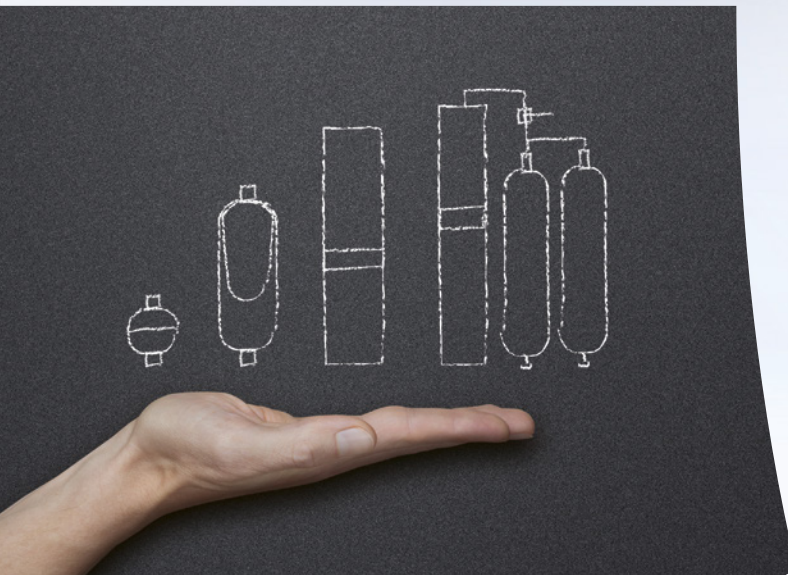


Accumulator

Piston accumulators

Roth
Hydraulics

Technical Information Piston position monitoring



excellent pressure solutions



Contents

Construction and Description

General	3
---------	---

Type description

Roth electrical end position switch ES	4
Roth electrical switching device SV	5
Roth electrical switching device SV-M	6
Roth electrical switching device SV-G	7
Roth electrical switching device SV-GB	8
Roth electrical switching device SV-GM	9
Roth Ultrasonic position sensor UPS	10
Roth piston accumulator measuring system KME	11
Roth Triplex sensor system	12

Construction and Description

■ General



Bolenz & Schäfer has been a leader in accumulator technology for more than 60 years. As a specialist in hydraulic accumulator applications, it is our foremost objective to develop innovative, efficient solutions to serve market needs. We are proud to continue our activities as Roth Hydraulics in our newly styled parent company, Roth Industries – Bolenz & Schäfer has been an established member of this company for more than 25 years.

Various versions of Roth piston position monitoring displays are available as supplementary options for Roth storage system construction, depending on application and monitoring requirement.

Roth piston position displays will allow monitoring of piston positions. Piston position display allows control of stroke paths, pressures, switching cycles, emergency switch-off etc. in piston accumulator systems.

Piston position monitoring displays may be visual, analog or digital.



Piston accumulator system with piston position display based on ultrasonic sensors.

The fields of application of Roth piston position display are manifold and may sometimes depend on the type and location of the installation. Combining different piston monitoring displays will also open up a wide range of applications.

Our many years of experience in the customised configuration of piston accumulator systems, qualify us as your competent partner in the selection of optimal piston position display.

We will gladly assist you in your selection.

Type description

■ Roth electrical limit switching device ES

Description

The electrical limit switching device consists of an anti-magnetic enclosure, a switching rod with a set of permanent magnets and a normally closed and/or a normally open switch. The electrical limit switching device is fitted on the outside of the accumulator and will be structurally sealed. The enclosure is pressurised.

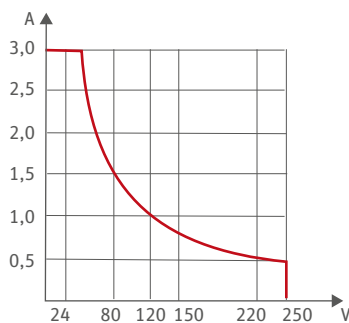
Function

The switch rod extends into the Roth piston accumulator. As the piston accumulator is filled with a liquid, the piston will push the switch rod against the resistance of the spring. The limit switch will display the top piston position. This signal will, for instance, allow the control of pumps or monitoring of potential loss of gas. The spring will move the switch rod back as the piston accumulator level drops. The limit switch may also, for instance, switch on a pump.

