OPERATOR CONTROLS

FOR HEAVY DUTY EQUIPMENT

The key to an efficient and ergonomic operator environment

SVAB

Rev. J DOC-0000439

OUR OFFER

We offer both highly configurable and ergonomic joystick grips and an electronic joystick base. The grips and base can be ordered separately or combined and are well suited and tested for heavy duty equipment.

Svab Grip L8

With SVAB Grip L8 we set a new standard in joystick grips. The L8 grip allows you to ergonomically control two roller functions simultaneously using your thumb and index finger.

The L8 is the multifunction ergonomic joystick grip that has set a new standard with its innovative, functional design. You can control two roller functions simultaneously with your thumb and index finger. Up to three rollers can be installed, two for the thumb and one for the index finger. On the grip there is room for up to nine buttons, which means that most functions can be gathered in a small area.

The properties and flexibility of the grip make it suitable for most machines, including excavators, graders and forest machines. The design of the L8 is based on meticulous ergonomic studies. The ergonomics and the easy-to-grip design have made the L8 the most popular joystick grip among machine operators of advanced excavators. Extra ergonomy simply added with our hand-rest!

Short lead time from request to first order

To make it fast and easy for you to develop your machine grip per your request the L8 is based on a unique technology platform. With years of experience managing complex requests on the svab grip L8, we have realized the importance of making our offer flexible and solution-focused. To handle all these requirements without lots of engineering hours that generate long-term projects, we have created a technology platform for the L8 where we have gathered all our years of special solutions and adaptations and made them into a configurable and quality assured standard range. The grip can be configured very freely based on component placement, color, functionality, and interface to the machine. To further help in the process of developing your grip you can use our online web configurator where you can easily customize your own L8 grip configuration. All this makes for a short lead time from request to first order.

- True ergonomic right and left-hand design with easy grip rubberized surface reduces the risk of repetitive strain injuries
- Multi-functional with room for a large number of different rollers, pushbuttons, mini joysticks and toggle switches located both on the front and back side of the grip
- Well proven in field with more than 100,000 units installed and quality ensured with extensive safety tests performed against all applicable standards in machinery directive 2006/42/ec
- Controls for many different functions gathered in easy to reach positions allowing for simultaneous control improving work efficiency
- Adapted for easy installation and to fit all joystick bases available on the market ensuring a wide area of application for the grip

Technical Summary

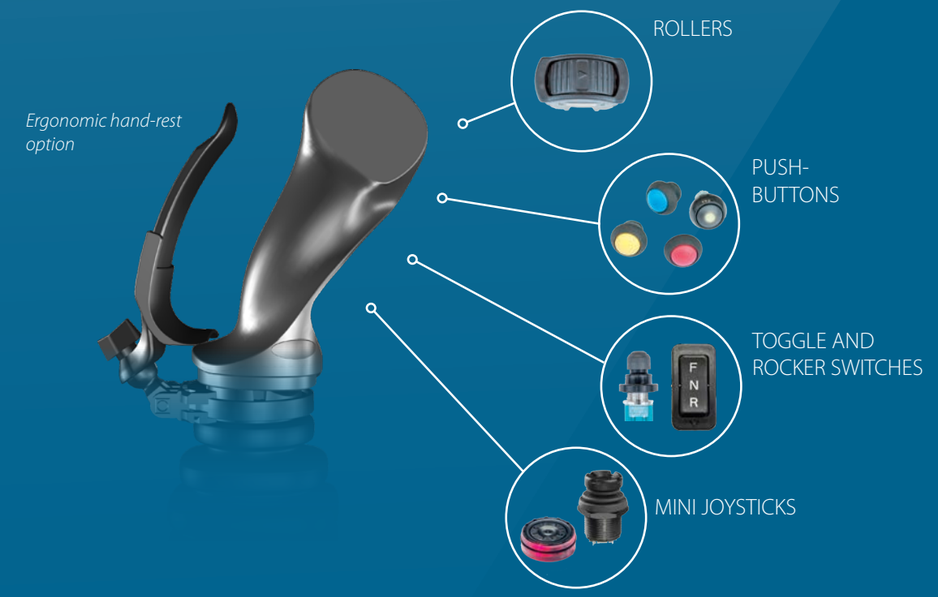
Maximum equipment (example layout):
3 rollers + 5 push buttons / toggle switches

2 rollers + 7 push buttons / toggle switches

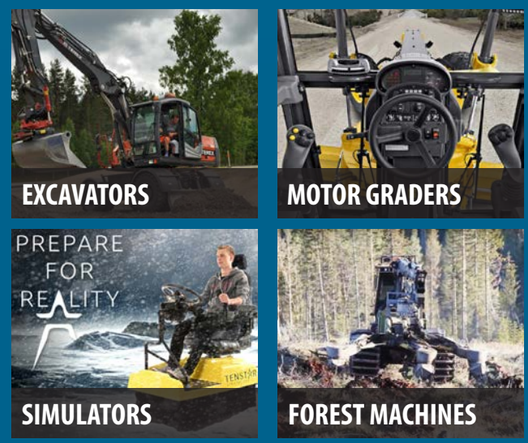
1 roller + 9 push buttons /toggle switches

Operating temperature range: -40° C to 85° C
Case material: PC / ABS
Coating: Soft touch
Mass: Up to 380 g
Electrical interface options: Analog / Digital, PWM or CAN-bus from integrated CAN module.

