



# **NOKIA 30 GSM CONNECTIVITY TERMINAL**

## **PRODUCT GUIDE**

**NOKIA**



# Contents

- DEFINITIONS AND TERMINOLOGY ..... 2
- 1. DOCUMENT SCOPE..... 3
- 2. PRODUCT CONCEPT AND USAGE ..... 3
- 3. OPERATING MODES..... 4
  - 3.1 USER CONTROL MODE ..... 4
  - 3.2 AT COMMAND MODE ..... 4
  - 3.3 M2M SYSTEM MODE ..... 5
- 4. FEATURES..... 7
  - 4.1 WIRELESS DATA BEARERS..... 7
  - 4.2 SERVER CONTROLLED I/O..... 7
  - 4.3 RELIABILITY AND ACCESS CONTROL..... 8
  - 4.4 SUPPLEMENTARY SERVICES ..... 9
- 5. INTERFACES ..... 10
  - 5.1 USER INTERFACE ..... 10
  - 5.2 M2M SYSTEM CONNECTOR INTERFACE ..... 11
  - 5.3 POWER INTERFACE..... 11
  - 5.4 ANTENNA INTERFACE ..... 11
  - 5.5 SIM CARD INTERFACE..... 11
  - 5.6 DIGITAL AND ANALOG AUDIO ..... 11
  - 5.7 REMOTE I/O CONTROL..... 13
- 6. SALES PACKAGES..... 13
  - 6.1 COMPLETE SALES PACKAGE ..... 13
  - 6.2 BASIC SALES PACKAGE ..... 14
- 7. ACCESSORIES..... 16
  - 7.1 POWER SUPPLY..... 16
  - 7.2 DATA PACKAGE..... 16
  - 7.3 EXTERNAL ANTENNA CABLE ..... 17
  - 7.4 CONFIGURATOR SOFTWARE ..... 19
- 8. CORBA AND NOKIA 30..... 20
  - 8.1 THE NOKIA 30 GSM CONNECTIVITY TERMINAL IDLS ..... 20





9. TECHNICAL SPECIFICATION ..... 21

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## DEFINITIONS AND TERMINOLOGY

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API	Application Programming Interface
AT	Attention
CORBA	Common Object Request Broker Architecture
CSD	Circuit Switched Data
DAI	Digital audio interface
GIOP	General Inter-ORB Protocol, General Inter-Object Request Broker Protocol
GSM	Group Special Mobile, Global System for Mobile Communications
GPRS	General Packet Radio Service
HSCSD	High Speed Circuit Switched Data
IDL	Interface Definition Language
M2M	Machine-to-Machine, Man-to-Machine, Machine-to-Man
MO	Mobile Originated
MT	Mobile Terminated
ORB	Object Request Broker
PC	Personal Computer
PIN	Personal Identity Number
PUK	Personal Unblocking Key
SIM	Subscriber Identity Module
SM	Short Message
SMS	Short Message Service
SMSC	Short Message Service Centre
USSD	Unstructured Supplementary Services Data



## 1. DOCUMENT SCOPE

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This document describes the main characteristics of the Nokia 30 GSM Connectivity Terminal. Sales packages and accessories are also described in this document.

For more detailed information and information about application development and development support for M2M, please visit our website at <http://www.forum.nokia.com>.

## 2. PRODUCT CONCEPT AND USAGE

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As we move quickly towards the third generation mobile world, more attention than ever is being paid to the wireless data market. We have only seen the first steps that have been taken towards the future of the mobile information society, but it is already clear that wireless data will be about a lot more than just web browsing. Machine-to-machine (M2M) communication solutions are an important part of wireless data services, making valuable information and services available to corporations and mobile users alike. The market potential is huge, and new applications are emerging continuously when operators, service providers and developers are searching opportunities for growth. The telecom industry in general is shifting towards end-to-end solutions, which requires reliable communication and information transfer.

M2M communications give corporations the opportunity to make savings in operational costs, enhance their customer service, and so on. Examples of M2M applications are the remote control of utility meters or vending machines, traffic information, industrial applications, security and surveillance, sales and payments, fleet management, telemedicine, public services and much more.

The Nokia 30 GSM Connectivity Terminal is an M2M (machine-to-machine) communications device with versatile interfaces and advanced functions. Connected to different machines and devices, it provides wireless connectivity and remote management possibilities for customer applications through its three operation modes. It offers GPRS, USSD, high-speed data, as well as other advanced services, over EGSM900/GSM1800 networks. It is a perfect fit for various application environments for its size, versatility and reliability.



