



DECTEQ™ MeltNet

Digital Electrode Control System



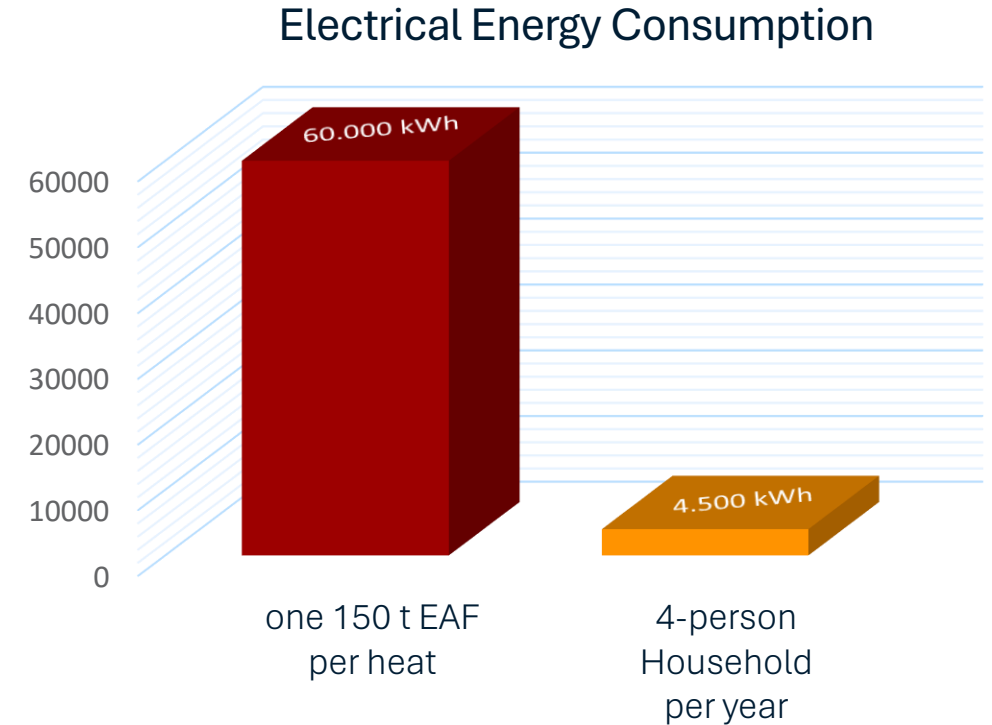
- reduce tap-to-tap time, **up to 8%**
- reduce energy consumption, **up to 5%**
- reduce electrode consumption, **up to 3 %**
- reduce the refractory consumption
- extend the maintenance intervals
- reduce commissioning time (up to 5 days)



Steel making in electric arc furnaces (EAF) and the further treatment in ladle furnaces (LF) as a modern technology to convert electrical energy to heat and metallurgical work in an effective way has become world-wide standard

EXAMPLE:

- A **150 t** Electric Arc Furnace in Italy with a tap-to-tap time of approx. **45 minutes** has a power consumption of nearly **60.000 kWh per heat**
- Compared to this, the average power consumption of a **4-person household** in Germany for **1 year** is approx. **4.500 kWh**





The money saving potential of a good working **Electrode Control System**

This **150 t** Electric Arc Furnace with **15** heats per day and **300** production days per year produces a total of **675.000 t** steel per year.

An average power consumption is about **400 kWh/t**. If you pay **5** cent per kWh, your costs for electrical power per year is:

$$675.000 \text{ t/a} \times 400 \text{ kWh/t} \times 0,05 \text{ €} = \underline{\underline{\text{€ 3.500.000,- / p.a.}}}$$

If the DECTEQ™ MeltNet system **saves only 3 %** of the average power consumption your money saving potential is:

$$\underline{\underline{\text{€ 405.000,- / p.a.}}}$$



Return Of Invest

just by energy saving costs:

3 to 4 month*

*additional ROI's by reducing of electrode consumption

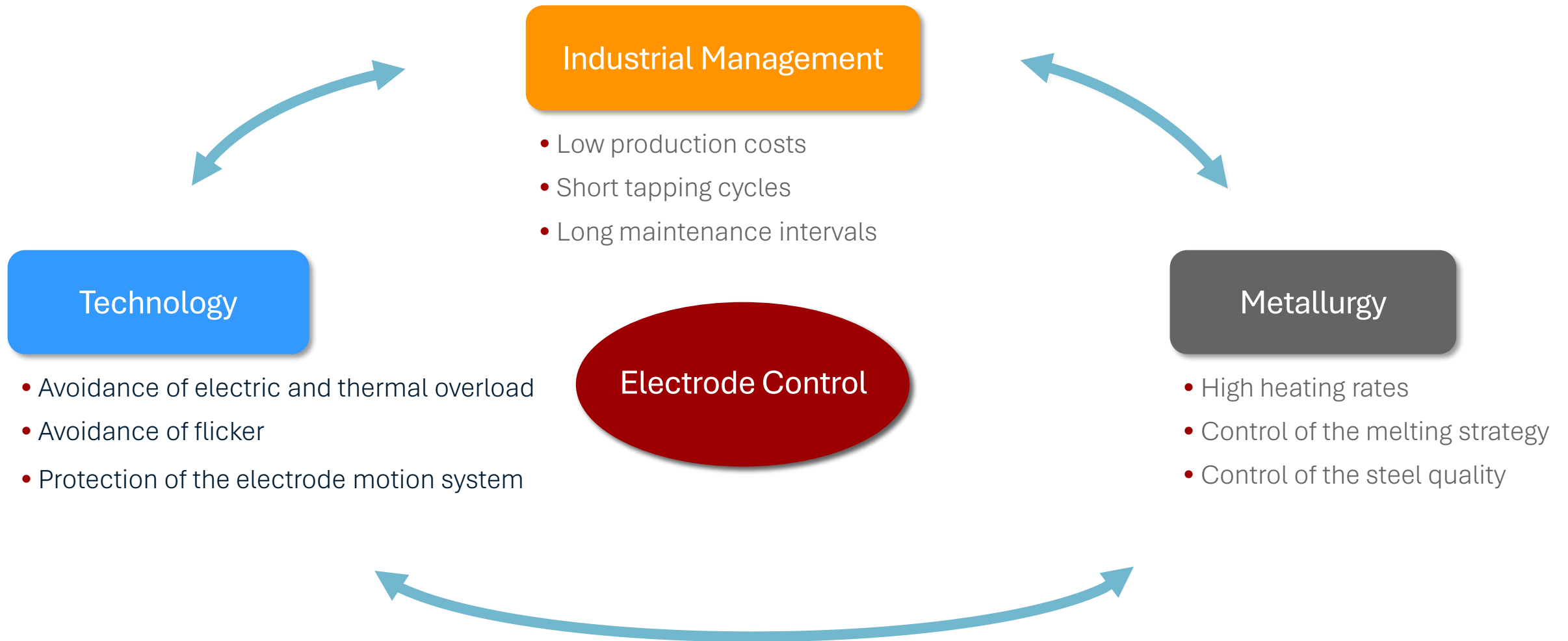
DECTEQ™ MeltNet is also able to:

- reduce the general production costs
- increase the productivity and efficiency

The DECTEQ™ – MeltNet System

- is based on an embedded system controller of NI (National Instruments), designed for real-time applications
- with a reliability of the embedded system comparable with PLC-systems
- with built-in visualization which allows flexible design
- it is based on a graphical user interface providing Microsoft Windows 10® “look and feel”
- with an optional “DECTEQ™ Redundant system”
- also available as “DECTEQ™ Upgrade System”
- and available as “DECTEQ™ Win10-UpdateKit”⁽¹⁾
- **it is vendor-independent of the Furnace-PLC**

(1): in case of an outdated Visualization-PC, e.g. Win7



The objective of electrode control system is to

- operate the furnace at an optimum operating point in every phase of the melting process
- adjust its output to the possible disturbances occurring during the process

where an operating point is characterized by a pair of current and voltage values.



