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# SENTRON

# Multi channel current measuring system 7KT PAC1200

System Manual



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Introduction	1
Safety notes	2
Product description	3
Connection	4
Operator control (software)	5
Service and maintenance	6
Technical data	7
Appendix	Α
ESD guidelines	В

# PAC

# Measuring Devices 7KT PAC1200 multichannel current measuring system

System Manual

### Legal information

#### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

#### 🛕 DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.

#### MARNING 🛦

indicates that death or severe personal injury may result if proper precautions are not taken.

#### 

indicates that minor personal injury can result if proper precautions are not taken.

#### NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

#### **Qualified Personnel**

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

#### Proper use of Siemens products

Note the following:

#### MARNING 🏠

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

#### Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

#### **Disclaimer of Liability**

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

# Table of contents

1	Introduction						
	1.1	Introduction	7				
2	Safetv no	Safety notes					
	2.1	Safety instructions	9				
3	Product d	lescription	13				
	3.1	Products of the system	13				
	3.2	Functions	15				
	3.3	Application area	20				
	3.4	Diagnostics options	21				
	3.5	System environment					
4	Connectio	on					
	4.1	Cables	24				
5	Operator control (software)						
	5.1	Browser-based web application	25				
	5.1.1	System environment	25				
	5.1.2	Function overview					
	5.1.3	Home page	27				
	5.1.4	Statistics					
	5.1.5	Current values					
	5.1.6	Installment					
	5.1.7	Energy stopwatch					
	5.1.8	Settings					
	5.1.8.1	Start					
	5.1.8.2	Device					
	5.1.8.3	Sensors					
	5.1.8.4	Network Settings					
	5.1.8.5	Data export					
	5.1.8.6	Firmware update	41				
	5.1.8.7	Tariff settings	41				
	5.1.8.8	Budget settings					
	5.1.8.9	Reset					
	5.2	Application for mobile devices					
	5.2.1	Getting started	43				
	5.2.2	Home					
	5.2.3	Statistics	46				
	5.2.4	Current values	49				

6	Service and maintenance				
	6.1	Error messages	51		
	6.2	Disposal	52		
7	Technical	data	53		
	7.1 7.1.1 7.1.2 7.1.3	Dimension drawings Dimensions of the Data Manager Dimensions of the sensor bar Dimensions of the sensors on the sensor bar			
Α	Appendix .		61		
	A.1	FAQs	61		
в	ESD guide	lines	63		
	B.1	Electrostatic sensitive devices (ESD)	63		
	Glossary		65		
	Index		67		

# Introduction

# 1.1 Introduction

The component parts of the 7KT PAC1200 multichannel current measuring system are described in this document

- Data Manager
- Sensor bar
- Sensors

The configuration is also described via the web server.

#### Target group

The tasks described in this document must only be carried out by persons with the following electrical

training/qualifications:

- Training in the installation und commissioning of electrical devices
- Training in electrical hazards and local safety regulations
- Knowledge of the relevant standards and guidelines

#### **Further documents**

You can find further details in the following documents:

• Operating Instructions "7KT PAC1200 multichannel current measuring system"

Introduction

1.1 Introduction

# Safety notes

# 2.1 Safety instructions

The safety instructions that have to be followed when using the 7KT PAC1200 multichannel current measuring system are given below.

# 

Hazardous voltage. Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on it. Installation and maintenance work on this device must by carried out by authorized persons with the appropriate electrical training only.

# 

Damage to, or destruction of, the Data Manager. Material damage.

Observe the prescribed minimum clearances between the network cable and the installation components that carry mains voltage, or use suitable insulation.

Always lay the data and power lines separately or in separate pipelines. Observe EN 50174-2 here.

#### NOTICE

#### Overvoltage. Material damage.

If network cables are laid in the outdoor area, overvoltages can arise as a result of lightning strikes, for example.

The network cable must be safeguarded with suitable overvoltage protection.

#### NOTICE

Damage to the sensor bar through transient overvoltages. Material damage.

Install additional overvoltage arresters in accordance with SPD Type 1 (primary protection) und SPD Type 2 (medium protection) upstream of the Data Manager.

Ensure that the Data Manager that supplies the sensor bar with voltage can be disconnected, for example, with a miniature circuit breaker. This must be labeled as a circuit breaker for the Data Manager, and it must be easily accessible.

#### NOTICE

Damage to, or destruction of, the Data Manager. Material damage.

Do not connect an ISDN cable to the Data Manager's network connection.

Use the multichannel current measuring system in dry environments only and keep away from liquids.

#### Note

Install the multichannel current measuring system in the control cabinet only, and ensure that the connection areas for the line conductor and the neutral conductor are located behind a cover or touch protection barrier.

Do not operate the Data Manager beyond the limits specified in the technical data.

The enclosures or electrical distribution boards must only be accessible using a key or tool to restrict access to authorized personnel. Disconnect the electrical distribution board before installation work or maintenance work, and protect it from being unintentionally switched on again.

#### Note

You can find the open-source software included in this product, and the corresponding opensource software license conditions, in the Readme\_OSS.

#### Data Manager

For safety reasons, it is forbidden to modify the product, including the software, or to install components that are not expressly recommended or marketed for this product.

Any use of the product other than the intended use described is considered improper use.

Impermissible modification, conversions, repairs, or opening of the product are forbidden. The enclosed documentation is a component part of the product and must be read, observed, and kept available at all times.

In accordance with its classification in Overvoltage category III, the Data Manager may only be connected in the subdistribution board or circuit distribution board on the load side downstream of the energy counter of the power supply company. It is suitable only for use in the indoor area, and it is approved for use in the member states of the EU. Use the sensor bar only in accordance with the information given in the enclosed documentation. Any other use can result in material damage and personal injury.

The Data Manager is not an electricity meter for active-power consumption in the sense of EU Directive 2004/22/EC (MID). It must only be used for internal accounting purposes. The data collected by the Data Manager about power generation in your plant can differ from the data of the main energy counter.

#### Sensor bar

The sensor bar may only be operated when installed in the distribution box and the protective covers are in place. The sensor bar is approved for use in dry indoor areas only.

Use the sensor bar only in accordance with the information given in the enclosed documentation. Any other use can result in material damage and personal injury.

