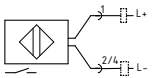
Piston detectors

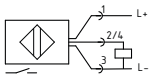
with adapters, optionally with cable break protection

Service manual

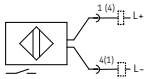
EN

Universal piston detector
234-13163-9





Bipolar piston detector
234-11454-1



Note!
Only for use in connection with SKF lubrication pumps of the series KFAS/KFBS or KFGS pumps for commercial vehicles and agricultural machinery.

Version 10
10.01.2025
951-150-032-EN

EU Declaration of Conformity pursuant to Directive 2014/30/EU, Annex IV

The manufacturer, SKF Lubrication Systems Germany GmbH, Walldorf Plant, Heinrich-Hertz-Str. 2-8, DE - 69190 Walldorf, hereby declares conformity of the electrical device

Designation: **Piston detector**
Model **Magnetic sensor M.....G**
Item number: **234-13163-9** and **234-11454-1**
with all relevant harmonization legislation of the European Union at the time of placing on the market.

Furthermore, the following Directives and (harmonized) standards were applied in the applicable areas:

2011/65/EU RoHS II

Standard
EN 60947-5-1:2018
EN IEC 63000:2018

Walldorf, 11/9/2021

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Manufacturer
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www.skf.com/lubrication

Warranty
The instructions do not contain any information on the warranty. This can be found in our General Terms and Conditions.

Further language versions can be found on the SKF homepage.

Disclaimer of liability
The manufacturer shall not be held liable for damage resulting from:

- Improper usage, assembly, operation, configuration, maintenance, repair, or accidents
- Improper reaction to malfunctions
- Unauthorized modifications to the product
- Intentional or gross negligence
- Use of non-original SKF spare parts

The maximum liability for loss or damage resulting from the use of our products is limited to the purchase price. Liability for indirect damage of any kind is excluded.

Explanation of symbols and signs

	General warning	Symbol	Meaning
	Wear personal protective gear (face mask)	●	Chronological instructions
	Wear personal protective gear (gloves)	○	Bullet list items
	Wear personal protective gear (protective clothing)	☞	Indicates the requirements that must be met for the actions described in the following
	Pressure injection		General notes
	Hot surfaces		

	Warning level	Consequence	Probability
	DANGER	Death, serious injury	Immediate
	WARNING	Death, serious injury	Possible
	CAUTION	Minor injury	Possible
	NOTICE	Property damage	Possible

Table of contents

1. Safety instructions

To convert the piston detector, consult the documentation for the metering device (lifecycle manual, assembly instructions) in which the old piston detector is used. The safety instructions in that documentation must be observed in full.
Further:

- The operator must ensure that these conversion instructions and the corresponding metering device documentation have been read by the person who converts the piston detector or supervises or instructs said person.
- Depressurize the affected metering device before disassembling the defective piston detector.
- The operator must also ensure that the staff fully understands the content of the instructions.
- Putting the products into operation or operating them without having read the instructions is prohibited.

2. Scope of delivery/storage

The conversion kit for the piston detectors includes a metering-device-specific adapter. The piston detectors may be used only with this adapter.
A stopper and a cable adapter are also enclosed for the metering device version.
The scope of delivery also includes these conversion instructions.

This service manual must accompany the product documentation.

