SVAB
Excavator Control Systems

Tiltrotator control 4-hose

tilt/gripper, tilt/extra and quick coupler

Mounting instructions

Revision D
DOC-0001260

Index

Sec.. Description Page

1. Introduction

SVAB 4-hose system is an electronic control system developed for controlling which function of tilt, gripper, additional and bucket lock that is active on a tiltrotator.

These mounting instructions are a guide to mounting a SVAB 4-hose system. The system can also be used in a 6-hose system.

This control system has been especially introduced for the types of machine stated in chapter 3 below, and may not be used in any other way than indicated in these instructions.

This system is classified according to

This system is classified as a partially complete machine per the definitions in the Machinery Directive, which means that the CE marking on the products shows that the system meets the requirements of the Machinery Directive for the incorporation of the machine (s) the system is intended for(please refer to the section regarding AREa of use). in Chapter 13 of this publication, you will find information about how and which requirements that this system fulfills under the condition that the parts are installed and used in the manner described. Beside the machine directive, the CE marking also shows that the EMC Directive has been fulfilled.

The system these instructions refers to is intended to be installed and used by experienced installation technicians/operators. If any uncertainties should arise regarding use, installation, understanding of the system or this document, stop installation work and contact the dealer for more information. You can prevent accidents by using common sense.

These installation instructions shall be used in the technical documentation that is the basis for or the machine's final CE marking. The checklist on page 39 must therefore be carried out carefully, filled in completely and signed by the installer responsible. Save this instruction with other technical documentation.

2. Safety

Read the installation instructions carefully before starting installation work. Follow the instructions and local provisions provided.

The system may only be handled by personnel trained for the machine.

Never carry out mounting work when the excavator is running.

Ensure that the hydraulic system is unpressurized and the electrical system unpowered before starting work on the system.

Check that hoses are the correct quality and that the hose connections are undamaged and correctly tightened. Hoses that become loose can cause serious injury.

Only use SVAB original parts. Damage or interrupted operation caused by parts other than SVAB original parts are not covered by Warranty or product liability.

Ensure that the driver's manual and joystick layout are in the cab before the machine is used!

2.1 Driver's manual

The driver's manual describes how our system should be used and contains important information and safety precautions.
The driver's manual is supplied with the tiltrotator kit but is also available for downloading and printing at www.svab.se under Applications – Tiltrotator control.
The manual must be placed in the cab

2.2 Joysticklayouts

The Joystick layouts describe for the driver which of the joysticks' rollers, buttons and switches control which functions on the tool or machine.

The layouts must be filled in for those handles the machine is equipped with.

Filled in layouts must be printed and placed in the cab..

2.3 Solenoid valve

The solenoid valve must be designed based on well tried safety principles and/or be assessed as a well tried component in accordance with ISO 13849-2 or an alternative method.

Hydraulic and mechanical designs for the quick coupler latch must be designed in accordance with EN474-1 Appendix B with well tried components or based on well tried safety principles in accordance with ISO 13849-2 or an alternative method
.

3. APPLICATION AREA

Permitted use of SVAB Tiltrotator 4-hose system

3.1 Permitted use

APPROVED APPLICATION AREAS

SVAB 4-slangssystem får användas till grävmaskiner och traktorgrävare/grävlastare.

APPROVED FUNCTIONS TO CONTROL

• Shift functions via button to electricaally manoeuvered valve in tiltrotator.
• Tool lock with Performance level d per ISO 13849-1..

3.2 Prohibited use

SVAB 4-hose system may only be used for control of approved functions accordning to ”3.1 Permitted use”.

SVAB is not responsible for damage or accidents that can occur due to control of functions
that are not approved.

