3.2. Converter service tools

It is recommended to have the converter service tools (according to Table 3–2) available on each converter site.

3.2.1. Converter service toolbox

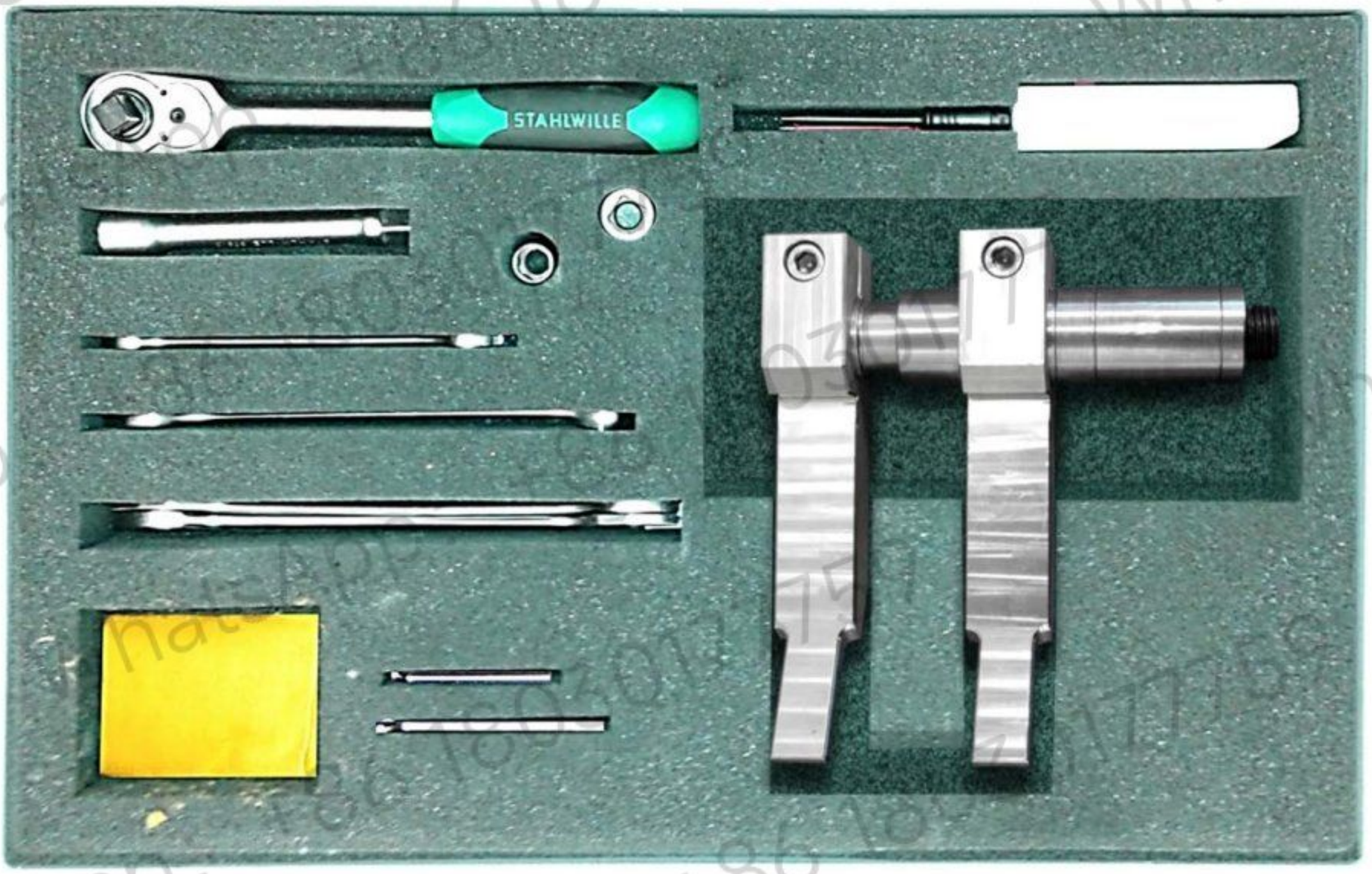

Figure 3–1 Converter service toolbox

- Weight: 4 kg
- Length: 600 mm
- Width: 400 mm
- Height: 111 mm

The converter service toolbox contains the tools listed in Table . These tools are required for replacing components in the POU (IGCTs, diodes, capacitors and resistors).