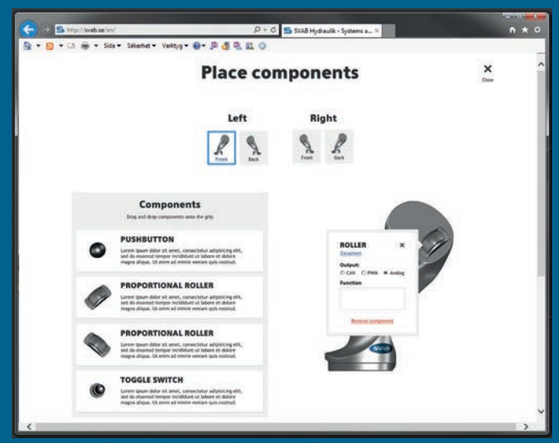
The markets most configurable grip for machines



Popular in many different machines



Easy to configure with short lead time from request to first order



Example of our online joystick grip configurator

- Electronic joystick base

Robust, safe and ergonomic electronic joystick base for modern electro-hydraulic excavators

The eJB is a robust and safe electronic joystick base designed for remote control of electro hydraulics via CAN. The joystick base mimics the mechanics, ergonomics and feel of a hydraulic joystick and has a design that is proven to be robust. The design of the mechanics and electronics is redundant to provide a high level of safety. The highly configurable SVAB Grip L8 is easily connected to the joystick base which allows a pass through for the grip CAN frames.

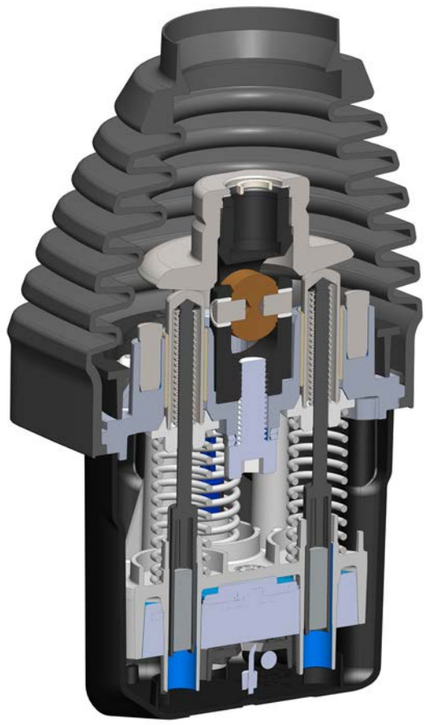
- Reliable and robust mechanism similar to a hydraulic joysticks base
- Provides the feeling of a hydraulic joystick
- Customizable operation force and stroke
- Single cable connection
- SIL2 and PLd compliant

Technical Summary

The joystick base is developed in accordance with the Machinery Directive and the safety standards ISO 13849 and IEC 61508. The eJB can be used to control functions with safety levels up to PLd or SIL 2.

Technology: Contactless detection via moving magnets and magnetic hall sensors.

Protection class electronic: IP 67
Protection class mechanical: IP 5X
CAN protocol: CANopen or CAN J1939



Technical Information

for the SVAB Grip L8 standard range and electronic joystick base

Contents **Page**

1. L8 GRIP - GENERAL TECHNICAL DATA

SVAB GRIP L8

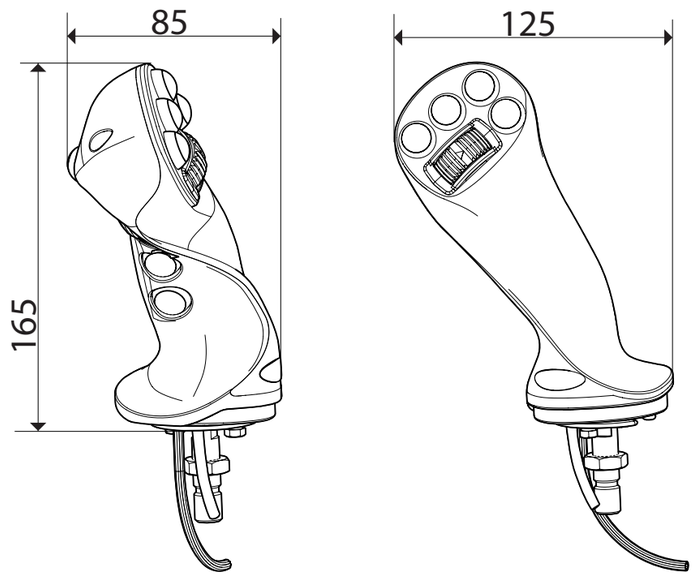
DIMENSIONS *(in millimeters)* AND TECHNICAL DATA

Description

The development of the SVAB Grip L8 joystick grip comes from long experience and ergonomic studies which has given the L8 great comfort and functionality.

