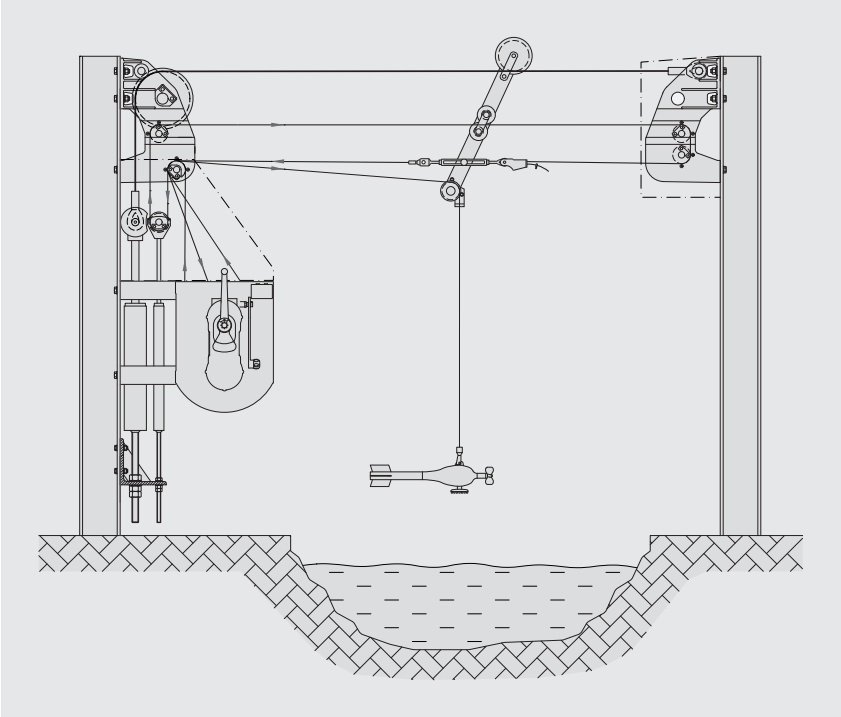
Operating instructions

OTT cable way for hydrological surveys



English

Subject to technical modifications!

Table of contents

1 Scope of supply

▶ OTT cable way

An OTT cable way consists of the following components:

– Mechanical Double-Drum Winch with crank handle, or
  Electrical Double-Drum Winch including switch cabinet and hand-held control unit

– 2 pulley blocks (vertical design; XX-V-X/X) or
  1 pulley block and 1 track cable attachment unit (horizontal design; XX-H-X/X)
– Track cable
– Current meter cable
– Towing cable
– Trolley
– Gas-spring tensioning or turnbuckle
– Crank handle (+ hexagon socket wrench) for emergency operation
  (Electrical Double-Drum Winch only)
– 2 limit stops (Electrical Double-Drum Winch only)
– Protective covers

– Optional: Uninterruptable power supply (UPS) for mechanical emergency operation in case of mains voltage failure (Electrical Double-Drum Winch only)

– Crane documentation
– Operating instructions
– Acceptance test certificate (FAT)

2 Type code/Order numbers

▶ OTT cable way

Vertical design, gas-spring at winch support post	SK-V-G/W
Vertical design, gas-spring at opposite support post	SK-V-G/G
Horizontal design, gas-spring at opposite support post	SK-H-G/G
Vertical design, turnbuckle tensioning at winch support post	SK-V-S/W
Horizontal design, turnbuckle tensioning at winch support post	SK-H-S/W

▶ Options/Accessories

Option: UPS for Electrical Double-Drum Winch 15.403.040.9.2
Uninterruptable power supply for mechanical emergency operation in case of mains voltage failure

Compensation unit 15.403.032.9.2
To compensate for an angular error of max. 3° on support posts twisted towards one another; installation between winch support post and Mechanical/Electrical Double-Drum Winch

OTT Z400 signal counter set 12.440.005.9.0
Including battery

Signal counter set connecting lead
6-pin metal angled socket with two "banana plugs" (Ø 4 mm)

– Length 2.5 m	17.150.060.4.2
– Length 5.0 m	17.150.061.4.2

OTT middle piece (loading weight)
With ground contact

– 25 kg	11.000.064.2.2
– 50 kg	11.000.063.2.2
– 100 kg	11.000.062.2.2

OTT C31 universal current meter see price list
– "Suspended current meter" design
– Including propellers and other accessories

3 About these instructions

3.1 Content and target group

These instructions describe operation of an OTT cable way for hydrological surveys. They are aimed at people who are involved in determining the hydrological flow (discharge) in a flowing waterway or taking water samples using sampling devices. Specialist theoretical knowledge of these activities is a prerequisite.

Note: Assembly and **commissioning** of an OTT cable way **are not covered by these instructions!** Further information about these activities can be found in chapter 6.

3.2 Country-specific regulations

These instructions are based on the regulations applicable in Germany. When operating an OTT cable way outside Germany, comply with the applicable national regulations in the relevant country. It is essential to check the applicable regulations in your country!

3.3 Markings and symbols used in the instruction

■ This bullet point indicates an instruction relating to a specific action.

▶ This bullet point indicates an item in a list.
– This bullet point indicates a sub-item in a list.

Note: …

▶ Information on easier and more efficient work
▶ Further information
▶ Definition

Please note: …

Information that prevents potential damage or malfunction on the OTT cable way.

3.4 Explanation of safety information used

The safety information used in these operating instructions is classified according to the nature and severity of a particular hazard. The hazard levels defined are indicated by the following signal words (Warning/Caution) and pictograms (orange/yellow triangle) in these operating instructions.

WARNING **Warning of a hazardous situation with a medium level of risk**

The safety information specifies the nature and source of the hazard.
If you fail to carry out the specified actions, the hazardous situation can result in **death** or **serious injuries**.

▶ Action to prevent the hazardous situation!
▶ Action to prevent the hazardous situation!

CAUTION **Warning of a hazardous situation with a lower level of risk**

The safety information specifies the nature and source of the hazard.
If you fail to carry out the specified actions, the hazardous situation can result in **minor** or **moderately severe injuries**.

▶ Action to prevent the hazardous situation!
▶ Action to prevent the hazardous situation!

4 Introduction

4.1 Components of an OTT cable way

A stationary cable way for hydrological surveys is a device that enables a measuring instrument (hydrometric suspended current meter ADCP [1] research boat or sampling device) on a tensioned wire cable over a waterway to be moved to any point on the cross-section.

The key components of an OTT cable way are (see Fig. 2):

- Mechanical/Electrical Double-Drum Winch
- Supports (winch support post and opposite support post)
- Track cable
- Towing cable
- Current meter cable
- Trolley
- Cable tensioning device (turnbuckle or gas-spring tensioning)
- Pulley blocks
- Track cable attachment unit (only on double-drum winches with horizontal cable outlet; see Fig. 5 and 7)
- Measuring device (suspended current meter, ADCP research boat or sampling device)

Mechanical/Electrical Double-Drum Winch
Winch for horizontal movement of the trolley and for lifting and lowering the measuring device. The towing cable uses a winding drum with multiple cable windings to generate the horizontal movement, while the current meter cable on a cable drum provides the vertical movement. For horizontal movement, the winding drum is engaged using a combined brake and clutch mechanism. Two electronic counters indicate the current position of the suspended measuring device (distance to cross-section zero point and depth under the water level). The operator side on the Mechanical Double-Drum Winch (emergency) crank handle and control lever position can be left or right.

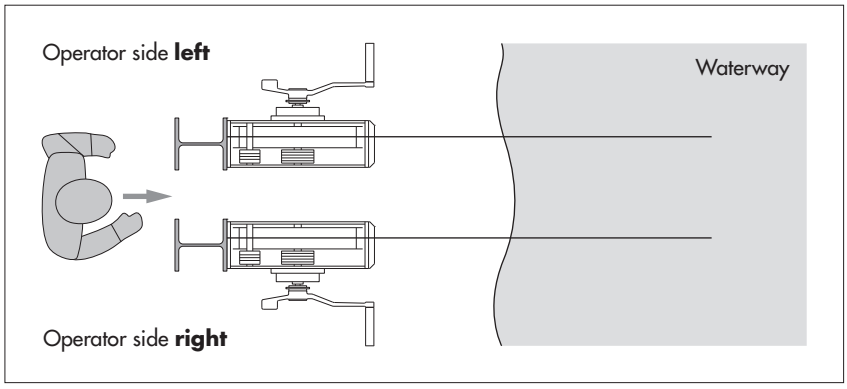


Fig. 1: Definition of "operator side left/ right" (schematic top view).

The operator side is determined by the location of a person shown, looking toward the waterway.

Both versions of the double-drum winch are equipped with a safety slip clutch. If a tensile force of greater than 3000 N occurs on the current meter cable – e.g. due to flotsam getting caught on the measuring device – the safety slip clutch on the double-drum winch trips. In this case, the current meter cable is completely detached from the cable drum.

Other functions of the Electrical Double-Drum Winch:
- Speed limitation at three levels or continuously adjustable using potentiometer
- Automatic deactivation of lowering movement when placed on the ground
- Crank handle for emergency operation of the double-drum winch in case of power failure
- Optional: UPS for electronics/signal counter set (integrated counting function in hand-held control unit with diagnostic and service settings)

[1] Acoustic Doppler Current Profiler

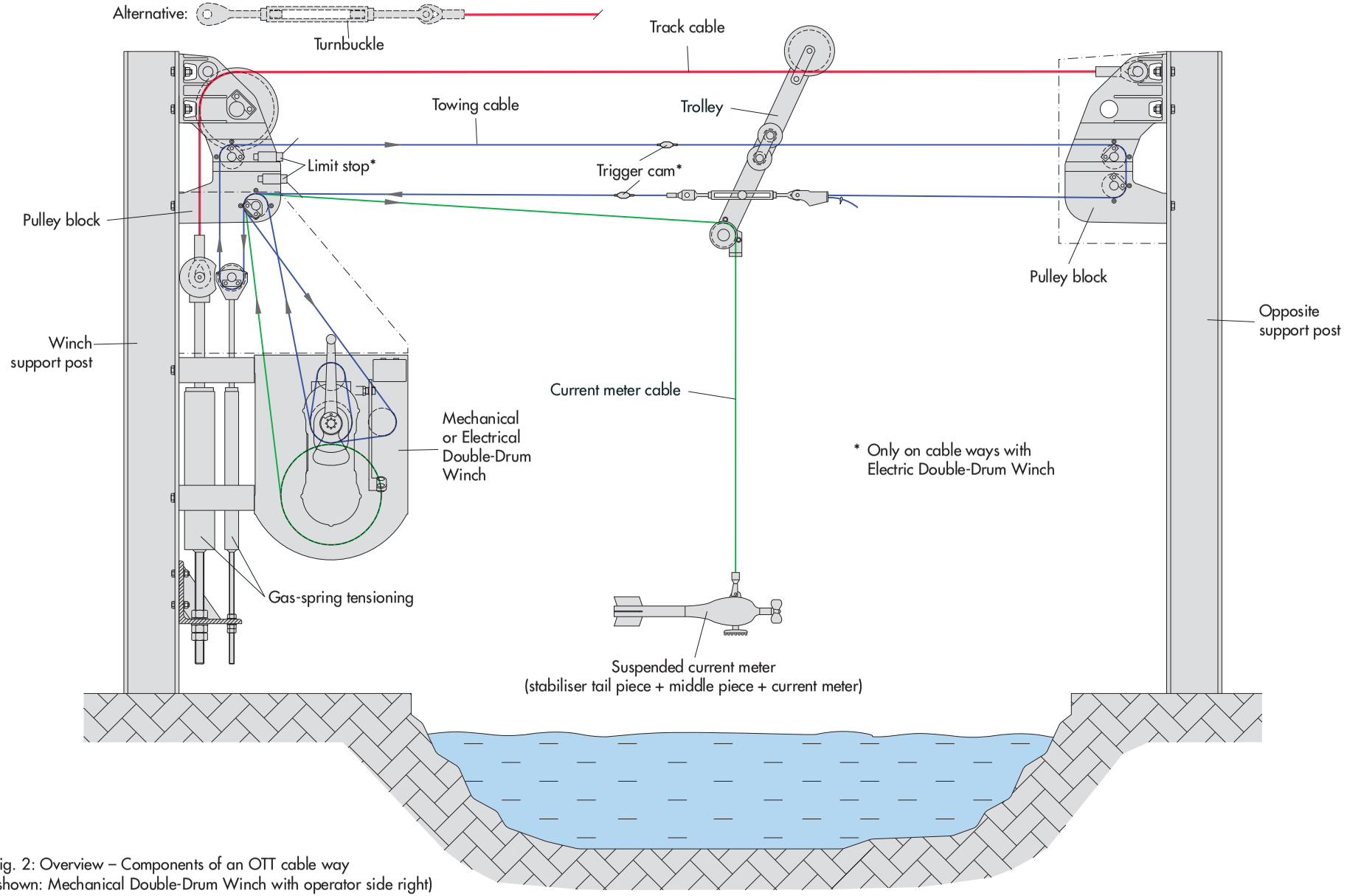


Fig. 2: Overview – Components of an OTT cable way
(shown: Mechanical Double-Drum Winch with operator side right)

Supports
Hot galvanised steel supports, HEB profile (wide flange beam) ≥ 200

Track cable
Pre-stretched, compressed special cable with steel core; galvanised;
16 mm diameter; as supporting element for the trolley

Towing cable (travel cable)
Wire cable made of galvanised wires; used for horizontal movement of the trolley. On an OTT cable way with Electrical Double-Drum Winch, two trigger cams are attached to the towing cable. These operate limit stops attached to the pulley block on the winch side. This automatically stops the electric drive for the double-drum winch when the trolley approaches the supports.

Trolley
Moving component for changing the current meter cable position. The trolley can be moved along the track cable using the towing cable.

Current meter cable (measuring cable)
Special cable with coaxial construction made of galvanised steel wires for suspension of a measuring device. The current meter cable has an internal insulated conductor for transmission of electrical signals (current meter pulses, ground contact).

Cable tensioner
Depending on the OTT cable way design, turnbuckle tensioning (up to max. 20 m range) or gas-spring tensioning (pneumatic tensioning unit with automatic temperature compensation).