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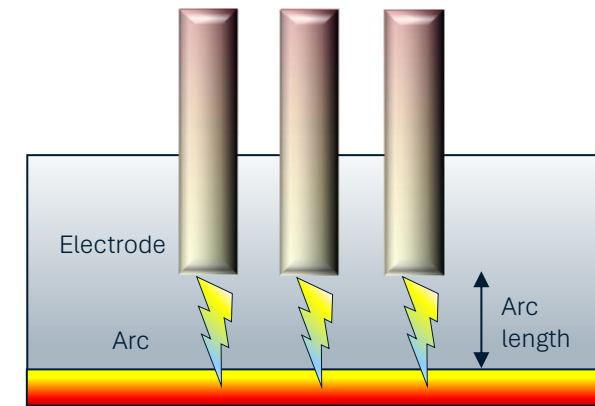
To minimize the variations between the actual and the desired working point the electrode control system moves the graphite electrodes up or down



this changes the distance to the liquid steel or the scrap



the result of the different distance is also a different value for the current and the voltage, so that the **working point** has changed



“The electrode control is the central device of every electrode furnace, there were a strong demand to develop a modern and powerful digital electrode control to increase the efficiency and offer an economical production.”

A standard electrode control for both EAF and LF, also for Single or Twin Shell

The DECTEQ™ **MeltNet** is designed as a Universal Electrode Control System for both Electric Arc Furnaces (EAF) and Ladle Furnaces (LF).

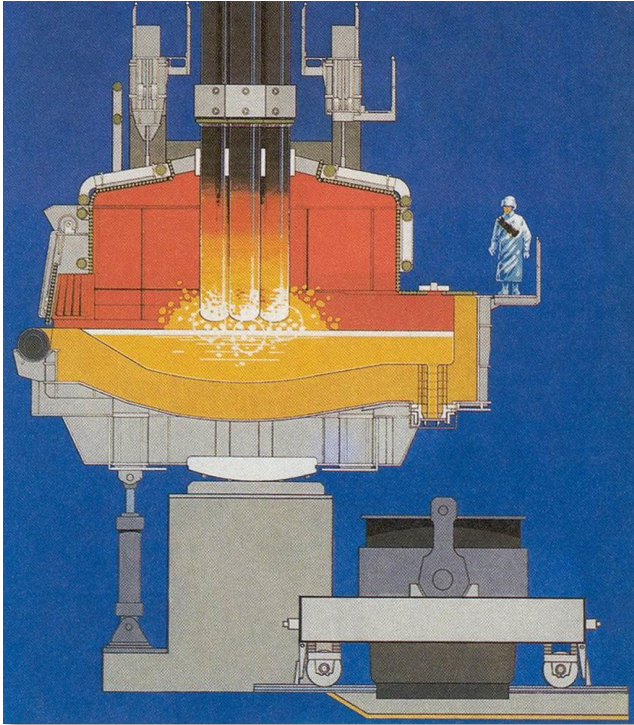
The actual MeltNet is a further development of the successful **DecNT** electrode control system, which has been standard equipment in many steel production furnaces around the world for many years.

Decades of experience have led to the **new MeltNet**, which is designed for embedded system platforms and is based on the latest hardware technologies.

Adaptation to the individual furnaces and operating systems is very easy to implement by parameterizing the software.



EAF

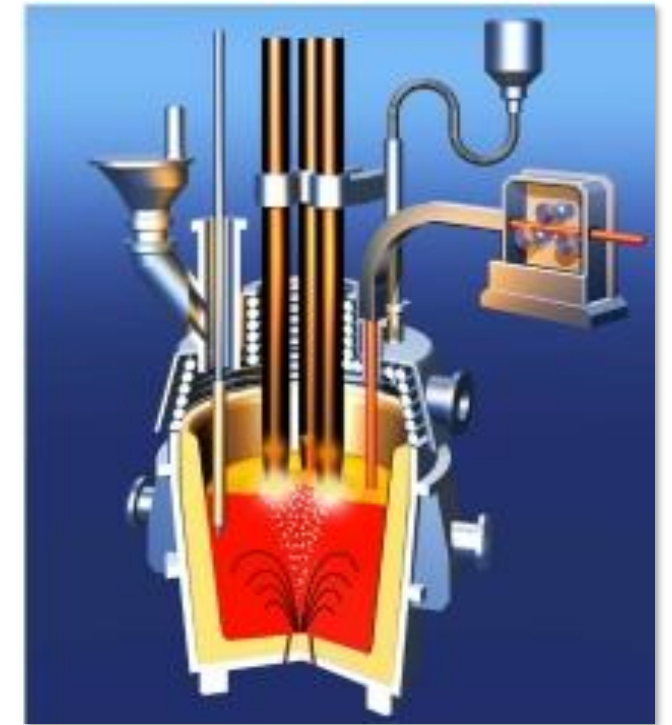


Electric **A**rc **F**urnace (AC) including ConArc, Consteel, ContiArc etc.

DECTEQ™ CAN'T BE USED FOR:

- DC-powered Electric Arc Furnaces
- Submerged Arc Furnaces
- any other kind of Reduction Furnaces

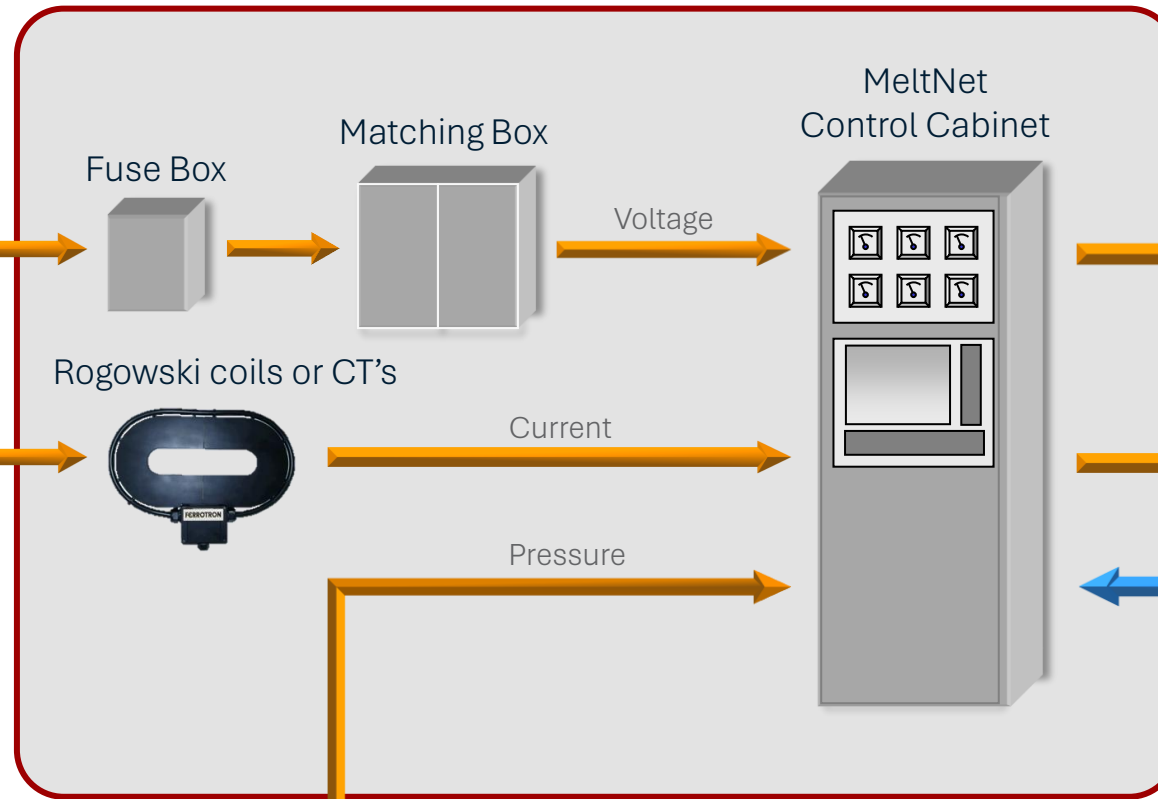
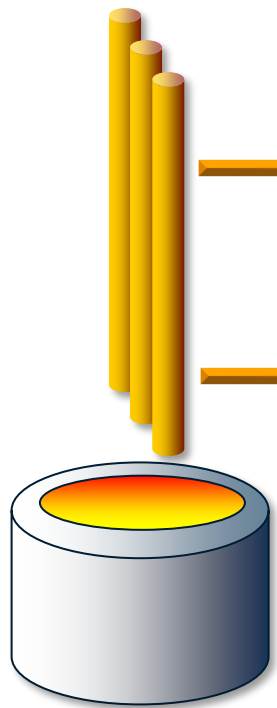
LF



Ladle Heat **F**urnaces (AC) in fixed or tilting versions, for single or double treatment position