2.1 Storage

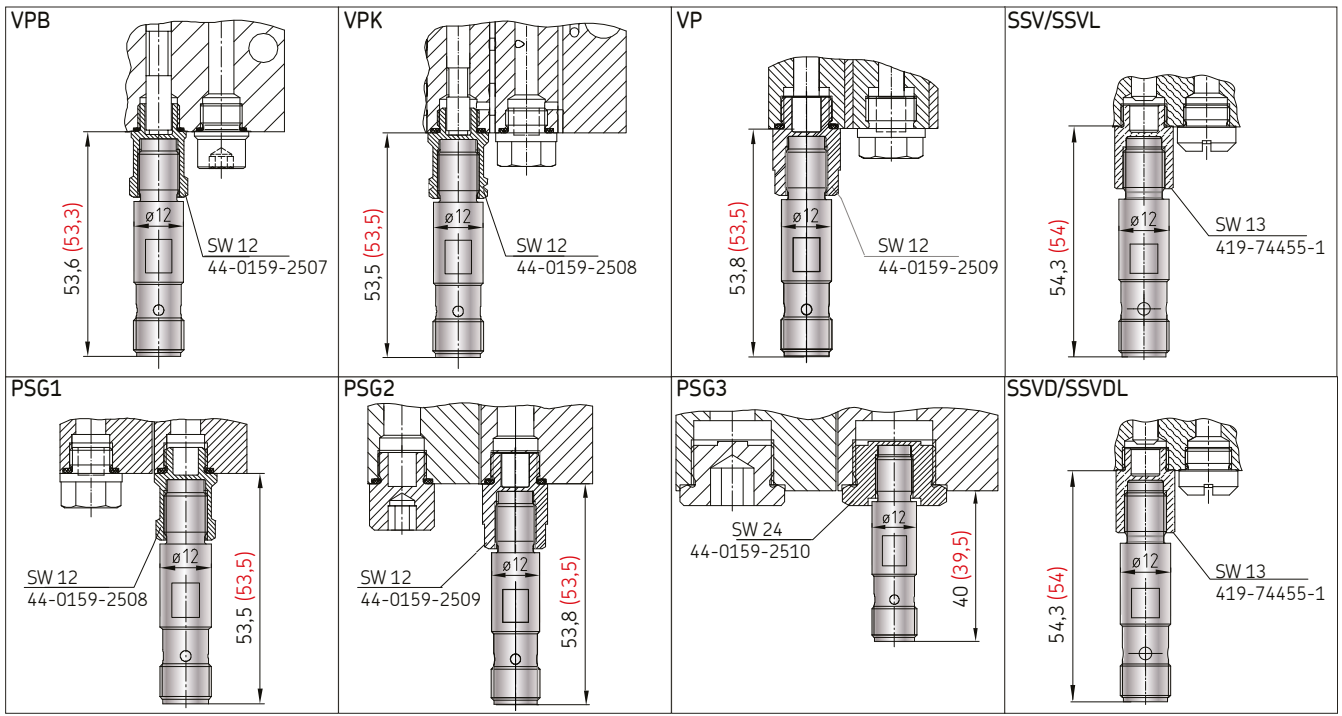
Storage conditions- See metering device documentation and:

- Store in the original product packaging.
- Store protected from nearby sources of heat or cold.
- The permissible storage temperature range is the same as the operating temperature range (see "Technical data").

3. Overview, functional description

3.1 Progressive metering device overview with universal piston detector 234-13163-9 or bipolar piston detector 234-11454-1

Mounting dimensions for universal and bipolar piston detectors, Fig. 1



(....) = mounting dimension of previous piston detector

3.2 Design

The universal piston detector 234-13163-9 and the bipolar piston detector 234-11454-1 are position sensors that, together with a pressure-resistant adapter, are screwed into the progressive metering device.
Through the closed adapter, the sensors detect the metering device piston without coming into direct contact with it.
Hydraulic pressure spikes therefore do not act directly on the front sensor surface of the piston detectors.
There are different adapters depending on the progressive metering device series. These differ in terms of thread size and clearance. They are specifically tailored to the respective metering device type and piston stroke type.

The universal piston detector automatically detects the customer's plug/cable assignment, 2-wire design or 3-wire design (with cable break protection).
The universal piston detector is not suitable for use in automotive applications with a KFGS or KFGL lubrication pump due to the undefined pin assignment. The bipolar piston detector should be used in this case.
The bipolar piston detector is available only in a two-wire design. The signal voltage can be applied to either pin 1 or pin 4.

3.2.1 Functioning

When the piston detector is actuated (piston stroke), a yellow LED lights up and indicates correct functioning of the piston detector.

Subsequent replacement of the piston detector during operation is possible in cases of piston detectors with adapter which have already been mounted if the correspondingly designed adapter is also mounted. A check of the adapter version (number of rings) is to be carried out beforehand in accordance with Chapter 5.1.

With the corresponding adapter, the piston detectors are available as replacements for all previous detectors of the metering device series PSG1, PSG2, PSG3, VP, VPK, VPB, SSV, SSVL, SSVD, SSVDL, SSVE, SSVD-E, SSVC. For the metering device series SSV, SSVL, SSVD, SSVDL, SSVE, SSVD-E, SSVC, an adapter cable might also be used, depending on the design.

VPB metering device, stainless steel version

Due to the material used in the piston (brass), the piston detectors described here are unable to detect the movement of the piston when a VPB metering device in the stainless steel version is used. Instead of the VPB metering device in the stainless steel version, please use a corresponding SSV metering device in the stainless steel version.

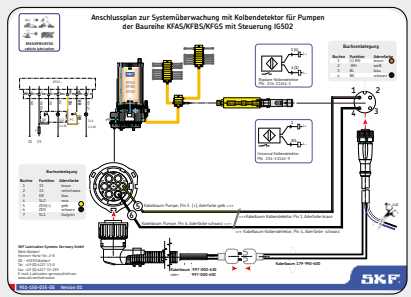
Use in commercial vehicles or agricultural machinery in connection with a KFAS; KFBS or KFGS pump

The bipolar piston detector 234-11454-1 is intended as a replacement for the piston detectors listed below.