Pulley block
Component for holding deflection pulleys for the track cable (with gas-spring tensioning) and the towing cable, and for securing the track cable.

Track cable attachment unit
Component for attaching the track cable on double-drum winches with horizontal cable outlet.

4.2 OTT cable way versions

OTT cable ways are available in five different versions:

OTT cable ways with gas-spring tensioning

▶ Double-drum winch with vertical cable outlet, gas-spring tensioning on winch support post	SK-V-G/W	(Fig. 3)
▶ Double-drum winch with vertical cable outlet gas-spring tensioning on opposite support post	SK-V-G/G	(Fig. 4)
▶ Double-drum winch with horizontal cable outlet, gas-spring tensioning on winch support post	SK-H-G/G	(Fig. 5)

OTT cable ways with turnbuckle tensioning

▶ Double-drum winch with vertical cable outlet, turnbuckle tensioning on winch support post	SK-V-S/W	(Fig. 6)
▶ Double-drum winch with horizontal cable outlet, turnbuckle tensioning on winch support post	SK-H-S/W	(Fig. 7)

4.3 Overview: OTT cable way version SK-V-G/W

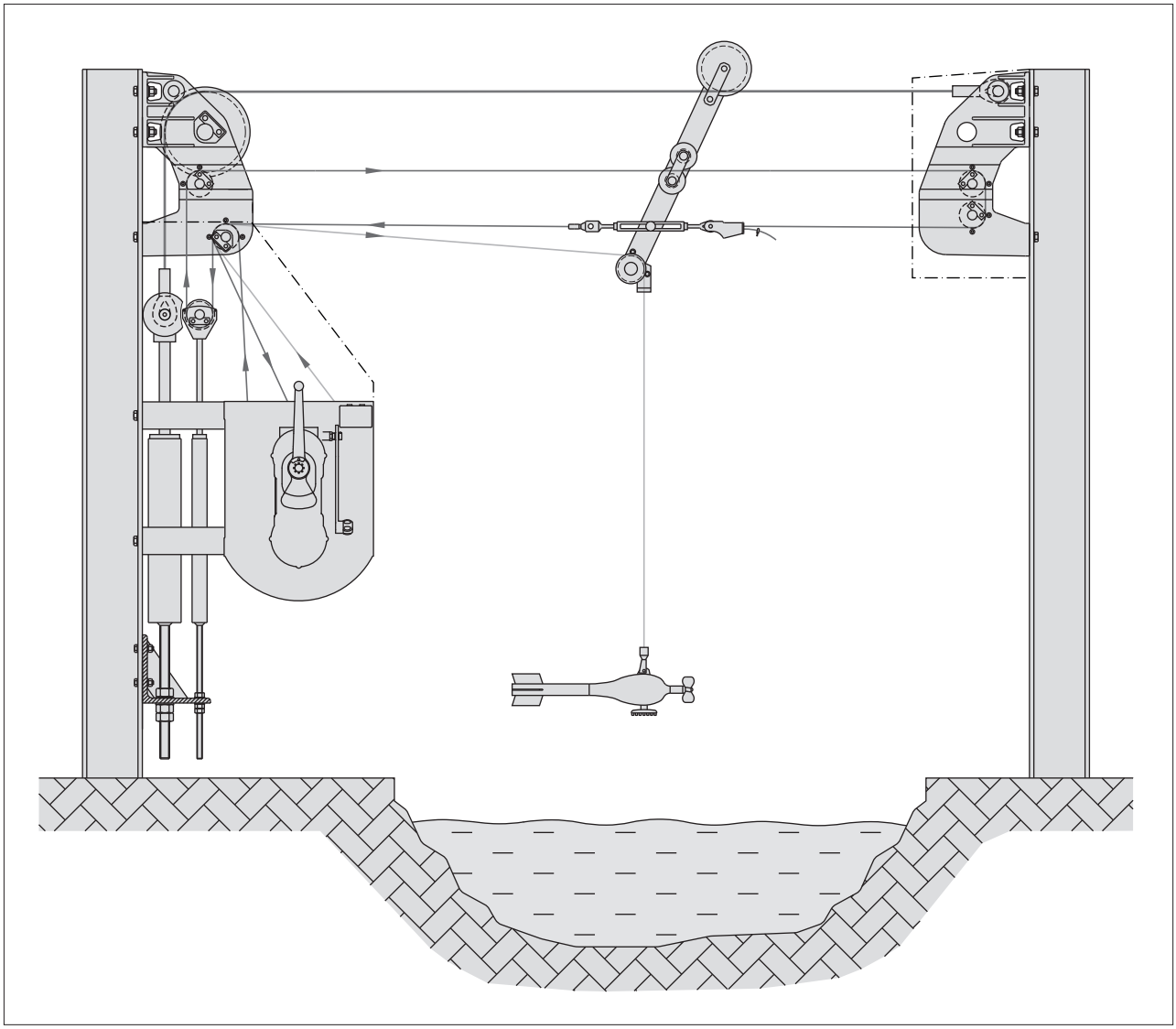


Fig. 3: Version SK-V-G/W (shown: Mechanical Double-Drum Winch).

- Version: Towing cable and current meter cable run **vertically** out of the winch.
- Tensioning: **Gas-spring tensioning,** on **winch support post.**
- Range: max. 160 m
- Middle piece: max. 100 kg
- Operator side: Right or left

4.4 Overview: OTT cable way version SK-V-G/G

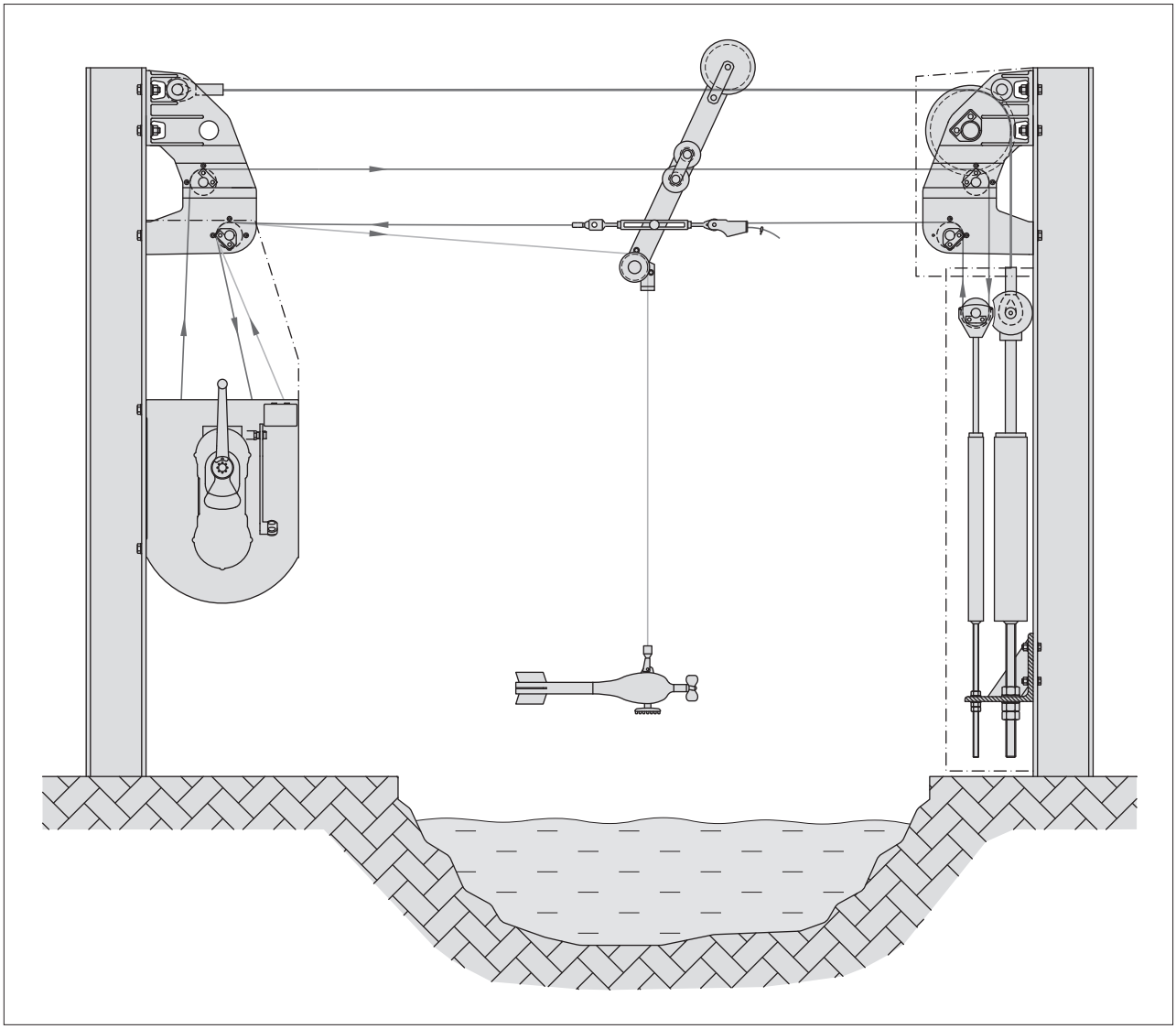


Fig. 4: Version SK-V-G/G (shown: Mechanical Double-Drum Winch).

- Version — Towing cable and current meter cable run **vertically** out of the winch.
- Tensioning — **Gas-spring tensioning,** on **opposite support post.**
- Range — max. 160 m
- Middle piece — max. 100 kg
- Operator side: — Right or left

4.5 Overview: OTT cable way version SK-H-G/G

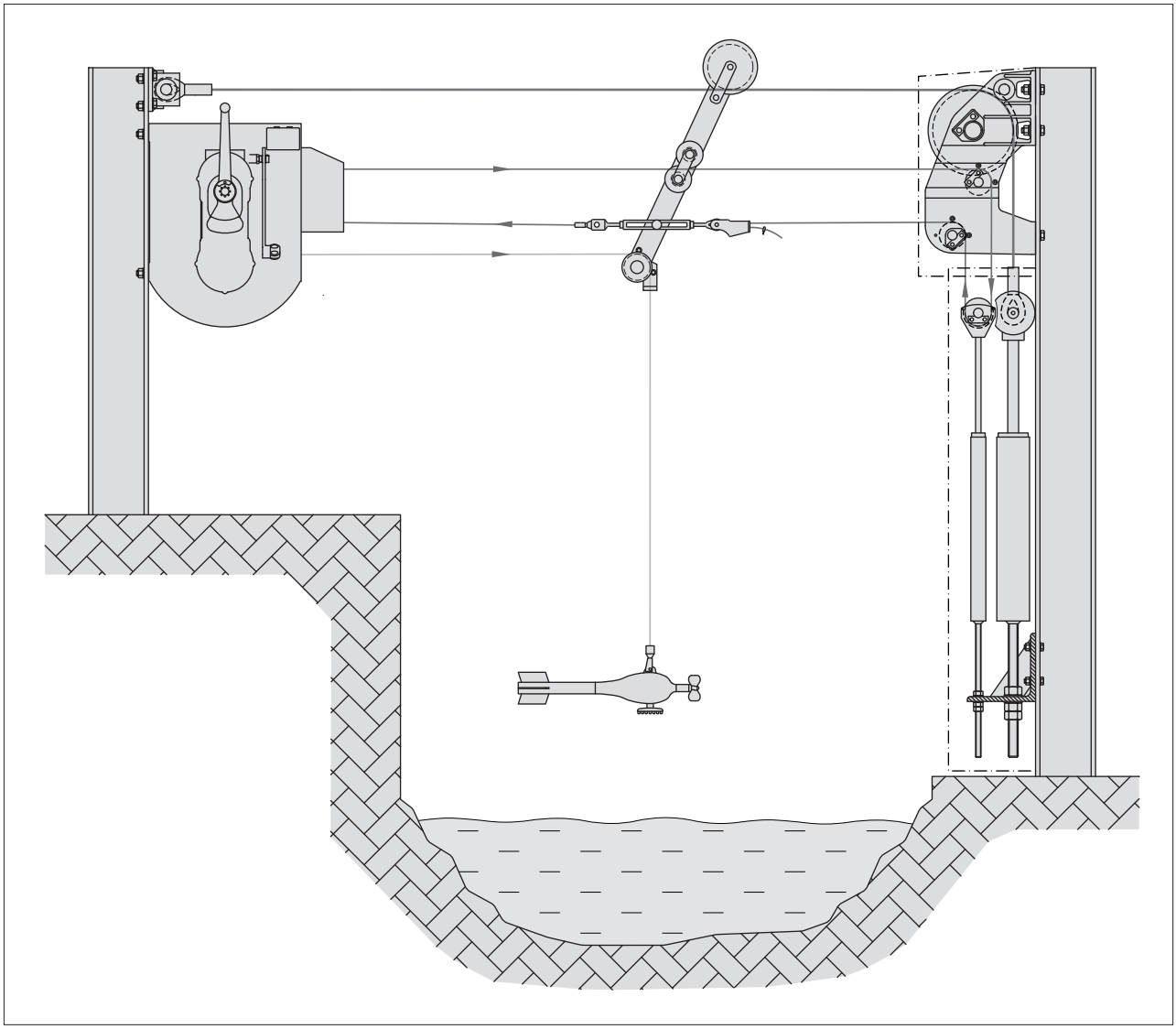


Fig. 5: Version SK-H-G/G (shown: Mechanical Double-Drum Winch).
On this version, the track cable is attached to the winch support post using the "track cable attachment unit".