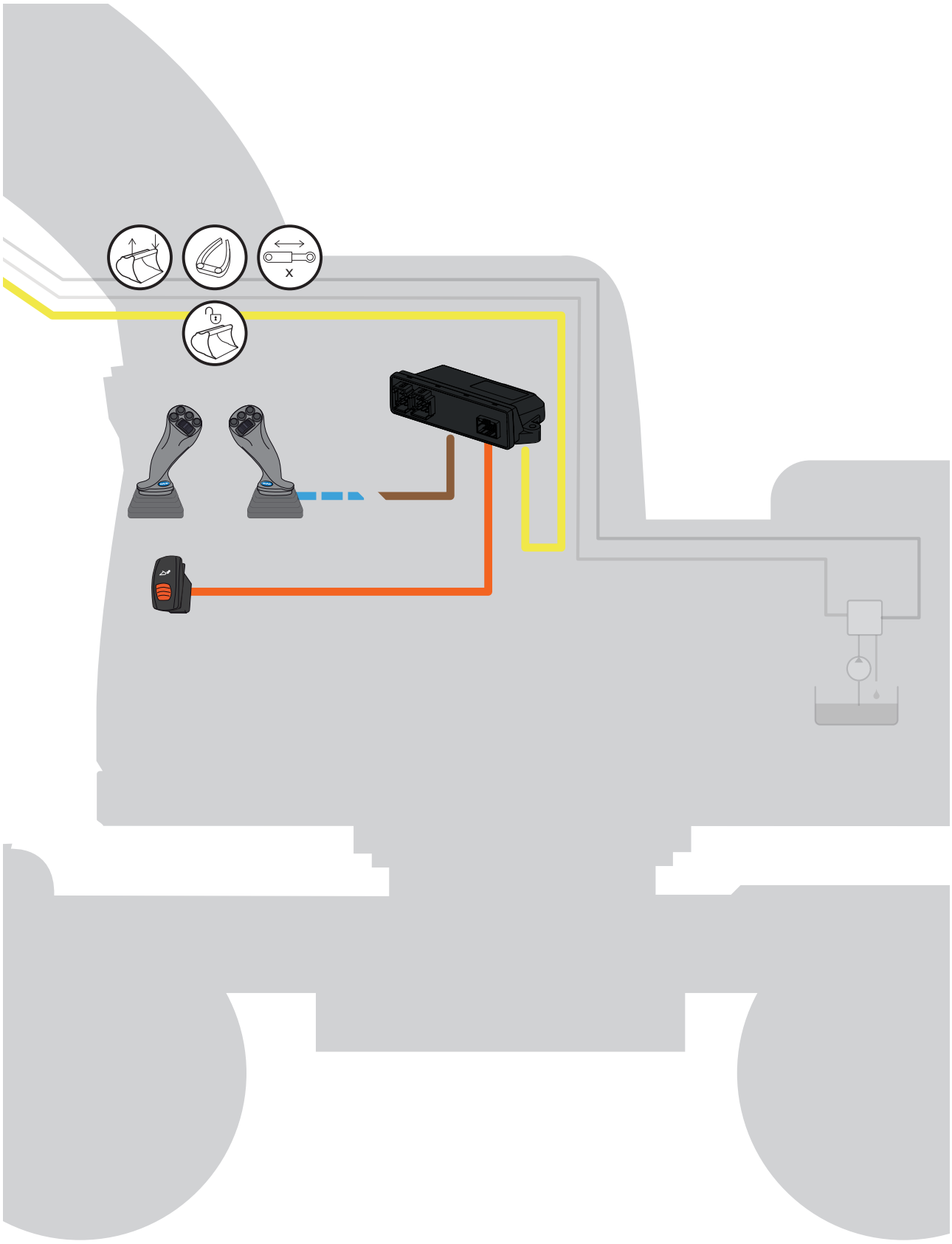
4. INSTALLATION OF CABLNG

Read this section carefully before starting installation of cabling. Read the safety text at the beginning of the instructions!

- The cable that goes into the handle must be able to move freely so that the seat can be moved from the forward to rearmost positions without damaging the cabling. Strain relieve the cabling both inside and outside the armrest for the best result.
- The cabling must be secure but not tensioned. The cabling must neither be tied so securely that it is pinched nor hang down.
- Use the existing cable lead-through. If new cable lead-throughs are necessary, take care to use some kind of grommet to protect the cabling from damage from sharp edges.

