

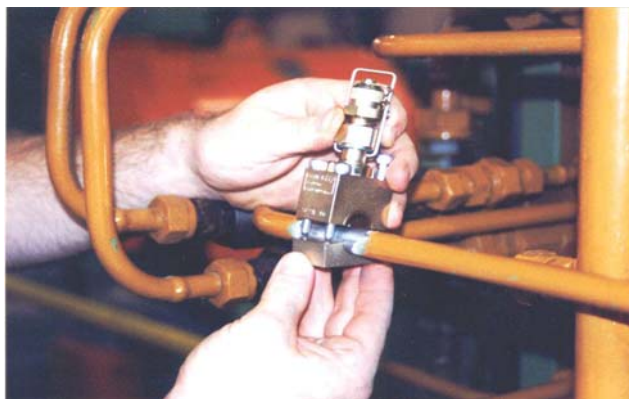
# serv-Clip® Hydraulic- pipe- measuring points + sensors



Installation on pressurized pipe **serv-Clip® 1**

Refit measuring points in existing hydraulic plants faster and much more cheaply.

**Installation in 3 minutes  
no cutting pipes, ready  
for use**



Installation on non-pressurized pipe **serv-Clip® 2**

for pipes up to 630 bar (9100 psi):

- 10 – 65 mm
- $\frac{3}{8}$  – 2 tube inch
- $\frac{1}{4}$ " – 3" pipe R-Zoll inch  
over 3"(88,9 mm) with SC-XE-607



Diagnostic-System **fluid-Check®**  
Mobile Measuring kit FM-1-B with  
Sensors:

- Flow rate
- Leakage
- Temperature
- Pressure
- Aqua (water content in oil)  
in Program soon!

Edition 2014  
EK-SC-FC-07-14

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Take only 3 minutes to install.  
Immediately ready for use



For all pipes-Ø  
10-42 mm  
3/8"-2" Tube (external-Ø)  
1/4"-3" Pipe (internal-Ø)

Special versions for stainless steel pipes available upon request

**serv-Clip 1**  
for mounting on pressurized pipes

**serv-Clip 2**  
for mounting on non-pressurized pipes



place of installation



screw down clamp bolts



place of installation



plunge the needle



remove paint



plunge the needle



remove paint and clean pipe



remove stirrup and needle



clean pipe



ready to measure



clamp SC onto pipe



screw valve



clamp SC onto pipe



screw down clamp bolts



ready to measure



[www.servclip.com](http://www.servclip.com)

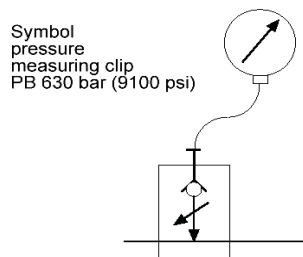
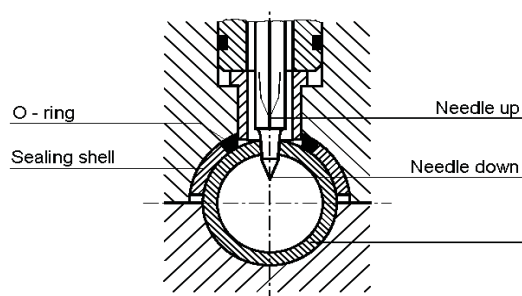
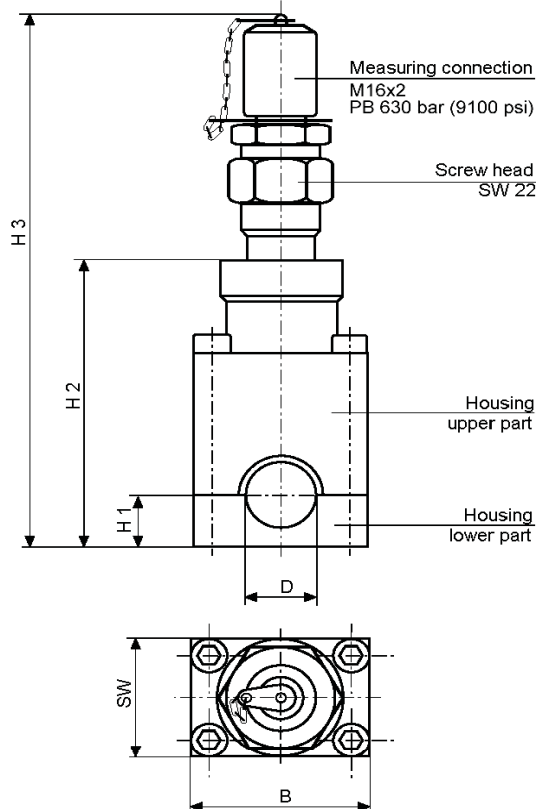
Available serv-Clip® measuring connectors											
For mounting on steel and <sup>(3)</sup> stainless steel pipelines –no cutting pipelines											
Type		SC-1-A-..		SC-1-P-..			SC-1-T-..		SC-1-P-..		
		SC-2-A-..		SC-2-P-..			SC-2-T-..		SC-2-P-..		
Housing size	for pipes with OD (mm)	Hydr. pipe DIN 2391		threaded pipe DIN			Tube-OD US Standard SAE cold-drawn		Pipe-ID US standard SAE warm rolled		
		ND mm	Pipe wall up to 5mm	ID R-Inches (approx.)	tube wall DIN 2440 medium heavy	DIN 2441 heavy	OD Inches	Pipe wall mm	ID Inches	Pipe wall Schedule 80	Schedule 160
I	9.52						3/8	1.2			
	10	10	L / S								
	<sup>(2)</sup> 12	12	L / S								
	12.7						1/2	2.1			
	13.5			R1/4	2.4	2.9			1/4	3.0	-
	14	14	S								
	15	15	L								
	15.9						5/8	2.5			
	16	16	S								
	17.2			R3/8	2.4	2.9			3/8	3.2	-
18	18	L									
II	19.05						3/4	2.9			
	20	20	S								
	21.4			R1/2	2.65	3.25			1/2	3.7	4.7
	22	22	L								
	25	25	S								
	25.4						1	3			
	26.9			R3/4	2.65	3.25			3/4	3.9	<sup>(1)</sup> 5.6
28	28	L									
III	30	30	S								
	31.75						1 1/4	3			
	33.7			R1	3.25	4.05			1	4.5	<sup>(1)</sup> 6.4
	35	35	L								
	38	38	S								
	38.1						1 1/2	4			
	42	42	L								
42.4			R1 1/4	3.25	4.05			1 1/4	4.85	<sup>(1)</sup> 6.4	
IV	48.3			R1 1/2	3.25	4.05			1 1/2	5.08	<sup>(1)</sup> 7.14
	50	50	6								
	50.8						2	5			
	60.3			R2	3.65	4.5			2	5.53	x
	65	65	8								
	76.1			R2 1/2	3.65	4.5			2 1/2	7.01	x
	88.9			R3	4.05	4.85			3	7.62	x
V	<sup>(1)</sup> For ordering the PIPE (P) model between 1" to 2" please reconfirm us the schedule 80 or 160. We deliver special mounting instructions / needle for schedule 160 upon request (no additional charge). <sup>(2)</sup> The flow rate and leakage sensor can be used from pipe 12 x 1,5 mm to 5,5 mm wall thickness (Exception: 12x2mm no possible) with the Pipe measuring point serv-Clip®. For pipes over 3" (88,9 mm) and wall thickness from 6 mm ask about our adapter SC-XE-607. <sup>(3)</sup> We deliver a special needle for stainless steel pipelines only upon request (up to 5 mm wall thickness) with SC-1 and SC-2 possible.										
Available in stock						Only in SC-2-.. available					

Application instructions for using serv-Clip® measuring connectors  
and Fluid-Check® sensors with hydraulic systems