Bipolar piston detector	Replaces previous piston detectors
234-11454-1	177-300-091
	177-300-092
	177-300-096

If a universal piston detector was accidentally ordered on the spare parts order instead of a bipolar piston detector, check that its connection is correct before installing it in the metering device. This is done by connecting the electrical plug-in connection (M12x1 plug). Then, switch on the KFG pump and hold a metal object in front of the face of the piston detector. If the yellow diode lights up (something is acting on the piston detector), the connection is correct. If this is not the case, change the pin assignment on the connecting cable to pin 4 (+) and pin 1 (load).

A detailed terminal diagram for connecting the bipolar piston detector to a KFAS, KFBS or KFGS pump is available at the links on page 1 in the respective national languages (attachment to the PDF).



Document No. 951-150-035-EN

3.3 Information on metering device series VP; VPB; VPK; PSG1; PSG2; PSG3

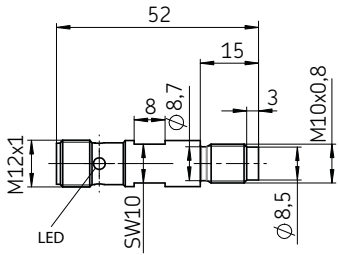
If the piston detector is mounted on the opposite side of the metering device (in contrast with its previous mounting position), the metering device piston must also be rotated. See the respective metering device documentation for a description of conversion.

4. Technical data

4.1 General technical data

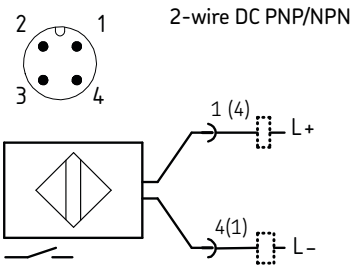
General data		Designation
Field of application		Lubricant metering devices
Ambient temperature	[°C]	–40 ....+85 (234-11454-1 / 234-13163-9) –40 ... +55 (234-13163-9) [1)]
Principle of operation		Piston detector/position sensor
Material		Active area stainless steel (1.4404); housing stainless steel (1.4016), plug: PEI
Mounting type		Mountable flush in the associated adapter
Tightening torque	[Nm]	7 ±0.5
Circuit state display	LED	Yellow/lights up on damping
Electrical connection		M12x1 plug-in connection, gold-plated contact

Dimensioned drawing



Sensing range		
sensing distance	[mm]	2.2 condition on delivery
Effective sensing distance (Sr)	[mm]	2.2 ±10%
Hysteresis	[% of Sr]	≤ 10
Accuracy/deviations		
Switching point	[% of Sr]	±10%
Reproducibility	[% of Sr]	±10%
Permiss. operating pressure with associated adapterr	[bar]	Identical to permissible operating pressure of the metering device in which the sensor with adapter is installed (see metering device documentation).

Bipolar piston detector

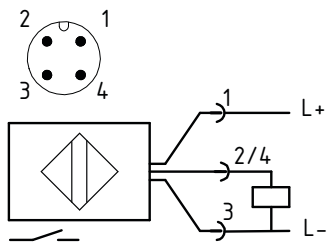


[1)] UL: Supply Class 2 Enclosure Type 1

Electrical data		Universal piston detector	Bipolar piston detector
Design		3-wire DC PNP 2-wire DC PNP/NPN	2-wire DC PNP/NPN
Operating voltage	[V]	10-36 DC, supply class 2 per cULus	
Max. harmonics	[V]	+/- 10% of max. permissible operating voltage	
Power consumption	[mA]	< 5 only in 3-wire operation	
Protection class		III	
Polarity reversal protection		Yes	Reversible
Output function		NO contact	
Voltage drop	[V]	3.5	4.5
Minimum load current	[mA]	5	
Residual current	[mA]	< 0.8	
Current-carrying capacity	[mA]	100	
Short-circuit-proof		Yes	
Overload-proof		Yes	
Switching frequency	[Hz]	10, with damping surface Ø 4mm to 7 Hz	
Enclosure rating	[IP]	IP65 / IP68 / IP69K; with cable box screwed on properly	
Immunity to magnetic fields	[mT]	- 0.5 to +0.5	

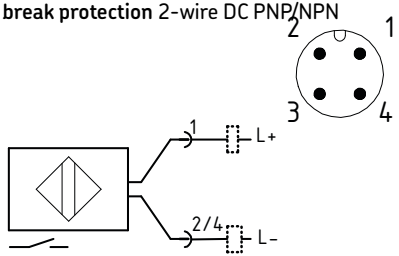
Universal piston detector

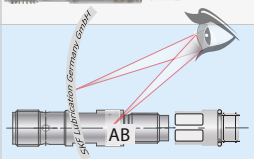
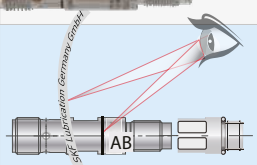
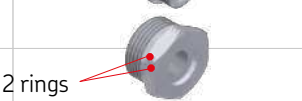
Connector pin assignment with cable break protection 3-wire DC PNP