For safety reasons, changes to the sensor bar are forbidden unless expressly approved for the product by Siemens AG. Any use of the product other than the intended use described is considered improper use. Impermissible modification, conversions, repairs, or opening of the product are forbidden. The enclosed documentation is a component part of the product and must be read, observed, and kept available at all times.

# 

#### Overvoltage. Material damage.

Only safety extra low voltages may be connected to the sensor bar.

#### Laws and directives

The following standards apply for this system:

- EN 61010-1: 2010 Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326-1: 2013 Electrical equipment for measurement, control and laboratory use - EMC requirements
- EN 60950-1:2006 + A11:2009 + A1:2010 Information technology equipment - Safety
- EN 50428:2005 + A1:2007 + A2:2009
   Switches for household and similar fixed electrical installations
- EN 60669-2-1:2004 + A1:2009 + A12:2010 Switches for household and similar fixed electrical installations - Part 2-1: Special requirements
- EN 60669-1:1999 + A1:2002 + Corrigendum:2007 + A2:2008 Switches for household and similar fixed electrical installations - Part 1: General requirements
- EN 61000-3-2:2014 + A1:2009 + A2:2009
   EMC Part 3-2: Limit values for harmonic currents
- EN 6100-3-3:2013
   EMC Part 3-3: Limits Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems
- EN 301 489-1:2011 V1.9.2 ERM, EMC - Part 1: Common technical requirements

Safety notes

2.1 Safety instructions

# **Product description**

# 3.1 Products of the system



5 Device for which current is being monitored

The 7KT PAC1200 multichannel current measuring system is part of the energy management portfolio.

The system comprises several components that are described in this chapter:

- Data Manager
- Sensor bar
- Sensors

3.1 Products of the system

#### Highlights

- Fully integrated smart meter
- 3-phase active power and reactive power energy measurement
- Measurement of energy as balancing counter
- Direct connection up to 63 A
- Optional use with external measuring transformer for extending the measuring range (e.g. 100 ... 600 A)
- Standard rail mounting (4 MW)
- Operator input / configuration: Web interface
- Support of up to 96 sensors for single-phase measurement

#### Applications

The 7KT PAC1200 multichannel current measuring system monitors and displays the energy consumption of up to 96 outgoing feeders. The Data Manager can supply up to eight sensor bars. The full configuration would thus be 8 sensor bars with 12 sensors each.

#### Value provided by the system

The system makes energy consumption and the resulting costs transparent for a given installation.

The system can be adapted to individual needs and application scenarios. In addition, single sensors can be named individually and compared with each other.

The system can also be configured flexibly as the number of sensor bars can be varied.

Up to eight different, selectable consumption sources can be compared with each other.

The measured values can be displayed via a Web browser. Both current values and statistical values can be displayed here. Display is possible in an application for mobile terminal devices, as a desktop application, or in powermanager.

Statistical values can be collected over different time periods and exported via a CSV file.

#### **Data Manager**

The Data Manager is a measuring instrument that determines electrical measured values at the connection point and makes them available via LAN or RS485.

The Data Manager is not an electricity meter for active-power consumption in the sense of EU Directive 2004/22/EC (MID). It must only be used for internal accounting purposes. The data collected by the Data Manager about power generation in your plant can differ from the data of the main energy counter.

In accordance with its classification in Overvoltage category III, the Data Manager may only be connected in the subdistribution board or circuit distribution board on the load side downstream of the energy counter of the power supply company. It is suitable only for use in the indoor area, and it is approved for use in the member states of the EU. Use the sensor bar only in accordance with the information given in the enclosed documentation. Any other use can result in material damage and personal injury.

#### Limits

This product is not an electricity meter for active-power consumption in the sense of EU Directive 2004/22/EC (MID); it must be used for internal accounting

purposes only. The data collected by the Data Manager about power generation in your plant can differ from the data of the main energy counter.

## 3.2 Functions

How the individual components of the system function is defined below.

The current sensor of the Data Manager is a current transformer in the ratio 1:1000.

The Data Manager reads out the connected sensor bar at fixed regular intervals and calculates the active power, the reactive power and the apparent power using the internally measured voltage U[1,2,3] of the respective phase PI[1,2,3] as well as the power factor (cos phi).

3.2 Functions

#### Data Manager

The Data Manager is a measuring instrument that determines electrical measured values at the connection point and makes them available via LAN.



\* Must be connected

The connections L1, L2, L3 can be found both on the upper and lower sections, plus an additional connection for N. On the front, you will find the connection for the LAN cable. The connection for the RS485 connector is at the top of the Data Manager.

On the left, you see 3 LEDs (Status, Network and Sensor) that indicate the status of the Data Manager.

Under the LEDs is the Reset button that causes restart or resetting of the device.

The accuracy of current measurement by the current sensors is  $\pm 1$  % of the full-scale value, and the accuracy of the voltage measurement of the Data Manager is  $\pm 0.5$  % of the full-scale value.

The overall accuracy of the Data Manager is ±2 % of the full-scale value.

There are 3 LEDs on the device. These indicate the operating status. The Status LED indicates operational readiness, the Network LED indicates the connection with the network, and the Sensor LED indicates sensor readiness.

The energy is measured simultaneously on all 3 phases (L1, L2, L3).

#### Note

#### Ensure correct phase assignment.

The correct phase assignment enables calculation of the current values of the sensor despite varying voltage in the individual phases.

3.2 Functions

#### Sensor bar

Currents in AC power systems can be measured with the sensor bar. The measured data are forwarded to the Data Manager via the RS485 bus and evaluated. The Data Manager also supplies the 9 V to the sensor bar.

The sensor bar is offered in four variants, with three, six, nine or twelve slots respectively for the current sensors. The current sensors are located directly on the miniature circuit breakers and they register the latest current values. The conductors to be measured are run through the ring-shaped opening in the current sensors to the connections of the miniature circuit breaker. Up to eight sensor bars can be connected to one Data Manager. With the sensor bar with twelve current sensors, the currents of up to 96 conductors can be measured and transferred to the Data Manager. Every sensor bar has a unique Modbus address in the range between 1 and 247.



