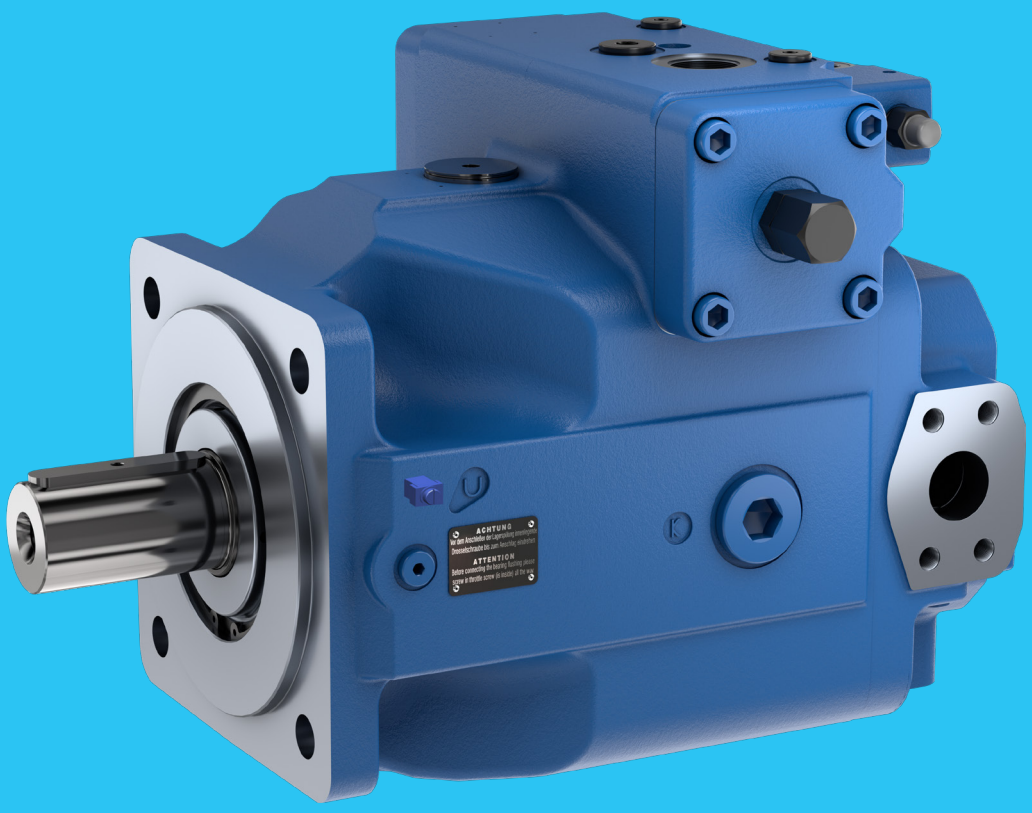
Part I of the operating instructions according to ATEX directive 2014/34/EU
Product-specific and general instructions

Axial piston variable pump

A4VSO Series 10, 11 and 30

for explosive areas
II 2G Ex h IIC T4-T1 Gb X and
II 3G Ex h IIC T4-T1 Gc X



RE 92050-01-X-B1/2025.04.15, EN

The products and configurations shown in this document are examples. The supplied product or configuration may therefore differ from what is shown in the figures.

The original manual was created in the German language.

Contents

1 About this documentation

1.1 Validity of the documentation

This documentation applies to the following products:

- Axial piston variable pump A4VSO ATEX series 1x and 30 for explosive areas II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X.

This documentation is intended for machine/system manufacturers, assemblers and service engineers.

This documentation contains important information on the safe and proper transport, installation, commissioning, operation, maintenance, removal and simple troubleshooting of the axial piston unit.

▶ Read this documentation completely, in particular chapter 2 "Safety instructions" on page 8 and chapter 3 "General instructions on property damage and product damage" on page 18 before you start work with the axial piston unit.

1.2 Required and supplementary documentation

▶ Only commission the axial piston unit if the documentation marked with the book symbol 🕮 is available to you and you have understood and observed it.

Table 1: Required and supplementary documentation

	Title	Document number	Document type
🕮	**Order confirmation** Contains the technical data relevant to the Axial piston variable pump A4VSO ATEX series 1x and 30 ordered.	–	Order confirmation
🕮	**Installation drawing** Contains the outer dimensions, all ports, and the hydraulic circuit diagram for your Axial piston variable pump A4VSO ATEX.	Please request the installation drawing from your contact at Bosch Rexroth.	Installation drawing
🕮	**Axial piston variable pump A4VSO for explosive areas II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X** Contains the permissible technical data.	92050-01-X-B2	Data sheet
🕮	**Control devices DR, DRG, DP, FR and DFR** Contains information on pressure and flow controllers	92060	Data sheet
🕮	**Power controllers LR2 and LR3** Contains information on power controllers	92064	Data sheet
🕮	**Control devices MA** Axial piston variable pumps A4VSO and A4VSG	92072	Data sheet
🕮	**Control devices HM** Axial piston variable pumps A4VSO and A4VSG	92076	Data sheet
🕮	**Hydraulic control, pilot-pressure related HD** Contains information on pilot-pressure related controllers	92080	Data sheet
🕮	**Hydraulic fluids based on mineral oils and related hydrocarbons** Describes the requirements on a hydraulic fluid based on mineral oil and related hydrocarbons for operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your hydraulic system.	90220	Data sheet

Table 1: Required and supplementary documentation

Title	Document number	Document type
Application notes for axial piston units in the low temperature range Contains additional information on the application of Rexroth axial piston units at low temperatures.	90300-03-B	Manual
Storage and preservation of axial piston units Contains additional information on storage and preservation.	90312	Data sheet

1.3 Representation of information

Standardized safety instructions, symbols, terms and abbreviations are used throughout this documentation so that you can work quickly and safely with your product. For clarification, they are explained in the sections below.

1.3.1 Safety instructions

This documentation contains safety instructions in chapter 2.6 "Product-specific safety instructions" on page 11 and in chapter 3 "General instructions on property damage and product damage" on page 18, as well as before a sequence of actions or a handling instruction involving a risk of personal injury and property damage. Always follow the measures for danger prevention associated with the use of this product.

Safety instructions are set out as follows:

⚠ SIGNAL WORD

Type and source of danger!
Consequences of non-compliance
▶ Danger prevention measures

- **Warning sign:** draws attention to the danger
- **Signal word:** identifies the degree of the danger
- **Type and source of danger:** indicates the type and source of the danger
- **Consequences:** describes the consequences of non-compliance
- **Precautions:** states how the danger can be avoided

Table 2: Hazard classes as defined in ANSI Z535.6-2006

Warning sign, signal word	Meaning
⚠ DANGER	Identifies a dangerous situation that will result in death or serious personal injury if it is not avoided.
⚠ WARNING	Identifies a dangerous situation that may result in death or serious personal injury if it is not avoided.
⚠ CAUTION	Identifies a dangerous situation that may result in minor to moderate personal injury if it is not avoided.
NOTICE	Property damage: The product or surrounding area may be damaged.

1.3.2 Symbols

The following symbols indicate instructions that are not safety-relevant but increase understanding of the documentation.

Table 3: Meaning of symbols

Symbol	Meaning
	If this information is disregarded, the product cannot be used and/or operated to its full extent.
▶	Single, independent action step
1. **2.** **3.**	Numbered handling instruction: The numbers indicate that the action steps must be completed in order.

1.3.3 Designations

This documentation uses the following designations:

Table 4: Designations

Designation	Meaning
A4VSO ATEX	Axial piston variable pump for potentially explosive areas II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X open circuit
Threaded plug	Metal screw, pressure-resistant
Protective plug	Made of plastic, not pressure-resistant, only for transportation

The designation "axial piston unit" will be used in the following as the umbrella term for "Axial piston variable pump A4VSO ATEX".

1.3.4 Abbreviations

This documentation uses the following abbreviations:

Table 5: Abbreviations

Abbreviation	Meaning
ANSI	**A**merican **N**ational **S**tandards **I**nstitute is an organization that coordinates the development of voluntary standards in the United States
ATEX	EC directive on explosion protection (**At**mosphère **ex**plosible)
DIN	**D**eutsche **I**ndustrie **N**orm (German Institute for Standardization)
A4VSO	**A**xial piston **v**ariable pump, **o**pen circuit
DFR	**P**ressure **f**low controller
DP	**P**ressure controller for **p**arallel operation
DR	**D**ruck**r**egler (ENG: pressure controller)
DRG	**P**ressure **c**ontroller, remotely controllable
FR	**F**low **c**ontroller
HD	**H**ydraulic control, **p**ressure-dependent
LR2	**P**ower **c**ontroller with hyperbolic characteristic curve
LR3	**P**ower **c**ontroller with remotely controllable power characteristic
OV	**W**ithout **c**ontrol
ISO	**I**nternational **O**rganization for **S**tandardization
JIS	**J**apan **I**ndustrial **S**tandard
RE	**R**exroth document in the **E**nglish language
VDI 2230	Guideline for the systematic calculation of heavy-duty threaded connections and cylindrical screw joints from the VDI (**V**erein **D**eutscher **I**ngenieure - Association of German Engineers)

2 Safety instructions

2.1 About this chapter

The axial piston unit has been manufactured to generally accepted engineering standards. There is still, however, a risk of personal injury or property damage if this chapter and the safety instructions in this documentation are not observed.

- Read this documentation completely and thoroughly before working with the axial piston unit.
- Keep this documentation in a location where it is accessible to all users at all times.
- Always include the required documentation when you pass the axial piston unit on to third parties.

2.2 Intended use

Axial piston units are hydraulic components, meaning that in their application area they are classified neither as complete nor as partly completed machinery in the sense of the EU Machinery Directive 2006/42/EC. The component is exclusively intended to form partly completed machinery or complete machinery together with other components. The component should only be commissioned after it has been installed in the machine/system for which it is intended, and the safety of the entire system has been established in accordance with the Machinery Directive.
This product is intended for the following use:
The axial piston unit is only approved as a pump for hydrostatic drives in an open circuit.

- Adhere to the technical data, the application and operating conditions, and the performance limits as specified in the data sheet (Part II) and in the order confirmation. Information about approved hydraulic fluids can be found in the data sheet (Part II).

The axial piston unit is only intended for commercial use and not for private use.
Intended use includes having fully read and understood this documentation, especially chapter 2 "Safety instructions" on page 8.
The axial piston units in the explosion-proof version satisfy the requirements of the EU ATEX Directive (2014/34/EU).
Information on the equipment group and category as defined in the ATEX Directive (2014/34/EU) can be found on the data sheet (Part II) under application in accordance with EU directive 2014/34/EU and on the name plate of the axial piston unit.
Under EU directive 1999/92/EC, the user/operator is required to divide explosive areas into zones. chapter 5.3.2 "Explosion protection marking" on page 25 compares the zones with the equipment groups and categories.
The axial piston unit should only be used in applications specified for the equipment group and category in Directive 2014/34/EU and according to the areas specified in the type of protection or in areas (explosion group, temperature class) with lower requirements. It should be operated in accordance with the technical data and ambient conditions specified in this directive and in these operating instructions.

2.3 Improper use

Any use other than that described as intended use is considered improper.
Bosch Rexroth AG is not liable for damage resulting from improper use.
The user is solely responsible for any risks arising from improper use.
The following types of faulty usage are also considered improper:

- Use outside the operating parameters approved in the data sheet (Part II) or in the order confirmation (unless customer-specific approval has been granted)
- Use of non-approved fluids, e.g. water or polyurethane components
- Changes to factory settings by unauthorized persons.
- Use of assembled parts (e.g., attachment filter, control unit, valves) other than specified Rexroth components
- Using the axial piston unit under water at a depth of more than 10 meters without necessary additional measures, e.g. pressure equalization
- Use of the axial piston unit over a permanent case pressure of max. 4 bar absolute. The case pressure must always be greater than the outside pressure at the shaft seal (ambient pressure). Momentary (t <0.1 s) maximums of up to 6 bar absolute are permissible. Beyond this, the maximum permissible case pressure specified in the data sheet Part II must not be exceeded.
- Application of the axial piston unit in explosive environments unless the component or machine/system has been certified as compliant with the ATEX Directive 2014/34/EU
- Use of the axial piston unit in a corrosive atmosphere
- Use of the axial piston unit in aircraft or spacecraft
- Use of the axial piston unit in areas where propagating brush discharge could occur (as per DIN EN ISO 80079-36)

2.4 Personnel qualifications

The activities described in this documentation require basic knowledge of mechanics, electricity, hydraulics and ATEX, as well as familiarity with associated technical terms. For transporting and handling the product, knowledge regarding the use of lifting devices and lifting accessories is required. In order to ensure safe use, these activities should only be performed by skilled personnel or an instructed person under the direction and supervision of skilled personnel.
Skilled personnel refers to persons who possess the professional training, knowledge and experience, as well as the understanding of the regulations relevant to the work to be done that are necessary to recognize possible dangers and take the appropriate safety measures. Skilled personnel must follow the rules relevant to their field and have the necessary hydraulic expert knowledge.
Hydraulic expert knowledge includes:

- Being able to read and fully understand hydraulic circuit diagrams
- In particular, fully understanding the relationships with regard to safety devices
- comprising knowledge regarding the function and layout of hydraulic components.

Bosch Rexroth offers you measures supporting training in specific areas.
For an overview of the training contents, visit our website under:
`http://www.boschrexroth.com/training`.

2.5 General safety instructions

- Adhere to all applicable legal regulations, rules and directives regarding explosion protection.
- Observe the country-specific accident prevention and environmental protection regulations.
- Observe the safety regulations of the country in which the product is used/operated.
- Use Rexroth products only when they are in good working order.
- Observe all instructions on the product.
- Do not assemble, operate, remove or maintain Rexroth products if under the influence of alcohol, drugs or medication that may affect your reaction time.
- Only use genuine Rexroth accessories and spare parts to ensure there is no hazard to persons from unsuitable spare parts.
- Observe the technical data and ambient conditions specified in the product documentation.
- If unsuitable products are installed or used in safety-relevant applications, unexpected operating conditions may occur in the application, which could result in personal injury or property damage. For this reason, only use the product in safety-relevant applications if this use is expressly indicated and approved in the product documentation, e. g. in explosion protection areas or in safety-related parts of a control system (functional safety).
- Only commission the product if it has been determined that the end product (e.g. machinery/system) in which the Rexroth products are installed corresponds to the country-specific provisions, safety regulations and standards for the application.
- Use tools appropriate for the work being performed and wear appropriate protective clothing to prevent punctures and cuts (e.g. when removing protective covers, disassembly).
- There is a risk of entanglement when operating the axial piston unit with a bare shaft end. Check whether or not your machine requires additional safety measures for your application. If necessary, make sure these are appropriately implemented.

2.6 Product-specific safety instructions

The following safety instructions apply to chapters 6 to 14.

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Serious injury caused by blast pressure and fire may result.

- Take care to remove dust in a timely manner in order to reduce the risk of ignition.
- The case leakage temperature on the drain port, or the inlet temperature on the suction port, must not exceed the specified limit values. The system operator must ensure that the case leakage temperature does not exceed the limit value under any operating conditions. This can be done by adhering to a maximum inlet temperature. The readings are checked on a daily basis. Observe the relevant information on the data sheet (Part II).
- The reservoir level should also be monitored.
- Make sure parts (e.g., coupling components) that are able to move relative to each other do not touch, as this could create sparks and/or heat and explosion protection would no longer be guaranteed.

Also observe the following for ATEX category II 2G Ex h IIC T4-T1 Gb X:

- The axial piston unit should only be operated if the hydraulic system is equipped with a leakage temperature monitor that, in the event the maximum leakage temperature is exceeded (see data sheet, Part II), deactivates the system so the temperature cannot continue to rise. This must be provided by the operator.

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust on a hot surface caused by overheating due to faults or defects, or actuation of high-pressure relief valves!

Serious injury caused by blast pressure and fire may result.

- Regardless of the control, the system should be safeguarded against pressure overload.
- Set the external pressure relief valve so the maximum permissible pressure cannot be exceeded; see data sheet (Part II).
- Set the cracking pressure of the high-pressure relief valve to a value not lower than 30 bar above the pressure controller setting.

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust on a hot surface caused by friction due to lack of lubricant!
Serious injury caused by blast pressure and fire may result.
- ▶ Ensure lubrication by means of leakage fluid. Always use the highest drain port to ensure internal lubrication through circulating leakage fluid, see chapter 7.3 "Installation position" on page 34.
- ▶ With above-reservoir installation, only operate the axial piston unit with bearing flushing.
- ▶ Prevent draining of the housing area in above-reservoir installations.
- ▶ Fill the axial piston unit with hydraulic fluid prior to commissioning.

Explosion and/or fire due to ignition of an explosive atmosphere or of combustible dust on a hot surface caused by overloading and damage to shaft key or splines causing coupling to turn on shaft!
Serious injury caused by blast pressure and fire may result.
- ▶ Make sure the permissible shaft load indicated on the data sheet (Part II) is not exceeded under any operating conditions.
- ▶ Make sure the shaft and coupling are correctly aligned; see chapter 7.4.4 "Installation with a coupling" on page 40.

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust on a hot surface caused by overheating!
Serious injury caused by blast pressure and fire may result.
- ▶ Make sure that the permissible case pressure stated in the data sheet (part II) is never exceeded as excessive case pressure or excessive pressure peaks can cause impermissible high temperatures on the shaft seal and thus a risk of ignition.
- ▶ Bearing damage or damage to rotary groups within the axial piston unit result in an increase in the leakage temperature due to mechanical heat loss caused by friction. A gradual increase in the case leakage temperature can, thus, indicate the start of bearing damage. In such a case, check whether there is an increase in the mechanical loading when the difference between the input- and output power gets to high. Contact Bosch Rexroth Service for repair if you cannot trace the increase in temperature to an increase in the loading of the axial piston unit.
- ▶ A sudden increase in the case leakage temperature indicates severe damage with extreme friction. If this occurs, shut down the axial piston unit immediately and contact Bosch Rexroth Service for repair.

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust on a hot surface caused by overheating due to excessive speed!

Serious injury caused by blast pressure and fire may result.

- Make sure the maximum permissible rotational speed as specified on the data sheet (Part II) is not exceeded.
- If necessary, take measures to ensure rotational speed is limited.

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust caused by mechanically generated sparks!

Serious injury caused by blast pressure and fire may result.

To prevent mechanically generated sparks due to foreign particles made of aluminum with ferric oxide and/or particles of rust on the surface (see DIN EN ISO 80079-36, 6.4.2.1), the pump comes with an anticorrosive paint.

- Make sure the paint is not damaged.
- Do not transport or store the axial piston unit in explosive areas.
- Do not load the axial piston unit in explosive areas.
- Do not unpack or pack the axial piston unit in explosive areas.

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust due to sparks caused by electrostatic discharge!

Serious injury caused by blast pressure and fire may result.

The axial piston unit has been painted as specified in Section 6.7 (Static Electricity) of DIN EN ISO 80079-36.

- Additional coats of paint should only be applied as specified in Section 6.7 of DIN EN ISO 80079-36, otherwise explosion protection is no longer guaranteed. The ground terminal must not be painted.
- Include the axial piston unit in the potential equalization connection.
- The axial piston unit is only approved for use in areas where no propagating brush discharge can occur.
- Do not transport or store the axial piston unit in explosive areas.
- Do not load the axial piston unit in explosive areas.
- Do not unpack or pack the axial piston unit in explosive areas.

⚠ WARNING

Danger due to excessive pressure!
Risk of death or injury, or property damage!
Improperly changing the factory pressure settings can result in a pressure increase beyond the permissible maximum pressure.
Operating the unit above the permissible maximum pressure can cause components to burst and hydraulic fluid to escape under high pressure.

- Changes to the factory settings may only be made by Bosch Rexroth specialists.
- If the axial piston unit is equipped with a pressure cut-off and/or pressure controller, this is not an adequate safeguard against pressure overload.
- Set the external pressure relief valve so the maximum permissible pressure cannot be exceeded; see data sheet (Part II).
- Set the opening pressure of the high pressure relief valve to a value of at least 30 bar above the value set at the pressure controller.

Danger due to suspended loads!
Risk of death or injury, or property damage!
Improper transportation may cause the axial piston unit to fall down and lead to injury, e.g. crushing or fracture, or damage to the product.

- Make sure that the load bearing capacity of the lifting device is sufficient to safely bear the weight of the axial piston unit.
- Never step or grip under suspended loads.
- Ensure a stable transport position.
- Use your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- Use suitable lifting devices for transport.
- Observe the prescribed position of the lifting strap.
- Observe the national laws and regulations on occupational health and safety, and transportation.

System/machine under pressure!
Danger to life or risk of injury, severe personal injury when working on machines/systems that are not shut down! Property damage!

- Switch off the relevant machine/system part and secure it against restarting according to the parameters by the machine/system manufacturer.
- Ensure that all relevant components of the hydraulic system are depressurized. For this purpose, observe the parameters indicated by the machine/system manufacturer.
- Please note that the hydraulic system might still be pressurized even after separation from the actual pressure supply.
- Do not disconnect any line connections, ports or components as long as the hydraulic system is under pressure.
- Switch off all power-transmitting components and connections (electric, pneumatic, hydraulic, mechanical) in line with the manufacturer's specifications and secure them against restarting.

⚠ WARNING

Escaping hydraulic fluid mist!

Risk of explosion and fire hazard, health hazard, risk of environmental pollution!

- Depressurize the machine/system and repair the leak.
- Only perform welding work when the machine/system is depressurized.
- Keep open flames and ignition sources away from the axial piston unit.
- Only use a hydraulic fluid that complies the requirements on the data sheet (Part II) (in accordance with DIN EN ISO 80079-36, chapter 4.5).
- If axial piston units are located in the vicinity of ignition sources or powerful thermal radiators, a shield must be erected to ensure any escaping hydraulic fluid cannot be ignited, and to protect hose lines from premature aging.

Escaping hydraulic fluid due to leak of machine/system components!

Risk of burning and risk of injury due to escaping hydraulic fluid jet!

In case of leakage at the axial piston unit, high-pressure fluid jets may escape.

- Depressurize the relevant machine/system component and repair the leak.
- Never attempt to block or seal the leak or hydraulic fluid jet with a cloth.
- Make sure that the fluid level in the reservoir is constantly monitored by an appropriate sensor in the system.

Hydraulic fluid will explode when making contact with water!

Explosion and fire hazard!

- Do not bring hot hydraulic fluids in contact with water.

Electrical voltage!

Danger to life or risk of injury due to electric shock or property damage!

- Always disconnect the voltage supply to the relevant machine/system part before installing the product and/or connecting or disconnecting the connector. Protect the machine/system against being restarted.

Restriction of control function!

Risk of injury or property damage!

- Under certain circumstances, moving parts in control equipment (e.g. valve spools) can stick in an undefined position due to contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator’s specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk.
- Check whether your application requires remedial measures on your machine in order to bring the driven consumer to a safe position (e.g. safe stop).
- If necessary, make sure these are appropriately implemented.

⚠ WARNING

Risk of pressurized hydraulic fluid leaking or flying components!
Danger to life or risk of injury! When selecting or using connecting elements without sufficient high-pressure resistance, they may burst or lead to the leakage of hydraulic fluid and/or to ejected components. The ports and fastening threads of the axial piston unit are designed for the specified maximum pressure.

- Only ever connect connecting elements and lines that match the ports of the axial piston unit and can resist the intended application conditions (e.g. pressure level, flow, hydraulic fluid, temperature) with the necessary safety factors.

⚠ CAUTION

High noise development during operation!
Risk of hearing damage or hearing loss!
The noise emission of axial piston units depends on rotational speed, working pressure and installation conditions, among other factors. The sound pressure level may rise above 70 dB (A) under normal application conditions.
- Always wear hearing protection near a running axial piston unit.

Hot surfaces on axial piston unit!
Risk of getting burnt!
- Allow the axial piston unit to cool down sufficiently before touching it.
- Wear heat-resistant, protective clothing, e.g. gloves.

Improper cable and line routing!
Risk of stumbling and property damage! Improper routing of cables and lines can cause a risk of stumbling as well as damage to equipment and components, e.g. due to lines and connectors being torn off.
- Always lay cables and lines so no one can trip over them, they do not become kinked or twisted, do not rub on edges and do not run through sharp-edged ducts without adequate protection.

Contact with hydraulic fluid!
Health hazard/risk of adverse health effects, e.g. eye injury, skin irritation, toxication from inhalation!
- Avoid any contact with hydraulic fluids.
- When handling hydraulic fluids, the safety instructions of the lubricant manufacturer need to be observed at all times.
- Use your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- Immediately seek medical attention, however, if hydraulic fluid gets into your eyes or blood circuit or if you swallow it accidentally.

Danger from improper handling!
Slip hazard! Risk of slipping on wet and/or fluid-coated surfaces when climbing on the axial piston unit.
- Never use the axial piston unit as a handle or step.
- Check how to safely get on top of the machine/system.

2.7 Personal protective equipment

Personal protective equipment is the responsibility of the user of the axial piston unit. Observe the safety regulations in your country.
All pieces of personal protective equipment should be intact.

3 General instructions on property damage and product damage

The following information applies to chapters 6 to 14.

NOTICE

Danger from improper handling!
Product can be damaged!
- Do not subject the product to improper mechanical loading.
- Never use the product as a handle or step.
- Do not put/place any objects on the product.
- Do not strike the drive shaft of the axial piston unit.
- Do not set/place the axial piston unit on the drive shaft or assembled parts.
- Do not strike assembled parts (e.g. sensors or valves).
- Do not hit sealing surfaces (e.g. on the working ports).
- Leave the protective covers on the axial piston unit until you connect the lines.
- Disconnect all electrical connectors before any electric welding and painting work.
- Make sure the electronic components (e.g. sensors) do not build up electrostatic charges (e.g. during painting work).

Risk of property damage due to inadequate lubrication!
Product can be damaged or destroyed!
- Never put the axial piston unit into operation without sufficient hydraulic fluid. Specifically, make sure that the rotary group has sufficient lubrication.
- When commissioning a machine/system, make sure that the housing area and the working lines of the axial piston unit are filled with hydraulic fluid and remain filled during operation. Avoid air inclusions in the forward drive shaft bearing, especially with the axial piston unit installed with the "drive shaft upward" installation position.
- Check the hydraulic fluid level in the housing area regularly and perform recommissioning if necessary. For above-reservoir installation, the housing area may drain out through the drain line after prolonged standstill periods or through the working line (gap leakage). This means the bearings are insufficiently lubricated when the system is turned on.
- Make sure the suction line is always filled with hydraulic fluid during commissioning and operation.

Mixing hydraulic fluids!
Product can be damaged!
- Before installation, remove all fluids from the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/system.
- Never mix hydraulic fluids from different manufacturers or different types from the same manufacturer.

NOTICE

Contamination of hydraulic fluid!

The cleanliness of the hydraulic fluid considerably impacts the service life of the axial piston unit. Contamination of the hydraulic fluid can cause premature wear and malfunctions!

- Always ensure a work environment in the installation site that is free from dust and foreign particles to prevent foreign particles, e.g., welding beads or metal cuttings, from entering the hydraulic lines and leading to wear and malfunctions in the product. The axial piston unit must be clean when installed.
- Only use clean ports, hydraulic lines and assembled parts (e.g. measuring devices).
- When plugging the ports, no contamination must ingress.
- Before commissioning, ensure that all hydraulic connections are tight and that all seals are correctly installed and undamaged to prevent fluids and foreign particles from entering the product.
- Filter the hydraulic fluid when filling the system with a suitable filter system to minimize the solid particle contamination and water in the hydraulic system and to achieve the required cleanliness level.

Improper cleaning!

Product can be damaged!

- Plug all openings with appropriate protective devices in order to prevent cleaning agents from entering the axial piston unit.
- Never use solvents or aggressive cleaning agents. Use only water and, if necessary, a mild cleaning agent to clean the axial piston unit.
- Please refer to chapter 10.1 "Cleaning and care" on page 57

Environmental pollution due to improper disposal!

Careless disposal of the axial piston unit and its assembled parts, the hydraulic fluid and the packaging material can cause environmental pollution!

- Dispose of the axial piston unit, hydraulic fluid and packaging in accordance with the regulations in your country.
- Dispose of the hydraulic fluid in accordance with the applicable safety data sheet for the hydraulic fluid.

Danger from chemical or corrosive environmental conditions!

Product can be damaged! Corrosion or, in extreme cases, a loss of function can result if the axial piston unit is exposed to chemical or corrosive environmental conditions, e.g. sea water, fertilizer, or road salt. Leaks may lead to leakage of hydraulic fluid.

- Take appropriate measures to protect the axial piston unit from chemical or corrosive environmental conditions.

NOTICE

Leakage or spilling of hydraulic fluid!
Risk of environmental pollution and contamination of ground water!
- Always place a drip tray under the axial piston unit when filling and draining hydraulic fluid.
- Use a suitable binding agent to collect any leaked hydraulic fluid.
- Observe the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

Danger from hot components!
Nearby products can be damaged! Neighboring products may be damaged if installed without sufficient safety distances, due to the heat development in components (e.g. solenoids).
- When installing the axial piston unit, check the safety distances to nearby products to ensure that they are not damaged.

The warranty only applies to the machine configuration as delivered.
The warranty will be voided if the product is incorrectly installed, commissioned or operated, or if it is used or handled improperly.
The warranty will also be voided if the product is serviced by anyone other than Bosch Rexroth Service or is not serviced within the specified intervals.

3.1 Operator's obligations

The operator has the obligation to check in the order confirmation that the axial piston unit supplied corresponds to the category needed and the related zone.

4 Scope of delivery

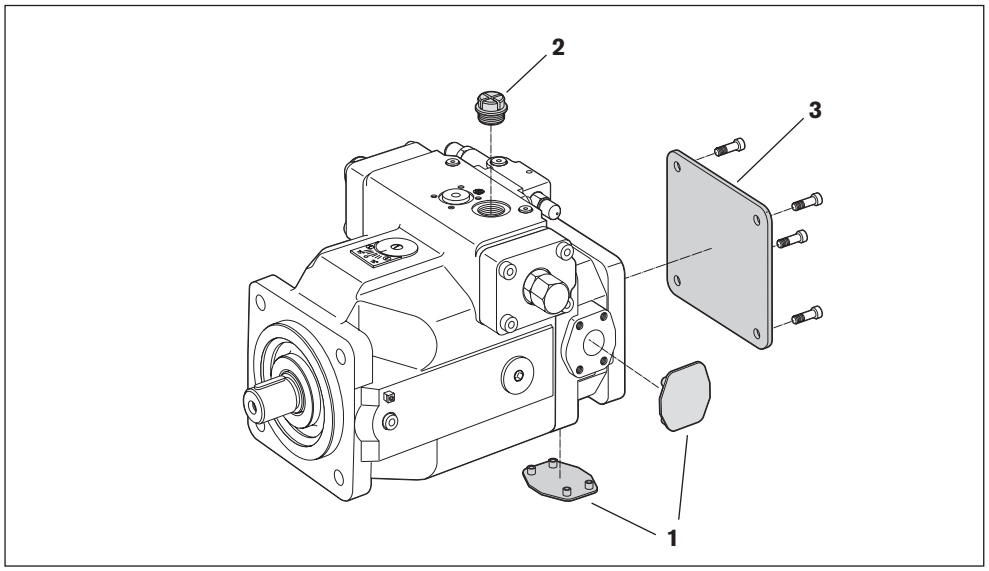


Fig. 1: Axial piston unit

The following is included in the scope of delivery:
- Axial piston unit as per order confirmation
- Operating instructions

The following parts come assembled on the unit:
- Protective covers (**1**)
- Protective plug/threaded plugs (**2**)
- For version with through drive, metallic protective cover and fixing screws (**3**)

Flange cover on version with universal through drive plugged and pressure-proof.

5 About this product

5.1 Performance description

The Axial piston variable pump generates, controls and regulates a hydraulic fluid flow. It is designed for stationary applications.
Refer to the data sheet (Part II) and the order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

5.2 Product description

The A4VSO ATEX is a variable pump with axial piston rotary group in swashplate design for hydrostatic drives in open circuits. Flow is proportional to drive speed and displacement.
The flow can be continuously adjusted by controlling the swashplate (cradle) (**13**). For axial piston units in swashplate design, the cylinder (**10**) with pistons (**11**) is aligned along the axis of the drive shaft (**1**).

Open circuit

In the open circuit, the hydraulic fluid flows from the reservoir to the hydraulic pump and is transported from there to the consumer via a directional valve. From the consumer, the hydraulic fluid is returned to the reservoir via a directional valve.