Features

- Ergonomically designed.
- Rubberized surface.
- Room for rollers and switches on both the front and back.
- Adapted for a large variety of electro-mechanical switches and hall effect controls.
- Easily mounted on market joystick bases. Both hydraulic and electric.



Operating temperature range	-40°C to 85°C
Case material	PC/ABS
Coating	Soft touch
Mass	Up to 380 g
Electrical interface options	Analog/Digital, CAN-bus or PWM

Safety

Developed in accordance with the MACHINERY DIRECTIVE 2006/42/ EC. SS-ISO 10968:2004.

	Tests according to
Electromagnetic compatibility	ISO13766 Volvo STD 515-0003
Environmental conditions	ISO16750-4
Salt spray test	Volvo STD 423-0010
Shock	Free fall acc. to ISO16750-3
Vibration	Test VIII acc. to ISO16750-3
Chemical resistance	ISO16750-5

2. L8 OUTPUTS

Available outputs for the L8 are analog / digital, CAN and PWM. Direct output from Hall Effect controls we refer to as analog. Direct output from electromechanical switches we refer to as digital. It is possible to combine both analog / digital, CAN bus and PWM outputs in the same grip. For more information on Hall Effect controls or electro-mechanical switches please see their respective data sheet.

CAN bus

The signals from hall effect controls and electromechanical switches can be converted to CAN data.

Protocols	J1939 and CANopen
CAN bus bit rate	125kb, 250kb or 500kb
CAN termination resistance	600 Ω
Supply voltage, permissible range	8 to 36 VDC

For further information regarding the CAN protocols please request the documentation "SVAB L8 CAN Profile" from SVAB.

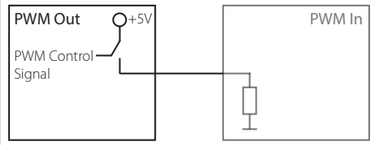
PWM

Our PWM is available in two different variants. "Highside" and "Lowside".

If an error is detected on the hall effect control, 50% DC is outputted.

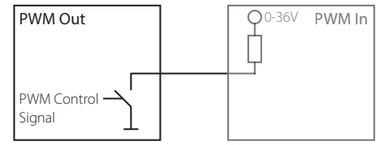
PWM outputs	2
PWM Frequency	Configurable.
PWM Duty Cycle	Configurable. Possibility to extend or shorten the pulse to compensate for signal rise and fall times.
Electrical Properties Highside	Voltage range 0-5V, Max current 30mA
Electrical Properties Lowside	Voltage range 0-36V, Max current 30mA

Highside



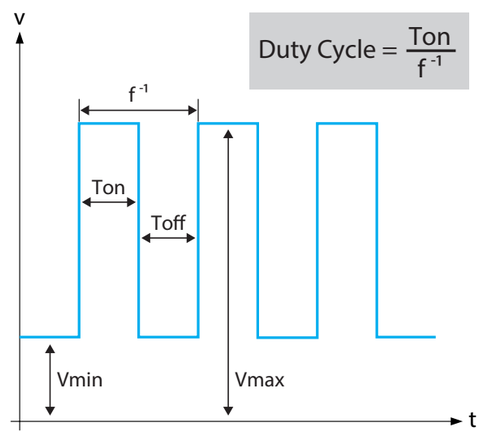
External pull-down resistor possibly situated in ECU.

Lowside



External pull-up resistor possibly situated in ECU.

PWM Signal Explanation



3. L8 CABLES

SVAB Grip L8 cables are available for both analog / digital signals as well as for CAN bus / PWM communication. It's possible to combine analog / digital and CAN bus / PWM cables in the same joystick grip. Our cables consists of high-performance insulation and sheath materials which cover a wide temperature range and are highly resistance to chemicals and abrasion. Cables are also well protected by a braided polyester sleeving which adds further mechanical resistance.

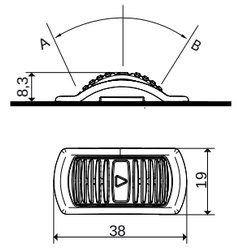
We refer direct outputs from Hall Effect controls as analogue signals. Direct outputs from electromechanical switches are referred to as digital signals.

Cables are delivered without contacting. Consult a SVAB sales representative if contacting is required.