<p>1. The measuring connectors SC-1 and SC-2 are supplied with M16 x 2 screwed couplings. Hydraulic connections can be directly screwed onto the pipe.</p> <p><b>For steel pipes Ø with thickness up to 7,5 mm</b></p> <p>10 - 42 mm 3/8 - 2 Tube inch 1/4" - 3" Pipe R-Zoll (inch)</p> <p>For <b>pipes over 3" (88,9 mm)</b> and <b>wall thickness from 6 mm</b> can be used our welding adaptor SC-XE-607.</p> <p>Special instructions for <b>stainless steel pipelines</b> up to 4 mm wall thickness with SC-2.</p> <p>The <b>flow rate sensor or leakage sensor</b> can be installed from pipes 12x1,5 mm to 5,5 mm wall thickness with serv-Clip.</p>	<p>With SC-1 or SC-2, you can immediately complete the following tasks:</p> <ul style="list-style-type: none"> <li>• Pressure measurements, sampling, bleeding</li> <li>• Installation of pressure sensors or pressure switches</li> <li>• Installation of partial flow filters or particle monitors</li> <li>• Connection of control oil to leak oil</li> </ul> <p>Only with SC-2 :</p> <p>Installation of sensors like</p> <p>Flow rate Leakage Temperature Pressure Water</p>	<p>SC-1</p> <ul style="list-style-type: none"> <li>• Very fast installation</li> <li>• No downtime</li> <li>• Instantaneous measurements</li> <li>• Low cost</li> <li>• No need to cut pipes</li> <li>• No contamination resulting from leaking hydraulic oil</li> <li>• No contamination of the hydraulic fluid</li> <li>• Allows connection of sensors and screwed couplings G 1/4"</li> </ul> <hr/> <p>SC-2</p> <ul style="list-style-type: none"> <li>• Very fast installation</li> <li>• Minimized downtime</li> <li>• Low cost</li> <li>• No need to cut pipes</li> <li>• No contamination resulting from leaking hydraulic oil</li> <li>• No contamination of the hydraulic fluid</li> <li>• Allows connection of sensors and screwed couplings G 3/8"</li> </ul>
<p><b>What type of measurement device is used?</b></p>	<p><b>What is measured, and how are the measurements carried out?</b></p>	
<p>Flow rate sensor for SC-2 or welding adaptor SC-XE-607</p>	<p>Sensor head inserted into the pipe, directly placed into the oil circuit</p> <p>Calorimetric measurements</p>	<ul style="list-style-type: none"> <li>• One sensor for all measuring connections</li> <li>• Easy and quick installation</li> <li>• Signal 4-20 mA</li> </ul>
<p>Leakage sensor for SC-2</p>	<p>Sensor head inserted into the pipe, directly placed into the oil circuit</p> <p>Calorimetric measurements</p>	<ul style="list-style-type: none"> <li>• One sensor for all measuring connections</li> <li>• Easy and quick installation</li> <li>• Signal 4-20 mA</li> </ul>
<p>Temperature sensor for SC-2 or welding adaptor SC-XE-607</p>	<p>Temperature sensor inserted into the pipe, directly placed into the oil circuit</p>	<ul style="list-style-type: none"> <li>• Sensor for all measuring connectors</li> <li>• Easy and quick installation</li> <li>• Signal 4-20 mA</li> </ul>
<p>Pressure sensor for SC-1 and SC-2 or welding adaptor SC-XE-607</p>	<p>BKM pressure sensor or any other commercially available product</p>	<ul style="list-style-type: none"> <li>• Easy and quick installation, with SC-1 even in pressurized conditions</li> <li>• Immediately ready for use</li> </ul>
<p><b>Why should you use SC-1 or SC-2 to connect sensors and other devices?</b></p>	<p><b>Avoid disruptions and downtimes</b></p>	<p><b>Installation and operation</b></p>
<p>Pressure measurement</p>	<p>Check settings</p>	<p>Installation of pressure gauges or sensors</p>
<p>Pressure switch</p>	<p>Monitor processes</p>	<p>Immediate installation of pressure switch</p>
<p>Bleeding</p>	<p>Remove air bubbles in oil</p>	<p>Bleeding pipes without risk and waisting time</p>

Sampling	Inspect oil quality	Taking oil samples at suspected sources of contamination
Detect oil contamination	Determine particle count or contamination class	Installation of particle counters
Partial flow filter	Remove impurities in oil	Installation of filters without downtime
Temperature sensors only for SC-2	Measure temperature	Installation immediately behind the potential source of interference
Water detector only for SC-2	Instant warnings of water intrusion in oil	Installation immediately behind the oil / water cooler
Flow rate sensor only for SC-2	Monitor flow rate in pipe	Monitor flow rate and wear of pump
<b>Where can serv-Clip® be installed on hydraulic pipes?</b>		
Pumps: Monitor flow rate	Together with QS- Sensor behind the pump in the P line	
Pumps: Connect or disconnect power supply	Together with QS- Sensor behind the pump in the P line	
Oil contamination: Monitor purity	Between P and L or T line for connecting the monitor (P= pump, L=leak oil, T=tank)	
Oil motors: Monitor speed (i.e. number of revolutions)	Together with QS- Sensor in A line	
Oil motors: Measure leak oil pressure, to avoid sealing damages	In L line for checking dynamic pressure	
Pressure switch: For inspection purposes and other special functions	Screw pressure switch onto SC	
Pressure sensors: For measuring and controlling pressure conditions	Screw pressure switch onto SC	
Open locked check valves:	Install SC to open the locked valve on the opposite pipeline.	
Pressure control valve: Oil drainage	On L line	
Oil cooler: Monitor function Temperature / Flow rate	Screw QS or TS sensor onto SC-2	
<b>serv-Clip Applications</b>		
Monitor pumps. Identify pump capacity reductions	Installation of a SC sensor in pressure pipeline behind the pump.	
Switch on/off pump gears, for optimal utilization of energy	Installation of QS sensors in pressure pipeline behind the pump.	
Detect contaminating particles in hydraulic oil. Find the source of contamination in the hydraulic system	Targeted installation of SC in pipeline system for taking oil samples.	
Detect sealing damages Identify over-pressure on oil motors.	Installation of SC on the leak oil pipeline for measuring dynamic pressure.	
Install pressure pipeline	Installation of SC on the pressure pipeline	
Install pressure gauge/switch/absorber		

# serv-Clip® -1 for mounting on pressurized pipes



- ◆ Quick and cheap installation of approx. 3 minutes with the help of a screw wrench
- ◆ No need to cut pipes
- ◆ No downtimes - installation on pressurized pipes
- ◆ No contamination of the fluid through swarfs
- ◆ Installation of gauges and sensors with screw ¼"
- ◆ Included valve M 16x2
- ◆ Measurement on hydraulic plants without switching off
- ◆ For use up to 630 bar (9100 psi) working pressure
- ◆ Particle measurement according to ISO or NAS classes
- ◆ **serv-Clip** is registered trade mark of BKM Hagen / Germany

## Description

The patented pressure measuring clip is simply screwed onto the cleaned surface of the pressurised hydraulic tube. It is not necessary to interrupt the operation of the plant.

A specially shaped steel needle is inserted through the wall of the tube above the screw head.

The screw head is then screwed back. The created hole is then open and it is possible to measure the pressure immediately.

This connection is simple, quick and safe to install. The procedure only takes a few minutes. No special tools are required to install the serv-Clip. The system is completely leakproof. Any pollution of the hydraulic liquid is impossible.

It is not necessary to dismantle the measuring clip on completion of the measuring procedure in order to save costs. The operational safety of the hydraulic system is maintained. The measuring point remains permanently available for taking measurements.

## Materials

Housing	9SMnPb28k	Sealing shell	St 37.4
O-ring	Viton	Screw head	9SMnPb28k
Measuring-needle	58CrV4		

## Dimensions

OD mm	type mm (A)	H1	H2	H3	B	SW
10 - L + S	SC-1-A-10	15	69	128	40	30
12 - L + S	SC-1-A-12	15	70	129	40	30
14 - S	SC-1-A-14	15	71	130	40	30
15 - L	SC-1-A-15	15	71,5	130,5	40	30
16 - S	SC-1-A-16	15	72	131	40	30
18 - L	SC-1-A-18	15	73	132	40	30
20 - S	SC-1-A-20	20	74	133	50	30
22 - L	SC-1-A-22	20	75	134	50	30
25 - S	SC-1-A-25	20	76,5	135,5	50	30
28 - L	SC-1-A-28	20	78	137	50	30
30 - S	SC-1-A-30	30	79	148	65	30
35 - L	SC-1-A-35	30	81,5	140,5	65	30
38 - S	SC-1-A-38	30	83	142	65	30
42 - L	SC-1-A-42	30	85	144	65	30
OD inch	type Tube (T)	H1	H2	H3	B	SW
3/8	SC-1-T-3/8	15	69	128	40	30
1/2	SC-1-T-1/2	15	70	129	40	30
5/8	SC-1-T-5/8	15	72	131	40	30
3/4	SC-1-T-3/4	20	78,5	137,5	50	30
1	SC-1-T-1	20	82	141	50	30
1 1/4	SC-1-T-1 1/4	30	95	154	65	30
1 1/2	SC-1-T-1 1/2	30	98	157	65	30

2 Tube in Type 2 available (Page 12)

Other diameters (ID) inches Pipe (P) available:

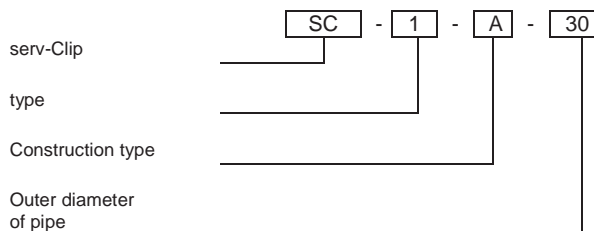
Type 1 : ½", ¾", 1"

Type 2 : ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2", 2½", 3"

# serv-Clip<sup>®</sup> -1 for mounting on pressurized pipes



## Characteristics to order



## Tube recommendations according to the manufacturer of screwing fittings

Series L	10 x 1,5 / 12 x 1,5	Series S	10 x 3,0 / 12 x 3,5
	15 x 2,0 / 18 x 2,0		14 x 4,0 / 16 x 3,0
	22 x 2,0 / 28 x 2,0		20 x 3,5 / 25 x 4,5
	35 x 2,0 / 42 x 3,0		30 x 4,0 / 38 x 5,0

## Safety instructions

To ensure a correct and safe installation of the serv-Clip, please read our separate leaflet 12.B with installation instructions and a chapter on safety referring to pressure measuring clips.

The indicated measuring clips **serv-Clip** are exclusively for use in fluid-technical plants. The field of application is Tubes with technical oils, like hydraulic systems and lubrication oil supply or cooling plants.

