Instructions for set-up

Fluid monitoring system
Application solution extension

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Contents

1 Preliminary note

ℹ You will find detailed instructions, technical data, approvals and further information using the QR code on the individual units / packagings or at www.ifm.com.

1.1 Symbols used

▶ Instruction
> Reaction, result
[...] Designation of keys, buttons or indications
→ Cross-reference

⚠ Important note
Non-compliance may result in malfunction or interference.

ℹ Information
Supplementary note.

1.2 Further documents

● Quick reference guide fluid monitoring system

● Operating instructions flow meter

● Operating instructions temperature transmitter

● Operating instructions IO-Link masters

● Operating instructions power supply

● Operating instructions Ethernet switch

● Software manual LR DEVICE

● Software manual LR SMARTOBSERVER

ℹ The documents can be downloaded at: www.ifm.com

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2 Safety instructions

- The devices described are integrated into a system as components.

  – The system manufacturer is responsible for the safety of the system.

  – The system creator undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the manufacturer of the system.

  – The system manufacturer is responsible for the functioning of the application programs.

- Read this document before setting up the product and keep it during the entire service life.

- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.

- Only use the product for its intended purpose (→ 3 Functions and features)

- Only use the product for permissible media (→ Technical data).

- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.

- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.

- Protect units and cables against damage.

[!] ► Read the instructions of the individual components of the application package before use.

3 Functions and features

The product package is used to monitor cooling water systems.

It allows the detection of malfunctions such as soiling, flow disturbances, leakages or loss of a welding tip.

The sensors of the fluid monitoring system detect the process values flow velocity, flow quantity, consumed quantity and medium temperature and transmit these process values to an IO-Link master via an IO-Link interface.

[i] The following applies to the SM6000 flow meter:
The device complies with the Pressure Equipment Directive and is designed and manufactured for group 2 fluids in accordance with the sound engineering practice. Use of media from group 1 fluids on request.

4 Function

4.1 Fluid monitoring system

The ZZ0600 fluid monitoring system contains the following components:

● SM6000 flow meter for monitoring and display of the flow temperature and the cooling water volumetric flow quantity. The setting of 2 switch points allows the detection of overflow (leakage / burst pipes / worn caps).

● Line regulator valve to regulate the volumetric flow quantity

● TA2405 temperature sensor to monitor the return temperature

The fluid monitoring system transfers the process values to an IO-Link master via the IO-Link interface. The parameters are set using the LR DEVICE parameter setting software.

4.2 IO-Link masters

The IO-Link master serves as a gateway for the process data of the connected sensors. The IO-Link master enables setting of the parameters of the connected sensors via the LR DEVICE parameter setting software.

4.3 Industrial PC

The industrial PC offers the following functions:

● Parameter setting of the IO-Link master and the connected sensors with LR DEVICE

