FLUKE
Process Instruments

TIP900

Wallboard Temperature Imaging
&
Profiling System

Operating Instructions

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59611

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The manufacturer warrants this instrument to be free from defects in material and workmanship under normal use and service for the period of two years from date of purchase. This warranty extends only to the original purchaser. This warranty shall not apply to fuses, batteries, or any product which has been subject to misuse, neglect, accident, or abnormal conditions of operation.

In the event of failure of a product covered by this warranty, the manufacturer will repair the instrument when it is returned by the purchaser, freight prepaid, to an authorized Service Facility within the applicable warranty period, provided manufacturer's examination discloses to its satisfaction that the product was defective. The manufacturer may, at its option, replace the product in lieu of repair. With regard to any covered product returned within the applicable warranty period, repairs or replacement will be made without charge and with return freight paid by the manufacturer, unless the failure was caused by misuse, neglect, accident, or abnormal conditions of operation or storage, in which case repairs will be billed at a reasonable cost. In such a case, an estimate will be submitted before work is started, if requested.

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The manufacturer does not warrant that the software described herein will function properly in every hardware and software environment. This software may not work in combination with modified or emulated versions of Windows operating environments, memory-resident software, or on computers with inadequate memory. The manufacturer warrants that the program disk is free from defects in material and workmanship, assuming normal use, for a period of one year. Except for this warranty, the manufacturer makes no warranty or representation, either expressed or implied, with respect to this software or documentation, including its quality, performance, merchantability, or fitness for a particular purpose. As a result, this software and documentation are licensed "as is," and the licensee (i.e., the User) assumes the entire risk as to its quality and performance. The liability of the manufacturer under this warranty shall be limited to the amount paid by the User. In no event shall the manufacturer be liable for any costs including but not limited to those incurred as a result of lost profits or revenue, loss of use of the computer software, loss of data, the cost of substitute software, claims by third parties, or for other similar costs. The manufacturer's software and documentation are copyrighted with all rights reserved. It is illegal to make copies for another person.

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The device complies with the requirements of the European Directives.

EC – Directive 2004/108/EC (EMC)

Electromagnetic Compatibility Applies to use in Korea only. Class A Equipment (Industrial Broadcasting & Communication Equipment)

This product meets requirements for industrial (Class A) electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and is not to be used in homes.

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GLOSSARY

HW	Hardware
SW	Software
Display domain	Specific area on the Touch Panel PC screen
Log Viewer	Program to analyze historical archived board images
Dryer	Kiln, Rack dryer, Plate dryer
Standard Operator	Standard user with limited editing and configuration rights
Supervisor	Fully authorized user for editing, configuration and access right administration

1. Safety Instructions

This document contains important information, which should be kept at all times with the instrument during its operational life. Other users of this instrument should be given these instructions with the instrument. Eventual updates to this information must be added to the original document. The instrument can only be operated by trained personnel in accordance with these instructions and local safety regulations.

Acceptable Operation

This instrument is intended only for the measurement of temperature. The instrument is appropriate for continuous use. The instrument operates reliably in demanding conditions, such as in high environmental temperatures, as long as the documented technical specifications for all instrument components are adhered to. Compliance with the operating instructions is necessary to ensure the expected results.

Unacceptable Operation

The instrument should not be used for medical diagnosis.

Replacement Parts and Accessories

Use only original parts and accessories approved by the manufacturer. The use of other products can compromise the operation safety and functionality of the instrument.

Instrument Disposal

Disposal of old instruments should be handled according to professional and environmental regulations as electronic waste.

Operating Instructions

The following symbols are used to highlight essential safety information in the operation instructions:

Helpful information regarding the optimal use of the instrument.

Warnings concerning operation to avoid instrument damage and personal injury.

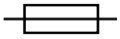
The instrument can be equipped with a Class 2 laser. Class 2 lasers shine only within the visible spectrum at an intensity of 1 mW. Looking directly into the laser beam can produce a slight, temporary blinding effect, but does not result in physical injury or damage to the eyes, even when the beam is magnified by optical aids. At any rate, closing the eye lids is encouraged when eye contact is made with the laser beam. Pay attention to possible reflections of the laser beam. The laser functions only to locate and mark surface measurement targets. Do not aim the laser at people or animals.

Pay particular attention to the following safety instructions.

Incorrect use in 110 / 230 V~ electrical systems can result in electrical hazards and personal injury, if not properly protected. All instrument parts supplied by electricity must be covered to prevent physical contact and other hazards at all times.

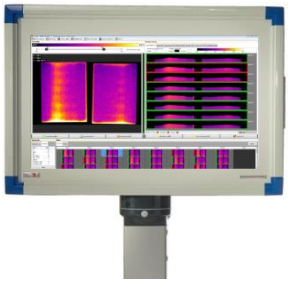
Safety Instructions

General Symbols

	**AC (Alternating Current)**
	**DC (Direct Current)**
	**Risk of danger. Important information. See manual.**
	**Hazardous voltage. Risk of electrical shock.**
	**Helpful information regarding the optimal use of the instrument.**
	**Earth ground**
	**Protective ground**
	**Fuse**
	**Normally-open (NO) relay**
	**Normally-closed (NC) relay**
	**Switch or relay contact**
	**DC power supply**
	**Conforms to European Union directive.**
	**Disposal of old instruments should be handled according to professional and environmental regulations as electronic waste**.

2. Product Description

The TIP900 is a powerful new measurement and monitoring system to supervise the production quality of gypsum wallboards. This system is a unique combination of a high sophisticated analysis and archiving software, based upon scanned infrared thermal images, performed by a Raytek MP150 Thermal Imager. The Thermal Imager acquires infrared energy as scanned lines, emitted from the upper wallboard surfaces of passing boards after kiln (dryer) discharge. Multiple cumulated line scans illustrate a thermal wallboard image, whereas the measured temperature distribution delivers an indication of the wallboard drying uniformity. Every scanned wallboard image will be compared with a good (proper) reference image, which previously has to be defined and selected by a production quality expert on customer side. An intelligent and powerful software based comparison and analysis process allows wallboard defect identification. The rasterized surface area comparison algorithm is able to identify and mark significant zones, where the wallboard temperature deviation is out of predefined scope. This gives a hint of nonconformance to reference boards and is a real time indication for bubbles, blisters or clumps. Regarding the predefined limits for the defect detection process, a **bad** wallboard signal is generated by the analysis SW, which is available as a digital output to steer a discharge lock mechanism.



For an improved and optimized SW defect detection process, an ambient temperature compensation function is integrated. It compensates the temperature drop of the wallboard average temperature between the kiln discharge and the Thermal Imager measurement position. A specific IR-temperature sensor is installed close to the kiln exit and measures the average discharge temperature of the wallboards. The acquired temperature drop between both measurement positions is added up the Thermal Imager measurement values. Such proceeding standardized the measured temperature values to the kiln discharge, whereas ambient temperature drop influences are reduced. A customer's production expert has to define the best installation position of the specific IR-sensor, to get the best average temperature values at kiln discharge over all dryer decks.

To bridge large distances (> 80m, 262 ft.) between the control area (Industrial Touch-Panel PC position) and the Thermal Imager position, a fiber optic connection has to be used instead of the standard LAN/Ethernet wiring. Such a connection is much more reliable in harsh environments and to overcome large distances between communication terminals. The optical fiber cable supports high speeds and long distance transmissions (up to 2 km / 1.2 mi). Data transfer quality and reliability in harsh environments is improved.

Figure 1: Example of fiber optical link to overcome large network distances

2.1 System Overview and Arrangement of Components

The TIP900 system is composed of measurement, process control, operator and graphical display HW/SW components and consists in general of the following devices:

Figure 2: TIP900SYS system components, which have to be integrated

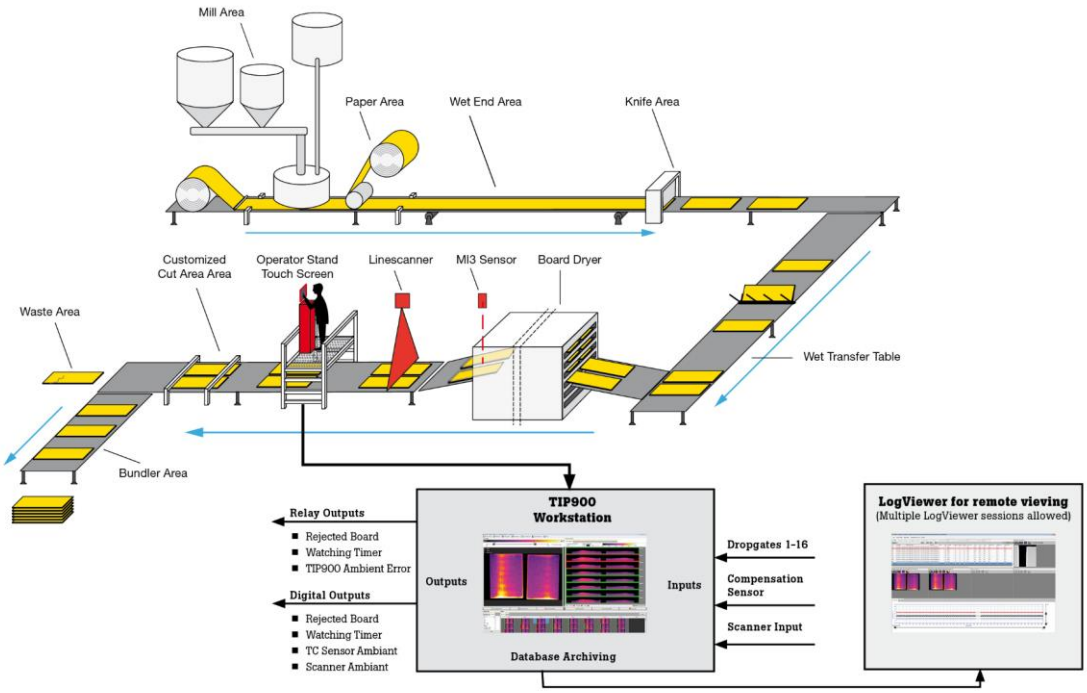


Figure 3: Process Overview and Arrangement of TIP900 Components (red)

The HW components are:

- Industrial Touch Panel PC (21.5”) for control, analysis and archiving, equipped with:
  - Touch sensitive panel PC module with two separate network channels
  - Power supply 100 – 240VAC, to power the PC module, see Figure 5 (**T3**)
  - Industrial Power Supply (24VDC, 2.5A, e.g. WAGO 787-1012), to power integrated Digital-Output modules and network switch, see Figure 5 (**T1**)
  - Industrial Digital-Output module (4 * Relay Output, e.g. WAGO 750-513)
  - Industrial Digital-Output module (16 * 24VDC-Output, e.g WAGO 750-1504)
  - Industrial Fieldbus coupler (e.g. WAGO 750-352), see Figure 5 (**T2**)
  - Industrial Terminal block, labeled for signal connection, see Figure 5 (**X1, X2**)
  - Industrial 5-channel network switch (e.g. WAGO 852-111), see Figure 5 (**X3**)

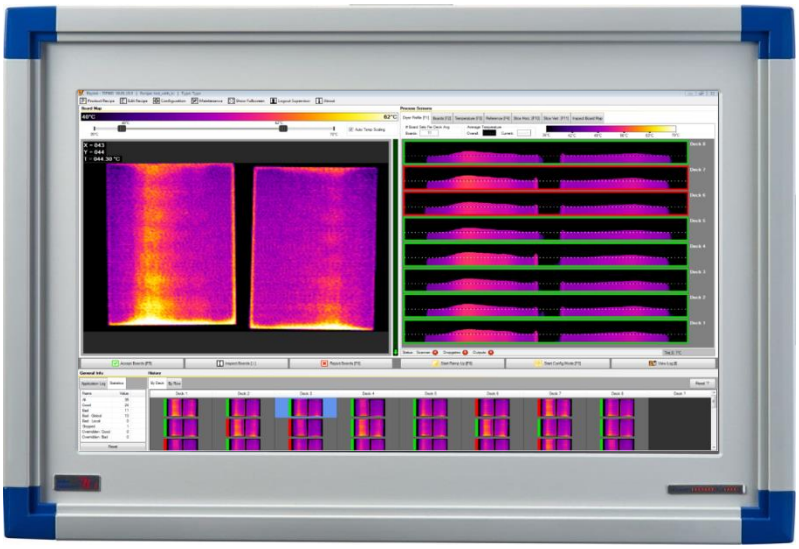


Figure 4: Front view of the Industrial Touch-Panel PC

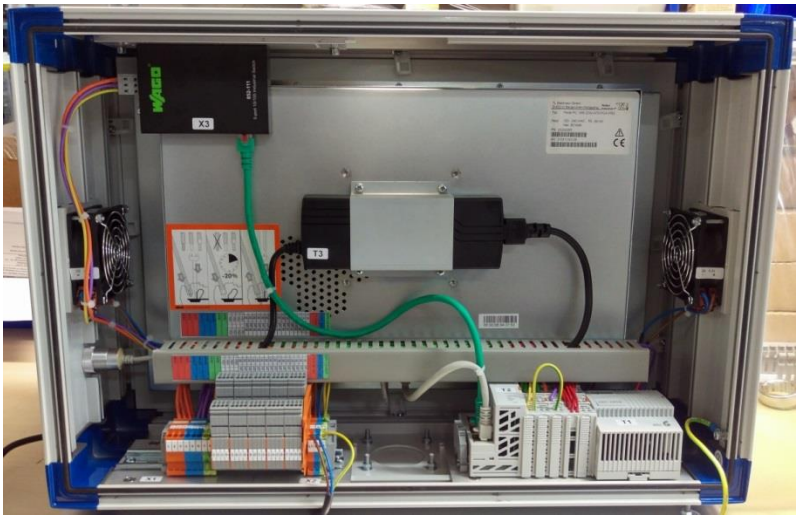


Figure 5: Rear view into the equipped Industrial Touch-Panel PC

- Option: Pedestal or swiveling supporting arm to fix the Industrial Touch Panel PC

Figure 6: Options to fix the Industrial Touch-Panel PC

- Industrial hardened Protective Housing for hardware system components in dusty environment, like the Thermal Imager, Power Supply, Terminal Block, Network Components

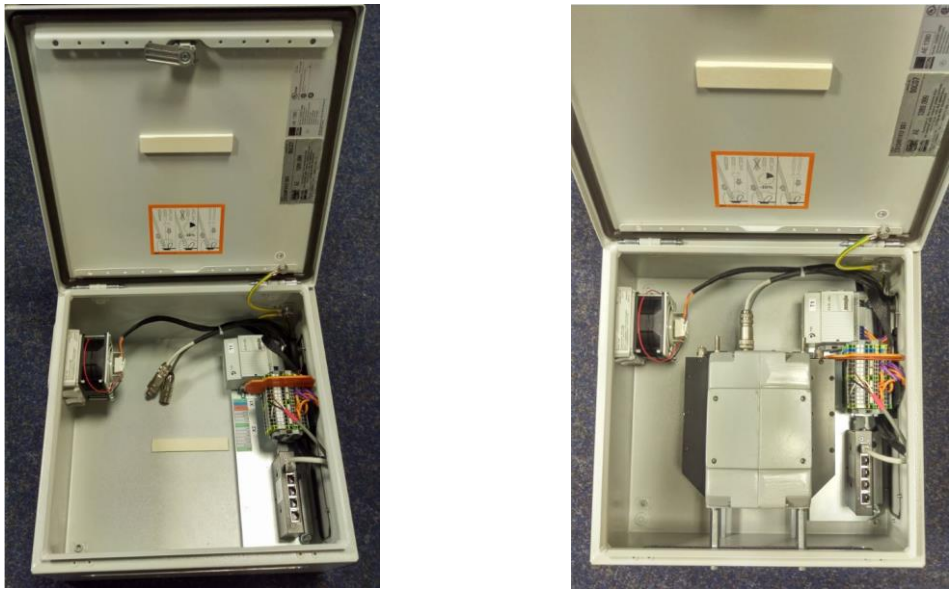


Figure 7: Protective Housing, equipped with Thermal Imager and network components

- Temperature Compensation set to reduce the ambient temperature influence. It has to be installed close to the kiln discharge between the upper and lower dropgate decks. The complete temperature compensation set consists of the following components:
  - A compact IR sensor with 15m head cable, installed in a telescope arm
  - A counter telescope arm with black surface paddle for good temperature reading
  - A connection box to adapt the compact IR sensor to the Ethernet network

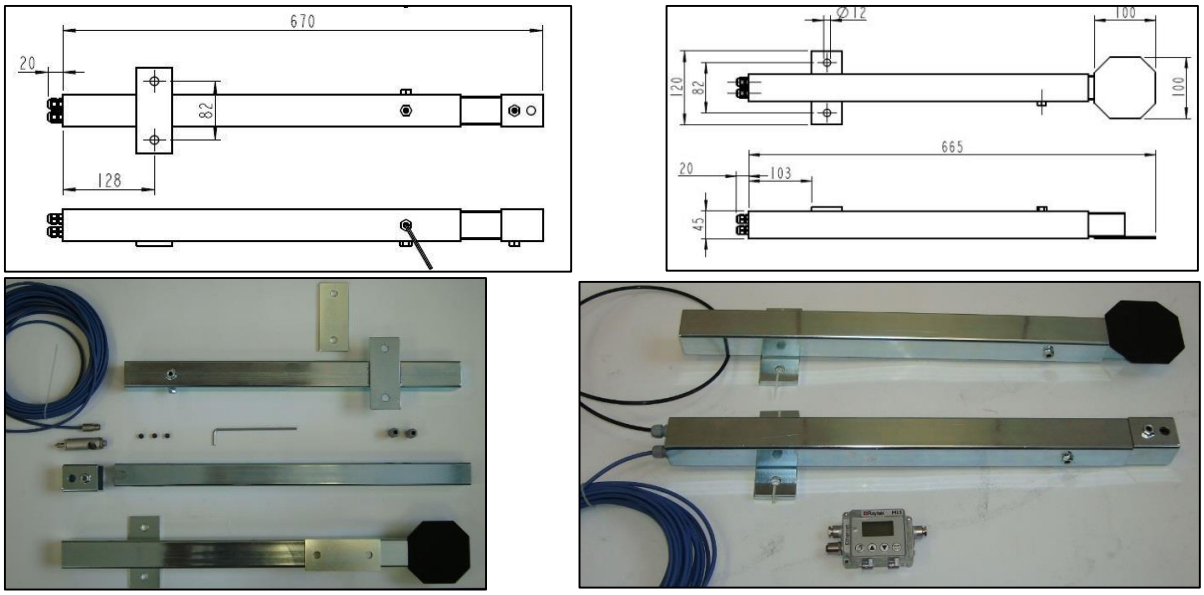


Figure 8: Temperature Compensation Set

- Drop gate identification and signaling set for the adaptation to process interfaces and intersystem network communication. The set is shipped separately and consists of a DIN-top hat rail, equipped with the following components:
  - Industrial Fieldbus coupler (e.g. WAGO 750-352)
  - Industrial 16-channel digital input module 24VDC (e.g WAGO 750-1406)
  - Prewired Terminal block
  - Industrial Power Supply 24V, 1.5A (e.g. WAGO 787-1002)

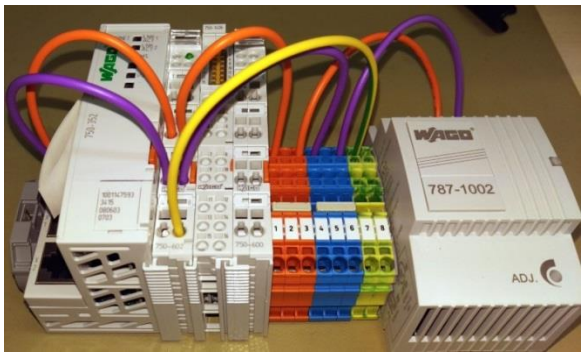


Figure 9: Drop gate identification and signaling set

The SW components, preinstalled on the Industrial Touch-Panel PC, are:

- Windows 7, 64-Bit, English
- TIP900 process SW for wallboard image scan, defect detection and long term image archiving
- Wago I/O Check SW for the standard Wago 750 field bus coupler integration
- DataTempDP Light / Continuum SW for the Thermal Imager integration
- Putty SW package for Thermal Imager and compact sensor integration
- Teamviewer QS SW package for remote service support
- File packer SW (7-Zip) for file packing and extracting
- MS Internet Explorer, standard web site: www.flukeprocessinstruments.com
- MS Security Essentials

3. Technical Data

3.1 Specifications

3.1.1 TIP900SYS (Thermal Imager, needs to be mounted in protective housing)

Type	Raytek MP150LT
Temperature Range	20 to 350°C (68 to 662°F)
Spectral Response	3 to 5 µm
Detector	MCT
System Accuracy	± 2°C (± 4°F) at 0 - 50°C (32 - 122°F) ambient temperature
Repeatability	± 1°C (± 2°F) at 0 - 50°C (32 - 122°F) ambient temperature
Temperature Resolution	0.1 K (digital interface), 16 bit (analog output)
Scan Rate	20 Hz, 36 Hz, 48 Hz, 76 Hz, 85 Hz, 108 Hz, 126 Hz, 150 Hz
Measured Points per Line (at FOV)	256 pixel @ 150 Hz, 512 pixel @ 76 Hz, 1024 pixel @ 36 Hz
Scan Angle (FOV)	90°
Standard Focal Distance	1.52 m (60“)
Optical Resolution D:S (90% energy)	170 : 1 (IFOV = 5.9 mrad)
Hot Spot Detection (50% energy)	510 : 1 (IFOV = 2 mrad)
Mechanical scanning system	MTBF: 40,000 hours at 48Hz scan rate
Power Supply	24 VDC ± 25%, 1A
Power Supply to protective housing	100 to 240 VAC, 50/60Hz
Protection rate for MP150LT	IP65 (NEMA4) in accordance to IEC 60529
Protection rate for protective housing	IP44 (NEMA3), Rittal cabinet
Ambient Operation Temperatures at still air (e.g. MP150LT integrated in protective housing):	
- Without cooling	0 to 50°C (32 to 122°F), no direct sunlight
Internal Operation Temperatures	0 to 60°C (32 to 140°F)
- Laser	automatic switch off at < 5°C (41°F) or > 50°C (122 °F)
Storage Temperatures	-25 to 65°C (-13 to 149°F)
Air Purge Collar: Pressure	max. 3 bar (43 psig)
Air Purge Collar: Flow rate	typ. 100 l/min to 200 l/min (3.53 to 7.06 cfm)
Warm-up Time	30 min.
Relative Humidity	10 to 90%, non-condensing, for operating and non-operating
Vibration	IEC 60068-2-6, 3 axes, 10 to 150 Hz, operating 2 g above 20 Hz
Shock	IEC 60068-2-27, 3 axes, operating: 5 g at 11 ms, 15 g at 6 ms
Dimensions	200 x 180 x 190 mm (7.8 x 7.02 x 7.41 in)
Weight (incl. air purge)	7 kg (15.4 lbs)

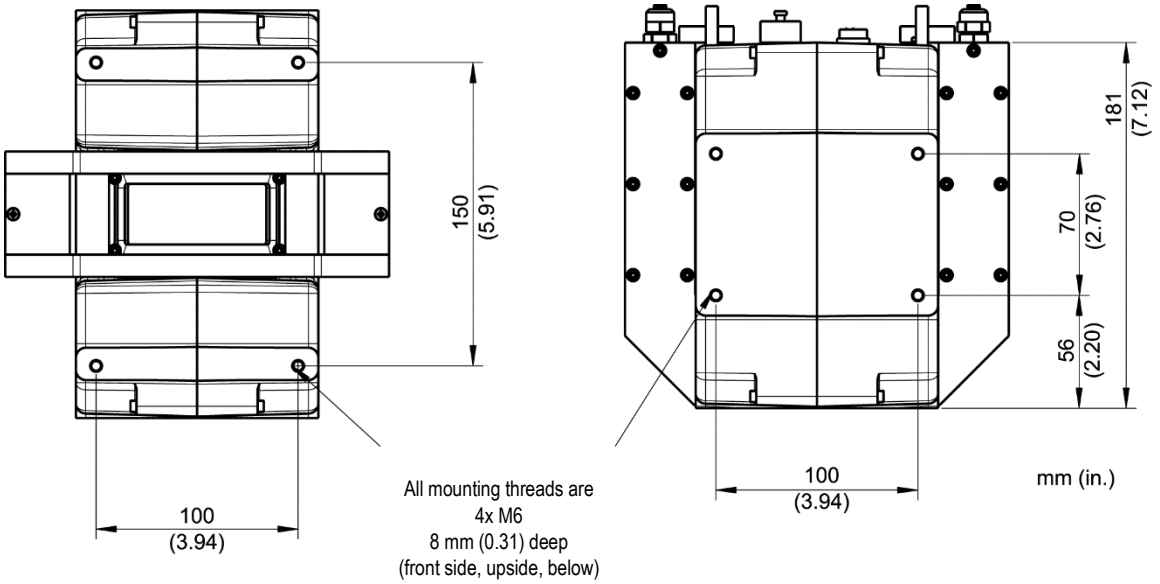


Figure 10: Thermal Imager mounting locations and dimensions

Note: The mounting dimensions are the same for top and bottom view!

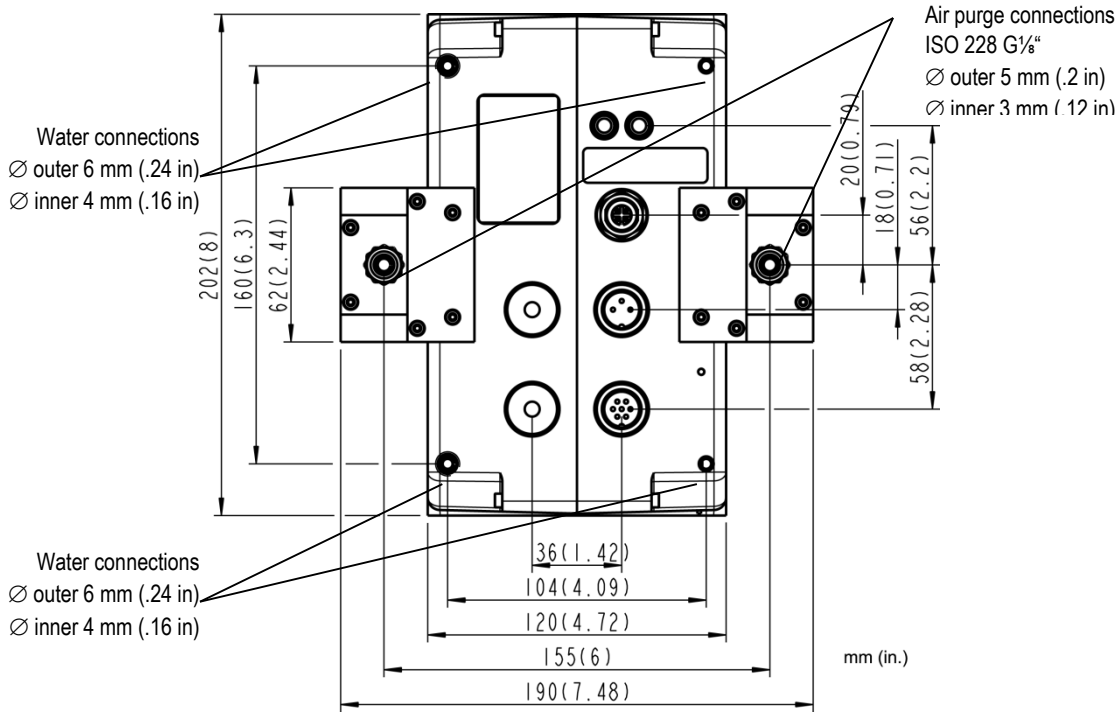


Figure 11: Thermal Imager air purge and water cooling connections

3.1.2 TIP900SYS (Telescope Arms for Temperature Compensation Set)

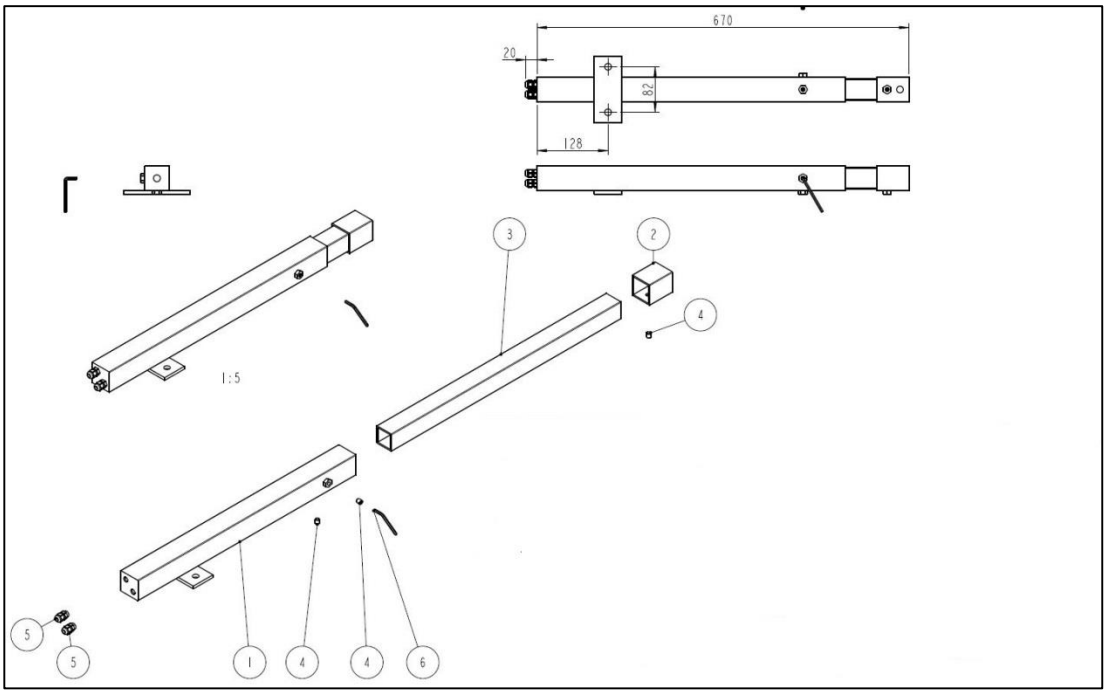


Figure 12: Sensor Telescope Arm for Temperature Compensation Set

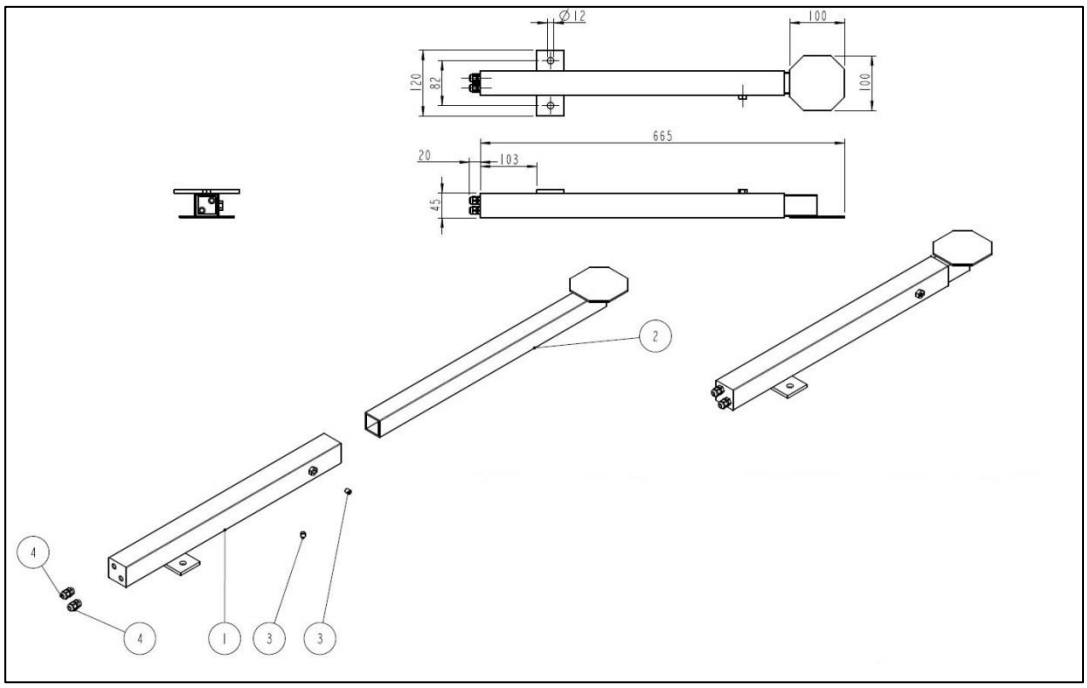


Figure 13: Counter Paddle Telescope Arm for Temperature Compensation Set

3.1.3 TIP900SYS (IR Temperature Sensor, mounted close to kiln discharge)

Type	Raytek LTS10
Temperature Range	-40 to 600°C (-40 to 1112°F)
Spectral Response	8 to 14 µm
Optical Resolution D:S	10:1
Response Time	130 ms
Accuracy	± (1% of reading or 1°C), whichever is greater
	± 2°C (± 4°F) for target temp. < 20°C (68°F)
Repeatability	± 0.5% of reading or ± 0.5°C, whichever is greater
Temperature Coefficient	± 0.05 K / K or ± 0.05% of reading / K, whichever is greater
Ambient Temperature	-10 to 120°C (14 to 248°F)
Storage Temperature	-20 to 120°C (-4 to 248°F)
Rating	IP65 (NEMA-4) / IEC 60529
Relative Humidity	10% to 95% non-condensing
EMC	EN 61326-1:2006
Vibration	11 to 200 Hz, 3 g above 25 Hz operating, 3 axes / IEC 60068-2-6
Shock	50 g, 11 ms, operating, 3 axes / IEC 60068-2-27
Weight	5 50 g (1.8 oz)
Material Head	Stainless steel
Material Head Cable	PUR (Polyurethane), Halogen free, Silicone free

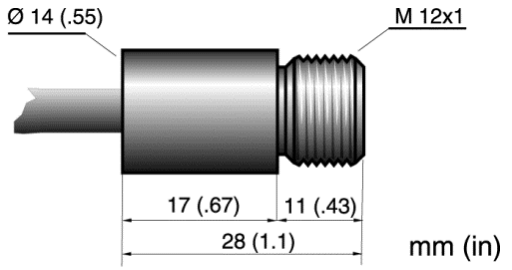


Figure 14: Dimensions of LTS10 Sensing Head

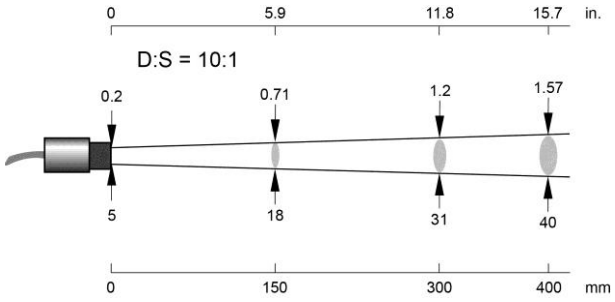


Figure 15: Spot Size Charts

3.1.4 TIP900SYS (IR Temperature Sensor Connection Box to network)

Type	RAYMI3COMME
Accuracy	
mA/V output	± 1°C
TC output	± 1.5°C
Temperature Resolution	
mA/V Output	± 0.1°C (± 0.2°F) / 12 bit
Temperature Coefficient	
mA/V Output	± 0.02 K / K
TC Output	± 0.05 K / K
Emissivity	0.100 to 1.100
Transmission	0.100 to 1.000
Loop Time	
mA/V Output	8 ms
digital	18 ms * number of connected heads
Voltage Supply	8 to 32 VDC (24 VDC from Rittal cabinet)
Power Consumption	max. 6 W
Alarm Output	1 potential-free relay output, 48 V / 300 mA Relay with wear-free contacts (solid state relay) for target temperature or head ambient temperature, electrically isolated from power supply
USB Interface	Version: 2.0, Connector on the board: type Mini-B
Analog Outputs	
Output 1	0 to 5/10 V output for head ambient temperature and object temperature, electrically not isolated from power supply
TC	Thermocouple (type J, K, R, or S)
Output 2	0 to 20 mA (active), 4 to 20 mA (active), 0 to 5 V, 0 to 10 V electrically **not** isolated from power supply
External Inputs	3 inputs are available useable in different modes:
FTC1-3	Emissivity control: 3 bit digital coded, 0 to VSS
FTC1	Emissivity control: analog, 0 to 5 VDC
FTC2	Ambient temperature compensation analog: 0 to 5 VDC
FTC3	for trigger/hold/laser functions, 0 to VSS
Ambient Temperature	-10 to 65°C (14 to 149°F)
Storage Temperature	-20 to 85°C (-4 to 185°F)
Rating	IP65 (NEMA-4) / IEC 60529
Relative Humidity	10% to 95% non-condensing
EMC	EN 61326-1:2006
Vibration	11 to 200 Hz, 3 g above 25 Hz operating, 3 axes / IEC 60068-2-6
Shock	50 g, 11 ms, operating, 3 axes / IEC 60068-2-27
Weight	370 g (13 oz)
Material	die-cast zinc enclosure

The box is equipped with three cable feed-through ports – two with IP65 compatible sealing glands, a third sealing gland comes for boxes with fieldbus communications (RS485, Profibus etc.). Boxes without fieldbus have a plugged expansion feed-through port instead (M12x1.5 thread).