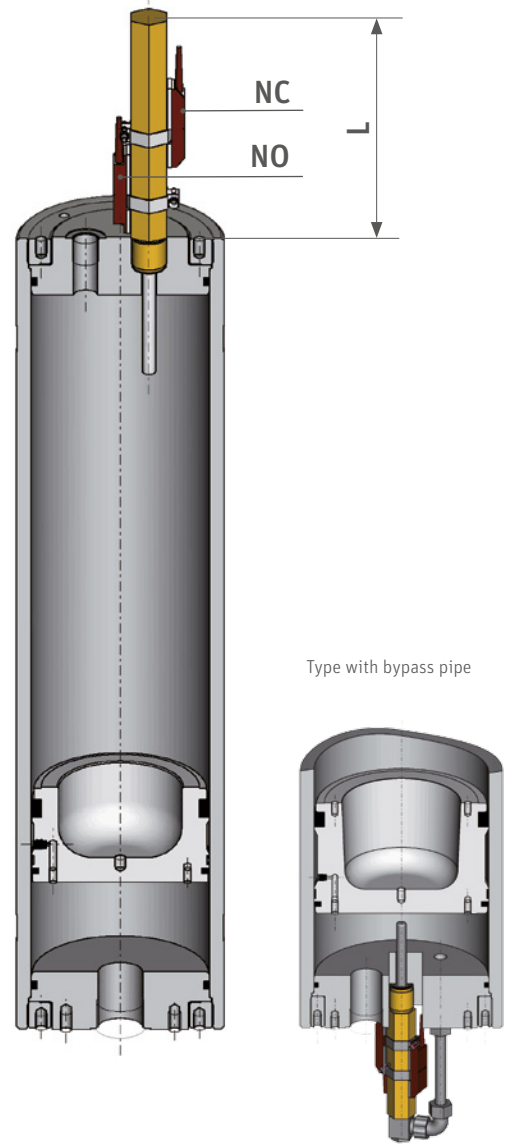
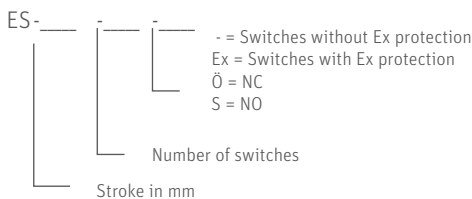
Note: Since the magnet cannot travel past the lower limit switch (NO), the “switch on pump” signal will always exist when the plant is switched off or depressurised, including when the plant is switched on.

Switching capacity

Voltage: max. 250 V AC/DC
 Current: max. 3 A
 Power: max. 120 VA/W



Product key



Overview

Overview of Roth limit switching device ES	
Stroke	75 mm each with one NC and NO contact
Overall length	L = 250 mm
Installation position	Arbitrary by spring reset
Design pressure	375 bar
Operating temperature	-25°C to +75°C
Piston speed	"Charge accumulator" should not exceed 0.5 m/s
Cable length	5 000 mm, other on request
Delivery option	Ex version Flange/special connections possible
Special design	Oil side with additional bypass pipe for pressure balance, Overall length on request.

Type description

■ Roth electrical switching device SV

Description

The electrical switching device consists of an anti-magnetic enclosure, a switch rod with a set of permanent magnets and an arbitrary number of bistable switches (grid). The electrical switching device is mounted on the outside of the Roth piston accumulator and is structurally sealed. The enclosure is pressurised.

Advantage: The monitored stroke range is selectable up to 1 500 mm, irrespective of the piston stroke length. Monitoring 50% of the stroke will normally suffice.

Function

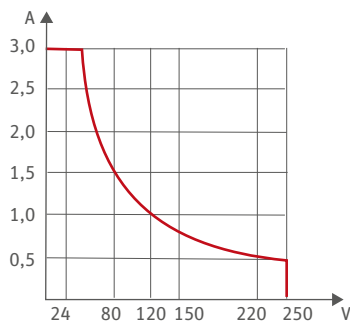
In starting position, the switch rod with its set of permanent magnets will be at the bottom. As the Roth piston accumulator is filled, the piston will push the switch rod upwards. Several switches may be installed, switching in sequence. The switch rod moves down under its own weight as the piston accumulator discharges. The switching functions are now reversed. Depending on stroke direction, the switches operate as NC or NO contacts.

Switching capacity

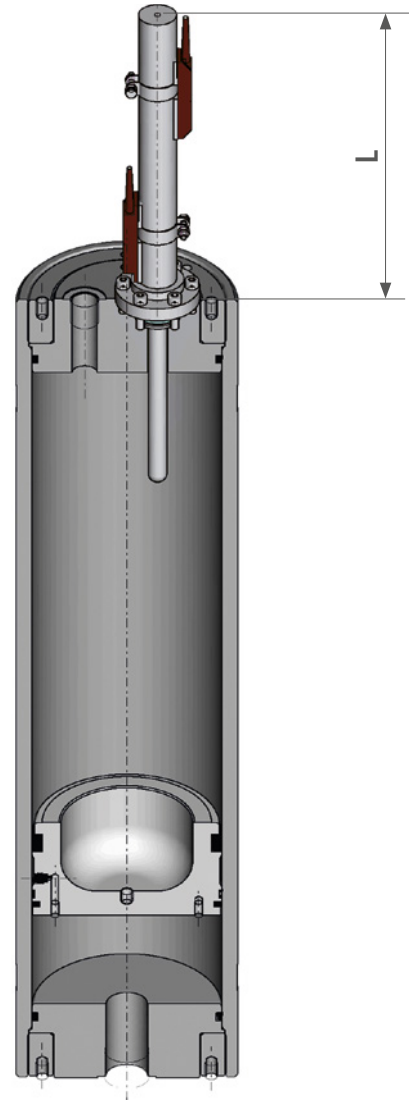
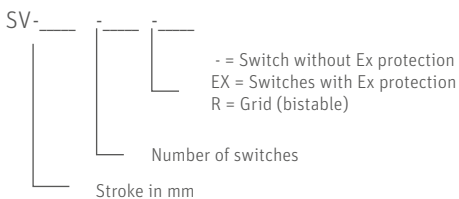
Voltage: max. 250 V AC/DC