### Use in air and gas tubes is forbidden.

We reserve ourselves the right to modifications which are useful for any further technical development.

## Installation of the serv-Clip

Prior to the installation a check must take place to ensure that the outer diameter of the tube concerned and that of the selected **serv-Clip** match. It is not permitted to install a serv-Clip onto tubes that are seriously rusted or seem to be cracked.

Furthermore, it is a precondition that the tube system should be laid and fixed in such a way that the **serv-Clip** is not affected by any additional burdens, stress and tensions. Tubes are to be laid so as to be adequately stable in relation to the operational conditions and they are to be equipped with fixed points.

Then the part of the tube where the installation is to take place has to be cleaned and all paint and paint remains are to be removed. The tube should be smooth, clean and dry at this point.

Then the housing, consisting of two parts, is positioned on the tube. The four housing screws are now fastened firmly.

The last step is to turn the screw head to the right to the stop position, using a wrench ( without extension ). The screw head is then screwed back.

Thus the connection has been made and the measuring point can be put to permanent use.

## Tolerances of the outer diameter of the tube according to DIN 2391

tube - Ø	permitted deviation
10 mm 3/8"	± 0,10 mm
12 – 30 mm 1/2" : 5/8", 3/4", 1"	± 0,08 mm
35 – 38 mm 1 1/4"; 1 1/2"	± 0,15 mm
42 mm -/-	± 0,20 mm

## Tube recommendation for steel made serv-Clips

Seamless drawn steel tubes made out of ST 35.4 material or pre-treated basic material ST 37.4 according to DIN 1630. Condition when supplied NBA (normalizing, bright annealed) with outer tube diameter tolerances according to DIN 2391, maximum hardness: HRB 75. Construction dimensions of the serv-Clip are adapted to the tubes and tolerances according to DIN 2391.

**Pressure capacity** P<sub>B</sub> 630 (9100 psi) the indications with regard to pressure and safety are based on the installation according to this data leaflet



# serv-Clip<sup>®</sup> -1 for mounting on pressurized pipes



**Working temperature** Steel -40... +120 °C  
 O-ring in Viton -25... + 200 °C  
 The indicated temperature limits for sealing materials are guidelines as these temperature limits may be influenced considerably by the medium.

clip material	temperature range	Pressure reduction
Steel	-40... +120 °C	---

**Pressure reduction** Required pressure reduction due to the material in comparison to catalogue details in the case of increased or reduced temperatures.  
 If there are divergent definitions for permissible pressures, safety margins, temperatures and, if necessary, applicable pressure reductions due to standards, regulations or approvals for specific applications, the information provided by them is obligatory. Nominal pressures (  $P_N$  ) and working pressures (  $P_E$  ) detailed in the catalogue are max. permissible working pressures including pressures peaks, whereby the temperature limits and pressure reductions detailed in the table above must be taken into consideration.

Functional safety under stationary load

Types with  $P_N$  indications : 4 times

Types with  $P_B$  indications : 2.5 times

**Technical tests** Tested sample: **serv-Clip** measuring clip  
 Tube diameter: 10... 42 mm / 3/8" ... 1 1/2"  
 Installation method: direct installation  
 Liquid used in test: Hydraulic oil Aero Shell Fluid 4

**High pressure test** Stress: Static  
 Test pressure: 2400 bar (34800 psi)  
 No damages to the measuring clip could be detected. No leakages of the measuring clip could be detected.

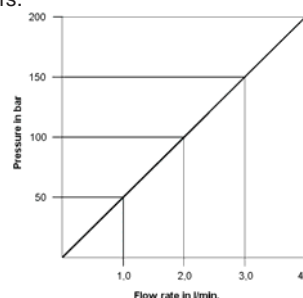
**Pulse pressure test** Stress: Dynamic  
 Test frequency: 1 Hz  
 Impulse pressure: 400 bar (5800 psi)  
 Cycles: 1 million  
 Test result: After completion of this load alteration test neither damages to nor leakages of the measuring clip could be detected.

**Flow rate** The flow rate measured applies to the series sc-1-A-.....and its value remains the same for all **serv-Clip** sizes ranging from 10 .....42 mm / 3/8" ... 1 1/2", as all types are equipped with the same interior parts and needle diameters.

The flow rate was measured at an oil temperature of 25 °C.

The test medium is the hydraulic oil HLP 46, which means its viscosity is 46 mm<sup>2</sup>/s at 40 °C.

The measurement was taken by means of a measuring hose of 1 meter lengths featuring a M16x2 mm connection coupling.

