

# **SIPP Node 500**

**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.

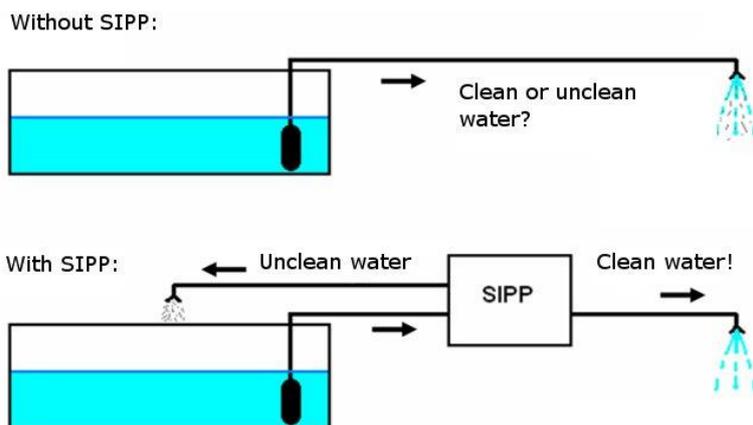


Figure 1. Schematic picture of discharge with and without SIPP Node

## 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, this gives each discharge full traceability.

### 2.2 Construction and functionality

All SIPP products comprise the following:

|                            |   |
|----------------------------|---|
| <b>Control electronics</b> | 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.   |
| <b>Pump</b>                | 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. |
| <b>Filter</b>              | 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.                      |
| <b>Measuring cell</b>      | The measuring cell measures the oil content of the water continuously with an measuring range of 0 to 20 ppm.   |
| <b>Flow meter</b>          | The flowmeter ensures that there is a flow through the measuring cell during the discharge.   |
| <b>Valves</b>              | 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 I for an overview of the SIPP Node 500 parts.

## 3 Operation – stationary unit for draining transformer pits

### 3.1 Start up

As soon as the SIPP Node 500 gets powered the unit initiates connection to IA Warehouse. When connection is established SIPP Node 500 enters standby mode.

Diodes on the electronic box indicated the device status:

|                      |               |
|----------------------|---------------|
| <b>Alarm</b>         | <b>Red</b>    |
| <b>Resting</b>       | <b>Yellow</b> |
| <b>OK</b>            | <b>Green</b>  |
| <b>Communication</b> | <b>Yellow</b> |
| <b>Power</b>         | <b>Green</b>  |

### 3.2 Standby

In standby mode, SIPP Node 500 continuously measures the water level of the pit. As long as measured level is lower than the preset start level, SIPP Node 500 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, a flow control is done and 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 Purge

Each discharge ends with a process to drain the system from water. During purge the mainpump uses air to push all remaining water through the system to.

The unit purge at:

- The end of each discharge
- Two hours after each discharge
- Hard reset (unit loose main power supply)
- Soft reset (the command RESET is sent to the unit)
- Every 24h

**Note :** *If the device after a hard or soft reset meet the requirements to start a discharge that is done instead of purge .*

### 3.5 Alarms

At each discharge a functional test is performed. The SIPP Node 500 tries to start a discharge up to three times before it enters alarm mode. An alarm can be acknowledged by switching the main power supply off or a soft reset.

### 3.6 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.

### 3.7 Heater

SIPP Node 500 has a 400W heater fitted. The heater is primarily intended to protect the electronics against too cold temperatures. The heater has a thermostat that activates the heater at +5grader and shuts off the heater at +15grader. The capacity of the heater is dimensioned so that the cabinet should be kept frost-free down to an ambient temperature of -40grader.

**Note:** *The unit temperature sensor presented in IA warehouse, that is used to determine if the start criterion is fulfilled, hangs outside the cabinet and measures the ambient temperature.*

## 4 Basic Service and support agreement

A "Basic Service and Support agreement" is signed by the buyer and 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 500 should be done on a regular basis.