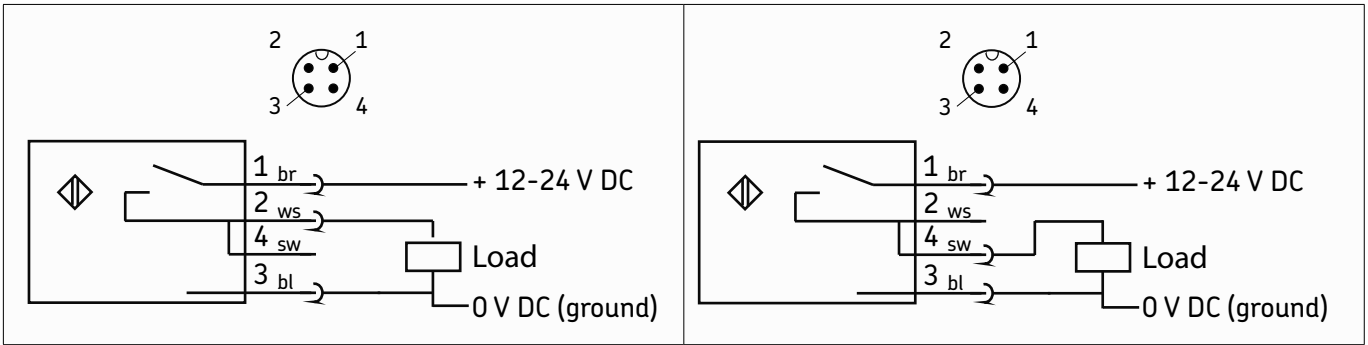
Universal piston detector

Connector pin assignment without cable break protection 2-wire DC PNP/NPN



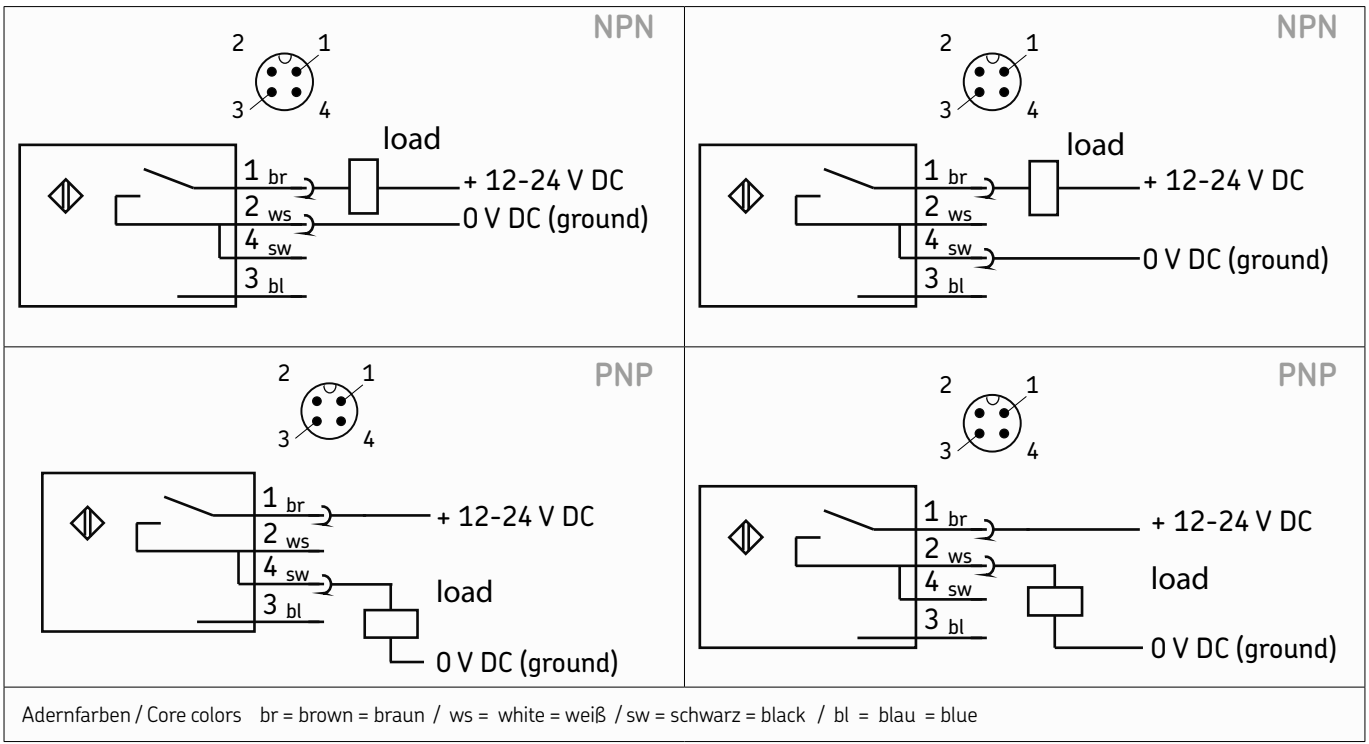
Electrical data	Universal piston detector	Bipolar piston detector
	234-13163-9	234-11454-1
Visual differentiations of the piston detectors		
Both of the current piston detectors are equipped with the **SKF Lubrication Systems Germany GmbH** lettering as well as with the identifier "**AB**." In addition to this identifier, the bipolar piston detector also has a thick black marking ring around its circumference (▌).		
Visual differentiations of the adapters for:	Marking	Item number
Progressive metering devices of the series VP and PSG2		**44-0159-2509**
Progressive metering devices of the series VPK and PSG1		**44-0159-2508**
Progressive metering devices of the series VPB		**44-0159-2507**
Progressive metering devices of the series PSG3		**44-0159-2510**
Progressive metering devices of the series SSV, SSVL, SSVD,SSVDL,SSVC,SLC,VSG,VSL		**419-74455-1**