- ① Connections for sensors
- ② Bus for RS485 and power supply
- ③ Status LED

#### Sensor



- ② Cable entry for the power cable
- ③ Connections for the sensor bar

# 3.3 Application area

The system is used primarily in the following areas:

- Small businesses
- Halls
- Residential buildings
- Supermarkets
- Data centers
- Office buildings

#### Application example of a brewery



Image 3-1 Application example

# 3.4 Diagnostics options

### Status indication via LEDs of the Data Manager

#### Status: Indicates readiness

Status	Readiness for operation
Off	Device switched off
Orange	Voltage boot active
Green, slow flashing	Linux is booting
Green, rapid flashing	Firmware update in progress
Green, continuous	Device ON

#### Network: Indicates connection with the supply system / indicates supply system activity

Status	Readiness for operation
Off	LAN has no link
Green on	LAN has link
Flashing green	Network traffic

#### Sensor: Indicates sensor readiness

Status	Readiness for operation
Off	No sensor connected
Green, continuous	All sensors online and in measuring mode

#### Status indication via LEDs of the sensor bar

Status	Readiness for operation
Green, continuous	Connected
Flashing green	Sensors scanned

# 3.5 System environment

The Data Manager is installed in the fuse cabinet where it is connected after the main fuse in the subdistribution board. The device must be connected to all three phases of the power system at the time of installation so that the overall energy consumption can be correctly measured.

The sensor bar is connected via RS485. The sensor bar and the connected sensors are located on the individual fuses in the fuse cabinet. Up to 8 sensor bars with 12 sensors each can be connected, giving a total of 96 sensors in the maximum configuration.

The Data Manager is connected by LAN (if necessary via an additional router) to the PC running the Siemens-specific Sentron software.

In communication via LAN, the Data Manager is the Modbus / TCP slave, while the PC with the Sentron software is the Modbus / TCP master. The data are sent continuously to the higher-level management system while a connection is present.

#### Note

A continuous data connection to the Sentron software is required. If the data connection is interrupted, no data are buffered on the Data Manager.

In communication via RS485, the product is the Modbus / RTU master, and the connected sensor bars are the Modbus slaves.

# Connection

# TN system



# IT system



#### Connection

4.1 Cables

#### **Overall connection**



# 4.1 Cables

#### Power supply

The Data Manager is supplied with energy via phase L1, in other words, the phase must always be connected.

The Data Manager has a 63 A direct connection. For applications with other requirements, external current transformers can be additionally connected to the Data Manager.

The corresponding transformer ratio can be set in the web browser so that the accuracy is not impaired.

When using external current transformers, the respective measuring accuracy must be taken into account. The Data Manager displays the current values extremely precisely at a current transformer ratio of 600:5.

#### Connections

Above, you will find the connections L1, L2, L3; below also, plus an additional connection for N. In the middle, you will find the connection for the LAN cable. On the top of the EM is the connection for the RS485 connector.

#### Connection of additional devices (e.g. printer)

The RS 485 interface of the Data Manager is used for connecting the sensor bar. This is done using the connector. The connector can be seen on the right on the Data Manager.

# **Operator control (software)**

# 5.1 Browser-based web application

#### 5.1.1 System environment

The web interface is designed for use on browser-based terminal devices (PC and notebook). Smartphone and tablet access to the web interface are also possible via WLAN.

The web interface is optimized for a resolution of 1024x768 (WxH).

The following minimum versions of the commercially available web browsers are supported:

- Microsoft Internet Explorer from version: 8
- Mozilla Firefox from version: 17
- Google Chrome from Version: 21
- Apple Safari from Version: 6

#### Settings via the system environment

The following settings can be made via the web interface:

Network Settings	Settings for the network and the time server
Data backup	Create or restore data backups
Firmware update	Perform firmware update
Reset	Restart system, reset configuration, restore delivery state (Reset)
Device settings	Set the date and time, password, transformer ratio, language and country
Sensor settings	Adding, deleting, replacing or grouping sensors
Modbus settings	Activating or deactivating Modbus

#### Required settings for commissioning

- Time of day
- Language
- Network Settings
- Country
- Currency
- Tariff settings
- Budget
- Where applicable: Transformer ratio
- Modbus settings and sensor management (connection, labeling, phase assignment, and grouping of the individual sensors).

#### 5.1.2 Function overview

The browser-based web application offers the following functions:

- Statistics
- Current values
- Installment
- Energy stopwatch
- Settings

### 5.1.3 Home page

The web interface is called up by entering the IP address in the address line of the browser. The following page opens:

SIEMENS		Data Manager 7KT1200	
Â			?
Home	>	Your current rate: 23.00 cents	
Statistics	>		
Current values	>	Based on your present kilowatt-hour rate, your current consumption of 0.363kW will cost you 0.083 € if continued for one hour.	
Your budget	>	0.262	
Energy Stopwatch	>	0.303 kW	
Settings	>	<b>0.083</b> € per hour	
		Hour   Day   Week   Month   Year	
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Image 5-1 Home

The Start page shows the instantaneous consumption at the specified rate on the day. Depending on the configuration, consumption can be displayed per hour, per day, per week, per month, and per year. If the product has not yet been operation for a year, projections are displayed.

On the left-hand side is a navigation bar via which you can access different sub-menus.

Additional product information can be called up via the Support link on the bottom right.

#### 5.1.4 Statistics

The statistics show the overall consumption of the selected sensors.

Consumption can be shown both in euros and in kWh. The results can be displayed in the form of a pie chart or a bar chart, depending on selection.

The periods that can be selected are as follows:

- Days
- Week
- Months
- Year

Both the overall consumption and the individual consumption of a sensor can be displayed.

It is also possible to generate a history so that any deviations can be investigated. A date can be selected for this using the button below the chart.

SIEMENS	Data	Manager 7K	T1200			
â						?
Home	>		-	Overall consumption		
Statistics	>	Current reading:	Individual con	sumption	Total: <b>2.21 €</b>	
Overview Sensor	5	kWh				
Current values	>	costs Gärbottich	EUR / day 0.21	Lagerung	Gärbottich	
Your budget	>	Fasskühlung Sud Whirlpool Umwälzpumpe	0.36 0.35 0.21	Red Thele	Fasskühlung	I
Energy Stopwatch	>	Maischen Bed. Theke	0.43		36 / day	
Settings	>	Lagerung	0.00	Maischen	Sud Whirlpool	!
					<ul> <li>Umwälzpumpe</li> </ul>	
			<	Monday, 12/07 2015		
				Day   Week   Month   Year	• •	
					print expo	rt
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Image 5-2 Statistics

### 5.1.5 Current values

Under the navigation item "Current values" you can see how high the consumption is at a particular moment in time. The "Current" value indicates this consumption. "Min / Max" indicates the minimum and maximum consumption.

