pivario™ V1™

Installation Manual

Polaris FS/FST, 2006 onwards

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Foreword

Pivario V1 clutches can be mounted on a wide range of snowmobiles. They broaden your snowmobile's range of use and the "freedom to choose."

Guarantee

The guarantee is only valid if:

- the equipment has been installed and checked according to these instructions
- the equipment has not been modified without written approval from Pivario AB.
- original spare parts are used for repairs
- the equipment is used and maintained according to the right user manual

Information

These instructions apply to mechanical and electrical installation and function testing of a pivario V1 clutch. Configuration of the control program and use and maintenance are described in separate manuals.

IMPORTANT! Read the instructions carefully. Incorrect use may result in personal injury or damage to the equipment.

The pictures in these instructions are primarily intended to show and clarify different parts of the installation. Pictures may, in some cases, show other snowmobile models similar to those stated on the front of the installation instructions.

Equipment and descriptions in these instructions may be changed without prior notice.

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Compliance with regulations and standards

The equipment is manufactured in compliance with the following regulations and standards:

- xxx
- xxx

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1 Introduction

1.1 About this manual

This manual describes the installation of the pivario V1 clutch on the snowmobile model(s) indicated on the front of the manual. The manual can also be used for other models of the same make, provided that the chassis, engine type, and electrical system do not differ.

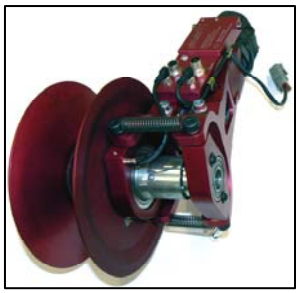
NOTE: The photos show installation on a Polaris FST 2006.

IMPORTANT! The manual assumes that the person performing the installation is knowledgeable about snowmobiles. Experience of service and repair work on snowmobile clutches is recommended. This manual is primarily intended for retailers who are also responsible for installing the pivario V1 clutch.

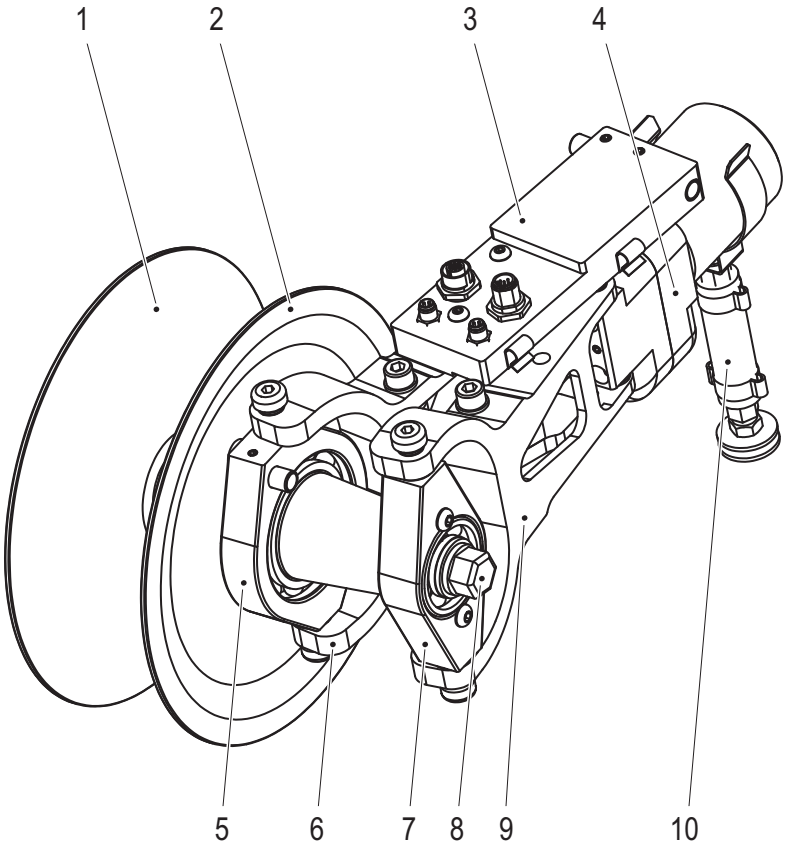
1.2 Technical description

The Pivario V1 clutch replaces the primary clutch that was originally mounted on the snowmobile. The clutch and its control equipment have been developed and specially adapted to work alongside the standard secondary clutch and drive belt.

