# U1602, U1603

ECS ENERGY · CONTROL · SYSTEM

- **64 processing channels**
  physical inputs or LON meter outputs can be assigned
  for the calculation of energy, power and costs
- **Energy Control Language**
  for the programming of analysis,
  monitoring and optimization applications
- **LON interface** for 63 LON devices
- **Two RS 232 interfaces (115 kBit/s)**
  for connection to PC, modem, printer or radio-controlled clock
- **Two ECS LAN interfaces**
  for the linking of individual summators over great distances
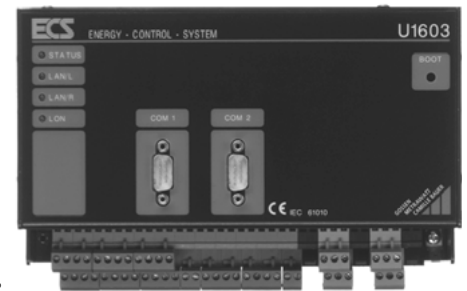- **Simple software update via serial interface (Flash)**
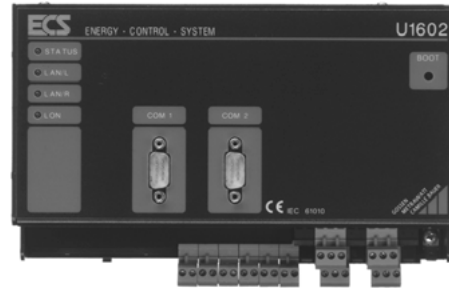
U1603

- **6 universal inputs:** ± 5 mA, ± 20 mA, ± 10 V, S0 pulse
- **2 analog outputs:** ± 20 mA or ± 10 V
- **2 relays and 4 MOS switches** for controlling external processes

QUALITY MANAGEMENT SYSTEM

DQS certified per
DIN EN ISO 9001 Reg. No.1262

Applications

The U1602 micro-summator and the U1603 mini-summator are used as PC adapters or LON interfaces for the ECS LAN, and are not equipped with any display or operating elements. Inputs and outputs expand the U1603 mini-summator into a miniature data collector and optimization unit.

Meter Inputs

Up to 63 LON devices can be connected to the U1602 micro-summator or the U1603 mini-summator via the easy-to-wire, polarity-reversal-protected, electrically isolated LON interface:

- Multifunctional power meter   A2000
- Programmable multi-measuring transducer   DME 400
- Electricity meter   U1681, U1687, U1689
- Meter reading module   U1660
- Analog input module   U1661
- Relay output module   OCL210 by Littwin

Analysis

All relevant energy and consumption data are logged over defined time periods at a programmable interval via 64 processing channels and are stored to memory as load profiles along with the corresponding maximum values.

Beyond this, the U1603 mini-summator is also capable of processing analog or pulse signals via six input channels with configurable parameters.

Operation

The U1603 is equipped with two analog outputs, four MOS switches and two relays (changeover contacts) for the control of external processes. Data exchange with a PC, as well as remote querying via modem are accomplished via the RS 232 interface (115 kBit / s). A radio-controlled clock for the synchronization of system time, as well as a report printer, can also be connected.

Networking

Individual summators can be linked into a network over great distances with the multi-master compatible **ECS LAN** with free selection of network topology, and have unrestricted access to all data available from each of the network users.

Universal Application

Both the U1602 micro-summator and the U1603 mini-summator are suitable for customer-specific calculations, analyses, monitoring and optimization thanks to integrated high-level intelligence and the system-specific ECL programming language - even independent of the Energy Control System.

Variable Installation

The compact housing and IP protection have been laid out for rugged industrial use, and the modules can be mounted to top-hat rails in accordance with EN50022. They can also be mounted with screws, or integrated into the control cabinet. Installation is user-friendly and easy with plug-in screw terminals.