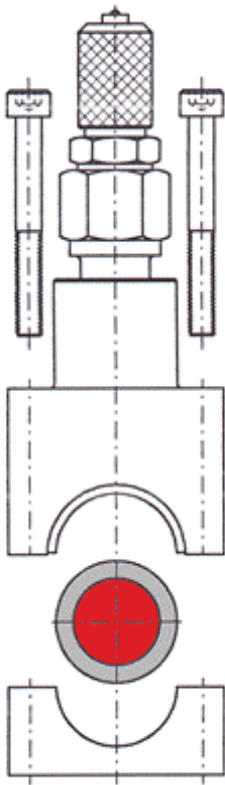


# serv-Clip<sup>®</sup>-1 for mounting on pressurized pipes

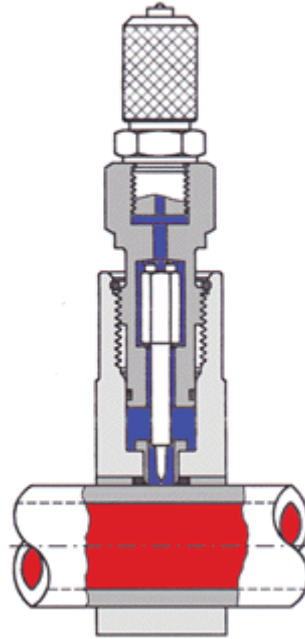


## Installation

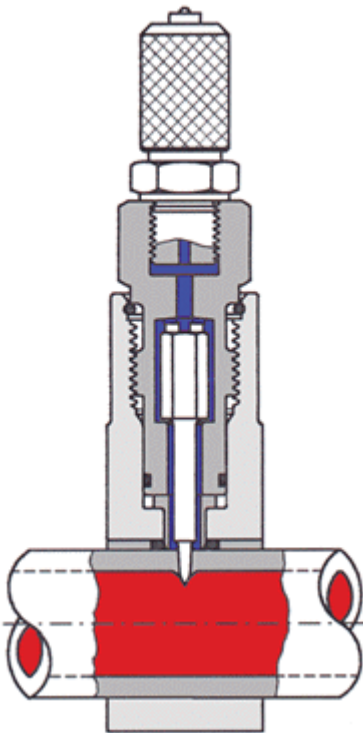
1. Place in position



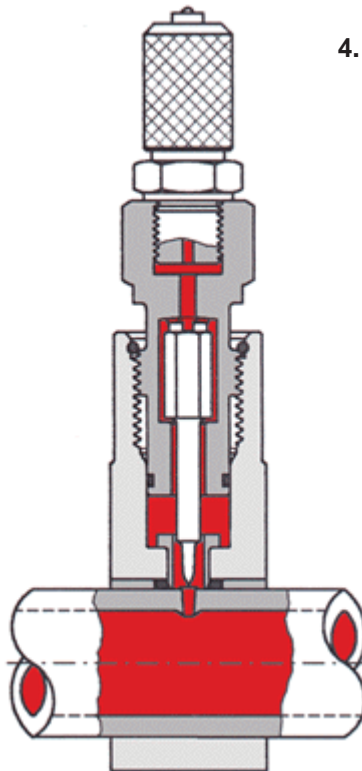
2. Screw down



3. Insert

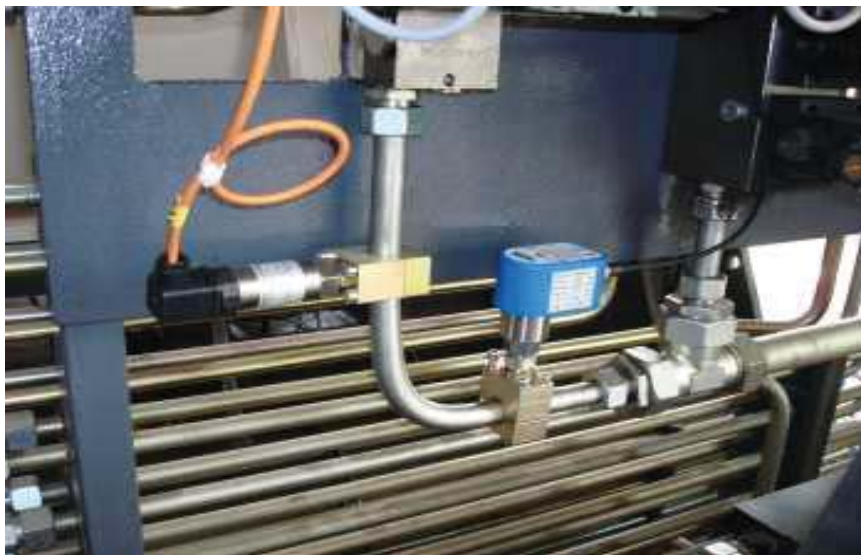


4. Measure



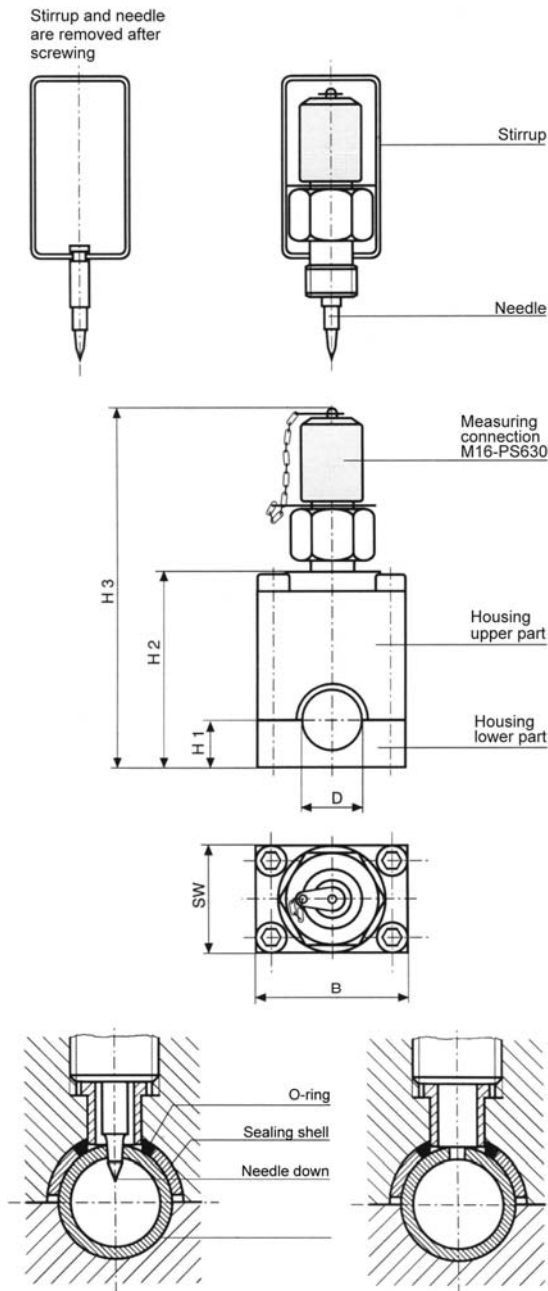


Picture 1: Pressure measurement at a flow pickling line for grease oils with **serv-Clip<sup>®</sup> -1** and pressure sensor **DS-1-A-400-1/4" fluid-Check<sup>®</sup>**



Picture 2: Pipe measuring point **serv-Clip<sup>®</sup> -1** with pressure sensor (threaded coupling G 1/4")

# serv-Clip<sup>®</sup>-2 for mounting on non-pressurized pipes



- ◆ Quick and cheap installation of approx. 3 minutes with the help of a screw wrench
- ◆ No need to cut pipes
- ◆ Minimized downtime - installation on non pressurized pipes
- ◆ No contamination of the fluid through swarfs
- ◆ Installation of gauges and sensors with screw 3/8"
- ◆ Included valve M 16x2
- ◆ Measurement on hydraulic plants without switching off
- ◆ For use up to 630 bar (9100 psi) working pressure
- ◆ Particle measurement according to ISO or NAS classes
- ◆ **serv-Clip** is registered trade mark of BKM Hagen / Germany

## Description

The patented measuring connector sc-2-A... has been developed for mounting to pressureless hydraulic tubes. Following installation, the measuring connector is capable of permanent use for a working pressure of 630 bar (9100 psi). The measuring connector sc-2-A... is supplied in a pre-assembled state with measuring connector and needle. Screwing in the measuring connector presses a special-shaped needle through the wall of the tube. Afterwards the measuring connector is screwed out and the needle removed along with the stirrup and a pressure disk. The measuring connector is now screwed back into the serv-Clip. The measuring point is now sealed off and permanent pressure can be applied up to 630 bar (9100 psi). This connection is quick and simple to make and is also reliable. The whole process takes only a few minutes to complete. No special tools are required for mounting the serv-Clip. The system is fully sealed off. Contamination of the hydraulic fluid is ruled out. The operating reliability of the system remains intact. The measuring point is now permanently available for measurements.

## Materials

Housing	9SMnPb28k	Sealing shell	St 37.4
O-ring	Viton	Measuring-needle	58CrV4

## Dimensions

OD mm	Type mm (A)	H1	H2	H3	B	SW
10 - L + S	SC-2-A-10	15	49	94	40	30
12 - L + S	SC-2-A-12	15	50	95	40	30
14 - S	SC-2-A-14	15	51	96	40	30
15 - L	SC-2-A-15	15	51,5	96,5	40	30
16 - S	SC-2-A-16	15	52	97	40	30
18 - L	SC-2-A-18	15	53	98	40	30
20 - S	SC-2-A-20	20	59	104	50	30
22 - L	SC-2-A-22	20	60	105	50	30
25 - S	SC-2-A-25	20	61,5	106,5	50	30
28 - L	SC-2-A-28	20	63	108	50	30
30 - S	SC-2-A-30	30	74	119	65	30
35 - L	SC-2-A-35	30	76,5	121,5	65	30
38 - S	SC-2-A-38	30	78	123	65	30
42 - L	SC-2-A-42	30	80	125	65	30
OD inch	Type Tube (T)	H1	H2	H3	B	SW
3/8	SC-2-T-3/8	15	49	94	40	30
1/2	SC-2-T-1/2	15	50	95	40	30
5/8	SC-2-T-5/8	15	52	97	40	30
3/4	SC-2-T-3/4	20	58,5	103,5	50	30
1	SC-2-T-1"	20	62	107	50	30
1 1/4	SC-2-T-1 1/4"	30	75	120	65	30
1 1/2	SC-2-T-1 1/2"	30	78	123	65	30
2	SC-2-T-2"	30	23	138	90	30

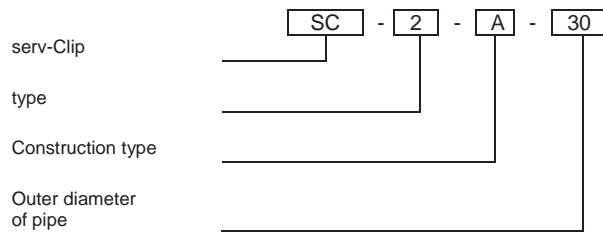
Other diameters (ID) inches Pipe (P) available:

1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3"

# serv-Clip<sup>®</sup> -2 for mounting on non-pressurized pipes



## Characteristics to order



## Tube recommendations according to the manufacturer of screwing fittings

Series L	10 x 1,5 / 12 x 1,5	Series S	10 x 3,0 / 12 x 3,5
	15 x 2,0 / 18 x 2,0		14 x 4,0 / 16 x 3,0
	22 x 2,0 / 28 x 2,0		20 x 3,5 / 25 x 4,5
	35 x 2,0 / 42 x 3,0		30 x 4,0 / 38 x 5,0

## Safety instructions

To ensure a correct and safe installation of the serv-Clip, please read our separate leaflet 12.B with installation instructions and a chapter on safety referring to pressure measuring clips.

The measuring connector serv-Clip is designed solely for use on technical fluid systems. The field of application covers tubelines with industrial oils such as hydraulic systems and lubricating-oil supply or cooling systems in a pressureless state when installing serv-Clip 2.

**Use in air and gas tubes is forbidden.**

We reserve ourselves the right to modifications which are useful for any further technical development.

## Installation of the serv-Clip

Prior to installing, a check needs to be carried out to see whether the line is in the pressureless state. Afterwards check to see whether the proposed tubeline matches the outside diameter of the serv-Clip that has been selected. Tubelines that are heavily corroded or appear unsound must not be used for installing a tube measuring connector.

Furthermore, it is a precondition that the tube system should be laid and fixed in such a way that the serv-Clip is not affected by any additional burdens, stress and tensions. Tubes are to be laid so as to be adequately stable in relation to the operational conditions and they are to be equipped with fixed points.

Then the part of the tube where the installation is to take place has to be cleaned and all paint and paint remains are to be removed. The tube should be smooth, clean and dry at this point.

During the last operating, the screw-in head joint is turned in the clockwise direction as far as it will go using an open-jawed wrench (without extension). Afterwards the measuring connector is screwed out and the spring plug, needle and pressure disk removed. The measuring connector is then screwed back in and the measuring point is available for permanent use.

## Tolerances of the outer diameter of the tube according to DIN 2391

tube - Ø	permitted deviation
10 mm      3/8"	± 0,10 mm
12 – 30 mm    1/2" : 5/8", 3/4", 1"	± 0,08 mm
35 – 38 mm    1 1/4", 1 1/2"	± 0,15 mm
42 mm      -/-	± 0,20 mm

## Tube recommendation for steel made serv-Clips

Seamless drawn steel tubes made out of ST 35.4 material or pre-treated basic material ST 37.4 according to DIN 1630. Condition when supplied NBA (normalizing, bright annealed) with outer tube diameter tolerances according to DIN 2391, maximum hardness: HRB 75. Construction dimensions of the serv-Clip are adapted to the tubes and tolerances according to DIN 2391.