- Version — Towing cable and current meter cable run **horizontally** out of the winch.
- Tensioning — **Gas-spring tensioning,** on **opposite support post.**
- Range — max. 160 m
- Middle piece — max. 100 kg
- Operator side: — Right or left

4.6 Overview: OTT cable way version SK-V-S/W

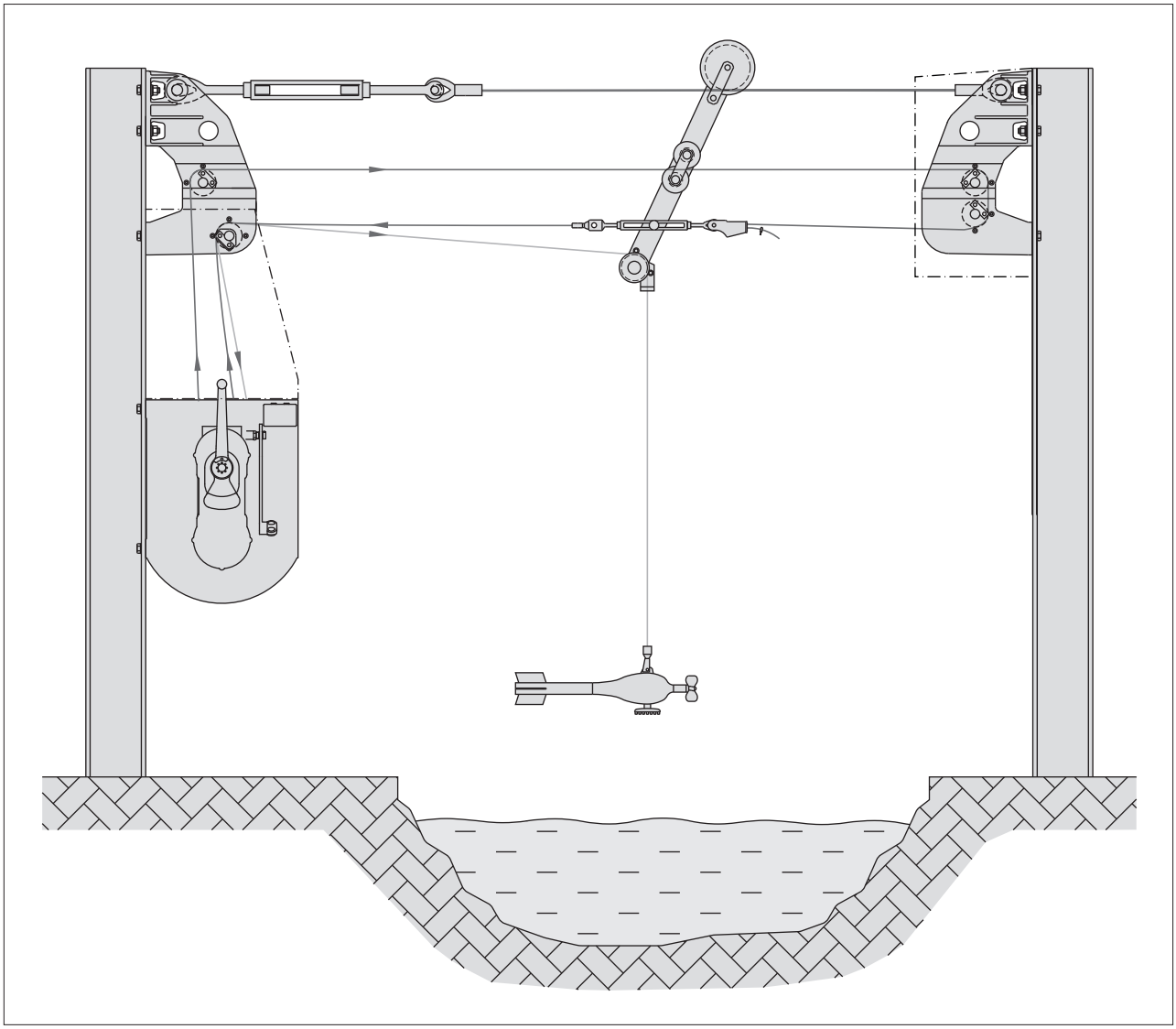


Fig. 6: Version SK-V-S/W (shown: Mechanical Double-Drum Winch).

- Version — Towing cable and current meter cable run **vertically** out of the winch.
- Tensioning — **Turnbuckle tensioning,** on **winch support post.**
- Range — max. 20 m
- Middle piece — max. 100 kg
- Operator side: — Right or left

4.7 Overview: OTT cable way version SK-H-S/W

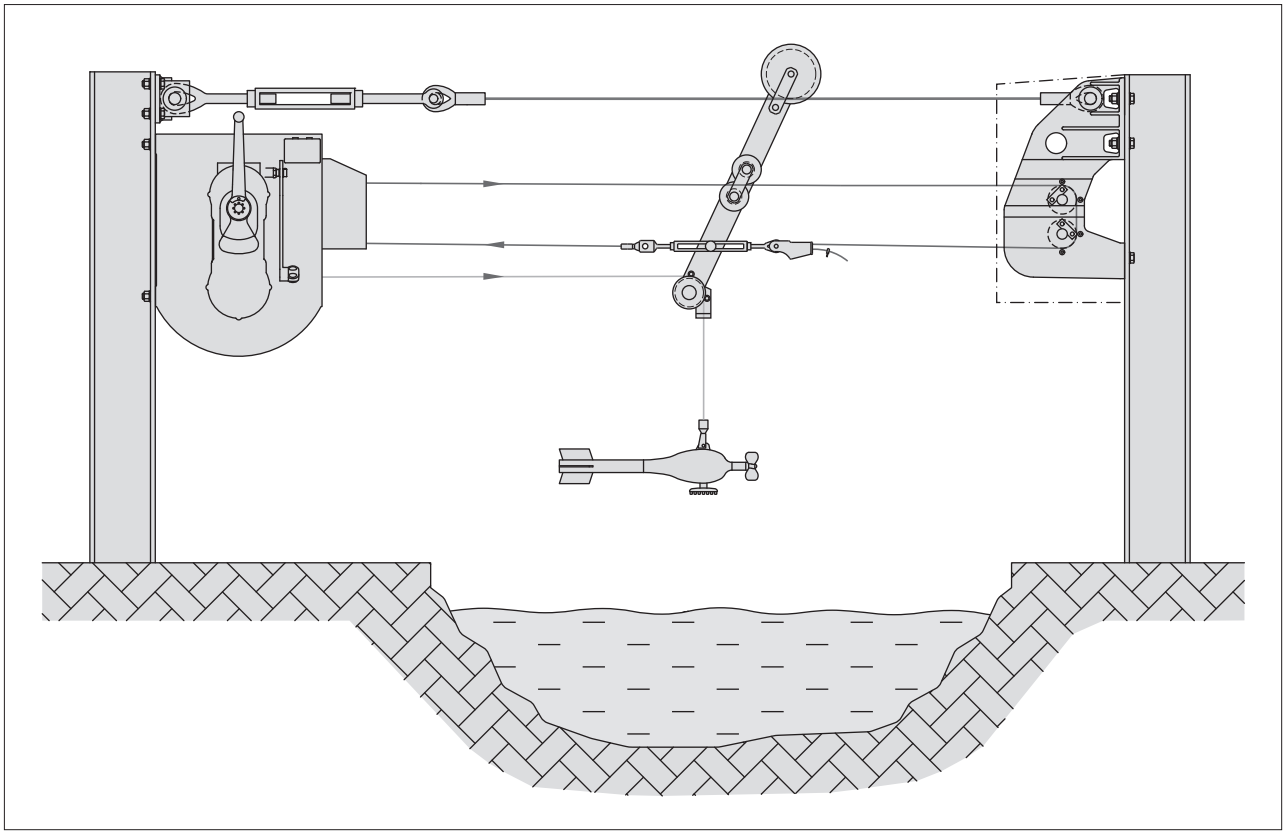


Fig. 7: Version SK-H-S/W (shown: Mechanical Double-Drum Winch).
On this version, the track cable is attached to the winch support post using the "track cable attachment unit".

- Version — Towing cable and current meter cable run **horizontally** out of the winch.
- Tensioning — **Turnbuckle tensioning,** on **winch support post.**
- Range — max. 20 m
- Middle piece — max. 100 kg
- Operator side: — Right or left

5 General safety information

When developing the OTT cable way, we paid special attention to the issue of safety. However, as with all work involving winches and heavy weights, there is a risk of injury. Proper operation, as described in these operating instructions, can avert these risks. In addition, it prevents damage to the OTT cable way and the measuring unit.

To ensure safe operation of the OTT cable way, always observe the following safety information:

- Read these operating instructions carefully before commissioning. Familiarise yourself thoroughly with operation of the OTT cable way and the accessories. Inform all personnel who will be present during the discharge measurement.
- Only use the OTT cable way as described in these operating instructions.
- Observe all hazard notices specified for the individual work steps.
- Only use middle pieces (load weights) up to a maximum of 100 kg.
- Make sure that personnel are never standing under a suspended load (measuring device).
- If the OTT cable way is damaged, it is only to be inspected and repaired by OTT HydroService!
- Do not make any modifications or alterations to the OTT cable way and accessories!

Intended use

OTT cable ways for hydrological surveys are intended for determining the hydrological flow (discharge) in a flowing waterway. In addition, they can be used for taking water samples with special sampling devices.

WARNING **Improper use**

Improper use of the OTT cable way results in the suspended load (measuring device), the incoming/outgoing current meter and towing cable, the trolley and other moving parts of the Electrical Double-Drum Winch posing a risk of severe injuries and even possible death in extreme cases.

- **Never** use OTT cable ways for transporting people!
- **Never** use OTT cable ways for lifting or moving loads other than measuring devices!

In addition, to ensure compliance with statutory accident prevention regulations the following must be observed when operating the cable ways:

1. To independently operate or maintain a cable way, personnel must meet the following requirements,
   – At least 18 years of age.
   – Trained by the operator in operation or maintenance of cable ways.
   – Reasonably expected to perform the tasks assigned to them reliably.
2. The operating personnel must check the functioning of the system before starting work. They must check the condition for visible defects.
   - If there are defects that jeopardise operational safety, work must be stopped.
   - All defects on the cable way are to be reported to the responsible supervisor and also entered in an operating log.
   - Operating personnel must ensure that
     – on an electrically powered double-drum winch: Before releasing the energy supply to the drive units, all controls must be moved to zero position,
     – on an electrically powered double-drum winch: The controls are moved to zero position and the energy supply is shut off before leaving the control station,
     – movement of the measuring device outside the water can be observed from the control station, otherwise a banksman is required.
   - It must be ensured that no personnel are standing under a suspended measuring device.
   - The control station must not be left while the measuring device is in use.
3. The operating personnel may not approach end positions that are limited by emergency stop mechanisms or secured by slip clutches during operation.

If work on waterways results in a risk of drowning, the following measures are to be taken:

- Wearing of life-saving collar or life vest.
- Provide rescue equipment, such as buoyant rescue ropes and life rings.

Also refer to the safety recommendations in the "Directive on construction and operation of stationary cable ways for hydrological surveys, safety requirements" (see Appendix B).

Requirements ...

... before starting a measurement

- Carry out a visual inspection for changes, e.g. tension of cables, external influences.
- Only install the current meter on the lowered middle piece (load weight).
- Inspect the measuring device to ensure secure attachment and check its function.
- With an electrically powered double-drum winch: Check the emergency stop function.

...during a measurement

- When extending and retracting the measuring device or lifting and lowering, be aware of the risk of the measuring device coming into contact with cable through-hole components, contact with the ground, collisions of the trolley or similar. Special attention must be paid to approaching the counter or winch support post.
- During operation, pay attention to possible traffic (pedestrians, vehicles on paths, boats). If necessary, warning signs should be set up on the bank.
- Particularly at high water, pay attention to flotsam and lift the measuring device out of the water in good time.
- At a current meter cable height of less than 2 metres above ground, the cable route may not be traversed.
- If a storm is imminent, the measuring device should be retracted into the gauging house in good time (before the max. permitted operating wind is reached).
- If an electrical storm occurs, work must be stopped immediately. The station must be exited immediately and a motor vehicle found if possible.

... at the end of a measurement

- At the end of the measurement, the trolley should be moved to the home position.
- Place the current meter on a support block, ensuring that a slight tension reemains in the current meter cable (avoid slack cables).
- Disconnect the electrically powered double-drum winch from the mains supply. To do this, secure the OTT cable way with Electrical Double-Drum Winch against unauthorised use by removing the switch cabinet key.

Instruction and warning signs attached to the OTT cable way

Fig. 8: Explanation of instruction and warning signs attached to an OTT cable way.

6 Assembly and commissioning

6.1 Assembling the OTT cable way

Note: Assembly of an OTT cable way **is not dealt with in these instructions. Assembly by the operator of the OTT cable way is not permitted.**

An OTT cable way is normally assembled by OTT HydroService. We use specially trained personnel with appropriate specialist knowledge and have access to the required special tools.

In exceptional cases, assembly can be carried out by a specially trained assembly company authorised by OTT.

6.2 Commissioning

Note: Commissioning of an OTT cable way **is not dealt with in these instructions. Commissioning by the operator of the OTT cable way is not permitted.**

After commissioning, OTT HydroService (or a specially trained assembly company authorised by OTT) performs a functional test on the OTT cable way. This includes instructing the operator on proper operation of the OTT cable way. As part of this instruction all documents are handed over:

- Crane documentation
- Operating instructions
- Acceptance test certificate (FAT)
- Factory certificates for
  - Track cable
  - Towing cable
  - Current meter cable
  - Gas springs (if fitted)
  - Towing cable turnbuckle (if fitted)

6.3 Information on German Machine Directive/ European Machine Directive (2006/42/EC)

Stationary cable ways for hydrological surveys are subject to the currently applicable version of the terms of the "Ninth Directive of the Product Safety Act" (Machine Directive – 9th ProdSV) of 12th May 1993 (BGBl. I of 27 September 1993). Compliance with this directive and the associated European Machine Directive (2006/42/EC) can be assumed, if the cable way has been assembled in accordance with the requirements of the "Directive on construction and operation of stationary cable ways for hydrological surveys, safety requirements" (see Appendix B).

Compliance with the European Machine Directive (2006/42/EC) is to be confirmed in a declaration of conformity in line with Appendix II A of the Machine Directive. The declaration of conformity must be created by the operator who has constructed (or had constructed) the cable way from its individual parts. A CE mark is then to be attached to the cable way

As a basis for this declaration of conformity, we issue an "Installation declaration for incomplete machines" for each of the components supplied by OTT Hydromet (for the Mechanical or Electrical Double-Drum Winch and for attached parts; this is part of the crane documentation).

In addition, OTT Hydromet provides the operator with a DEKRA test certificate. OTT Hydromet has an inspection carried out by an "authorised body" (DEKRA) – using a prototype provided – for compliance with the directives and standards applicable for cable ways; this corresponds to the earlier "voluntary prototype inspection". An EU prototype test in compliance with the European Machine Directive (2006/42/EC) Appendix IX is not required for stationary cable ways for hydrological surveys.