SETUP OF THE MELTNET CONTROLLER SYSTEM

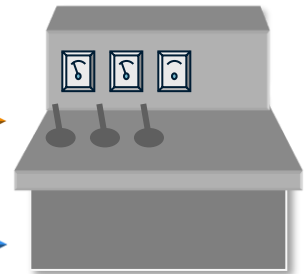
High current conductors
of furnace transformer



Proportional valves



Main control desk



Control Voltage

Voltage and Current indication

Commands

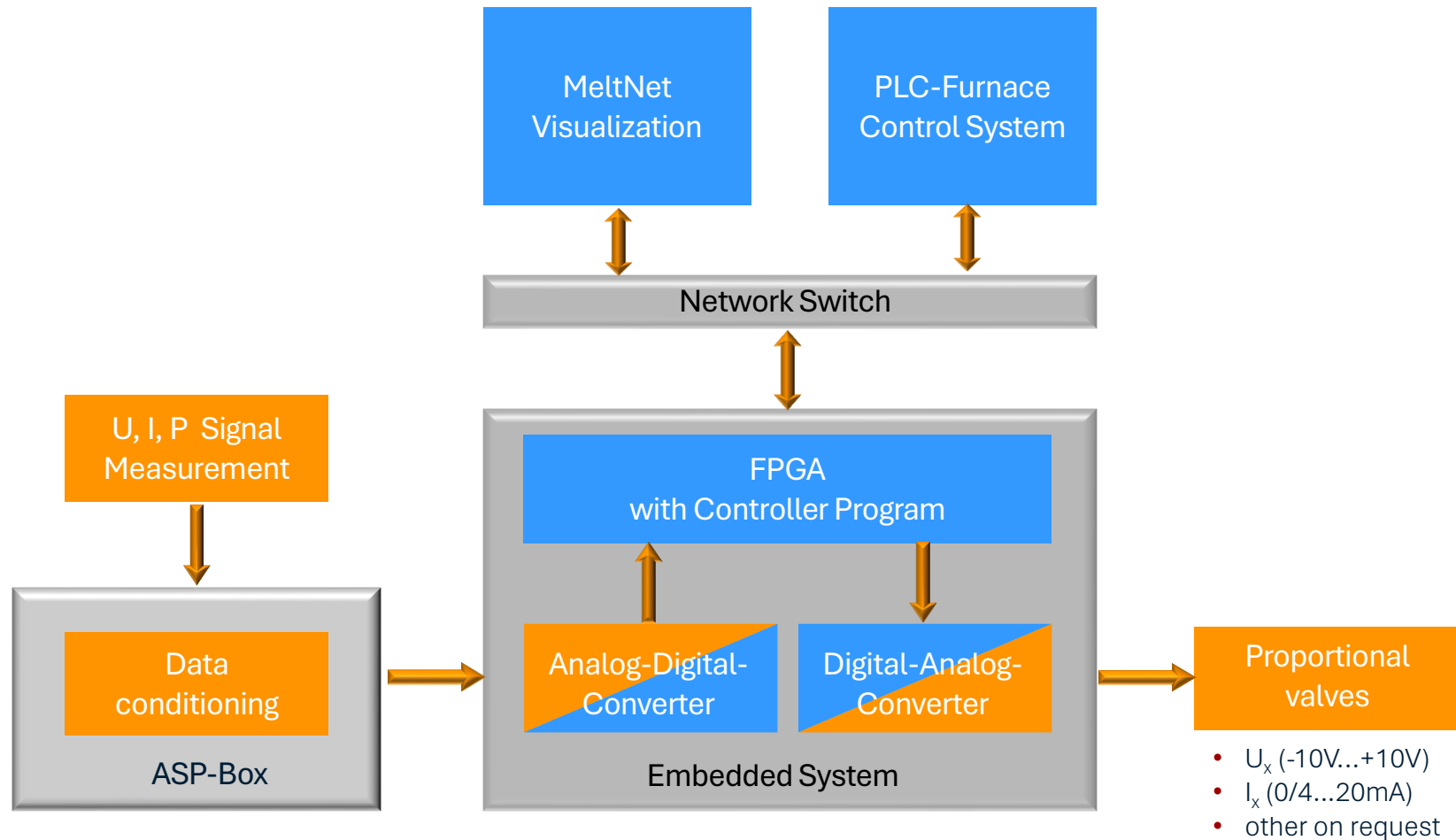
Furnace automation
system

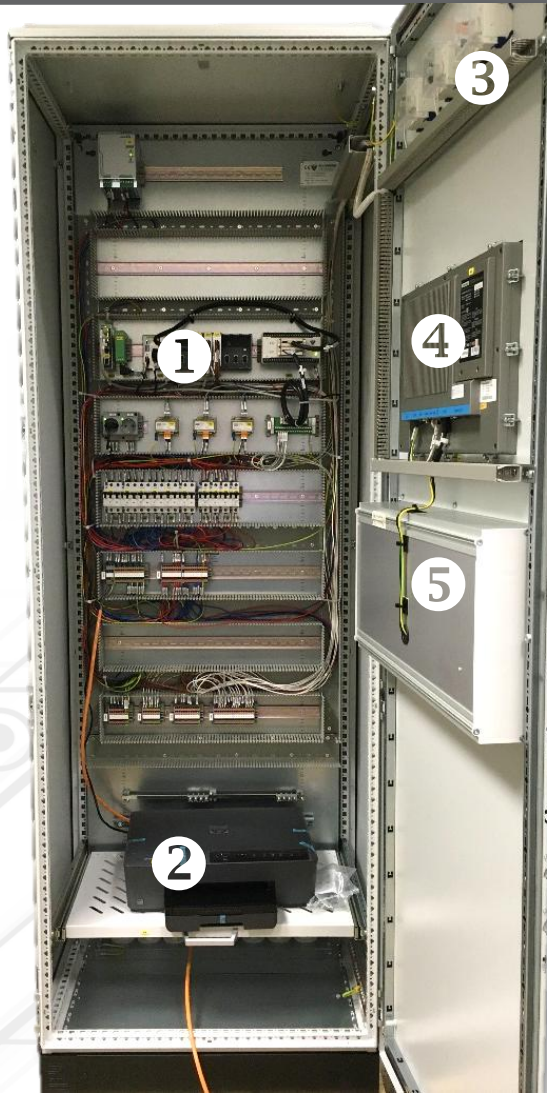
SCOPE OF SUPPLY OF **FERROTRON**

Pressure Transmitters
Recommended use for EAF, optional use for LF

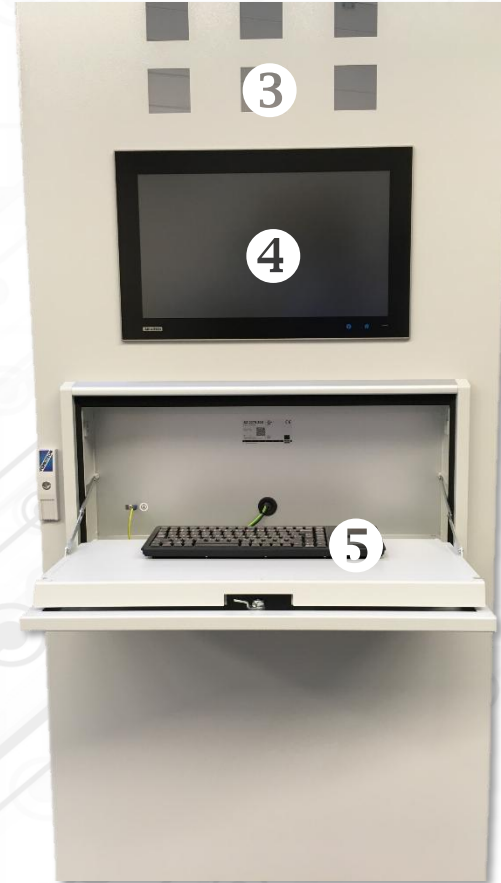


SYSTEM LAYOUT OF THE DECTEQ™ MELTNET SYSTEM





