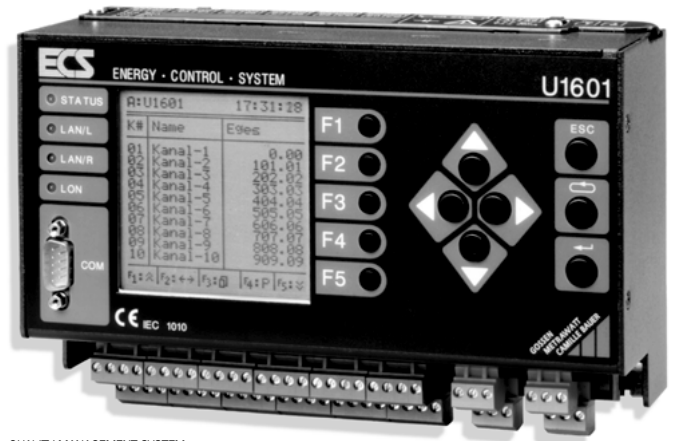


U1601

ECS ENERGY • CONTROL • SYSTEM

3-348-844-03
4/8.05

- **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
- **12 universal inputs:** ± 5 mA, ± 20 mA, ± 10 V, S0 pulse
- **LON interface** for 63 LON devices
- **2 analog outputs:** ± 20 mA or ± 10 V
- **2 relays and 4 MOS switches** for the control of external processes
- **2 RS232 interfaces (115 kBit/s)**
for the connection of PC, modem, printer or radio-controlled clock
- **2 ECS LAN interfaces**
for the interconnection of individual summators over large distances
- **Simple software updates via serial interface (Flash)**



QUALITY MANAGEMENT SYSTEM



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



Applications

The U1601 summator expands the **Energy Control System (ECS)** to include the processing of analog values and simplifies the inter-connection of energy meters via the LON bus. All electrical and non-electrical energy and energy consumption can thus be logged, visualized, optimized and billed to individual cost centers.

Signal and Meter Inputs

A maximum of twelve analog or pulse-shaped signals can be fed into the summator, which originate from, for example, flow meters, energy meters and heat meters. Power supply to the pulse outputs is accomplished with an integrated 24 VDC auxiliary voltage supply.

Furthermore, up to 63 LON devices can be connected to the U1601 summator with the easy-to-wire, polarity-reversal-protected, electrically isolated LON interface:

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

Analysis

64 processing channels calculate work, power or consumption with the above-mentioned, freely assignable physical inputs. These values are summated over a defined period of time at a programmed interval, and are stored together with the corresponding maximum values.

Operation

Two electrically isolated analog outputs, four MOS switches and two relays (changeover contacts) are available for the control of external processes, which can be operated either directly via the user-specific summator background program, or via the interface at the PC. Data exchange with the PC, or remote query via modem, is accomplished with the high-speed RS232 interface (115 kBit/s). A radio-controlled clock can also be connected for system time synchronization, as well as a report printer.

Networking

Individual summators can be interconnected over large distances with the multi-master-compatible **ECS LAN** and thus have unrestricted access to all network user data.

Universal Application

Thanks to integrated high-level intelligence and the system-specific programming language, Energy Control Language (ECL), the U1601 summator is also suitable for applications outside of the Energy Control System. These include the monitoring of distant systems and machines, as well as support for service calls and maintenance work with remote querying via modem.

Variable Installation

The compact housing and the protection type have been designed for rugged industrial use, and allow for mounting to a top-hat rail in accordance with EN 50022. It can also be wall mounted with screws or integrated into the control panel. Easy installation is facilitated through the use of plug-in screw terminals.

Applicable Regulations and Standards

EN 61010-1	Safety regulations for electrical measuring, control, and laboratory devices
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 procedures 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	Measured quantity upper range value
Y	Output quantity, analog output
Y2	Output quantity upper range value

Memory Capacities per Channel

Energy

Cumulative Energy as of a Defined Starting Point	
E total	independent of tariff
E total T1	from tariff 1 only
E total T2	from tariff 2 only
E total T1T2	from tariff 1 + tariff 2
Cumulative Energy for Defined Time Periods	
E Day	for the current day and each of the last 10 days
E Month	for the current month and each of the last 12 months
E Year	for the current year and each of the last 4 years
E int	for all stored measuring intervals (measurement data list)
Measuring Interval Maximum Values with Date and Time	
E maxint	the 10 highest values for all measuring intervals as of a defined starting point
E maxDay	respective daily peak values for the current day and the last 10 days
E maxMonth	respective daily peak values for the current month and the last 12 months
E maxYear	peak value for the current year, and peak values for the last 4 years