## **3. OPERATING MODES**

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The Nokia 30 supports three operation modes from which the best suited one for the application can be chosen.

The User control mode is especially designed with man-to-machine and machine-to-man communications in mind. One can easily control simple applications built using the services of the Nokia 30 with a mobile handset.

The AT command mode offers efficient point-to-point communications through the modem capabilities of the Nokia 30.

The M2M System mode in turn takes in full use all the advanced services offered by the Nokia 30. In the M2M System mode, the Nokia 30 functions as a part of the intelligent Nokia M2M Platform that offers seamless wireless communications for different machine-to-machine solutions.

### **3.1 USER CONTROL MODE**

In the user control mode the Nokia 30 GSM Connectivity Terminal is controlled by a mobile phone. Text message templates that are sent from the mobile to the Nokia 30 instruct the terminal, which in turn controls a device or machine attached to it through the M2M System connector.

An example of a device attached to the Nokia 30 for wireless control would be a refrigerator. You might want to check the temperature of the refrigerator when out of town. The temperature of the refrigerator could be altered with the mobile as well. You could also turn off the lights of the apartment that you had accidentally left on by sending a text message template.

There are three levels of access control for the User control mode. Firstly, a message identifier entered when the terminal is used for the first time with the Nokia 30 Configurator is only known by the person who entered it. This identifier begins every text message template aimed to control the Nokia 30 and the application attached to it. Secondly, it can be specified from which phone number the text message templates are allowed. Thirdly, a password can be used that is entered whenever a text message template is sent to the Nokia 30.

### **3.2 AT COMMAND MODE**

Besides the User control mode, the Nokia 30 can also be used in AT command mode. In this mode, the terminal can be used as a wireless modem for data and fax communication when attached to a PC or a compatible device. In addition to this, the terminal can be controlled directly with AT commands by different machines and devices, for example.

Data modem usage is enabled with an RS-232 data adapter connected to the Nokia 30; see Figure 6. The RS-232 adapter has a connector for the standard RS-232 data cable. The RS-232 data cable is then connected to a PC or another compatible device. In addition to this, AT commands are also available via the M2M System Connector.

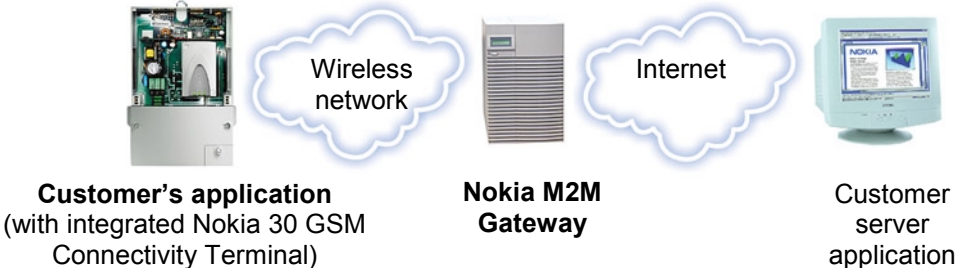
All applicable ITU-T V.25ter, ETSI GSM 07.07 and ETSI 07.05 AT commands are supported. The supported AT commands are described in the AT command list, which is available on the Nokia 30 CD-ROM included in the complete sales package (see chapter 6.1) and in the data package (see chapter 7.2).

In modem use, no Nokia-specific user interface software or driver is required. The Nokia 30 can be used with standard modem drivers and communications applications. However, special modem driver for the Nokia 30 is provided in the Nokia 30 CD-ROM included in the Nokia 30 complete sales package (see chapter 6.1) and in the data package (see chapter 7.2).

The Nokia 30 complete sales package includes all of the accessories required for the Nokia 30 to be used as a normal GSM modem. Alternatively, GSM modem functionality can be achieved with the Nokia 30 basic sales package combined with the data package and a power supply unit. (See chapters 6 and 6.2)

### 3.3 M2M SYSTEM MODE

In the M2M System mode the Nokia 30 functions as a part of the Nokia M2M Platform. The Nokia M2M Platform is a complete, wireless end-to-end solution for machine communication; see Figure 1. It comprises the GSM Connectivity Terminals and the Nokia M2M Gateway. With the Nokia M2M Platform, development costs can be minimised.




