

SIPP Node 5000

Safe Indication of Petroleum Products

Manual – English version

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1 Introduction to SIPP - Secure Indication of Petroleum Products

Beneath a field power transformer there is an oil catch pit, used in case of a transformer breakdown followed by heavy leakage of cooling oil. The pit secures the leaked oil and protects the surrounding environment. For the pit to retain function, it must be emptied regularly in an environmentally safe manor.

In a best case scenario, the pit only contains clean water from rain and snow melting. But due to impact from temperature, changes which cause minor leaks, and/or spill during maintenance the pit can also contain cooling oil.

In the past the decision to empty a pit or not was left to the service operator, who performed an ocular survey. To detect oil content as low as a few ppm with your bare eyes is, needless to say, very difficult, if not impossible.

The statutory requirements of self-monitoring demand that each discharge of water from a contaminated environment needs to be measured, documented and archived with best available technology. To reach a quality assured process with full traceability, every discharge should generate a protocol.

The product SIPP Node consists of a bilge pump and a device for continuous measuring of oil concentration in flowing water. SIPP Node discharges clean water (i.e. water with an oil content under the set limit) and returns water containing a higher level to the transformer pit. The unit monitors the discharge process and creates a protocol, then uploads it automatically for safe storage and traceability to our internet based interface SIPP Warehouse.

By draining water through a SIPP product the statutory requirements of self-monitoring are fulfilled regarding measuring, documenting and archiving.

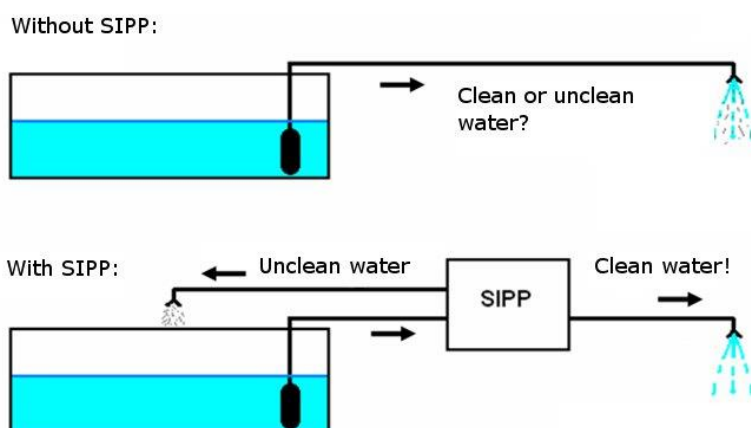


Figure 1. Schematic picture of discharge with and without SIPP Node

2 System overview

2.1 Description

SIPP Node is a fixed installed product used for fully automatic, environmentally safe and quality assured discharge of water in transformer pits.

With the latest measuring technology and an active, continuous monitoring and logging function the complete discharge is environmentally ensured. The system automatically generates a complete protocol in the internet based service SIPP Warehouse which gives each discharge full traceability.

2.2 Construction and functionality

All SIPP products comprise the following:

Control electronics	Contains software to connect and communicate via GPRS/3G. The electronics control the system's other components and report the status to the web interface via GPRS/3G.
Pump	The pump(s) ensure that water is pumped from the pit and through the measuring cell. It is important to choose the correct type of pump to meet the requirements for the installation site. Important parameters are the pump's suction height, capacity and working temperature.
Filter	The filter disperses the oil in the water. For dirty pits or pits with a so-called sump, an external pre-filter can be installed. However, a SIPP product is not designed to clean water from oil but to verify that the water pumped out of a pit is clean.
Measuring cell	The measuring cell measures the oil content of the water continuously with an measuring range of 0 to 20 ppm.
Flow meter	The flowmeter ensures that there is a flow through the measuring cell during the discharge.
Valves	The valves' main task is to ensure that clean water is pumped out of the pit and oily water is returned to the pit.

See appendix II for an overview of the SIPP Node 5000 parts.

3 Operation – stationary unit for draining transformer pits

3.1 Start up

As soon as the SIPP Node 5000 gets powered the unit initiates connection to SIPP Warehouse. When connection is established SIPP Node 5000 enters standby mode.