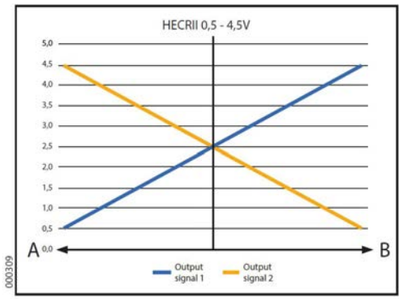
4. PROPORTIONAL ROLLER

HECR II

TECHNICAL DATA



Output characteristics



Description

The HECR II is a finger / thumb controlled dual proportional output spring-back roller used for proportional steering. The HECR II uses hall effect technology and is constructed for small mounting dimensions. The HECR II is fully backward compatible with the HECR I.

Features and Benefits

- Constructed with high performing electrical linearity in mind - Allows stable calibration enabling good fault monitoring without inadvertant faults being detected.
- Sturdy construction and good magnetic shielding - Long operating life and reduced risk of external influences.
- Programmable output range - Good compatibility.

Agency approvals

Electrical	
Nominal supply voltage	5 Vdc
Operating voltage range	5±0.5 Vdc
Output	Dual analogue programmable outputs ratiometric to Vs. Please contact SVAB Hydraulik AB for required output.
Output voltage tolerance (at 5Vdc Vs)	± 0.15 VDC
Max load/output	5mA (1kΩ)
Max current consumption (at max load)	25 mA
Sensor type	Hall-effect
Resolution	12-bit DAC
Mechanical	
Roller mechanical angle	± 40°
Roller mechanical force	0.65 to 1.08 N
Operating life	> 5 million cycles
Weight	11g
Material wheel	PA6
Material housing	POM
MTTFd	4715 yrs
Environmental	
Operating temperature	-40 to +90°C
Storage temperature	-40 to +90°C (100°C for 2h)
EMI/RFI rating	100 V/m acc. to ISO13766
ESD	±8 kV contact discharge ±15 kV air discharge acc.to ISO10605 mounted in panel
Shock	Free fall acc. to ISO16750-3
Vibration	Test VIII acc. to ISO16750-3

5. PUSHBUTTONS

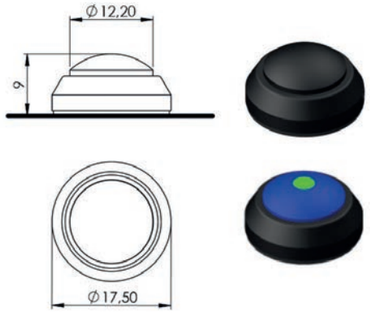
PUSHBUTTON MOMENTARY ACTION

DIMENSIONS *(in millimeters)* AND TECHNICAL DATA

Features

- Momentary snap-action.
- Tactile feedback.
- Sealed to IP67.
- UL 61058 Recognized.
- Wide range of appearances.
- Illuminated (LED) option.
- Long Life.

Agency approvals



Electrical (Sea Level @ 28VDC or 115VAC 60/400Hz)		
Load	**SPST (NO)**	**SPDT (NO/NC)**
Resistive	5A	5A
Inductive	3A	3A
Dielectric strength	1,000 Vrms	1,000 Vrms

Mechanical / Electrical	
Insulation resistance	1 GΩ
Contact resistance	50 mΩ
Contact bounce	1 millisecond
Electrical life	25,000 cycles maximum 5A @ 28VDC
Mechanical life	1,000,000 cycles
Sealing	IP67 to IEC 60529
Temperature (operating)	-40°C to + 85°C
Button travel	1.5mm
Operating force	3.5N±0.5N

Materials	
Case	Thermoplastic
Button	Thermoplastic
Contacts	Gold over silver
Cables	Potted AWG 20 ETFE-Single Core
Available buttons	Black, Red, Green, Blue, Yellow, Orange

LED button	
Available LED colors	Red, Green, Blue
Voltage supply	5V
Cables	Potted AWG 28 ETFE-Single Core for LED
Available buttons	Black, Red, Green, Yellow, Blue

SVAB

PUSHBUTTON MAINTAINED ACTION

TECHNICAL DATA

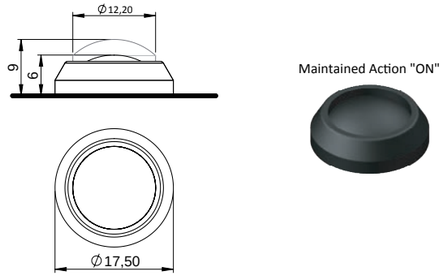
Description

Pushbutton with maintained action. A good option when a distinct remaining button press is desired. When pressing the button it remains in its pressed state until the button is pressed again.