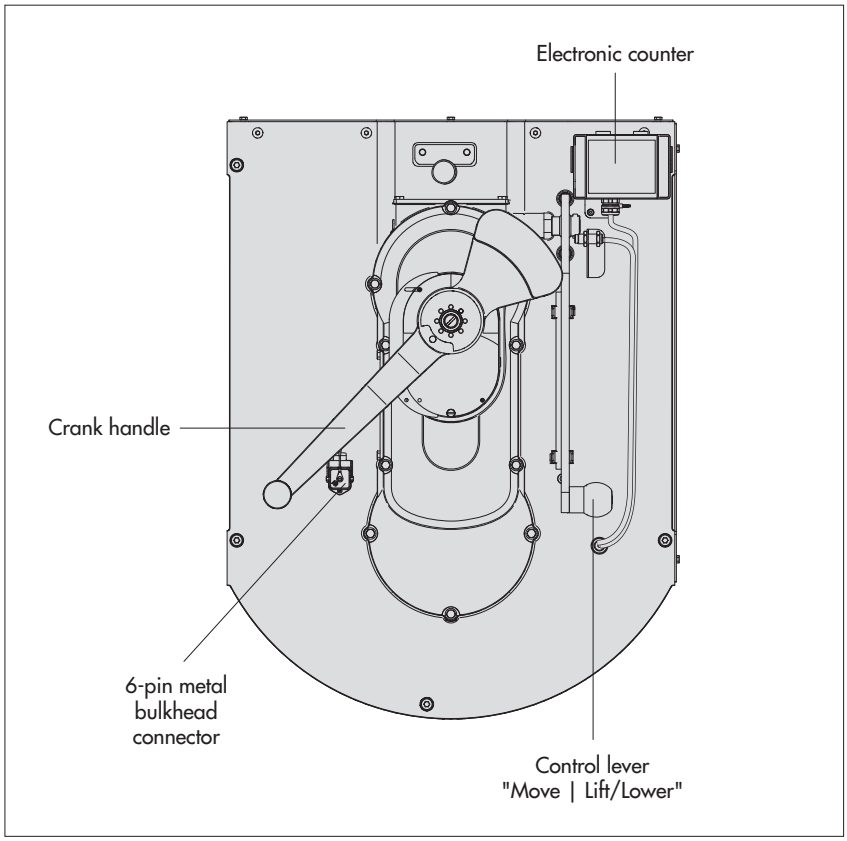
7 Operating the Mechanical Double-Drum Winch

The Mechanical Double-Drum Winch has the following controls and connections:

- Crank handle
- "Move | Lift/Lower" control lever
- Electronic counter
- 6-pin metal bulkhead connector (connection for external signal counter set [1])

[1] The Mechanical Double-Dum Winch is designed and tested for use with an external signal counter set from OTT. OTT provides no guarantee of functionality for unrestricted operation of the Mechanical Double-Drum Winch in combination with signal counter sets made by other manufacturers.

Fig. 9: Controls and connections on the Mechanical Double-Drum Winch.



7.1 Moving the measuring device

Risk of damage to OTT cable way

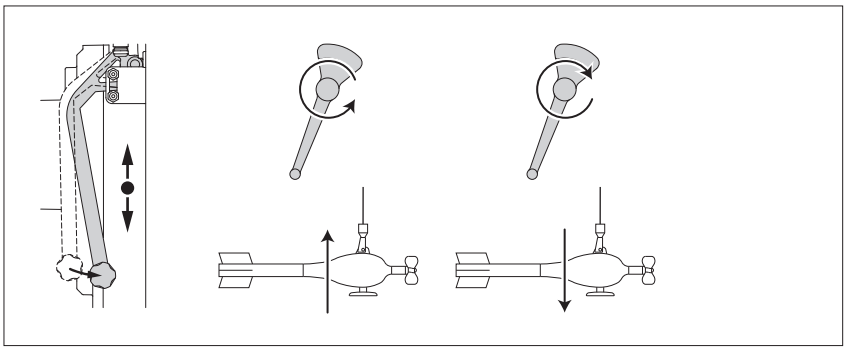
- When moving the measuring device, make sure that you:
  - Do not move the current meter cable catch against the trolley (see Fig. 30);
  - Do not move the trolley against the pulley blocks or the Mechanical Double-Drum Winch.
- Always keep the current meter cable under tension. Avoid slack cables.

Lifting and lowering the measuring device

- Set the "Move | Lift/Lower" control lever to the "**Lift/Lower"** posistion (see Fig. 10 and sticker on the Mechanical Double-Drum Winch).
- **Lifting the measuring device**: Turn the crank handle **anticlockwise**.
- **Lowering** the measuring device: Turn the crank handle **clockwise**.

Fig. 10: Lifting/lowering the measuring device.

The "Move | Lift/Lower" control lever is in the "Lift/Lower"position.



Moving the measuring device

- Set the "Move | Lift/Lower" control lever to the **"Move"** position (see Fig. 11 and sticker on the Mechanical Double-Drum Winch).

Mechanical Double-Drum Winch with operator side: **right**

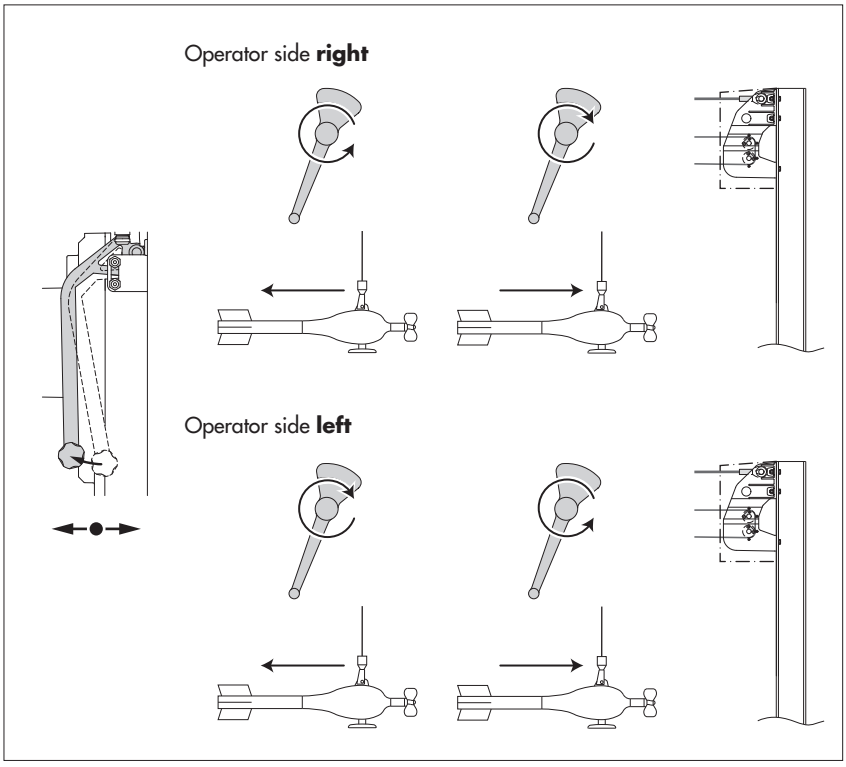
- Moving the measuring device towards the **opposite support post:** Turn the crank handle **clockwise**.
- Moving the measuring device towards the **winch support post:** Turn the crank handle **anticlockwise.**

Mechanical Double-Drum Winch with operator side: **left**

- Moving the measuring device towards the **opposite support post:** Turn the crank handle **anticlockwise.**
- Moving the measuring device towards the **winch support post:** Turn the crank handle **clockwise.**

Fig. 11: Moving the measuring device.

The "Move | Lift/Lower" control lever is in the "Move"position.



7.2 Operating the electronic counter

The electronic counter indicates the horizontal and vertical position of the measuring device. The reference points (cross-section zero point and water surface (alternatively the bottom of the waterway)) can be defined using two reset buttons.

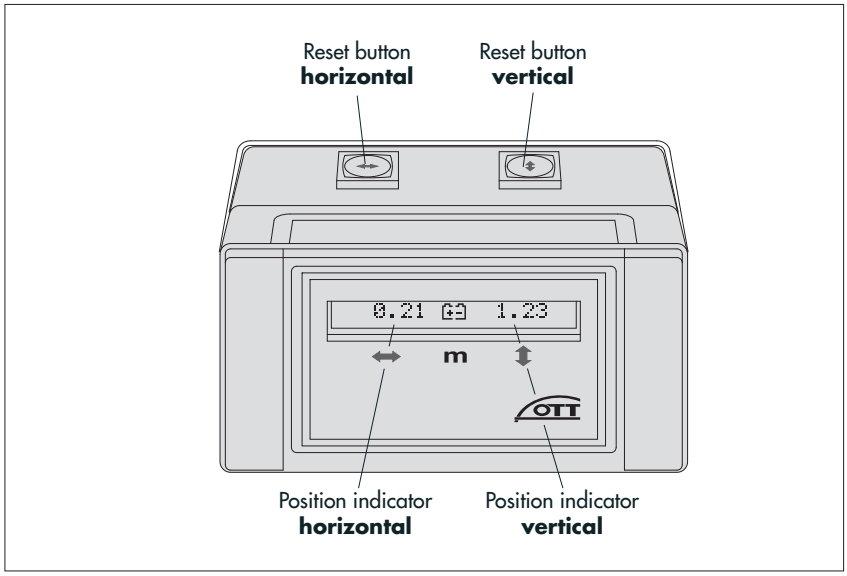


Fig. 12: Operating the electronic counter on the Mechanical Double-Drum Winch.

Turning on the counter

- Press the "horizontal" or "vertical" reset button for approx. 0.5 seconds. Both counter readings then show 0.00.

Setting the counter to 0.00 (referencing to the reference point)

- Setting the cross-section zero point counter to 0.00: Briefly press the **"horizontal"** reset button.
- Setting the water surface counter to 0.00: Briefly press the **"vertical"** reset button.

Notes:

- The counter is automatically switched off approx. 2 hours after the last movement of the Mechanical Double-Drum Winch.
- Electronic counter measuring range: 655.35 m (at a counter reading of 655.36 m, the counter returns to 0.00).
- Battery symbol flashing in the display: Remaining battery capacity maximum 10 hours of operation.

Replacing the battery

- Open the counter housing on the rear, remove the used battery and insert the new battery, ensuring correct polarity.

Battery type used:	9 V block battery; alkaline design
Operating time:	approx. 60 hours at 20 °C ambient temperature
	approx. 30 hours at 0 °C ambient temperature

8 Operating the Electrical Double-Drum Winch

The Electrical Double-Drum Winch has the following controls and connections:

Switch cabinet with
- Main switch (key switch)
- Three push buttons
- Metal bulkhead connector (connection for external signal counter set)

Hand-held control unit with
- Joystick
- Emergency stop button
- Potentiometer for travel speed
- Electronic controller with display and function-/cursor keys

8.1 Operation on switch cabinet

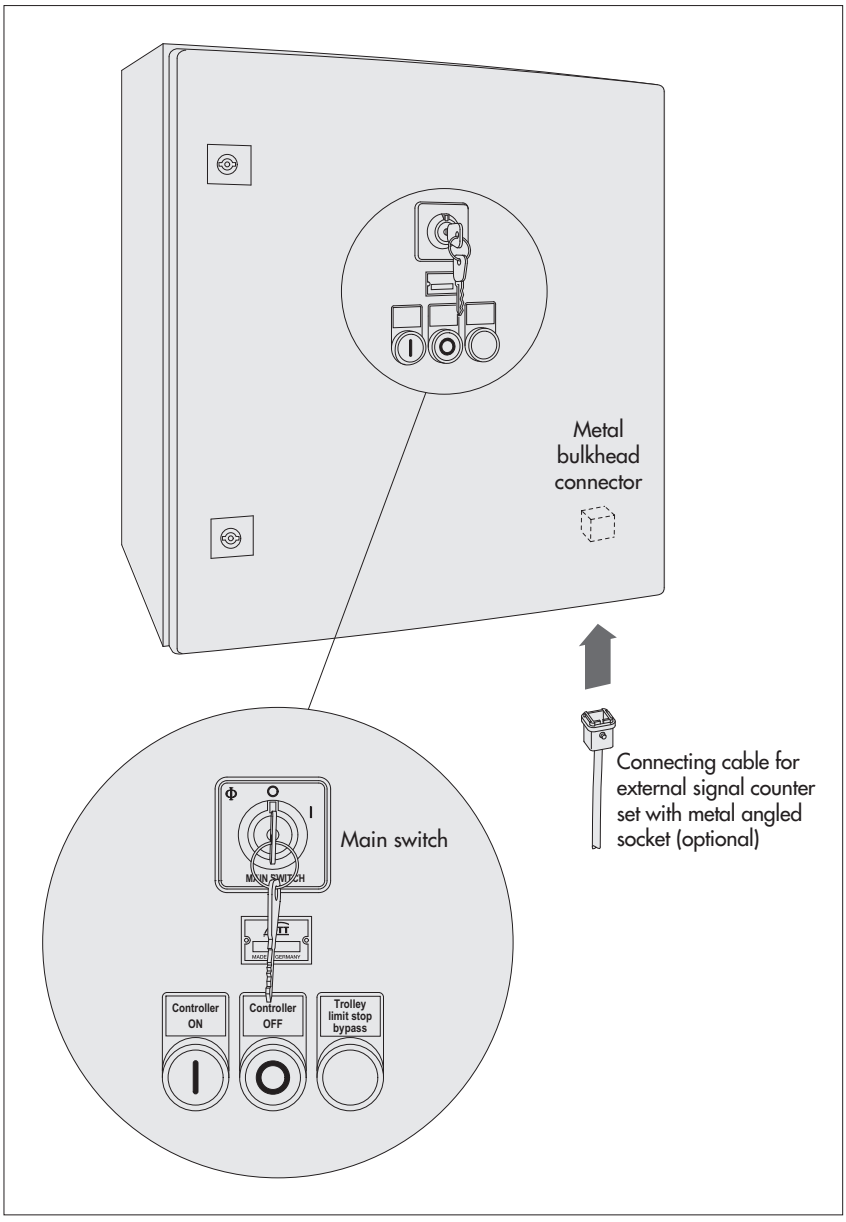


Fig. 13 Electrical Double-Drum Winch switch cabinet.