On the controlunit the status of the SIPP Node 5000 is indicated with 5 diodes:

Alarm	Red
Resting	Yellow
OK	Green
Communication	Yellow
Power	Green

3.2 Standby

In standby mode, SIPP Node 5000 continuously measures the water level of the pit. As long as measured level is lower than the preset start level, SIPP Node 5000 stays in standby mode. The unit reports status information in a so-called heartbeat every hour to the web interface.

3.3 Discharge

The unit starts discharging when the water level in the pit rises above a pre-set starting level and if:

- The unit has contact with the web interface
- The temperature is 3-25°C
- The unit is in standby

Note : *If the temperature has been below 0 ° C continuously for more than 24 hours , the unit will be suspended until the temperature has been continuously above 0 ° C for at least 72h . A device that measures a temperature outside the acceptable range will report the status HIBERNATION .*

At each discharge, first a flow control is done thereafter all valves are tested for function and leakage. If the unit detects oily water during the discharge process, the valves will switch mode so that the oily water is returned to the pit. A leakage test is carried out at each switching.

During the discharge process the web interface is continually updated to always show the latest information about level and status of the unit.

The discharge ends if:

- The pit is empty of water/water level is below the stop level
- The water is too dirty
- Low flow
- Leakage test is not approved
- Unknown cause

3.4 Alarms

At each discharge a functional test is performed. If any of the tests fails the unit shows the reason on the display. The SIPP Node 5000 tries to start a discharge up to three times before it enters alarm mode. When the unit is in alarm mode the red led on the overlay is lit. The unit needs to be restarted by switching the main power supply off or a remote reset needs to be sent by managed service to enter standby mode again.

3.5 SIPP Protocols

When SIPP Node starts a discharge, data regarding start time and date is stored. It also stores information about the identity of the SIPP and identity information for the station and pit. The entire

discharge process is then logged with minute resolution. SIPP Node takes measurements for ppm, flow and level every second. A log position for ppm is calculated as a mean value for the past 60 samples for ppm, which means that each point in the ppm-graph is the mean value for 1 minute. If SIPP detects ppm over preset limit value and changes valve position, this moment is stored as a log position. SIPP Node also calculates a number of key figures for the discharge such as amount of discharged water, average ppm for the water that was discharge from the pit, maximum measured ppm-value and more.

When a discharge is ended, SIPP Node automatically connects to SIPP Warehouse and delivers the generated log file. Also, if present, undelivered log files from previous discharges are delivered. If no connection is available, the log file is stored internally until next time internet connection is available.

4 Basic Service and support agreement

A Basic Service and Support agreement is signed by the buyer of the SIPP Node Standard unit with Industriarmatur (IA).

The following services are included in the agreement:

- Access to the SIPP Warehouse for one (1) user.
- Alarm management and notification via email.
 - Alarm controlled and managed remotely normally within 72h.
 - If maintenance or service work is needed notifications are sent out.
- Storage of protocols with full traceability for five years.
- Telephone support during office hours.

5 IA Warehouse

IA Warehouse is a web based administration tool for the information related to environmentally safe discharge with SIPP products.

The system is connected to the GSM network for wireless communication with SIPP products and to the internet for easy user access.

SIPP Node connects to the system to exchange information, set time and deliver log files. The result of a discharge is accessed via the internet directly after performed discharge.

The address to the web interface is:

<https://swh.industriarmatur.se>

or

<http://www.industriarmatur.se/> and click on IA Warehouse login

All customers get their own login to their connected products. Trained service technicians get their own login to those products the service technician is responsible for.

For more information and instructions, see SIPP Warehouse Manual on the web interface.

6 Maintenance

6.1 General



Industriarmatur cannot be held responsible for any damages on the unit due to incorrect use or if no maintenance has been carried out on the unit. Before performing service on the unit, the voltage cable must be unplugged to prevent the user from the risk of getting in contact with live conductors. Only authorised personnel are allowed to open the unit's electronic device.

The maintenance for the SIPP Node 5000 should be done on a yearly basis.

We also recommend that the condition of the unit and pit is controlled at each inspection of the station and documented according to appendix I.

Changing filter and replacing the oil cell can be carried out by any service personnel that are familiar with this manual.

Important!

After changing filter or replacing the measuring cell these actions MUST be registered in SIPP Warehouse!