**Figure 1. Nokia 30 GSM Connectivity Terminal as part of Nokia M2M Platform**

The M2M system mode of Nokia 30 offers many unique benefits such as wireless bearer selection (GPRS, USSD, HSCSD, CSD, SMS), ready-made protocol stacks, separation of data transfer from the application and the possibility of introducing new technologies without changing the application. It offers an open interface for application developers and effective and reliable methods for controlling the terminal and the application.

In addition to other benefits, the Nokia 30 offers additional reliability and access control in the M2M System mode. Abnormalities in communication can be easily detected with the help of system monitoring; see Chapter 4.3. The Nokia M2M Platform has built-in reliability in its method calls. Mutual authentication between the Nokia M2M Gateway and the GSM Connectivity Terminals enables efficient access control.

Technologically, the Nokia M2M Platform is an object-oriented SW platform based on CORBA, an open and widely accepted industry standard. The Nokia M2M Platform is adaptable to a wide range of purposes and communication methods and can be used in several applications. The Nokia M2M Platform hides network complexities and is transparent



to different machines, OS and language implementation, thanks to CORBA method calls. (See Chapter 8).

In the M2M System mode, the services offered by the Nokia 30 are used via its M2M system connector (see Figure 3). The customer's application module is connected directly, or using flat cable, to the Nokia 30 via the M2M system connector.





## 4. FEATURES

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### 4.1 WIRELESS DATA BEARERS

The Nokia 30 GSM Connectivity Terminal supports five bearers for wireless data transfer, which can be used where GSM networks support them.

- General Packet Radio Service (GPRS)
- High speed circuit switched data (HSCSD)
- Circuit switched data (CSD)
- Short messages (SMS)
- Unstructured Supplementary Service Data (USSD)

General Packet Switched Service (GPRS) utilises packet switched technology where information is transmitted in small bursts of data. The GPRS mobile station class of the Nokia 30 is class B. This means that both GPRS connections and circuit switched connections are possible, although it has to be defined which one is used each time. The Nokia 30 supports GPRS multi-slot class 6, thus multiple timeslots can be used for data transfer at the same time: 3 + 1, 2 + 2 or 2 + 1 slots.

With High Speed Circuit Switched Data (HSCSD), the Nokia 30 is a multi-slot class 6 terminal and offers data transfer speeds of up to 43.2kbit/s when 3+1 timeslots are in use.

Circuit switched data offers data speeds of up to 14.4kbit/s.


The Short Message Service allows the user to send and receive messages of up to 160 characters via the Nokia 30. The service can deliver messages to the Nokia 30 whenever it is connected to the network, even when the terminal is engaged on an active call. SMS is a convenient way of passing data quickly and easily to and from Nokia 30 terminals. The Nokia 30 also supports unicode SMS messages for graphical character sending.

Unstructured Supplementary Services Data (USSD) offers reliable interactive messaging services. USSD allows the user to send and receive messages of up to 182 characters via the Nokia 30. When USSD is used, a session is established for the duration of the connection. This increases data transfer reliability, as the delay is known. In addition, it shortens response times.

With the Nokia 30, it is possible to choose which bearer is used in the application. With a wireless bearer choice, communication costs can be optimised. When new technologies and bearers are introduced, the onward compatibility of the Nokia 30 offers the possibility of choosing from more bearers.

### 4.2 SERVER CONTROLLED I/O

A control similar to the one described in chapter 3.3 is also possible in the M2M System mode. In this case, the control of the device is performed from the Internet browser that utilises the services of the Nokia 30 as part of the Nokia M2M Platform.



With server controlled I/O there are wider possibilities for controlling devices than in the user control mode. In the user control mode it is possible to read continuous information such as the temperature reading and turning something on or off. When server controlled I/O is used, it is also possible to get the temperature reading on a specified frequency: for example, an update could be sent every 10 minutes. You can also set limits for an alarm; if the temperature rises above e.g. –15 degrees, a message is sent to the Internet.

On the Internet the information from the device is interpreted on a network server, and it can be acted upon. An example of the usage of the Server controlled I/O could be a company operating in the process industry. It could have a system consisting of 500 containers and a central monitoring station. If the temperature of one of the containers were to exceed a specific limit, an alarm message would be sent to the monitoring station and to the monitor person. The person would then know exactly where the problem is and would be able to act on it. The information could also be stored on the database for future use and analysis.

