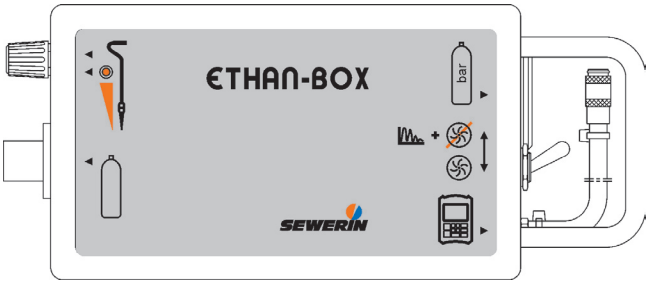
ETHAN-BOX

Operating Instructions



SEWERIN

Measurable success by Sewerin equipment

You settled on a precision instrument.

A good choice!

Our equipment stands out for guaranteed safety, optimal output and efficiency.

They correspond with the national and international guide-lines.

These operating instructions will help you to handle the instrument quickly and competently.

Please pay close attention to our operating instructions before usage.

In case of further queries our staff is at your disposal at any time.

Yours

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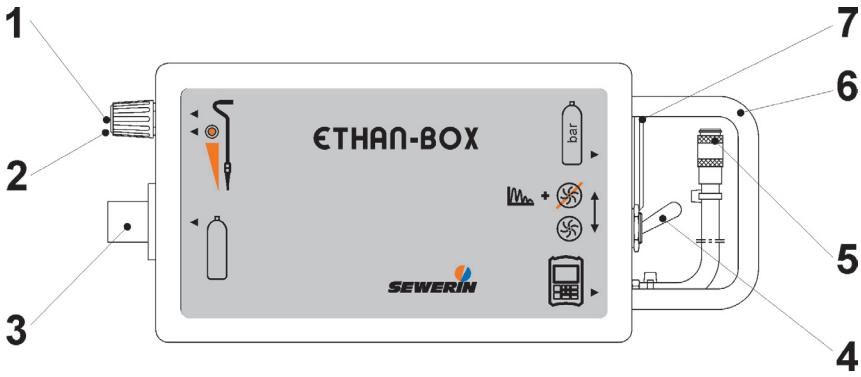


Note:
Refer to Page 4 for a key to Item Nos.

Operating Instructions

ETHAN-BOX

01.04.2005 – 02 – 103187 – en

This product may only be put to service by adequately instructed persons having familiarised themselves with the product‘s instruction manual.

This product may only be used as directed; it is intended for use in industrial and commercial applications only.

Repairs may only be carried out by skilled personnel or by adequately instructed persons.

Modifications or changes to the product shall be subject to prior approval of Hermann Sewerin GmbH. The manufacturer shall not accept liability for any damage attributable to unauthorised modifications made to the product.

Only genuine accessories supplied by Hermann Sewerin GmbH may be used with the product.

In the event of repairs, use shall be made of spare parts subject to permission granted by Hermann Sewerin GmbH .

Hermann Sewerin GmbH shall not accept liability for any damage resulting from failure to comply with the above instructions and guidance. The above instructions and guidance shall not be considered to broaden the provisions regarding warranty and liability under Hermann Sewerin GmbH’s terms and conditions of sale and delivery.

The right is reserved to supply products featuring technical modifications introduced under the company’s policy of continuous development and improvement.

While taking the above into account, compliance with generally applicable safety and accident prevention codes is of the essence!

Symbols used:

CAUTION!
This symbol is used to warn of danger or hazards that may jeopardise the user or may cause complete failure of, or damage to, the product.

Note:
This symbol is used to denote information and tips beyond operator control of the product.

