

The background of the top half of the cover is a photograph of a sky with large, white, fluffy clouds. A bright light source, likely the sun, is visible behind the clouds, creating a lens flare effect. A diagonal design element, consisting of two overlapping translucent blue triangles, runs from the top left towards the bottom right, bisecting the sky image.

/HydroMet

User Manual

CAEP

 **KISTERS**
Empowering decisions of tomorrow

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I Disclaimer

The information provided in this manual was deemed accurate as of the publication date. However, updates to this information may have occurred.

This manual does not include all of the details of design, production, or variation of the equipment nor does it cover every possible situation which may arise during installation, operation or maintenance. KISTERS shall not be liable for any incidental, indirect, special or consequential damages whatsoever arising out of or related to this documentation and the information contained in it, even if KISTERS has been advised of the possibility of such damages.

Any errors found in any KISTERS product should be reported to KISTERS where every effort will be made to quickly resolve the problem.

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This document is public.

II Scope of Delivery

- Class A Evaporation Pan
- Bird guard (if required)
- Timber pallet (to support the pan)
- Accessory items (e.g. Fixed Point Gauge, Measuring Cylinder etc.)

III Safety Instructions

- Read the user manual including all operating instructions prior to installing, connecting and powering up the KISTERS Class A Evaporation Pan. The manual provides information on how to operate the product. The manual is intended to be used by qualified personnel, i.e. personnel that have been adequately trained, are sufficiently familiar with installation, mounting, wiring, powering up and operation of the product.
- Keep the user manual on hand for later reference!
- If you encounter problems understanding the information in the manual (or part thereof), please consult the manufacturer or its appointed reseller for further support.
- KISTERS Class A Evaporation Pan is intended to be used in hydrometeorological or environmental monitoring applications.
- Before starting to work, you have to check the functioning and integrity of the system.
 - Check for visible defects on the Class A Evaporation Pan, this may or may not include any or all of the following: mounting facilities, connectors and connections, mechanical parts, internal or external communication devices, power supplies or power supply lines, etc.
 - If defects are identified that could compromise operational safety, work must be stopped immediately. This applies to defects detected both before work begins and during operation.
- Do not use the KISTERS Class A Evaporation Pan in areas where there is a danger of explosion.
- The present user manual specifies environmental/climatic operating conditions as well as mechanical and electrical conditions. Installation, wiring, powering up and operating the KISTERS Class A Evaporation Pan must strictly comply with these specifications.
- Perform maintenance only when tools or machinery are not in operation.
- If guards are removed to perform maintenance, replace them immediately after servicing.
- Never make any electrical or mechanical diagnostics, inspections or repairs under any circumstances. Return the product to the manufacturer's named repair centre. You can find information on how to return items for repair in the relevant section of the KISTERS website.



Disposal instructions: After taking the KISTERS Class A Evaporation Pan out of service, it must be disposed of in compliance with local waste and environmental regulations. The KISTERS Class A Evaporation Pan is never to be disposed of in household waste!



Inputs and outputs of the device are protected against electric discharges and surges (so-called ESD). Do not touch any part of the electronic components! If you need to touch any part, please discharge yourself, i.e. by touching grounded metal parts.

1 Introduction



Thank you for choosing our product. We hope you will enjoy using the device.

KISTERS manufactures, sells, installs and operates quality instrumentation, data loggers and communication technology. Products are designed with passion for environmental monitoring and with a deep understanding of the quality, accuracy and robustness needed to fulfil the requirements of measurement practitioners in the field.

The present User Manual will help you understand, install and deploy the device. If, however, you feel that a particular information is missing, incomplete or confusing, please do not hesitate to contact us for further support!

The CAEP is a standard device for manual measurement of evaporation (Australian Bureau of Meteorology Class A type). The pan represents an open body of water: It is filled with water and exposed on a flat plateau. The evaporation rate is calculated by the change in level of the free water surface (daily manual readings) and the recorded rainfall (in millimetres). Data can be calculated for any period required for estimation of evaporation and evapotranspiration rates.

2 Installation

This chapter contains the following subsections:

- [Site Selection](#)
- [Set Up](#)

2.1 Site Selection

The following considerations are important for selecting a site for the system. The proposed site must be:

- On flat ground.
- Clear of any surrounding obstacles (e.g. trees or buildings). As a general rule the pan must be sited a minimum of 4 times the height of any obstacle in the area. If for example a tree nearby is 10 m high, the pan should be sited a minimum of 40 m from the tree.
- Installed inside a lockable, chain wire type enclosure to minimize vandalism or interference from other parties (e.g. animals drinking from pan etc.).
- Nearby to a water supply, which is needed to facilitate "topping up" of water following depletions caused by evaporation.
- Nearby to a rain gauge (e.g. manually read Standard Rain Gauge or similar).

