2.2.1 Brief description

The basic unit 07 KT 98 works either as

- bus master in the decentralized automation system Advant Controller 31 or as
- slave (remote processor) in the decentralized automation system Advant Controller 31 or as
- stand-alone basic unit.

The basic unit is powered by 24 V DC.

2.2.1.1 Main features

- 24 digital inputs with LED displays
- 16 digital transistor outputs with LED displays
- 8 digital inputs/outputs with LED displays
- 8 **individually configurable** analog inputs 0...10 V, 0...5 V, ±10 V, ±5 V, 0...20 mA, 4...20 mA, differential inputs, Pt100 (2-wire or 3-wire), the analog inputs are also individually configurable as digital inputs
- 4 **individually configurable** analog outputs ±10 V, 0...20 mA, 4...20 mA
- 2 counters for counting frequencies up to 50 kHz, configurable in 7 different operating modes
- 1 CS31 system bus interface for system expansion
- 1 interface for connecting communication modules (e.g. 07 KP 90)
- 2 serial interfaces COM1, COM2
  – as MODBUS interfaces and
  – for programming and test functions
  – as freely programmable interfaces
- Real-time clock
- LEDs for displaying operating conditions and error messages
- Detachable screw-type terminal blocks
- Fastening by screws or by snapping the device onto a DIN rail
- The lithium battery 07 LE 90 can be put into the battery compartment in order to
  – store and backup data which is additionally contained in the RAM, e.g. the status of flags (RETAIN)
  – backup the time and date (real-time clock)
- RUN/STOP switch for starting and aborting the program execution
- Extensive diagnosis functions
  – self-diagnosis of the basic unit
  – diagnosis of the CS31 system bus and the connected modules
- Integrated Flash EPROM for storing program and data
- Exchangeable SmartMedia Card 07 MC 90 for user data or for updating the operating system or PLC program

2.2.1.2 Project planning / start-up

The following has to be observed for project planning and start-up:

- Programming
  is performed with AC31 programming software, which can be run on commercially available IBM compatible PCs (see documentation of the programming system 907 AC 1131).
- Online program modification
  A quick modification of the user program is possible without interrupting the operation (see programming system 907 AC 1131).
- Possible operating modes
  – Stand-alone basic unit
  – Bus master basic unit
  – Slave basic unit
- Backup of data areas,
  i.e. saving of data during power OFF/ON, is possible with an integrated battery and/or

  by storing them in the Flash EPROM.
- When using the PROFIBUS DP interface, project planning is performed in the same way as with 07 KT 97. For details see chapter "System Description".

2.2.7 Technical Data 07 KT 98

In general, the technical system data listed under ”System data and system configuration” in chapter 1 of volume 2 of the Advant Controller 31 system description are valid. Additional data or data which are different from the system data are listed as follows.

2.2.7.1 General data

Number of digital inputs		24
Number of digital transistor outputs		16
Number of digital inputs/outputs		8
Number of analog inputs		8
Number of analog outputs		4
I/O expansion via CS31 system bus by up to		992 digital inputs 992 digital outputs 224 analog input channels 224 analog output channels max. 31 remote modules altogether
Number of serial interfaces		2 (for programming or connection to man-machine communication)
Number of parallel interfaces		1 special interface for connection of a communication processor (for networking with other bus systems)
Integrated memory	Flash EPROM	1 MB program + 128 kB user data
	SRAM	256 kB RETAIN
	DRAM	1 MB program + 1 MB user data
Resolution of the integrated real-time clock		1 second
Data of the integrated high-speed hardware counter		
Number of operating modes		7
Counting range		-32768...+32767 (16 bits signed integer)
Counting frequency		max. 50 kHz
Processing time, 65 % bits, 35 % words		typ. 0.07 ms/kB program
Number of software timers		any
delay time of the timers		1 ms...24.8 days
Number of up/down counter software blocks		any
Number of bit flags	in the addressable flag area	8192
Number of word flags	"	8192
Number of double word flags	"	1024
Number of step chains	"	256
Number of constants KW	"	1440
Number of constants KD	"	384
Indication of operating statuses and errors		60 LEDs altogether
Wiring method		removable screw-type terminal blocks
Power supply, CS31 system bus		max. 1 x 2.5 mm^2 or max. 2 x 1.5 mm^2 (see also page 2.2-9)
all other terminals		max. 1 x 1.5 mm^2

2.2.7.2 Power supply

Rated supply voltage	24 V DC
Current consumption	max. 0.55 A
Protection against reversed polarity	yes