Current: max. 3 A

Power: max. 120 VA/W



Product key



Overview

Overview of Roth electrical switching device SV	
Stroke	Arbitrary up to 1 500 mm Overall lengths > 1 500 mm as special design generally only for full piston stroke
Overall length	L = Stroke +132 mm
Installation position	Vertical, gas side on top
Design pressure	350 bar
Operating temperature	-25°C to +75°C
Piston speed	"Charge accumulator" should not exceed 0.5 m/s
Cable length	5 000 mm, other on request
Delivery option	Ex version Visual display (Type SV-M) available

Type description

■ Roth electrical switching device SV-M

Description

The electrical switching device consists of an anti-magnetic enclosure, a switch rod with a set of permanent magnets and an arbitrary number of bistable switches (grid). The electrical switching device is mounted on the outside of the Roth piston accumulator and is structurally sealed. The enclosure is pressurised.

Advantage: The monitored stroke range is selectable up to 1 500 mm, irrespective of the full piston stroke. Monitoring 50% of the stroke will normally suffice. The stroke may be read visually.

The SV-M switching device has a magnetic vane display.

The passing magnet will change the display from white to red. The stroke movement in the Roth piston accumulator and the filling level will thus show. No switching functions are included. In addition to the visual display, the proximity switches may also be installed.

Function

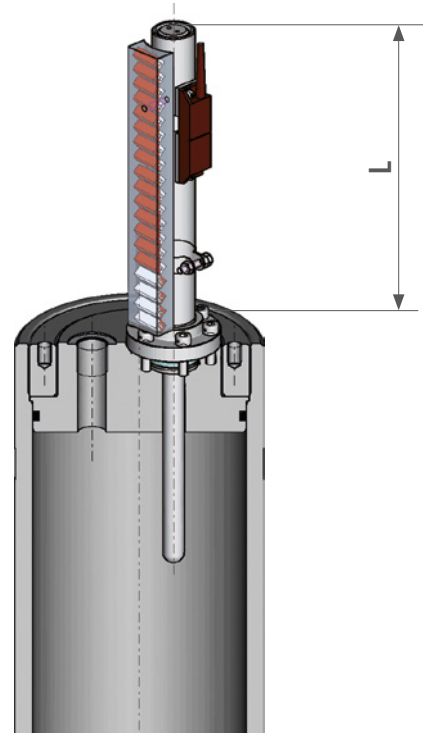
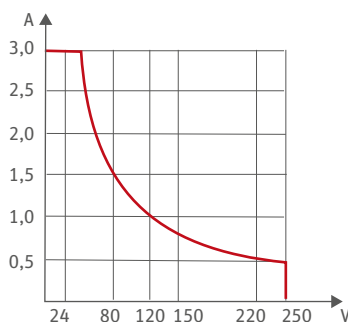
In starting position, the switch rod with its set of permanent magnets will be at the bottom. As the Roth piston accumulator fills, the piston will push the switch rod upwards. Several switches may be installed, switching in sequence. The switch rod moves down under its own weight as the piston accumulator discharges. The switching functions are now reversed. Depending on stroke direction, the switches operate as NC or NO contacts.

Switching capacity

Voltage: max. 250 V AC/DC

Current: max. 3 A

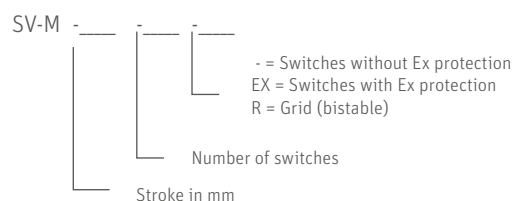
Power: max. 120 VA/W



Overview

Overview of Roth electrical switching device SV-M	
Stroke	Arbitrary up to 1 500 mm Overall lengths > 1 500 mm as special design, generally only for full piston stroke
Overall length	L = Stroke + 132 mm
Installation position	Vertical, gas side on top
Design pressure	350 bar
Operating temperature	-25°C to +75°C
Piston speed	"Charge accumulator" should not exceed 0.5 m/s
Cable length	5 000 mm, other on request
Delivery option	Ex version Types: SV, SV-G, SV-GB or SV-GM (some with visual display) available

Product key



Type description

■ Roth electrical switching device SV-G

Description

The electrical switching device consists of an anti-magnetic enclosure mounted on the accumulator and connected to the piston via a rope, with a set of permanent magnets in a bent measuring pipe and an arbitrary number of bistable switches (grid). The electrical switching device is mounted on the outside of the Roth piston accumulator, fastened with a 180° bent pipe on the gas side and structurally sealed. The enclosure is pressurised.

Advantage: The entire piston stroke can be monitored, requiring little space.

Function

In starting position, the set of permanent magnets will be in top position. As the Roth piston accumulator fills, the set of magnets will drop by its own weight. It is possible to install several switches on the measuring pipe, switching sequentially. The piston will pull the magnets upwards as the piston accumulator discharges. The switching functions are now reversed. Depending on stroke direction, the switches operate as NC or NO contacts.