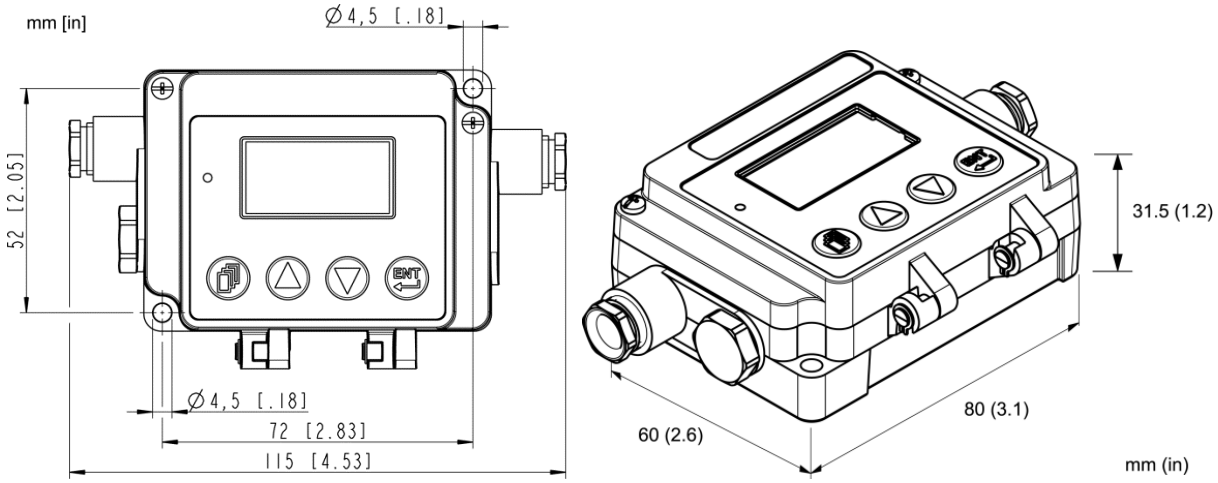


Figure 16: Dimensions of RAYMI3COMME Box

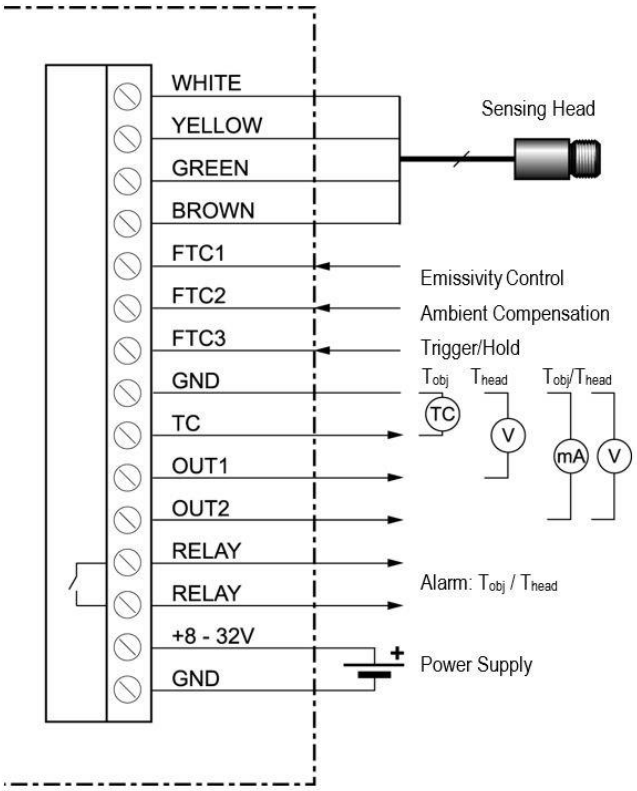


Figure 17: Terminal Wiring for the RAYMI3COMME Box

3.1.5 TIP900SYS (Protective Housing for Thermal Imager, Network, Power …)

Type / Brand	Cabinet / Rittal
Material	sheet steel, powder-coated
Temperature Range	0 to 50°C (32 to 122°F)
Dimensions (W x H x D)	380 x 380 x 210 mm (15 x 15 x 8.3 in)
Gross Weight (with all components)	approx. 13 kg (28.7 lb)
Protection Rate:	IP44 (NEMA 3)
Power Supply	100 - 240 VAC, 50/60 Hz / 24 VDC
Power Supply Wiring	wire cross section max. 2.5 mm² (AWG 14)
Power Consumption	max. 60 W (total for all integrated components)

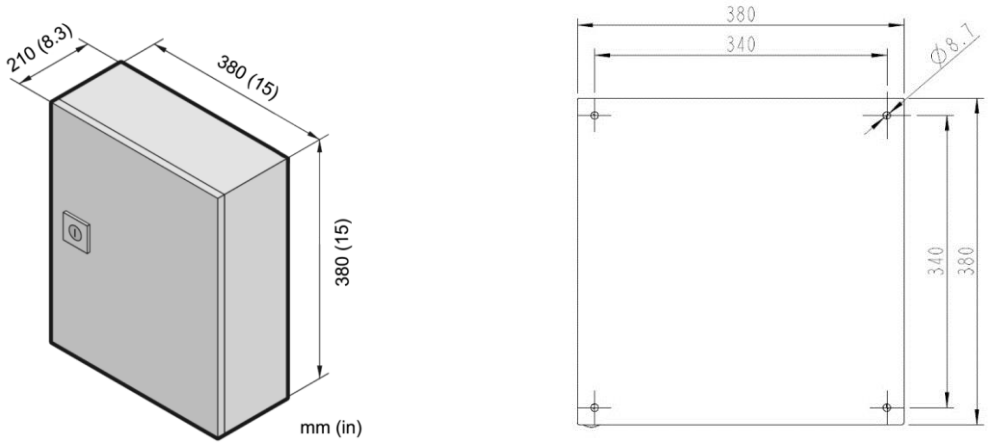


Figure 18: Protective Housing for Thermal Imager, Network Components, Power Supply

3.1.6 TIP900SYS (Option: Fiber Optic / RJ45 Ethernet Converter > 80m, 262ft)

Ethernet Communications	
Ports	4x
Port connector	RJ45
Distance	max. 90 m (295 ft)
Fibre Optic Communications	
Ports	2x
Port connector	SC type
Fibre	multi-mode, 62.5/125 µm or 50/125
Distance	max. 2 km (1.24 mi)
Mechanics	
Dimensions (W x H x D)	37 x 140 x 95 mm (1.45 x 5.5 x 3.7 i
Mounting	DIN-rail
Power	
Power input	12 to 48 VDC, redundant dual input
Power connector	removable screw terminal
Power consumption	6.5 W
Environment	
Operating temperature	-10 to 60°C (14 to 140°F)
Storage temperature	-40 to 85°C (-40 to 185°F)
Operating humidity	5 to 95% RH
Protection	4.000 VDC ESD (Ethernet), 3.000 VDC Surge (EFT for power)

3.1.7 TIP900SYS (Touch-Panel PC with industrial computer components)

Type / Brand	Cabinet for industrial PC components / Controlline-cc3000-22w
Material of side walls	extruded aluminum sheath Al Mg Si 05, RAL7035 color coated
Material of case corners	aluminum die casting Al Si 12, RAL5010 color coated
Protection Rate:	IP54 (NEMA 3)
Temperature Range	0 to 50°C (32 to 122°F)
Dimensions (W x H x D)	590 x 400 x 200 mm (23.23 x 15.75 x 7.87 in)
Gross Weight (with all components)	approx. 18 kg (39.7 lb)
Power Supply	100 - 240 VAC, 50/60 Hz
Power Consumption	max. 140 W (total for all integrated components)

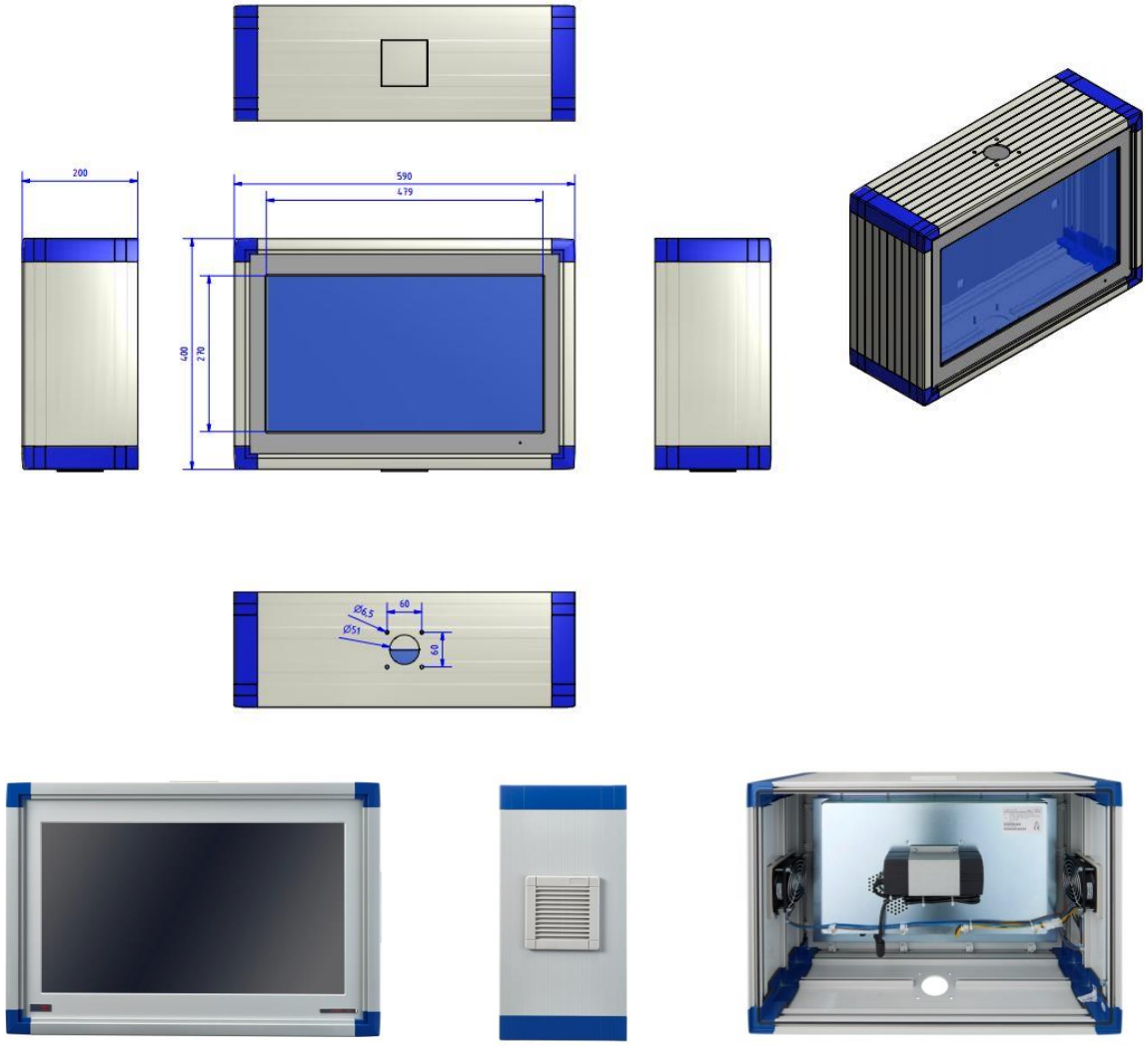


Figure 19: Industrial cabinet for Touch-Panel PC and integrated components

3.2 Scope of Delivery

Preconfigured Industrial Touch Panel PC (21.5”) for control, analysis and archiving, equipped with:

- Preinstalled SW package
  - Windows 7, 64-Bit, English
  - TIP900 process SW for wallboard image scan, defect detection and archiving
  - Wago I/O Check SW for the standard Wago 750 field bus coupler integration
  - DataTempDP Light / Continuum SW for the Thermal Imager integration
  - Putty SW package for Thermal Imager plus MI3 sensor integration
  - Teamviewer QS SW package for remote service support
  - File packer SW (7-Zip) for file packing and extracting
  - MS Internet Explorer, standard web site: www.flukeprocessinstruments.com
  - MS Security Essentials

- Preinstalled HW components:
  - Touch sensitive panel PC module with two separate network channels
  - Power supply 100 – 240VAC, to power the Touch-Panel PC module
  - Industrial Power Supply to power Digital-Output modules and network switch
  - Industrial Digital-Output module with 4 * Relay Output
  - Industrial Digital-Output module with 16 * 24VDC-Output
  - Industrial Fieldbus coupler
  - Industrial Terminal block, labeled for signal connection
  - Industrial 5-channel network switch (100 BASE-TX)

Preconfigured Protective Housing (brand Rittal), equipped with:

- DC fan with dust filter unit for cooling and ventilation
- Passive Ethernet switch (100BASE-TX) / Option: Fiber optics interface
- Terminal block with segregated sections
- 24VDC Power supply to power the Thermal Imager and Temperature Comp. Sensor Box

Thermal Imager (separately transport secured and shipped) for integration into Protective Housing

Temperature Compensation set consists of:

- Temperature sensor head with 15m(49ft) cable to communication box, integrated in right angle mirror with Air Purge Jacket housing, installed in the telescope arm
- Compact sensor communication box to adapt the sensor to LAN/Ethernet network
- Temperature sensor telescope arm with preinstalled compact temperature sensor and air purge fitting
- Target telescope arm (black paddle) as counterpart to compact temperature sensor, to get a defined ambient or background temperature reading

DVD with TIP900 SW installation image and needed Operator Manuals in PDF

Printed documentation (binder) with relevant manuals

4. Installation

4.1 Pre-Installation terms and conditions

For a trouble-free installation of the ordered TIP900 system and associated components, several pre-installation tasks have to be performed and guaranteed:

- Definition and clearance of the location for the operators Industrial Touch Panel PC
  - Free access to cable trays and power supply (110 – 240VAC, 50/60Hz)
  - Unobstructed and danger free cable inlet (power, network, control wires)
  - Determination of all cable lengths to associated terminals
  - Lead in and connect the network, power supply and control cables either direct into the Touch Panel PC case or through an optional pedestal / support shaft

- Definition and clearance of the location for the Protective Thermal Imager housing
  - Free access to cable trays and power supply (110 – 240VAC, 50/60Hz)
  - Unobstructed and danger free cable inlet (power, network, control wires)
  - Determination of all cable lengths to associated terminals. If network cable length exceeds 80m (262 ft.), then fiber optic option needs to be considered and ordered
  - Determination of max. scan width (inner conveyance belt width) for dried wallboards
  - Definition, production and installation of a vibration free mounting frame to adapt the Protective Housing in a specific height and centered over the conveyance belt.
    For details, see chapter 4.3.1 and 4.3.2.
  - Installation of the protective housing and associated equipment:
    - Mounting the Protective Thermal Imager housing, centered over the conveyance belt, to the mounting frame. The installation height of lower housing edge above wallboard surface is about ½(half) of inner conveyance belt width. See Figure 24 for more details.
    - Integration of the separately shipped Thermal Imager in the housing
    - Lead in and connect the network, power supply and control cables

- Definition and clearance of the locations for the Temperature Compensation Set
  - Free access to cable route to associated terminals
  - Unobstructed and danger free cable inlet (power, network, control wires)
  - Production and installation of mounting accessories (brackets, cable fixation)
  - Installation of the Temperature Compensation Set:
    - Mounting the telescope arm with integrated Compact Temperature Sensor close to kiln discharge at a convenient position
    - Mounting the counter telescope arm (black paddle) in near distance to the telescope arm with Compact Temperature Sensor, close to kiln discharge
    - Mounting the Compact Temperature Sensor Communication Box in a convenient position and connect the Compact Temperature Sensor cable. Be aware, that the supplied cable length of the Compact Temperature Sensor Head is 15m(49ft)
    - Install the cabling for power supply and network between the Communication Box and the Thermal Imager cabinet.

- Definition of wallboard-numbering, pixel counting, viewing orientation and suggested installation positions regarding an established production flow orientation
    - Clear definition of an unambiguous viewing position, which is against the production flow in the direction of the kiln discharge
    - Clear assignment of passing gypsum wallboards in accordance to the correct screen/window domain on the touch panel display. The manner of counting and numbering is from left to right, starting with 1 (outer left wallboard) to n (outer right one).
    - Clear definition of pixel counting and assignment to the scanned thermal images. The manner of X-pixel counting for the passing boards is defined form the outer left position up to the outer right position of the inner conveyor width. In dependence of the chosen scan resolution for the thermal imager, the X-pixel numbering is in the range of 1-256, 1-512 or 1-1024. The manner of Y-pixel counting for the passing boards is defined from the leading edge up to the trailing edge, starting with 1 (leading edge) up to n (trailing edge).
    - The installed hardware devices have to work properly together with complex software functions. **No** pixel flip over or wrong wallboard orientation has to be corrected by SW. Regarding the defined viewing orientation, the thermal imager needs to be mounted in such a way, that the scanned thermal line starts from the outer left position (1) of the inner conveyor width. A standard installation position of the Protected Housing with the correct thermal imager orientation in the housing has to be defined, to guarantee an easy and understandable hardware installation procedure.

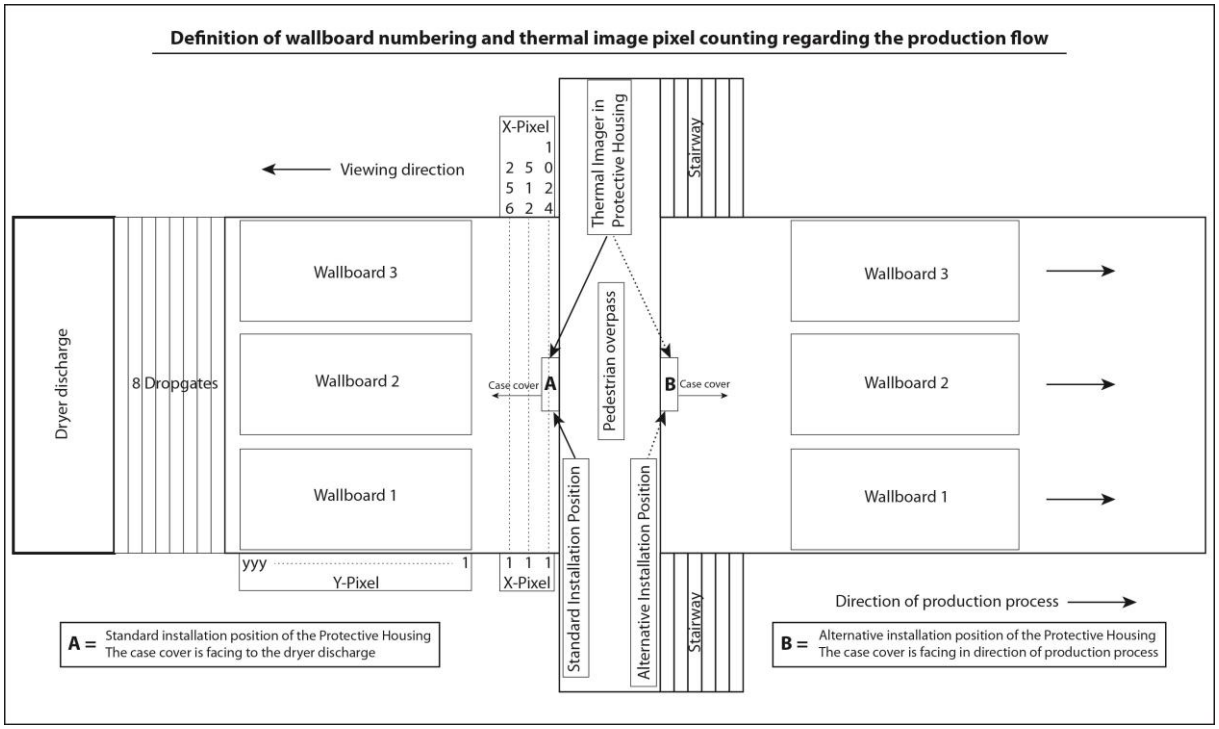


Figure 20: TIP900 Definitions for wallboard, image orientation and pixel numbering

4.2 Environment

Please take note of the following:

- The ambient temperature range for the Thermal Imager in protective housing is 0°C - 50°C (122°F). If necessary, protect the housing from direct sunlight or provide water-cooling direct to the imager.
- For details on grounding the mounted housings and devices, please refer to the local guidelines.
- The housings of all TIP900 components (protective housing, Touch-Panel PC, Compact sensor box) must have the same grounding potential. Check for good electrical contact at grounding wire port.

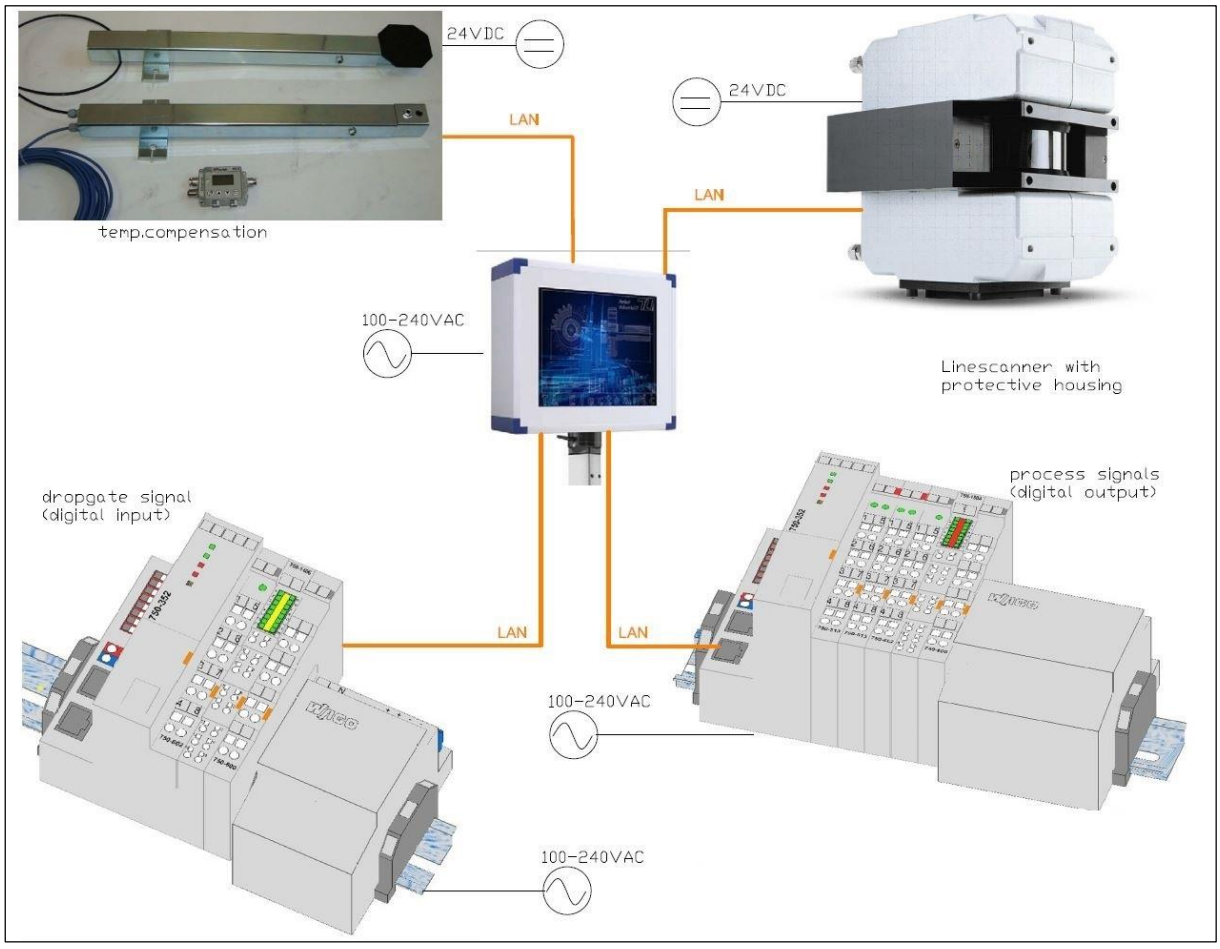


Figure 21: TIP900 schematic wiring of concerned components

In dependence of the customer specific component arrangement and the distances between the concerned devices, the electrical wiring expert decides the best way of cable routing. The Protective Housing and the Industrial Touch-Panel PC are equipped each with a Network Switch and a 24VDC Power Supply unit. Therefore, the LAN connection as well the 24VDC supply to the Temperature Compensation Box could be done from the a. m. components.

4.3 Installation of Protective Housing with internal Thermal Imager

4.3.1 Mechanical Installation of the Protective Housing

The TIP900 system needs a Thermal Imager, installed above passing gypsum wallboards, which left the kiln. Up to eight (8) in parallel feeded wallboards via the conveyance belt, will be processed by the TIP900 system. The system shall deliver thermal infrared image line scans across the inner conveyance belt width. Under the limitation of a 90° scan angle, a specific installation height above passing wallboard surfaces is mandatory.

The Thermal Imager comes with an installed air-purge collar and four (4) loose mounting stud bolts, 60mm (2.362”) long, associated Allen® screws and a convenient Allen® wrench as separately shipped items. An expert on customer side has to install the sensitive Thermal Imager device in the Protective Housing prior to install the Protective Housing carefully at a frame. The mounting stud bolts elevate the center of the scan optic above the lower edge of the Protective Housing. Please be aware, that the Thermal Imager has center symmetric mounting screw threads and it’s possible to install the device in the wrong orientation in the Protective Housing. The Thermal Imager has a fixed rotating scan direction and it’s mandatory to be installed in the right orientation inside the Protective Housing. There are two possible installation positions of the Protective Housing described in Figure 20: TIP900 Definitions for wallboard, image orientation and pixel numbering.

A - The standard installation position:
Please refer to Figure 22: Mounting of the Thermal Imager in the Protective Housing and verify, that the visible product label at the rear plane of the Thermal Imager is in the upper position.

B - The alternative installation position:
Please mount the Thermal Imager **contrary** to **A** and verify, that the visible product label at the rear plane of the Thermal Imager is in the lower position.

See Figure 18: Protective Housing for Thermal Imager, Network Components, Power Supply. Mount the Protective Housing by four (4) screws, min. thread diameter 6mm, with washers and self locking nuts to a vibration-free frame, centered over the conveyance belt to allow height variance.

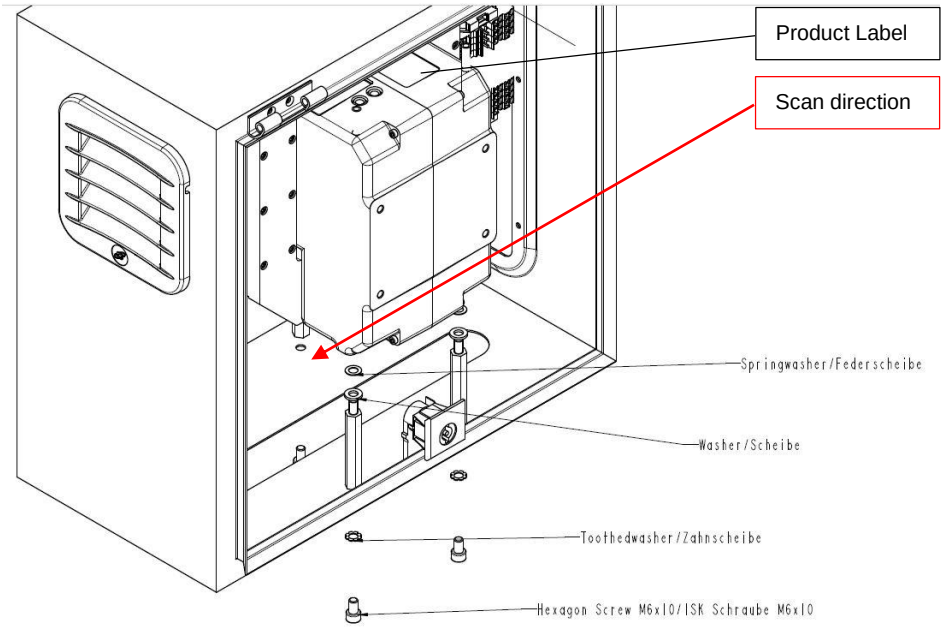
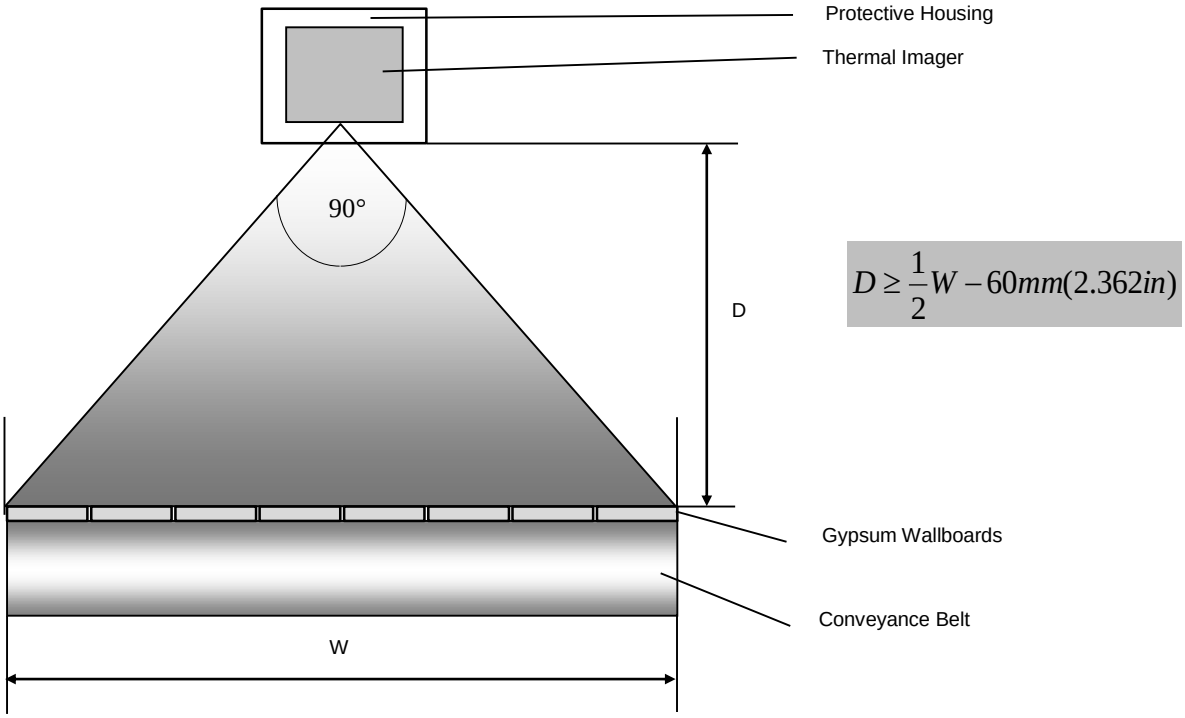


Figure 22: Mounting of the Thermal Imager in the Protective Housing

Figure 23: Loose supplied parts for mechanical installation support

The installation height of the protective housing above the wallboard surfaces is calculated as follows:



where:

D = Distance between lower edge of protective housing and wallboard surfaces
W = Width of inner wallboard conveyor (required scan width for 90° scan angle)

60mm (2.362”) is the stud bolt length, which elevates the internal thermal imager above the lower edge of the protective housing

Figure 24: Distance between Protective Housing and wallboard surfaces

4.3.2 Electrical Installation of the Protective Housing

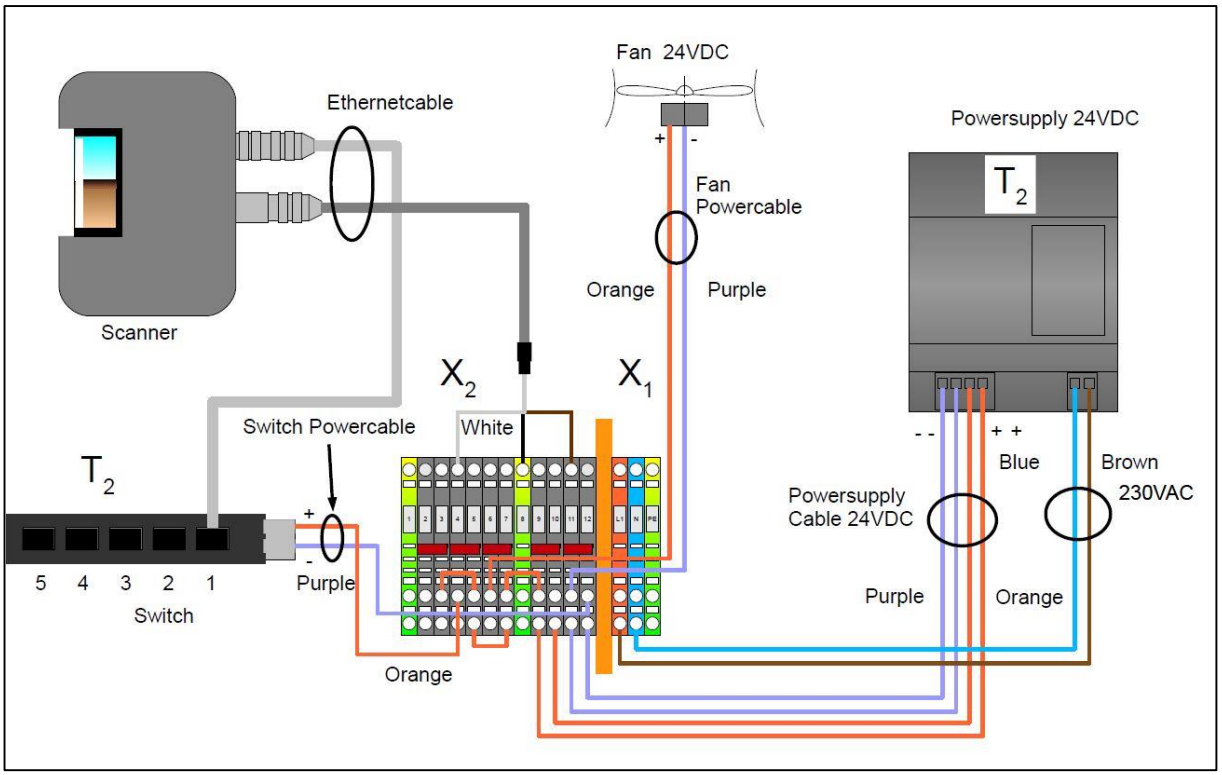


Figure 25: Principle diagram of internal wiring in Protective Housing

The external wiring to the Protective Housing consists in total of four cables, which are:

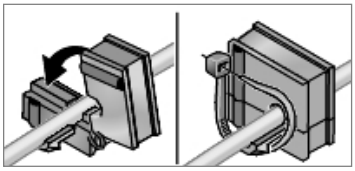
- 100 – 240VAC power supply, ~ 100W, max. 2.5mm², AWG14
- 24VDC, ~ 6W power supply to the Temperature Compensation Network Box, max. 0.5mm², AWG21, shielded cable
- RJ45 LAN to the Temperature Compensation Network Box (< 80m distance), min. Cat5e
- RJ45 LAN to the Industrial Touch-Panel PC (< 80m distance), min Cat5e

If installing the TIP900 Protective Housing in a warm environment, water-cooling may be necessary. The tubes used for water may be run through the second grommet plate!

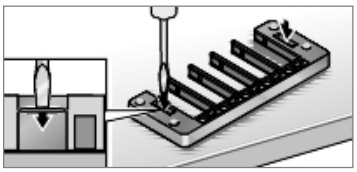
4.3.2.1 Cable Entry System

The cable entry system is a split system that allows pre-assembled cables to be routed into the protective housing without disassembling the connectors.

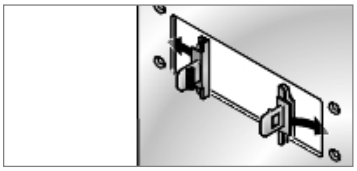
Snap-on mounting[1]



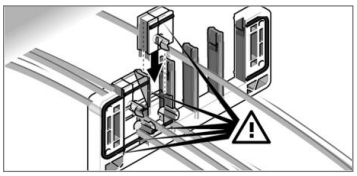
Lay cable into appropriate grommet and provide strain relief where necessary using cable ties.



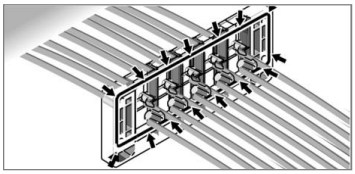
Use appropriate tool to punch through cover on base frame.



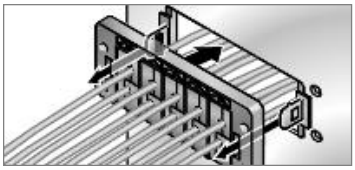
Set catch hooks into the sides of the cut-out.



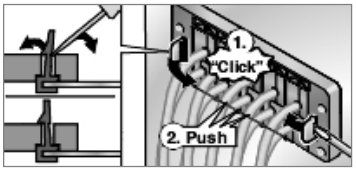
Insert rail completely.



The grommet must produce a continuous seal on the back side.



Set the rail onto the catch hooks and press on.



Lock the catch hooks with the rail. Press gently on grommet one more time.

Figure 26: Pictures and description of cable entry system

All LAN cables and the 24VDC cable to the Temperature Compensation Sensor Box must be shielded! Local building codes should be observed when selecting cables!

Longer cable length or less wire gauge causes a certain voltage drop on the power cable. It has to be ensured, that all devices will be supplied with sufficient voltage power!

[1] Illustrations: © Murrplastik

4.4 Installation of the Temperature Compensation set

4.4.1 Mechanical Installation of the Temperature Compensation set

For the temperature compensation set there are three items, which need to be installed to guarantee a proper functionality.

- Upper telescope arm fixture, equipped with an IR sensor head, tilted mirror, air-purge unit, 15m sensor cable and air-purge supply inlet hose
- Lower telescope arm fixture as target (black counter paddle) for correct temperature reading
- Aluminum die casting box for IR-Sensor to LAN connection

Please see chapter 3.1.2 until 3.1.4 for the dimensions and mounting points of the three items.

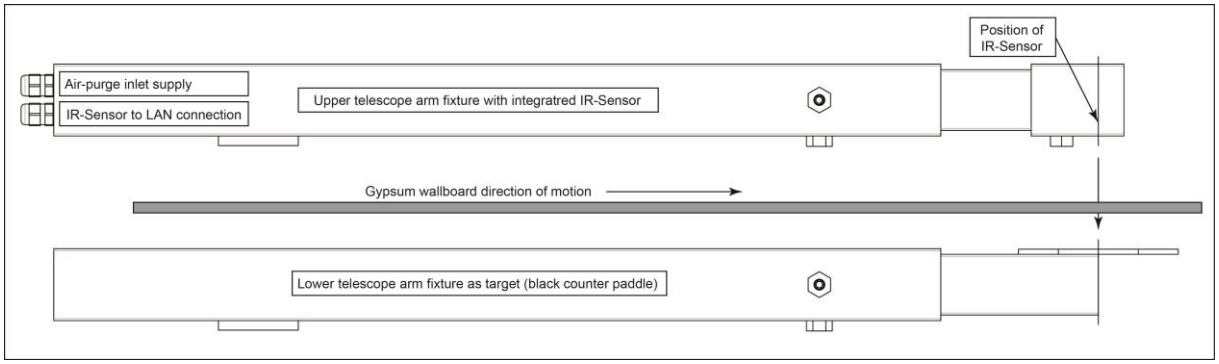


Figure 27: Upper and lower telescope arm fixtures installed after kiln exit

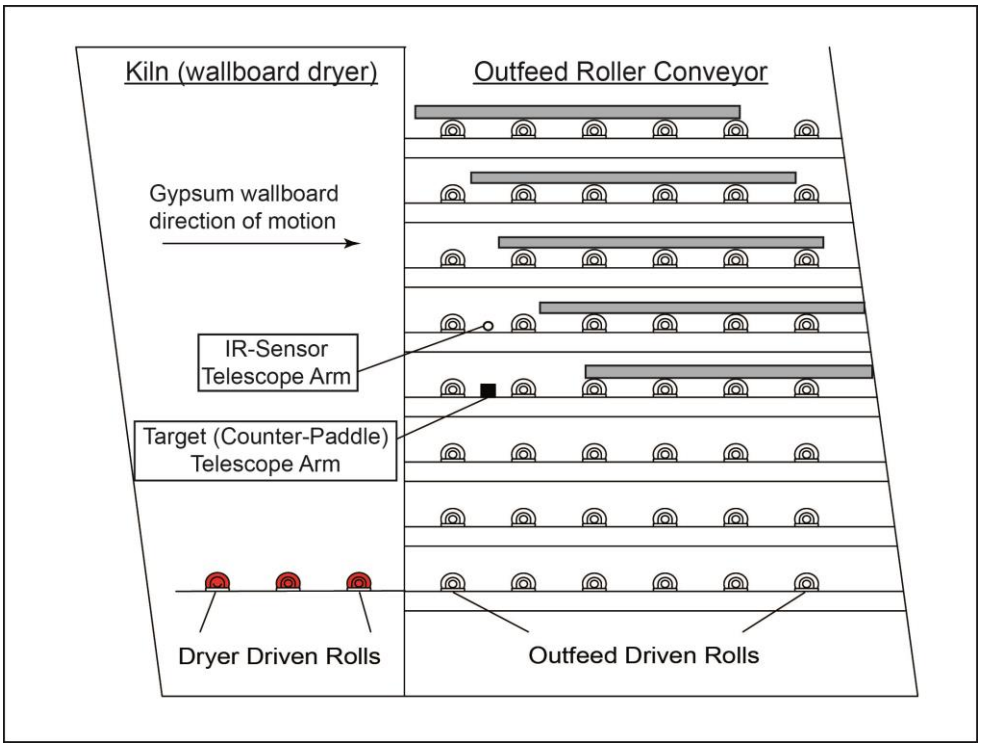


Figure 28: Schematic of kiln and deck outfeed arrangement

To get a stable temperature reading of an average wallboard temperature, it's recommended to install the opposing telescope arm pair at the center deck close to the kiln exit at the outfeed section, just past the dryer-speed rollers. This position is where the boards are starting to pull a gap. The boards roll end-to-end on the dryer driven rolls but the outfeed section rolls are faster, so they pull a gap between the boards. This is necessary for the Temperature Compensation sensor, because a gap is needed in order to differentiate between boards and the background target.

- Install the IR-Sensor telescope arm as close to dryer exit or last dryer driven roll as possible. There should be at least about 6" (152.4mm) board gap pulled at that point.
- Mount the IR-Sensor telescope arm and the opposing target (black counter paddle) telescope arm at a deck near the vertical center of the dryer. The opposite target (black counter paddle) telescope arm needs to be mounted immediately below on the next deck, whereas the center of the black surface should be aligned opposite to the overhead IR-sensor head.
- The IR-Sensor and target telescope arms can be mounted on either side of the Outfeed Conveyor, wherever the optimized installation position and passing wallboard coverage prevails.
- Adjust both telescoping arm sections (IR-Sensor and target) so, that the viewed spot of the passing wallboards is about centered between the boards outer edges. Final adjustment has to be made after initial operation of the system.
- It's recommended to install an air-purge supply to have an unadulterated temperature reading of the IR-Sensor. For that purpose please supply an air-purge with airflow of about 30 to 60l/min. The maximum air-pressure supply shall not exceed pressures values over 5 bar (72,5psi).
- Mount the IR-Sensor connection box at a convenient position with the lowest environmental influence (temperature, humidity, EMC) up to distance where the supplied sensor cable reaches.