5. SYSTEM VERVIEW

5.1 4-hose system

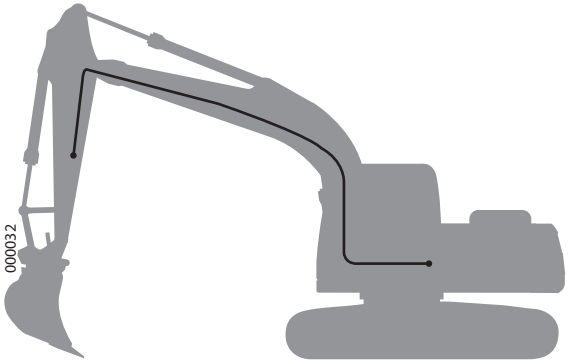


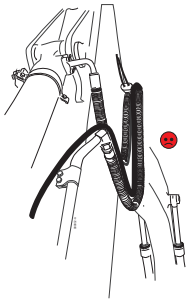
5.2 Component parts

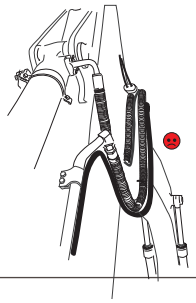
Artikel nr	Benämning	Comment
P-0000253	GP1 TR 4-hose system	Tilt mormally closed
P-0000942	GP1 TR 4-hose system	Tilt normally open
210438	Mounting plate GP1 KPL	
P-0000909	Cable TR Deutsch 3,4m 4-hose system	
P-0000186	Cable I/O GP1 complete, 4-hose system	
P-0000941	Cable poer supply GP1, w/o CAN, 2.0 m	
371053	Switch 2-läges 1-1 växl.	
200341	Frame for Carlingswitch, SWF51	
P-0000564	Cable Machine 15m 8-pos DT-->ILME	

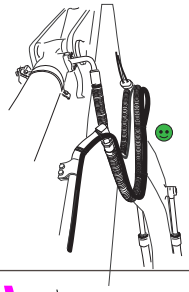
6. Machine cable

01









The machine cable is the cable that connects the Tiltrotator to SVAB's control system.

The machine cable is mounted so that it meets the tiltrotator's unit cabling on the stick and is routed into the cab where it connects to the electronic conrol unit.
.

MPORTANT!
Use existing holes and lead-ins, because new holes can affect the machine's existing CE marking!

Start by mounting the machine cable connector on the stick. (One of SVAB's ready to use attachment plates is recommended)

Remember that the connector is mounted at a suitable distance from the tiltrotator so that the unit cable reaches the connector, but is not so close to the tool that it risks ending up under water.

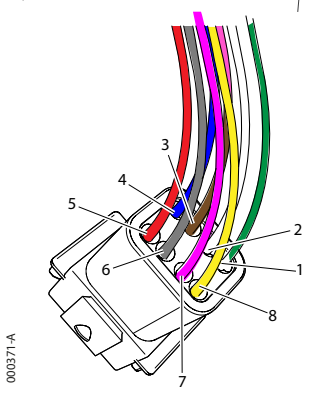
In this connector there is also a function for interlocking the upper tool lock on the machine when the tool is connected.

The machine cable is then secured along the machine's stick and boom.

Make sure to route the cable so that it cannot be trapped/stretched and that the machine has a full range of movement.

Insert the cable into the cab via a lead-through. Point out a suitable place in the cab for the controller to be mounted and and route the cable to that spot.

02

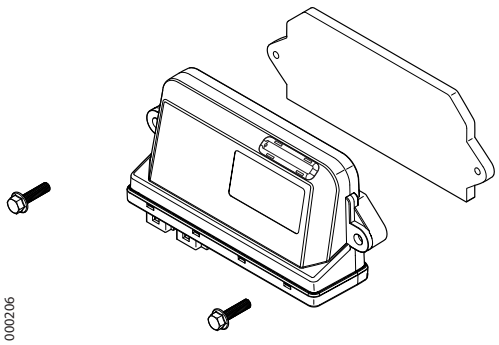
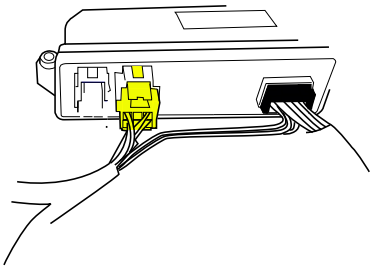


Connect the machine cable contactor according to image below:

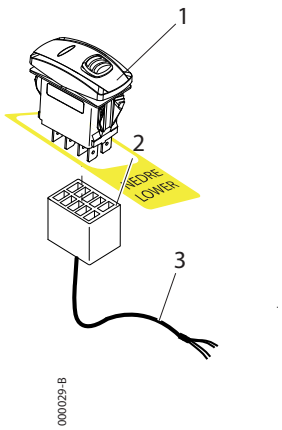
1 - Green (Quick coupler GND)
2 - White (Lock +)
3 - Brown (Tilt)
4 - Blue (Gripper)
5- Red (Extra)
6 - Grey (GND)
7 - Pink (GND)
8 - Yellow (Activating signal Tiltrotator)*

* Signal quick coupler. In order for the tiltrotator to function, this cable must be connected.