Costs

Cumulative Costs as of a Defined Starting Point	
CostT1	from tariff 1 only
CostT2	from tariff 2 only
CostT1T2	from tariff 1 + tariff 2

Power

Instantaneous Value	
P inst	determined by means of the time interval between the last two meter pulses (when connected to E1 ... E12)
Measuring Interval Mean Values	
P int	for all stored measuring intervals (measurement data list)
Measuring Interval Maximum Values with Date and Time	
P maxint	the 10 highest values for all measuring intervals as of a defined starting point
P maxDay	respective daily peak values for the current day and the last 10 days
P maxMonth	respective daily peak values for the current month and the last 12 months
P maxYear	peak value for the current year, and peak values for the last 4 years

Technical Data

Inputs

The 12 inputs can be individually configured with 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	75 Ω 300 Ω
X2: 20 mA X2: 5 mA	
Common mode rejection	$\geq 80 \text{ dB } (\leq 120 \text{ Hz})$

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	$\leq 30 \text{ V}$
Control limit	$\pm 1.25 X2$
Input resistance	118 k Ω
Common mode rejection	$\geq 80 \text{ dB } (\leq 120 \text{ Hz})$

Binary Input	
Input quantity	Direct voltage (square-wave pulse, SO compatible)
Design	electrically isolated
Operating point (adjustable)	Signal level: L: 0.5/1.25/2.5/3.5 mA
Max. input voltage permanent short-term ($t \leq 1$ s)	≤ 48 V ≤ 60 V
Series resistance (internal)	4.7 k Ω
Admissible switching elements	Semiconductor switching device, relay
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 individually configured with DIP switches

Analog Output (Current)	
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	$0 \leq 250 \Omega \leq 400 \Omega$

Analog Output (Voltage)	
Output quantity	direct current
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	$2.5 \text{ k}\Omega \leq 5 \text{ k}\Omega < \infty$
Ripple content	0.5 %

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

Switching Output (Relay)	
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 to External Switching Contacts	
Voltage U_y (electrically isolated)	24 V =
Voltage tolerance	$\leq \pm 4$ %
Current (short-circuit and idling-proof)	≤ 0.15 A
Ripple content (≤ 100 kHz)	≤ 2 %

RS 232 Interface (PC / Printer)

Number	2
Connectors	plug connector, sub miniature D9 plug
Possible Connections 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 (Summator Interconnection) (RS 485)

Number	2
Connectors	plug connector with screw terminals (up to 255 users)
Users per segment	16 (32 at 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	≤ 1200 m
2-wire, bus	≤ 100 m
Transmission speed (hamming distance = 4)	15.6 ... 375 kbps
Status display	2 LEDs
Matching resistor	can be activated

LON Interface (Connection of Meters)

Number	1 (FTT-10, twisted 2-conductor cable)
Connectors	plug connector with screw terminal (up to 63 users per station)
Operating mode	LonTalk protocol (CSMA)
Cable lengths	wiring as desired ≤ 500 m bus, terminated ≤ 2700 m with special cable
Transmission speed	78 kbps
Status display	1 LED, LON active
Bus terminating element	can be activated; 50/100 Ω

Display

Display element	graphic LCD, 128 x 128 (illuminated)
Format	21 characters, 16 lines

Measurement Value Storage

Storage method	consecutive
Memory depth	with 2 channels 65530 entries with 64 channels 10560 entries
Memory life span	with back-up battery ≥ 5 years (see also auxiliary power supply – back-up battery)
Resetting of Meters to Zero	via PC or device keyboard

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Time Generator for Date and Clock

Smallest unit of time	1 s
Admissible deviation	10 ppm = 5.3 min/year

Functions Monitoring

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

Electromagnetic 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 kontakt, 8 kV atmosphere
	EN 61000-4-3:1996+A1:1998	10 V/m
	EN 61000-4-4:1995	Feature A
	EN 61000-4-5:1995	Feature B mains cable: 1 kV sym., 2 kV asym. signal cable: 1 kV asymmetrical
	EN 61000-4-6:1996	Feature A 3 V/m
EN 61000-4-11:1994	Feature B Feature A	