4.4.2 Electrical Installation of the Temperature Compensation set

The external wiring to the Temperature Compensation Set consists in total of three cables, which are:

- 24VDC, ~ 6W, max. 0.5mm^2, AWG21, shielded cable to supply the Temperature Compensation Network Box. It depends on the wiring specialist to decide from where the power will be fed in. Power supply could be routed to the Temperature Compensation Box from the Protective Housing, the Touch-Panel PC or even from the dropgate digital input terminal block.

- RJ45 LAN, min. Cat5e, < 80m distance to the Temperature Compensation Network Box either from Protective Housing or Touch-Panel PC

- Temperature sensor head cable (15m), already installed at sensor head side, has to be connected to the Temperature Compensation Box, see Figure 17: Terminal Wiring for the RAYMI3COMME Box

In a dusty environment like in the gypsum wallboard production, it's strongly recommended to install the air-purge supply to keep the sensor head and associated mirror dust-free. Bad temperature reading influences the temperature compensation capability.

4.5 Installation of the drop gate identification and signaling set

The drop gate identification and signaling set for the adaptation to process interfaces and intersystem network communication is a separately shipped and prewired component composition. It consists of a DIN-top hat rail, equipped with the following components:

- Industrial Fieldbus coupler (e.g. WAGO 750-352)
- Industrial 16-channel digital input module 24VDC (e.g WAGO 750-1406)
- Prewired Terminal block
- Industrial Power Supply 24V, 1.5A (e.g. WAGO 787-1002)

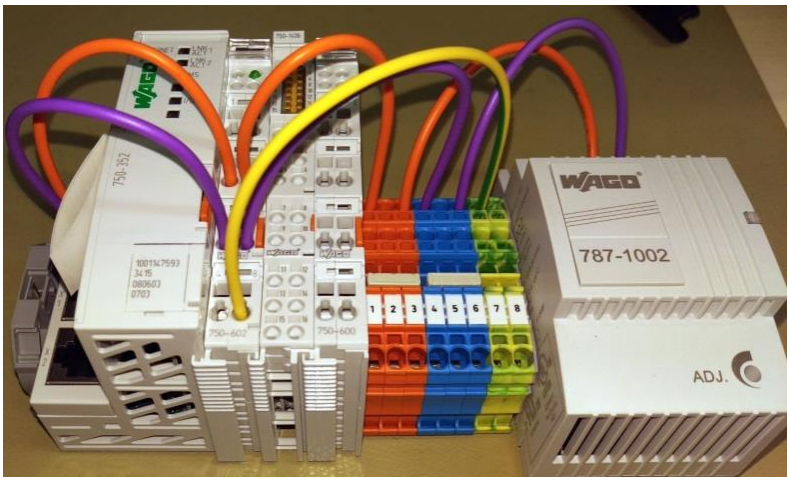


Figure 29: Drop gate identification and signaling set

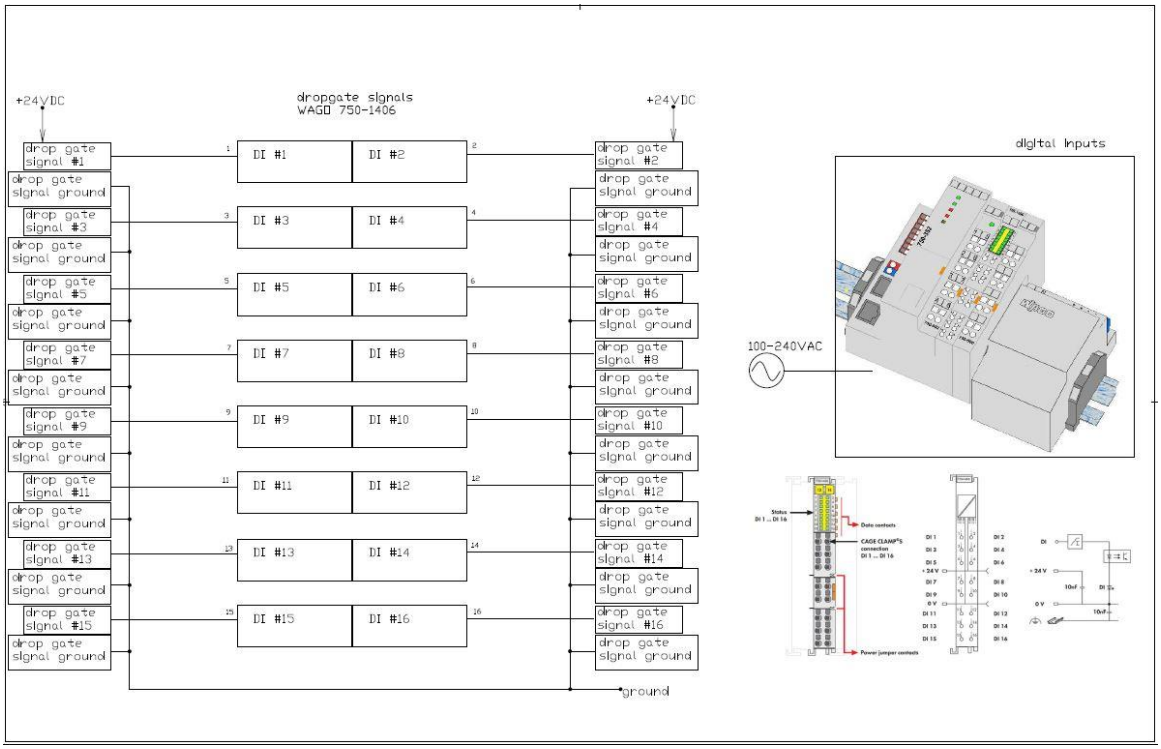


Figure 30: Schematic of drop gate wiring to identification and signaling set

4.6 Installation of the Industrial Touch-Panel PC

4.6.1 Mechanical Installation of the Touch-Panel PC

The industrial Touch-Panel PC needs to be installed, where its fix mounted and protected against unexpected damage, hard shocks and harsh environmental conditions. All power supply, network and control cables have to be fed in the foreseen top or bottom hole of the PC case and through pedestal or swiveling supporting arm, prior to mount the components.

Please refer to **Figure 19: Industrial cabinet for Touch-Panel PC and integrated components** for dimensions and technical details.

In case of the ordered mounting option for a pedestal or swiveling supporting arm, the following details are given, see **Figure 6: Options to fix the Industrial Touch-Panel PC**:

Pedestal
Height: 1127mm (44.37 in)

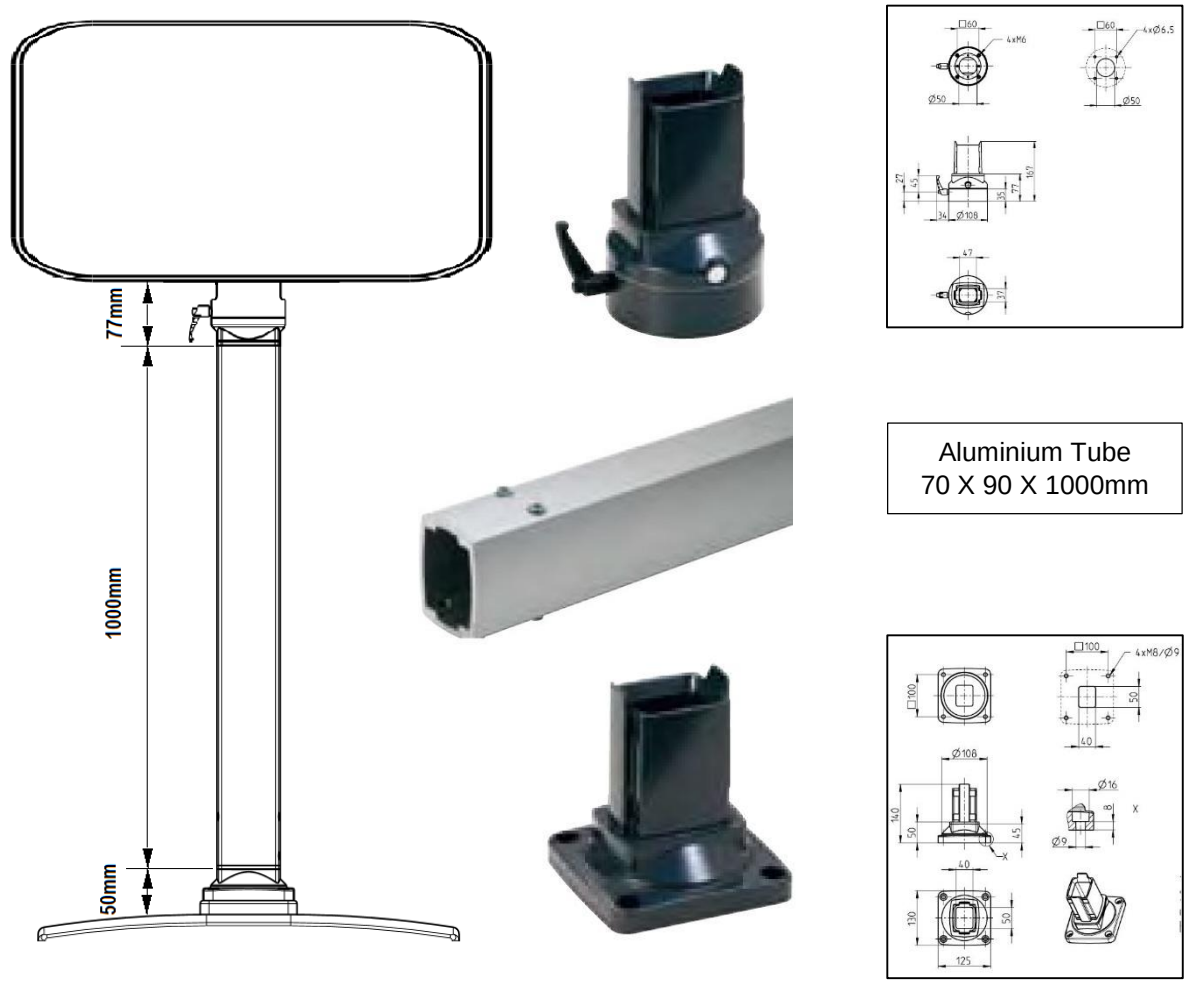


Figure 31: Base mounted pedestal with mounting dimensions

Swiveling Supporting Arm
Height: 422mm (16.61 in)
Overhang: 745mm (29.33 in)

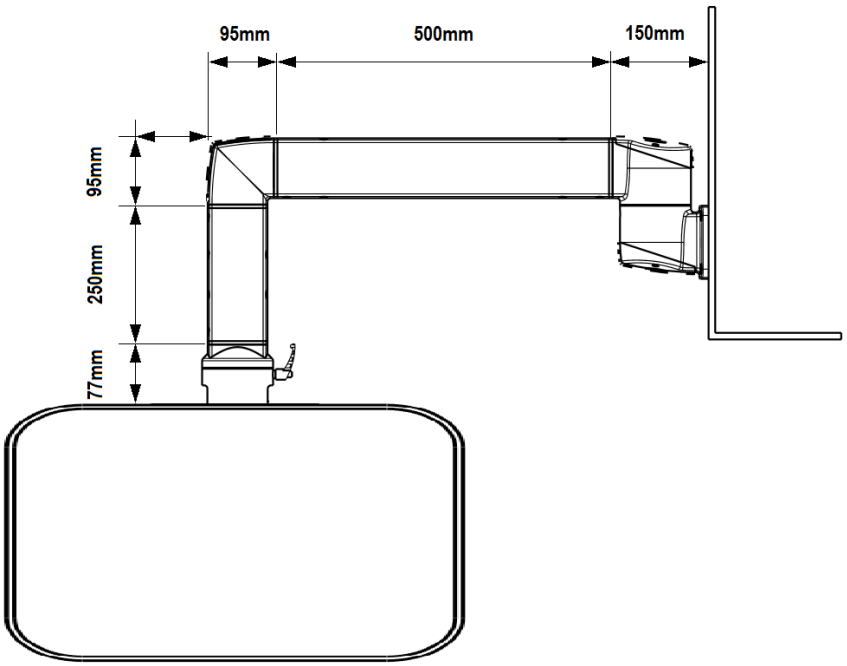


Figure 32: Wall mounted swiveling supporting arm with dimensions

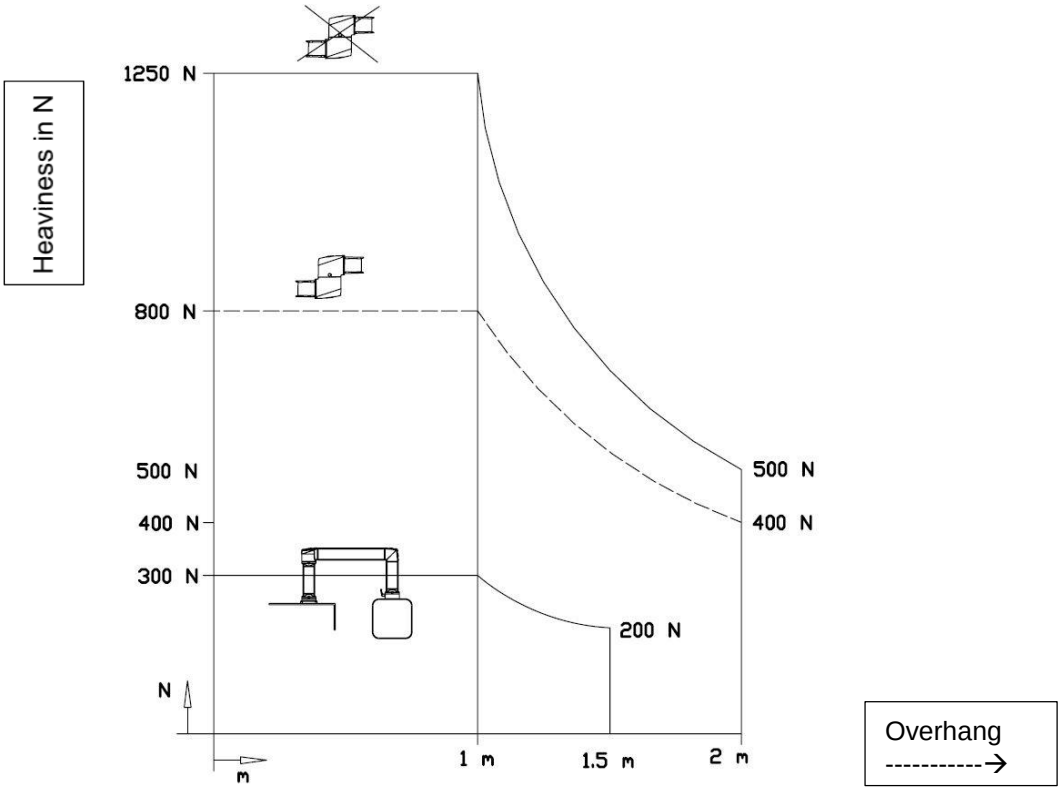
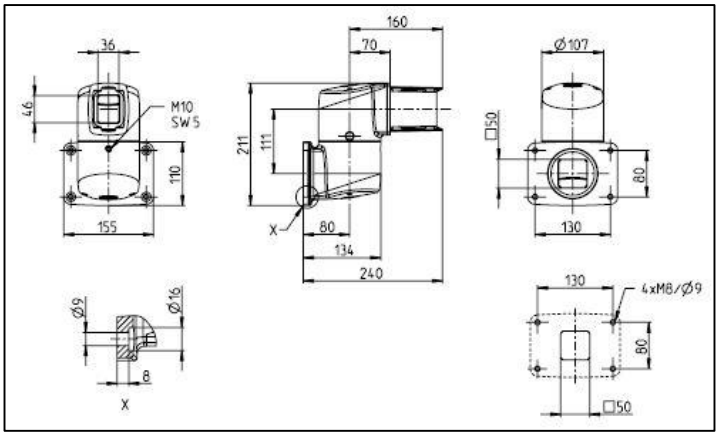
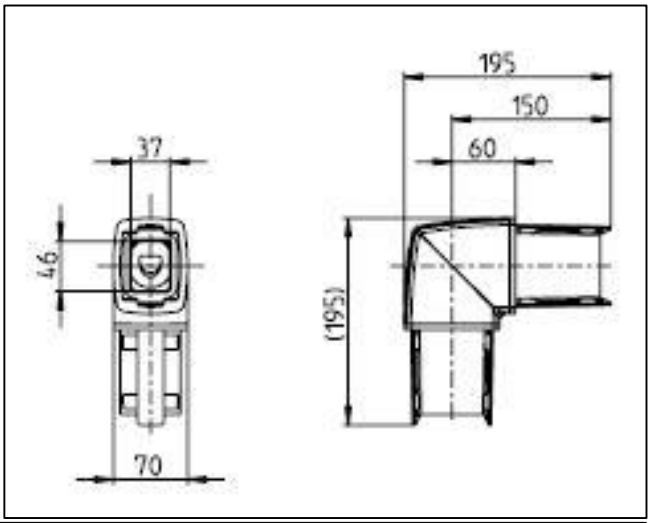


Figure 33: Load diagram for wall mounted swiveling supporting arm



Aluminum Tube
70 X 90 X 500mm



Aluminum Tube
70 X 90 X 250mm

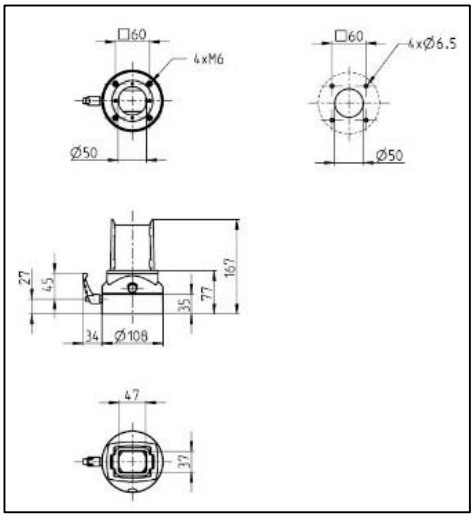
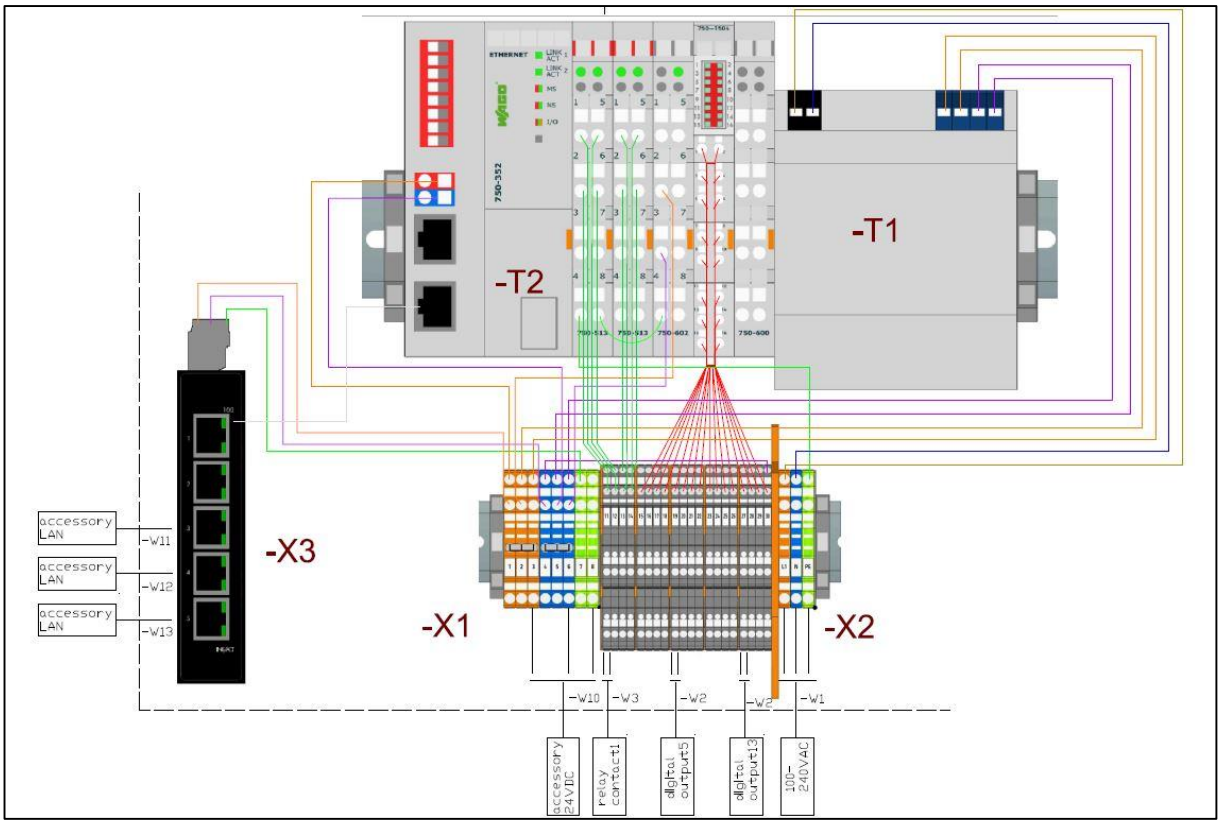


Figure 34: Mounting elements for wall mounted swiveling supporting arm with dimensions

4.6.2 Electrical Installation of the Touch-Panel PC



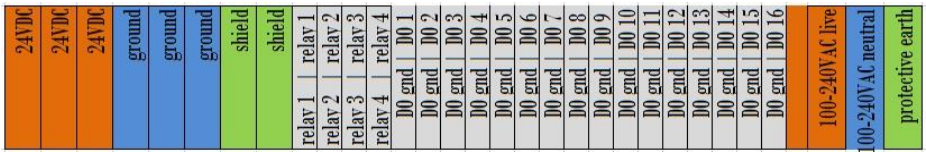


Figure 35: Wiring Terminal Block in Touch-Panel PC

5. Operation

5.1 System Prerequisites, Limitations & General User Information

The following prerequisites are valid for a proper operation of the TIP900 system:

- All customer specific HW system components have to be correct installed, aligned, wired, supplied and system-wide tested
- All TIP900 SW system components and utility programs have to be correct, executable and customer specific preconfigured installed
- The operator personnel is trained and confident with MS-Windows based operator concepts for graphical user interfaces in touch-panel or keyboard-mouse mode
- Concerning IT security, process stability and performance aspects, the TIP900 works in a closed own network environment, which is fully segregated from other LAN's like specific company networks
- It is not permitted to install extra SW products by the end user, which might disturb the correct functionality and expected behavior

The following limitations of the TIP900 system are important and have to be taken into account:

- The automatic Windows-Update mechanism is deactivated by default and shall not be activated, if the system is working in a running production environment. This is to avoid an unintended computer restart or shutdown, which results in the loss of computing and archiving functionality.
- In case of a needed Windows-OS or Driver update, we recommend a manually performed installation outside the productive phase (maintenance phase), where no data is acquired.
  It is mandatory to have the automatic Windows-Update function deactivated afterwards.
- With the shipment of the TIP900 system, we guarantee the functionality just for the pre-installed SW version and all related SW drivers.
- In standard configuration of the TIP900 Touch-Panel PC, there is a 500GB hard disk installed, whereas about 400GB disk space is usable for long-term data logging of gypsum wallboard thermal image files. The process speed, the Thermal Imager resolution and the scan frequency are the limiting factor for the total logging duration. Such a disk space lasts about for a period of six (6) months long-term data logging in a 24/7 wallboard production process at big wallboard producer plants.

The TIP900 user SW consists of two separate programs, which can run simultaneously. The main user program is the TIP900 recipe driven gypsum wallboard monitoring and defect identification SW. A second SW program is the TIP900_LogViewer and will be used for online or offline viewing of logged (historical) wallboards, which are stored in a long term archive.

The standard TIP900 operator device is a touch-panel PC, who enables all operator functions via a touch sensitive graphical user interface. An alternative solution (not standard) is to connect a keyboard and a mouse as operator elements.

If the TIP900 Touch-Panel PC is powered, you are logged in and no program is running, you will see three icons on your PC desktop. The TIP900 Help folder and both link icons, which were created during the SW installation process.

Figure 36: Created TIP900 icons during SW installation process

5.2 Operation of TIP900 monitoring and defect identification SW

5.2.1 General description, assigned screen areas, related elements & menus

Please see the brief general TIP900 system description under Product Description on page 11.

The icon in Figure 36: Created TIP900 icons during SW installation process represent the recipe based monitoring and defect identification SW for gypsum wallboard production.

In the program a distinction is drawn between the **Standard Operator** and the **Supervisor**. The supervisor has administration and configuration rights and may assign specific rights to the operator.

In the high complex SW part, there is a view function integrated, to display logged thermal images. A recipe related sub-program call of the TIP900_LogViewer SW, described in chapter 5.3, will be executed.

A double click on the TIP900 icon starts the program in standard operator mode with restricted rights. In such mode is just a reduced main menu with five (5) selection items available, see chapter **5.2.2**.

To ease the description of the program functionality and its assigned screen areas, seven (7) red marked domains were identified. These domains are consecutively separately described.

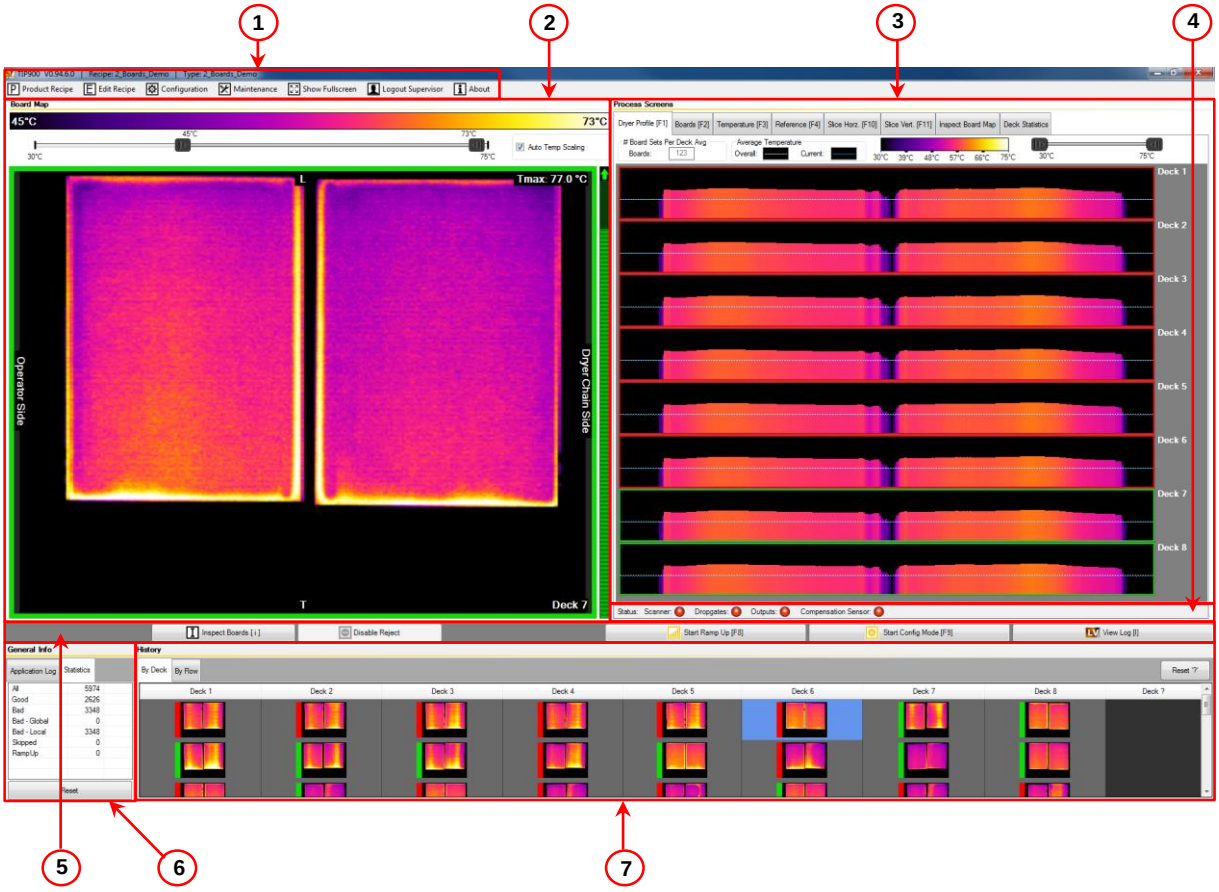


Figure 37: Program is running in supervisor mode, 7 domains are marked

5.2.1.1 The program title & version line and the user mode dependent menu bar domain (1)

The program title, version and recipe indication line with the operator mode dependent menu bar is split into eight (8) red marked sub-domains. Some sub-domains are identical in each operation mode and are not described twice.

See chapter 5.2.1.1.1, which is related to the red marked domain (1.1) and describes the content of the program title line.

The subsequent chapters 5.2.1.1.2 until **5.2.1.1.8** are related to the red marked menu bar domains until (1.2) and (1.8) describe all the selectors, which are available in Operator or Supervisor mode.

See in Figure 38 all menu selectors in Operator mode and in Figure 39 all menu selectors in Supervisor mode.

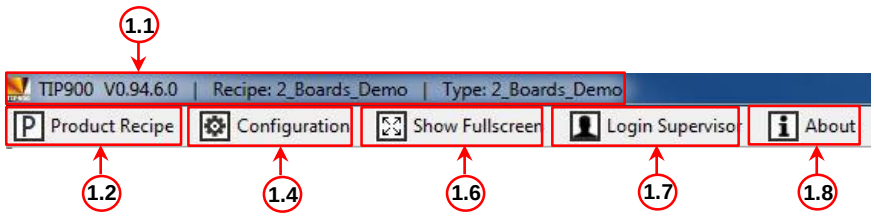


Figure 38: Program is running in Operator mode with restricted rights

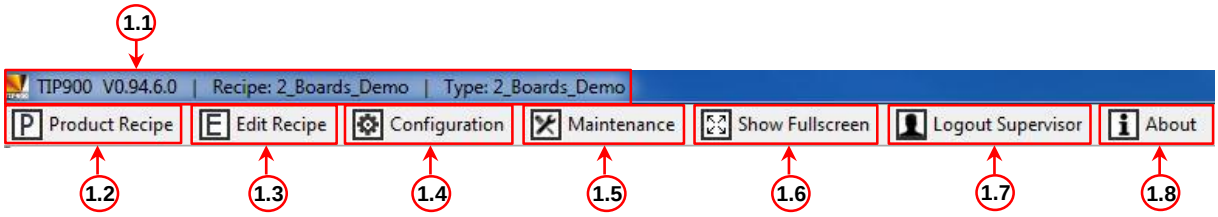


Figure 39: Program is running in Supervisor mode with administration rights

5.2.1.1.1 The program title line and its information content

In the screen domain (1.1) above, the program title line indicates the program name “TIP900”, the current SW version number, the selected recipe name and the specific recipe type.

The displayed program title line is identical, whether you’ve logged in as a Supervisor or as an Operator.

To avoid a mix-up of archived (logged) thermal image data during the production process, a specific recipe type indicator is introduced to distinguish between similar gypsum wallboard recipes, which differ in a minor way from the standard recipe type.

Archived data for specific recipe type variants are stored in separate database folders.

In the example of the following chapters 5.2.1.1.2 until 5.2.1.1.8, the recipe name as well the specific recipe type indicator is named identical. This indicates more or less a standard recipe, without any specific features.

5.2.1.1.2 The Product Recipe selector in the menu bar

The Product Recipe selector button allows the selection of a preconfigured recipe.

Just the Supervisor is able to edit and preconfigure different recipes, which are selectable in a production process change by the operator.

In general the Product Recipe selector is for viewing and verification of recipe specific parameters for a chosen gypsum wallboard production recipe.

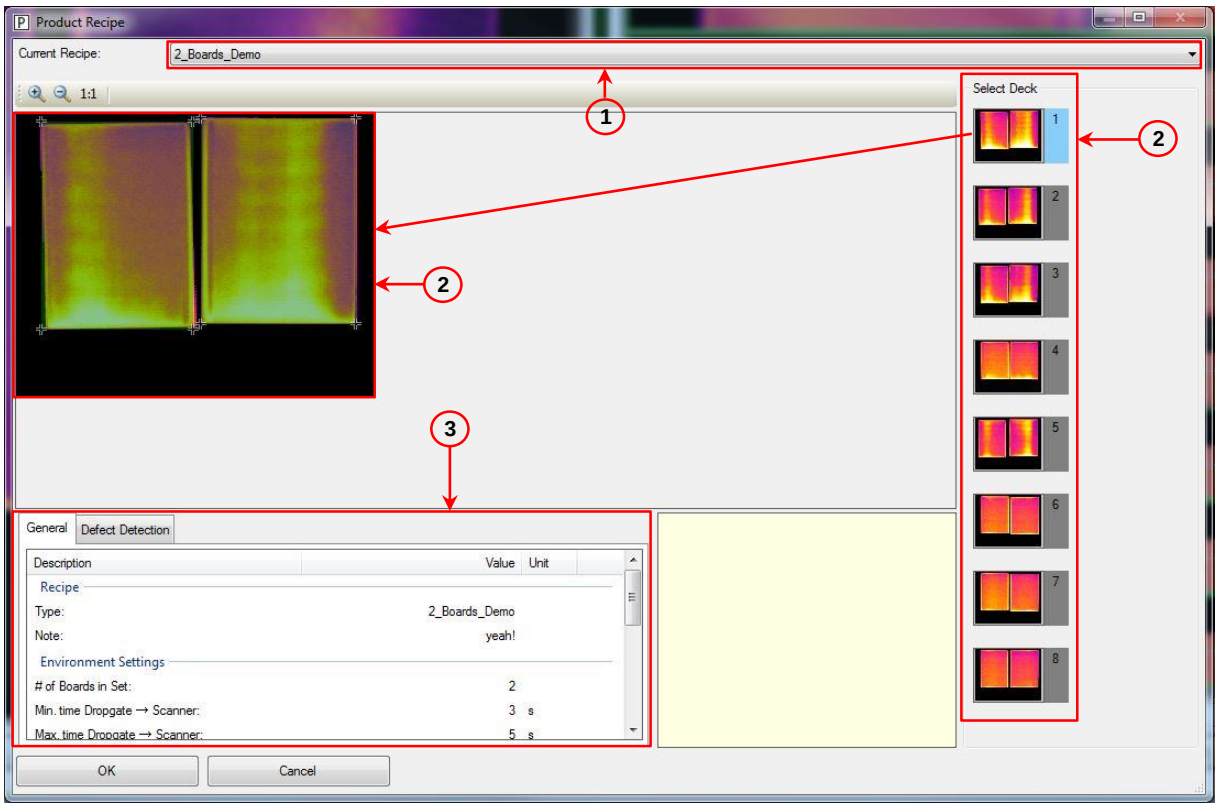


Figure 40: Product Recipe selection screen in Operator or Supervisor mode

Name: The recipe name, established during recipe creation by the Supervisor, has to be selected in the drop down list (1)

Reference map per deck: The defined (good, error free) board maps, which have to be assigned by the Supervisor per dryer deck as reference maps. A click on the right small deck picture shows the reference board map as a big picture in the upper left display area (2)

The “General” and the “Defect Detection” parameters are shown in the red marked box (3) and are preset by the Supervisor during the recipe creation.

See all to box (3) assigned parameters in the following description:

-- General parameters --

Type:	The specific type identifier for similar recipes, which differ in minor items. The type name is very important to keep a proper data archive structure alive. There is for each type name a specific folder or database table created, where the assigned images will be stored.
Note:	Additional textual description and information for the specific recipe
# of Board in Set:	The count of boards per deck. Each board of every deck needs a shape to be defined in the recipe editor.
Min. time Dropgate → Scanner:	The default minimum time between a dropgate signal set and the scanning start of a board. To avoid configuration errors, "Min. time Dropgate → Scanner" has to be smaller than "Max. time Dropgate → Scanner" and the distance between them should be at least 1 second. This parameter will be overridden by the corresponding recipe parameter.
Max. time Dropgate → Scanner:	The default maximum time between a dropgate signal set and the scanning start of a board. To avoid configuration errors, "Min. time Dropgate → Scanner" has to be smaller than "Max. time Dropgate → Scanner" and the distance between them should be at least 1 second. This parameter will be overridden by the corresponding recipe parameter.
Min. temp of the color range:	The minimum temperature of the color range. Used in the history, the recipe editor and in the LogViewer. To avoid recipe errors “Min. temp of the color range” must be smaller than “Max. temp of the color range” and the distance between them should be at least 10 degrees.
Max. temp of the color range:	The maximum temperature of the color range. Used in the history, the recipe editor and in the LogViewer. To avoid recipe errors “Min. temp of the color range” must be smaller than “Max. temp of the color range” and the distance between them should be at least 10 degrees.
Trigger Background-Temperature:	The background temperature of the process. A new snapshot will be started when the scanner measures a temperature above “Trigger Background-Temperature” + “Trigger Start-Delta-Temperature”. The snapshot will be stopped when the scanner measures a temperature below “Trigger Background-Temperature” + “Trigger Stop-Delta-Temperature”.
Trigger Start-Delta-Temperature:	A new snapshot will be started when the scanner measures a temperature above “Trigger Background-Temperature” + “Trigger Start-Delta-Temperature”.
Trigger-Stop-Delta-Temperature:	A snapshot will be stopped when the scanner measures a temperature below “Trigger Background-Temperature” + “Trigger Stop-Delta-Temperature”.

Resolution: The resolution snapshots will be taken for a single line scan. The resolution per line scan is pre-settable in the Edit Recipe function in steps of 256, 512, 1024 pixel/line.

Frequency: It's the frequency, which indicates how many lines will be scanned per second in the given resolution of previous field. Scan frequency and scan resolution are in a direct dependence of each other. The following frequency values are allowed:
Resolution = 256 pixel/line → Frequency in range 81 – 150Hz
Resolution = 512 pixel/line → Frequency in range 41 – 80Hz
Resolution = 1024 pixel/line → Frequency in range 20 – 40Hz

-- Defect Detection parameters --

Global Error Min Deck 1: The minimum allowed global error (average temperature deviation) for all parallel scanned wallboards in Deck1. This is the lower threshold of all parallel scanned gypsum wallboard average temperatures per dryer deck in relation to reference wallboard average temperatures. If the average temperature of the parallel scanned boards per dryer deck is below the average temperature of the reference boards **minus** the "Global Error Min Deck 1" threshold, a global error for dryer Deck 1 will be indicated.

Global Error Max Deck 1: The maximum allowed global error (average temperature deviation) for all parallel scanned wallboards in Deck1. This is the upper threshold of all parallel scanned gypsum wallboard average temperatures per dryer deck in relation to reference wallboard average temperatures. If the average temperature of the parallel scanned boards per dryer deck is above the average temperature of the reference boards **plus** the "Global Error Max Deck 1" threshold, a global error for dryer Deck 1 will be indicated.

-
-
-
-

Global Error Min Deck X: In dependence of the customer specific kiln (dryer), the maximum deck number can vary up to 16 decks and is limited in the SW. Please see the description of "Global Error Min Deck X" under the previous description for "Global Error Min Deck 1".

Global Error Max Deck X: In dependence of the customer specific kiln (dryer), the maximum deck number can vary up to 16 decks and is limited in the SW. Please see the description of "Global Error Max Deck X" under the previous description for "Global Error Max Deck 1".

5.2.1.1.3 The Edit Recipe selector in the menu bar

The Edit Recipe selector button is just available in the Supervisor mode and allows the creation of new recipes, the edit/configuration of existing recipes and the assignment of reference board maps to specific dryer decks.

Please see under chapter 5.2.1.1.2 in red marked boxes to (1) (3) all parameter descriptions, which are settable by the Supervisor.