7. Electronic contriol unit (ECU) 4-hose system

01  000206	Select a suitable location in the cab for the mounting of the ECU. The surface that the mounting bracket is attached to must be well cleaned. Clean the surface by moving the rag in one direction (not in circles) Pull off the red protective film and press the mounting bracket against the surface fully for at least 30 seconds. . Allow the adhesive on the mounting rails (2) to harden for a couple of minutes. Note that it can take up to least 8 hours before the glue has hardened and reached full strength.
02  000431-A	Connect the cables to the ECU.
03	Connect the trunk cable from previous step, 6.02, 8-pos DT..
04	**Note**: Berfore you continue the installation: When mounting a 6-hose system, the quick coupler will not be installed. Please leave the step 08 out in this instruction when mounting a 6-hose system.

05



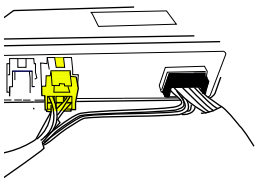
Select a suitable location in the dash board, easily reached for the driver, for the mounting of the quick coupler.

Place the sticker for lower coupler between button (1) and socket/base (2)

Mount the switch (1) to the matching base (2) on quic coupler cable.

Connect cable (3) to push button, marked QC-SW from ECU.

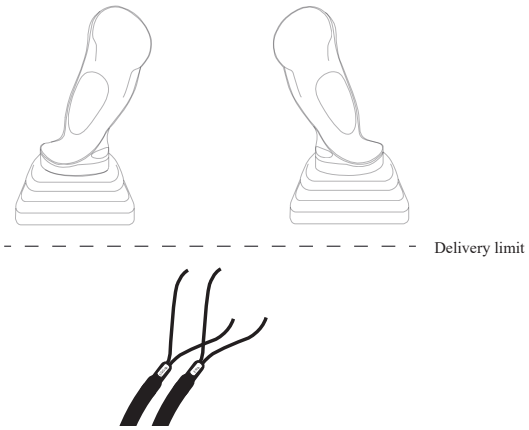
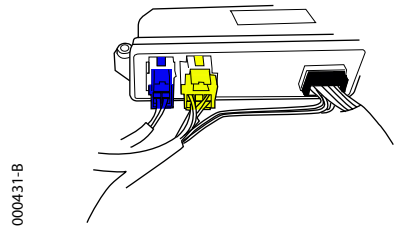
06



Connect cable marked SG/Gripper to push button

Connect cable marked Extra to push button.

Note: Make sure to strain relieve the cables entering the ECU. This will protect the contactors from too much weight.

07	Connect safety gate cable to + feed from safety gate (+5-24V) Koppla in kabel grindsignal till + matning från säkerhetsgrind (+5-24 V), marked Safety gate. The signal for breaking the hydraulic functions is directly connected with a diode in series to the machine's original safety gate signal for reverse voltage protection. The diode may not be removed or connected in another way than stated on electric diagram on page 17
08 	Connect suitable push buttons for shifting functions Gripper and Extra, marked SG/Gripper and Extra. Note: Please refer to existing documentation for connection of the cables.
09 	Connect the power supply cable (blue) to the ECU. Connect the 2-pos cable without contactor to suitable + feed (12-24 V) and GND. Fuse with 5 A . Note: The ECU shall only be energized upon machine start-up.

8. System start

8.1 Activation

SVAB 4-hose system is activated when the machine's electronics is activated by the ignition. Note that the tiltrotator or other functions will necessarily not activate upon a systemstart. To activate the tiltrotator or other functions, the machine might need to be placed in workingmode/operating mode.