Table 3–4 Converter service toolbox content (3BHB008753R0002)

Designation	Order number
hex-key, 5 mm	NB 307950P0513
hex-key, 3 mm	NB 307950P0511
6HEX PIN INSERT 1/2” 12 mm	WMN 400007P0212
Double fork key C 21x23	WM 420039P0023
Extension 1/2”-130	GMN 744036P0028
RATCHET 1/2Z	GMN 744036P0043
Spreader tool	3BHE041414R0001

Table 3–4 Converter service toolbox content (3BHB008753R0002) (continued)

Designation	Order number
Spreader jaw 1	3BHE041418R0001
Spreader jaw 2	3BHE041429R0001
Main pipe	3BHE041430R0001
Secondary pipe	3BHE041431R0001
Hex socked set screw M24x50	3BHL001192P0001
SCR-CYL-ISO4762-AM10X40-A2-70	NB 315840P0259
SSW-ISO4026-M8X25-A2-21H	GMN 323232P6211
Double fork key C 12X13	WM 420039P0005
DG-key C18x20	3BHE009970R0001
6HEX PIN INSERT 1/2” 8 mm	WMN 400007P1208
View briefcase A4	Q 101130P0021
Assembling jig	HEFA415052
FADEC 3 - Semiconductor inspection tool	3BHE043725R0001
Hexagon key 8 (32x112) with ball head	3BHE055664R0002
Hexagon key 4 (22x80) with ball head	3BHE055664R0001
Screwdriver P-B 135 5	3BHE055712R0001

The spreading tool (see Fig. 3–2) is used to release the stacks containing semiconductors to allow replacement of semiconductors. See also section 10.6.3, **Using the spreading tool**, page 145.

Figure 3–2 Spreading tool (part of converter service toolbox)

The stabilizer plate (see Fig. 3–3) is used to stabilize the stacks containing semiconductors during replacement. See section 10.7.2, **Releasing the stacks**, page 179.