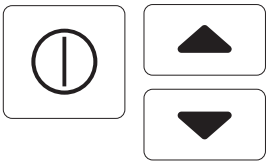
1 ETHAN-BOX Analyser

1.1. Intended Use

- Portable analyser for straightforward differentiation between natural gas and biogas (digester or fermentation gas, marsh gas).
- Natural gas, as distinct from biogas, contains small proportions of ethane (typical values: 0.3–8.0 vol.%).
- Can be used in conjunction with an existing **EX-TEC® SR5, EX-TEC® SR 6, VARIOTEC® 8, VARIOTEC® 8-EX** or **VARIOTEC® 9-EX combination instrument** (... software status from V1.8) and an existing pinpointing probe.
- Synthetic air as test gas is used to force the gas sample to be examined through a separation column in the **ETHAN-BOX** where the sample is decomposed.
- The following components are displayed on the combination instrument with a time lag and can be polled following the measurement:
  - Total **Hydrocarbons CH**
  - Shares of **Methane CH_4**
  - Shares of **Ethane C_2H_6**
  - Shares of **Propane C_3H_8**
  - Shares of **Butane C_4H_{10}**
- Leakage on a gas pipe is clearly detected through the share ethane.
- Time saving through local analysis during systematic survey proceedures.
- Hence, onerous laboratory analysis may be dispensed with.
- There is no individual power supply required.
- A 1-litre test gas (synthetic air) can is included in the scope of supply.

1.2 Inquiring about the Software Status and Enabling the Function

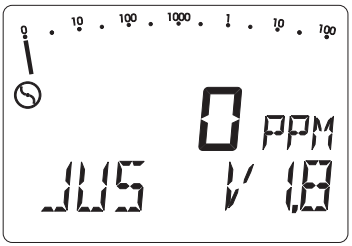
To inquire about the software status on your combination instrument (e.g. EX-TEC SR® 6) proceed as detailed below:



- On the instrument in the OFF condition, press the following keys at a time:
  - Hold both arrow keys depressed.
  - ON/OFF Key.

First step – Check the version number

Upon display of the remainig operating time , the instrument will be in **adjustment mode**:

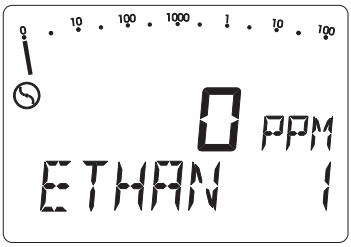


- Check the software status. For proper measuring, the software version number must be **V1.8 or higher**.

- Then, press one of the arrow keys several times until the display reads “ETHAN”.

Second step – Enable the function

Next thing, you have to enable the function for interaction with the **ETHAN-BOX**:



- Press the ON/OFF key to select/deselect the function as applicable:

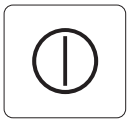
  ETHAN 1 = (ON)

  ETHAN 0 = (OFF)

Third step – Exit the setting mode

- Pressing the arrow keys several times will take you back to the display of the Version number.

- Press the Pump key for about 2 seconds to select the measuring mode, or



- Press the ON/OFF key to turn off the instrument.

2 Measuring Mode

2.1 Components of the ETHAN-BOX

Note:
Refer to the figure on the front-cover inside page.

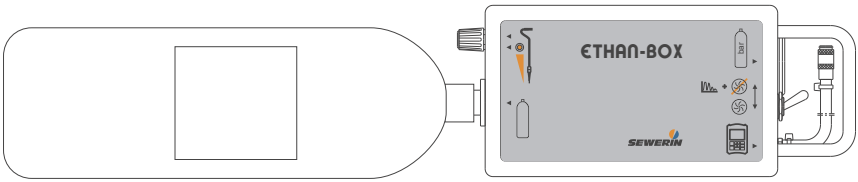
Item	Description	Function
1	Probe connection	Nipple to connect the pinpointing probe and the probe hose
2	Bypass valve	Produce the gas-air mixture required
3	Test gas can connection	Threaded end to connect the test gas (synthetic air) can
4	Mode selector switch	Switch to select any of the two modes: **- Sampling** **- Analysis**
5	Instrument connection	Flexible-hose connection to the combination instrument
6	Carrying handle	Permits the analyser to be carried during the measurement
7	Manometer	Displays the test gas can pressure