Transmission behaviour

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

Influencing Quantities and Influence Errors

Influencing Quantity	Nominal Range of Use	Admissible 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 voltage	nominal range of use	10%

Resistance to Climatic Conditions

Relative humidity	75%, no condensation allowed
Temperature range	Operation/function
	Storage, transport
Elevation	up to 2000 m

Electrical Safety

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

Auxiliary Power Supply

Wide-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
Back-Up Battery	
Lithium cell (replaceable without tools and without data loss)	CR 2450
Service life without auxiliary voltage at 20 °C	≥ 5 years
Capacity loss after 5 years with auxiliary voltage at 20 °C	$\leq 15\%$

Mechanical Design

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

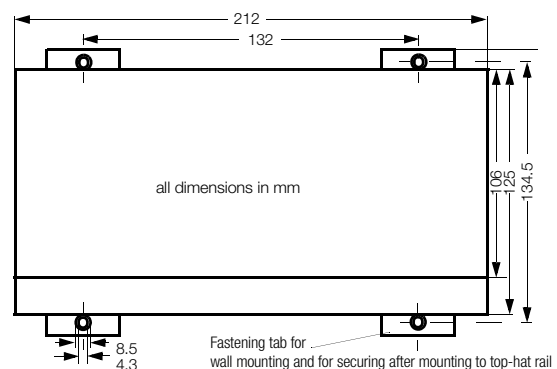


Figure 1 Dimensions

Electrical Connection


Signal Cables

Connectors	screw terminals
Admissible connector cable cross section	2.5 mm ²

Auxiliary Voltage Cables

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

Terminal Assignments

⊖ Analog / S0																								Relay 1			Relay 2			 85...264V AC 45...420Hz AC / DC 20...72V DC
+E1	+E2	+E3	+E4	+E5	+E6	+E7	+E8	+E9	+E10	+E11	+E12	⎓			⎓															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
⊕ Analog						⊖ S0						Uv		LAN L		LAN R		LON		Status			U _H ~							
+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	-
13	input E7	+
14	input E7	-
15	input E8	+
16	input E8	-
17	input E9	+
18	input E9	-
19	input E10	+
20	input E10	-
21	input E11	+
22	input E11	-
23	input E12	+
24	input E12	-
25	relay 1	Ö
26	relay 1	W
27	relay 1	Sch
28	relay 2	Ö
29	relay 2	W
30	relay 2	Sch

Terminal	Function	Designation
31	output A1 analog	+
32	output A1 analog	-
33	output A2 analog	+
34	output A2 analog	-
35	output S1 binary (S0)	+
36	output S1 binary (S0)	-
37	output S2 binary (S0)	+
38	output S2 binary (S0)	-
39	output S3 binary (S0)	+
40	output S3 binary (S0)	-
41	output S4 binary (S0)	+
42	output S4 binary (S0)	-
43	supply to ext. switching contacts	+ 24 V
44	supply 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/-

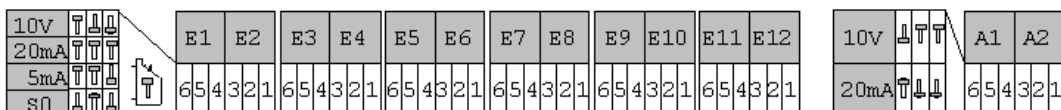
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Meter Input and Output Configuration

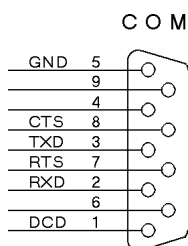
The analog inputs and outputs can be adapted to the desired measuring range with DIP switches .

Parameter settings for the respective upper range limits are accomplished with the firmware.



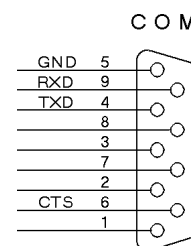
COM1 Pin Assignments for Sub Miniature D9 Plug

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	
3	
4	TXD
5	signal ground
6	CTS
7	
8	
9	RXD



The cable with the designation Z5232 000 R0001 must be used for the connection of a PC or a terminal.

Summator Configuration

Configuration of the U1601 summator is clearly structured. Distinction is made between 5 different configuration groups (see figure 2, SETUP PARAMETERS).