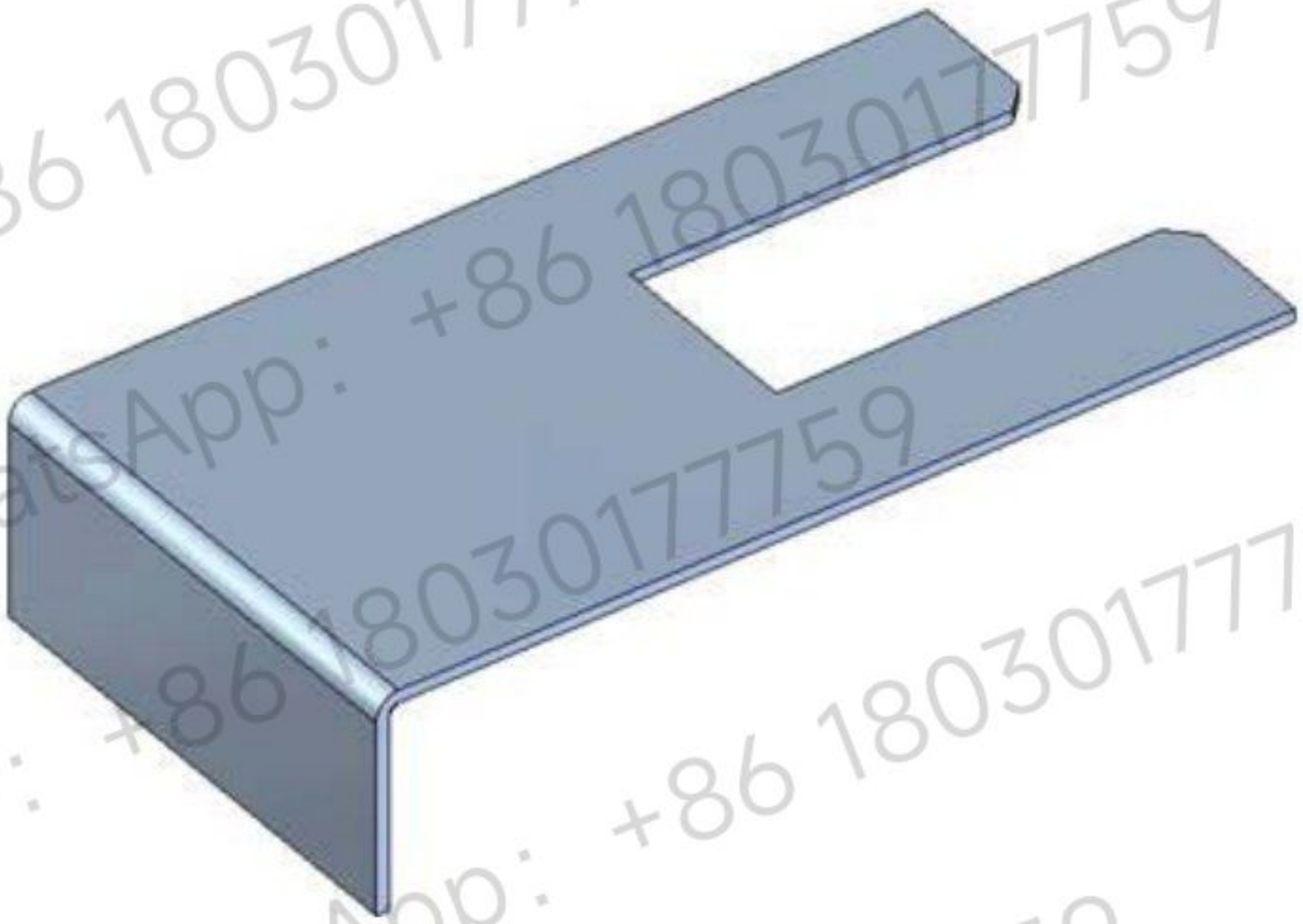

Figure 3–3 Stabilizer plate (part of converter service toolbox)

The FADEC 3 is a test device to find defective semiconductor in the stack. See chapter 9, **Checking diodes, IGCTs and IPS**, page 115 and the “PCS6000 user manual”, 3BHS600000 E40.