**Pressure capacity** P<sub>B</sub> 630 (9100 psi) the indications with regard to pressure and safety are based on the installation according to this data leaflet

**Working temperature** Steel -40... +120 °C  
O-ring in Viton -25... + 200 °C

The indicated temperature limits for sealing materials are guidelines as these temperature limits may be influenced considerably by the medium.

clip material	temperature range	Pressure reduction
Steel	-40... +120 °C	---

**Pressure reduction** Required pressure reduction due to the material in comparison to catalogue details in the case of increased or reduced temperatures.

If there are divergent definitions for permissible pressures, safety margins, temperatures and, if necessary, applicable pressure reductions due to standards, regulations or approvals for specific applications, the information provided by them is obligatory. Nominal pressures ( P<sub>N</sub> ) and working pressures ( P<sub>E</sub> ) detailed in the catalogue are max. permissible working pressures including pressures peaks, whereby the temperature limits and pressure reductions detailed in the table above must be taken into consideration.

Functional safety under stationary load

Types with P<sub>N</sub> indications : 4 times

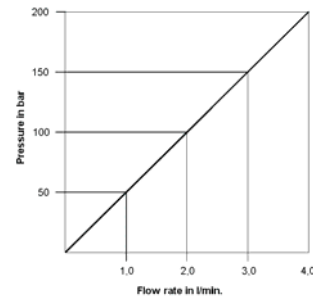
Types with P<sub>B</sub> indications : 2.5 times

**Flow rate** The flow rate measured applies to the series sc-1-A-.....and its value remains the same for all serv-Clip sizes ranging from 10 .....42 mm / 3/8" ... 1 1/2", as all types are equipped with the same interior parts and needle diameters.

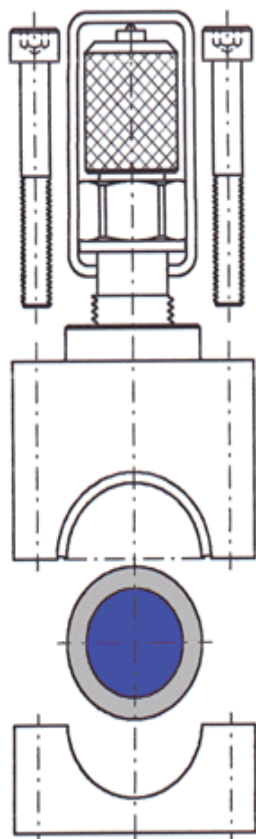
The flow rate was measured at an oil temperature of 25 °C.

The test medium is the hydraulic oil HLP 46, which means its viscosity is 46 mm<sup>2</sup>/s at 40 °C.

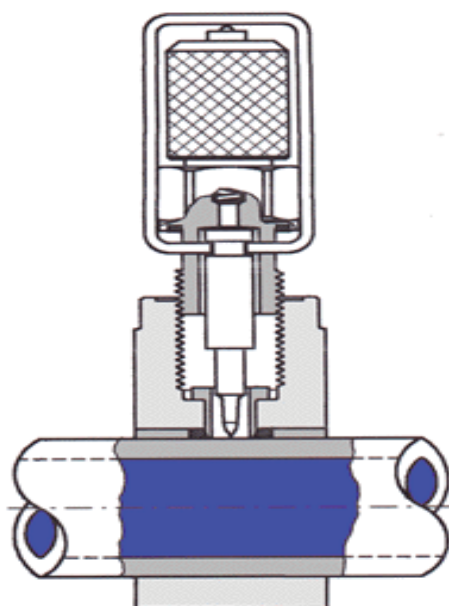
The measurement was taken by means of a measuring hose of 1 meter lengths featuring a M16x2 mm connection coupling.



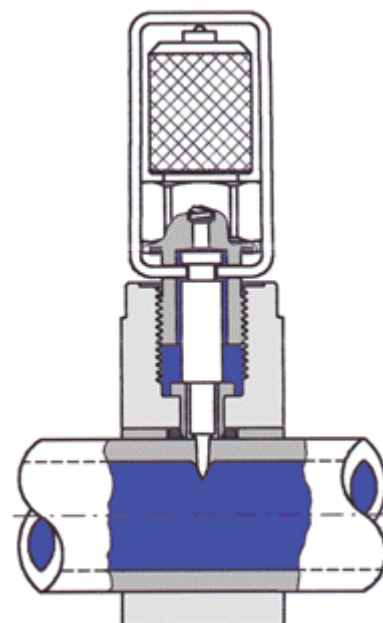
# serv-Clip<sup>®</sup>-2 for mounting on non-pressurized pipes



1. Place in position

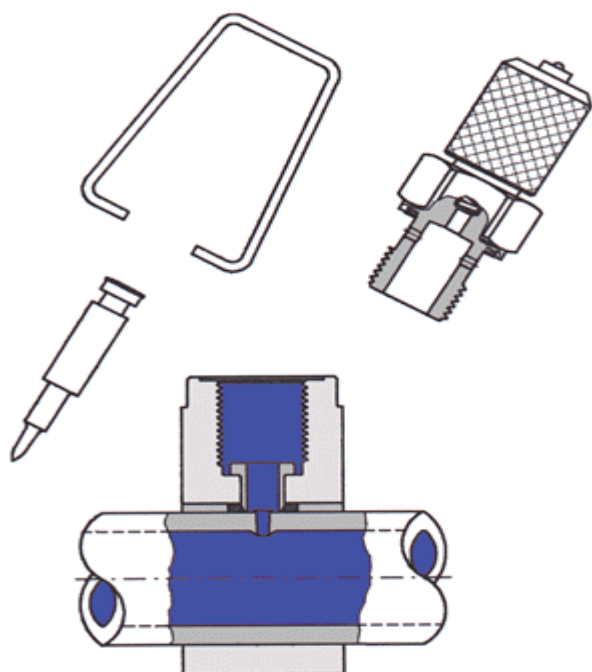


2. Screw down

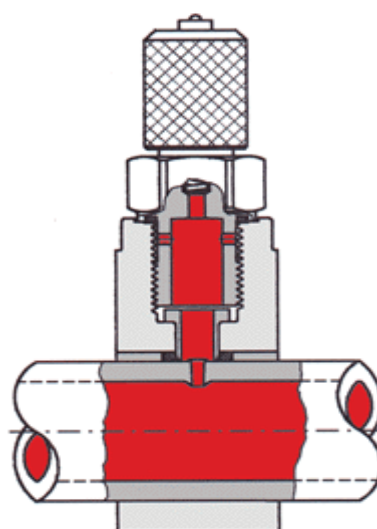


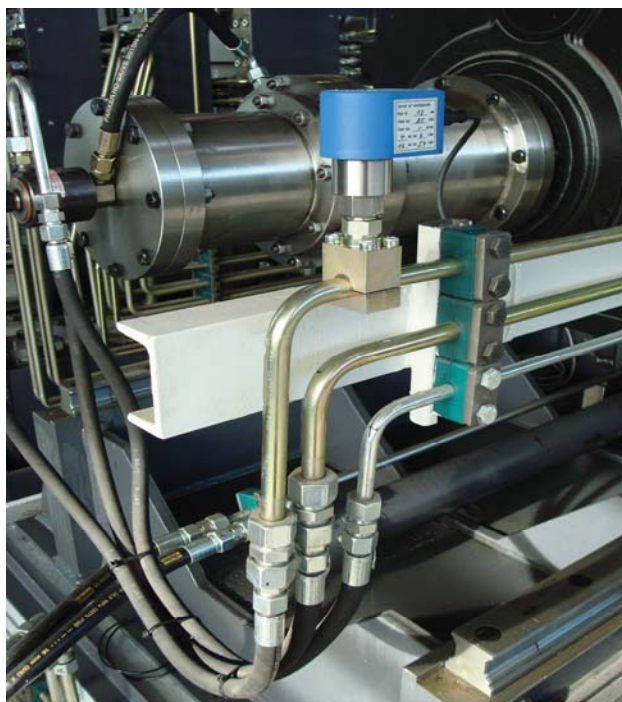
3. Insert

4. Remove needle and stirrup



5. Measure





Picture 3: Leakage sensor **fluid-Check<sup>®</sup>** with **serv-Clip<sup>®</sup>-2** for recognizing seal damages at cylinders of a reeling machine



Picture 4: Control of a lubrication oil line with flow rate sensors **fluid-Check<sup>®</sup>** and **serv-Clip<sup>®</sup>-2** at a continuous pickling line.