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Applicable Regulations and Standards

EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN 43864	Current interface for pulse transmission between impulse meters and tariff devices
VDE 0470 Part 1	IP protection provided by enclosures (DIN 40050)
IEC 68 Part 2-6	Basic environmental test procedure Sinusoidal oscillation
UL 94	Test for flammability of plastic materials for parts in devices and appliances
EMC Standards	see Technical Data

Symbols and their Meanings

Symbol	Meaning
X	Measured quantity, analog input
X2	Upper range value of measured quantity
Y	Output quantity, analog output
Y2	Upper range value of output quantity

Memory Capacities per Channel

Energy

Cumulative Energy as of a Defined Starting Time	
E tot	Independent of tariff
E tot T1	For tariff 1 only
E tot T2	For tariff 2 only
E tot T1T2	For tariff 1 + tariff 2
Cumulative Energy for Defined Time Periods	
E Day	For current day and each of the last 10 days
E Month	For current month and each of the last 12 months
E Year	for current year and each of the last 4 years
E Int	For all stored measuring intervals (measurement data list)
Maximum Values for Measuring Intervals, with Date and Time Stamp	
E maxInt	The 10 highest values for all measuring intervals as of a defined starting time
E maxDay	Maximum value for the current day, and for each of the last 10 days
E maxMonth	Maximum daily value for the current month, and for each of the last 12 months
E maxYear	Maximum value for the current year, and for each of the last 4 years

Costs

Cumulative Costs as of a Defined Starting Time	
CostT1	For tariff 1 only
CostT2	For tariff 2 only
CostT1T2	For tariff 1 + tariff 2

Power

Instantaneous Power	
P mom	Determined from the time interval between the last two pulses (with connection to E1 … E12)
Mean Values for Measuring Intervals	
P int	For all stored measuring intervals (measurement data list)
Maximum Values for Measuring Intervals, with Date and Time Stamp	
P maxInt	The 10 highest values from all measuring intervals as of a defined starting time
P maxDay	Maximum value for the current day, and for each of the last 10 days
P maxMonth	Maximum daily value for the current month, and for each of the last 12 months
P maxYear	Maximum value for the current year, and for each of the last 4 years

Technical Data

Inputs (U1603)

The 6 inputs can be configured individually with the DIP switches.

Analog Input (Current)	
Input quantity	direct current
Design	electrically isolated
Input range	$-X2 \leq X \leq +X2$
Upper range value X2	5 mA/20 mA
Max. input current	$\leq 2.5\ X2$
Control limit	$\pm 1.25\ X2$
Input resistance X2: 20 mA X2: 5 mA	75 Ω 300 Ω
Common mode rejection	≥ 80 dB (≤ 120 Hz)

Analog Input (Voltage)	
Input quantity	direct voltage
Design	electrically isolated
Input range	$-X2 \leq X \leq +X2$
Upper range value X2	10 V
Max. input voltage	≤ 30 V
Control limit	$\pm 1.25\ X2$
Input resistance	118 kΩ
Common mode rejection	≥ 80 dB (≤ 120 Hz)

Binary Input	
Input quantity	direct voltage (square-wave pulses, SO compatible)
Design	electrically isolated
Operating point (adjustable)	signal level: L: 0.5/1.25/2.5/3.5 mA
Max. input voltage continuous intermittent (t $\leq$ 1 s)	 ≤ 48 V ≤ 60 V
Series impedance (internal)	4.7 kΩ
Allowable switching elements	semiconductor switches, relays
Pulse duration T_{on} (adjustable)	10 … 2550 ms
Interpulse period T_{off}	≥ 2 ms
Pulse frequency	≤ 250 Hz

Outputs:

The 2 analog outputs can be configured individually with the DIP switches.

Analog Output (Current) (U1603)	
Output quantity	direct current
Design	electrically isolated
Output range	$-Y2 \leq Y \leq +Y2$
Upper range value Y2	20 mA
Max. output voltage	≤ 30 V
Max. output current	≤ 25 mA
Load range	$0 \leq \underline{250\ \Omega} \leq 400\ \Omega$

Analog Output (Voltage) (U1603)	
Output quantity	direct voltage
Design	electrically isolated
Output range	$-Y2 \leq Y \leq +Y2$
Upper range value Y2	10 V
Max. output voltage	≤ 12.5 V
Max. output current	≤ 40 mA
Load range	$2.5\ k\Omega \leq \underline{5\ k\Omega} < \infty$
Alternating component	0.5 %