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

Changing filter and replacing the measuring 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 IA 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 maintenance intervals

| <i>Part</i>           | <i>Article number</i> | <i>Required tools</i>  | <i>Recommended service interval</i>  |
|-----------------------|-----------------------|------------------------|--|
| <b>Measuring cell</b> | 680001                | Allen screwdriver 4 mm | After 250 m <sup>3</sup> of discharged water or 4 years after commissioning. |
| <b>Filter unit</b>    | 665201                |                        | After 50 m <sup>3</sup> of discharged water or 2 years                       |

6.3 Maintenance description for each part

| Part                      | Picture  | Description   |
|---------------------------|--|---|
| <p><b>Filter unit</b></p> |   | <p><b>Filter change</b></p> <p>Push the upper part on top of the black connector and the filter and remove the gray angled connectors. Remove the filter from the holder by pulling outwards. Attache the new filter in the holder.</p> <p><b>Check the flow direction - arrows should be pointing downwards!</b></p> <p>See appendix III and IV for a more detailed description.</p>   |
| <p><b>Oil cell</b></p>    |  | <p><b>Exchange of measuring cell</b></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>See appendix V for a more detailed description.</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 both pumps are working at startup.
  - Clean the hoses and the pump located in the water.
- Verify that water is coming out of the grey and red hose at startup.
  - Locate where the water is stopped and clean.
- Examine the flowmeter and its connector.

### 7.2 *Leakage test*

Discharge ended because of failed leakage test. Locate the leakage by checking where water comes out during leakage test. Commonly, the leakage is at one of the solenoid valves or a hose that is not firmly connected.

### 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 400 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 500**

| Parameter                   | Specification        |
|-----------------------------|----------------------|
| Power supply                | 230 V, 50/60 Hz, 16A |
| Protection class            | IP 56                |
| Type approvals              | CE                   |
| Pump capacity               | 5 l/min              |
| Capacity heater             | 400W                 |
| Temperature range operating | 3-25°C               |
| Temperature range storage   | -20 to +60°C         |
| Weight                      | 18 kg                |
| Dimensions                  | 884x343x206mm        |

### 8.2 SIPP Oil Cell

**Table 2. Specification for SIPP Measuring 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 AB gives 5 years warranty for production and material faults if such fault is given to Industriarmatur AB within 5 years 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 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

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## Appendix I - SIPP Node 500 parts



1. Electronic box
2. Pump unit
3. Filter unit
4. Measuring cell
5. Flow unit
6. Heater
7. Main switch
8. Air valve
9. Connection for service interface

## Appendix II – Inspection protocol SIPP Node 500

|                 |  |
|-----------------|--|
| <b>Unit ID:</b> |  |
| <b>Date:</b>    |  |

1. Visual control

|  |                                      |   |  |
|--|--------------------------------------|---|--|
| <b>Unit dry inside</b> <input type="checkbox"/>  |                                      | <b>Unit wet inside</b> <input type="checkbox"/> |  |
| <b>Gray and red hose</b>   | <b>Pass</b> <input type="checkbox"/> | <b>Fail</b> <input type="checkbox"/>            |  |
| <i>Not clamped, fitted with proper inclination and outlet in pit without risk of ending up under water</i> |                                      |   |  |
| <b>Green hose</b>  | <b>Pass</b> <input type="checkbox"/> | <b>Fail</b> <input type="checkbox"/>            |  |
| <i>Not clamped, 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.

For assistance regarding classification see Appendix 1.

|  |  |
|--|--|
| <b>Filter clean</b> <input type="checkbox"/>   | <b>Filter dirty</b> <input type="checkbox"/>       |
| <b>Filter emptied</b> <input type="checkbox"/> | <b>Filter not emptied</b> <input type="checkbox"/> |

Action plan:

**Filter dirty** Contact your support for approval of a filter change.  
**Filter not emptied** Contact your support for approval of a filter change.

3. Check and classify pit status.

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

Comment/Action:

4. Check the water level in the pit.

|                                   |  |
|-----------------------------------|--|
| <b>Measured water level in mm</b> |  |
|-----------------------------------|--|

Action plan:

**Water level over 300mm** Contact your support.

5. If required, filter replacement and calibration of the measuring cell through the exchange as described in appendix 2 and 3.