Switching on the electrical controller
- Turn the main switch (key switch) on the switch cabinet to "I".
- Press the "Controller ON" button on the switch cabinet.

WARNING **In case of malfunction with imminent danger**

- Immediately switch off the Electrical Double-Drum Winch using the red emergency stop button on the hand-held control unit.

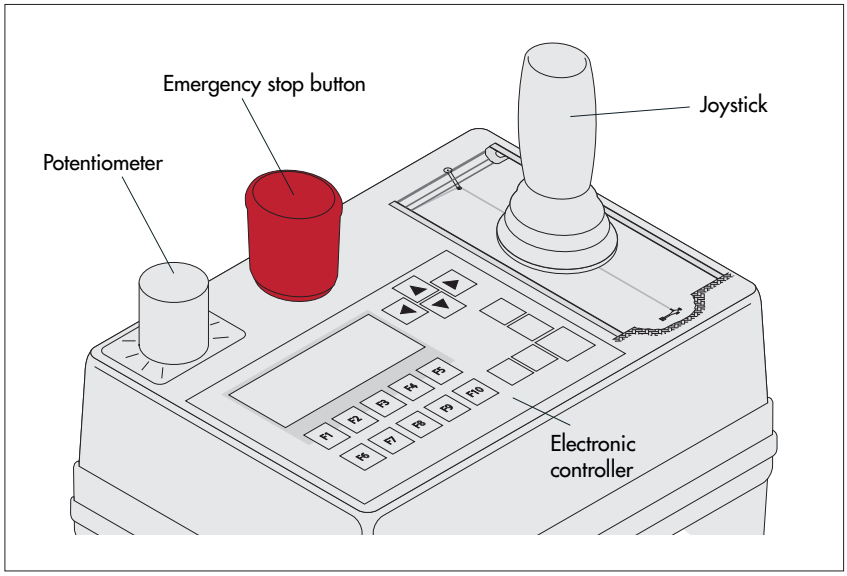


Fig. 14: Controls on the Electrical Double-Drum Winch hand-held control unit.

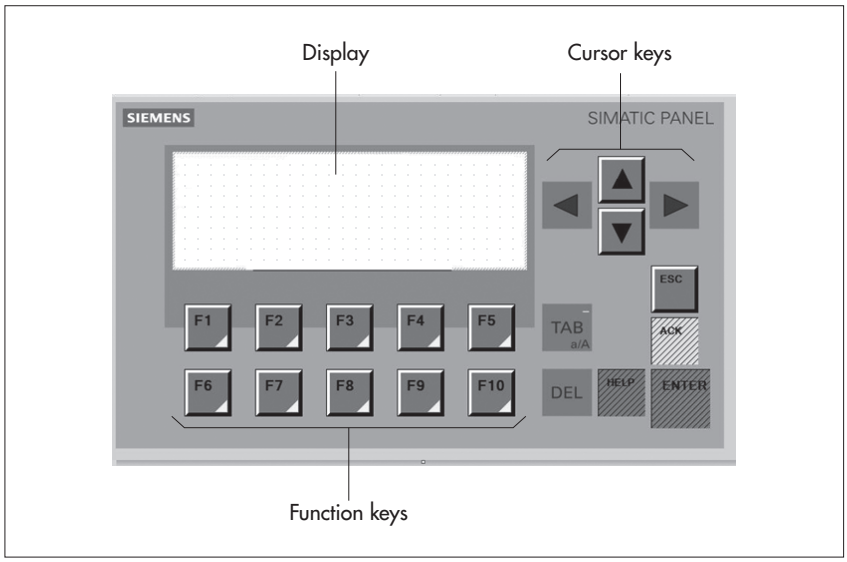
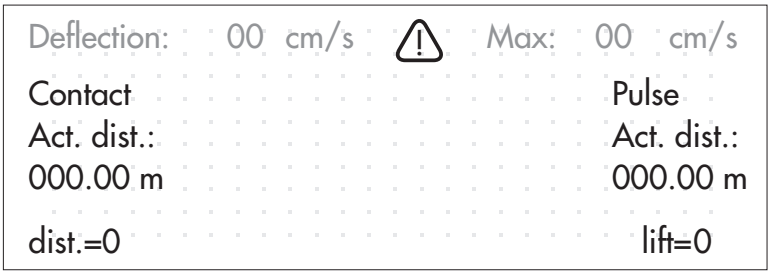


Fig. 15: Electronic controller on the Electrical Double-Drum Winch hand-held control unit.

- **ESC** Cancel, return to main screen
- **ACK** Acknowledge fault
- **ENTER** Enable editing, complete entry
- **HELP** no function
- **TAB** no function
- **DEL** no function

Fig. 16: Main screen of electronic controller display.

The figure shows the main screen with an external signal counter activated. ("External signal counter set" setting parameter → "On". This hides the text for the internal signal counter set.)



- ▶ Deflection [1]: Current speed
- ▶ Max [1]: Set maximum speed
- ▶ Contact: Highlighted in black: Ground contact detected
- ▶ Pulse: Highlighted in black: Current meter pulse detected (propeller rotating)
- ▶ Act. dist.: (left): Actual distance in horizontal direction (trolley)
  Act. dist.: (right): Actual distance in vertical direction (lift)
- ▶ dist. = 0: Press function key **F1** to set actual distance in horizontal direction (trolley) to "0.00"
- ▶ lift = 0: Press function key **F5** to set actual distance in vertical direction (lift) to "0.00"
- ▶ Warning triangle: Fault acknowledged with **ACK** but still present

8.3 Moving the measuring device

Risk of damage to OTT cable way

- ▶ When moving the measuring device, make sure that you:
  – Do not move the current meter cable catch against the trolley (see Fig. 30);
  – Do not move the trigger cams as far as the limit stops (emergency limit stop).
- ▶ Move the joystick carefully and never jerkily.
- ▶ Always keep the current meter cable under tension. Avoid slack cables.

Selecting the speed

The speed (move / lift and lower measuring device) is selected either using the deflection of the joystick or using the potentiometer.

With joystick [2]

- ■ Pre-select the relevant speed with maximum deflection of the joystick by pressing the **F6, F7** or **F8** key.
  The following speeds are factory preset:
  F6: Max. 5 cm/s
  F7: Max. 25 cm/s
  F8: Max. 50 cm/s
- ■ If required, the factory preset speed can be changed manually for the current measurement: press the relevant key F6, F7 or F8 and change the speed upwards/downwards with the cursor keys (F1=1, F2=2, ..., F10=0).

With Potentiometer [3]

- ■ Select the required speed with the potentiometer.

Note: The speed can be changed at any time during travel.

[1] The "Deflection: / Max" line is only visible if the speed is selected by the deflection of the joystick. "Potentiometer" setting parameter → "off"; see chapter 8.4

[2] "Potentiometer" setting parameter → "off"; see chapter 8.4

[3] "Potentiometer" setting parameter → "on"; see chapter 8.4

Lifting and lowering the measuring device

- Carefully move the joystick up or down and hold.
  When the joystick is at its limit, the set maximum speed is reached (unless the speed is selected using the potentiomenter, see above).

If the electronic controller detects ground contact (buzzer sounds and "Contact" is highlighted in black in the display), no further lowering of the measuring device is possible.

Moving the measuring device

- Carefully move the joystick right or left and hold.
  When the joystick is at its limit, the set maximum speed is reached (unless the speed is selected using the potentiomenter, see above).

Note: The cable way should always be in the "Lift/Lower" postition when it is switched off! This prevents potential malfunction of the electromechanical switch device (lifting cylinder); see menu "Teach lifting cylinder".

Setting the counter to 0.00 (referencing to reference point)

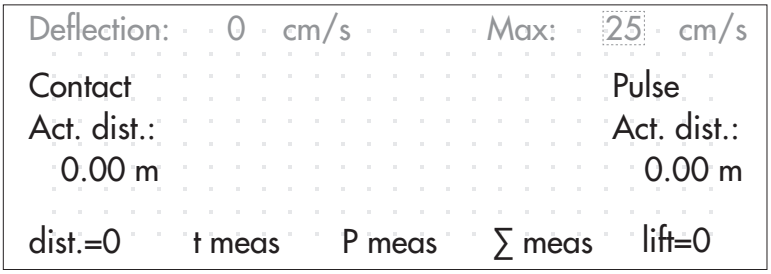
- Setting the cross-section zero point counter to 0.00: Press the **F1** key (dist.=0).
- Setting the water surface counter to 0.00: Press the **F5** key (lift=0).

Note: All counter readings are retained after switching off. This does not require a back-up battery.

If no external signal counter set is used, the measuring functions integrated into the hand-held control unit can be used.

Fig. 17: "Integrated measuring functions" menu.

The figure shows the main screen with an internal signal counter set activated. ("External signal counter set" setting parameter → "off". The texts for the internal signal counter set "t meas", "I meas" and "∑ meas" are displayed.)



- **F2** activates time measurement "t meas" is highlighted in black.
- **F3** activates pulse measurement "P meas" is highlighted in black.
- **F4** activates integration measurement "∑ meas" is highlighted in black.

Intergrated measuring function – Time measurement (t meas)
This measuring method records the number of current meter pulses during a specified time interval.

- **F2** — Pressing the key changes the specified time interval between 5 and 120 seconds in 10 second increments (up to 20 seconds in 5 second increments).
- **F7** — Pressing the key starts the measurement, "t meas" flashes. The time interval begins with the first current meter pulse; the remaining time and number of current meter pulses are displayed; the "t" displayed in the top line flashes. The buzzer sounds to indicate the end of the time interval.
- **ESC** — Cancels the current measurement.
- **Enter** — – Enables free setting of the specified time interval using the cursor keys (message shown: "Function keys disabled"). The "Target time" must be selected (rectangular frame). Select the "up/down" cursor keys as required.
  – Pressing again: the changed values are adopted.
- **Cursor keys** — Cursor keys change the specified time interval to any value

Intergrated measuring function – Pulse measurement (I mess)
This measuring method records the time required for a set number of current meter pulses.

- **F3** — Pressing key changes the specified number od current meter pulses between 10 and 50 in increments of 5.
- **F8** — Pressing the key starts the measurement, "I meas" flashes. The measuring process begins with the first current meter pulse; the elapsed time and number of current meter pulses are displayed; the "I"displayed in the top line flashes. The buzzer sounds to indicate the end of the measuring process.
- **ESC** — Cancels the current measurement.
- **Enter** — – Enables free setting of the specified number of current meter pulses using the cursor keys (message displayed: "Function keys disabled"). The "Target pulses" must be selected (rectangular frame). Select the "up/down" cursor keys as required.
  – Pressing again: the changed values are adopted.
- **Cursor keys** — Cursor keys change the specified number of current meter pulses to any value.

Intergrated measuring function – Intergration measurement (∑ meas)
This measuring method records the required time and the number of current meter pulses when lowering the suspended current meter from the water surface until the ground probe on the middle piece responds.

- **F9** — Pressing the key starts the measurement, "∑ meas" flashes. The measuring process begins with the first current meter pulse; the elapsed time and number of current meter pulses are displayed; the "∑" displayed in the top line flashes. The buzzer sounds to indicate the end of the measuring process.
- **ESC** — Cancels the measuring process.

8.4 Control unit menu

The control unit menu includes the following screen:

- Language
- Buzzer
- External signal counter set
- Potentiometer
- Sample collector
- Diagnostics
- Alarms
- Distance with sign
- Teach lifting cylinder (available from software version 14.0)
- Software version

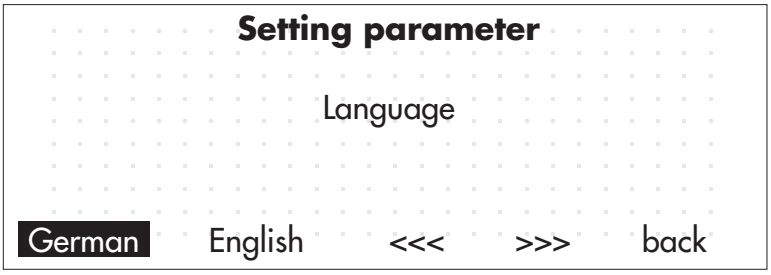
Opening the menu

- Press the F10 button.
  The first setting parameter "Language" appears.

"Language" setting parameter

This setting parameter is used to specify the language for the user interface.

Fig. 18: "Language" setting parameter.

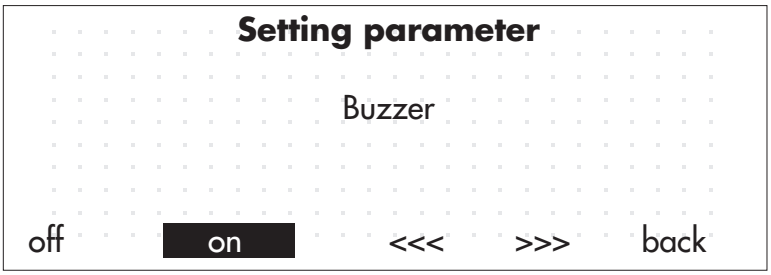


- **F1** Select language "German". "German" is highlighted in black.
- **F2** Select language "English". "English" is highlighted in black.
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

"Buzzer" setting parameter

This setting parameter can be used to activate or deactivate a buzzer sound for current meter pulses.

Fig. 19 "Buzzer" setting parameter.



- **F1** Select buzzer "off". "off" is highlighted in black
- **F2** Select buzzer "on". "on" is highlighted in black.
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

"External signal counter set" setting parameter

Note: If an external signal counter set is used, the setting must be changed **before** connecting the signal counter set.

This setting parameter activates or deactivates the use of an external signal counter set.

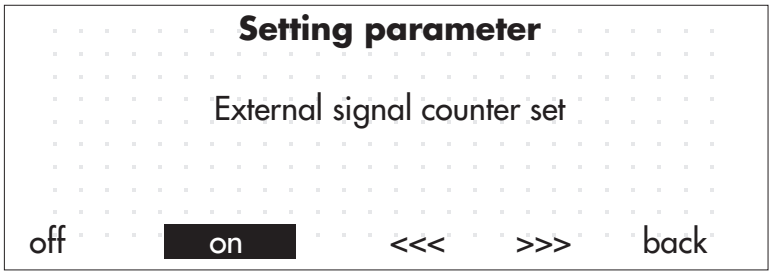


Fig. 20: "External signal counter set" setting parameter.