● Monitoring of the process data of the fluid monitoring system with LR SMARTOBSERVER
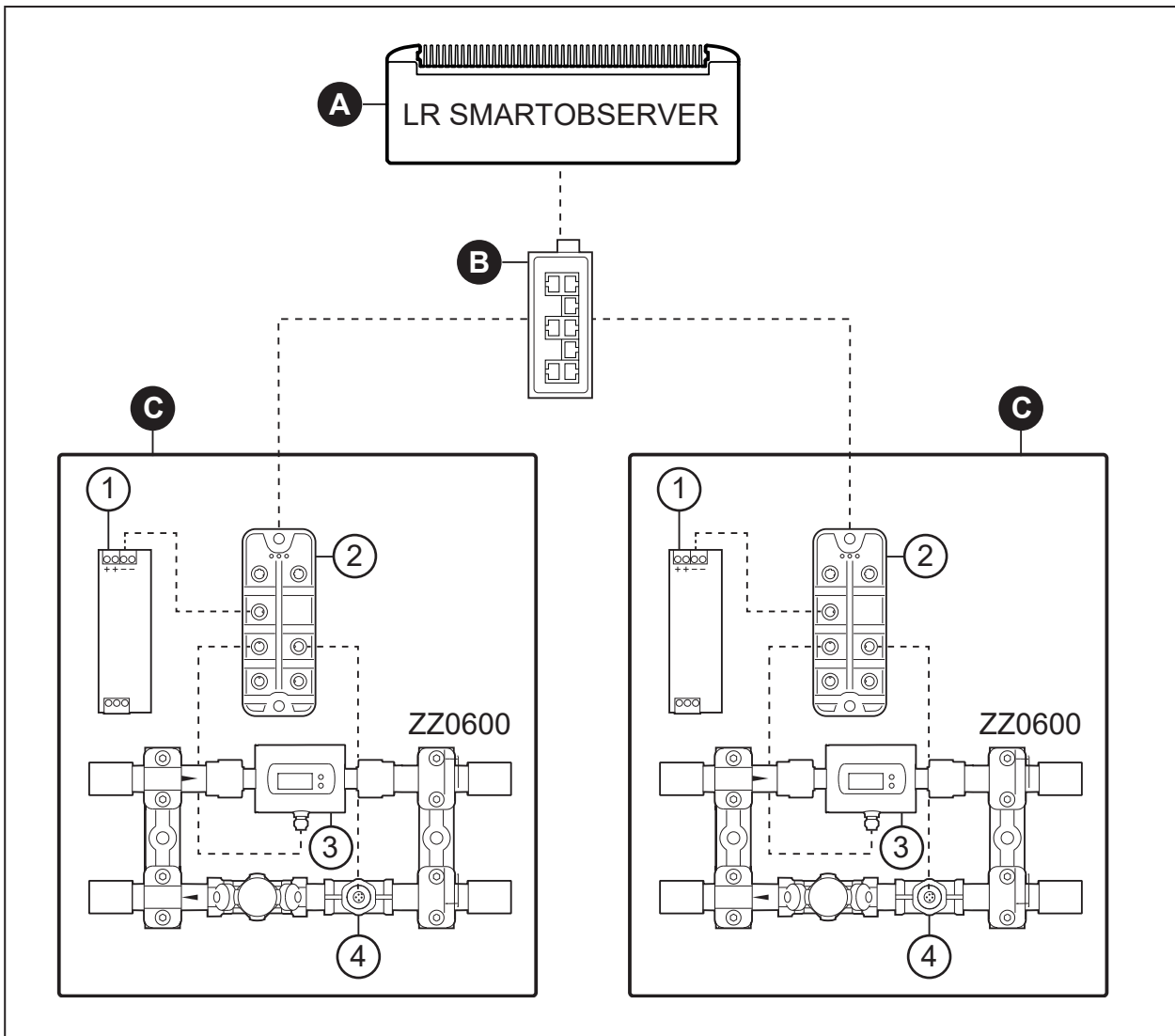
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Fig. 1: Overview application solution extension

A: Preconfigured industrial PC

B: Switch (optional)

C: Application packages (maximum 7), each consisting of:

1: Power supply
2: AL13nn IO-Link master
3: SM6000 flow meter
4: TA2405 temperature sensor

[i] Optionally available: Ethernet switch

5 Installation

[!] ► Disconnect the power of the machine before installation.

► Adhere to the instructions enclosed to the individual devices.

5.1 Fluid monitoring system

► Mount the fluid monitoring system in the cooling water process.

► Adhere to the flow direction during installation (black arrow mark).

5.2 IO-Link master

► Fix the IO-Link master to a flat installation surface.

► Use 2 M5 mounting screws and washers for fastening.Tightening torque: 1.8 Nm.

5.3 Power supply

► Integrate the power supply into the control cabinet. The following has to be observed:

– Suited for DIN rails according to EN 60715 with a height of 7.5 or 15 mm.

– Align the input terminals downwards.

– In case of continuous full load adhere to the following installation distances:
Left / right: 5 mm (15 mm for adjacent heat sources)
Top: 40 mm, bottom 20 mm from the device.

⚠ The device is rated for convection cooling.

► Do not impede the air circulation. Adhere to installation distances.

5.4 Ethernet switch (optional)

► Install the Ethernet switch in the control cabinet.