2.2 Pre-sampling Requirements

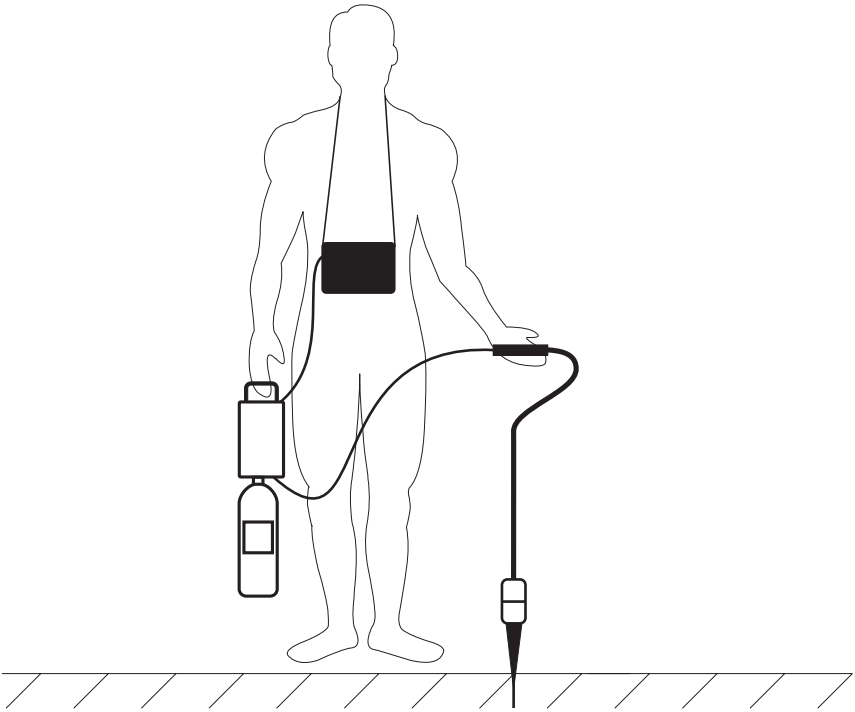
- Connect your pinpointing probe to the associated probe hose.

Note:
Consistently use a probe hose with hydrophobic filter!

- Set the mode selector switch (Item 3) to **Sampling**.
- Manually screw the test gas (synthetic air) can fully into the threaded connection (Item 3) of the **ETHAN-BOX**.
- Unless you are sure that the **ETHAN-BOX** has been purged with test gas after the last analysis, make sure that a purge of not less than 15 minutes is performed prior to starting the analysis!

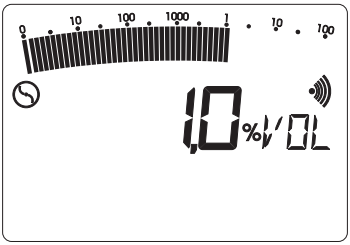


- Connect the probe hose to the **ETHAN-BOX** (Item 1).
- Finally, establish connection between your combination instrument and the **ETHAN-BOX** (Item 4).
- This completes all the preparatory steps for the measurement.

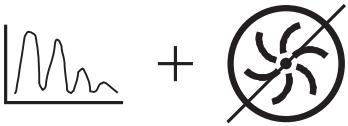


2.3 Conducting an Analysis

- Turn on your combination instrument and wait until it has zeroed.
- Use the pinpointing probe to take a sample from the bar hole.



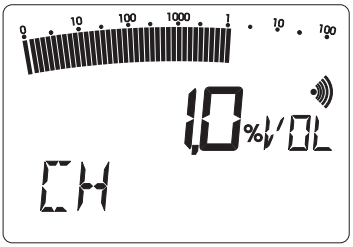
- The bypass valve (Item 2) lets you mix the drawn-in gas sample with ambient air so as to lessen the gas concentration. For a correct measurement, the concentration of the gas-air mixture **must not** exceed **1.0 %VOL**!



- Next, stop the pump and set the mode selector switch (Item 3) to **Analysis**.
- This done, the analysis will operate automatically.

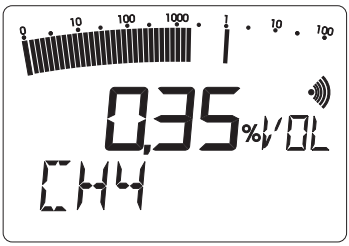
Note:
The times specified for the intervals until the various peaks are displayed are referred to ambient conditions at **approx. 20°C**.
These time intervals vary as a function of the current ambient temperature:
– Lower temperatures will entail a longer time interval.
– High temperatures result in shorter time intervals.

First display – Total hydrocarbons CH



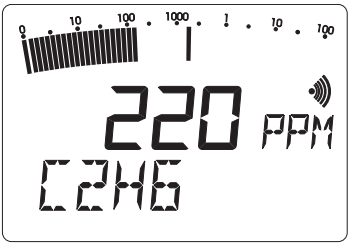
- Time after start of the measurement: **Immediately**
- The concentration prevailing at the onset of the measurement is displayed.