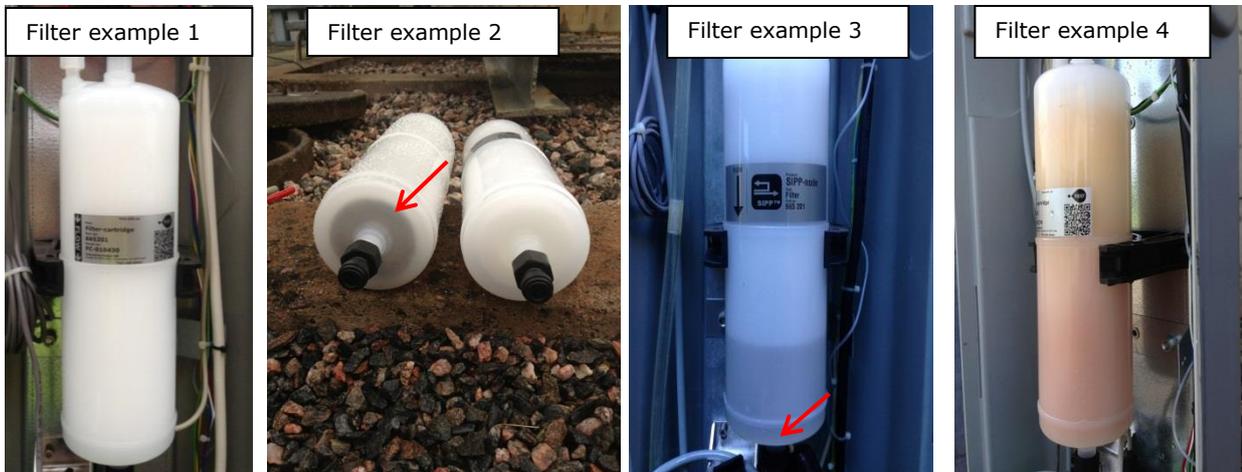
|   |                          |
|---|--------------------------|
| Filter exchange registered                                      | <input type="checkbox"/> |
| Calibration of measuring cell registered                        | <input type="checkbox"/> |
| Unit started manually and discharged started through GREEN 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:

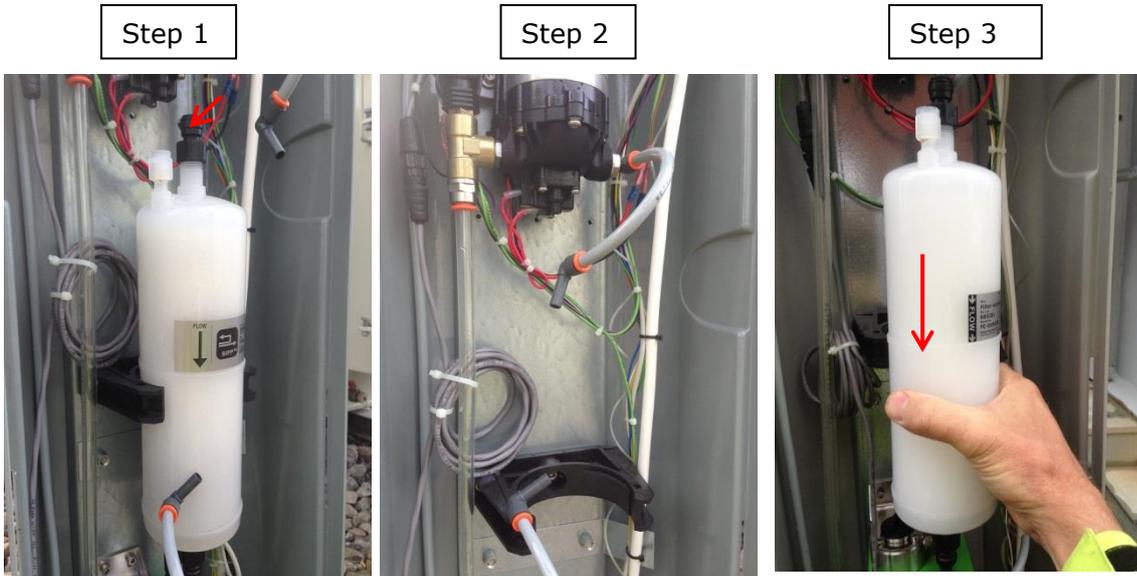
1. Scan unit QR code, enter the access code and then follow the instructions.
2. Contact support via SMS, telephone or email