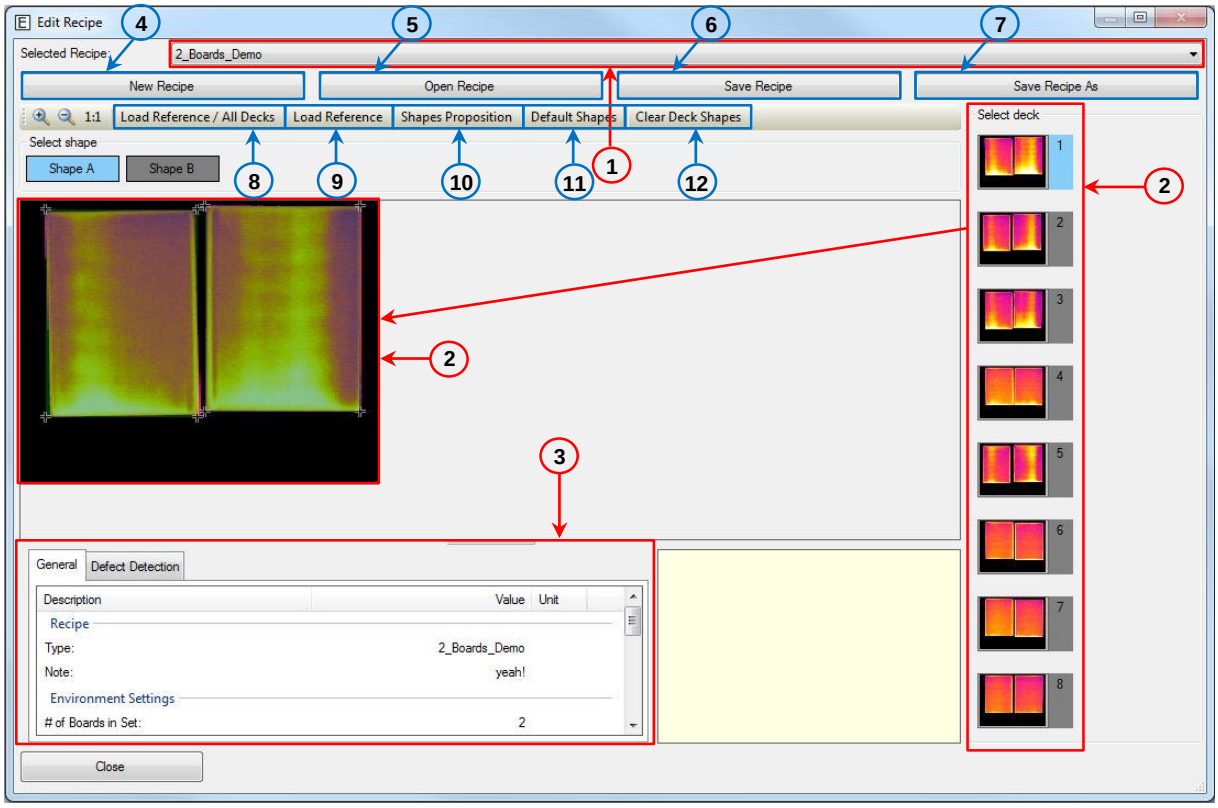


Figure 41: Edit Recipe selection screen in Supervisor mode

The following selections by pressing or clicking onto the blue marked buttons can be made by the Supervisor:

(4) New Recipe: This selection creates a new recipe by the Supervisor. All under chapter 5.2.1.1.2 possible entries have to be set or altered. The New Recipe button already presets default values for the new recipe, which have to be verified by the Supervisor and adapted. After all entries have to be adapted and verified, the new recipe has to be saved under a new recipe name.

(5) Open Recipe: This selection opens an existing recipe, which can be selected out of a recipe/profile list. The Supervisor has all rights to modify each entry of the opened recipe.

(6) Save Recipe: The Save Recipe button just stores the currently modified recipe. Every recipe modification and storage action will be logged by the TIP900 SW and is displayed in the General Info (Application Log) window element.

7	Save Recipe as:	The Save Recipe As button is to ease the creation of a new recipe by using an already created one. It's far more convenient to use a preset recipe as a template for a new recipe, which differs marginal.
8	Load Reference/All Decks:	Herewith you are able to force the TIP900 program to set for every dryer deck a reference board map in on step. All dryer decks get the same reference board map assigned. This is just preferable, if all the dryer decks are well optimized. That means the kiln temperature distribution is nearly identical for all decks.
9	Load Reference:	Herewith you are able to set an individual reference board map to each individual dryer deck. First you have to select the deck number by clicking onto one image in the "Select deck" column (2) and press the Load Reference button, to select a convenient board map image. The procedure has to be repeated for every available deck and is necessary, if the kiln temperature distribution varies much between the decks. A second, much more comfortable and error reducing method is the reference map to deck assignment, by an integrated capability in the deck history display domain. This works, if you're logged in as a supervisor. Herein you have to select a specific deck number, where the board map snapshot seems suitable as a good deck reference. Click with the left mouse button or touch button onto the preferred board map and select **"Load as reference into the recipe editor"** to assign the selected board map to the deck of the currently used recipe. Such proceeding is much more comfortable and less fault-prone in comparison to the above described individual reference map selection.
10	Shapes Proposition:	With the Shapes Proposition button is an automatic SW capability assigned, which enables to identify correct board map shapes. In processes, where the boards are very close to each other, correct gap detection is sometimes difficult to blank out the background zones in average temperature calculations.
11	Default Shapes:	The button is to assign a default board map shape to one specific deck. It's just for using this board map shape to draw it at the corner marks to bring the shape in coverage with the current board map. Such proceeding overrules the previously assigned board map limits by a manual correction for optimization.
12	Clear Deck Shapes:	The Clear Deck Shapes button releases the already assigned board map shapes per deck. Every deck has to be treated individually to release the shape from the board map.

5.2.1.1.4 The Configuration selector in the menu bar

The Configuration selector button is always visible, but the entries are modifiable just in Supervisor mode. If you're in supervisor mode, the process control will be interrupted after the configuration push button is activated.

Under four (4) separate screen tabs you will find the different configuration categories, which are listed below.

Application Tab(1) **Application Tab(2)**

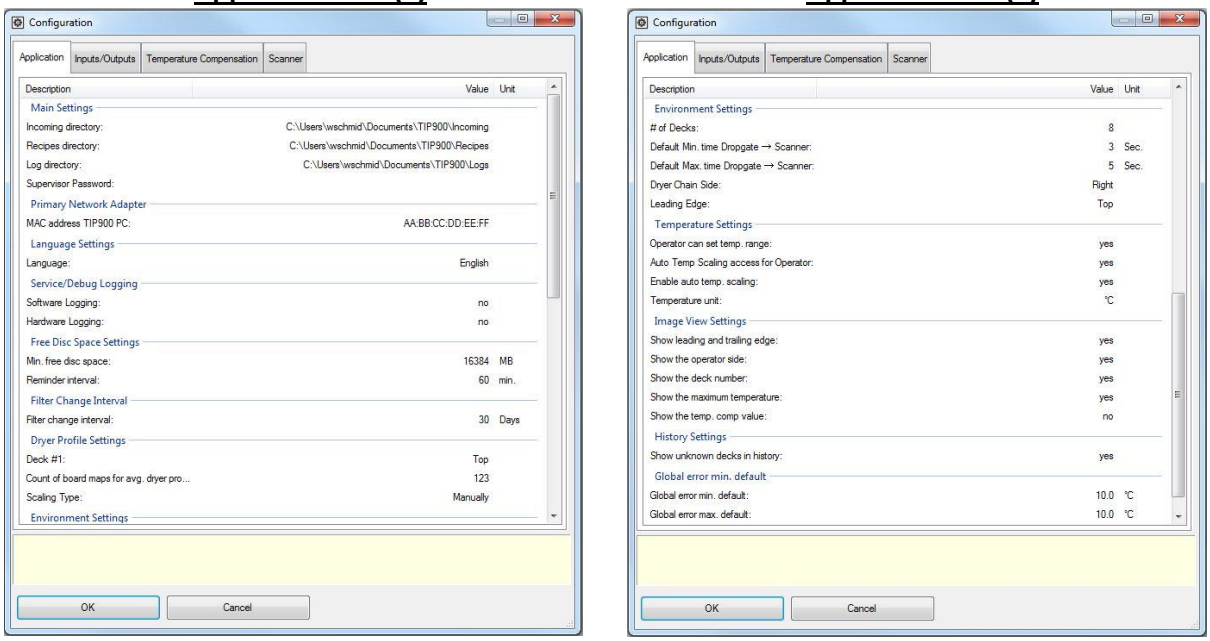


Figure 42: Application configuration tab screens in Supervisor mode

-- Main Settings --

Incoming directory: This is the standard directory to monitor new scanner snapshots during a running production process. If the TIP900 SW will be terminated, the scanner snapshots will be shifted into subfolders of the Log directory. The Incoming directory will be cleared each time the TIP900 SW is restarted.

Recipes directory: The default directory where recipes are located. All recipes within this directory are shown in the drop-down-control within the "Product Recipe" and "Edit Recipe" dialogs.

Log directory: The directory where all logs are saved to. It is also the parent directory for the Archive-Directories for all models.

Supervisor Password: This is the hidden Supervisor password, which has to be set by the Supervisor and shall not made public to everyone.

-- Primary Network Adapter --

MAC Address TIP900 PC: This is the unique 48 Bit network adapter address, assigned by the network adapter manufacturer.

-- Language Settings --

Language: Program language setting to the specific location, where the program is in use. It is the application language in the TIP900 application and in the LogViewer program. Changes require an application restart to take effect.

-- Service/Debug Logging --

Software Logging: Internal logging of the software. Software logging is NOT required for general usage.

Hardware Logging: Internal logging of the hardware connections. Hardware logging is NOT required for general usage.

-- Free Disk Space Settings --

Min. free disk space: The minimum amount of free disk space before the warning is issued.

Reminder interval: When a Free Disc Space warning was already issued, how long to wait up to remind the warning again.

-- Filter Change Interval --

Filter change interval: The interval in days, after the filters in the scanner cabinet and the Touch Panel PC cabinet should be changed.

-- Dryer Profile Settings –

Deck #1: Sets the position of deck #1 in the dryer profile view. Deck #1 can be on "top" or at the "bottom".

Count of maps for avg. dryer pro..: The number of board maps for averaging to determine an averaged dryer profile view.

Scaling Type: Type of temperature scaling method for the dryer profile. Possible selection criteria are “Manually” and “Automatic”.

-- Environment Settings --

# of Decks: Number of existing kiln/dryer decks. Up to 16 decks are supported by the TIP900 software.

Default Min. time Dropgate → Scanner: The default minimum time between a dropgate signal set and the scanning start of a board. To avoid configuration errors, "Min. time Dropgate → Scanner" has to be smaller than "Max. time Dropgate → Scanner" and the distance between them should be at least 1 second. This parameter will be overridden by the corresponding recipe parameter.

Default Max. time Dropgate → Scanner: The default maximum time between a dropgate signal set and the scanning start of a board. To avoid configuration errors, "Min. time Dropgate → Scanner" has to be smaller than "Max.

time Dropgate → Scanner" and the distance between them should be at least 1 second. This parameter will be overridden by the corresponding recipe parameter.

Dryer Chain Side: Displays the Dryer Chain Side on the board map image. Selection criteria is “Left” or “Right”

Leading Edge: Selection criteria are “Top” or “Bottom”. When "Top" is selected, the leading edge of the boards is on top of the board map image.

-- Temperature Settings --

Operator can set temp. range: The operator is allowed to set the temperature range. If disabled, only the supervisor can change the temperature range. Possible selection is Yes/No.

Auto Temp Scaling access for Operator: Allow the Operator to enable/disable the automatic temperature scaling feature. Possible selection is Yes/No.

Enable auto temp. scaling: Enables/Disables the automatic temperature scaling feature. Possible selection is Yes/No.

Temperature unit: The default temperature unit in the TIP900 application and in the LogViewer. Changes require an application restart to take effect.

-- Image View Settings --

Show leading and trailing edge: Displays the position of the leading and trailing edge overlaid in the board map image for correct orientation. Possible selection is Yes/No.

Show the operator side: Displays the side of the operator overlaid in the board map image. Possible selection is Yes/No.

Show the deck number: Displays the currently processed deck number as overlay in the board map image and the separated board maps view. Possible selection is Yes/No.

Show the maximum temperature: Displays the maximum temperature overlaid in the board map image. Possible selection is Yes/No.

Show the temp. comp. value: Displays the current temperature compensation value overlaid in the board map image. Possible selection is Yes/No.

-- History Settings --

Show unknown decks in history: Displays board maps with unknown decks origin in the history. Possible selection is Yes/No. This is a very important field to identify wrong process configurations (e. g. timing parameters).

-- Global error min.-max. default --

Global error min. default: The default minimum allowed global error value. This value will be used in all new recipes.

Global error max. default: The default maximum allowed global error value. This value will be used in all new recipes.

Inputs/Outputs Tab **Temperature Compensation Tab**

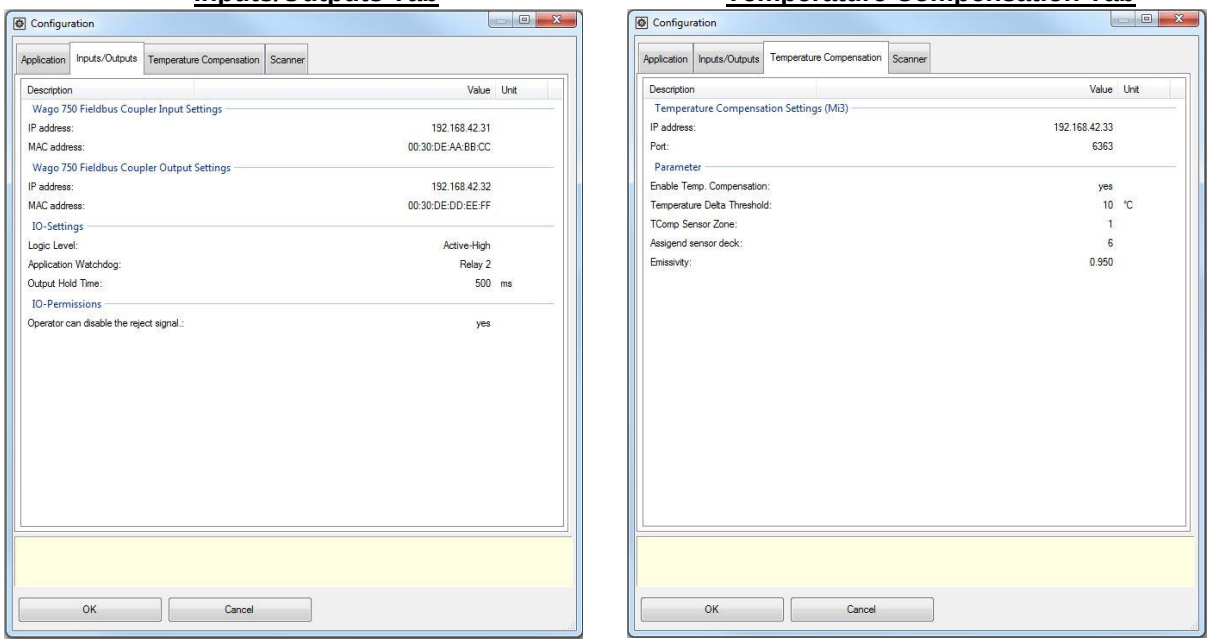


Figure 43: Inputs/Outputs & Temperature Compensation tab screens in Supervisor mode

-- Inputs/Outputs: Wago 750 Fieldbus Coupler Input Settings --

IP address: The IP address for the Wago 750 Fieldbus Coupler for inputs will be assigned via BootP in the network. The default IP address is “192.168.42.31”.

MAC address: The unique MAC address of the Wago 750 Fieldbus Coupler for inputs, which should be served via BootP and addressed via the IP address above.

-- Inputs/Outputs: Wago 750 Fieldbus Coupler Output Settings --

IP address: The IP address for the Wago 750 Fieldbus Coupler for outputs will be assigned via BootP in the network. The default IP address is “192.168.42.32”.

MAC address: The unique MAC address of the Wago 750 Fieldbus Coupler for outputs, which should be served via BootP and addressed via the IP address above.

-- Inputs/Outputs: IO-Settings --

Logic Level: Sets the type of logic level “Active-High” or “Active-Low”.

Application Watchdog: Assigns the output of the application watchdog. The application watchdog applies to communication errors of the scanner, the temperature compensation (Mi3) and a crash of the TIP900 application. Selection criteria are “Relay2” or “Digital Output 2”.

Output Hold Time: The reset time after a watchdog triggered event (Output) releases the hold state. The application watchdog remains unaffected.

-- Inputs/Outputs: IO-Permissions --

Operator can disable the reject signal: The operator is allowed to disable the reject signal. If enabled, an operator can disable the reject signal. The corresponding reject output signal will then not be triggered.

-- Temperature Compensation: Temperature Compensation Settings MI3--

IP address: IP address of the temperature compensation. The MI3 box default address is “192.168.42.130”.

Port: The port to be used for communication with the temperature compensation (MI3 box) in the network. The default port number is “6363”.

-- Temperature Compensation: Parameter--

Enable Temp. Compensation: Setting to enable or disable the temperature compensation. Possible selection is Yes/No.

Temperature Delta Threshold: The temperature delta threshold is the delta temperature to the ambient temperature of the compensation sensor to start the recording of temperature compensation values.

TComp Sensor Zone: The zone where the temperature compensation sensor looks at in the board map. A board map is divided into four areas. Counting direction is from left to right. Zone 1 is most left in the board map. Zone 4 is most right in the board map.

Assigned Sensor Deck: This is the deck where the compensation sensor is mounted and measures the temperature.

Emissivity: The emissivity of the material to measure. The right value has to be determined regarding the background (black paddle surface of counter telescope arm).

Scanner Tab

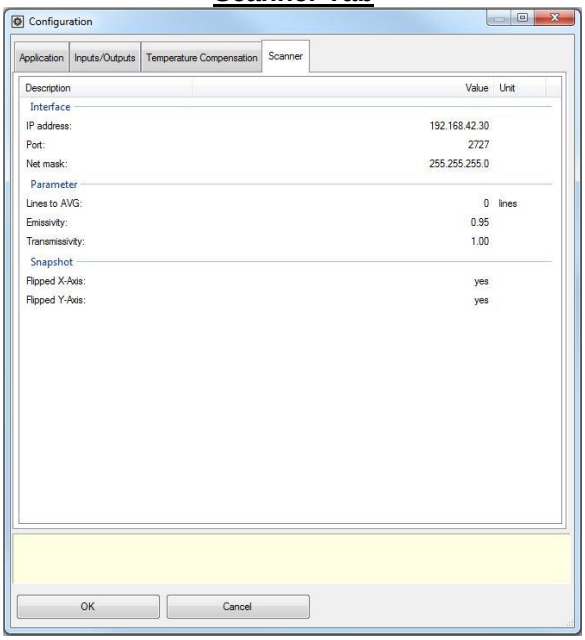


Figure 44: Scanner tab screen in Supervisor mode

-- Scanner: Interface--

IP address: The IP address of the scanner in the network. The default IP address is “192.168.42.30”.

Port: The port to be used for the communication with the scanner in the network. The default port number is “2727”.

Net mask: The net mask of the scanner. The default net mask is “255.255.255.0”.

-- Scanner: Parameter--

Lines to AVG: The number of lines for averaging. Allowed values are “0 – 9000”.

Emissivity: The emissivity of the material to measure. In gypsum wallboard production, it’s the surface material emissivity.

Transmissivity: The transmissivity of the scanner window (glass cover).

-- Scanner: Snapshot--

Flipped X-Axis: Flip X-Axis of the scanner snapshot.

Flipped Y-Axis: Flip Y-Axis of the scanner snapshot.

5.2.1.1.5 The Maintenance selector in the menu bar

The Maintenance selector button is just visible and available in the Supervisor mode. There is no process monitoring and defect detection possible, if maintenance mode is selected. If selected, a screen window opens, which shows at most four (4) separate screen tabs, if the **Enable Temp. Compensation** parameter is activated (**Yes**) under the configuration item, see chapter 5.2.1.1.4. There is no tab for the "Compensation Sensor" displayed, if **Enable Temp. Compensation** is set to **No**. These individual tabs enable you to verify the functionality of assigned process HW devices (Input/Output modules, MP150 scanner, Compensation Sensor) and to confirm a dust filter change. The configured time period for the dust filter change has to be applied for both filters units, installed in the Protective Housing for the scanner and the Industrial Touch Panel PC.

Be aware, that a Supervisor in Maintenance mode can influence the process HW (e.g Output signals). This could endanger maintenance personnel and influences the gypsum wallboard production process chain.

Inputs/Outputs Tab

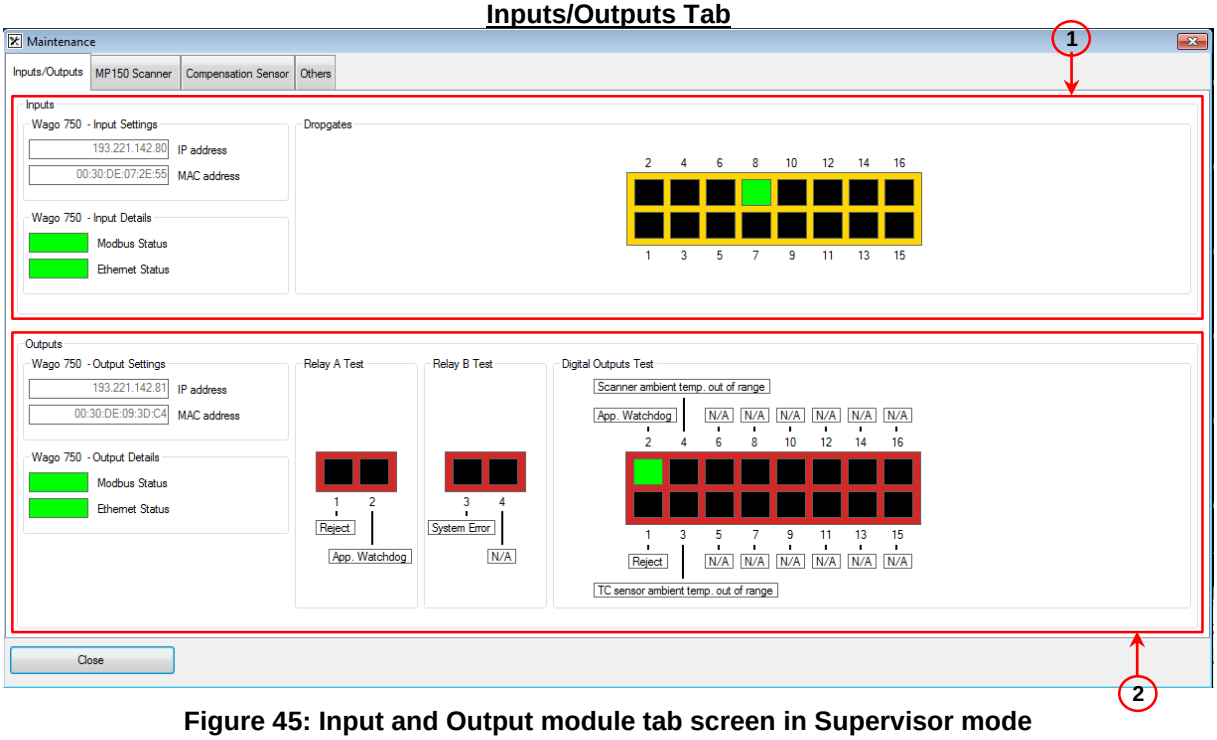


Figure 45: Input and Output module tab screen in Supervisor mode

(1) Inputs (16 Channel): Shows the activated input signals, coming from the Dropgate switches. If you activate a specific Dropgate sensor signal (switch-signal), the assigned bit field changes from black to green background. Up to 16 decks with assigned Dropgate signals can be handled by the Input module. The Modbus/Ethernet status changes from green to red color, if the module is not accessible.

(2) Outputs (16 Channel): Can be activated by the Supervisor. Up to 16 digital Output signals plus 4 isolated relay Outputs can bet set individually by clicking into the black field. If activated, the background color changes from black to green. The Modbus/Ethernet status changes from green to red color, if the module is not accessible.

Maintenance Information for the MP150 Scanner

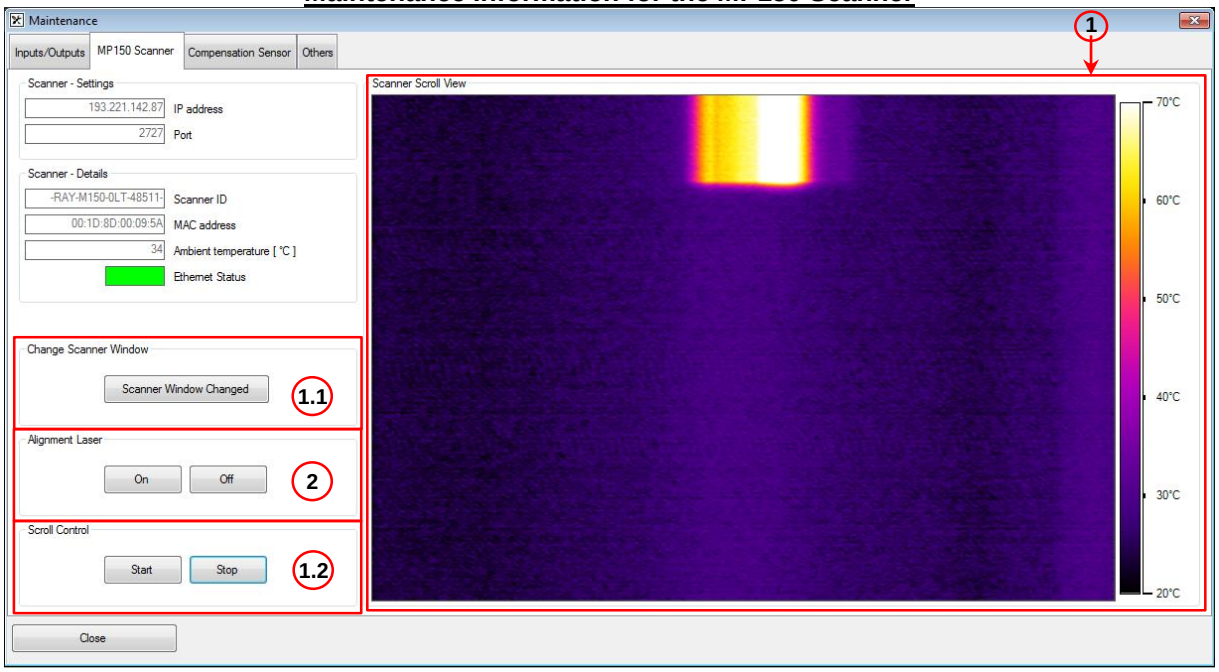


Figure 46: Maintenance of MP150 Scanner in Supervisor mode

1	Scanner Window:	Shows the scanned lines of MP150 scanner regarding the current settings in system configuration. Resolution per line and the line scan frequency are taken over to display the current thermal image. If the scanner is not accessible, the scanner Ethernet status changes from green to red background color. The displayed “Ambient Temperature” is the measured scanner ambient temperature inside the Protective Housing for the scanner device. Don’t mismatch such temperature with the real ambient temperature in the gypsum wallboards surrounding area.
1.1	Change Scanner Window:	Artificial change of the glass window transmissivity in the scanner housing. Such proceeding simulates a more or less dust contaminated front glass window in the scanner.
1.2	Scroll Control:	Regarding the configured scan resolution and scan frequency, the displayed image is scrolled from the top to the bottom.
2	Alignment Laser:	Herewith you are able to switch the scanner Alignment Laser on/off. If doing this, be aware that nobody stares into the laser beam.

Maintenance Information for the Temperature Compensation Sensor

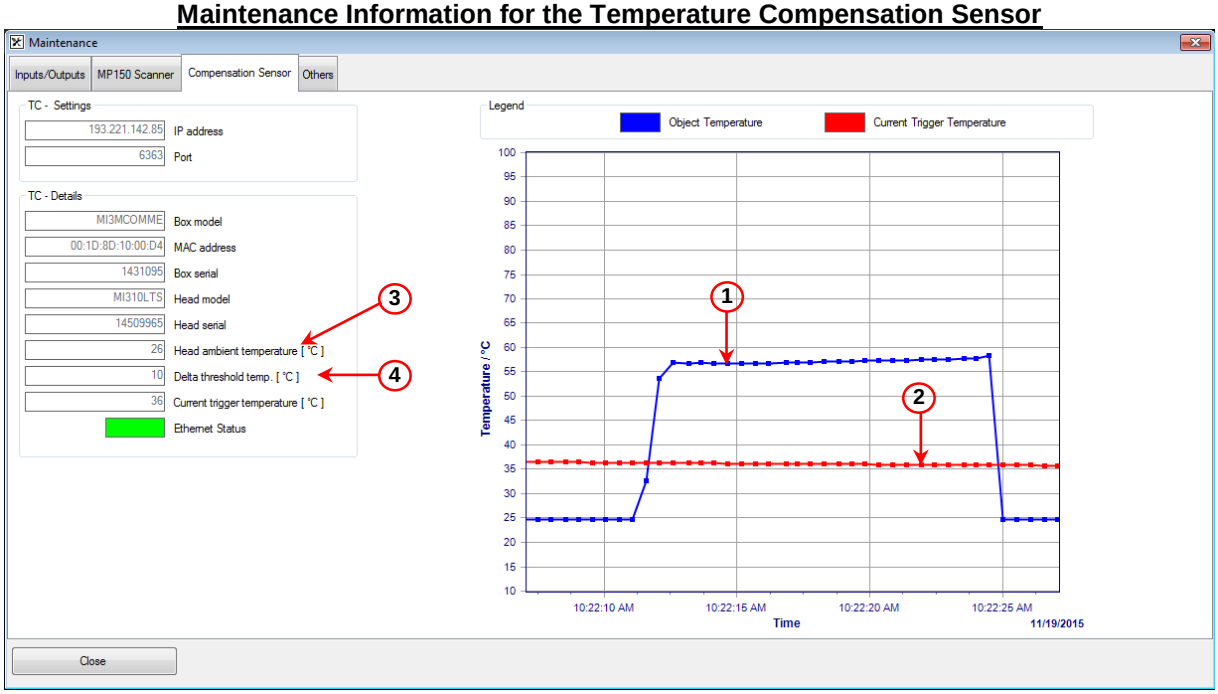


Figure 47: Maintenance tab of Temperature Compensation in Supervisor mode

If the Temperature Compensation box, which adapts the temperature compensation sensor head via Ethernet to the TIP900 network, is not accessible, the MI3-Box Ethernet status changes from green to red background color. In status red, no valid temperature values will be measured.

(1) Object Temperature:	Shows the current gypsum wallboard surface temperature of a passing wallboard at a specific measurement position, close to the kiln exit. The specific measurement position depends on the number of dryer decks and the area, where the best stable kiln exit ambient temperature is. The object temperature is acquired by the IR sensor head, connected to the MI3-Box.
(2) Current Trigger Temp.:	This is the value, which has to be achieved to indicate a trigger. The value is based on the measured ambient temperature plus a defined trigger threshold.
(3) Head Ambient Temp.:	The Head Ambient Temperature is measured by a standard temperature sensor, which is integrated in the sensor head to determine the stable ambient temperature at the measurement position.
(4) Delta Threshold Temp.:	It is the threshold plus the measured Head Ambient Temperature, which has to be exceeded to indicate, that a dried gypsum wallboard passes the sensor. The Delta Threshold Temperature value will be set globally under the configuration item and just displayed 1:1 herein.

Maintenance Information for the dust filter change

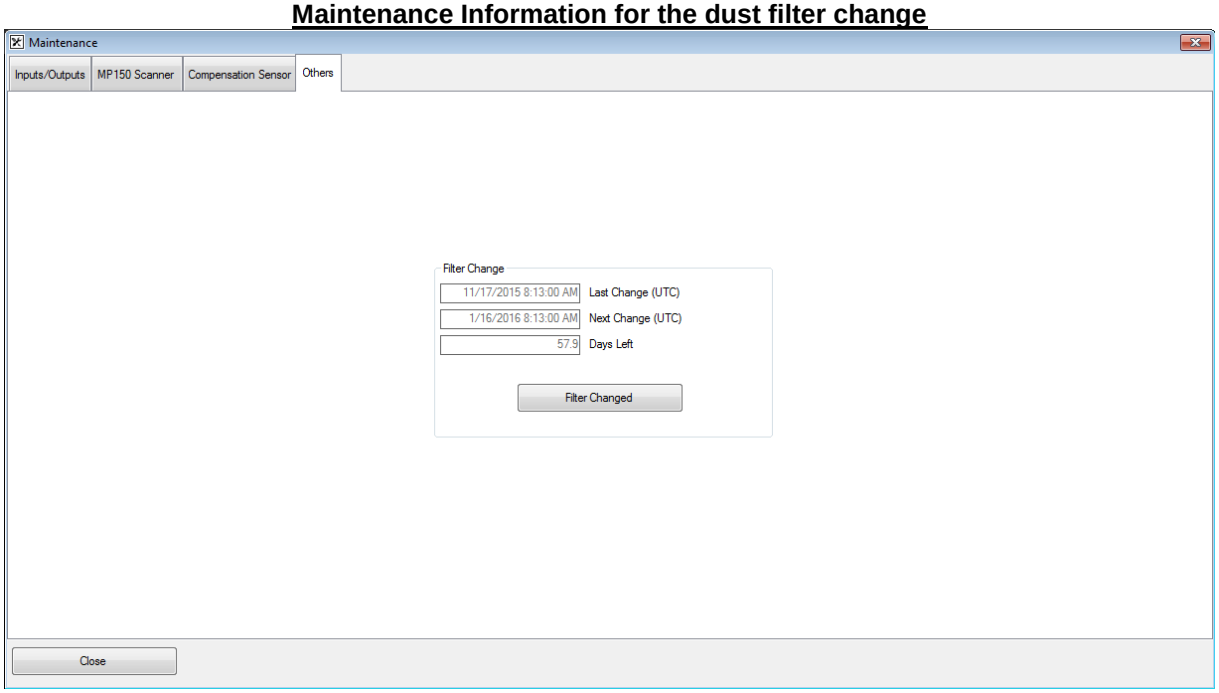


Figure 48: Dust filter change confirmation, to keep the configured filter change interval

To guarantee a proper running TIP900 system, a defined dust filter change has to be performed after a specified time period.

The dust filter change has to be applied for all TIP900 dust filters, which are installed in the Protective Housing for the scanner and the Touch Panel PC.

A filter change period has to be determined by Supervisor experience in relation to production domain dust pollution.

If a filter change interval is fixed, the interval time needs to be set in the configuration menu under Supervisor responsibility.

When the filter change interval expires, the TIP900 program reminds you to perform the filter change. The reminder pops up every 24h, if no filter change confirmation is given in the maintenance window above.

If the button “Filter Changed” is confirmed by the Supervisor, the current date is taken over into the “Last Change (UTC)” field. The “Next Change (UTC)” field entry is calculated by the preset filter change interval (configuration menu) and updated as well.

5.2.1.1.6 The  *selector in the menu bar*

If the **Show Fullscreen** selection is done, a small sub-selection field opens to allow choosing between **Process Screens [F12]** and **History [CTRL F12]**.

The process screens and the history display in full screen mode is a more detailed view of screen content and functionality, which will be described in chapter **5.2.1.2**, **5.2.1.3** and **5.2.1.7**.