4.2 Connection options 234-13163-9, 12-24V DC, 3-wire PNP



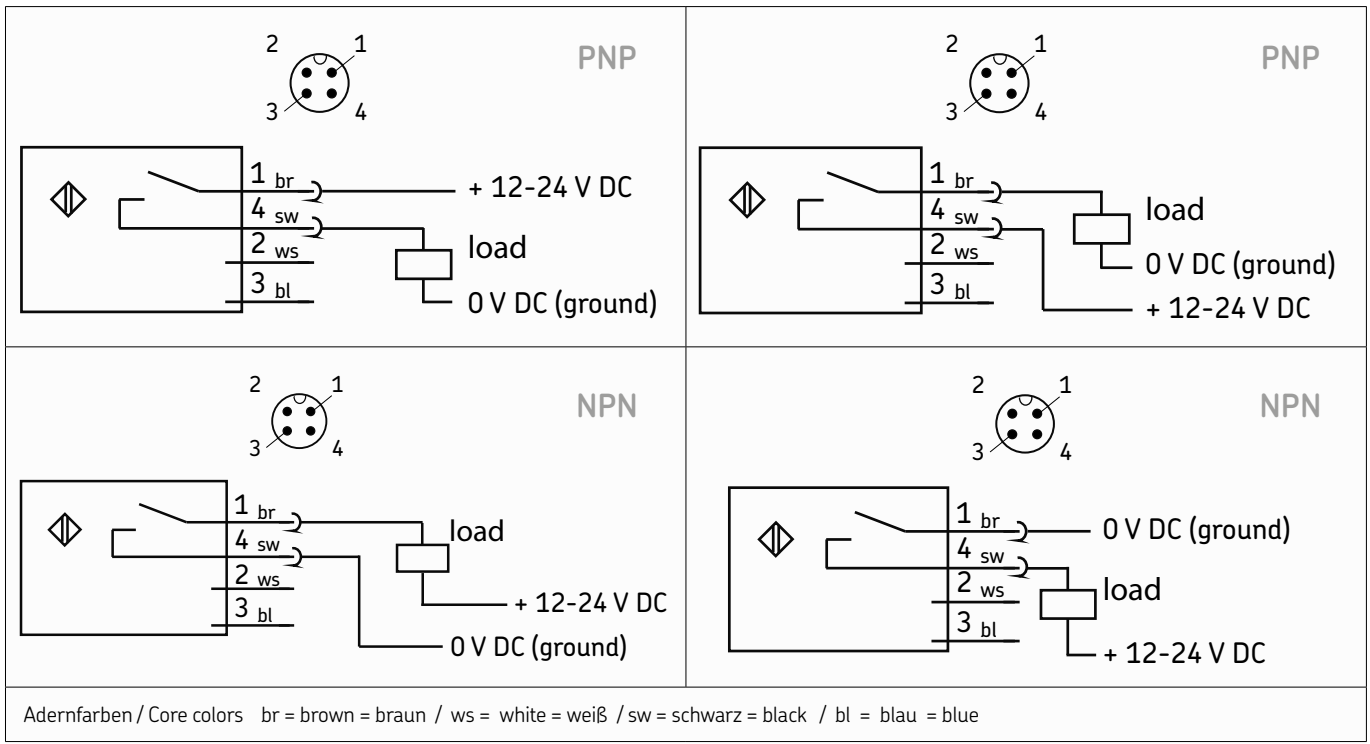
Adernfarben / Core colors br = brown = braun / ws = white = weiß / sw = schwarz = black / bl = blau = blue