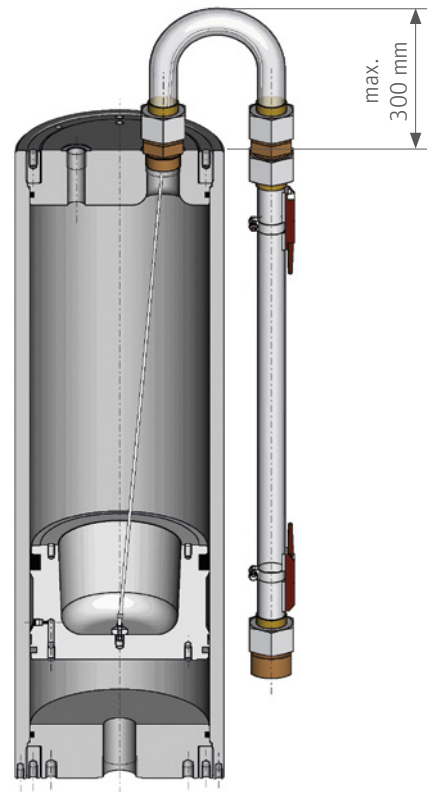
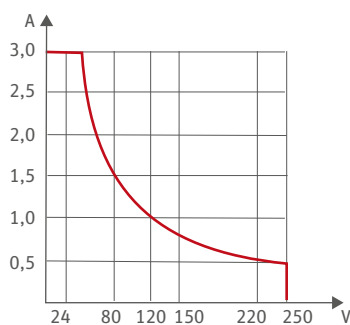
 **Note:** Only suited for slow, smooth piston movement

Switching capacity

Voltage: max. 250 V AC/DC

Current: max. 3 A

Power: max. 120 VA/W



Overview

Overview of Roth electrical switching device SV-G	
Stroke	Suitable only for full piston stroke. Monitors complete piston stroke
Installation position	Vertical, gas side on top
Design pressure	Up to max. 350 bar
Operating temperature	-25°C to +75°C
Piston speed	"Charge accumulator" should not exceed 0.5 m/s
Cable length	5 000 mm, other on request
Delivery option	Ex version Types: SV, SV-M, SV-GB or SV-GM (some with visual display) available

Product key

SV-G - - - -
 - = Switches without Ex protection
 EX = Switches with Ex protection
 Ö = NC
 S = NO
 R = Grid (bistable)
 Number of switches
 Stroke in mm

Type description

Roth electrical switching device SV-GB

Description

The electrical switching device consists of an anti-magnetic enclosure mounted on the accumulator and connected to the piston via a rope, with a set of permanent magnets in a bent measuring pipe and an arbitrary number of bistable switches (grid). The electrical switching device is mounted on the outside of the Roth piston accumulator, fastened with a 180° bent pipe on the gas side and structurally sealed. The enclosure is pressurised.

An electronic length measuring system allows switching device monitored piston strokes to be transmitted as an analog signal. This may be read by the machine controller.

Advantage: The entire piston stroke can be monitored, requiring only limited space. The measuring system signals can be read by the machine controller.

Function

In starting position, the set of permanent magnets will be in top position. As the Roth piston accumulator fills, the set of magnets will drop by its own weight. It is possible to install several switches on the measuring pipe, switching sequentially. The piston will pull the magnets upwards as the piston accumulator discharges. The switching functions are now reversed. Depending on stroke direction, the switches operate as NC or NO contacts.

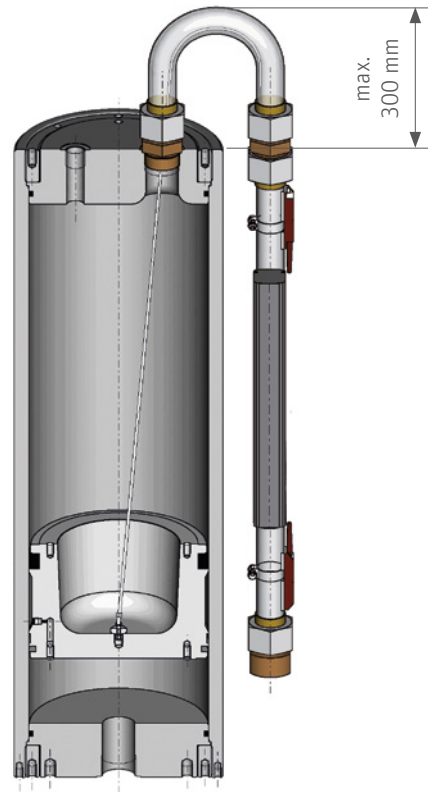
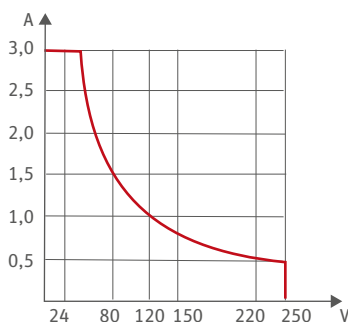
Note: Only suited for slow, smooth piston movement.
May also be combined with length measuring systems with magnetic vane indicators and bistable switches.