2.2 Set Up

The CAEP is normally installed on the timber platform supplied to ensure there is a flow of air under the pan. The pan must also be 100 % level in all planes. Please refer to figure below for details.

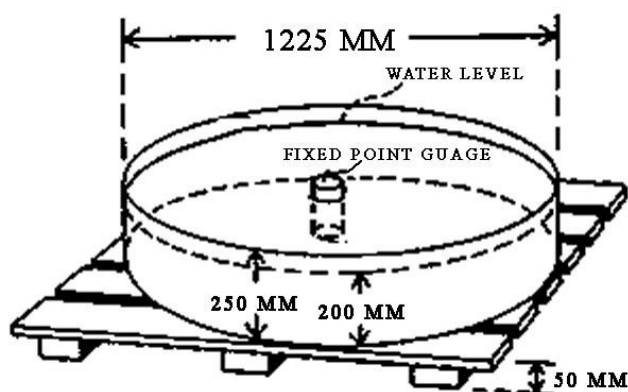


Figure 1 – Class A Evaporation Pan Installed on a Wooden Platform

3 Configuration

CAEP is a purely mechanical instrument. No specific configuration is required.

Please follow [installation instructions](#) .

4 Operation

This chapter contains the following subsections:

- [Rainfall](#) 
- [Class A Evaporation Pan](#) 
- [Observation Chart Template](#) 

4.1 Rainfall

To calculate the evaporation it is necessary to measure the rainfall and the water level in the pan at the same time.

- [Normal Rainfall Situation](#) 
- [Unusual Heavy Rainfall](#) 

4.1.1 Normal Rainfall Situation

1. Read the rain gauge every day at 9:00 a.m. If the rain gauge is empty no entry need to be made against the date [i.e in column (L)]. [see figure [Example \(1\)- When adding water to the pan](#)  and figure [Example \(2\)- When removing water from the pan](#) .
2. If the reading is 0.1 mm (i.e below the first graduation in the measure) enter the word “trace” in column (L) [see figure [Example \(1\)- When adding water to the pan](#)  and figure [Example \(2\)- When removing water from the pan](#) ]. **Note:** Days in which rainfall is less than 0.1 mm are not considered as rain days.
3. If the amount measured is due entirely to frost, fog or dew please write the word “frost”, “fog” or “dew” beside the entry of the amount. **Note:** although an amount of 0.2 mm or more may be entered these particular days are not counted as rain days.
4. If there is an error in the rain gauge reading due to “rain gauge overflow”, “rain gauge leaking” or “funnel blocked by hail” enter the amount and enter the reason for suspecting the reading in the “remarks” section.

4.1.2 Unusual Heavy Rainfall

1. In addition to the routine check of rainfall at 9:00 a.m., it is valuable to provide information of the actual time when heavy rainfall occurs.
2. If heavy rainfall has been falling for some hours a reading of the rain gauge at the time is considered a valuable information.
3. A reading of the rain gauge at the end of a thunderstorm also provides valuable information.

4.2 Class A Evaporation Pan

1. Measure the evaporation daily at 9:00 a.m.
2. If an observation is missed leave the columns for that day blank and enter the time interval since the previous observation in the remarks section (e.g. “72 hours period” entered on Monday when Saturday and Sunday are missed).

Case1: Water level in the pan is below the fixed point, proceed as follow:

- a. Let “A” be the amount of water added to the pan, enter the “A” value in column (F) of the observation chart.
- b. Water should only be added using the supplied **measuring cylinder**. **Always full measures** should be used.