– Suited for DIN rails according to EN 60715 with a height of 7.5 or 15 mm.

– Align the input terminals upwards.

5.5 Industrial PC

► Install the industrial PC in the control cabinet, taking the following into account:

– Mount the industrial PC on a flat mounting surface.

– Use 4 M5 mounting screws and washers for fastening.

⚠ The device is rated for convection cooling.

► Do not impede the air circulation. Adhere to installation distances.

6 Electrical connection

⚠ The unit must be connected by a qualified electrician.

► Observe the national and international regulations for the installation of electrical equipment.

► Adhere to the instructions enclosed to the individual devices.

► Disconnect power.

1. Connect application package 1

– Connect the sensors of the fluid monitoring system to the IO-Link master.

– Connect the IO-Link master to the secondary side of the power supply.

– Connect IO-Link master to Ethernet switch via IoT port.

2. To connect further application packages, repeat the actions in step 1.

3. Connect the Ethernet switch to the Ethernet interface 1 of the industrial PC.

4. Connect the Ethernet switch to the secondary side of the power supply.

5. Connect the industrial PC to the secondary side of a power supply.

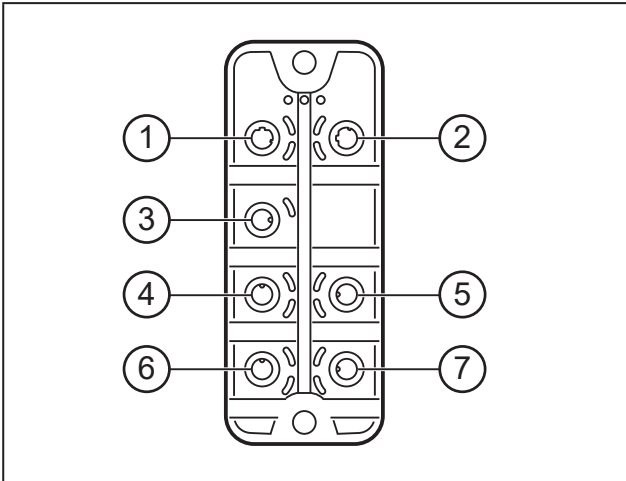6. Connect the primary sides of the power supplies to the voltage supply.

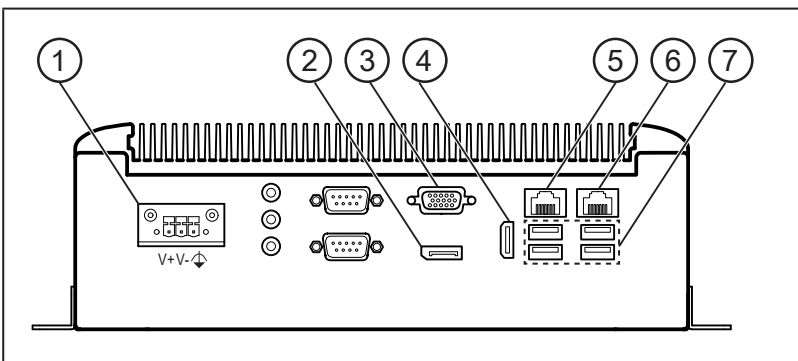## 6.1 Wiring diagram of the IO-Link master

AL1300 / AL1320 / AL1330 / AL1340
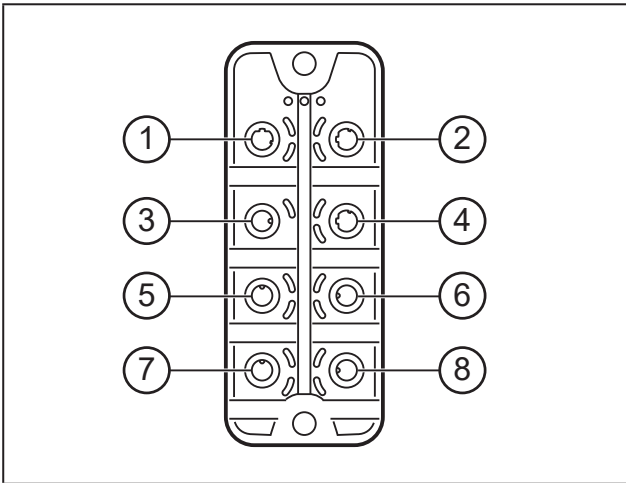
1: Fieldbus (optional)
2: Fieldbus (optional)
3: Power supply
4: Ethernet switch (industrial PC)
5: SM6000
6: TA2405
7: not connected
8: not connected