2.2.7.3 Lithium battery

Battery for backup of RAM contents	Battery module 07 LE 90
Lifetime at 25°C	typ. 5 years

2.2.7.4 Digital inputs

Number of channels per module	24
Distribution of channels into groups	3 groups of 8 channels each
Common reference potential	
for group 1 (8 channels)	ZP0 (channels 62,00...62,07)
for group 2 (8 channels)	ZP1 (channels 62,08...62,15)
for group 3 (8 channels)	ZP2 (channels 63,08...63,15)
Electrical isolation	between the groups, between groups and other circuitry (see also Fig. 2.2–4)
Signal coupling of input signals	with optocoupler
Configuration possibilities of the inputs	
Input signal delay	typ. 7 ms (configurable to 1 ms)
Channels E 62,00 and 62,01	configurable for the high-speed counter
Signalling of input statuses	one green LED per channel, the LEDs correspond functionally to the input signals
Input signal voltage	
Signal 0	-30 V...+ 5 V
Signal 1	+13 V...+ 30 V
Input current per channel	
Input voltage = +24 V	typ. 7.0 mA
Input voltage = + 5 V	> 0.2 mA
Input voltage = +13 V	> 2.0 mA
Input voltage = +30 V	< 9.0 mA
Max. cable length, unshielded	600 m
Max. cable length, shielded	1000 m

2.2.7.5 Digital outputs

Number of channels per module	16 transistor outputs
Distribution of channels into groups	2 groups of 8 channels each
Common supply voltage	
for group 1	UP3 (channels 62,00...62,07)
for group 2	UP4 (channels 62,08...62,15)
Electrical isolation	between the groups, between groups and other circuitry (see also Fig. 2.2–4)
Signalling of output statuses	one yellow LED per channel, the LEDs correspond functionally to the output signals
Output current	
Rated value	500 mA with UP3/4 = 24 V
Maximum value	625 mA with UP3/4 = 24 V + 25%
Leakage current with signal 0	< 0.5 mA
Demagnitization of inductive loads	internally with a varistor
Switching frequency with inductive loads	max. 0.5 Hz
Switching frequency with lamp loads	max. 11 Hz with max. 5 W

Max. cable length	400 m (pay attention to voltage drops)
Short-circuit proof / overload proof	yes
Protection of the outputs against reversed polarity	yes
Forcing of 24 V DC at the outputs possible	yes
Total load (via UP3 or UP4)	max. 4 A

2.2.7.6 Digital inputs/outputs

Number of channels per module	8 inputs/outputs
Distribution of channels into groups	1 group with 8 channels
Common reference potential Common voltage supply	ZP5 (channels E/A 63,00...E/A 63,07) UP5 (channels E/A 63,00...E/A 63,07)
Electrical isolation	between the group and other circuitry (see Fig. 2.2-4)
Signal coupling of the input signals	with optocoupler
Configuration possibilities of the inputs Input signal delay, channels E 63,00...E 63,07	 typ. 7 ms (configurable to 1 ms)
Signalling of input/output statuses	one yellow LED per channel, the LEDs correspond functionally to the I/O signals
Input signal voltage (if used as inputs)	for details see Fig. 2.2-13 as well as the chapter "Circuit configuration of the digital inputs/outputs"
Signal 0 Signal 1	-6 V...+ 5 V +13 V...+ 30 V
Input current per channel	see Digital inputs
Output current / switching frequency / inductive loads	see Digital outputs
Max. cable length	see Digital inputs/outputs

2.2.7.7 Analog inputs

Number of channels per module		8
Distribution of channels into groups		1 group with 8 channels
Common reference potential for group 1 (8 channels)		 AGND1 (channels 06,00...06,07)
Electrical isolation		none (see also Fig. 2.2–4).
Max. permissible potential difference between Terminal M (minus pole of the power supply voltage) and terminal AGND (analog I/O minus pole)		± 1 V
Signalling of input statuses		none
Configuration possibilities (each channel), see 2.2.4.7		0...10 V, 0...5 V, ±10 V, ±5 V (also with differential signal) 0...20 mA, 4...20 mA Pt100 -50...+400°C and -50...+70°C (2-wire and 3-wire configuration) digital input
Input impedance per channel,	voltage input current input digital input	> 100 kΩ ca. 330 Ω ca. 4 kΩ

The current input has a self-protecting mechanism. If the input current gets too high, the shunt is switched off and the value for range overflow is generated. About every second, the unit tries to switch on the shunt again. In this way the correct measurement will succeed after the current has reached a normal value again.