Figure 3–4 Semiconductor test device FADEC 3

3.2.2. Grounding kit

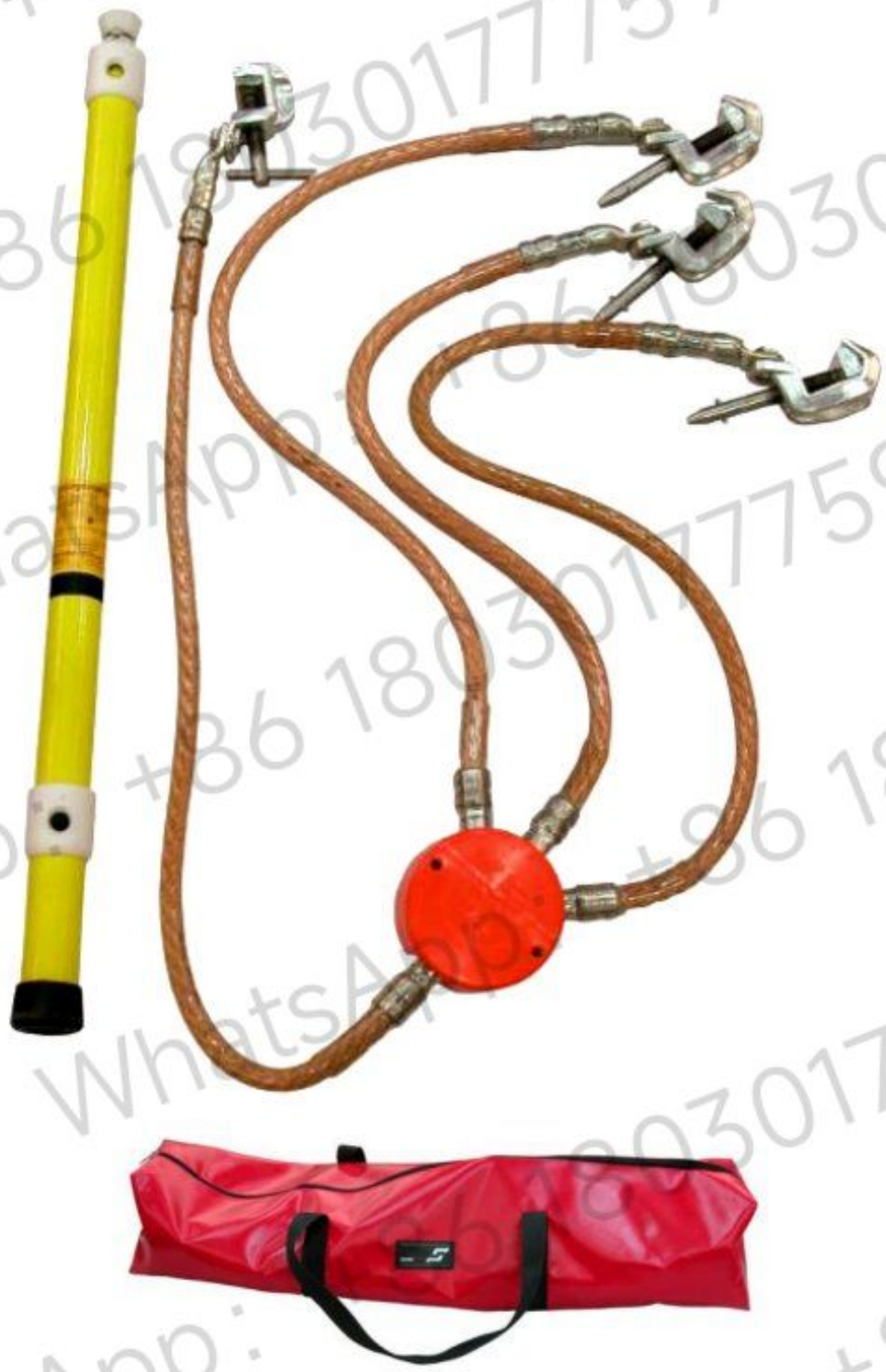

Figure 3–5 Grounding kit

- Weight: 15 kg
- Length: 1000 mm
- Width: 300 mm
- Height: 300 mm

The grounding kit comprises the grounding device with four ground connectors (made of 95 mm^2 stranded copper wire with three 1 m long ends for phase connection and a 2 m long end for PE connection), a connection pole and a bag.

The grounding kit is used to ground the converter before any service or maintenance work on the converter is done.

3.2.3. Tube cutter

Figure 3–6 Tube cutter

- Weight: approximately 200 g
- Length: approximately 100 mm
- Width: approximately 100 mm
- Height: approximately 20 mm

The tube cutter is used to adjust the length of the water cooling tubes in the converter. The tool can cut tube diameters between 2 and 12 mm.

Instruction to connect tubes to Legris adapters

1. Cut the tube plane with the cutter. If the tube was already assembled, cut off the groove that was caused by the lock washer.
2. Insert the tube into the Legris adapter as far as it will go.
3. Make sure that there is no mechanical stress on the tube, especially not from sideways.