5.2.1 Axial piston unit layout

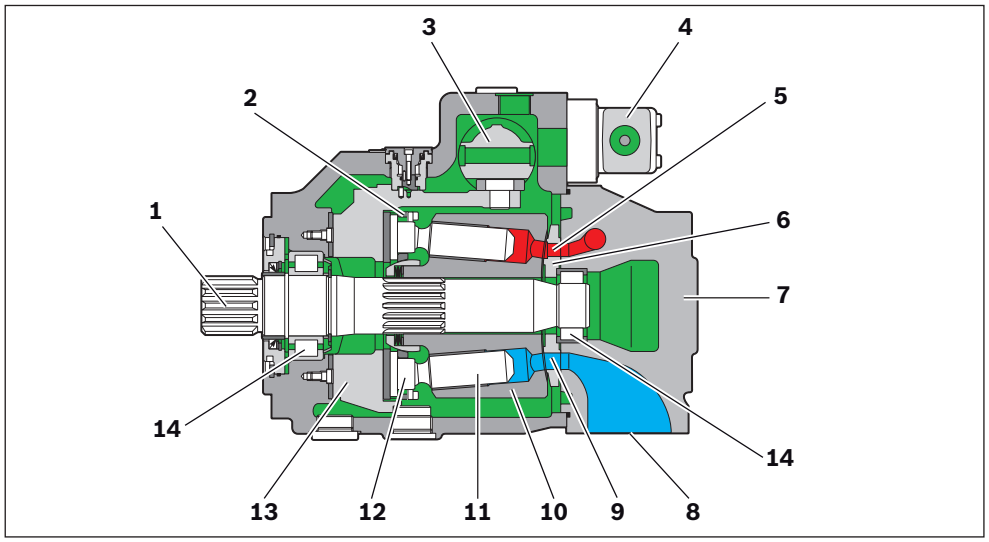


Fig. 2: Layout of the A4VSO ATEX

1 Drive shaft
2 Retaining plate
3 Stroking piston
4 Control valve DR
5 High-pressure side
6 Distributor plate
7 Port plate
8 Suction port
9 Suction side
10 Cylinder
11 Piston
12 Piston-slipper pad
13 Cradle
14 Cylinder roller bearing

5.2.2 Functional description

Pump

Torque and rotational speed are applied to the drive shaft (**1**) by a drive motor. The drive shaft is connected by splines to the cylinder (**10**) to set this in rotation. With every revolution, the pistons (**11**) complete a stroke in the cylinder bores, the size of which depends on the pitch of the cradle (**13**). The slipper pads (**12**) are held on with the pistons and guided along the glide surface of the cradle by the retaining plate (**2**). The pitch of the swashplate during a revolution causes each piston to move over the bottom and top dead centers and back to its initial position. During this sequence, hydraulic fluid is fed in and drained out through the two control slots in the distributor plate (**6**) according to displacement. On the high-pressure side (**5**), the hydraulic fluid is pushed out of the cylinder chamber and into the hydraulic system by the pistons. At the same time, hydraulic fluid flows into the expanding piston chamber on the low-pressure side (**9**). In an open circuit, this sequence is supported by the return flow and boost pressure.

Control

The swivel angle of the cradle (**13**) is continuosly adjustable. Controlling the swashplate swivel angle changes the piston stroke and, therefore, the displacement. The swivel angle is changed hydraulically via the control valve (**4**) or the stroking piston (**3**). The cradle is mounted in swivel bearings for easy movement and the neutral position is spring-centered. Increasing the swivel angle increases the displacement; reducing the angle reduces displacement accordingly.

Additional information on the control devices, e.g. the circuit diagram or characteristic curves, can be found in the data sheet (Part II).

The following warning note relates to all axial piston units with central position as basic setting of the pump:

⚠ CAUTION

The spring feedback feature in the control module is not a safety device!

The control module can stick in an undefined position by internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.

- Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

5.3 Product identification

5.3.1 Axial piston unit name plate

The axial piston unit can be identified by the name plate.

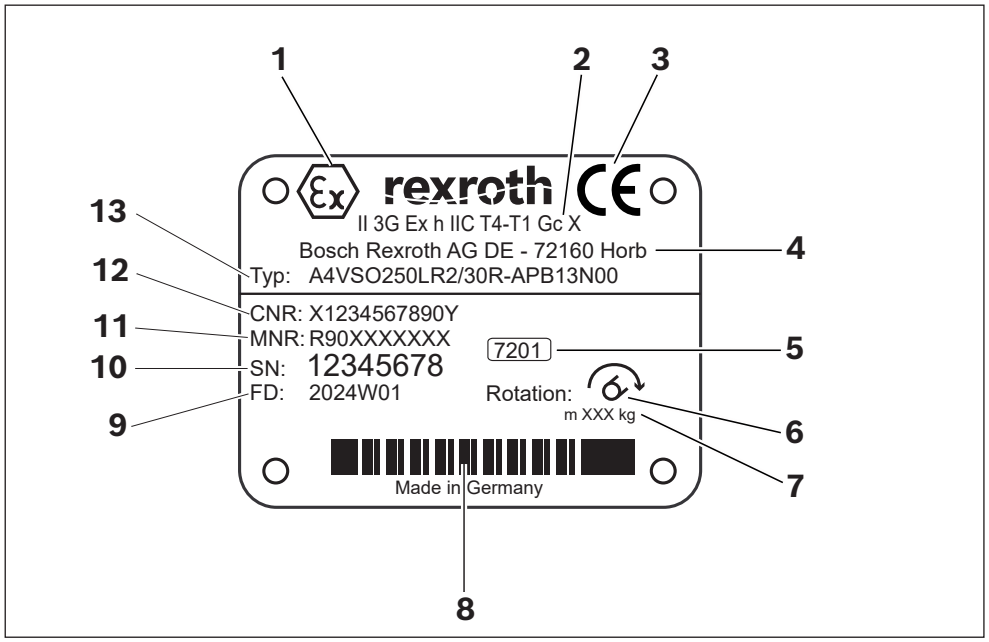


Fig. 3: Name plate A4VSO ATEX

1 Explosion protection marking
2 Marking for protection class according to EU Directive 2014/34/EU (explosion protection directive) and marking for the ignition protection type of the mechanical part according to DIN EN ISO 80079-36 and 37
3 CE mark
4 Manufacturer name and address
5 Internal plant designation
6 Direction of rotation (viewed on drive shaft) – here: clockwise
7 Weight (optional)
8 Bar code
9 Manufacturing date
10 Serial number/production number
11 Material number of the axial piston unit
12 Customer material number
13 Type code

5.3.2 Explosion protection marking

This chapter explains the codes for the protection class markings.

Comparison of equipment groups/ categories and associated zones

Table 7 contains the equipment groups/categories according to 2014/34/EU and the corresponding zones according to 1999/92/EC as well as the equipment group and the equipment protection level according to DIN EN ISO 80079-36.

Table 6: Comparison of equipment groups/categories and zones

Usable in zone according to 1999/92/EC	Equipment group according to Directive 2014/34/EU	Category according to 2014/34/EU	Application/characteristics (excerpt from the directives)	Equipment group according to DIN EN ISO 80079-36	Equipment protection level (EPL) according to DIN EN ISO 80079-36
–	I	M1	Areas with firedamp atmospheres (Equipment Group I), i.e., underground mines and their surface installations. Continued operation is possible in the event of an explosive atmosphere. Very high level of safety	I	Ma
–		M2	Areas with firedamp atmospheres (Equipment Group I), i.e., underground mines and their surface installations. In the event of an explosive atmosphere, it must be possible to switch off the device. High level of safety	I	Mb
0, 1, 2	II	1G	Explosive areas in which explosive gases, mists or vapors (Equipment Group II) occur constantly or for long periods or frequently. Corresponds to Zone 0 per Directive 1999/92/EC. Very high level of safety	II	Ga
1, 2		2G	Explosive areas in which explosive gases, mists or vapors (Equipment Group II) occur occasionally. Corresponds to Zone 1 per Directive 1999/92/EC. High level of safety	II	Gb
2		3G	Explosive areas in which combustible gases, mists or vapors (Equipment Group II) do not normally occur or occur only infrequently or briefly. Corresponds to Zone 2 per Directive 1999/92/EC. Normal level of safety	II	Gc
20, 21, 22		1D	Explosive areas in which combustible dust/air mixtures (Equipment Group III) occur constantly or for long periods or frequently. Corresponds to Zone 20 per Directive 1999/92/EC. Very high level of safety	III	Da
21, 22		2D	Explosive areas in which combustible dust/air mixtures (Equipment Group III) occur occasionally. Corresponds to Zone 21 per Directive 1999/92/EC. High level of safety	III	Db
22		3D	Explosive areas in which an explosive atmosphere caused by dust in the air (Equipment Group III) does not normally occur or occurs only infrequently or briefly. Corresponds to Zone 22 per Directive 1999/92/EC. Normal level of safety	III	Dc

Categorization of gases, mists and vapors into explosion groups

Gases, mists and vapors are categorized into the explosion (sub)groups IIA, IIB and IIC according to their ignition resistance, i.e., their ability to conduct or prevent an explosion through a narrow gap. Ignition resistance is a measure of the risk of a gas exploding. Explosion Group IIA contains the less dangerous materials; Explosion Group IIC contains the most dangerous materials. Products in a given explosion group should also always be used in areas with lower risk.

Table 7: Categorization of gases, mists and vapors into explosion groups

Explosion group	Examples of gases, mists and vapors	Danger
IIA	Acetone, ammonia, gasoline, benzene, carbon monoxide, ethyl alcohol, methane, hydrogen sulfide, propane	Moderate
IIB	Ethylene, coal gas, acetaldehyde	High
IIC	Hydrogen, carbon disulfide, acetylene	Very high

Refer to the technical literature for further material classifications as needed.

Temperature classes

In explosive areas at risk from explosive gases, mists or vapors (zones 0, 1, 2 specified for Equipment Group II, categories 1G, 2G and 3G), also note that the maximum surface temperature of the axial piston unit must be below the ignition temperature of the surrounding explosive gas, mist or steam.
The categorization of an Equipment Group II operating fluid into temperature classes T1 through T6 according to its maximum surface temperature indicates the suitability of the operating fluid for use in explosive areas at risk from explosive gases, mists or vapors.

Table 8: Temperature classes

Temperature class according to DIN EN ISO 80079-36	Maximum surface temperature	Permissible ignition temperature of the gas, mist or steam
T1	450 °C	> 450 °C
T2	300 °C	> 300 °C
T3	200 °C	> 200 °C
T4	135 °C	> 135 °C
T5	100 °C	> 100 °C
T6	85 °C	> 85 °C

Type of protection

The type of protection describes the type of measures taken to prevent the ignition of a surrounding explosive atmosphere.

Table 9: Type of ignition protection

Type of ignition protection	Meaning	Relevant for	
		non-electrical devices	Electrical apparatus
Ex h	Control of ignition sources	X	–
Ex h	Constructional safety	X	–
Ex d	Flameproof enclosures	X	X
Ex eb, ec	Increased safety	–	X
Ex h	Fluid encapsulation/liquid immersion	X	–
Ex ob, oc	Oil encapsulation/liquid immersion	–	X
Ex px, py, pz	Pressurized enclosure	X	X
Ex qb	Powder filling	–	X
Ex ma, mb, mc	Encapsulation	–	X
Ex ia, ib, ic	Intrinsic safety	–	X

6 Transport and storage

⚠ DANGER

Risk of explosion by explosive atmosphere!

Static discharges and sparking resulting from material contact in an explosive atmosphere may cause explosions that can result in serious injury or even death.

- ▶ Do not transport or store the axial piston unit in explosive areas.
- ▶ Do not unpack or pack the axial piston unit in explosive areas.

⚠ CAUTION

Risk of damage!

Striking or impact forces could damage the axial piston unit.

- ▶ Do not strike the coupling or drive shaft of the axial piston unit.
- ▶ Do not set/place the axial piston unit on the drive shaft.
- ▶ Do not strike sensitive assembled parts (e.g., sensors or valves).
- ▶ Do not strike sealing surfaces (e.g., on the suction port or through drive).

- ▶ Always observe the required ambient conditions for transport and storage; see chapter 6.2 "Storing the axial piston unit" on page 29.

Information on unpacking can be found in chapter 7.1 "Unpacking" on page 31.

6.1 Transporting the axial piston unit

The following optional means of transport can be applied depending on the weight and duration of transport:

- Transport by hand
- Transporting with a lifting device (eye bolt or lifting strap)

Dimensions and weights

Table 10: Dimensions and weights

Size		40	71	125	180	250	355	500
Weight	kg	39	53	88	102	184	207	320
Width	mm	Dimensions vary by equipment. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary).						
Height	mm							
Depth	mm							

Weight may vary by equipment.

6.1.1 Transport by hand

Up to a specific maximum weight, axial piston units can be transported by hand for a short distance. Observe the national regulations in your country. To prevent health damage, we recommend renouncing any transport by hand.

CAUTION! Risk of injury due to heavy loads!
Health hazard from carrying axial piston units.
Only manually transport the axial piston unit for a short period of time.
Observe the national regulations in your country for manual transport.

- Always use appropriate lifting, lowering and moving techniques.
- Use your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).

- Do not transport the axial piston unit by sensitive assembled parts (e.g. sensors or valves).
- Carefully place the axial piston unit on the seating to prevent it from being damaged.

6.1.2 Transport with lifting devices

For transporting, the axial piston unit can be connected to a lifting device via an eye bolt or a lifting strap.

Transporting with eye bolt

The axial piston unit can be transported suspended from an eye bolt screwed into the drive shaft as long as only outward (pulling) axial forces are applied.

- For all female threads, use a stud end from the same system of units and of the correct size.
- To do this, screw an eye bolt completely into the female thread on the drive shaft. The thread size is indicated in the installation drawing.
- Make sure that the eye bolt can bear the total weight of the axial piston unit plus 20%.

You can lift the axial piston unit as shown in Fig. 4 with the eye bolt screwed into the drive shaft.

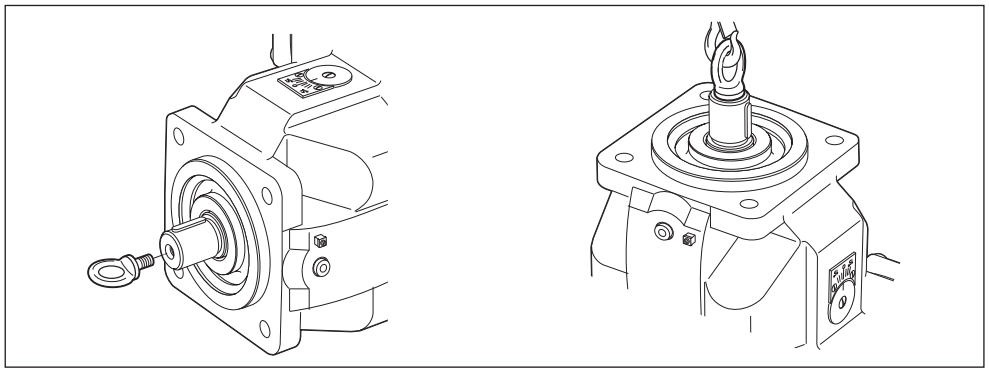


Fig. 4: Mounting the eye bolt in the drive shaft

Transport with lifting strap

WARNING! Danger due to suspended loads!
During transport with lifting strap, the axial piston unit can topple out of the lifting strap and cause injury.

- Use the widest possible lifting strap.
- Make sure that the axial piston unit is securely fixed with the lifting strap.
- Only guide the axial piston unit by hand for fine positioning and to avoid swinging.
- Never step or grip under suspended loads.

- ▶ Place the lifting strap around the axial piston unit in such a way that it neither passes over the assembled parts (e.g., valves, sensors) nor that the axial piston unit is hung from assembled parts.

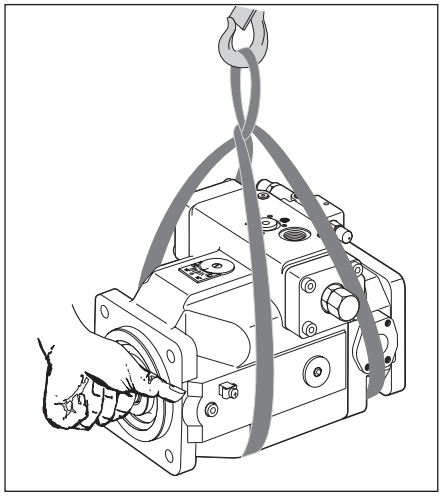


Fig. 5: Transport with lifting strap

6.2 Storing the axial piston unit

Requirement

- Storage areas must be free of corrosive materials and gases.
- To prevent damage to the seals, do not operate ozone-forming equipment (e.g. mercury-vapor lamps, high-voltage equipment, electric motors, sources of electrical sparks or electrical discharge) in storage areas.
- Storage areas must be dry.
  Recommended relative humidity ≤ 60%.
- Ideal storage temperature: +5 °C to +20 °C.
- Minimum storage temperature: -25 °C.
- Maximum storage temperature: +60 °C.
- Keep out of direct sunlight.
- Do not stack axial piston units and store them in a shock-proof manner.
- Do not store the axial piston unit on the drive shaft or assembled parts, e.g. sensors or valves.
- For further storage conditions, see Table 11.

- ▶ Check the axial piston unit monthly to ensure professional storage.

After delivery

The axial piston units come in corrosion protection packaging (corrosion protection film) provided at the factory.
Table 11 lists the maximum permissible storage times for an unpackaged axial piston unit as per data sheet 90312.

Table 11: Storage time with factory-supplied corrosion protection

Storage conditions	Standard corrosion protection	Long-term corrosion protection
Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film.	Maximum 12 months	Maximum 24 months

The warranty will be voided if the requirements and storage conditions are not observed or after expiration of the max. storage time (see Table 11).

After the maximum storage time has elapsed, have the axial piston unit checked by Bosch Rexroth Service; for the address, see chapter 10.5 "Repair" on page 63.

After removal

An uninstalled axial piston unit must be preserved with corrosion protection for the storage time.

The following instructions only refer to axial piston units operated with mineral oil-based hydraulic fluid.

Bosch Rexroth recommends the following procedure:

1. Clean the axial piston unit; see chapter 10.1 "Cleaning and care" on page 57.
2. Drain the axial piston unit.
3. For storage times up to 12 months: Moisten the inside of the axial piston unit with mineral oil and fill with approx. 100 ml mineral oil.
   For storage times up to 24 months: Fill the axial piston unit with VCI corrosion protection oil (20 ml).
   Filling is performed via the drain port **T** or **R(L)**, see chapter 7.4 "Installing the axial piston unit", Fig. 13 on page 45.
4. Plug all ports so they are airtight.
5. Coat unpainted areas of the axial piston unit with mineral oil or suitable, easily removable corrosion protection, e.g. acid-free grease.
6. Pack the axial piston unit with desiccant in an airproof manner in corrosion protection film.
7. Store the axial piston unit in a non-explosive area and in such a manner that it is protected against shocks; see "Requirement" on page 29 in this chapter.

7 Installation

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust

Serious injury caused by blast pressure and fire may result.

- ▶ Only carry out installation work in a non-explosive atmosphere.
- ▶ The system operator is responsible for ensuring the appropriate ambient conditions. The operator is also responsible for installation.

Prior to installation, the following documents must be to hand:

- Data sheet (part II) of the axial piston unit (contains the permissible technical data, main dimensions, and circuit diagrams of standard ATEX versions)
- Installation drawing for the axial piston unit (can be obtained from your contact person at Bosch Rexroth, if required)
- Hydraulic circuit diagram for the axial piston unit (in the data sheet and on the installation drawing)
- Hydraulic circuit diagram for the machine/system (available from the machine/system manufacturer on request)
- Order confirmation (contains the order-related technical data for your axial piston unit)

7.1 Unpacking

The axial piston unit comes in a polyethylene material (PE) corrosion protection film.

DANGER! Risk of explosion and/or fire due to ignition of an explosive atmosphere or of combustible dust!
Static discharges and sparking resulting from material contact in an explosive atmosphere may cause explosions that can result in serious injury or even death.

- ▶ Do not unpack the axial piston unit in explosive areas.

CAUTION! Danger due to falling parts!
If the packaging is not opened correctly, parts may fall out and damage the parts or even result in injury.

- ▶ Place the packaging on a level underground with sufficient load-bearing capacity.
- ▶ Only open the packaging from the top.

- ▶ Remove the packaging from the axial piston unit.
- ▶ Check the axial piston unit for transport damage and completeness; see chapter 4 "Scope of delivery" on page 21.
- ▶ Verify that the operating instructions are complete by cross-checking with the table of contents. Please contact us if the operating instructions are incomplete.
- ▶ Dispose of the packaging in accordance with the regulations in your country.

7.2 Installation conditions

The installation position and location of the axial piston unit essentially determine how it is installed and commissioned (e.g. when filling and air bleeding the axial piston unit).

- Fasten the axial piston unit so that the expected forces and torque can be transferred without any danger. The machine/system manufacturer is responsible for sizing the mounting elements.
- Observe the permissible radial forces as indicated on page 7 of the data sheet (Part II) on the drive shaft when transferring output drive with radial loading. Do not use belt drives; see chapter 7.4.3 "General instructions" on page 39.
- Make sure the axial piston unit is always filled with hydraulic fluid during commissioning and operation. Also do this also after relatively long standstill periods, since the axial piston unit may drain out through the hydraulic lines.
- Install carefully and in accordance with ATEX guidelines to prevent damage to the bearings, housing, clamp collar and drive shaft.
- Direct the leakage in the housing area to the reservoir through the highest drain port. Use a line size that matches the port.
- A check valve in the drain line is only permissible on a case-by-case basis following consultation. Please consult your proper contact person at Bosch Rexroth.
- To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g. reservoir, frame parts).
- Make sure the suction, leakage, and return lines flow into the reservoir below the minimum fluid level under all operating conditions. This will prevent air from being drawn in and foam from forming.
- When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. We recommend using a baffle (baffle plate) between suction line and drain line. A baffle improves the air separation ability as it gives the hydraulic fluid more time for desorption. Apart from that, this prevents the heated return flow from being drawn directly back into the suction line. The suction port must be supplied with filtered, cooled, calmed and degassed hydraulic fluid over a sufficient period of time.
- Make sure that a minimum suction pressure of 0.8 bar absolute is present at port **S** during operation for all installation positions and installation locations of the axial piston unit; see Fig. 6. See the data sheet (Part II) for additional pressure levels.

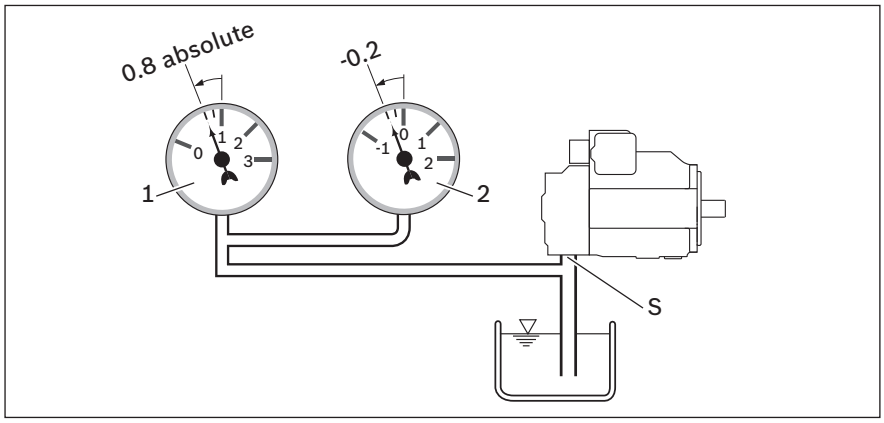


Fig. 6: Suction pressure

1 Absolute pressure gauge
2 Standard pressure gauge (relative)

The suction conditions improve with below-reservoir installation

- Make sure that the reservoir level is monitored. If the minimum level falls below a value, the axial piston unit may be damaged and its ignition protection nullified. Do not restart the machine/system until the hydraulic fluid level is once more above the minimum level.
- For Equipment Category II 2G Ex h IIC T4-T1 Gb X, the reservoir level must be monitored continuously and the system must be switched off immediately if the min. level falls below a value.
- Make sure that the working environment at the installation site is completely free of dust and foreign substances. The axial piston unit must be clean when installed. Contamination of the hydraulic fluid can considerably affect the function and service life of the axial piston unit, as well as its suitability for use in explosive areas.
- Use fiber-free cleaning cloths for cleaning.
- Use suitable mild cleaning agents to remove lubricants and other difficult-to-remove contamination. Do not allow cleaning agents to enter into the hydraulic system.
- Only clean the axial piston unit with a damp cloth; cleaning with a dry cloth could cause static electricity to build.

7.3 Installation position

⚠ DANGER

Explosion and/or fire hazard due to ignition of combustible dust or of an explosive dust-air mixture on a hot surface!
An improper installation position of the axial piston unit may result in risk of explosion due to excessive case temperature during operation. Serious injury caused by blast pressure and fire may result.

- Drain the leakage fluid at the highest port.
- For drain ports and pipeline routing conditions, see the data sheet Part II
- For above-reservoir installation and for all installation positions with the drive shaft up, make sure bearing flushing is installed at port "**U**".
- Also take care to remove dust in a timely manner in order to reduce the risk of ignition.

The following installation positions are permissible. The pipeline routing shown illustrates the basic layout.

Select the installation location outside of the range of influence of pulsating parts, e.g. cardan shaft.

Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Key	
R(**L**) (**F**)	Filling/air bleeding
S	Suction port
T	Drain port
U	Flushing port
$\mathbf{K}_1$, $\mathbf{K}_2$	Flushing port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to reservoir bottom (100 mm)
$h_{S\ max}$	Maximum permissible suction height (800 mm)

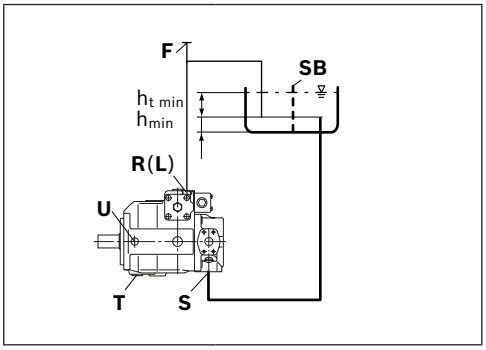
7.3.1 Below-reservoir installation (standard)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

Recommended installation position: 1 and 2.

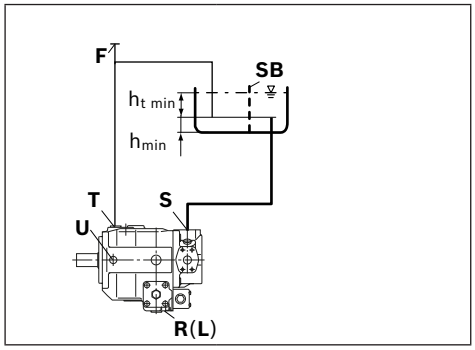
Installation position 1

Air bleed	Filling
R(L) (F)	S + R(L) (F)



Installation position 2

Air bleed	Filling
T (F)	S + T (F)



Installation position 3

Air bleed	Filling
T + U (F)	S + T + U (F)

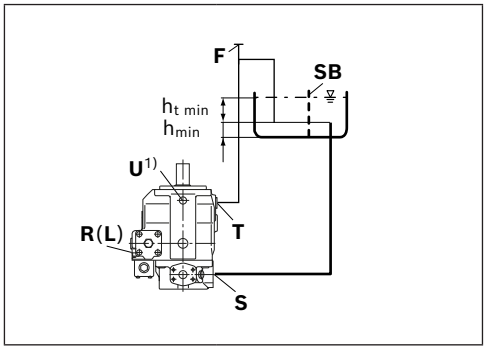


Fig. 7: Below-reservoir installation with horizontal installation position 1, 2 and vertical installation position 3

1) Install bearing flushing, see data sheet (Part II) for minimum flushing volume

7.3.2 Inside-reservoir installation

NOTICE

Risk of damage with inside-reservoir installation!

To prevent damages to the axial piston unit, all plastic parts (e.g. protective caps, covers) must be removed prior to installation in the reservoir.

- Remove all plastic parts before installing the axial piston unit in the reservoir. Make sure that no parts of them remain in the reservoir.
- Axial piston units with electrical component must not be installed below the hydraulic fluid level.

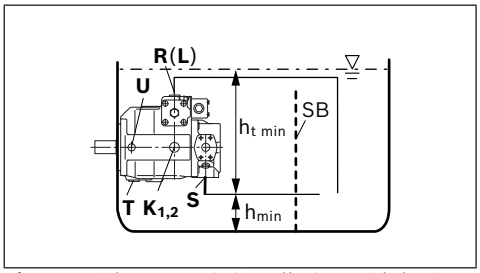
Inside-reservoir installation is when the axial piston unit is installed in the tank below the minimum hydraulic fluid level. The axial piston unit is completely below the hydraulic fluid.

If the minimum fluid level is equal to or below the upper edge of the pump, see chapter 7.3.3 "Above-reservoir installation".

Our advice is to fit a suction pipe to the suction port "**S**" and to fit a pipe to case drain port "**R**(**L**)" or "**T**". In this case, the other ports must be plugged, except the bearing flushing "**U**" for installation position "drive shaft up". When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. The housing of the axial piston unit must be filled before fitting the piping and filling the reservoir with hydraulic fluid. To prevent draining of the housing, the reservoir has to be filled with hydraulic fluid as soon as possible.

Installation position 3

Air bleed	Filling
R(L)	R(L) + U



Installation position 4

Air bleed	Filling
T + U	T + U

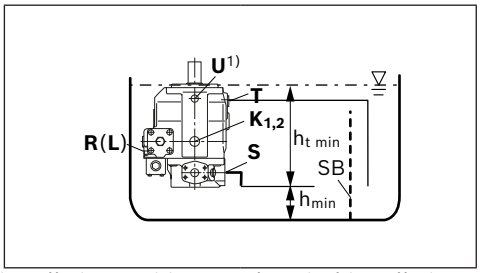


Fig. 8: Inside-reservoir installation with horizontal installation position 3 and vertical installation position 4

[1)] Install bearing flushing, see data sheet (Part II) for minimum flushing volume

7.3.3 Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir.

To guarantee lubrication of the front bearing and of the shaft seal with above-reservoir installation, Rexroth specifies a working bearing flushing at port "**U**".

CAUTION

Risk of damage due to inadequate lubrication!

Ensure adequate lubrication to avoid damage to the axial piston unit.

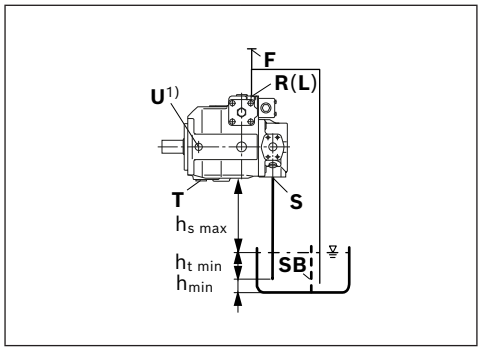
- Make sure the housing is completely filled with hydraulic fluid during commissioning and operation when installed with the drive shaft up (e.g., no air inclusions).
- Check the hydraulic fluid level in the housing area regularly and perform recommissioning if necessary. For above-reservoir installation, the housing area may drain out through the drain line after prolonged standstill periods (air enters through the shaft seal) or through the working line (gap leakage). The bearings are thus insufficiently lubricated when recommissioning.
- Make sure that the suction line is always filled with hydraulic fluid during commissioning and operation.
- Make sure that the bearing flushing is working properly for above-reservoir installation and in all installation positions with the drive shaft up. To do this, check e.g. the flushing pressure or the minimum flushing flow, see data sheet (Part II).

Observe the maximum permissible suction height $\mathbf{h_{s\,max}}$ = 800 mm. The permissible suction height $\mathbf{h_s}$ is derived from the total pressure loss.

Above-reservoir installation is not recommended for sizes 180 to 500.

Installation position 5

Air bleed	Filling
R(L)	R(L) + U



Installation position 6

Air bleed	Filling
T + U	T + U

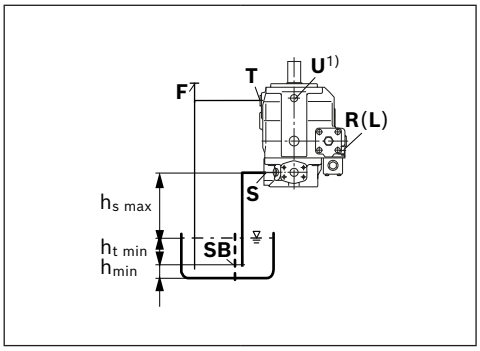


Fig. 9: Above-reservoir installation with horizontal installation position 5 and vertical installation position 6

[1] Install bearing flushing, see data sheet (Part II) for minimum flushing volume

7.4 Installing the axial piston unit

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust due to sparks caused by electrostatic discharge!
Installing the axial piston unit on an electrically non-conductive base plate or port plate may cause explosions due to electrostatic discharge that may result in serious injury or even death.

- Install the axial piston unit on an electrically conductive base plate or port plate.
- Include the base plate and port plate in the potential equalization connection.
- Hydraulic hoses must be suitable for ATEX and have to be grounded separately.
- The A4VSO ATEX features a ground connection on the housing. This generally has to be included in the potential equalization to prevent a buildup of electrostatic charge.
- Also take care to remove dust in a timely manner in order to reduce the risk of ignition.

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust due to sparks caused by electrostatic discharge!
The use of components with different material characteristics (material pairing) and different ignition properties may cause to explosions due to electrostatic discharge that may result in serious injury or even death.

- Check whether the explosion protection marks on the name plates of the axial piston unit match the information in these operating instructions.
- Check whether the explosion protection class and temperature class correspond to the zone classification in the explosion protection document of the system.
- Also take care to remove dust in a timely manner in order to reduce the risk of ignition.

7.4.1 Preparation

1. Check the specifications on the name plate of the axial piston unit to see if the correct type of variable pump is present.
2. Compare the material number and designation (type code), required ATEX category and related zone with the details in the order confirmation.

If the material number for the axial piston unit does not match the one in the order confirmation, contact your local contact person for clarification. You can find their contact information at www.boschrexroth.com/addresses
For the address, also see chapter 10.5 "Repair" on page 63.

3. Before installing, completely drain the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/system.

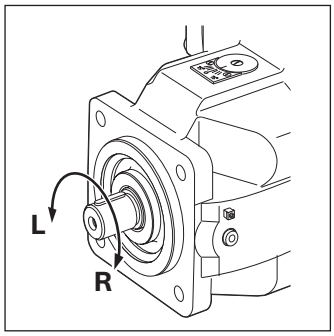


Fig. 10: Direction of rotation

L Counter-clockwise
R Clockwise

The direction of rotation as indicated on the name plate determines the direction of rotation of the axial piston unit as viewed on the drive shaft; see chapter 5.3 "Product identification" on page 24. For information on the direction of rotation of the drive motor, please refer to the drive motor manufacturer's operating instructions.