### **4.3 RELIABILITY AND ACCESS CONTROL**

The Nokia 30 supports normal GSM encryption, GSM security codes, AutoPIN, system monitoring and authentication to ensure the reliability and security of the M2M application.

The Nokia 30, as part of the Nokia M2M Platform, offers reliability through a supervised data pipeline. Supervision is provided by effective and reliable methods for controlling the terminals and the application via CORBA method calls. Connection between the Gateway and the Nokia 30 is mutually authenticated to prevent any intervention. Additional methods for security and encryption can be completed by the application.

With the Nokia 30's reliability features and supervision provided by the Nokia M2M Platform, full control of a customer's M2M application is possible. Messages are passed to the correct destination, in the correct form, in a way that can also be tracked.

#### **GSM encryption**

The Nokia 30 supports normal GSM encryption for end-user privacy.

#### **GSM security codes**

The Nokia 30 supports the following GSM security codes:

- PIN
- PIN2
- PUK
- PUK2
- SECURITYCODE
- CALLBARRINGCODE

Security codes can be changed via the Nokia 30 Configurator (see Chapter 7.4) as well as from the network and from the application module.



## **AutoPIN**

SIM security enables device recovery following (occasional) power cuts without on-site intervention and helps prevent fraud. SIM security is achieved using the AutoPIN feature. The PIN code is programmed in the terminal's memory where it is relayed in unusual situations. When AutoPIN is in use, the SIM card is useless to any outsider.

## **System monitoring**

Connection between the Nokia 30 and the application module is checked periodically by live checks. Based on the live checks, the Nokia 30 and the application module can be reset automatically if the connection between them breaks. This feature only exists in the M2M system mode (see Chapter 0) when traffic is sent through the M2M system connector.

## **Authentication**

The terminal and Gateway authenticate each other when circuit switched data or high speed circuit switched data is used. This kind of authentication can be used in the M2M System mode.

## **4.4 SUPPLEMENTARY SERVICES**

Supplementary service features are network services. They are special services provided by wireless network service providers and therefore vary from one network and country to another.

The Nokia 30 supports the following GSM phase 2+ supplementary services.

- Call Forwarding
- Call Waiting
- In-Call Handling
- Call Restriction
- Security Options
- Call Transfer
- Multiparty Call

## 5. INTERFACES

### 5.1 USER INTERFACE

Three light indicators (LEDs) form the user interface of the Nokia 30. The LED user interface is shown in Figure 2. LED 1 shows the terminal status, while the other two are reserved for the application module following start-up. During start-up and special operations, all three light indicators are in terminal use. The functionality of the light indicators in start-up, normal, and special situations, is described in Table 1, Table 2, and Table 3, respectively. All three LEDs can also be configured so that they will not show any status and will stay off during any operation.

**Table 1. Nokia 30 light indicator states during start-up.**

LED 1	LED 2	Status LED	Description
-	-	-	Power off/silent mode
Green scan	Green scan	Green scan	Power on, connecting to network
-	Red blink	-	PIN query/new PIN query
-	Red blink	Red blink	PUK query
			<b>Intensity of Field Strength:</b>
Red blink	-	-	Unacceptable
Green Blink	-	-	
Green	-	-	Weak
Green	Green Blink	-	
Green	Green	-	Moderate
Green	Green	Green Blink	
Green	Green	Green	Good
			>-80 dBm

**Table 2. Nokia 30 light indicator states during normal operation.**

LED 1	LED 2	Status LED	Description
*	*	Green	In service
*	*	Green blink	Call on
*	*	Green blink	Incoming call
*	*	Green/Red blink	Message received/Voicemail in box
*	*	Red blink	Message arriving and memory is full

\*) Application module controllable in M2M System mode



**Table 3. Nokia 30 light indicator states in special situations.**

LED 1	LED 2	Status LED	Description
Green/Red blink	Green/Red blink	Green/Red blink	Insert SIM card
Red blink	Red blink	Red blink	Failure, contact service
Yellow	Yellow	Yellow	Initialising

## 5.2 M2M SYSTEM CONNECTOR INTERFACE

The preferable interface between the Nokia 30 and the application is the M2M system connector. The M2M system connector supports CORBA messaging, power input/output, RS232 at 3 V level, Digital Audio Interface (DAI) and analog audio interface, and remote input/output control. The M2M system connector is shown in Figure 3.