AL1350

1: Ethernet switch (industrial PC)
2: not connected
3: Power supply
4: SM6000
5: TA2405
6: not connected
7: not connected
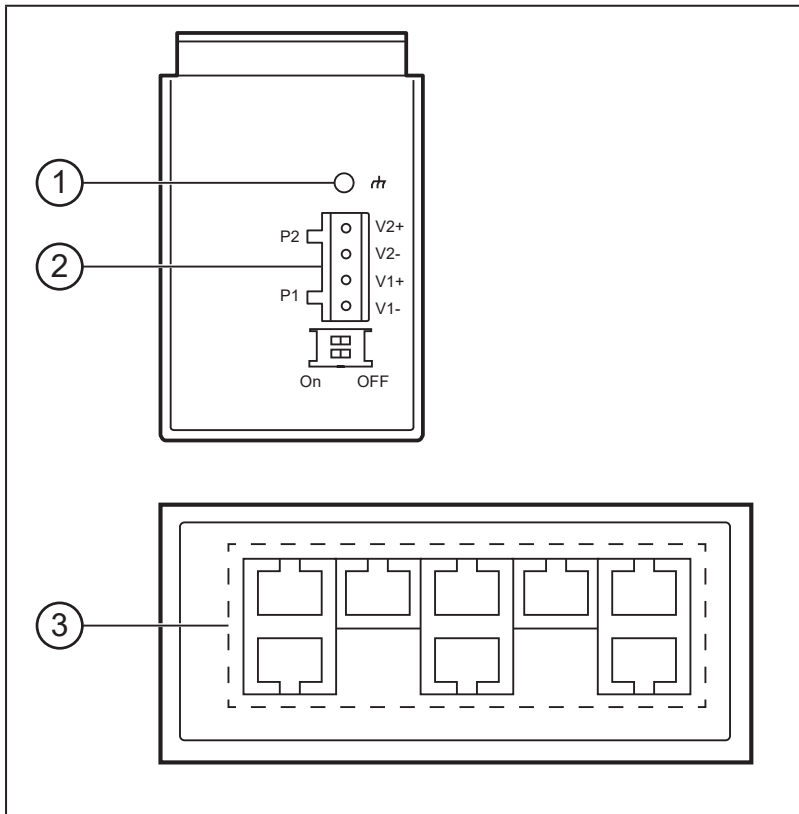
6.2 Wiring diagram industrial PC

1: Power supply
2: Display port
3: VGA socket
4: HDMI interface
5: Ethernet interface 2
6: Ethernet interface 1
7: USB ports

6.3 Wiring diagram of the Ethernet switch

1: Earthing screw
2: Voltage supply
3: Ethernet interfaces

7 Set-up

When the operating voltage has been switched on, the components of the application solution work with the factory settings. The LEDs show the status of the devices and interfaces (→ Instructions of the individual components).

7.1 Set up the industrial PC

The operating system Windows 10 and the software components LR DEVICE, LR AGENT and LR SMARTOBSERVER are pre-installed on the industrial PC.

The industrial PC has 2 Ethernet interfaces.

- Interface 1 is used to connect the industrial PC to the IoT network.

- Interface 2 provides access to the Windows user interface of the industrial PC.

> Login details for the industrial PC:
>
> - user: admin
>
> - password: admin
>
> Factory settings of the industrial PC's Ethernet interfaces:

Parameters	Ethernet interface 1	Ethernet interface 2
IP address	192.168.0.50	192.168.2.50
Subnet mask	255.255.255.0	255.255.255.0
Gateway IP address	0.0.0.0	0.0.0.0

There are two options for setting up and operating the industrial PC (→ 7.1.1; → 7.1.2).