4. Check the direction of rotation of the axial piston unit (on the name plate) and make sure that this corresponds to the direction of rotation of the drive shaft at the drive motor.
5. Check the swivel angle indicator (**1**) on the axial piston unit.

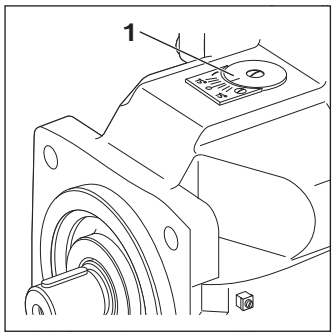


Fig. 11: Swivel angle indicator

If swivel angle "0" is not indicated at the swivel angle indicator, hydraulic fluid is pumped by the axial piston unit immediately after activation.

7.4.2 Dimensions

For standard ATEX versions, the data sheet (part II) contains all required installation dimensions as well as the position and dimensions of the ports.
If necessary, an installation drawing can be requested. Also observe the manuals provided by the manufacturers of the other hydraulic components when selecting the required tools.

7.4.3 General instructions

Follow these general notices when installing the axial piston unit:

- Note that certain installation positions will affect the control system. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in response time.
- Torsional vibrations and speed variations may cause increased rotary angular acceleration of the rotary group of the axial piston unit. Diesel drives with a small number of cylinders and low flywheel mass are at particular risk.

Do not use a belt drive the A4VSO ATEX due to the buildup of static electricity.

- On the drive of an axial piston unit, a cardan shaft may cause vibrations and impermissible rotary angular accelerations. Depending on the frequency and temperature, this may cause leaks in the shaft seal and damage the rotary group.
- If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain lines have to be installed (see chapter 8).
- Excessive case pressure or excessive pressure peaks can cause wear, leaks and excessive temperatures in the shaft seal, creating a risk of sparks (see also chapter 2.6 "Product-specific safety instructions" on page 11).

The version of installation for the axial piston unit depends on the connecting elements to the drive side. The following descriptions explain the installation of the axial piston unit:
- With a coupling
- On a gearbox
- With cardan shaft

7.4.4 Installation with a coupling

The following describes how to assemble the axial piston unit with a coupling:

NOTICE! Danger from improper handling!
Product can be damaged!
- ▶ Do not install the coupling hub on the drive shaft of the axial piston unit by striking it.

1. Install the specified coupling half on the drive shaft of the axial piston unit according to the information of the coupling manufacturer.

The drive shaft of the axial piston unit is equipped with a female thread. Use this female thread to pull the coupling element onto the drive shaft. The size of the female thread can be seen in the installation drawing.

2. Clamp the coupling hub onto the drive shaft or ensure permanent lubrication of the drive shaft. This prevents the formation of frictional corrosion and the associated wear. Moreover, this prevents relative movement which could cause heat or sparks to form.
3. Transport the axial piston unit to the installation location.
4. Make sure that the installation location is clean and free from dirt and foreign particles.
5. Install the coupling on the output shaft of the drive motor in accordance with the specifications provided by the coupling manufacturer.

Do not fasten down the axial piston unit until the coupling has been correctly assembled.

6. Fasten the axial piston unit at the installation location.
7. Align the drive shaft of the axial piston unit and the output shaft of the drive motor so there is no angular deviation.
8. Make sure no excessive axial and radial forces are acting on the drive shaft.
9. For bell housing installation, check the coupling axial play through the bell window according to the manufacturer's specifications.
10. Details on the required tools and tightening torques for the fixing screws are available from the machine/system manufacturer.
11. Use the shaft collar as a stop for the coupling. The coupling must not grind on stationary parts. When using elastic couplings, maintain an air gap to the housing so that no sparking can occur through material contact. When using elastic couplings, make certain that a sufficiently large air gap to the housing is present, even during operation.
12. When using elastic couplings, check that the drive does not resonate after completing the installation.

7.4.5 Installation on a gearbox

The following describes how to assemble the axial piston unit on a gearbox. After installing on a gearbox, the axial piston unit is covered and is difficult to access:

- Therefore, before installing, make sure the spigot diameter centers the axial piston unit and that no excessive axial or radial forces act on the drive shaft of the axial piston unit (installation length).
- Protect the drive shaft against frictional corrosion by ensuring permanent lubrication.
- Maintain a sufficiently large air gap between the coupling and the housing so no sparking or heat buildup can occur through material contact.
- Fasten the axial piston unit at the installation location.

For attachment via gear wheel or helical gear shaft

No spline forces higher than the permissible axial and radial forces should act on the shaft; if necessary, support the gear wheel at the gearbox output separately.

7.4.6 Installation with cardan shaft

To connect the axial piston unit to the drive motor via a cardan shaft:

1. Position the axial piston unit near the intended installation location. Allow enough space for the cardan shaft to fit through on both sides.
2. Place the cardan shaft on the output shaft of the drive motor.
3. Push the axial piston unit to the cardan shaft and place the cardan shaft on the drive shaft of the axial piston unit.
4. Bring the axial piston unit to the installation position and fasten it. Details on the required tools and tightening torques for the fixing screws can be obtained from the system manufacturer if required.

7.4.7 Completion of installation

1. Remove any installed transport screws.

CAUTION! Operation with protective plugs!
Operating the axial piston unit with protective plugs may result in injury or damage to the axial piston unit.

- ▶ Before commissioning, remove all protective plugs and replace them with suitable, pressure-resistant connecting fittings.

2. Remove the transport protection.
   The axial piston unit comes with protective covers (**1**) and protective plugs (**2**). They are not pressure-resistant and have to be removed prior to connection. Use a suitable tool for this to prevent damage to the sealing and functional surfaces. If sealing or functional surfaces are damaged, contact your Bosch Rexroth service partner or the service department of the manufacturer's plant of the axial piston unit.

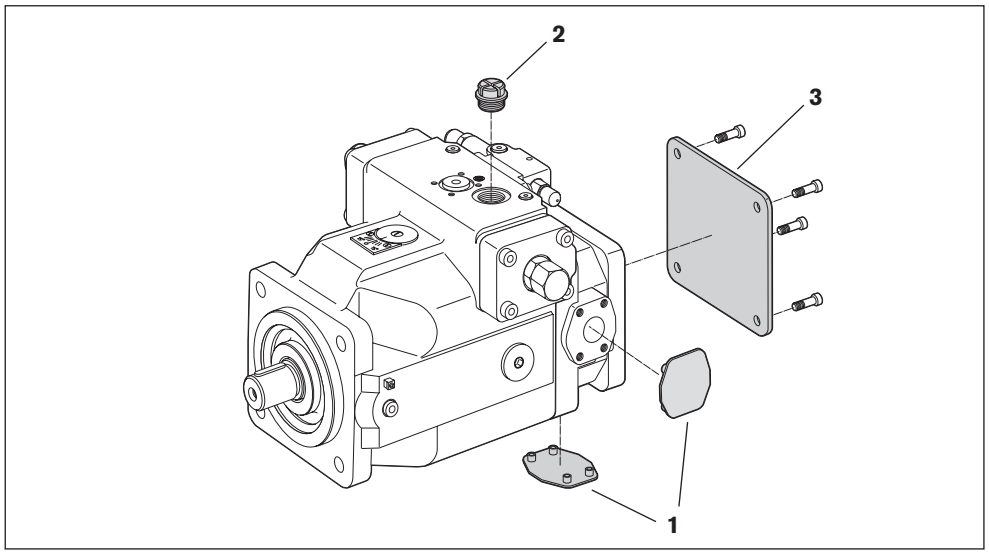


Fig. 12: Removing transport protection

1 Protective covers
2 Protective plugs/threaded plugs
3 For version with through drive, flange cover and fixing screws

Ports intended for connecting lines come with protective plugs and/ or threaded plugs, which serve as transport protection. Connect all ports required for functional operation (see Table 12 "Ports A4VSO" on page 45). Non-compliance could lead to malfunctions or damage. If a port is not connected, plug it with a threaded plug since the protective plugs are not pressure-resistant.

The setting screws are protected against unintentional adjustment by caps. Adjusting the setting screws will render the warranty void. If you need to change the settings, please contact your local contact person. You can find their contact information under `www.boschrexroth.com/addresses`

3. For versions with through drive, install the auxiliary pump according to the pump manufacturer's manual. Since the protective cover (**3**) is not pressure-resistant, using it during operation is not permissible.

7.4.8 Hydraulically connecting the axial piston unit

NOTICE

Insufficient suction pressure!
Generally, a minimum permissible suction pressure at port **S** is specified for axial piston pumps in all installation positions. If the pressure at port **S** drops below the specified values, damage may occur which may lead to the destruction of the axial piston pump!

- Make sure the required suction pressure is maintained. This is influenced by:
  - The piping (e.g. suction cross-section, pipe diameter, length of suction line)
  - The position of the reservoir
  - The viscosity of the hydraulic fluid
  - A filter element or check valve in the suction line (check the level of contamination of the filter element regularly)
  - The geodesic height of the place of use

The machine/system manufacturer is responsible for dimensioning of the lines. Connect the axial piston unit to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine/system manufacturer.
The ports and fastening threads are designed for the maximum permissible pressures p_{max} of the respective ports, see Table 12 "Ports A4VSO" on page 45.
The machine/system manufacturer is required to ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

Connect only hydraulic lines that are match the axial piston unit port (pressure level, size, system of units).

Information on routing of lines

Observe the following information when routing the suction, pressure and drain lines.

- Lines and hoses must be assembled without pretension, so that no further mechanical forces are applied during operation that will reduce the service life of the axial piston unit and, if applicable, the entire machine/system.
- Use suitable seals as sealing material.
- Suction line (pipe or hose)
  - The suction line should be as short and straight as possible.
  - Measure the cross-section of the suction line so that the pressure at the suction port does not drop below the minimum permissible pressure. Make sure the maximum suction pressure is not exceeded (e.g. when prefilling).
  - Make sure the connections and connecting elements are airtight.
  - The hose must be pressure-resistant, also to external air pressure.
- Pressure line
  - For the pressure lines, use only pipes, hoses and connecting elements rated for the working pressure range specified on the data sheet (Part II); see Table 12.
- Drain line
  - Always route the drain lines so that the housing is constantly filled with hydraulic fluid and to ensure no air gets through the shaft seal, even during extended standstill periods.
  - Under no operating circumstances may the case pressure exceed the limit values specified for the axial piston unit in the data sheet (Part II).
  - The drain line inflow in the reservoir must always be below the minimum fluid level (see chapter 7.3 "Installation position" on page 34).
- If the axial piston unit is equipped with assembled screw fittings, do not remove them. Screw the stud end of the fitting directly into the assembled fitting.

Risk of confusion with threaded connections

Axial piston units are used in application areas that use the metric system as well as the Anglo-American (imperial) and the Japanese measuring system (JIS – **J**apan **I**ndustrial **S**tandard). Various kinds of seals are also used.
The system of units, the kind of seal and the size of female thread and stud ends (e.g. threaded plug) must all match.
There is a risk of confusion due to the limited ways of visually telling them apart.

WARNING!Leaky and bursting stud ends!
If a stud end with a measurement system, seal type and size that are different from the female thread is pressurized, the threaded plug may loosen itself or even be propelled out of the hole. This can result in serious injury and property damage. Hydraulic fluid can escape from this leakage point.

- ▶ Use the drawings (installation drawing) to determine the required stud end for each fitting.
- ▶ Make sure the right fittings, mounting bolts and threaded plugs are installed.
- ▶ For all female threads, use a stud end from the same system of units and of the correct size.

Port overview

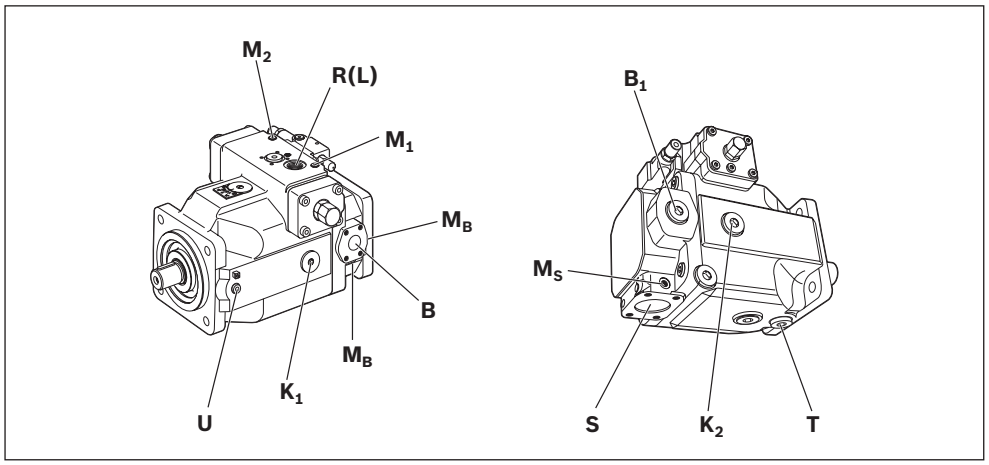


Fig. 13: Port overview A4VSO, DR control

Table 12: Ports A4VSO

Ports[1]		p_{max} [bar][3]	State[4]
B	Working port (high-pressure series) Fastening thread	400	O
B_1[5]	2nd working port (high-pressure series) Fastening thread	400	X
S	Suction port Fastening thread	30	O
K_1	Flushing port	6 absolute	X
K_2	Flushing port	6 absolute	X
M_B	Measuring working pressure	400	X
M_S	Measuring suction pressure	30	X
M_1, M_2[2]	Measuring control pressure	400	X
M_{St}	Pilot pressure measuring	400	X
R(L)	Fluid filling + air bleeding	6 absolute	
T	Fluid drain	6 absolute	
U	Flushing port (bearing flushing)	6 absolute	
X_D	Pilot pressure port for pressure controller (for DRG)	400	O
X_D	Pilot pressure port for pressure controller (for DR)	400	X
X_F	Pilot pressure port for flow controller	350	O
R_{KV}	External control fluid return (NG40 to 71 LR2..)	45	O
R_{KV}	External control fluid return (NG125 to 355 LR2..)	100	X
R_{KV}	External control fluid return (NG40 to 355 LR3..)	100	X
X_{LR}	Pilot pressure remote adjustment for power controller	100	O
$X_{1/2}$	Pilot pressure	40	O
P	Control pressure (HD..)	350	X

1) The measuring system and thread size can be found in the installation drawing.
2) Only available with NG 180 through 500
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Depending on the installation position, **T**, **K_1**, **K_2**, or **R**(**L**) must be connected (see also Installation position starting on page 34)
5) Plugged with flange plate

Tightening torques

The following tightening torques apply:

- Fittings:
  Observe the manufacturer's specifications regarding the tightening torques of the fittings used.
- Female threads in the axial piston unit:
  The max. permissible tightening torques $M_{G\,max}$ are the maximum values for the female threads and must not be exceeded. For values, see Table 13.
- Threaded plugs:
  For the metallic threaded plugs supplied with the axial piston unit, the required tightening torques of threaded plugs M_V apply. For values, see Table 13.
- Fixing screws:
  For fixing screws with metric ISO threads according to DIN 13 and/or ASME B1.1 threads, we recommend checking the tightening torque in individual cases in accordance with VDI 2230.

In addition to the ports specified in Table 12 "Ports A4VSO" on page 45, axial piston units may have openings that are also closed with a threaded plug. These plugs must not be opened on the customer side. If you have opened the threaded plug accidentally, please contact your local contact person to ensure safe re-closing of the plug. You can find the address at www.boschrexroth.com/addresses

Table 13: Tightening torques for female threads and threaded plugs

Ports		Maximum permissible tightening torque of female threads M_G max	Required tightening torque of threaded plugs M_V	WAF hexagon socket of the threaded plug
Standard	Thread size			
ISO 6149	M8 × 1	10 Nm	7 Nm	4 mm
	M10 × 1	30 Nm	15 Nm	5 mm
	M12 × 1.5	50 Nm	25 Nm	6 mm
	M14 × 1.5	80 Nm	45 Nm	6 mm
	M16 × 1.5	100 Nm	55 Nm	8 mm
	M18 × 1.5	140 Nm	70 Nm	8 mm
	M20 × 1.5	170 Nm	80 Nm	10 mm
	M22 × 1.5	210 Nm	100 Nm	10 mm
	M27 × 2	330 Nm	170 Nm	12 mm
	M30 × 2	420 Nm	215 Nm	17 mm
	M33 × 2	540 Nm	310 Nm	17 mm
	M42 × 2	720 Nm	330 Nm	22 mm
	M48 × 2	900 Nm	420 Nm	22 mm

Table 13: Tightening torques for female threads and threaded plugs

Ports Standard	Thread size	Maximum permissible tightening torque of female threads M_G max	Required tightening torque of threaded plugs M_V	WAF hexagon socket of the threaded plug
DIN 3852	M8 × 1	10 Nm	7 Nm[1)]	3 mm
	M10 × 1	30 Nm	15 Nm[2)]	5 mm
	M12 × 1.5	50 Nm	25 Nm[2)]	6 mm
	M14 × 1.5	80 Nm	35 Nm[1)]	6 mm
	M16 × 1.5	100 Nm	50 Nm[1)]	8 mm
	M18 × 1.5	140 Nm	60 Nm[1)]	8 mm
	M22 × 1.5	210 Nm	80 Nm[1)]	10 mm
	M26 × 1.5	230 Nm	120 Nm[1)]	12 mm
	M27 × 2	330 Nm	135 Nm[1)]	12 mm
	M33 × 2	540 Nm	225 Nm[1)]	17 mm
	M42 × 2	720 Nm	360 Nm[1)]	22 mm
	M48 × 2	900 Nm	400 Nm[1)]	24 mm
ISO 11926	5/16-24 UNF-2B	10 Nm	7 Nm	1/8 in
	3/8-24 UNF-2B	20 Nm	10 Nm	5/32 in
	7/16-20 UNF-2B	40 Nm	18 Nm	3/16 in
	9/16-18 UNF-2B	80 Nm	35 Nm	1/4 in
	3/4-16 UNF-2B	160 Nm	70 Nm	5/16 in
	7/8-14 UNF-2B	240 Nm	110 Nm	3/8 in
	1 1/16-12 UN-2B	360 Nm	170 Nm	9/16 in
	1 5/16-12 UN-2B	540 Nm	270 Nm	5/8 in
	1 5/8-12 UN-2B	960 Nm	320 Nm	3/4 in
	1 7/8-12 UN-2B	1200 Nm	390 Nm	3/4 in

1) The tightening torques for the threaded plugs are valid for the condition "dry" and "lightly oiled".

2) The tightening torques for the threaded plugs are valid for the condition "dry" – in the condition "lightly oiled", the tightening torques for M10 × 1 are reduced to 10 Nm and for M12 × 1.5 to 17 Nm.

Procedure To connect the axial piston unit to the hydraulic system:

1. Remove the protective plugs and/or threaded plugs from the ports where the connections should be made according to the hydraulic circuit diagram.
2. Make sure the sealing surfaces of the hydraulic ports and functional surfaces are not damaged.
3. Use only clean hydraulic lines or flush them before installation.
   Hydraulic hoses must be suitable for ATEX and have to be grounded separately.
   (Observe chapter 8.1.6 "Performing flushing cycle" on page 54 when you flush the hydraulic system.)
4. If using an external bearing flushing, screw the throttle screw in port "**U**" in to the stop.
5. Connect the lines in accordance with the installation drawing and the machine or system circuit diagram. Check that all ports are connected or plugged with threaded plugs.
6. Properly tighten the fittings (observe tightening torques!). Mark all properly tightened fittings, e.g. with a permanent marker.
7. Check all pipes and hose lines and every combination of connecting pieces, couplings or connecting points with hoses or pipes to ensure they are in safe working condition.

For the relationship between direction of rotation and flow direction, see the data sheet (Part II).

7.4.9 Electrically connecting the axial piston unit

⚠ DANGER

Risk of explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Serious injury caused by blast pressure and fire may result.

- To prevent the buildup of static electricity, include all ground connections of the axial piston unit in the potential equalization connection.
- Hydraulic hoses must be suitable for ATEX and have to be grounded separately.
- Make sure assembled parts, tools and personnel have the same potential as the axial piston unit before they come into contact with them.
- The electrical connections should only be made by a suitably qualified skilled electrician.
- De-energize the current circuits before working on them or opening a terminal box. In explosive areas, only use tools and measuring equipment approved for these areas.
- In the event of a malfunction, check the wire connections and power supply in the non-explosive atmosphere for proper function.
- If this is not possible, make sure there is no risk of explosion while working and monitor for such a risk.
- The electrical connection can be established via the connection line outside the explosive area or with an explosion-proof terminal box inside the explosive area.

NOTICE

Short circuit due to penetrating hydraulic fluid!

Fluid can penetrate the product and cause a short circuit!

- Do not install axial piston units with electric components (e.g. electric controls, sensors) in a reservoir below the fluid level (inside-reservoir installation).

For Equipment Category II 2G Ex h IIC T4-T1 Gb X Requirements on control units for temperature monitoring

- The leakage temperature of the pump should be monitored by a sensor with integrated shut-off feature installed in the drain line (maximum 30 cm distance from drain port). The operator is responsible for selecting and installing this temperature sensor.
- As soon as the specified maximum leakage temperature (see data sheet Part II) is exceeded in a sensor installed in the drain line or as soon as a malfunction is detected in the temperature monitor, the control units should immediately shut off the control device of the axial piston unit and the drive motor. Make sure that the pump is switched off no later than 5 seconds after the monitoring function responds.
- The control units should include a monitoring circuit for sensor faults and cable breaks, and a self-monitoring circuit for malfunctions in the control unit. Such faults should also cause the control device of the axial piston unit to switch off and the drive motor to shut down.

7.4.10 Connecting to potential equalization

DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust due to sparks caused by electrostatic discharge!
Axial piston units fastened with elastic elements and the use of hydraulic hoses can constitute a risk of sparks due to electrostatic discharge if they come into contact with assembled parts, tools and personnel with a different potential. Serious injury caused by blast pressure and fire may result.

- To prevent the buildup of static electricity, include all ground connections of the axial piston unit in the potential equalization connection.
- Hydraulic hoses must be suitable for ATEX and have to be grounded separately.
- Make sure assembled parts, tools and personnel have the same potential as the axial piston unit before they come into contact with them.

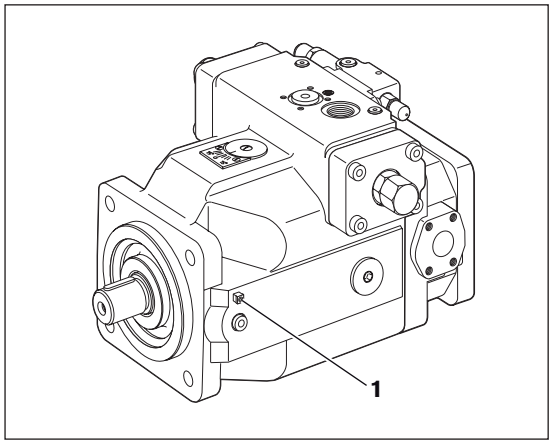


Fig. 14: Ground connections

For details of the location of the ground connections (**1**) see data sheet (Part II) chapter "Dimensions".
The ground terminals are designed for a maximum of two ground wires, each with a cross section of 4 mm^2. The minimum wire cross-section should be 2.5 mm^2.
Tightening torque of the pump housing ground terminal: 2 to 4 Nm

7.5 Performing flushing cycle

In order to remove foreign particles from the system, Bosch Rexroth recommends a flushing cycle for the hydraulic system before the first commissioning. To avoid internal contamination, do not include the axial piston unit in the flushing cycle.

Use an additional flushing unit to perform the flushing cycle. Observe the information of the flushing unit manufacturer for the exact procedure during the flushing cycle.

8 Commissioning

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Serious injury caused by blast pressure and fire may result.

- Only commission the unit in a non-explosive atmosphere.
- The system operator is responsible for ensuring the appropriate ambient conditions.

⚠ WARNING

Danger while working in the danger zone of a machine/system!

Danger to life, risk of injury or severe personal injury!

- Pay attention to and eliminate potential danger sources before commissioning the axial piston unit.
- Make sure no one is in the danger zone of the machine/system.
- The emergency stop button for the machine/system must be within the operator's reach.
- Always observe the information of the machine/system manufacturer during commissioning.

⚠ CAUTION

Commissioning an incorrectly installed product!

Risk of injury and property damage!

- Make sure all electrical and hydraulic ports are connected or plugged.
- Commission only a fully installed, fully functioning product with original accessories from Bosch Rexroth.

8.1 Initial commissioning

During all work on commissioning the axial piston unit, observe the general safety instructions and intended use in chapter 2 "Safety instructions" on page 8.

- Connect the pressure gauge for the working pressure, case pressure and suction pressure to the specified measuring points on the axial piston unit or in the hydraulic system, to check the technical data at first operation.

- During commissioning, monitor the temperature of the hydraulic fluid in the reservoir to make sure it remains within the permissible temperature and viscosity limits.

Usually, the cleanliness level of commercial hydraulic fluids is insufficient for the requirements of our components. These hydraulic fluids must be filtered during filling using an appropriate filter system to minimize solid particle contamination and water in the system.

8.1.1 Complying with the limit values for inlet/leakage temperature

- When commissioning, a test must be carried out in order to ensure that, at maximum operating power, the leakage temperature of the axial piston unit does not exceed the limit value as specified in the data sheet (Part II).
- In operation, the leakage temperature must be checked regularly according to the requirements and action must be taken if it exceeds the specified limit. The recommended maintenance interval is one day.
- For equipment category II 2G Ex h IIC T4-T1 Gb X, the leakage temperature is continuously monitored by a temperature sensor selected by the operator and integrated into the shut-off chain (see chapter 7.4.9 "Electrically connecting the axial piston unit" on page 48).
- If it is not possible to monitor the leakage temperature, a maximum inlet temperature (data sheet (Part II)) can also be observed (does not apply to operation with HF fluids). (This does not apply for ATEX category II 2G Ex h IIC T4-T1 Gb X)

8.1.2 Functional test of shut-off chain (equipment category II 2G Ex h IIC T4-T1 Gb X only)

- Make sure that the shut-off chain of the machine/system is compliant with the specified ignition protection system type b1 according to DIN EN ISO 80079-37 and check its function in accordance with the switch-off temperatures and limit values specified in the data sheet (part II).

8.1.3 Filling the axial piston unit

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust on a hot surface!
Operating the axial piston unit without or with insufficient hydraulic fluid may lead to a risk of ignition due to overheating caused by dry running on the shaft seal ring. Serious injury caused by blast pressure and fire may result.

- Fill the housing, and the suction and working lines with hydraulic fluid prior to commissioning.
- For above-reservoir installation and in all installation positions with the drive shaft up, make sure the pump is only operated with the bearing flushing at port "**U**".
- Drain the leakage fluid at the highest port.
- Comply with the specified case leakage pressure and case leakage temperature.
- Observe the operating data; see the data sheet (Part II).
- Also take care to remove dust in a timely manner in order to reduce the risk of ignition.

Professional filling and air bleeding is required to prevent damage to the axial piston unit and to maintain proper function.

The axial piston unit should be filled with a filling unit (10 µm filter grade).
Do not operate the axial piston unit while it is being filled by the filling unit.

Only use hydraulic fluid that meets the requirements according to the data sheet (Part II):
The machine/system manufacturer can send you precise information about the hydraulic fluid. Use a hydraulic fluid that corresponds to the data sheet (Part II).
At no point of the axial piston unit may the temperature of the hydraulic fluid be higher than the temperature specified in the data sheet (Part II).

Procedure

Proceed as follows to fill the axial piston unit:

1. Place a drip tray under the axial piston unit to collect any hydraulic fluid that may leak.

NOTICE!Contaminated hydraulic fluid!
The cleanliness levels of commercial hydraulic fluids are usually insufficient for the requirements of our components.

- Use a suitable filter system to filter hydraulic fluids during filling to minimize solid particle contamination and water in the hydraulic system.
- Note that contaminated hydraulic fluid can constitute a risk of sparking due to overheating.

2. Fill and air bleed the axial piston unit via the appropriate ports; see chapter 7.3 "Installation position" on page 34. Also fill the hydraulic lines of the system.

NOTICE! Risk of property damage due to inadequate lubrication!
Product can be damaged or destroyed!

- When using a shut-off valve in the suction and/or drain line, make sure the drive of the axial piston unit can only be started when the shut-off valves are open.
- Dimension a shut-off valve in the suction line so that no inadmissible pressure drop occurs in the suction area when the shut-off valve is open.

3. If you use a shut-off valve in the suction line, only operate the axial piston unit with opened shut-off valves.
4. Test the direction of rotation of the drive motor. To do this, run the drive motor briefly at the lowest rotational speed (inching). Make sure that the direction of rotation of the axial piston unit agrees with the details of the name plate, see chapter 5.3 "Product identification", Fig. 3: Name plate A4VSO ATEX on page 24.
5. Operate the axial piston pump at a low rotational speed (starter speed for internal combustion engines and/or inching mode for electric motors) until the hydraulic system is completely filled and air bled. To inspect, drain the hydraulic fluid at the drain port and wait until it drains without bubbles.

8.1.4 Testing the hydraulic fluid supply

The axial piston unit must always have a sufficient supply of hydraulic fluid.
For this reason, the supply of hydraulic fluid must be ensured at the start of the commissioning process.
When you test the hydraulic fluid supply, constantly monitor noise development and check the hydraulic fluid level in the reservoir. If the axial piston unit becomes louder (cavitation) or the leakage fluid contains bubbles, this is an indication that the axial piston unit is not being sufficiently supplied with hydraulic fluid.
For information on troubleshooting, see chapter 14 "Troubleshooting" on page 68.
To test the hydraulic fluid supply:

1. Test the axial piston unit in a non-explosive atmosphere.
2. Allow the drive motor to run at the lowest rotational speed (per data sheet [Part II]). The axial piston unit should be operated without load. Pay attention to leaks and noises.
3. Check the axial piston unit's drain line during the test. The leakage fluid should not contain any bubbles.
4. Increase the load and check whether the working pressure rises as expected.
5. Perform a leak test to ensure the hydraulic system is sealed and can withstand the max. pressure.
6. Check the suction pressure at port **S** of the axial piston pump at nominal speed and max. swivel angle. Refer to the data sheet (Part II) for the permissible value.
7. At maximum pressure, check the case leakage pressure at port **T** or **R(L)**. Refer to the data sheet (Part II) for the permissible value.

8.1.5 Performing a functional test

⚠ WARNING

Improperly connected axial piston unit!
Mixing up the ports will cause malfunctions (e.g. lift instead of lower) and could endanger personnel and equipment!
- Before the functional test, check whether the piping specified in the hydraulic circuit diagram has been installed.

Once you have tested the hydraulic fluid supply, perform a functional test of the machine/system. The functional test must be performed according to the instructions of the machine/system manufacturer.
The axial piston unit is tested for functional capability and performance before delivery according to the technical data. During commissioning, make sure the axial piston unit was installed in the machine/system as intended.
- After starting the drive motor, check the specified pressures in particular, e.g., system pressure, boost pressure and case pressure.
- Prior to normal operation, measure the heat development with an approved measuring device without load and with the customer-specific operating data. The temperature can rise up to the maximum temperature specified on the data sheet (Part II).
- Prior to normal operation, perform a leak test and heat development test without and with load in a non-explosive atmosphere.
- If necessary, remove the pressure gauge and plug the ports with threaded plugs.

8.1.6 Performing flushing cycle

In order to remove foreign particles from the system, Bosch Rexroth recommends a flushing cycle for the entire system prior to initial commissioning. To avoid internal contamination, do not include the axial piston unit in the flushing cycle.

Use an additional flushing unit to perform the flushing cycle. Observe the information of the flushing unit manufacturer for the exact procedure during the flushing cycle.

8.2 Running-in phase

NOTICE

Property damage due to insufficient viscosity!
Elevated hydraulic fluid temperature may excessively reduce viscosity and damage the product!
- Monitor the operating temperature during the running-in phase, e.g. by measuring the case leakage temperature.
- Reduce the loading (pressure, rotational speed) of the axial piston unit if unacceptable operating temperatures and/or viscosities occur.
- Excessively high operating temperatures indicate faults that have to be analyzed and eliminated.

The bearings and sliding surfaces are subject to a running-in phase. The increased friction at the start of the running-in phase results in increased heat development which decreases with increasing operating hours. The mechanical-hydraulic efficiency is also greater until the running-in phase of about 10 operating hours is concluded.
To ensure contamination in the hydraulic system does not damage the axial piston unit, the following procedure is recommended after the running-in phase:

- ▶ After the running-in phase, have a hydraulic fluid sample analyzed for the required cleanliness level.
- ▶ Change the hydraulic fluid if the required cleanliness level is not reached. If a laboratory test is not carried out after the running-in phase, it is recommended to change the hydraulic fluid.

8.3 Recommissioning after standstill

Depending on the installation conditions and ambient conditions, changes may occur in the hydraulic system which make recommissioning necessary.
The following criteria may make recommissioning necessary:

- After a period of standstill longer than one hour (to ensure fluid immersion especially with above-reservoir installation)
- Air and/or water in the hydraulic system
- Old hydraulic fluid
- Other contamination

- ▶ Before recommissioning, proceed as described in chapter 8.1 "Initial commissioning" on page 50.

9 Operation

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust on a hot housing surface!
Insufficient monitoring during operation may result in excessively high case temperature. Serious injury caused by blast pressure and fire may result.

- During operation, monitor the fluid level and temperature in the reservoir.
- Comply with the specified case leakage pressure and case leakage temperature.
- **For equipment category II 2G Ex h IIC T4-T1 Gb X:** Monitor the leakage temperature in accordance with the specifications in this manual.
- Observe the operating data; see the data sheet (Part II).

Risk of explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust resulting from damage to a bearing or the rotary group!
Early bearing damage will cause interior heating of the axial piston unit. Overheating can pose an ignition risk.