1.2.1 Clutch unit



The clutch has no moving weight arms, and the gearing is instead regulated by an electronic shift. The electronic shift affects a movable arm, connected to the outer drive pulley. The principle is illustrated in the following picture:



Component	
1	Fixed drive pulley
2	Movable drive pulley
3	Control unit
4	Shift/Gear housing
5	Large bearing
6	Right arm
7	Small bearing
8	Central screw
9	Left arm
10	Rear attachment

1.2.2 Control unit

The control unit is mounted on the clutch and contains all the electronics and circuits used to store the clutch's control programs. The unit is embedded so that it can cope with variations in temperature, moisture and vibration.

On delivery from Pivario AB the control unit contains a basic program. When installing the pivario V1 clutch the control parameters should be optimized for the snowmobile on which it will be used.

1.2.3 Control panel

Preset driving modes can be changed with the help of the control panel which is placed on the handlebars. This makes it quick and easy to change driving mode while driving. Some calibrations may also be carried out using the control panel.

Please see the pivario *User Manual* for more information.

1.2.4 What is included?

The clutch is delivered complete, including the control panel and cables. Please check your delivery against the table/model below:

Component		Description	Article number
	Primary clutch	Incl. control unit and sensor	
	Central screw	Incl. 2 washers	
	Rear attachment	Incl. 1 attachment screw and washers	
	Magnets, 1 set	6 incl. attachment screws for secondary clutch	

Component		Description	Article number
	Control panel	Incl. mounted cable set	
	Cables	For voltage measurement, incl. 20 A fuse	
	Cable accessories, 1 set	For connecting cables from control panel	
	User manual		
	Sticker set		
	Attachment, secondary sensor		
	Bracket	Stay for protective panel on air filter	
	Sensor cable	Extension to secondary clutch	

1.3 ID Marking

Each clutch is marked with a unique serial number. The number is engraved on the cover of the control unit.

Always state the serial number in correspondence with Pivario AB.

2 Safety

2.1 General information

The pivario V1 clutch has been constructed and tested to fulfill current safety requirements. Read the following safety instructions before installation.

These instructions describe the safest and- in most cases -the most practical installation procedure, but should never replace personal responsibility or local safety regulations.

Whenever performing installation- or any other type of work, always pay proper attention to:

- Your own personal safety and that of others.
- Product integrity through correct installation according to these instructions.

2.2 Warning symbols

The following warnings and important messages are used in these instructions:

WARNING!
Warning (in bold text) with a warning symbol is used to highlight a risk area that may result in personal injury.

IMPORTANT!
Important (in bold text) is used to show there is a risk of damage to the equipment.

NOTE: (in bold) is used to highlight information that is important for problem-free installation and use of the equipment.

2.3 Safety instructions

The following safety instructions must always be adhered to. Also pay attention to other warnings that may be found in association with each instruction:

WARNING!
Exercise caution if the engine/clutch must be test run without the belt guard being mounted. Avoid high revs and do not lean over the clutch.

WARNING!
Never stand in front of the snowmobile when the engine is started.

WARNING!
Never rev the engine if someone is standing in front of the snowmobile.

WARNING!
The clutch's shifting motor intermittently works with a great deal of power. Never touch moving parts when the ignition is on or the snowmobile's engine is running.

2.4 Safety features

2.4.1 Belt guard

Unless otherwise stated, the snowmobile's ordinary belt guard can be used as protection from moving parts on the pivario V1 clutch. If this is not effective for any reason, suitable protection must be mounted. If necessary, contact Pivario AB.

3 Preparations

Some disassembly and minor modifications to the snowmobile are necessary before installation of the new clutch can begin. The following section briefly describes all the necessary actions. For a detailed disassembly description, also see the exploded views or the snowmobile's maintenance handbook (not included in the delivery from Pivario AB).