7.1.1 Option 1: Local access

The user accesses the user interface of the industrial PC via an operator terminal on the control cabinet.

► Connect the monitor to the display port, VGA socket or HDMI interface.

► Connect the mouse and keyboard to USB ports.

► Start the industrial PC.

> The Windows login screen appears.

► Enter the login details and confirm with [Enter].

> The Windows desktop interface of the industrial PC appears.

7.1.2 Option 2: Remote access

The user accesses the user interface of the industrial PC via a remote desktop connection. For remote access, the Ethernet interfaces of the industrial and local PC must be configured for the same IP address range.

► Connect the local PC to Ethernet interface 2 of the industrial PC.

► Start the industrial PC.

On the local PC:

► [Control Panel] > [Network and Internet] > [Network and Sharing Center]

► Adapt the Ethernet adapter settings to the IP address range of the industrial PC's Ethernet interface 2.

> The local PC can access the Windows user interface of the industrial PC.

► Start the Windows app "Remote Desktop Connection".

► Enter the IP address of the industrial PC's network interface 2 and confirm with [Enter].

> The local PC establishes a connection to the industrial PC.

> The Windows login screen appears.

► Enter the login details and confirm with [Enter].

> The Windows desktop interface of the industrial PC appears.

7.2 Create a backup copy of the operating system

ifm recommends you to create a backup copy of the Windows operating system before continuing to work with the industrial PC.

On the industrial PC:

► [Control Panel] > [All Control Panel Items] > [Backup and Restore (Windows 7)]

► Click on [Create a system image].

> A dialogue window appears.

► Select the destination for the backup copy.

► Confirm the selection and start the backup.

> Windows creates a backup copy of the system.

7.3 Set up LR DEVICE

LR DEVICE is used to set the parameters of the IO-Link masters and the connected sensors.

► Start LR DEVICE.

► The user interface of the LR DEVICE appears.

7.3.1 Configure interfaces to IO-Link masters

For parameter setting, the IoT interfaces of the IO-Link master and the Ethernet interface 2 of the industrial PC must be configured for the same subnet.

In LR DEVICE:

► Click on the symbol [🔧] to scan the network for available devices.

> LR DEVICE finds the connected IO-Link masters.

For application package 1:

► In the [ONLINE] area: Click on the IO-Link master of the application package.

> The detail window shows the IT settings of the IoT interface.

► Change the following parameters:

Parameters	Value
IP address	192.168.0.1
Subnet mask	255.255.255.0
Default gateway IP address	0.0.0.0

► Click on the symbol [🔧] to write the changed values to the IO-Link master.

> LR DEVICE reads the unit with the changed values once again.

For more application packages:

► Click on the IO-Link master of the respective application package.

► Set the IP settings of the IoT interfaces as follows:

| Application package	IP address	Subnet mask	Default gateway IP address
Extension package 1	192.168.0.2	255.255.255.0	0.0.0.0
Extension package 2	192.168.0.3	255.255.255.0	0.0.0.0
Extension package 3	192.168.0.4	255.255.255.0	0.0.0.0
Extension package 4	192.168.0.5	255.255.255.0	0.0.0.0
Extension package 5	192.168.0.6	255.255.255.0	0.0.0.0
Extension package 6	192.168.0.7	255.255.255.0	0.0.0.0

After configuring the IoT interface, the user can access all available parameters of the IO-Link master and the connected sensors of the fluid monitoring system (→ 8 Parameter setting).

7.3.2 Configure the interface to the LR SMARTOBSERVER

To visualise the process data of the fluid monitoring system in the monitoring software, the interface of the LR SMARTOBSERVER must be configured in the IO-Link masters. In addition, the user can assign a unique name (application tag) to each application package to be displayed in the LR SMARTOBSERVER.

For application package 1:

► In the [ONLINE] area: Click on the IO-Link master of the application package.