The kW values consumed at a certain time are shown in a curve diagram. Here also, either the overall consumption or the consumption of an individual sensor can be displayed.

It is also possible to switch between various modes in this view.

- History
- Current values: for individual sensors
  - Current
  - Voltage
  - Power factor of the individual phases
- Meter reading



Image 5-3 Current values

#### 5.1.6 Installment

The installment is calculated from the specified budget over a specified time period and from the monthly base fee.

If the budget is exceeded, the final amount appears against a red background and a warning is issued on the Home page. If annual budget is selected, a table and a graphic appear with the monthly consumption.

SIEMENS		Data Manager 7KT1200	
â			?
Home	>	Friday, 12/04	/2015
Statistics	>		
Current values	>	Monthly charge: Monthly base fee: Power used so far:	+ 200.00 € - 10.00 € - 5.82 €
Your budget	>	Total amount (for power used so far)	+184.18 €
Energy Stopwatch	>		
Settings	>		
		Current monthly budget	Annual budget
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Image 5-4 Installment - Day



Image 5-5 Installment - Year

Operator control (software)

5.1 Browser-based web application

# 5.1.7 Energy stopwatch

Consumption over a specific period can be checked with the current stopwatch. These measurements can be saved for comparison purposes.

SIEMENS		Data Manager 7KT1200	
			?
Home	>	New measurement	
Statistics	>		
Current values	>	Your current rate: 23.00 cents Time elapsed: 00:00:00	
Your budget	>	Switch off all non-continuously working devices. You can start your measurement as soon as the non-operating current is constant.	
Energy Stopwatch	>	0.351 kW	
Settings	>		
		Start Stop	
		Current meter reading   Stored readings	
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Image 5-6 Energy stopwatch

# 5.1.8 Settings

#### 5.1.8.1 Start

On the Settings homepage, you will find an overview of the serial number, firmware version, and LAN MAC address of the device.

SIEMENS	I	Data Manager 7KT1200		
Â				?
Device Settings	>	Settings a	nd system information	
Sensor Settings	>	Here is additional information about	t vour Siemens Data Manager	
Network Settings	>		, <u>,</u> ,	
Modbus Settings	>	Serial number Firmware version LAN mac address	70090198 1.49 00:D0:93:2A:D0:E1	
Data Export	>			
Backup	>			
Firmware Update	>			
Your Tariff	>			
Your budget	>			
Reset	>			
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Image 5-7 Settings - Start page

#### 5.1.8.2 Device

In the menu item Device Settings, the following settings can be made:

- Language
- Location
- Date
- Time of day
- Transformer ratio
- Password

These settings appear on initial commissioning of the Data Manager.

SIEMENS		Data Manager 7KT1200	
â			?
Device Settings	>	Language	
Sensor Settings	>		
Network Settings	>	Language: English Country:	
Modbus Settings	>		
Data Export	>	Apply	
Backup	>		
Firmware Update	>		
Your Tariff	>		
Your budget	>		
Reset	>		
		Language   Date and time   Password   CT ratio	
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Image 5-8 Device settings

#### 5.1.8.3 Sensors

Under Sensor settings you will find two views:

- Sensor settings
- Current values

#### Sensor settings

In the Sensor settings, you can search for sensor bars connected to the Data Manager by clicking the button "Rescan sensor bus".

As soon as the sensor bars are detected, they appear in the left-hand column.

The number of sensor bars is detected automatically. The sensors can be assigned individual names, and they must be assigned to individual phases. The power factor is set individually to increase the accuracy of the calculated active power. If a sensor is not connected, there is also no need for any phase assignment.

An eye symbol on the far right shows which sensors are to be compared with each other statistically. This can be adapted individually. Up to eight sensors can be compared with each other, regardless of whether they are located on the same sensor bar or not. The sensors that are to be compared with each other need only be connected to the same Data Manager.

Device Settings	>	Sensor bars			Se	etti	nas		
Sensor Settings	>								
			r	Sensor name	Power factor		Phase purchase		
Network Settings	>	1 💽 -12 SNR: 83.CD.7A.35.8A.01 —		Sudkessel	0.85	Ŧ	L1 <b>v</b>	~	
Modbus Settings	>	2 -12 SNR: B6.54.90.75.79.14		Umwälzpumpe	0.85	Ŧ	L2 🔻	~	o
		3 -12 SNR: 71.CD.D0.53.ED.2B		Rührwerk	0.75	•	L3 🔻	~	
Data Export	>	4 🛃 -12 SNR: 91.0D.99.28.23.7F		Fasskühlung	0.90	T	L1 🔻	~	0
Backup	>			Schrotmühle	0.90	T	L2 🔻	~	
		5 - 12 SNR: 55.EB.83.75.AA.A4		Gärbottich	0.90	T	L2 T	~	
Firmware Update	>	6 -12 SNR: F8.CF.A4.0C.E7.BA		Heizung Maisc	1	T	L1 🔻	~	
Your Tariff	>	7 -12 SNR: FE.28.46.7A.DC.BF		Heizung Maisc	1	Ŧ	L2 🔻	~	
	ĺ.	8 🔤 -12 SNR: 4B.49.7A.DE.C5.D8		Heizung Maisc	1	Ŧ	L3 🔻	~	
Your budget	>			Rührwerk	0.95	T	L1 🔻	~	
Reset	>	Rescan sensor bus		Rührwerk	0.95	T	L2 🔻	~	o
			L	Rührwerk	0.95	T	L3 🔻	~	Ļ
		Selection for diagram – Total cons	sum	ption 🕒 🔋					
		Umwälzpu Fasskühl Rührwerk Fassk	kühl	. Heizung E	Bed. Th	e			

Image 5-9 Sensor settings

#### **Current values**

Under "Current values", the following live values of the sensors can be read out:

- Current
- Voltage
- Power factors of the different phases
- Current values of the individual sensors

"0" values against a red background indicate sensors through which no power is currently flowing. "-" values with a red background indicate sensors for which no phase assignment has been carried out. In this way, it is immediately apparent if there is a fault, or if the sensors are not active. This view hugely reduces the search effort for errors, especially with up to 96 connected sensors.