Second display – Shares of methane CH_4



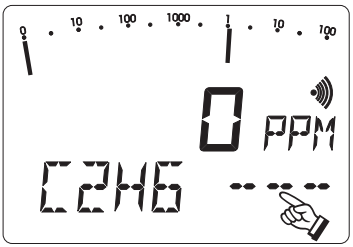
- Time after start of the measurement: **45-50 seconds**
- The magnitude of the **methane peak** is displayed (e.g. **0.35 %VOL**).
- In addition, the slave pointer of the last component is shown.

Third display – Shares of ethane C_2H_6



- Time after start of the measurement: **100-120 seconds**
- The magnitude of the **ethane peak** is displayed (e.g. **220 PPM**).
- In addition, the pointer of the last component is shown.

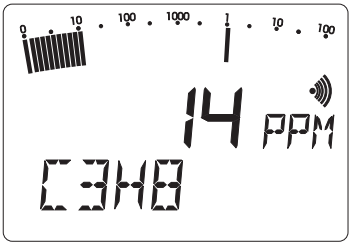
If no ethane is present you will see the following display



- Time after start of the measurement: **100-120 seconds**
- There is **no ethane** present (Display: **-- -- --**)
- In addition, the pointer of the last component is shown.

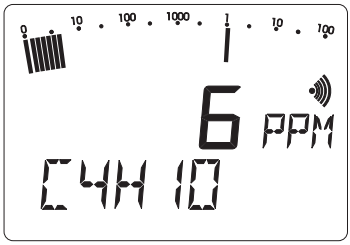
Note:
Biogas (e.g. marsh gas, digester gas) consists of pure methane. Thus, if analysis has revealed that ethane is present the particular gas is natural gas! The analysis is complete at this point.
In order to verify the result it is possible (e.g. in case of doubt) to analyse the gas sample for further components (propane, butane, etc.) (... this takes more time).

Fourth display – Shares of propane C_3H_8



- Time after start of the measurement: **6-10 minutes**
- The magnitude of the **propane peak** is displayed (e.g. **14 PPM**).
- In addition, the pointer of the last component is shown.

Fifth display – Shares of butane C_4H_{10}



- Time after start of the measurement: **25-30 minutes**
- The magnitude of the **butane peak** is displayed (e.g. **6 PPM**).
- In addition, the pointer of the last component is shown.

2.4 Display of Components

- After several minutes of measuring time, repeated pressing of the arrow keys lets you see the shares measured:

CH Hydrocarbons

CH_4 Methane

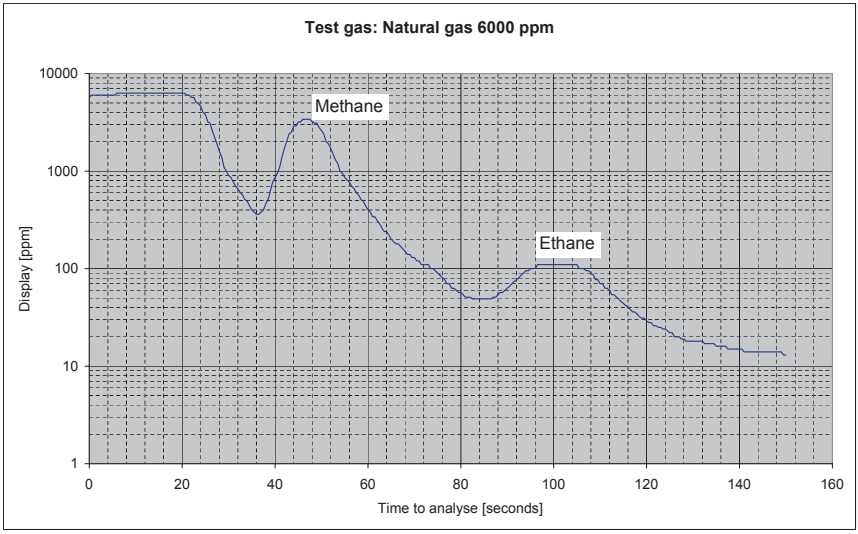
C_2H_6 Ethane

C_3H_8 Propane

C_4H_{10} Butane

Note:
When the pump is started the values saved are deleted and cannot be retrieved any more!