- Perform both an inspection for unusual noise development and a visual inspection of external integrity daily.
- Check the leakage temperature (or inlet temperature) daily. (Realized automatically for Equipment Category II 2G Ex h IIC T4-T1 Gb X by integrated temperature monitoring).
- Observe the maintenance interval for the axial piston unit (see Table 14).

Only use the product within the performance range specified in the technical data; see the data sheet (Part II). The machine/system manufacturer is responsible for proper project planning of the hydraulic system and its control.
Do not alter the settings on the axial piston unit.

- If the axial piston unit can no longer achieve the specified torque (pressure), shut the system down.

9.1 Operating the optional auxiliary actuation device

⚠ WARNING

Risk of injury from working movement of a connected consumer!

- Only operate the auxiliary actuation device if it is ensured it will not trigger any potentially dangerous working movements in the connected consumer!

10 Maintenance and repair

DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Serious injury caused by blast pressure and fire may result.

- Maintenance and repair work should only be performed in a non-explosive atmosphere.
- The system operator is responsible for ensuring the appropriate ambient conditions.

NOTICE

Overdue inspection and maintenance work!

Property damage!

- Carry out the specified inspections at the intervals described in this manual.
- Carry out the specified maintenance work at the intervals described in this manual.

10.1 Cleaning and care

DANGER

Risk of explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Serious injury caused by blast pressure and fire may result.

- The axial piston unit must not be cleaned with compressed air, solvents, aggressive cleaning agents or high-pressure cleaners since these can result in changes that could result in the loss of the explosion protection.
- Only clean the axial piston unit with a damp, lint-free cloth; cleaning with a dry cloth could cause static electricity to build.

For cleaning and care of the axial piston unit, observe the following:

- Check whether all seals and plug-in connections are securely seated to ensure no humidity can penetrate into the axial piston unit during cleaning.
- Use only water and, if necessary, a mild cleaning agent to clean the axial piston unit. Never use solvents or aggressive cleaning agents.
- Only clean the axial piston unit with a damp cloth; cleaning with a dry cloth could cause static electricity to build.
- Remove major external contamination and keep clean sensitive and important components, such as solenoids, valves, indicators and sensors.

10.2 Inspection

In order to keep the axial piston unit running reliably for a long time, Bosch Rexroth recommends testing the hydraulic system and axial piston unit on a regular basis, and documenting and archiving the following operating conditions:

Table 14: Inspection schedule

Tasks to be performed		Interval
Hydraulic system	Check hydraulic fluid level in the reservoir.	Daily
	Check the operating temperature under comparable load condition at the drain port and in the reservoir.	Weekly
	Perform hydraulic fluid analysis: Viscosity, aging and contamination	Yearly or every 2000 operating hours (whichever occurs first)
Axial piston unit	Check that the leakage temperature of the temperature or inlet of the axial piston unit are within the specified limit values. Exceeding these limits means explosion protection is no longer guaranteed.	Daily
	Check axial piston unit for leakage. Early detection of hydraulic fluid loss can help to find faults on the machine/system and rectify them. This is why Bosch Rexroth recommends always keeping the axial piston unit and system clean	Daily
	Check axial piston unit for unusual noise development.	Daily
	Visual inspection for external integrity, housing damage.	Daily
	Visual inspection of paint for damage. Initiate repairs as necessary in accordance with DIN EN ISO 80079-36 section 6.7. Otherwise, explosion protection is no longer guaranteed.	Monthly
	Check mounting elements for tight seating. Check all mounting elements only when the hydraulic system is switched off, depressurized and cooled down.	Monthly
	Check ground connection lines for tight seating.	Monthly
	Remove dust deposits from between the shaft and the sealing flange	Depending on ambient condition

10.3 Maintenance

The axial piston unit is low-maintenance when used as intended. You can change the hydraulic fluid; all other maintenance work should be performed by Bosch Rexroth Service. Observe the specifications in the chapter titled "Hydraulic fluid" on the data sheet (Part II).

Changing hydraulic fluid

The service life of the axial piston unit is heavily dependent on the quality of the hydraulic fluid. This is why we recommend changing the hydraulic fluid at least once per year or every 2000 operating hours (whichever occurs first), or having it analyzed by the hydraulic fluid manufacturer or a laboratory to determine its suitability for further use.

Maintenance interval

The service life of the axial piston unit is limited to the service life of the bearings and the shaft seal used if the permissible operating parameters are observed. Observe the maintenance interval for replacing the bearings and shaft seal.
Have Bosch Rexroth Service perform maintenance on the unit upon reaching the operating hours listed in the following table or every four years, whichever comes first; for the address, see chapter 10.5 "Repair" on page 63.
If your application data differs from that shown here, request an individual calculation from your local contact person. The address can be found under `www.boschrexroth.com/addresses`

Maintenance work on the axial piston unit should only be performed by Bosch Rexroth Service; for the address, see chapter 10.5 "Repair" on page 63.

10.4 Service life characteristics of NG 40 to 500

The following diagrams are suitable as an orientation for the service life:

Size 40

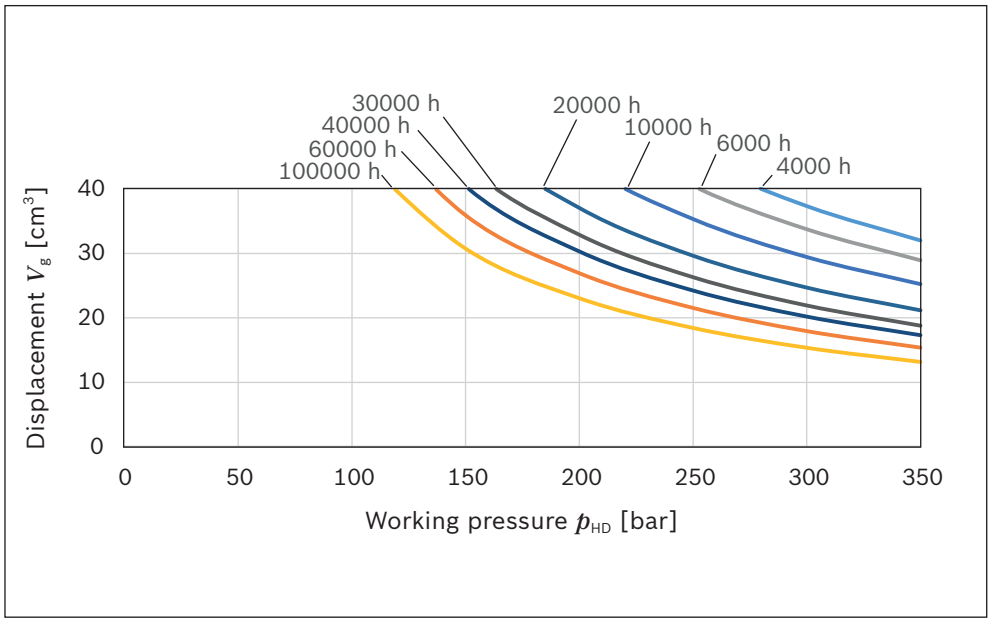


Fig. 15: Service life characteristic of size 40 at 1800 rpm

Size 71

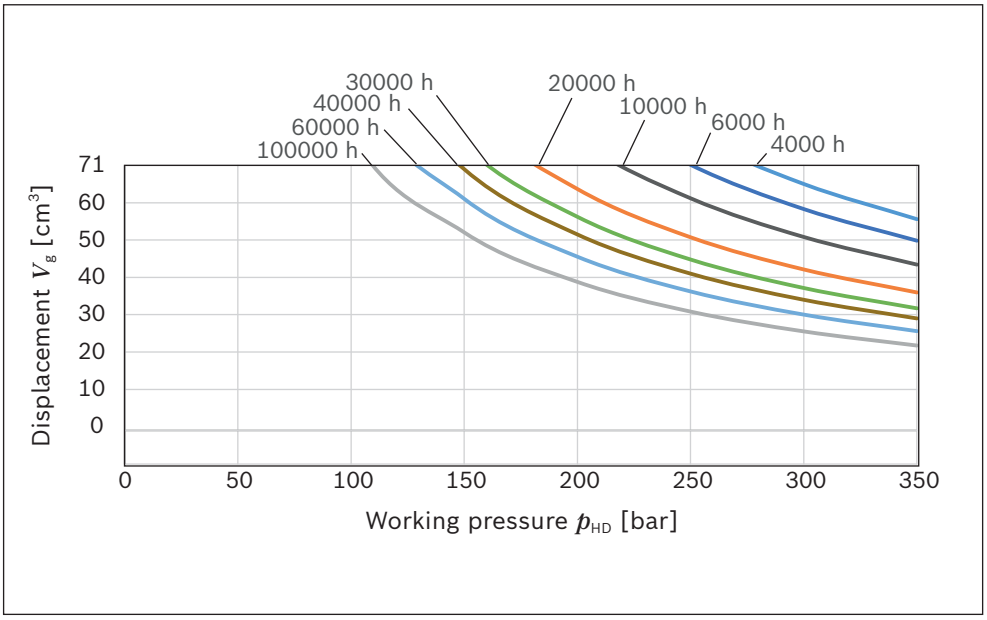


Fig. 16: Service life characteristic of size 71 at 1800 rpm

Size 125

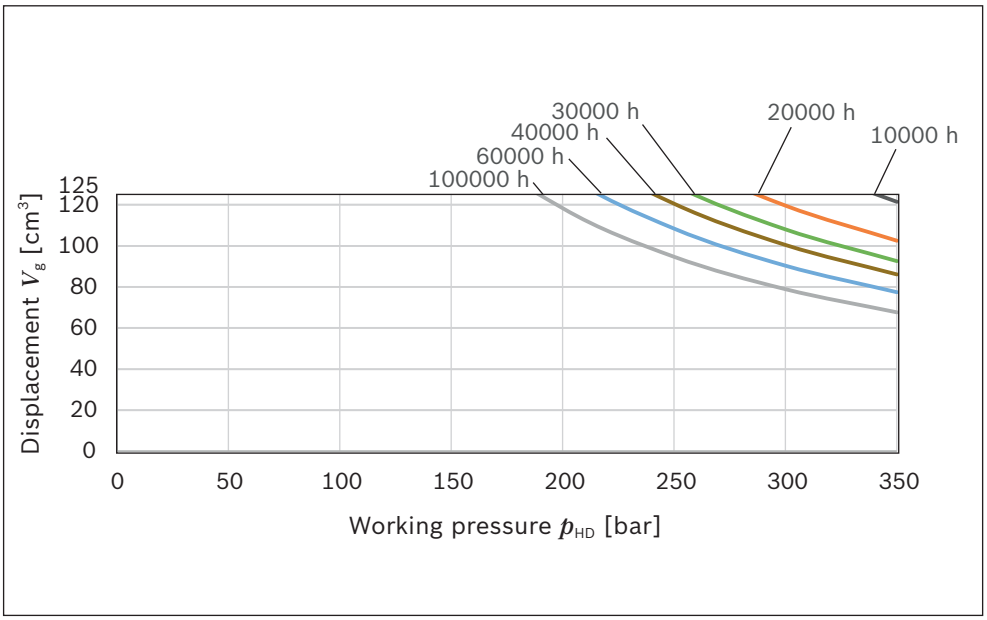


Fig. 17: Service life characteristic of size 125 at 1800 rpm

Size 180

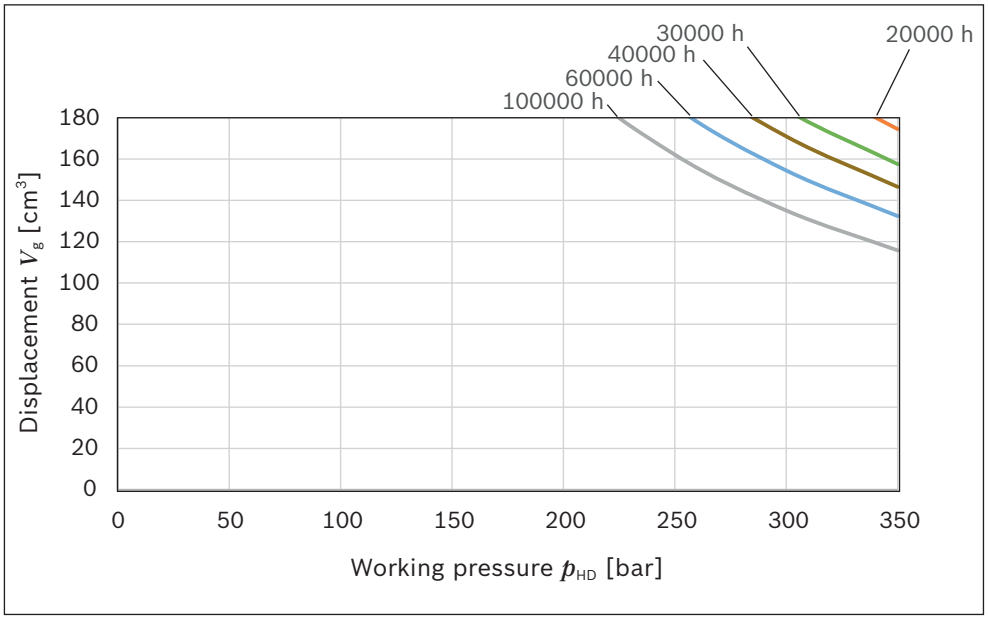


Fig. 18: Service life characteristic of size 180 at 1800 rpm

Size 250

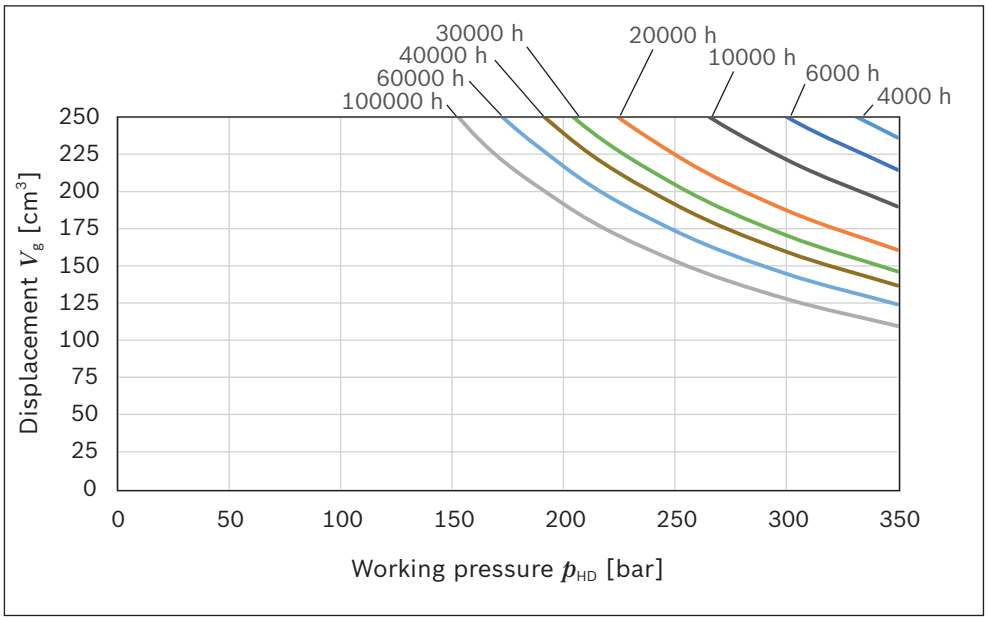


Fig. 19: Service life characteristic of size 250 at 1800 rpm

Size 355

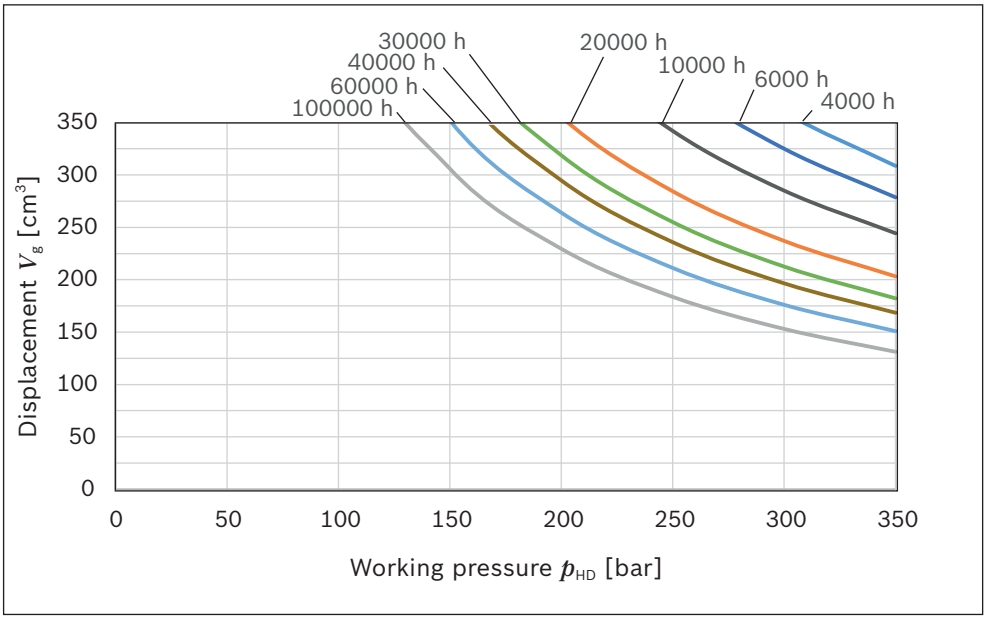


Fig. 20: Service life characteristic of size 355 at 1700 rpm

Size 500

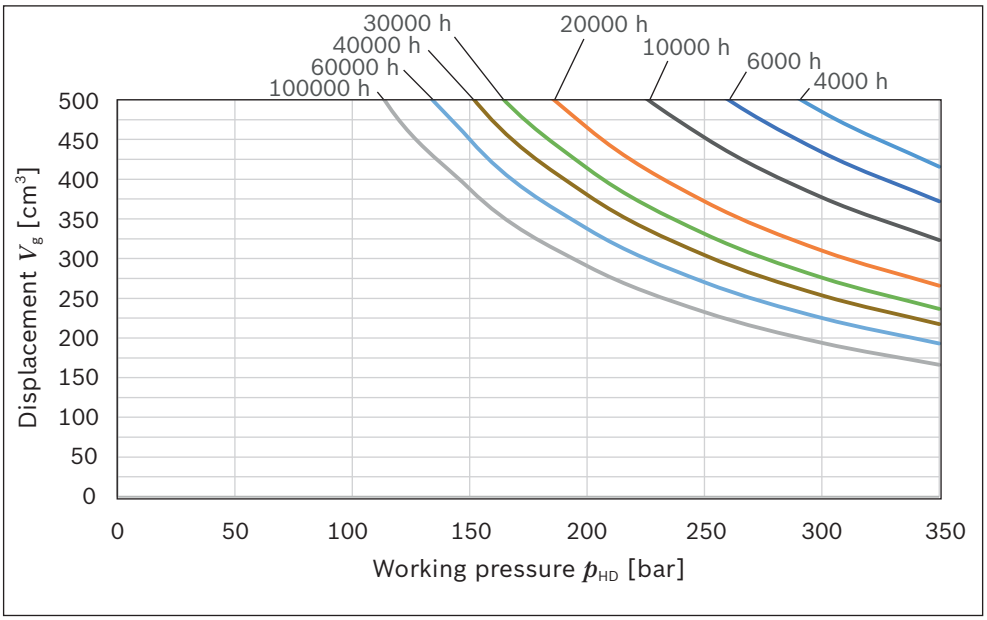


Fig. 21: Service life characteristic of size 500 at 1500 rpm

The following requirements apply:
Viscosity ν = <10 mm²/s
Cleanliness level 19/17/14 according to ISO 4406
Constant load condition

Notice! Bearing service life!
The h value stated in the diagrams is not the guaranteed service life, but rather a time at which there is a 10% probability of failure at the assumed load.

At higher viscosity, a higher bearing service life is required.

10.5 Repair

Bosch Rexroth offers a comprehensive range of services for the repair of Rexroth axial piston units.
Repairs on the axial piston unit and its assembled parts should only be performed by Bosch Rexroth Service.

Bosch Rexroth AG
An den Kelterwiesen 14
72160 Horb a.N., Germany
Hotline +49 9352 405060
service.ma.horb@boschrexroth.de

For general inquiries, please contact your local contact person. You can find their contact information at
www.boschrexroth.com/addresses

11 Removal and replacement

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Serious injury caused by blast pressure and fire may result.

- Only remove or replace the unit in a non-explosive atmosphere.
- The system operator is responsible for ensuring the appropriate ambient conditions.

11.1 Required tools

Removal can be performed using standard tools. No special tools are necessary.

11.2 Preparing for removal

1. Decommission the relevant system part as described in the operating instructions for the machine or system.
   - Relieve pressure in the hydraulic system according to the information of the machine or system manufacturer.
   - Make sure the relevant machine/system components are depressurized and de-energized.
2. Secure the relevant system part against restarting.

11.3 Performing the removal

Proceed as follows to remove the axial piston unit:

1. Verify that the hydraulic system is depressurized.
2. Allow the axial piston unit to cool down until it can be removed without danger.
3. For below-reservoir installation, seal the connection to the reservoir or drain the reservoir before removing the axial piston unit from the overall system.
4. Place a drip tray under the axial piston unit to collect any hydraulic fluid that may leak.
5. Disconnect the lines and collect the escaping hydraulic fluid in the drip tray.
6. Remove the axial piston unit. Use a suitable lifting device.
7. Completely drain the axial piston unit.
8. Plug all openings.

11.4 Preparing the components for storage or further use

⚠ DANGER

Explosion and/or fire hazard due to ignition of an explosive atmosphere or of combustible dust!

Reusing used units in an explosive atmosphere may cause explosions that can result in serious injury or even death.

- Make sure used units are not reused in an ATEX environment.
- Make sure used units are tested by Bosch Rexroth Service before reusing them in an ATEX environment; for the address, see chapter 10.5 "Repair" on page 63.

- Proceed as described in chapter 6.2 "Storing the axial piston unit" on page 29.

12 Disposal

Careless disposal of the axial piston unit, the hydraulic fluid and the packaging material can result in environmental pollution.
Observe the following when disposing of the axial piston unit:

1. Completely drain the axial piston unit.
2. Dispose of the axial piston unit and packaging material in accordance with the regulations in your country.
3. Dispose of the hydraulic fluid in accordance with the regulations of your country. Also observe the applicable safety data sheet for the hydraulic fluid.
4. Disassemble the axial piston unit into its constituent parts for proper recycling.
5. For example, separate the parts into:
   - Castings
   - Steel
   - Aluminum
   - Non-ferrous metal
   - Electronic waste
   - Plastic
   - Seals

13 Extension and conversion

Do not modify the axial piston unit and/or its assembled parts. This also includes adjusting the setting screws. Installation of the relevant ATEX class is approved in accordance with the corresponding attachment pump on the through drive (a special ATEX through drive is required here).

The warranty from Bosch Rexroth only applies to the configuration as delivered. The warranty will be voided if the unit is modified or upgraded.

The setting screws are protected against unintentional adjustment by caps. Adjusting the setting screws will render the warranty void. If you need to change settings, contact Bosch Rexroth Service; see chapter 10.5 "Repair" on page 63 for an address.

14 Troubleshooting

The Table 15 is intended to support troubleshooting. This table is not exhaustive. Issues may occur in practice that are not listed here.

14.1 How to proceed for troubleshooting

- Perform troubleshooting if possible with reduced operating data (e.g. slowly swivel in or out and slow pressure increase).
- Work systematically and in a targeted manner, even when pressed for time. Random, indiscriminate removal and changing of settings could make it impossible to determine the original cause of the fault.
- First get a general idea of how your product works in conjunction with the entire system.
- Try to determine whether or not the product was working properly in conjunction with the entire system before the fault occurred.
- Try to determine any changes to the entire system in which the product is installed:
  - Have there been any changes to the application conditions or operating range of the product?
  - Has maintenance work recently been carried out? Is there an inspection or maintenance log?
  - Have any changes (e.g. upgrades) or repairs been made to the overall system (machine/system, electrics, control) or to the product? If yes: Which ones?
  - Has the hydraulic fluid been changed?
  - Has the product or machine been used as intended?
  - How does the malfunction appear?
- Try to get a clear idea of the cause of the fault. Directly ask the (machine) operator.
- Document the work carried out.
- If faults cannot be rectified, contact Bosch Rexroth Service; for the address, see chapter 10.5 "Repair" on page 63.

14.2 Malfunction table

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
Unusual noises	Insufficient air bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed the axial piston unit and hydraulic system
		Check correct installation position
	Insufficient suction conditions, e.g., insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, suction filter too small or blocked, etc.	Machine/system manufacturer: Check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove foreign particles from the suction line
		Check the filter system and change the filter as necessary
	Drive speed too high	Machine/system manufacturer: Reduce drive speed
	Wrong direction of rotation	Machine/system manufacturer: Check correct direction of rotation, see chapter 7.4.1 "Preparation" on page 38
	Improper mounting of the axial piston unit	Check the mounting of the axial piston unit according to the specifications of the machine/system manufacturer – observe tightening torques
	Improper mounting of assembled parts, hydraulic lines or improper installation of the coupling	Fasten assembled parts according to the parameters provided by the coupling fitting manufacturer
	Resonances due to a defective or unsuitable elastic coupling	Check the specification of the elastic coupling and/or exchange defective or worn coupling
	Oscillate pressure limitation and pressure control valves of the axial piston unit (boost-pressure relief valve, high-pressure relief valve, pressure cut-off)	Air bleed the axial piston unit and hydraulic system
		Contact Bosch Rexroth Service: Optimize the settings of the pressure relief and pressure control valves
	Mechanical damage to the axial piston unit (e.g. bearing damage)	Replace axial piston unit
		Contact Bosch Rexroth Service

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
No or insufficient flow	Insufficient air bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed the axial piston unit and hydraulic system
	Faulty mechanical drive (e.g. defective coupling)	Contact machine/system manufacturer
	Drive speed too low	Contact machine/system manufacturer
	Insufficient suction conditions, e.g., insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, suction filter too small or blocked, etc.	Machine/system manufacturer: Check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove foreign particles from the suction line
		Check the filter system and change the filter as necessary
	Hydraulic fluid not in optimal viscosity range	Machine/system manufacturer: Check temperature range and use suitable hydraulic fluid
	Insufficient boost pressure	Check boost pressure
		Contact Bosch Rexroth Service
	Insufficient pilot pressure or control pressure	Check pilot pressure or control pressure
		Contact Bosch Rexroth Service
	Malfunction of the control device or controller of the axial piston unit	Contact Bosch Rexroth Service
	Control of the control device defective	Check control (contact machine/system manufacturer or Bosch Rexroth Service)
	Wear or mechanical damage to the axial piston unit	Replace axial piston unit
		Contact Bosch Rexroth Service

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
No or insufficient pressure	Insufficient air bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed the axial piston unit and hydraulic system
		Check correct installation position
	Faulty mechanical drive (e.g. defective coupling)	Contact machine/system manufacturer
	Drive power too low	Contact machine/system manufacturer
	Insufficient suction conditions, e.g., insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, suction filter too small or blocked, etc.	Machine/system manufacturer: Check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove foreign particles from the suction line
		Check the filter system and change the filter as necessary
	Hydraulic fluid not in optimal viscosity range	Machine/system manufacturer: Check temperature range and use suitable hydraulic fluid
	Insufficient boost pressure	Check boost pressure
		Contact Bosch Rexroth Service
	Insufficient pilot pressure or control pressure	Check pilot pressure or control pressure
		Contact Bosch Rexroth Service
	Malfunction of the control device or controller of the axial piston unit	Contact Bosch Rexroth Service
	Control of the control device defective	Check control (contact machine/system manufacturer or Bosch Rexroth Service)
	Wear or mechanical damage to the axial piston unit	Replace axial piston unit
		Contact Bosch Rexroth Service
	Output unit defective (e.g. hydraulic motor or cylinder)	Contact machine/system manufacturer

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
Pressure/flow fluctuations or instabilities	Insufficient air bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed the axial piston unit and hydraulic system
		Check correct installation position
	Insufficient suction conditions, e.g., insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, suction filter too small or blocked, etc.	Machine/system manufacturer: Check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove foreign particles from the suction line
		Check the filter system and change the filter as necessary
	Oscillate pressure limitation and pressure control valves of the axial piston unit (boost-pressure relief valve, high-pressure relief valve, pressure cut-off)	Air bleed the axial piston unit and hydraulic system
		Contact Bosch Rexroth Service
	Unstable control signal	Contact machine/system manufacturer or Bosch Rexroth Service
	Malfunction in the control devices or the controller	Contact Bosch Rexroth Service
Excessively high temperature of hydraulic fluid and housing	Excessively high inlet temperature at the axial piston unit	Machine/system manufacturer: Inspect system, e.g. malfunction in the cooler, insufficient hydraulic fluid in the reservoir
	Wrong setting or malfunction of the pressure relief and pressure control valves (e.g. high-pressure relief valve, pressure cut-off, pressure controller)	Optimize the adjustment of the pressure relief and pressure control valves of the axial piston unit and the pressure limitation in the hydraulic system
		Contact Bosch Rexroth Service
		Contact machine/system manufacturer
	Flushing flow of the flushing valve too low	Contact Bosch Rexroth Service
	Axial piston unit worn	Replace axial piston unit; contact Bosch Rexroth Service

15 Technical data

The permissible technical data for your axial piston unit can be found in the data sheet (Part II).
Depending on the control device of your axial piston pump, other technical data sheets are also applicable: 92060, 92064, 92072, 92076 or 92080.

The data sheets of control devices are provided in the Download Center:
www.boschrexroth.com
or
In the industrial hydraulics product catalog under control systems for A4VS:

Order-related technical data for your axial piston unit can be found in the order confirmation.

16 Alphabetical index

R

S

T

U

W

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Subject to change
RE 92050-01-X-B1/2025.04.15

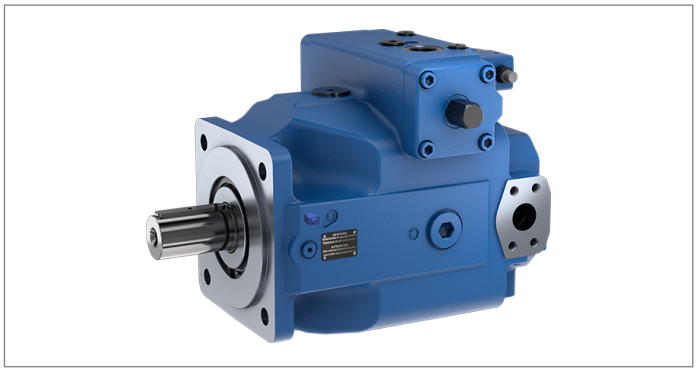
RE 92050-01-X-B2/2025-04-15
Replaces: 2019-08-23

rexroth
A Bosch Company

Axial piston variable pump A4VSO Series 10, 11 and 30

for explosive areas
II 2G Ex h IIC T4-T1 Gb X and
II 3G Ex h IIC T4-T1 Gc X

Part II of the operating instructions according to ATEX Directive (2014/34/EU) data sheet



- Sizes 40 to 500
- Nominal pressure 350 bar
- Maximum pressure 400 bar
- Open circuit

Information on explosion protection

- Application according to Directive 2014/34/EU (ATEX)
- Gas: II 2G Ex h IIC T4-T1 Gb X according to DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016
- Gas: II 3G Ex h IIC T4-T1 Gc X according to DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016

Features

Variable displacement pump with axial piston rotary group of swashplate design for hydrostatic drives in open circuit
Flow is proportional to drive speed and displacement.
Flow can be infinitely varied by controlling the swashplate angle.