3.2.4. Polishing kit for fiber optics

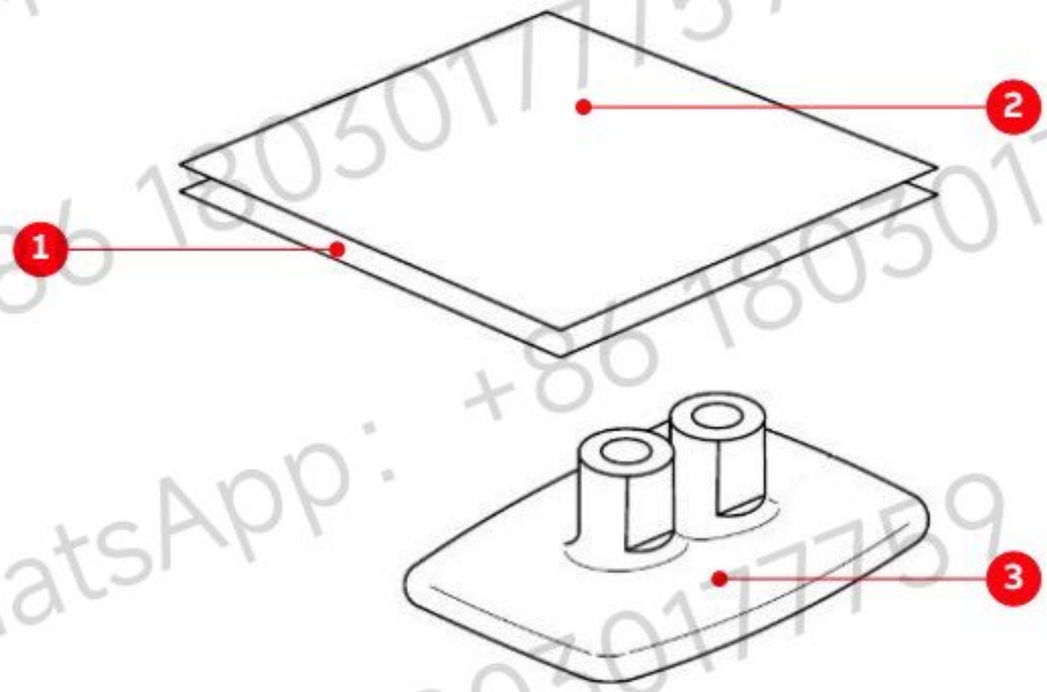

Figure 3–7 Polishing kit for fiber optics (used with all connection types)

1) 3 µm lapping film
2) 600 grit abrasive paper
3) Polishing fixture

The polishing kit for fiber optics is used to prepare and polish plastic fiber optical cables from Avago. These fiber optic cables are used in the converter for the control system.

3.3. Commissioning tools

The commissioning tools (according to Table 3–2) are intended for com-missioning of the PCS6000, but they are also used for service tasks.

3.3.1. RCI-Box XU D194

Figure 3–8 RCI-Box XU D194 with power cables and fiber optic cables

- Weight: approximately 2 kg
- Length: 275 mm
- Width: 136 mm
- Height: 101 mm
- Input: 24V DC

The RCI-Box (Remote Control Interface) XU D194 is used to transfer digital measurement signals from the main controller to an oscilloscope. This allows to monitor internal measurement signals in real-time without having to install any probes in the converter.

The digital internal signals are converted to analog signals and sent to the oscilloscope by the RCI-Box. The signals to be monitored can be freely selected in the PCS6000 HMI. A maximum of 8 channels can be monitored simultaneously with one RCI.Box.

3.3.2. PCS6000 HMI

The PCS6000 HMI is used for monitoring/controlling of the converter during commissioning and service. It will be installed locally on the IPC (Industrial PC) in the converter. Access is obtained remotely using the remote desktop protocol.