3.1 Disassembling the original clutch

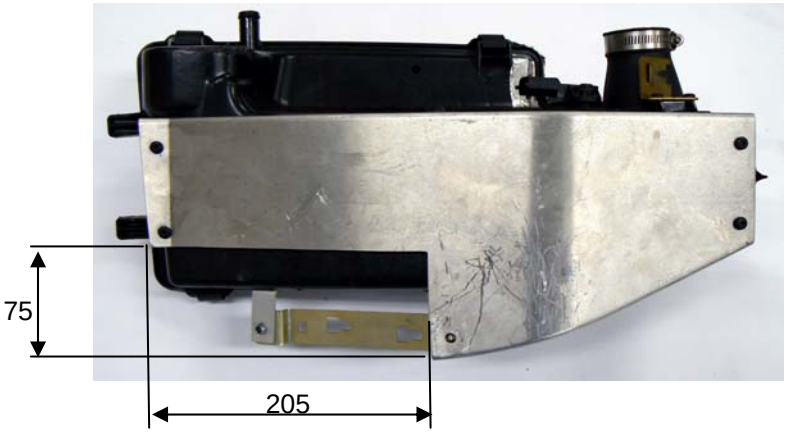
The original primary clutch should be disassembled from the engine's crankshaft journal.

IMPORTANT! Use an original puller that is adapted for disassembly of the primary clutch. Use of other tools may damage both the clutch and the crankshaft journal.

3.2 Opening in protective panel

In order to make room for the clutch you have to make an opening in the protective panel below the air filter.

1. Remove the air filter box from the snowmobile.
2. Remove the protective panel below the box.
3. Make an opening in the panel according to the picture below:



4. Replace the protective panel.

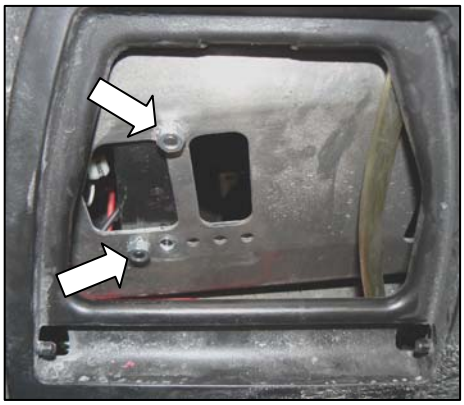
5. Screw the accompanying bracket to the filter box and paneling as shown in the picture:

6. Replace the air filter box.

3.3 Attachment for the secondary sensor

A separate attachment must be installed for the secondary sensor. The attachment is mounted on the aluminum sheeting in front of/above the left footrest.

1. Measure the distance between the holes on the attachment.
2. Then drill a new hole (Ø 8.5 mm) at the measured distance from the existing holes in the aluminum sheeting.
3. Mount the attachment in the holes in accordance with the pictures below. Note toothed locking washers below the nuts.



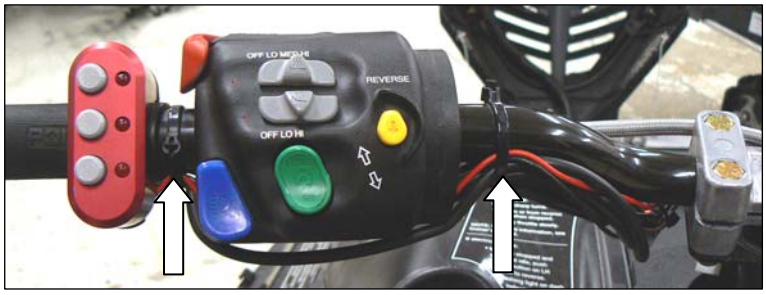
4 Installation

IMPORTANT! Disconnect the battery's negative pole before beginning installation.

NOTE Installation is easiest if it is carried out in the order described. I.e. finish the installation with mounting and connecting the actual clutch unit.