8.2 Tiltrotator control

SVAB 4-hose system has primarily been designed to control a tiltrotator. This is normally achieved with the aid of two rollers on the joysticks. You control the tiltrotator's functions by moving these rollers. You normally control the tiltrotator's rotation with the left thumb roller and its tilt with the right thumb roller.

When you move the thumb roller in one direction, you affect rotor/tilt variably, i.e. the more you move the thumb roller, the faster the function will operate, with the change in speed taking place smoothly and responsively.

The way in which the tiltrotator is activated can vary depending on the type of machine, but in many cases the tiltrotator is activated when the machine's excavator function is activated

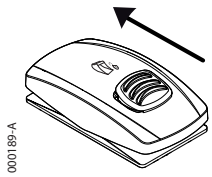
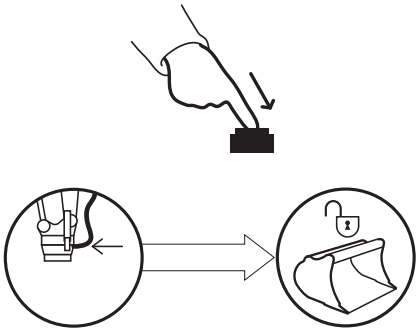
8.3 Additional functionality of the Tiltrotator

SVAB 4-hose system shifts the tiltfunction to gripper or extra. For the connection and disconnection of attachments, see section "CONNECTING AND DISCONNECTING ATTACHMENTS".

9. CONNECTING AND DISCONNECTING ATTACHEMENTS

⚠	Always read the information from the tiltrotator's manufacturer regarding connecting and disconnecting tools on the tiltrotator. Failure to follow the manufacturer's instructions may result in danger to life. In order to connect or disconnect the tiltrotator, see information from the manufacturers of both the tiltrotator and the machine. Always ensure that the area around the machine is free of people when connecting or disconnecting a tool. Also ensure that the tiltrotator is lowered as close to the ground as possible. Always ensure that the tool is securely attached to the tiltrotator before starting work