The process screens display in full screen mode

Board Map display in full screen mode

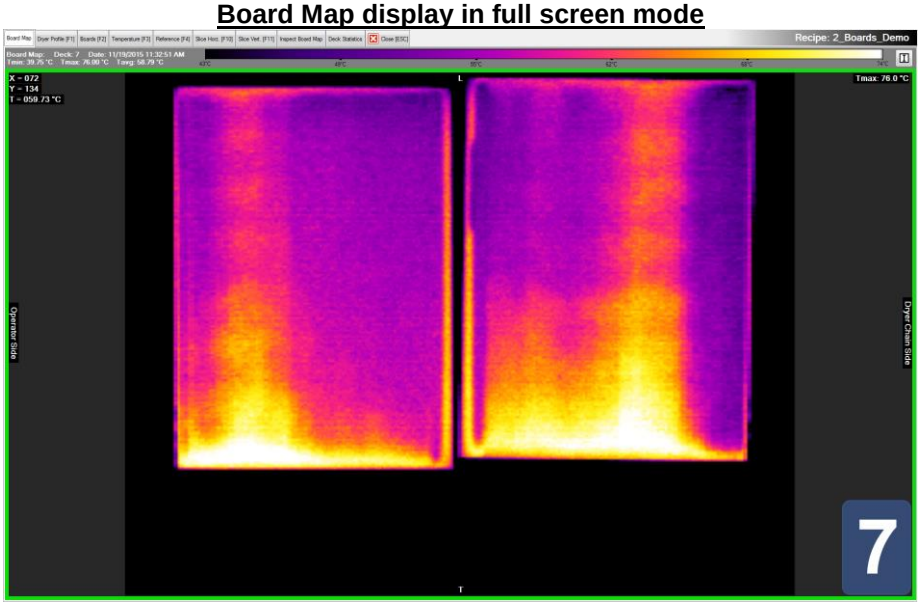


Figure 49: Process Screens: Display of Board Map

Dryer Profile display in full screen mode

Figure 50: Process Screens: Display of Dryer Profile (8 decks)

Boards display in full screen mode

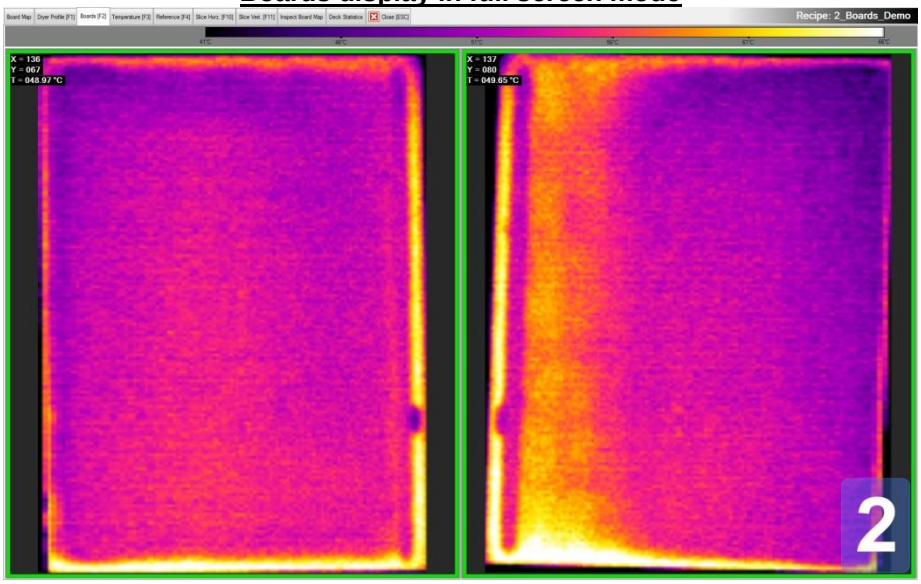


Figure 51: Process Screens: Boards Display of 2 boards per deck

Temperature display in full screen mode

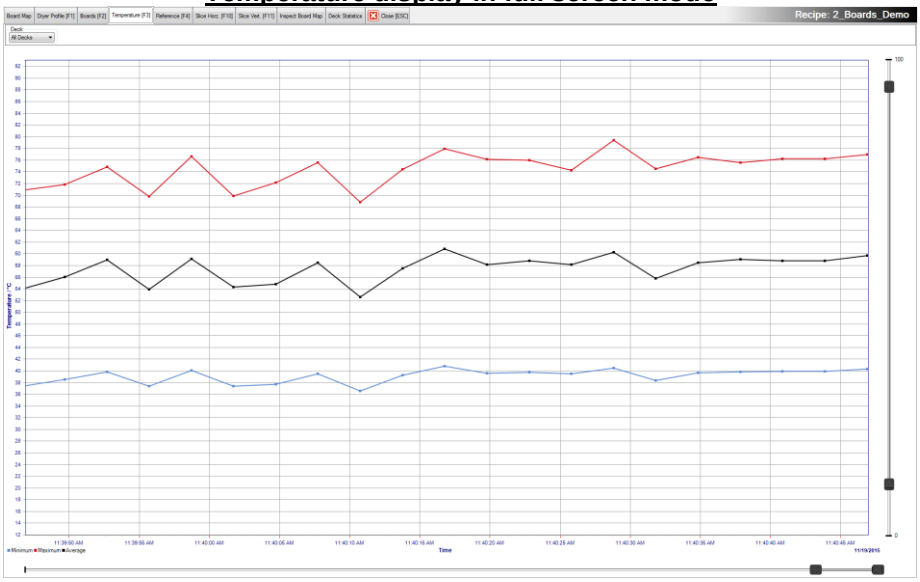


Figure 52: Process Screens: Temperature curve for min., max., average temperature

Reference display in full screen mode

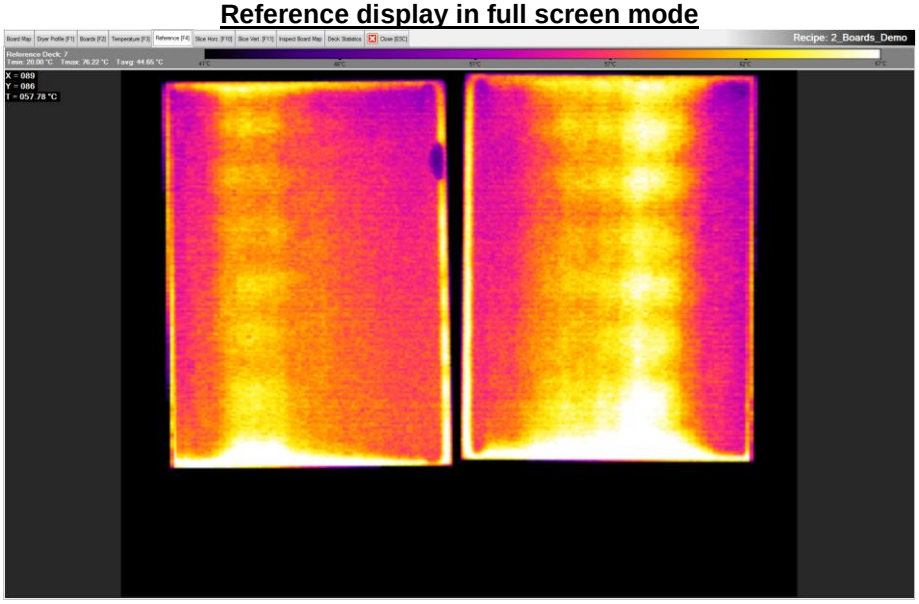


Figure 53: Process Screens: Comparison current boards to reference boards

Slice Horizontal temperature slice display in full screen mode

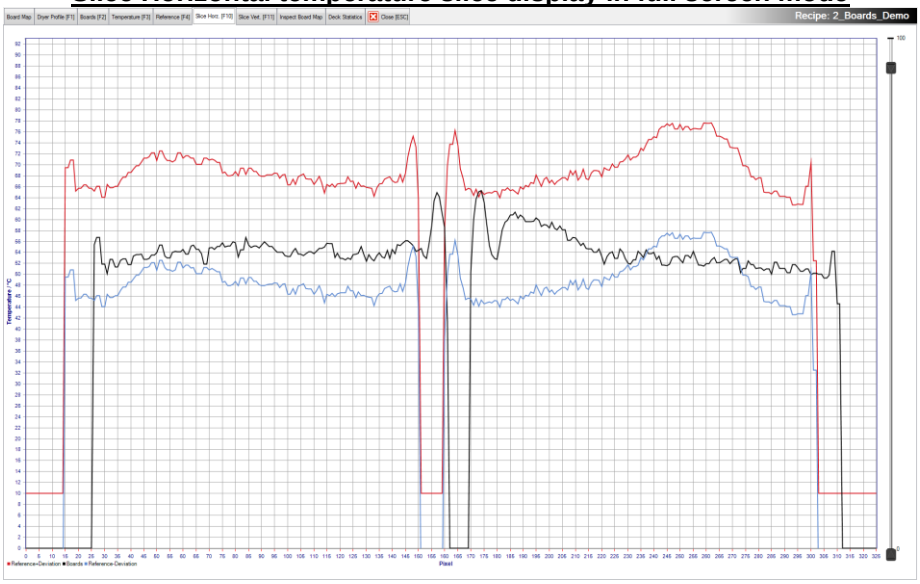


Figure 54: Process Screens: Horizontal slice of boards temperature distribution

Slice Vertical temperature slice display in full screen mode

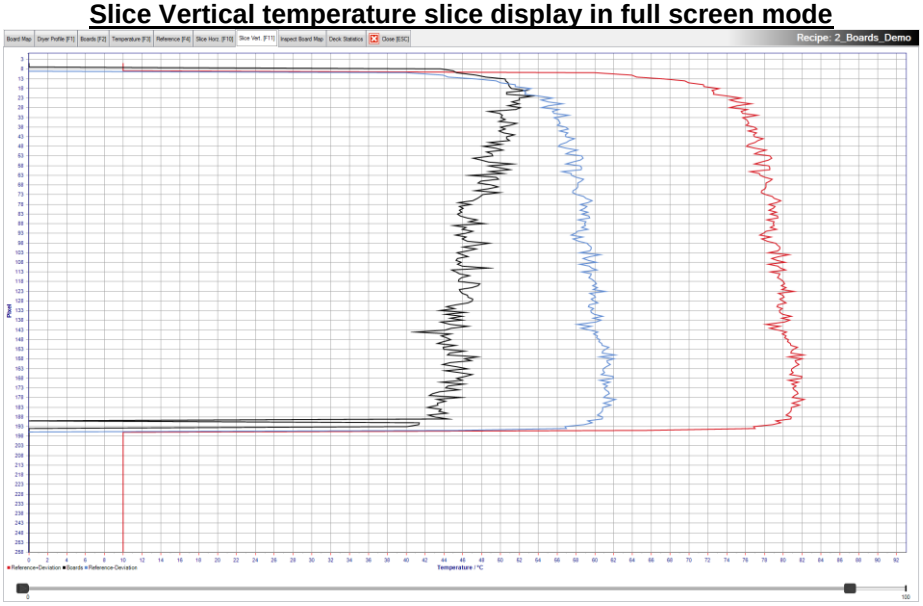


Figure 55: Process Screens: Vertical slice of boards temperature distribution

Inspect Board Map display in full screen mode

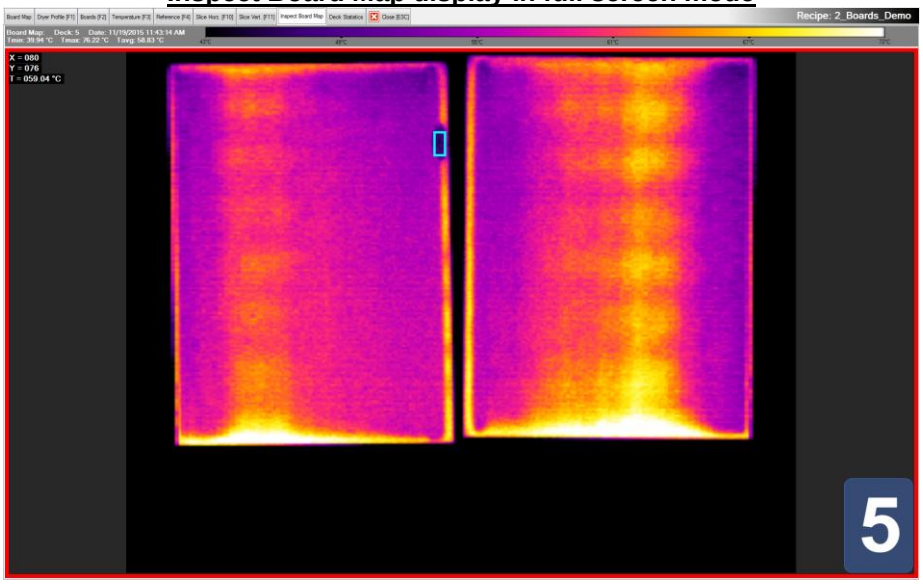


Figure 56: Process Screens: Inspect Board Map

Deck Statistics display in full screen mode

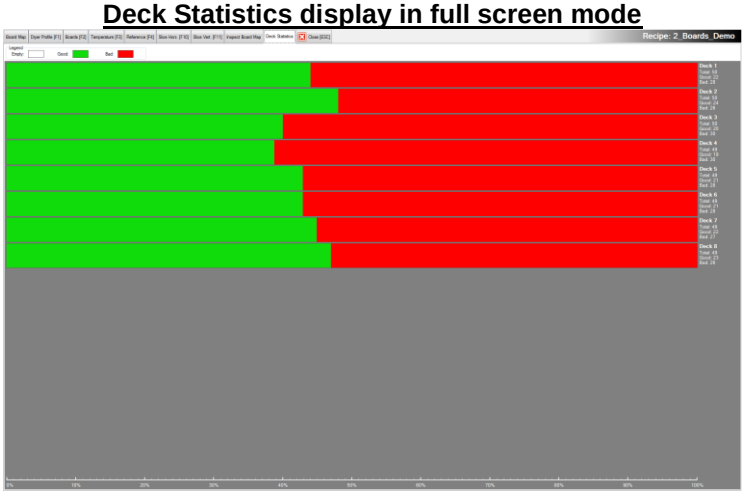


Figure 57: Process Screens: Deck Statistics of good and bad boards

Deck History display by deck and row in full screen mode

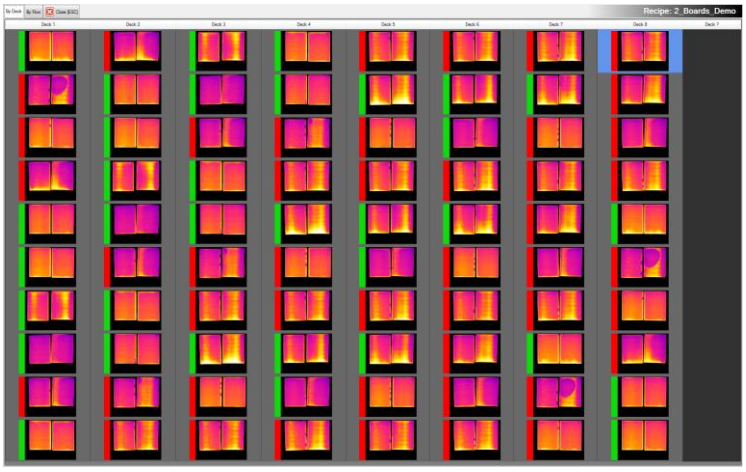


Figure 58: By deck history of good/bad boards

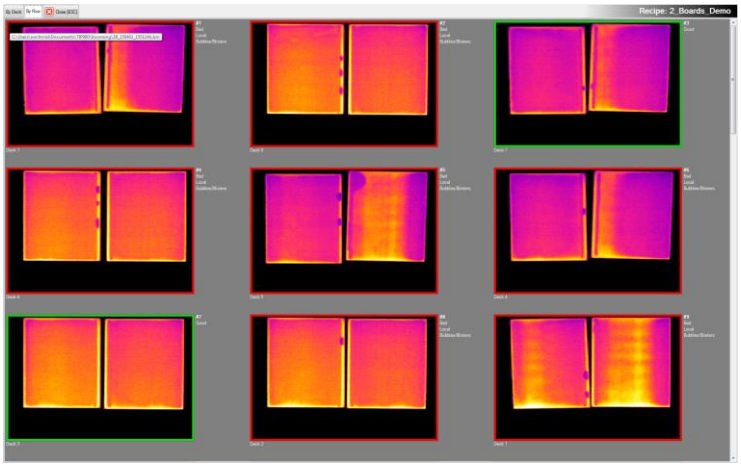


Figure 59: By row history of good/bad boards

5.2.1.1.7 The Login Supervisor and the Logout Supervisor selectors

In standard operation, the supervisor is logged out and the normal operator works with assigned access rights in a restricted environment.

By selecting the Login Supervisor button, the TIP900 program opens a login sub-window and prompts you to enter a supervisor password, to get the needed privileges.

During the very first TIP900 program installation, there is no specific supervisor password preset. It is empty and needs to be set by the supervisor in the configuration menu, see chapter 5.2.1.1.4.

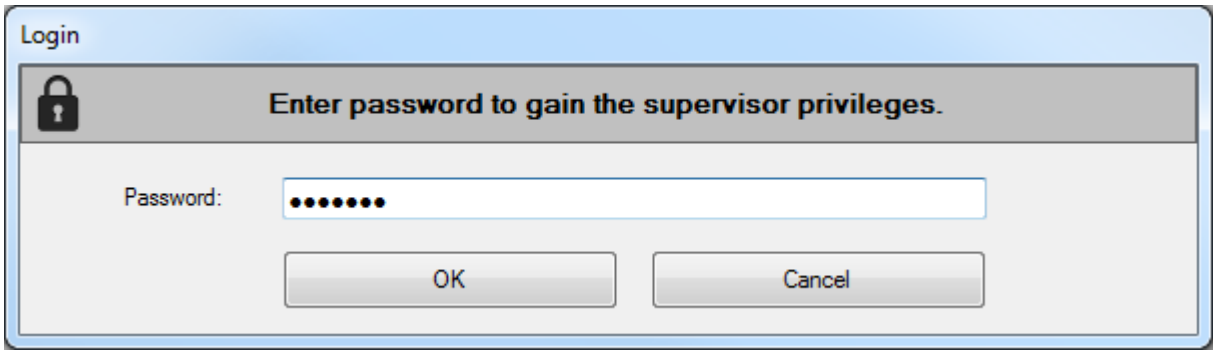


Figure 60: Login mask for Supervisor login

The Logout Supervisor selection just returns from supervisor mode into normal operator mode. All previously assigned supervisor privileges will be withdrawn by the program.

5.2.1.1.8 The About selector in the menu bar

The selection of the **About** button opens a small sub-window, where a “Help” or “Info” selection is possible.

The selection of **Help** opens the TIP900 help documentation and enables a detailed view and search capability.

The selection of **Info** opens the TIP900 information screen, which displays the program developer, the program name, the program version number and license and warranty conditions.

5.2.1.2 The Board Map display domain (2)

Please see under chapter 5.2.1 for detailed information regarding the boards map domain location on the PC screen of the TIP900 monitoring and defect identification SW.

The board map display shows in an assigned domain the currently produced and scanned gypsum wallboards, which just passed the line scanner (thermal imager).

In dependence of the specific product recipe you see 1, 2, 3…8 boards in parallel, which pass by.

See the red marked domain elements, which are described in hereafter.

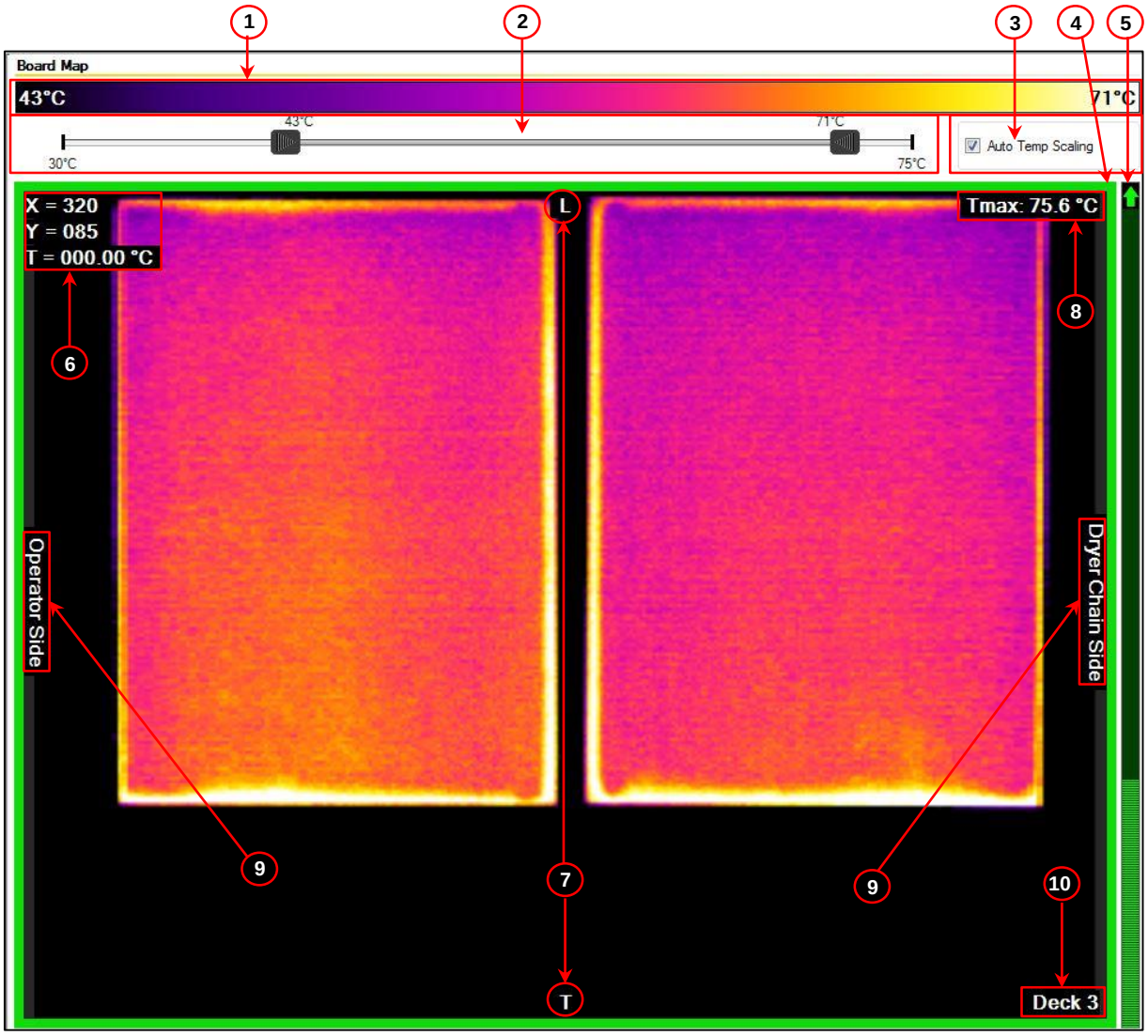


Figure 61: Board map domain with marked sub-domains

(1) : Temperature color table as temperature bar, to distinguish the different board temperature values by color.

(2) : Temperature color slider, to allow in normal mode (no auto scaling activated) to shift the color → temperature assignment manually.

(3) : Auto temperature scaling activation. Herewith the lower and upper temperature to color assignment is performed by automatic calculation. It's a normalize temperature function, like the Gaussian distribution.

(4) : GREEN or RED outline to indicate, that good or bad boards were detected by the software defect detection algorithm.

(5) : Direction of gypsum wallboard movement in relation to the fix scanner position. See also under no. 7 the indicator marks for L = leading edge, T = trailing edge. The lower green status bar in the column grows towards the green direction arrow, to indicate a running process with moving gypsum wallboards.

(6) : Cursor position information of a pointing device (mouse, touch area), which is shifted over the board map domain. The current temperature value at the current cursor position is displayed. The cursor position counts in X- and Y- axis from the upper left board map domain corner. The black area is the blanked out domain of the background and gets 0°C or 32°F assigned to. This is done by the board border recognition process in the TIP900 software.

(7) : In dependence of the board movement in direction to the scanner, it has to be marked, where board leading edge = L and the board trailing edge = T is. Both symbols indicate that.

(8) : Indication of the maximum measured surface temperature of the scanned wallboard set.

(9) : Display of "Dryer Chain Side" and "Operator Side" as orientation support.

(10) : Display of the current processed dryer deck number, where the wallboards are assigned to.

Note: In the board map display domain is a hidden **"Inspect Boards"** activation function available, which will be described in chapter **5.2.1.5**. If you move or wipe the position cursor over the board map area, you discover the changing X-Y cursor positions and the assigned temperature values in the upper left corner. In case there is any point of interest on the displayed board map, like a dark (low temperature) or bright (high temperature) zone, which is worth for a more detailed analysis, you can select the point of interest by touch selection or mouse click. Immediately after the selection is done, the actual board map snapshot is taken and will be displayed in the **"Inspect Board Map"** sub-window of the **"Process Screens"** domain, which is described in chapter 5.2.1.3. While the production process continues and the **"Board Map"** displays shows the currently scanned thermal images passing by, the **"Inspect Board Map"** sub-window stays with the last map snapshot for a detailed analysis.

5.2.1.3 The Process Screens display domain (3)

The Process Screens display domain contains eight (8) sub-screens, which can be selected for different view or analysis purposes. Specific display and control elements are marked with blue outer frames, to distinguish regarding the used software auto-colors green/red. The green color frames mark the as good identified wallboard sets, the red frames mark the bad (defects identified) wallboard sets.

5.2.1.3.1 The Dryer Profile

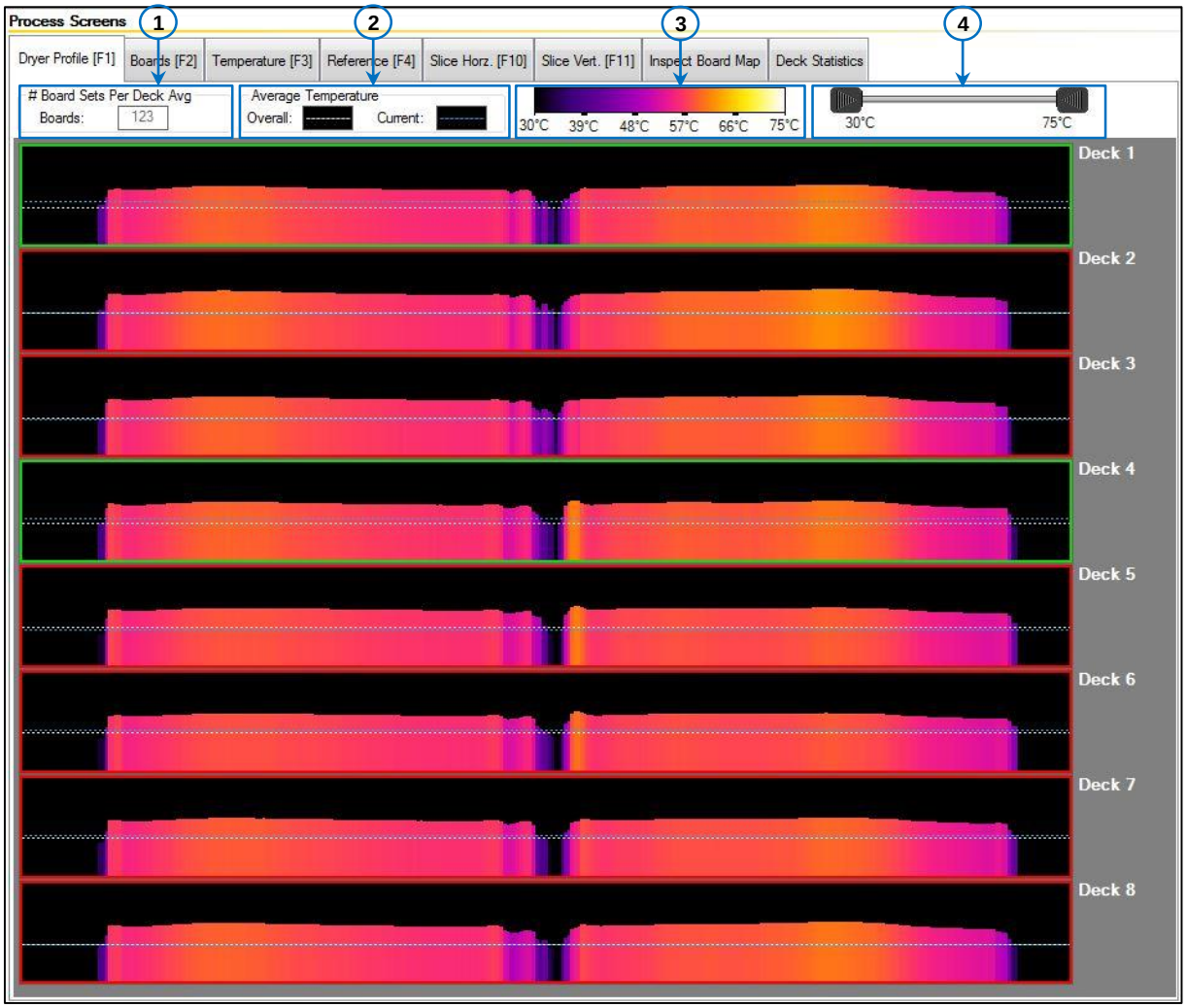


Figure 62: The Dryer Profile of wallboard sets leaving the kiln

(1)	#Board Sets Per Deck Avg.:	This is an information field regarding the preset number of board sets per deck, which are taken for average temperature calculation. In this example a number of 123 values are used for temperature averaging.
(2)	Average Temperature:	The displayed line for the Overall Temperature shows the calculated average temperature over 123 board sets per deck. The line for the Current Temperature shows the calculated average temperature of the currently processed board set.

3	Temperature Color Table:	Temperature color table as temperature bar, to distinguish the different board temperature values by color.
4	Temperature Color Slider:	Temperature color slider, to shift the color → temperature assignment manually by the left and right slider. The related scope (Manually, Automatic) is settable globally under the configuration item. See chapter 5.2.1.1.4 for details regarding the **"Scaling Type"** parameter in section Dryer Profile Settings.

5.2.1.3.2 The Boards display

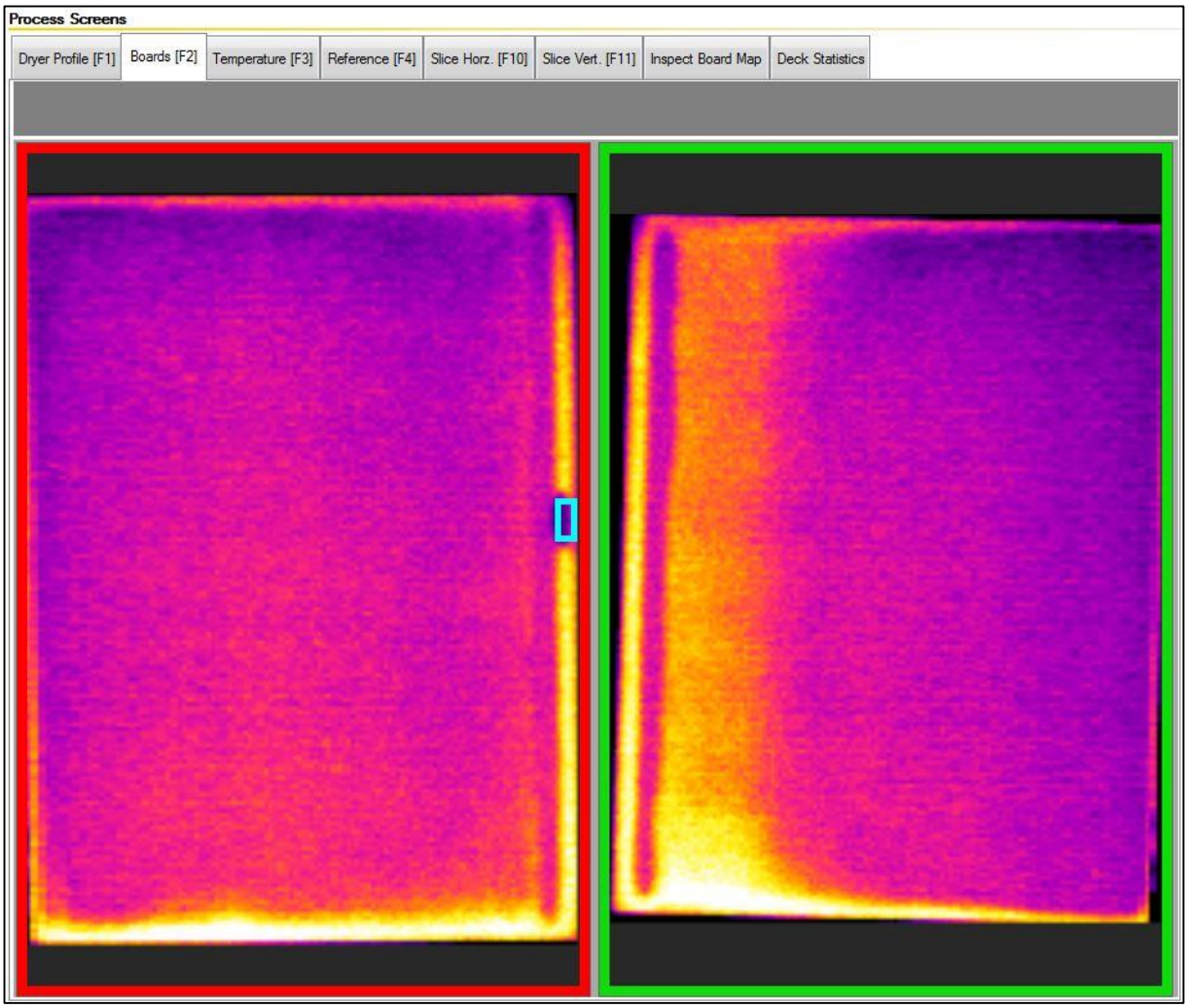


Figure 63: The Boards Display shows a currently scanned set of wallboards

The boards display under process screens is similar to the boards map display, already described under chapter 5.2.1.2. Herein the good or bad boards are individually marked in green or red color to identify defects on single board level. Regarding the boards map display in chapter 5.2.1.2, there is just one outer frame per boards set, to identify defects on boards set level. No differentiation to a single board is possible there.

5.2.1.3.3 The Temperature display

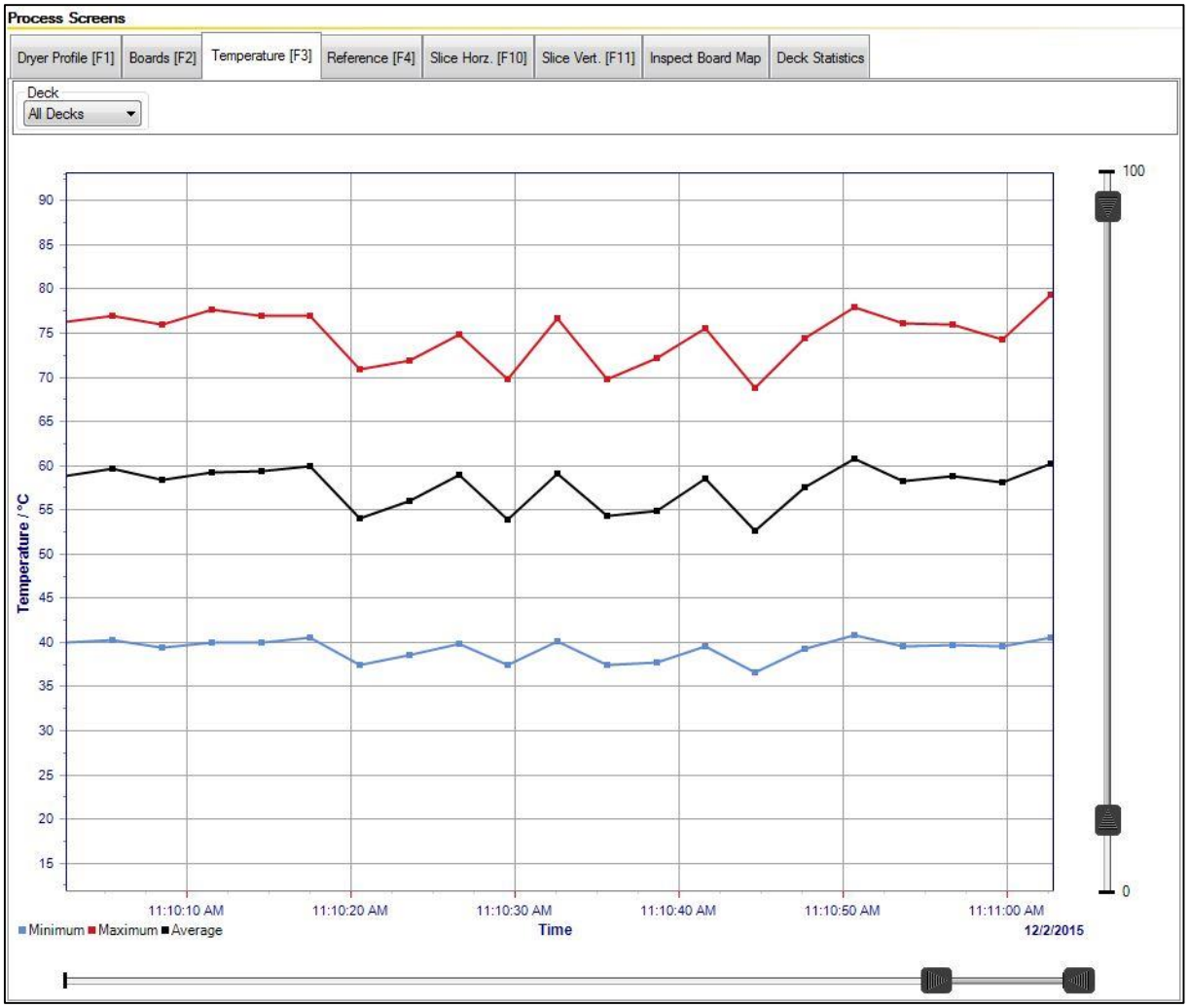


Figure 64: Temperature trend display of scanned wallboards

The temperature display shows the temperature trend of scanned wallboards. The SW algorithm calculates the minimum, the maximum and the average temperature values of all active board pixels per deck. If in the upper check box “All Decks” is selected, new calculated temperature values will be displayed after each deck change signal. If a specific deck number is selected, new temperature values will be updated after a full deck pass cycle (e.g. 8 decks). The both slider scales, one on the right hand side and the other on the lower picture side, are for the individual adaption (extension, compression) of the X/Y-axis.

5.2.1.3.4 The Reference Boards display

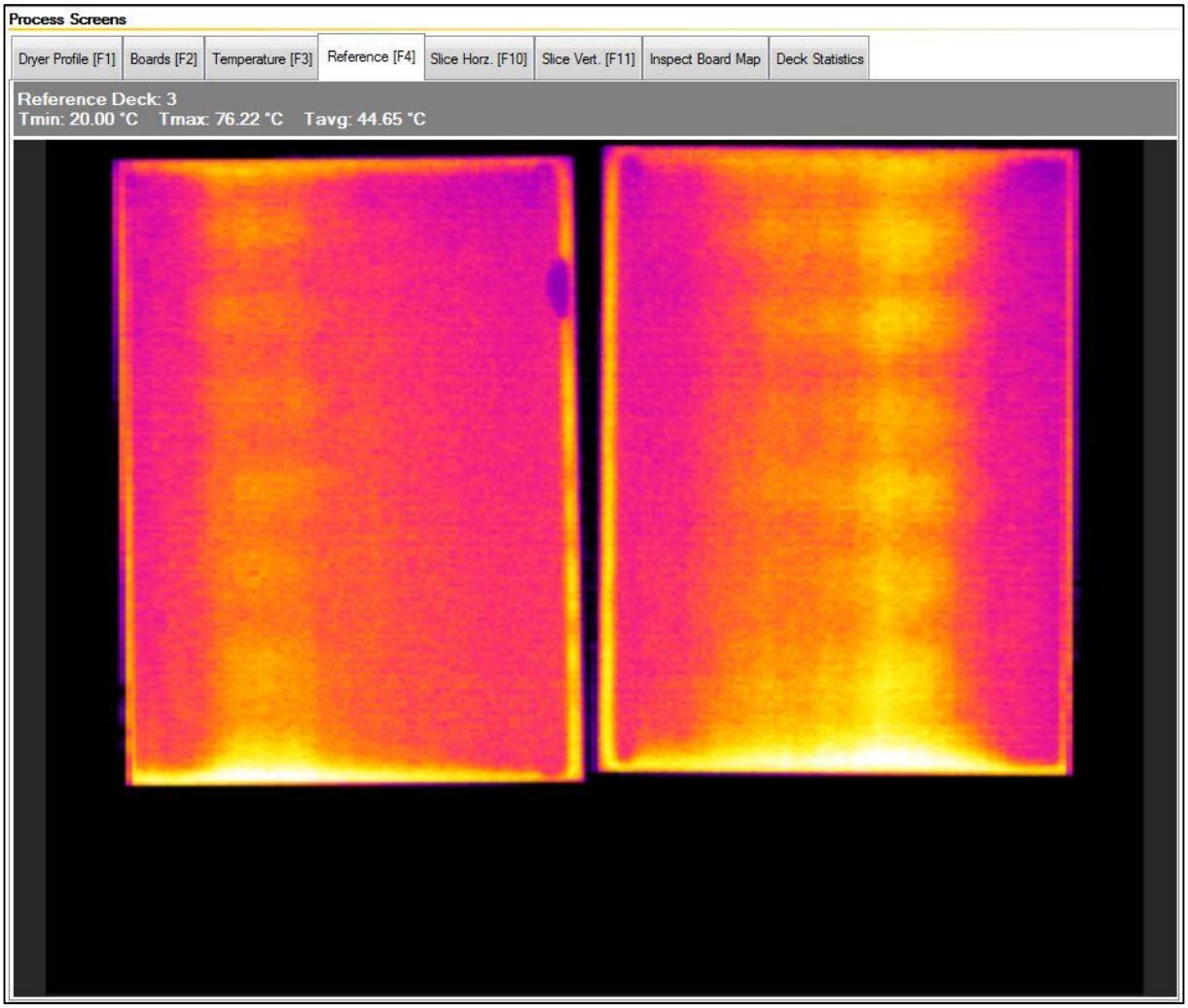


Figure 65: The Reference Board display shows the assigned references per dryer deck

The Reference Boards Display shows the assigned reference boards per dryer deck, which was set by the supervisor during the “Edit Recipe” procedure. See chapter 5.2.1.1.3 for more details regarding the reference board assignment by the supervisor.

5.2.1.3.5 The Horizontal Slice through the boards map

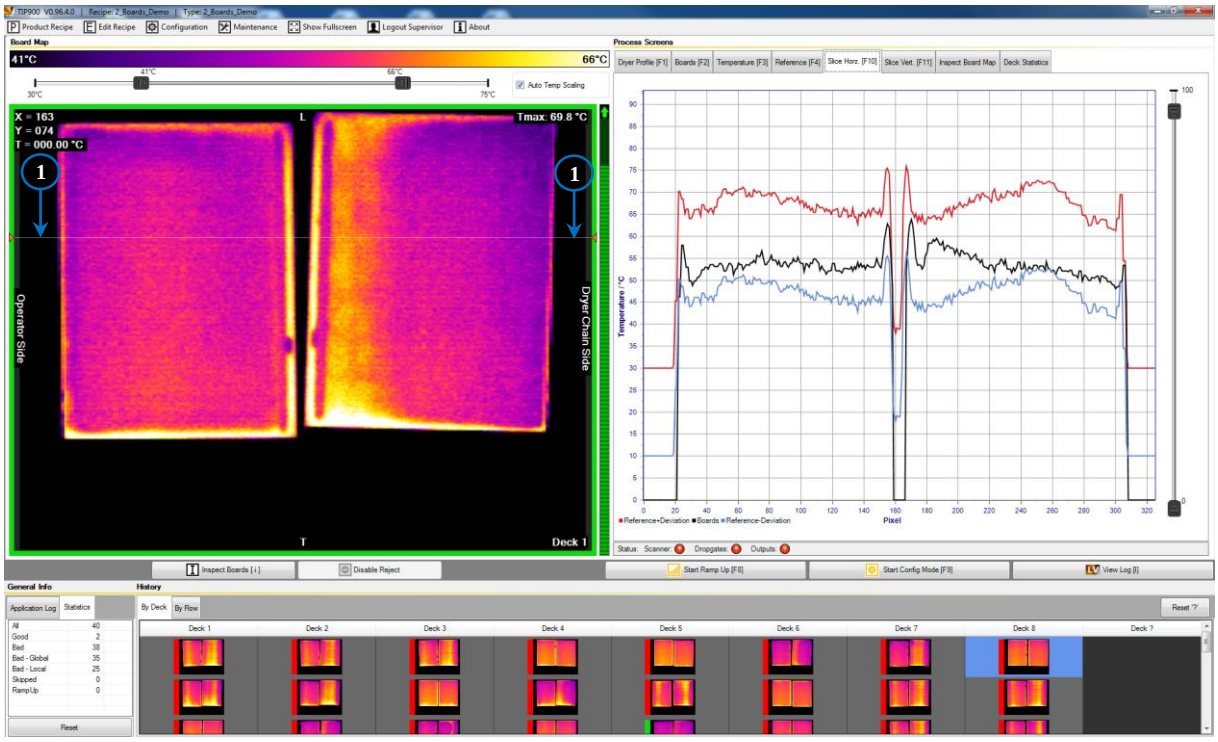


Figure 66: Horizontal Slice Display shown in the right display section

The horizontal slice display delivers a thermal image view per scanned line over the configured scan width, whereas the configured scan width is nearly the inner conveyance belt width.