4.1 Control panel

The control panel should be placed on the left handlebar. The buttons should be easily reached using the thumb, without needing to release your hand from the handlebar.



Install the control panel in the following way:

1. Place the semi-circular insert in the control panel and place it on the handlebar. Screw it loosely around the handlebar with the accompanying spring clamp.

IMPORTANT! Check that the handbrake handle and parking brake lever can be used without them colliding with the control panel.

2. Adjust the panel until it is in the right position. Make sure that no cables are trapped. The cables should pass through the opening in the spring clamp.
3. Tighten the screws alternately.
4. Remove the casing around the handlebar.
5. Lead the cables from the panel along the handlebar. Clip the cables around the handlebar and the existing cabling. See the above picture.
6. Check that the cables can move freely for the full range of handlebar movement.

4.2 Cables

IMPORTANT! Cable placement and connection has been thoroughly tested by Pivario AB. For the guarantee to apply, the cables must be installed and connected according to these instructions.

4.2.1 Cable for sensing “ignition on”

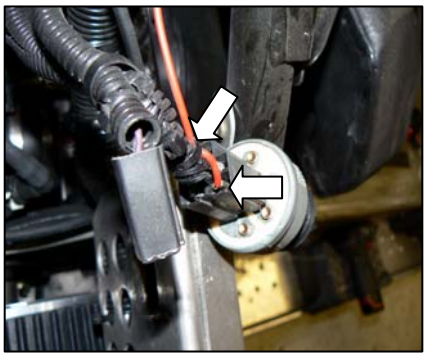
IMPORTANT! This stage requires that the snowmobile’s electrical diagram is available. The cable colors shown on the pictures may differ between different snowmobile models!

The red cable from the control panel should be connected to the snowmobile’s electrical system to send the “ignition on” signal to the clutch’s control unit. Use a test instrument to find the right cable.

IMPORTANT! The clutch’s control panel and control system should only be live when the snowmobile’s ignition is on.

Connect the cable in the following way:

1. Loosen the ignition switch from the plastic casing.
2. Use a test instrument to check that there is current in the free plug in the ignition switch when the ignition is turned on.
3. Mount cable clips on the red cable from the control panel, and connect it to the free plug, straight to the ignition switch’s connector.



IMPORTANT! Use proper cable clip pliers when mounting cable clips and slicing sleeves. Use the accompanying splicing sleeves. These

contain melt adhesive and provide tension deloading after completed assembly.

4.2.2 Cable for sensing “throttle position” (TPS)

IMPORTANT! This stage requires that the snowmobile’s electrical diagram is available. The cable colors shown on the pictures may differ between different snowmobile models!

The black cable from the control panel should be connected to the sensor on the snowmobile that registers how open the throttle is (current throttle position). A certain amount of disassembly is necessary in order to reach the TPS cable. The cable is accessible inside the left footrest.

IMPORTANT! The cabling to the TPS sensor normally contains three cables. The connection should be made to the cable in which voltage varies when opening the throttle (normally 0 – 5 Volt).

1. Remove the seat and move the tank slightly to the right.
2. Localize the cabling and connector that includes the TPS cable, see the picture below.
3. Localize the correct cable by turning on the ignition, opening the throttle as wide as possible and measuring the voltage on the TPS sensor’s cable connectors in the connector. The voltage should vary on opening the throttle.
   NOTE! In some cases the motor must also be started in order for the TPS sensor to send a signal.
   (In this case it is the green cable in the cabling).
4. Disconnect the connector to allow better access and cut off the cable about 5 cm from the fixed contact.

IMPORTANT! Use proper cable clip pliers when mounting cable clips and slicing sleeves. Use the accompanying splicing sleeves. These contain melt adhesive and provide tension deloading after completed assembly.

5. Splice the cable together again using the accompanying splicing sleeve, along with the black cable from the control panel.