Picture 5: Temperature and pressure sensor with **serv-Clip<sup>®</sup>-2**



Picture 6: Flow rate or leakage sensor *fluid-Check<sup>®</sup>*

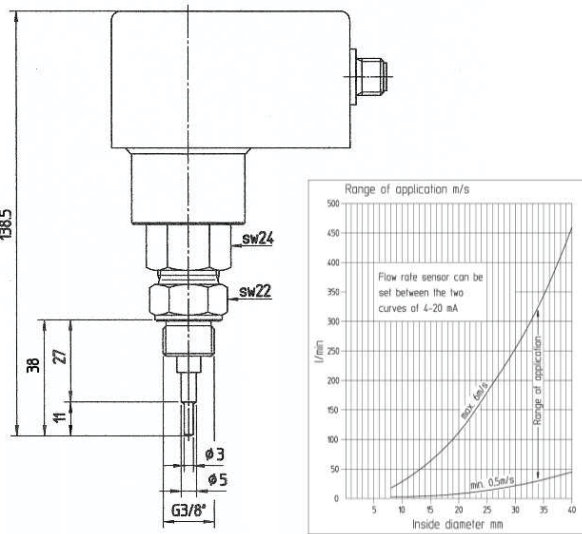
stainless steel housing (**QS-1-B-008 / LS-1-B...**) and PBT housing (**QS-2-B-008 / LS-2-B...**) on **serv-Clip<sup>®</sup>-2**



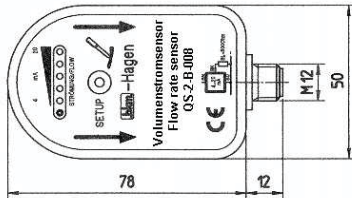
Picture 7: Installation comparison of conventional G-fitting and **serv-Clip<sup>®</sup>-2**. No need to cut open pipes

## Flow rate sensor QS for serv-Clip<sup>®</sup> 2

- No need cutting pipelines -

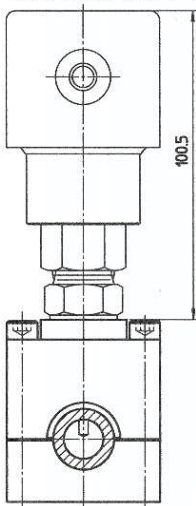


Display 6 Led  
red = 04 mA  
1. green > 04mA  
2. green > 08mA  
3. green > 12mA  
4. green > 16mA  
5. green > 20mA

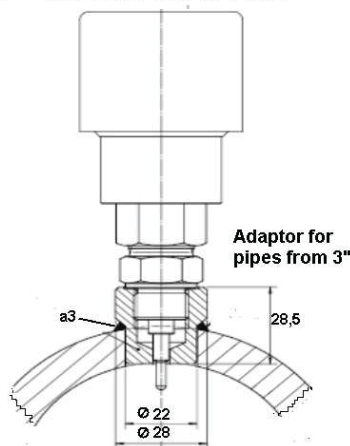


1: BN+24 VDC  
3: BU-  
4: BK Analog 4-20mA

### QS with serv-Clip



### QS with SC-XE-607



### RECOMMENDED MEASURING RANGES

Range	OD-Pipe in mm	Tube Inch (OD)	Pipe Inch (ID)	ID-Pipe in mm	Recommended Measuring range l/min
001	12	3/8	-	8 - 10	0,5 - 38
002	14 - 15	1/2	1/4	11 - 12	0,7 - 52
003	16 - 18	5/8	3/8	12 - 14	0,9 - 75
004	20 - 22	3/4	1/2	15 - 17	1,4 - 110
005	25 - 28	1	3/4	19 - 22	2,2 - 190
006	30 - 35	1 1/4	1	23 - 29	4,0 - 320
007	38 - 42	1 1/2	1 1/4	30 - 36	6,0 - 500
008	-	-	-	-	No calibrated

Calibration is adjusted only for a measuring range

### What can I measure? Hydraulic and gear oil

With the QS flow rate sensor (up to 600 l/min):

- Monitoring flow rate and wear of pumps
- Operability of accumulators
- Filter transmittance
- Heat exchangers
- Nozzle flow rate
- Speed of hydraulic motors
- Lubrication lack of gears

**Options:** stainless steel housing (QS-1-B-008) or PBT housing (QS-2-B-008)

Leakages detection? Our solution LS Sensor (catalogue-page 19)  
Mobile Measurement kit FM-1-B for sensors (catalogue-page 22)

### Description

The flow rate sensor QS **fluid-Check<sup>®</sup>** was developed for monitoring hydraulic systems. The installation takes few minutes with the help of the **pipe measuring point serv-Clip<sup>®</sup> Type 2 - no cutting pipes**. A screw driver 6 mm and a jaw wrench sw 22 will be needed for the installation only.

The flow rate sensor will be installed with the applicable pipe measuring point **serv-Clip<sup>®</sup>** for **steel pipelines** from 12 mm x 1,5 mm up to 5,5 mm wall thickness. Exception: with 12x2 mm use no possible

For pipes from 3" (88,9 mm) and wall thickness from 6 mm can be used the welding adaptor SC-XE-607.

**serv-Clip Type 2 special needles for stainless steel pipelines up to 5,5 mm wall thickness can be provided upon request.**

The measurement system is based on the **calorimetric principle**, which provides a direct measurement of the flow velocity in l/min rather than measuring the volume flow. It means sensor head has an intern thermo element and a heating (calorimetric principal). The running oil temperature will be measured. The sensor head temperature raises at 2°C. The time for this will be measured and the flow rate will be calculated. The measuring cycle takes 5 seconds.

### Calibration service (please see chart of the left side)

For the ID-pipe with the wished measuring range from/to in l/min.

With your instructions for calibration you get a data sheet with curves mA in l/min.

### Installation with serv-Clip<sup>®</sup> 2 - no cutting pipes- no oil contamination

The patented measuring connector **sc-2...** was developed for installation on pressureless hydraulic pipes. Installation takes few minutes no cutting pipes.

After installation, the measuring connection can continuously be used, supporting operating pressures of up to 630 bar.

The measuring connection **sc-2...** comes pre-mounted, including measurement coupling and needle, and is mounted as described in the corresponding installation instructions.

**To install the flow rate sensor, the created 2 mm hole must be widened.**

**In the first step, the short needle of the measurement coupling is screwed down completely - without applying much force - until the stop is reached. Then it is unscrewed again. In the second step, the long needle is screwed down completely and unscrewed again, too.**

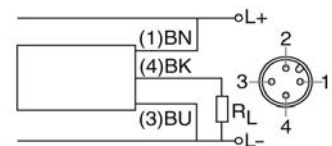
Now the flow rate sensor can be screwed into the **serv-Clip<sup>®</sup>**. The measuring connection is completely tight and is ready for continuous use.

Using the **serv-Clip<sup>®</sup> sc-2...**, the flow rate sensor can be installed easily, quickly and safely even by non-technical staff. The whole process takes a few minutes only. No special tools are required for the installation of the **serv-Clip<sup>®</sup>** and the **flow rate sensor**.

The system is completely tight, preventing any contamination of the hydraulic oil and ensuring sustained operational safety. The measuring connections are continuously available for measurement applications.

### Specifications

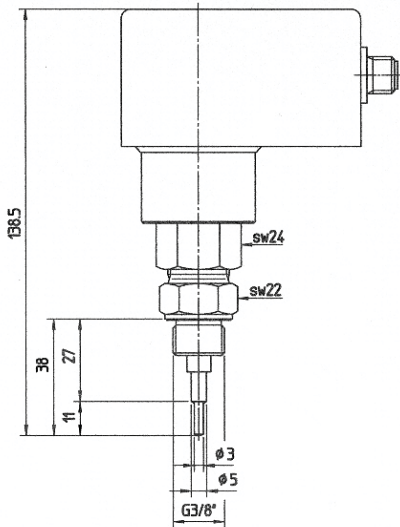
Measuring range	0,05 ... 8 Meter/Second
Flow rate	up to 600 l/min, depending on ID
Pressure	630 bar (9100 psi)
Temperature	-20...80°C
Threaded coupling	G 3/8"
Accuracy	+/- 2% at 65°C
Output signal	4...20 mA (analogue)
Power supply	24 V DC +/- 10%; 150mA
Connection	M12 Universalstecksystem
Setting	Per Micro button
Display	6 LED lights
Protection mode	IP 65
Sensor head	stainless steel 1.4571
Housingoptions	Stainless steel or PBT



For a quotation: Let us know (for the serv-Clip) outer diameter and wall thickness of the pipeline in mm and (for calibration) wished quantity min/max in Liter/Minutes

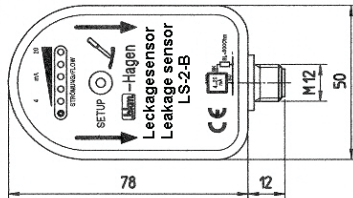
## Leakagesensor LS for serv-Clip® 2

- No need cutting pipelines -

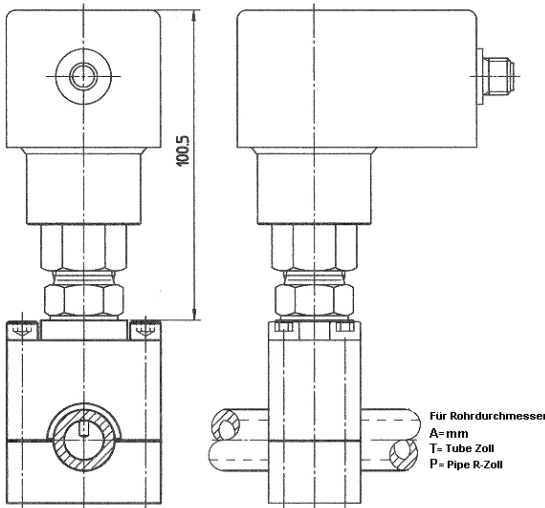


Anzeige 6 LED:

- rot = 0.4mA
- 1. grün > 0.4mA
- 2. grün > 0.8mA
- 3. grün > 1.2mA
- 4. grün > 1.6mA
- 5. grün > 2.0mA



- 1: BN+24VDC
- 3: BU-
- 4: BK Analog 4-20mA



### Leakage sensor types

Type Code	A mm	Tube Inch OD	Pipe Inch ID	Flow l/min
001	12	3/8"	-	0,02-5
002	14-15	1/2"	3/4"	0,03-5
003	16-18	5/8"	3/4"	0,05-5
004	20-22	3/4"	1/2"	0,08-5
005	25-28	1"	3/4"	0,12-10
006	30-35	1 1/4"	1"	0,40-10
007	38-42	1 1/2"	1 1/4"	0,70-10

Example: Choose the correct LS for 16 mm pipe-Ø

Type LS-1 or 2-B-003 Flow rate > 0,05 l/min up > 4 mA measurable  
5,0 l/min by 20mA measurable

## What can I measure? Hydraulic and gear oil

With the LS-2-B- leakage sensor (from 0,02 l/min):

- Leakage
- Sealing damages

**Options:** stainless steel housing (QS-1-B-008) or PBT housing (QS-2-B-008)

Flow rate detection? (catalogue page 18)

Mobile measuring suitcase FM-1-B for sensors (catalogue page 22)

### Description

The leakage sensor LS fluid-Check® was developed for monitoring hydraulic systems recognizing and reporting very small leakage and sealing damages (from 0,02 l/min). The installation takes few minutes with the help of the **pipe measuring point serv-Clip® Type 2- no cutting pipes**. A screw driver 6 mm and a jaw wrench sw 22 will be needed for the installation only.