	SIEMENS		Data Manager 7KT1200	
1	ñ			?
	Device Settings	>	Real-time values	
	Sensor Settings	>	Phase 1: L1 Phase 2: L2 Phase 3	
	Network Settings	>	Current:         0.44 A         Current:         0.61 A         Current           Voltage:         225.20 V         Voltage:         225.84 V         Voltage           Power factor:         0.93         Power factor:         0.95         Power	t 0.67 A 8: 226.01 V factor: 0.87
	Modbus Settings	>	Sensor bar:         12-Sensors:         83.CD.7A.35.8A.01           1         0.00 A         2         0.00 A         3         0.00 A         4         0.00 A         5         0.00           7         0.00 A         8         0.00 A         9         0.00 A         10         0.00 A         11         0.00	00 A 6 0.00 A
	Data Export	>	Sensor bar. 12-Sensors: B6.54.90.75.79.14           1         0.00 A         2         0.00 A         3         0.00 A         4         0.00 A         5         0.00	00 A 6 0.00 A
	Backup	>	7         0.00 A         8         0.00 A         9         0.00 A         10         0.00 A         11         0.           Sensor bar: 12-Sensors: 71.CD.D0.53.ED.2B         1         0.00 A         2         0.00 A         3         0.00 A         4         0.68 A         5         0.	42 A 12 0.42 A
	Firmware Update	>	7 0.60 A 8 0.00 A 9 0.61 A 10 0.41 A 11 0. Sensor bar: 12-Sensors: 91.0D.99.28.23.7F	00 A 12 0.43 A
	Your Tariff	>	1         0.00 A         2         0.00 A         3         0.00 A         4         0.00 A         5         0.           7         0.42 A         8         0.41 A         9         0.00 A         10         0.00 A         11         0.	00 A 6 0.00 A 00 A 12 0.00 A
	Your budget	>	Sensor bar: 12-Sensors: 55.EB.83.75.AA.A4 1 0.00 A 2 0.03 A 3 0.00 A 4 0.03 A 5 0.	03 A 6 0.00 A
	Reset	>	7 0.41 A 8 0.41 A 9 0.00 A 10 0.00 A 11 0.	00 A 12 0.00 A
			1         0.00 A         2         0.00 A         3         0.00 A         4         0.68 A         5         0.           7         0.60 A         8         0.00 A         9         0.62 A         10         0.41 A         11         0.	00 A 6 0.67 A 00 A 12 0.42 A
			Sensor bar: 12-Sensors: FE.28.46.7A.DC.BF 1 0.00 A 2 0.00 A 3 0.03 A 4 0.00 A 5 0.	00 A 6 0.00 A
			7 0.68 A 8 0.67 A 9 0.59 A 10 0.63 A 11 0.	42 A 12 0.42 A 🗸
			Sensor Settings   Current values	
© S	iemens AG, 2015   Imprint	Privacy Policy   C	ookie Policy   Terms Of Use	Support: www.siemens.com/7kt1200

Image 5-10 Sensor settings - Current values

#### Note

Note the ID number on the sensor bar.

#### 5.1.8.4 Network Settings

In the Network Settings, a static IP address can be assigned manually. The Data Manager is supplied with a fixed IP address (192.168.1.200).

The Data Manager can also be assigned an individual name here. In the Timeserver settings, you can determine whether the Data Manager obtains the time automatically from the network via the server. This is only possible if the Data Manager is connected to the network.

SIEMENS		Data Manager 7KT1	1200
Â			?
Device Settings	>		Network Settings
Sensor Settings	>		
Network Settings	>	the user interface to b	nanges to the this settings, wARNING) inappropriate settings may cause secome inaccessible!
·····,		IP configuration	static T
Modbus Settings	>	IP address:	192.168.1.200
		Subnet mask:	255.255.255.0
Data Export	>	Delault gateway.	132, 100, 1, 1
Data Export	-		L
Backup	>	Assign an individual	I device name here, so your device can be identified in the network.
		Hostname:	siemens-dm-7kt1200
Firmware Undate	>		
initiale opuate	-		Apply
Your Tariff	>		
Your budget	>		
Porot			
heset			
			Network Settings   Timeserver settings
© Siemens AG, 2015   Imprint   Pri	vacy Policy   Co	ookie Policy   Terms Of Use	Support: www.siemens.com/7kt1200

Image 5-11 Network Settings

#### 5.1.8.5 Data export

Data transfer is configured via the Modbus settings. All measured values are transferred through this connection. As a bidirectional counter, the Data Manager measures active power [W], reactive power [var], apparent power [VA] and power factor per phase and in total, current [A] and voltage [V] per phase, and the network frequency [Hz].

The Data Manager provides a Modbus TCP server that uses the standard port 502 for incoming connection enquiries. This port and the IP address must be configured to establish a connection with the Data Manager.

#### Data export

In the case of data export, a CSV file is exported. This contains the instantaneous overall consumption and the consumption of the individual sensors in € and kWh. To enable recording of the values of the individual sensors in the CSV file, data transmission via Modbus must be activated, and the individual phases must be assigned to the sensors. If these settings are not made, only the overall consumption is recorded.

The following settings can be made in the "Data Export" dialog:

- Sensors that must appear in the CSV file
- Resolution: 15 min., 1 hour, 1 day and 1 week
- Time frame: If the period extends back more than one week, representation in increments of 15 minutes is no longer possible.

SIEMENS		Data Manager 7KT1200	
Â			?
Device Settings	>	Export settings	
Sensor Settings	>	Consumptions and costs Meter readings and current values	
Network Settings	>		
Modbus Settings	>	United to the second s	
Data Export	>	2 v, a, vv, vvii, vai	7
Backup	>	You can either create an export file right now, or schedule an automated export according your requirements.	
Firmware Update	>	Manually or automatically:     Manual export     ▼       Format:     CSV file       Period:     04.12.2015     To 04.12.2015	
Your Tariff	>	Target: Download to hard disk drive	
Your budget	>	C SV file content	
Reset	>	Resolution: <ul> <li>15 minutes</li> <li>1 hour</li> <li>1 day</li> <li>1 week</li> </ul> Metering information:         Select all           Overall consumption         Image: Consumption           Sudkessel         Image: Consumption           Umwätzpumpe Maischen         Image: Consumption           Rührwerk         Image: Consumption           Fasskühlung         Image: Consumption           Export         Image: Consumption	
		Export settings   Email settings   FTP settings	

Image 5-12 Data export

#### Data export with counter statuses and instantaneous values

As well as the data export described above, there is the option of exporting a CSV file with the meter statuses and instantaneous values.