- Excellent suction characteristics
- Low noise level
- Long service life
- Modular design
- Short control response times
- Variable through drive options
- Optical swivel angle indicator

Contents

Type code

01	02	03	04	05		06	07		08	09	10	11	12
	A4VS	**O**			**/**			**–**				**25**	

Hydraulic fluid/version

			40	71	125	180	250	355	500	
01	Mineral oil (without code)		●	●	●	●	●	●	●	
	High-speed version		–	–	–	–	●	●	●	**H**

Axial piston unit

02	Swashplate design, variable, nominal pressure 350 bar, maximum pressure 400 bar	**A4VS**

Operating mode

03	Pump, open circuit	**O**

Size (NG)

04	Geometric displacement, see table of values on page 6	**40**	**71**	**125**	**180**	**250**	**355**	**500**	

Control device

		Information on controller selection	40	71	125	180	250	355	500	
05	Without control		●	●	●	●	●	●	●	**OV**
	Pressure controller	See page 10 and data sheet 92060	●	●	●	●	●	●	●	**DR**
	Pressure controller for parallel operation		●	●	●	●	●	●	●	**DP**
	Flow controller		●	●	●	●	●	●	●	**FR..**
	Pressure and flow controller		●	●	●	●	●	●	●	**DFR.**
	Power controller with hyperbolic characteristic curve	See page 12, 13, and data sheet 92064	●	●	●	●	●	●	●	**LR2..**
	Power controller with remotely controllable power characteristic		●	●	●	●	●	●	●	**LR3..**
	Manual control	See page 14 Data sheet 92072	○	○	○	○	○	○	○	**MA**
	Rod system control (maximum working pressure 150 bar)		–	●	●	●	–	–	–	**GE**
	Hydraulic control, depending on quantity	Data sheet 92076	●	●	●	●	●	●	●	**HM1 HM2**
	Hydraulic control, pressure-dependent HD.U and HD.T not available in ATEX	See page 13 and data sheet 92080	●	●	●	●	●	●	●	**HD...**

Series

		40	71	125	180	250	355	500	
06	Series 1, index 0	●	●	–	–	–	–	–	**10**
	Series 1, index 1 only for HD control	●	●	–	–	–	–	–	**11**
	Series 3, index 0	–	–	●	●	●	●	●	**30**

Directions of rotation

			40	71	125	180	250	355	500	
07	Viewed on drive shaft	Clockwise	●	●	●	●	●	●	●	**R**
		Counter-clockwise	●	●	●	●	●	●	●	**L**

Sealing material and ATEX version

		40	71	125	180	250	355	500	
08	FKM (fluoroelastomer) and ATEX version II 2G Ex h IIC T4-T1 Gb X	●	●	●	●	●	●	●	**R**
	FKM (fluoroelastomer) and ATEX version II 3G Ex h IIC T4-T1 Gc X	●	●	●	●	●	●	●	**A**

Drive shafts

		40	71	125	180	250	355	500	
09	Parallel keyed shaft DIN 6885	●	●	●	●	●	●	●	**P**
	Splined shaft DIN 5480	●	●	●	●	●	●	●	**Z**

Mounting flange

			40	71	125	180	250	355	500	
10	Based on ISO 3019-2 (metric)	4-hole	●	●	●	●	●	●	–	**B**
		8-hole	–	–	–	–	–	–	●	**H**

Working port

				40	71	125	180	250	355	500	
11	SAE flange ports, metric fastening thread	**B** and **S** with 90° lateral offset	2nd pressure port B_1, opposite **B**, plugged with flange plate on delivery	●	●	●	●	●	●	●	**25**

● = Available ○ = On request – = Not available

01	02	03	04	05		06	07		08	09	10	11	12
	A4VS	**O**			**/**			**–**				**25**	

Through drive[1] (for mounting options, see page 41)

12	Flange ISO 3019-2 (metric) Diameter	Hub for splined shaft Diameter		For mounting of ATEX axial piston pump	40	71	125	180	250	355	500	
	without through drive and auxiliary pump				●	●	●	●	●	●	●	**N00**
	with through drive for mounting of an axial piston pump				●	●	–	–	–	–	●	**K...**
	Universal through drive[2]				–	–	●	●	●	●	–	**U...**
	125-4	32x2x14x9g[3]		A4VS NG40	●	●	●	●	●	●	●	**31**
	140-4	40x2x18x9g[3]		A4VS NG71	–	●	●	●	●	●	●	**33**
	160-4	50x2x24x9g[3]		A4VS NG125 and NG180	–	–	●	●	●	●	●	**34**
	224-4	60x2x28x9g[3]		A4VS NG250	–	–	–	–	●	●	●	**35**
		70x3x22x9g[3]		A4VS NG 355 and 500	–	–	–	–	–	●	●	**77**
	315-8	80x3x25x9g[3]		A4VS NG 500	–	–	–	–	–	–	●	**43**
	80-2	3/4 in	11T 16/32DP[4]	A10VSO 18/31	○	●	●	●	●	●	○	**B2**
	100-2	7/8 in	13T 16/32DP[4]	A10VSO 28/31	●	●	●	●	●	●	○	**B3**
	100-2	1 in	15T 16/32DP[4]	A10VSO 45/31	●	●	●	●	●	●	●	**B4**
	125-2	1 1/4 in	14T 12/24DP[4]	A10VSO 71/31	–	●	●	●	●	●	●	**B5**
	125-2	1 1/2 in	17T 12/24DP[4]	A10VSO 100/31	–	–	●	●	●	●	○	**B6**
	Prepared for through drive, with pressure-resistant plugged cover				●	●	●	●	●	●	●	**99**

● = Available ○ = On request – = Not available

Notes

- Note the project planning notes on page 46.
- In addition to the type code, please specify the relevant technical data when placing your order.

Features of the ATEX version

The ATEX version is an advanced development of the A4VSO for compliance with Directive 2014/34/EU (ATEX). External distinguishing features compared to the standard pump:

- The ground terminal.
- The EX mark and the CE mark on the name plate.

Temperature classes according to DIN EN ISO 80079-36

Depending on the two temperature classes, T3 and T4, observe the maximum permissible temperatures (see "Hydraulic fluid" and "Operating data monitoring – X parameters").

Notes

- **ATEX classification:** When ordering, please state which equipment group, category, explosion group, temperature class and ignition protection type are required for your intended ATEX application.
- **Technical data:** Compared to the standard pump, restrictions apply in terms of temperature, case pressure and bearing flushing/installation position.
- **Painting/color selection:** In order to avoid mechanically generated sparks from foreign particles made of aluminum with iron oxide and/or particles of rust on the surface[5], the pump is painted as standard with corrosion protecting. Please contact your Rexroth partner for available colors.
- **Bearing service life:** The bearing service life must be calculated in any case. The load cycle forms the basis for this. Please contact us.
- **Potential equalization:** The pump must be grounded. For grounding points, please refer to the drawings starting on page 15.

1) All attachment pumps must match the ATEX classification for the application in question.
2) With through-drive shaft, without hub, without intermediate flange, plugged on a functionally reliable basis with cover (see data sheet 95581).
3) Splined hub ..... × 8H according to DIN 5480
4) Hub for splined shaft according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
5) See DIN EN ISO 80079-36, 6.4.2.1

Hydraulic fluids

The A4VSO ATEX variable pump is designed for operation with HLP mineral oil according to DIN 51524. Application instructions and requirements for hydraulic fluid selection, behavior during operation as well as disposal and environmental protection should be taken from the following data sheets before the start of project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons

Selection of hydraulic fluid

Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235.
Hydraulic fluids with positive evaluation in the Fluid Rating are listed in the following data sheet:

- 90245: Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)

Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (v_{opt}; see selection diagram).

Please note

The leakage temperature which is influenced by pressure and rotational speed is always above the reservoir temperature.
Temperature class T4 and T3 according to ATEX:
Safety instructions, see page 5

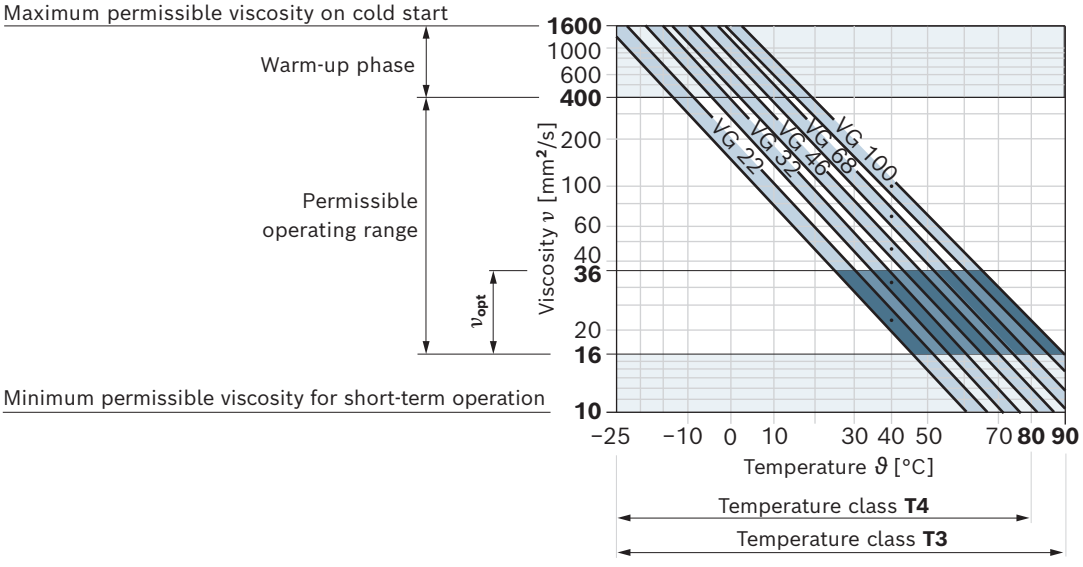
Ignition temperature of hydraulic fluid

The pump is approved for temperature class T4 to T1 according to DIN EN ISO 80079-36.
According to DIN EN ISO 80079-37, only hydraulic fluids with an ignition temperature at least 50 K above the maximum surface temperature of the approved temperature class should be used. Example: For the temperature class T4, the ignition temperature of the hydraulic fluid should be ≥ 185 °C.

Viscosity and temperature of hydraulic fluids

	Viscosity	Temperature	Remarks
Cold start	v_{max} ≤ 1600 mm²/s	ϑ_{St} ≥ −25 °C	t ≤ 3 min, without load p ≤ 50 bar Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
Warm-up phase	v = 1600 to 400 mm²/s		For p_{nom}, 0.5 × n_{max} and t ≤ 15 min
Permissible operating range	v = 400 to 16 mm²/s	**T3** ϑ = −25 °C to +90 °C **T4** ϑ = −25 °C to +80 °C	Measured at the drain port Observe the permissible temperature range of the shaft seal
	v_{opt} = 36 to 16 mm²/s		Optimal operating viscosity and efficiency range
Short-term operation	v_{min} ≤ 16 to 10 mm²/s	**T3** ϑ = −25 °C to +90 °C **T4** ϑ = −25 °C to +80 °C	t <3 min, p <0.3 × p_{nom}

▼ **Selection diagram**



Operating data monitoring – X parameters

Ambient temperature Ta (T3-T1): -20 °C to +60 °C; Ta (T4): -20 °C to +40 °C

Safety instructions for temperature class T3–T1

ATEX category II 3G Ex h IIC T3–T1 Gc X
To observe the **maximum leakage temperature of 90 °C**, at least one of the following measures must be taken and checked regularly:

- Check the leakage temperature at port **T** or **R**(**L**) (maximum distance 30 cm)
- Check the maximum inlet temperature of 60 °C at the suction port
- Check a maximum inlet temperature that must be determined for the following operating points when commissioning:
  - Maximum working pressure and maximum possible flow
  - Maximum working pressure and minimum flow

Also monitor the reservoir level. Take appropriate action if the temperature exceeds limits.

ATEX category II 2G Ex h IIC T3–T1 Gb X
To observe the **maximum leakage temperature of 90 °C**, the following measures must be taken:

- Continuously monitor the leakage temperature at each pump with a temperature sensor on port **T** or **R**(**L**) (maximum distance to port 30 cm).
- Connect the temperature sensor with a switching-off for the system at the limit temperature of 90 °C.
- This shut-off function should be tested during commissioning; see chapter 8.1.1 of the operating instructions.
- Reservoir level monitoring is also required.

Safety instructions for temperature class T4

ATEX category II 3G Ex h IIC T4 Gc X
To observe the **maximum leakage temperature of 80 °C**, at least one of the following measures must be taken and checked regularly:

- Check the leakage temperature at port **T** or **R**(**L**) (maximum distance 30 cm)
- Check the maximum inlet temperature of 50 °C at the suction port
- Check a maximum inlet temperature that must be determined for the following operating points when commissioning:
  - Maximum working pressure and maximum possible flow
  - Maximum working pressure and minimum flow

Also monitor the reservoir level. Take appropriate action if the temperature exceeds limits.

ATEX category II 2G Ex h IIC T4 Gb X
To observe the **maximum leakage temperature of 80 °C**, the following measures must be taken:

- Continuously monitor the leakage temperature at each pump with a temperature sensor on port **T** or **R**(**L**) (maximum distance to port 30 cm).
- Connect the temperature sensor with a switching-off for the system at the limit temperature of 80 °C.
- This shut-off function should be tested during commissioning; see chapter 8.1.1 of the operating instructions.
- Reservoir level monitoring is also required.

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.
A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406
At a hydraulic fluid viscosity of less than 10 mm²/s (e.g. due to high temperatures during short-term operation) at the drain port, a cleanliness level of at least 19/17/14 according to ISO 4406 is required.
Examples of temperatures of hydraulic fluids at a viscosity of 10 mm²/s:

- 73 °C at HLP 32
- 85 °C at HLP 46

Bearing flushing

Bearing flushing is required for a safe, continuous operation under the following operating conditions:

- When installed vertically (drive shaft up) for lubricating the front bearing and shaft seal
- When operated at temperature and viscosity limits when using mineral oil
- For above-reservoir installation

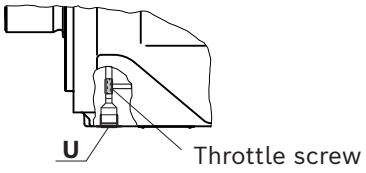
Bearing flushing is realized at port **U** in the area of the front flange of the variable pump. The flushing fluid flows through the front bearing and discharges with the pump drain at the drain port.
For the individual sizes, the following minimum flushing flows are necessary:

Size			40	71	125	180	250	355	500
Flushing flow	q_{sp}	l/min	3	4	5	7	10	15	20

For the flushing flows indicated, there is a pressure differential of approx. 2 bar (Series 10 and 11) or 3 bar (Series 30) between port **U** (including fitting) and the housing area.

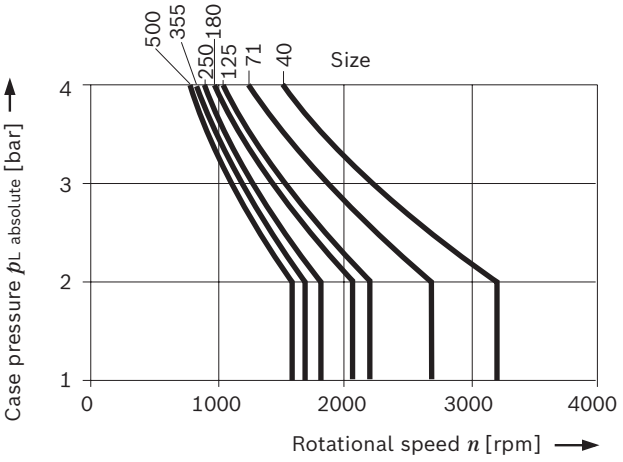
Notice regarding series 3x

When using external bearing flushing, the throttle screw in port **U** must be turned in to the end stop.



Case pressure

Permissible pressure load
The service life of the shaft seal is influenced by the rotational speed of the axial piston unit and the leakage pressure in the housing. Momentary (t <0.1 s) pressure peaks of up to 6 bar absolute are acceptable. The service life of the shaft seal decreases with increasing frequency of pressure peaks and increasing mean differential pressure.
The pressure in the housing must be equal to or greater than the ambient pressure.



Maximum case pressure	
$p_{L\ absolute\ max}$	4 bar absolute

The parameters are reference values; under certain operating conditions, restrictions may be required.

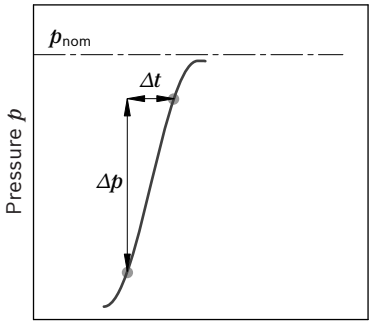
Flow direction

S to **B**

Working pressure range

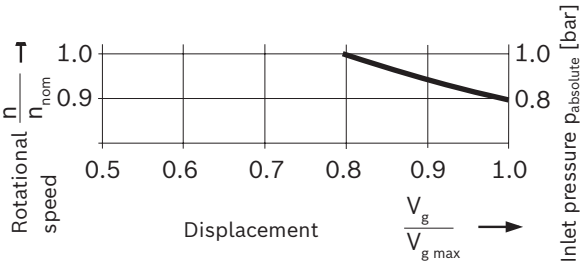
Pressure at working port B		**Definition**
Nominal pressure p_{nom}	350 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	400 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of the single operating periods must not exceed the total operating period (maximum number of cycles: approx. 1 million).
Single operating period	1 s	
Total operating period	300 h	
Minimum pressure (high-pressure side)	15 bar	Minimum pressure on the high-pressure side (**B**) which is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and the swivel angle.
Rate of pressure change $R_{A\,max}$	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)		
Minimum pressure $p_{S\,min}$ **Standard**	0.8 bar absolute	Minimum pressure at suction port **S** (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Maximum pressure $p_{S\,max}$	30 bar	
Case pressure at port T, K_1, K_2, R(L)		
Maximum pressure $p_{L\,max}$	4 bar absolute	The permissible case pressure depends on the rotational speed. The parameters are reference values; under certain operating conditions, restrictions may be required.
Pressure peaks $p_{L\,peak}$	6 bar absolute	t<0.1 s

▼ **Rate of pressure change $R_{A\,max}$**



▼ **Minimum pressure (inlet)**

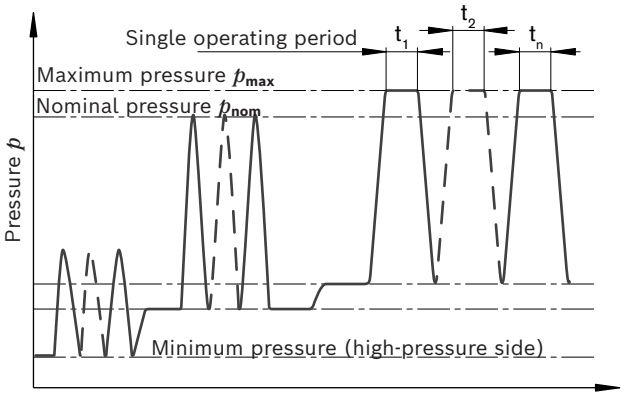
In order to avoid damage to the axial piston unit, a minimum pressure must be guaranteed at the suction port S (inlet).



The inlet pressure is the static supply pressure and the minimum dynamic value, respectively, e.g. in case of pre-charge pressure.

Maximum permissible rotational speed n_{nom}, see page 8.

▼ **Pressure definition**



Total operating period = $t_1 + t_2 + ... + t_n$

Notice

Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

Technical data

Size		NG		40	71	125	180	250	250 H[1)]	355	355 H[1)]	500	500 H[1)]
Geometric displacement, per revolution		$V_{g\,max}$	cm^3	40	71	125	180	250	250	355	355	500	500
Maximum rotational speed[2)]	at $V_{g\,max}$	n_{nom}	rpm	2600	2200	1800	1800	1500	1800	1500	1700	1320	1500
Flow	at n_{nom} and $V_{g\,max}$	$q_{v\,max}$	l/min	104	156	225	324	375	450	533	604	660	750
	at n_E = 1500 rpm	$q_{vE\,max}$	l/min	60	107	186	270	375	375	533	533	–	750
Power	at n_{nom}, $V_{g\,max}$ and Δp = 350 bar	P	kW	61	91	131	189	219	262	311	352	385	437
	at n_E = 1500 rpm, $V_{g\,max}$ and Δp = 350 bar	$P_{E\,max}$	kW	35	62	109	158	219	219	311	311	–	437
Torque	at $V_{g\,max}$ and Δp = 350 bar	M_{max}	Nm	223	395	696	1002	1391	1391	1976	1976	2783	2783
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	64	113	199	286	398	398	564	564	795	795
Rotary stiffness	Drive shaft P	c	kNm/rad	80	146	260	328	527	527	800	800	1145	1145
	Drive shaft Z	c	kNm/rad	77	146	263	332	543	543	770	770	1136	1136
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0049	0.0121	0.03	0.055	0.0959	0.0959	0.19	0.19	0.3325	0.3325
Maximum angular acceleration[3)]		α	rad/s^2	17000	11000	8000	6800	4800	4800	3600	3600	2800	2800
Case volume		V	L	2	2.5	5	4	10	10	8	8	14	14
Weight without through drive (approx.)		m	kg	39	53	88	102	184	184	207	207	320	320

Determination of the characteristics

Flow	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[l/min]
Torque	$M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$	[Nm]
Power	$P = \frac{2\pi \cdot M \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$	[kW]

Key

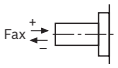
V_g	=	Displacement per revolution [cm^3]
Δp	=	Differential pressure [bar]
n	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{mh}	=	Mechanical-hydraulic efficiency
η_t	=	Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or total destruction of the axial piston unit and loss of explosion protection. We recommend checking the loading by means of experiment or calculation/simulation and comparison with the permissible values.

1) High-speed version
2) The values are applicable:
   – at an absolute pressure $p_{absolute}$ = 1 bar at the suction port **S**
   – for the optimum viscosity range from v_{opt} = 36 to 16 mm^2/s
   – with hydraulic fluid based on mineral oils
3) The data are valid for values between the minimum required and maximum permissible rotational speed. It applies for external stimuli (e.g. diesel engine 2 to 8 times rotary frequency, cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.

Permissible radial and axial loading on the drive shafts

Size	NG		40	71	125	180	250	355	500
Radial force, maximum  at X/2	$F_{q\,max}$	N	1000	1200	1600	2000	2000	2200	2500
Maximum axial force 	$\pm F_{ax\,max}$	N	600	800	1000	1400	1800	2000	2000

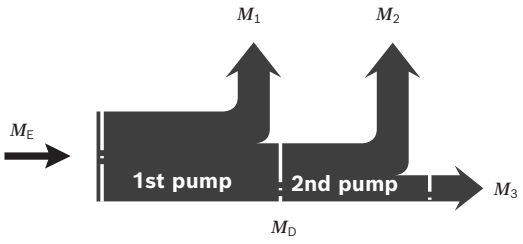
Permissible input and through-drive torques

Size	NG		40	71	125	180	250	355	500
Torque at $V_{g\,max}$ and Δp = 350 bar[1]	M_{max}	Nm	223	395	696	1002	1391	1976	2783
Max. input torque on drive shaft[2]									
Splined shaft Z	$M_{E\,max}$	Nm	446	790	1392	2004	2782	3952	5566
Shaft key P	$M_{E\,max}$	Nm	380	700	1392	1400	2300	3557	5200
Maximum through-drive torque	$M_{D\,max}$	Nm	223	395	696	1002	1391	1976	2783

Notes

- In case of through drive pumps as well as in case of bi-directional torque loads, the use of a splined shaft is recommended.
- The through-drive torques apply to the through-drive shaft without hub:
  Prepared for through drive, with pressure-resistant plugged cover – order code K/U99.
- The permissible output torques of the supplied hub depend on the drive torques of the attachment pumps from the table:
  Overview of mounting options on page 41
- All attachment pumps must match the ATEX classification for the application in question.

▼ **Distribution of torques**



Torque at 1st pump	M_1		
Torque at 2nd pump	M_2		
Torque at 3rd pump	M_3		
Input torque	M_E	=	$M_1 + M_2 + M_3$
	M_E	<	$M_{E\,max}$
Through-drive torque	M_D	=	$M_2 + M_3$
	M_D	<	$M_{D\,max}$

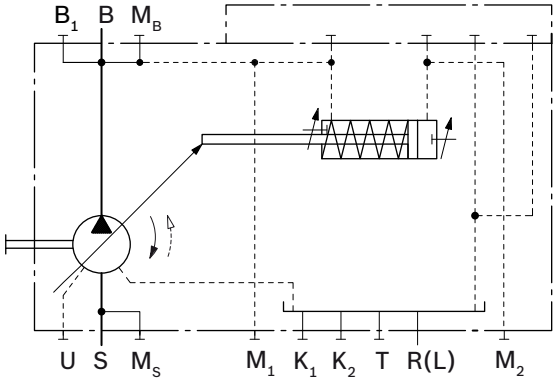
1) Efficiency not considered
2) For drive shafts with no radial force

Overview of control devices

OV – Without control

At axial piston units without OV control, the stroking piston is based on DR control. The stroking piston is unloaded to the reservoir. The $V_{g\ max}$ limitation can be adjusted from 50 to 100%. The axial piston unit without control acts like a fixed pump in operation.

▼ **Circuit diagram**



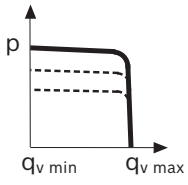
DR - Pressure controller
(see 92060)

The DR pressure controller limits the maximum pressure at the pump outlet within the control range of the pump. The pressure is continuously adjustable on the control valve.

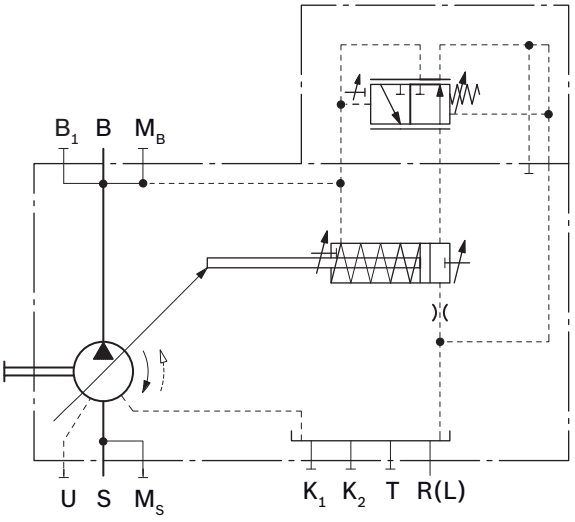
- Setting range 50...350 bar

Optional:
Remotely controllable (DRG)

▼ **Characteristic curve**



▼ **Circuit diagram**



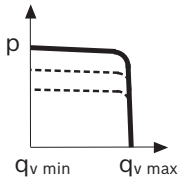
Notice

- All additional components have to comply with the application-specific ATEX classification.

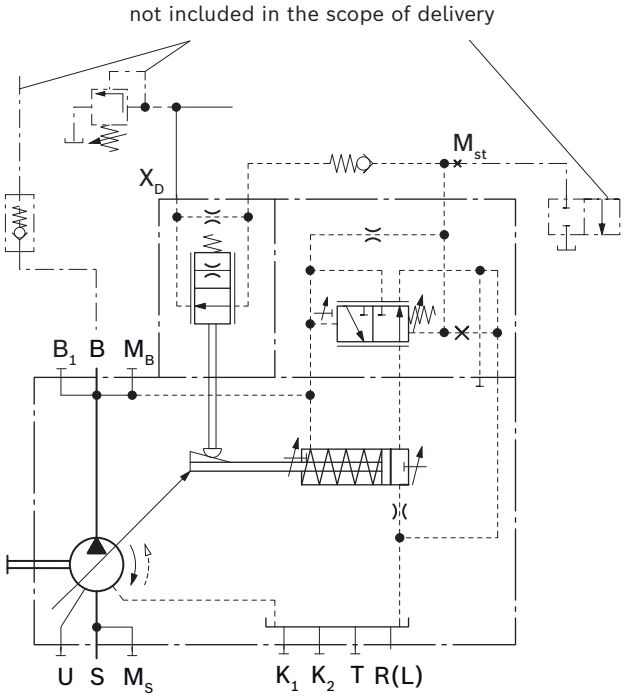
DP - Pressure controller, for parallel operation
(see 92060)

Suitable for pressure control of multiple A4VSO ATEX axial piston units in parallel operation.
Optional:
Flow control (DPF)

▼ **Characteristic curve**



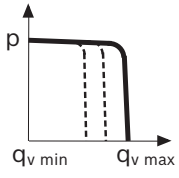
▼ **Circuit diagram**



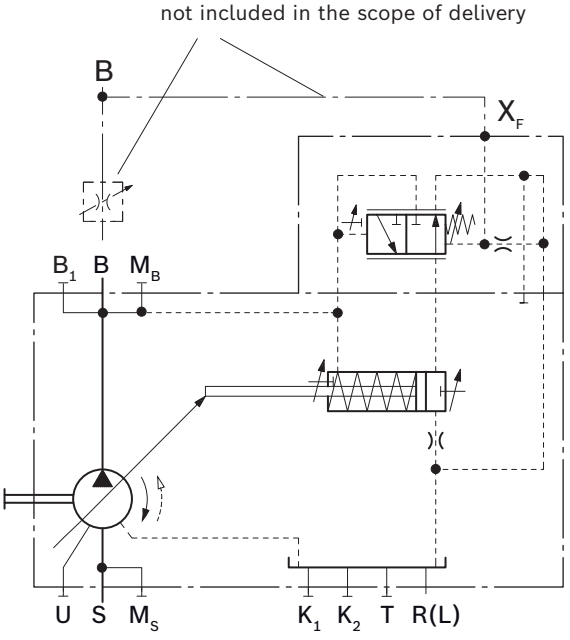
FR – Flow controller
(see 92060)

Maintains a constant flow in a hydraulic system.
Optional:
Remotely controllable pressure control (FRG)
Connection from $\mathbf{X}_F$ plugged to the reservoir (FR1, FRG1)

▼ **Characteristic curve**



▼ **Circuit diagram**



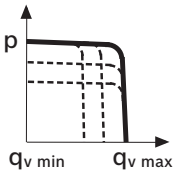
Notice

- All additional components have to comply with the application-specific ATEX classification.

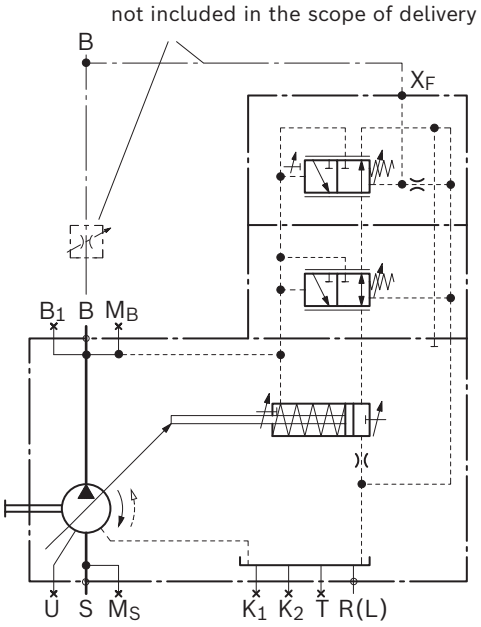
DFR – Pressure and flow controller
(see 92060)

This controller keeps the flow of the pump constant, even under changing operating conditions.
Flow control is overlaid by a mechanically adjustable pressure controller.
Optional:
Connection from $\mathbf{X_F}$ plugged to the reservoir (DFR1)

▼ **Characteristic curve**



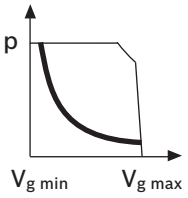
▼ **Circuit diagram**



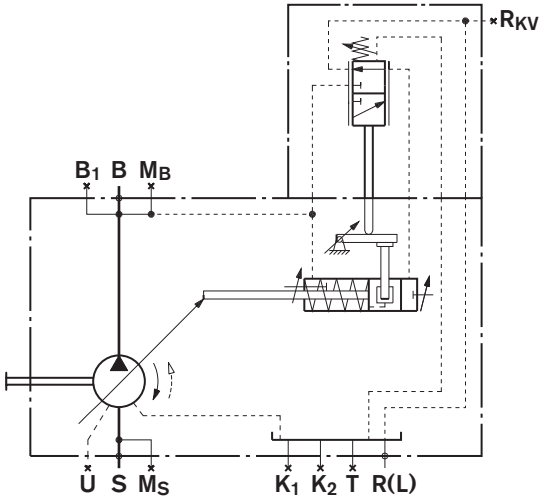
LR2 – Power controller with hyperbolic characteristic curve
(see 92064)

The hyperbolic power controller keeps the specified drive power constant at the same drive speed.
Optional:
Pressure control (LR2D), remotely controllable (LR2G);
Flow control (LR2F, LR2S);
hydraulic two-point control (LR2Z)
Not available from RE 92064:
LR2.Y (electric unloading valve)

▼ **Characteristic curve**



▼ **Circuit diagram**



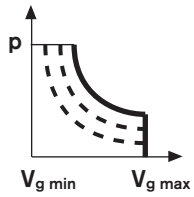
Notice

- All additional components have to comply with the application-specific ATEX classification.

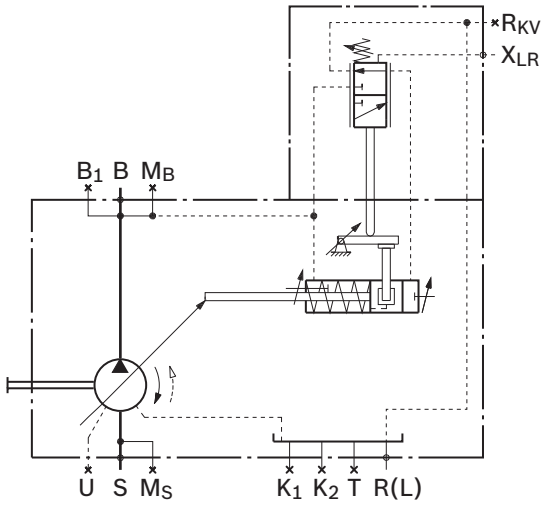
LR3 – Power controller with remotely adjustable power characteristic
(see 92064)

This hyperbolic power controller keeps the specified drive power constant, whereby the power characteristic is adjustable remotely.
Optional:
Pressure control (LR3D), remotely controllable (LR3G); Flow control (LR3F, LR3S); hydraulic two-point control (LR3Z)
Not available from RE 92064:
LR3.Y (electric unloading valve)

▼ **Characteristic curve**



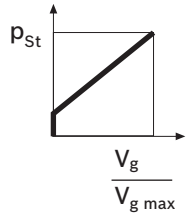
▼ **Circuit diagram**



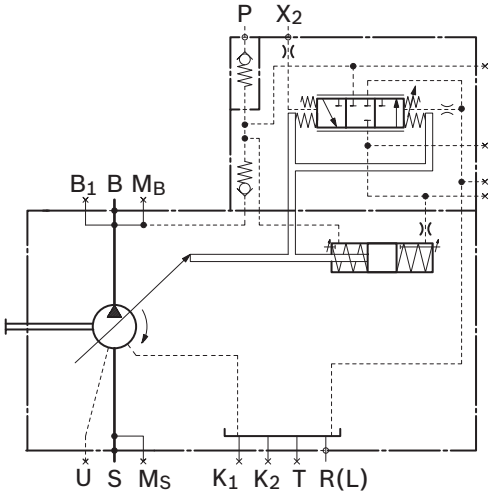
HD – Hydraulic control, pilot-pressure related
(see 92080)

Stepless setting of the pump displacement according to the pilot pressure. The control is proportional to the specified pilot pressure (difference between pilot pressure and case pressure).
Optional:
Control characteristics (HD1, HD3);
pressure control (HD.B);
Remote pressure control (HD.GB); power control (HD1P)
Not available from RE92080:
HD..T and HD..U (DBEP6 mounted)

▼ **Characteristic curve**



▼ **Circuit diagram**



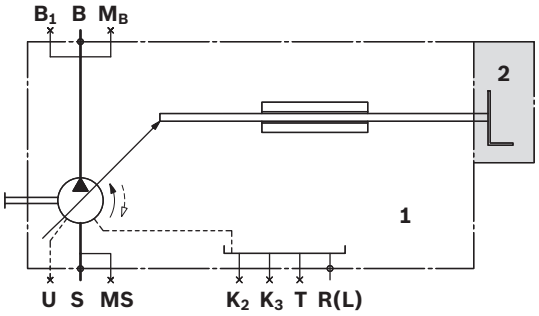
Notice

- All additional components have to comply with the application-specific ATEX classification.