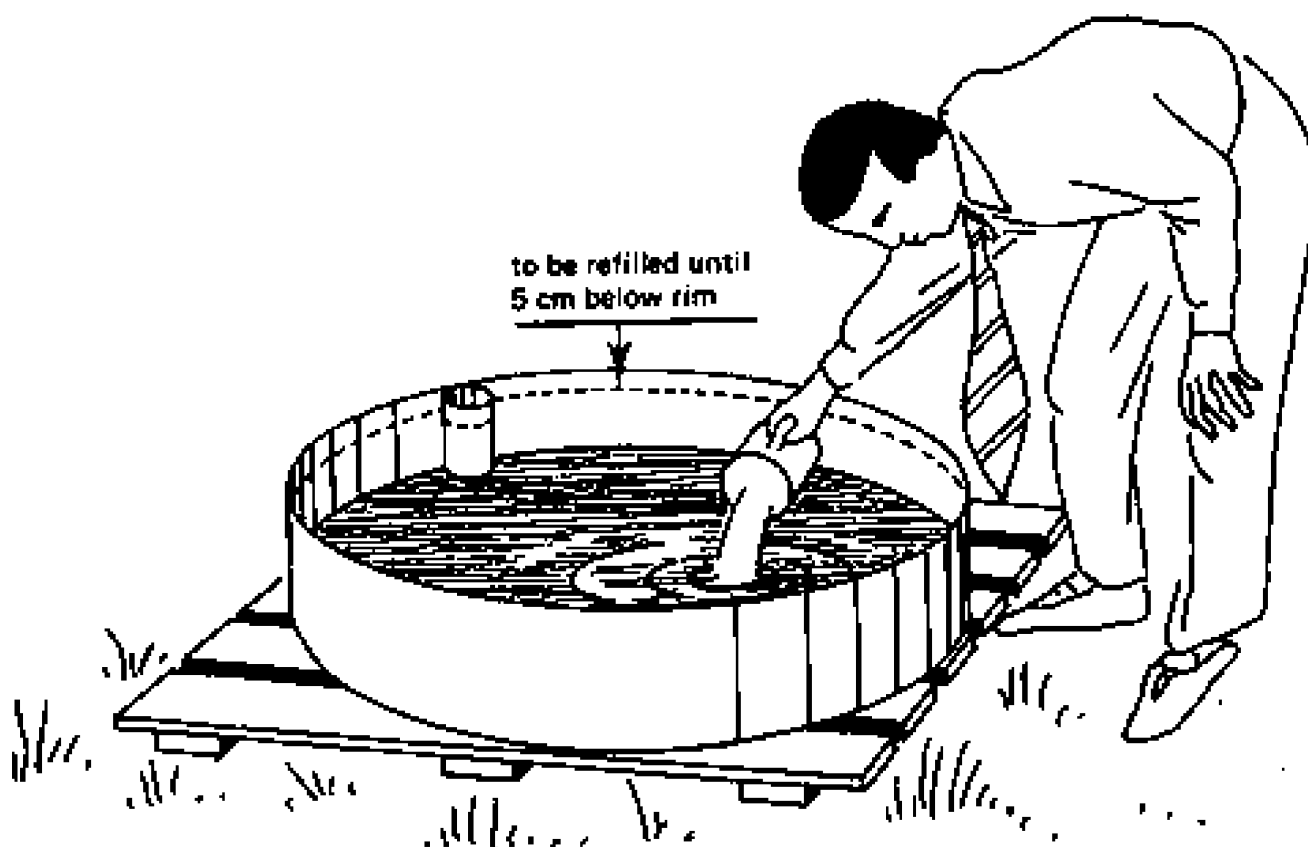


Figure 2 – Refilling water to the fixed point gauge (datum).

- Let “G” be the **number** of full measures (i.e filled to the zero mark in the measuring cylinder).
- Add the “G” value to column (G) in the observation chart and times the “G” value by 4.
- Let “H” be the value of full measure **amount** added to the pan.
Therefore the H value is obtained as shown in equation (1) below.

$$G \times 4 = H \text{ (Equation 1).}$$
 Let say $G = 5 \Rightarrow H = 5 \times 4 = 20 \text{ mm}$ (Equation 2).
- Add the “H” value to the observation chart as shown in figure [Example \(1\)- When adding water to the pan.](#) below.
- When the water level just reaches the fixed point **read**, to the nearest 0.2 mm, the level of the water remaining in the measure.

Rainfall, Evaporation Observations					Station: <u>SYDNEY</u>					Time: <u>9:00</u>		Date: <u>13/ 8 /20</u>	
Day	Water Temperature (°C)				Amount of Water Added or Removed(mm)					Rainfall (mm)	for office use only	Evaporation (mm)	Remarks
	before touching		after setting		A or R	no. of full measures	full measures amount	part measure amount	total	24 hours to 0900		if A in col. F L+K = M	
	max	min	max	min								if A in col. R L-K = M	
	B	C	D	E								F	
1	26	21	22	22	A	5 x 4 =	20.0	2.4	22.4	0.6		23	5 FULL MEASURES
2						x 4 =							

Figure 3 – Example (1)- When adding water to the pan.