Switching capacity

Voltage: max. 250 V AC/DC

Current: max. 3 A

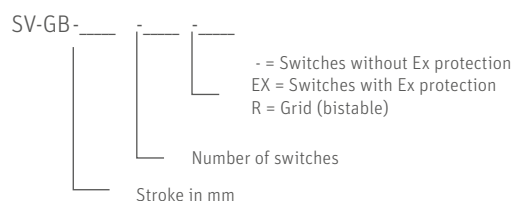
Power: max. 120 VA/W



Overview

Overview of Roth electrical switching device SV-GB	
Stroke	Suitable only for full piston stroke. Monitors complete piston stroke
Installation position	Vertical, gas side on top
Design pressure	Max. 350 bar
Operating temperature	-25°C to +75°C
Piston speed	"Charge accumulator" should not exceed 0.5 m/s
Cable length	5 000 mm, other on request
Delivery option	Ex version Types: SV, SV-M, SV-G or SV-GM (some with visual display) available

Product key



Type description

■ Roth electrical switching device SV-GM

Description

The electrical switching device consists of an anti-magnetic enclosure mounted on the accumulator, connected to the piston by a rope in a bent measuring pipe, with a set of permanent magnets and an arbitrary number of bistable switches (grid). The electrical switching device is mounted on the outside of the Roth piston accumulator, fastened with a 180° bent pipe on the gas side and structurally sealed. The enclosure is pressurised.

An additional magnetic length measuring system allows the switching device monitored piston stroke to also be visually tracked. The passing magnet will change the display from white to red. The stroke in the piston accumulator and the fill level can now be shown. No switching functions are included. In addition to the visual display, the proximity switches may also be installed.

Advantage: The full piston stroke may be monitored and visually indicated, requiring little space.

Function

In starting position, the set of permanent magnets will be in top position. As the Roth piston accumulator fills, the set of magnets will drop by its own weight. It is possible to install several switches on the measuring pipe, switching sequentially. The piston will pull the magnets upwards as the piston accumulator discharges. The switching functions are now reversed. Depending on stroke direction, the switches operate as NC or NO contacts.

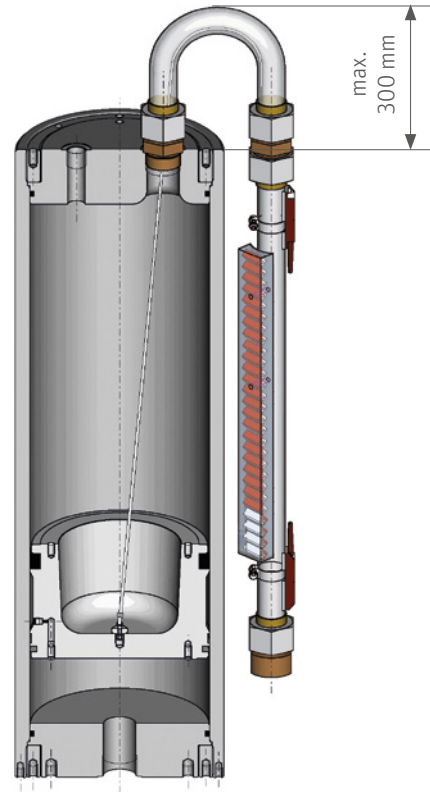
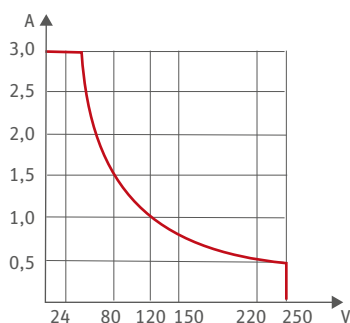
 **Note:** Only suited for slow, smooth piston movement

Switching capacity

Voltage: max. 250 V AC/DC

Current: max. 3 A

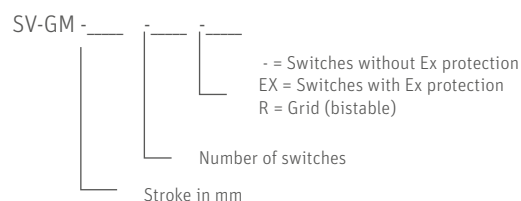
Power: max. 120 VA/W



Overview

Overview of Roth electrical switching device SV-GM	
Stroke	Suitable only for full piston stroke. Monitors complete piston stroke
Installation position	Vertical, gas side on top
Design pressure	Max. 350 bar
Operating temperature	-25°C to +75°C
Piston speed	"Charge accumulator" should not exceed 0.5 m/s
Cable length	5 000 mm, other on request
Delivery option	Ex version Types: SV, SV-M, SV-G or SV-GB (some with visual display) available