Features

- Maintained action
- Panel sealed to IP 67
- Long life

Agency approvals



Electrical SPST (NO) Double Press	
Resistive load	250mA @ 12VDC, 100K cycles 150mA @ 28VDC, 150K cycles (momentary) 100mA @ 48VDC, 100K cycles 10mA @ 12VDC, 1 million cycles (momentary)
Dielectric strength	1,000 Vrms

Mechanical / Electrical	
Insulation resistance	1G OHM
Contact resistance	50 mΩ max (initial)
Contact bounce	1 millisecond
Sealing	IP67 to IEC 60529
Temperature (operating)	-40°C to +85°C
Button travel	2.3 mm
Operating force	3N±0.5N

Materials	
Case	Thermoplastic
Button	Thermoplastic
Contacts	Gold
Available buttons	Black

6. TOGGLE SWITCHES, ROCKERS AND MINI JOYSTICKS

TOGGLE SWITCH

DIMENSIONS *(in millimeters)* **AND TECHNICAL DATA**

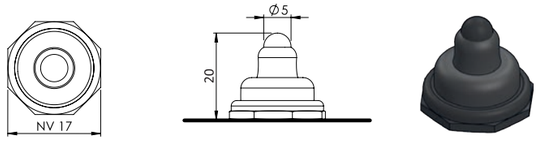
Types

Model No.	Switching Position		
44	ON	ON	ON
46	ON		ON
47	(ON)	OFF	(ON)
49	ON	OFF	ON

Agency Approvals / Preferential List

CECC 96201-007

3A 250VAC, 6A 125VAC



Electrical

Contact	Maximum	Minimum
Silver, gold plated (AD)	4A 30VDC Gold plating withstands up to 100mA 30VDC	10mA 50mV 10µA 5V

Initial contact resistance	10 mΩ max
Insulation resistance	1.000 MΩ min. at 500VDC
Dielectric strength	1.000 Vrms 50 Hz min. between terminals 1.500 Vrms 50 Hz min. between poles 1.500 Vrms 50 Hz min. between terminals and frame
Contact bounce	2ms max
Electrical life at full load	50.000 cycles
Low level or mechanical life	100.000 cycles

Materials

Case	Diallylphthalate (DAP) or high temperature plastic material (UL94-V0)
Actuator	Brass, nickel plated
Paddles	UL94HB polyamide
Lever caps	Vinyl
Bushing	Brass, nickel plated
Housing	Stainless steel or steel tin plated
Contacts	AD : silver, gold plated
Terminal seal	Epoxy

Environmental

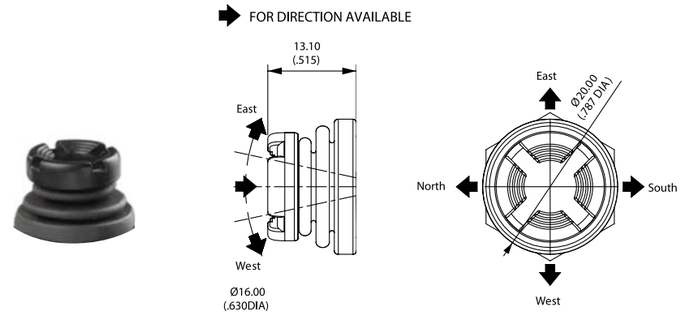
Operating temperature	-40°C to +85°C

MINI JOYSTICK

DIMENSIONS *(in millimeters)* **AND TECHNICAL DATA**

Description

Compact 5-way navigation thumb control. Tactile feedback in all directions & pushbutton. Shock, vibration & salt spray resistant. 1 million lifecycles. Sealed to IP69K.



Environmental

Front Panel Sealing	IP69K according to DIN 40050-9, IP67 according to IEC 60529.
Shock Resistance per IEC 60068-2-27	3 sinusoidal impulse 300m/s^2. 18ms on 3 axis.
Vibrations (random, 3 axis) per IEC 60068-2-64	10-350Hz.
Vibrations (sinus) per IEC 60068-2-6	10-200Hz / 20m/s^2 ; dwell period 30 minutes.
Salt Spray	96 h per IEC 60068-2-11/KA.
Damp Heat per IEC 68-2-78	40 °C (104 °F) 93% HR - 10 days.
Cold and Dry Heat, Temperature Shock per IEC 68-2-14/Na	-40°C to +85°C (-40 °F to +185 °F)- 10 cycles.
Operating Temperature	-40 °C to +65 °C (-40 °F to +149 °F).

Electrical

Electrical Function	4 or 5 momentary NO.
Max. Current/Voltage Rating with Resistive Load	50 mA 12 VDC.
Electrical Life at Full Load	1,000,000 cycles per direction. 1,000,000 cycles for validation.

Mechanical

Expected Life	1 million cycles per direction.
Angular Travel	12°.
Operating force	Direction 4 N ±1 N. Validation 11 N ±2 N.
Mechanical Strength	The switch can withstand a force of 100 N applied in any directions.