- Functionality of the PCS6000 HMI:
- Single line diagrams of converter status
- Main operational status values
- Alarm / fault viewer
- View / operate inputs and outputs signals
- Overview and control of converter state
- Usage of RCI-Box
- Online measurement data monitoring (option)

User interface (main screen) of the PCS6000 HMI:

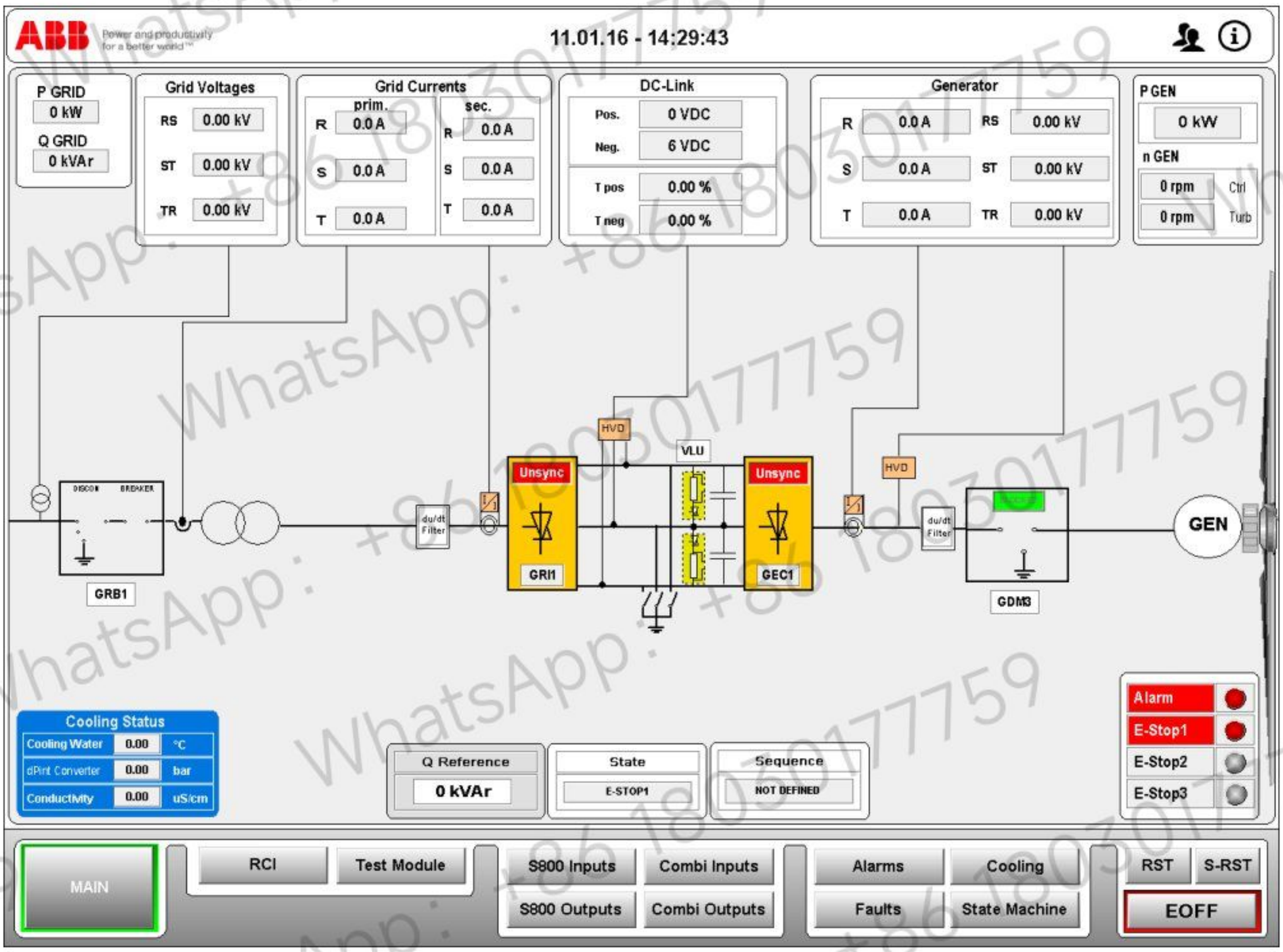

Figure 3–9 User interface of the PCS6000 HMI

3.3.3. Filling kit for PCS6000 water cooling