4.3 Connection options 234-13163-9, 12-24V DC, 2-wire PNP/NPN



Adernfarben / Core colors br = brown = braun / ws = white = weiß / sw = schwarz = black / bl = blau = blue

4.4 Connection options 234-11454-1, bipolar 12-24V DC 2-wire PNP/NPN



Adernfarben / Core colors br = brown = braun / ws = white = weiß / sw = schwarz = black / bl = blau = blue

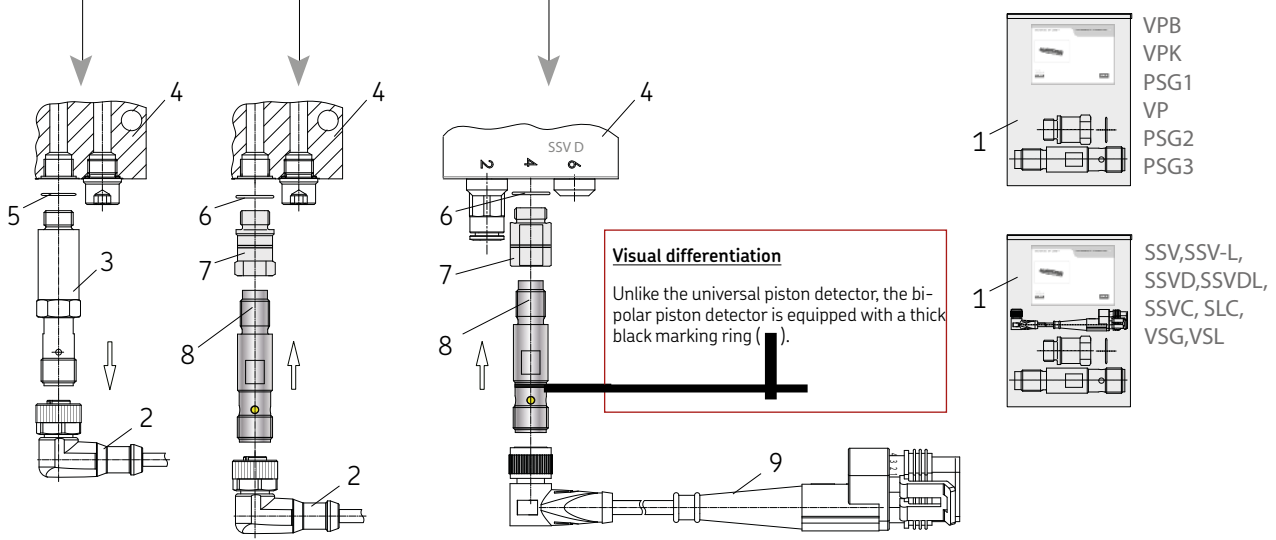
5. Installation

Assembly drawing, Fig. 2

5.1 Removal of the old piston detector (VPB/VPK/PSG1/VP/PSG2/PSG3/SSV/SSVL/SSVD/SSVDL)

5.2 Installation of the new piston detector (VPB/VPK/PSG1/VP/PSG2/PSG3)

Installation of the new piston detector (SSV,SSVL,SSVD,SSVDL,SSVC,SLC,VSG,VSL)



Visual differentiation

Unlike the universal piston detector, the bi-polar piston detector is equipped with a thick black marking ring ( ).

5.1 Removal of the old piston detector

☞ See Figures 1 to 3

	CAUTION
	Pressure hazard Before beginning conversion work, depressurize the system in which the metering device with the piston detector to be replaced is installed.

- Depressurize the lubrication system and metering device
- If possible, place a drip pan for the discharging lubricant below the corresponding metering device
- Place individual parts of the new piston detector replacement kit (**1**) on a clean storage surface
- Disconnect the electrical connection cable (**2**) from the old/defective piston detector
- Detach and unscrew the defective piston detector (**3**) from the metering device (**4**)
- Then check whether an adapter (**7**) is already installed

Procedure for metering devices without an adapter installed (**7**):