Product key



Type description

■ Roth Ultrasonic position sensor UPS

Description

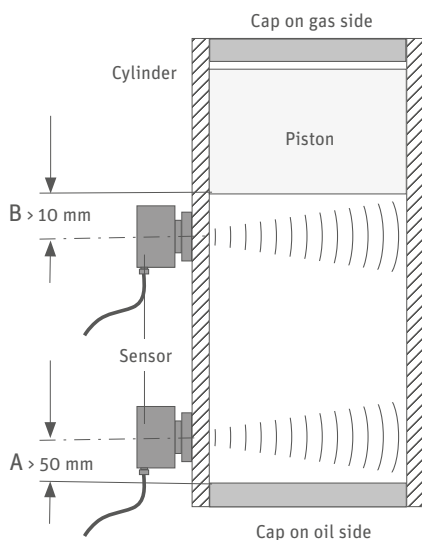
The ultrasonic position sensor is mounted on the piston accumulator cylinder using a clamp. The sensor monitors the specific desired position. The electrical connection is via an angled connector to the UPS. A green LED in the angled connector on the UPS indicates the monitored operating voltage. The ultrasonic position sensor optionally also has an NPN or PNP switched output. This will, for instance, allow switching a relay. It is possible to use two synchronously operating sensors.

*Advantage: Freely selectable sensor positioning.
Two simultaneously operating synchronised sensors are possible. The sensor may be retrofitted with no technical changes to the piston accumulator.*

Function

The UPS is a compact sensor allowing ultrasonic piston position sensing in a piston accumulator. The sensor principle is based on the ultrasonic impulse echo method. Ultrasonic position sensors detect the interruption of the acoustic path (e.g. by the piston or drop in fluid level) and signal this via a switched output (indicated by the yellow LED in the angled plug).

Measuring principle



Overview

Overview of the UPS Roth ultrasonic position sensor	
Type	Compact sensor unit comprising a sensor element and evaluation electronics
Monitoring range	Complete piston stroke – 60 mm possible (see measuring principle diagram)
Measuring principle	Ultrasonic impulse echo method
Measuring rate, Measuring accuracy	Max. 155 Hz static ± 1 mm, measured from the centre of the sensor
Installation position	Arbitrary
Operating temperature	-20°C to +80°C (observe viscosity)
Temperature	-20°C ... +60°C
Piston speed	Affects "B" (see Measuring principle diagram)
Supply voltage	18 to 30 VDC
Serial interface	Single cable interface for configuration and synchronisation (with PC and adapter for programming)
Switched output	NPN or PNP (max. 60 mA at max. 30 VDC)
Connections	Sensor plug connector M12 Cable, 4-pole without screen Brown: positive supply voltage 18 ... 30 VDC Blue: negative supply voltage (GND) Black: Switched output White: Synchronisation, serial programming for configuration
Cable length	2 000 – 5 000 mm with angled plug
Switching point display	LED integrated in angled plug (green, yellow)
Protection class	IP 67, oil-proof
Hydraulic fluid	Mineral oil (HL, HLP), HFA, (HFB), HFC, HFD, water; Purity 20 μ m

Type description

■ Roth piston accumulator measuring system KME

Description and function

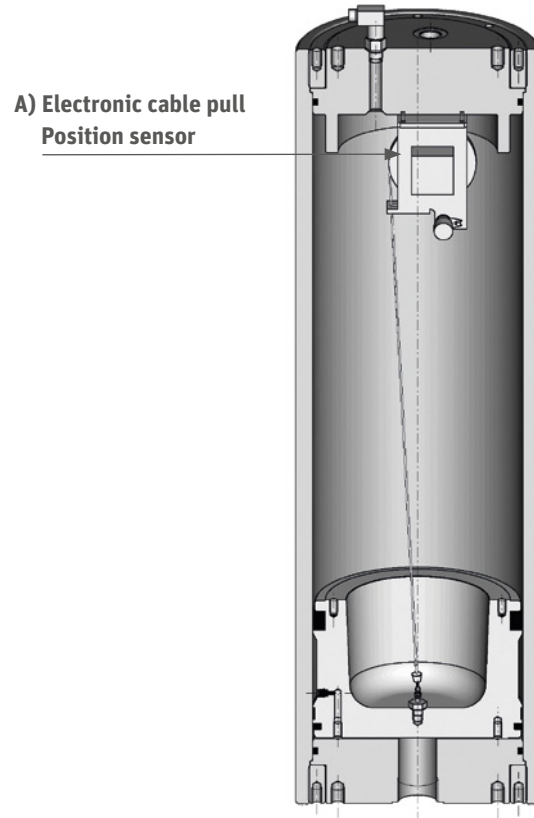
The accumulator piston is connected to an automatic winder via a rope on the gas side. The automatic winder (winding and unwinding) drives a 10 turn potentiometer. The electrical connection is via a pressure-tight feed-through from piston accumulator to measuring transducer. The measuring transducer converts the resistance to a 4 to 20 mA analog signal. The PLC may use the 4 to 20 mA signal for control purposes. The connection between transducer and potentiometer must be via screened cable, e. g. LiYCY 3 x .1.5 mm. If significant external interference is possible, the cable should be laid in a metal conduit or tube. For cable lengths in excess of 100 m between sensor and display device, the display must be readjusted on site.

The transducer may optionally be connected to a display unit (C). The piston stroke may be shown as a percentage, as litres or as mm.