> The detail window shows the available parameters of the IO-Link master.
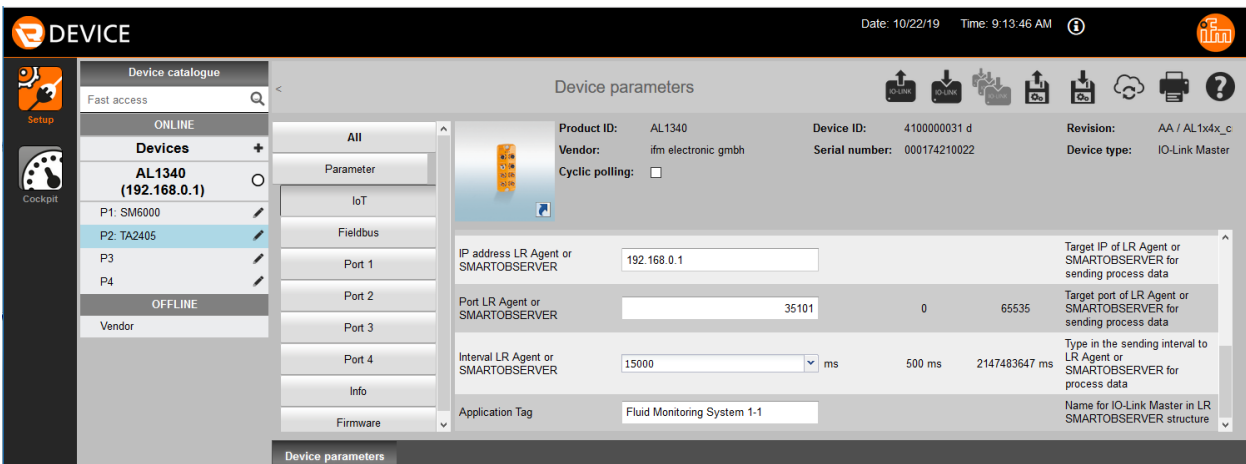
► Change the following parameters in the [IoT] menu:

Parameters	Value
IP address LR Agent or SMARTOBSERVER	192.168.0.1
Port LR Agent or SMARTOBSERVER	35101
Interval LR Agent or SMARTOBSERVER	15000
Application tag	Fluid Monitoring System 1-1

► Click on the symbol [🔽] to write the changed values to the IO-Link master.

For more application packages:

► Click on the IO-Link master of the respective application package.

► Set the interface to LR SMARTOBSERVER as follows:

Application package	IP address	Port	Interval	Application tag
Extension package 1	192.168.0.50	35101	15000	Fluid Monitoring System 2
Extension package 2	192.168.0.50	35101	15000	Fluid Monitoring System 3
Extension package 3	192.168.0.50	35101	15000	Fluid Monitoring System 4
Extension package 4	192.168.0.50	35101	15000	Fluid Monitoring System 5
Extension package 5	192.168.0.50	35101	15000	Fluid Monitoring System 6
Extension package 6	192.168.0.50	35101	15000	Fluid Monitoring System 7

7.4 Adapt the calculation of the heat quantity

In the factory settings, the calculation of the heat quantity is rated for the coolant "water". If a different coolant is used, execute the following actions:

On the industrial PC:

► Open the following directory in the file explorer:C:\Program Files\ifm electronic\LR4\LRAgent\ LRAgent_customized\Config\FMS

► Open the "Parameters" file using the text editor.

► Change the values of the following parameters according to the selected coolant:

Parameters	Description
SpecificHeatCapacity	Specific heat capacity of the coolant (e.g. 4.18)
Density	Density of the coolant (e.g. 995.0)

► Save and close the file.

► Open the "Services" Windows application.

► Right mouse click on the service "LR Agent (FMS)"

► Select the command "Restart" in the context menu.

> The service is restarted.

> Changed parameter values are used to calculate the heat quantity.

[!] The set parameter values apply to all connected fluid monitoring systems.

8 Parameter setting

The parameters can be set before installation or during operation via the IO-Link interface.

[!] If you change parameters during operation, this will influence the function of the plant.
  ► Ensure that there will be no malfunctions in your plant.