MA – Manual control
(see 92072)

Manual control enables adjustment of the pump displacement by rotating the handwheel.
The change of displacement can be monitored via the swivel angle indicator.
The MA adjustment has a locking lever for fixing the displacement during operation.

▼ **Circuit diagram** (example using A4VSO)



Components

1 Axial Piston variable Pump A4VSO
2 Handwheel

GE – Rod system control

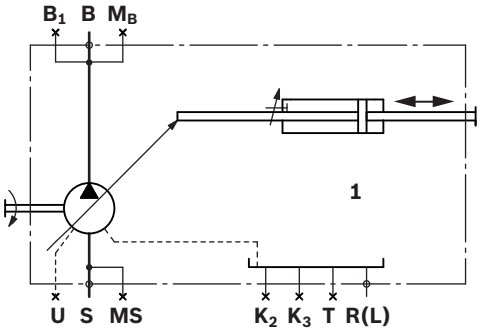
A stroke movement of the stroking piston is realized by means of directly connected control on the customer side with a direct connection to the rod system of the stroking piston. This leads to a change in displacement of the pump from $V_{g\,min}$ to $V_{g\,max}$ or vice versa.
The change of displacement can be monitored via the optical swivel angle indicator.

Max control force NG 71:	6000 N
Max control force NG 125, 180:	9000 N
Maximum permissible working pressure:	150 bar

Flow direction

Drive direction viewed on drive shaft	Swivel direction	Flow
Clockwise	Counter-clockwise	**B**, **B**$_1$

Circuit diagram (example using A4VSO NG71)



Components

1 Axial Piston variable Pump A4VSO

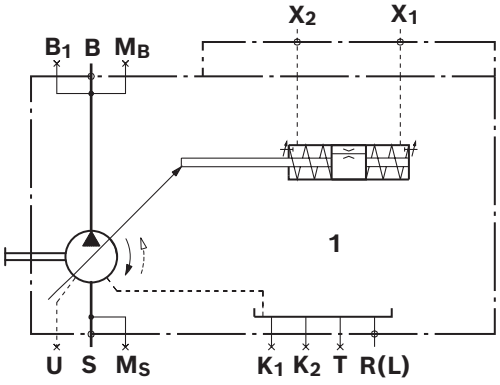
Hydraulic control HM 1/2, volume-dependent
(see 92076)

The pump displacement volume is continously adjustable in relation to the control fluid quantity in ports **X**$_1$ and **X**$_2$.
Application:
– 2-point circuit
– Base device for servo or proportional controls

Notice

▶ All additional components have to comply with the application-specific ATEX classification.

Circuit diagram (example using A4VSO)



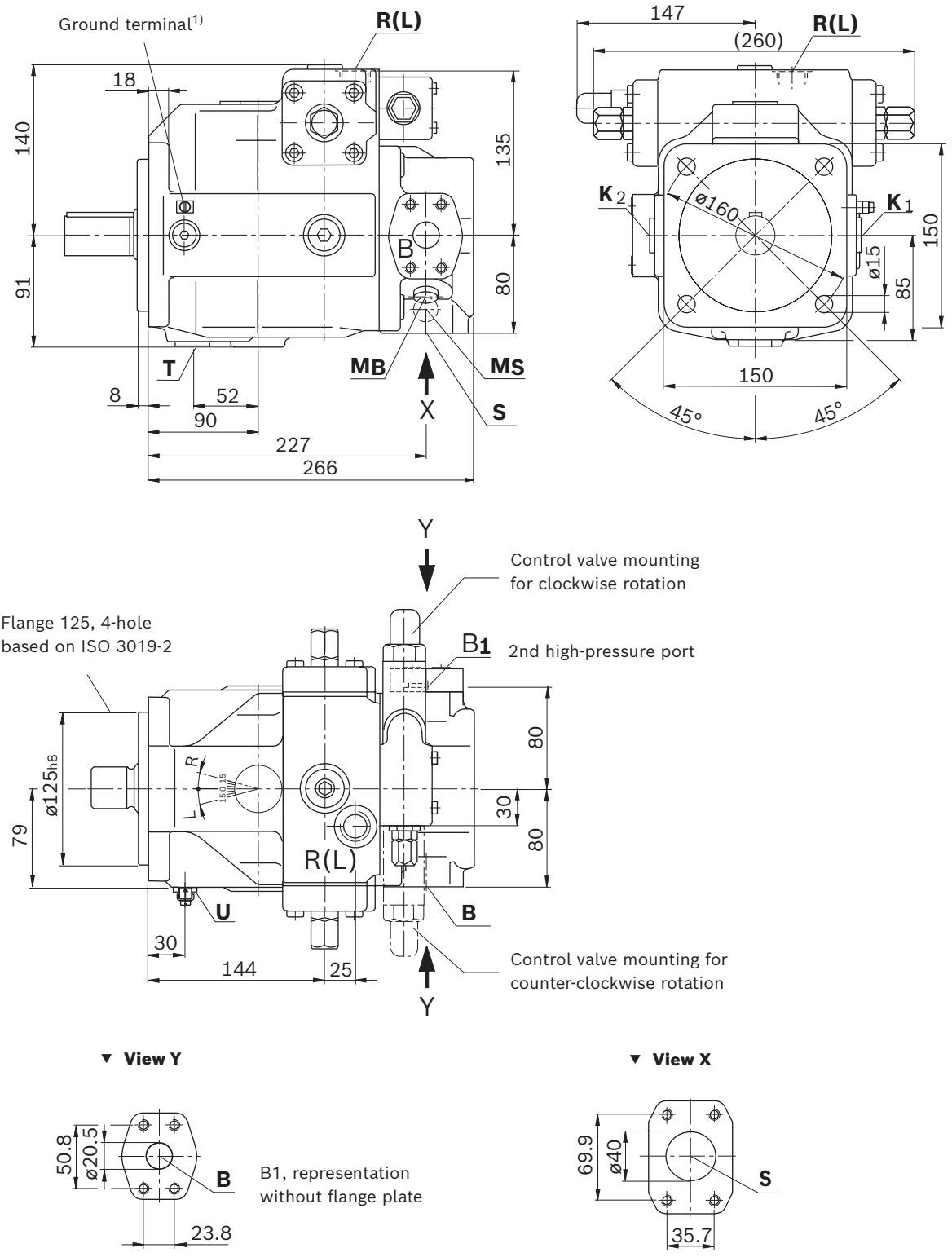
Components

1 Axial Piston variable Pump A4VSO

Dimensions, size 40

DR – Pressure controller; flange valve version metric

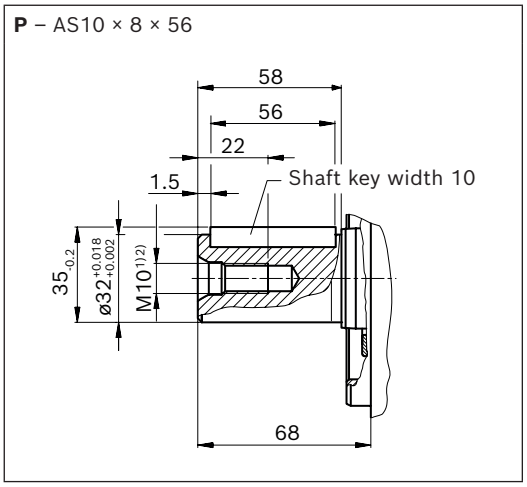
(for further dimensions of control devices, please refer to the respective data sheets)



1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

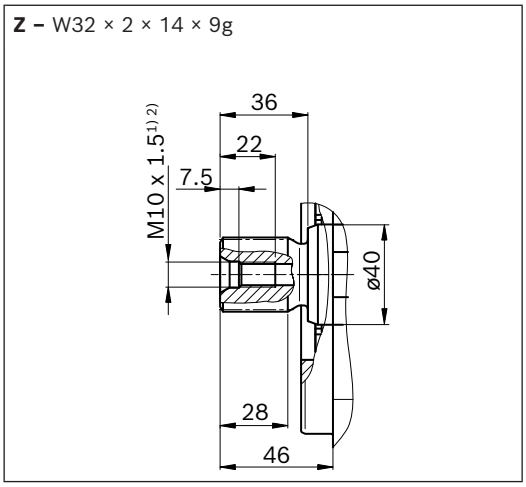
▼ **Parallel keyed shaft (DIN 6885)**

P – AS10 × 8 × 56



▼ **Splined shaft (DIN 5480)**

Z – W32 × 2 × 14 × 9g



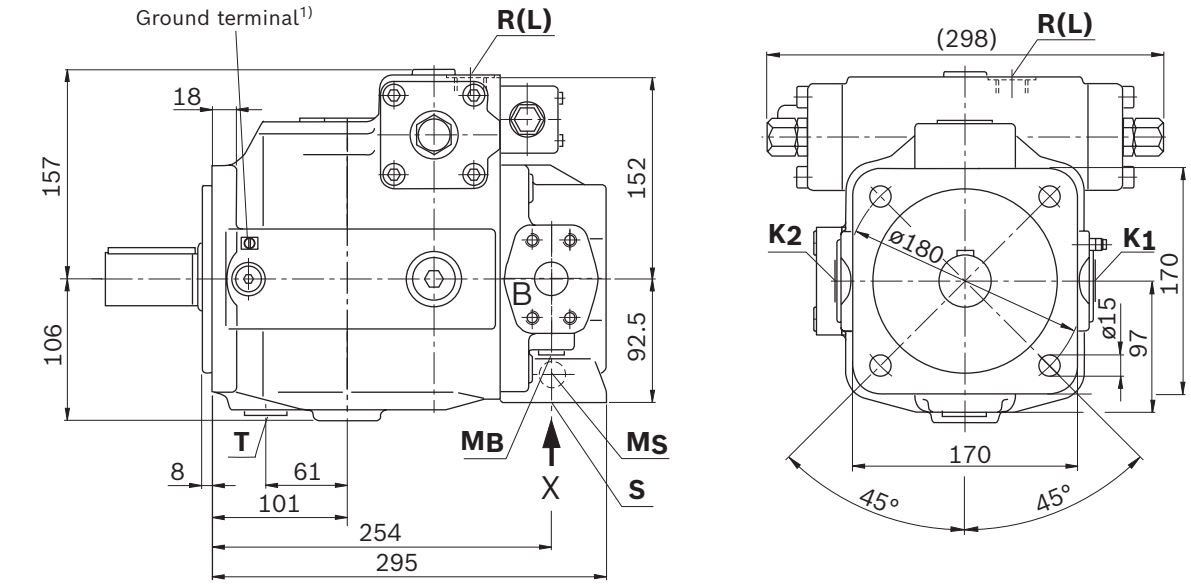
Ports		Standard	Size[3]	p_{max} [bar][4]	State[9]
B	Working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	3/4 in M10 × 1.5; 17 deep	400	X[8]
S	Suction port Fastening thread	SAE J518[6] DIN 13	1 1/2 in M12 × 1.75; 20 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5]	M22 × 1.5; 14 deep	6 absolute	X
T	Fluid drain	DIN 3852[5]	M22 × 1.5; 14 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5]	M22 × 1.5; 12 deep	6 absolute	O
U	Flushing port	DIN 3852[5]	M14 × 1.5; 11.5 deep	6 absolute	X[7]

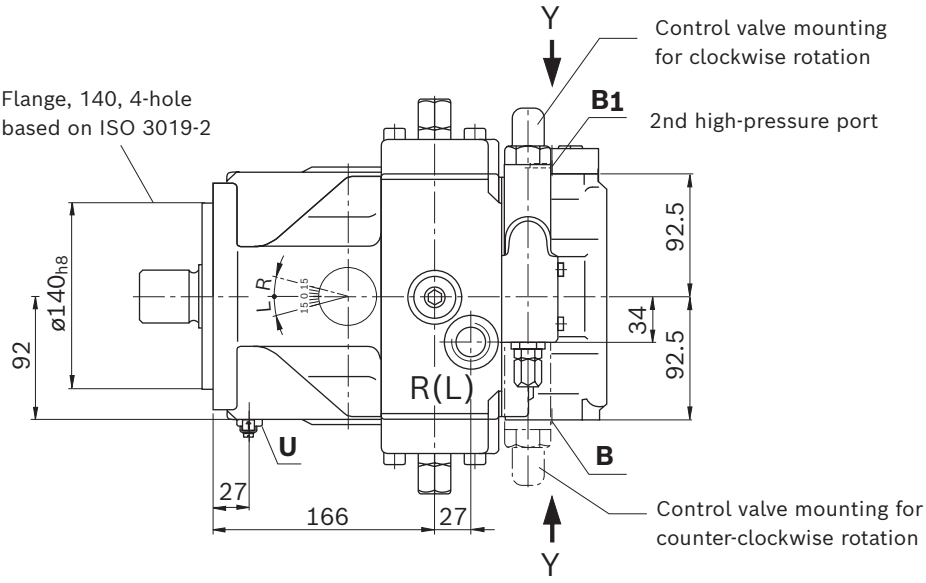
1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

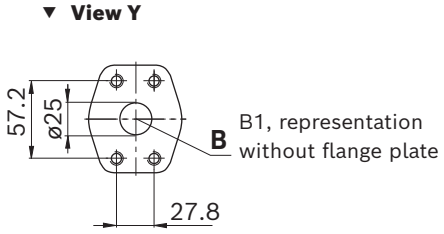
Dimensions, size 71

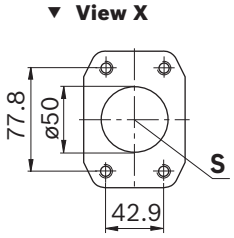
DR – Pressure controller; flange valve version metric

(Further dimensions for the controls are provided in the relevant data sheets)



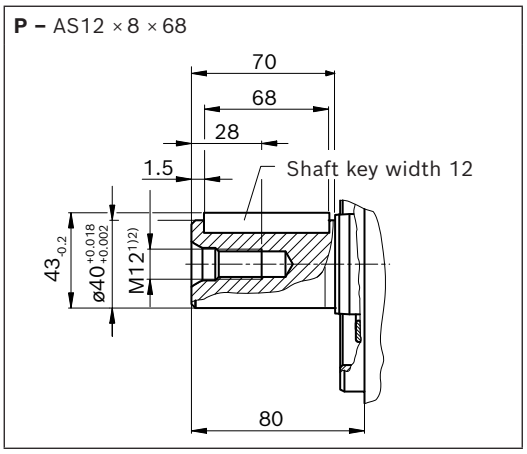




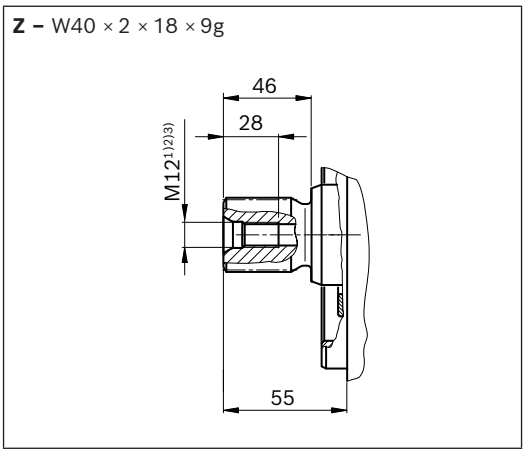


1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



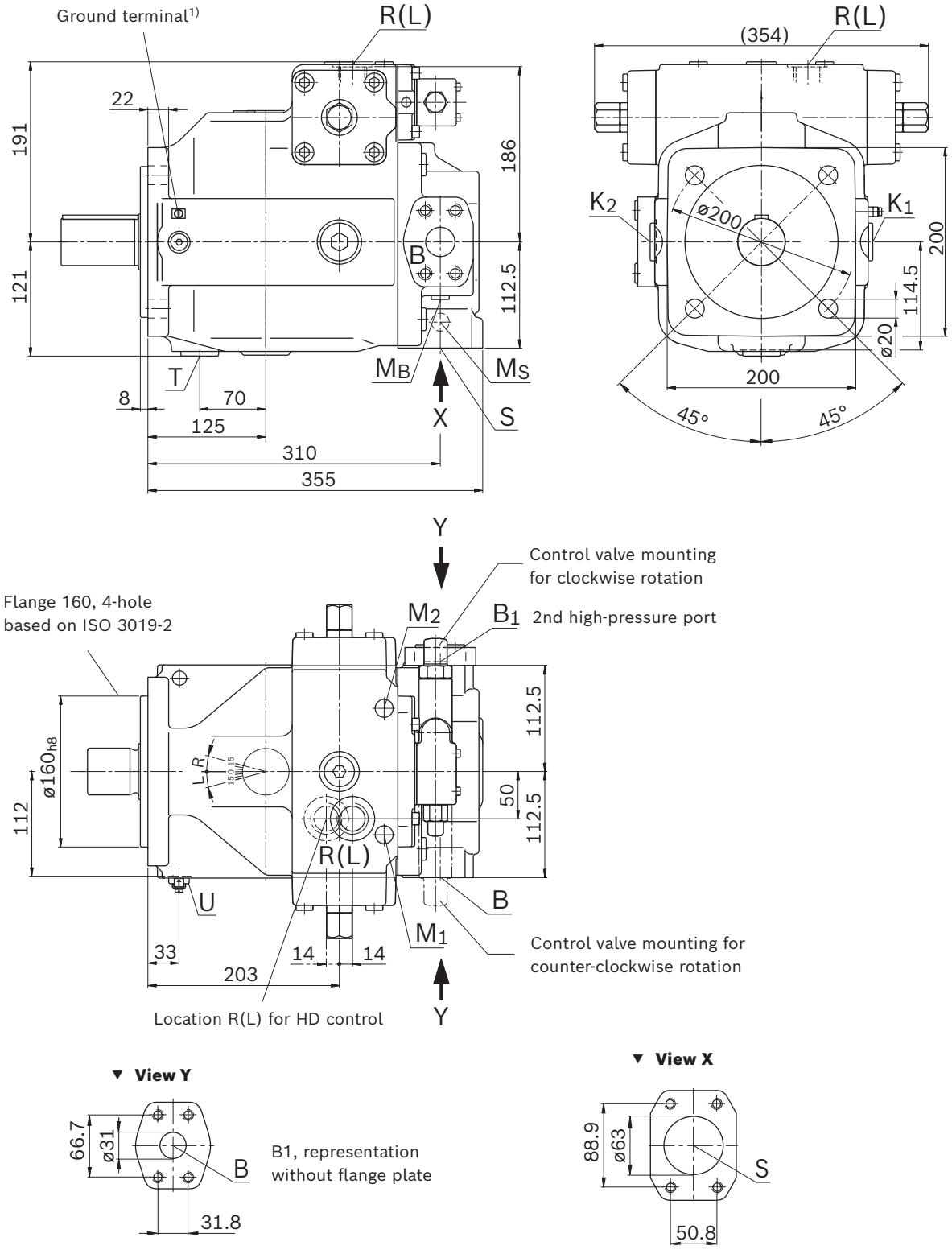
Ports		Standard	Size[3]	p_{max} [bar][4]	State[9]
B	Working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 in M12 × 1.75; 20 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 in M12 × 1.75; 20 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	2 in M12 × 1.75; 20 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5]	M27 × 2; 16 deep	6 absolute	X
T	Fluid drain	DIN 3852[5]	M27 × 2; 16 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5]	M27 × 2; 16 deep	6 absolute	O
U	Flushing port	DIN 3852[5]	M14 × 1.5; 12 deep	6 absolute	X[7]

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 125

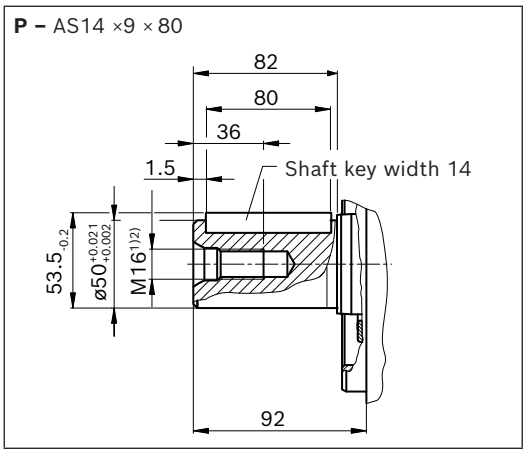
DR – Pressure controller; flange valve version metric

(Further dimensions for the controls are provided in the relevant data sheets)

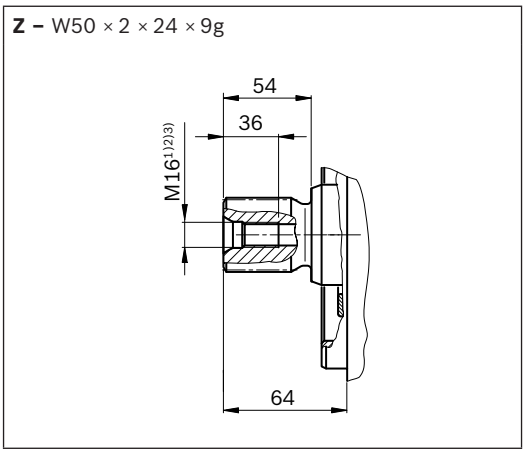


1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



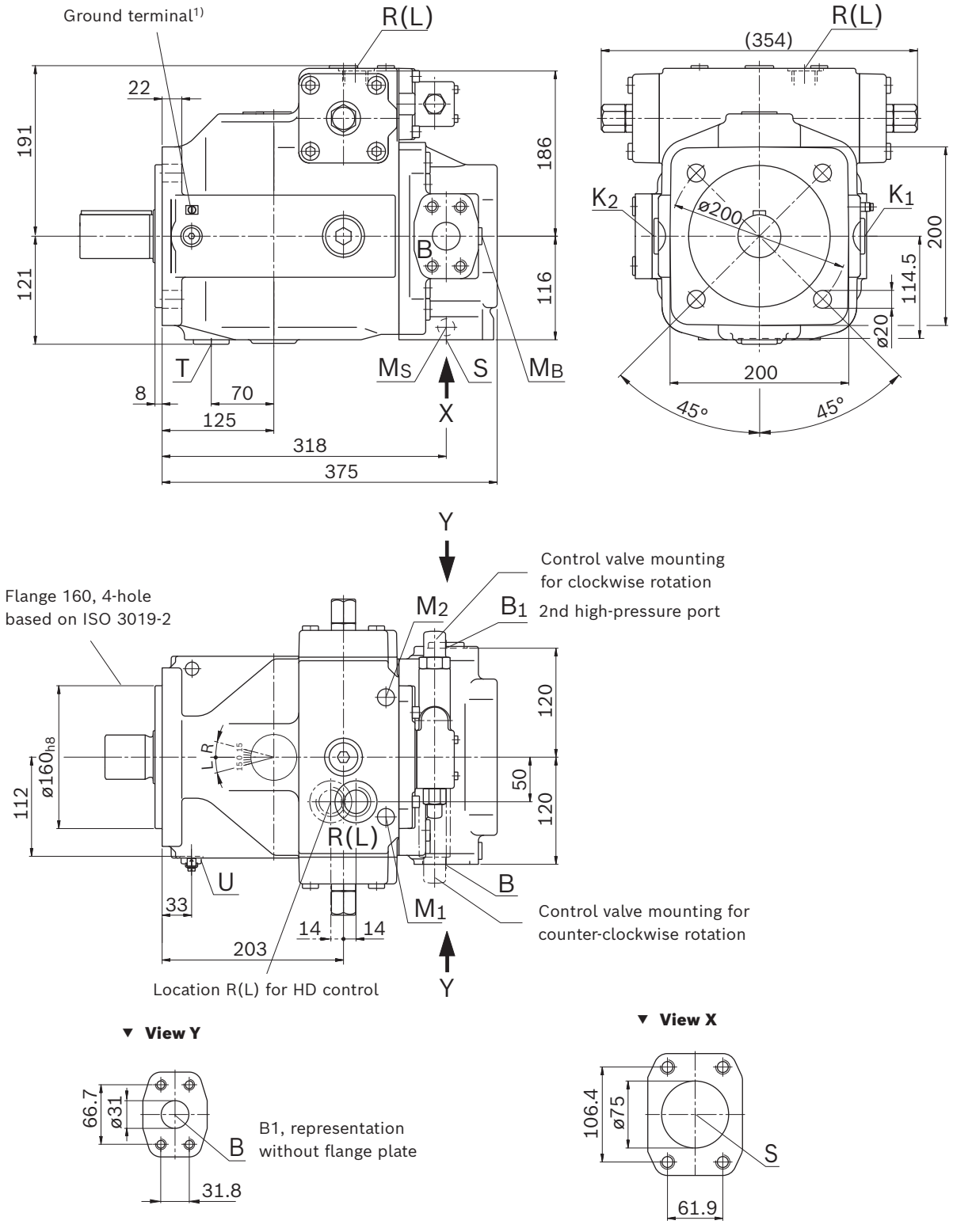
Ports		Standard	Size[3]	p_{max} [bar][4]	State[9]
B	Working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	2 1/2 in M12 × 1.75; 18 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5]	M33 × 2; 18 deep	6 absolute	X
T	Fluid drain	DIN 3852[5]	M33 × 2; 18 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5]	M33 × 2; 18 deep	6 absolute	O
U	Flushing port	DIN 3852[5]	M14 × 1.5; 12 deep	6 absolute	X[7]
M_1, M_2	Measuring control pressure	DIN 3852[5]	M14 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 180

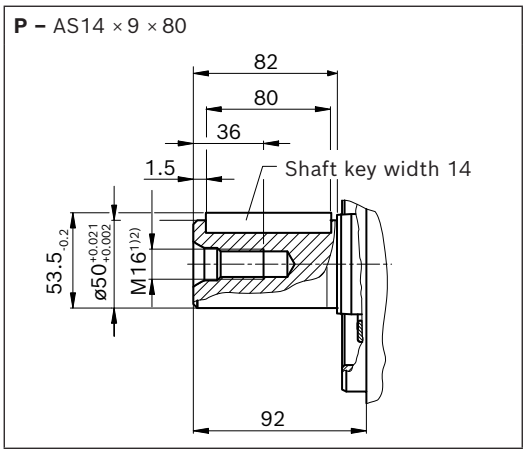
DR – Pressure controller; flange valve version metric

(Further dimensions for the controls are provided in the relevant data sheets)

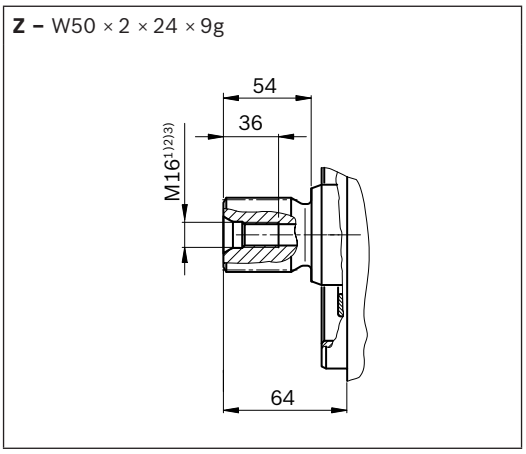


1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



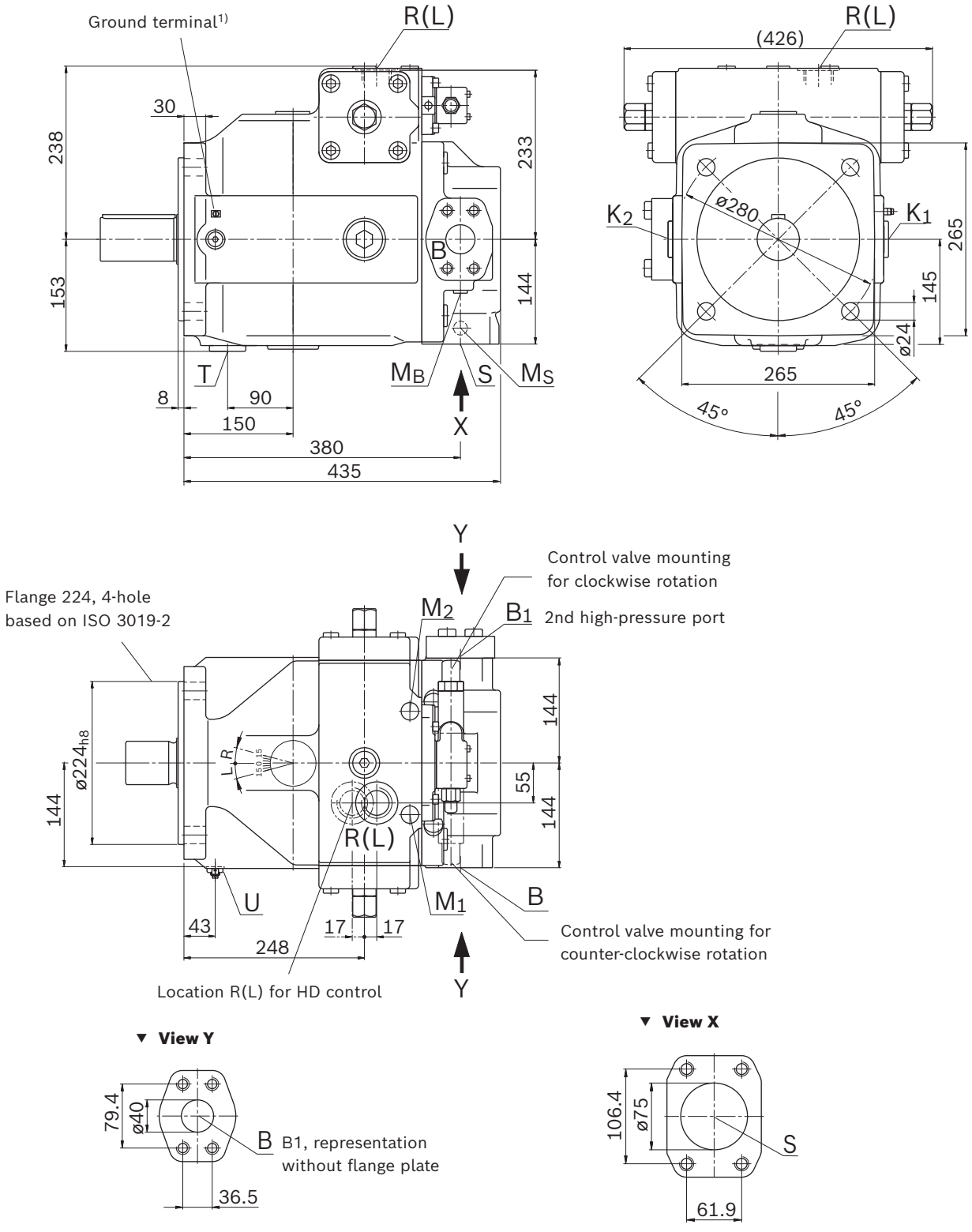
Ports		Standard	Size[3]	p_{max} [bar][4]	State[9]
B	Working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	3 in M16 × 2; 24 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5]	M33 × 2; 18 deep	6 absolute	X
T	Fluid drain	DIN 3852[5]	M33 × 2; 18 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5]	M33 × 2; 18 deep	6 absolute	O
U	Flushing port	DIN 3852[5]	M14 × 1.5; 12 deep	6 absolute	X[7]
M_1, M_2	Measuring control pressure	DIN 3852[5]	M14 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 250

DR – Pressure controller; flange valve version metric

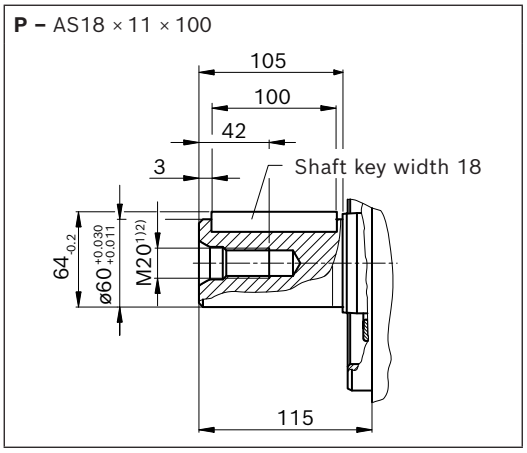
(Further dimensions for the controls are provided in the relevant data sheets)