Advantage: The piston monitoring system is protected inside the piston accumulator and protected from external mechanical impact. It requires no additional space near the plant.

Overview

Overview of Roth piston accumulator measuring system KME	
A) Electronic cable pull position sensor	
Stroke	Up to 6 000 mm
Installation position	Piston accumulator vertical, gas side top, horizontal installation possible for short measuring lengths
Design pressure	375 bar
Operating temperature	-20°C to +85°C
Temperature	-20°C ... +60°C
Piston speed	max. 1 m/s
Piston acceleration	max. 5 g
B) Measurement transducer	
Supply voltage	24 VDC
Output signal	4 to 20 mA
C) Display unit	
Supply voltage	10 - 30 VDC
Output signal	Analog output: 0/4-20 mA, 0-10 VDC, 16 bit Switched output: 2 relay outputs (changeover) 250 V/5 A AC, 30 V/5 A DC
Delivery option	



B) Measurement transducer



C) Display unit



Type description

■ Roth Triplex sensor system

Description

The Roth Triplex sensor simultaneously measures piston position, pressure and temperature. Piston position is determined ultrasonically using two independent measurements. In addition to the direct determination of the piston position, the integrated evaluation system also calculates the position using gas volume and hydraulic pressure. The piston position will be constantly and reliably available by analysis of the two parameters. Loss of pressure/gas will be diagnosed by comparison of historic and current measurements. The temperature sensor constantly measures the temperature conditions in the accumulator tank.

Advantage: The piston position will be constantly and reliably available. The function is correctly, reliably and securely monitored through comprehensive condition monitoring.

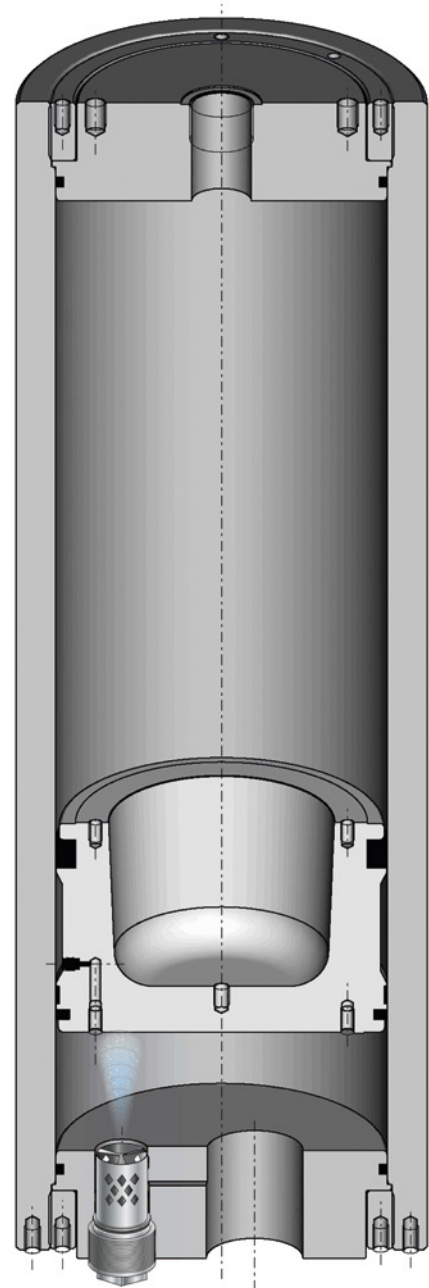
Function

The sensor transmits measuring data pertaining to piston position, hydraulic pressure and tank temperature directly. A CAN bus interface may be used to directly connect the sensor to higher level controllers.

The accumulator charging condition is determined and displayed as a percentage. The sensor may alternatively be connected to the system controller via an interface module. The piston position limits may be set via switching points and associated hysteresis. Alarms or controls will be triggered if set switching points are exceeded.

Overview

Overview of Roth Triplex Sensor	
Measuring range	Measuring lengths up to 7 000 mm, pressures 1 to 400 bar Accuracy of the measured distance 0.5%
Installation position	Arbitrary
Operating overpressure	350 bar
Operating temperature	-20 to +85°C
Operating voltage	DC 10 to 32 V
Degree of protection	IP 67
Material	On media side VA, high-strength epoxy resin
Connection	Cable with plug (straight)
Cable length	5 000 mm, other on request



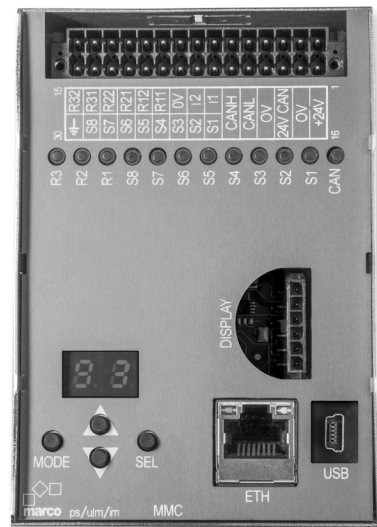
Interface module

The Triplex Sensor interface module for DIN top hat rail installation will connect sensor piston monitoring to higher level controllers. Digital and analog signal lines are provided. The Triplex sensor is directly connected here.