This export variant is automated, in other words, data are exported, saved and sent by email, or stored on an FTP server over a specified period.

Here too, there is the option of activating data logging, which results in a CSV file being saved to the hard disk at a specific resolution. In this file, you will find total power, overall consumption, current, voltage, and power factor. These data are also included, divided according to the different phases and the individual sensors.

SIEMENS		Data Manager 7KT1200			
<b>^</b>					?
Device Setting	js ≻		Export sett	ings	
Sensor Setting	gs ≻	Consumptions and costs		Meter readings and current values	
Network Setti	ngs >	CSV		CSV CSV	
Modbus Settin	ngs >	 ↓ ₩h, ∰		exy:	
Data Export	>	© 2			r
Backup	>	Activate automatic export:			
		Format:	CSV file		
Firmware Upd	late >	Frequency:	quarter-hourly ▼		
V		Start:	04.12.2015 No ▼		
Your Taritt	· · · ·	Target:	Email settings	The export via email or to the FTP	
Your budget	>	Ŭ	FTP settings	server is not configured.	
Reset	>	CSV file content Activate data logging:			
		Storage status:	0 B / 1000 MB		
		Interval:	15 minutes 🔻		
		Logfiles:			
		De	lete all logfiles	Apply gs   FTP settings	
© Siemens AG, 2015   Im	nprint   Privacy Policy   (	Cookie Policy   Terms Of Use		Support: www.siemens.co	m/7kt1200

Image 5-13 Data export with counter statuses and instantaneous values

The settings made and the meter statuses can be downloaded and saved at any time by means of data backup. This data backup can be restored.

#### 5.1.8.6 Firmware update

Current updates can be installed on the Data Manager in the "Firmware Update" menu.

Before this can take place, a data backup must be carried out.

The firmware update can then be installed. The Data Manager restarts automatically following installation, and changes to the Start page.

#### 5.1.8.7 Tariff settings

#### Edit tariff

The following values can be processed under Tariff:

- Currency in which the tariff is to be presented
- Tariff name
- Monthly basic charge including value added tax
- Current rate

SIEMENS	Dat	a Manager 7KT120	0	
â				?
Device Settings	>		Your tariff: Demo Tarif	
Sensor Settings	>			
Network Settings	>	Currency: Your tariff:	EUR V Demo Tarif	
Modbus Settings	>	Monthly base fee:* Your current rate:*	10 00 € 23 00 cents/kWh	
Data Export	>	*) The amount includes VAT		
Backup	>		Save	
Firmware Update	>			
Your Tariff	>			
Your budget	>			
Reset	>			
			Edit tariff   Adjust tariff	
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Image 5-14 Tariff settings

#### Operator control (software)

5.1 Browser-based web application

#### Adjust tariff

Under "Adjust tariff", the tariff can be changed at a particular time.

#### 5.1.8.8 Budget settings

Two values can be entered for budget settings:

- Available budget
- Period during which the budget is to be used

When calculating the installment, the budget is distributed evenly across the number of months.

SIEMENS		Data Manager 7KT1200	
Â			?
Device Settings	>	Your budget	
Sensor Settings	>		
Network Settings	>	Amount.*200.00€Period:1 month▼	
Modbus Settings	>	*) The amount includes VAT	
Data Export	>	Apply	
Backup	>		
Firmware Update	>		
Your Tariff	>		
Your budget	>		
Reset	>		
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Image 5-15 Budget settings

#### 5.1.8.9 Reset

There are three options under the menu item "Reset":

- Restart device: Settings and other data are retained.
- **Reset configurations:** Network and sensor settings are deleted, but the configuration of the Modbus data transfer is retained.
- Reset device to the delivery state: All configurations and settings, as well as counter statuses, are deleted.

# 5.2 Application for mobile devices

#### 5.2.1 Getting started

As well as the browser-based web application, there is also an application for mobile devices. The application can only be used to monitor and not to configure. The web application must be used for configuration.

Configurations set in the browser-based web application synchronize with the mobile application.

To use the application for mobile devices, it must first be installed on the desired devices. The procedure depends on the device used.

#### Android device

The mobile device must be connected to a PC. The installation file can then be downloaded to the tablet or smartphone and installed.

#### iOS device

Requirements for the iOS device:

- iPhone version 4S or higher
- iPad 2 or higher

"iTunes" software is required for installing the application on an iOS device. The "UDID" of the device can be read out via iTunes.

5.2 Application for mobile devices

#### Start of the application

If the application is started following successful installation, an automatic search is made for available multi-channel current measuring systems.

The found systems are listed on a Start screen.

	PLEASE SELECT A DATA MANAGE	ER
S/N: IP Address: Software:	<b>70347199</b> 192.168.178.123 1.50	(((•
S/N: IP Address: Software:	<b>70347207</b> 192.168.178.37 1.50	((1•
<b>S/N:</b> IP Address: Software:	<b>70391816</b> 192.168.178.77 1.50	(((•
		_

The system to be monitored can now be selected from this list.

#### 5.2.2 Home

After a multichannel system has been selected, the Home page with the current energy consumption appears.

Further information on available on the Home page:

- Date and time
- Navigation to:
  - Statistics
  - Current values
  - Installment
  - Energy stopwatch
- Closing of the selected multichannel current measuring system: Display returns to the selection of the detected systems.
- "Swipe" to the left / right to change between hourly, daily, weekly, monthly and annual consumption.



Image 5-16 Start page of the application

Operator control (software)

5.2 Application for mobile devices

#### 5.2.3 Statistics

The Statistics view offers the following evaluations:

- Overall consumption
- Individual system consumption
- Individual consumption
- Consumption of the individual sensors

Consumption (top right) can be shown in:

- €
- kWh

Possible display intervals:

- Hour
- Day
- Week
- Month
- Year

#### **Overall consumption**

Overall consumption is visualized using a bar chart.