- **F1** Disables an external signal counter set, "off" is highlighted in black.
- **F2** Enables an external signal counter set, "on" is highlighted in black.
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

Tip: With an external signal counter set enabled, switch off the "Buzzer" setting parameter as most signal counter sets have their own buzzer.

"Potentiometer" setting parameter
This setting parameter can be used to activate and deactivate the speed setting using the potentiometer. If the speed setting using the potentiometer is activated, the speed setting using the relevant deflection of the joystick is deactivated.

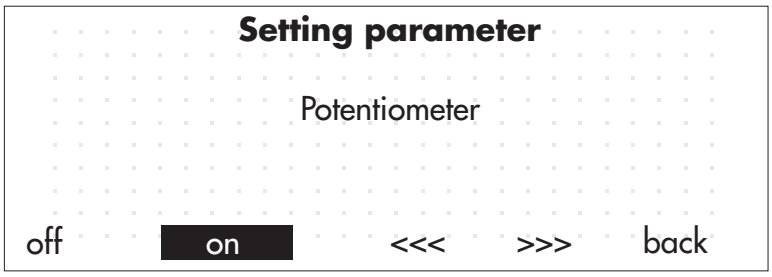
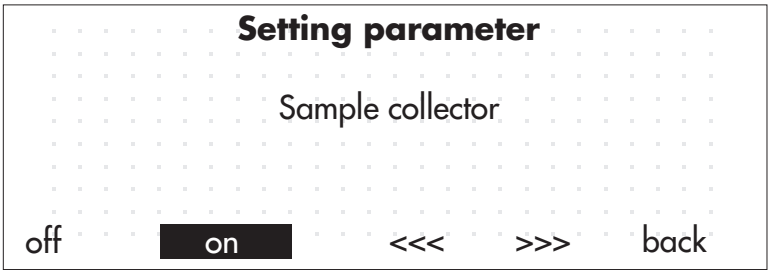


Fig. 21: "Potentiometer" setting parameter.

- **F1** Select potentiometer "off". "off" is highlighted in black.
- **F2** Select potentiometer "on". "on" is highlighted in black.
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

"Sample collector" setting parameter
This setting parameter is used to disconnect the current meter cable from the voltage. This automatically deactivates the buzzer and ground contact detection is no longer possible. If necessary, a voltage can be connected to the current meter cable to control a sample collector.

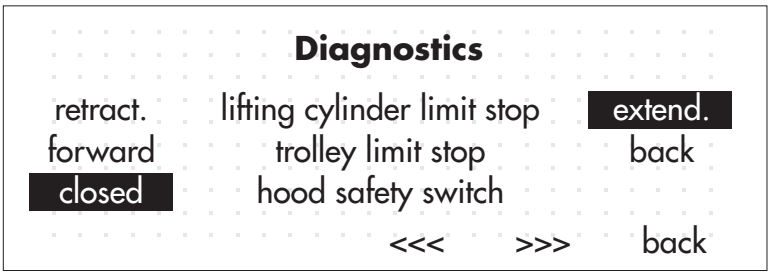
Fig. 22: "Sample collector" menu.



- **F1** Select sample collector "off". "off" is highlighted in black.
- **F2** Select sample collector "on". "on" is highlighted in black.
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

"Diagnostics" menu
This menu can be used to check the limit stops on the Electrical Double-Drum Winch.

Fig. 23: "Diagnostics" menu.



The values highlighted in black have the following meaning:

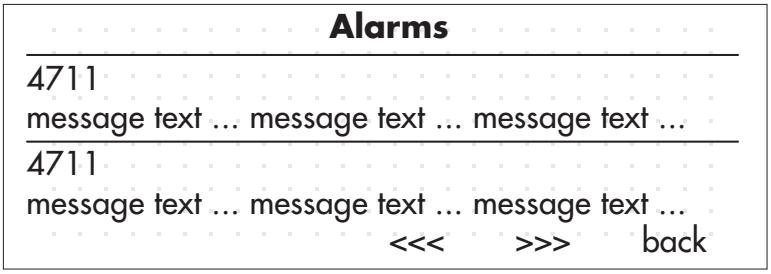
- **Lifting cylinder limit stop**
  - retract. Lifting cylinder in "Lift/Lower"
  - extend. Lifting cylinder in "Move" position
- **Trolley limit stop**
  - forward Trolley forward limit stop active
  - back Trolley back limit stop active
- **Hood safety switch**
  - closed Protective hood using "Move | Lift/Lower" control lever and crank holder cover are correctly fitted

- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

Note:
If neither "retract." nor "extend." is highlighted in black in the line "lifting cylinder limit stop" the lifting cylinder has lost its stored setting. A so-called "teach-in drive" is required; see menu "Teach lifting cylinder".

"Alarms" menu
This menu shows any alarms occuring on the Electrical Double-Drum Winch. Alarms are displayed with a number and a message text.

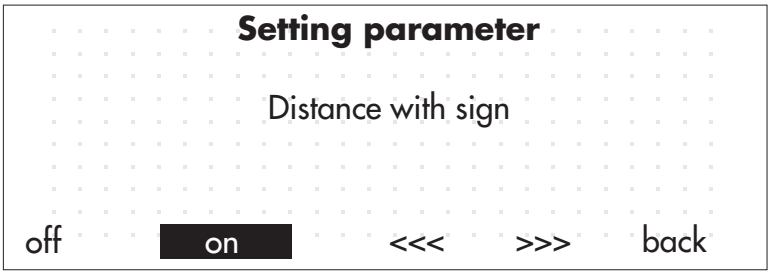
Fig. 24: "Alarms" menu.



- **ACK** Acknowledge alarm. The next alarm is displayed.
- **F3/F4** Move to previous/next setting parameter
- **F5** Back to main screen.

"Distance with sign" menu
Shows the actual distance in horizontal direction (trolley) and vertical direction (lift) with or without a negative sign in the main screen.

Fig. 25: "Distance with sign" menu.



- **F1** Select distance with sign "off". "off" is highlighted in black.
- **F2** Select distance with sign "on". "on" is highlighted in black.
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen

Menu "Teach lifting cylinder"
This function is available as of software version 14.0 [1] (Software version query: see menu "Software version", page 33).

The Electrical Double-Drum Winch has an electronical switch device, the so-called "lifting cylinder". The lifing cylinder is used to switch the electric drive between"Move" and "Lift/Lower". Deflecting the joystick to the left/right (Move) or up/down (Lift/Lower) controls the lifting cylinder accordingly.

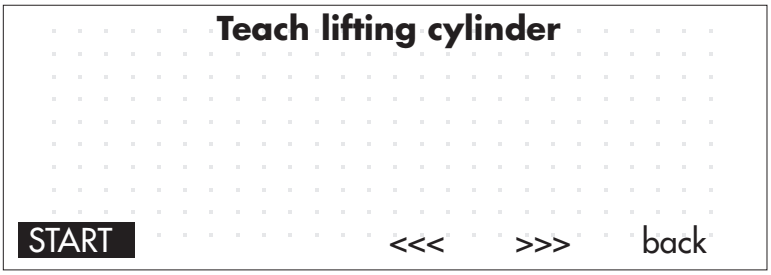
Certain operating conditions can cause the lifting cylinder to lose its stored setting (travel distance):

- during a lifting cylinder movement:
  – emergency stop button is triggered;
  – button "Control OFF" is pressed;
  – safety switch on the protective hood (above control lever/lifting cylinder) or crank mounting cover (above crank holder) is open;
- trigger cam is moved to limit stop (emergency limit stop);
- cable way with lifting cylinder is switched off in position "Move".

Normally, the electronic control system recognizes these operating conditions independently and starts a so-called "teach-in drive" the next time the device is put back into operation. For this purpose, the lifting cylinder moves to both end positions (retracted and extended), determines the travel distance and then stores it. A teach-in drive lasts approx. 12 seconds (it is performed during re-commissioning parallel to the booting process of the electronic control).

If required you can also start this teach-in drive manually, via the menu "Teach lifting cylinder":

Fig. 26: Menu "Teach lifting cylinder".



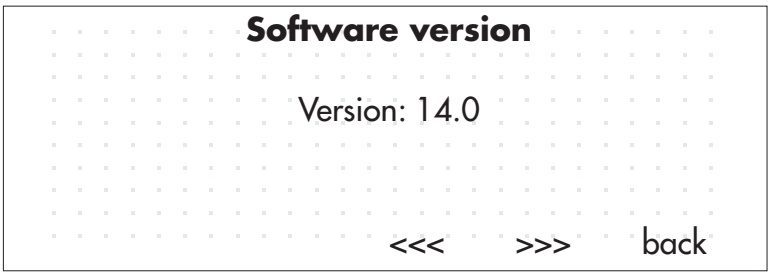
- **F1** Starts a "Teach-in drive".
- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

Note:
For a successful "Teach-in drive" …
- the voltage must be continuously applied!
- the Electrical Double-Drum Winch must not be converted to mechanical emergency operation!

[1] please contact OTT Hydroservice for a potential software update

"Software version" menu
This menu displays the current electronic controller software version.

Fig. 27: "Software version" menu.



- **F3/F4** Move to previous/next setting parameter.
- **F5** Back to main screen.

8.5 Mechanical emergency operation of Electrical Double-Drum Winch in case of power failure

If there is a lengthy power failure, you can operate the Electrical Double-Drum Winch by hand to return the measuring device. A crank handle is provided for this mechanical emergency operation.

If the Electrical Double-Drum Winch is equipped with the optional uninterruptible power supply (UPS), mechanical emergency operation can be used to
- complete a discharge measurement already started, or
- perform a complete new discharge measurement.

The UPS means that the display of actual distances in horizontal and vertical direction on the hand-held control unit and the integrated signal counter set remain fully functional in the event of a power failure.

Note: The integrated battery for the UPS in the switch cabinet is automatically charged during normal operation of the Electrical Double-Drum Winch.

Switching the Electrical Double-Drum Winch to mechanical emergency operation

CAUTION **Risk of injury due to falling measuring device**

If the crank handle is attached incorrectly, the brake on the current meter cable can come loose.

- First install the crank handle and check it is functioning correctly and only then uncouple the motor.
- Steps 1 to 4 must be carried out in te correct order.

Step 1: Prepare emergency operation

- On OTT cable ways without UPS: Turn the main switch (key switch) to "0" and remove the key (see Fig. 13; additional safety measure).
- Have the crank handle and hexagon socket wrench (included in scope of supply) ready.
- Raise the dark grey protective hood on the crank handle by a few centimetres and detach it.
- Loosen the four knurled screws on the black cover of the crank holder and remove the cover.

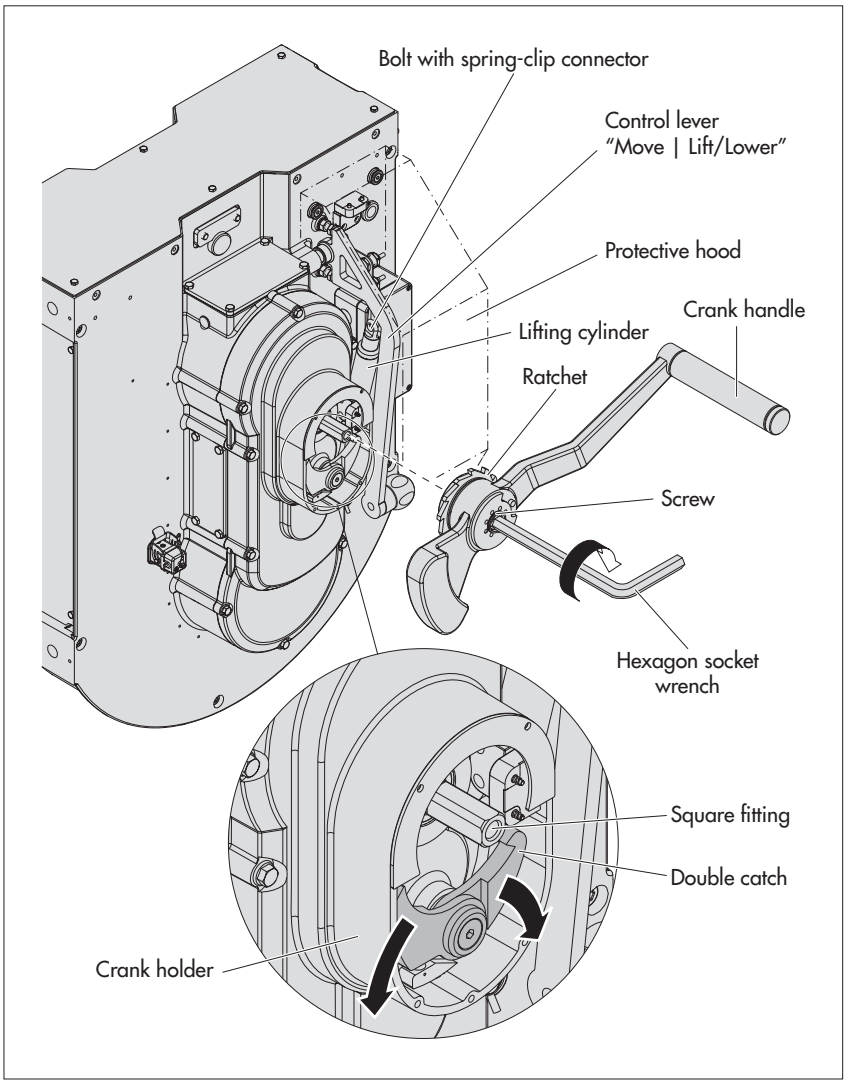
Step 2: Install the crank handle

See Figure 28.

- Fit the crank handle on the square fitting of the crank mounting.
- Push apart the double catch.
- Slide the crank handle onto the square fitting towards the winch housing until the ratchet is located almost completely inside the double catch.
  If the screw in the crank handle prevents this, centre the screw in the hole using a hexagon socket wrench.
- Tighten the screw in the crank handle with a hexagon socket wrench.
- Check the function of the double catch and visually inspect the ratchet:
  – The ratchet must be completely located inside the double catch!
  – The screw must be tightened.