9.1 Tiltrotator attachements - connection and disconnection

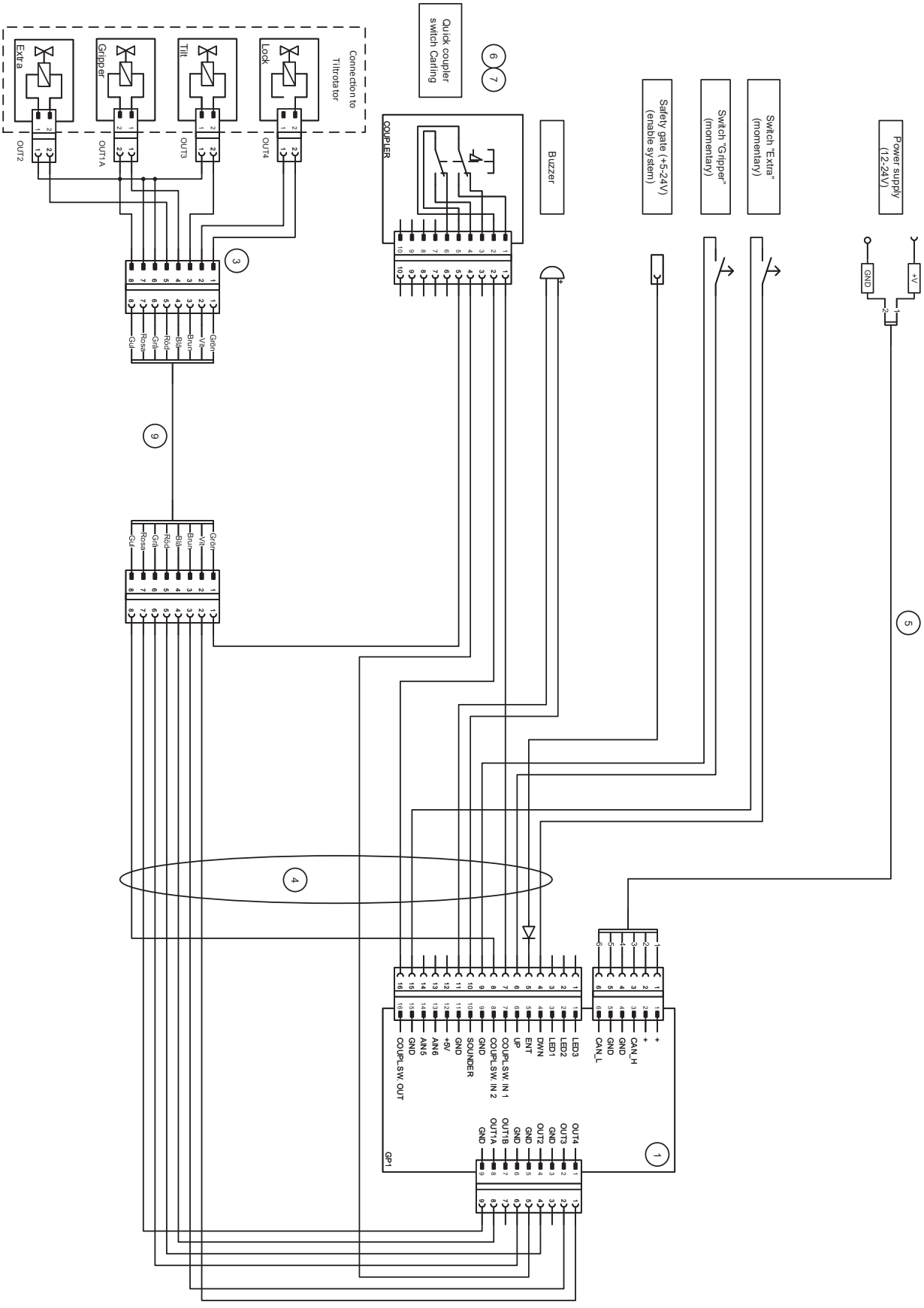
01  	The machine must be running. Locate the quick coupler lock switch for the lower quick coupler lock. Place the switch in the unlocked position by opening the switch's lock catch at the same time as pressing the switch. .
02 	You should now hear a pulsing signal, which indicates that the quick coupler lock is preparing to open Locate the pressure setting button, which should be located on one of the joysticks. The pressure setting button should be included in the joystick layout
03 	Press the pressure setting button to open the lower quick coupler lock. The signal should now change from pulsing to a continuous tone, which indicates that the valve for the quick coupler lock is open. Hold the button pressed until you see that the quick coupler lock's locking cylinder is fully retracted. You can now release the button. You can now connect an attachment to the tiltrotator or disconnect an attachment from the tiltrotator. .
04 	When the attachment is connected to the tiltrotator or disconnected from the tiltrotator, the switch should be placed in the locked position in order to lock the attachment to the tiltrotator or to place the quick coupler lock in locked mode. The sound signal should now cease and the lock cylinder should move towards its locked position **Note**: It might require additional pressurizing in order to make the lock go all the way. Use gripper or extra function to pressurize. **Always ensure that the attachment is securely attached to the tiltrotator before starting work.** If the lock cylinder has not moved to its locked position after 5 seconds, try pressing in the pressure setting button...

10. ELECTRIC DIAGRAM

10.1 Index

Pos	Artikel nr	Benämning	Remark
1	P-0000253	GP1 TR 4-hose system	Tilt normally closed
1	P0000942	GP1 TR 4-hose system	Tilt normally open
2	210438	Mounting plate GP1 KPL	
3	P-0000909	Cable TR Deutsch 3,4m 4-hose system	
4	P-0000186	Cable I/O GP1 complete, 4-hose system	
5	P-0000941	Cable poer supply GP1, w/o CAN, 2.0 m	
6	371053	Switch 2-Position 1-1 växl.	
7	200341	Frame for Carlingswititionch, SWF51	
9	P-0000564	Cable Machine 15m 8-pos DT-->ILME	

10.2 Electric diagram

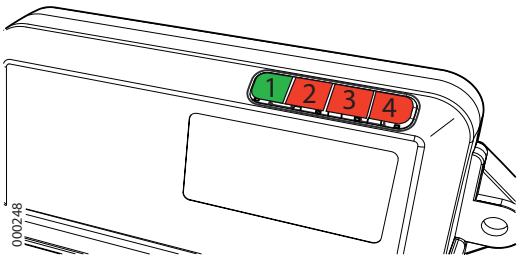


11. TOUBLESHOOTING

11.1 General

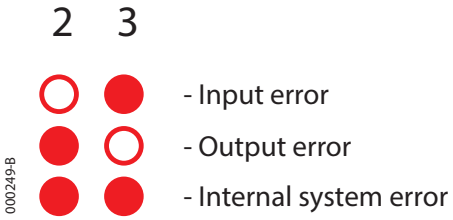
This section describes what to do when error codes are reported via the ECU unit's LEDs

01



The green LED (1) indicates that the GP1 unit is running. When LED 1 lights and stays on, this means normal operation.