During parameter setting the sensors remain in the operating mode. They continue to monitor with the existing parameter until the parameter setting has been completed.

[i] The sensors' IODD at www.ifm.com contains a complete list of adjustable parameters.

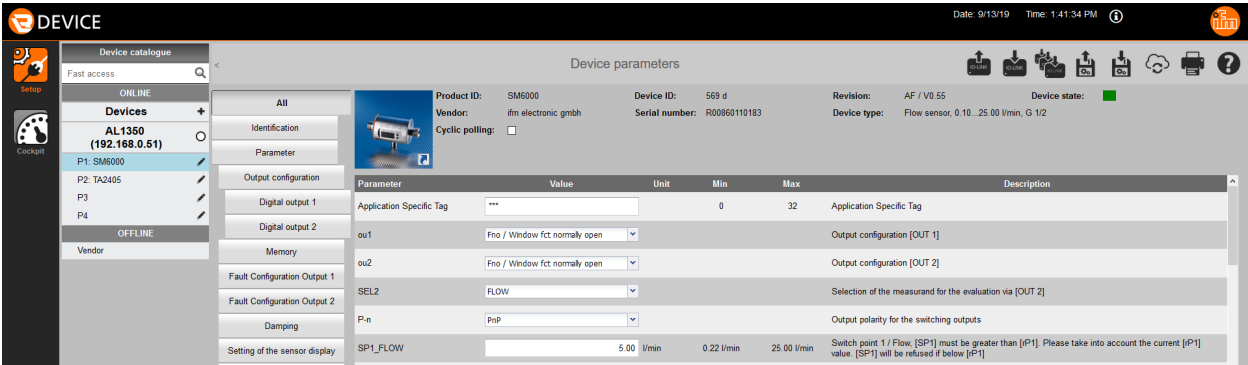## 8.1 Change limit values and switch points

Adjust the limit values and switch points of the sensors:

In LR DEVICE:

► Click on the symbol [⬆] to scan the network for available devices.

> LR DEVICE finds the connected IO-Link masters.

For application package 1:

► In the [ONLINE] area: Click on the IO-Link master of the application package.

> LR DEVICE shows the sensors connected to the ports.

► Click on the port ([P1: SM6000] or [P2: TA2405]).

> Adjustable parameters of the connected sensor are displayed.

► Change limit values and switch points.

► Click on the symbol [⬇] to write the changed parameter values to the sensor.

> The sensor functions with the changed parameter values.

For further application packages:

► Click on the IO-Link master of the respective application package.

► Change limit values and switch points of the sensors.

9 Operation

9.1 Monitor the process data

The LR SMARTOBSERVER enables the monitoring of process data. The LR SMARTOBSERVER is preconfigured for the "fluid monitoring system" application solution.