Switching Output (Binary) (U1603)	
Switching element	semiconductor relay
Design	electrically isolated, passive
Number	4
Switching voltage	$\leq \pm 50$ V
Switching current ON OFF	 $\leq\ 200$ mA $\leq\ \ \ 10\ \mu A$
Volume resistance (AC/DC)	$5\ \Omega$

Switching Output (Relay) (U1603)	
Switching element	relay (changeover contact)
Design	electrically isolated
Number	2
Switching voltage	250 V~, 30 V=
Switching current	8 A resistive, 3 A inductive
Operating cycles	$\leq 10^5$

Power Supply For External Switching Contacts	
Voltage U_V (electrically isolated)	24 V =
Voltage tolerance	$\leq \pm 4\,\%$
Current (short-circuit and idling proof)	≤ 0.15 A
Alternating component (≤ 100 kHz)	$\leq 2\,\%$

RS 232 Interface (PC / Printer)

Number	2
Connectors	plug connector, sub miniature D9 plug
Possible connection to COM1/COM2:	PC, modem, terminal, printer, radio-controlled clock
Number of data bits	8
Transmission speed COM1/ COM2:	1200 … 115000 bit/s
Parity	even / no check
Operating Mode	FDX handshake Xon / Xoff or RTS / CTS

ECS LAN Interface (For Linking Summators) (RS 485)

Number	2
Connectors	threaded plug connector (up to 255 users)
Users per segment	16 (32 with loop resistance $< 100\ \Omega$)
Operating mode	multi-master, HDX or FDX
Data protocol	HDLC/SDLC (adapted to multi-master requirements)
4-wire, device to device 2-wire, bus	≤ 1200 m ≤ 100 m
Transmission (hamming distance = 4)	15.6 … 375 kbps
Status display	2 LEDs
Matching resistors	can be activated

LON Interface (for Connecting Meters)

Number	1 (FTT-10, twisted pair wires)
Connectors	threaded plug connector (up to 63 users per summator)
Operating mode	LonTalk protocol (CSMA)
Cable lengths	wiring as desired $\quad \leq 500$ m bus, terminated $\quad \leq 2700$ m with special cable
Transmission speed	78 kbps
Status display	1 LED, LON active
Bus termination	can be activated 50/100 Ω

Measurement Value Storage

Storage mode	continuous
Memory depth	with 2 channels: $\quad$ 65530 entries with 64 channels: $\quad$ 3966 entries
Memory life span	with backup battery ≥ 5 years (see also auxiliary power supply - backup battery)
Resetting of meters to zero	via PC

Time and Date Clock

Smallest unit of measure	1 s
Admissible deviation	10 ppm = 5.3 min per year

Functions Monitoring

Status display	with LED at front panel
Status relay	changeover contact
Switching voltage	250 V ~, 30 V =
Switching current	8 A resistive, 3 A inductive
Operating cycles	$\leq 10^5$

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Electromagnetie Compatibility

Product standard	EN 61326-1:1997/A1: 1998, industrial range	
Interference emission	EN 55022:1998 class A	
Interference immunity	EN 61000-4-2:1995	4 kV contact, 8 kV atmosphere Feature B
	EN 61000-4-3:1996+A1:1998	10 V/m Feature A
	EN 61000-4-4:1995	Feature B
	EN 61000-4-5:1995	mains cable: 1 kV sym., 2 kV asym. signal cable: 1 kV asymmetrical Feature A
	EN 61000-4-6:1996	3 V/m Feature B
	EN 61000-4-11:1994	Feature A

Transmission Behaviour

Accuracy class	(with reference to the upper range value)	
Analog input/output	0.25 % (U1603)	
Binry input/output	±1 pulse (U1603)	
Cycle time	analog meas. channels	≤ 2 ms
	LON 1 channel	≤ 1 s
	LON 64 channels	≤ 10 s

Influencing Quantities and Influence Error (U1603)

Influencing Quantity	Nominal Range of Use	Allowable Influence Error as Percentage of Accuracy Class
Temperature	10 °C ... 22 - 24 ... 40 °C	50%
	0 °C ... 22 - 24 ... 55 °C	100%
Output load	load range	20%
Auxiliary power	nominal range of use	10%