02

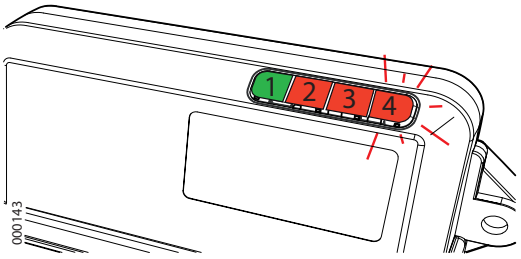


If a fault arises, LEDs 2 and 3 show the type of fault with a steady glow (see image):

In the event of "Input signal fault" or "Output fault", you can check that the unit's contacts are properly connected and that the unit's wiring is not damaged.

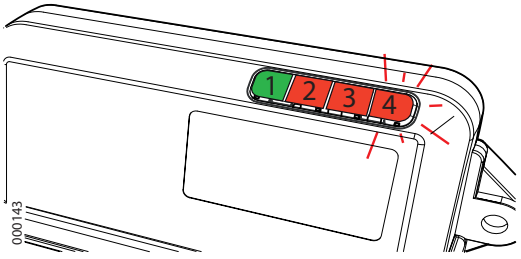
In the event of "Internal system error" or if you cannot rectify the fault yourself, you should contact the system installer.

03



LED 4 shows which unit and which function the fault applies to. The LED flashes in 2 different ways
.
Distinct flashes indicate the unit in which the fault is located, in this case where only one unit is used there will always be one (1) distinct flash.

04



Toned flashes indicate the function to which the fault relates.

In the following alarm list, error codes will be shown within square brackets [on-on-off-1/3]. It starts with the state of the first (green) LED. Then the states of the second and third LEDs separated by dashes follows. The fourth LED is described by two digits separated by a slash, the first digit indicates the number of distinct blinks, and the second digit indicates the number of fading blinks

Exemple: [on - on - off - 1/3] indicates an output error, on the third output (to the valve) of ECU

11.2 Larmlist, ottput signals

Below you can find error codes that can arise.

	Error code	Plausible cause	Action
1	[on - on - off - 1/1]	Interrupt / short circuit Gripper function	Check that the unit's contacts are properly connected, then restart the system. If the error code is regenerated, shut down the system. systemet. Disconnect the contact on the stick. Perform a resistance measurement on positions 4 and 7 on cable to tiltrotator using a multimeter. If the meter indicates 5-30 Ohm, the cable and the solenoid have no damage. If the meter indicates values higher or lower from the interval, there is a suspected interruptionor shoirt circuit. To be able to rule out the ECU, also perform a voltage measurement rom the cab side.
2	[on - on - off -1/2]	Interrupt / short circuit Extra function	Check that the unit's contacts are properly connected, then restart the system. If the error code is regenerated, shut down the system. systemet. Disconnect the contact on the stick. Perform a resistance measurement on positions 5 and 7 on cable to tiltrotator using a multimeter. If the meter indicates 5-30 Ohm, the cable and the solenoid have no damage. If the meter indicates values higher or lower from the interval, there is a suspected interruptionor shoirt circuit. To be able to rule out the ECU, also perform a voltage measurement rom the cab side.
3	[on - on - off - 1/3]	Interrupt / short circuit Tilt function	Check that the unit's contacts are properly connected, then restart the system. If the error code is regenerated, shut down the system. systemet. Disconnect the contact on the stick. Perform a resistance measurement on positions 3 and 7 on cable to tiltrotator using a multimeter. If the meter indicates 5-30 Ohm, the cable and the solenoid have no damage. If the meter indicates values higher or lower from the interval, there is a suspected interruptionor shoirt circuit. To be able to rule out the ECU, also perform a voltage measurement rom the cab side..