- Let “J” be the level of the water remaining in the measure. Add this value to the observation chart (see figure 4)
Let Say: $J = 2.4 \text{ mm}$ (equation 3)
- Let “K” be the entries added in column “H” and “J”
Therefore: $K = H + J$ (equation 4)
Substitute equations (2) and (3) in equation (4)
Therefore $K = 20 + 2.4 = 22.4 \text{ mm}$ (equation 5)
- Add the rainfall value in column “L” to the “K” value and enter the result in column “M” of the observation chart
Therefore the evaporation to the nearest 0.2 mm is calculated as follows:

$$M = L + K \text{ (equation 6)}$$
 By looking at the example in figure (4) the value of “M” will be:

$$M = 0.6 + 22.4 = 23.0 \text{ mm}$$

Note: Please note equation (6) is only used when water is added to the evaporation pan by the observer.

Case2: Water level in the pan is above the fixed point proceed as follow:

- Let "R" be the amount of water removed from the pan, enter the "R" value in column (F) of the observation chart.
- Water should only be removed using a vessel and the supplied **measuring cylinder**. Remove water with a vessel and pour into measuring cylinder till you reach the **zero mark**. Continue with the operation until the level of water required in the pan is reached. If the last measure is **partly filled** read value to the nearest 0.2 mm.
- Let "G" be the **number** of full measures removed (i.e filled to the zero mark in the measuring cylinder).
- Add the "G" value to column (G) in the observation chart and times the "G" value by 4.