Registration of filter replacement and calibration of the measuring cell as well as manual start and reset of the device can be done by:

- 1. Scan unit QR code, enter the access code and then follow the instructions.**
- 2. Contact support via SMS, telephone or email**

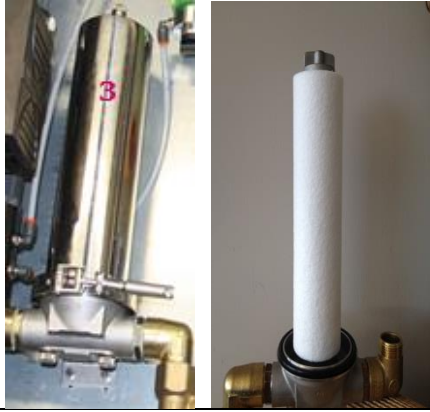


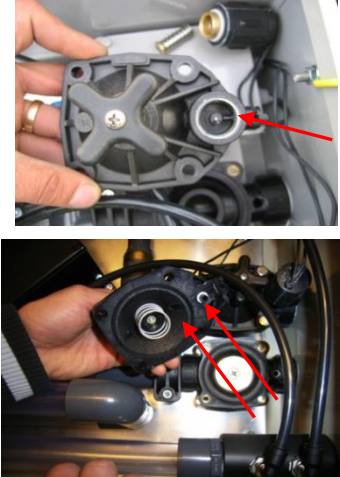
All other types of service work must be carried out by trained service technicians.

Only spare parts from IA may be used for the service work.

6.2 Recommended service intervals

<i>Part</i>	<i>Article number</i>	<i>Required tools</i>	<i>Recommended service interval</i>
Measuring cell	680001	Allen screwdriver 4mm	Once a year or after 900m ² of discharged water
Filter unit	501110		Once a year or after 250m ² of discharged water
Particle filter on pump			On demand
Solenoid valves		Included tool	On demand

6.3 Maintenance description for each part

Part	Picture	Description
<p>Filter unit</p>		<p>Filter change</p> <p>Open the filter unit by losen the compression clamp. Lift up the filterholder and the filter will be visible. Losen the nut at the top and replace the filter. Tighten the nut, put the filterholder back in place and close the filterholder with the compression clamp.</p>
<p>Oil cell</p>		<p>Exchange of oil cell</p> <p>Disconnect the two grey hoses and the electrical connector M12. Use the 4 mm allen screwdriver to remove the two screws holding the oil cell.</p> <p>Replace the oil cell with a factory calibrated oil cell. When reconnecting the grey hoses make sure that they are pushed all the way to the bottom of the connector to avoid leakage.</p>
<p>Particle filter on pump</p>		<p>Clean the particle filter</p> <p>Lift up the pump from the pit. Unscrew the filter lid and clean in flowing water. When remounting, make sure lid is tightened to avoid leakage.</p> <p><i>Under no circumstances may the equipment be used without this filter since it will cause major damage to the equipment and void the warranty.</i></p>
<p>Solenoid valve</p>		<p>Clean solenoid valve</p> <p>Unscrew the valve with the included tool. Clean the area between coil and solenoid body.</p> <p>Demount the membrane and clean it. Also clean the pipes marked with red arrows.</p> <p>There is a small O-ring at the right arrow, make sure that it is in place when mounting the valve back together.</p>

7 Troubleshooting

7.1 *Too low flow*

The discharge is ended because of too low flow.

- Verify that the unit is filled up with water at start up.
 - Verify that the pump is working
 - Clean pump particle filter on the pump
- Verify that water is coming out of the red marked hose at startup.
 - Verify that the solenoid valve is open.
 - Clean the solenoid valve.
- Examine the flowmeter and its connector

7.2 *Leakage test*

Discharge ended because of failed leakage test. The leakage could be at one of the solenoid valves, vacuum valve or a hose connected to the oil cell. Locate the leakage by checking where water comes out during leakage test. Commonly, the leakage is at one of the solenoid valves. Clean the valves.

7.3 *PPM above threshold value*

The discharge is ended 2 minutes after startup. Usually there is oil in the water; 5ppm is one teaspoon in one kbm of water.