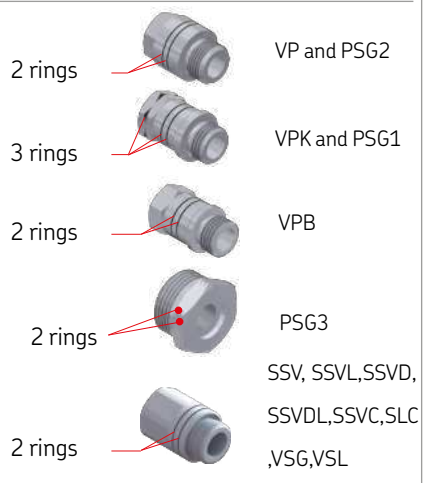
- If present, remove the old packing ring (**5**) from the metering device (**4**) (VP; VPB; VPK; PSG1; PSG2; SSV/SSVL/SSVD/SSVDL)

Procedure for metering devices with an adapter installed (**7**):

☞ The adapters (**7**) have different wall thicknesses to match the piston detectors/metering devices. Therefore check the identification of the adapter in accordance with Figure 3 before installing the piston detector.

- If the adapter identification (rings) of the adapter that is already installed does not match the identification in Figure 3, disconnect the old adapter (**7**) and remove it from the metering device (**4**)

Adapter identification, Fig. 3



5.2 Installation of the new piston detector

☞ See Figures 1 to 3

- Apply grease to the new packing ring (**6**) and place it on the new adapter (**7**)
- Apply the adapter (**7**) to the metering device (**4**) and tighten with the following torque:

Torques for tightening the adapter

VP/PSG2	13 mm AF	=	20+1Nm
VPK/PSG1	12 mm AF	=	15+1Nm
PSG3	24 mm AF	=	70±4Nm
SSV/SSVC/SSVD/SSVE	13 mm AF	=	15±1Nm
SSVL/SSVDL	13 mm AF	=	15±1Nm
SSVD/SSVD-E	13 mm AF	=	15±1Nm
SLC1/SLC2	13 mm AF	=	15±1Nm
VSG, VSL	13 mm AF	=	15+1Nm
VPB	12 mm AF	=	15+1Nm

- Apply new piston detector (**8**) to the adapter (**7**) and tighten gently

Avoid uncontrolled tightening of the piston detector.
This could cause damage. Adhere to the tightening torque of **$7^{\pm 0.5}$ Nm**.

- Tighten the piston detector (**8**) with a torque of **$7^{\pm 0.5}$ Nm**
- Connect electrical connection cable (provided by customer) (**2**) to the piston detector (**8**)

In case of different cable connection:

- Remove old connection cable (**2**).
- In place of the previous connection cable, connect the supplied adapter cable (**9**) to the piston detector (**8**) and a customer-provided port
- Attach the adapter cable (**9**) in a stress-free position
- Clean the work area/metering device of lubricant contamination
- Remove the drip pan.

5.3 Checking the signal

☞ See Figure 2

☞ On the subsequent metering device strokes, the signal from the piston detector must be received by the customer's monitoring equipment.

- Carry out a few strokes of the metering device, and check the metering stroke signal from the piston detector on the yellow piston detector LED (flashing) or at the customer's signal connection

6. Malfunctions, causes, and remedies

6.1 Metering devices signal missing

Malfunctions table

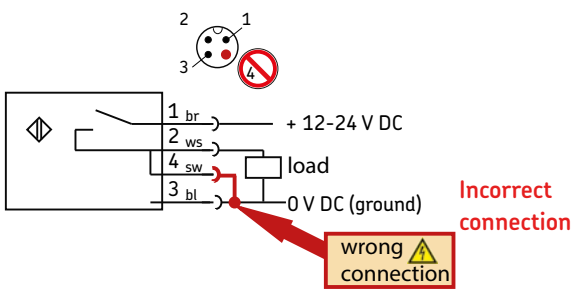
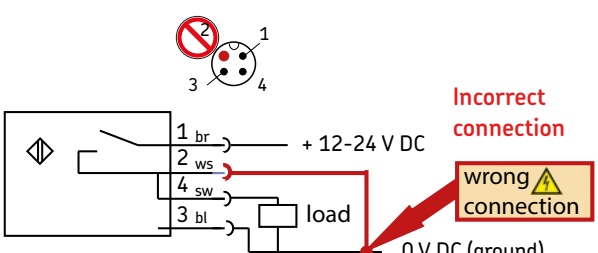
Fault	Possible cause	Remedy
	○ Mechanical blockage of the metering device	• Eliminate the blockage, check the metering device
Metering device signal missing	○ Socket not connected or connected incorrectly	• Check plug contacts, mount the socket correctly
	○ Signal line is broken	• Check signal line
	○ Piston detector is not installed correctly	• Check engagement depth of adapter and piston detector, tighten if necessary
	○ Piston detector overtightened	• Disconnect the piston detector, check the signal, replace the piston detector if damaged
	○ Wrong adapter used	• Use only the adapter approved for the respective metering device
	○ A universal piston detector is being used instead of a bipolar piston detector. (Only when connected to KFG pumps for automotive lubrication.)	• Swap the pigtail leads: see Chapter 3.3
Flashing light	○ Load is too low (< 5mA)	• Increase the load by, for example, connecting a resistor in parallel in the input circuit of the piston detector.