6. Heat the splicing sleeve with a hot air gun to protect the branching. Clip the cable in the cable trunk.

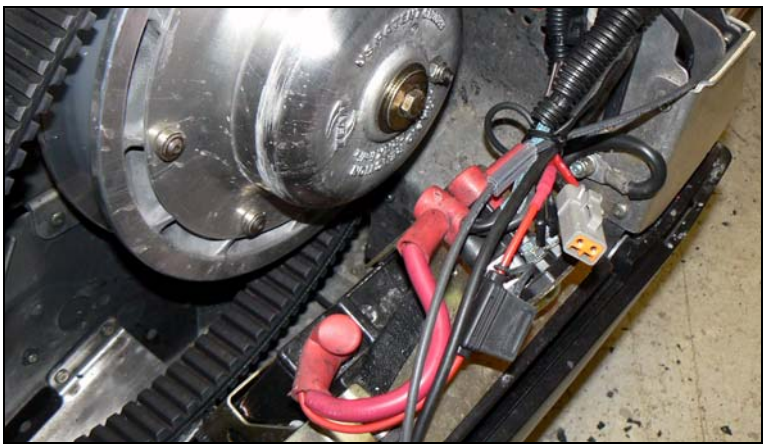
4.2.3 Cables for voltage measurement

Cables for voltage measurement should be connected from the clutch unit to the battery's positive and negative poles.

The cables, including the main fuse, are included in the delivery from Pivario AB.

Here it is possible to connect straight to the poles on the battery. The battery is located next to the clutch on the left side.

1. Remove the protective covers on the battery poles and screw on the cables along with the existing cable clips for the battery poles.



IMPORTANT! Make sure that the cables do not come into contact with hot surfaces or sharp edges.

2. Run the cables backwards and attach them in suitable places using bundling ties.

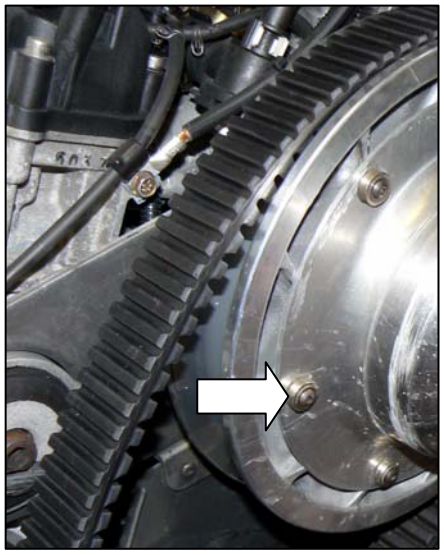
3. Bundle and place spare cable lengths inside the covering bars, above the left footrest.

4. Pull back the connector and place it close to the battery. See previous picture above.

4.3 Magnets on the secondary clutch

IMPORTANT! The magnets have a “north pole” and a “south pole.” When mounting them they should face in alternate directions, so that every other magnet has its “north pole” turned outwards.

The magnets must be mounted on the secondary clutch so that the control unit is able to register the clutch’s rpm. Mount the magnets with the accompanying screws in the clutch’s pre-threaded holes. NOTE! The screws should be locked with screwlock, type “hard” (Permabond 1046 green or similar).



4.4 Secondary sensor

The sensor that registers the rotation speed of the secondary clutch should be mounted on a separate attachment as follows:

1. Disassemble the secondary sensor from the clutch unit.

2. Mount the sensor in the separate spring clamp and adjust the distance to the magnets on the secondary clutch (about 30 mm).

4.5 Clutch unit

The clutch unit is delivered complete from Pivario AB, so that installation should be quick and easy.

Install the clutch unit in the following way:

1. Make sure the crankshaft journal is undamaged, clean and dry.

2. Carefully push the clutch unit on the crankshaft journal.

3. Place the two washers on the central screw. Note that the spring washer is to be closest to the head of the screw and that the collar of the large washer is to be turned towards the clutch.

IMPORTANT! Do **not** use the original central screw to mount the pivario V1 clutch.

4. Mount the central screw. Hold central housing with the hook wrench (included in the workshop kit). There are predrilled holes in the housing outside the outer drive pulley.

5. Tighten using moments according to the snowmobile's maintenance handbook.

6. Rotate the clutch up to the desired position and check that no moving parts come into contact with the clutch or cables.