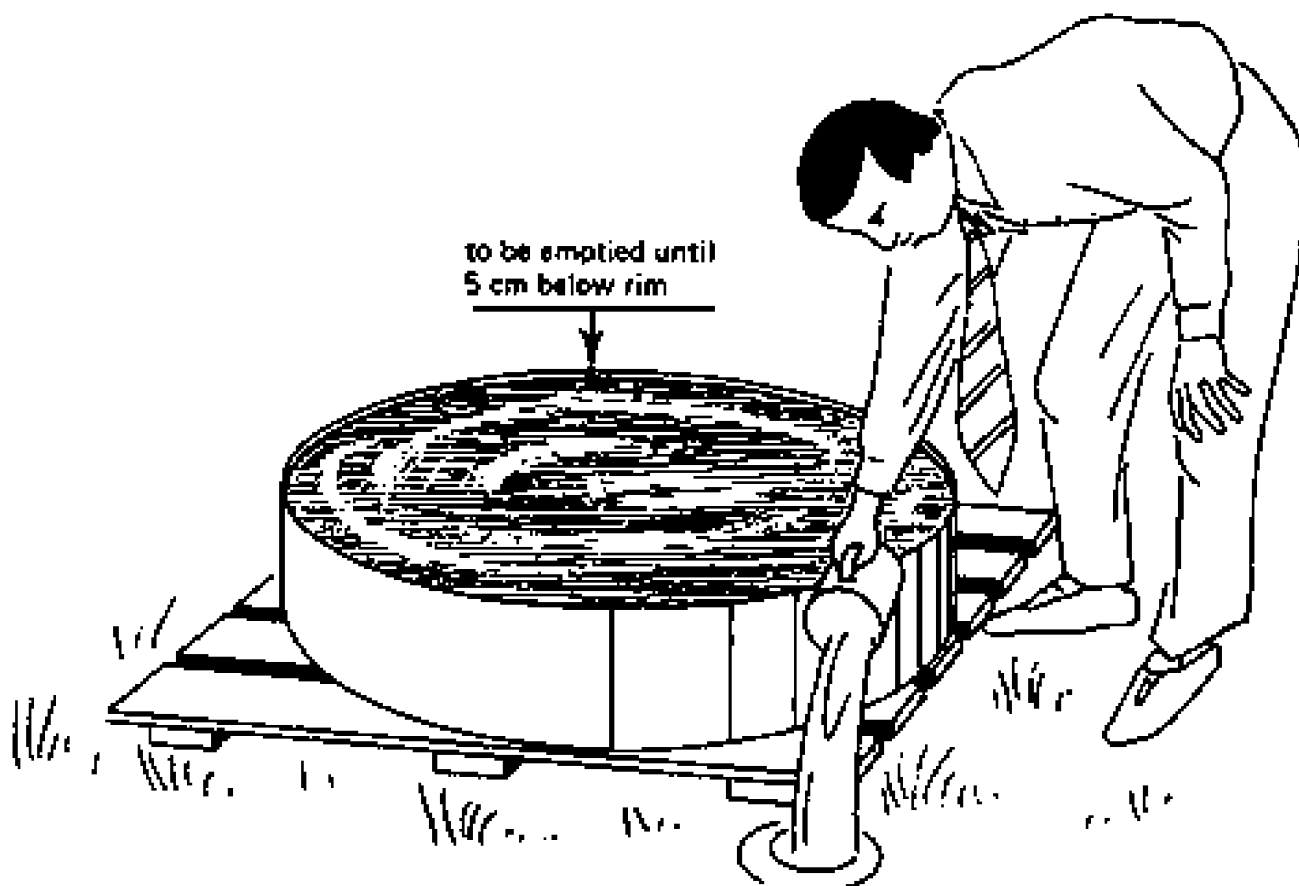


Figure 4 – Emptying water to the fixed point gauge (datum).

- Let "H" be the value of full measure **amount** removed from the pan. Therefore the H value is obtained as shown in equation (7) below.
 $G \times 4 = H$ (equation 7).
 Let say $G = 2 \Rightarrow H = 2 \times 4 = 8 \text{ mm}$ (equation 8).
- Add the "H" value to the observation chart as shown in figure (6) below.

Rainfall, Evaporation Observations					Station: <i>NEWCASTLE</i>					Time: <i>9:00</i>		Date: <i>13/8/1</i>		
Day	Water Temperature (°C)				Amount of Water Added or Removed(mm)					Rainfall (mm)	for office use only	Evaporation (mm)	Remarks	
	before touching		after setting		A or R	no. of full measures	full measures amount	part measure amount	total	24 hours to 0900		if A in col. F L+K = M		
	max	min	max	min								if A in col. R L-K = M		
												B		C
1	20	16	18	18	R	2	x 4 =	8.0	1.6	9.6	24.8		15.2	2 FULL MEASURES
2							x 4 =							

Figure 5 – Example (2)- When removing water from the pan.

- Let "J" be the level of the water remaining in the partly filled measure. Add this value to the observation chart (see figure 6)
 Let Say: $J = 1.6 \text{ mm}$ (equation 9)
- Let "K" be the entries added in column "H" and "J"
 Therefore: $K = H + J$ (equation 10)

Substitute equations (8) and (9) in equation (10)

Therefore $K = 8 + 1.6 = 9.6$ mm (equation 11)

- i. Subtract the rainfall value in column "L" from the "K" value and enter the result in column "M" of the observation chart
Therefore the evaporation to the nearest 0.2 mm is calculated as follows:

$M = L - K$ (equation 12)

By looking at the example in figure (6) the value of "M" will be:

$M = 24.8 - 9.6 = 23.0$ mm

Note: Please note equation (12) is only used when water is removed from the evaporation pan by the observer.

If there is a Bird Guard in use with the evaporation pan. Please use the gate on the top when adding or removing water from the pan and close when operation is finished.

4.3 Observation Chart Template

Please refer to the recording template below.

Rainfall, Evaporation					Station: _____					Time: _____		Date: ____/____/20__		
Day	Water Temperature (°C)				Amount of Water Added or Removed (mm)					Rainfall (mm)	for office use only	Evaporation (mm)	Remarks	
	before touching		after setting		A or R	no. of full measures	full measures amount	part measure amount	total	24 hours to 0900		if A in col. F $L+K=M$		if R in col. F $L-K=M$
	max	min	max	min										
	B	C	D	E										
1						x 4 =								
2						x 4 =								
3						x 4 =								
4						x 4 =								
5						x 4 =								
6						x 4 =								
7						x 4 =								
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26						x 4 =								
27						x 4 =								
28						x 4 =								
29						x 4 =								
30						x 4 =								
31						x 4 =								
Total									Total Rainfall		Total Evap.		Name Of Observer : _____	
Mean													Signature: _____	

5 Repair

KISTERS precision instruments and data loggers are produced in quality-controlled processes. All KISTERS production and assembly sites in Australia, New Zealand and Europe are ISO 9001 certified. All equipment is factory tested and/or factory calibrated before it is shipped to the client. This ensures that KISTERS products perform to their fullest capacity when delivered.

Despite KISTERS most rigorous quality assurance (QA), malfunction may occur within or outside of the warranty period. In rare cases, a product may not be delivered in accordance with your order.