The M2M system connector offers an open interface for application developers and effective and reliable methods for controlling the terminal and the application.

## 5.3 POWER INTERFACE

The Nokia 30 has a DC connector for the Nokia ACW-5A power supply. The power interface is shown in Figure 3.

- Input voltage range: 6.2 Vdc – 14.0 Vdc

The M2M system connector provides regulated voltage for the application. Alternatively, the application module can supply the terminal with a wide voltage range.

- DC input voltage range: 4.75 V – 15.0 V

Nokia 30 has a regulated switch able power output for customer application.

- DC output voltage: 3.6 V DC
- DC output current: 300 mA

## 5.4 ANTENNA INTERFACE

The transmitting (RF) power of the Nokia 30 is 2W (max) in GSM900 and 1W (max) in GSM1800 networks. The antenna interface is shown in Figure 2.

## 5.5 SIM CARD INTERFACE

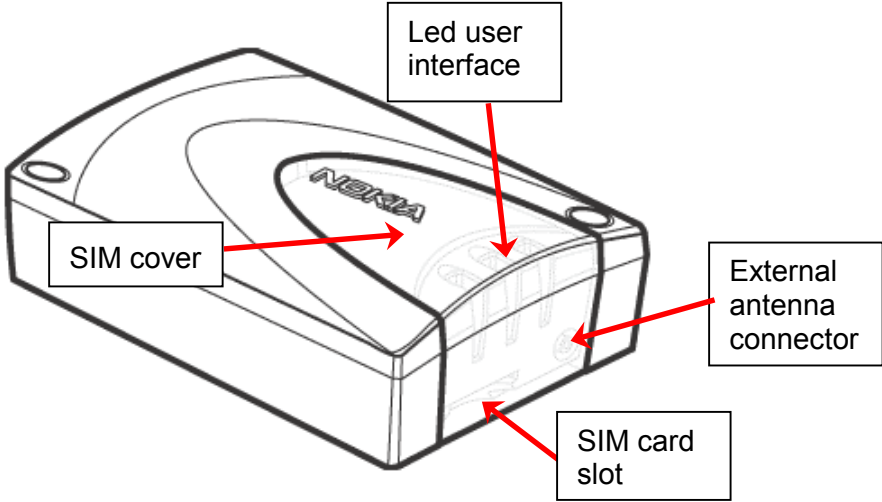
The Nokia 30 supports small-sized 3 V SIM cards. The SIM card slot is shown in Figure 2.

## 5.6 DIGITAL AND ANALOG AUDIO

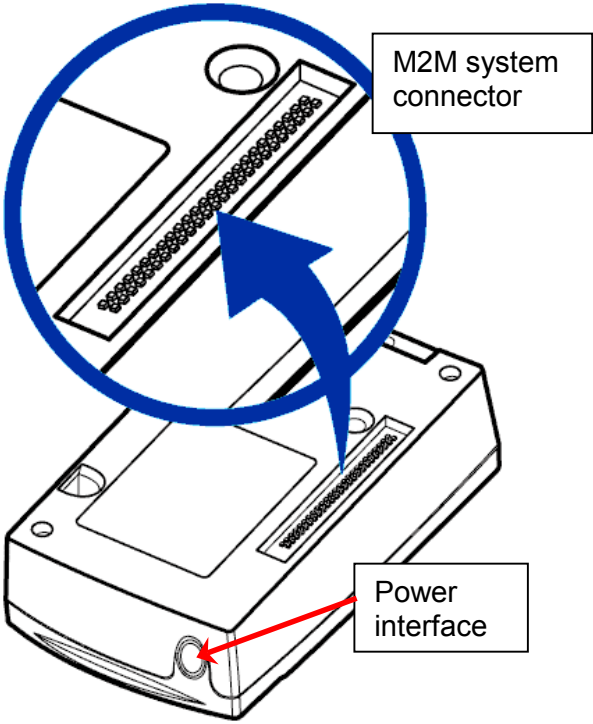
The Nokia 30 offers digital audio functionality for GSM via Digital Audio Interface (DAI). DAI support is found in the M2M system connector. An external audio codec is required.



The M2M system connector also supports analog audio functionality that is an alternative to the Digital Audio Interface. Microphones and headphones can be connected through the analog audio signal interface.