Resistance to Climatic Conditions

Relative humidity	75 %, no condensation allowed
Temperature range Operation/function Storage, transport	−10 °C ... +55 °C −25 °C ... +70 °C
Elevation	up to 2000 m

Electrical Safety

Protection class	I per EN 61 010-1:1993/A2:1995
Overvoltage category	III
Nominal isulation voltage: Input Output: analog, binary, Uv Output: relay Interfaces AC Auxiliary Power DC Auxiliary Power	50 V 30 V 250 V 50 V 265 V 80 V
Test voltages: Input - housing Input - output Auxiliary voltate - input Input - relay	0.5 kV 0.5 kV 3.7 kV 3.7 kV

Auxiliary Power Supply

Broad Range Input, AC - DC	
Nominal range of use, AC (45 ... 420 Hz)	85 V ... 264 V
Nominal range of use, DC	100 V ... 280 V
Power consumption	≤ 15 W (25 VA)
Fuse	2 A slow-blow
Direct Voltage Input (optional)	
Nominal range of use, DC	20 V ... 72 V
Power consumption	≤ 15 W
Fuse	2 A slow-blow
Backup Battery	
Lithium cell (replaceable without tools and without data loss)	CR 2450
Service life without auxiliary power at 20° C	≥ 5 years
Capacity loss after 5 years with auxiliary power at 20° C	≤ 15%

Mechanical Design

Housing material	aluminum sheet
Dimensions	212 x 125 x 85 mm
Installation position	as desired
Mounting	top-hat rail per EN 50022 / 35 mm, or screw-mounted to plate
Protection	housing: IP 40 terminals: IP 20
Weight	1.6 kg

All dimensions in mm

Figure 1   Dimensions

Electrical Connection

Signal Cables

Connectors	screw terminals
Admissible cross section for connector cable	2.5 mm^2

Auxiliary Voltage Cables

Connectors	screw terminals (L and N, or + and –)
Admissible cross section for connector cable	2.5 mm^2
Protective conductor	6.3 mm cable lug

Terminal Assignments U1602

Uv	LAN L		LAN R		LON		Status		$\updownarrow$ U$_H$ $\sim$	85...264V AC 45..420Hz AC / DC 20..72V DC
+24V	+ EA	+ E	+ EA	+ E	A	B			L N	
43 44	45 46	47 48	49 50	51 52	53	54	55 56 57		58 59 60	

Terminal Assignments U1603

	Analog / S0							Relay 1	Relay 2	
+ E1	+ E2	+ E3	+ E4	+ E5	+ E6			25 26 27	28 29 30	85...264V AC 45..420Hz AC / DC 20..72V DC
1 2	3 4	5 6	7 8	9 10	11 12					

Analog	S0		Uv	LAN L		LAN R		LON	Status	$\updownarrow$ U$_H$ $\sim$
+ A1 + A2	+ S1 + S2 + S3 + S4		+24V	+ EA + E		+ EA + E		A B		L N
31 32 33 34	35 36 37 38 39 40 41 42		43 44	45 46 47 48		49 50 51 52		53 54	55 56 57	58 59 60

Terminal	Function	Designation
1	input E1	+
2	input E1	–
3	input E2	+
4	input E2	–
5	input E3	+
6	input E3	–
7	input E4	+
8	input E4	–
9	input E5	+
10	input E5	–
11	input E6	+
12	input E6	–
25	relay 1	Ö
26	relay 1	W
27	relay 1	Sch
28	relay 2	Ö
29	relay 2	W
30	relay 2	Sch
31	analog output A1	+
32	analog output A1	–
33	analog output A2	+
34	analog output A2	–