4	[on - on - off - 1/4]	Interrupt / short circuit quick coupler	Check that the unit's contacts are properly connected, then restart the system. If the error code is regenerated, shut down the system. systemet. Disconnect the contact on the stick. Perform a resistance measurement on positions 1 and 2 on cable to tiltrotator using a multimeter. If the meter indicates 5-30 Ohm, the cable and the solenoid have no damage. If the meter indicates values higher or lower from the interval, there is a suspected interruptionor shoirt circuit. To be able to rule out the ECU, also perform a voltage measurement rom the cab side. **Note:** The GND of the quick coupler goes through the panel switch which means that GND beomes postion 1 if the switch is activated.
5	[on - on - off - 1/5]	Interrupt / short circuit summer	Check that the contact where the summer is positioned is properly connected, then restart the system. f the error code is regenerated, replace the cable with the summer.

11.3 Larmlist, input signals

	Error code	Plausible cause	Action
1	[on - off - on - 1/0] followed by [on - on - off - 1/4]	Felaktig insignal, snabbkoppling	Check connections to the quick coupler. Compare to electric diagram on page 18. Measure pos 1 and 2, make sure there is no direct connection to GND. Se elelctric diagram on page 17.

12. CHECKLIST

A checklist for installation technicians should be prepared and included in the system's installation instructions.
This checklist shall then be signed by the installation technician/inspector and be included in the machine's documentation for CE marking.
Important points for this system's installation are the following.

Electrical installation

- Check that cables are correctly routed and properly secured, and that cable protection is mounted where cables can be subjected to wear.
- Check that the system is correctly connected per the electrical diagram.
- Check that the system is correctly fused.
- Check that supply cables are not run close to fuel lines.
- Check that no holes or other modifications are made on the shovel boom or on the cab's ROPS structure.
- Check that no cables or units are blocking the machine's emergency exits.
- Check that all plates, interior components, buttons and other parts that have been removed are correctly refitted and in working order.

Testing/adjustment

- Check that the maximum hydraulic pressure is adjusted to maximum permitted pressure for the applicable rotational and/or tilting unit as well as free return.
- Check that the user manual accompanies the machine upon delivery to the end-user.
- Check that the lever function overview accompanies the machine upon delivery to the end-user.

Safety functions (These must always be checked and approved by a person other than the installation technician).

- Check that the lower tool lock interlock functions correctly (upon activated function, the buzzer sounds).
- Check that the gate catch function works correctly.

When the checklist has been gone through thoroughly and any errors corrected, it must be signed off, below, by the installer responsible.
Save these instructions together with other technical documentation..

Machine model:	
Serial number machine:	Serial number GP1 TR 4:
Signature and date:	

13. DECLARATION OF INCORPORATION

SVAB
Precision Control Systems

Declaration of incorporation

According to EC Directive 2006/42/EC for machinery (Appendix IIB)

The manufacturer's name and address:
SVAB Hydraulik AB
Ulvsättersgatan 2
69491 Hallsberg
Sweden

We hereby give assurance, that the partially complete machine as described below

Article number: 150140, 150141, 150142, 150143, 150144

Product description: Tiltrotator control, 4-hose

fulfils the basic health and safety requirements of EC Directive 2006/42/EC, as far as products supplied by us permit, within the framework of the following harmonized standards:
EN12100:2010
EN474-1:2006+A1:2009
EN474-5:2006+A1:2009

Furthermore, we give assurance that the relevant technical documentation has been produced in accordance with section B of Appendix VII.
The partially completed machine also meets the requirements of EC Directive 2004/108/EC in relation to electromagnetic compatibility.

We commit to providing, on specific request by national authorities, relevant information about the partially completed machine.

The partially completed machine must not be put into operation, until the complete machine it is intended for incorporation within has been declared to conform with the regulations of Directive 2006/42/EC for machinery and until an EC declaration of conformity has been made, in accordance with Appendix IIA.

Person authorized to compile the relevant technical documentation:
Name: Clas Fredriksson
Address: SVAB Hydraulik, Ulvsättersgatan 2, SE-69491 Hallsberg

Hallsberg 2018-01-02

Fredrik Eriksson, CEO

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


SVAB
Excavator Control Systems