- Check the status of the pit, the water should be clear. Water that is colored by for example dust or sand cannot be properly evaluated by the measuring cell. Install a prefilter to solve the problem. Contact Industriarmatur for support.
- Check the status of the filter.

7.4 *Pump does not start*

If the SIPP Node does not start, make sure that the SIPP Node 5000 is connected to the main power and that **all** start criteria are met.

8 Technical specification

8.1 General data

Table 1. Specification for SIPP Node 5000

Parameter	Specification
Power supply	230 V, 50/60 Hz, 16 A
Protection class	IP 56
Type approvals	CE
Pump capacity	5 m ³ /h
Capacity heater	400 W
Temperature range <i>operating</i>	3-25°C
Temperature range <i>storage</i>	-20 to +60°C
Weight	60 kg
Dimensions	760x760x300 mm

8.2 SIPP Oil Cell

Table 2. Specification for SIPP Oil Cell

Parameter	Specification
Measuring range	0 - 20 ppm
Resolution	0.1 ppm
Accuracy	±1ppm
Response time	<5 sec
Communication	RS232
Relative temperature	1 - 60°C
Water temperature	1 - 60°C
Sampling flow	0.5 - 4.0 litre / min
Water pressure	0.1 bar - 6 bar
Power supply	9 VDC
Protection class	IP 56

9 Warranty

Industriarmatur Sweden AB gives 12 months warranty for production and material faults if such fault is given to Industriarmatur Sweden AB within 12 months from delivery. Faults caused by wrong handling and maintenance or over voltages are not included in warranty.

Unit claimed for warranty should be sent to Industriarmatur Sweden AB after contacting support. Customer stands risk and transport cost. Industriarmatur Sweden AB stands risk and cost for transport back to customer. For service outside warranty freight is invoiced.

For a warranty action to apply the installation should be done according to the Industriarmatur guidelines and the Basic Service and Support Agreement should be signed for the specific installation. Maintenance should be carried out in accordance with this manual and other instructions from Industriarmatur.

10 Support

Industriarmatur Sweden AB
Kämpegatan 16
411 04 Göteborg
SWEDEN

Phone: +46 31 80 95 50

E-mail: support@industriarmatur.se

Web: www.industriarmatur.se

11 Appendix I - Inspection protocol

Unit ID:	
Date:	

1. Visual control

Unit dry inside <input type="checkbox"/>		Unit wet inside	<input type="checkbox"/>
Return hose	Pass <input type="checkbox"/>	Fail	<input type="checkbox"/>
<i>Not clamped or damaged, fitted with proper inclination and outlet in pit</i>			
Clean water hose	Pass <input type="checkbox"/>	Fail	<input type="checkbox"/>
<i>Not clamped or damaged, fitted with proper inclination and outlet outside pit</i>			

Action plan:

Unit wet inside Contact your support.
Hose examination failed Contact your support.

2. Check and classify the filter status.

Filter clean <input type="checkbox"/>	Filter dirty <input type="checkbox"/>
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Action plan:

Filter dirty Contact your support for approval of a filter change.

3. Check and classify pit status.

Pit clean <input type="checkbox"/>	Cleaning necessary <input type="checkbox"/>
Algae in the water <input type="checkbox"/>	Oil on surface <input type="checkbox"/>
Ice on surface <input type="checkbox"/>	Pit bottom frozen <input type="checkbox"/>

Comment/Action:

4. Check the water level in the pit.

Measured water level in mm	
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Action plan:

Water level over 300mm Contact your support.