- Plot of a typical analysis pattern with methane and ethane peaks



2.5 End of Analysis

- Set the mode selector switch (Item 3) to **Sampling** and start the pump again.
- To prepare the next analysis, with the test gas can screwed in, you should wait until after a

  purge time of not less than 15 min

  has passed.

CAUTION!
For a correct analysis, the ETHAN-BOX must be gas-free. Unless you are absolutely sure that a purge was performed after the last analysis, you should run a 15-min purge prior to analysis so as to remove at least ethane and propane.

- Upon completion of your analysis, unscrew the can that contains the test gas.

3 Technical Guidance

Pressure indication

- The current pressure in the test gas (synthetic air) can can be read on the manometer (Item 6).
- When full, the can pressure is approx. 12 bar. Once the pressure has dropped to 1 bar, replace the can with a new one.

Duration of measurement

- The pressure drop per hour of analysis is about 2 bar. Hence, a operating time of approx. 5 1/2 h can be achieved with any one can.

Working temperature

- The service temperature range for the **ETHAN-BOX** is from **-5°C to +30°C**.

Sampling

- The semiconductor sensor in the combination instruments is used to verify that ethane is present. Therefore, the sample drawn in should **not exceed 1.0 vol.%**. The bypass valves (Item 2) can be used to rarefy the sample with air.
- For the detection, the ethane proportion too in your natural gas is important. A **minimum concentration of 50 ppm ethane** is required in the sample drawn in. To this end, consider the example shown on the next page.

CAUTION!
Consistently calculate for the locally available natural gas which minimum concentration your gas sample must have in order to contain at least 50 ppm ethane! It is, therefore, essential to consider the example shown on the next page!

Example:

Assuming you wish to verify ethane C_2H_6 in a **Grade L (Netherlands)** natural gas. In the example, the ethane content is 3.680 vol.% (cf. Table)
Then, the sample drawn in must have at least the following concentration:
100 vol.% x (50 ppm/36,800 ppm) = 0.136 vol.%

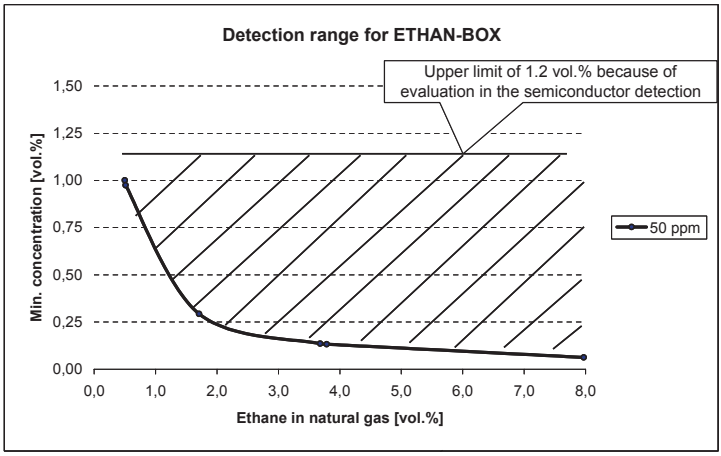
You should adopt the same approach to calculate prior to every measurement the minimum required concentration of your gas sample!

For a safe working practice, it is recommended that the concentration of the gas sample be consistently adjusted to 1.0 vol.%.

NATURAL GASES

Gas component		NATURAL GAS-H			NATURAL GAS-L		
		Russia	Bunde	North Sea	Werne	Bielefeld	Holland
		vol.%	vol.%	vol.%	vol.%	vol.%	vol.%
Methane	CH4	98,320	92,048	86,660	86,871	87,578	83,390
Ethane	C2H6	0,500	3,787	7,970	0,513	1,708	3,680
Propane	C3H8	0,190	0,653	2,020	0,023	0,268	0,690
Nitrogen	N2	0,810	2,296	1,100	10,482	9,203	10,670
arbon dioxide	CO2	0,080	0,568	1,530	2,034	1,242	1,260
Others	CnHm	0,100	0,648	0,720	0,077	0,001	0,310

Detection:	50 ppm Ethane in the gas sample (Minimum!)					
Minimum concentration	1,000	0,132	0,063	0,975	0,293	0,136



4 Function control of the ETHAN-BOX

Pursuant to the DVGW Guideline G 465-4, March 2001 edition, testing is required to be conducted at weekly to half-yearly intervals, depending on the frequency of use. Tests shall be documented, and the records kept for a period of not less than one year. A quantity of 50 ppm ethane shall be employed as test gas.