In such cases KISTERS' return and repair policy applies. For you as a customer, this means the following:

- Contact KISTERS using the Repair Request Form and the Declaration of Contamination made available online:

Region (Language)	Download Link
Asia-Pacific (English)	Repair Request Form (APAC) Declaration of Contamination (APAC)
Europe, the Middle East and Africa (English)	Repair Request Form (EMEA) Declaration of Contamination (EMEA)
Germany (German)	Repair Request Form (DE) Declaration of Contamination (DE)

In response you will receive a reference number that must be referenced on all further correspondence and on the freight documents accompanying your return shipment.

- Please provide as much information and/or clear instructions within the return paperwork. This will assist our test engineers with their diagnosis.
- Please do not ship the goods prior to obtaining the reference number. KISTERS will not reject any equipment that arrives without reference number; however, it may take us longer to process.

Custom requirements for items sent to KISTERS for warranty or non-warranty repairs: Check with your national customs/tax authorities for details, processes and paperwork regarding tax exempt return of products. Typically, special custom tariff codes are available (such as HS Code = 9802.00) that verify the item is being returned for repair and has no commercial value. Please note that the customs invoice / dispatch documents should also clearly state: "Goods being returned to manufacturer for repair – No Commercial value". It is mandatory to have any returned goods accompanied by a commercial invoice on headed paper. KISTERS reserves the right to charge the customer for time spent rectifying incorrect customs documents.

Note: Please ensure that your goods are packed carefully and securely. Damage that occurs during transit is not covered by our warranty and may be chargeable.

5.1 Part List

Part Name	Part Number	Description
Evaporation pan (pan only)	EP	Class A Evaporation Pan supplied in packing crate
Evaporation pan and bird guard	EP/BG	Class A Evaporation Pan and bird guard supplied in packing crate
Fixed point gauge	SC051-03	Fixed point gauge for KISTERS Evaporation Pan
Measuring cylinder	CAEP345	Class A Evaporation Pan measuring cylinder
Timber platform	SC051-23	Timber platform to suit Class A Evaporation Pan

6 Technical Data

Material	Stainless steel, non-corrosive
Construction	Welded
Size	- Height: 260 mm - Diameter: 1225 mm
Shipping size and weight (crated)	- EP (Evaporation Pan only) 1400 × 1400 × 350 mm / 50 kg - EP/BG (Evaporation Pan and bird guard) 1400 × 1400 × 700 mm / 70 kg
Models	- EP: Class A Evaporation Pan without Bird Guard or any accessories - EP/BG: Class A Evaporation Pan with bird guard and no accessories

7 Obligations of the Operator and Disposal

This chapter contains the following subsections:

- [Obligations of the Operator](#) ¹⁵
- [Dismantling / Disposal](#) ¹⁵

7.1 Obligations of the Operator

European Union

In the Single European Market it is the responsibility of the operator to ensure that the following legal regulations are observed and complied with: national implementation of the framework directive (89/391/EEC) and the associated individual directives, in particular 2009/104/EC, on minimum safety and health requirements for the use of work equipment by employees at work.

Worldwide

Regulations: If and where required, operating licences must be obtained by the operator. In addition, national or regional environmental protection requirements must be complied with, regardless of local legal provisions regarding the following topics:

- Occupational safety
- Product disposal

Connections: Local regulations for electrical installation and connections must be observed.

7.2 Dismantling / Disposal

When disposing of the units and their accessories, the applicable local regulations regarding environment, disposal and occupational safety must be observed.

Before dismantling

- Electrical Devices:
 - Switch off the units.
 - Disconnect electrical appliances from the power supply, regardless of whether the appliances are connected to the mains or to another power source.
- Mechanical devices:
 - Fix all loose components. Prevent the device from moving independently or unintentionally.
 - Loosen mechanical fastenings: Please note that appliances can be heavy and that loosening the fastenings may cause them to become mechanically unstable.

Disposal

Operators of old appliances must recycle them separately from unsorted municipal waste. This applies in particular to electrical waste and old electronic equipment.

Electrical waste and electronic equipment must not be disposed of as household waste!

Instead, these old appliances must be collected separately and disposed of via the local collection and return systems.

Integrated or provided batteries and accumulators must be separated from the appliances and disposed of at the designated

collection point. At the end of its service life, the lithium-ion battery must be disposed of according to legal provisions.

EU WEEE Directive

As players in the environmental market, KISTERS AG is committed to supporting efforts to avoid and recycle waste. Please consider:

- Avoidance before recycling!
- Recycling before disposal!



This symbol  indicates that the scrapping of the unit must be carried out in accordance with Directive 2012/19/EU. Please observe the local implementation of the directive and any accompanying or supplementary laws and regulations.

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