5. If required, filter replacement and calibration of the measuring cell through exchange.

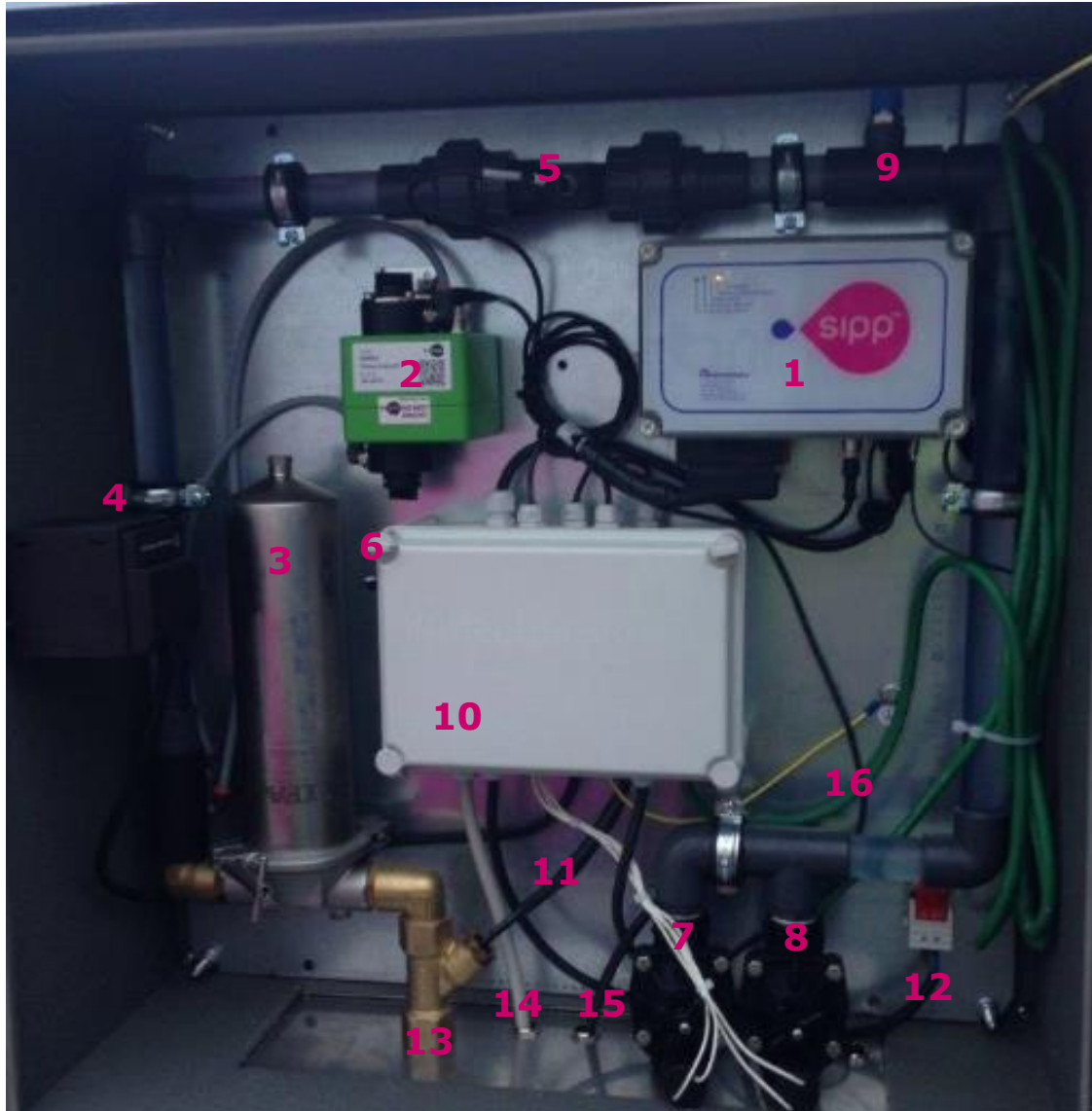
Filter exchange registered	<input type="checkbox"/>
Calibration of measuring cell registered	<input type="checkbox"/>
Unit started manually and discharged through clean water hose	<input type="checkbox"/>

Important!

Registration of filter replacement and calibration of the measuring cell as well as manual start and reset of the device can be done by:

1. Scan unit QR code, enter the access code and then follow the instructions.
2. Contact support via SMS, telephone or email

12 Appendix II - Parts SIPP Node 5000



Appendix II Parts SIPP Node 5000

1. **Control unit**
2. **Oil cell**
3. **Filter unit**
4. **Heater**
5. **Flowmeter**
6. **Main switch**
7. **Solenoid valve return**
8. **Solenoid valve outlet**
9. **Vacuum valve**
10. **Connection box**
11. **Heater cable**
12. **Thermostat**
13. **Inlet flow from pump**
14. **Main power**
15. **Power supply pump**
16. **Level sensor**