Materials

Sealing Gasket	Elastomeric
Case	Brass, black chrome plated
Actuator	ABS
Lever	Steel

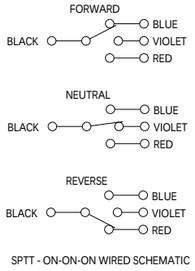
ROCKER SWITCH FNR

DIMENSIONS *(in millimeters)* **AND TECHNICAL DATA**

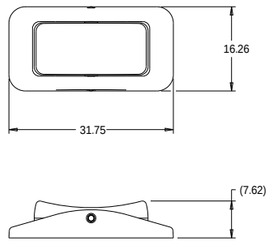
Description

Compact 3-way rocker switch marked with F (forward), N (neutral) and R (reverse).

WIRED CIRCUIT DIAGRAM



SPTT - ON-ON-ON WIRED SCHEMATIC



Electrical

Logic level, 10 mA at 5 VDC max. Logic level ratings void If logic level load(s) exceeded at anytime.	
Electrical life:	1,000,000 cycles
Max power:	0.5 VA
DWV:	250 VRMS

Mechanical

Mechanical Life:	1,000,000 cycles
Enclosure design:	ISO 20653, IP66 / IP6K8S - Dusttight, continuous immersion, 1 meter for 31 minutes, stationary during tests.
Temperature range:	-40°C to +85°C

Materials

Base material:	Black thermoplastic
Button material:	Black thermoplastic
Bezel material:	Black thermoplastic

7. INSTALLATION ADAPTERS

The L8 joystick grip is attached on the joystick base with adapters. The adapters comes in different types and can be fitted on a large variety of joystick bases.

BALL JOINT ADAPTER

DIMENSIONS *(in millimeter)*

Description

Ball joint adapter that fits a wide range of joystick bases.

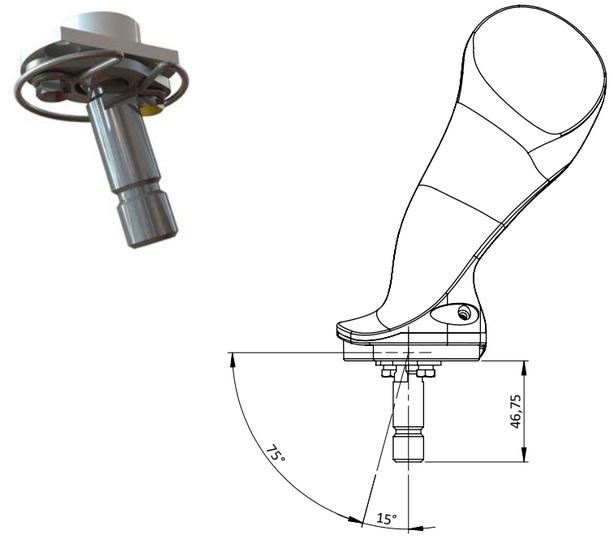
Can be ordered with a pre-set angle of the ball joint adapter. Angle can also be set or adjusted in field. Angle can be set to a maximum of 15°.

Currently available in M10, M12, M14 and M14x1,5 threads.

Other lengths of the ball joint rod are available on request.

Features and Benefits

- Easy to adjust angle in field
- Robust design
- Easy "snap in" function of bellow holder