The test setup you use to check the ppm range of your combination instrument (e.g. SPE PPM or SPE 2) may also be employed for testing the **ETHAN-BOX**.

To start with, connect the test gas can (50 ppm ethane) to the test set. Then, connect the test set to the **ETHAN-BOX** in place of the pinpointing probe and conduct an ethane analysis. Provided the **ETHAN-BOX** is working properly, the combination instrument will indicate an ethane peak after 100- 120 seconds.

5 Technical Data

Measuring principle:	Separation column
Operating time:	approx. 5 1/2 h (... on one test gas can)
Operating temperature:	-5°C to +30°C
Storage temperature:	-25°C to +70°C
Dimensions (W x H x D):	257 x 110 x 70 mm (... without test gas can)
Weight:	1,300 g

6 Accessories

Pinpointing probe	for measuring concentrations in bar holes, with hard-rubber cone for sealing the bar holes, two probe tips (245 mm and 345 mm long)
Probe hose	with hydrophobic filter and quick couplers, in 1-meter, 2-meter and 6-meter lengths

7 Wearing Parts

Fine-dust filter	in the probe connection of the instruments
Probe filter element	in the pinpointing probe
Hydrophobic filters	in the 1-meter, 2-meter and 6-meter probe hoses
Test gas can	synthetic air CAUTION! The can is pressurised. Do not store at temperatures above 50°C.

INSPECTION PROTOCOL ETHAN-BOX

Serial No. of ETHAN-BOX:

Use with gas detector(e.g.EX-TEC® SR 6)

Serial No. of gas detector:

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31.05.2005

1.0	**Device status**										
1.1	- Status correct (e.g. Y / N)										

2.0	**Pressure of test gas (synthetic air)**										
2.1	- Display > 1 bar										

3.0	**Ethane (C_2H_6) as test gas**										
3.1	- Concentration (e.g. 50 ppm)										

4.0	**Total hydrocarbons (CH)**										
4.1	- Display										

5.0	**Methane (CH_4) share**										
5.1	- Display (desired display " - - - ")										

6.0	**Ethane (C_2H_6) share**										
6.1	- Display > 30% of test gas concentration										

7.0	**Propane (C_3H_8) share**										
7.1	- Display (desired display " - - - ")										

8.0	**Notes** - Fractured enclosure - Repair - Inspection at the manufacturer's - or the like										

9.0	**Test**										
	- Day										
	- Month										
	- Year										
	- Signature										

CERTIFICATE OF ANALYSIS	ETHAN-BOX
Serial No. of ETHAN-BOX:	
Use with gas detector (e.g. EX-TEC® SR 6)	
Serial No. of gas detector:	

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31.05.2005

1.0	**Locally available natural gas**	
1.1	- Proportional ethane in natural gas	
1.2	- Conc. Natural gas with 50 ppm ethane	

2.0	**Pressure of test gas (synthetic air)**	
2.1	- Display > 1 bar	

3.0	**Test gas purge of ETHAN-BOX**	
3.1	- Purge of ETHAN-BOX necessary (e.g. Y / N)	
3.2	- Time to purge	

4.0	**Concentration in probe hole**	
4.1	- Display	

5.0	**Gas sample**	
5.1	- Gas-sample conc. downstream of bypass valve	
5.2	- Conc. within detection range (e.g. Y / N)	

6.0	**Total hydrocarbons (CH)**	
6.1	- Display	

7.0	**Methane (CH_4) share**	
7.1	- Display	

8.0	**Ethane (C_2H_6) share**	
8.1	- Display	

9.0	**Propane (C_3H_8) share**	
9.1	- Display	

10.0	**Test gas purge of ETHAN-BOX**	
10.1	- Time to purge	

11.0	**Notes**	
	- Fractured enclosure - Repair - Inspection at the manufacturer's - or the like	

12.0	**Date**	
	- Place (e.g. Street) - Day - Month - Year - Signature	

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