With the selection of the horizontal slice display in the right hand side process screens domain, on the left hand side “Board Map” domain display appears a horizontal slice selection line. ①

The line can be selected by moving the cursor over the horizontal line until the standard cursor arrow changes into a double arrow symbol and both horizontal line end triangles change from white color to orange color. Click on the line and hold the pressed selection button to shift the line along the vertical board orientation. The desired Y-position, where you release the pressed selection button, delivers the horizontal slice display of the currently processed boards, shown in the right hand side section.

The black curve displays the horizontal slice of the normalized board temperature values. That means all background temperature values will be normalized to 0°C / 32°F.

A right hand side slider allows the individual display adaption (extension, compression) of the Y-axis temperature values for the horizontal slice.

5.2.1.3.6 The Vertical Slice through the boards map

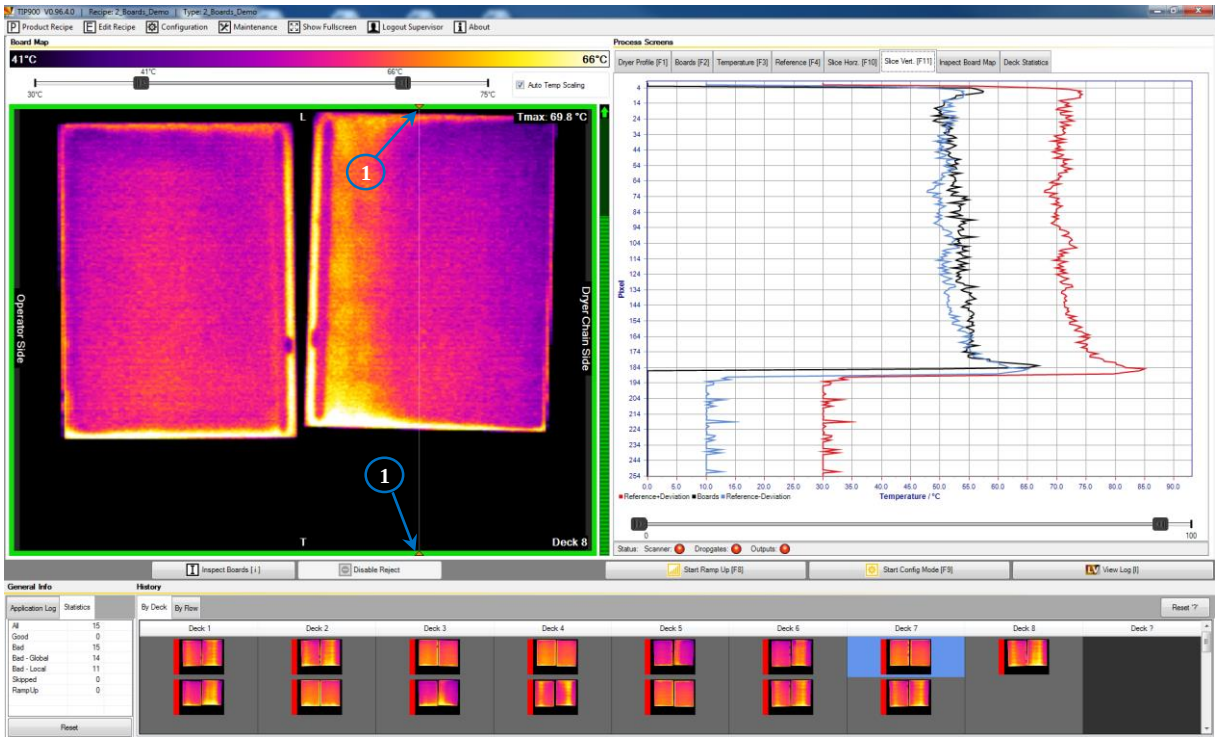


Figure 67: Vertical Slice Display shown in the right display section

The vertical slice display delivers a thermal image view per scanned line over the board's longitudinal direction, whereas the displayed wallboard length depends on the board's conveyance velocity.

With the selection of the vertical slice display in the right hand side process screens domain, on the left hand side "Board Map" domain display appears a vertical slice selection line. ①

The line can be selected by moving the cursor over the vertical line until the standard cursor arrow changes into a double arrow symbol and both vertical line end triangles change from white color to orange color. Click on the line and hold the pressed selection button to shift the line along the horizontal board orientation. The desired X-position, where you release the pressed selection button, delivers the vertical slice display of the currently processed boards, shown in the right hand side section.

The black curve displays the vertical slice of the normalized board temperature values. That means all background temperature values will be normalized to 0°C / 32°F by a sophisticated SW algorithm.

A bottom slider allows the individual display adaption (extension, compression) of the X-axis temperature values for the vertical slice.

5.2.1.3.7 The Inspect Boards Map display

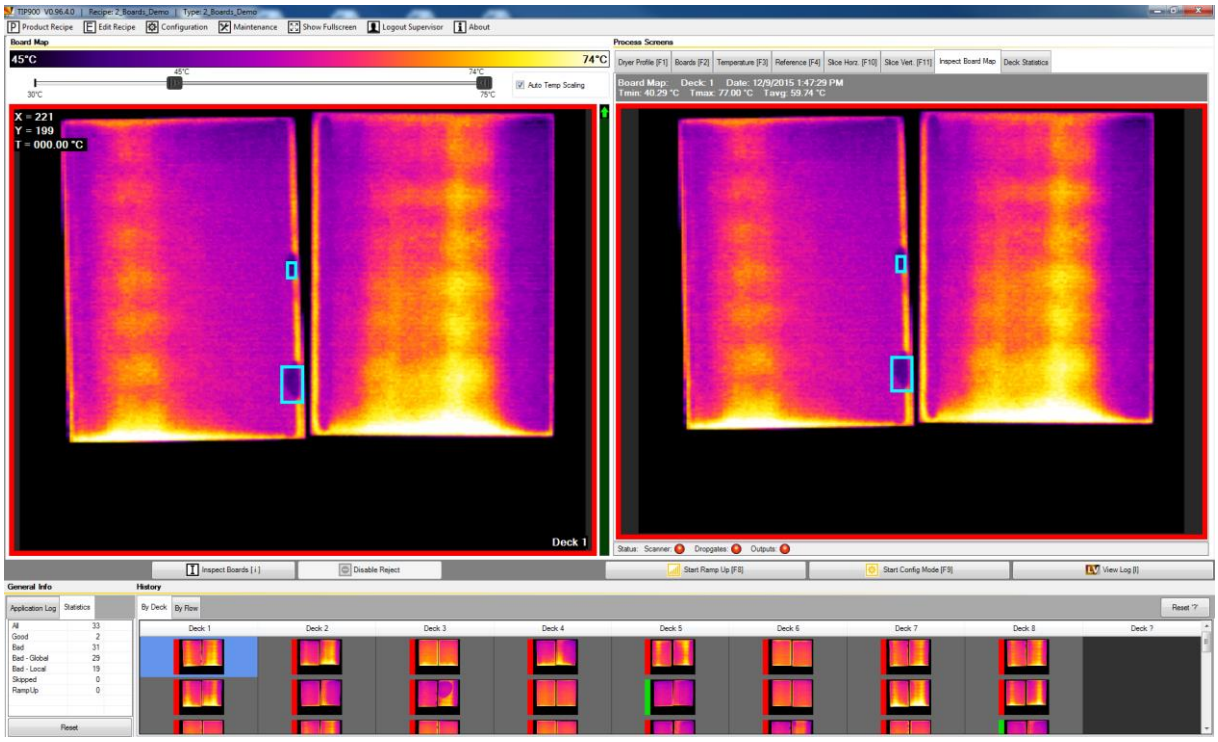


Figure 68: Inspect Boards Display shown in the right display section

The Inspect Boards Map display as a sub-display under the process screens menu is for snapshot analysis of processed wallboards. The last taken snapshot out of a running wallboard production process is captured. A snapshot (copy of currently processed set of wallboards) is taken, if a selection click is performed in the “Boards Map” display domain or on the selection button 

below the “Boards Map” display domain. Such proceeding changes automatically to the sub-display “Inspect Board Map” under the process screens domain. Now a deeper analysis of the captured board map is possible during a continuing production process.

5.2.1.3.8 The Deck Statistics display

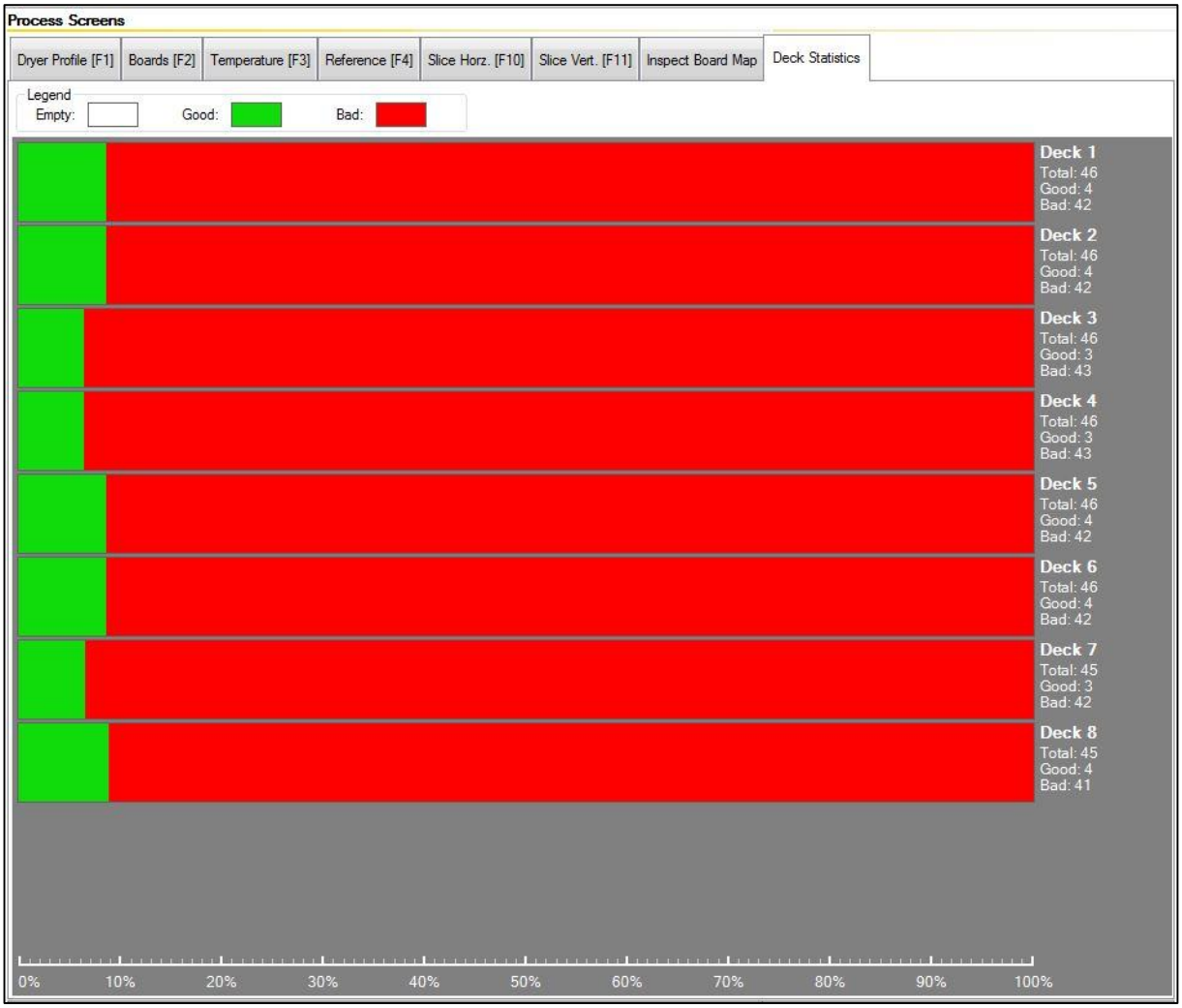


Figure 69: Deck Statistics Display shows the relation of good/bad produced wallboard sets

This sub-display is a very important one to have an overview of the current production quality. The example above indicates a very bad production result, because the relation between good/bad board sets is about 0.1 (10% good, 90% bad). This might be also an indication for an inaccurate recipe or overall configuration. Herein the bad result was intentionally forced by a bad recipe configuration with bad reference boards per deck.

Note: Just high quality reference board sets enable a good defect detection capability by the SW algorithm. Especially the kiln deck temperature variance has to be taken into account, if the variance between the decks is high. Please use individual reference board set per deck or adapt the individual defect detection threshold temperature per deck.

5.2.1.4 The Hardware Status Indicator display domain (4)

Figure 70: The Hardware Status Indicators

The hardware status indicator bar indicates the availability of the needed process hardware for a proper wallboard production process. There is no “Compensation Sensor” status indicator LED displayed, if the parameter **“Enable Temp. Compensation”** is set to **“No”** under the configuration item in chapter 5.2.1.1.4. All available and working hardware components are indicated as a green LED spot. Not available or malfunctioning hardware is indicated as a red LED spot. In a real production environment all configured and working hardware elements shall indicate a green spot.

5.2.1.5 The Special Function selection display domain (5)

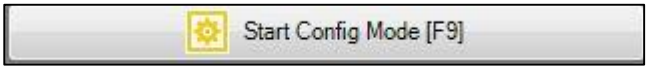
Figure 71: The Special Function selection bar

The special function selection bar contains five push button elements for activation, if access or execution right is assigned. A logged in supervisor has all the rights to activate and execute the functions, which are assigned to the push buttons. A normal operator has just limited access or execution rights. Some rights may assigned by the supervisor to the normal operator.

Is already described in chapter 5.2.1.3.7 and triggers the board inspection function. Operator has full access right.

The automatic software controlled board set discharge function is overruled by the supervisor or operator.

If a new wallboard production is started after a shutdown phase, where a changed configuration or recipe has to be applied and the kiln needs to be heated up. During such a phase the defect detection algorithm is bridged and the operator has to supervise the production quality until process stability.



The push button is just highlighted, if the supervisor is logged in. In normal operator mode, the push button is grayed out and is not selectable by the operator. The selection of the “Start Config Mode” by the supervisor interrupts the running defect detection and logging function.

The push button initiates a sub-program call of the TIP900_LogViewer program. The final selected recipe name defines the database folder for the logged thermal image data, where the program relates to.

5.2.1.6 The General Information display domain (6)

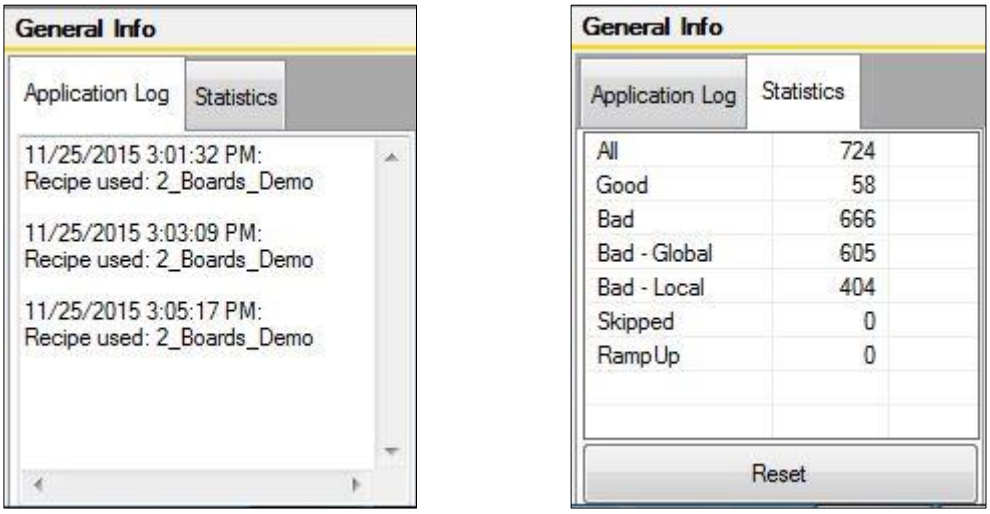


Figure 72: The General Info Sub-Screens

The General Information display delivers current status information about the running production process. Two sub-screens inform about “Application Log” and “Statistics”.

Under the “Application Log” sub-screen are all software application related items logged and displayed. Herein you will find every recipe and configuration modification, recipe change and program start hints, logged with a current time stamp.

The “Statistics” sub-screen delivers statistic production process information related to the currently used recipe. A short view on the “Statistics” sub-screen above, indicates you, that there is a huge quality problem or a wrong recipe / configuration setting.

5.2.1.7 The Deck History Information display domain (7)

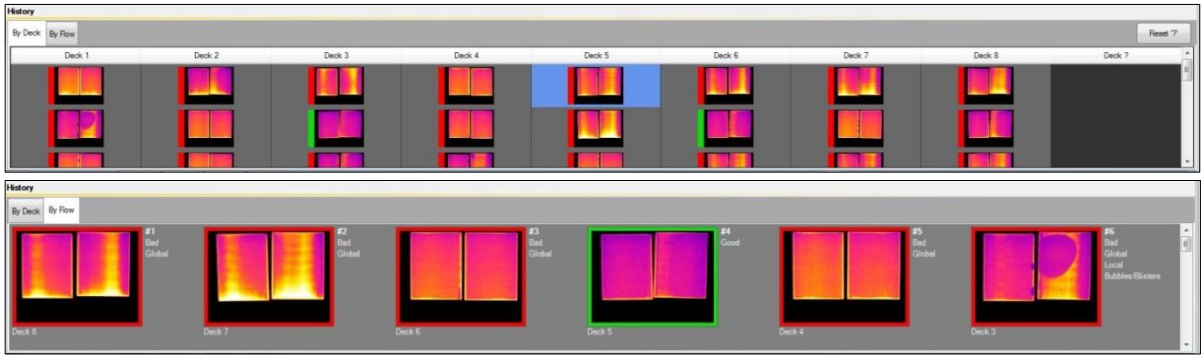


Figure 73: The both Deck History sub-screens

The deck history sub-screens give an overview about the running wallboard production process and the related product quality per dryer deck. Two different views “By Deck” or “By Row” are selectable to display the relevant deck history. Herein it’s possible to identify kiln deck related problems, which might be the reason for bad wallboard quality. An easy way to mark and assign a deck specific board map image as a good reference board map to the deck number is integrated. Please see in chapter 5.2.1.1.3 under (9) “Load Reference” for detailed information.

5.2.2 Operation in “Standard Operator” mode

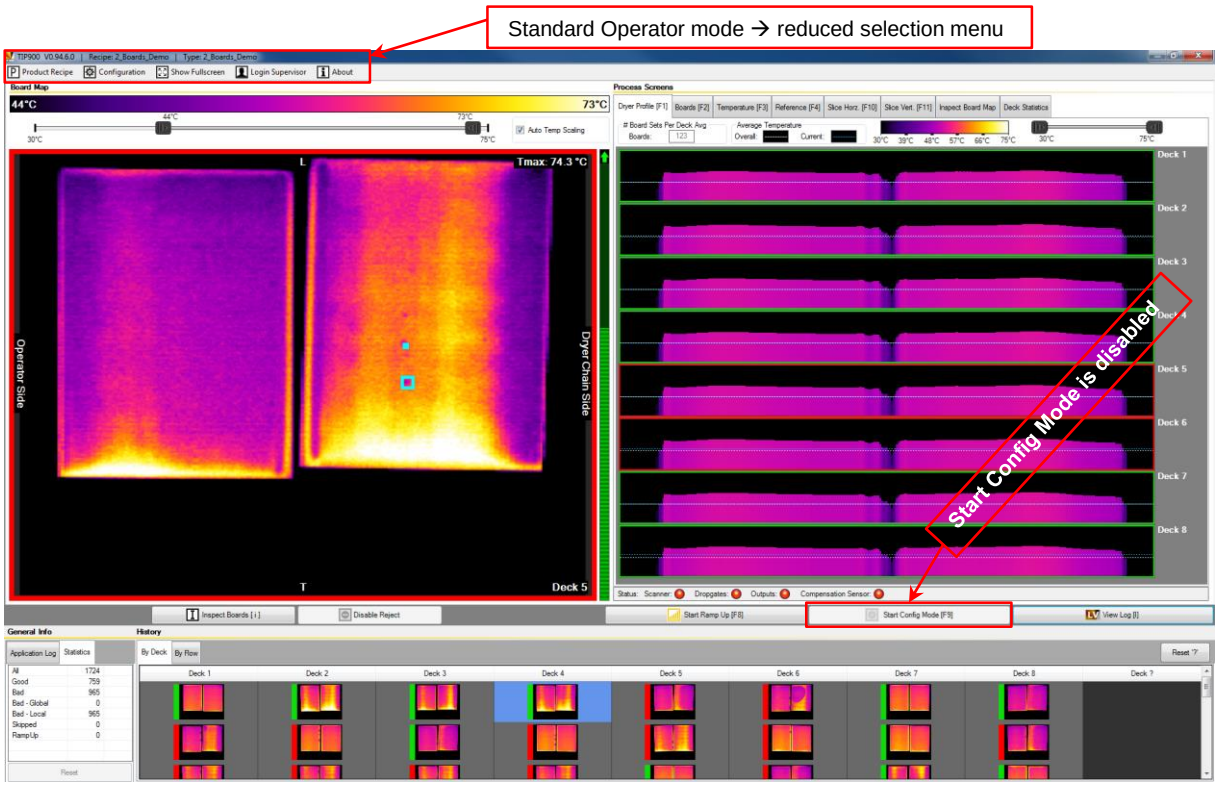


Figure 74: Program is running in Standard Operator mode with restricted rights

A double click on the icon in Figure 36: Created TIP900 icons during SW installation process starts the program in the standard operator mode with restricted rights. In such mode is just a reduced main menu with five (5) selection items available.

In the standard operator mode some selector push buttons are grayed out and disabled for activation. A logged in supervisor may assign some extra power to the standard operator and enables to activate grayed out elements.

As a standard operator, without assigned extra power by the supervisor, you’re not able to edit or configure system relevant parameters.

If the program is started the very first time after SW installation, an empty supervisor password is preset and needs to be updated by a valid one. The responsible supervisor has to take care about this and the chosen password must be treated confidentially.

Please see chapters 5.2.1.1.2 until 5.2.1.1.8 for detailed information regarding the five (5) selection items for the related functionalities and parameters.

5.2.3 Operation in “Supervisor” mode

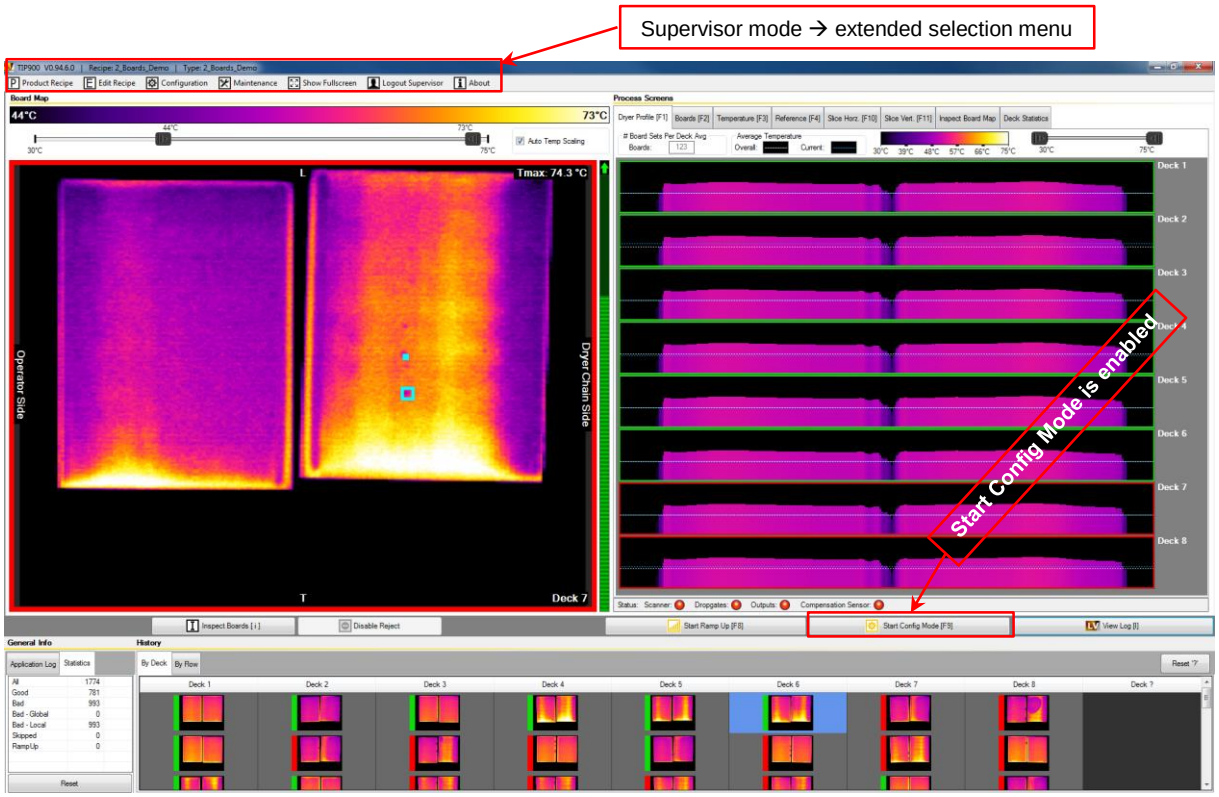
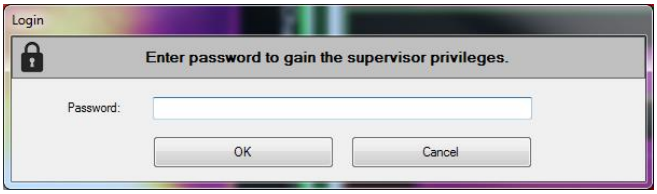


Figure 75: Program is running in Supervisor mode with administration rights

The standard operator mode can be left by clicking onto the selector button Login Supervisor and enter the correct password in the subsequent window.



A valid supervisor password has to be preset on the very first start of the program after installation. The supervisor has to take care about the chosen password and must treat it confidential. After entering the correct supervisor password, the main menu selection bar is extended by two extra items Edit Recipe and Maintenance with additional rights to configure parameters.

The supervisor has all administrative rights and is able to assign specific power (rights) to the standard operator. Please see chapters 5.2.1.1.2 until 5.2.1.1.8 for detailed information regarding the seven (7) selection items for the related functionalities and parameters. Especially the edit and configuration power distinguishes the supervisor from the standard operator. Such aspect has to be handled with care, because it influences the production and process quality, if automatic side track (board set rejection) is enabled.

As a safety feature is an automatic logout from supervisor mode integrated, which takes place after about 5 minutes without supervisor interaction. This should avoid leaving all supervisor priorities to the standard operator staff in case of missing a correct logout as supervisor.

5.3 Operation of TIP900_LogViewer online/offline viewing SW

5.3.1 General description of the functionality and assigned screen elements

Please see the brief general TIP900 system description under Product Description on page 11.

The icon in Figure 36: Created TIP900 icons during SW installation process represents the online/offline analysis SW of archived thermal images in gypsum wallboard production. A double click on the icon starts the program.

Another activation method of the program is out of the running “TIP900 monitoring and defect identification SW” program by pressing the push button

This initiates a sub-program call of the TIP900_LogViewer program with the final selected recipe name as passed parameter. The passed recipe name defines the database folder for the logged thermal image data, where the program relates to.

To ease the description of the program functionality and its assigned screen areas, seven (7) red marked domains were identified. These domains are consecutively separately described.

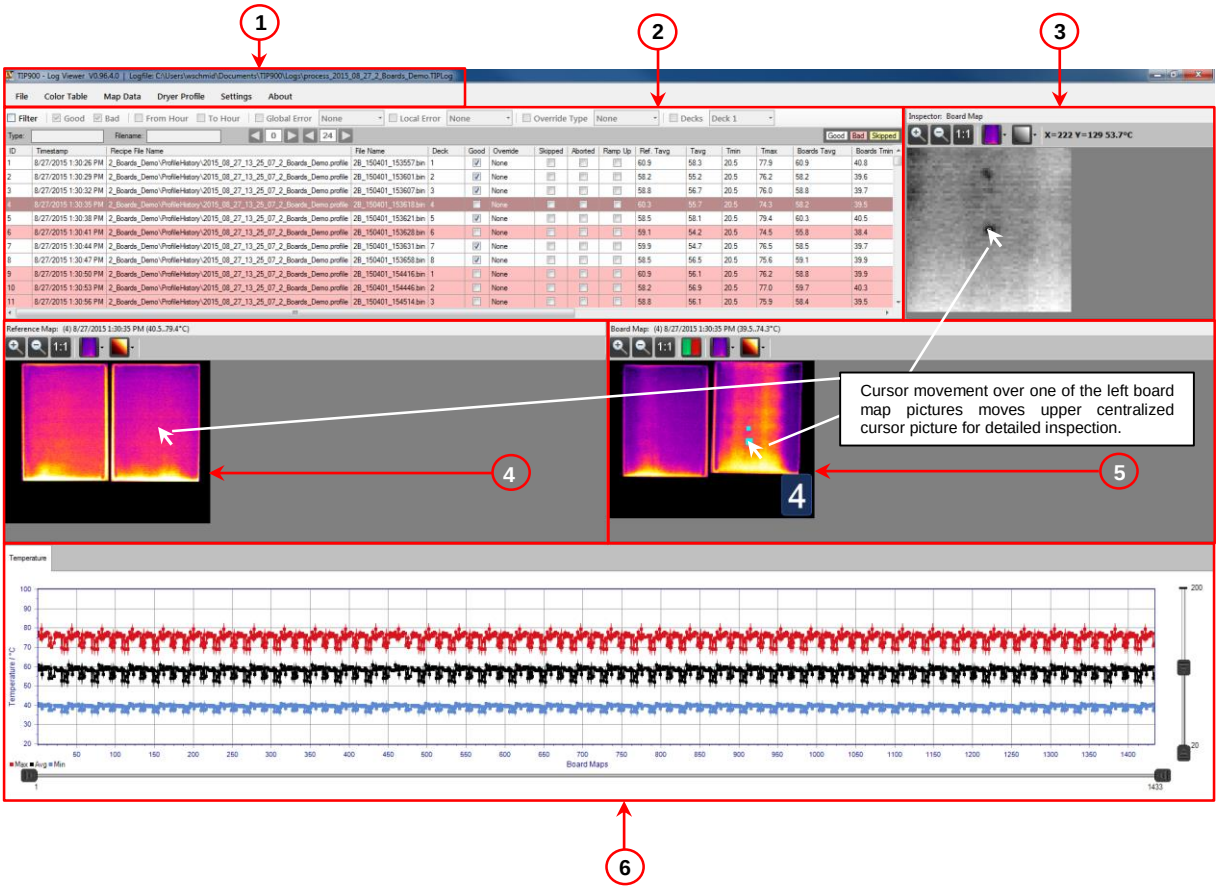


Figure 76: Program is started, a valid log-file is opened, 6 domains are marked

5.3.1.1 The program title & version line with the menu bar domain (1)

The program title, version and menu bar is split into six (6) red marked sub-domains.

See chapter 5.3.1.1.1, which is related to the red marked domain (1.1) and describes the content of the program title line.

The subsequent chapters 5.3.1.1.2 until 5.3.1.1.7 are related to the red marked menu bar domains until (1.2) and (1.7) describe all the available selectors.

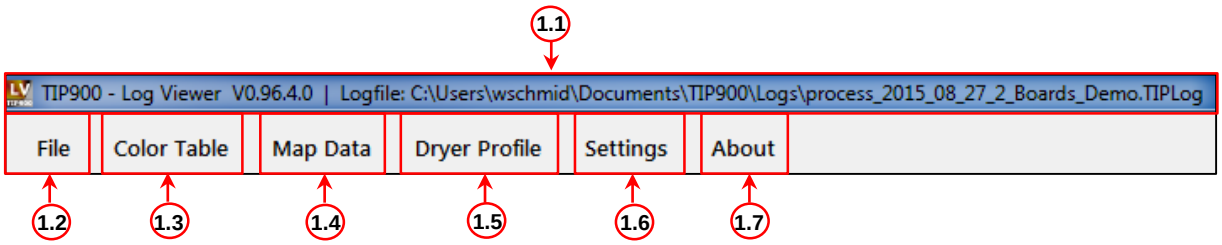


Figure 77: TIP900 – Log Viewer title line and menu bar selectors

5.3.1.1.1 The program title line and its information content

In the screen domain (1.1) above, the program title line indicates the “TIP900 - Log Viewer” program name, the current SW version number and the chosen Logfile name. If the program is started by a double click onto the LV-icon in Figure 36: Created TIP900 icons during SW installation process, no Logfile name will be displayed. After a selection of a Logfile and the confirmation to open the file, the filename will be displayed.

A program start by a simple click onto the LV-push button in the “TIP900 monitoring and defect identification SW” application, displays the last chosen Logfile name, as shown above.

The chosen Logfile name contains the specific storage folder, the logging date and the related definite recipe. Archived data for specific recipe type variants are stored in separate database files.

5.3.1.1.2 The File selector in the menu bar

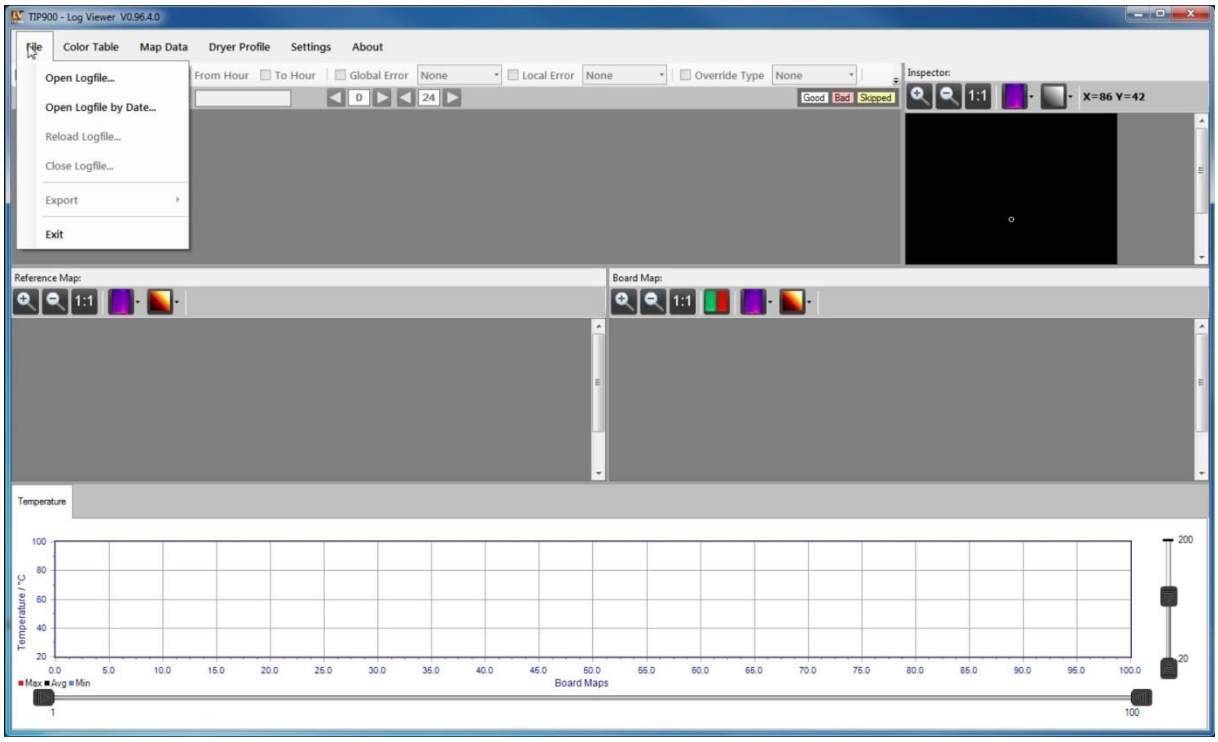


Figure 78: TIP900 – Log Viewer File selector in the menu bar

No Logfile name was passed during program or sub-program call, which is why no Logfile is opened and all sub-screens are empty.

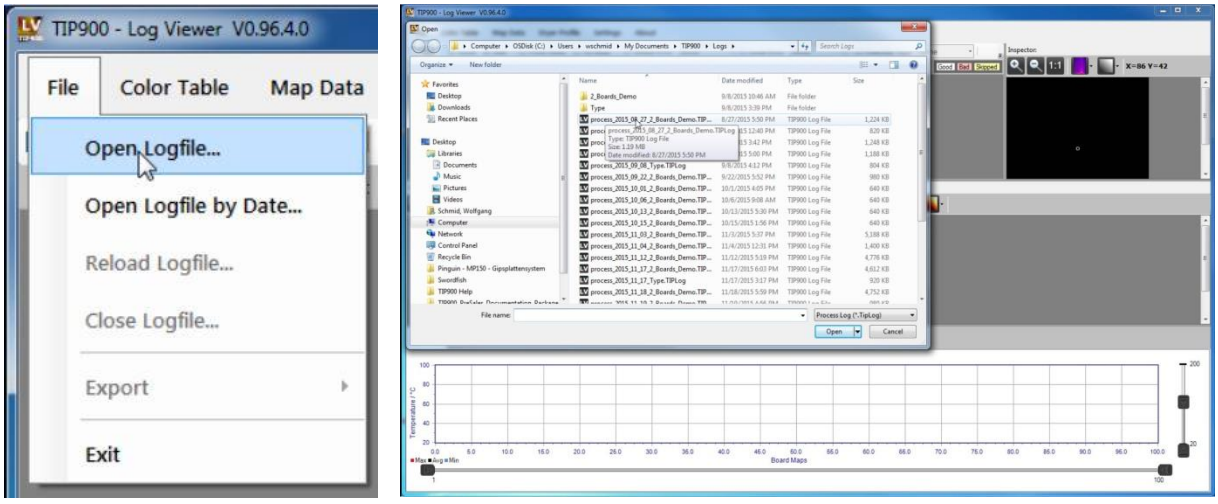


Figure 79: TIP900 – Log Viewer File selector to open a Logfile

A Logfile name is selected by the operator or supervisor in the subsequent window and needs to be confirmed by a click to open the file.