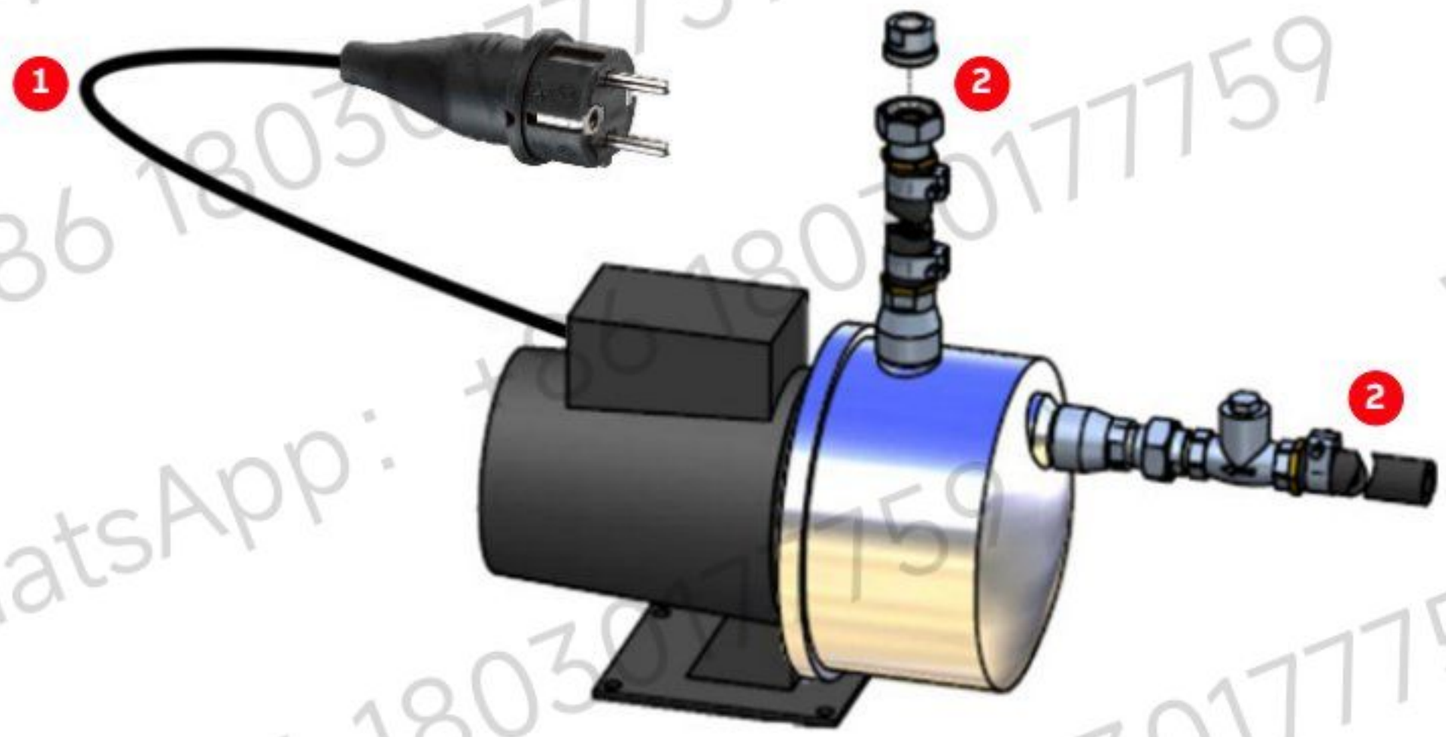

Figure 3–10 Filling kit for PCS6000 water cooling

1) 1.5 m with connector type “F”	2) 1/2” or 1”

- Weight: approximately 10 kg
- Length: 400 mm
- Width: 300 mm
- Height: 300 mm
- Power: 850 W
- Input: 1x 220 - 240 V AC 50Hz

The filling kit for PCS6000 water cooling is used to fill the water cooling system with cooling liquid. It consists of a pump with one hose to connect to the converter (with connection) and one to the water source.