1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

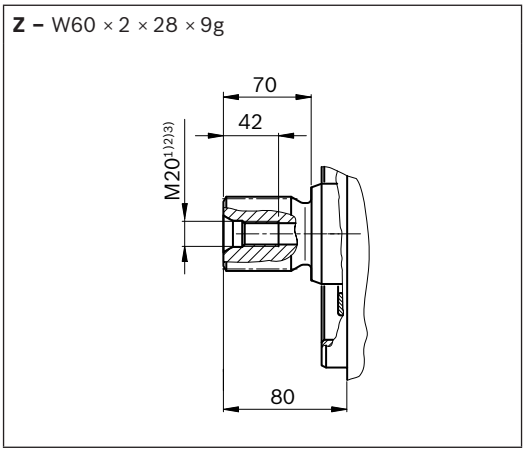
▼ **Parallel keyed shaft (DIN 6885)**

P – AS18 × 11 × 100



▼ **Splined shaft DIN 5480**

Z – W60 × 2 × 28 × 9g



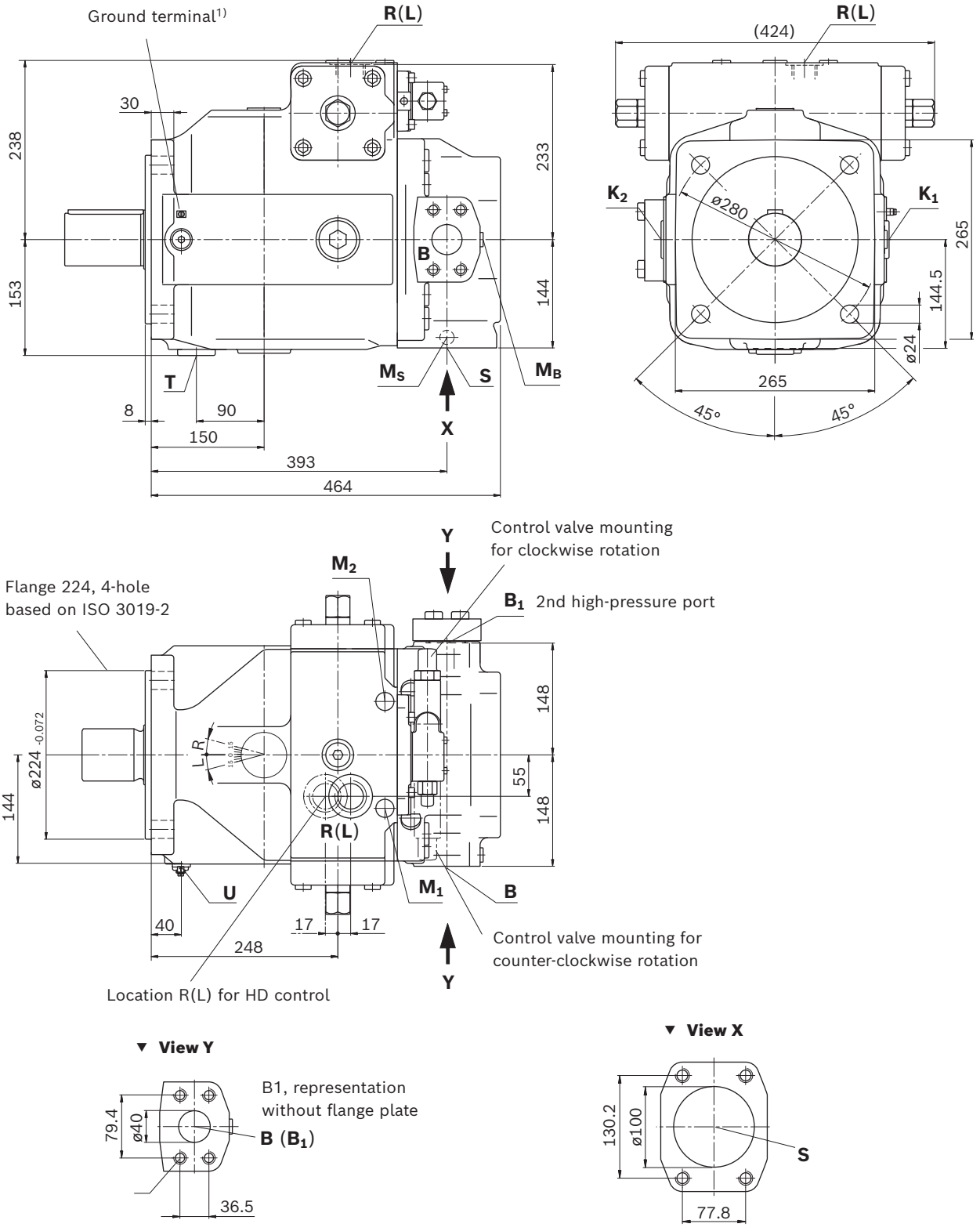
Ports		Standard	Size[3)]	p_{max} [bar][4)]	State[9)]
B	Working port (high-pressure series) Fastening thread	SAE J518[6)] DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6)] DIN 13	1 1/2 in M16 × 2; 25 deep	400	X[8)]
S	Suction port	SAE J518[6)] DIN 13	3 in M16 × 2; 24 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5)]	M42 × 2; 20 deep	6 absolute	X
T	Fluid drain	DIN 3852[5)]	M42 × 2; 20 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5)]	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5)]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5)]	M42 × 2; 20 deep	6 absolute	O
U	Flushing port	DIN 3852[5)]	M14 × 1.5; 12 deep	6 absolute	X[7)]
M_1, M_2	Measuring control pressure	DIN 3852[5)]	M14 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 355

DR – Pressure controller; flange valve version metric

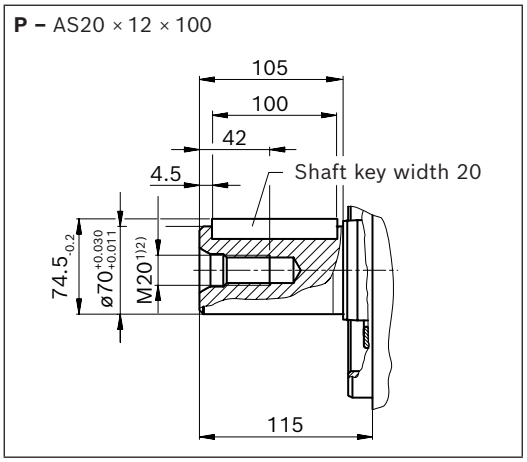
(Further dimensions for the controls are provided in the relevant data sheets)



1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

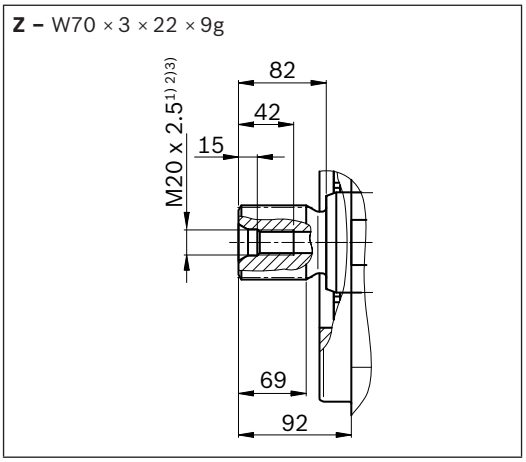
▼ **Parallel keyed shaft (DIN 6885)**

P – AS20 × 12 × 100



▼ **Splined shaft DIN 5480**

Z – W70 × 3 × 22 × 9g



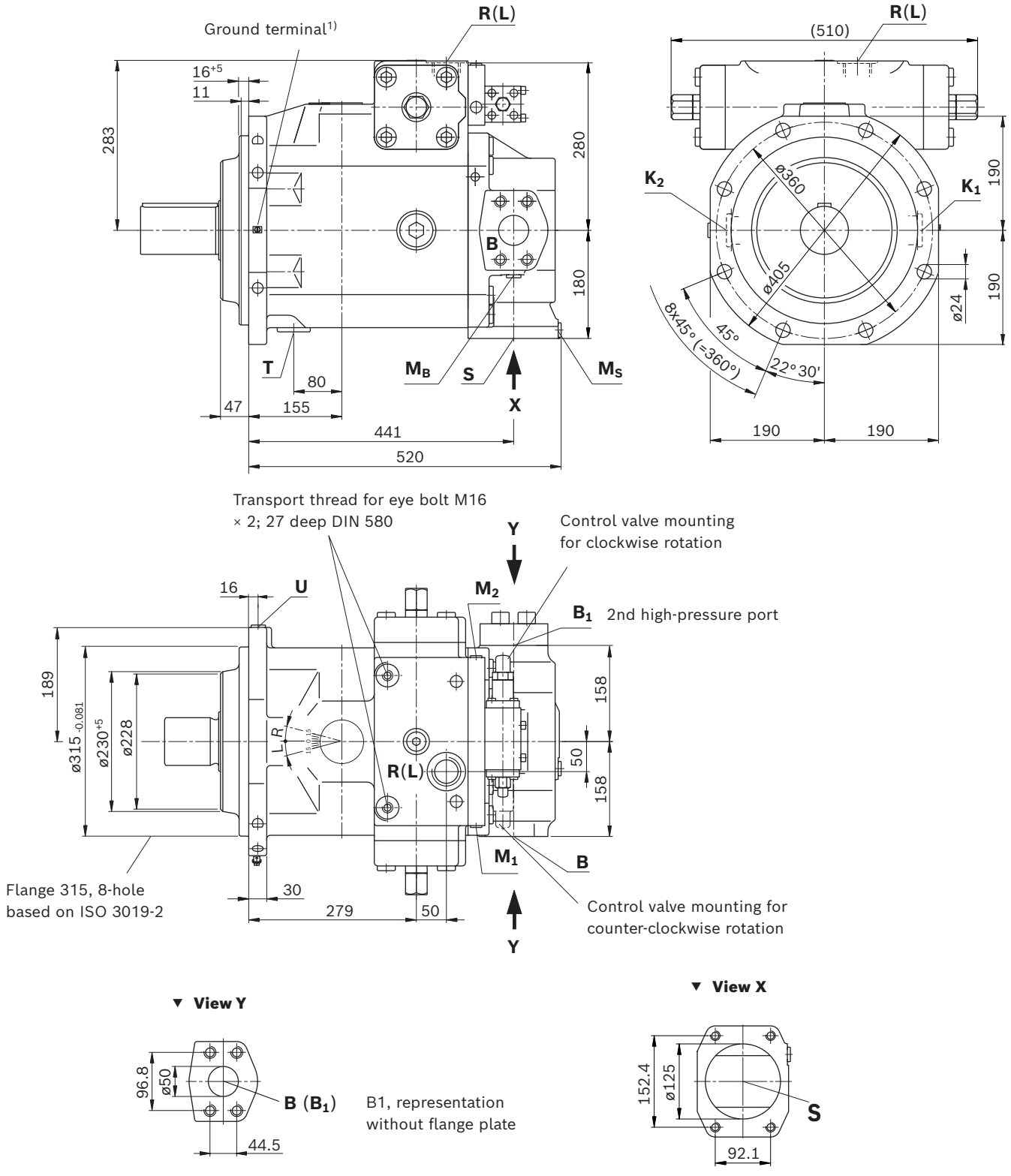
Ports		Standard	Size[3]	p_{max} [bar][4]	State[9]
B	Working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	1 1/2 in M16 × 2; 25 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	4 in M16 × 2; 24 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5]	M42 × 2; 20 deep	6 absolute	X
T	Fluid drain	DIN 3852[5]	M42 × 2; 20 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5]	M42 × 2; 20 deep	6 absolute	O
U	Flushing port	DIN 3852[5]	M18 × 1.5; 12 deep	6 absolute	X[7]
M_1, M_2	Measuring control pressure	DIN 3852[5]	M18 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 500

DR – Pressure controller; flange valve version metric

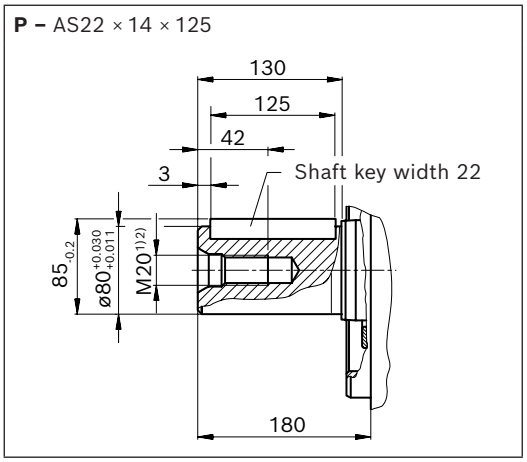
(Further dimensions for the controls are provided in the relevant data sheets)



1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

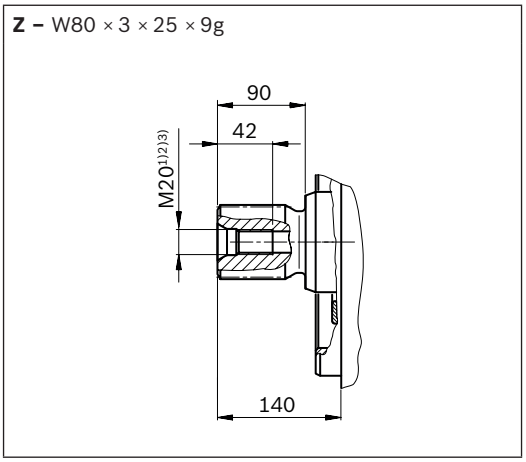
▼ **Parallel keyed shaft (DIN 6885)**

P – AS22 × 14 × 125



▼ **Splined shaft DIN 5480**

Z – W80 × 3 × 25 × 9g

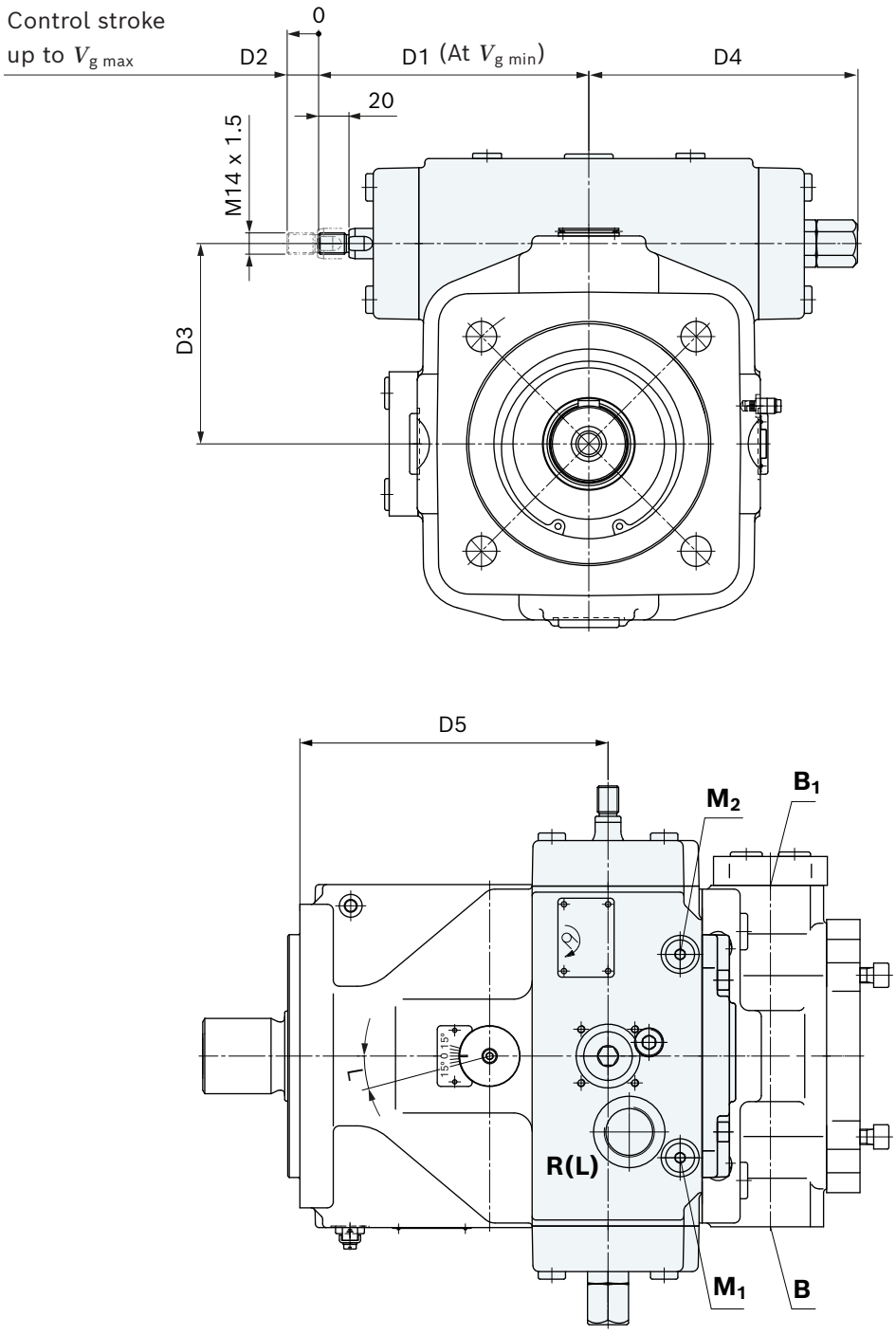


Ports		Standard	Size[3]	p_{max} [bar][4]	State[9]
B	Working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	2 in M20 × 2.5; 25 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518[6] DIN 13	2 in M20 × 2.5; 24 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	5 in M16 × 2; 24 deep	30	O
K_1, K_2	Flushing port	DIN 3852[5]	M48 × 2; 22 deep	6 absolute	X
T	Fluid drain	DIN 3852[5]	M48 × 2; 22 deep	6 absolute	X
M_B	Measuring pressure **B**	DIN 3852[5]	M18 × 1.5; 12 deep	400	X
M_S	Measuring pressure **S**	DIN 3852[5]	M18 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852[5]	M48 × 2; 22 deep	6 absolute	O
U	Flushing port	DIN 3852[5]	M18 × 1.5; 12 deep	6 absolute	X[7]
M_1, M_2	Measuring control pressure	DIN 3852[5]	see data sheet of control devices	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Metric fastening thread is a deviation from standard.
7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B_1** must be connected. The unused port must be plugged with a flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, GE control, NG 71, 125 and 180

GE – Rod system control (clockwise rotation, counter-clockwise swivel direction)



Further dimensions and ports in respective sizes can be found in this manual.

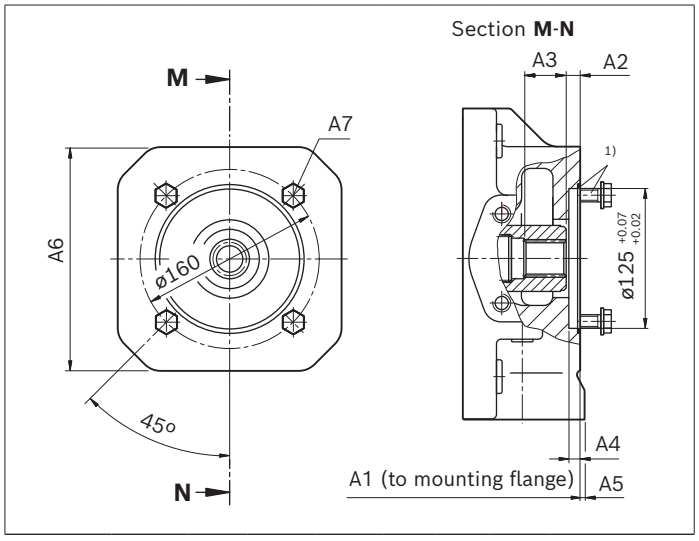
Size	D1	D2	D3	D4	D5	Ports M_1 and M_2	State
71	180	17.1	108	149	166	–	–
125	178	20.7	132	177	203	M14 × 1.5	Plugged
180	178	20.7	132	177	203	M14 × 1.5	Plugged

Dimensions, through drive

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]	Availability across sizes							Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
125-4	⌘	N32×2×14×8H	●	●	–	–	–	–	●	K31
		N32×2×14×8H	–	–	●	●	●	●	–	U31

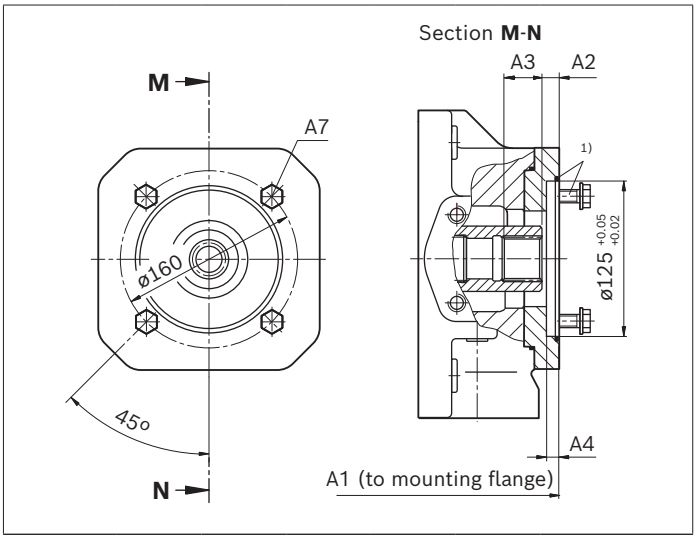
● = Available o = On request – = Not available

▼ **125-4**



K31	NG	A1	A2	A3	A4	A5	A6	A7[3][4]
	40	288	12.5	40	9	–	–	M12; 24 deep
	71	316	12.5	33.6	9	–	–	M12; 24 deep
	500	505	12.5	38.6	9	15	240	M12; 18 deep

▼ **125-4**



U31	NG	A1	A2	A3	A4	A7[3][4]
	125	369	12.5	35.6	9	M12; 22 deep
	180	393	12.5	35.6	9	M12; 22 deep
	250	453	12.5	38.0	9	M12; 15 deep
	355	482	12.5	38.0	9	M12; 15 deep

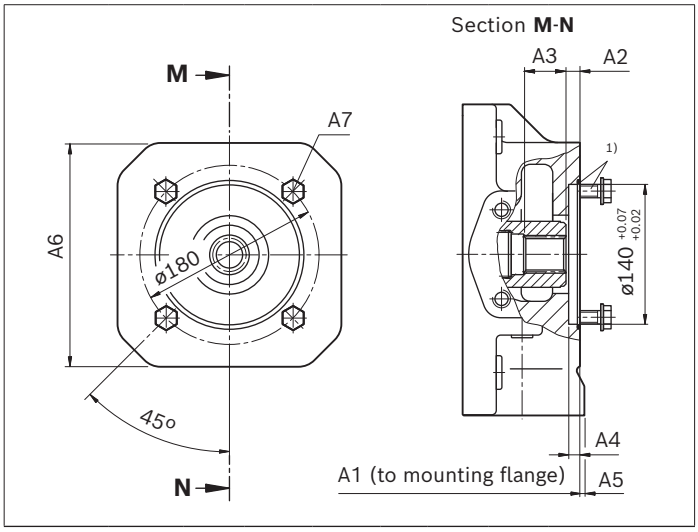
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Splined hub according to DIN 5480
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
140-4		N40×2×18×8H	–	●	–	–	–	–	●	K33
		N40×2×18×8H	–	–	●	●	●	●	–	U33

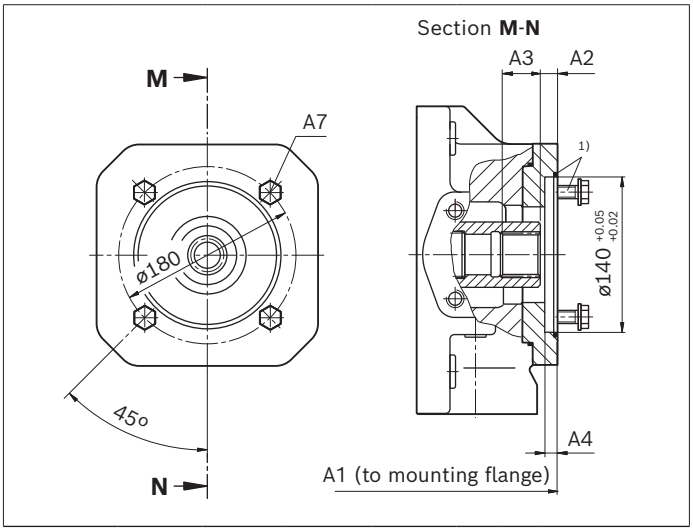
● = Available o = On request – = Not available

▼ **140-4**



K33	NG	A1	A2	A3	A4	A5	A6	A7[3][4]
	71	316	11.5	42.8	9	–	–	M12; 24 deep
	500	505	12.5	57	9	–	–	M12; 18 deep

▼ **140-4**



U33	NG	A1	A2	A3	A4	A7[3][4]
	125	369	12.5	43.8	9	M12; 22 deep
	180	393	12.5	43.8	9	M12; 22 deep
	250	453	12.5	48.9	9	M12; 22 deep
	355	482	12.5	48.0	9	M12; 22 deep

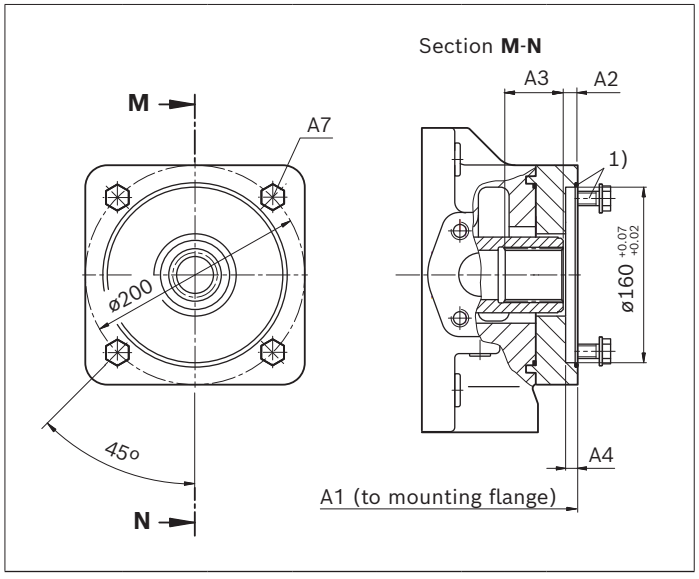
Notice
All attachment pumps must match the ATEX classification for the application in question.

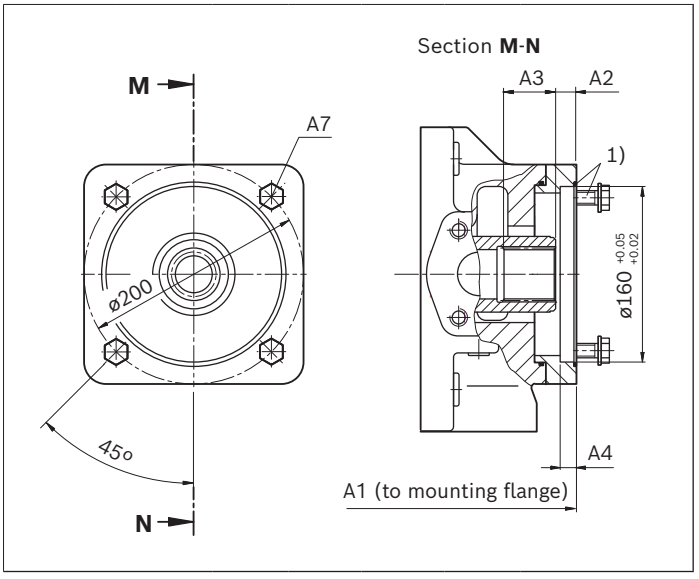
1) Fixing screws and O-ring seal are included in the scope of delivery
2) Splined hub according to DIN 5480
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]							Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
160-4	⌘	N50×2×24×8H	–	–	–	–	–	–	●	K34
		N50×2×24×8H	–	–	●	●	●	●	–	U34

● = Available o = On request – = Not available

▼ **160-4**





K34	NG	A1	A2	A3	A4	A7[3)4)]
	500	505	13.5	54.5	10	M16; 24 deep

U34	NG	A1	A2	A3	A4	A7[3)4)]
	125	369	12.5	51.6	9	M16; 22 deep
	180	393	12.5	51.6	9	M16; 22 deep
	250	453	12.5	54.0	9	M16; 22 deep
	355	482	12.5	54.0	9	M15; 22 deep

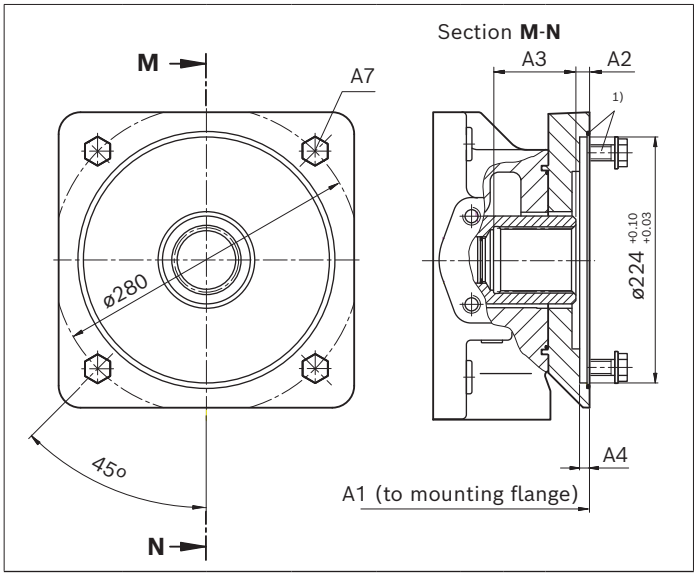
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Splined hub according to DIN 5480
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]							Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
224-4	⌘	N60×2×28×8H	–	–	–	–	–	–	●	K35
		N60×2×28×8H	–	–	–	–	●	●	–	U35

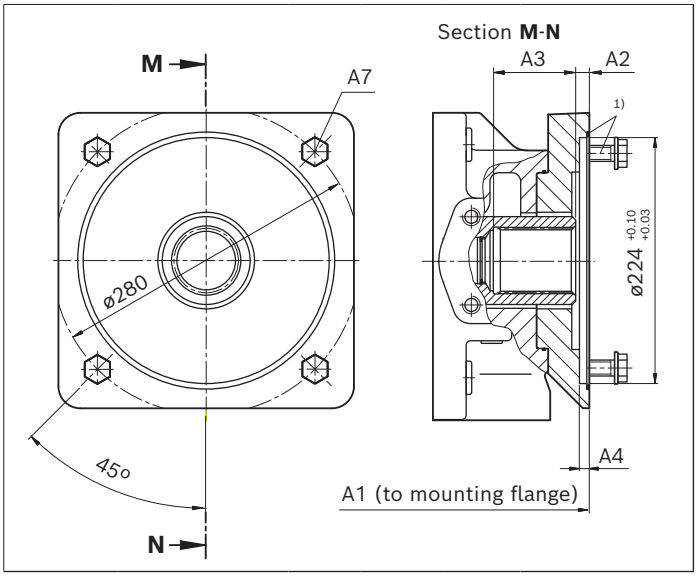
● = Available o = On request – = Not available

▼ **224-4**



K35	NG	A1	A2	A3	A4	A7[3)4)]
	500	541	12.5	74	9	M20; 36 deep

▼ **224-4**



U35	NG	A1	A2	A3	A4	A7[3)4)]
	250	469	12.5	75	9	M20; 37 deep
	355	498	12.5	75	9	M20; 37 deep

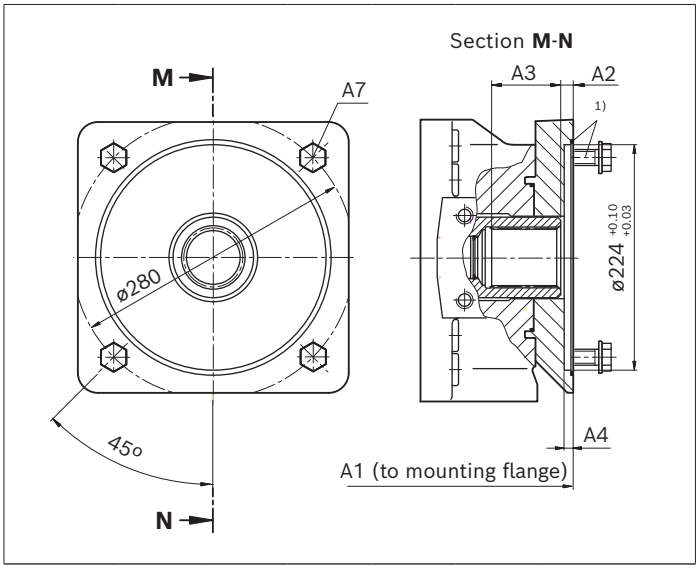
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Splined hub according to DIN 5480
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]							Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
224-4	⌘	N70×3×22×8H	–	–	–	–	–	–	●	K77
		N70×3×22×8H	–	–	–	–	–	●	–	U77

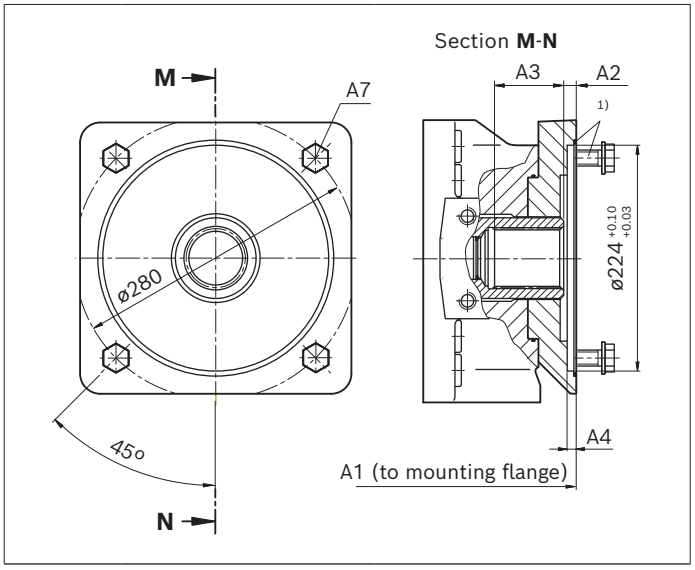
● = Available o = On request – = Not available