5.2 Application for mobile devices

#### Individual system consumption

Individual system consumption is displayed in the form of a pie chart. The sensors selected in the Sensor settings are displayed here in a direct comparison.



#### Individual consumption

In the case of individual consumption, all selected sensors are represented underneath each other in a horizontal bar chart.

In this way, the individual sensors can be compared at a glance. This in turn means that differences in consumption of the individual sensors can be quickly detected.

All sensors connected to the Data Manager, as well as in the web interface, can, of course, also be looked at individually.

This is represented in the form of a bar chart.

# 5.2.4 Current values

The current values are represented in real time, exactly as in the browser-based web application.

It is possible to stop the recording here. The latest current (power) values are also shown in the current values.

Currently: 1.922 kW       Min/Max: 1.902 / 1.930 kW         2.00 kW	<	TI	ME GRAPH	I: TOTAL COM	SUMPTIO	N	¢°	
1.75 kW 12:14:00 12:15:00 12:16:00 03/09/2016 12:17:00 12:18:00 € € €	Currently: 1.92 2.25 kW	22 kW	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Min	/Max: 1.902 / 1.9	130 kW	
со в: — т (со со с	1.75 kW	::14:00	12:15:00	12:16:00 03/09/2016	12:17:00	12:18:00	0	
	٨		Ш	M	* -	Ø		

Image 5-17 Current values - Overall consumption

5.2 Application for mobile devices



#### Image 5-18 Current values - Current values

Another method of accessing the Data Manager via the application is to use the energy stopwatch. This can be started and stopped again.

# Service and maintenance

# 6.1 Error messages

The Status LED does not light up

Problem: The Data Manager is not supplied with power.

Solution: Ensure that at least the line conductor L1 and the neutral conductor N are connected to the Data Manager.

The Status LED lights up or flashes red.

Problem: There is a fault. Solution: Restart Data Manager. Solution: Contact Service.

The network LED does not light up, or the Data Manager is not found in the network.

Problem: The network cable is not correctly connected to the network connection. Solution: Ensure that the network cable is correctly connected to the network connection.

Problem: The Data Manager is not located in the same local network.

Solution: Connect the Data Manager with the same router / switch, or change the IP address in the PC.

The Energy Manager supplies unrealistic measured values.

Problem: The Data Manager has been installed incorrectly.

Solution: Check connection of L1 to L3 again.

6.2 Disposal

The user interface cannot be accessed via http://siemens-dm-testraum.local/.

The domain name is unable to be resolved.

The resolution of the host name requires at least one DNS service on the network.

Call up the user interface using the current IP address of the Data Manager. To do so, call up the user interface of the router, and read the IP address of the Data Manager (see router instructions).

With Windows XP/7/8: Install Apple Bonjour® (download links available at www.apple.com. Tip: Apple Bonjour® is also included in Apple iTunes®).

Contact the Network Administrator.

# 6.2 Disposal

The Data Manager must be disposed of in accordance with the locally applicable regulations for the disposal of electronic waste.

# **Technical data**

#### Process data

- ARM9 processor with 450 MHz
- DDR2 RAM with 128 MB
- eMMC Flash 4GB

#### **Operating system**

Embedded Linux with integrated TCP / IP stack

#### Interfaces (standard)

- LAN (10 / 100 Mbits)
- RS 485 (half-duplex, max. 115200 bit/s) for data transmission via Modbus RTU

#### Voltage and current inputs

Rated voltage	230 / 400 V AC		
Operating voltage	230 V ± 10 %		
Frequency	50 Hz ± 5 %, 110 V 60 Hz on request		

#### Intrinsic consumption

Voltage circuit	< 0.01 VA per phase	
Current circuit	< 2 VA per phase	
Overall device	< 5 W without activated WLAN	
Rated current	5 A	
Current limit	63 A	
Starting current	< 25 mA	

### Mounting

Conductor cross-section	10 25 mm <sup>2</sup> (mechanically from 1.5 25 mm <sup>2</sup> )
Torque for screw terminals	2.0 Nm

#### Measuring accuracy

Accuracy class in accordance with IEC 61557-12, relative to the measured value of the Data Manager

Voltage	± 0.5 %
Current	± 0.5 %
Active power	± 1.0 %
Apparent power	± 1.0 %
Reactive power	± 1.0 %
Power factor (p.f.)	± 1.0 %

#### Related to IEC IEC 62053-22 or -23 (typically)

Active energy	Class 1
Reactive energy	Class 1

When using external current transformers, the respective measuring accuracy must be taken into account.

#### EMC

#### ESD (IEC 61000-4-2)

- 4 kV contact discharge
- 8 kV air discharge

#### **RF** irradiation

• 3 V / m

#### Burst (IEC 61000-4-4)

- Network: ± 4 kV
- Ethernet: ± 2 kV

#### Surge (IEC 61000-4-5)

- Phase-phase: 1 kV
- Phase-ground: 2 kV
- Ethernet: ± 2 kV

#### Conducted interference (IEC 61000-4-6)

- 150 kHz ... 80 MHz
- RMS value: 3 V

#### RF irradiation (EN 55022)

Class B

#### **Operating conditions**

- Ambient temperature: 25°C ... + 45°C
- Storage temperature: 25°C ... + 70°C
- Relative humidity:
  - Up to 75 % annual average
  - Up to 95 % on up to 30 days / year

#### Mechanical data

- Material enclosure: Glass-fiber reinforced polyamide
- Glow-wire test: According to IEC 695-2-1
- Protection class / type: II / IP20
- Weight / size: 0.3 kg / 88x70x65 mm

#### RS485 interface

Protocol	Modbus	
Туре	RS485 half-duplex	
Data transmission rate	19200 or 115200 kbits	
Connectors	4-pin male connector 2.54 mm, enclosure	
	Proprietary	
RS 485 driver	Slew-rate limited, CS-Sensor MAX13412	
Electrical isolation	No	
Power supplies for sensors	Yes (280 mA)	
Voltage (min, max, typ.)	min. 8 V, max. 10 V, typ. 9 V	
Short-circuit protection of power supply	Yes	
Position of connectors	Top right, behind the control cabinet masking frame	

#### Connector assignments

Pin direct	Pin indirect	Description
1	4	Supply voltage 9 V
2	3	RS485-B
3	2	RS485-A
4	1	Ground

Technical data

7.1 Dimension drawings

# 7.1 Dimension drawings

# 7.1.1 Dimensions of the Data Manager

### View from the right and from the front



### View from above and from below



# 7.1.2 Dimensions of the sensor bar

Sensor bar with three sensor slots



## Sensor bar with six sensor slots



Technical data

7.1 Dimension drawings

### Sensor bar with nine sensor slots



#### Sensor bar with twelve sensor slots



# 7.1.3 Dimensions of the sensors on the sensor bar



Technical data

7.1 Dimension drawings

# Appendix

# A.1 FAQs

#### What is the measuring accuracy of the overall system?

Data Manager 1 %, overall system 2 %

#### At which intervals are the sensor values transferred to Siemens Data Manager?

< 1 second

# If the sensor bar is removed for replacement and then re-installed, how long does it take until the system continues as usual?