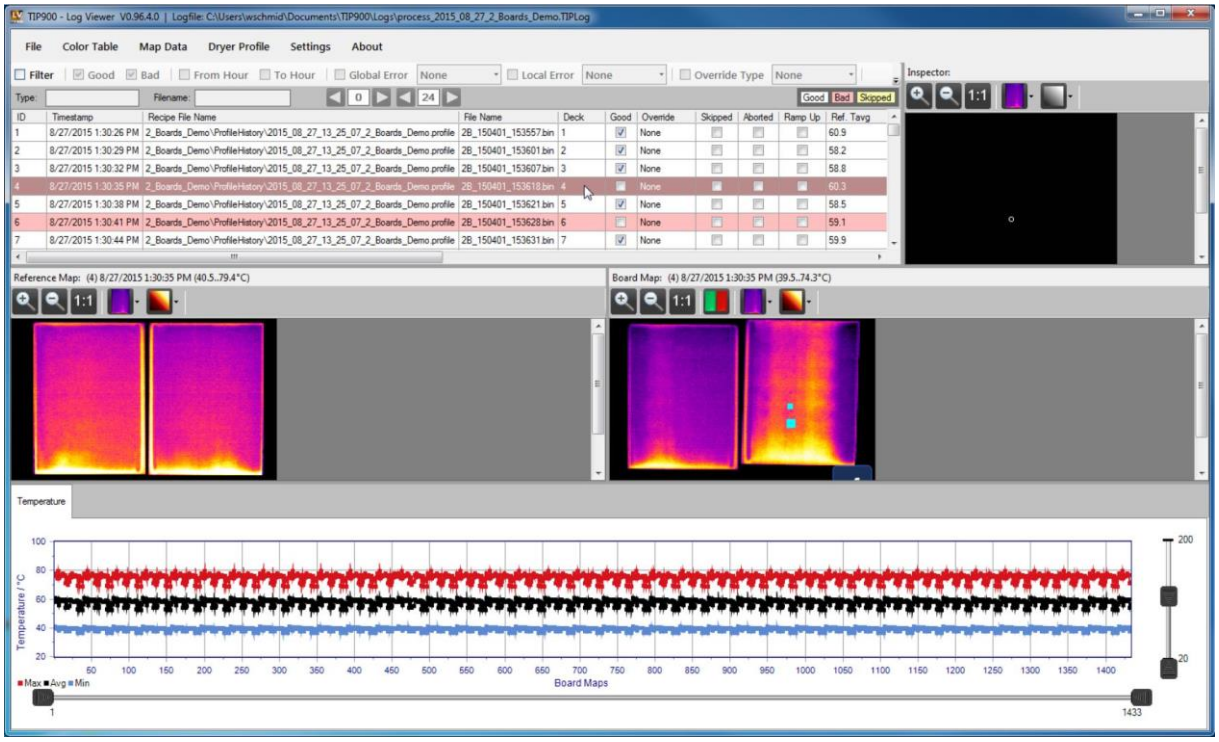


Figure 80: TIP900 – Log Viewer with selected and opened Logfile

The selected and opened Logfile is listed in a table view of archived board maps. Good and error free board map entries are in a white colored background. Bad and defective board map entries are marked with a light pink colored background. Skipped board maps are marked with a yellow background color. A selected board map for detailed inspection is marked in a blue colored background, if a good board map is chosen, in dark pink background color, if a bad board map is chosen.

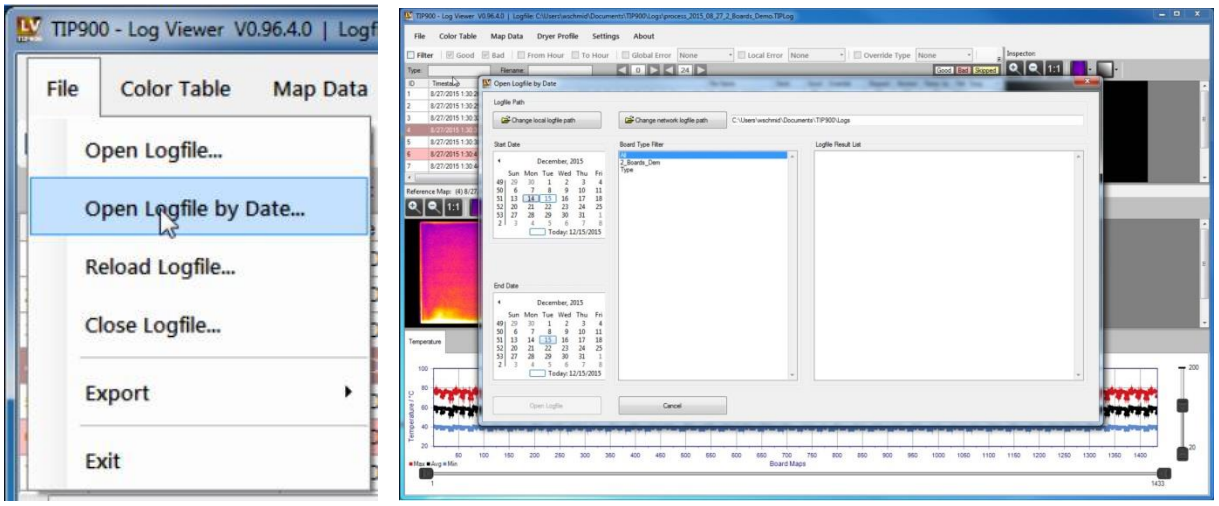


Figure 81: TIP900 – Log Viewer to open a Logfile by Date filtering

Select the known Logfile archive date and confirm in the subsequent window to open the individual marked file. If a board type name in the “Board Type Filter” field is selected and a date range is set, all archived Logfiles of the specific board type name in the given time frame will be opened. This is an easy way to find historical archived Logfiles and to open these for detailed inspection.

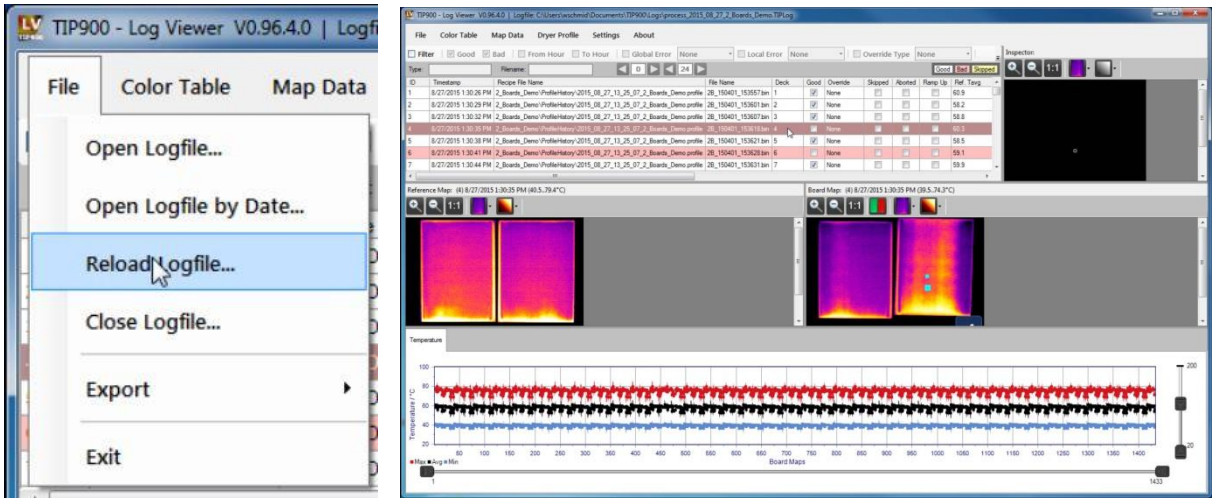


Figure 82: TIP900 – Log Viewer to reload an opened Logfile

The already opened Logfile is reloaded in case the logging process is still running and new board maps are archived during the inspection procedure. You've got also the choice to reload the opened Logfile by pressing the function key F5. The latest archived board maps are added to the last opened Logfile display table.

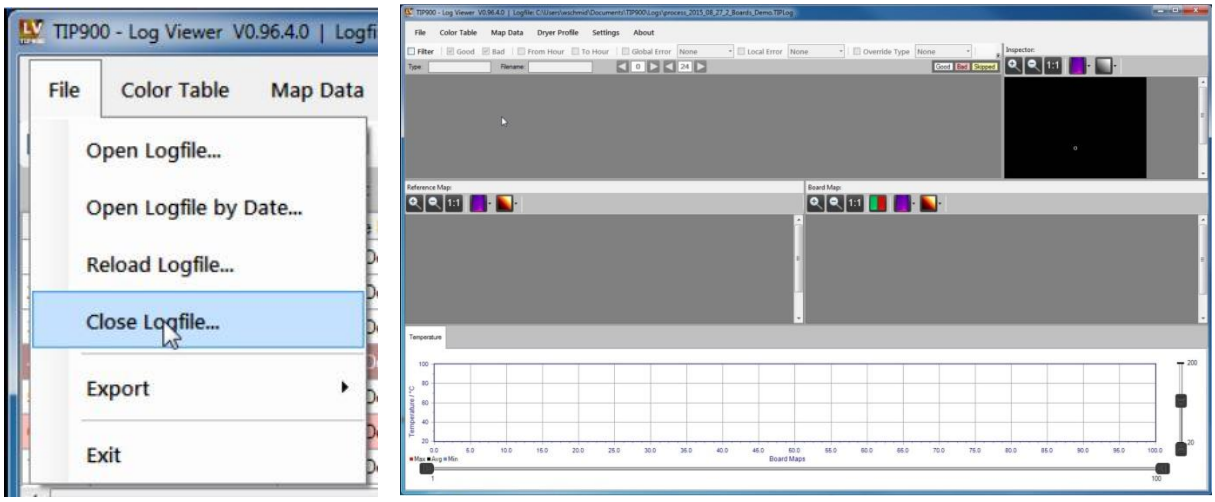


Figure 83: TIP900 – Log Viewer to close an opened Logfile

The last opened Logfile is closed and no further selection or filtering is possible. The Logfile is closed in the state, when it was opened. No operator or supervisor is able to modify any archived Logfile data content. Just the logging process itself is able to store the pure archived thermal image data in conjunction with the related recipe type.

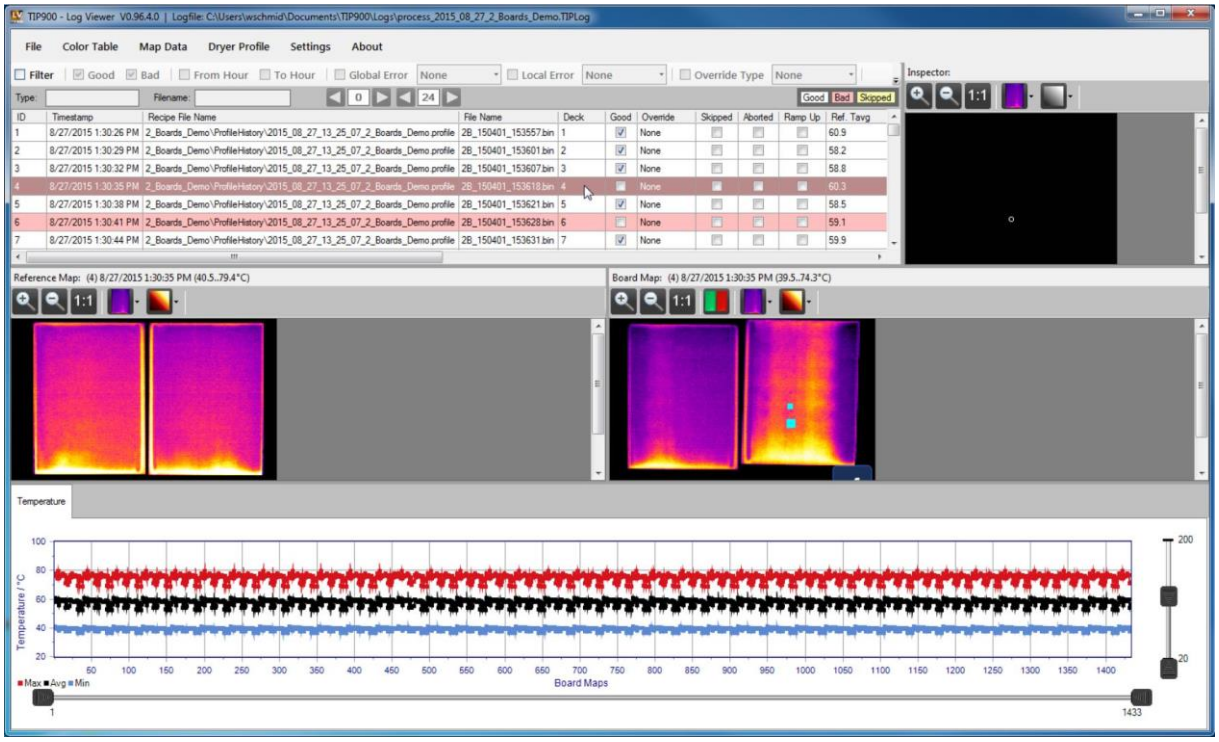


Figure 84: TIP900 – Log Viewer with selected and opened Logfile

The selected and opened Logfile is listed in a table view of archived board maps. Good and error free board map entries are in a white colored background. Bad and defective board map entries are marked with a light pink colored background. Skipped board maps are marked with a yellow background color. A selected board map for detailed inspection is marked in a blue colored background, if a good board map is chosen, in dark pink background color, if a bad board map is chosen.

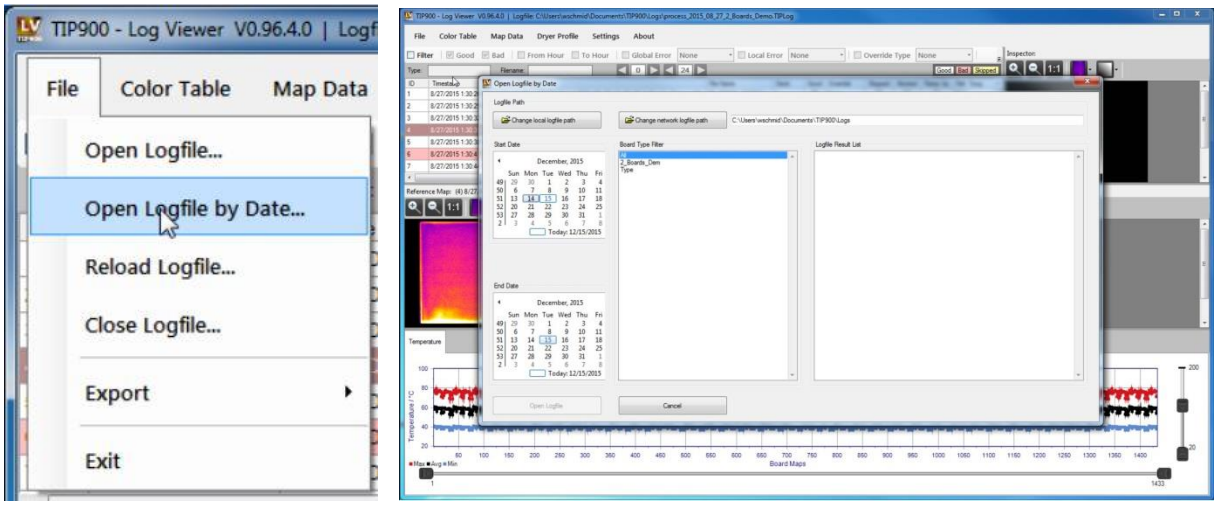


Figure 85: TIP900 – Log Viewer to open a Logfile by Date filtering

Select the known Logfile archive date and confirm in the subsequent window to open the individual marked file. It's an easy way to find historical archived Logfiles and to open these for detailed inspection.

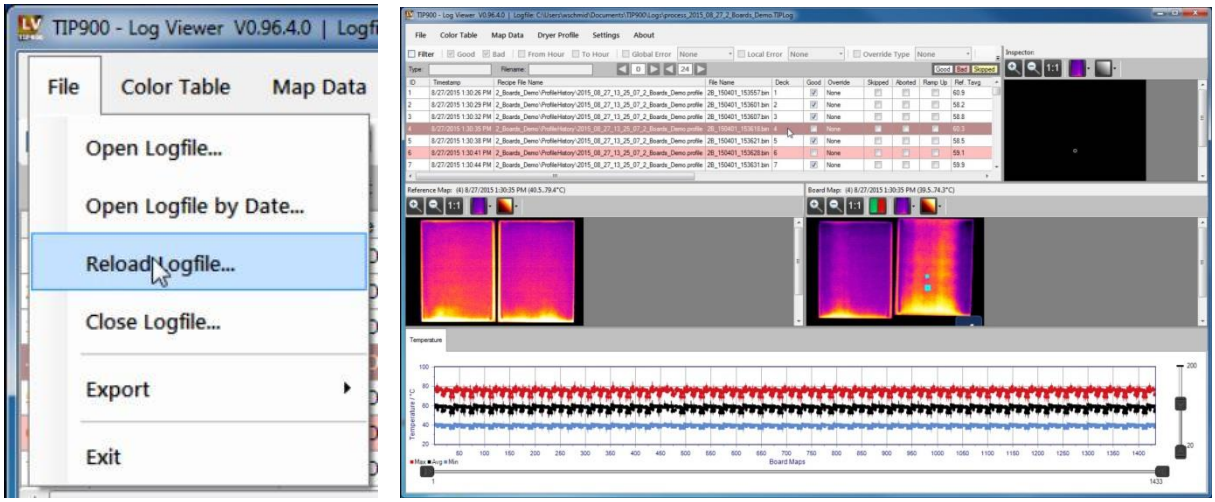


Figure 86: TIP900 – Log Viewer to reload an opened Logfile

The already opened Logfile is reloaded in case the logging process is still running and new board maps are archived during the inspection procedure. The latest archived board maps are added to the last opened Logfile display table.

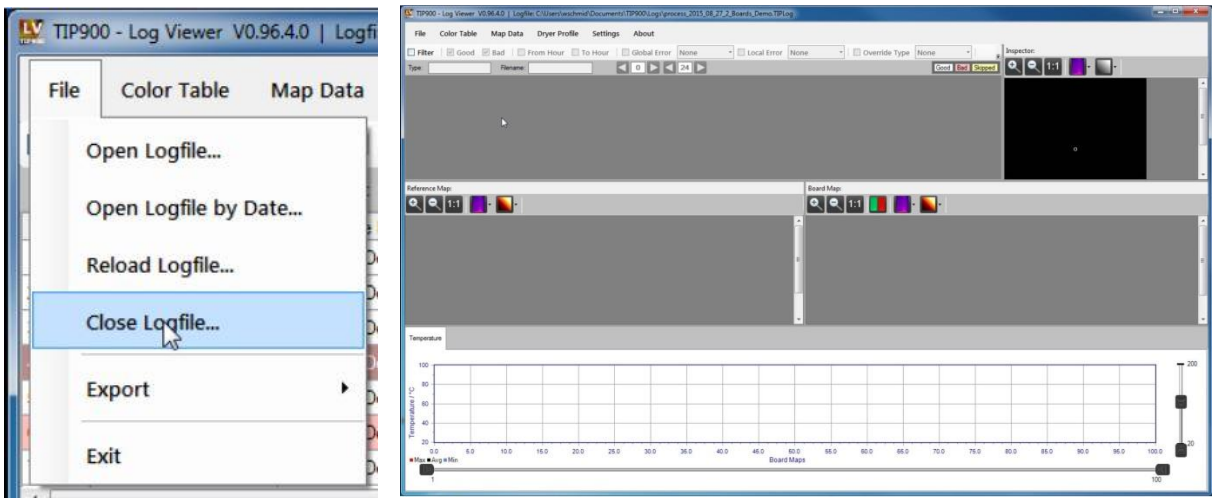


Figure 87: TIP900 – Log Viewer to close an opened Logfile

The last opened Logfile is closed and no further selection or filtering is possible. The Logfile is closed in the state, when it was opened. No operator or supervisor is able to modify any archived Logfile data content. Just the logging process itself is able to store the pure archived thermal image data in conjunction with the related recipe type.

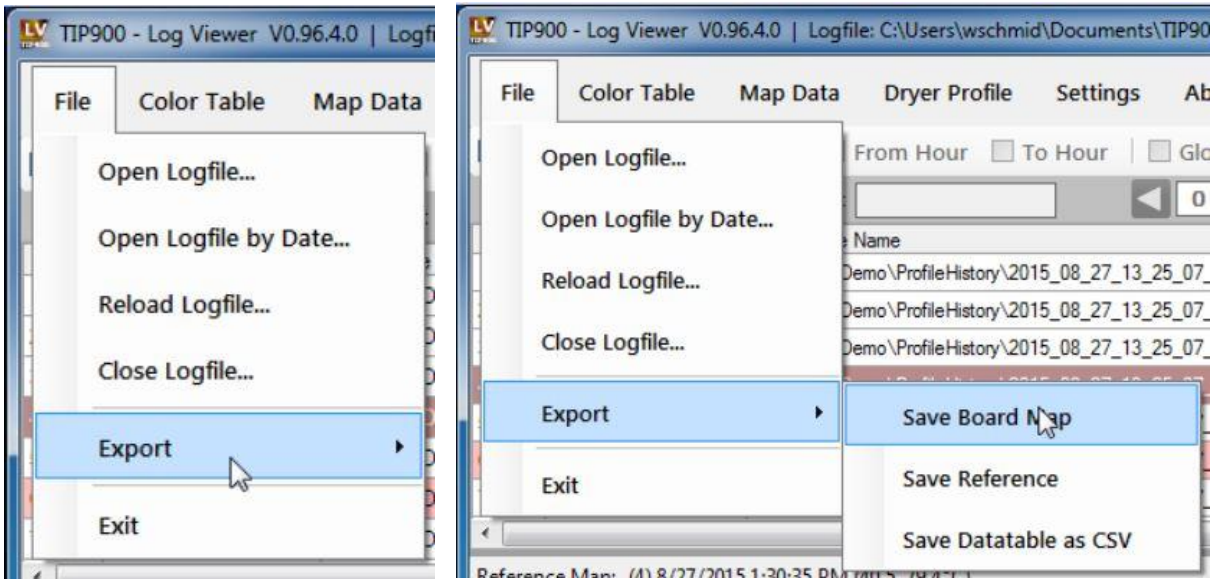


Figure 88: TIP900 – Log Viewer to export a board map in binary format

The selected blue or dark pink colored board map of the specific deck will be exported as a binary file to a destination folder of your own choice. You're able to save the selected board map in the *.bin, *.JPG and *.PNG file format. Select the folder of your choice in the subsequent window and confirm to save the binary file.

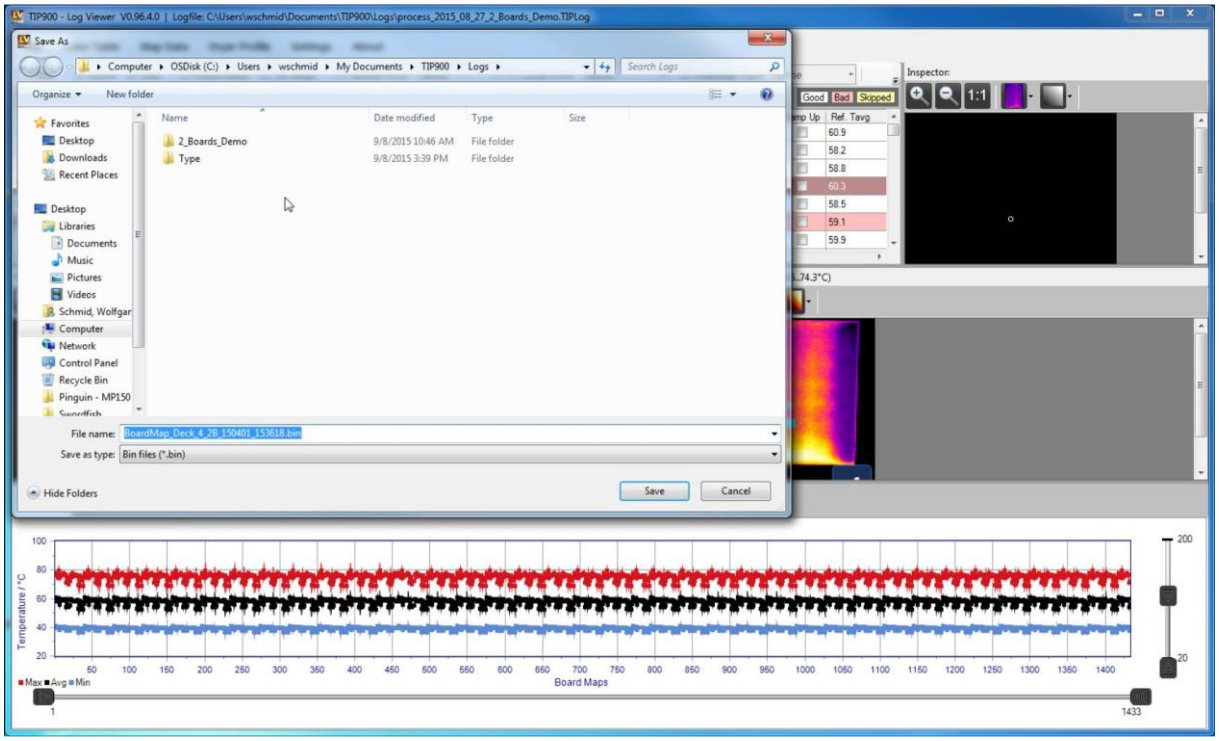


Figure 89: TIP900 – Log Viewer to save the selected board map in binary format

The save button confirms your selection and stores the board map binary file to a destination folder of your choice.

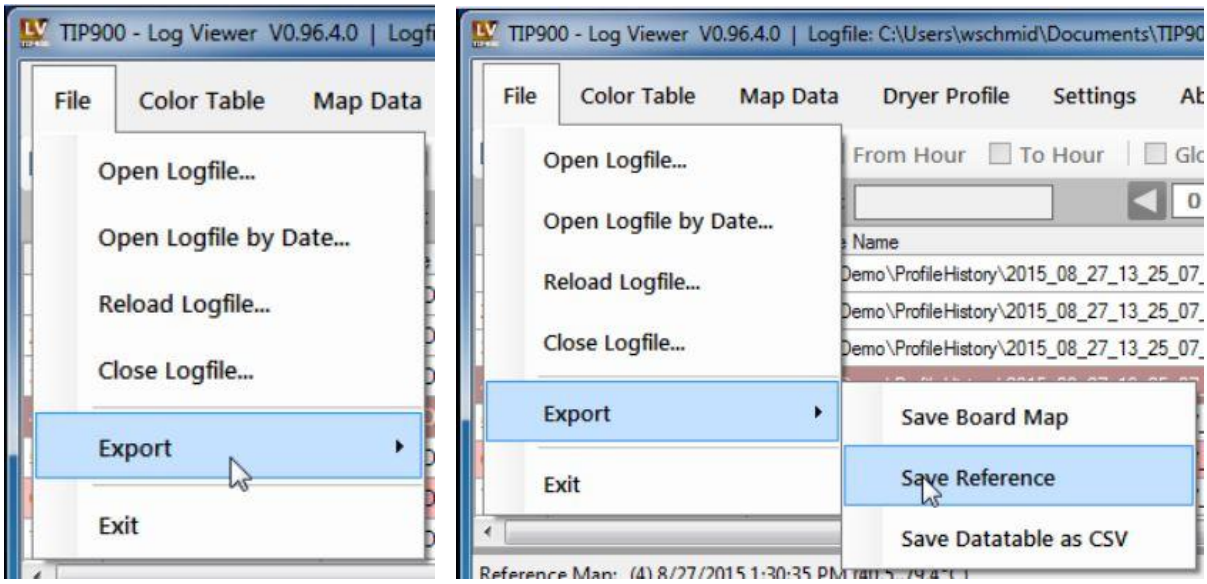


Figure 90: TIP900 – Log Viewer to export a reference board map in binary format

The assigned reference board map per deck of the selected board map will be exported as a binary file to a destination folder of your own choice. You're able to save the selected reference board map in the *.bin, *.JPG and *.PNG file format. Select the folder of your choice in the subsequent window and confirm to save the binary file.

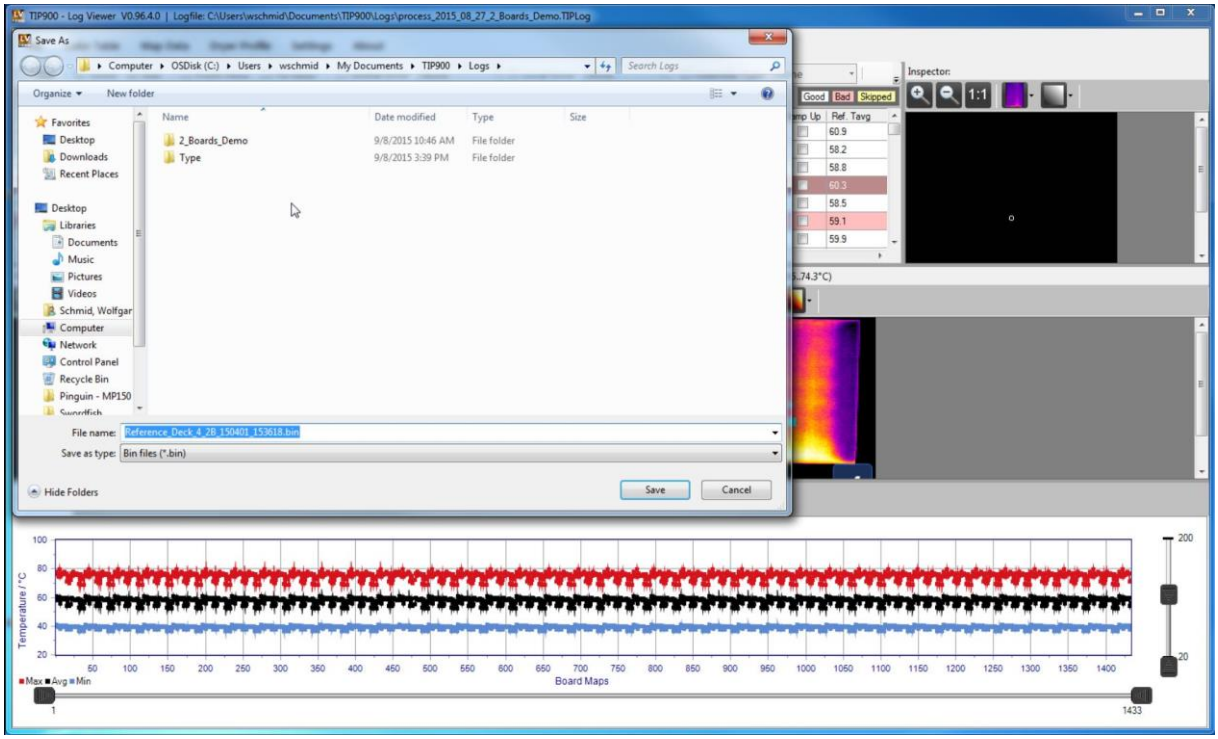


Figure 91: TIP900 – Log Viewer to save the selected reference board map in binary format

The save button confirms your selection and stores the reference board map binary file to a destination folder of your choice.

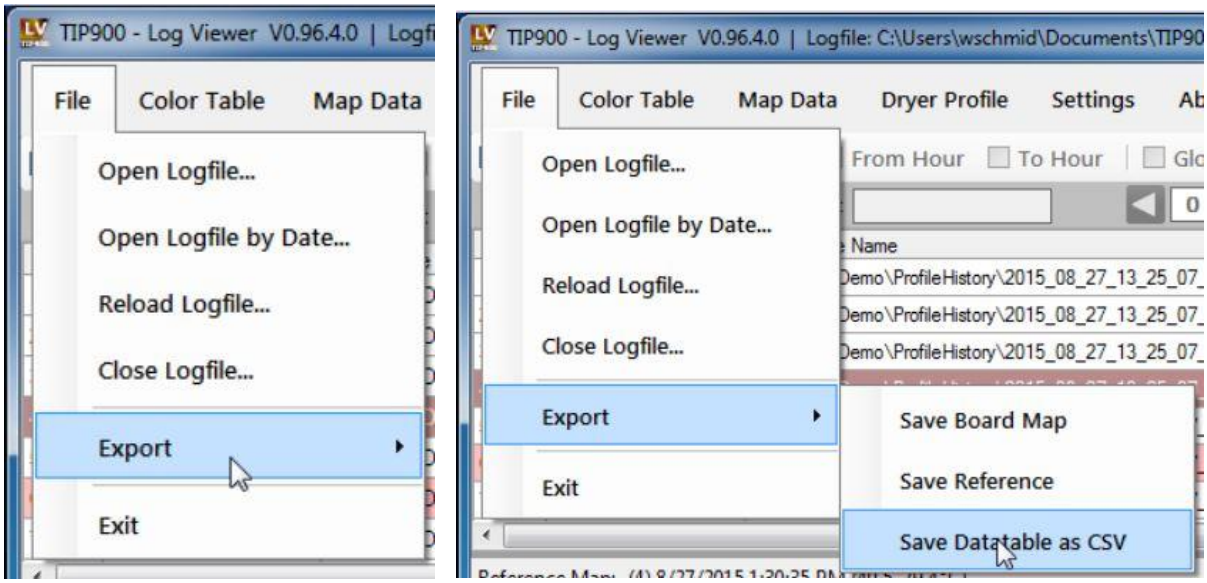


Figure 92: TIP900 – Log Viewer to export the board map data table in CSV format

The data table of the opened Logfile will be exported as a CSV (comma separated value) formatted file to a destination folder of your own choice. A CSV file export is generally used for further processing, analysis or statistical evaluations under spreadsheet programs like EXCEL. The export function into a CSV file is influenced by everything what is displayed in the LogViewer window. Especially all selected filters alter the CSV file content in a WYSIWYG manner

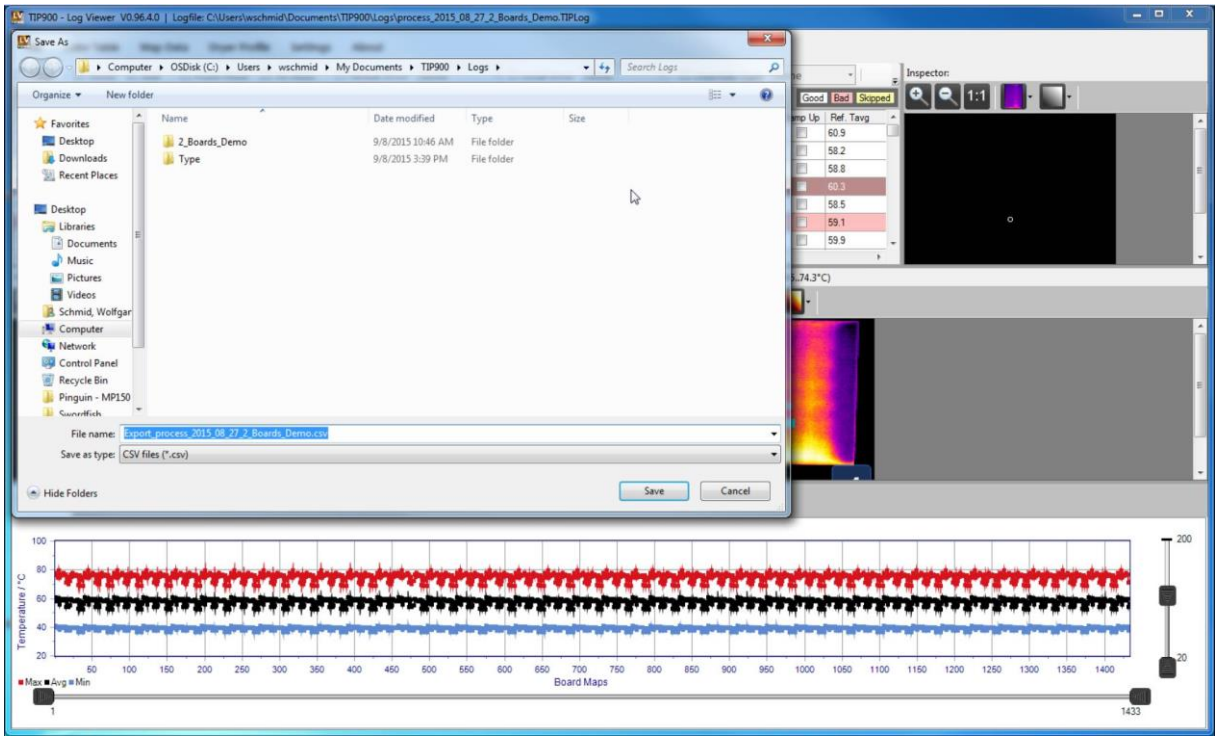


Figure 93: TIP900 – Log Viewer to save the board map data table in CSV format

The save button confirms your selection and stores the board map data table file to a destination folder of your choice.

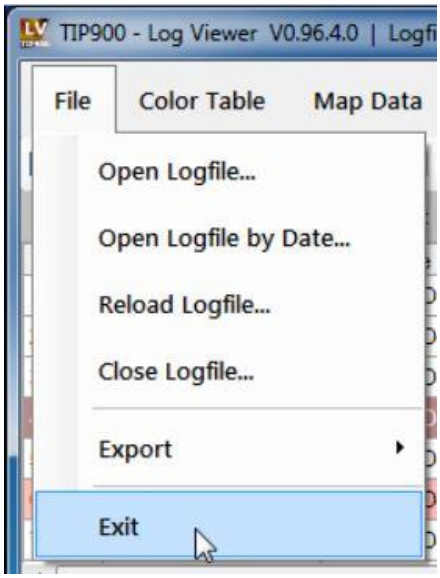


Figure 94: TIP900 – Log Viewer to exit/terminate the program

The exit field selection terminates the program execution and returns to the invoked user interface.

5.3.1.1.3 The Color Table selector in the menu bar

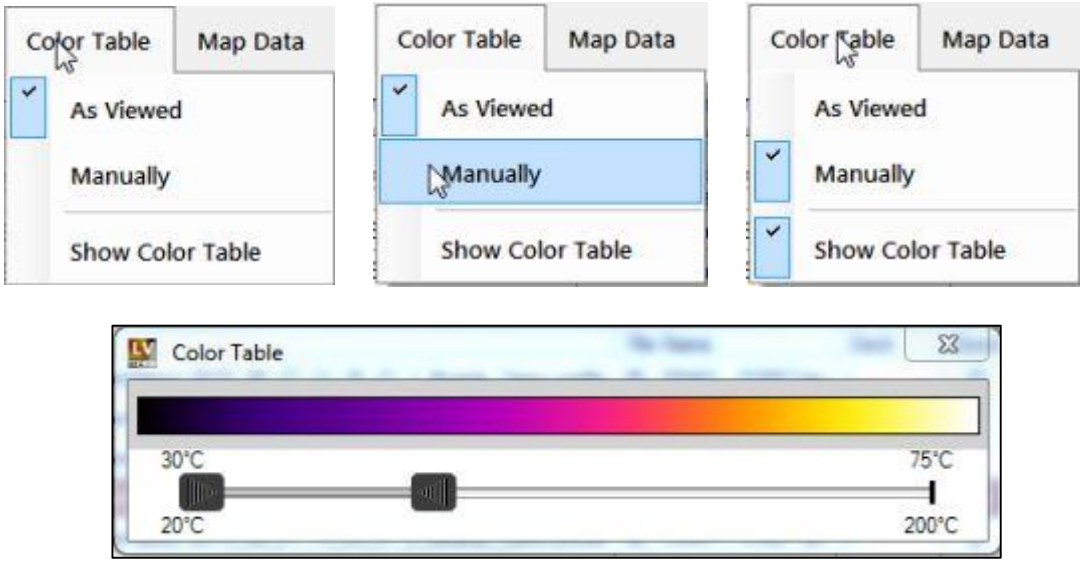


Figure 95: TIP900 – Log Viewer Color Table selections

Herewith the color to temperature assignment can be adapted for the image viewing of the archived board map data.

- As Viewed is the color table assignment, which were set during the data archiving process.
- Manually is the modified and manually assigned color table for the archived board maps.
- Show color table opens the color slider bar to adapt the displayed color to temperature assignment by individually shifting the lower and upper sliders.

5.3.1.1.4 The Map Data selector in the menu bar

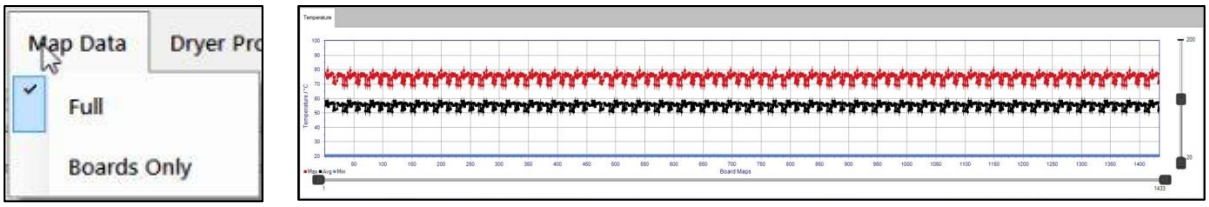


Figure 96: TIP900 – Log Viewer display of Full Map Data

The selection of “Full” map data calculates and displays the maximum, the average and minimum temperature values per scanned board map set, whereas “Full” takes also the non-board pixel into account for the calculation. The lower blue minimum temperature curve in Figure 96 represents more or less the board map background temperatures (black area around the boards), whereas the minimum temperature is close to the lowest acquired value (e.g. floor ambient temperature).