System parameters may be entered via 4 keys and 2-digit display. Piston position and pressure may be displayed via a 4 to 20 mA interface.

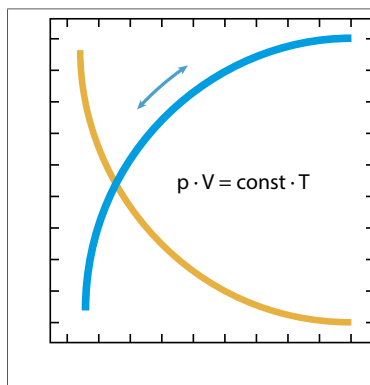
Overview

Overview of Roth Interface Module	
Dimensions	Length 101.6 mm, width 71.6 mm, depth 28.3 mm DIN top hat rail installation
Operating voltage	24 V ± 10%
Power input	50 mA without output current + 50 mA sensor + max. 150 mA for each switched output
Relay outputs	AC/DC 350 V, 0.13 A
Working temperature	-20 to +85°C
Configuration	Supply connections, display connection, control LEDs, adjusting keys, micro SD card, mini USB, Ethernet 10/100 Mbit

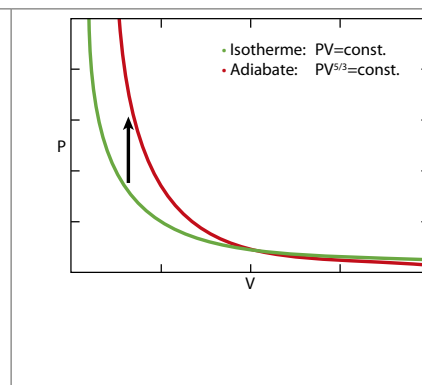


Operating modes

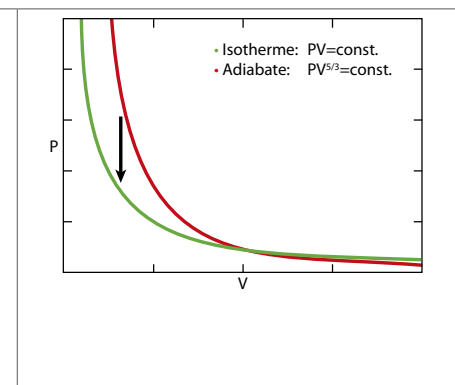
Stationary mode



Charging



Discharging



Our strengths

Your benefits

Innovative

- > own product development
- > In-house technology centre for all relevant tests and inspections
- > among other: Burst and swell test rig, endurance test rig, cold chamber, salt spray test
- > close cooperation with universities and institutes
- > tested and proven design and simulation program for all types of hydraulic accumulators

Global

- > worldwide production, installation and service locations
- > certified in accordance with DIN EN ISO 9001:2015, DIN EN ISO 14001
- > proximity to customers thanks to own representatives and extensive global dealer network
- > global product accreditations, such as ASME Code, Russian Customs Union TR-CU, Korea KGS

Complete product portfolio

- > extensive range of diaphragm, bladder and piston accumulators
- > complete and tested range of accessories, including for professional installation and for (accumulator) safety
- > accumulator measuring and monitoring systems, mechanical or proximity
- > customised special solutions

A large, stylized version of the Roth Hydraulics logo, with "Roth" in a bold, white, sans-serif font and "Hydraulics" in a smaller, white, sans-serif font below it. The logo is set against a dark background and is partially supported by a hand from the bottom left corner.



Roth Hydraulics

Accumulator

- > Diaphragm accumulators
- > Bladder Accumulators
- > Piston accumulators

Accumulator systems

- > Accumulator plant
- > Monitoring systems
- > System accessories
- > Pressure vessels

Special solutions

- > Spring accumulators
- > Damper systems
- > Railway hydraulics
- > Special accumulators

Roth
Hydraulics



ROTH Hydraulics GmbH
(formerly Bolenz & Schäfer GmbH)
Lahnstraße 34
D-35216 Biedenkopf-Eckelshausen
Germany
Phone: +49 (0) 64 61 / 9 33-0
Fax: +49 (0) 64 61 / 9 33-161
E-mail: service@roth-hydraulics.de
www.roth-hydraulics.de



ROTH Hydraulics (Taicang) Co., Ltd.
(formerly BSD Hydraulic Technology (Taicang) Co., Ltd.)
Building 14 A, No. 111,
Dongting North Road, Taicang City,
Jiangsu Province 215400, P.R. China
Phone: +86 (0) 5 12 / 53 20 88 36
Fax: +86 (0) 5 12 / 53 20 88 39
E-mail: service@roth-hydraulics.cn
www.roth-hydraulics.cn



ROTH Hydraulics NA Inc.
One General Motors Drive,
PO Box 245, Syracuse
New York 13211
USA
Phone: +1 (0) 3 15 / 4 75 01 00
Fax: +1 (0) 3 15 / 4 75 02 00
E-mail: service@roth-hydraulics.com
www.roth-hydraulics.com