FIXED ADAPTERS

DIMENSIONS *(in millimeter)*

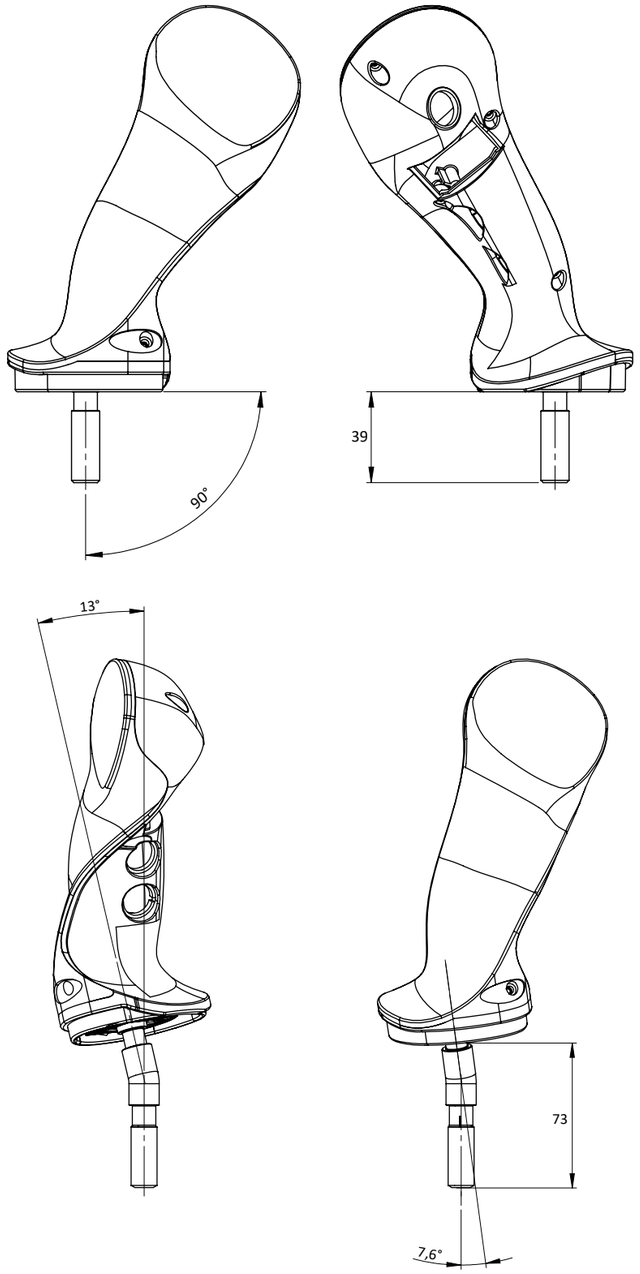
Description

Adapters with fixed angles that fits a wide range of joystick bases. Comes in two main variants. The straight adapter and a 13° fixed angled adapter.

The straight adapter is currently available in M14x2 thread. The angled adapter is currently available in M10, M12, M14 and M14x1,5 threads.

Features and Benefits

- Robust design
- Easy installations with fixed adapters
- Angles proven to be well suited for many machines



8. ACCESSORIES

Accessories for SVAB Grip L8 joystick. Among the accessories you will find bellow holders and a hand-rest.

8.1 BELLOW HOLDERS

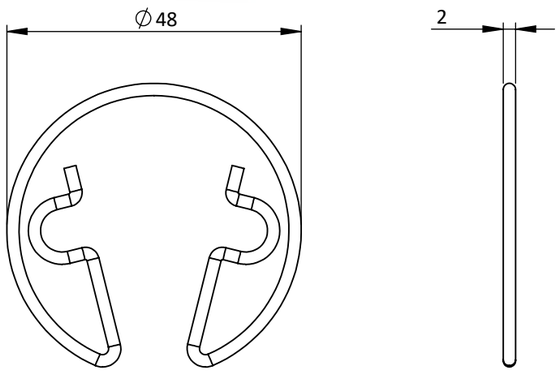
CIRKULAR BELLOW HOLDER FOR BALL JOINT ADAPTER

DIMENSIONS (in millimeter)

Description

Cirkular bellow holder in spring steel for the ball joint adapter.

Enables the attachment of the joystick base bellow to the L8 joystick grip.

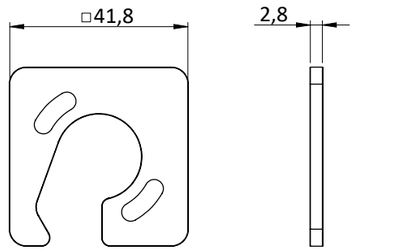


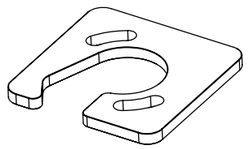
RECTANGULAR BELLOW HOLDER FOR BALL JOINT ADAPTER

DIMENSIONS (in millimeter)

Description

Rectangular steel bellow holder used for attaching the bellow of the joystick base to the joystick grip. This bellow holder is compatible with the ball joint adapter.





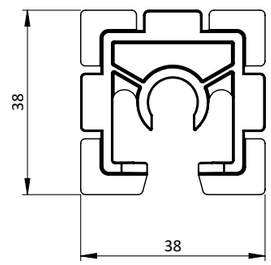
BELLOW HOLDER FOR FIXED ADAPTERS

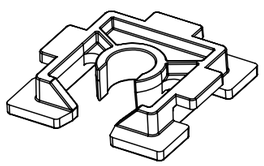
DIMENSIONS (in millimeter)

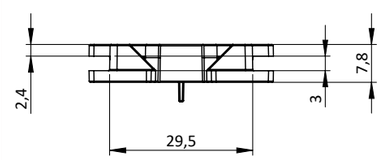
Description

Used for attaching the bellow of the joystick base to the joystick grip. This bellow adapter is compatible with the fixed adapter sticks only.

Material: Black plastic, PC/ABS.