Step 3: Disconnect the lifting cylinder / "Move | Lift/Lower" control lever

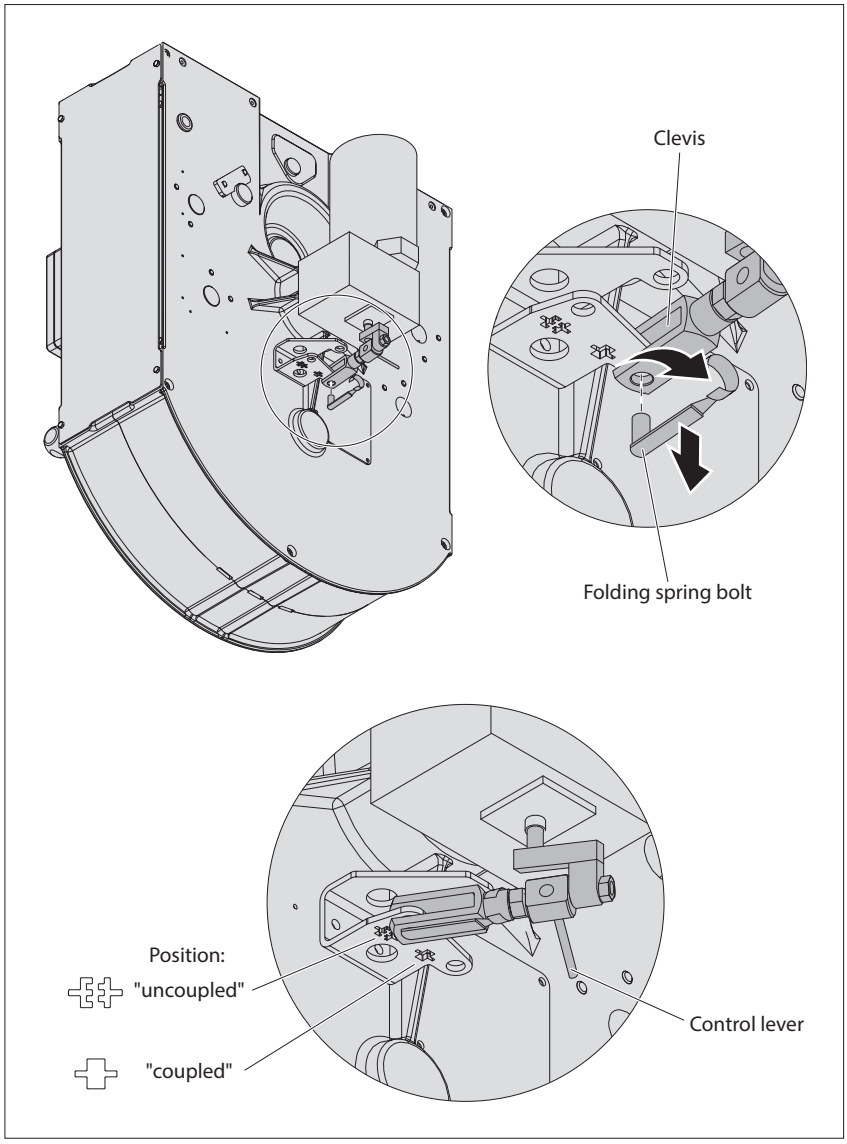
Fig. 28: Installing the crank handle.



- Remove the spring-clip connector on the bolt for the lifting cylinder / "Move | Lift/Lower" control lever and remove the bolt.
- Tilt the lifting cylinder a few degrees backwards (towards the winch housing).
- Re-insert the bolt in the "Move | Lift/Lower" control lever and secure with the spring-clip connector.

Step 4: Uncouple the motor

Fig. 29: Uncoupling the motor.



- Detach the folding spring bolt from the clevis on the motor side.
- Move the clevis with control lever to the "uncoupled" position. The motor is now uncoupled from the winding drum and current meter cable drum.
- Insert the folding spring bolt into the clevis in the new position.

The Electrical Double-Drum Winch is switched to mechanical emergency operation. You can now operate the Electrical Double-Drum Winch in the same way as a Mechanical Double-Drum Winch; see chapter 7.1.

CAUTION **Risk of injury due to falling measuring device**

If the specified sequence is not observed, the brake on the current meter cable can accidentally come loose.

▶ The sequence of steps 1 to 5 must be observed.

Step 1: Switch off control unit

- Set the key switch to "0".

See figures 28 and 29.

Step 2: Couple the motor

- Detach the folding spring bolt from the clevis on the motor side.
- Move the clevis with control lever to the "coupled" position.
  The motor is now coupled to the winding drum and current meter cable drum.
- Insert the folding spring bolt into the clevis in the new position.

Step 3: Connect the lifting cylinder / "Move | Lift/Lower" control lever

- Remove the spring-clip connector on the bolt in the "Move | Lift/Lower" control lever and then remove the bolt.
- Tilt the lifting cylinder forwards by a few degrees.
- Re-insert the bolt at the "Move | Lift/Lower" control lever connection and secure with the spring-clip connector.

Step 4: Remove crank handle

- Loosen the screw in the crank handle with a hexagon socket wrench.
- Remove and detach the crank handle.

Step 5: Final work

- Fit the black cover on the crank mounting and tighten the four knurled screws.
- Re-attach the dark grey protective hood from above.

The Electrical Double-Drum Winch is now reset for electrical operation. If the mains voltage is connected, you can use the Electrical Double-Drum Winch as described in chapter 8.

9 Performing the discharge measurement

This chapter assumes that the operating personnel are familiar with how to perform discharge measurements and know and observe the general safety measures required, see chapter 5.

WARNING **Risk of drowning**

Depending on the structural design of the station (presence of protective equipment, bank structure), there is a risk of falling into the waterway when performing a discharge measurement, being carried along by the current and drowning. This risk is particularly high in the case of flood events.

If there is a risk of falling into the waterway:

- Wear a life vest!

WARNING **Danger due to suspended load**

A discharge measurement involves lifting and moving measuring devices with a weight of up to 100 kg.

- Wear safety shoes and a helmet!
- Never stand under the suspended load (measuring device).

WARNING **Danger due to high tensile forces in current meter cable**

If a tensile force of greater than 3000 N occurs on the current meter cable – e.g. due to flotsam getting caught on the measuring device – the safety slip clutch on the Mechanical Double-Drum Winch trips. In this case, the current meter cable completely detaches from the cable-drum with an uncontrolled lashing motion.

- Maintain a sufficient clearance to the cable route (track, towing and current meter cable).

WARNING **In case of malfunctions with imminent danger**

- Immediately switch off the Electrical Double-Drum Winch using the red emergency stop button on the hand-held control unit.

Caution **Risk of hand injuries due to moving parts/heavy weights**

When operating the OTT cable way, there is a risk of hand injuries in the area of the double-drum winch/towing cable/current meter cable/middle piece.

- Wear protective gloves
- Take care of your hands. Do not touch moving parts.

9.1 Connecting a signal counter set

Mechanical Double-Drum Winch:

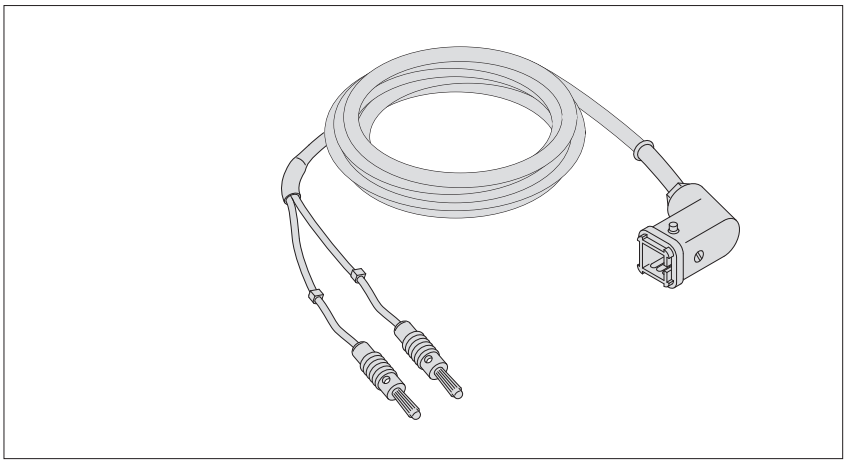
- Connect the metal angled socket on the signal counter set connecting cable (accessory; see Fig. 30) to the bulkhead metal connector (see Fig. 9).

Electrical Double-Drum Winch:

Only when using an external signal counter set [1].

- Connect the metal angled socket on the signal counter set connecting cable (accessory; see Fig. 30) to the bulkhead metal connector on the underside of the switch cabinet (see Fig. 13). Alternatively, the bulkhead metal connector on the side of the Electrical Double-Drum Winch can be used (see Fig. 9).

Fig. 30: Signal counter set connecting lead (accessory).

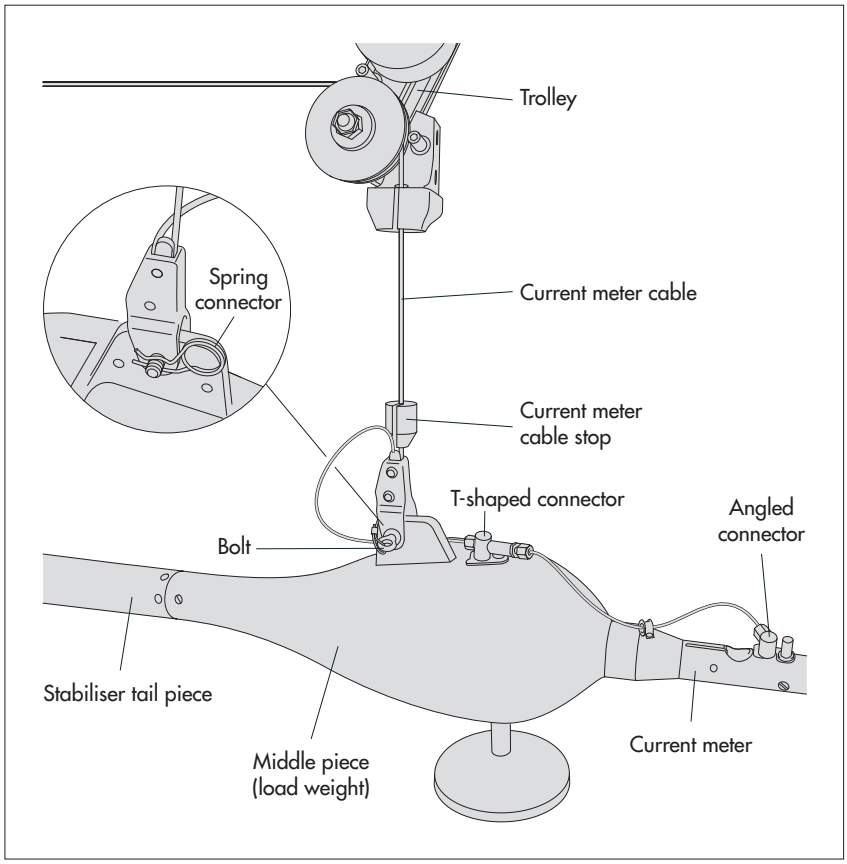


[1] The Electrical Double-Drum Winch is designed and tested for use with an external signal counter set from OTT. OTT provides no guarantee of functionality for unrestricted operation of the Electrical Double-Drum Winch in combination with signal counter sets made by other manufacturers.

9.2 Attaching the middle piece to the current meter cable

- Attach the middle piece (maximum 100 kg; with stabiliser tail piece and current meter fitted) to the current meter cable as shown in Fig. 31. Secure the bolt with a spring-clip connector. Ensure that the current meter cable runs on the current meter cable stop without kinks.
- Insert the T-shaped connector in the middle piece and secure.
- Insert the angled connector in the current meter and secure.

Fig. 31: Attaching the middle piece to the current meter cable.



9.3 Performing the measurement

Risk of damage to the OTT cable way

- ▶ When moving the measuring device, make sure that you:
  - – Do not move the current meter cable catch against the trolley (see Fig. 31);
  - – On OTT cable ways with Electrical Double-Drum Winch: Do not move the trigger cams to the limit stops (emergency limit stop).
- ▶ On OTT cable ways with Electrical Double-Drum Winch: Move the joystick carefully and never jerkily!
- ▶ Always keep the current meter cable under tension! Avoid slack cables.

Note: If a tensile force of greater than 3000 N occurs on the current meter cable – e.g. due to flotsam getting caught on the measuring device – the safety slip clutch on the double-drum winch trips. In this case, the current meter cable is completely detached from the cable drum; this breaks the electrical connection for the current meter cable. The current meter cable and measuring device are normally lost in the waterway.

Performing the measurement
(example point measurement with suspended current meter)

- ■ Move the trolley with suspended current meter to the cross-section zero point.
- ■ Set the horizontal value to 0.00 ("horizontal" reset-button on electronic counter or F1 key (dist.=0) on control unit.
- ■ Move the trolley with suspended current meter to the first measuring vertical.
- ■ Lower the suspended current meter onto the water surface. The water surface is reached when the current meter starts to turn.
- ■ Set the vertical value to 0.00 ("vertical" reset button on electronic counter or F5 key (lift=0) on control unit).
- ■ Lower the suspended current meter to the required water depth.
- ■ Start measurement on the external signal counter set/electronic control display.
- ■ At the end of measurement, read off and note the pulses on the external signal counter set/electronic control display.
- ■ If required, perform further measurements at this measuring vertical (depending on the selected number of measuring points).
- ■ Read off and note the pulses on the external signal counter set/electronic control display.
- ■ Lift the suspended current meter until it is above the water surface again.
- ■ Move the trolley with suspended current meter to the next measuring vertical and perform the next measurement.

After the measurement

- ■ Return the suspended current meter to the gauging house.
- ■ If required: Detach the suspended current meter from the current meter cable (in reverse order to that described in chapter 9.2). In this case, fix the current meter cable at an anchor point and keep it under low tension.