The standard length of the tube between pump and converter is 2 meters.

The use of the filling kit for PCS6000 water cooling is described in the Operation and maintenance manual of the PCS6000 water cooling system (provided in Appendix A06, Data sheets components of the user manual).

3.3.4. Filling kit extension tube

Figure 3–11 Filling kit extension tube

- Weight: 0.25 kg/m
- Outer diameter: 22 mm

If the tube of the filling kit for PCS6000 water cooling is not sufficient, ie, if the distance between the converter and the water source is bigger than 2 meters, an extension tube is available.

The length of the extension tube can be selected (maximum 25 meters).

3.4. Replacement tools

The replacement tools (according to Table 3-3) are required very seldom and therefore it is suggested to bring them on site only when required.

3.4.1. Reactor replacement kit

Figure 3–12 Reactor replacement kit

- Weight: approximately 6 kg
- Length: 700 mm
- Width: 570 mm
- Height: 206.5 mm

The reactor replacement kit can be installed at the lower beam of the cabinet to pull out the filter reactor on its slides. Two M10 ring bolts (not shown in Fig. 3–12) are also part of the reactor replacement kit.

The use of the reactor replacement kit is shown in Fig. 10–99.

3.4.2. Base beam lifting jack

Figure 3–13 Base beam lifting jack (3BHE039648R0001)

- Weight: approximately 1 kg
- Length: 100 mm
- Width: 75 mm
- Height: 125 mm

The base beam lifting jack can be hooked into the top frame of the converter cabinet, eg, to hang up a chain-block. The structure of the converter can carry a maximum 250 kg load on the lifting jack in any top frame mounting position.

The use of the base beam lifting jack is shown in Fig. 10–80 “Use of chain-block to lift out pump” on page 231.

3.4.3. Chain-block

Figure 3–14 Chain-block

- Weight: 2.4 kg
- Length: 84 mm
- Width: 88 mm
- Height: 217 mm

The chain-block is used to remove heavy parts as transformers, reactors or pumps from the cabinet. It has to be used together with a base beam lifting jack (see section 3.4.2, **Base beam lifting jack**, page 42).

The use of the chain-block is shown for example in Fig. 10–80.

3.4.4. Pump maintenance table kit (Only for Swedewater WCU)

Figure 3–15 Pump maintenance table kit

- Weight: approximately 8 kg
- Length: 729.5 mm
- Width: 280 mm
- Height: 1047.5 mm

The Swedewater WCU pump maintenance table kit consists of a support table plate and two pairs of legs (long for the upper pump and short for the lower pump).

The use of the pump maintenance table is shown for example in Fig. 10–79 “Pump maintenance table with long legs (for upper pump)” on page 231.

Please note that the pump maintenance table kit can only be used with converters delivered after 1st January 2013. For converters delivered before that date this table can only be used partly (if the corresponding mounting holes are available).

3.4.5. Generator breaker replacement kit

Figure 3–16 Generator breaker replacement kit

- Weight: 33.7 kg
- Trolley length: 800 mm
- Trolley width: 600 mm
- Trolley height: 1000 mm (foldable)
- Rail length: 800 mm

The generator breaker replacement kit consists of a trolley and two trolley track beams. With the trolley the generator breaker can be pulled out of the cabinet. The trolley can also be used for transportation of material.

The use of the generator breaker replacement kit is shown for example in Fig. 10–125.