> Login details for the LR SMARTOBSERVER:
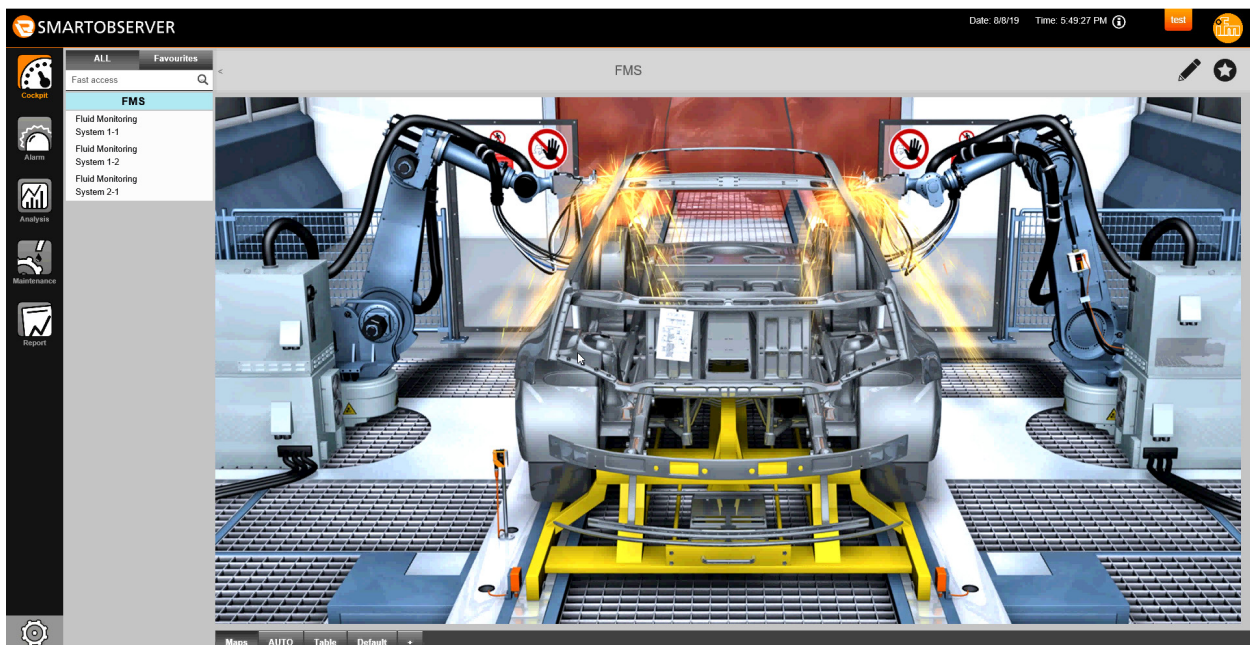> - user name: test
> - password: test

► Start the LR SMARTOBSERVER.

> The login screen appears.

► Enter the user name and password and confirm with [OK].

> The user interface of the LR SMARTOBSERVER appears.

> The [FMS] area shows a list with the application tags of the available application packages.

► Click on the application tag of the respective application package (e.g. fluid monitoring system 1-1).

► In the status line: Select the [AUTO] tab.

> The window shows the current process values of the selected fluid monitoring system.
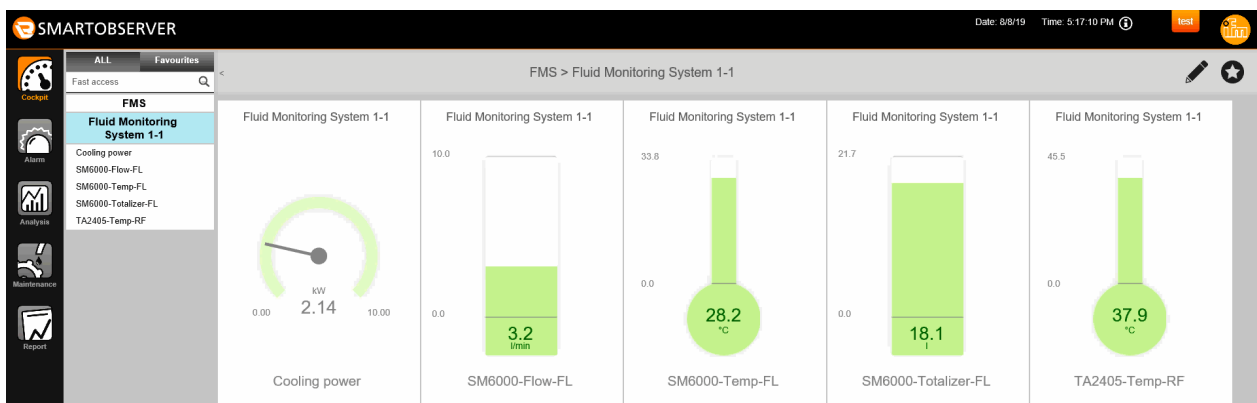
Explanation:

Display	Description	Source
Cooling Power	Cooling power (in kW)	calculated from the process data
SM6000-Flow-FL	Flow (in l/min)	SM6000
SM6000-Temp-FL	Temperature in the supply line (in °C)	SM6000
SM6000-Totalizer-FL	Volumetric flow quantity since the last reset (in l)	SM6000
TA2405-Temp-FL	Temperature in the return line (in °C)	TA2405

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Display	Description	Source