CONTROL CABINET

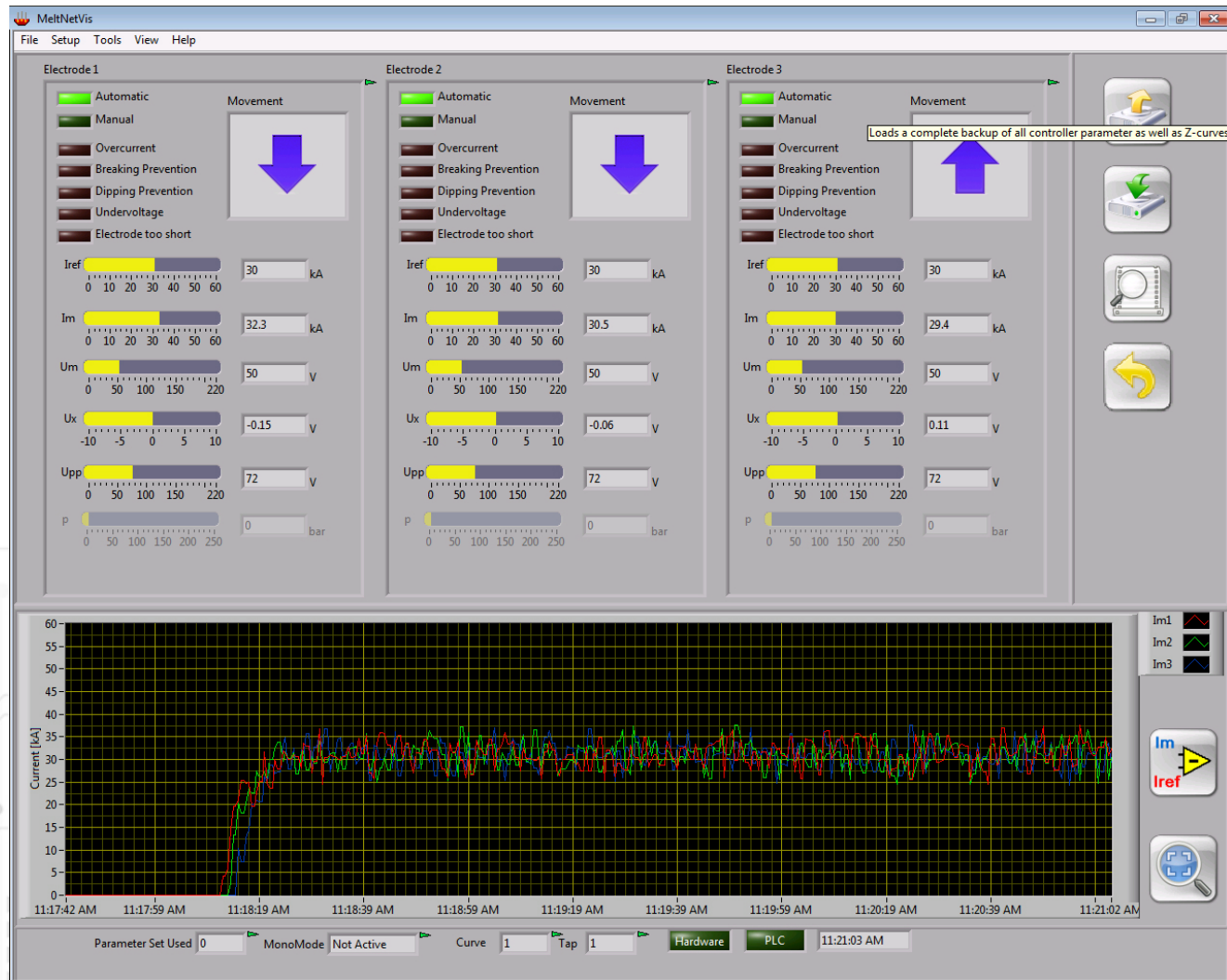


FRONT PLATE

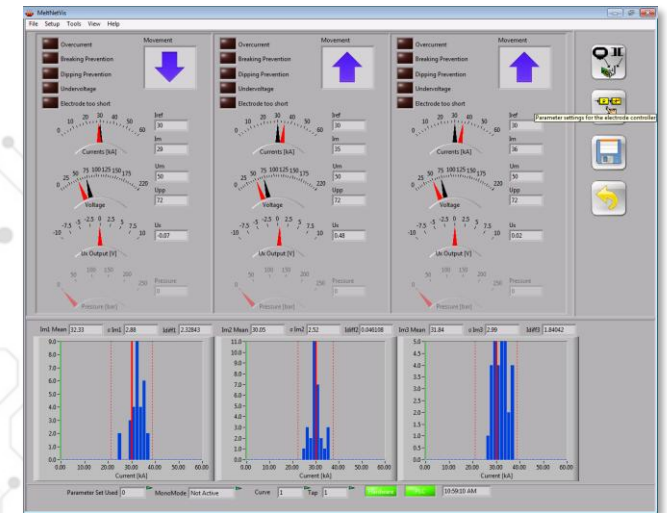
- ① mounting plate with:
Embedded System, ASP-Box,
Circuit Breakers, Terminals, etc.
- ② Printer (Optional)
- ③ Analog indicators
(if applicable)
- ④ MeltNet Visualization
Multi-Touch Panel Computer
- ⑤ Fold-out Tray with Keyboard
and Mouse

SELECTABLE MAIN-SCREEN

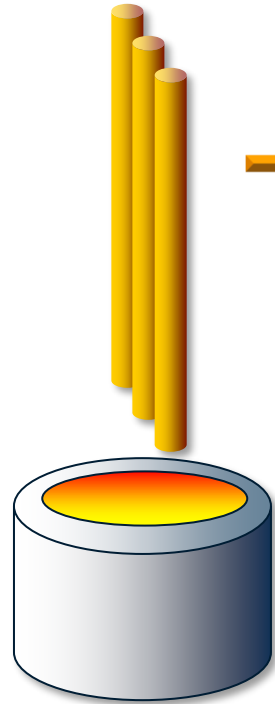
MiNTEQ



ALTERNATIVE SCREENS:



High current conductors
of furnace transformer



Mainly consisting of:

- Fuses with fuse switch
- Terminals for auxiliary switch, indicating fuse fault

Fuse Box

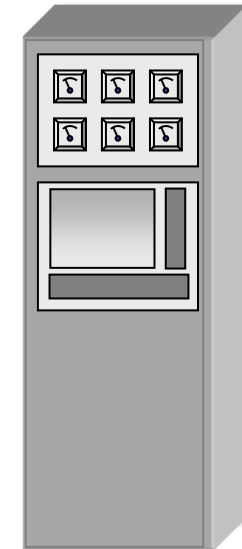


Matching Box



Voltage

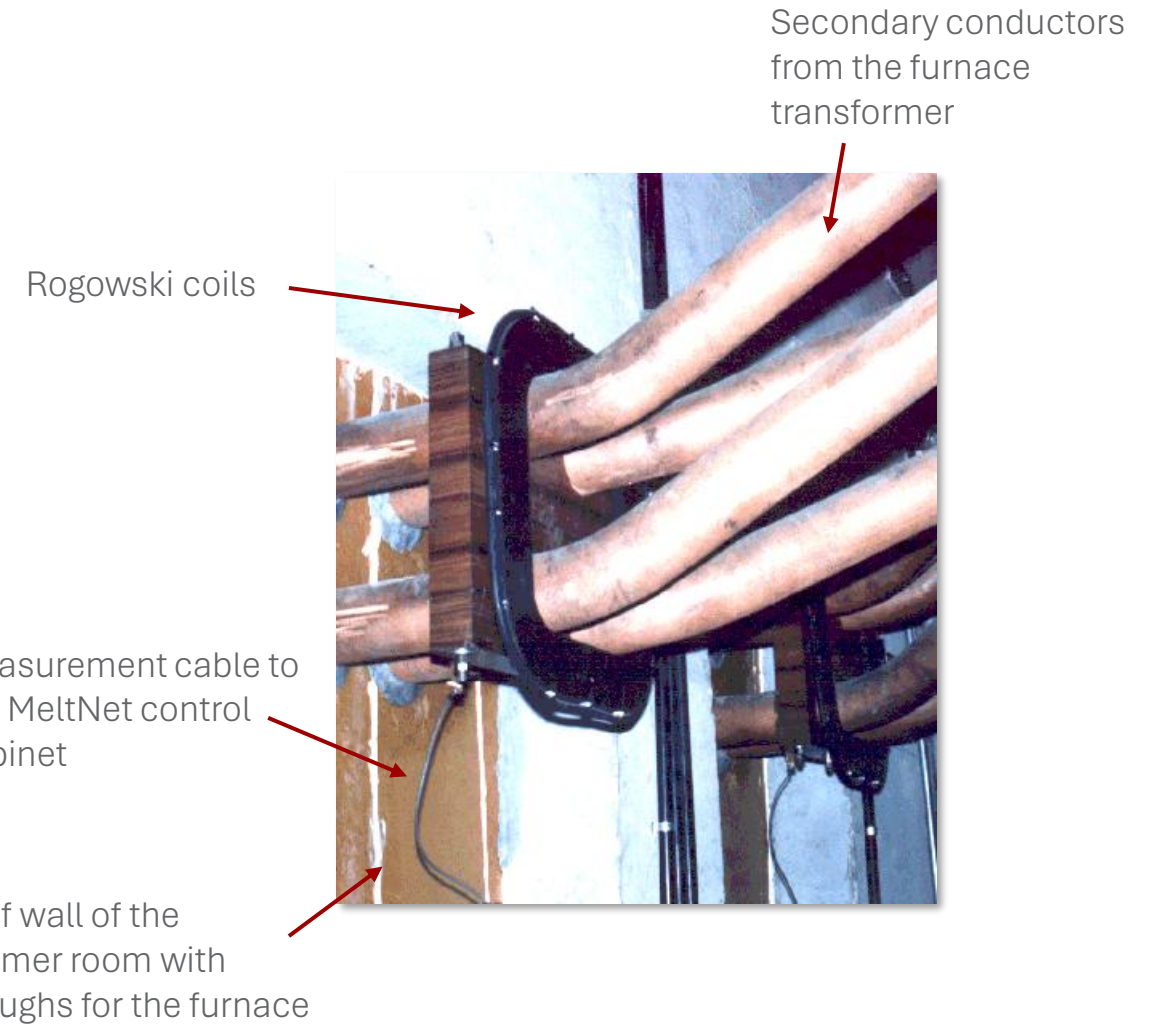
MeltNet
Control Cabinet



Mainly consisting of:

- Varistors
- High current resistors
- Voltage transformers
- Fuse switch disconnectors

Current measurement via **Rogowski Coils** mounted around high-current busbars in the transformer room.



Examples of available custom-made Rogowski Coils in various shapes



Inline Busbars



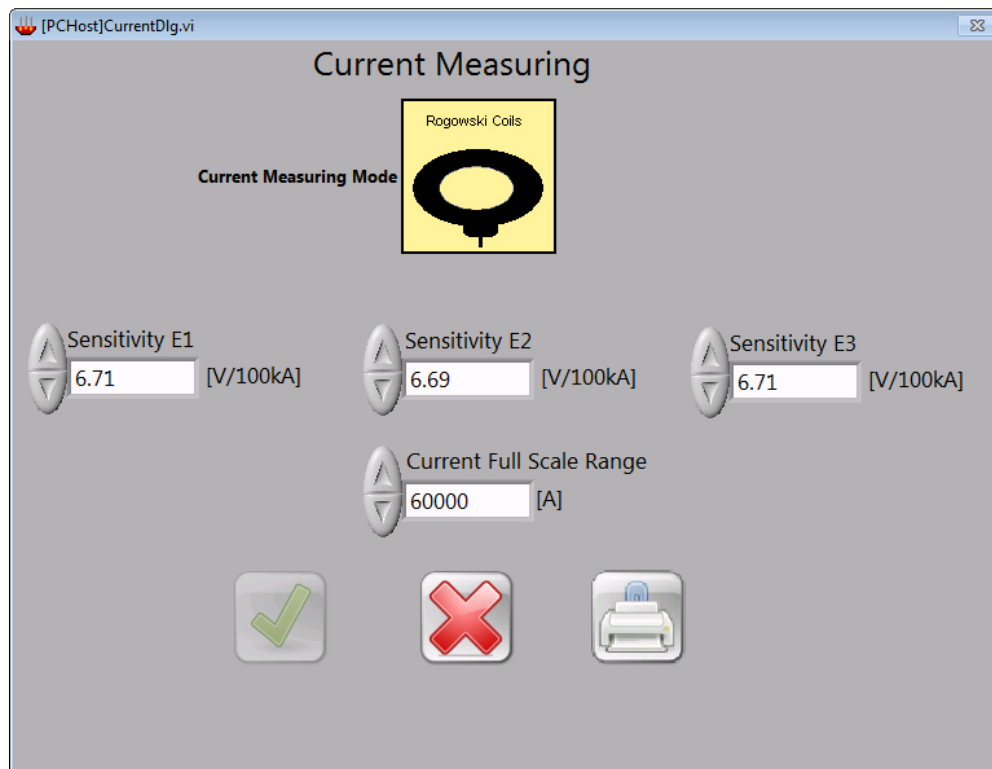
Symmetrical
Busbars



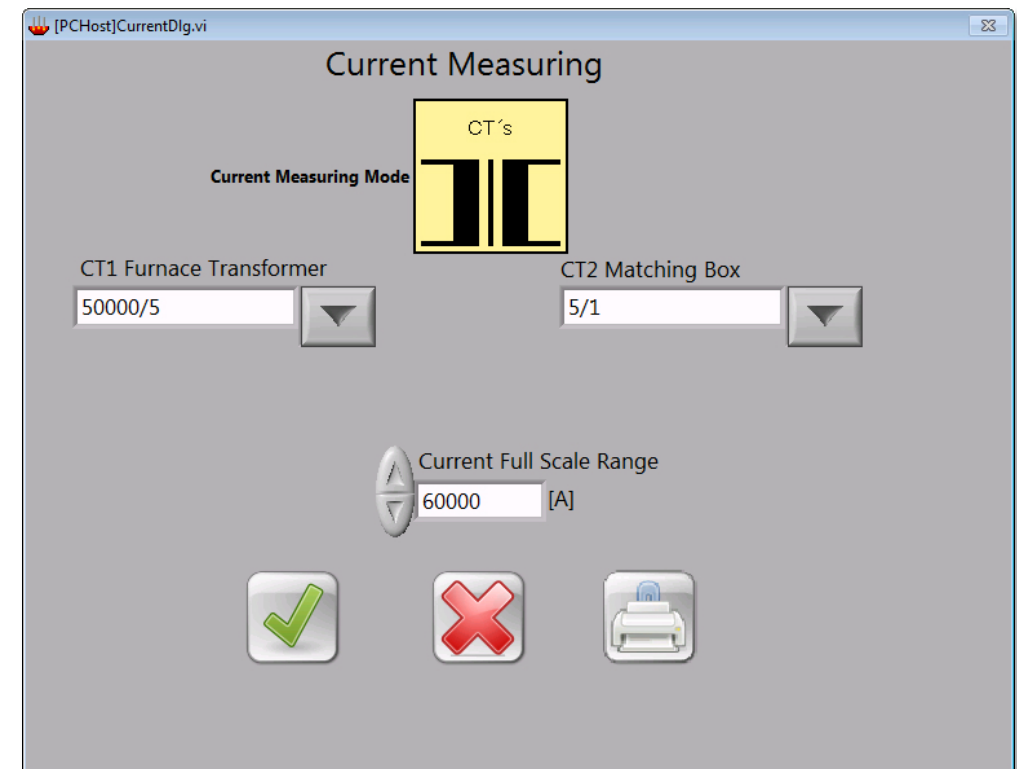
Rectangular
Conductors

Rogowski Coil current transducers are used for the high precision measurement of alternating currents. They consist of a toroidal winding on a non-magnetic core, fitting around the current conductors to be measured. The output of the Rogowski Coil is a voltage proportional to the changing rate of the current. This voltage is integrated electronically on the measurement card to get a signal proportional to the current. Rogowski Coils have significant advantages compared to conventional current transmitters with an iron core.