4.5.1 Rear attachment for clutch

The pivario V1 clutch is primarily hung on the crankshaft journal, but the rear end (shift housing) should also be anchored to the snowmobile's chassis via a flexible attachment.

1. Mount the attachment on the attachment for the secondary sensor according to the following picture. NB washer under the head of the screw. Use locking fluid/screwlock, type "strong."

2. Rotate the clutch unit up the desired position.

3. Press the rear attachment onto the ball found on the rear end of the shifting motor.

4. Check carefully that the V1 clutch does not come into contact with the secondary clutch.

4.5.2 Electrical connections

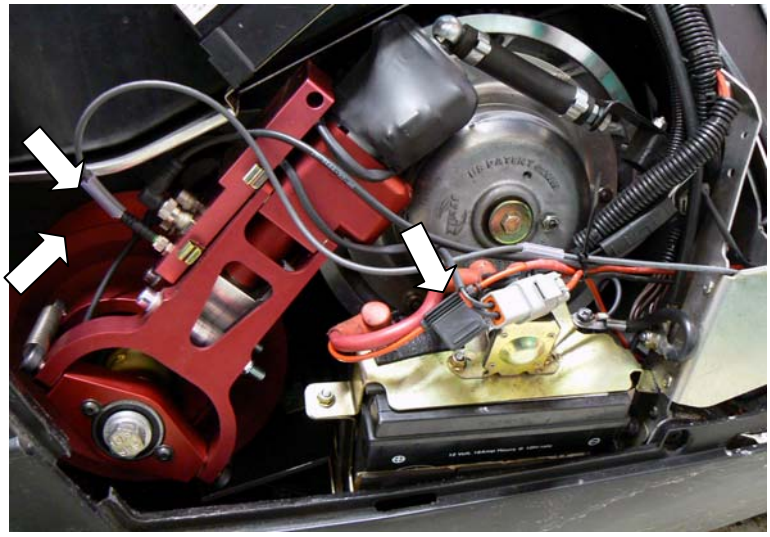
1. Connect the black cable/contact from the control panel to the control unit's connector marked "Panel".

2. Connect the red and black cables on the clutch unit to the cabling from the battery (connector).

3. Connect the secondary sensor with the accompanying extension cable to the control unit's outer sensor contact.

IMPORTANT! Make sure that no cables can come into contact with the secondary clutch.

4. Attach the cables where appropriate so that they cannot come into contact with moving parts.



5 Calibration and adaptation of control program

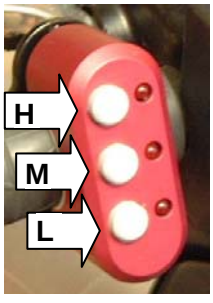
5.1 Requirements

On delivery from Pivario AB the clutch's control unit normally contains a basic program and a basic range of control parameters. When you know the snowmobile (make and model) on which the clutch is to be installed, certain control parameters should be adjusted. For this you will need a configuration unit + cable. These are not part of the clutch delivery from Pivario AB; they should be ordered separately:

Component		Description	Article number
1	Configuration unit	Incl. connection cable	

5.2 Calibration

When the clutch has been completely installed you must carry out the following calibrations before test driving the snowmobile. These can be carried out without external equipment with the help of the control panel on the handlebar.



NOTE: The LEDs on the control panel are never continuously lit, instead they blink rapidly. This is absolutely normal and means that they are easier to read in bright light.

In general, the buttons are used as follows when calibrating:

- **H+L** are used to preselect the calibration mode.
- **H** and **L** are used to choose the type of calibration, and to increase/reduce the value or setting.
- **M** is used to activate and confirm a calibration.

The relevant calibrations are described in detail below.

NOTE: You can terminate a calibration procedure at any time by turning off the ignition. No new settings will be saved and the clutch will work as before.

5.2.1 Engagement calibration and function test

WARNING! The engagement calibration and function test must be carried out before the snowmobile is started for the first time after the clutch is installed.

WARNING! Do not start the motor. For safety reasons, this calibration must be carried out with an immobile clutch.