Terminal	Function	Designation
35	binary output S1 (S0)	+
36	binary output S1 (S0)	–
37	binary output S2 (S0)	+
38	binary output S2 (S0)	–
39	binary output S3 (S0)	+
40	binary output S3 (S0)	–
41	binary output S4 (S0)	+
42	binary output S4 (S0)	–
43	power to ext. switching contacts	+ 24 V
44	power to ext. switching contacts	0 V
45	LAN Left	EA +
46	LAN Left	EA –
47	LAN Left	E +
48	LAN Left	E –
49	LAN Right	EA +
50	LAN Right	EA –
51	LAN Right	E +
52	LAN Right	E –
53	LON	A
54	LON	B
55	status relay	Ö
56	status relay	W
57	status relay	Sch
58	auxiliary power supply	L / +
59		
60	auxiliary power supply	N / –

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Meter Input and Output Configuration (U1603)

The analog inputs and outputs can be matched to the desired measuring range with the DIP switches. The respective upper limit value for any given range is configured with the help of the firmware.

COM1 Pin Assignments for Sub Miniature D9 Plug

Pin Number	Function
1	DCD
2	RXD
3	TXD
4	
5	signal-ground
6	
7	RTS
8	CTS
9	

COM2 Pin Assignments for Sub Miniature D9 Plug

Pin Number	Function
1	
2	RXD
3	TXD
4	
5	signal-ground
6	
7	RTS
8	CTS
9	

The cable with the designation Z5232 000 R0001 must be used for connecting a PC or a terminal.
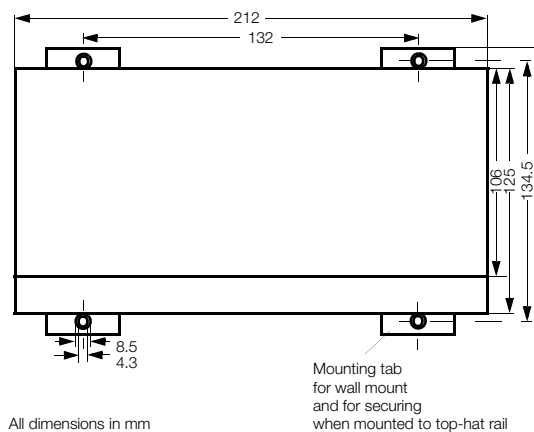
Micro and Mini-Summator Configuration

Communications and parameters configuration for the U1602 micro-summator and the
U1603 mini-summator are accomplished with ECSwin software.

Configuration of the U1602 micro-summator and the U1603 mini-summator is clearly structured.
Differentiation is made amongst five different parameters groups (see figure 2, setup parameters).

"General" parameters are used to configure the summator and are thus superordinate in nature, whereas the
"channel-specific" parameters are directly related to the individual channels.