**Figure 2. Nokia 30 GSM Connectivity Terminal, front view.**



**Figure 3 Nokia 30 GSM Connectivity Terminal, bottom view.**



## **5.7 REMOTE I/O CONTROL**

There are three general-purpose inputs and five general-purpose outputs on the M2M system connector. The inputs can be used in either digital (on/off) or analog (continuous signal) mode. The outputs can be used in digital mode only (set something on/off).

The general-purpose inputs and outputs can be controlled with either specified text messages in the User control mode (see chapter 3.3) or with CORBA messages using the Server controlled I/O service (see chapter 4.2) of the Nokia 30.

## **6. SALES PACKAGES**

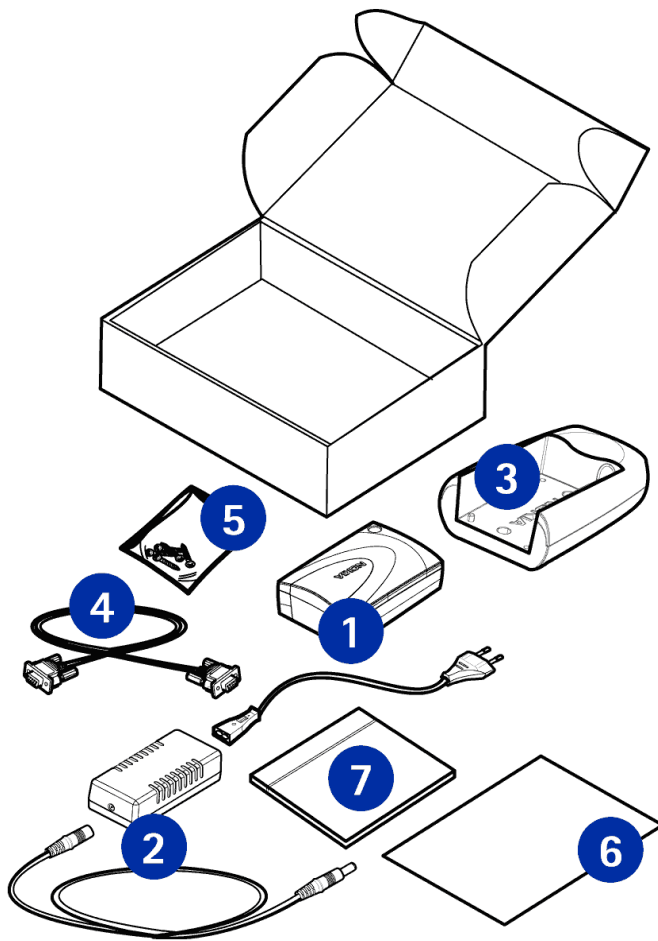
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The Nokia 30 is available in two sales packages: a basic sales package and a complete sales package.

### **6.1 COMPLETE SALES PACKAGE**

1. Nokia 30 GSM Connectivity Terminal
2. Power supply ACW-5A
3. Data adapter RS-232
4. Data cable RS-232
5. Installation kit
6. Product note
7. Nokia 30 CD-ROM includes: User's guide for modem use, AT command list, Modem options for Nokia 30, Nokia 30 Configurator

Sales package contents are shown in Figure 4.



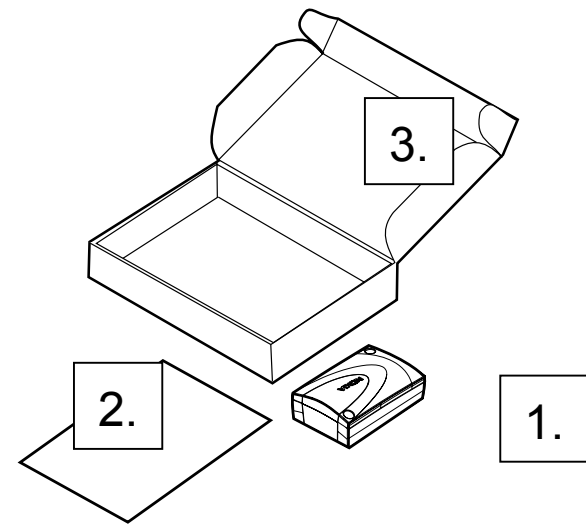
**Figure 4 Nokia 30 GSM Connectivity Terminal Complete Sales Package.**

## **6.2 BASIC SALES PACKAGE**

- 8. Nokia 30 GSM Connectivity Terminal
- 9. Product note
- 10. Package carton

Sales package contents are shown in Figure 5.