The belt guard must be removed when calibration is carried out so that the clutch's movements can be observed.

The clutch's engagement position is calibrated in the following manner:

1. Check that the drive belt is load-free in the primary clutch, and that the secondary clutch completely compressed.
2. Turn on the ignition.
3. Press and hold down both the **H**+**L** buttons until the **M**+**L** LEDs blink (about 5 seconds).
4. Watch the clutch during this operation!
   Press and hold down the **M** button. The drive pulley is now in the initial position.
5. Watch the clutch during this operation!
   Continue to hold down the M button. At the same time, press the:
   - **H** button to move the drive pulley towards the belt
   - **L** button to move the drive pulley away from the belt.
6. Continue to hold down the **M** button and check that the drive pulleys are precisely positioned against the belt. It should be possible to move the belt, but it should not be loose between the drive pulleys.
   Make any necessary adjustments using the **H** and **L** buttons.
7. Release the **M** button. The new engagement position is now saved, at the same time as the control program returns to the driving mode.

NOTE: If all three LEDs blink for a moment when the **M** button is released, a fault has occurred during calibration. In this case the calibration will not be saved.

5.2.2 TPS calibration

WARNING! The snowmobile is started during this calibration. Connect an exhaust extractor or perform this calibration outdoors.

WARNING! Replace the belt guard before starting the motor.

WARNING! Make sure that no-one is standing in front of the snowmobile before starting the engine.

The throttle's position is calibrated using the control panel in the following manner:

1. Start the snowmobile and let it run until it has warmed up and is ready to use.

2. Release the accelerator entirely and let the snowmobile idle.

3. Press and hold down both the **H**+**L** buttons until the **M**+**L** LEDs blink (about 5 seconds).

4. Press the **H** button to shift to TPS calibration. Now the **M**+**H** LEDs should blink.

5. Hold the snowmobile's brake in or put the parking brake on during this operation!
   Press and hold down the **M** button, and then completely open the throttle for a moment. The release the throttle entirely.

6. Release the **M** button and allow the motor to return to idling rpms.

The TPS calibration is complete when the diodes stop flashing (about 2 sec.). This calibration should normally only be carried out once, in association with the first startup.

NOTE: If all three LEDs blink for a moment when the M button is released, a fault has occurred during calibration. In this case the calibration will not be saved.

5.3 Parameter settings

Some control parameters should always be adjusted to suit the snowmobile. Pivario AB continually tests pivario V1 on new models and can help with the appropriate parameter values.

The descriptions below apply to basic adaptations that should ALWAYS be done in order to get the right drive characteristics for each snowmobile model.

It is possible to make further adjustments to obtain drive modes and gear ratio characteristics that are personally adjusted or optimized for special purposes. More information about this is available in a separate *Configuration Manual*. Please contact Pivario AB for more information.

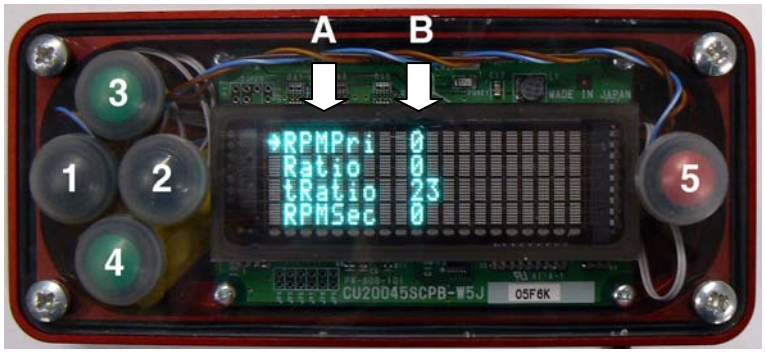
5.3.1 Preparations

IMPORTANT! Make sure that the battery is fully charged and working properly.

1. Remove the protective cover on the control unit's screwed connection marked "Data."
2. Connect the configuration unit to the control unit's connector marked "Data."
3. Turn the snowmobile's ignition key to activate the clutch's control unit and the configuration unit.