The "RS 232" and "ECS LAN" parameter groups relate to the serial interface (RS 232) and the
ECS LAN system bus (Energy Control System local area network).
A six character password is used to protect individual parameters against unauthorized modification.
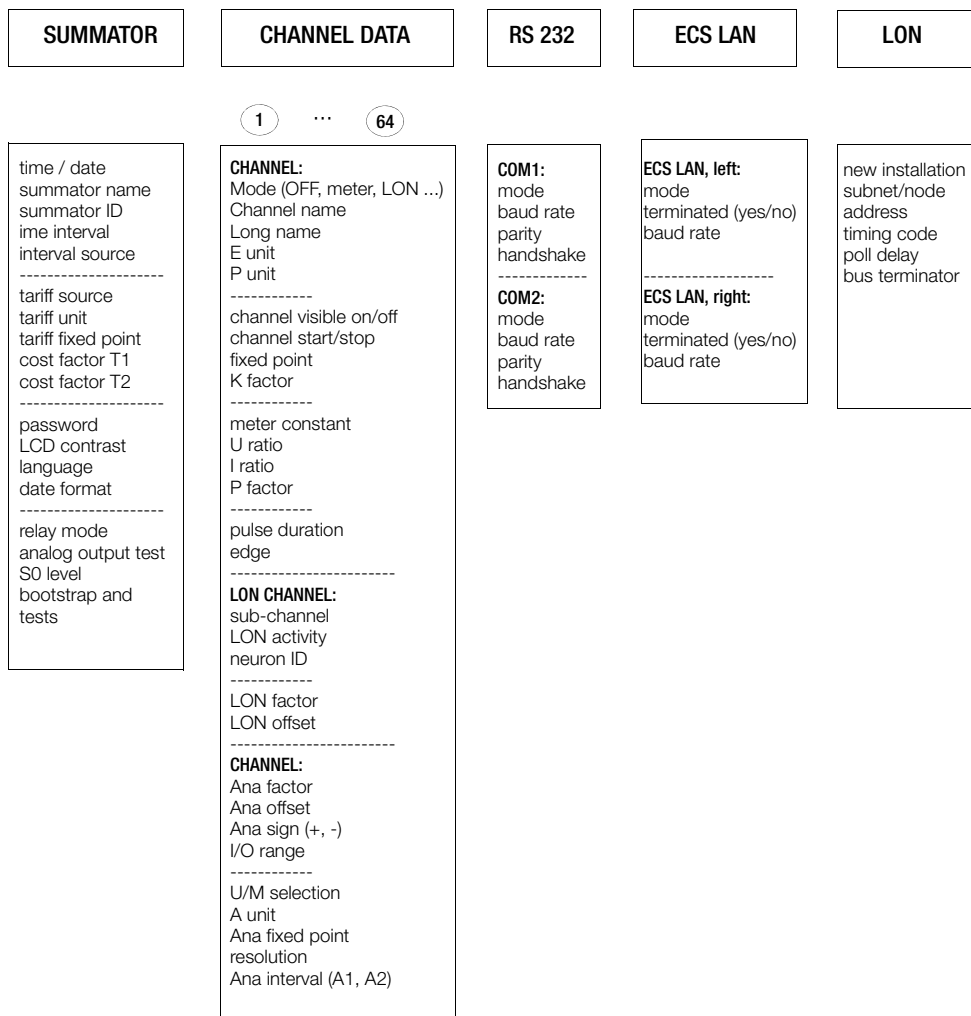
Basic Configuration

Setup Parameters Overview

SUMMATOR	CHANNEL DATA	RS 232	ECS LAN	LON

CHANNEL DATA: ① ⋯ ⑥④

SUMMATOR

time / date
summator name
summator ID
ime interval
interval source
----
tariff source
tariff unit
tariff fixed point
cost factor T1
cost factor T2
----
password
LCD contrast
language
date format
----
relay mode
analog output test
S0 level
bootstrap and
tests

CHANNEL DATA

CHANNEL:
Mode (OFF, meter, LON ...)
Channel name
Long name
E unit
P unit
----
channel visible on/off
channel start/stop
fixed point
K factor
----
meter constant
U ratio
I ratio
P factor
----
pulse duration
edge

LON CHANNEL:
sub-channel
LON activity
neuron ID

LON factor
LON offset

CHANNEL:
Ana factor
Ana offset
Ana sign (+, -)
I/O range

U/M selection
A unit
Ana fixed point
resolution
Ana interval (A1, A2)

RS 232

COM1:
mode
baud rate
parity
handshake

COM2:
mode
baud rate
parity
handshake

ECS LAN

ECS LAN, left:
mode
terminated (yes/no)
baud rate

ECS LAN, right:
mode
terminated (yes/no)
baud rate

LON

new installation
subnet/node
address
timing code
poll delay
bus terminator

Figure 2   Setup Parameters

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Order Information

The following applies to order designations:
- only one designation may be chosen for each given letter.
- if only zeros follow the capital letter in the designation, it need not be included in the order.

Feature		Designation				
U1602 Micro-Summator	with bus termination, serial interface and LON interface	U 1602				
U1603 Mini-Summator	with bus termination, serial interface and 6 universal inputs, LON interface	U 1603				
Auxiliary Power	AC + DC nominal range of use: 85 V ... 264 V DC nominal range of use: 20 V ... 72 V	H1 H2				
Operating Instructions and Commands Reference	German English	W1 W2				

Order Example

Either the feature or the designation can be included in the order.

Feature (clear text)		Designation				
U1603 Summator	with bus termination, serial interface and 6 universal inputs, LON interface	U 1603				
Auxiliary Power	DC nominal range of use: 20 V ... 72 V	H2				
Operating Instructions and Commands Reference	English	W2				

Accessories

Feature		Designation			
Connector Cable	for PC or terminal	GTZ 5232 000 R0001			