via **Rogowski Coil**



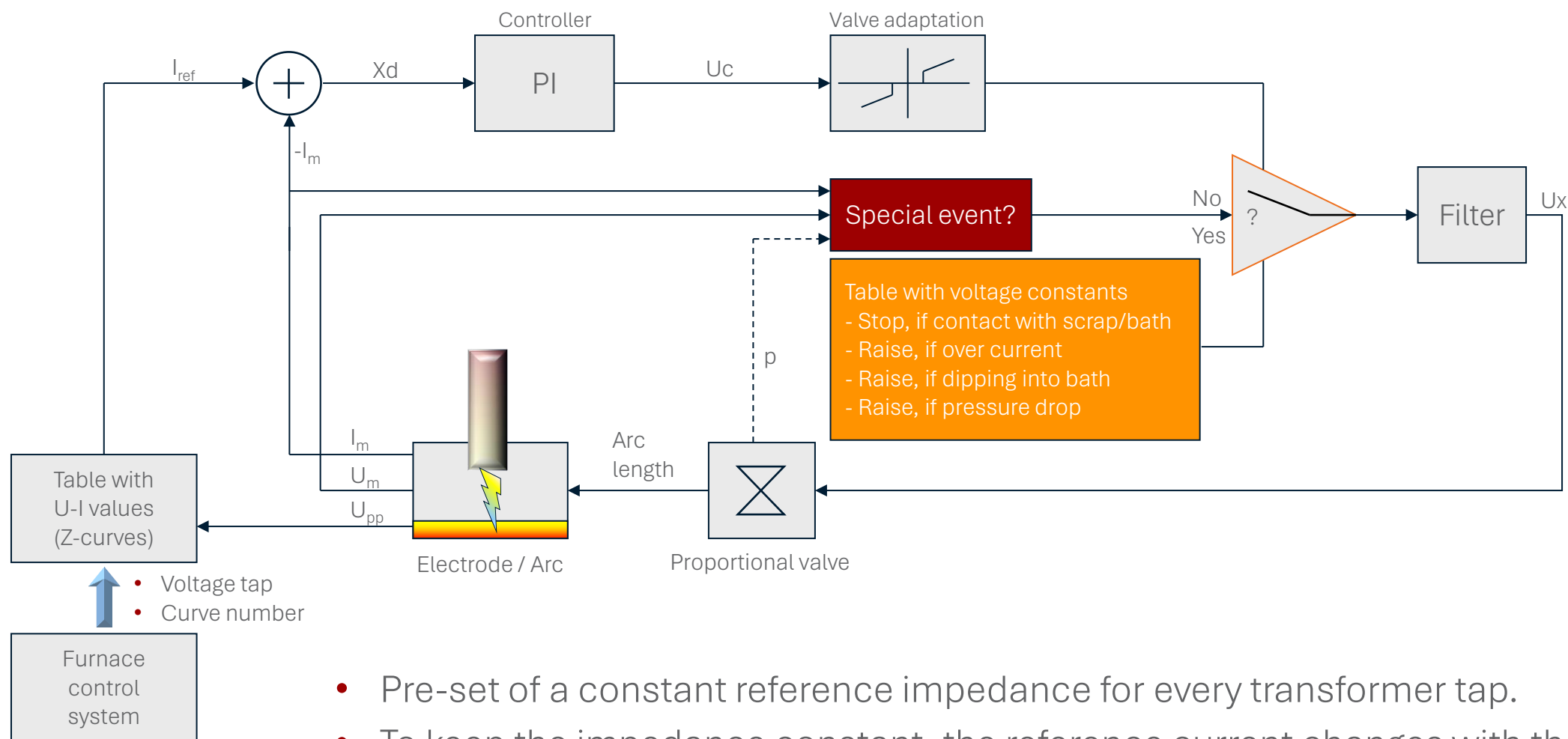
via **Current Transmitters**



Individual Setup can be done by corresponding dialogues in Software.

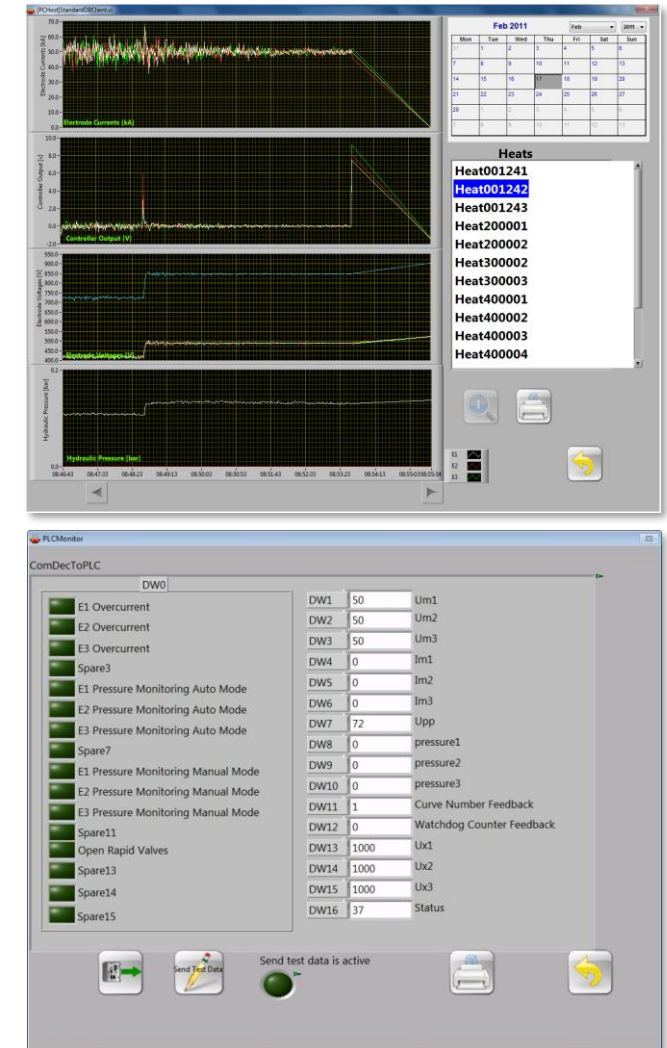
Controller functions of the DECTEQ™ MeltNet

- Keeping the set points by use of ...
 - Current Control Mode
 - Impedance Control Mode
- Reaction to special events ...
 - Start of Arc Ignition (Contact of an Electrode to scrap or bath)
 - Overcurrent
 - Dipping into the bath
 - Touch down on non conducting material
- Individual adaptation of Electrode reference-currents
 - Thermal symmetry to avoid hot spots
- Adaptation of the controller gain to the valve characteristic
- Reduction of the reference-current when the transformer tap is changed



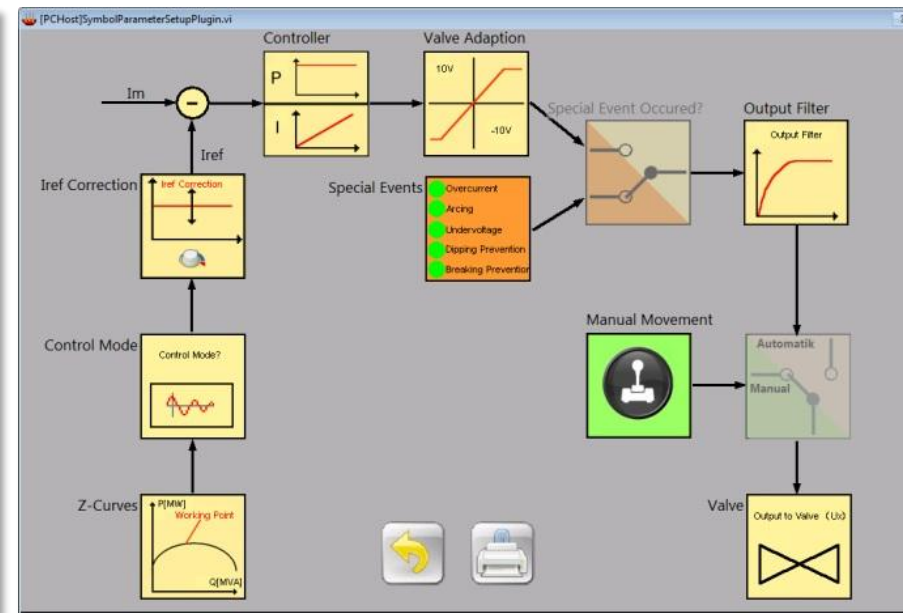
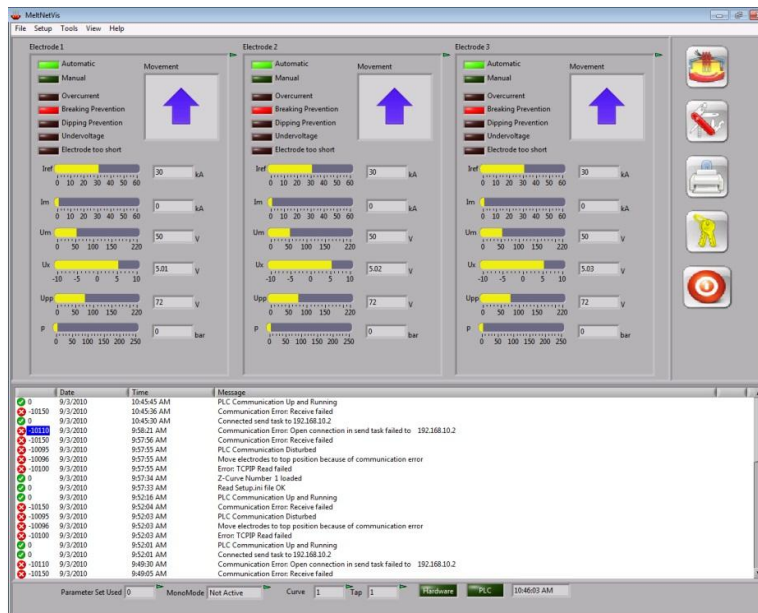
- Pre-set of a constant reference impedance for every transformer tap.
- To keep the impedance constant, the reference current changes with the voltage.