## Appendix III – Status of a SIPP Node filter



1. A filter that works well. The water level in the filter after pumping is under the edge.
2. To the left, a used filter that needs to be replaced, to the right a brand new filter.
3. The filter is clogged and needs to be replaced immediately because water cannot be pushed out. As it becomes this much water left in the filter, this water slowly drips down into the measuring cell and the flow meter. If there will be water standing in these units when it gets below freezing, there is an imminent risk that the units will freeze.
4. The pumped water is dirty. The filter will most likely need replacement earlier than recommended 50 m<sup>3</sup>.

## Appendix IV Instruction – SIPP Node filter change



1. Turn the power off.
2. Push the upper part on top of the black connector on the filter to remove the gray angled connector that attaches to the hose. Sometimes it can be helpful to use a small needle nose plier.
3. Remove the filter from the holder by pulling it outward.
4. Attach the new filter in the holder.  
**NOTE! Check the flow direction – arrows should be pointing downwards!**
5. Connect the hoses by pressing the gray connectors firmly into the filter's black connectors.
6. Turn on the power and verify that the unit starts a discharge. If the water level is too low for an automatic start, then force a manual start. To manually start the pump scan the QR code and follow "Instruction QR code" or contact support.
7. Verify that there is no leakage in the system and that the unit after the start up sequence discharge through the GREEN hose.
8. For questions or problems contact support!

Contact us at [support@industriarmatur.se](mailto:support@industriarmatur.se) eller or +46 31-80 95 50.

## Appendix V Instruction - Exchange of Measuring cell



1. Turn the power off.
2. Remove the grey hoses (1) from the measuring cell by pushing the orange-colored part of the connector and gently pull the hose out.
3. Loosen the M12-connector (2).
4. Unscrew the two screws (3) with a 4mm Allen screwdriver.
5. Replace the measuring cell.
6. When reconnecting the grey hoses make sure that they are pushed all the way to the bottom of the connector to avoid leakage.
7. Turn on the power and verify that the unit starts a discharge. If the water level is too low for an automatic start, then force a manual start. To manually start the pump scan the QR code and follow "Instruction QR code" or contact support.
8. Verify that there is no leakage in the system and that the unit after the start up sequence discharge through the GREEN hose.
9. For questions or problems contact support!

Contact us at [support@industriarmatur.se](mailto:support@industriarmatur.se) eller or +46 31-80 95 50.

## Appendix VI Instruction – QR code SIPP Node

### Sign in

1. Scan the QR-code SIPP Node, which is located on the side of the unit. The first page contains information about the device, for example device status information (Activity) and time of last status update (Last heartbeat).
2. In order to control and manage data of the unit, click on *Administration*.
3. Log in by entering your username and password to SIPP Warehouse.

### Register maintenance

1. Click on *Maintenance* in the main menu.
2. Register **Exchange of measuring cell** by entering the serial number (ex. NC-1234) for the new measuring cell and click on *Register service*. Maintenance is registered in SIPP Warehouse for set date and time, the preset time can be adjusted manually.
3. To register a **filter change** scroll down and click on the *Register service* button, no serial number required.
4. Return to the main menu by clicking on the *Back* button.

### Manual start

This action can be used to force a discharge to start when the water level is too low to start automatically.

1. Click on *Actions* in the main menu.
2. Force a start by clicking on *Start the pump*.
3. Return to the main menu by clicking on *Back* button.

### Reset SIPP Node

This action can be used to reset the unit after an alarm or to bring the device out of hibernation, rest because of the high / low temperature.

1. Click on *Actions* in the main menu.
2. Reset the device manually, by clicking on *Reset Device*.
3. Return to the main menu by clicking on the *Back* button.

To manage a different unit shut down the tab and scan a new QR code.  
For questions or problems, contact support!

Contact us at [support@industriarmatur.se](mailto:support@industriarmatur.se) or +46 31-80 95 50.