**Figure 5. Nokia 30 GSM Connectivity Terminal Basic Sales Package.**



## **7. ACCESSORIES**

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A full range of accessories are available for the Nokia 30 GSM Connectivity Terminal.

- Power supply ACW-5A
- Data package
- Antenna adapter
- Configurator software

### **7.1 POWER SUPPLY**

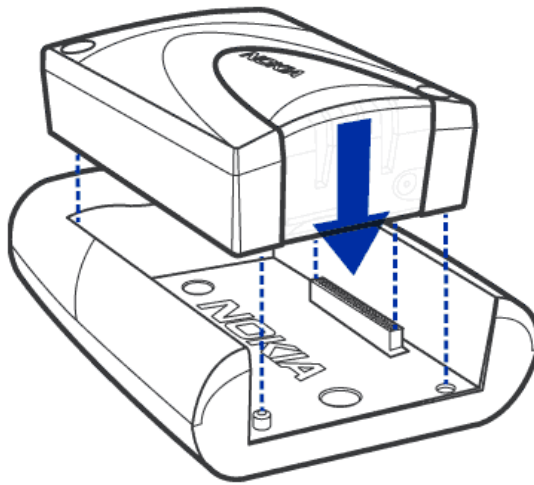
A power supply unit (ACW-5A) is included in the complete sales packages. The power supply plug type (Euro, UK, US) depends on the country and region.

### **7.2 DATA PACKAGE**

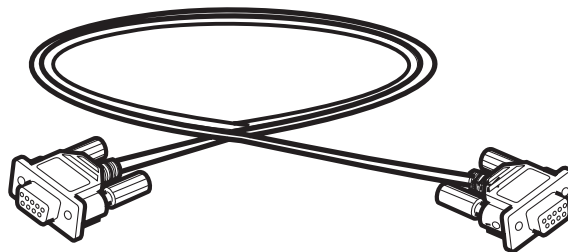
The data package includes:

- Data adapter RS-232
- Data cable RS-232
- Nokia 30 CD-ROM: user's guide for modem use, AT command list, Modem options for Nokia 30, Nokia 30 Configurator

Data cable RS-232 and data adapter RS-232 are required when the Nokia 30 is used in AT command mode as a data modem. The data cable RS-232 is connected to the D9 connector in the RS-232 adapter and to the serial port of an application module, a computer, or other compatible device.



**Figure 6 Mounting the Nokia 30 to the Data adapter RS-232.**



**Figure 7 Data cable RS-232.**

### **7.3 EXTERNAL ANTENNA CABLE**

The Nokia 30 has an optional external antenna connector cable (XRM-1). The cable is connected to the external antenna connector of the Nokia 30 and to an external antenna with a standard FME connector (see Figure 8). A package contains ten pieces of the external antenna cable.



***Figure 8 External antenna cable XRM-1.***





## 7.4 CONFIGURATOR SOFTWARE

Configurator software is used when the Nokia 30 GSM Connectivity Terminal is activated for the first time, or when terminal settings need to be changed. It helps to modify the basic settings of the terminal so that the connection to the GW can be established. The following configurations can be configured with the software:

- M2M System settings
- Remote I/O control settings
- GSM security settings
- GSM settings
- Quick install

A PC or laptop, data adapter RS-232 and data cable RS-232 are required when configuring the Nokia 30. Nokia 30 Configurator software is included in the Nokia 30 CD-ROM provided in the Complete sales package and in the Data package. It is also available from the Forum Nokia web page: <http://www.forum.nokia.com>.



## 8. CORBA AND NOKIA 30

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The CORBA (Common Object Request Broker Architecture) is a widely distributed computing infrastructure, standardised by the Object Management Group (OMG) consortium. In short, CORBA applications are composed of objects which can be located within different machines. Objects have services and they are utilised with request messages. The CORBA hides the underlying transferring network, such as the Internet or GSM network as well as the underlying protocols, so that a user can use functions as local procedure calls.

Object services are described with an abstract language named IDL (Interface Definition Language). The IDL also provides the necessary information required to develop clients that use an object's interface operations. The interface definition specifies which member functions, data types, attributes and exceptions are available to a client, without making any assumptions about an object's implementation. An IDL compiler is responsible for mapping IDL interfaces onto the particular programming language, such as C, C++ or Java. Thus, the programming language that is used in CORBA implementation does not have to be object-oriented.