- Online process analysis
 - Statistical analysis of process data (minima, maxima, mean values, standard deviations)
- Automatic calibration of the electrode velocities
 - quick and easy determination of the correlation between electrode speed and valve control voltage (valve characteristic)
- Recording of process data
 - use of standardized Microsoft® Access databases
 - numerical and graphical view
 - integrated heat database viewer
- Communication Monitor
 - to/from Furnace-PLC, with send/receiving data



The controller program on an embedded system is designed as a real-time software with all necessary supports for the communication to the Furnace-PLC. With a response time of less than 5ms it is possible to recognize and process external time-critical signals.

The visualization program equipped with tools for setup, analyzing and maintenance allows an easy access and handling of the MeltNet controller.



Standard Specification of Digital Electrode Control System - DECTEQ™ MeltNet

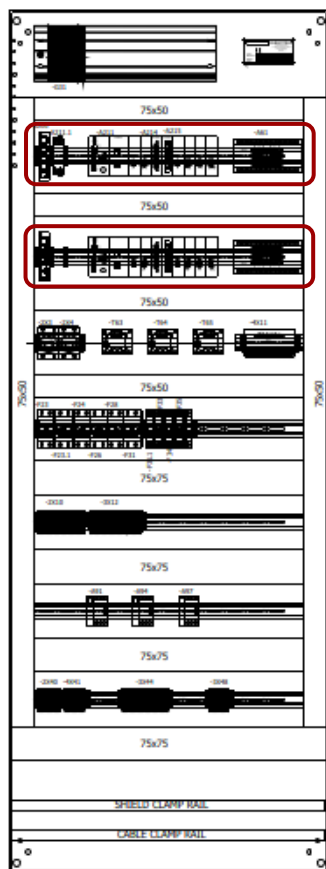
1x DECTEQ™ MeltNet Control Cabinet	Rittal type VX25-8826, dim. 800x2200x600mm (WxHxD, without base), with base (100/200mm) on request 17"/18,5" Industrial-type Touch-Panel-PC (or equivalent) with robust bezel, mounted in front door completely wired to terminal strip
1x Fuse Box	Rittal type AE1033, dim. 300x300x210mm
1x Matching Box	Rittal type AE1073 or AE1130, dim. 760/1000x760x300mm, completely wired-up to terminal strips
3x Rogowski Coils	Size and Design depend on high current bus bar

1x Selector Switch (optional)	Electrode voltage (Phase - Phase, off, Phase - Ground)
3x V-meter (optional)	Electrode voltage
3x A-meter (optional)	Electrode current
1x Software Package	Application software and operation system
Manuals	Drawings and Description in German and English language
Excluding	cables, mounting material and hydraulic parts (proportional valves, valve amplifier, pressure transmitter), etc.
Options (extra charge)	1. Inkjet printer 2. UPS, 230VAC, 620VA 3. 2nd workstation (loose provision, not mounted in front door) 4. redundant system (hot stand-by) 5. PROFIBUS-DP module 6. Coupling-PLC, type SIEMENS S7-300 or equivalent

Colour of Cabinet	RAL7035, mounting plate zinc-plated
External Power Supply	230V / 115V AC, 1000W
Internal	24V DC, 10A for proportional valves etc.
Data Interface	with Furnace-PLC via Ethernet Link, optional: PROFIBUS-DP
Supported Protocols	Native TCP/IP via Ethernet, Modbus TCP via Ethernet optional: PROFIBUS-DP
Voltage Acquisition	Secondary side of Furnace Transformer with Matching Box
Current Acquisition	Secondary side of Furnace Transformer with Rogowski Coils or with CT's (range 5A/1A requested)
Pressure Acquisition	Pressure Transmitter 0/4...20mA (supply of hydraulic)

Control Output	+/-10V for proportional valves for electrode movements, optional: 0/4...20mA via amplifier
sec. Voltage indication	optional: 3 V-meter range 100V AC, mounted in front door and/or loose provision for main control desk
sec. Current indication	optional: 3 A-meter range 4...20mA, mounted in front door and/or loose provision for main control desk
prop. Valve indication	optional: 3 V/A-meter range +/-10V / 4...20mA for valve feedback signal, mounted in front door and/or loose provision for main control desk
Pressure indication	optional: 3 A-meter range 0/4...20mA in case of option electrode safety device only, mounted in front door and/or loose provision for main control desk

OPTIONAL: REDUNDANT SYSTEM



← 1st Controller (standard), ASP-Box 1

← 2nd Controller (stand-by), ASP-Box 2

NO major interruption of production

NO loss of production time

NO long-term loss of production capacity

- A 100% Redundant Control System (Embedded system) in cold stand-by design is available as an optional feature
- Just 4 cables have to be switched, which takes just a few seconds
- A 2nd Workstation can also be supplied as a separate accessory, without pre-assembly in the front door of the DECTEQ™ MeltNet control cabinet

- In case of an DECTEQ™ MeltNet Upgrade system, just the existing control cabinet is being replaced by a new, state-of-the-art MeltNet control cabinet
- Easy, fast and cost-effective upgrade to state-of-the-art automation components
- All other systems and components related to existing electrode control system, like
 - Fuse box
 - Matching box (used for voltage adaption)
 - Rogowski coils or CT's



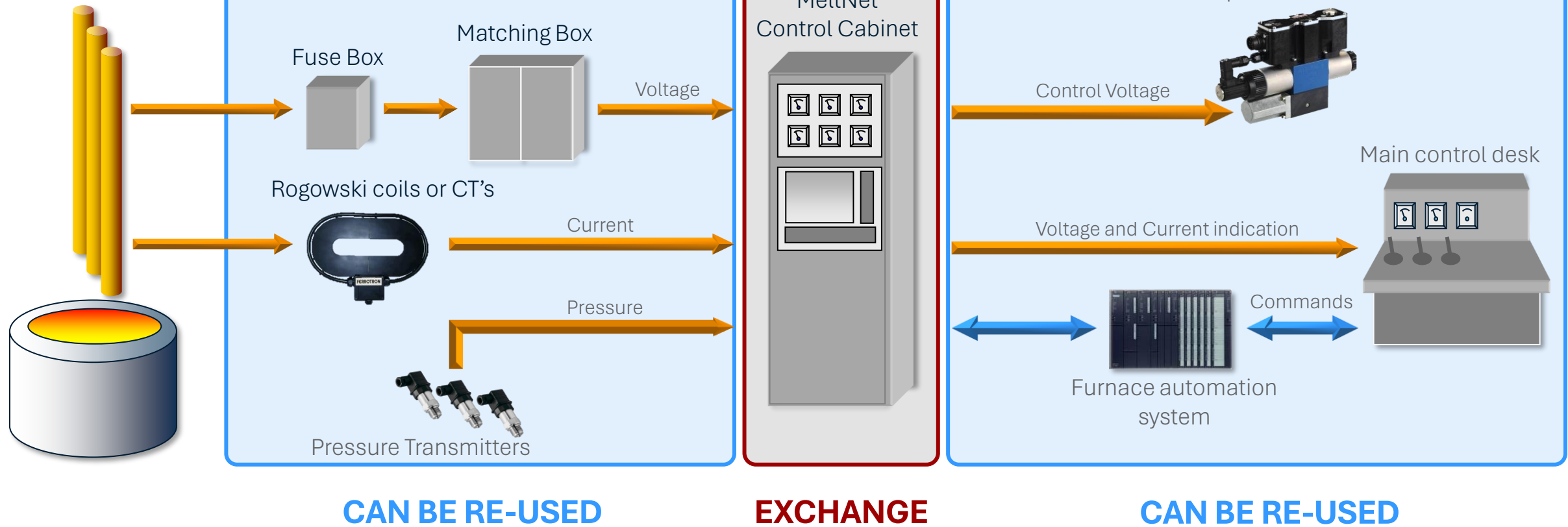
remain unchanged and will be re-used from existing installation

- DECTEQ™ MeltNet upgrade system is not only limited to installations provided by Ferrotron, but can be adapted to other vendors of electrode control systems⁽¹⁾

DECTEQ™ MELTNET UPGRADE SYSTEM II

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High current conductors
of furnace transformer