Time constant of the input filter	470 µs with voltage, 100 µs with current
Conversion cycle of current and voltage channels	Each configured input channel (U, I, Pt100) increases the conversion cycle of the U/I channels by typ. 1 ms.
Conversion cycle (by filtering time) of Pt100 channels	Each configured input channel (U, I, Pt100) increases the conversion cycle of the Pt100 channels by typ. 50 ms.
Conversion cycle of unused input channels	Input channels configured as "unused" are skipped, i.e. they do not need any conversion time.

Examples for the conversion cycle

Example No.	1	2	3	4	5	6
Channels configured for U/I	1	8 *	-	-	2	4
Channels configured for Pt100	-	-	4	8	2	4
Channels configured as "unused"	7	-	4	-	4	-
Conversion cycle of U/I channels	1 ms	8 ms	-	-	4 ms	8 ms
Conversion cycle of Pt100 channels	-	-	200 ms	400 ms	200 ms	400 ms

* Factory setting

Resolution in bits	ranges ±10 V, 0...10 V	11 bits plus sign
	ranges ±5 V, 0...5 V	10 bits plus sign
	ranges 0...20 mA, 4...20 mA	12 bits without sign
	range -50 °C...+70 °C	10 bits plus sign
	range -50 °C...+400 °C	11 bits plus sign
Resolution in mV, µA	range ±10 V	ca. 5 mV
	range 0...10 V	ca. 5 mV
	range 0...20 mA	ca. 5 µA
	range 4...20 mA	ca. 4 µA

Relationship between input signal and hex code: -100 %...0...+100 % = 8008_H...0000_H...$7FF8_H$ (-32760...0...32760 decimal)

Conversion inaccuracy caused by non-linearity, temperature sensitivity, ageing, adjustment error on delivery and resolution:

U, I	typ. 0.5 %, max. 1 %
Pt100	typ. 1 °C, max. 2 °C

Threshold, if analog input is configured as digital input: ca. 7 V

Max. cable length, 2-core shielded and cross section ≥ 0,5 mm²: 100 m

2.2.7.8 Analog outputs

Number of channels per module	4
Reference potential	AGND2 (channels 06,00...06,03)
Electrical isolation	none (see also Fig. 2.2–4).
Max. permissible potential difference between Terminal M (minus pole of the power supply voltage) and terminal AGND (analog I/O minus pole)	± 1 V

Signalling of output statuses	none
Output signal ranges (configurable)	-10 V...0...+10 V 0...20 mA 4...20 mA
Output load capability of the voltage outputs	max. ±3 mA
Resolution	12 bits
Resolution (1 LSB), range –10 V...0...+10 V	5 mV
Relationship between output signal and hex code	-100 %...0...+100 % = 8008_H...0000_H...$7FF8_H$ (-32760...0...32760 decimal)
Conversion cycle for outputs	typ. 1 ms for each configured output channel
Conversion inaccuracy caused by non-linearity, temperature sensitivity, ageing, adjustment error on delivery and resolution	typ. 0.5 %, max. 1 %
Max. cable length, 2-core shielded and cross section ≥ 0,5 mm^2	100 m

2.2.7.9 Connection of serial interfaces COM1 and COM2

Interface standard	EIA RS-232
Programming with 907 AC 1131	with IBM PC (or compatible)
Program modifications with 907 AC 1131	with IBM PC (or compatible)
Man-machine communication	yes, e.g. with an operating station
Electrical isolation	versus digital inputs and outputs, versus CS31 system bus interface (see also Fig. 2.2–4)
Potential differences	In order to avoid potential differences between the 07 KT 98 basic unit and the peripheral devices connected to the COM1/COM2 interfaces, these devices are supplied from the switch-gear cabinet socket (see also the earthing connections in Fig. 2.2-5).
Pin configuration and description of the COM1/COM2 interfaces	see chapters 2.2.4.10 and 2.2.4.11

2.2.7.10 Connection to the CS31 system bus

Interface standard	EIA RS-485
Connection as a Master PLC as a Slave PLC	yes, transmitting and receiving areas are configurable yes, see ”System constants”
Setting of the CS31 module address	yes, by system constant, stored in Flash EPROM of the Slave PLC
Electrical isolation	versus supply voltage, inputs and outputs, versus interfaces COM1/COM2 (see also Fig. 2.2-4)
Terminal assignment and description of the CS31 bus interface	see chapter 2.2.4.3