The “general” parameters apply to all of the summators, and are thus superordinate in nature, whereas the “channel specific” parameters are directly associated with each individual channel.

The configuration groups “RS 232” and “ECS LAN” apply to the serial interface (RS 232) and the ECS LAN system bus (Energy Control System Local Area Network).

A six character password protects the individual parameters against unauthorized modification.

Basic Configuration

Setup Parameters

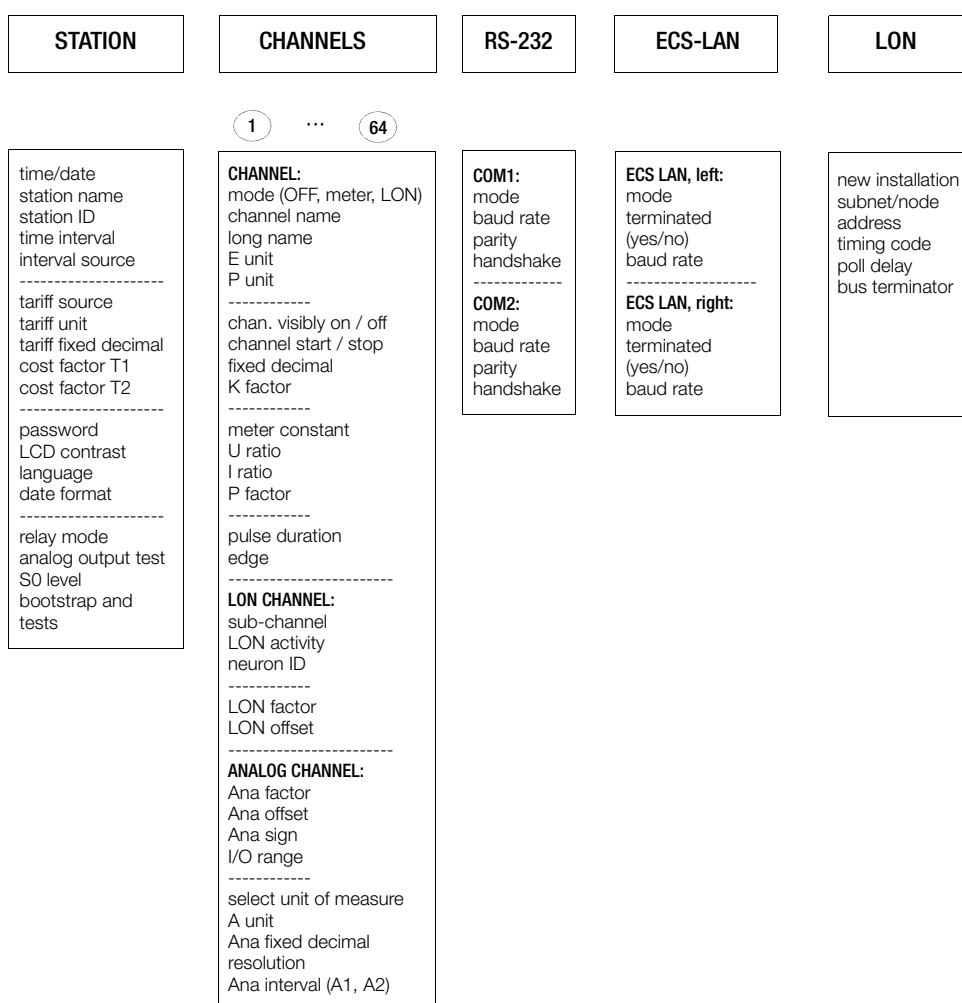


Figure 2 Setup Parameters

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Order Information

The following applies to the selection of order numbers:

- only one designation with the same given letter may be selected
- if the capital letter in the designation is followed by zeros only, the designation need not be included in the order

Description	Designation				
U1601 Summator with bus connector, serial interface and 12 universal inputs, LON interface	U 1601				
Auxiliary Voltage 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 Register German English	W1 W2				

Order Example

Either the description or the designation can be entered into the order.

Description (plain text)	Designation				
U1601 Summator with bus connector, serial interface and 12 universal inputs, LON interface	U 1601				
Auxiliary Voltage DC nominal range of use 20 V ... 72 V	H2				
Operating Instructions and Commands Register English	W2				

Accessories

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

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