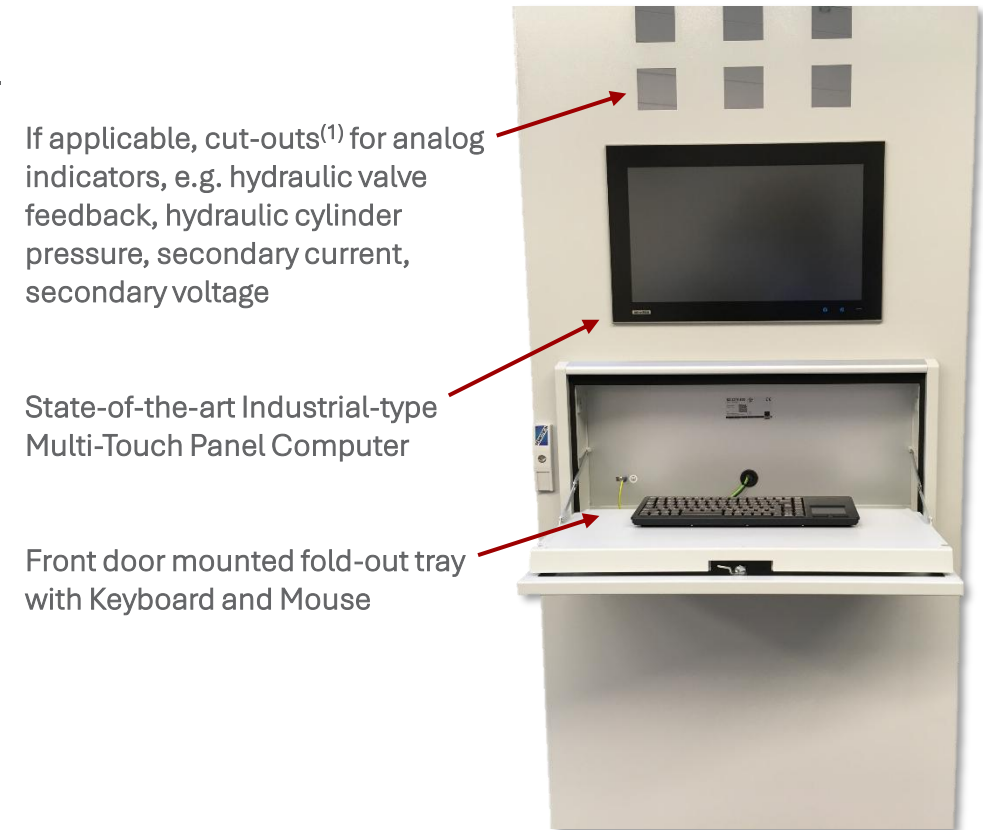


- In case of an “DECTEQ™ UpdateKit” system, just the existing MeltNet visualization PC is being replaced by a new, State-Of-The-Art Microsoft Windows11-based Industrial-Touch-Panel-PC ⁽¹⁾
- All other systems and components mounted to the existing DECTEQ™ MeltNet control cabinet, like
 - Embedded system (controller)⁽²⁾
 - internal voltage adaption
 - internal valve amplifiers (if applicable)
 - wiring and terminals⁽³⁾
- Remain unchanged and will be re-used from existing installation
- Easy, fast and cost-effective update to state-of-the-art Visualization-PC



Notes
(1): incl. steel sheet door
(2): software update included
(3): except: wiring to/from cabinet door

- Existing DECTEQ™ MeltNet-installations can be easily and cost-effectively updated to a State-of-the-Art Microsoft Windows 10®-based Visualization-PC by reusing major components of the existing DECTEC™ MeltNet-control cabinet.
- The outdated Visualization-PC (incl. glass sight door and built-in swing-frame) will be dismantled from existing cabinet and replaced by a steel sheet door with built-in Industrial-Touch-Panel-PC.



(1): acc. to the design of existing installation

INSTALLED BASE – MORE THAN 230 SYSTEMS GLOBALLY

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AMERICAS

- Brazil
- Canada
- Chile
- Mexico
- USA
- Venezuela



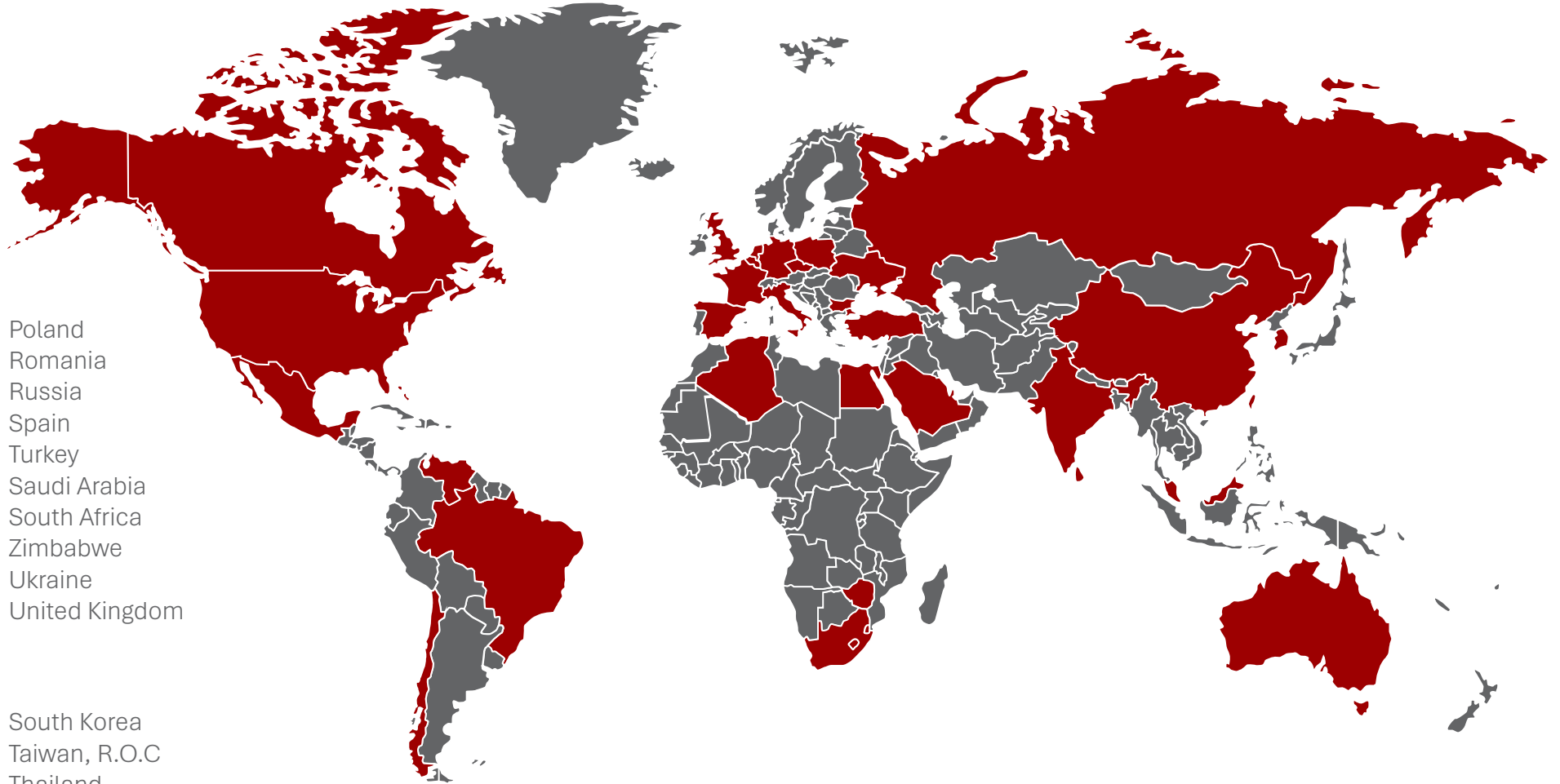
EMEA

- Algeria
- Belgium
- Czech Republic
- Egypt
- Finland
- France
- Germany
- Italy
- Luxembourg
- Netherlands
- Poland
- Romania
- Russia
- Spain
- Turkey
- Saudi Arabia
- South Africa
- Zimbabwe
- Ukraine
- United Kingdom



APAC

- Australia
- India
- Indonesia
- Malaysia
- P.R. of China
- South Korea
- Taiwan, R.O.C
- Thailand



MiNTEQ

A MINERALS TECHNOLOGIES COMPANY

FERROTRON
A **MiNTEQ** DIVISION