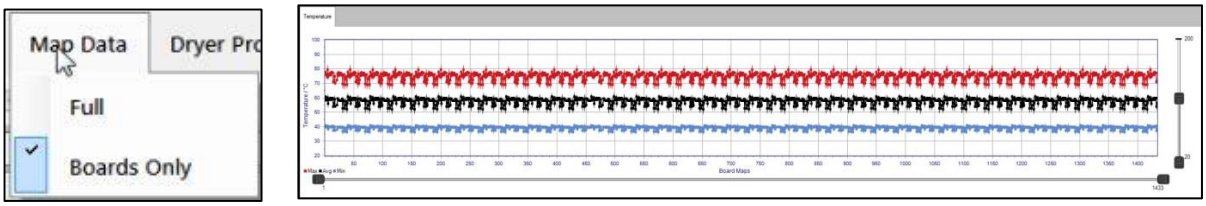


Figure 97: TIP900 – Log Viewer display of Boards Only Map Data

The selection of “Boards Only” map data calculates and displays the maximum, the average and minimum temperature values per scanned board map set, whereas “Boards Only” takes just the valid board pixel into account for the calculation. This display type selection represents the real temperature values of produced wallboard sets.

5.3.1.1.5 The Dryer Profile selector in the menu bar

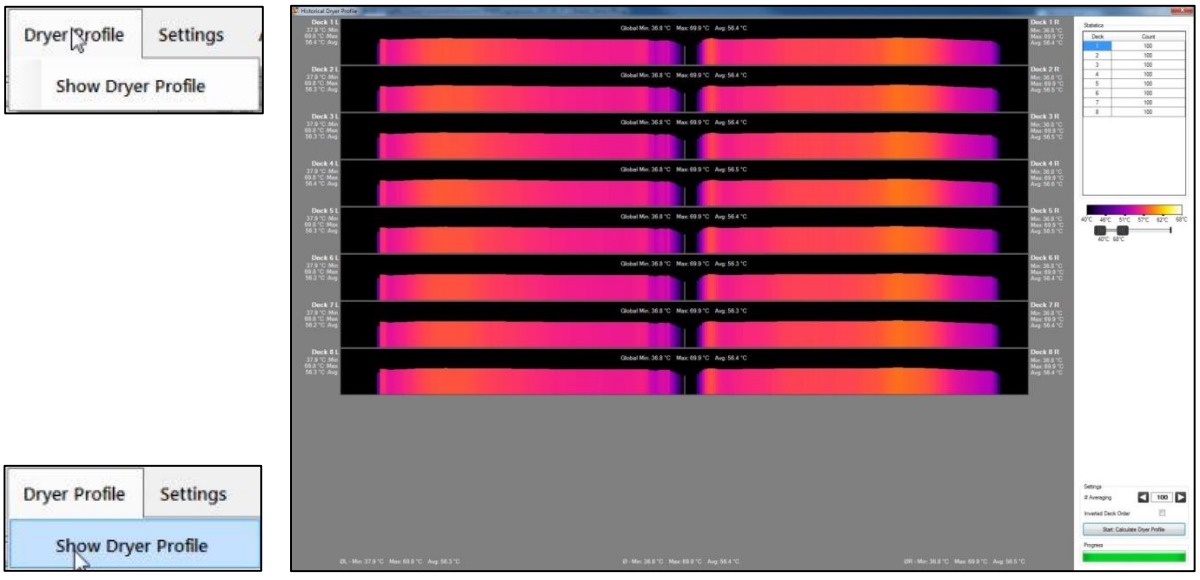


Figure 98: TIP900 – Log Viewer display of the Dryer Profile

The previous knowledge how the “Dryer Profile” works and where it’s based on:

- A starting point for the Dryer Profile has to be selected by clicking (highlighting) onto the last important line of archived board maps for the given board map binary archive file.
- The algorithm to generate the Dryer Profile works reverse from the last chosen (highlighted) board map entry and tries an averaging per deck regarding the preset average count. If the preset average count isn’t reached for any deck average calculation, an error message will be displayed to inform the user to review the board table and the average count.

After the selection of “Dryer Profile” and the confirmation to “Show Dryer Profile”, an empty (black) historical dryer profile will be displayed. First thing to do is to set the weighting factor for averaging in the right lower window corner. Afterwards click onto the “Start: Calculate Dryer Profile” button in the right lower display corner for the dryer profile calculation. The reverse averaging per deck starts, beginning from the last highlighted one up to the point, where the average weighting count for every deck is reached. Adapt the weighting factor for averaging in case of deck weighting problems. If you modify the weighting factor for averaging, please restart the calculation of the dryer profile and wait until it’s finished and the display is renewed. Above the “Start: Calculate Dryer Profile” button is an “Inverted Deck Order” checkbox, which can be activated to alter the deck display order.

5.3.1.1.6 The Settings selector in the menu bar

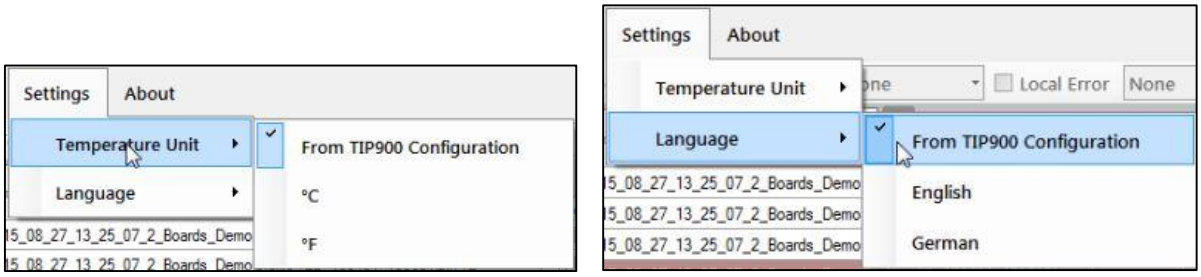


Figure 99: TIP900 – Log Viewer display to set temperature unit & language

The “Settings” selector is to set the display “Temperature Unit” and “Language”. For the temperature unit selection you can choose between the units, displayed in °C or °F. All installed display language variants will be listed, where you are able to select from.

5.3.1.1.7 The About selector in the menu bar

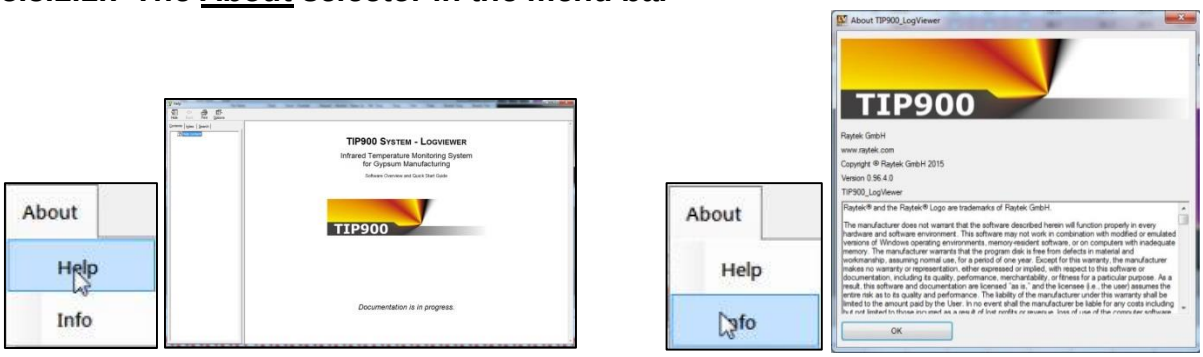
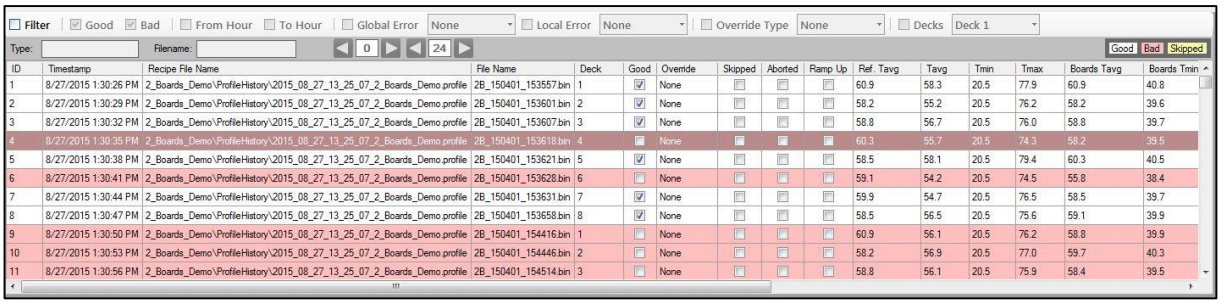


Figure 100: TIP900 – Log Viewer display About the integrated help function and SW information

- The TIP900 – LogViewer SW help function allows to search for several specific topics.
- The TIP900 – LogViewer information screen displays the creator, the copyright, the version and trademark information of the SW.

5.3.1.2 The TIP900-LogViewer binary archive file table domain ②



ID	Timestamp	Recipe File Name	File Name	Deck	Good	Override	Skipped	Aborted	Ramp Up	Ref. Tavg	Tavg	Tmin	Tmax	Boards Tavg	Boards Tmin
1	8/27/2015 1:30:26 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153557.bin	1	☑	None	☐	☐	☐	60.9	58.3	20.5	77.9	60.9	40.8
2	8/27/2015 1:30:29 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153601.bin	2	☑	None	☐	☐	☐	58.2	55.2	20.5	76.2	58.2	39.6
3	8/27/2015 1:30:32 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153607.bin	3	☑	None	☐	☐	☐	58.8	56.7	20.5	76.0	58.8	39.7
4	8/27/2015 1:30:35 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153618.bin	4	☐	None	☐	☐	☐	60.3	55.7	20.5	74.3	58.2	39.5
5	8/27/2015 1:30:38 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153621.bin	5	☑	None	☐	☐	☐	58.5	58.1	20.5	79.4	60.3	40.5
6	8/27/2015 1:30:41 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153628.bin	6	☐	None	☐	☐	☐	59.1	54.2	20.5	74.5	55.8	38.4
7	8/27/2015 1:30:44 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153631.bin	7	☑	None	☐	☐	☐	59.9	54.7	20.5	76.5	58.5	39.7
8	8/27/2015 1:30:47 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_153658.bin	8	☑	None	☐	☐	☐	58.5	56.5	20.5	75.6	59.1	39.9
9	8/27/2015 1:30:50 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_154416.bin	1	☐	None	☐	☐	☐	60.9	56.1	20.5	76.2	58.8	39.9
10	8/27/2015 1:30:53 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_154446.bin	2	☐	None	☐	☐	☐	58.2	56.9	20.5	77.0	59.7	40.3
11	8/27/2015 1:30:56 PM	2_Boards_Demo\ProfileHistory\2015_08_27_13_25_07_2_Boards_Demo.profile	2B_150401_154514.bin	3	☐	None	☐	☐	☐	58.8	56.1	20.5	75.9	58.4	39.5

Figure 101: TIP900 – Log Viewer binary archive file table domain

In the binary archive file table domain you have the choice to filter the whole list of archived board sets to your needs. By clicking the checkbox “Filter” you will be able to set additional different filter options to reduce the mass of listed map data entries. You are able to filter for good or bad board maps, localize the hour of archived board maps, filter for “Global” or “Local” errors and deck numbers. The selection of filters influences the amount of exported data into a CSV file, which could be used for further analysis in a spreadsheet program.

5.3.1.3 The TIP900-LogViewer board map inspector domain ③

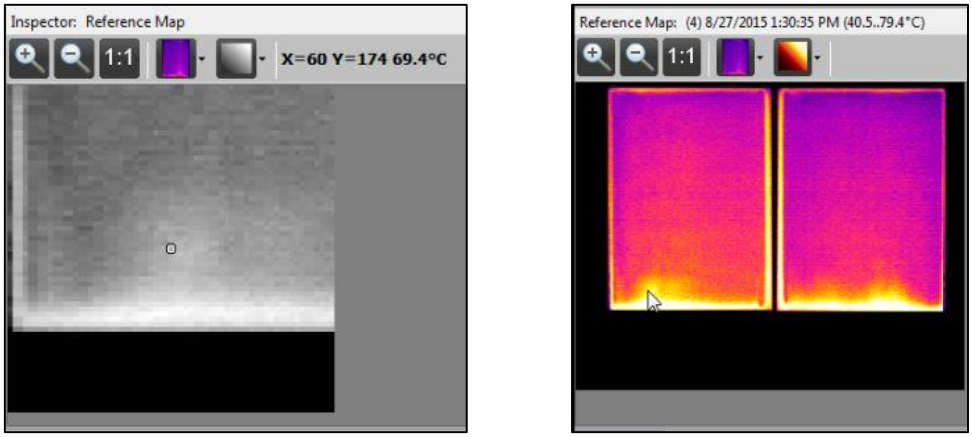


Figure 102: TIP900 – Log Viewer board map inspection of a reference board map

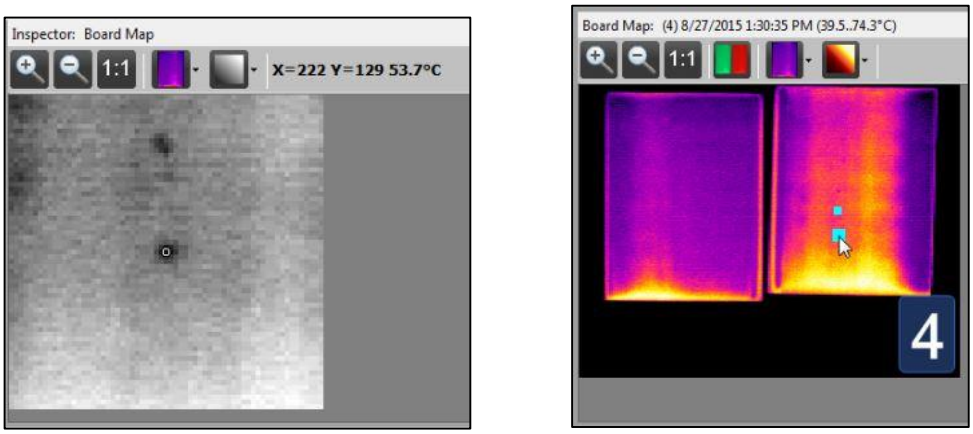


Figure 103: TIP900 – Log Viewer board map inspection of a scanned board map

The board map inspector domain is for detailed inspection of archived board maps and their assigned reference board maps. Wherever you place the current cursor, either on the reference board map display domain or archived board map display domain, see chapters 5.3.1.4 and 5.3.1.5, the cursor position is displayed in a centralized manner in the board map inspector display domain. In Figure 102 and Figure 103 you see the currently placed cursor in the reference board map domain and the scanned archived board map domain, displayed centralized in the inspector board domain. The chosen inspector view is in levels of gray. All three (3) display domains 5.3.1.3, 5.3.1.4 and 5.3.1.5 have identical display functionality and operator push buttons for zooming, return to 1:1 standard size, image or horizontal slice view, gray level or color view.

5.3.1.4 The TIP900-LogViewer dryer deck specific reference board map display domain ④

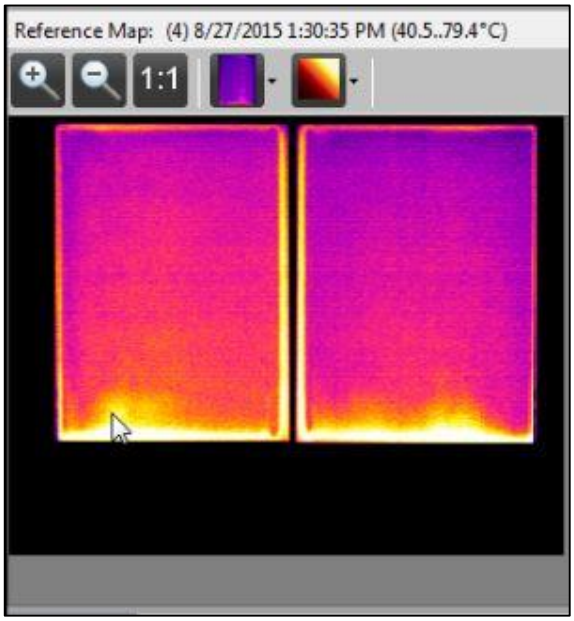


Figure 104: TIP900 – Log Viewer reference board map display domain

The dryer deck specific reference board map display domain is for finding and inspecting abnormalities of assigned reference board maps. Wherever you place the current cursor, its position is displayed in a centralized manner in the board map inspector display domain, see chapter 5.3.1.3. The five (5) operator push buttons are for zooming in and out, return to 1:1 standard size, image or horizontal slice view, gray level or color view.

5.3.1.5 The TIP900-LogViewer dryer deck related archived board map display domain ⑤

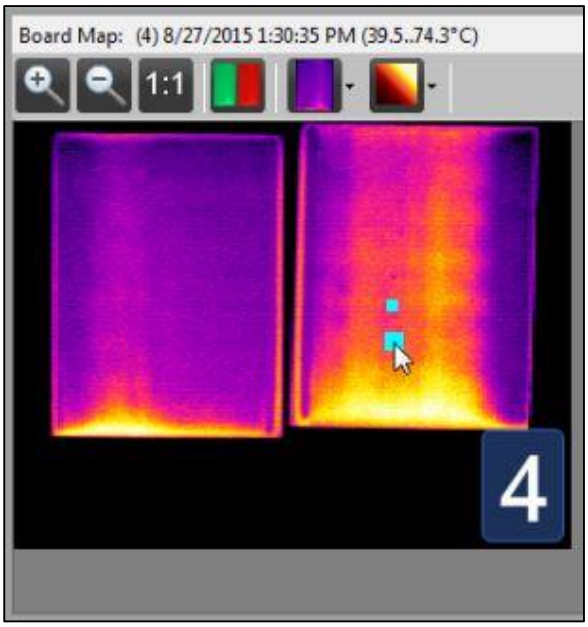


Figure 105: TIP900 – Log Viewer archived board map display domain

The archived board map display domain is for finding and inspecting abnormalities of scanned and archived board maps. Wherever you place the current cursor, its position is displayed in a centralized manner in the board map inspector display domain, see chapter 5.3.1.3. The six (6) operator push buttons are for zooming in and out, return to 1:1 standard size, identification of good (green) or bad (red) borads in set, image or horizontal slice view, gray level or color view.

5.3.1.6 The TIP900-LogViewer historical board map temperature display domain ⑥

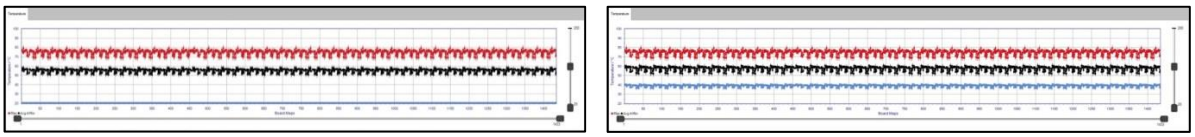


Figure 106: TIP900 – Log Viewer of "Full Map Data" & "Boards Only Map Data"

The historical board map temperature display domain shows the minimum, average and maximum temperature of each scanned deck specific board set. Please see chapter 5.3.1.1.4 for detailed information regarding the data content of both upper map data displays.

Two selection sliders allow reducing or expanding the display range for the board map numbers and the temperature. The lower slider localizes the displayed board map numbers out of the whole archived set of board map data. This expands the view onto specific board map zones. The right hand side slider localizes the displayed temperature range. A stretching or shrinking allows a closer view onto specific zones.

6. Configuration

It is strongly recommended to run the TIP900 software exclusively on the PC! Other applications could affect function and performance.

For the TIP900 system, it is necessary to disable Windows default power management settings in order to avoid that the computer goes to sleep automatically.

Make sure that a possible firewall does not block needed communication ports

The following sections of this manual describe the HW and SW configuration of the TIP900 system.

A complete configuration requires the following steps:

1. Installation of the system software.
2. Configure the system HW and SW.

Before proceeding with the following sections please ensure that the physical installation (communication and power wiring, air, water if necessary, etc.) is completed and working satisfactorily.

6.1 TIP900 HW Configuration

The manufacturer preconfigures all TIP900 hardware items, which are shipped to customers. A final customer specific configuration has to be made on-site the customers premises during system installation.

6.2 TIP900 SW Configuration

The TIP900 SW package will be already preinstalled and preconfigured by the manufacturer. All HW and SW items are tested in an overall system test, prior to shipment. Customer and production (recipe) specific configuration tasks have to be performed by trained and authorized personnel. Please refer to chapter 5.2.1.1.2 until 5.2.1.1.7 for all relevant SW configuration items, which are modifiable by the supervisor.

7. Options

7.1 TIP900SYSPCST (Pedestal for Touch-Panel PC)

The option item can be ordered in association with the TIP900SYS order, if this is the preferred Touch-Panel PC mounting method. Please refer to chapter 4.6.1 for detailed installation dimensions.

7.2 TIP900SYSPCAF (Swiveling Supporting Arm Touch-Panel PC)

The option item can be ordered in association with the TIP900SYS order, if this is the preferred Touch-Panel PC mounting method. Please refer to chapter 4.6.1 for detailed installation dimensions.

Pay particular attention to the safety instructions regarding wall/rack mounted devices with overhang. Determine the right mounting loads and consider Figure 33: Load diagram for wall mounted swiveling supporting arm, to avoid device damage and personal injury.

8. Accessories

Accessories include items that may be ordered at any time and added on-site.

8.1 TIP900-PCST (Pedestal for Touch-Panel PC)

The accessory item can be ordered at any time or in association with the TIP900SYS order, if this is the preferred Touch-Panel PC mounting method. Please refer to Figure 6: Options to fix the Industrial Touch-Panel PC and chapter 4.6.1 for detailed installation dimensions.

8.2 TIP900-PCAF (Swiveling Supporting Arm for Touch-Panel PC)

The accessory item can be ordered at any time or in association with the TIP900SYS order, if this is the preferred Touch-Panel PC mounting method. Please refer to Figure 6: Options to fix the Industrial Touch-Panel PC and chapter 4.6.1 for detailed installation dimensions.

8.3 TIP900-HSFIC4 (High Speed Fiber Optic / RJ45 Converter Set)

The high-speed fiber optic to LAN/RJ45 converter set consists of two (2) converters, a 2m long standard Cat5e LAN/Ethernet cable and a 2m long fiber optic cable with SC-type connectors. To bridge distances > 80m (262 ft.) by a fiber optic link, it is under the customers responsibility to provide and establish such link. Please see Figure 1: Example of fiber optical link to overcome large network distances and chapter 3.1.6 for detailed information regarding the converter, the optical connector and fiber specification.

8.4 TIP900-ETHLTCB (7.5m, 25ft Ethernet Cable, Cat5, 70°C)

The 4-conductor shielded connecting cable (7.5m, Cat5, 70°C) is used to link the Temperature Compensation Connection Box to a LAN/Ethernet device. It is a standardized cable, equipped with a M12 4-pin connector type, D-coded, suited for industrial Ethernet with IP67 protection rate and a screw retention feature on one side and a RJ45 connector type on the counter side.

8.5 TIP900-ETHLTCB15 (15m, 49ft Ethernet Cable, Cat5, 70°C)

The 4-conductor shielded connecting cable (15m, Cat5, 70°C) is used to link the Temperature Compensation Connection Box to a LAN/Ethernet device. It is a standardized cable, equipped with a M12 4-pin connector type, D-coded, suited for industrial Ethernet with IP67 protection rate and a screw retention feature on one side and a RJ45 connector type on the counter side.

8.6 TIP900-ETHLTCB30 (30m, 98ft Ethernet Cable, Cat5, 70°C)

The 4-conductor shielded connecting cable (30m, Cat5, 70°C) is used to link the Temperature Compensation Connection Box to a LAN/Ethernet device. It is a standardized cable, equipped with a M12 4-pin connector type, D-coded, suited for industrial Ethernet with IP67 protection rate and a screw retention feature on one side and a RJ45 connector type on the counter side.

9. Appendix

9.1 Software Installation on Touch-Panel PC

The software installation process requires full local administrator rights, whereby the administrator requires a dedicated password.

It is strongly recommended to switch off the automatic Windows-Update process for the operating system before installing the TIP900 software!

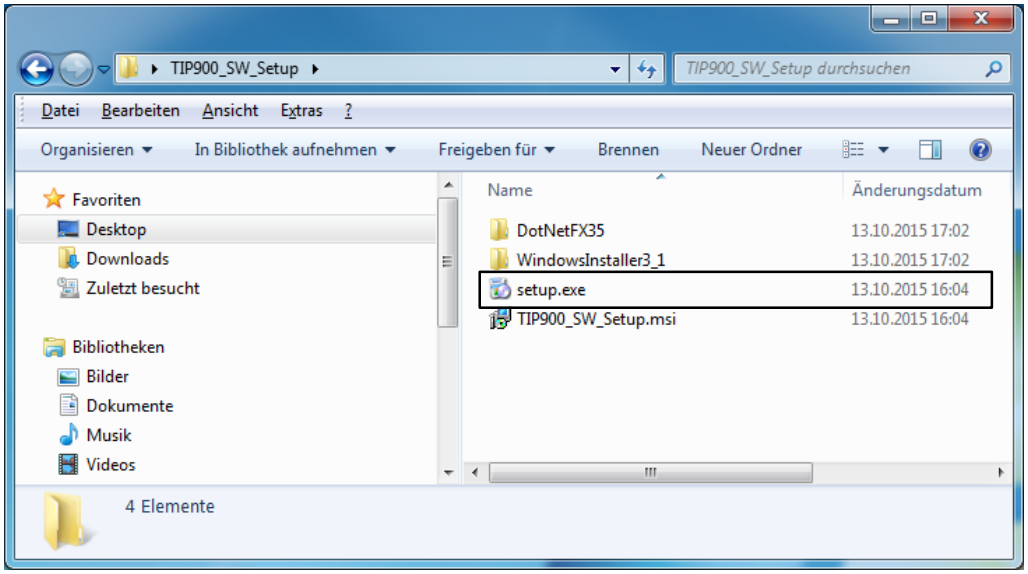
Disable all energy saving functions of the operating system like automatic shutdown, energy saving modes, and hard drive spin down!

Maintenance tasks like virus scan, hard disc defragmentation or other processing time influences shouldn't started automatically. Such tasks have to be scheduled and integrated in the factory maintenance time schedule!

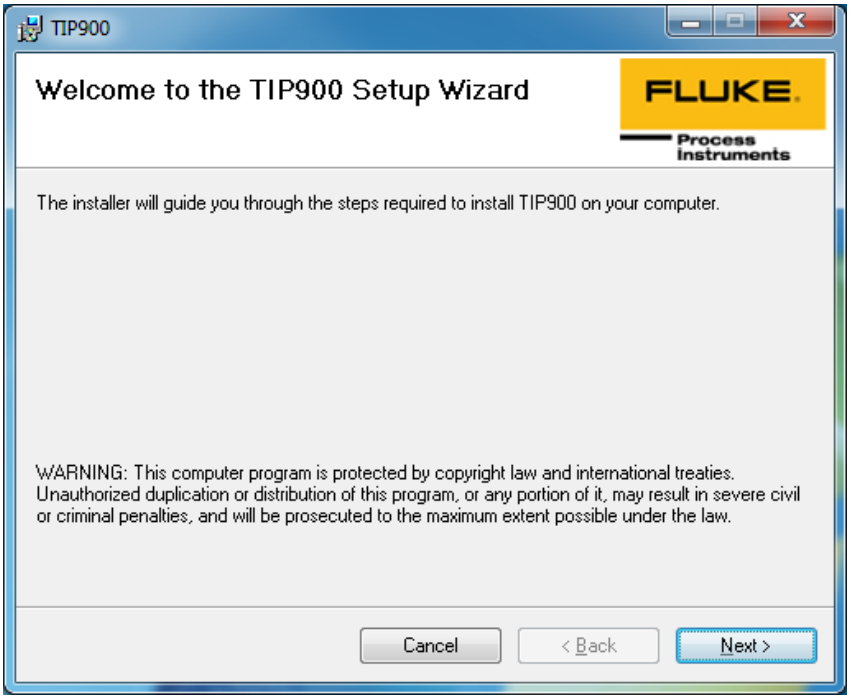
-- Important rule to follow, if the subsequent SW installation is a SW update to a previous one --

- Please de-install under the MS-Windows complete the former TIP900 SW version
- Restart the Touch-Panel PC and login as an administrator with full permissions

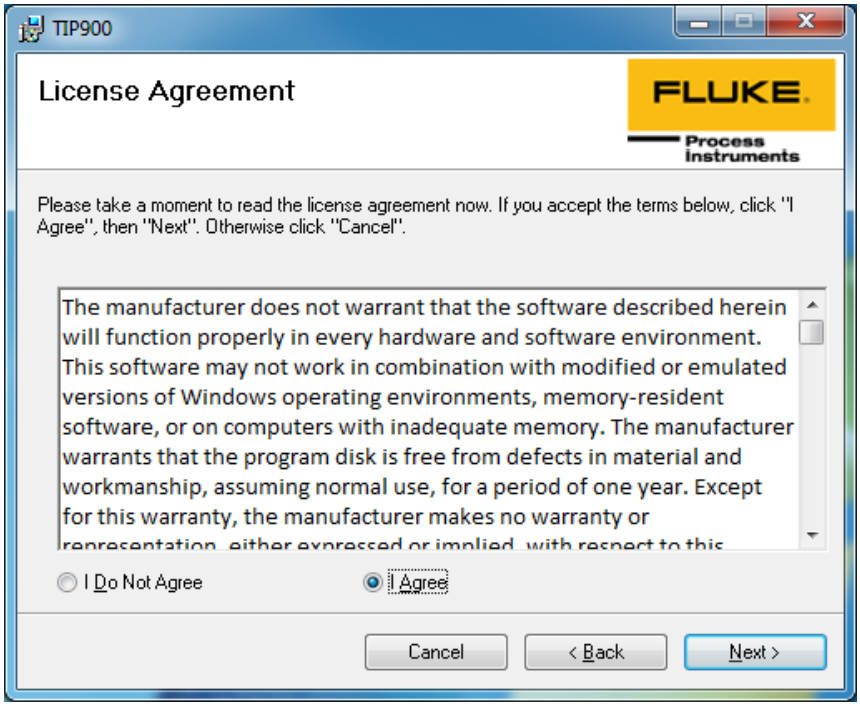
Insert the TIP900 SW-DVD or a storage medium with the installation program on it.



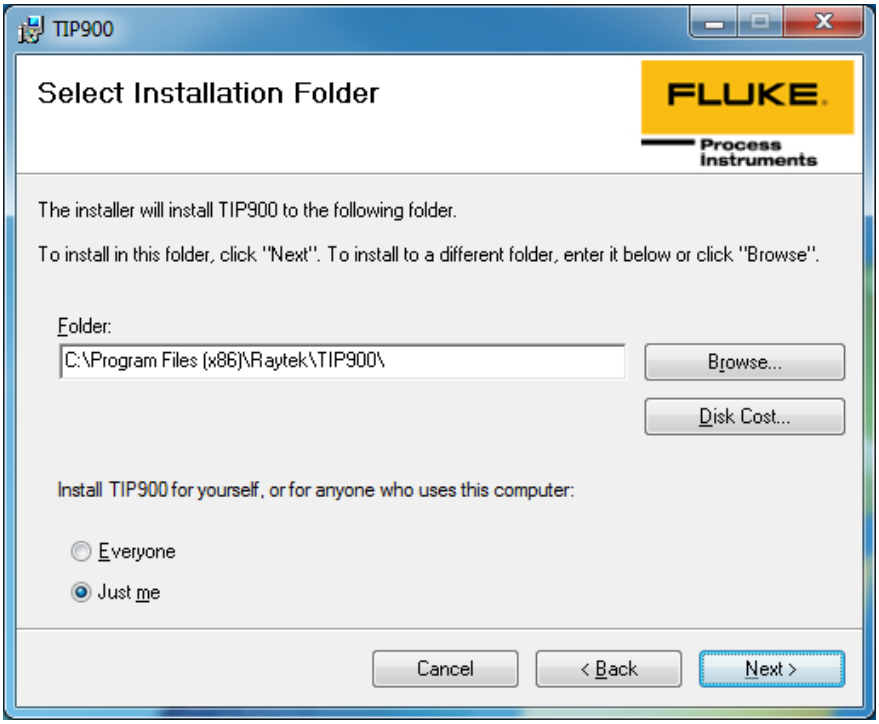
Double click on the <Setup.exe> file. The install setup application will start, showing the following screens in a sequential order.



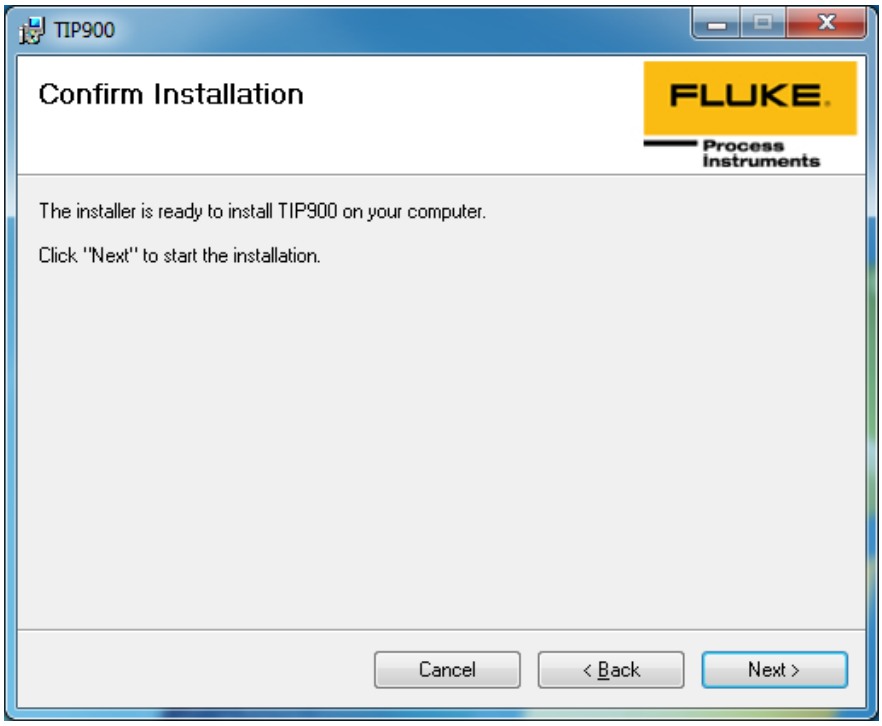
Confirm the first install screen with the warning hint by clicking on Next >!



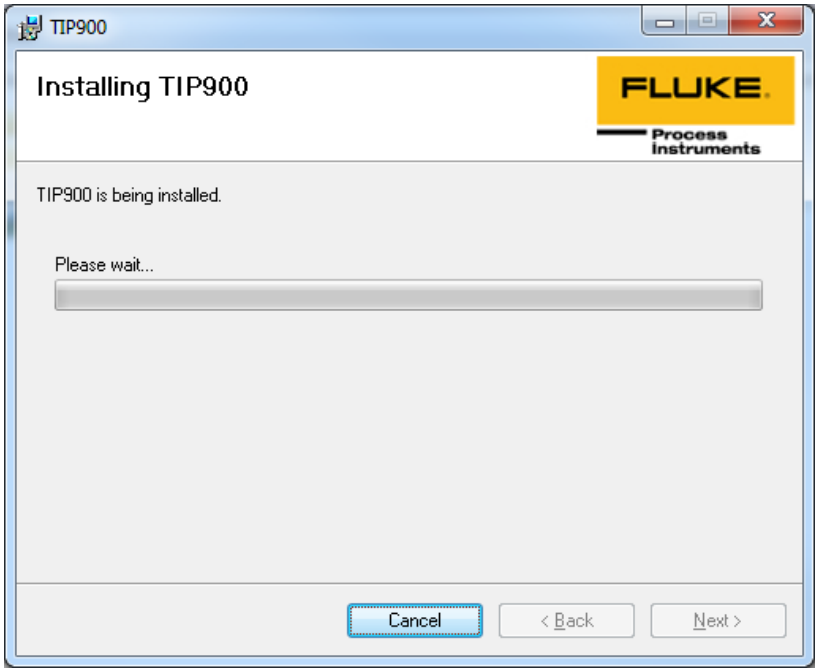
Click on the Check-Button “I Agree” and confirm the license agreement text by clicking on Next >!



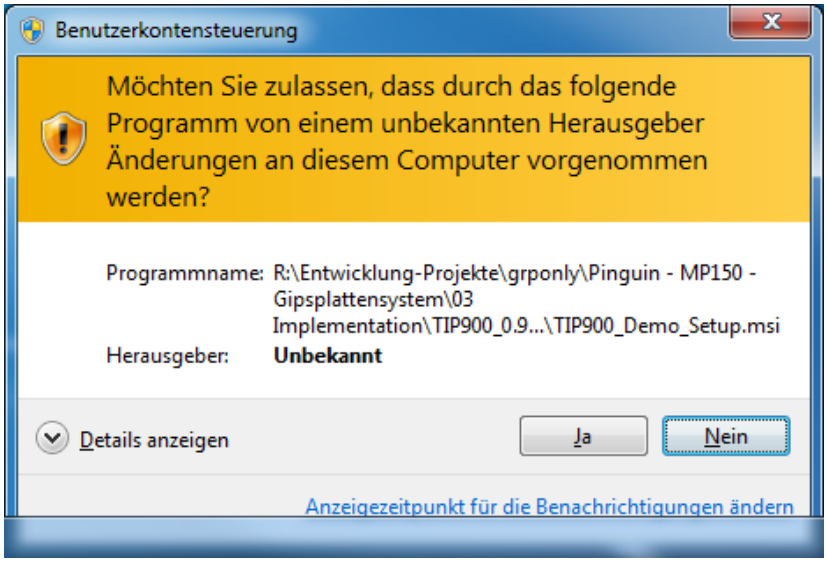
Decide, if “Everyone” or “Just me” should be able to use the installed TIP900 software by clicking the Check-Button of your choice. It’s recommended to leave the suggested folder name unchanged, to ease remote trouble reporting and offsite support. Confirm your selection by clicking on Next >!



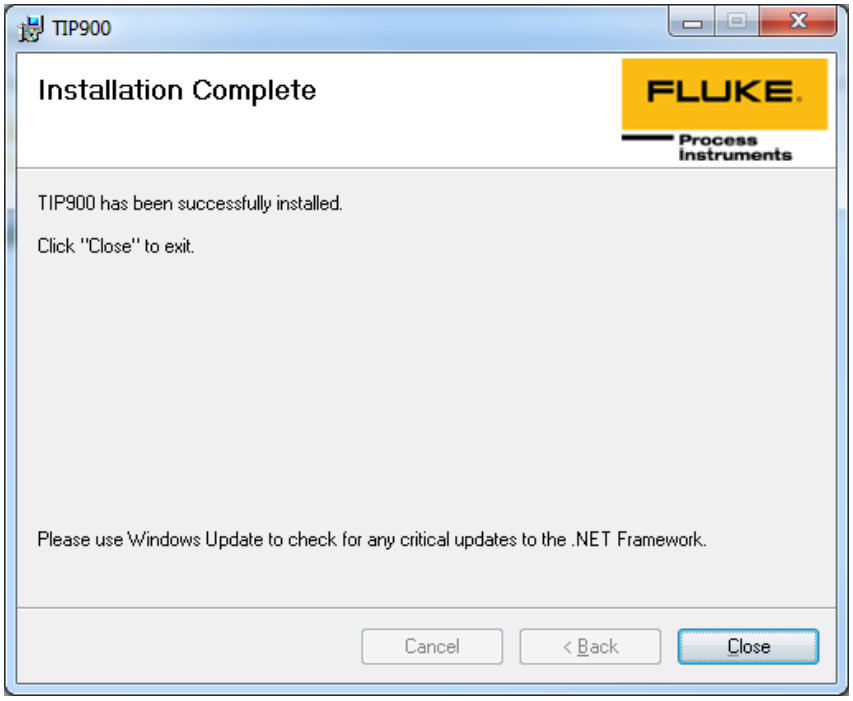
Confirm the TIP900 software installation process by clicking on Next >!



Information screen shows, that the TIP900 software is being installed. This could take some seconds.



User Account Control screen asks to permit the installation of the TIP900 software with all changes on the computer. Please confirm and permit by clicking on the “Yes” Button.



Read the final installation indication and close the installation by clicking on the “Close” Button.