Malfunctions table

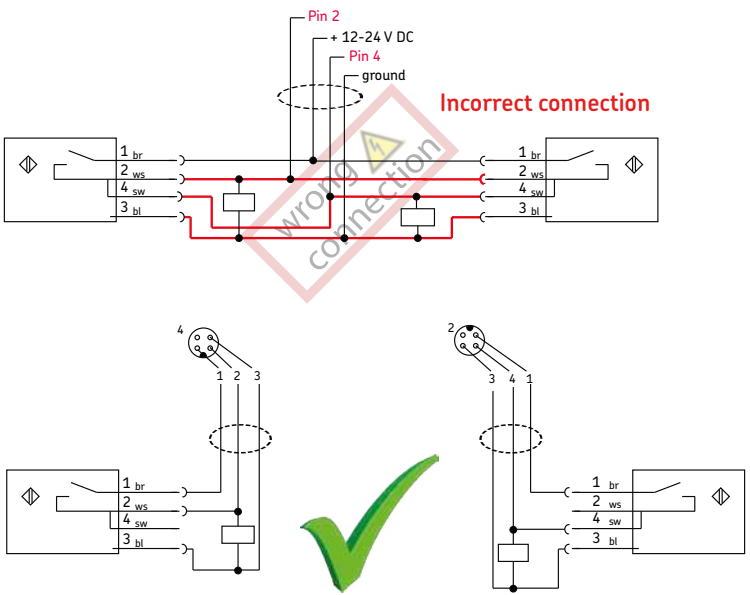
If, after working through the fault causes (previous page), there is still a malfunction in the metering device signal (continuous signal or missing signal), proceed as follows:

Fault	Possible cause	Remedy
Continuous signal	○ Positive magnetic field beyond the permissible immunity margin (greater than 0.5 mT)	**Requirements:** **The metering device must be functioning correctly, and the piston detector must be connected correctly.** • Check for any excessive magnetic fields in the assembly area of the metering device. Proceed as follows: • Remove the metering device with piston detector from the installation location and carry out a functional test of the piston detector installed in the metering device. • If the fault (continuous signal or missing signal) **no longer occurs**, suitable measures should be taken to prevent the excessive magnetic field. Contact SKF Service for assistance. • If the fault (missing change of signal) continues to occur, return the entire metering device to SKF Service/your dealer - see the manufacturer's address on page 3).
Missing signal	○ Negative magnetic field beyond the permissible immunity margin (less than -0.5 mT)	

Prohibited connections for the piston detector 234-13163-9

Fault	Possible cause	Remedy
Short circuit! If pin 4 is connected to pin 3 (ground), a short circuit will result! When activated, the detector will flicker due to short circuit detection by the detector	○ Piston detector 234-13163-9 connected incorrectly 	• Connect the piston detector in accordance with chapter 4.2, Connection options 234-13163-9, 3-wire PNP
Short circuit! If pin 2 is connected to pin 3 (ground), a short circuit will result! When activated, the detector will flicker due to short circuit detection by the detector		

Prohibited connections (Y cable)

Fault	Possible cause	Remedy
	○ **Piston detector is receiving incorrect signals:** sporadic interference will occur if a second sensor or an actuator is connected using a Y-splitter cable. 	• Do not connect the piston detector's signal line using a Y-splitter cable. SKF recommends using a separate 3-core signal cable for every piston detector connection.

7. Spare parts

WARNING

Adapter sleeves may only be changed when the metering device is depressurized.

Spare parts list

Designation	Item number	Designation	Item number	Quantity
Universal piston detector	**234-13163-9**	2-wire or 3-wire connector		1x each
Bipolar piston detector	**234-11454-1**	2-wire connector for automotive lubrication		
VP adapter sleeve	44-0159-2509	VP O-ring	WVN 501-12x1.5	
VPK adapter sleeve	44-0159-2508	VPK O-ring	WVN 501-10x1.5	
VPB adapter sleeve	44-0159-2507	VPB O-ring	WVN501-10x1	
PSG1 adapter sleeve	44-0159-2508	PSG1 O-ring	96-9120-0062	
PSG2 adapter sleeve	44-0159-2509	PSG2 O-ring	WVN 532-12x1.5	
PSG3 adapter sleeve	44-0159-2510	PSG3 O-ring	None	
Adapter sleeve SSV/SSVL; SSVD/SSVDL; SSVC; SLC; VSG/VSL	419-74455-1	O-ring SSV/SSVL; SSVD/SSVDL	219-13798-3	

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