Differs according to system configuration.

#### In which languages can the system be configured?

The languages English and German are currently provided. Other languages are possible following verification.

#### Is the actual current communicated by the sensors or only a ratio?

The current is measured (in amperes).

#### Is mixed operation of 40 A and 63 A sensors possible in the case of the sensor bar?

It is possible.

#### Appendix

A.1 FAQs

# B.1 Electrostatic sensitive devices (ESD)

ESD components are destroyed by voltage and energy far below the limits of human perception. Voltages of this kind occur as soon as a device or an assembly is touched by a person who is not electrostatically discharged. ESD components which have been subject to such voltage are usually not recognized immediately as being defective, because the malfunction does not occur until after a longer period of operation.

#### ESD guidelines

### 

#### Electrostatic sensitive devices

Electronic modules contain components that can be destroyed by electrostatic discharge. These modules can be easily destroyed or damaged by improper handling.

- You must discharge your body electrostatically immediately before touching an electronic component. To do this, touch a conductive, grounded object, e.g., a bare metal part of a switch cabinet or the water pipe.
- Always hold the component by the plastic enclosure.
- Electronic modules should not be brought into contact with electrically insulating materials such as plastic film, plastic parts, insulating table supports or clothing made of synthetic fibers.
- Always place electrostatic sensitive devices on conductive bases.
- Always store and transport electronic modules or components in ESD-safe conductive packaging, e.g. metallized plastic or metal containers. Leave the component in its packaging until installation.

#### NOTICE

#### Storage and transport

If you have to store or transport the component in non-conductive packaging, you must first pack the component in ESD-safe, conductive material, e.g., conductive foam rubber, ESD bag.

The diagrams below illustrate the required ESD protective measures for electrostatic sensitive devices.

#### B.1 Electrostatic sensitive devices (ESD)



- (2) ESD standing position
- (3) ESD seat and ESD standing position

Protective measures

- a Conductive floor
- b ESD table
- c ESD footwear
- d ESD smock
- e ESD bracelet
- f Cubicle ground connection

# Glossary

# Application Application software or computer program that executes a useful function for the user. **Balancing counter** The balancing counter calculates the total of energy flows of all three phases, and registers this total according to the direction of the energy flow. CSV file This file format describes the structure of a text file for saving or exchanging simply structured data. Spreadsheet programs such as Microsoft Excel can read in or export CSV files. IT system Separation of all active parts from ground, or connection between a point and ground via an impedance in the distribution system. Direct grounding of the exposed conductive part of the electrical installation, regardless of existing grounding of a point in the supply system. Modbus One master and several slaves can be connected using Modbus. There are two versions, one for the serial interface and one for Ethernet. Every bus node must have a unique address. Any node may send messages over the bus. This is usually initiated by the master, and an addressed slave replies

Glossary

# Index

# Α

Additional devices Connection, 24 Android device Requirements, 43 Application Current values, 49 Individual system consumption, 48 Introduction, 43, 44 Overall consumption, 47 Start, 44 Statistics, 46 Applications, 14, 20

# В

Browser application Budget settings, 42 Current values, 29 Data export, 38 Device settings, 34 Energy stopwatch, 32 Function overview, 26 Getting started, 27 Installment, 30 Network Settings, 37 Reset, 43 Sensor settings, 35 Settings, 33 Statistics, 28 System environment, 25 Tariff settings, 41 Budget Settings, 42

## С

Conductive floor, 64 Connection, 23, 24 Additional devices, 24 Cubicle ground connection, 64 Current values, 29 Application, 49

### D

Data export Settings, 38 Data Manager Dimensions, 56 Introduction, 15 Overview, 16 Device Settings, 34 Diagnostics option LEDs, 21 Network LED, 21 Sensor LED, 21 Status LED, 21 Dimensions Data Manager, 56 Sensor bar, 57 Discharge, 63 Disposal, 52

## Ε

Electrostatic sensitive devices, 63 EMC, 54 Energy stopwatch, 32 Error messages, 51 LED, 51 ESD bracelet, 64 ESD footwear, 64 ESD guidelines, 63 ESD protective measures, 63 ESD seat, 64 ESD smock, 64 ESD standing position, 64 ESD table, 64

#### F

Firmware update, 41

### I

Individual system consumption Application, 48 Installment, 30 Interfaces, 53 Intrinsic consumption, 53 Introduction Application, 43 iOS device Requirements, 43

### L

Limits, 15

#### Ν

Network Settings, 37

### 0

Operating system, 53 Overall consumption Application, 47

#### Ρ

Power supply, 24 Process data, 53

# R

Requirements Android device, 43 iOS device, 43 Reset Settings, 43

### S

Sensor Overview, 19 Settings, 35 Sensor bar Dimensions, 57 Overview, 18 Settings Background information, 33 Browser application, 33 Budget, 42 Data export, 38 Device, 34 Network, 37 Reset, 43 Sensor, 35 Start-up, 26 System environment, 25 Tariff, 41 Start-up Settings, 26 Statistics, 28 Application, 46 Storage, 63 System environment, 22 Browser application, 25 Settings, 25

### Т

Tariff Settings, 41 Technical specifications, 53 Interfaces, 53 Intrinsic consumption, 53 Measuring accuracy, 54 Mounting, 53 Operating system, 53 Process data, 53 RS 485 interface, 55 Voltage and current inputs, 53 Transport, 63

#### V

Voltage and current inputs, 53

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