Example applications implemented using CORBA IDL can be found at the Forum Nokia web pages; <http://www.forum.nokia.com>.

### 8.1 THE NOKIA 30 GSM CONNECTIVITY TERMINAL IDLS

The Nokia 30 offers services through three IDLs: *wirelessDevice*, *Nokia GSM connectivity terminal* and *Remote IO Control*. The *wirelessDevice* IDL is common for all kinds of devices. Terminal-specific services are described in the Nokia GSM Connectivity Terminal IDL and features related to remote input/output control in the Remote IO Control IDL.

The services offered by *WirelessDevice* IDL are divided into four groups: *Device*, *ParamObserver*, *EventObserver* and *IOControlObserver*. The *Device* group has functions to handle dynamic parameters and counters. It also has functions to manage event and parameter observation. The *EventObserver* services are used to provide information regarding unusual events like incoming calls or network connection loss. *ParamObserver* functions are used in the same way, but in their case, are used to receive notification of changes in dynamic parameters. The *IOControlObserver* is used to indicate changes in the general-purpose input and output pins.

The Nokia GSM connectivity terminal IDL provides GSM-related operations, such as call control, SMS, USSD, supplementary service and light indicator control functions. They provide easy access to basically all mobile network services.

Remote IO Control IDL has functions for the remote control of input/output pins residing in the M2M System Connector.

All dynamic parameters and counters in the Nokia GSM connectivity terminal are described with XML (Extensible Markup Language) so they are easily available in a simple and universal format.



## 9. TECHNICAL SPECIFICATION

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### Operation modes

User control mode: Enables simple applications that are controlled by mobile handsets with text messages. Control is through general-purpose inputs and outputs of the terminal.

AT Command Mode: the Nokia 30 can also function as a GSM data modem using AT commands

M2M System Mode: offers effective and reliable methods for controlling the terminal and the application. Provides network transparent development and communication through a vendor, operating system and language independent architecture.

### Features

Dual band EGSM 900/GSM1800 MHz

Wireless bearer selection (In M2M System mode)

GPRS multi-slot class	Class 6 (3+1, 2+2, 2+1)
GPRS mobile station class	Class B
CSD	Up to 14.4 kbps
HSCSD multi-slot class	Class 6 (3+1, 2+2, 2+1)
Messaging services	SMS, USSD (MO, MT)
Supplementary services	GSM Phase 2/2+ supported
Audio services	Digital audio interface (DAI), Analog audios
Remote I/O control	Server/User controlled I/O,3 digital/analog inputs, 5 digital outputs
Reliability & access control	GSM encryption, GSM security codes, AutoPIN, authentication, system monitoring





## Interfaces and connectors

Power:	DC connector for the Nokia ACW-5A power supply
M2MSC:	M2M System Connector is 50-pin male connector for serial communication, RS-232, power input/output, digital/analog audio, fax, Remote I/O control
RS-232:	RS-232 interface available on M2M system connector at 3 V level. D9 female connector for standard level RS-232 available with a data adapter RS-232 accessory. Supports AT commands
UI:	User interface with 3 light indicators (LEDs)
SIM-card:	SIM-card reader supporting small-size SIM cards (3V)
Antenna:	Internal antenna, use of external antenna supported

## Accessories

Power supply (ACW-5A):	A switched mode power supply (90-264 Vac)
Data package:	Data adapter RS-232 and data cable RS-232 with D9 connectors, Nokia 30 CD-ROM
Nokia 30 Configurator:	Software for configuring the different settings of the Nokia 30
Antenna adapter (XRM-1):	An adapter cable that is used between the Nokia 30 and standard FME connector of an external antenna

## Technical specification

Size	84 x 53 x 26 mm
Weight	65 g
Volume	116 cm <sup>3</sup>
Environmental temperature	-10...+55 °C
Storage temperature	-40...+85 °C
Humidity range, operation	20...75 %
Humidity range, storage	5...95 %
SIM-card	Small
Band	Dual band EGSM900 & GSM1800





RF power (max.)	2W (900 MHz), 1W (1800 MHz)
Power consumption	150 mW (stand-by)

**Input voltage DC plug**

Absolute min	6.2 V
Absolute max	14.0 V

**Power supply ACW-5A**

Voltage	13.5 V
DC	700 mA
Operating range between	90 – 264 Vac
Frequency range	47 – 63 Hz
Weight	70 g + cables
Volume	100 cm <sup>3</sup>