▼ **224-4**



K77	NG	A1	A2	A3	A4	A7[3)4)]
	500	541	12.5	82	9	M20; 36 deep

▼ **224-4**



U77	NG	A1	A2	A3	A4	A7[3)4)]
	355	498	12.5	75	9	M20; 37 deep

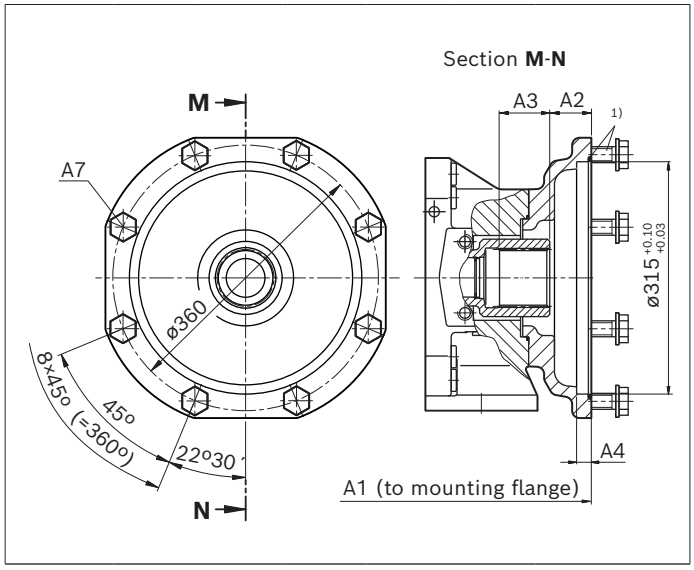
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Splined hub according to DIN 5480
3) Thread according to DIN 13, see Part Ig for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
315-8		N80×3×25×8H	–	–	–	–	–	–	●	K43

● = Available o = On request – = Not available

▼ **315-8**



K43	NG	A1	A2	A3	A4	A7[3)4)]
	500	590	53.5	71.9	19	M20; 26 deep

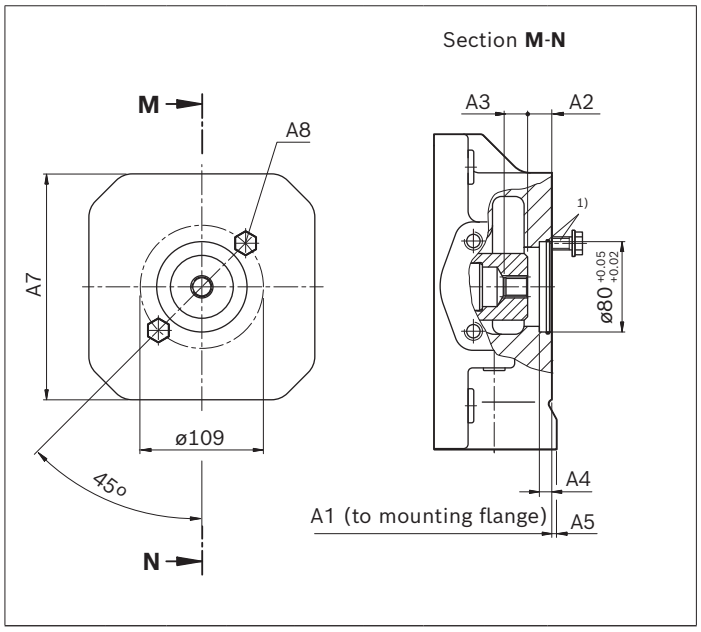
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Splined hub according to DIN 5480
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
80-2		3/4 in 11T 16/32DP	○	●	–	–	–	–	○	KB2
		3/4 in 11T 16/32DP	–	–	●	●	●	●	–	UB2

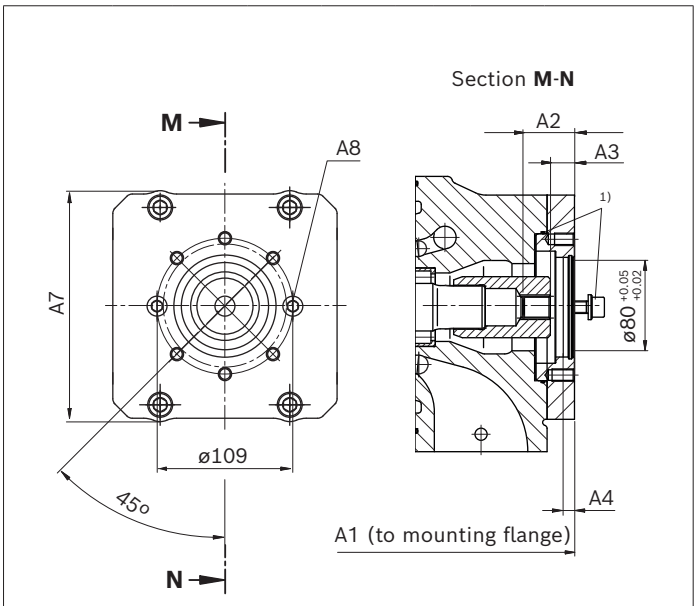
● = Available ○ = On request – = Not available

▼ **80-2**



KB2	NG	A1	A2	A3	A4	A5	A7	A8[3)4)]
	71	291	21.5	19	10	2	140	M10; 15 deep

▼ **80-2**



UB2	NG	A1	A2	A3	A4	A7[3)]	A8[3)4)]
	125	367	40.5	19.4	9	180	M10; 16 deep
	180	393	40.5	19.4	9	180	M10; 16 deep
	250	453	40.5	19	9	200	M10; 16 deep
	355	482	40.4	19	9	200	M10; 16 deep

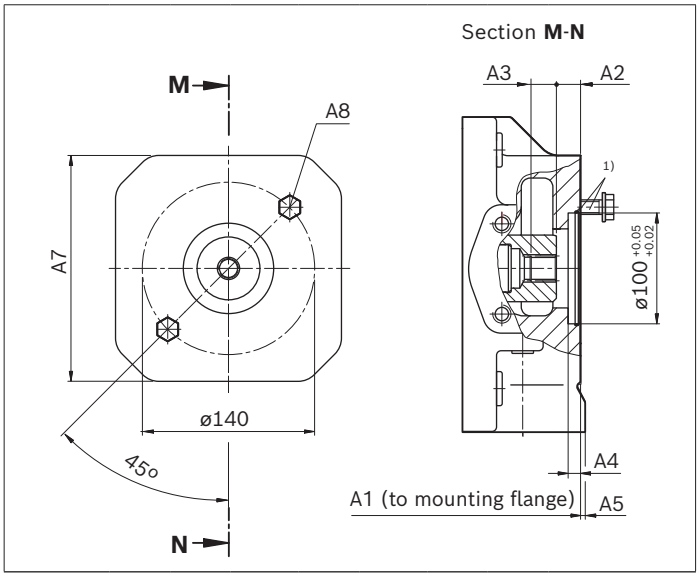
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
100-2		7/8 in 13T 16/32DP	●	●	–	–	–	–	○	KB3
		7/8 in 13T 16/32DP	–	–	●	●	●	●	–	UB3

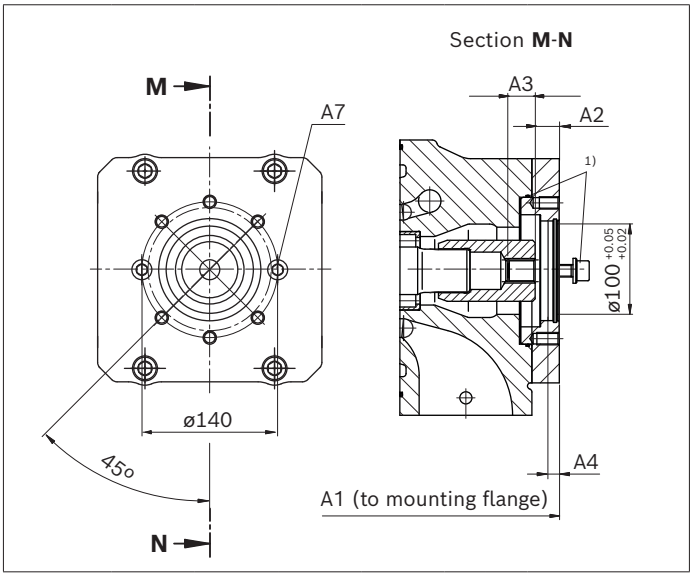
● = Available ○ = On request – = Not available

▼ **100-2**



KB3	NG	A1	A2	A3	A4	A5	A7[3]	A8[3][4]
	40	290	20.3	23	10	–	–	M12; 18 deep
	71	291	20.4	23	10	2	140	M12; 18 deep

▼ **100-2**



UB3	NG	A1	A2	A3	A4	A7[3][4]
	125	369	18.5	24.9	10	M12; 22 deep
	180	393	18.5	24.9	10	M12; 22 deep
	250	453	19.5	23	10	M12; 18 deep
	355	482	19.5	23	10	M12; 18 deep

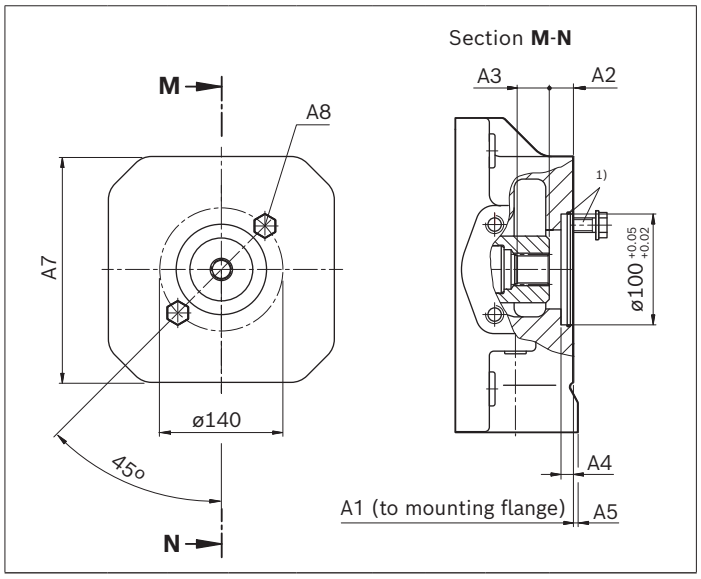
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
100-2		1 in 15T 16/32DP	●	●	–	–	–	–	●	KB4
		1 in 15T 16/32DP	–	–	●	●	●	●	–	UB4

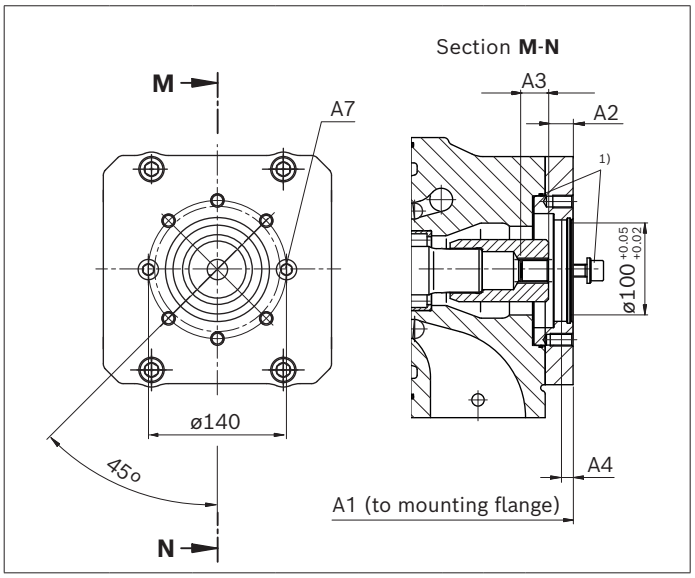
● = Available o = On request – = Not available

▼ **100-2**



KB4	NG	A1	A2	A3	A4	A5	A7[3]	A8[3][4]
	40	290	20.8	27.5	10	–	–	M12; 18 deep
	71	316	20.8	27.5	8	–	–	M12; 24 deep
	500	505	20.4	28.9	10	15	240	M12; 18 deep

▼ **100-2**



UB4	NG	A1	A2	A3	A4	A7[3][4]
	125	369	18.9	29.5	10	M12; 22 deep
	180	393	18.9	29.5	10	M12; 22 deep
	250	453	18.9	29.5	10	M12; 18 deep
	355	482	18.9	29.5	10	M12; 18 deep

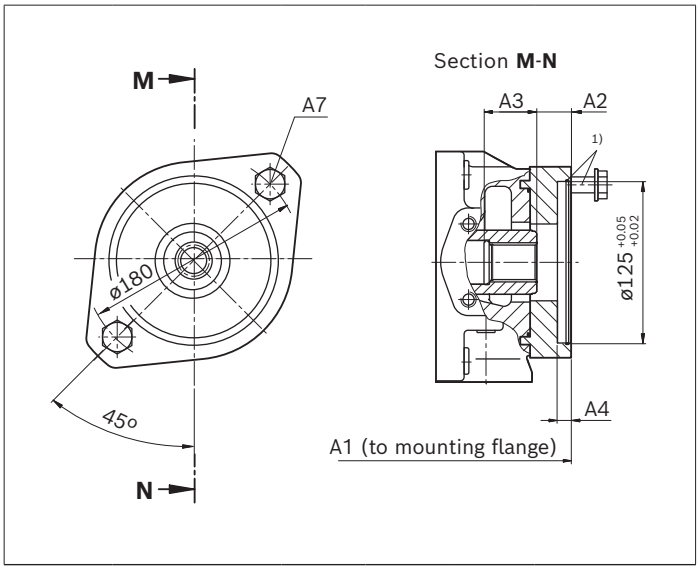
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
125-2		1 1/4 in 14T 12/24DP	–	●	–	–	–	–	●	KB5
		1 1/4 in 14T 12/24DP	–	–	●	●	●	●	–	UB5

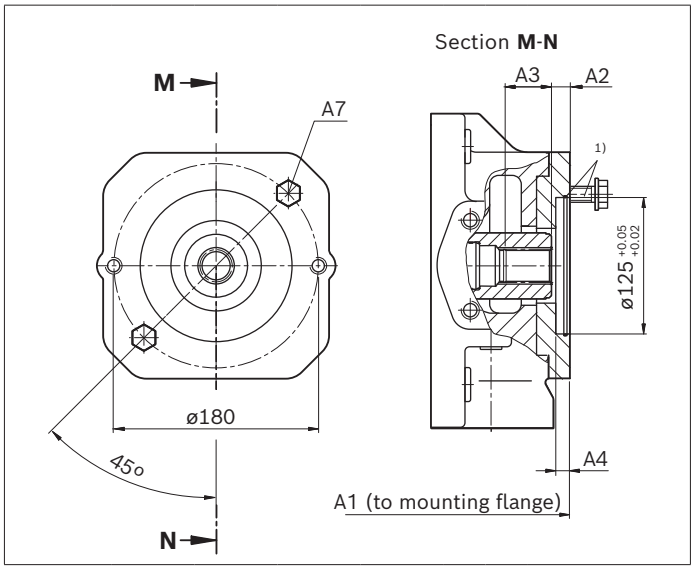
● = Available o = On request – = Not available

▼ **125-2**



KB5	NG	A1	A2	A3	A4	A7[3)4)]
	71	321	23	38	10	M16; 29 deep
	500	505	19.3	40.4	10	M16; 24 deep

▼ **125-2**



UB5	NG	A1	A2	A3	A4	A7[3)4)]
	125	369	20	38	9	M16; 22 deep
	180	393	20	38	9	M16; 22 deep
	250	453	20.9	37.9	9	M16; 22 deep
	355	482	20.9	37.9	9	M16; 22 deep

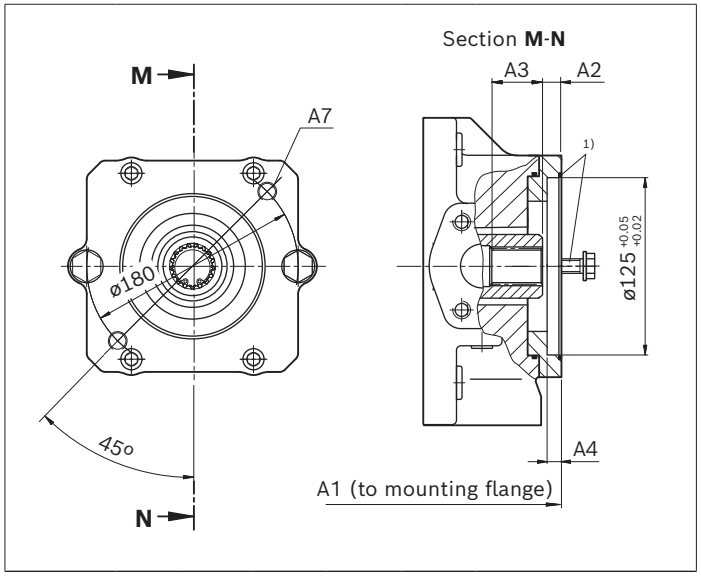
Notice
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft[2]									Code
Diameter	**Symbol**	**Diameter**	**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
125-2		1 1/2 in 17T 12/24DP	–	–	●	●	●	●	–	–	–	UB6

● = Available o = On request – = Not available

▼ **125-2**



UB6	NG	A1	A2	A3	A4	A7[3][4]
	125	369	10.4	50	9	M16; 22 deep
	180	393	10.4	50	9	M16; 22 deep
	250	453	12.5	55	9	M16; 22 deep
	355	482	12.5	55	9	M16; 22 deep

Notice
All attachment pumps must match the ATEX classification for the application in question.

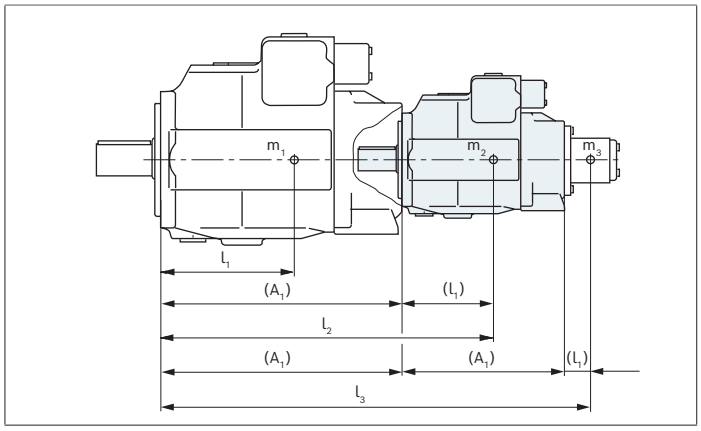
1) Fixing screws and O-ring seal are included in the scope of delivery
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Thread according to DIN 13, see Part I for maximum tightening torques
4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Overview of mounting options

Through drive			**Mounting options – 2nd pump**
Flange ISO 3019-2	**Hub for splined shaft DIN 5480**	**Short designation**	**A4VSO ATEX NG (shaft)**
125-4	N32×2×14×9g	K31; U31	40 (Z)
140-4	N40×2×18×9g	K33; U33	71 (Z)
160-4	N50×2×24×9g	U34	125, 180 (Z)
224-4	N60×2×28×9g	U35	250 (Z)
	N70×3×22×8H	K77; U77	355 (Z)
315-8	N80×3×25×8H	K43	500 (Z)
Flange ISO 3019-2	**Hub for splined shaft SAE J744**	**Short designation**	**A10VSO ATEX NG (shaft)**
80-2	3/4 in 11T 16/32DP	KB2; UB2	18 (S, R)
100-2	7/8 in 13T 16/32DP	KB3; UB3	28 (S, R)
	1 in 15T 16/32DP	KB4; UB4	45 (S, R)
125-2	1 1/4 in 14T 12/24DP	KB5; UB5	71, 88 (S, R)
	1 1/2in 17T 12/24DP	KB6; UB6	100 (S)

Combination pumps A4VSO + A4VSO (A4VSO + A10VSO)

A tandem pump, with two pumps of equal size, is permissible without additional supports, assuming that the dynamic mass acceleration does not exceed a maximum of 10 g (= 98.1 m/s²).
For combination pumps consisting of more than two pumps, the mounting flange must be rated for the permissible mass torque (please contact us).



Notice

- All attachment pumps must match the ATEX classification for the application in question.

m_1, m_2	Weight of pump	[kg]
l_1, l_2	Distance from center of gravity	[mm]

$$T_m = (m_1 \times l_1 + m_2 \bullet l_2) \times \frac{1}{102}$$ [Nm]

Permissible mass moment of inertia A4VSO

NG				**40**	**71**	**125**	**180**	**250**	**355**	**500**
Static	T_m	Nm		1800	2000	4200	4200	9300	9300	15600
Dynamic at 10 g (98.1 m/s²)	T_m	Nm		180	200	420	420	930	930	1560
Weight	m	kg		39	53	88	102	184	207	320
Distance from center of gravity	l_1	mm		120	140	170	180	210	220	230

Permissible mass moment of inertia A10VSO

NG			**18**	**28**	**45**	**71**	**100**
Static	T_m	Nm	500	880	1370	2160	3000
Dynamic at 10 g (98.1 m/s²)	T_m	Nm	50	88	137	216	300
Weight with through-drive plate	m	kg	14	19	25	39	54
Weight without through-drive plate			12	15	21	33	45
Distance from center of gravity	l_1	mm	90	110	130	150	160

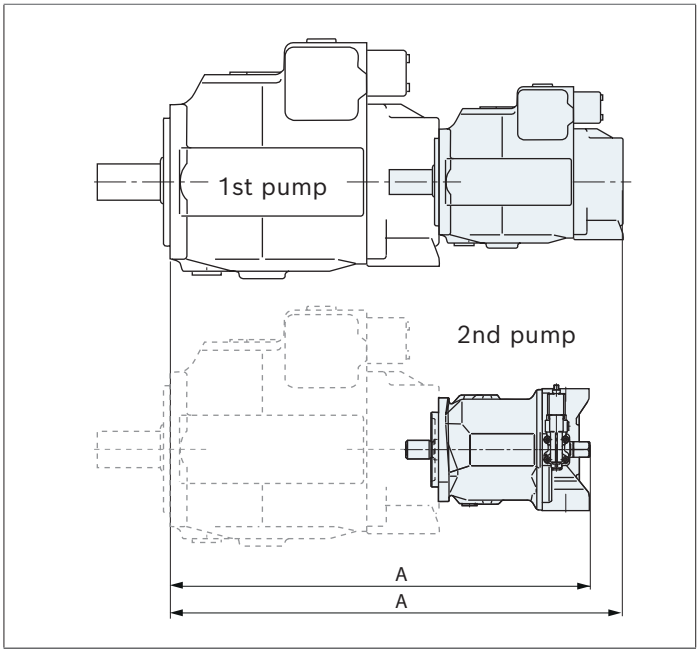
Dimensions of the combination pumps

Total length "A" with attachment pump A4VSO

1st pump A4VSO	2nd pump A4VSO						
Size	**40**	**71**	**125**	**180**	**250**	**355**	**500**
40	554	–	–	–	–	–	–
71	582	611	–	–	–	–	–
125	635	664	724	–	–	–	–
180	659	688	748	768	–	–	–
250	719	748	808	828	904	–	–
355	748	777	837	857	933	962	–
500	771	800	860	880	976	1005	1110

Total length "A" with attachment pump A10VSO

1st pump A4VSO	2nd pump A10VSO				
Size	**18**	**28**	**45**	**71**	**100**
40	458	496	514	–	–
71	486	497	540	548	–
125	564	575	593	*626*	*698*
180	588	599	617	650	722
250	648	659	677	710	782
355	677	688	706	741	811
500	700	711	729	764	857



Notice
All attachment pumps must match the ATEX classification for the application in question.

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation.
This must also be observed during longer standstills, as the axial piston unit can empty itself via the hydraulic lines.
Particularly in the installation position "drive shaft upwards," filling and air bleeding must be carried out completely as there is e.g. a danger of dry running.
The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**, **K_1**, **K_2**, **R**(**T**)).
For combination pumps, the leakage must be drained off at each single pump.
If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid.
To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g., reservoir, frame parts).
Under all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height h_S results from the total pressure loss, but must not be higher than hS max = 800 mm. The suction pressure at port S must not fall below the minimum of 0.8 bar absolute during operation and cold start.
When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. We recommend using a baffle (baffle plate) between suction line and drain line.
A baffle improves the air separation ability as it gives the hydraulic fluid more time for desorption. Apart from that, this prevents the heated return flow from being drawn directly back into the suction line. The suction port must be supplied with air-free, calmed and cooled hydraulic fluid.

Notice

In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.

Installation position

See the following examples **1** to **7**.
Further installation positions are available upon request.
Recommended installation position: **1** and **2**

Key	
F	Filling / Air bleeding
R(**L**)	Filling / Air bleeding
S	Suction port
T	Drain port
U	Flushing port
K_1, **K_2**	Flushing port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to reservoir bottom (100 mm)
$h_{S\ max}$	Maximum permissible suction height (800 mm)

Notice

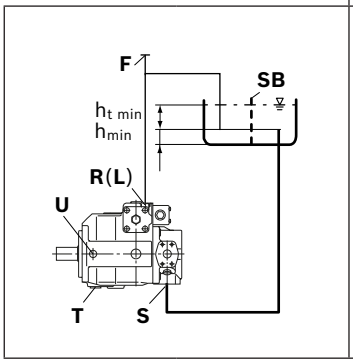
Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Below-reservoir installation (standard)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

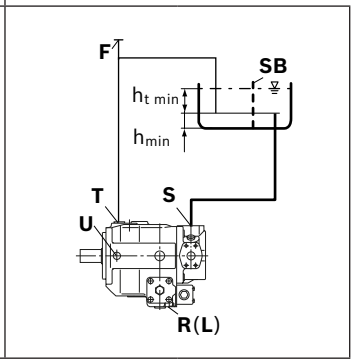
▼ **Installation position 1**

Air bleed	Filling
R(L) + F	S + R(L)



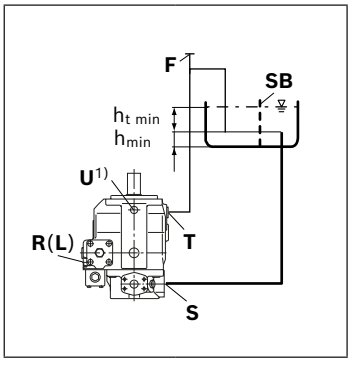
▼ **Installation position 2**

Air bleed	Filling
T + F	S + T



▼ **Installation position 3[1)]**

Air bleed	Filling
T + F	S + T + U



For key, see page 43

Above-reservoir installation

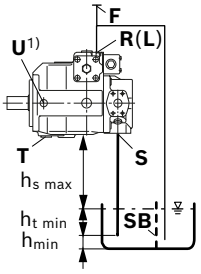
Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. Observe the maximum permissible suction height $h_{S\,max}$ = 800 mm.
Above-reservoir installation is not recommended for sizes 180 to 500.

Notice

- To guarantee lubrication of the front bearing and of the shaft seal with above-reservoir installation, Rexroth specifies a working bearing flushing at port "**U**".

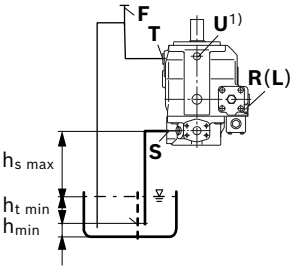
▼ **Installation position 4[1)]**

Air bleed	Filling
F + R(L)	R(L) + F



▼ **Installation position 5[1)]**

Air bleed	Filling
F + T	T + F + U



1) Install bearing flushing, minimum flushing volume see page 6

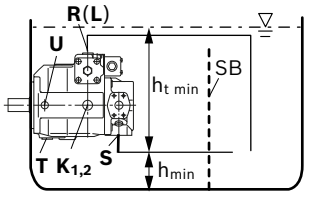
Inside-reservoir installation

Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid if the minimum fluid level is equal to or below the upper edge of the pump, see chapter "**Above-reservoir installation**".

Axial piston units with electric components (e.g. electric controls, sensors) must not be installed in a reservoir below the fluid level.

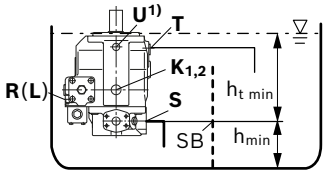
▼ **Installation position 6**

Air bleed	Filling
R(**L**)	**R**(**L**) + **U**



▼ **Installation position 7**[1)]

Air bleed	Filling
T + **U**	**T** + **U**



Notice

- We recommend providing the suction port **S** with a suction pipe and piping the drain port **T** or **R**(**L**). In this case, the other drain port must be plugged. The housing of the axial piston unit is to be filled via **R**(**L**) or **T** (see installation position 6 to 7) before the piping is fitted and the reservoir is filled with hydraulic fluid.

1) Install bearing flushing, minimum flushing volume see page 6

Project planning notes

- The A4VSO ATEX pump is intended to be used in open circuits.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled personnel.
- Before using the axial piston unit, please read the appropriate operating instructions (parts I and II) thoroughly and in full. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and information contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the operating instructions.
- Not all configuration variants of the product are approved for use in safety functions according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- For drives that are operated for a long period of time with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency ×9). This can be prevented with suitably designed hydraulic lines.
- Pressure control is not an adequate safeguard against pressure overload. Therefore, a pressure relief valve must be added to the hydraulic system (integrated into the pump or externally in the system). In this connection, observe the technical limits of the pressure relief valve.
- For controllers requiring external pilot pressure, sufficient control fluid must be provided to the associated ports to ensure the required pilot pressures for the respective controller function. These controllers are subject to leakage due to their design. An increase in control fluid demand has to be anticipated over the total operating time. The design of the control fluid supply must thus be sufficiently large. If the control fluid is too low, the respective controller function may be impaired and undesired system behavior may result.
- Please note the information regarding the tightening torques of connection threads and other screw connections in the operating instructions (part I).
- The ports and fastening threads are designed for the p_{max} permissible pressures of the respective ports, see the connection tables. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- The service ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, stick in an undefined position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and make sure any measures are properly implemented.

Related documentation

Product-specific documentation

Document type	Title	Document number
Data sheet	Control systems DR, DP, FR, and DFR for axial piston variable pump A4VSO	92060
	A4VSO, A4VBO power controller LR2, LR3 and LR2N, LR3N	92064
	Control systems MA... for axial piston variable pump A4VSO and A4VSG	92072
	Control devices HM series 1x and 30	92076
	Control devices HD	92080
	Universal through drive for axial piston variable pump A10VSO, A10VO, A10VZO, A4VSO, A4VBO, A15VSO/A15VLO and A15V(L)O	95581
	Storage and preservation of axial piston units	90312
Operating instructions part I	Axial piston variable pump A4VSO Series 1x and 30	92050-01-X-B0

Documentation for hydraulic fluids

Document type	Title	Document number
Data sheet	Hydraulic fluids based on mineral oils and related hydrocarbons	90220
	Rating of hydraulic fluids used in Rexroth hydraulic components (pumps and motors)	90235
	Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)	90245

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rexroth
A Bosch Company

EU-Konformitätserklärung - *Original*
EC declaration of conformity

Datum / *Date*: 19.08.2019

- ☐ nach Maschinenrichtlinie 2006/42/EG / *in accordance with Machinery Directive 2006/42/EC*
- ☐ nach Niederspannungsrichtlinie 2014/35/EU / *in accordance with Low Voltage Directive 2014/35/EU*
- ☐ nach EMV-Richtlinie 2014/30/EU / *in accordance with EMC Directive 2014/30/EU*
- ☐ nach Druckgeräte-Richtlinie 2014/68/EU / *in accordance with Pressure Equipment Directive 2014/68/EU*
- ☒ nach ATEX-Richtlinie 2014/34/EU / *in accordance with ATEX Directive 2014/34/EU*
- ☐ nach RoHS-Richtlinie 2011/65/EU / *in accordance with RoHS Directive 2011/65/EU*
- ☐

Hiermit erklärt der Hersteller, / *The manufacturer*

Bosch Rexroth AG, An den Kelterwiesen 14, 72160 Horb a.N.,

dass die nachstehenden Produkte / *hereby declares that the products below*

Bezeichnung / *Name*: **Axialkolben-Verstellpumpe für explosionsgefährdete Bereiche**

Typ / *Type*: **A4VSO.../...-R...** Kennzeichnung: **II 2G Ex h IIC T4-T1 Gb X**

Typ / *Type*: **A4VSO.../...-A...** Kennzeichnung: **II 3G Ex h IIC T4-T1 Gc X**

in Übereinstimmung mit oben genannte(n) Richtlinie(n) entwickelt, konstruiert und gefertigt wurde. / *was developed, designed and manufactured in compliance with the above-mentioned directive(s).*

Die alleinige Verantwortung für die Ausstellung dieser EU-Konformitätserklärung trägt der Hersteller. / *This EC declaration of conformity is issued under the sole responsibility of the manufacturer.*

Angewandte harmonisierte Normen / *Harmonized Standards applied:*

Norm / *Standard*	**Titel / *Name***	**Ausgabe / *Issue***
DIN EN ISO 80079-36	Explosionsfähige Atmosphären – Teil 36: Nicht-elektrische Geräte für den Einsatz in explosionsfähigen Atmosphären – Grundlagen und Anforderungen (ISO 80079-36:2016); Deutsche Fassung EN ISO 80079-36:2016	2016-12
DIN EN ISO 80079-37	Explosionsfähige Atmosphären – Teil 37: Nicht-elektrische Geräte für den Einsatz in explosionsfähigen Atmosphären – Schutz durch konstruktive Sicherheit „c", Zündquellenüberwachung „b", Flüssigkeitskapselung „k" (ISO 80079-37:2016); Deutsche Fassung EN ISO 80079-37:2016	2016-12

Weitere Erläuterungen / *Further explanations:*

Die Montage- und Installationshinweise gemäß Produktdokumentation RD 92050-01-X-B0 sind zu beachten. / *The assembling and installation instructions according to the manual RE 92050-01-X-B0 have to be followed.*

Horb	,	19.08.2019		
Ort / *Place*		Datum / *Date*	Leiter Entwicklung / *Head of development* Clemens Krebs (DC-MH/EPI)	Leiter Fertigung / *Head of production* Jens Fernholz (HorP/PT)

Änderungen im Inhalt der EU-Konformitätserklärung sind vorbehalten. Derzeit gültige Ausgabe auf Anfrage.
We reserve the right to make changes to the content of the EC Declaration of Conformity. Current issue on request.

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