8.2 HAND-REST

HAND-REST

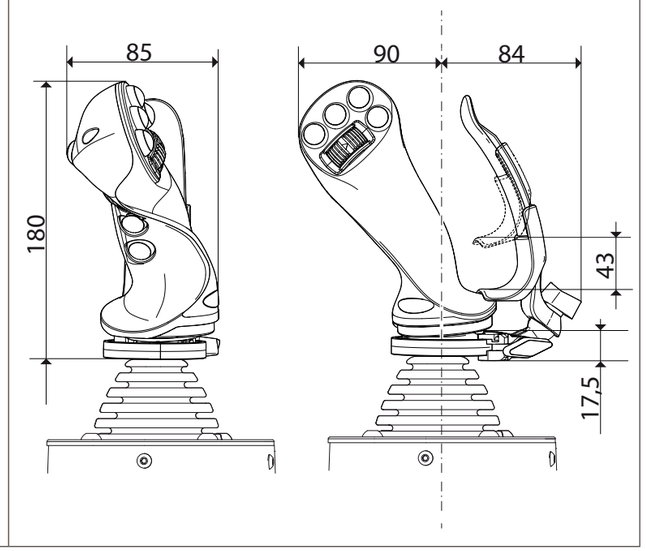
DIMENSIONS (in millimeter)

Description

The hand-rest can easily be retrofitted to any L8 configuration. The hand-rest increases comfort, relieves the hands and reduces the risk of repetitive strain injuries. The hand-rest improves control of the steering and allows a flexible adjustment for different hand sizes and personal preferences.

The hand-rest can be tilted as you prefer and allows free adjustment inward, outward, forward and backward thanks to its mounting system. The lower palm rest is adjustable in 5 different height positions which makes the hand-rest adaptable to different hand sizes.

Material: PC/ABS



8.3 MISCELLANEOUS

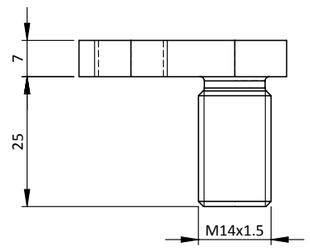
OFFSET ADAPTER FOR ADAPTERS

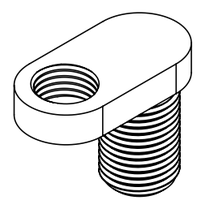
DIMENSIONS *(in millimeter)*

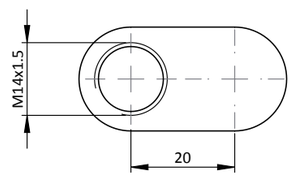
Description

The offset adapter offsets the ball joint and fixed adapters and joystick grip 20 mm in the preferred direction from the joystick base.

Currently available in M14x1,5 thread. Other threads possible on request.

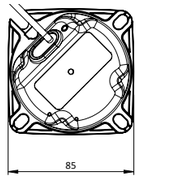


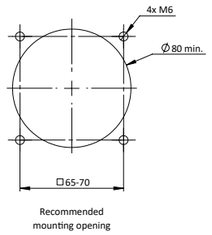


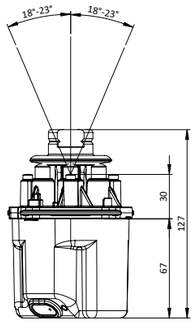


9. eJB - ELECTRONIC JOYSTICK BASE

SVAB JOYSTICK BASE
eJB







Description

Robust and safe electronic 2-axis joystick base that mimics the mechanics, ergonomics and feel of a hydraulic joystick. The SVAB eJB is designed for remote control of electro hydraulics via CAN bus.

Functional principle

The joystick movement is activating the rods, making the magnet move up or down. For each axis there are double sensors that read the position of the magnets. This design of the mechanics and electronics are redundant to provide a high level of safety.

The operating force is determined by the force of the active spring, which can be adapted to the application. The axis stroke can be individually chosen between 18° and 23°.

The grip is easily connected to the eJB which provides a single cable connection for the complete joystick to the machine.

Safety

Developed in accordance with the Machinery Directive and the safety standards ISO 13849 and IEC 61508. The SVAB eJB can be used to control functions with safety levels up to PLd or SIL 2.

Mechanical	
Installation size	85 x 85 x 127 mm
Weight (base without grip)	Approximately 780 g
Mounting screw connection	4x M6 screws
Mechanical life	≥ 6 million cycles
Lever stroke	±18 to 23° according to customer specification.
Operating force	Light, medium, hard or extra hard, according to customer specification.
Environmental	
Operating temperature range	-40°C to +85°C
Protection class electronic	IP67
Protection class mechanical	IP5X
Fire resistance	UL94-HB
Electrical	
CAN bus connectors	1 or 2* (*dual CAN as option for a fully redundant CAN bus).
CAN bus protocol	CANopen or CAN J1939
CAN bus supply voltage	6V to 36V
Digital inputs	5
Analog inputs	2
Power output	1 (5V, max 90 mA)

10. PRODUCT KEY FOR CONFIGURATION

Because of the almost endless possible configurations of the L8 grip, this documentation does not contain a product key for configuration of the grip. Instead we have developed a user friendly web configurator. You will find the web configurator at www.svab.se.

SVAB Hydraulik AB has extensive experience in control electronics, hydraulics and ergonomic design for industrial vehicles, with guaranteed quality production and prompt delivery.

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