The flow rate sensor will be installed with the applicable pipe measuring point **serv-Clip® Type 2** for **steel pipelines** from 12 mm x 1,5 mm up to 5,5 mm wall thickness. Exception: with 12x2 mm use no possible. **serv-Clip Type 2 special models for stainless steel pipelines up to 5,5 mm wall thickness can be provided upon request.**

The measurement system is based on the **calorimetric principle**, which provides a direct measurement of the flow velocity in l/min rather than measuring the volume flow. It means sensor head has an intern thermo element and a heating (calorimetric principal). The running oil temperature will be measured. The sensor head temperature raises at 2°C. The time for this will be measured and the flow rate will be calculated. The measuring cycle takes 5 seconds.

### Calibration service (please see chart of the left side)

For the ID-pipe with the wished measuring range from/to in l/min.

With your instructions for calibration you get a data sheet with curves mA in l/min.

### How do I choose an LS?

Confirm the pipe outer diameter of the installation place (eg 16 mm).

Select the type of the LS - see chart above (eg Type 003).

Determine switch-point 4-20 mA (eg 8.5 mA).

For the leakage sensor LS-1 or 2-B-003 you need a **serv-Clip® SC-2-A-16**.

### Installation with serv-Clip® 2- No cutting pipes- no oil contamination

The patented measuring connector **sc-2-...** was developed for installation on pressureless hydraulic pipes. Installation takes few minutes only.

After installation, the measuring connection can continuously be used, supporting operating pressures of up to 630 bar.

The measuring connection **sc-2-...** comes pre-mounted, including measurement coupling and needle, and is mounted as described in the corresponding installation instructions.

**To install the flow rate sensor, the created 2 mm hole must be widened.**

**In the first step, the short needle of the measurement coupling is screwed down completely - without applying much force - until the stop is reached. Then it is unscrewed again. In the second step, the long needle is screwed down completely and unscrewed again, too.**

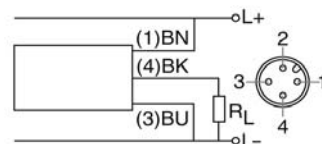
Now the flow rate sensor can be screwed into the **serv-Clip®**. The measuring connection is completely tight and is ready for continuous use.

Using the **serv-Clip® sc-2-...**, the flow rate sensor can be installed easily, quickly and safely even by non-technical staff. The whole process takes a few minutes only. No special tools are required for the installation of the **serv-Clip®** and the **flow rate sensor**.

The system is completely tight, preventing any contamination of the hydraulic oil and ensuring sustained operational safety. The measuring connections are continuously available for measurement applications.

### Specifications

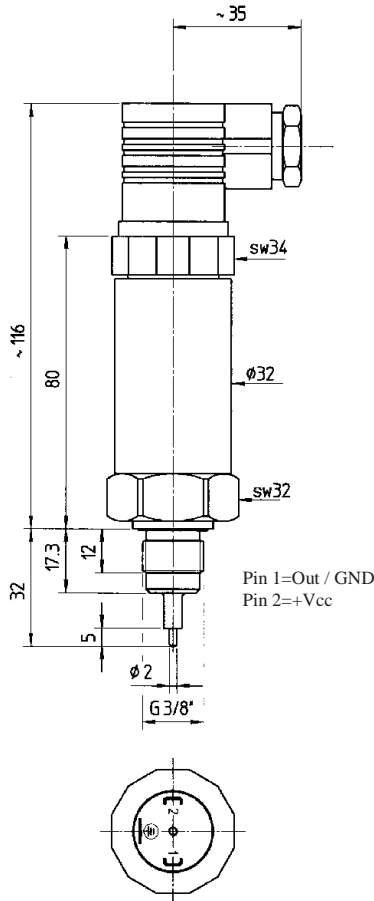
Measuring range	0,05 ... 8 Meter/Second
Leakage	from 0,02 L/min, depending on ID
Pressure	630 bar (9100 psi)
Temperature	-20...80°C
Threaded coupling	G 3/8"
Accuracy	+/- 2% at 65°C
Output signal	4...20 mA (analogue)
Power supply	24 V DC +/- 10%; 150mA
Connection	M12 Universalstecksystem
Setting	Per Micro button
Display	6 LED lights
Protection mode	IP 65
Sensor head	stainless steel 1.4571
Housingoptions	Stainless steel or PBT



For a quotation: Let us know (for the serv-Clip) outer diameter and wall thickness of the pipeline in mm and (for calibration) wished quantity min/max in Liter/Minutes

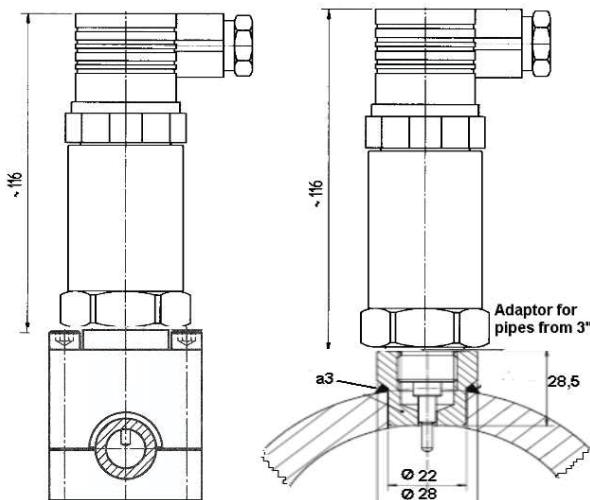
**Temperature sensor  
TS-1-A-120-3/8“  
for serv-Clip<sup>®</sup> 2**

**- No need cutting pipelines -**



**TS with serv-Clip**

**TS with SC-XE-607**



- ◆ Temperature sensor Type L thermocouple
- ◆ Temperature range -30 ... +120 °C
- ◆ Output 4 ... 20 mA / 2 wires
- ◆ Protection mode IP 65
- ◆ Right-angle plug connection DIN43650 A
- ◆ Robust stainless steel housing

**Description**

In all industries, sheathed (mineral-insulated) thermocouples are increasingly used for temperature measurement applications.

Compared to other thermocouples and resistance thermometers, they respond to temperature changes more quickly and are smaller in size, which makes it possible to use them in constricted areas and places that are difficult to access. In addition, they are shock-resistant, pressure-resistant and excel by their long durability.

The temperature sensor TS-1-A-120-3/8“ can be used for direct temperature measurements inside pipes such as hydraulic and lubricating oil pipes.

In addition to its robust and compact design, it stands out by its high accuracy and its extensive measurement range. As a standard, the housing and all parts exposed to the liquid are made of stainless steel (Type 1.4571). Soft seals consist of Viton.

Typical fields of application include systems and plant engineering, automation, air conditioning and refrigeration.

**Installation with serv-Clip 2**

The patented measuring connector **sc-2-...** was developed for installation on pressureless hydraulic pipes. After installation, the measuring connection can continuously be used, supporting operating pressures of up to 630 bar. The measuring connection **sc-2-...** comes pre-mounted, including measurement coupling and needle. By screwing the measurement coupling onto the pipe, a specially shaped needle is pressed through the pipe wall. Afterwards the measurement coupling is unscrewed again. In the next step, the temperature sensor can be screwed into the **serv-Clip**. The measuring connection is completely tight and is ready for continuous use.

Using the **serv-Clip<sup>®</sup> sc-2-...**, the temperature sensor can be installed easily, quickly and safely even by non-technical staff. The whole process takes a few minutes only. No special tools are required for the installation of the **serv-Clip** and the temperature sensor. The system is completely tight, preventing any contamination of the hydraulic oil and ensuring sustained operational safety. The measuring connections are continuously available for measurement applications.

**Installation with welding adaptor SC-XE-607**

For pipes from 3“ (88,9 mm) and wall thickness from 6 mm can be used the welding adaptor SC-XE-607.