5.3.2 Using the configuration unit

A short description of how to use the configuration unit follows:



Button/Display Field		Description
1	“left”	Select menu/ Navigate one row to the left
2	”right”	Select menu/ Navigate one row to the right
3	”up”	Navigate upwards between the rows
4	”down”	Navigate downwards between the rows
5	”enter”	Select and confirm parameter value
A	Parameter name	
B	Parameter value	

- Choose menu (view) with the buttons **1** and **2**:
  - ”View 1” – Present values that change during driving
  - ”View 2” – Log values for evaluation/troubleshooting
  - ”View 3” – Parameter values independent of drive mode
  - ”View 4” – Parameter values for each drive mode (**L**,**M**,**H**)
- Navigate up/down in the parameter lists using buttons **3** and **4**.
- Select the marked value by quickly pressing button **5**.
- Move the marker right/left in the window with buttons **1** and **2**.
- Increase/reduce the marked value figure with buttons **3** and **4**.
- Press button **5** to transfer the adjusted parameter value to the control unit (save).
- Use the control panel on the handle bar to change between parameter values for each driving mode in “View 4.”

5.3.3 Checking the control program version

To make sure that the right parameters have been installed you must first check which program version the control unit contains. This is done using the configuration unit.

Shortly after the ignition is turned on, the control unit's program version is shown in the display window for 5-10 seconds, before switching to "View 1."

IMPORTANT! The updated control program may contain adjust parameter values. Always ensure the current parameter values are used. Check the information about the program version and publication date on the information sheet. If there are any uncertainties, please contact Pivario AB.

5.3.4 Entering parameter values

The parameters that should be adjusted are described in a separate information sheet for each make/model.

IMPORTANT! Only the parameter values stated on the information sheet should be changed.

Follow the instructions in the section *Using the configuration unit* to change and transfer adjusted values to the control unit. Note that a value must be saved/transferred before the next value can be changed.

6 Test driving

6.1 The first test drive

After completed installation and calibration, the snowmobile should be test driven with the new pivario V1 clutch. Test driving SHALL be carried out before the snowmobile is transferred to the end customer.

NOTE: The pivario V1 clutch results in the snowmobile partly having different drive characteristics. Engagement rpm, gear ratio characteristics, and disengagement rpm may differ from the same snowmobile with a standard clutch.

For maneuvering and using the clutch's control panel, see the *User Manual*.

1. Start the snowmobile and warm up the engine according to the snowmobile's instructions.

2. Test drive the snowmobile with a light load. Start with drive mode **L** and then change to **M** and **H** while driving.
   The clutch should react immediately when the drive mode is changed. Also check that the right LED on the control panel is activated (blinking).

3. Release the gas and allow the snowmobile to "roll" on a hard flat surface until it is standing still. Check that the snowmobile is standing still and that the engine is running unstressed at the normal idling rpm.

6.2 Test the crawl function

The crawl function works regardless of the current driving mode.

1. Dive the snowmobile at an even speed. Press and hold down one of the buttons **L**, **M** or **H**.

2. Now check that after 1 second the clutch successively gears down to the lowest gear ratio and locks itself there.

3. Release the accelerator. The clutch should now NOT disengage; instead you should be able to crawl at the lowest possible speed as far as the motor can take you.

6.3 Test the freeze function

You can prevent the clutch engaging by using the freeze function. Test this in the following way:

1. Start the engine and let it idle.
2. Press and hold down one of the buttons **L**, **M** or **H**.
3. Successively increase the motor's rpm. The snowmobile should remain still regardless of how far the throttle is opened.

6.4 Troubleshooting

If disturbances or abnormal functioning occurs during the test drive, you should initially check the cabling for the clutch installation and connections to the snowmobile's electrical system.

- For faults and problems that can be due to hardware (clutch, sensor and cabling), see the *Troubleshooting* section in the *User Manual*.
- If abnormal functioning remains after measures have been taken according to the User Manual, it is probably connected to the control program/parameter values:
  - check that the parameter values for the right snowmobile model are uploaded.
  - Read the *Configuration Manual* for more information.

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