For OTT cable ways with Electrical Double-Drum Winch:

- ▶ Move joystick briefly upwards with minimum deflection → keeps the current meter cable under low tension and the lifting cylinder (electromechanical switch device) is in the "Lift/Lower" position; recommended position when switching off.
- ■ Press the "Controller OFF" button on the switch cabinet"
- ■ Turn the main switch (key switch) on the switch cabinet to "O".

10 Troubleshooting

WARNING **In case of malfunctions with imminent danger**

▶ Immediately switch off the Electrical Double-Drum Winch using the red emergency stop button on the hand-held control unit.

ED = Electrical Double-Drum Winch
MD = Mechanical Double-Drum Winch
ED/MD = Electrical and Mechanical Double-Drum Winch

Problem	Cause	Troubleshooting
ED: Winch not running	No supply voltage	■ Check fuses in switch cabinet. ■ Check fuses in building installation. ■ Main switch on? ■ "Controller ON" button on switch cabinet pressed? ■ Protective hood/crank mounting cover removed? → Emergency manual operation ■ Emergency stop button on hand-held control unit engaged?
ED: Winch starts up unintentionally ED: Winch not running at correct speed ED: Winch running with unusual noise	Fault on electronic controller	■ Note fault message on display in switch cabinet; subsequent actions to be decided in consultation with OTT HydroService [1] → Secure winch against restarting (key switch).
ED/MD: Signal counter set/display not showing any current meter pulses	Connection to suspended current meter broken	■ Check correct fitting of the T-connector and angled connector on the suspended current meter. ■ Move the metal angled socket on the signal counter set connecting cable from the bulkhead metal connector on the control cabinet to the one on the winch; current meter pulses displayed? Yes → Fault on electronic controller No → Current meter cable damaged; repair by OTT HydroService [1]
ED: Suspended current meter cannot be lowered any further	Ground probe on middle piece has tripped	Normal operating condition
	Setting parameter set to external signal counter set and signal counter set not (correctly) connected or not switched on. Incompatible signal counter set used.	■ Check that the external signal counter set is connected and ready for use. ■ Use a compatible signal counter set.

[1] You can contact OTT HydroService by phone from Monday to Thursday between 07:30 and 16:00 and on Friday between 07:30 and 12:00 on the direct number +49 831 5617–430. Our call centre can take your calls from Monday to Thursday between 08:00 and 17:00 and until 15:00 on Friday on +49 831 5617–0.

Problem	Cause	Troubleshooting
ED: Winch stopped	Limit stop has tripped	■ Press and hold the black bypass button on the switch cabinet. Also press the green "Controller ON" button. Hold down both buttons until the limit stop is released (this is possible immediately; there is no need to wait for the electronic controller to start up). Only movement away from the limit stop is possible.
MD: Battery warning symbol flashing	Buffer battery almost dead	■ Insert new buffer battery; Battery holder in electronic counter.
ED/MD: Current meter cable not correctly wound	Current meter cable is not constantly under tension (slack cable)	**CAUTION** **Risk of hand injuries**  Wear personal protective equipment (protective gloves). ■ Unwind the current meter cable under load and then wind again.
ED: Deflection of joystick leads to no reaction.	The function "Teach lifting cylinder" has been started manually; the lifting cylinder carries out a teach-in drive.	No special action required; entries can be made again via joystick after approx. 12 seconds.

11 Maintenance

11.1 Maintenance work

All components of the OTT cable way are **maintenance free**. Due to the short operating times[1)] of an OTT cable way, no lubrication work or oil changes are necessary during its service life

The combined brake and clutch for the Electrical and Mechanical Double-Drum Winch should be checked every three years as part of a **regular inspection**. For further information, refer to chapter 11.2 and 11.4.

[1)] up to approx. 50 discharge measurements per year

11.2 Recurring checks

Note: The recurring checks set out here are based on the regulations applicable in Germany. When installing and operating an OTT cable way outside Germany, comply with the applicable national regulations in the relevant country. To ensure fault-free operation of the OTT cable way, we recommend performing the recurring checks listed in these operating instructions!

OTT cable ways for hydrological surveys are to be inspected **annually** by a **qualified person** [2)] for cable ways.

We recommend that this inspection is performed by OTT HydroService. OTT uses specially trained personnel with appropriate specialist knowledge and have access to the required special tools. Any necessary repair, replacement or adjustment work can generally be carried out immediately

[2)] see glossary in Appendix A

Warning **Increased safety risk**

The annual inspection of the OTT cable way involves an increased safety risk, due to the removal of safety covers and the generation of unusual operating conditions.

- Shut down the OTT cable way before performing any inspection work. This does not apply if the inspection work can only be carried out during operation, where there is no risk of crushing and falling during the work and there is voice and visual contact between the maintenance and operating personnel.
- Always wear personal protective equipment for inspection work.
  Safety shoes; helmet; protective gloves; if there is a risk of falling into the waterway: life vest; if there is a risk of falling: safety harness.

Annual inspection
A functional test and visual inspection for damage, wear, corrosion or other changes to all assemblies should be conducted:

- Steel construction
- Track cable (areas visible without special equipment) including the cable end connections
- Tensile force in track cable (only on turnbuckle tensioned OTT cable ways)
- Entire length of towing cable
- Entire length of current meter cable
- Deflection pulleys
- Trolley
- Gas-spring tensioning/turnbuckle tensioning
- Electrical or Mechanical Double-Drum Winch
- Efficiency of safety equipment

- Every three years: Switching force of combined brake and clutch for double-drum winch (see chapter 11.4)

A comprehensive inspection list for cable ways can be found in the "Directive on construction and operation of stationary cable ways for hydrological surveys, safety requirements"; see Appendix B: Bibliography in these operating instructions.

Additional inspection at intervals of 4 years
- Electrical system is to be inspected by a qualified electrician.

Additional inspection of gas springs
No statutory inspection intervals are stipulated for gas springs. From many years experience, we recommend the following inspection intervals:
- Every two years: External inspection
  There is no need for a strength test if there are no indications of leaks or damage.
- Every five years, for the first time after ten years: Strength test on gas springs installed outdoors and subject to weathering.
- Every five years, for the first time after fifteen years: Strength test on gas springs installed in the gauging house and not subject to weathering.

i Instead of the strength tests, an inspection of the walls can be carried out using ultrasound wall thickness measurement and/or an X-ray inspection (shadow graph).

Documentation of recurring checks
The results of the checks must be entered in an inspection log for the cable way and attested by the inspector. The inspection result must clearly show:

- Nature and space of inspection
- Outstanding parts of inspection
- Defects identified
- Assessment of wether there are any concerns over continued operation
- Decision on wether a follow-up inspection is required

Any defects identified should be repaired as soon as possible by OTT HydroService.

11.3 Parts with limited service life

Double-drum winch

The Electrical and Mechanical Double-Drum Winches have no parts with a limited service life. The service life of the double-drum winch is designed to be the same as the other components of the OTT cable way. There is no need for an annual calculation of the proportion of the theoretical service life used up.

Cables

The cables should be discarded after a maximum of 15 years (sooner if there is heavy corrosion, damage or a reduction in diameter by more than 10 %).
If the service life should go above 15 years in individual cases, from the beginning of the 16th year an annual inspection by an authorised expert [1] is required.

[1] see glossary in Appendix A

11.4 Checking the switching force of the combined brake and clutch for the Mechanical Double-Drum Winch [1]

- Place the measuring device on a support block and disconnect it from the current meter cable.
- Attach a suitable test load of 1500 N (1200 N + 25 % safety margin) to the current meter cable.
- On an Electrical Double-Drum Winch: Set up the winch for manual operation as described in chapter 8.5.
- Lift the test load by approx. 10 centimetres using the crank handle.
- Using a spring balance, measure the switching force necessary to move the "Move | Lift/Lower" control lever to the central position between the two positions. The switching force must be at least 70 N. The test load may not be lowered.

Is the switching force lower than 70 N or is the test load lowered when switching?
→ Have the combined brake and clutch adjusted by OTT HydroService.

[1] The switching force is to be checked in addition to the measurements on the load limitation mechanism stipulated in the LAWA-inspection list, section 2.2.

12 Technical data

General mechanical data

OTT cable way

Range		
with turnbuckle tensioning		up to 20 m
with gas-spring tensioning		up to 160 m
Cable diameter [1]		
track cable		16 mm
towing cable		6 mm
current meter cable		3.5 mm

Double-drum winch

Current meter cable drum		
nominal cable tension		1250 N
max. cable tension		3000 N ±20 %
safety slip clutch release force		3000 N ±20 %
Towing cable drive pulley		
max. cable tension [2]	groove 1 + 2 + 3 + 4	3 500 N
	groove 1 + 2 + 3	4 600 N
	groove 1 + 2	7 000 N
	groove 1	7 000 N
Current meter cable drum		
usable cable length		164 m
max. number of layers		6
minimum remaining windings		3 (≙ 3.1 m)
capacity of 1st layer		23.7 m
capacity of 2nd layer		27.2 m
capacity of 3rd layer		27.7 m
capacity of 4th layer		28.2 m
capacity of 5th layer		28.7 m
capacity of 6th layer		29.2 m
Required torque on crank		11 N/m (with 100 kg middle piece)
Crank length		0.3 m

[1] For further technical data, refer to the factory certificate for the cables (supplied with the OTT cable way.)

[2] The maximum cable tension depends on the number of windings on the towing cable drive pulley; groove 1 = one winding on groove 1, groove 1 + 2 = two windings on groove 1 and 2, etc.; groove 1 is located directly on the combined brake and clutch.

Mechanical Double-Drum Winch

Distance/depth counter	
design	5-digit LED display; with reset buttons
resolution	1 cm
buffer battery	9 V monobloc battery (alkaline)
Dimensions (W x H x D)	
with crank handle	approx. 570 mm x 770 mm x 670 mm
without crank handle	approx. 450 mm x 750 mm x 560 mm
Weight	
without current meter cable and crank handle	approx. 100 kg
Operating temperature	–20 °C to +60 °C
Storage temperature	–40 °C to +85 °C
Humidity	0 % to 95 %, non-condensing

Electrical Double-Drum Winch

Electrical drive	
supply voltage	230 V / 50 Hz
control voltage	24 V DC
motor power	1.5 kW
degree of protection	IP 54
sound level	70 dB (A)
Dimensions (W x H x D)	
Electrical Double-Drum Winch[3)]	approx. 570 mm x 900 mm x 670 mm
switch cabinet (W x H x D)	600 mm x 600 mm x 250 mm
Weight	
without current meter and crank handle	approx. 135 kg
motor	35 kg
switch cabinet	approx. 30 kg
Control unit with chest strap	
dimensions without control and chest strap (W x H x D)	280 mm x 200 mm x 130 mm
display	5 lines, b/w, incl. assignment of function keys
controls	joystick, emergency stop button, 10 function keys (can also be used as numerical keys), cursor keys, fixed assignment keys, additional potentiometer for speed setting
acoustic signal	integrated buzzer for ground contact
Operating temperature	
standard	0 °C to +50 °C
with opt. heating	–20 °C to +50 °C
with opt. cooling	0 °C to +60 °C
Storage temperature	–40 °C bis +85 °C
Humidity	0 % to 95 %, non-condensing

[3)] without emergency operation crank handle

Appendix A: Glossary

Qualified person
Qualified persons are those who, due to their specialist training and experience, have an adequate knowledge in the area of the equipment to be inspected. In addition, they must be sufficiently familiar with the applicable statutory health and safety regulations, accident prevention regulations, directives and generally recognised technical regulations (e.g. DIN standards, VDE regulations, technical rules in other member states of the European Union or other states in the European Economic Area) to enable them to assess whether the equipment is in an operationally safe condition.
Those with the technical suitability to perform the inspection by a qualified person include operating engineers, machine supervisors or specialist personnel with a very high level of training on the cable way to be inspected.

Authorised expert
Authorised experts are persons who, due to their specialist training and experience, have a very high level of knowledge in the area of the equipment to be inspected, as well as sufficient knowledge of the applicable regulations (laws, EU directives, accident prevention regulations), other directives and technical rules (e.g. EN standards, DIN standards, VDE regulations, technical rules in other member states of the European Union or other states in the European Economic Area). They must be able to inspect the technical equipment and provide an expert assessment of it. In addition to authorised experts in technical monitoring, the only authorised experts suitable for inspection of cable ways are those certified by the trade association. (The trade association also issues authorisations for specific parts of the inspection.)

Appendix B: Bibliography

LAWA
Bund/Länder-Arbeitsgemeinschaft Wasser (Federal/State Working Group on Water)

Pegelvorschrift (Flood Estimation Handbook)
Anlage G (Appendix G)
Arbeitsschutz (Health and safety)
Teil 2: Seilkrananlagen (Part 2: Cable ways)

"Richtlinie für den Bau und Betrieb ortsfester Seilkrananlagen für gewässerkundliche Zwecke, Sicherheitstechnische Anforderungen"
(Directive for construction and operation of stationary cable ways for hydrological surveys, safety requirements)

Note: The appendix to this directive contains a detailed list of all relevant standards and regulations for the construction and operation of stationary cable ways.

www.lawa.de

Source:
Kulturbuch-Verlag GmbH
Sprosserweg 3
12351 Berlin-Buckow
Phone: +49 30 661 84 84
Fax: +49 30 661 78 28
kbvinfo@kulturbuch-verlag.de

Other basic standards and requirements

Designation	Issue	Title
DIN EN ISO 4375	2015	Hydrometry cable ways in flowing waterways
DIN EN ISO 12100	2011	Safety of machines: General design principles – Risk assessment and risk reduction
DIN EN 60204-1	2016	Safety of machines: Electrical equipment on machines
DIN EN ISO 13850	2016	Safety of machines: Emergency stop – design principles
DIN EN ISO 13857	2020	Safety of machines: Safety distances to prevent entry of upper and lower limbs into danger zones
DIN EN ISO 13849-1	2016	Safety of machines: Safety-related components of control systems – Part 1: General design principles
DIN EN 614	2009	Safety of machines: Ergonomic design principles
DIN EN 82079	2013	Creation of instructions: Layout, content and representation

Document number
18.001.500.B.E 03-0621

OTT HydroMet GmbH
Ludwigstrasse 16
87437 Kempten · Germany
Phone +49 831 5617-0
Fax +49 831 5617-209
euinfo@otthydromet.com
www.otthydromet.com