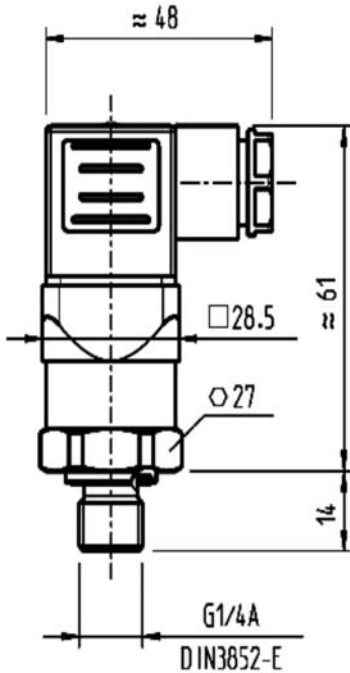
**Special instructions for stainless steel up to 4 mm wall thickness with SC-2 can be provided.**

**Specifications**

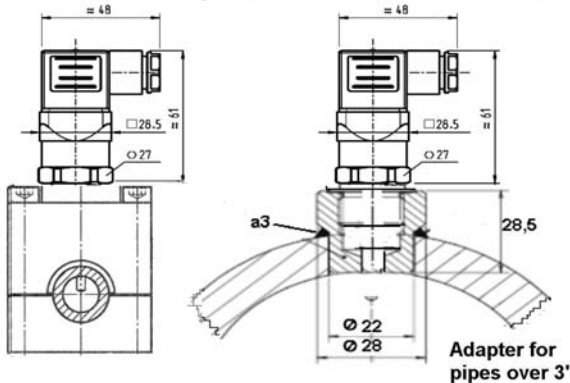
Temperature range	-30 ... +120°C
Accuracy	+/- 2 K
Repeatability	Better than 1 K
Pressure range	Up to P <sub>B</sub> 630 bar
Output signal	4 ... 20 mA
Power supply	15 ... 30 V DC, protected against reverse connection
Configuration	2 wires
Protection mode	IP 65
Linearity	0,2 % typ. / max. 0,5 %
Threaded coupling	G3/8“ male
Electrical connection	Right-angle plug connection Type DIN 43650 A

**Pressure sensor  
DS-1-A-400-1/4" or 3/8"  
for serv-Clip® 2**

- No need cutting pipes -



**DS with serv-Clip DS with SC-XE-607**



Electric connection  
EN 175301-803A  
Pin 1 = Out / GND  
Pin 2 = OV

- ◆ Measurement range 0 ... 400 bar
- ◆ Output 4 ... 20 mA / 2 wires
- ◆ Operating temperature -30 ... 100°C
- ◆ Protection mode IP 65
- ◆ Right-angle plug connection DIN EN 175301-803A
- ◆ Robust stainless steel housing
- ◆ Fully encased sensor element made of stainless steel

**Description**

The piezo-resistive pressure sensor DS-1-A-400- ... was developed for a wide range of general measurement applications in the field of industrial hydraulics.

Typical applications include systems and plant engineering, automation, air conditioning, and refrigeration.

In addition to its robust and compact design, it stands out by its high accuracy and its extensive measurement range.

As a standard, the housing and all parts exposed to the liquid are made of stainless steel (Type 1.4571).

The standard connection is G1/4", with soft seals made of NBR.

**Installation with serv-Clip 1**

Before mounting the measurement connector **sc-1...**, the standard measurement coupling is replaced by the pressure sensor.

The patented measuring connector is simply screwed onto the pressurized pipe (after cleaning the pipe surface) without having to interrupt the operation of the system.

Via the screw head, a specially shaped steel needle is pressed through the pipe wall. Afterwards, the screw head is screwed back. The hole created in this way thus becomes open and can be used by the sensor.

**Installation with serv-Clip 2**

The patented measuring connector **sc-2...** was developed for installation on pressureless hydraulic pipes. After installation, the measuring connection can continuously be used, supporting operating pressures of up to 630 bar.

The measuring connection **sc-2...** comes pre-mounted, including measurement coupling and needle. By screwing the measurement coupling onto the pipe, a specially shaped needle is pressed through the pipe wall. Afterwards the measurement coupling is unscrewed again. The measuring connection is completely tight and is ready for continuous use.

Using the **serv-Clips sc-1...** and **sc-2...**, the pressure sensor can be installed easily, quickly and safely even by non-technical staff. The whole process takes a few minutes only. No special tools are required for the installation of the **serv-Clips**.

The system is completely tight, preventing any contamination of the hydraulic oil and ensuring sustained operational safety. The measuring connections are continuously available for measurement applications.

**Installation with welding adaptor SC-XE-607**

For pipes from 3" (88,9 mm) and wall thickness from 6 mm can be used the welding adaptor SC-XE-607.

**Special instructions for stainless steel up to 4 mm wall thickness with SC-2 can be provided**

**Specifications**

Pressure range	0 ... 400 bar, against 1 bar
Overpressure	600 bar
Output signal	4 ... 20 mA
Power supply	8 ... 30V DC
Operating temperature	-30 ... 100°C
Ambient temperature	-30 ... 100°C
Configuration	2 wires
Protection mode	IP 65 DIN EN 175301-803A
Accuracy	1,0%
No-Linearity	0.5% BFSL
Pressure connection	G1/4" male / G3/8" male

**Mobile Measurement kit FM-1-B  
in suitcase for :**

- Flow rate sensors
- Leakage sensors
- Temperature sensors
- Pressure sensors



**Mobile Measurement kit FM-1-B with  
multi-propose display AX 345  
( 1 input )**



**Multi-propose display AX 345**

For sensors. Separate unit without switch cabinet with 2 inputs. Available upon request.

**Examples for :**

- |                          |                        |
|--------------------------|------------------------|
| Fixed displacement pumps | Pumping capacity       |
| Variable capacity pumps  | Percentage of leak oil |
| Oil coolers              | Flow characteristics   |
| Water coolers            |                        |
| Differential cylinders   | Leak oil               |
| Synchronous cylinders    | Sealing damages        |
| Plunger cylinders        | Moving speed           |
| Oil motors               | Leak oil               |
| Pressure accumulators    | Bladder control        |
|                          | Charging behaviour     |
|                          | Nitrogen charge        |

**Technical Data :**

- Switch cabinet with multi-purpose display with one analogue input, 4 – 20 mA and scaling facility
- Suitable for display of input channel A or input channel B as well as the sum A+B, the differential A-B or the ratio A:B
- Display range +/- 4 1/2 decades at 15 mm size
- Power supply 115 / 230 VAC or 18 – 30 VDC
- Setup of zero and full scale by means of two front keys and menu support
- Selectable linearization functions

**Included :**

- Power cord 230V AC
- Connecting cable with plug M12 connector for kit and sensors
- Suitcase made of plastic (black/blue)  
Outer dimension 340 x 275 x 84 mm
- Technical documentation and operating instructions

**- Sensors and mobile measuring kit in suitcase - fluid-Check<sup>®</sup>**

Description	Type
Flow rate sensor suitable for <b>serv-Clip<sup>®</sup> -2</b> + calibration service (*)	QS-1-B-008 QS-2-B-008
Leakage sensor suitable for <b>serv-Clip<sup>®</sup> -2</b> + calibration service (*)	LS-1-B-... LS-2-B-...
Temperature sensor suitable for <b>serv-Clip<sup>®</sup> -2</b>	TS-1-A-120-3/8"
Pressure sensor suitable for <b>serv-Clip<sup>®</sup> -1</b>	DS-1-A-400-1/4"
Pressure sensor suitable for <b>serv-Clip<sup>®</sup> -2</b>	DS-1-A-400-3/8"
Mobile measuring kit in suitcase for : QS, LS, DS, TS sensors	FM-1-B-008 with AX 345 analogue

(\*) Please inform us intern diameter ID and quantity in min/max liter/minute for each pipe

**Service suitcase - serv-Clip<sup>®</sup> & fluid-Check<sup>®</sup>**



Suitcase (340 x 275 x 84 mm)  
**GRATIS**  
Combine several diameters  
for getting this offer

Type	Contents
I	8 x serv-Clip <sup>®</sup> Type -1-A/T/P...
II	8 x serv-Clip <sup>®</sup> Type -2-A/T/P...
III	3 x serv-Clip <sup>®</sup> Type -1-A/T/P... 3 x serv-Clip <sup>®</sup> Type -2-A/T/P... 2 x Sensors (T or P) no QS-Sensor
IV	8 x Sensors (T or P) no QS-Sensor

A: Millimetres, T: Tube (OD) ins, P: Pipe (ID) ins

Bulk **serv-Clips** will be delivered in closed packages with installation instructions.  
Each **serv-Clip** has a gravure with corresponding type and diameter.

## SYSTEM COMPONENTS



For all pipe Ø  
from 10-42 mm  
3/8"-2" Tube (external Ø)  
1/4"-3" Pipe (internal Ø)

**serv-Clip 1**  
for mounting on pressurized pipes



Pressure Sensor

**serv-Clip 2**  
for mounting on non-pressurized pipes



Temperature Sensor

Pressure Sensor

Flow rate and Leakage Sensor

Combinated with

Suitcase with mobile measuring system FM-1-B for Q,L,P,T Sensor



Combinated with

For mounting on pipe



Tube connection

serv-Clip provides the basis for



The sensor monitoring and diagnostic system is equipped with a touch-screen based symbol display and ensures optimized maintenance of systems when combined with serv-Clip.

**bkm** [www.servclip.com](http://www.servclip.com)



Combine different diameters with our service suitcase (Content : 8 pieces)



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